

Chapter 4. Alternatives

4.1 Introduction

This chapter describes the management actions identified for the alternatives for each refuge. The alternatives described in this chapter comprise the U.S. Fish and Wildlife Service's (Service's) actions for which potential impacts are analyzed in Chapter 6, Environmental Consequences.

The Service did not identify a preferred alternative in the draft comprehensive conservation plan/environmental impact statement (CCP/EIS). This is because the Service based much of its decision-making not only on impact analysis and the degree and way alternatives meet stated goals, but also on how the interested and affected public responded. Therefore each of the alternatives was fully analyzed and compared to let public comment help determine the preferred alternative for the final CCP/EIS. The preferred alternative for each refuge is identified in Tables 4.8, 4.11, 4.14, 4.16, and 4.18 in the final CCP/EIS. Actions in the alternatives are discussed at a programmatic level in the draft and final CCP/EIS, except where sufficient details are known to evaluate them at a project-specific level. Future projects implemented after adoption of the selected alternative and final CCP/EIS will be evaluated in subsequent National Environmental Policy Act (NEPA) documents.

The Service proposes to develop and implement a CCP for the refuges in the Klamath Basin National Wildlife Refuge Complex (Refuge Complex) that best achieves the purposes for which each refuge was established; fulfills the mission of the National Wildlife Refuge System (NWRS); is consistent with sound fish and wildlife management; and ensures that the biological integrity, diversity, and environmental health of the NWRS are maintained.

Alternatives include measures to respond to goals and resolve needs or issues. Although these are summarized in Chapters 1 and 3 in the CCP/EIS, they as well as objectives and strategies are explained in more detail in Appendix F. Appendix F also provides rationales for each objective to explain the need for the management actions and identify how the objective meets the goals of the refuge.

In this chapter, the following topics are presented for each refuge.

- **Features common to all alternatives**
- **Description of alternatives considered**
- **Management actions considered but eliminated from detailed analysis as part of the alternatives**

The end of each refuge section includes a summary of the management alternatives for that refuge in tabular form.

4.1.1 Alternatives Development

As part of the analytical process mandated by Section 102 (E) of the NEPA, federal agencies are required to “study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.” The Council on Environmental Quality (CEQ) regulations implementing NEPA directs federal agencies to “rigorously explore and objectively evaluate

all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated” (1502.14[a]).

In determining the scope of alternatives to be considered, the emphasis is on what is “reasonable.” Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense (Council on Environmental Quality 1981). Therefore, for alternatives to be considered reasonable, they must resolve the stated need for action, meet the stated purpose, and be within legal, technical or economic constraints.

As described in Section 1.2 of the CCP/EIS, the purpose of this federal action is to develop and implement a comprehensive 15-year management plan for the Refuge Complex consistent with refuge purposes; refuge goals and objectives; and applicable laws, regulations, and policies. Purposes for each refuge are listed in Section 1.6. Goals and objectives for each refuge are detailed in Appendix F. Key legal and policy guidelines are detailed in Section 1.4 and a comprehensive list is included in Appendix E. Legal and regulatory constraints are important sideboards in the development of the range of reasonable alternatives. Service Policy (602 FW 3.4 C[4]), states that alternatives represent different approaches to management that can be reasonably undertaken to achieve refuge purposes, visions, and goals; help fulfill the NWRS mission; and resolve issues.

For this CCP/EIS, the overarching need for action is to have a formal management plan for the Refuge Complex. The need for action includes addressing “issues” such as those listed in Section 3.2 when they are either something the agency agrees on or the public suggests and the agency considers valid. The alternatives for each refuge address wildlife, habitat, and cultural resources management, and opportunities for compatible recreation to help achieve refuge purposes, visions, and goals. The purposes, needs, goals, objectives, and legal constraints for each alternative are described in Chapters 1, 2, and 3 as well as in Appendix M, and are summarized and integrated in this section.

For this CCP/EIS, a key statute that influenced the development of alternatives is the Kuchel Act (Public Law [PL] 88-567). The Kuchel Act applies to all refuges in the Refuge Complex CCP/EIS except for Bear Valley Refuge. As stated in Section 2 of the Kuchel Act: “Notwithstanding any other provisions of law, all lands owned by the United States lying within the Executive Order (EO) 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...”

Thirty-three years after the passage of the Kuchel Act, Congress amended the National Wildlife Refuge System Administration Act of 1966 (16 United States Code [USC] 668dd-668ee) with passage of the National Wildlife Refuge System Improvement Act (PL 105-57) (Refuge Improvement Act). This 1997 act requires the development of CCPs for each refuge in the NWRS. As described in Chapters 1 and 2, the CCP is to guide refuge management for a 15-year period. This is why vision and goal statements in Sections 2.4 and 2.5 are not prescriptive but rather a direction toward which the refuge will move. Refuge CCPs are to

consider the mission and policies of the NWRS; however, refuge purposes from EOs and legislation, such as the Kuchel Act, take precedence.

Prior to developing alternatives for the CCP/EIS, the Service needed to articulate its interpretation of the Kuchel Act in a manner consistent the act's language and Congress's intent, and determine how implementation of the Kuchel Act would be integrated with mandates from the 1997 Refuge Improvement Act. Accurate interpretation of legal mandates guiding refuge management was seen as key to developing management alternatives during the CCP process as well as a framework from which to conduct future management planning. Accordingly, the Service prepared a document titled "The Kuchel Act and Management of Lower Klamath and Tule Lake National Wildlife Refuges" (Kuchel Act Paper), a copy of which is provided in Appendix M. Through the Kuchel Act Paper, the Service 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."

Although "proper waterfowl management" is the major purpose of the Kuchel Act, additional secondary refuge purposes related to agriculture are derived from the Kuchel Act. The Kuchel Act directs that the Secretary of the Interior continue the "present pattern of leasing," maximize lease revenues in specifically identified areas of the refuges, and optimize agriculture, all consistent with waterfowl management. For the "present pattern of leasing" to be consistent with proper waterfowl management, the Service determined 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. The Kuchel Act also 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. 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 serve this intent; however, this intent is subject to the primary intent (major purpose) of proper waterfowl management.

The second key component of alternative development, particularly at the Lower Klamath and Tule Lake Refuges, is the availability of water for refuge management purposes. Section 3.3.1 describes the importance of water in achieving refuge purposes and the overall challenges in obtaining a reliable and flexible water supply. Key points are summarized below.

- Lower Klamath and Tule Lake Refuges, established in 1908 and 1928, respectively, are located within the Klamath Reclamation Project and are depending on project facilities for delivery of their water supplies. Both refuges are on lands originally withdrawn by the United States for reclamation purposes in 1905. The Klamath Reclamation Project,

as one of the nation's first Bureau of Reclamation (Reclamation) projects, was authorized for irrigation, domestic, and power purposes. The refuges in the Refuge Complex are not a purpose of the Klamath Reclamation Project.

- Historic water management began to change in 1988 when the Lost River and shortnose suckers were listed as endangered under the Endangered Species Act (ESA).
- The Pacific Southwest Regional Solicitor's Memorandum of 1995 clarified how water should be managed in the Klamath Reclamation Project. The memorandum concluded that the first priority for water was compliance with the ESA, followed by protection of tribal trust resources, and then, to the extent water was available, to meet the obligation of contracts with Klamath Reclamation Project waters users, including irrigated lands on the refuges. Lastly, water would be supplied to meet the junior priority federal reserved water rights of the refuges. ESA listing of the coho salmon in the Klamath River in the late 1990s further limited water supplies to the Klamath Reclamation Project, including the refuges, by mandating increased flows in the river.
- In March 2013, the Service and the National Marine Fisheries Service issued a joint Biological Opinion (2013 BiOp) on the "Effects of Proposed Klamath Project Operations from May 31, 2013 through March 31, 2023, on Five Federally Listed Threatened and Endangered Species." The 2013 BiOp has a large influence on how much and when water is available within in the Klamath Reclamation Project.
- The Oregon water rights adjudication was initiated in the late 1990s to determine the validity, priority, quantity, and other components of water rights to surface water in the upper Klamath Basin. In 1997, the Service filed two sets of claims based on the dates when the Lower Klamath and Tule Lake Refuges were established. In the Final Order of Determination issued by the Oregon Water Resources Department in March 2013, the Service received Klamath Reclamation Project water rights with a 1905 priority date for irrigation uses for the leased and cooperative farm lands on both refuges, totaling nearly 85,000 acre-feet; and federal reserved rights with a priority date of 1925 for Lower Klamath Refuge (108,229 acre-feet) and 1928 and 1936 priority dates for Tule Lake Refuge (97,687 acres-feet). The refuges' Project water rights are overlapped by a portion of the federal water reserved; however, the quantities provided for the two claim types are not additive.
- In the vested claims filed by the United States in the adjudication, both Reclamation and the Service claimed "irrigation for or consistent with Refuge purposes" which was specified to include the growth of wetland plants. The State of Oregon's definition of irrigation, "the artificial application of water to crops or plants by controlled means to promote growth or nourish crops or plants," (Oregon Administration Rules 690-300 [26]) is broad enough and commonly applied to include the application of water to grow wetland plants. But in the Findings of Fact and Final Order of Determination, issued March 7, 2013, the State denied the claimed use, asserting that the use of water for wetland plants is not consistent with the meaning of the term "reclamation." The United States is challenging the State's legal opinions on reclamation and irrigation in the adjudication court. However, until that challenge is resolved, the more restrictive language in the Final Order is applied to the rights and the Service is not allowed to change the purpose of the claims, which is currently agricultural irrigation. Given that the first phase of the Klamath Adjudication took 38 years to complete, it is reasonable to assume that the judicial phase of the adjudication will not be completed during the 15-year life of this CCP. As a result, the alternatives for both Lower Klamath and Tule Lake

Refuges assume that changes to the purpose of irrigation water rights is not feasible during the life of the CCP.

- Although the adjudication granted the water rights for the refuges and established the relative priority of all water rights within the basin, the priority of Project water users relative to each other, the “within-Project priority,” was not, and should not have been, addressed in the adjudication. This is an issue for determination by the Secretary of the Interior. If project water supply is limited, water is distributed to project users according to the within-Project priority system. The irrigated lands on Tule Lake Refuge have an A, or first right, to Project water, as identified in the 1956 Tulelake Irrigation District (TID) contract. In contrast, the within-Project priority for irrigated lands on Lower Klamath Refuge has not been conclusively determined.
- Historic deliveries of direct project diversions to Lower Klamath Refuge have drastically declined in recent years, mainly due to the unresolved question of within-Project priority for the Lower Klamath Refuge.

A No Action Alternative, which consists of a continuation of the current management actions and is used as a baseline to compare the action alternatives, is included for each of the refuges. The process of developing the range of action alternatives is summarized briefly below and the alternatives are presented in detail in Sections 4.2 through 4.6.

Lower Klamath Refuge

In developing the action alternatives for the Lower Klamath Refuge, the Service used the refuge purposes (see Section 1.6), the interpretation of the Kuchel Act (see Appendix M), water rights constraints, water supply availability (see Section 3.3.2), and modeled habitat needs from the Bioenergetics Paper (Appendix N).

Because the Kuchel Act directs the Service to manage Lower Klamath Refuge for the primary purpose of waterfowl management, this becomes the primary focus of the refuge’s habitat management program. Habitat management alternatives were developed based in part on the model runs completed for the 2008 Bioenergetics Paper (Appendix N). Through the Bioenergetics Paper the Service established waterfowl population objectives and estimated the habitats needed to achieve these objectives. Results of bioenergetics modeling presented in Dugger et al. (2008) indicated that the mixture of habitats provided on Lower Klamath Refuge in the recent past was adequate to support population objectives for dabbling ducks, diving ducks, and swans 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. 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). Additional models were developed that represented potential management alternatives to alleviate food resource deficits identified in Model 2. For the Lower Klamath Refuge this included a model run determining the acreage of standing grain and pasture needed to fully support goose objectives (Model 3), and a model run evaluating a “Big Pond” alternative (Model 4). These model runs formed the basis of the alternatives presented in Section 4.2.

In addition to the refuge’s primary focus of waterfowl management, the Service has a legal mandate to provide for migratory birds. In the case of Lower Klamath Refuge, wetland-oriented non-game migratory birds are of primary importance. Similar to waterfowl, refuge

managers and biologists will strive to provide a complex of wetland habitats sufficient to support objective numbers of priority non-game waterbird species during both the migratory and spring/summer breeding periods. Priority species are selected to be representative of the habitat needs of other similar guilds of waterbird species. Population objectives for these species are presented in Appendix F.

The final focus of habitat management is to support a full range of endemic fish and wildlife species with an emphasis on “sensitive” species. This will allow the refuge to provide for the full range of endemic biological diversity that was historically present in the Lower Klamath Lake Basin. To achieve this, the refuge will provide habitats to support endemic wildlife species with an emphasis on federal- or state-listed species or species that are considered rare or declining in numbers.

The model simulations developed for the Bioenergetics Paper in 2008 made no assumptions regarding the availability of water on the refuge. As summarized above and described in Section 3.3, the availability of water on Lower Klamath Refuge has become more of a constraint in providing sufficient waterfowl habitat. Because the CCP/EIS was developed to provide direction for refuge management over a 15-year period, it was important to disclose how the Service would work to meet habitat objectives under a variety of potential future water delivery scenarios. The Service elected to use two scenarios that “bookend” how much habitat can be developed. The first scenario represents how water supply is currently allocated in the Klamath Reclamation Project, in accordance with the 2013 BiOp. The second scenario represents how water would have been allocated under the Klamath Basin Restoration Agreement (KBRA) if it were implemented. Although the U.S. Congress adjourned last year without taking action to implement the KBRA, which then expired on January 1, 2016, parties to the KBRA continue to work to realize the bargained-for benefits of the agreements. As a result, the Service still considers this a reasonable best-case water delivery scenario. Section 4.2 describes how these two scenarios were used to bracket the amount of water the refuges would receive in a wet, average, and dry year.

