

*Appendix M – The Kuchel Act and
Management of Lower Klamath and
Tule Lake National Wildlife Refuges*

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The Kuchel Act and Management of Lower Klamath and Tule Lake National Wildlife Refuges

U.S. Fish and Wildlife Service
Klamath Basin National Wildlife Refuges
Tulelake, California

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Executive Summary

The Klamath Reclamation Project (Project), initiated in 1905, sought to drain the historic lakes and marshes of the Upper Klamath Basin for the purpose of creating dry land suitable for agricultural development. In the midst of Project development, Lower Klamath and Tule Lake National Wildlife Refuges (NWRs) were established by Executive orders in 1908 and 1928, respectively; however, these lands retained their prior withdrawal for reclamation purposes. Thus was born the conflicting expectations for land management within the Klamath Project. As the lakes and marshes within the Project were drained, lands were passed to private ownership through the homesteading process, ultimately leading, in the 1950s, to proposals to homestead portions of Tule Lake and Lower Klamath NWRs. After nearly a decade of debate, the Kuchel Act (Public Law 88-567, 16 U.S.C. 695k-r) was enacted in 1964. The legislation dedicated the lands within the boundaries of Tule Lake and Lower Klamath NWRs to wildlife conservation for the major purpose of waterfowl management and placed the lands permanently in ownership by the United States. Agricultural leasing that is consistent with proper waterfowl management would continue. The mandate of continuing an agricultural leasing program consistent with “proper waterfowl management” on two national wildlife refuges complicates traditional refuge management. Various persons or entities interpret some portions of the Kuchel Act differently.

In 1997, Congress amended the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee) with passage of the National Wildlife Refuge System Improvement Act (Pub. L. 105-57). This Act requires the development of comprehensive conservation plans (CCPs) for each refuge in the National Wildlife Refuge System (NWR System). These CCPs are to guide refuge management for a 15-year period. Refuge CCPs are to consider the mission and policies of the Refuge System; however, the establishing EO’s and legislated refuge purposes, such as the Kuchel Act take precedence. During the CCP process, the U.S. Fish and Wildlife Service (Service) is required to evaluate all aspects of refuge management and prepare alternatives for evaluation and public review. Prior to developing alternatives, the Service needs to articulate its interpretation of the Kuchel Act in a manner consistent with the Act’s language and Congress’ intent, and determine how implementation of the Kuchel Act will be integrated with mandates from the 1997 Improvement Act. Proper interpretation of legal mandates guiding refuge management is key to developing management alternatives during the CCP process as well as a framework from which to conduct future management planning.

This document is divided into nine chapters. Chapter I introduces the reader to a summarized history of Lower Klamath and Tule Lake NWRs, including their relationship to the Klamath Reclamation Project. Chapter II describes the legal directives pertinent to the refuges with an emphasis on refuge purposes derived from the Kuchel Act. In reviewing language in the Kuchel Act and congressional testimony, it is clear that the intent of the Act was to provide for proper waterfowl management as the major purpose of the refuges and if consistent with proper waterfowl management to continue the refuge leased land farming program in specific areas of the refuges to benefit the waterfowl resource as well as adjacent counties and the local farm economy. Other areas of the refuges were also to be managed for the primary purpose of waterfowl management, but with greater flexibility in management, and to serve a wider array of wildlife values.

Chapters III, IV, and V define key terms within the Kuchel Act, including those terms related to wildlife conservation (with an emphasis on “proper waterfowl management”) and those terms related to agriculture. Most importantly, these chapters also describe how the Service interprets and prioritizes these terms and integrates them with other Refuge System legal mandates and policies. In terms of the refuge leased land program, the Service will integrate the program into the overall habitat management planning process such that these lands serve a designated function in meeting refuge-wide wildlife population objectives, with an emphasis on migratory waterfowl. Refuge leased land contracts will be structured to achieve this function.

Chapters VI, VII, and VIII... Chapter VI provides a historical context for how waterfowl use of both refuges have responded to habitat management programs under the Kuchel Act. This comparison of waterfowl use between the 1970s and 1990s indicates that Tule Lake NWR, in particular, has experienced significant declines in some waterfowl guilds. Chapter VII introduces new migratory waterfowl population objectives and, using a bioenergetics model, assesses the ability of current habitat management programs to support these objectives. This analysis indicates that shortages in foraging resources for waterfowl are evident on both refuges, and especially on Tule Lake NWR. Chapter VIII provides a document summary and a series of recommendations for future refuge management.

Chapter I Introduction

"We cruised over a large part of the lake, and found that the large rookeries of cormorants, grebes, white pelicans, great blue herons, California gulls and Caspian terns form one of the most extensive bird colonies we have ever seen. Doubtless this locality has never been disturbed to any extent by Man. This is the great breeding ground of that whole region."

(William Finley at Lower Klamath Lake, 1905)



Breakfast in the tules. Bohman in the boat, Finley on the box.

The Klamath Basin of northern California and southern Oregon historically contained over 350,000 acres of wetlands (Akins 1970) with Tule Lake and Lower Klamath Lake being two of the largest lake and marsh habitats (Fig. 1). According to the summary presented in Weddell et al. (1998) and writings by early 19th century naturalist William Finley, wildlife populations were extensive. However, despite the presence of these significant wildlife resources in the historic lakes and marshes, the potential for agricultural development was soon realized and pursued by early Euro-American settlers to the area.

Lower Klamath and Tule Lakes were originally acquired from the United States by Oregon and California under the Swamp and Overflowed Lands Act of 1850 (9 Stat. 519, September 28, 1850, 43 U.S. C. 971-994). Privately financed irrigation in the Klamath Basin began in 1882; by 1903, it had expanded to over 10,000 acres (Weddell et al. 1998). In 1902, the Reclamation Act (Public Law 57-161, 43 U.S.C. 391 et seq.) was passed, which authorized the establishment of Federal irrigation projects across the arid and semi-arid West. In 1905, California and Oregon passed legislation ceding the lands underlying Tule and Lower Klamath Lakes back to the United States for reclamation purposes, and the United States then withdrew these lands from entry by private individuals. Prior to this withdrawal, about 20,000 acres of Lower Klamath Lake marshes had been patented to individuals (Weddell et al. 1998). In May of 1905, the Klamath

Reclamation Project (Project) was authorized; by 1907, the first irrigation deliveries through Project facilities began. The first announcement opening reclaimed lands to homesteading was made in 1908.

One of the principal activities of the Project was to lower the levels of Tule and Lower Klamath Lakes. For Tule Lake, this was accomplished by withholding and diverting the Lost River from reaching its historic destination in Tule Lake. Lower Klamath Lake was reduced in size by severing its connection to the Klamath River. With the shutoff of water to Tule and Lower Klamath Lakes, the lake beds became exposed and dried, allowing their use for farming. From 1922 to 1948, most of the exposed Tule Lake bed passed to private ownership through the homesteading process (Abney 1964).

Lower Klamath and Tule Lake National Wildlife Refuges (NWRs) were established after initiation of the Project. Both refuges are within the Project (Fig. 1) and exist on lands that were previously withdrawn for reclamation purposes. The Federal Executive Orders that established these refuges provided that the lands retained prior withdrawal for reclamation purposes. Lower Klamath NWR was established on August 8, 1908, by Executive Order (EO) 924, "...as a preserve and breeding ground for native birds." Lower Klamath NWR was established primarily to protect waterfowl and colonial nesting waterbirds from the market hunting that occurred early in the 20th century.

In the midst of Project development, Tule Lake NWR was established by EO 4975 on October 4, 1928, "...as a refuge and breeding ground for birds." Biologically, the refuge was established for several reasons. First, it was necessary to control the high level of essentially unregulated waterfowl hunting that was occurring. Second, it was believed that establishing a refuge on Tule Lake would help offset the loss of habitat and birds occurring at that time on Lower Klamath Lake. A more extensive discussion of refuge establishment (both Tule Lake and Lower Klamath NWRs) can be found in Weddell et al. (1998). Refuge purposes for both Lower Klamath and Tule Lake NWR were further refined with passage of the Kuchel Act in 1964 (16 U.S.C. 695k-r).

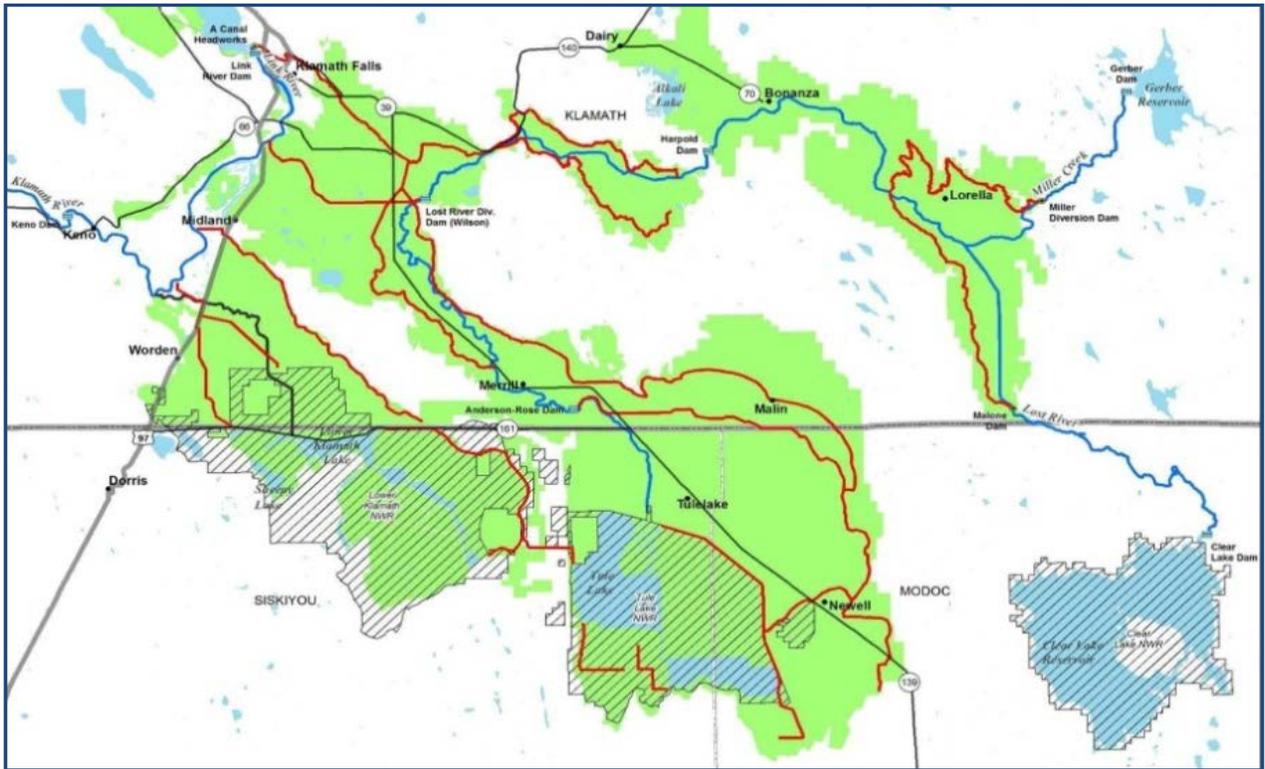
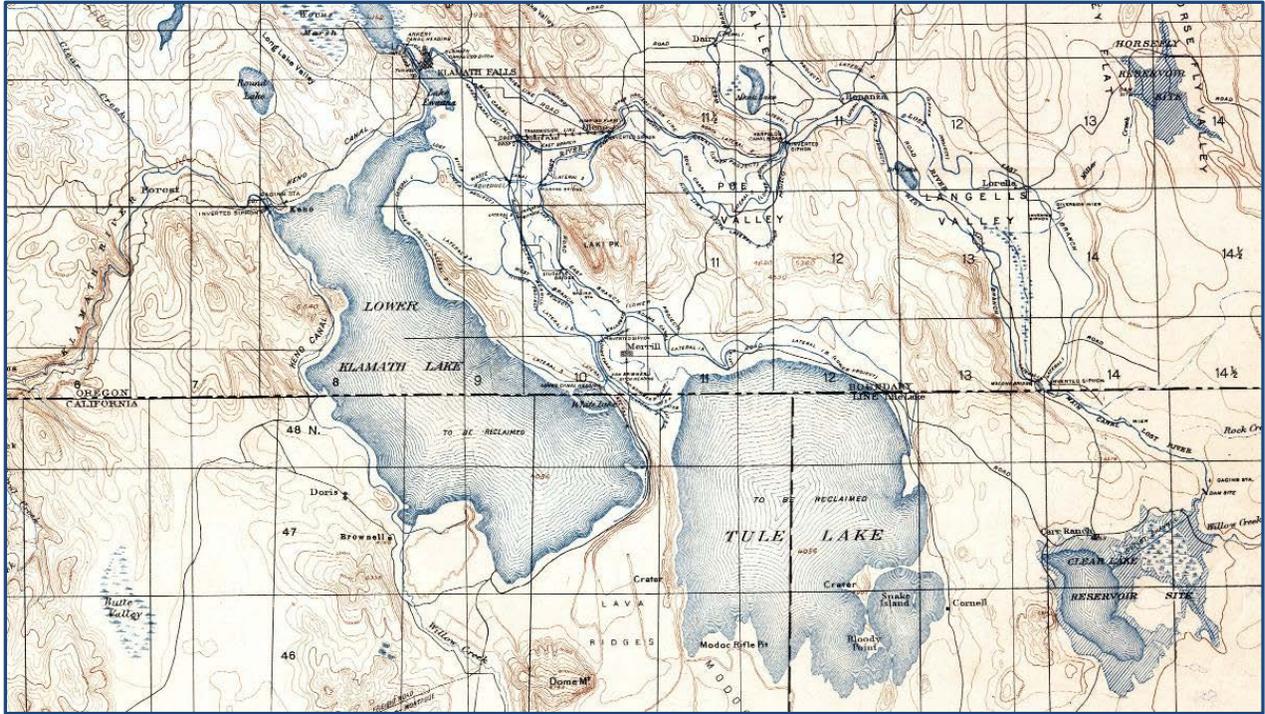


Fig. 1 Lower Klamath and Tule Lakes prior to Project development (circa 1905) (top) and current location of Tule Lake and Lower Klamath National Wildlife Refuges (cross-hatched) within the Klamath Reclamation Project (in green) (bottom).

Rationale for document

Interpretation of the Kuchel Act has become increasingly controversial. Some environmental conservationists believe that the size and scope of current agricultural programs on these refuges is inconsistent with the mission of the National Wildlife Refuge System (NWR System, Refuge System), and some with agricultural interests believe that the Kuchel Act guarantees that the agricultural program will continue unchanged from its present configuration. At the heart of the controversy is the largest commercial farming program in the Refuge System. Currently a 22,000-acre agricultural leasing program operates on Tule Lake and Lower Klamath NWRs. The program consists of more than 200 lots that are leased to local growers by a sealed bidding process. Successful bidders have the annual option to renew for up to five years. In 2012, gross lease revenues exceeded \$4.4 million. The leased agricultural lands represent a portion of the overall habitat complex on Tule Lake and Lower Klamath NWRs. As such, they require integration and/or modification, subject to the Kuchel Act, such that the overall habitat management program fulfills refuge wildlife and—more specifically—waterfowl objectives.

The National Wildlife Refuge System Administration Act (Administration Act) of 1966 (16 U.S.C. 668dd-668ee), as amended in 1976 (Public Law 94-233), designated the U.S. Fish and Wildlife Service (Service) as the agency responsible for administering units of the Refuge System, including Kuchel Act lands. Currently, the U.S. Bureau of Reclamation (Reclamation) administers the agricultural leasing program on the refuges on behalf of the Service under a 1977 cooperative agreement between the agencies.

In 1997, Congress amended the Refuge System's 1966 Act with passage of the National Wildlife Refuge System Improvement Act (Improvement Act) of 1997 (Pub. L. 105-57). This Act requires the development of comprehensive conservation plans (CCPs) for each refuge in the NWR System. These CCPs are to guide refuge management for a 15-year period. Refuge CCPs are to consider the mission and policies of the NWR System; however, where legislated purposes, such as the Kuchel Act, conflict with the NWR System mission, legislated purposes take precedence. During the CCP process, the Service is required to evaluate all aspects of refuge management and prepare alternatives for evaluation and public review. However, prior to developing alternatives, the Service needs to articulate its interpretation of the Kuchel Act in a manner consistent with the Act's language and Congress' intent.

The purpose of this document is to (1) establish refuge purposes for Lower Klamath and Tule Lake NWRs, (2) determine the intent of the Kuchel Act, particularly relative to leased land farming, (3) define key terms, including those related to wildlife conservation (with an emphasis on waterfowl management) and those related to agriculture, (4) evaluate waterfowl populations trends on the refuges since passage of the Kuchel Act, (5) evaluate current habitat management programs relative to waterfowl population objectives, and (6) recommend appropriate changes using a bioenergetics approach for conservation planning, consistent with the Kuchel Act, for waterfowl habitat management programs on Tule Lake and Lower Klamath NWRs. Overall, this document will provide a framework for developing and evaluating alternatives in the CCP planning process and for developing specific habitat management plans and compatibility determinations in the future.

Chapter II Legislative history and refuge purposes

Introduction

Refuge management priorities derive from the Refuge System mission; individual refuge purpose(s); laws that specify Service responsibilities for trust resources; the mandate to maintain the biological integrity, diversity, and environmental health of the public's refuges; and relevant Executive orders, regulations, and policies. The following narrative discusses the origin of refuge purposes, their role in refuge management, and the methods by which those purposes are prioritized or reconciled where conflicts exist.

The Refuge System Improvement Act established a legislative mission for the NWR System: *“The mission of the 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.”* Additionally the Improvement Act directed the Secretary of the U.S. Department of Interior (Interior) to *“...ensure that the biological integrity, diversity, and environmental health of the System are maintained...”* The Improvement Act defined refuge purposes as the *“purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit.”*

Collectively, the Refuge System mission and refuge purpose(s) define the duty of the Service in the administration and management of any refuge in the Refuge System. Ideally, the Refuge System mission and refuge purpose(s) are symbiotic in nature. Refuge purposes that deal with conservation, management, and restoration of fish, wildlife, and plants and ecosystem health take precedence over other purposes in the management and administration of a refuge, ***“unless otherwise indicated in the establishing law, order, or other legal document”*** [emphasis added] (601 FW 1.15). Therefore, although the Improvement Act established a mission for the Refuge System and directed the Secretary to maintain the System's biological integrity, diversity, and environmental health, these purposes do not supersede the specific purposes of the Lower Klamath and Tule Lake NWRs provided in their establishing Executive orders or specific provisions of legislation such as the Kuchel Act (Public Law 88-567, 16 U.S.C. 695K-r).

Establishing Executive orders

Refuge purposes were originally established for Lower Klamath NWR by EO 924 on August 8, 1908. This EO was subsequently amended by EO No. 2200 (May 14, 1915), No. 3187 (December 2, 1919), No. 3422 (March 28, 1921), and No. 8475 (July 10, 1940). These later EOs changed the name and size of the refuge. From the EOs, refuge purposes for Lower Klamath NWR include:

1. “...as a preserve and breeding ground for native birds.” (EO 924), and
2. “...protection of native birds.” (EO 2200)

Initial refuge purposes for Tule Lake NWR were established by EO 4975 on October 4, 1928. This EO was subsequently amended by EO 5945 (November 3, 1932) and EO 7341 (April 10, 1936), which changed the name and size of the refuge. The EOs provided the following purposes for the refuge:

1. "...as a refuge and breeding ground for birds..." (EO 4975), and
2. "...as a refuge and breeding ground for wild birds and animals" (EO 5945).

The Executive orders establishing these refuges also provided that the lands retained prior withdrawal for reclamation purposes, addressed later in the Kuchel Act.

Kuchel Act (Public Law 88-567, 16 U.S.C. 695k-r) (Appendix 1)

Because the lands within the boundaries of both Tule Lake and Lower Klamath NWRs were subject to prior reclamation purposes, they were ultimately vulnerable to the homesteading process. Thus, in the 1950s, Reclamation proposed homesteading and transferring areas of the refuges into private ownership. This proposal resulted in intense debate between agricultural interests and conservationists over the future of the refuges at a time when Tule Lake and Lower Klamath NWRs held fall waterfowl populations that were unparalleled in North America, with peak populations exceeding 5-7 million birds during fall migration.