Clear Lake Refuge

Clear Lake Refuge is overlain on the Klamath Reclamation Project (established in 1905). The lake itself functions as a storage reservoir to meet the irrigation purposes of the Klamath Reclamation Project. The refuge is also managed under the Kuchel Act of 1964 which states that Clear Lake Refuges is to be managed “...for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith...” Clear Lake is managed by Reclamation for irrigation, flood control, and wildlife habitat. Since the Service does not have jurisdiction over lake levels, habitat management is focused on shoreline and upland habitat.

Vegetation on Clear Lake Refuge is primarily grassland and sagebrush. The major habitat-related issue at Clear Lake Refuge is the expansion of the native western juniper trees from their historically small isolated distribution to extensive patches across the landscape of the Modoc Forest and subsequently onto the refuge. The encroachment of western juniper can alter the sagebrush habitat by reducing plant species diversity and effectively eliminating sagebrush habitat. Consistent with the refuge purposes, goals and objectives related to habitat management were developed (see Appendix F). In 2006, the Service removed most of the western juniper trees from the refuge. Issues raised by the public during scoping for the

CCP/EIS related to Clear Lake Refuge focused on enhancing and sustaining sucker populations, continuing cooperative sage-grouse restoration, and providing additional public access. Because sage-grouse habitat restoration is the major habitat-related issue on the refuge, the Service developed one action alternative to evaluate modifications to current management and to evaluate additional public use of the refuge.

Tule Lake Refuge

Alternative development for the Tule Lake Refuge was similar to that of Lower Klamath in that the Service used the refuge purposes (see Section 1.6), the interpretation of the Kuchel Act (see Appendix M), water supply availability (see Section 3.3), and model runs contained in the Bioenergetics Paper (Appendix N).

Because the Kuchel Act directs the Service to manage Tule Lake Refuge for the primary purpose of waterfowl management, this becomes the primary focus of the refuge's habitat management program. Habitat management alternatives were developed based in part on the model runs completed for the 2008 Bioenergetics Paper (Appendix N). Through the Bioenergetics Paper, the Service established waterfowl population objectives and estimated the habitats needed to achieve these objectives. Results of bioenergetics modeling presented in the Bioenergetics Paper indicated that agricultural food resources were inadequate to meet the foraging needs of dabbling ducks and geese (Model 2). The modeling exercise revealed that food resources on Tule Lake Refuge were adequate to meet population objectives for diving ducks and swans. However, dabbling duck foods were exhausted by early fall, and 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 the fall because potatoes are consumed by geese but not dabbling ducks. Four additional model runs evaluated different options for addressing the deficit of food resources for dabbling ducks and geese identified in Model 2. Model 5 evaluated if population objectives could be met if the standing grain acreage were increased to the acreage present on the refuge in the 1970s. Model 8 is a refinement of Model 5 that determined the minimum standing grain needed to meet population objectives. This model formed the basis for habitat objectives under Alternatives B and C for Tule Lake Refuge (Section 4.4). Two other model runs (Models 6 and 7) for Tule Lake were also included in the Bioenergetics Paper but not included in CCP/EIS management alternatives because they are not feasible due to the water rights constraints described above.

In addition to the refuge's primary focus of waterfowl management, the Service has a legal mandate to provide for migratory birds. In the case of Tule Lake Refuge, wetland-oriented non-game migratory birds are of primary importance. Similar to waterfowl, refuge managers and biologists will strive to provide a complex of wetland habitats sufficient to support objective numbers of priority non-game waterbird species during both the migratory and spring/summer breeding periods. Priority species are selected to be representative of the habitat needs of other similar guilds of waterbird species. Population objectives for these species are presented in Appendix F.

The final focus of habitat management is to support a full range of endemic fish and wildlife species with an emphasis on "sensitive" species. This will allow the refuge to provide for the full range of endemic biological diversity that was historically present in the Tule Lake Basin. To achieve this, the refuge will provide habitats to support endemic wildlife species

with an emphasis on federal- or state-listed species or species that are considered rare or declining in numbers.

Upper Klamath Refuge

The Upper Klamath Refuge was initially established by EO 4851 in 1928 to set apart 7,560 acres of land to be known as the Upper Klamath Refuge. Since 1928, the Service has acquired 23,098 acres of land within the approved acquisition boundary. Two areas of the refuge fall under provisions of the Kuchel Act of 1964: the lands within EO 4851, and Hanks Marsh which is 1,069 acres of land on the east edge of Upper Klamath Lake. Upper Klamath Refuge wetlands are located immediately adjacent to Upper Klamath Lake. Marsh water elevations are completely dependent on adjacent lake elevation which is managed by Reclamation for Klamath Reclamation Project purposes in accordance with the 2013 BiOp. As such, active wetland management is limited on this refuge. Issues raised by the public during scoping for the CCP/EIS related to Upper Klamath Refuge focused on influencing Upper Klamath Lake water levels and providing additional public use of the refuge. Therefore, the Service developed one action alternative to evaluate modifications to current habitat management and to evaluate additional public use of the refuge.

Bear Valley Refuge

Bear Valley Refuge was established in 1978 as a communal winter roost for bald eagles (Service 1978). The Bear Valley Refuge is not subject to the Kuchel Act. Issues raised by the public during the scoping process for the CCP/EIS focused on forest health issues, particularly fuel loading and overstocked density, as well as the desire to expand public access to the refuge. Since acquisition, refuge management has focused on alleviating excessive fuel loadings and reintroducing fire as a natural ecological process. The Service prepared an environmental assessment/finding of no significant impact (EA/FONSI) in 1996 and selected the alternative of commercial timber sales over 10 to 15 years to obtain the appropriate tree densities. Habitat conditions on the refuge in 1996 were progressing toward a climax mixed-conifer forest dominated by white fir, thus deteriorating eagle roosting habitat and contributing to declining forest health and disease. The 1996 EA/FONSI identifies the desired future conditions to support bald eagle roosting habitat. The Service has managed the refuge over the last 20 years to achieve these desired conditions. Management of this refuge has continued to focus on thinning high-density young age conifers to develop the open condition of historic ponderosa pine stands. Much progress has been made since the refuge was acquired in 1978. Therefore, the Service developed one action alternative to evaluate modifications to the current habitat management including the opportunity to restore riparian habitat on Bear Creek in addition to evaluating additional public use of the refuge.

4.2 Lower Klamath National Wildlife Refuge Alternatives

4.2.1 Features Common to All Alternatives – Lower Klamath Refuge

A number of current management actions would be continued for Lower Klamath Refuge under each of the alternatives. The three action alternatives propose additional management actions to improve refuge conditions. Actions that are common to all alternatives are described below and are not repeated in each alternative description.

Adaptive Management Approach

Habitat management on Lower Klamath Refuge would be primarily guided by the purposes of the refuge identified in Chapter 1 (Section 1.6.1). To achieve these purposes in a dynamic and sometimes unpredictable environment, Lower Klamath Refuge would be managed adaptively, with managers and biologists able to adjust management as on-the-ground monitoring reveals the results of previous habitat management practices, as other new information is developed, or as the needs of waterfowl populations change. Refuge managers and biologists compare waterfowl population objectives to the numbers different refuge habitats can support to estimate the quantity and type of habitats needed to be added or changed. Thus, population objectives become thresholds toward which direct habitat management (quantity, quality, diversity, seasonality, location, etc.) is targeted. Inventory and monitoring of populations would be used to evaluate actual waterfowl populations and habitat use as part of an adaptive management process.

Refuge managers and biologists would seek to provide a complex of habitats sufficient to support the population objectives of migrating, breeding, and molting waterfowl. **Conservation planning for migrating and wintering waterfowl is based on the fundamental premise that food is the resource that limits population performance.** A variety of habitat types are required to meet the needs for both migratory species and those species that remain during spring and summer to breed. Habitats would include seasonal and permanent wetlands, agricultural lands, and uplands.

In addition to the year-specific matrix of habitats, there would be a rotational component to the program. In many areas, wetlands and croplands would be rotated as a means of managing vegetative succession in wetlands, and year-round wetlands would be 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% to 60% 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).

In addition to the refuge's primary focus of waterfowl management, the Service and the refuge have a legal mandate to provide for migratory birds. In the case of Lower Klamath Refuge, wetland-oriented non-game migratory birds are second only to waterfowl in management priority. Similar to waterfowl, refuge managers and biologists would strive to provide a mosaic of wetland habitats sufficient to support objective numbers of priority non-game waterbird species during both the migratory and spring/summer breeding periods (Appendix F).

The final focus of habitat management would be to support a full range of endemic fish and wildlife species with an emphasis on "sensitive" species. This would allow the refuge to work toward restoring the biological diversity that was historically present in the Lower Klamath Lake Basin. To achieve this, the refuge would provide habitats to support endemic wildlife and in particular those federal- or state-listed species or those species considered rare or declining in numbers.

Figure 4.1 below depicts the basic stepwise process of prioritizing habitat management among the above three focus areas. It is important to note there is considerable overlap in habitats among the three. For example, wetland habitat is used by waterfowl, non-game waterbirds, and endemic fish and wildlife species.

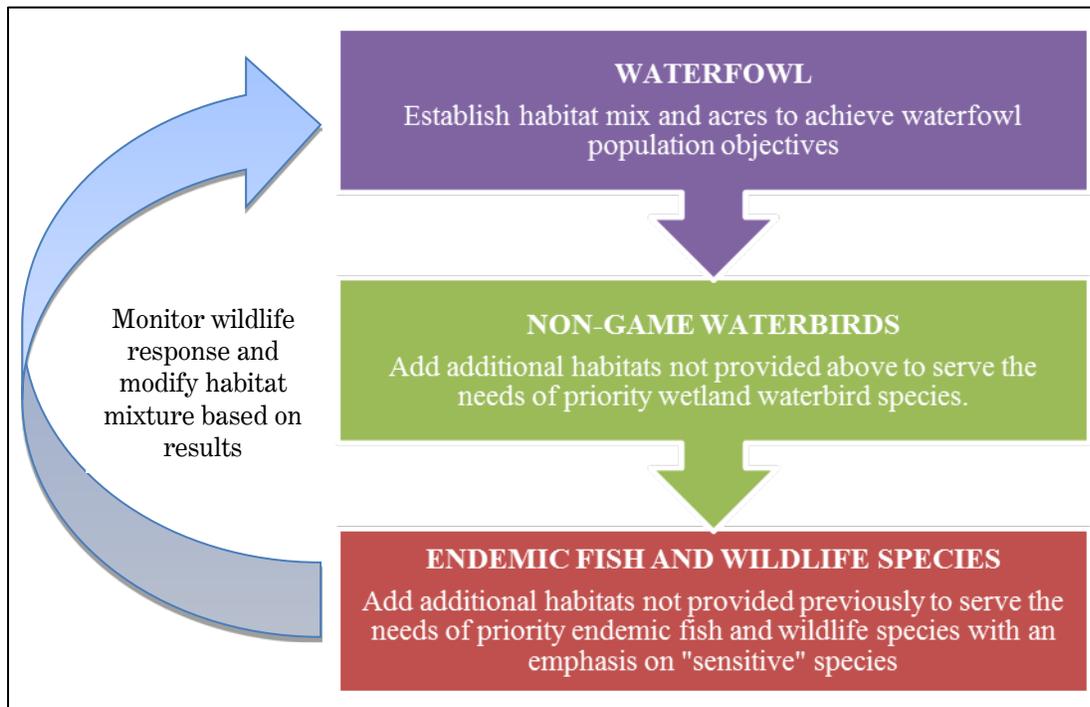


Figure 4.1. Habitat management prioritization process for Lower Klamath Refuge.

Water Management

Lower Klamath Refuge would continue to receive most water from two main sources: (1) D Plant, which pumps water from Tule Lake through the Tule Lake Tunnel; and (2) the Ady Canal at State Highway 161, which supplies water directly diverted from the Klamath River. Inflow from D Plant pumping, a function of runoff and irrigation return flows in Tule Lake, is controlled by TID and the timing and quantity of these inflows reflects their management needs more than it reflects refuge water needs. When available, deliveries through the Ady Canal are coordinated with Reclamation and Klamath Drainage District. There is one main outflow from Lower Klamath Refuge: the Klamath Straits Drain at State Highway 161.

Water Delivery Scenarios

The volume of monthly water deliveries to Lower Klamath Refuge from Ady Canal was estimated under two future water allocation scenarios to represent the range of potential water deliveries within the 15-year time frame of the CCP. The first scenario represents how water is currently allocated in the Klamath Reclamation Project in accordance with the *Biological Opinions on the Effects of Proposed Klamath Project Operations from May 31, 2013 through March 31, 2023, on Five Federally Listed Threatened and Endangered Species* (2013 BiOp [NMFS and Service 2013]), issued May 31, 2013. The second scenario represents estimated water deliveries Lower Klamath Refuge would have received if the KBRA were implemented.

For the 2013 BiOp scenario, Reclamation produced simulated deliveries to Lower Klamath Refuge through the Ady Canal using the Klamath Basin Planning Model. This model simulates what refuge deliveries would have been from 1981 through 2011 if the current BiOp would have been in place during that time. Since a wide range of total precipitation (wet to dry) and associated

Klamath Reclamation Project water supply is included in this period, it is considered representative of the range of potential water supplies during the 15-year planning period of the CCP. Simulated D Plant inflows were estimated based on actual deliveries from 2010 through 2015.

The second scenario represents how water would have been allocated under KBRA if it were implemented. **Although the KBRA expired on January 1, 2016, without being implemented by Congress, the water management scenario it represents provides a model for parties negotiating alternative agreements to secure a firm water supply for the refuges in the future.** In addition to amending the Klamath Reclamation Project purpose to include fish and wildlife, KBRA would have provided specific allocations and delivery obligations for water for the Lower Klamath Refuge which would have substantially increased water availability and reliability. Service hydrologists estimated quantities of water delivered to the refuge through both the Ady Canal and D Plant. As with the 2013 BiOp scenario, D Plant inflows were estimated based on actual deliveries from 2010 through 2015.