Several individuals noted these waterfowl concentrations. Refuge manager C. Fairchild (Fairchild et al. 1939) wrote: *"...considerable grain is left on the ground to provide an abundance of food for migratory waterfowl. This happy combination of suitable water area closely and completely surrounded by abundant food and situated in the middle of the Pacific Flyway attracts enormous numbers of both ducks and geese to this refuge on their migrational flights The Tule Lake Wildlife Refuge is classed as one of the primary refuges in the entire United States. Judged solely from the number of birds utilizing the refuge, the area involved, and the available food, it is without question the most important refuge on the Pacific Flyway."*

Service Director John Farley, in a transmittal letter (U. S. Fish and Wildlife Service 1956a) with the Service's 1956 report "Plan for wildlife use of federal lands in the Upper Klamath Basin" (U.S. Fish and Wildlife Service 1956b), stated: *"Adequate lands, water, and food for waterfowl in the Upper Klamath River Basin are indispensable to the welfare of the Continental waterfowl population. About 80% of all the waterfowl of the Pacific Flyway funnel through the Upper Klamath River Basin in their annual migrations. In the Fall of 1955, for example, there were at one time upwards of 7,000,000 birds on the Lower Klamath and Tule Lake National Wildlife Refuges in the Basin. This is the greatest concentration of waterfowl in North America and probably in the world."*

To address the controversy associated with potential homesteading and refuge land transfers, the Secretary of the U.S. Department of the Interior directed Reclamation and the Service to conduct studies and submit recommendations. In response, Reclamation submitted its report (U.S. Bureau of Reclamation 1954) followed by the Service report (U.S. Fish and Wildlife Service 1956b). For the most part, these studies represented opposing viewpoints. To reconcile these differences, the Secretary assigned a technical review staff to evaluate the available information. The review staff's report recommended that refuge lands not be homesteaded and that the lands

be permanently retained under a leasing system. It was believed that administratively maintaining the leasing program would not settle the controversy as the issue would continue to surface with new administrations. Thus, the report recommended that the leasing system be permanently maintained through legislative action. Among other recommendations, the report also recommended that lease revenues be shared with the counties and that legislation be proposed for additional actions that could not be taken administratively (Bennett 1958).

Based on this report, on April 1, 1958, Secretary Fred Seaton approved a plan to settle the controversy stating that Tule Lake and Lower Klamath NWRs: “...*must be used in a manner that will fully protect the valuable waterfowl resources of that area...*” The plan sought to halt homesteading within the refuges but would allow for continued agricultural leasing of refuge lands. “*The Fish and Wildlife Service and game agencies of California and Oregon declare that retention of the present leasing system is essential to maintain the wildfowl population of the Pacific Flyway without danger of extensive crop depredation, unless or until substitute wildfowl habitat along the Flyway has been provided.*” (U.S. Department of the Interior 1958).

Weddell et al. (1998) summarized the legislative progress of the proposed legislation: “*Initially the Kuchel Act was introduced as Senate bill S. 1988 in 1962. A hearing was held on February 23, 1962, by the Subcommittee on Irrigation and Reclamation of the Committee on Interior and Insular Affairs. The bill passed the Senate without opposition, but time did not permit the House to finish consideration (Hearing before the Subcommittee on Irrigation and Reclamation, February 23, 1962).*”

The following year Senator Engle sponsored S. 784 and Congressman Johnson introduced a similar bill in the House of Representatives. In addition, Senator Kuchel and Senator Robertson introduced S. 793. In most respects the two bills were similar. A hearing on S. 784 and S. 793 was held on April 24, 1963. S. 793 ultimately became Public Law 88-567 on September 2, 1964 (Hearing before the Subcommittee on Irrigation and Reclamation, April 24, 1963.)”

The essence of the debate over the Kuchel Act was summarized in Secretary Stewart Udall’s statement before the Senate’s Interior and Insular Affairs Committee (Udall 1962). Secretary Udall believed that the proposed Kuchel Act (S. 1988) would settle the long-standing question on the ultimate fate of refuge lands. He recognized that local interests desired that the lands remain in agricultural use and be transferred into private ownership; however, he also acknowledged the opposing view from the conservation community and farming interests further south in California, who wanted the refuge’s waterfowl values be preserved. He also knew the Department of Interior had obligations to both the Project and the migratory waterfowl resource through international treaty responsibilities and that the bill was in the greater public interest. Thus, the Secretary supported the bill, as it would both retain refuge lands in Federal ownership with the major purpose of waterfowl management and would still maintain agricultural leasing consistent with the irrigation purposes of Klamath Project and the economic needs of local communities. In congressional hearings, representatives from both the Bureau of Reclamation and the Fish and Wildlife Service were united in their support for the legislation.

At the time, the bill was viewed as a win-win solution. The lands would remain in Federal ownership for the major purpose of waterfowl management, and agricultural use would continue consistent with waterfowl management. In the 1950s, agricultural crops were viewed as a

requirement for waterfowl in the Klamath Basin. In its report to the Secretary of the Interior, the U.S. Fish and Wildlife Service (1956b) recognized that waterfowl in the Klamath Basin fed largely on agricultural crops on the refuges, and it was desirable to maintain that agricultural land base to support the millions of waterfowl in the basin and to delay their migration into valuable private croplands further south in California. If refuge lands were transferred to private ownership, it was feared that human-caused disturbance would lower the capacity of those lands to support waterfowl and there would be no control over cropping patterns and practices (i.e., the types of crops grown, harvest dates, etc.). If the agricultural lands were maintained in government ownership, small grains could be maintained as a primary food crop for waterfowl (U.S. Fish and Wildlife Service 1956b). In summary, from the Service's perspective, the intent of the bill was to maintain and stabilize the management of refuge lands. Service Director Daniel Janzen's statement summarizes this vision: "*It [Tule Lake NWR] still has the heaviest waterfowl use of any area in the Nation. I want to emphasize that. This is so because of a combination of shallow water sumps and the adjoining 2,500 acres of agricultural land farmed exclusively for the birds, plus the 15,000 acres of farmland leased by the Bureau of Reclamation to local farmers and which is by agreement devoted to crops which after harvest provide a great deal of waste grain ... We feel this refuge must remain intact and continue to be managed in such manner as it is now.*" (Janzen 1962).

Ultimately, after more than a decade of proposals and debate, the Kuchel Act (Public Law 88-567, 16 U.S.C. 695K-r) (Appendix 1) was enacted on September 2, 1964. The Act states: "*It is hereby declared to be the policy of the Congress ... to preserve intact the necessary existing habitat for migratory waterfowl in this vital area of the Pacific Flyway, and to prevent depredations of migratory waterfowl on agricultural crops in the Pacific Coast States*" (Sec. 1). The Act additionally states that Tule Lake and Lower Klamath NWRs "*...are hereby dedicated to wildlife conservation. Such lands shall be administered by the Secretary of the Interior for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith. Such lands shall not be opened to homestead entry*" (Sec. 2).

Based on language within the Kuchel Act, congressional testimony, and Interior and Service reports, it is clear that the intent of the Kuchel Act relative to Lower Klamath and Tule Lake NWRs was as follows:

1. To maintain permanent ownership, by the United States, of the lands and waters to maintain the waterfowl values of the refuges by dedicating the lands and waters to wildlife conservation and specifically for the major purpose proper waterfowl management.
2. To provide food and habitat that would prevent waterfowl crop depredation on agricultural lands within the Upper Klamath Basin. In addition, to manage the refuges to delay the southward migration of waterfowl into agricultural areas of the Central and Imperial Valleys of California.
3. To maintain the significant historic production of waterfowl on the refuges by allowing for favorable regulation of water levels in the Tule Lake sumps.
4. To give full consideration to optimum agricultural use that is consistent with the major purpose of waterfowl management; and, if consistent with proper waterfowl

management, continue the present pattern of leasing at a price or prices designed to obtain maximum lease revenues, except that not more than 25 per centum of the total leased lands may be planted to row crops.

5. To prevent further agricultural development of the Tule Lake sumps.

Refuge purposes as provided in the Kuchel Act

The Kuchel Act (Appendix 1) superseded some elements of the original EOs by creating refuge purposes that were more specific than the purposes provided in the EOs. The intent of Congress, in new more specific refuge purposes, is evident in the following language: “**Notwithstanding** any other provision of law...Tule Lake National Wildlife Refuge...[and]...Lower Klamath National Wildlife Refuge ... are hereby dedicated to wildlife conservation. Such lands shall be administered...for the major purpose of waterfowl management...” [emphasis added] (Kuchel Act 695l).

The Kuchel Act provides that the refuges are

1. “... to preserve intact the necessary existing habitat for migratory waterfowl in this vital area of the Pacific flyway...” (Kuchel Act, Sec. 695k).
2. “...to prevent depredations of migratory waterfowl on the agricultural crops in the Pacific Coast States.” (Kuchel Act, Sec. 695k).
3. “...dedicated to wildlife conservation.” (Kuchel Act 695l).
4. “...for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith” (Kuchel Act 695l).
5. “...consistent with proper waterfowl management, continue the present pattern of leasing the reserved lands...” (Kuchel Act 695n).
6. “...for waterfowl purposes, including the growing of agricultural crops by direct plantings and sharecrop agreements with local cooperators where necessary...” (Kuchel Act 695n).

Refuge acquisitions under other authorities

The majority of lands within Lower Klamath NWR were withdrawn from the public domain under EO 924, EO 2200, and the Kuchel Act. However, approximately 4,500 acres were acquired under the general authority of the Migratory Bird Conservation Act (16 U.S.C. 715a-715r). As a result, these acquired lands are under the Migratory Bird Conservation Act purpose: “... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds” (Migratory Bird Conservation Act, 16 U.S.C. Sec. 715d).

Refuge purposes – Lower Klamath NWR

Given the previous discussion, refuge purposes for Lower Klamath NWR are:

1. “...as a preserve and breeding ground for native birds” (EO 924).
2. “...protection of native birds” (EO 2200).

3. "... to preserve intact the necessary existing habitat for migratory waterfowl in this vital area of the Pacific flyway..." (Kuchel Act, Sec. 695k).
4. "...to prevent depredations of migratory waterfowl on the agricultural crops in the Pacific Coast States" (Kuchel Act, Sec. 695k).
5. "...dedicated to wildlife conservation...for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith" (Kuchel Act 695l).
6. "...consistent with proper waterfowl management, continue the present pattern of leasing the reserved lands..." (Kuchel Act 695n).
7. "...for waterfowl purposes, including the growing of agricultural crops by direct plantings and sharecrop agreements with local cooperators where necessary..." (Kuchel Act 695n).
8. "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (Migratory Bird Conservation Act, 16 U.S.C. Sec. 715d).

Refuge purposes – Tule Lake NWR

Given the previous discussion, refuge purposes for Tule Lake NWR are:

1. "...as a refuge and breeding ground for birds..." (EO 4975).
2. "...as a refuge and breeding ground for wild birds and animals" (EO 5945).
3. "... to preserve intact the necessary existing habitat for migratory waterfowl in this vital area of the Pacific flyway..." (Kuchel Act, Sec. 695k).
4. "...to prevent depredations of migratory waterfowl on the agricultural crops in the Pacific Coast States" (Kuchel Act, Sec. 695k).
5. "...dedicated to wildlife conservation...for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith" (Kuchel Act 695l).
6. "...consistent with proper waterfowl management, continue the present pattern of leasing the reserved lands..." (Kuchel Act 695n).
7. "...for waterfowl purposes, including the growing of agricultural crops by direct plantings and sharecrop agreements with local cooperators where necessary..." (Kuchel Act 695n).

Chapter III Applying “wildlife conservation” purposes to refuge lands

Refuge purposes derived from the Kuchel Act are more specific than those in the Executive orders. The primary purpose of the refuges in the Kuchel Act is proper waterfowl management as indicated in the language of the Act (Sections 1, 2, 4 and 6), as well as the debate in Congress in formulating the legislation. The viewpoint of the Secretary, conservation organizations, and agricultural interests further south in California clearly prevailed over other interests whose desire was to convert portions of the refuges to private ownership through homesteading. While “proper waterfowl management” is the primary refuge purpose under the Act, the Kuchel Act also dedicates the lands to the broader purpose of wildlife conservation.

Section 2 of the Kuchel Act specifically states that, “*Notwithstanding any other provisions of law, all lands owned by the United States lying within the Executive order boundaries of the Tule Lake National Wildlife Refuge, the Lower Klamath National Wildlife Refuge, the Upper Klamath National Wildlife Refuge and the Clear Lake National Wildlife Refuge are hereby **dedicated to wildlife conservation**. [Emphasis added.] Such lands shall be administered by the Secretary of the Interior for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith.*”

Although waterfowl management is clearly the primary purpose, these refuges are also dedicated to the more general purpose of wildlife conservation, particularly in those areas not used as leased agricultural lands. During congressional testimony for S. 1988 (Kuchel Act), Secretary Udall spoke of the additional wildlife values of the refuges in Klamath Basin NWR Complex (which include Tule Lake and Lower Klamath NWRs) by stating, “*Nearly 250 different kinds of birds have been recorded on these refuges including 22 kinds of shorebirds, ... and 25 different species of hawks and owls. Over 160 species have been recorded as nesting.*” He additionally stated, “*Thousands of grebes—eared, western, and pied-billed—nest on Tule Lake. These species are again becoming common on Lower Klamath where they once nested in great numbers. This lake was drained and remained dry from 1921 to 1942, and bird populations have, in many instances, been slow in recovering.*” (Udall 1962, page 21). The Service interprets these statements to mean that the refuges are to be managed for “wildlife conservation” but that waterfowl are to receive priority in management. In other words, **if there is a conflict in providing habitats to various groups of wildlife, waterfowl objectives are met first—before meeting the needs of other wildlife groups.**

In implementing habitat management planning on the refuges within the broader language of “wildlife conservation,” the Service will develop management programs consistent with Service policy and legal mandates. Service policy on achieving the Refuge System mission, goals, and purposes is defined in 601 FW 1. Specifically, Refuge System goals are to:

A. Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.

B. Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.

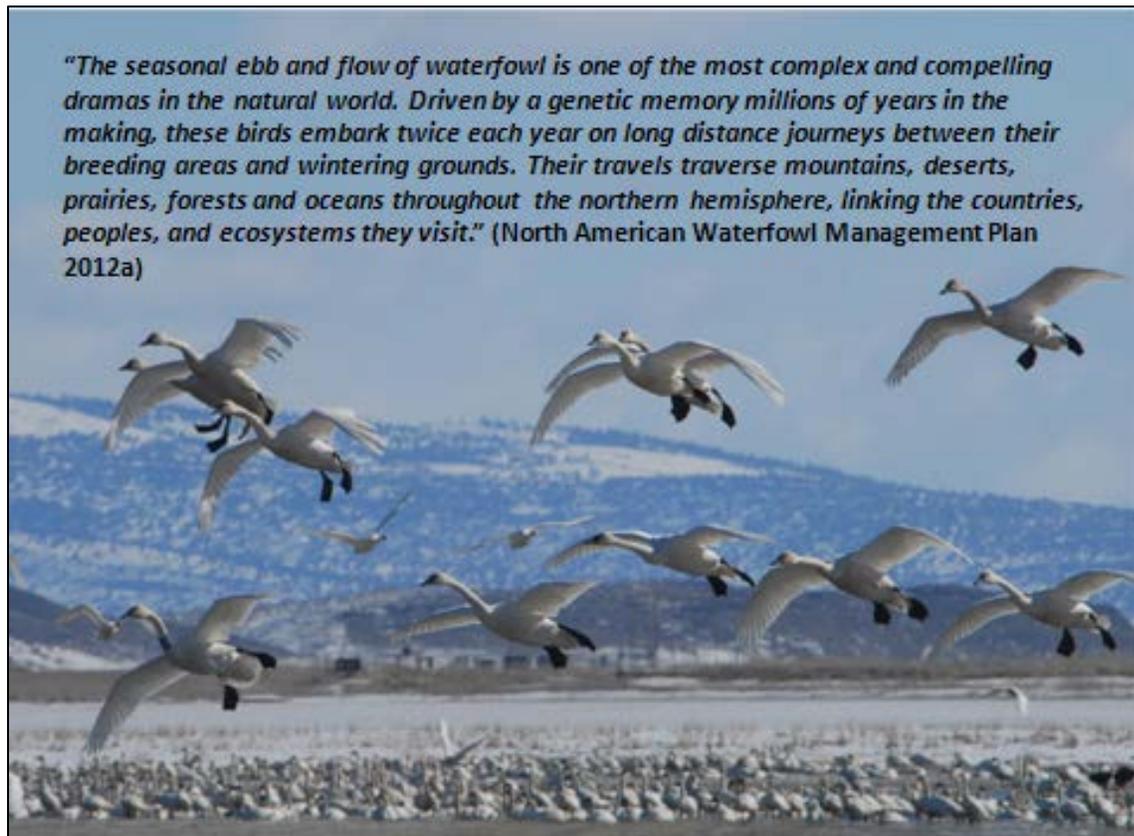
C. Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.

D. Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).

E. Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

To achieve the Improvement Act's mandate to maintain the biological integrity, diversity, and environmental health of the Refuge System, refuge managers are guided by Service policy FW 601 3, which states, *"The policy is an additional directive for refuge managers to follow while achieving refuge purpose(s) and System mission. It provides for the consideration and protection of the broad spectrum of fish, wildlife, and habitat resources found on refuges and associated ecosystems. Further, it provides refuge managers with an evaluation process to analyze their refuge and recommend the best management direction to prevent further degradation of environmental conditions; and where appropriate and in concert with refuge purposes and System mission, restore lost or severely degraded components."*

Chapter IV Definition of “proper waterfowl management”



Tundra swans, Lower Klamath National Wildlife Refuge. Photo by Dave Menke, U.S. Fish and Wildlife Service

Over thousands of years, Native Americans harvested North American waterfowl as a food resource and for other purposes. Generally, populations of Native Americans were insufficient or they lacked the technologies to seriously deplete waterfowl numbers. That changed with European immigration to North America and the evolution of firearms. Early in the 20th century, unregulated commercial harvest (market hunting) severely depleted waterfowl numbers. Nationally, market hunting and associated decline in populations, coupled with losses of hundreds of thousands of waterfowl to avian disease annually, particularly avian botulism in the western United States (Bolen 2000), raised significant concerns over the future of waterfowl in North America. These concerns were central to the development and evolution of waterfowl management as practiced today.

To define “proper waterfowl management” in contemporary terms, the Service used three approaches: (1) an evaluation of the scientific literature, (2) review of the goals of the North American Waterfowl Management Plan (NAWMP), and (3) expert opinion gathered from a series of waterfowl management workshops involving refuge staff and waterfowl managers and biologists from the Pacific Flyway.

Review of pertinent literature

Food habits and the dietary needs of waterfowl: In its infancy, the science and practice of waterfowl management placed considerable emphasis on providing foods waterfowl consumed as a basis for habitat management. Food habit studies of waterfowl were initiated in the early 1900s by the U.S. Bureau of Biological Survey (McAtee 1911, 1914, 1915) with the first large scale studies completed in 1939 (Cottam 1939, Martin and Uhler 1939). Most of the thousands of samples in these early studies were collected during the fall and winter hunting seasons from the gizzard and esophagus of waterfowl. Although these early studies subsequently were found to have shortcomings, they identified important waterfowl foods and formed the foundation for habitat management and protection for many years.

Work by Swanson and Bartonek (1970) identified significant biases in early food habit studies by documenting that soft foods such as aquatic invertebrates were quickly digested, often prior to reaching the gizzard. Thus, it was formally recognized that early food habit studies were biased towards hard seeds or food items that were maintained in the gizzard for longer periods of time. Bartonek (1968) determined that 95 percent of food habit studies conducted prior to 1965 were based on analyses of gizzard contents. Thus, these early studies concluded that plant material was the dominant component of waterfowl foods. Using new protocols for food habit studies, a host of additional studies were launched that examined food resource needs of waterfowl, including during other seasons of the year, particularly the breeding season. This improved understanding of the foods consumed by waterfowl, coupled with the nutritional content of food resources and the dietary needs of waterfowl, led to an evolution in how waterfowl habitats were managed.

Waterfowl use several basic food types, including aquatic and terrestrial invertebrates, seeds, agricultural foods, and other plant parts. Each food type provides different benefits depending on nutritional value, species of waterfowl, and requirements during the annual life cycle. During fall and winter, many waterfowl species, and especially geese, have adapted their feeding behavior to the availability of cereal grains (Baldassarre and Bolen 2006), using these foods when the need for carbohydrates is high. Agricultural foods are now a primary constituent of foods available in many of the major waterfowl wintering and migration areas of North America. Agriculture provides foods that are high in metabolizable energy (net energy available after subtracting energy required for digestion and absorption and that which is excreted) and are readily available (Reinecke et al. 1989). However, agricultural foods do not contain sufficient protein or required amino acids to satisfy nutritional requirements for wintering waterfowl (Baldassarre et al. (1983). Agricultural foods generally contain less than 10 percent protein, whereas protein content of most natural seeds range from 10-20 percent (Fredrickson and Taylor 1982), and those of aquatic invertebrates often exceed 50 percent (Krapu and Swanson 1975). However, because agricultural foods are readily available and abundant, waterfowl can often satisfy foraging needs more rapidly in croplands than in other habitats (Baldassarre and Bolen 2006). Baldassarre and Bolen (2006) summarized this trade off among food resources; “... *although managers should manage agricultural foods for waterfowl, such food sources are no substitute for the long-term benefits of foods provided in natural wetland habitats.*”

Invertebrates, primarily aquatic but also terrestrial at times, form an important food resource for waterfowl, particularly during the spring breeding season and in the diets of young waterfowl.

Invertebrates are high in protein, often exceeding 50 percent (Krapu and Swanson 1975). Newly hatched ducklings consume invertebrates almost exclusively, with the proportion of invertebrates in their diet decreasing with age (Chura 1961, Collias and Collias 1963). Aquatic invertebrates such as midge larvae (*Chironomidae*), water boatman (*Corixidae*), and scuds (*Amphipoda*) contain 56 percent, 72 percent, and 47 percent protein, respectively, and provide a complete array of amino acids (Sugden 1973). Amino acid composition is especially important during egg production (Sedinger 1984) and during molt (Reinecke et al. 1989, Heitmeyer 1988). Natural foods, like invertebrates and natural seeds, provide a more complete array of amino acids and minerals than do agricultural grains (Baldassarre et al. 1983).

Non-agricultural seeds include native and exotic seeds found in both seasonal and year-round flooded wetlands; however, the greatest quantity and diversity is generally found in seasonal wetlands. Seasonal (often termed “moist-soil”) wetlands are dewatered in late spring to provide for the growth of desired annual, seed-producing plants. Seeds from seasonal wetlands provide a greater quantity and quality of protein than agricultural crops (Fredrickson and Taylor 1982); however, their metabolizable energy is generally less than agricultural foods.

Other waterfowl foods, including tubers, roots, rhizomes, stems, and leaves, are also important waterfowl food items (Baldassarre and Bolen 2006). Sago pondweed (*Potamogeton pectinatus*) is an important food for waterfowl, particularly for diving ducks and swans, throughout the Intermountain West, including Lower Klamath and Tule Lake NWRs. In addition, spring migrating geese use newly sprouted green vegetation (typically grasses and legumes) for the high protein content of this forage.

Habitat management for waterfowl: Wetlands form the primary natural habitat for waterfowl. However, wetlands are extremely diverse in their geographic scope and complexity. Wetlands of the Great Basin (also termed the Intermountain West and including the Klamath Basin), are somewhat unique in North America. Wetlands in this region are widely scattered among otherwise arid and semi-arid landscapes. As such, wetlands are extremely valuable as stepping stones in migration, as waterfowl transition between northern nesting areas and southern wintering grounds in the Pacific Flyway (Bellrose 1976).

Many wetlands in the Intermountain West have been physically and hydrologically altered and typically compete with agriculture for scarce water supplies (Kadlec and Smith 1989). Wetlands of the Klamath Basin are no exception. Historic Lower Klamath and Tule Lakes have essentially disappeared, having been replaced with managed wetland impoundments and return-flow sumps related to the Klamath Project’s agricultural purposes. Wetland managers now face the challenge of attempting to emulate historic wetland hydrology and function, and manage a much smaller complex of wetlands for myriad plant and animal species (Laubhan and Fredrickson 1993). The reduction of wetland habitats throughout North America, coupled with the high demand for abundant waterfowl populations from both the hunting and non-hunting public, has necessitated that the remaining habitats be optimally managed to produce and sustain waterfowl. The changing nature of wetlands throughout North America is discussed in Fredrickson and Reid (1990):

“... productivity of our national wetland resource has been severely impacted because the natural hydrology that resulted in wetland formation, and to which myriad plants and animals

have adapted, has been compromised. Developments such as dams for hydropower and flood control, diversions to speed water flow, levees for flood protection, wetland drainage for commercial districts and agriculture, and filling wetlands for marinas have modified wetlands across the continent. These destructive processes have been so complete within the 48 conterminous states that all watersheds have been degraded to some degree and few wetlands have retained either their natural hydrology or productivity. Because of these modifications in natural hydrological regimes, intensive wetland management is essential in many regions if wetlands are to retain their values and productivity.”

The managed habitat complex: The natural hydrology of Lower Klamath and Tule Lake NWRs is highly altered, being replaced with an extensive network of Klamath Project related infrastructure. This fact, coupled with different habitat requirements and physiological needs of the multitude of waterfowl and other wetland wildlife species, necessitates the need for active habitat management. *“One of the greatest challenges facing wetland managers today is to provide the resources required for different waterfowl, including individuals of varying physical condition and social status, that utilize a single wetland complex.”* (Reid et al. 1989).

A mix of habitats is desirable for several reasons. Habitat complexes tend to be complimentary, with the strength of one habitat complementing the weakness in another. For example, while agricultural habitats can provide the greatest energy per acre, wildlife diversity is low. In contrast, food energy densities are lower in wetlands, but the diversity of foods provided and number of wildlife species is greater (Reinecke et al 1989). *“Various types of wetlands are required to match the seasonal needs of waterfowl and, for optimal production, the appropriate types must be included on those public and private landscapes managed for waterfowl”* (Bolen 2000). Because agricultural foods contain insufficient protein and/or a full complement of required amino acids (Baldassarre et al. 1983) and support a relatively limited assemblage of waterfowl species, experts believe that agricultural crops should be limited to the minimum necessary to satisfy food production objectives that cannot be provided from more “natural” foods (Reinecke et al. 1989).

The primary habitat management question then becomes: what are the appropriate diversity, juxtaposition, and quantities of habitats to support the desired numbers and diversity of waterfowl species (as well as other species using the refuges). Despite the relative abundance of agricultural foods and their high caloric content, waste grains lack essential nutrients found in wetland oriented foods (Baldassarre et al. 1983). Thus, comprehensive habitat management plans should provide sources of natural foods found in wetlands (Baldassarre and Bolen 2006). *“Overall, management of waterfowl and other wetland wildlife in agricultural settings depends on striking a balance between food available as waste grains and food available in wetlands; for managers, this includes issues of species diversity and ecology...”* (Baldassarre and Bolen 2006).

Agriculture and waterfowl management: Under the Kuchel Act, the present pattern of agricultural leasing, optimizing agricultural use, or maximizing lease revenues must each be consistent with the refuges’ major purpose of “proper waterfowl management. In the 1950s and 1960s, the wetlands provided in the sumps on Tule Lake NWR and surrounded by the leased agricultural lands were the optimal fall waterfowl habitat in the Pacific Flyway, as evidenced by large waterfowl populations.

During the 20th century, a reduction in wetland acres throughout the Pacific Flyway (particularly in California) coupled with large numbers of waterfowl produced in the northern prairies of Canada and the United States, forced migrating waterfowl into limited habitat areas during the fall, winter, and spring. In response, some waterfowl—principally mallards, pintails, wigeon, and geese—switched from feeding in wetlands to field feeding on small grains and other crops (Baldassarre and Bolen 2006). Agricultural foods are now a primary constituent of foods used by waterfowl in many of their major wintering and migration areas of North America.

Despite the benefits that many waterfowl derive from agricultural foods, given a choice, feeding in farmlands is not preferred, particularly in a dryland setting. Baldassarre and Bolen (2006) determined that the tendency for waterfowl to field feed is directly related to the abundance and availability of foods in natural habitats. In the Mississippi Alluvial Valley, mallards feed in dry agricultural fields only after flooded foraging sites are unavailable due to drought or the onset of cold weather (Reinecke et al. 1989). The following quotation typifies the sometimes tenuous connection between waterfowl and agricultural landscapes, “*Waterfowl migration and wintering habitats, many of which have already lost the vast majority of their wetlands, are being further threatened by invasive plant species, degraded water quality and diminished water supplies. The food and energy demands of non-breeding waterfowl are often met by the seasonal availability of agricultural foods – a resource with an uncertain future dependent on supply and demand, farming technology and irrigation water.*” (NAWMP 2012a)

Key points from literature review:

1. Waterfowl are comprised of a series of broad guilds, including dabbling ducks, diving ducks, geese, and swans, each having different habitat and foraging requirements.
2. Because extensive areas of wetlands have been drained or severely compromised, active habitat management practices are required on the remaining acres to provide maximal benefits to waterfowl and other wetland dependent species.
3. To meet the multifaceted habitat and foraging needs of waterfowl, a diverse complex of habitats is required.
4. Where waterfowl make extensive use of agricultural landscapes, waterfowl managers must strike the proper balance of habitats for waterfowl.

An evolving paradigm for waterfowl management

The North American Waterfowl Management Plan: During the mid-1980s, drought returned to the primary waterfowl production areas of North America, resulting in declines in waterfowl populations. This led to a renewed interest in preserving wetland habitats on both northern production areas and more southerly migration and wintering habitats. It was also recognized that a new, more comprehensive approach was needed to preserve and enhance wetlands. Future waterfowl habitat protection and enhancement would require participation from a broader constituency. The relatively small acreage of state- and federally-owned wildlife areas was simply insufficient to preserve and restore waterfowl populations. Thus, the North American Waterfowl Management Plan (NAWMP, Plan), signed by the United States and Canada (1986) and by Mexico in 1994, seeks to restore duck populations to levels of the 1970s and goose and

swan populations consistent with populations of the early 1980s and species population management plans. The overall aim of this continental habitat program is to maintain and manage an appropriate distribution and diversity of high quality waterfowl habitat in North America that will (1) maintain current distributions of waterfowl populations, and (2) under average environmental conditions, sustain an abundance of waterfowl. The NAWMP seeks to ensure habitat for 62 million breeding ducks on the continent and a fall flight of more than 100 million ducks, as well as sufficient habitat to support more than 6 million wintering geese and 60,000 wintering swan in the Western United States. NAWMP forms the foundation for waterfowl habitat and population management in North America. The NAWMP (1986) designates wetlands of the Klamath Basin as areas of international significance for waterfowl (NAWMP 1986).

The NAWMP is updated in response to changes across the landscape and in use patterns among waterfowl, new scientific information, and evolving societal desires (see NAWMP 1994, 1998, 2004, and 2012a). The most recent NAWMP (2012a) update represented a review and revision of plan goals, placing more focus on the need to better incorporate changing societal needs into waterfowl management. This most recent update includes three primary goals:

Goal 1: Abundant and resilient waterfowl populations to support hunting and other uses without imperiling habitat.

Goal 2: Wetlands and related habitats sufficient to sustain waterfowl populations at desired levels, while providing places to recreate and ecological services that benefit society.

Goal 3: Growing numbers of waterfowl hunters, other conservationists, and citizens who enjoy and actively support waterfowl and wetlands conservation.

Also included in the 2012 NAWMP update are a series of Plan principles, including:

1. Waterfowl are among North America's most observed and highly valued natural resources.
2. Waterfowl management is a complex enterprise involving multiple governments, people, waterfowl populations, wetlands, and other habitats. These elements are highly interdependent and should be managed in a coherent, integrated manner.
3. Resident and endemic species also are important components of each nation's waterfowl resource and deserve conservation emphasis from within the jurisdictions where they occur.
4. Managed harvest of the waterfowl resource is desirable and consistent with its conservation.
5. Maintenance of abundant waterfowl populations is dependent on protection, restoration, and management of habitat and the support of people who use and value these resources.
6. Primary vehicles for accomplishing Plan objectives will include partnerships within and among three key waterfowl management arenas: habitat conservation, population management, and resource users.
7. Long-term protection, restoration, and management of waterfowl habitats requires that Plan partners collaborate with conservation and community efforts in the development of

conservation, economic, and social policies and programs that sustain the ecological health of landscapes.

8. Sound science and knowledge is the foundation for planning, implementing, and evaluating the NAWMP programs.
9. Programs that manage waterfowl populations, habitats, and recreational users should embrace and employ adaptive management. Making progress toward Plan goals requires an unwavering commitment to support essential monitoring and assessment activities.
10. Waterfowl should be managed consistent with the North American Model of Wildlife Conservation.

Also in 2012, the NAWMP Action Plan (2012b) was completed to provide initial guidance and strategic ideas for implementing the NAWMP 2012 update. In completing the 2012 update, the authors convened a series of nationwide workshops. Two-thirds of the workshop participants (waterfowl managers and biologists) believed that the NAWMP should include numeric distribution objectives for breeding, migration, and wintering areas. It was believed that this would allow the joint ventures to apportion population and habitat objectives within specific larger geographic areas that would then link back to continental population objectives (see Petrie et al. 2011). *“Since the initial specification of population objectives in 1986, a key challenge to NAWMP implementation has been the development of a consistent and cohesive set of regional habitat objectives necessary to achieve continental population objectives.”* (NAWMP Action Plan 2012b)

Intermountain West Joint Venture: Habitat conservation and planning under the NAWMP is pursued through a series of regional and, in several cases, species specific joint ventures. The joint ventures are partnerships of State and Federal agencies, tribes, business, conservation groups, and individuals that combine resources and expertise to enhance waterfowl habitats. The Klamath Basin is situated within the Intermountain West Joint Venture (IMWJV).

Geographically, the IMWJV is the largest of the joint ventures, ranging from Canada to Mexico and encompassing the lands between the Cascade and Sierra mountain ranges to the west and the Rocky Mountains to the east. Winter in the IMWJV is typically severe, thus most waterfowl migrate elsewhere to winter, typically California, Mexico, and the Gulf Coast. The primary contribution of this area to continental populations is migration and breeding habitat.

Because waterfowl management philosophy has expanded to be more inclusive of other wetland dependent wildlife species (Baldassarre and Bolen 2006, NAWMP 2012a), all habitat joint ventures, including the IMWJV, have broadened their focus and are now considered “all bird” joint ventures. The IMWJV is developing focal species lists and population objectives for waterfowl as well as non-game waterbirds (IMWJV 2012 in prep) with a particular emphasis on shorebirds (Oring et al. 2004) and colonial nesting waterbirds (Ivey and Herziger 2006). Non-game waterbirds are broadly grouped as shorebirds, gulls, terns, cranes, rails, herons, grebes, egrets, and ibis. Currently, Lower Klamath NWR is considered the most significant waterbird nesting site in California (Ivey and Herziger 2006).

Consistent with the NAWMP, which seeks to focus waterfowl conservation efforts in key areas, the IMWJV is developing waterfowl population and habitat objectives within the southern

Oregon and northeastern California (SONEC) region (Fig. 2). The planning effort is focused on use of the bioenergetic model TRUOMET (Central Valley Joint Venture 2006) as a tool to evaluate current habitat conditions for priority waterfowl species and to inform future habitat objectives. The TRUOMET model essentially matches waterfowl population objectives with food resources available. Although Tule Lake and Lower Klamath NWRs account for only a small fraction of the SONEC landscape, these refuges support a significant proportion of the waterfowl that use SONEC in fall and winter (Kadlec and Smith 1989, Fleskes and Yee 2007). Thus, population objectives for the SONEC region in fall/winter are essentially the fall/winter population objectives for Tule Lake and Lower Klamath NWRs. During spring migration, snow melt and precipitation creates a much larger wetland habitat base for waterfowl, thus population objectives for both refuges are only a portion of the SONEC region's overall total population objective. However, spring waterfowl use of Tule Lake and Lower Klamath NWRs is proportionally higher than any other subregion in SONEC (Fleskes and Yee 2007).

Key points from the NAWMP and associated IMWJV:

1. Because of the migrational nature of waterfowl, population management must be coordinated across broad landscapes.
2. Continentally, duck population objectives are based on populations experienced during the 1970s. Goose and swan populations may vary but are linked to flyway species management plans and are more reflective of current conditions.
3. Collective waterfowl population and habitat objectives are built from the ground up through the joint venture planning process.
4. Waterfowl management under the NAWMP also considers the full range of wildlife species associated with wetland habitats.

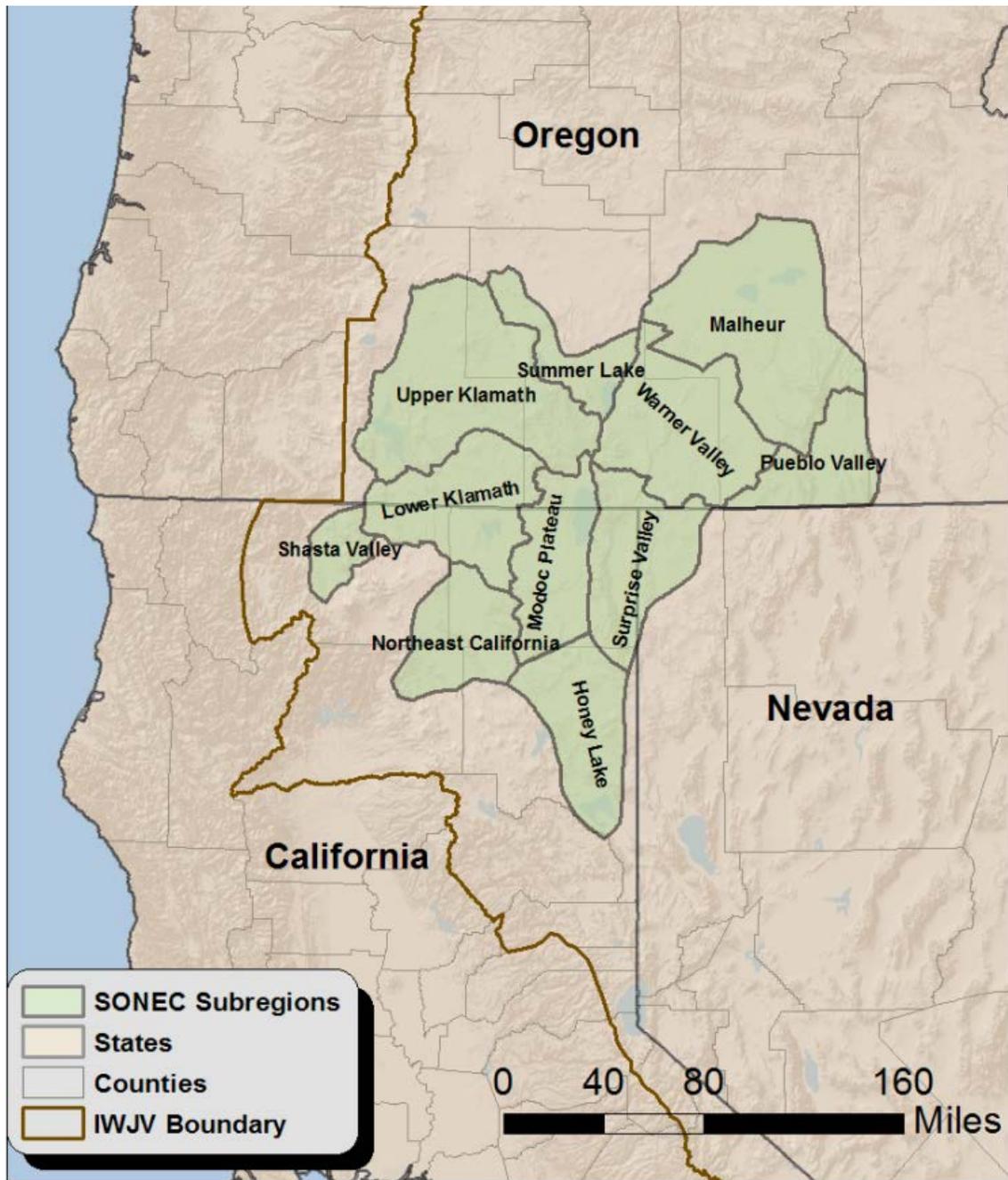


Fig. 2. Southern Oregon and northeastern California subregion within the Intermountain West Joint Venture.