Since the expiration of the KBRA, progress has been made **on some alternative agreements.** On April 6, 2016, a revised version of the Klamath Hydroelectric Settlement Agreement that did not require Congressional approval was signed by the governors of California and Oregon, and the Secretary of the Interior. The agreement proposes to remove four Klamath River dams owned by PacifiCorp by 2020 to improve river flows and benefit fisheries and river communities. Secretary Jewell has expressed a strong desire to move into the next phase of Klamath settlement by committing to resume negotiations with Klamath Basin stakeholders to address the many water issues that the recently signed agreements were unable to fully address. This includes resolving water rights disputes, water quality issues, habitat restoration activities, refuge water needs, tribal lands transfer, and details on regulatory assurances for irrigators. Negotiations regarding these remaining issues are ongoing. **The Upper Klamath Basin Comprehensive Agreement remains in force.**

Water Delivery Estimates

A range of simulated monthly water delivery volumes (combined Ady Canal and D Plant deliveries) for both scenarios (2013 BiOp and KBRA) are presented in Figure 4.2. The 0.2 percentile values represent a relatively dry year where 20% of years are drier and 80% of years are wetter. The 0.5 percentile values represent a median year where half of years are drier and half are wetter. The 0.8 percentile values represent a relatively wet year where 80% of years are drier and 20% of years are wetter. This range in water years (dry, median, and wet) and associated water delivery volumes is provided to illustrate the limited water supplies available to the Service to achieve wetland and agricultural habitat objectives under the range of conditions likely to be experienced during the life of the CCP. However, it is important to note that these are simulated deliveries and that the volume and timing of actual deliveries could vary substantially. Also depicted in Figure 4.2 is the full monthly water demand (need) to completely satisfy wetland and agricultural water needs.

Under the 2013 BiOp, irrigation water (1905 irrigation water rights) would be used to flood lease land and cooperatively farmed grain and hay units. Water from the D Plant and 1928 Federal Reserved water deliveries through the Ady Canal would be used to flood seasonal and permanent wetland units and pre-irrigate grain and pasture units outside the irrigation season. In all but the wettest years under the 2013 BiOp, water deliveries would fall well short of habitat needs. Annual

water deliveries under the 2013 BiOp would range from 18% of full demand in a 0.2 percentile water year to 84% in a 0.8 percentile water year.

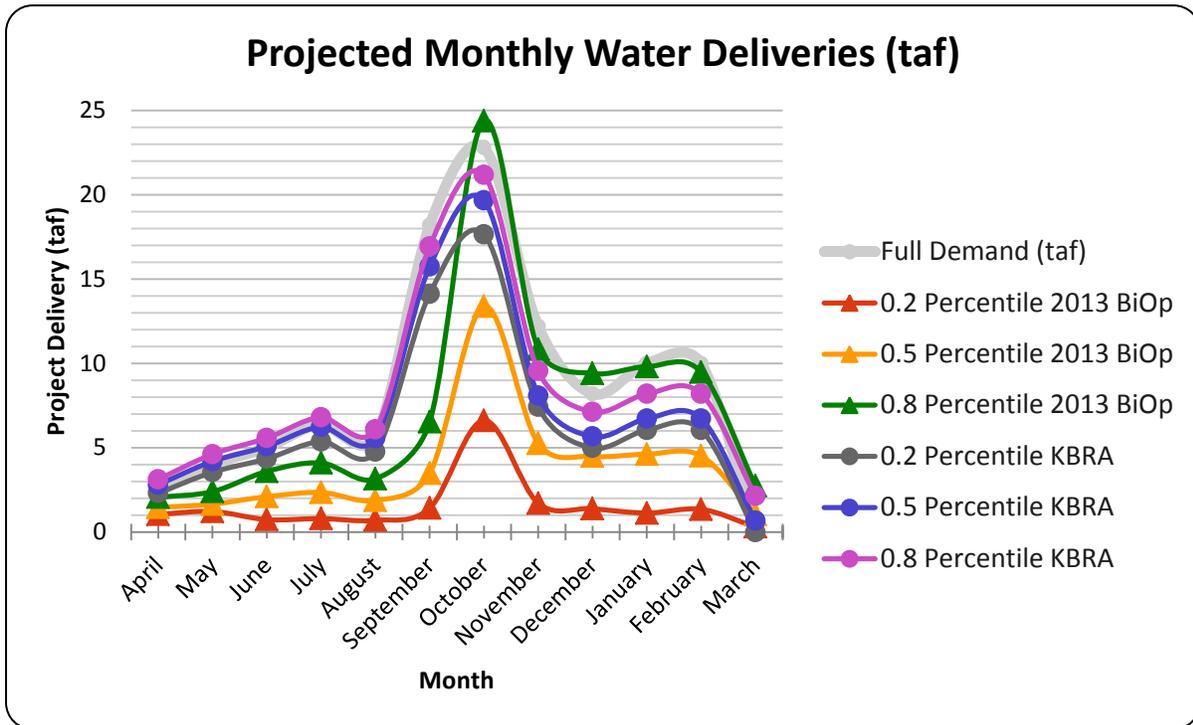


Figure 4.2. Projected 0.2, 0.5, and 0.8 percentile water deliveries (1,000 acre-feet) to Lower Klamath National Wildlife Refuge under the current water allocation system (2013 BiOp) and KBRA.

Under KBRA, refuge water deliveries under the 1905 water right could be used for any wetland or agricultural habitat management purpose. Deliveries under KBRA would be greater and more consistent than under the 2013 BiOp, especially during dry years. Modeled deliveries range from 73% of full demand in a 0.2 percentile water year to 95% in a 0.8 percentile water year.

Water Use

The application rate (acre-feet/acre) of delivered water that would be used for each habitat type is summarized in Table 4.1. These application rates apply under any future water delivery scenario. However, it is important to note that these values are estimates and actual values can vary depending on a variety of factors. For managed wetlands, these factors include temperature, wind, precipitation, irrigation method, and the ratio of open water to emergent vegetation. For agricultural crops, factors include crop type, temperature, wind, precipitation, and irrigation method.

The Service also would continually seek to improve water conservation and efficiencies to optimize water use. Opportunities to offset increasing power and pumping rates for the D Plant also would be pursued. The Service would continue to monitor water quality of delivered water supplies, pass through water, and spill water. The Service would work with Reclamation to identify water quality issues and implement best management practices (BMPs) to protect water quality.

Table 4.1. Delivered Water Demand (acre-feet/acre) for Lower Klamath National Wildlife Refuge Habitats

<i>Habitat</i>	<i>Delivered Water Demand (acre-feet/acre)</i>
Permanent Wetlands	3.6
Seasonal Wetlands	2.5-3.0
Wet meadows	n/a
Grain	2.5
Pasture	2.8
Uplands	n/a

Agricultural Habitat Management

Farming

The primary purpose of the farming program would continue to be to provide food for fall and spring migrant waterfowl and sandhill cranes and provide depredation relief to private farm lands. In addition, the cooperative farming program is also a cost-effective method used to influence successional processes in emergent wetlands. As noted above in the seasonal wetlands section, wetland units that become overly dense with late successional marsh vegetation, which provide less wildlife benefit, can be drained and farmed. Water can then be applied on previously farmed units, converting them back to early successional wetlands. This dynamic rotation of wetlands and farm crops creates a diverse mosaic of habitats to benefit wildlife. In addition to helping meet habitat objectives for dabbling ducks and geese, farming is also used to control invasive plant species such as perennial pepperweed. In dry years when water is not available for seasonal wetlands, the refuge may increase the acreage of cooperative farm fields as a method to control invasive plant species instead of using pesticides.

Under the cooperative farming program on Lower Klamath Refuge, the selected farmers would supply materials and labor needed to establish the crop and leave a portion (25%–33%) standing for waterfowl use. Subject to water availability, all cooperatively farmed units would be pre-irrigated from November through February with water removed from February through April. This helps mimic natural wetland values and produces a high-yield grain crop which provides critical food to support dabbling ducks and geese during fall migration. Planting of small grains generally would be completed by early June. Because of the high water-holding capacity of the soils, no summer irrigation would be required for small grains. Most of the cooperative farm fields would be farmed organically. For those fields farmed conventionally, no insecticides would be allowed and all other pesticides must be approved by the Service. Fields would be planted in small grains (e.g., wheat, barley).

Area K is the only part of the refuge where lease land farming occurs. The lease lands are consolidated in a single block of land devoted primarily to waterfowl management and commercial crop production. Refuge lands are leased for agriculture under a provision of the Kuchel Act (PL 88-567) that allows the Service to consider the optimum agricultural use that is consistent with the major purpose of waterfowl management (see Appendix M). Pursuant to the 1977 Cooperative Agreement between the Service and Reclamation, this area would continue to be leased by Reclamation to private farmers on a competitive bid basis (Service and Reclamation 1977). Leases are for 5 years with an annual option to renew. Area K consists of 43 individual lots ranging from 102 to 160 acres for a total of 5,605 irrigated acres. The only agricultural crops grown in Area K

would be small grains. In addition, some lots are managed as irrigated pasture and either hayed or grazed. No row crops would be grown in Area K. Subject to water availability, all lease lots would be pre-irrigated from November through February with water removed from February through April. Planting of small grains would generally be completed by early June. Because of the high water-holding capacity of the soils, no summer irrigation would be required for small grains. Hay and pasture lands would undergo additional flood irrigation in the summer.

A variety of management techniques would be used on leased refuge farmlands to combat pests and help ensure successful crop yields, including pre-plant flood irrigation, flood fallowing, rotation of crops, pre-plant tilling, pre-plant prescribed burning, and application of pesticides. These are the primary practices used as the Service pursues an integrated pest management (IPM) approach to farming and pest management on the refuge. Pest management activities on lease land units (Area K) are done in accordance with the 1998 *Final Environmental Assessment for an Integrated Pest Management Plan for Leased Lands at Lower Klamath and Tule Lake National Wildlife Refuges Oregon/California* (herein after referred to as the 1998 EA IPM Plan), which is incorporated by reference (Service 1998a).

Walking Wetlands

The Walking Wetlands Program is a 1- to 4-year fallow cycle in which croplands are flooded, taking them out of agricultural production, either seasonally (fall through spring) or year-round, then returned to agricultural production. The Service would continue to provide incentives for local farmers to participate in the Walking Wetlands Program on their own private croplands off refuge by granting preference for participation in the refuge's cooperative farming program. In addition to providing off-refuge wetland habitat for wildlife, walking wetlands also enhance soil fertility and crop yields, and suppress soil pathogens and weeds. This reduces the need for fertilizers and pesticides on the croplands of participating private landowners.

Fire Management

Under all alternatives, the Service would continue to implement the Klamath Basin National Wildlife Refuge Complex Fire Management Plan. All wildfires would be suppressed. Fuel reduction projects would focus on a 5- to 10-year cycle or more frequent if needed for invasive plant control or other resource reasons. Prescribed burning would be used in a variety of ways on Lower Klamath Refuge. As a stand-alone tool, it would be used in wetlands and uplands. Prescribed fire would be used in wetlands to open up dense stands of emergent vegetation, thereby creating open water areas for use by fall and spring migrant waterfowl. Shallow flooded burn areas are also used extensively by shorebirds during spring migration and as night roosts by sandhill cranes. Areas that have been burned and then flood warm quickly in the spring and are heavy producers of aquatic invertebrates, key food items of spring migrant ducks and shorebirds. Although fire is useful for creating openings in dense stands of emergent plants, this effect is short-lived as these plants resprout quickly from below ground in the subsequent spring. Long-term control requires follow-up treatments of disking or plowing.

Prescribed fire in uplands invigorates grass nesting cover for waterfowl and other ground-nesting birds and creates green browse for spring migratory geese. Fire in upland habitats reduces brush species and increases the cover of grasses and forbs.

Burning would also continue to be used to remove residual vegetation prior to farming operations. Removal of residual vegetation ensures a clean seed bed for optimal production of small grains.

Prescribed fire on Lower Klamath Refuge is conducted by trained and experienced personnel following national and regional fire policies. Burn plans are written for each fire and include goals and objectives of the burn, staffing needs, required environmental conditions (wind speed, relative humidity, air temperature, etc.), and safety considerations.

The Service would continue to allow lease land farmers to contract for prescribed burning of fields rather than being burned by Service fire staff.

Research

Research activities would continue to be allowed on a case-by-case basis using special use permits (SUPs).

4.2.2 Alternative A - No Action: Current Management Program – Lower Klamath Refuge

The No Action Alternative describes the current management for the refuge and assumes this management would continue for the lifetime of the CCP. It serves as a baseline with which the objectives and management actions of the three action alternatives, Alternatives B, C, and D, can be compared and contrasted.

Adaptive Management Approach

Under Alternative A, the Service would continue to implement the Habitat Management Plan for Lower Klamath Refuge (Service 1994). This plan provides a conceptual framework under which more specific annual plans can be written. As such, this plan was not intended to provide precise prescriptions for individual units of the refuge for each year, thus allowing for the flexibility needed to address unanticipated changes in habitat conditions or wildlife populations. For example, some habitat objectives have been modified over time to address such changes.¹ The modified habitat acreage objectives based on the 1994 Habitat Management Plan are:

- seasonally flooded wetlands, 12,000 to 16,000 acres;
- permanently flooded wetlands, 5,000 to 9,000 acres;
- seasonally flooded uplands (also called wet meadow), 4,700 acres;
- open submergent (also called flood fallow), 500 to 1,500 acres;
- grain, 3,000 to 8,000* acres (cooperative farming); 3,800* acres (lease land);
- irrigated pasture/hay, 1,800* acres (lease land); 800* acres (cooperative farming); and
- upland, 7,938 acres.

Annual habitat plans would continue to be developed each spring based on habitat management priorities (see Figure 4.1), current habitat conditions, water delivery projections, and the results of monitoring. The diversity and juxtaposition of potential habitats in each management unit

¹ Habitat objectives that have been modified from the 1994 Habitat Management Plan are designated with a “*.”

under Alternative A are depicted in Figure 4.3. It is important to note that the acreages of wetland and agricultural habitats the refuge can support each year are highly dependent on the volume and timing of water deliveries. As detailed in Section 5.2.1, Hydrology, Klamath Reclamation Project deliveries to the refuge have decreased substantially in recent years. As a result, the Service is unable to fully meet habitat objectives in most years and this pattern is expected to continue in the future, barring significant changes in water availability to the refuge. For example, if KBRA or a similar agreement were implemented, water deliveries to the refuge would be expected to increase and become more reliable. Since this could happen regardless of the implementation of the CCP, each alternative for Lower Klamath Refuge (including the No Action Alternative) evaluates what would happen under both the current (2013 BiOp) and KBRA scenarios.