Workshops with waterfowl managers and biologists from the Pacific Flyway

Expert opinion was gained through an initial workshop convened September 16-18, 2002. In attendance were waterfowl biologists and managers from the Pacific Flyway (Oregon and California) representing State and Federal agencies, as well as several non-governmental organizations. Considerable discussion focused on establishing waterfowl population objectives for Tule Lake and Lower Klamath NWRs, assessing the role of non-game waterbirds in wetland management, and using bioenergetic modeling to design and assess current and alternative habitat management strategies for waterfowl. Recommendations from the workshop resulted in implementation of specific projects, including an assessment of waterfowl foods produced from refuge habitats, establishing waterfowl population objectives, conducting a bioenergetic assessment of current and potential habitat management alternatives (see Dugger et. al 2008), and surveys to assess populations of non-game waterbird species (see Shuford et. al 2006). A second workshop was convened April 29-30, 2009, to review results of implemented studies and to solicit input to develop a contemporary definition of waterfowl management.

Key points from workshops:

1. Migratory waterfowl population objectives should be linked to the NAWMP through the IMWJV.
2. Objectives for breeding and molting waterfowl should be established.
3. Population objectives for other wetland dependent wildlife species should be developed and considered in waterfowl habitat management, especially those species that are not well served by habitats managed for waterfowl.
4. Use bioenergetic modeling to link populations to habitat needs.
5. Incorporate estimates of water needs relative to wetland habitat objectives.
6. “Proper waterfowl management” should include providing habitats and food resources to support the needs at all stages of the waterfowl life cycle, and management should be consistent with the goals of the NWAMP, IMWJV, and Pacific Flyway management plans.

Definition of “proper waterfowl management”

Based on the previous sources (expert opinion, literature review, and the NAWMP), the Service has determined that “proper waterfowl management” is defined as: *providing habitats sufficient to support waterfowl population objectives throughout the annual cycle while promoting the highest possible natural biological diversity of refuge habitats. A sufficient quantity and diversity of foraging resources should be provided that will meet the energy requirements and nutritional demands of all waterfowl species. Where feasible, natural foods should be given priority over agricultural crops.*

Chapter V Defining agricultural purposes from the Kuchel Act

The Service believes that the major purpose of the Kuchel Act is waterfowl management as indicated in the language of the Act (Sections 1, 2, 4, and 6), as well as the debate in Congress in formulating the legislation. While “proper waterfowl management” is the major purpose of the Act, there are additional secondary refuge purposes related to agriculture derived from the Kuchel Act. The Kuchel Act directs that the Secretary continue the “present pattern of leasing,” maximize lease revenues in specifically identified areas of the refuges, and optimize agriculture, all consistent with waterfowl management.

The “present pattern of leasing”

Since 1964, when the Kuchel Act was passed, the cropping pattern on the refuges has changed significantly (Tables 1 and 2). Leased land farmers have been allowed flexibility to select crops within the broad guidelines of the Kuchel Act, which allows, “...for the growing of grain, forage, and soil-building crops, except that not more than 25 per centum of the total leased lands may be planted to row crops.” (Sec. 4) For example, prior to 2005, barley was the principal small grain crop, which has now been replaced by wheat. Oats expanded in acreage in the 1970s as a rotation crop to reduce soil pest populations (nematodes) that were reducing barley yields. Since 1980, alfalfa, considered a soil-building crop, has expanded in acreage on Tule Lake NWR, again primarily driven by market conditions and a desire to control soil pests in small grains and row crops. It is clear from the language of the Kuchel Act and congressional testimony, including testimony from the Secretary (see Udall 1962), that leased agricultural lands were important to the local farm economy and served as a source of revenue to the adjacent counties; however, proper waterfowl management is the major purpose of the lands and any agricultural leasing must be consistent with that major purpose.

Because the Kuchel Act provides that agricultural leasing will continue in specific areas of the refuges if consistent with proper waterfowl management, the Service must continually evaluate agricultural uses and cropping patterns to ensure that they are consistent with proper waterfowl management. For the “present pattern of leasing” to be consistent with proper waterfowl management, the Service finds that the overall program must provide sufficient food resources to support population objectives for waterfowl (dabbling ducks and geese) during the spring and fall migration. In addition, post-harvest farming practices and other practices must be implemented that will increase the attractiveness of the fields for foraging waterfowl and disperse waterfowl use as widely in the leased lands as possible. Bioenergetic modeling approaches (see Chapter VII) such as presented by Dugger et al. (2008) could be used to evaluate the carrying capacity of the refuge’s agricultural programs (including the refuge leased lands) for waterfowl.

Table 1. Crop history of Tule Lake and Lower Klamath National Wildlife Refuge leased lands, California and Oregon, 1980-2012. Alfalfa, onions, potatoes, and horseradish are only grown on Tule Lake NWR, while “other hay” (grass hay) is generally only grown on Lower Klamath NWR. Small grains are grown on both refuges. Data from Tule Lake Irrigation District and Klamath Basin National Wildlife Refuge files.

Year	Barley	Wheat	Oats	Rye	Sugar beets	Onions	Potatoes	Pea seed	Alfalfa	Horse-radish	Other Hay	Total
1980	10,435	646	3,697	3			2,291		371		3,529	20,972
1981	11,076	720	4,564			329	2,453		431		3,032	22,605
1982	11,236	533	4,972			441	2,603		492		2,503	22,780
1983	10,520	962	5,311			435	2,652		574		2,365	22,819
1984	10,502	750	5,147			134	2,945		660		2,311	22,449
1985	9,963	1,044	5,189			224	3,262		803		2,194	22,679
1986	9,238	1,431	3,168			647	2,788		704		2,217	20,193
1987	8,800	1,329	3,966			410	3,071		491		2,181	20,248
1988	10,704	835	3,956			573	2,436		401		2,075	20,980
1989	9,027	1,939	5,768			613	2,727		598		1,948	22,620
1990	9,941	1,942	4,429			614	3,037	53	666		1,940	22,622
1991	10,096	1,681	4,156		265	947	2,224		765		2,340	22,474
1992	11,491	1,930	2,948		456	160	2,226		707		1,940	21,858
1993	9,456	1,717	3,155		607	318	2,919		512		2,010	20,694
1994	9,798	1,797	2,927		699	134	2,893	102	749		1,819	20,918
1995	10,623	1,757	3,691		658	318	2,909		712		1,802	22,470
1996	10,277	2,054	3,110		818	387	2,625		906		1,806	21,983
1997	9,066	1,377	2,996		901	717	2,456		975		1,802	20,290
1998	8,342	2,667	2,280		648	868	2,467		960	13	1,802	20,047
1999	5,227	6,573	1,988		425	1,249	1,589	10	989	25	2,475	20,550
2000	7,011	4,017	2,504		141	993	1,945	10	1,306	34	2,717	20,678
2001	5,758	485	3,482	111					1,280	34	2,380	13,530
2002	5,775	5,177	2,832	61		265	1,535		2,090	33	2,185	19,953
2003	4,931	5,566	2,289	61		401	1,952		2,576	33	2,167	19,976
2004	4,601	6,971	2,239	73		374	1,754		3,237	33	2,126	21,408
2005	2,016	7,851	1,684	90		521	2,703		3,409	38	2,211	20,523
2006	1,964	8,345	1,656	72		745	2,973		3,592	38	2,253	21,638
2007	2,145	7,183	2,134	145		529	3,019		3,450	38	2,346	20,989
2008	1,960	8,432	820	72		1,222	2,729		3,324	38	2,031	20,628
2009	1,121	9,275	1,244			1,220	2,572		2,663	38	1,815	19,948
2010	4,642	4,666	1,664			218	755		2,413	30	1,802	16,190
2011	2,469	8,210	1,295	97		768	3,235		1,759	38	1,802	19,673
2012	3,156	7,031	1,516	33		1,049	2,822		1,651	38	2,026	19,322

Table 2. Crop history of Tule Lake NWR 1957-79. Data from Tule Lake Irrigation District and Klamath Basin National Wildlife Refuge files.

Year	Barley	Wheat	Oats	Onions	Potatoes	Alfalfa/hay	Total
1957	13,431	362	10	33	1,334		15,170
1958	13,702	112		33	1,128		14,975
1959	13,381	310		52	1,443	14	15,200
1960	13,563	720	8	68	1,381	17	15,757
1961	11,078	1,665	155	14	1,690	11	14,613
1962	11,865	1,447	4	55	1,194	11	14,576
1963	9,449	2,231			2,747		14,427
1964	11,174	682			2,566		14,422
1965	11,895	197		21	2,509		14,622
1966	12,152	174		21	2,057		14,404
1967	12,143	375			2,118		14,636
1968	10,803	1,430	163	96	2,140		14,632
1969	No data	650	766	144			Data incomplete
1970	11,060	409	2,982	125	2,157		16,733
1971	8,217	1,595	4,539	52	2,289	669	17,361
1972	9,811	1,446	3,479	212	1,856	431	17,235
1973	8,071	3,331	2,686	450	1,554	501	16,593
1974	6,703	3,870	3,140	468	1,506	902	16,589
1975	7,800	2,619	3,656	357	1,389	818	16,639
1976	8,501	2,296	3,453	34	1,480	673	16,437
1977	9,794	967	3,282	575	1,351	859	16,828
1978	9,458	956	2,938	630	1,889	791	16,662
1979	9,067	1,243	3,317	472	2,021	663	16,783

Maximizing lease revenues

The Kuchel Act provides that consistent with the proper waterfowl management, leases for refuge lands will be at a price or prices designed to obtain maximum lease revenues. Maximizing lease revenues and the cropping pattern on the leased lands are directly linked. During winter and early spring, agricultural leases are advertised for competitive bidding by Reclamation. Kuchel Act language is relatively broad related to crop types, allowing “...for the growing of grain, forage, and soil-building crops, except that not more than 25 per centum of the total leased lands may be planted to row crops.” (Sec. 4) To achieve maximum revenues, bids are selected based on the highest price. Changing market conditions and more efficacious agricultural technologies influence farm profitability, and thus the ability to bid competitively. Farmers that are successful in the bidding process are those who can adapt to changing conditions and technologies. Thus, maximizing revenues and broadly defined allowable crops results in an evolving cropping pattern on the refuge leased lands over time.

The Service believes it was the intent of Congress to maintain the leasing program on the refuges to the extent consistent with proper waterfowl management to support the economies of local rural communities and to provide revenue to adjacent Modoc, Siskiyou, and Klamath Counties. Some flexibility in crop types and the desire to maximize revenues both serve this intent; however, this intent is subject to the primary intent (major purpose) of proper waterfowl management. Thus, the needs of waterfowl are first assessed, and then lease contract stipulations

regarding acreage, cropping patterns, and requisite management practices on the lands will need to be developed consistent with this assessment.

Full consideration for optimizing agricultural use

Section 2 of the Kuchel Act directs the Secretary to manage Tule Lake and Lower Klamath NWRs “...for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith.” By allowing for the evolution of cropping patterns under the language of Section 4, which allows “...for the growing of grain, forage, and soil-building crops, except that not more than 25 per centum of the total leased lands may be planted to row crops,” the Service is providing full consideration to optimum agricultural use. However, there are limits to this optimization if it does not meet proper waterfowl management needs. On the refuge leased lands, the language of Section 4 and the five-year (one year annual renewal for four years) duration of most lease contracts has maintained the larger proportion of the lands in small grains. Numerous references by the Service, either in the congressional testimony or supporting documents (U.S. Fish and Wildlife Service 1956b), state the importance of small grains to waterfowl in the Klamath Basin and, in particular, on these two refuges. Similar to other agricultural related language in the Kuchel Act, the Service will provide “...full consideration to optimum agricultural use...” consistent with waterfowl management. Again, the Service will assess the needs of waterfowl relative to the leased refuge lands and then optimize agriculture to the extent consistent with proper waterfowl management and other applicable Service and Interior policies.

Chapter VI Habitat management and waterfowl use 49 years after the Kuchel Act

In evaluating habitat management for waterfowl under the Kuchel Act, an analysis of how waterfowl populations have responded to refuge management since passage of the Act is warranted. The following chapter describes general habitat management as it has occurred over the last 47 years for both refuges and describes use of the refuges by breeding and migratory waterfowl.

Lower Klamath NWR

Habitat management: With the exception of the portion of the refuge known as Area K (also termed the Straits Unit) (see Fig. 3), habitat management on Lower Klamath NWR is primarily guided by Section 4 of the Kuchel Act, which states: “*All other reserved public lands included in section 2 of this Act shall continue to be managed by the Secretary for waterfowl purposes, including the growing of agricultural crops by direct planting and sharecrop agreements with local cooperators where necessary.*”

Management of these “*other reserved public lands,*” which comprise most of Lower Klamath NWR, has evolved over the decades because the Service has broad discretion over management of these lands for waterfowl. Management flexibility is high, with managers and biologists able to change habitat management practices as on-the-ground monitoring reveals the results of habitat management practices, as other new information is developed, or as the needs of waterfowl populations change. Basic habitat types consist of seasonal wetlands that are dewatered at various times in spring and reflooded in fall. This is the primary habitat for fall and spring migrant waterfowl. Other marshes are flooded year round and are the primary habitat used by diving ducks and as brood rearing habitat for waterfowl. Small grains are produced on a sharecrop basis; 25-33 percent of a crop is left unharvested and used by fall and spring waterfowl, primarily dabbling ducks and geese. Some areas are grazed or hayed to provide short stature grasses for spring migrant geese. The diversity and juxtaposition of typical habitats are depicted in Fig. 3.

In addition to the year-specific matrix of habitats, there is a rotational component to the program. In many areas, wetlands and croplands are rotated as a means of managing vegetative succession in wetlands, and year-round wetlands are periodically dewatered to enhance their productivity. Where possible, the hydrology of the refuge is managed to mimic what historically occurred within Lower Klamath Lake, when water levels reached annual lows in September and left approximately 50-60 percent of the lake bed dry. Natural reflooding would begin in September or October with the lake and marsh reaching annual high levels during March or April (Weddell 2000).

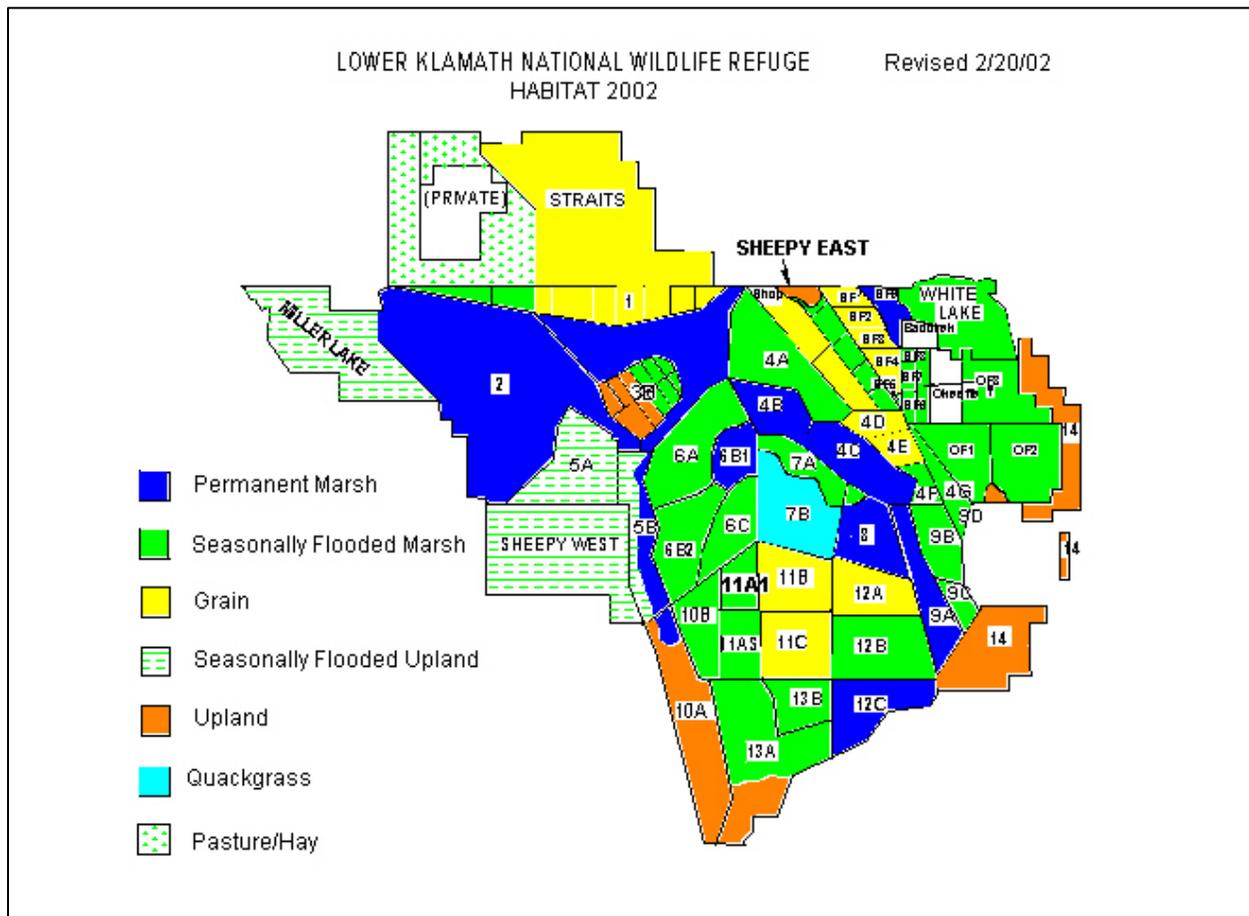


Fig. 3. Management units and typical habitats on Lower Klamath National Wildlife Refuge, California-Oregon, 2002.

Migratory waterfowl use: In examining waterfowl use on Lower Klamath NWR, the Service used data presented in Dugger et al. (2008) in which the authors compared the decade of the 1970s with the 1990s. The 1970s were chosen as the baseline year in which continental waterfowl populations were at NAWMP goals. The 1990s was chosen as the most recent decade in which refuge water supplies were at least comparable to the 1970s.

On Lower Klamath NWR, dabbling numbers have increased slightly between the 1970s and the 1990s census periods (Fig. 4). Goose use of Lower Klamath NWR has increased in spring (Fig. 5), while diving ducks have increased in all seasons (Fig. 6). Tundra swan use has increased in the spring period (Fig. 7).

In a more extensive review of the refuge's waterfowl census data, Gilmer et al. (2004) determined that most of the waterfowl use of the Klamath Basin shifted from Tule Lake to Lower Klamath NWR in the early 1980s and has remained there to the present day.

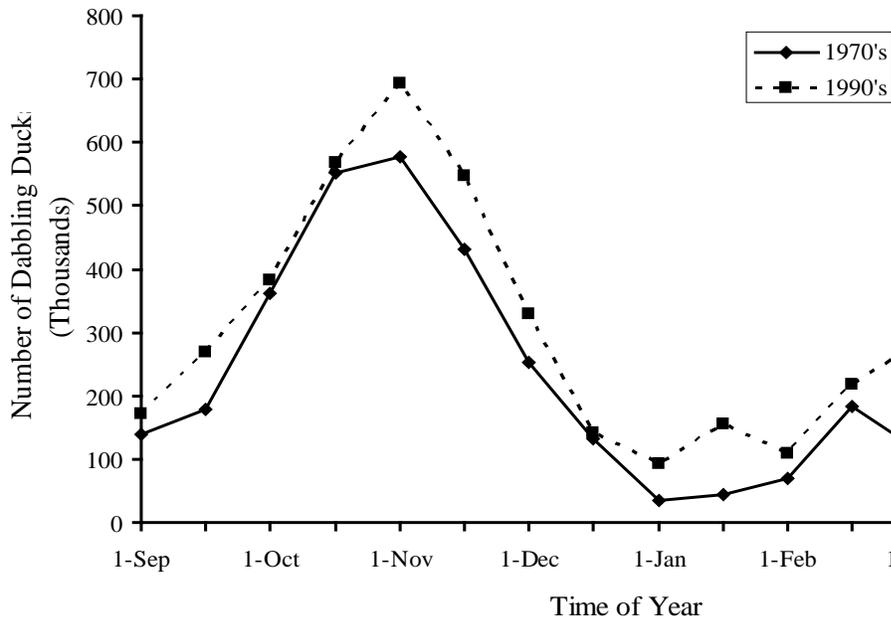


Fig. 4. Mean counts of dabbling ducks by date at Lower Klamath NWR in the 1970s (1970-1979) and 1990s (1990-1999) determined from aerial surveys (from Dugger et al. 2008).

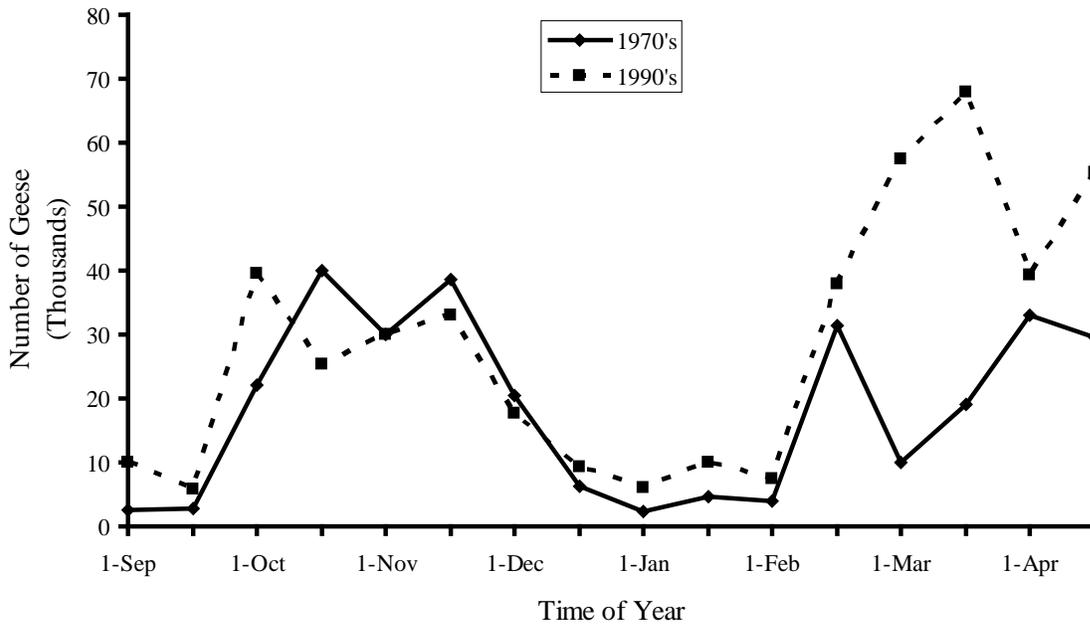


Fig. 5. Mean counts of geese by date at Lower Klamath NWR in the 1970s (1970-1979) and 1990s (1990-1999) determined from aerial surveys (from Dugger et al. 2008).

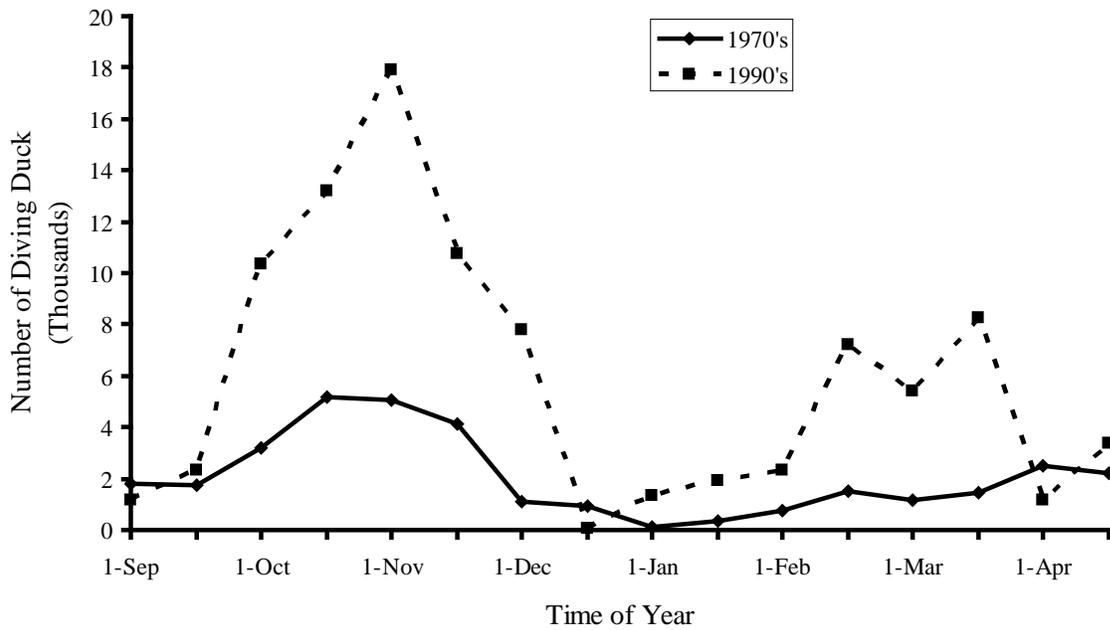


Fig. 6. Mean counts of diving ducks by date at Lower Klamath NWR in the 1970s (1970-1979) and 1990s (1990-1999) determined from aerial surveys (from Dugger et al. 2008).

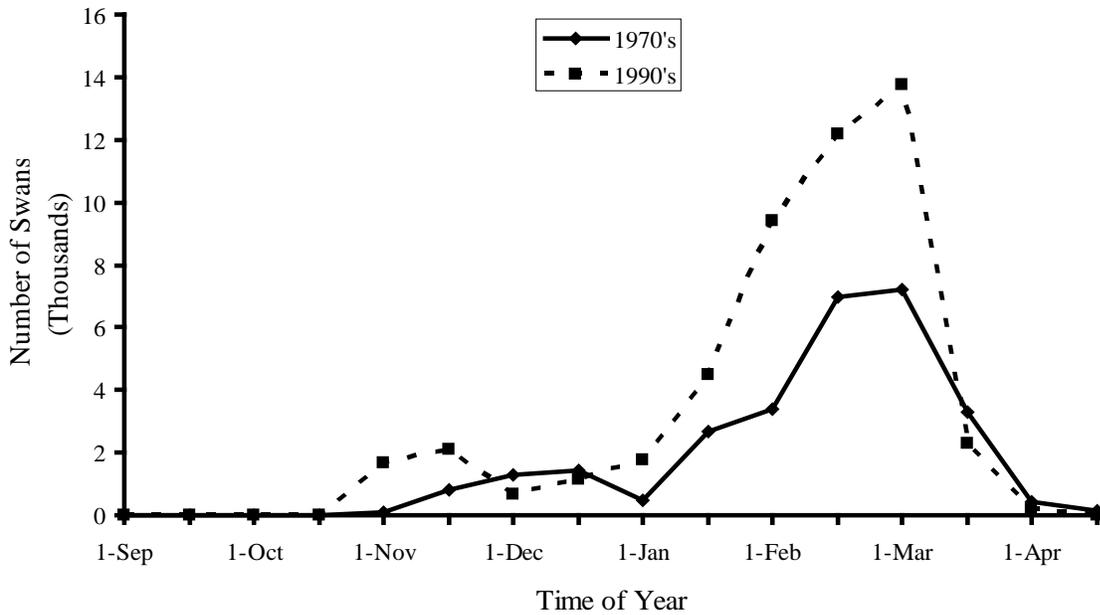


Fig. 7. Mean counts of swans by date at Lower Klamath NWR in the 1970s (1970-1979) and 1990s (1990-1999) determined from aerial surveys (from Dugger et al. 2008).

Breeding waterfowl: Lower Klamath NWR has a long history as a waterfowl production area in the Intermountain West (Jensen and Chattin 1964), and this value was discussed during Kuchel Act testimony (Janzen 1962). Table 3 depicts estimated breeding pairs of the most common waterfowl using Lower Klamath NWR. From the 1950s through the 1990s, most species have remained relatively unchanged with the exception of gadwall, which increased over 500 percent in the 1990s. Ruddy ducks have declined approximately 75 percent from the 1970s.

Table 3. Estimated mean number of breeding pairs of waterfowl on Lower Klamath NWR for the 12 years prior to the Kuchel Act (1953-64) and the decade of the 1970s and 1990s.

Species	1953-64	1970-79	1990-99
Redhead	1,178	782	1,471
Ruddy duck	1,104	2,435	648
Mallard	1,054	1,534	2,454
Gadwall	1,770	1,672	11,321
Cinnamon teal	617	1,100	889

Tule Lake NWR

Habitat management: The foundation for habitat management on Tule Lake NWR is based on language in Section 4 of the Act, which states:

“The Secretary shall, consistent with proper waterfowl management, continue the present pattern of leasing the reserved lands of the Klamath Straits unit, the Southwest sump, the League of Nations unit, the Henzel lease, and the Frog Pond unit, all within the Executive order boundaries of the Lower Klamath and Tule Lake National Wildlife Refuges and shown in plate 4 of the report entitled, “Plan for Wildlife Use of Federal Lands in the Upper Klamath Basin, Oregon-California,” dated April 1956. Leases for these lands shall be at a price or prices designed to obtain the maximum lease revenues. The leases shall provide for the growing of grain, forage, and soil-building crops, except that not more than 25 per centum of the total leased lands may be planted to row crops.”

Relative to the sumps on Tule Lake NWR, Section 5 states: *“The areas of sumps 1(a) and 1(b) in the Klamath project lying within the Executive order boundaries of the Tule Lake National Wildlife Refuge shall not be reduced by diking or by any other construction to less than the existing thirteen thousand acres.”*

Section 6 states: *“...waters under the control of the Secretary of the Interior shall be regulated, subject to valid existing rights, to maintain sump levels in the Tule Lake National Wildlife Refuge at levels established by regulations issued by the Secretary pursuant to the contract between the United States and the Tulelake Irrigation District, dated September 10, 1956, or any amendment thereof. Such regulations shall accommodate to the maximum extent practicable waterfowl management needs.”*

Thus, Tule Lake NWR waterfowl habitats are comprised nearly entirely of the leased lands and agricultural return flow Sumps 1(A) and 1(B), management of which is guided by Sections 4

(leased lands) and Sections 5 and 6 (Sumps 1(A) and 1(B)). The leased lands are managed primarily through agricultural lease contracts, and sump management and elevations are maintained consistent with the 1956 Tulelake Irrigation District (TID) contract, as amended, as well as interagency agreements between Reclamation and the Service. The ability to effect change under this framework is often slow and sometimes contentious. Nearly all of Tule Lake NWR is (and has been) managed under this basic framework since the early 1940s when the D pumping plant was constructed.

A major portion (more than half) of Tule Lake NWR's habitat acreage is a direct result of cropping patterns in the leasing program (Fig. 8, Table 1). In addition, the location and water elevations of the sumps have changed little since passage of the Kuchel Act. Essentially the Kuchel Act sought to freeze management in time such that waterfowl values of the refuge would be maintained. This made sense at the time because habitats on Tule Lake NWR, during debate and eventual passage of the Kuchel Act, supported one of the largest fall staging populations in North America. However, unlike Lower Klamath NWR, habitat management did not evolve over time with advances in the science and practice of waterfowl management. The assumption that Tule Lake NWR would continue to support robust waterfowl populations proved erroneous, and the refuge increasingly resembled a time capsule, showcasing waterfowl management from the 1950s and 60s. Specifically, management under the Kuchel Act assumed that:

- Dry agricultural fields would remain the preferred foraging habitat for waterfowl.
- Without active management, manipulating water levels, and/or habitat restoration of the sump, the Tule Lake sumps would remain productive for waterfowl.
- Waterfowl would remain the single goal associated with the practice of “waterfowl management.”

Since the mid-1990s, the Service, in cooperation with TID and Reclamation, implemented significant projects that are beginning to improve habitats for waterfowl and other wetlands wildlife species. These include the current Walking Wetlands program, where wetlands are inserted into agricultural crop rotations, and the Sump 1(B) project, initiated in 1999, which allows for water manipulation at this 3,500-acre location. These efforts primarily focused on enhancing the diversity and productivity of wetland habitats. More work is needed to enhance the agricultural lands for waterfowl.

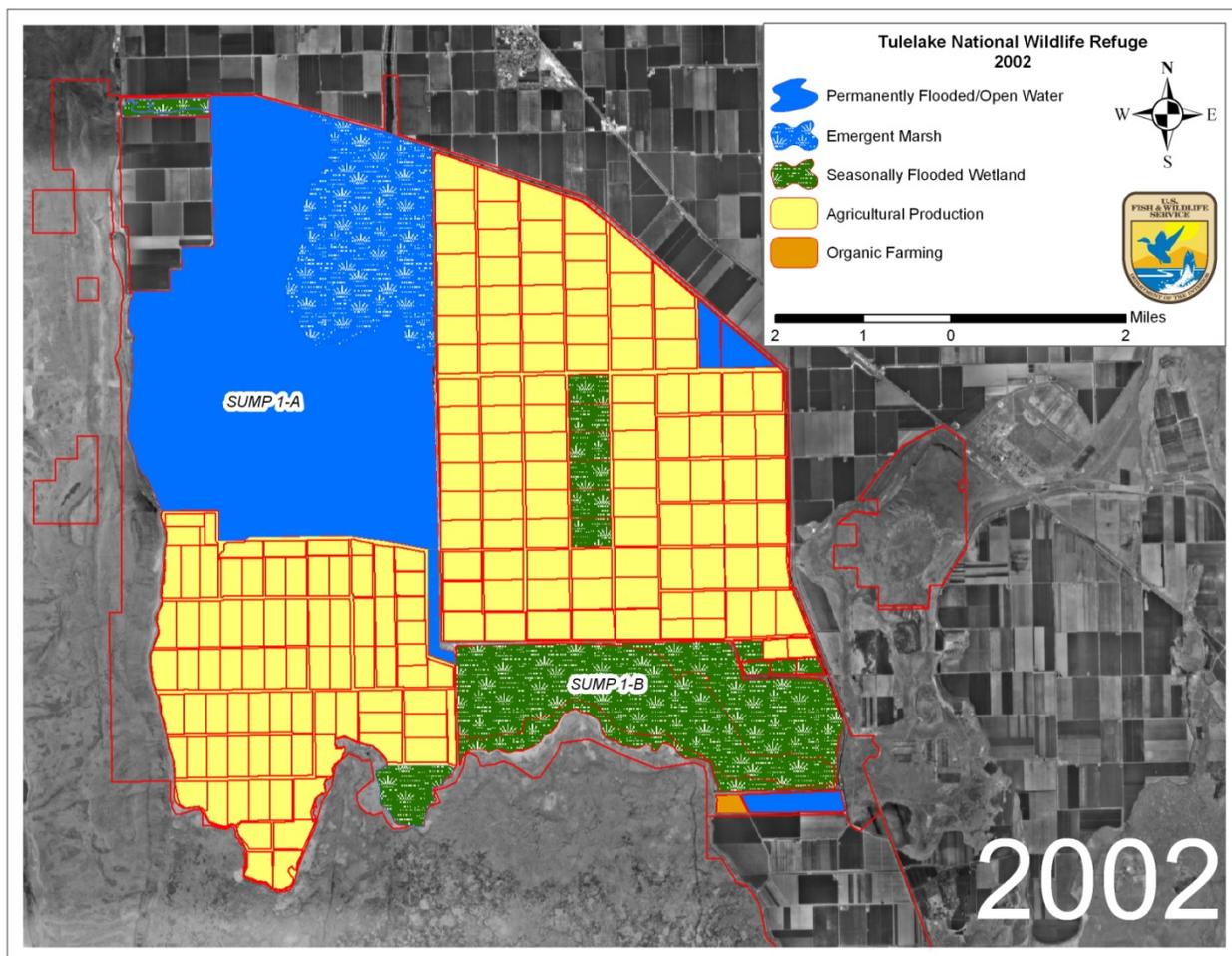


Fig. 8. Habitats of Tule Lake National Wildlife Refuge, 2002.

Migratory waterfowl use: A recent comparison of 1970s and 1990s population trends indicates that waterfowl use of Tule Lake NWR has changed significantly over time (Dugger et al. 2008). Especially notable are dabbling (Fig. 9) and goose use (Fig. 10), which have declined significantly compared to the 1970s. In contrast, diver numbers (Fig. 11) have increased, and swan use has remained relatively unchanged (Fig. 12). Guilds of waterfowl that make the greatest utilization of agricultural crops (geese and dabbling ducks) have undergone the most significant decline since the 1970s.

Changing cropping patterns (Tables 1 and 2) and harvest efficiencies on Tule Lake NWR and surrounding private lands, particularly in small grains, may be reducing the attractiveness and carrying capacity of the agricultural lands for waterfowl. In particular, small grains on surrounding private lands have been replaced by alfalfa and mint, particularly in the Tule Lake Basin. In addition, barley in the Klamath Basin has been replaced by wheat as the primary small grain crop grown. Modern combines are also more efficient in harvest than older combines were, potentially leaving less grain in fields after harvest. Krapu et al. (2004) compared 1978 corn harvest efficiencies in Nebraska to 1997-1998 efficiencies. Although average yields increased 20 percent, over the 20-year period, waste grain remaining in fields were 76 percent and 53 percent, respectively, of grain residues estimated in 1978. The authors believed this

reduction in waste grain and corn acreage, coupled with competition from increasing numbers of other seed eating species (geese), was forcing sandhill cranes into longer foraging flights at higher energetic costs.

The role of agriculture in providing foods for large populations of staging waterfowl in the Klamath Basin was recognized by former Service Director Janzen, who stated during the congressional hearings on S. 1988, "... 15,000 acres within the refuge [Tule Lake NWR] is cash leased to local farmers by the Bureau of Reclamation. Following the harvest, waterfowl glean the lease lands stubble fields for waste grain. The lease areas provide space for waterfowl to disperse, loaf, and feed, and are particularly attractive and valuable to geese and field feeding species of ducks, such as mallards and pintails." (Janzen 1962, page 41). It seems reasonable to assume that agricultural practices, crop cultivars, and combine efficiency have advanced over the last 47 years, potentially leaving less grain in fields than occurred in the 1950 and 1960s. In fact, bioenergetics modeling work conducted by Dugger et al. (2008) on Tule Lake NWR indicates that small grain resources are currently insufficient to support waterfowl populations of the 1970s (see Chapter VII of this document), much less the much larger populations present during the 1950s and 1960s (Gilmer et al. 2004). Reduced standing grain acreage on Tule Lake NWR, historically farmed by either the refuge or its cooperators, may also have played a role in the reduced small grain food resources available.

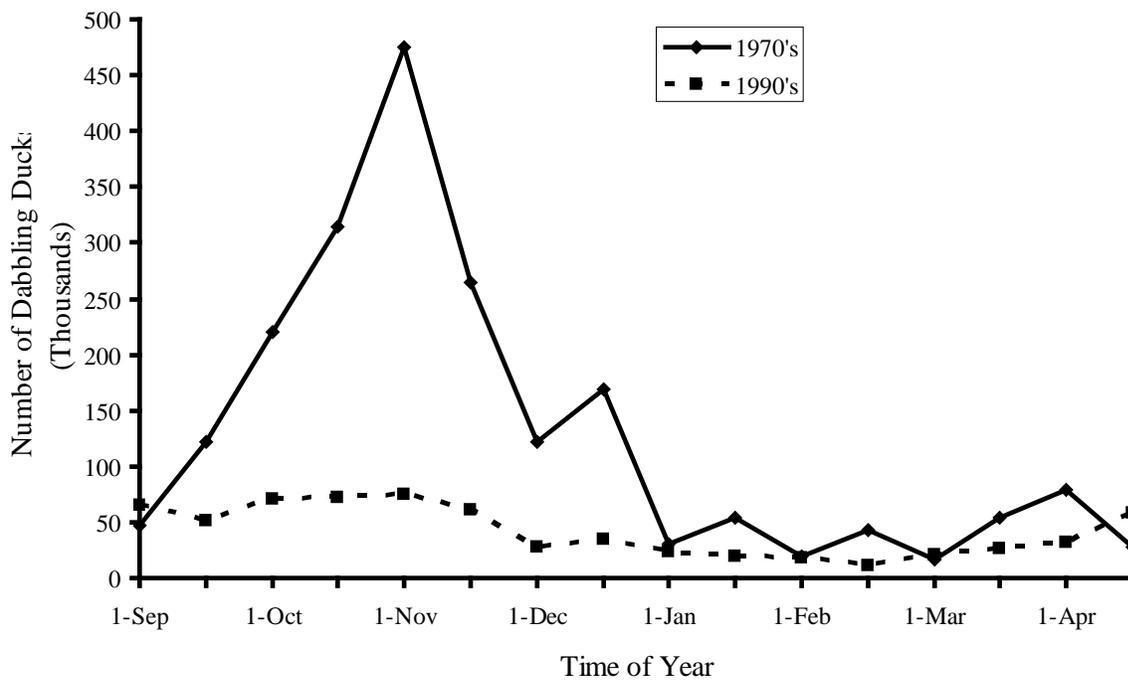


Fig. 9. Mean counts of dabbling ducks by date at Tule Lake NWR in the 1970s (1970-1979) and 1990s (1990-1999) determined from aerial surveys (from Dugger et al. 2008).