In addition to the broad management approach described above, the Service would also continue to implement specific wildlife management strategies under Alternative A. For example, the Service currently sets aside 52% of the refuge land base as a disturbance-free sanctuary area (no public use); this would continue under the No Action Alternative. Additionally all colonial nesting waterbird breeding sites would be protected from disturbance. The Service would also continue to implement the wildlife disease contingency plan (Service 1986c).

Wildlife Monitoring

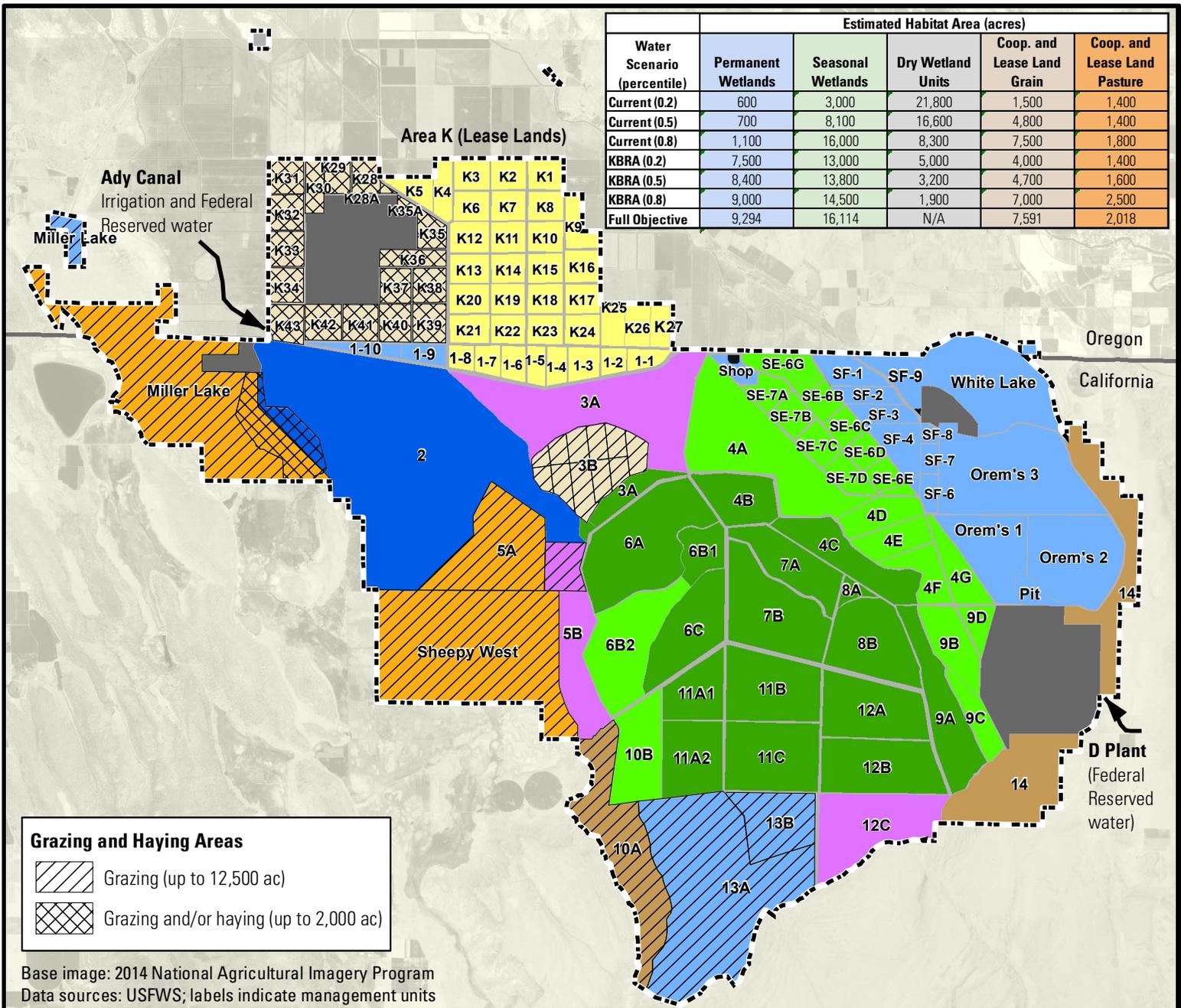
Aerial bird surveys would continue to be conducted two times per month from September through April, and bird numbers recorded by management unit. Species counted would include all waterfowl, bald eagles, sandhill cranes, and white pelicans. In addition, Point Reyes Bird Observatory periodically conducts spring and fall shorebird surveys on selected units of the refuge. These counts are important as they assist refuge managers in determining timing of wetland drawdowns for shorebird use. Additional surveys include waterfowl pair counts, and waterfowl brood surveys, colonial waterbird surveys, tricolored blackbird surveys, and others. These data in conjunction with the biologist's professional judgment are used in determining whether wildlife use is meeting goals for a particular habitat. Table 4.2 below summarizes the frequency and timing of surveys on Lower Klamath Refuge that would continue under Alternative A.

Disease Monitoring

Waterfowl diseases are a major concern on Lower Klamath Refuge. Similar to other monitoring activities, disease data are collected by management unit. Ultimately, this information is used to determine if particular management activities precipitate disease outbreaks or if certain geographical areas are prone to disease.

Water Management

Under the No Action Alternative, the Service would maintain 1905 irrigation rights and 1928 Federal Reserved water rights pursuant to the 2013 Final Order and Determination (FOD) (Oregon Water Resources Department 2013). In addition, the Service would continue to pursue exceptions to the FOD that would allow the use of irrigation water in seasonal wetlands, follow the flood fallow agricultural practice, and change the period of use for irrigation water to year-round. Tables 4.3 and 4.4 summarize how monthly water deliveries would be prioritized for use among different habitats under the current water delivery scenario (2013 BiOp [NMFS and Service 2013] and KBRA [2010]).



Grazing and Haying Areas

Grazing (up to 12,500 ac)
 Grazing and/or haying (up to 2,000 ac)

Base image: 2014 National Agricultural Imagery Program
 Data sources: USFWS; labels indicate management units

<p>Water Rights:</p> <ul style="list-style-type: none"> -Maintain 1905 irrigation right and 1925 Federal Reserved rights -Pursue exceptions to the FOD that would allow the use of irrigation water in seasonal wetlands and change the period of use to year round 	<p>Water Management:</p> <ul style="list-style-type: none"> -Irrigation water deliveries used for Lease Land and cooperatively farmed grain and pasture -Federal Reserved water used to flood seasonal and permanent wetlands 	<p>Wetland Management:</p> <ul style="list-style-type: none"> -Use disking, plowing, prescribed burning, grazing, and rotation through grain to set back vegetative succession and improve habitat conditions 	<p>Agricultural Habitat Management:</p> <ul style="list-style-type: none"> -Maintain Lease Land and Cooperative farming programs to provide food for waterfowl, consistent with the Kuchel Act
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Approved acquisition boundary
 Private land
 Developed

Management Unit Rotations

Permanent marsh	Seasonal marsh/Grain
Seasonal marsh	Wet meadow
Permanent marsh/seasonal marsh	Grain
Permanent marsh/seasonal marsh/Grain	Pasture/hay
	Upland

Figure 4.3. Alternative A Habitat Management

Lower Klamath Refuge

0 0.75 1.5 3
Miles

Table 4.2. Ongoing Wildlife Surveys and Monitoring on Lower Klamath National Wildlife Refuge

<i>Survey Name</i>	<i>Frequency of Survey</i>	<i>Survey Timing</i>
Breeding Canada Goose Pairs	Recurring – every year	Mid-March
Breeding Duck Pairs Survey	Recurring – every year	Mid-May
Breeding Sandhill Cranes	Recurring – every year	April
Colonial Waterbird Surveys	Recurring – every year	Methods and timing depend on the species
Fall Sandhill Crane Staging Survey	Recurring – every year	September through November
Fall Staging Waterbird Survey	Recurring – every year	Mid-August
Mid-Winter Waterfowl Survey	Recurring – every year	Early January
Non-game Waterbird Breeding Population Survey	Recurring – every year	Mid-June
Periodic Waterfowl Surveys	Recurring – every year	September through April
Secretive Marshbird Surveys	Recurring – every year	May – July
Spring Shorebird Survey	Recurring – every year	Late April
Tricolored Blackbird Survey	Periodic/in conjunction with other surveys	April through June
Vegetation Mapping	Recurring – every year	August through September
Water Records	Recurring – every year	Year round
Wintering Raptor Surveys	Recurring – every year	January and February
Wintering Tule Goose Survey	Recurring – every year	October and November

Wetland Habitat Management

Basic wetland habitat types consist of seasonal and permanently flooded marshes and winter irrigated grain fields.

Permanent Wetlands

Under Alternative A, permanently flooded wetlands and open submergent wetlands would be managed for a diverse emergent and submergent plant community with hardstem bulrush and sago pondweed the preferred plant species. The target emergent/open water interspersions ratio would be between 30% and 70% of either type. The refuge's permanent wetlands would be intensively managed to provide for an interspersions of successional stages. Prescribed fire is and would continue to be used often in combination with disking and plowing to remove dense stands of emergent vegetation, thereby increasing the proportion of open water areas for use by fall and spring migrant waterfowl. Removing emergent vegetation also creates sites for submergent plants in permanently flooded wetlands.

Similar to seasonally flooded wetlands, farming for cereal crops may be used to set back succession in permanent wetland units. By draining and farming former marsh units, all vestiges of unwanted vegetation can be eliminated and then desirable plants reestablished with seasonal water management regimes resulting in a more productive wetland.

Table 4.3. Alternatives A, B, and C: Priorities for Use of Delivered Water by Month and Habitat Type Under the Current Water Allocation System (2013 BiOp).

Month	Habitat					
	Permanent Wetland	Seasonal Wetland	Co-op Grain	Lease Land Grain	Co-op Pasture	Lease Land Pasture
March	FFF	FFFF	0	0	II	II
April	FFFF	FF	0	0	0	0
May	FFFF	F	0	0	0	0
June	FFFF	0	0	0	0	II
July	FFFF	0	0	0	0	0
August	FFFF	0	0	0	0	0
September	FF	FF	0	IIII	I	IIII
October	FF	FF	III	IIII	I	IIII
November	FF	FFF	FF	FF	0	0
December	FF	FFF	FF	0	0	0
January	FF	FFF	FF	0	0	0
February	FF	FFF	FF	0	FFF	FF

Federal Reserved Water
 FFFF Highest Priority
 FFF Medium High Priority
 FF Medium Priority
 F Low Priority
 0 No water

Irrigation Water (in above box, March through October)
 IIII Highest Priority
 III Medium High Priority
 II Medium Priority
 I Low Priority
 0 No water

Table 4.4. Alternatives A, B, and C: Priorities for Use of Delivered Water by Month and Habitat Type Under KBRA or Similar Settlement

Month	Habitat					
	Permanent Wetland	Seasonal Wetland	Co-op Grain	Lease Land Grain	Co-op Pasture	Lease Land Pasture
March	++++	+++	0	0	+	+
April	++++	++	0	0	+	+
May	+++	+	0	0	0	0
June	++++	0	0	0	0	++
July	++++	0	0	0	0	0
August	++++	0	0	0	0	0
September	+++	++	0	0	0	0
October	++	+++	++	+++	0	0
November	++	+++	+++	++	0	0
December	++	+++	++	++	0	0
January	++	+++	++	0	0	0
February	++	+++	+++	0	0	0

All Deliveries

- ++++ Highest Priority: all water deliveries this month would go to this habitat
- +++ Medium High Priority: most but not all water would go to this habitat
- ++ Medium Priority: water would be split approximately equally among this and other habitats as appropriate
- + Low Priority: water would only be used for this habitat if in excess of other needs or if not available in more suitable times (less than ideal)
- 0 No water

Seasonal Wetlands

Under Alternative A, seasonally flooded wetlands would be managed for moist soil and a diversity of emergent wetland plants, with an emphasis toward red goosefoot, smartweed, and hardstem

bulrush. This habitat type is very important to fall and spring migrant waterfowl and shorebirds. Typically, seasonal wetland units would be flooded during the early fall to early winter period and then dewatered in late spring to early summer by gradually lowering the water level either by draining, evaporation, or a combination of both. Seasonally flooded marshes have a finite productive life, as they tend to evolve to a largely monotypic stand of alkali bulrush scattered with clumps and patches of hardstem bulrush and cattail. When the marsh reaches this level of plant succession, its ability to provide food and resting sites for migrating waterfowl, shorebirds, and sandhill cranes is greatly diminished. Unless the seasonal wetland unit is to be retained for breeding habitat for waterfowl and other wetland species, a management change usually would be implemented at this point. A number of options may be implemented.

After spring drawdown, one option is to use disking, plowing, and prescribed burning, often in combination, to remove dense stands of emergent vegetation from wetland units and increase the proportion of open water for use by fall and spring migrant waterfowl. Prescribed fire also would be used in seasonal wetland units to open up dense stands of emergent vegetation, thereby creating open water areas for use by fall and spring migrant waterfowl. Removing emergent vegetation creates sites for moist-soil seed plants such as smartweed and goosefoot which are highly desirable for waterfowl.

A second option would be to return the unit to cereal grain farming for a period, thus eliminating all natural wetland plants in the unit. After the farming period, a return to the seasonally flooded wetland water management regime has proven to result in very productive early succession wetland.

Finally, the unit could be managed as a permanently flooded wetland. Year-round flooding would eliminate all the seasonal marsh plants except hardstem bulrush and cattail and develop a submergent plant community as well. This management option would be implemented only if a sufficient summer water supply is available and the unit does not have a history of avian botulism.