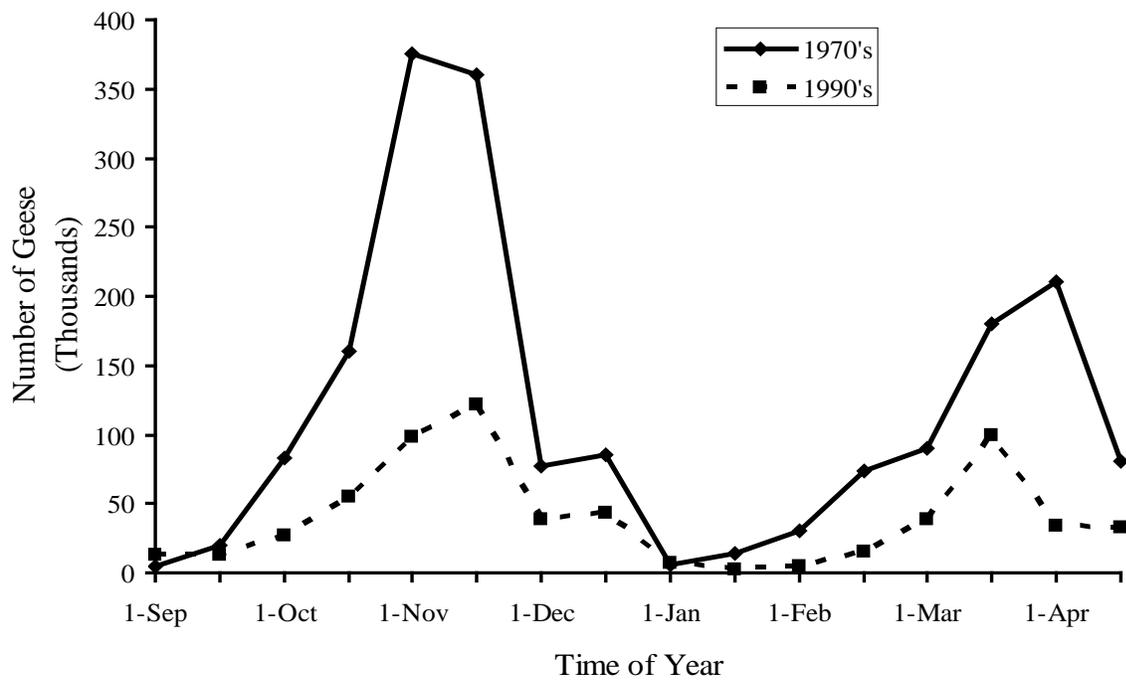


Fig. 10. Mean counts of geese by date at Tule Lake NWR in the 1970s (1970-1979) and 1990s (1990-1999) determined from aerial surveys (from Dugger et al. 2008).

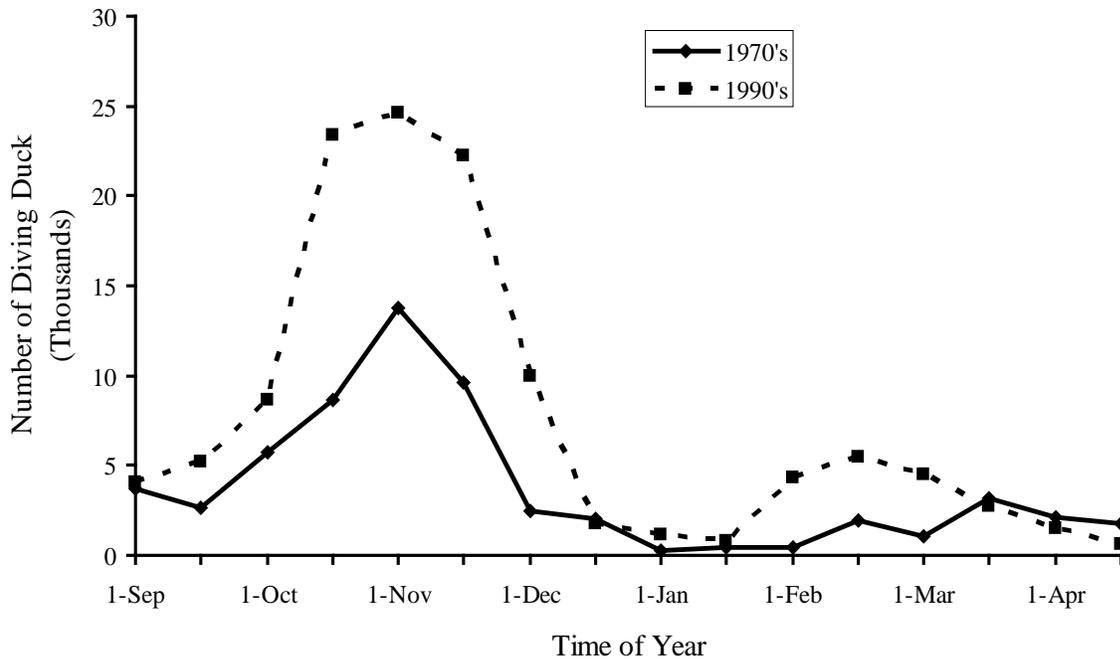


Fig. 11. Mean counts of diving ducks by date at Tule Lake NWR in the 1970s (1970-1979) and 1990s (1990-1999) determined from aerial surveys (from Dugger et al. 2008).

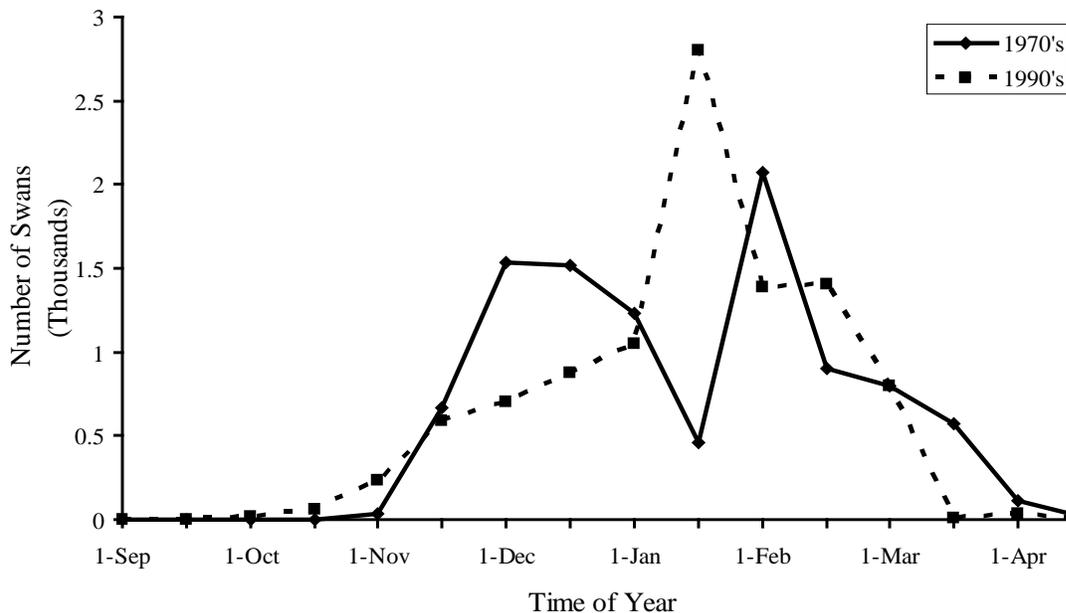


Fig. 12. Mean counts of swans by date at Tule Lake NWR in the 1970s (1970-1979) and 1990s (1990-1999) determined from aerial surveys (from Dugger et al. 2008).

Breeding waterfowl: Tule Lake NWR has a long history as a waterfowl production area within the Intermountain West (Jensen and Chattin 1964) and was discussed at length, particularly for breeding redheads, during congressional testimony for the Kuchel Act. Secretary Udall stated, *“The marshes of the Klamath Basin refuges rank among the best waterfowl production areas in the Nation, with the last 10-year average being 78,000 ducks and geese produced annually and peaks up to 112,000 earlier due to better nesting conditions. The Redhead, a species which is dwindling in numbers over much of its range, is the most abundant nester. Tule Lake, Lower and Upper Klamath, and Klamath Forest [now Klamath Marsh NWR] are key refuges in the preservation of this species, which require large marsh areas for survival.”* (Udall 1962)

Similar to Lower Klamath NWR, breeding gadwall have increased over the years at Tule Lake NWR (Table 3). Breeding pairs of cinnamon teal and both common diving duck species (redhead and ruddy duck) have declined significantly. A likely cause of the decline in diving ducks is a reduction in the suitability of the sumps on Tule Lake NWR for breeding. Specifically, relatively stable water levels in the sumps have removed the very process that contributes to productive wetland habitats. Historically, fire, flooding, and drought created dynamic water regimes and wetland plant successional patterns to which wetland wildlife were adapted (Fredrickson and Reid 1990). Abney (1964), in a report completed shortly after the Kuchel Act was enacted, recognized that high stabilized water levels in the sumps had reduced the area of emergent wetlands from over 9,000 acres in the 1930s to approximately 2,500 acres by the late 1950s. In addition, sedimentation since passage of the Kuchel Act has reduced water depths in the remaining emergent marsh in Sump 1A to a fraction of that present in 1964, rendering this 2,500-acre marsh unsuitable as breeding or foraging habitat for diving ducks. The waterfowl production capacity of the sumps on Tule Lake was discussed at length during the Kuchel Act testimony and likely led to inclusion of Section 6 in the Act. Prior to the Kuchel Act, the

Service, Reclamation, and the Tule Lake Irrigation District were frequently at odds over management of water levels in the Sumps. The Service felt that rising water levels during the spring nesting period was flooding the nests of over-water nesting species such as diving ducks. Unfortunately, the Service’s belief that stabilizing management of the sumps would ensure continued production of diving ducks proved unfounded.

Table 4. Estimated mean number of breeding pairs of waterfowl on Tule Lake NWR for the 12 years prior to the Kuchel Act (1953-1964) and the decade of the 1970s and 1990s.

Species	1953-1964	1970-1979	1990-1999
Redhead	1,350	635	161
Ruddy duck	1,503	3,092	315
Mallard	1,795	2,186	2,072
Gadwall	494	1,128	1,256
Cinnamon teal	610	667	200

Tule Lake NWR and the Pacific Flyway

Because waterfowl are migratory, reduced populations of fall staging geese and dabbling ducks may be caused by factors outside the Klamath Basin. Waterfowl are highly mobile and exploit a diverse array of wetland and non-wetland habitats over large geographic landscapes (Baldassarre and Bolen 2006). Thus, they are able to shift wintering and staging areas as available habitat changes within the Pacific Flyway. In North America, major waterfowl staging and wintering areas are often comprised of a mixture of wetlands and private agricultural lands. All waterfowl use wetlands as their primary habitat base for food, shelter, and other behavioral and physiological needs. Some waterfowl species are completely dependent on wetlands, while other species currently use a combination of wetlands and agricultural lands. Current goose populations are especially tied to agricultural lands, which they use from nearby wetland roost sites. Ringleman (1990) noted these large-scale shifts in waterfowl use patterns in North America, which often occurred in response to changes in agricultural practices and cropping patterns.

In the 1950 and 1960s, Tule Lake NWR represented optimal habitat for fall staging waterfowl in the Pacific Flyway, if not North America. The intent of the Kuchel Act was to preserve this “snapshot in time.” The agricultural lands surrounding Sumps 1(A) and 1(B) supported literally millions of waterfowl at the peak of migration. However, the practice of wetland management for waterfowl and the science behind that management changed over time. This change was reflected in changing habitat management on Lower Klamath NWR and elsewhere in California, particularly in the Central Valley. Because the Central Valley is the primary wintering destination for waterfowl, habitat conditions there have a major impact on waterfowl populations in the Pacific Flyway, as well as how those birds move within the flyway.

During the 1800s, the Central Valley of California contained more than four million acres of wetlands that supported 20 to 40 million waterfowl annually. Agriculture and urban development reduced this wetland habitat by over 95 percent (Central Valley Joint Venture 2006). To address this issue, the Central Valley Joint Venture (CVJV) was established in 1988

as one of the six priority joint ventures under the NAWMP. Implementation of the CVJV has been hugely successful with 121,969 acres of wetlands protected, restored, or enhanced and more than 384,000 acres of agricultural lands enhanced for waterfowl between 1990 and 2003 (CVJV 2006). Of the agricultural enhancement, over 90 percent of the acres are comprised of fall and winter flooded rice. Miller et al. (2010) estimated that flooded rice fields increased 40 percent in 2007 compared to 1999-2000 and increased 90 percent over the fall-winter of 1993-94. In addition, passage of the Central Valley Project Improvement Act of 1992 significantly increased the reliability of water supplies for public and private wetlands in the Central Valley.

Tule Lake NWR experienced its highest fall waterfowl populations during the 1950s and 1960s when Central Valley wetland and agricultural habitat conditions were least attractive to wintering waterfowl. Subsequent improvements to Central Valley habitats appear to have strongly influenced fall waterfowl use of Tule Lake NWR and, to a lesser degree, Lower Klamath NWR. Spring populations, however, continue to increase in the Klamath Basin, particularly on Lower Klamath NWR. Thus, while other major waterfowl use areas of the Pacific Flyway have enhanced and expanded their habitats, management of Tule Lake NWR has remained relatively unchanged since the 1950s and 1960s.

In the case of Tule Lake NWR, the reduction of waterfowl use since the early 1970s can be attributed to several causes: (1) a lack of productive wetland habitats, (2) a lack of sufficient agricultural food resources (see Chapter VII), (3) improved wetland habitat conditions in the Central Valley of California, particularly in fall, and (4) increased attractiveness of Central Valley agriculture for waterfowl, primarily due to significantly increased acreage of early fall flooding of rice.

A large proportion of wintering waterfowl in the Pacific Flyway are now dependent on the food and habitat resources of private agricultural lands of the Central Valley. The future of these lands for waterfowl is not secure, as it is subject to changing agricultural market conditions, scarcity, and/or valuation of water for other uses in California, and other unforeseen circumstances. Changing conditions in this critical wintering area will alter how waterfowl use the Pacific Flyway and the Klamath Basin in the future.

Chapter VII Assessing current waterfowl habitat management using a bioenergetics model

In addition to assessing waterfowl use and habitat management of the refuges, the Service contracted with Oregon State University and Ducks Unlimited to examine the current carrying capacity of both refuges for waterfowl. More specifically, this project's objectives were to: (1) develop waterfowl population objectives for both refuges, and (2) evaluate current habitat management programs using the TRUOMET bioenergetics model (Dugger et al. 2008). Bioenergetics modeling is the current method used in both the Intermountain West and Central Valley joint ventures (Central Valley Joint Venture 2006) to estimate waterfowl habitat needs for specified population objectives.

Developing waterfowl population objectives

The Klamath Basin forms a natural funnel for the Pacific Flyway as migratory waterfowl transition from northerly breeding areas to major wintering sites in the Central Valley of California (Gilmer et al. 1982). Lower Klamath and Tule Lake NWRs represent key migrational spring and fall staging areas in the Klamath Basin and for the larger Pacific Flyway (Gilmer et al. 2004). Both refuges are unique in the Refuge System in having a long history of periodic aerial waterfowl surveys, dating as far back as the 1950s (Gilmer et al. 2004). Dabbling ducks are comprised primarily of mallard, pintail, wigeon, and green-winged teal. Major goose species include white-fronted snow, and Ross's goose. Divers are comprised primarily of canvasback, redhead, scaup, ruddy, and bufflehead; the tundra swan is the primary swan species on both refuges.

There are three primary reasons for establishing population objectives at Tule Lake and Lower Klamath NWRs. First, it will match habitats with desired waterfowl numbers; second, it will provide habitats in coordination with other flyway-wide habitat and population objectives; and third, it serves as a communication tool so that the public understands the basis for refuge habitat management programs. In establishing population objectives, of the factors that influence waterfowl use of an area, many are outside the control of refuge managers and biologists. For example, drought in northern breeding areas may reduce continental populations. Year-specific weather patterns may mean an earlier or later migration or cause waterfowl to shift migration and wintering areas. Landscape conditions in other areas of the flyway may influence populations at migrational staging or wintering areas. Many of these variables cannot be anticipated or influenced. Thus, it is not necessarily reasonable to expect to achieve exact specified population objectives every year.

At the individual refuge scale, matching habitats to population objectives is also desirable from an operational efficiency standpoint. If waterfowl objectives can be met with, for example, 70 percent of the refuge's land area, the other 30 percent could be used to meet the broader refuge purpose of "wildlife conservation" under the Kuchel Act. At a flyway scale, Tule Lake and Lower Klamath NWRs are primarily migration habitat and should be providing sufficient foods and habitats to sustain desired Pacific Flyway populations as the birds migrate either south to wintering areas or north in spring to breeding areas.

The NAWMP update (2012) recommends that joint ventures, including the IMWJV, step down continental waterfowl population objectives to joint venture objectives. The IMWJV has begun this process with population objectives for key migrational staging areas, which includes the SONEC region (Fig. 2) of which the Klamath Basin is a key part. Population objectives for Tule Lake and Lower Klamath NWRs represent a portion of the total objectives for the larger SONEC region. Waterfowl population objectives developed for Tule Lake NWR (Table 5) and Lower Klamath NWRs (Table 6) are consistent with objectives of the NAWMP, as well as planning efforts within the Intermountain West and the Pacific Flyway.

Migrating ducks: Aerial surveys from the 1970s conducted once every two weeks were used to develop population objectives for ducks at Tule Lake and Lower Klamath NWRs for each two-week interval between September 1 and April 15. Population objectives for each interval were based on survey counts from 1970 to 1979 and were equal to the 75th percentile of these counts (Tables 5 and 6). The 75th percentile rather than the mean was chosen because population numbers based on aerial surveys often are negatively biased (i.e., typically undercount the true number of birds) (Caughley 1977: 35) and because birds are often undetectable from the air (Pollock and Kendall 1987). A second reason for choosing the 75th percentile was to achieve a greater probability that provided habitats would meet the needs of desired populations. By increasing the population objective to the 75th percentile, habitats are increased and the needs of waterfowl would be met in greater than 50 percent of future years.

Migrating geese and Swans: Although duck population objectives were derived from the 1970s, population objectives for geese and swans were based on refuge counts from 1990 to 1999. Using data for goose populations from the 1990s is the same approach currently used in the IMWJV SONEC planning effort. Goose and swan populations in the Pacific Flyway have undergone major changes in size and distribution since the 1970s, so more recent counts were used to establish population objectives for Tule Lake and Lower Klamath NWRs. Aerial surveys every two weeks were used to develop population objectives for geese and swans at both refuges for each two-week interval between September 1 and April 15. Population objectives for each interval are equal to the 75th percentile of these counts (Tables 5 and 6). The rationale for the 75th percentile is the same as described for ducks.

Table 5. Waterfowl population objectives by date for Tule Lake National Wildlife Refuge, California (from Dugger et al. 2008). Population objectives were included for coots (based on 1970s aerial surveys), as coots compete with diving ducks and swans for food resources and must be considered in estimating habitat needs for waterfowl.