Upland Habitat Management

Uplands

Under Alternative A, prescribed fire and grazing would continue to be used in the 6,500 acres of upland units to reduce cover of brush species, invigorate grass nesting cover for waterfowl and other ground-nesting birds, and create green browse for spring migratory geese. Herbicides also would be selectively applied to reduce populations of noxious/exotic weeds such as perennial pepperweed.

Wet Meadows

Under Alternative A, wet meadow units would begin flooding in the winter months, usually starting in mid-December and continuing through March, and then evaporate dry in April and early May. Since these units have no water supply except small streams fed by runoff from the immediate basin, the duration and amount of annual flooding would be highly variable but could include up to 3,000 acres or more. Some units (e.g., Sheepy West and Unit 5a) would be grazed during the fall months, thus enhancing their use by spring migratory waterfowl and shorebirds. Deferred season grazing would be used to lessen impacts to vegetative communities. Burning (100–500 acres) occasionally would be used to promote green browse for spring migrant geese.

Agricultural Habitat Management

Under the No Action Alternative, agricultural lands are primarily managed through farming, haying, grazing, mowing, and prescribed fire, to help achieve habitat and associated wildlife objectives.

Farming

If the Service received full water deliveries needed to meet habitat objectives, the farmed acres on the refuge would total approximately 9,600 acres composed of 7,600 acres of grain and 2,000 acres of pasture. This constitutes about 18% of the refuge land area. However, the actual quantities of crops grown on the refuge will vary from year to year depending on the water year type and the water allocation system that is implemented. The projections of crop types and wetlands on the refuge under a range of scenarios are discussed in Chapter 6. In addition to helping meet habitat objectives for dabbling ducks and geese, farming is also used to control invasive plant species such as perennial pepperweed, **quackgrass, mustard, and *Bassia* sp.** **To control those species, farmed fields may be subjected to permanent flooding for a period of up to 18 months every 5 to 8 years.** In dry years when water is not available for seasonal wetlands, the refuge may choose to increase the acreage of cooperative farm fields by up to 4,000 acres as a method to control invasive plant species instead of using pesticides. In this situation, there may be more cooperative farming than is needed to meet habitat objectives. The additional cropland acreage on the refuge would be used to provide incentives for cooperative farmers to provide wetlands on private lands off of the refuge through the Walking Wetlands Program.

Grazing

Approximately 11,000 acres (3,670 animal-unit-months [AUMs]) in the western, central, and southern areas of the refuge (i.e., Units 2, 3B, 5A, 10, and 13A; Miller Lake; and Sheepy West) are grazed annually; this would continue under the No Action Alternative.

Grazing and the other habitat management techniques, as appropriate, would continue to be used on varying acreages and be rotated around different parts of the refuge to ensure that a diversity of habitat types, qualities, and successional stages are always available for use by refuge wildlife. The mixture, acreage, locations, and timing of management techniques deployed during any particular year would be based on an assessment of current and likely future habitat conditions and wildlife needs, including the potential availability of water; the availability of adequate funding, staff, and equipment; air quality restrictions; the availability of local farmers, ranchers, and livestock; forage quality; and site conditions (e.g., access, roughness of the terrain, fencing, and other infrastructure). Depending on precipitation and irrigation, grazing could occur from late spring through the middle of the winter.

Currently a variety of domestic livestock, primarily cattle (*Bos taurus*), but possibly including goats (*Capra aegagrus hircus*) and/or sheep (*Ovis aries*) graze refuge lands. Plants grazed include broadleaf cattail (*Typha latifolia*); grasses (e.g., barley [*Hordeum* spp.], bent grasses [*Agrostis* spp.], bluegrasses [*Poa* spp.], and saltgrass [*Distichlis spicata*]); rushes (e.g., alkali [*Schoenoplectus maritimus*] and hardstem [*Schoenoplectus acutus*] bulrushes, and *Juncus* spp.); sedges (e.g., *Carex* spp. and spike sedges [*Eleocharis* spp.]); a mixture of forbs; and similar species.

Invasive plants such as reed canarygrass (*Phalaris arundinacea*), crested wheatgrass (*Agropyron* spp.), and perennial pepperweed (*Lepidium latifolium*), are also grazed by domestic

livestock. All of these species grow on the refuge without the need for planting, irrigation, fertilization, or pest management/pesticide use.

Grazing involves the use of various types of equipment and infrastructure on the refuge, potentially including trucks, trailers, off-road vehicles, horses, dogs, loading/unloading ramps, corrals, barns, water pumps, off-stream watering facilities, and temporary (likely electric) and permanent (including barbed-wire) fences and gates; and the personnel to operate these machines and manage the livestock. Ranching personnel are on site as needed throughout the season to manage the livestock and perform appropriate ranching-related functions, including fence maintenance, providing and positioning any watering facilities and mineral blocks, and operating the equipment. Some or all of this equipment could be on the refuge throughout the season.

Haying

Under the No Action Alternative, haying would continue to be conducted, along with other management techniques such as grazing, mowing, and prescribed fire, to help achieve habitat and objectives described under the Adaptive Management Approach section. Haying on refuge lands includes the cutting, drying/curing, raking, baling, temporary storage (stacking of bales), and removal of vegetation (including plant heads, leaves, and stems), usually for livestock fodder. The most common plants hayed on the refuge include pasture grasses, rushes, and sedges. Some or all of these plants grow on the refuge without the need for planting, irrigation, fertilization, and/or pest management. Other plants (e.g., pasture grasses) may involve planting, irrigation, fertilization, and/or pest management. Under Alternative A, approximately 200 acres in the western portion of the refuge (i.e., Miller Lake and Unit 2) and 2,150 acres in the northern (Oregon) portion of the refuge (i.e., Area K) would be hayed annually (see Figure 4.3).

The mixture, acreage, locations, and timing of management techniques deployed during any particular year are based on an assessment of current and likely future habitat conditions and wildlife needs, including the potential availability of water; the availability of adequate funding, staff, and equipment; air quality restrictions; the availability of local cooperators; and site conditions (e.g., roughness of the terrain, fencing, and other infrastructure).

Haying requires the use of a variety of farm machines on the refuge (potentially including tractors, swathers/windrowers, hay rakes, hay balers, and trucks) and the personnel to operate these machines. Personnel are on site as needed throughout the season to monitor the field(s)/crop(s) and perform appropriate farming-related functions, including operating the machines. Some or all of these machines could be on the refuge throughout the season.

Integrated Pest Management

The Service would continue to manage pests on the refuge consistent with policies of the Service and Department of Interior (DOI) (see 569 FW 1 and 517 DM 1) using an IPM approach. The Service would continue to scout, map, and control priority weed species with an emphasis on protecting high-priority wildlife habitat. The Service would continue to combat plant and animal pests alongside roads and trails; around parking lots and restrooms; around administrative and visitor buildings; and around visitor overlooks, kiosks, and signs. The purposes of these pest management actions is to control early infestations of invasive species; minimize the spread of established invasive species; facilitate maintenance of administrative and visitor facilities; allow visitors to readily observe signs and access and enjoy trails, overlooks, restrooms, and other

visitor facilities; and help ensure visitor safety (e.g., associated with poisonous plants or disease-carrying animals).

Pest control for wildlife/habitat and infrastructure includes the following practices: irrigation and flooding; tilling and disking; mowing with brush/deck mower and cutting with a sickle bar mower; variation in the timing of these practices; hand pulling weeds; prescribed burning; use of bag-type repellents; trapping and removal; and application of pesticides. Table 4.5 below summarizes current IPM practices on Lower Klamath Refuge that would continue under the No Action Alternative. IPM involves using methods based on effectiveness, cost, and minimal ecological disruption (which consider minimum potential effects to non-target species and the refuge environment). As noted in Table 4.5, pesticides are an IPM method and are used when other IPM methods are impractical or incapable of providing adequate control, eradication, or containment. When pesticides are needed on the refuge, the Service allows only the most specific (selective) chemical available for the target species unless considerations of persistence or other environmental and/or biotic hazards preclude it. Consistent with DOI policy (517 DM 1), the Service allows only pesticides registered with the U.S. Environmental Protection Agency (USEPA) in full compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which further restricts the spectrum of pesticides used on the refuge.

Table 4.5. Summary of Integrated Pest Management Practices on Lower Klamath National Wildlife Refuge

<i>Category</i>	<i>IPM Practices</i>	<i>Description</i>	<i>Purpose</i>
Weed Control	Cultural or agronomic: crop rotation, crop refuse destruction, soil tillage, variation in time of planting or harvesting, thinning or pruning, fertilization, sanitation, water management	Water management through irrigation and flooding, tilling/disking, and variation in timing of all practices to produce desirable native vegetation and reduce undesirable/invasive weed species.	Habitat management
	Cultural or agronomic	Pre-plant flood irrigation and rotational flood fallow to reduce undesirable/invasive vegetation. Rotation of units between crops and wetland habitats on a varied schedule (one to many years). Pre-plant soil tillage.	Farming
	Mechanical: hand destruction, barriers, crushing and grinding, mowing	Hand pulling small noxious weed infestations (purple loosestrife). Mowing with brush/deck mower and cutting with sickle bar mower to reduce invasive and undesirable vegetation and limit the seed bank.	Habitat management and general maintenance
	Physical: prescribed burning	Prescribed burning to decrease areas of thick, dead under-layer vegetation which impedes growth of beneficial vegetation and wildlife use.	Habitat management
	Physical: prescribed burning	Prescribed burning to reduce all vegetation prior to tillage and planting.	Farming
	Chemical	Hand and utility-terrain vehicle boomless spraying to reduce noxious and pest weed species.	Habitat management and general maintenance
	Chemical ¹	Ground/boom spraying to reduce noxious and pest weed species in crops.	Farming

Table 4.5. Summary of Integrated Pest Management Practices on Lower Klamath National Wildlife Refuge

<i>Category</i>	<i>IPM Practices</i>	<i>Description</i>	<i>Purpose</i>
Vertebrate Control	Repellants	Herbal and/or all natural “bag type” repellants are used to deter rodents from buildings and equipment.	General maintenance
	Trap and remove	Trapping and removal of problem animals such as muskrats and beavers that burrow into dikes and roadways reducing the integrity of these infrastructures. Trapping of mice in buildings where repellants are not successful to protect office and general maintenance equipment and supplies. Trapping and removal of mammalian and avian predators from mitigation nesting islands (Unit 2 and Orems 1) to protect white pelican and Caspian tern nests and young.	Habitat management, general maintenance, and wildlife management

¹NOTE: Refuge management gives preference to cooperators who will farm these units as organic to reduce the use of chemicals; however, conditions change from year to year making the use of these materials necessary in some situations. These are the only chemicals allowed for co-op farming on this refuge.

When pesticides are used on the refuge the Service follows standard BMPs (see Appendix L), including adherence to all USEPA and California Environmental Protection Agency warning labels and application requirements, as well as the Service’s pesticide use proposal (PUP) process. Pesticides are to be applied only by certified/licensed pesticide applicators or individuals under the direct supervision of such applicators. While on the refuge, all pesticides are stored, transported, and otherwise handled in accordance with label specifications. In addition, written contingency plans are prepared for all sites where pesticides would be used or stored, and appropriate materials and supplies (e.g., shovels, disposal containers, absorbent materials, first aid supplies, and clean water) are available on site to clean up any small-scale accidental hazardous spill. Hazardous material spills are then reported to the appropriate state environmental quality agency.

The use of pesticides on the refuge is initiated at the field-station level and documented using a PUP. Field station personnel identify the pesticide product(s) proposed for use and describe the associated use pattern; target pest(s); alternative management practices that may be integrated into the overall management action; location of use including factors important to the environmental fate of the pesticide post-application; and sensitive non-target resources that may be exposed. The refuge manager or refuge project leader reviews the PUP and may approve some pesticide uses where that authority has been delegated by the regional office. Uses that can be approved at the field-station level typically are pesticides with inherently low risk to wildlife resources. Field-station-level reviewers also have to consider all applicable federal, state, and local laws, regulations, policies, and court decisions applicable to pesticide use on the refuge. PUPs that cannot be approved at the field-station level are elevated to the regional level (the regional IPM coordinator) or possibly to the national headquarters office for review and final decision (i.e., approval, approval with modification, or disapproval).

Potential effects of pesticide use on the physical environment, biological resources (including mammals, birds, and fish), and potentially humans; and environmental fate (including mobility, persistence, translocation, bioaccumulation, and degradation) of these chemicals are evaluated

during the PUP review process. Summaries of this information and an ecological risk assessment are contained in pesticide-specific chemical profiles. Chemical profiles are prepared for active ingredients (e.g., glyphosate and imazapic) that are contained in one or more trade name products registered and labeled with the USEPA. The chemical profiles provide basic information about pesticide formulations, including active ingredients and other chemicals to improve the storage, handling, safety, application, and effectiveness of the pesticide; quantitative assessment/screening tools and threshold values to evaluate potential effects of pesticide uses on the physical environment and biological resources; and BMPs. The completed chemical profiles provide a structured decision-making process using quantitative assessments/screening tools with threshold values that are used to evaluate potential biological and other effects on refuge resources.

Under the No Action Alternative ongoing pest management for the lease lands (Area K) would continue as described in the 1998 EA IPM Plan (Service 1998a). The 1998 EA IPM was prepared by the Service and Reclamation with the goal of minimizing the use of pesticides associated with agricultural practices on the lease lands over time. The IPM Plan does not eliminate the use of pesticides, but attempts to have them used as a last line of defense against pests, not as the first option of control. As with non-leased land areas of the refuge, all pesticides proposed for use on the lease lands are reviewed under the PUP process. However, the PUP review and approval process for lease lands on the Lower Klamath and Tule Lake Refuges was modified in 1995. In 1995, the Regional Director requested and received a delegation of authority for the review and approval of all pesticides and application methods for all pest species on the leased lands (farmed by Reclamation lessees) on both the Lower Klamath and Tule Lake Refuges. The rationale for this request was based on:

- the Kuchel Act of September 2, 1964;
- large-scale crop production as a purpose of the Lower Klamath and Tule Lake Refuges;
- the extensive acreage of the federal leased lands on both refuges; and
- local knowledge needed to necessitate numerous adjustments to local conditions given the diversity of crops grown and wildlife management techniques involved.

Based on this delegation of authority, a PUP Committee was formed with members from both the Service and Reclamation who could collectively provide expertise in the agricultural lease lands program, refuge management, agronomy, IPM, environmental toxicology, endangered species, and local agronomic practices.

The PUP Committee also uses the chemical profiles prepared for the active ingredients to assess each pesticide proposed for use on the refuge and determine whether to allow its use. If approved, the PUP includes BMPs to ensure that pesticides are used effectively, safely, and in a manner designed to minimize potential effects on the environment (e.g., soils, water, and air) and non-target organisms. For administrative purposes and to ensure cohesive pest control, pesticides that are approved for use on the leased lands are also approved for use on cooperative farm units.

Land Conservation

Under Alternative A, the Service would continue to pursue acquisition of lands within the approved acquisition boundary from willing sellers.

Cultural Resources Management

Cultural resources would be managed and conserved in accordance with all applicable laws, policies, and regulations. The Service would identify historic properties that coincide with existing and planned roads, facilities, public use areas, and habitat projects and evaluate threatened and impacted sites for eligibility to the National Register of Historic Places (NRHP). As required, the Service would prepare and implement activities to mitigate impacts to sites.

Visitor Services

Following is a summary of the visitor services that would continue under the No Action Alternative. More detailed descriptions of current visitor opportunities are included in the *Visitor Services* section of Chapter 5. The visitor services and facilities that would be offered under this alternative are summarized in Figure 4.4.

Wildlife Observation and Photography

Under Alternative A, the refuge would continue to be open to the public daily for wildlife observation and photography along the auto tour route, vehicle pull-offs, and wildlife overlook from sunrise to sunset year-round. The Service would continue to maintain the 14.8-mile auto tour route located 12.0 miles from the Refuge Complex Visitor Center off of State Line Road. The only parking area open to the general public during non-hunting season along the auto tour route is the viewing kiosk located at the main entrance off of Highway 161. Here visitors can get general information from kiosks and walk to the wildlife viewing platform on the Lower Klamath Refuge.

In addition to the photography opportunities at the wildlife viewing platform and the auto tour route, the Service would maintain one photo blind on the refuge (Lower Klamath Eagle Snag Blind). This is a newly constructed, two-person blind located near a dead tree where eagles and raptors perch in the late fall and winter.

Interpretation

The Service would maintain existing opportunities for nature interpretation at Lower Klamath Refuge, including information kiosks and signs along the auto tour route. The Service would continue to provide to the public periodic staffed nature interpretation programs, brochures and maps, maintained websites, and current information to the public.

Environmental Education

The Service would maintain existing opportunities for environmental education at Lower Klamath Refuge. The Service would maintain an emphasis on wetland habitats and bird education programs at the visitor center. The Service would maintain kindergarten through 12th grade bird biology curriculum and kindergarten through 8th grade wetlands curriculum to match California and Oregon state standards. The Service would maintain existing opportunities for outreach about natural resources in the ecoregion and the NWRS. The Service would continue to host special events at the Refuge Complex, participate in community events, and offer off-site presentations on request.

Wildlife Observation and Photography:

Alternative A

- Maintain wildlife observation and photo opportunities via photo blinds, vehicle pull-offs, a wildlife overlook and the auto tour route

Alternatives B, C, D

- Develop additional vehical pull-off on State Line Rd.

Interpretation:

Alternative A

- No action

Alternative B, C, D

- Provide a contact station at the entrance of Lower Klamath NWR to greet visitors

Hunting:

Alternative A

- No action

Alternative B

- Provide drive-in, boat-in mobility-impaired accessible hunting opportunities

Alternative C

- Same as Alt B and phase in new requirement allowing only 4 stroke or direct injection 2 stroke engines

Alternative D

- Same as Alt C and revise hunt and sanctuary areas as remnant historic hydrology unit is developed

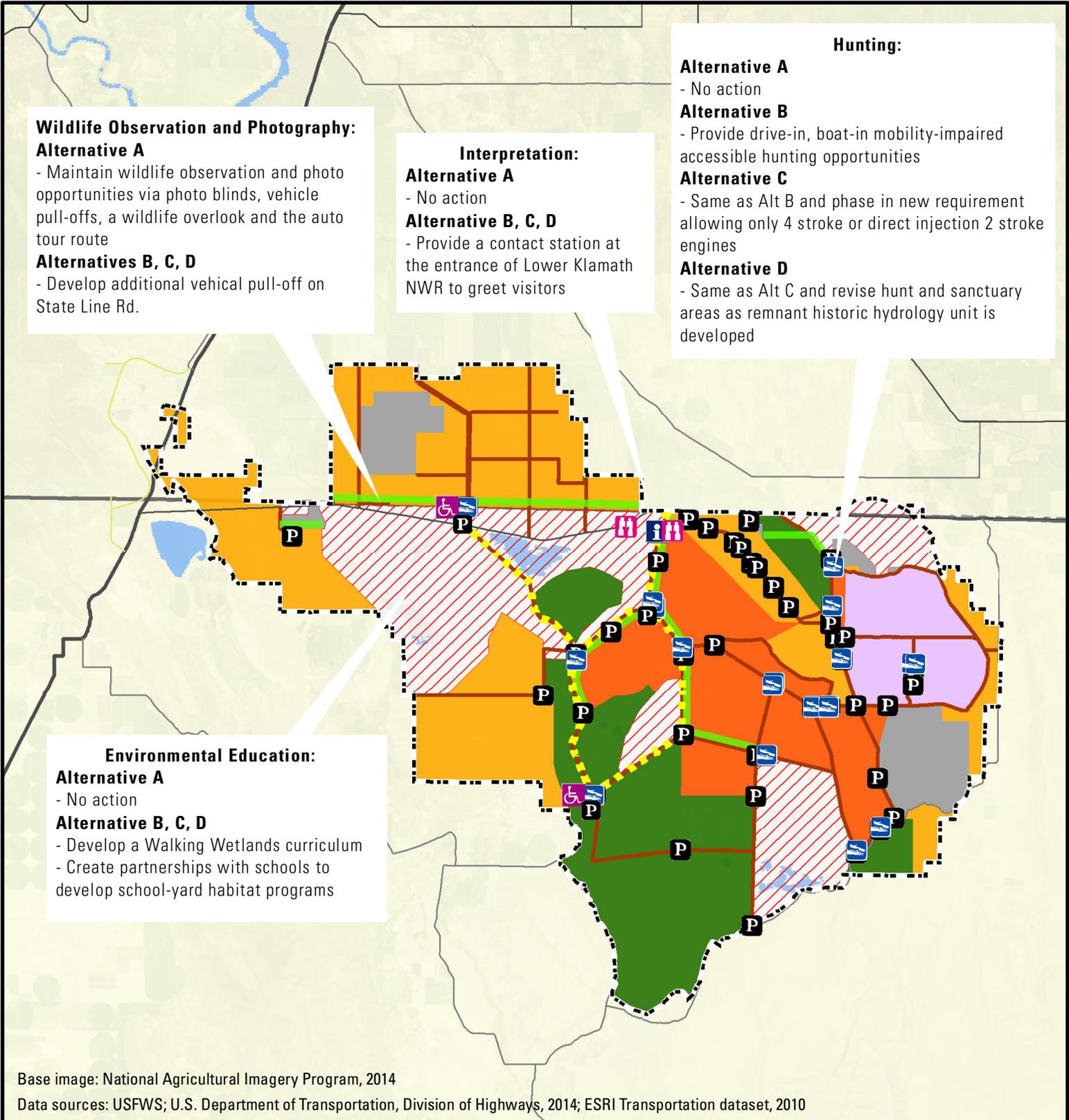
Environmental Education:

Alternative A

- No action

Alternative B, C, D

- Develop a Walking Wetlands curriculum
- Create partnerships with schools to develop school-yard habitat programs



Base image: National Agricultural Imagery Program, 2014

Data sources: USFWS; U.S. Department of Transportation, Division of Highways, 2014; ESRI Transportation dataset, 2010

--- Approved acquisition boundary	P Designated parking area	Pheasant & rotating waterfowl hunting (up to 50% open to waterfowl on an annual basis)
--- Auto tour route	Hunt blinds - accessible to mobility impaired	Hunting prohibited
--- Refuge road	Boat launch	
--- Hunter retrieval area	Waterfowl hunting only	
Private inholding	Pheasant hunting only	
Wildlife observation	Waterfowl & pheasant hunting	
Visitor information		

Figure 4.4. Visitor Services Alternatives - Lower Klamath Refuge



Hunting

The Service would continue to offer a diversity of hunting opportunities on up to 24,380 acres (approximately 48% of the refuge), subject to the availability of water. Sport hunting for waterfowl, including geese, ducks (including mergansers), American coots (*Fulica americana*), and common moorhens (*Gallinula chloropus*), and Wilson's snipe (*Gallinago gallinago*) would be allowed on designated areas of the refuge. These areas would change each season depending on availability of water and habitat conditions. Hunting would be permitted throughout the California and Oregon season. Opening weekend hunts on the California portions of Lower Klamath Refuge would continue to be under a draw permit system. The Service would continue to allow hunting 7 days per week during the normal state season. However, shoot time ends at 1:00 pm on the California portion of the refuge. The Service would maintain existing hunt fees.

Waterfowl hunt opportunities would continue to include walk-in units, boat-in marsh units (for both motorized and non-motorized craft), various agricultural fields (e.g., pasture, grain/field crops, and row crops), seven pit blinds (all first come, first served), and uplands. Fields and marshes would continue to be free-roam. The Service would also maintain flooded pit blinds and mobility impaired hunt. As it does now, the Service would maintain hunt area accessibility via automobiles, motor boats, canoe style boats, and walk-ins.

Commercially guided sport hunting for waterfowl would continue to be permitted through a competitive contract and SUPs. Guided sport hunting would be conducted in the areas open for that use as determined annually by the Service and described in the SUP. Guided sport hunting could continue to occur on all units open to waterfowl and pheasant hunting.

Sport hunting for ring-necked pheasant (*Phasianus colchicus*) would continue to be allowed on designated areas of Lower Klamath Refuge during the state-regulated hunting season. The size of the hunt area could vary depending on habitat conditions but would total up to 9,300 acres. California Department of Fish and Wildlife regulations allow some upland game to be hunted with shotguns, bow and arrow (archery), and hawk or falcon (falconry). An SUP is required for guided sport hunting.

Law Enforcement and Public Safety

Service law enforcement staff would continue to maintain safe conditions at all visitor facilities at the refuge.

4.2.3 Alternative B – Lower Klamath Refuge

Adaptive Management Approach

Under Alternative B, the Service would follow the adaptive management approach outlined under Actions Common to All Alternatives and Alternative A. However, the goals, objectives, and strategies identified for Lower Klamath Refuge in Appendix F would take the place of the 1994 Habitat Management Plan (Service 1994) and guide management over the next 15 years.

The habitat objectives in Appendix F are designed to achieve proper waterfowl management as defined in Appendix M. Objectives for wetland and agricultural habitats are based on providing sufficient food to support the 75th percentile of 1970s duck and 1990s goose populations. Appendix F also includes monitoring elements which are the surveys that are used to track achievement of

the objectives. Finally, Appendix F lists the management strategies which are the specific actions, tools, or techniques that are necessary to accomplish each objective.

The goals, objectives, and strategies for Lower Klamath Refuge in Appendix F would form the basis of a new habitat management plan which the Service would develop. This plan would include more specific objectives for each refuge habitat, monitoring programs that track achievement of both population and habitat objectives, and thresholds for taking management actions.

Annual habitat plans would continue to be developed each spring based on habitat management objectives (Appendix F), current habitat conditions, water delivery projections, and the results of monitoring. The diversity and juxtaposition of potential habitats in each management unit under Alternative B are depicted in Figure 4.5. It is important to note that the acreages of wetland and agricultural habitats that the refuge can support each year are highly dependent on the volume and timing of water deliveries. Annual wetland and agricultural habitat objectives would be scaled based on projected water deliveries in a given year.

Inventory and Monitoring

Under Alternative B, the Service would develop a new inventory and monitoring plan for Lower Klamath Refuge in conjunction with the habitat management plan. The purpose of the inventory and monitoring plan would be to identify and prioritize existing and new inventories and monitoring needed to inform adaptive management of priority refuges resources. The Service would also monitor changes in the environment, such as vegetation communities, wildlife trends, and surface water and groundwater levels, to assess the effects of climate change on the refuge.