Date	Waterfowl Taxa or Guild ^a				
	Dabblers ^b	Divers ^c	Geese ^d	Swans	Coots
Sept 1	53,100	4,270	14,680	0	31,000
Sept 15	54,725	2,990	10,630	0	82,575
Oct 1	292,200	6,998	37,460	0	124,900
Oct 15	281,100	10,730	82,170	0	115,200
Nov 1	765,901	16,440	136,413	260	52,375
Nov 15	268,328	11,088	146,605	713	35,925
Dec 1	193,700	3,825	50,275	1,230	10,650
Dec 15	262,400	2,200	64,608	1,125	8,000
Jan 1	37,015	193	9,240	640	300
Jan 15	91,955	675	4,040	4,205	800
Feb 1	24,635	525	8,350	1,525	2,550
Feb 15	42,850	3,115	13,935	1,530	5,300
Mar 1	16,903	1,308	44,233	1,115	3,750
Mar 15	63,486	3,388	112,708	8	12,375
Apr 1	92,620	2,555	35,705	50	14,500
Apr 15	32,975	2,638	39,595	0	10,250

^aSpecies combined into guilds based on foraging method and diet. Seventy-fifth percentiles calculated for either 1970-1979 (ducks and coots) or 1990-1999 (geese and swans); see methods in Dugger et al. (2008) for explanation.

^bDabblers include mallard, gadwall, northern pintail, green-winged teal, cinnamon teal, and northern shoveler.

^cDivers include canvasback, redhead, ruddy duck, bufflehead, ring-necked duck, goldeneye, and scaup.

^dGeese include Canada goose, cackling goose, greater white-fronted goose, lesser snow goose, Ross's goose.

Table 6. Waterfowl population objectives by date for Lower Klamath National Wildlife Refuge, California (from Dugger et al. 2008). Population objectives were included for coots (based on 1970s aerial surveys), as coots compete with diving ducks and swans for food resources and must be considered in estimating habitat needs for waterfowl.

Date	Waterfowl Taxa or Guild ^a				
	Dabblers ^b	Divers ^c	Geese ^d	Swans	Coots
Sept 1	213,521	2,270	7,640	0	28,000
Sept 15	219,869	1,791	5,820	0	33,250
Oct 1	401,738	3,708	51,610	0	52,863
Oct 15	597,010	7,385	36,095	0	59,925
Nov 1	597,536	6,313	34,160	1,545	23,625
Nov 15	487,361	5,783	46,855	3,193	15,925
Dec 1	372,560	1,250	19,475	930	19,500
Dec 15	198,118	855	12,488	1,398	5,500
Jan 1	10,594	160	7,430	2,490	540
Jan 15	27,171	305	12,990	7,211	550
Feb 1	77,714	800	11,431	14,043	1,750
Feb 15	223,459	2,175	56,580	14,960	8,350
Mar 1	148,414	1,560	66,248	18,995	4,850
Mar 15	203,306	1,600	80,433	3,186	11,000
Apr 1	96,775	3,600	49,880	0	45,000
Apr 15	83,339	2,020	70,185	0	16,475

^aSpecies combined into guilds based on foraging method and diet. Means calculated for either 1970-1979 (ducks and coots) or 1990-1999 (geese and swans); see methods in Dugger et al. (2008) for explanation.

^bDabblers include mallard, gadwall, northern pintail, green-winged teal, cinnamon teal, and northern shoveler.

^cDivers include canvasback, redhead, ruddy duck, bufflehead, ring-necked duck, goldeneye, and scaup.

^dGeese include Canada goose, cackling goose, greater white-fronted goose, lesser snow goose, Ross's goose.

Breeding waterfowl: Population objectives for breeding waterfowl have not yet been established for the IMWJV. In the interim, for purposes of habitat management planning (for the CCP and habitat management plan [HMP]), breeding waterfowl objectives for the refuges will be similar to populations present in the 1970s (see Tables 3 and 4). As more information becomes available, detailed justification for breeding waterfowl and associated habitat objectives will be incorporated into habitat management planning documents.

Molting waterfowl: Habitat for molting waterfowl (particularly mallards breeding further south in California, see Yarris et al. (1994)) is an important function of both refuges. Unfortunately, very few late summer surveys have been conducted on Tule Lake and Lower Klamath NWRs to estimate current populations from which to develop population objectives. Population objectives for molting mallards could be achieved either through an extended period of survey work (5-10 years) or by assigning an objective based on a portion of the estimated breeding population of

mallards in California. Over the last 20-plus years, the California Department of Fish and Game has conducted statewide waterfowl breeding population surveys each spring.

Bioenergetics modeling and current refuge habitat management

Using waterfowl population objectives in concert with food resources provided by different refuge habitats allows refuge managers and biologists to estimate the quantity and type of habitats needed to support population objectives. Thus, population objectives become thresholds toward which direct habitat management (quantity, quality, diversity, seasonality, location, etc.) is targeted. Inventory and monitoring of populations are then used to evaluate actual waterfowl populations and habitat use as part of an adaptive management process. This modeling approach assumes food availability is a key factor limiting waterfowl populations (Miller 1986, Conroy et al. 1989, Reinecke et al. 1989). During 2004 and 2005, the Service contracted with Oregon State University and Ducks Unlimited to evaluate current habitat management programs using the TRUOMET bioenergetics model (Dugger et al. 2008).

The TRUOMET model provides an estimate of population energy demand and population energy supply for specified time periods. Population energy demand is a function of period-specific population objectives and the daily energy requirements of individual birds during that period. Population energy supply is a function of the foraging habitats available and the biomass and nutritional quality of foods contained in these habitats. A comparison of energy supply vs. energy needs provides a measure of how well refuge habitats meet the energy needs of its target waterfowl populations. A more detailed description of the TRUOMET model is found in Dugger et al. (2008). There are seven explicit inputs required for each model run:

1. number of days or time periods being modeled,
2. population size for each waterfowl guild being modeled during each time period,
3. daily energy requirement of a single bird within a foraging guild,
4. acreage of each habitat available for each time period,
5. biomass of food in each habitat type on day one,
6. nutritional quality of each food type, and
7. percentage of a bird's daily energy needs met on site and the habitats or food types each guild uses to satisfy its daily energy requirements.

In using energetics modeling for Tule Lake and Lower Klamath NWRs, Dugger et al. (2008) evaluated current habitat management programs (habitats available in 2005) relative to waterfowl population objectives. In this modeling work, it was assumed that waterfowl would obtain 75 percent of their food resources on refuge (dabbling ducks and geese) or 100 percent of food resources on refuge in the case of diving ducks, gadwalls, and coots. Coots were included in the modeling work because of their relatively large numbers and because they compete for food resources with diving ducks and swans.

Lower Klamath NWR: Results of bioenergetics modeling presented in Dugger et al. (2008) indicated that current (2005) habitats provided on Lower Klamath NWR were adequate for population objectives for dabbling ducks (Fig. 13) and diving ducks and swans (Fig. 15) throughout the fall through spring period; however, refuge habitats were insufficient to support goose population objectives, as food resources were exhausted prior to March 1 (Fig. 14). One

approach to modifying refuge habitats to provide for goose population objectives would require increasing standing grains by 500 acres and green browse by 2,000 acres (Dugger et al. 2008).

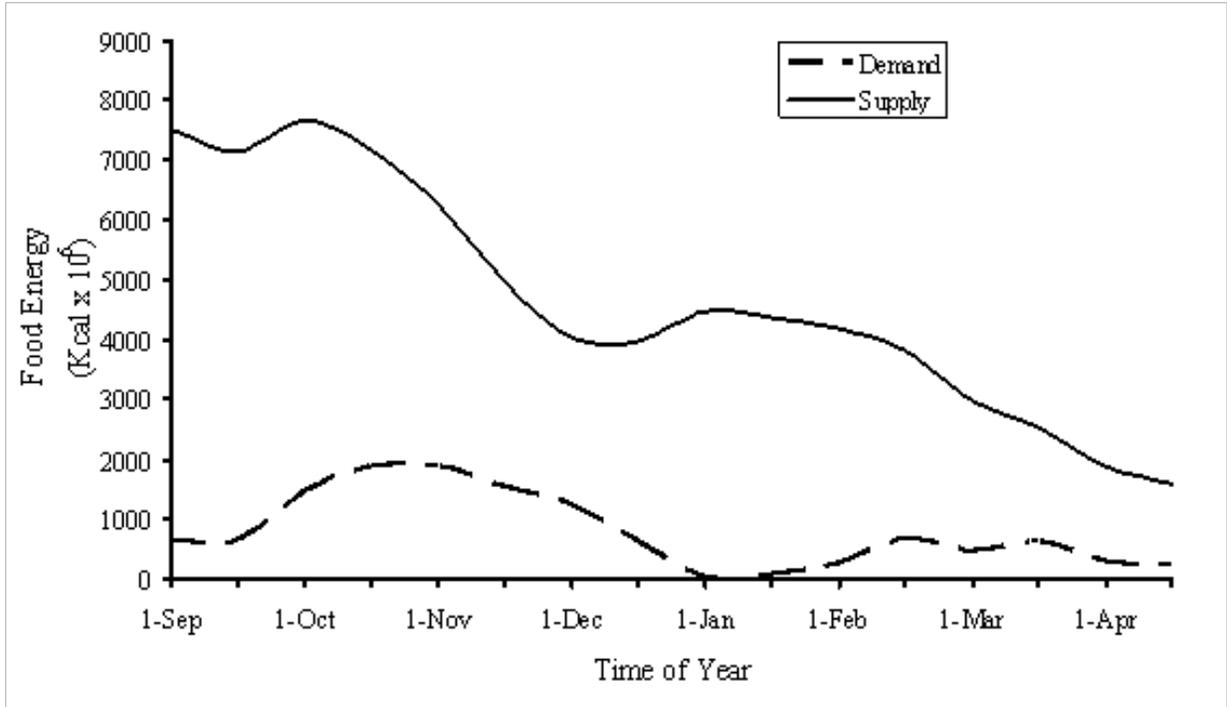


Fig. 13. Population energy demand vs. food energy supplies (simulated 2005 habitats) for dabbling ducks at Lower Klamath NWR relative to refuge population objectives (from Dugger et al. 2008). Food resources are insufficient to meet demand where the demand and supply curves cross.

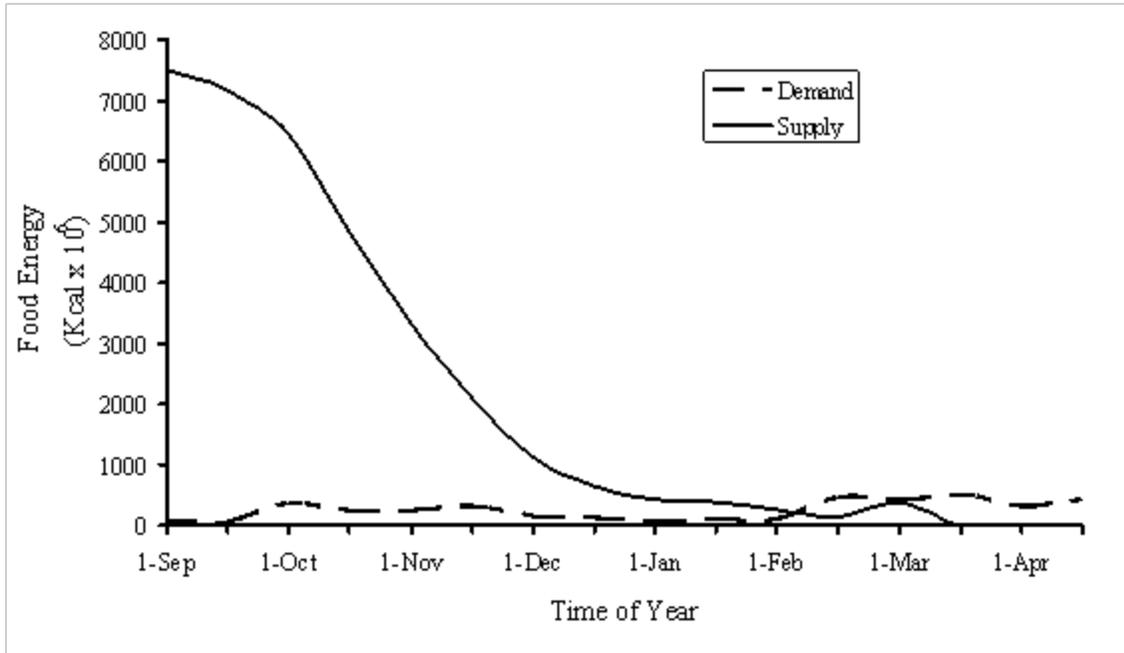


Fig. 14. Population energy demand vs. food energy supplies (simulated 2005 habitats) for geese at Lower Klamath NWR relative to refuge population objectives. Food resources are insufficient to meet demand where the demand and supply curves cross. (Dugger et al. 2008)

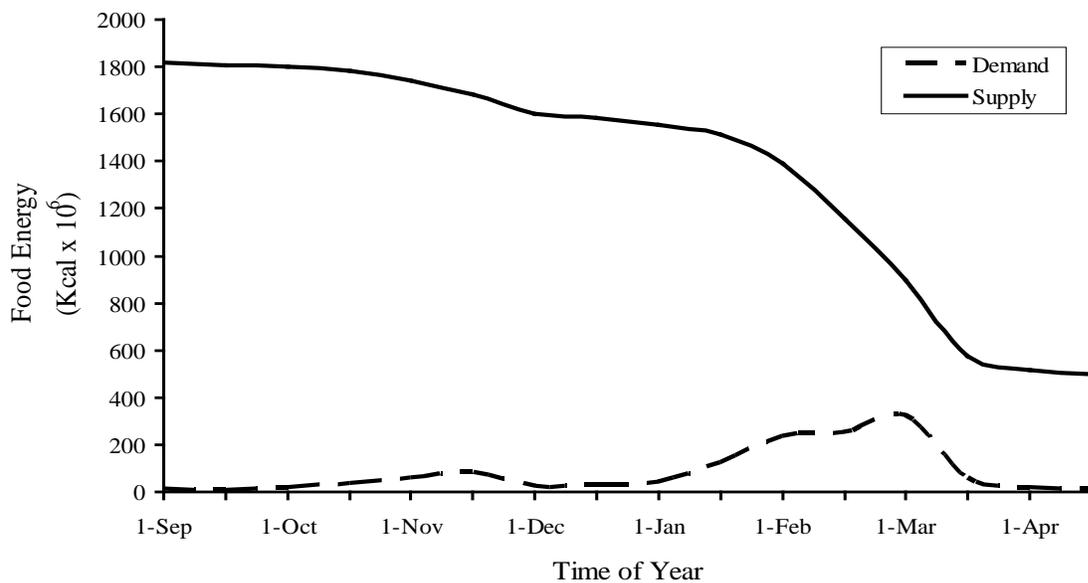


Fig. 15. Population energy demand vs. food energy supplies (simulated 2005 habitats) for diving ducks and swans at Lower Klamath NWR, relative to refuge population objectives. Food resources are insufficient to meet demand where the demand and supply curves cross. (Dugger et al. 2008)

Tule Lake NWR: The bioenergetics modeling for Tule Lake NWR indicated that agricultural food resources were inadequate to meet the foraging needs of dabbling ducks (Fig. 16) and geese (Fig. 17). Dabbling duck foods were exhausted by early fall, while goose food resources were exhausted by late winter. This shortage of foods for dabbling ducks and geese was primarily due to a lack of small grains on the refuge. Food resources for geese lasted longer into fall because potatoes are consumed by geese but not dabbling ducks. To rectify this situation, Dugger et al. (2008) estimated that 1,750 acres of additional unharvested grain would be required on the refuge. The modeling exercise revealed that food resources on Tule Lake NWR were adequate to meet population objectives for diving ducks and swans (Fig. 18).

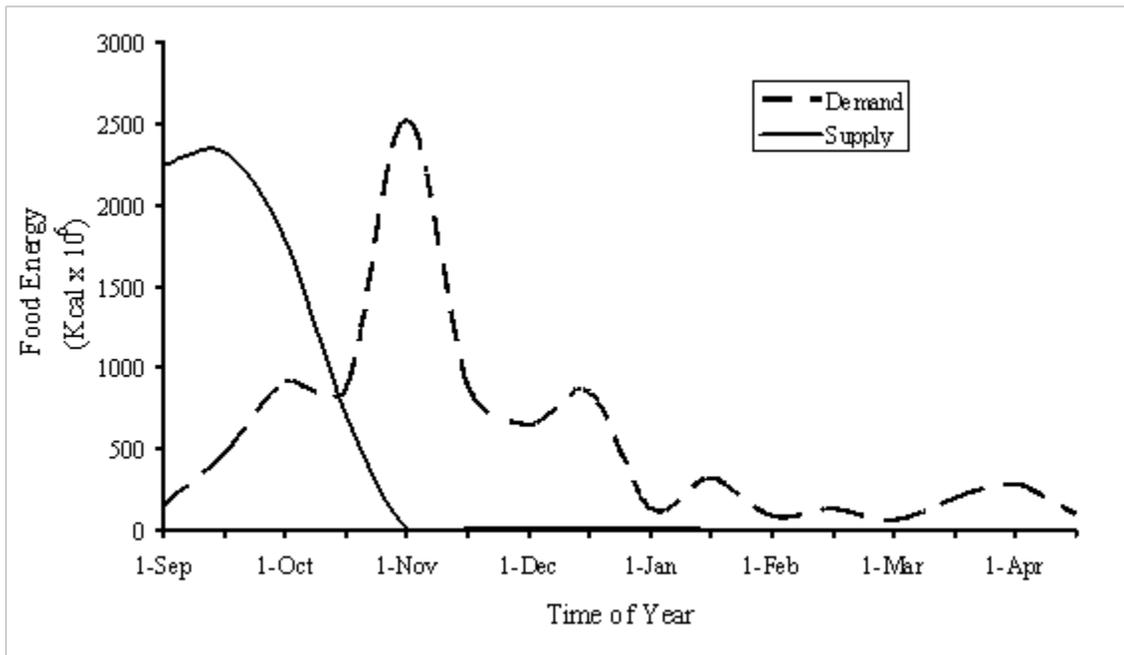


Fig. 16. Population energy demand vs. food energy supplies (simulated 2005 habitats) for dabbling ducks at Tule Lake NWR relative to refuge population objectives (from Dugger et al. 2008). Food resources are insufficient to meet demand where the demand and supply curves cross.

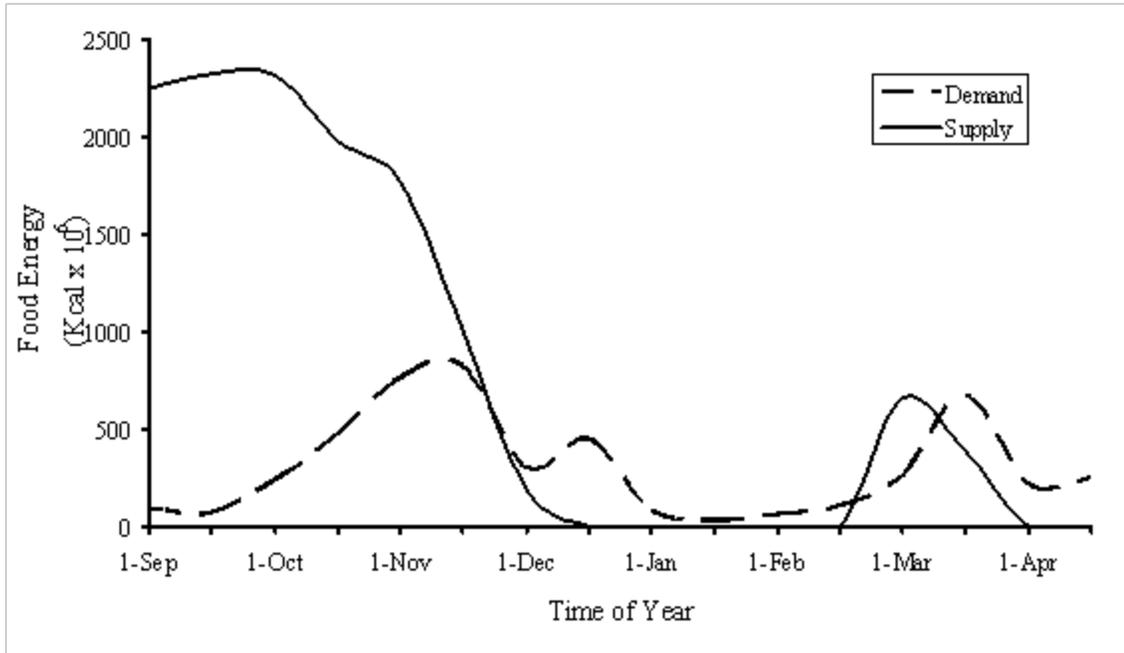


Fig. 17. Population energy demand vs. food energy supplies (simulated 2005 habitats) for geese at Tule Lake NWR relative to refuge population objectives (from Dugger et al. 2008). Food resources are insufficient to meet demand where the demand and supply curves cross.