Water Management

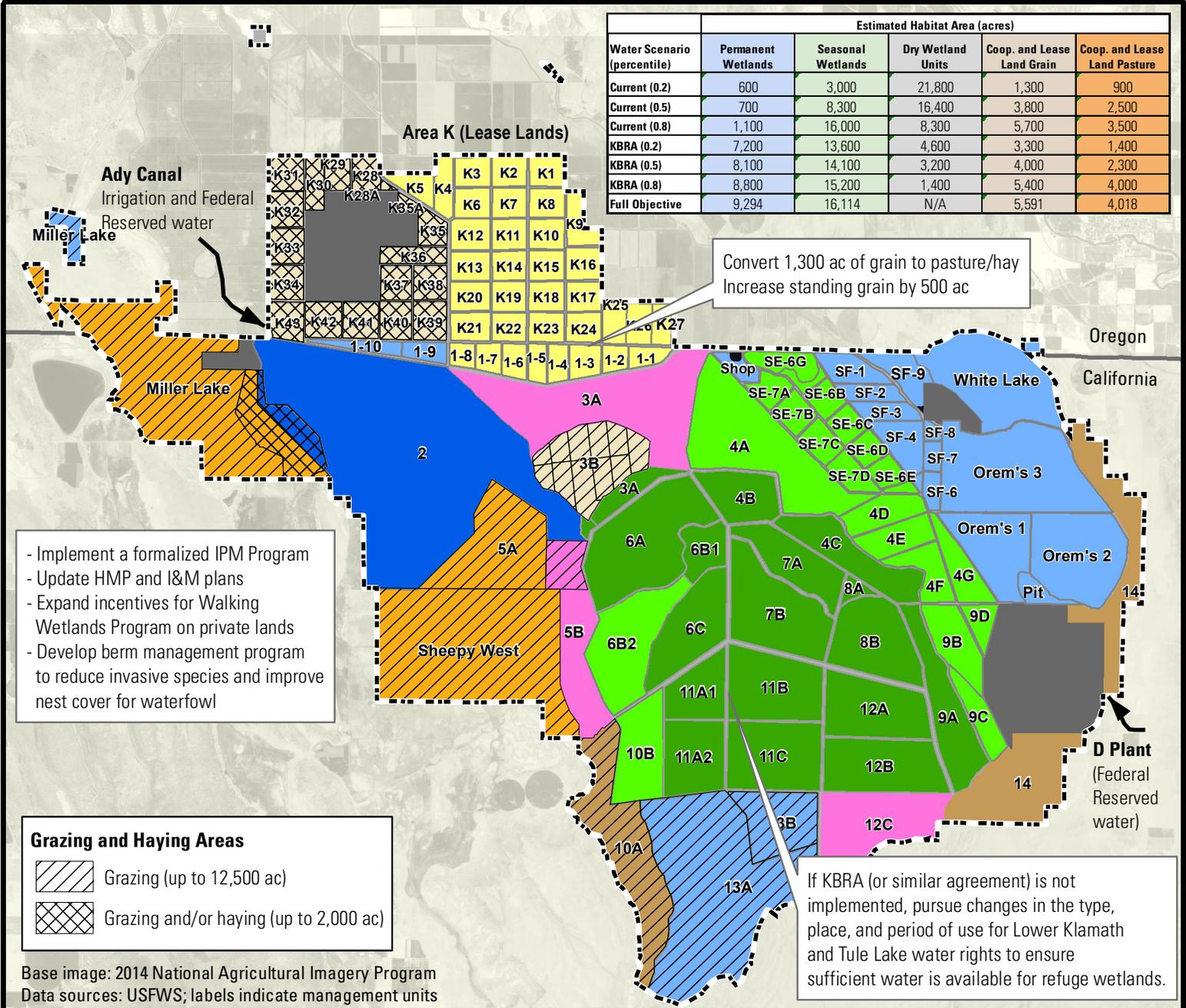
Same as Alternative A. Tables 4.2 and 4.3 summarize how monthly water deliveries are prioritized for use among different habitats under both water delivery scenarios (2013 BiOp [NMFS and Service 2013] and KBRA [2010]). In addition, if KBRA or some comparable agreement is not implemented, the Service would pursue changes in the type, place of use, and period of use for Lower Klamath and Tule Lake water rights to ensure sufficient water is available for refuge wetlands. **However, given that the first phase of the Klamath Adjudication took 38 years to complete, it is reasonable to assume that the judicial phase of the adjudication will not be completed during the next 15 years. As a result, any changes to water rights are not likely during the 15-year life of this CCP.**

Wetland Habitat Management

Wetland management under Alternative B would be the same as Alternative A with the following exceptions. Under Alternative B, wetland habitat objectives 1.5 (seasonal wetlands) and 1.6 (permanent wetlands) in Appendix F would guide wetland habitat management activities. However, wetland management tools and activities would be the same as under Alternative A.

Upland Habitat Management

See *Grazing* under Agricultural Habitat Management below.



Water Rights:

- Maintain 1905 irrigation right and 1925 Federal Reserved rights
- Pursue exceptions to the FOD that would allow the use of irrigation water in seasonal wetlands and change the period of use to year round

Water Management:

- Irrigation water deliveries used for Lease Land and cooperatively farmed grain and pasture
- Federal Reserved water used to flood seasonal and permanent wetlands

Wetland Management:

- Use disking, plowing, prescribed burning, grazing, and rotation through grain to set back vegetative succession and improve habitat conditions

Agricultural Habitat Management:

- Maintain Lease Land and Cooperative farming programs to provide food for waterfowl, consistent with the Kuchel Act

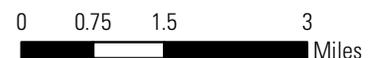
- - - - Approved acquisition boundary
- Private land
- Developed

Management Unit Rotations

- Permanent marsh
- Seasonal marsh
- Permanent marsh/seasonal marsh
- Permanent marsh/seasonal marsh/Grain
- Seasonal marsh/Grain
- Wet meadow
- Grain
- Pasture/hay
- Upland

Figure 4.5. Alternative B Habitat Management

Lower Klamath Refuge



Agricultural Habitat Management

Farming

Farming under Alternative B would be the same as Alternative A, with the following exceptions. Under Alternative B, the Service would require annual SUPs for Reclamation that include stipulations and a prescribed mixture of habitat types based on the energetics models (Appendix N) to ensure the stipulations in the compatibility determinations are effectively implemented **in new leases**. The Service would also require annual SUPs for commercial contractors (i.e., for fertilizer and pesticide applications). Additionally, stipulations and all other specific requirements from the SUPs shall be included as part of the lease contracts.

Lower Klamath Refuge objectives 1.7 (irrigated pasture) and 1.8 (small grains) describe the desired conditions for agricultural habitats (Appendix F). To support dabbling duck and geese population objectives during winter and spring, the Service would increase the acreage of unharvested cooperatively farmed grain by 500 acres and reduce the acreage of harvested grain accordingly. Subject to water availability, an additional 2,000 acres of harvested grain would be converted to pasture/green browse. Approximately 700 acres would come from units that are currently cooperatively farmed for grain and the remainder would come from Area K lease lands grain fields. In addition, the Service would seek to leverage more wetland habitat on private lands in the basin by expanding the use of preferential permits for cooperatively farmed grain and hay units for farmers that participate in the Walking Wetlands Program on their private lands. Finally, the Service would 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.

Haying

Under Alternative B, haying would be the same as under Alternative A with one exception. Grazing and or haying would be used to manage the additional 2,000 acres of pasture under this alternative.

Grazing

Same as Alternative A.

Integrated Pest Management

Under Alternative B, the Service would continue to manage pests on the refuge consistent with policies of the Service and DOI (see 569 FW 1 and 517 DM 1) using an IPM approach as described under the No Action Alternative. Under Alternative B, the Service would use GPS and other appropriate tools to map and monitor invasive plant populations and treatment actions to determine effectiveness. The Service would also develop a rapid assessment and control program for new invasive species as well as develop a program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species.

In addition, under Alternative B, the Service would formalize the ongoing pest management for habitat, maintenance, and cooperative farming into an IPM program as described in Appendix Q. Although Service Policy (569 FW 1.12) does not require an IPM plan prior to pesticide application, doing so may allow multi-year approvals of certain proposed pesticide uses that would normally

require regional- or national-level review. Pest control on leased lands would continue to follow the 1998 IPM plan for leased lands at Lower Klamath and Tule Lake Refuges described under the No Action Alternative.

Both the 1998 IPM for leased lands and the 2016 IPM for cooperative farmland, habitat management, and general maintenance (Appendix Q) are focused on using a range of tools to manage pests, not simply chemical methods. Prior to pesticide application on the refuge, an approved PUP is required (see 569 FW 1.10 and 1.12). The Service would continue to use the PUPs authorized through the Lease Land PUP Committee as the master set of pesticides that can be used on cooperative farm units. However, the Service will also continue to limit the amount and type of pesticide used at Lower Klamath Refuge. On Lower Klamath Refuge, the restrictions in the SUP limit the types of pesticides that can be used on conventional crops to the following: one ground broadcast application of 2,4-D amine, MCPA, glyphosate, and/or dicamba. On cooperative farm units that are farmed organically, only pesticides that meet the standards outlined by the National Organic Program criteria are used. However, if crop pests reach levels that will cause significant economic injury either within or adjacent to cooperative farm fields, or if environmental or economic forces affect the attractiveness of refuge cooperative farmland to organic growers, then the spectrum of PUPs approved by the PUP Committee for lease land crops may be used on cooperative farm units. While desirable, the Service will not make organic agriculture a strict requirement of either lease land or cooperative farm units because organic agriculture is dependent on a consistent water supply and external economic forces.

Land Conservation

Under Alternative B, the Service would continue to pursue acquisition of lands within the approved acquisition boundary from willing sellers. In addition, the Service would coordinate with local, state, and federal agencies and other stakeholders to explore development of a new conservation easement program for the Klamath Basin. Planning for this program would be completed under a separate planning process and NEPA document.

Cultural Resources Management

Alternative B would include the cultural resources management actions under Alternative A. In addition, the Service would implement a proactive cultural resources management program to evaluate the NRHP eligibility of cultural resources that may be impacted by Service undertakings, management activities, erosion, or neglect. The Service would also develop partnerships with The Klamath Tribes for cultural resources inventory, evaluation, and project monitoring. The Klamath Tribes include the Klamath, Modoc, and Yahooskin Peoples. The Service would also perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility and develop partnerships (e.g., University of Oregon, National Park Service [NPS], etc.) to assist in the stabilization and restoration of archaeological and historic sites and structures. Finally, the Service would create and utilize a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act.

Visitor Services

The visitor services and facilities that would be offered under Alternative B are summarized above in Figure 4.4. More detailed descriptions are provided below.

Wildlife Observation and Photography

In addition to wildlife observation features in Alternative A, the Service would work with California Department of Transportation to develop another vehicle pull-off on State Line Road. The Service would also replace signs on the auto tour route.

Environmental Education

Environmental education under Alternative B would include all the elements of Alternative A. In addition, the Service would develop a Walking Wetlands Program curriculum and create partnerships with schools to develop schoolyard habitat programs.

Interpretation

In addition to the actions under Alternative A, the Service would provide additional interpretive programs to the public. The Service would also develop a contact station at the entrance of Lower Klamath Refuge to greet visitors. The general brochures also would be updated to include current boundaries. In consultation with The Klamath Tribes, the Service would also prepare interpretive media (e.g., pamphlets, signs, exhibits) that relate to the cultural resources.

Hunting

In addition to the actions identified under Alternative A, the Service would provide drive-in and boat-in mobility-impaired accessible hunting opportunities. In addition, the Service would evaluate the existing hunt guide program (i.e., maintain, modify, or eliminate); analyze hunt area and auto tour route (i.e., maintain or separate in time or space); and analyze cost-effectiveness of current hunt fees (i.e., maintain or increase fee).

Law Enforcement

Under Alternative B, the Service would seek to hire one to two additional law enforcement officers (for all refuges in the Refuge Complex) to improve public safety and resource protection.

4.2.4 Alternative C – Lower Klamath Refuge (Preferred Alternative)

Adaptive Management Approach

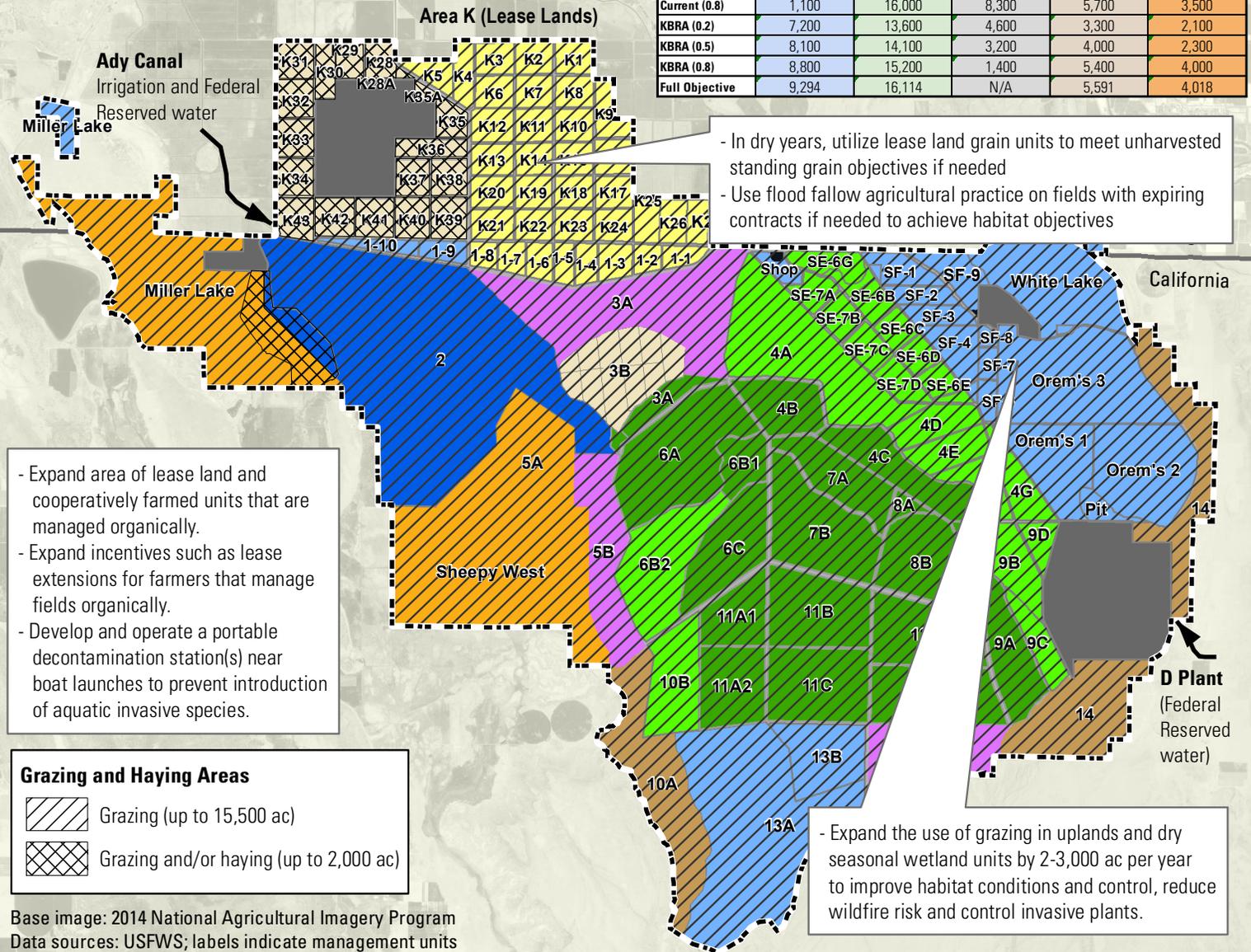
The adaptive management approach would be the same as described under Alternative B. The diversity and juxtaposition of potential habitats in each management unit under Alternative C are depicted in Figure 4.6.