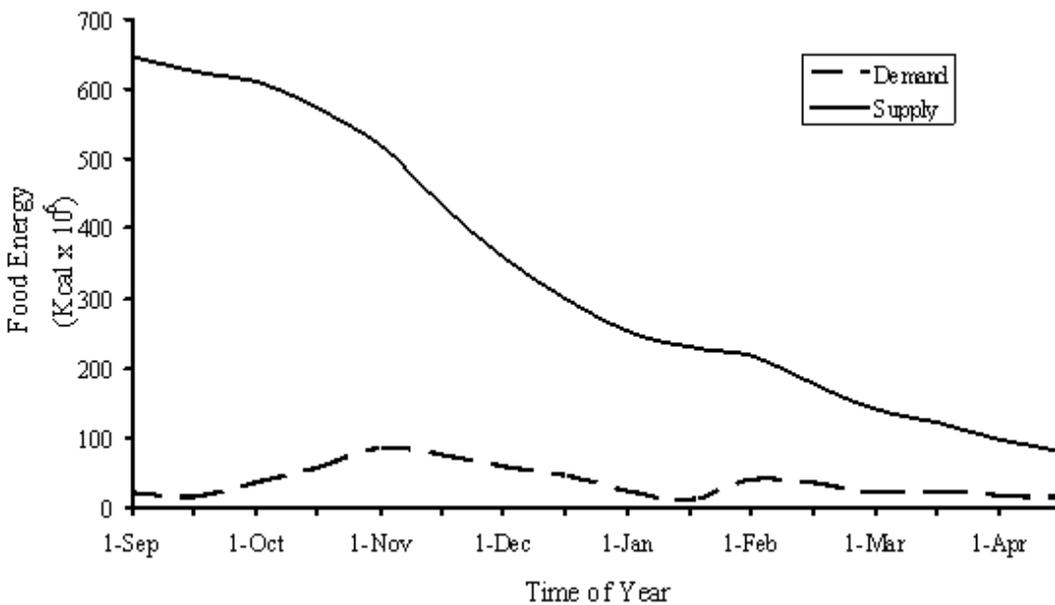


Fig. 18. Population energy demand vs. food energy supplies (simulated 2005 habitats) for diving ducks and swans at Tule Lake NWR relative to refuge population objectives (from Dugger et al. 2008). Food resources are insufficient to meet demand where the demand and supply curves cross.

Chapter VIII Summary and recommendations

Summary

The science and practice of both waterfowl management and agriculture have changed significantly since passage of the Kuchel Act. An improved understanding of waterfowl ecology, increasing demands by the public for a broader array of wildlife species provided, and increasingly scarce water resources to provide those values have necessitated changing management of the refuges. Within the broadly defined allowable crops in Section 4 of the Kuchel Act, cropping patterns have changed on the refuges primarily due to changing markets and improving agricultural technologies. In addition, the agricultural landscape adjacent to the refuges—as well as habitats available further south in the primary waterfowl wintering grounds in California—has also undergone modification. All of these factors have had impacts on waterfowl use of Tule Lake and Lower Klamath NWRs.

The Kuchel Act language and the congressional testimony leading to final enactment make clear that Congress intended that Tule Lake and Lower Klamath NWRs be managed for the major purpose of proper waterfowl management, but it is also evident that Congress intended that, to the extent consistent with proper waterfowl management, refuge agricultural leasing continue in specific areas of the refuges. Other refuge lands would be managed at the discretion of the Service. Analysis of waterfowl census data indicates that Tule Lake NWR has experienced significant declines in waterfowl use relative to Lower Klamath NWR, where the Kuchel Act allows greater flexibility in waterfowl habitat management.

Section 1 of the Kuchel Act makes clear that Congress' intent was to preserve existing waterfowl habitats on the Klamath Basin refuges and prevent waterfowl depredations on agricultural crops in the Pacific Flyway. This would occur through proper management of these refuges to provide adequate habitat to hold birds until crops had been harvested in the Central Valley (U.S. House of Representatives 1963). Thus, to comply with the Act, it is imperative that the Service restores lost waterfowl values at Tule Lake and Lower Klamath NWRs by developing strategies that improve and maintain those lands for waterfowl under the definition of "proper waterfowl management," while also continuing the refuge agricultural leasing program to the extent consistent with proper waterfowl management of those lands.

Moreover, the leased agricultural lands on the refuges should not be managed in isolation. They represent a component of the overall refuge habitat complex and must be used and/or modified as needed to provide the food and habitat needs in concert with other refuge habitats. This is especially important relative to the nutritional needs of waterfowl. Although agricultural crops contain an abundance of carbohydrates, they do not meet complete nutrition needs alone, because they have lower amounts of proteins, minerals, and key amino acids than other natural foods. In Lower Klamath NWR, agricultural lands currently consist of 27 percent of the overall refuge habitat matrix with a variety of other habitats in the land base. Thus waterfowl have the ability to utilize various habitats in Lower Klamath NWR that provide foods or other attributes, such as water and cover in addition to croplands. On Tule Lake NWR, refuge agricultural lands currently comprise approximately 55 percent of the overall refuge habitat mix, with the remaining habitat primarily in Sumps 1(A) and 1(B). The two sump areas do not provide the

diversity and complexity of wetland habitats provided on Lower Klamath NWR, thus waterfowl currently have less option for utilizing diverse habitats on Tule Lake NWR.

Recommendations

The Service should implement a series of actions that will ensure that Tule Lake and Lower Klamath NWRs continue to be managed for wildlife conservation with the primary purpose of waterfowl management, as well as other Kuchel Act mandates, relevant Refuge System statutes, and applicable Department of Interior and Service policy. These actions include, but are not limited to the following:

- Under the Kuchel Act, the primary purpose of the Tule Lake and Lower Klamath NWRs is waterfowl management. The Kuchel Act also directs the Secretary to continue the “present pattern of leasing” and maximize lease revenues. Agricultural technologies and changing market conditions will alter cropping patterns on the leased lands in the future, as they have in the past. Thus, the Service should periodically evaluate the leasing program to ensure that sufficient agricultural foods are available to support spring and fall population objectives for geese and dabbling ducks. In future habitat management planning, Tule Lake and Lower Klamath NWR’s leased land farming programs should be considered a component of the overall refuge habitat management program and be assigned to meeting specific waterfowl life history needs. Habitat management planning should be handled separately for each refuge.
- Refuge lands outside the leased lands, including wetlands, uplands, and agricultural lands, will also be managed for the primary purpose of waterfowl management. However, the broader “wildlife conservation” purposes also apply, subject to the primary purpose of waterfowl management. In implementing habitat management programs, the Service will use mandates from the 1997 Improvement Act, including Refuge System mission and Service policy related to biological integrity, diversity, and environmental health (601 FW 1). Consistent with the Kuchel Act, agricultural use will be fully considered in management of these “other refuge lands” when required to meet waterfowl management needs and/or the broader needs of wildlife conservation.
- Habitat management (620 FW1) and inventory and monitoring (701 FW 2) plans should be written or updated for both refuges. These documents are necessary to design, implement, and evaluate habitat management on both refuges.
- The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, mandates that all uses on national wildlife refuges must be compatible with the purposes for which the refuge was established. For the purpose of the compatibility determination process, the consistency requirements in the Kuchel Act are deemed synonymous with the “compatibility” requirement in the Refuge Administration Act and the Refuge Improvement Act. Thus, compatibility determinations should be conducted for the refuges’ farming programs consistent with the Refuge System Improvement Act and the Service’s current compatibility policy (603 FW 2). Compatibility is defined by Federal law as, “...a

wildlife-dependent recreational use or any other use of a refuge that, in the sound professional judgment of the Director, will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the refuge” (16 U.S. C. 668ee(1)).

The Service’s compatibility policy (603 FW 2) should be used to describe the stipulations required to ensure compatibility and consistency of the leased land farming program with waterfowl management and other Service and Interior policies as appropriate. These stipulations should be incorporated into lease contract language such that: (1) waterfowl food resources are provided during the appropriate time periods, and (2) specific management practices such as flooding during the waterfowl migration period, burning, interspersions of wetlands, and/or other provisions will increase the attractiveness, utilization, and interspersions of waterfowl use of the leased lands and make the agricultural program more consistent with waterfowl management. The leasing program will continue and revenues will be maximized, as required by the Kuchel Act, subject to the waterfowl management needs identified in habitat management planning and the compatibility determination process.

- This document provides a framework for developing alternatives in the CCP process, as well as guidance for preparation of habitat management plans for Lower Klamath and Tule Lake Refuges (see Service policy at 620 FW 1). From the more general HMP, year-specific habitat management plans are developed. Habitat management planning, utilizing the bioenergetics approach to conservation planning, provides the foundation for a successful, efficient, and well-coordinated use of refuge resources targeted to achieve refuge purposes and the Refuge System mission.
- In the late 1990s, the Service filed water rights claims in the Oregon adjudication. For both refuges, the Service filed claims for an irrigation right and claims for Federal reserved water rights. On March 7, 2013, Oregon Water Resources Department issued a Final Order of Determination. An irrigation right with a 1905 priority date, similar to other Project irrigators, was granted for croplands on both refuges (leased lands and cooperative farmed lands). For broader wetland purposes, a Federal reserved right was recognized with priority dates ranging from 1925 to 1964 (see Appendix 2). Due to legal issues and questions relative to these recently granted rights, it is likely that the Service will file exceptions with the Klamath County Circuit Court. But the junior priority of the Federal reserved water rights will not be contested.
- The availability of water is the key to providing agriculture and wetland waterfowl habitats. The Service can best meet the needs of all the guilds with reliable and full water delivery. The quantity of water and the timing of delivery determine which habitat types the Service can provide. The Service will manage these refuges according to habitat objectives outlined in the bioenergetics assessment. If less than full water delivery is available, the Service will calculate the proportion of habitat acreage objectives that can be met and prioritize which habitat types can be created to best manage for proper waterfowl management.

- Ongoing efforts among the Service, Reclamation, and TID to restore and enhance wetlands and other habitats on Tule Lake NWR should continue. Current examples include the Walking Wetlands/flood fallow program and Sumps 1A and 1B wetland enhancement projects. These projects have shown significant improvement in habitat conditions for wetland dependent wildlife species. In addition, the rotational nature of wetlands within the leased lands have significantly increased lease revenues, reduced fertilizer and pesticide use, and increased agricultural profitability.

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Appendix 1.

September 2, 1964

1771

KUCHEL ACT (PL 88-567)

WILDLIFE MANAGEMENT, KLAMATH PROJECT

An act to promote the conservation of the Nation's wildlife resources on the Pacific Flyway in the Tule Lake, Lower Klamath, Upper Klamath, and Clear Lake National Wildlife Refuges in Oregon and California and to aid in the administration of the Klamath Reclamation Project. (Act of September 2, 1964, Public Law 88-567, 78 Stat. 850)

Sec. 1. [Policy of the Congress.] - It is hereby declared to be the policy of the Congress to stabilize the ownership of the land in the Klamath Federal reclamation project, Oregon and California, as well as the administration and management of the Klamath Federal reclamation project and the Tule Lake National Wildlife Refuge, Lower Klamath National Wildlife Refuge, Upper Klamath National Wildlife Refuge, and Clear Lake National Wildlife Refuge, to preserve intact the necessary existing habitat for migratory waterfowl in this vital area of the Pacific Flyway, and to prevent depredations of migratory waterfowl on agricultural crops in the Pacific Coast States. (78 Stat. 850; 16 U.S.C. §695k)

Sec. 2. [Areas preserved for migratory waterfowl - Agricultural use.] - Notwithstanding any other provisions of law, all lands owned by the United States lying within the Executive order boundaries of the Tule Lake National Wildlife Refuge, the Lower Klamath National Wildlife Refuge, the Upper Klamath National Wildlife Refuge and the Clear Lake National Wildlife Refuge are hereby dedicated to wildlife conservation. Such lands shall be administered by the Secretary of the Interior for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith. Such lands shall not be opened to homestead entry. The following public lands shall also be included within the boundaries of the area dedicated to wildlife conservation, shall be administered by the Secretary of the Interior for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith, and shall not be opened to homestead entry: Hanks Marsh, and first form withdrawal lands (approximately one thousand four hundred and forty acres) in Klamath County, Oregon, lying adjacent to Upper Klamath National Wildlife Refuge; White Lake in Klamath County, Oregon, and Siskiyou County, California; and thirteen tracts of land in Siskiyou County, California, lettered as tracts 'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', and 'N' totaling approximately three thousand two hundred and ninety-two acres, and tract "P" in Modoc County, California, containing about ten acres, all as shown on plate 4 of the report entitled "*Plan for Wildlife Use of Federal Lands in the Upper Klamath Basin, Oregon-California,*" dated April 1956, prepared by the United States Fish and Wildlife Service. All the above lands shall remain permanently the property of the United States. (78 Stat. 850; 16 U.S.C. § 695l)

WILDLIFE MANAGEMENT, KLAMATH PROJECT

Explanatory Note

Klamath Project and Klamath Compact. All lands referred to in Section 2 above lie within, adjacent to or nearby the Klamath Federal reclamation project, Oregon-California. The project was authorized by the Secretary of the Interior, pursuant to the Reclamation Act of June 17, 1902, 32 Stat. 388, on May 15, 1905. The

consent of Congress to the negotiation of a compact relating to the waters of the Klamath River by the States of Oregon and California was given by the Act of August 9, 1955, 69 Stat. 613. The consent of Congress to the resulting compact was given by the Act of August 30, 1957, 71 Stat. 497. Each of these acts appears herein in chronological order.

Sec. 3. [Payments to counties in lieu of taxes.] - Subject to conditions hereafter prescribed, and pursuant to such regulations as may be issued by the Secretary, 25 per centum of the net revenues collected during each fiscal year from the leasing of Klamath project reserved Federal lands within the Executive order boundaries of the Lower Klamath National Wildlife Refuge and the Tule Lake National Wildlife Refuge shall be paid annually by the Secretary, without further authorization for each full fiscal year after the date of this Act to the counties in which such refuges are located, such payments to be made on a pro rata basis to each county based upon the refuge acreage in each county: *Provided*, That the total annual payment per acre to each county shall not exceed 50 per centum of the average per acre tax levied on similar lands in private ownership in each county, as determined by the Secretary: *Provided further*, That no such payments shall be made which will reduce the credits or the payments to be made pursuant to contractual obligations of the United States with the Tulelake Irrigation District or the payments to the Klamath Drainage District as full reimbursement for the construction of irrigation facilities within said district, and that the priority of use of the total net revenues collected from the leasing of the lands described in this section shall be (1) to credit or pay from such revenues to the Tulelake Irrigation District the amounts already committed to such payment or credit; (2) to pay from such revenues to the Klamath Drainage District the sum of \$197,315; and (3) to pay from such revenues to the counties the amounts prescribed by this section. (78 Stat. 850; 16 U.S.C. § 695m)

Sec. 4. [Leasing of reserved lands continued.] - The Secretary shall, consistent with proper waterfowl management, continue the present pattern of leasing the reserved lands of the Klamath Straits unit, the Southwest sump, the League of Nations unit, the Henzel lease, and the Frog Pond unit, all within the Executive order boundaries of the Lower Klamath and Tule Lake National Wildlife Refuges and shown in plate 4 of the report entitled "*Plan for Wildlife Use of Federal Lands in the Upper Klamath Basin, Oregon-California*," dated April 1956. Leases for these lands shall be at a price or prices designed to obtain the maximum lease revenues. The leases shall provide for the growing of grain, forage, and soil-building crops, except that not more than 25 per centum of the total leased lands may be planted to row crops. All other reserved public lands included in section 2 of this Act shall continue to be managed by the Secretary for waterfowl purposes, including the growing of agricultural crops by direct planting and sharecrop agreements with local cooperators where necessary. (78 Stat. 851; 16 U.S.C. § 695m)

WILDLIFE MANAGEMENT, KLAMATH PROJECT

Sec. 5. [Areas not to be reduced.] - The areas of sumps 1(a) and 1(b) in the Klamath project lying within the Executive order boundaries of the Tule Lake National Wildlife Refuge shall not be reduced by diking or by any other construction to less than the existing thirteen thousand acres. (78 Stat. 851; 16 U.S.C. § 695o)

Sec. 6. [Water levels to be maintained.] - In carrying out the obligations of the United States under any migratory bird treaty, the Migratory Bird Treaty Act (40 Stat. 755), as amended or the Migratory Bird Conservation Act (45 Stat. 1222), as amended, waters under the control of the Secretary of the Interior shall be regulated, subject to valid existing rights, to maintain sump levels in the Tule Lake National Wildlife Refuge at levels established by regulations issued by the Secretary pursuant to the contract between the United States and the Tulelake Irrigation District, dated September 10, 1956, or any amendment thereof. Such regulations shall accommodate to the maximum extent practicable waterfowl management needs. (78 Stat. 851; 16 U.S.C. § 695p)

Explanatory Notes

Reference in the Text. The Migratory Bird Treaty Act of July 3, 1918, 40 Stat. 755, as amended, which is referred to in the text, does not appear herein. The Act is codified in 16 U.S.C. § 703, *et seq.*

Reference in the Text. The Migratory Birds Conservation Act of February 18, 1929, 45 Stat. 1222, as amended, which is referred to in the text, does not appear herein. The Act is codified in 16 U.S.C. § 715, *et seq.*

Sec. 7. [Clear Lake National Wildlife Refuge studies continued.] - The Secretary is hereby directed to complete studies that have been undertaken relating to the development of the water resources and waterfowl management potential of the Clear Lake National Wildlife Refuge. The results of such studies, when completed, and the recommendations of the Secretary shall be submitted to the Congress. (78 Stat. 851; 16 U.S.C. § 695q)

Sec. 8. [Regulations to implement Act.] - The Secretary may prescribe such regulations as may be necessary to carry out the provisions of this Act. (78 Stat. 851; 16 U.S.C. § 695r)

Explanatory Notes

Editor's Note, Annotations. Annotations of opinions are not included because none were found dealing primarily with the activities of the Bureau of Reclamation under this statute.

Legislative History. S. 793, Public Law 88-567 in the 88th Congress. Reported in Senate from Interior and Insular Affairs June 28, 1963; S. Rept. No. 341. Passed Senate July 15, 1963. Reported in House from Interior and Insular Affairs Dec. 19, 1963; H.R. Rept. No. 1072. Passed House, amended, Apr. 20, 1964. Senate asks for a conference Apr. 23, 1964. House agrees to a conference May 7, 1964. Conference report filed Aug. 17, 1964; H.R. Rept. No. 1820. House agrees to conference report Aug. 18, 1964. Senate agrees to conference report Aug. 19, 1964

Appendix 2.

Water rights for Lower Klamath and Tule Lake National Wildlife Refuges as determined by the Final Order of Determination issued March 7, 2013, by Oregon Water Resources Department.

Claim	Priority date	Location	Measurement Station	Quantity (A-F)	Period of use	Place of use
312	1905	LKNWR Irrigation	Station 48 Ady/Central Canal at K-River	35,000	Ady – Mar 1-Oct 31 Sta. 48-Feb 15-Nov 15	10,000 acres within 25,881.7 acres of refuge lands.
313	1925	LKNWR Fed Res Right	Station 48 Ady/Central Canal	108,229. 4	Jan 1-Dec 31	Most refuge lands
314	1964	LKNWR Fed Res Right	Station 48	3,680.1	Jan 1-Dec 31	Primarily White Lake and some small P- canal parcels.
315	1944	LKNWR Fed Res Right	Station 48 Ady/Central Canal	1,141.7	Jan 1-Dec 31	Units 9b/c/g area
316	1949	LKNWR Fed Res Right	Station 48 Ady/Central Canal	87.6	Jan 1-Dec 31	Small parcel SE area of Refuge
317	1905	TLNWR Irrigation	Station 48	49,902.3	Feb 15-Nov 15	16,000 acres within area of 17,967.3 ac (Sumps 2-3 lease and coop lands)
318	1928	TLNWR Fed Res Right	Station 48	31,480.9	Jan 1-Dec 31	8,168.8 ac, Sump 1A
319	1932	TLNWR Fed Res Right	Station 48	2,874.7	Jan 1-Dec 31	766.4 ac, within Sump 1A
320	1936	TLNWR Fed Res Right	Station 48	66,205.8	Jan 1-Dec 31	21,867.7 ac, Sump 1B, and Sumps 2-3

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