Inventory and Monitoring

Same as Alternative B.

Alternative C includes the features of Alternative B, and the following:

Water Scenario (percentile)	Estimated Habitat Area (acres)				
	Permanent Wetlands	Seasonal Wetlands	Dry Wetland Units	Coop. and Lease Land Grain	Coop. and Lease Land Pasture
Current (0.2)	600	3,000	21,800	1,700	1,200
Current (0.5)	700	9,700	15,000	4,300	2,400
Current (0.8)	1,100	16,000	8,300	5,700	3,500
KBRA (0.2)	7,200	13,600	4,600	3,300	2,100
KBRA (0.5)	8,100	14,100	3,200	4,000	2,300
KBRA (0.8)	8,800	15,200	1,400	5,400	4,000
Full Objective	9,294	16,114	N/A	5,591	4,018



- Expand area of lease land and cooperatively farmed units that are managed organically.
- Expand incentives such as lease extensions for farmers that manage fields organically.
- Develop and operate a portable decontamination station(s) near boat launches to prevent introduction of aquatic invasive species.

Grazing and Haying Areas

- Grazing (up to 15,500 ac)
- Grazing and/or haying (up to 2,000 ac)

- Expand the use of grazing in uplands and dry seasonal wetland units by 2-3,000 ac per year to improve habitat conditions and control, reduce wildfire risk and control invasive plants.

Base image: 2014 National Agricultural Imagery Program
Data sources: USFWS; labels indicate management units

<p>Water Rights:</p> <ul style="list-style-type: none"> -Maintain 1905 irrigation right and 1925 Federal Reserved rights -Pursue exceptions to the FOD that would allow the use of irrigation water in seasonal wetlands and change the period of use to year round 	<p>Water Management:</p> <ul style="list-style-type: none"> -Irrigation water deliveries used for Lease Land and cooperatively farmed grain and pasture -Federal Reserved water used to flood seasonal and permanent wetlands 	<p>Wetland Management:</p> <ul style="list-style-type: none"> -Use disking, plowing, prescribed burning, grazing, and rotation through grain to set back vegetative succession and improve habitat conditions 	<p>Agricultural Habitat Management:</p> <ul style="list-style-type: none"> -Maintain Lease Land and Cooperative farming programs to provide food for waterfowl, consistent with the Kuchel Act
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Approved acquisition boundary
 Private land
 Developed

Management Unit Rotations

Permanent marsh	Seasonal marsh/Grain
Seasonal marsh	Wet meadow
Permanent marsh/seasonal marsh	Grain
Permanent marsh/seasonal marsh/Grain	Pasture/hay
	Upland

Figure 4.6. Alternative C Habitat Management

Lower Klamath Refuge



Water Management

Under Alternative C, water management would be the same as under Alternatives A and B. Refer to Tables 4.2 and 4.3 above, which summarize how monthly water deliveries are prioritized for use among different habitats under both water delivery scenarios (2013 BiOp [NMF'S and Service 2013] and KBRA [2010]).

Wetland Habitat Management

Under Alternative C, wetland habitat management would be the same as under Alternative B. In addition, the Service would expand the use of grazing in dry wetland units to control invasive plants like perennial pepperweed (see the Grazing section below).

Upland Habitat Management

Same as Alternative A.

Agricultural Habitat Management

Farming

Under Alternative C, agricultural habitat management would be the same as under Alternative B, with the following additional actions. The amount of unharvested grain would be increased by 1,500 acres instead of 500 acres as it is in Alternative B. The Service would work with Reclamation to revise future lease land contracts for Area K so that if this habitat objective cannot be met on cooperatively farmed units in a given year, some or all of lease land contract holders would be required to leave 25% of their fields as unharvested standing grain until this habitat objective is met. In addition the Service would expand the area of lease land and cooperatively farmed units that are managed organically by increasing incentives such as lease/permit extensions. Subject to the availability of water, the Service would also increase the use of the flood fallow agricultural practice on fields with expiring contracts which would help transition fields to organic status.

Haying

Same as Alternative B.

Grazing

Similar to Alternatives A and B, grazing would be used under Alternative C in conjunction with other management tools to achieve habitat and associated wildlife objectives in pasture and wet meadow units. Management activities would be the same as under Alternative A, but additional areas of the refuge would be considered for grazing in the future as dictated by habitat management needs. To provide the best habitat, a variety of seral stages of wetland and upland habitats are required. As noted above under the description of Alternative A, to prevent emergent wetlands from becoming overstocked with certain plant species such as hardstem bulrush, cattail, and alkali bulrush, they need to be periodically treated to reduce the area of the clumps. In this alternative, the refuge would use grazing to set back, maintain, or alter succession in uplands and seasonally flooded wetlands. Although other methods such as haying, mowing, fire, plowing, and disking can often be used, grazing is sometimes the best and safest method for use. Late-season grazing is a reliable tool to use in areas where burning cannot be used because of hazards

associated with peat fires and mechanical means are not practical or cost effective. Grazing would also be used to reduce the biomass of plants to limit wildfire danger (especially in dry years) as well as to control the spread of invasive exotic plants by reducing plant vigor and seed setting. For example, during droughts, many of the seasonal wetlands are dry for much or all of the season and can be invaded by invasive plants such as perennial pepperweed. Grazing may also provide a feasible alternative to herbicides for controlling this highly invasive weed. The Service estimates that up to an additional 2,000 to 3,000 acres per year could be grazed under this alternative. However, the actual area grazed would depend on water deliveries since both fall pre-irrigation and summer irrigation are needed to support productive pasture.

Integrated Pest Management

Under Alternative C, IPM would be the same as under Alternative B. In addition, the Service would seek to prevent the introduction of aquatic invasive species by pursuing partnerships with the states of California and Oregon to develop and operate a portable decontamination station(s) near boat launches on the refuge.

Land Conservation

Same as Alternative B.

Cultural Resources

Same as Alternative B.

Visitor Services

The visitor services and facilities that would be offered under Alternative C are summarized above in Figure 4.4.

Wildlife Observation and Photography

Under Alternative C, wildlife observation and photography would be the same as under Alternative B.

Environmental Education

Same as Alternative B.

Interpretation

Same as Alternative B.

Hunting

Under Alternative C, hunting would be the same as under Alternative B. In addition, the Service would phase in a new requirement allowing only 4-stroke or direct injection 2-stroke boat engines to be used on the refuge.

Law Enforcement

Same as Alternative B.

Land Conservation

Same as Alternative B.

4.2.5 Alternative D – Lower Klamath Refuge

Adaptive Management Approach

The adaptive management approach would be the same as described under Alternatives B and C. The diversity and juxtaposition of potential habitats in each management unit under Alternative D are depicted in Figure 4.7.

Inventory and Monitoring

Same as Alternative C.

Water Resources Management

The water availability for Lower Klamath Refuge would be the same as under the other alternatives. Irrigation water (1905 irrigation water rights) would be used to flood leased land and cooperative farmed grain and hay units. Water from the D Plant and 1928 Federal Reserved water deliveries through the Ady Canal would be used to flood seasonal wetland units and pre-irrigate grain and pasture units outside the irrigation season.

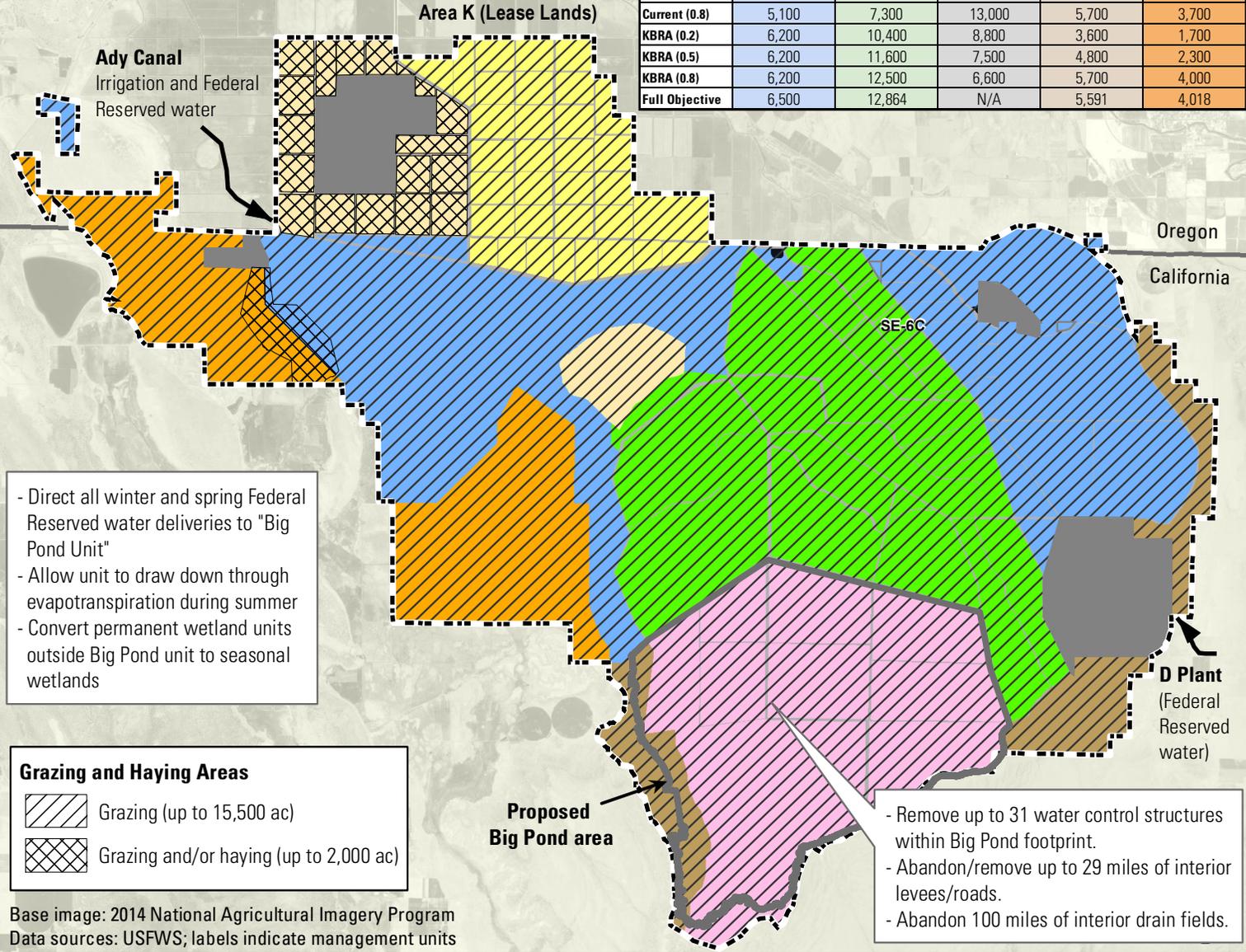
If KBRA or a similar settlement is implemented, wildlife habitat would become one of the purposes of the Klamath Reclamation Project. As a result, refuge water deliveries under the 1905 water right could be used for any wetland or agricultural habitat management purpose.

However, water that is available would be distributed differently in this alternative. During winter and spring, all Federal Reserved water deliveries would be distributed to the lower one-fifth of the refuge to create a large open water and wetland area referred to in the CCP/EIS as “the Big Pond.” Water to fill the Big Pond would come from two sources: the Ady Canal and the P Canal system (from D Plant). Up to 9,000 acres would be flooded to a maximum depth of 7 feet. Summer and fall evaporation would reduce this acreage by half if summer and fall water deliveries were unavailable. Existing units actively managed as permanent wetland, seasonal wetland, and grain (see Figure 4.3) would be replaced by a single large wetland unit (see Figure 4.7). Water distribution in the refuge would need to be changed to direct flows to the Big Pond. A new, taller dike up to 6 miles long would likely need to be constructed along an existing canal embankment on the north side of the unit to contain the ponded water. Up to 31 water-control structures would likely require irrevocable removal. In addition, the Service would abandon or remove up to 29 miles of interior levees/roads and abandon up to 100 miles of interior drain fields. Additional NEPA compliance to determine the best way to achieve this redistribution of water and its site-specific impacts would be completed as required to implement Alternative D.

Preliminary estimates indicate that the area would hold approximately 40,000 acre-feet of water (water surface elevation of approximately 4,081 feet). It is estimated that the Big Pond area would

Alternative D includes the features of Alternative C, and the following:

Water Scenario (percentile)	Estimated Habitat Area (acres)				
	Permanent Wetlands	Seasonal Wetlands	Dry Wetland Units	Coop. and Lease Land Grain	Coop. and Lease Land Pasture
Current (0.2)	0	2,500	22,900	1,700	1,200
Current (0.5)	400	9,900	15,100	4,300	2,400
Current (0.8)	5,100	7,300	13,000	5,700	3,700
KBRA (0.2)	6,200	10,400	8,800	3,600	1,700
KBRA (0.5)	6,200	11,600	7,500	4,800	2,300
KBRA (0.8)	6,200	12,500	6,600	5,700	4,000
Full Objective	6,500	12,864	N/A	5,591	4,018



- Direct all winter and spring Federal Reserved water deliveries to "Big Pond Unit"
- Allow unit to draw down through evapotranspiration during summer
- Convert permanent wetland units outside Big Pond unit to seasonal wetlands

Grazing and Haying Areas

- Grazing (up to 15,500 ac)
- Grazing and/or haying (up to 2,000 ac)

- Remove up to 31 water control structures within Big Pond footprint.
- Abandon/remove up to 29 miles of interior levees/roads.
- Abandon 100 miles of interior drain fields.

Base image: 2014 National Agricultural Imagery Program
Data sources: USFWS; labels indicate management units

<p>Water Rights:</p> <ul style="list-style-type: none"> -Maintain 1905 irrigation right and 1925 Federal Reserved rights -Pursue exceptions to the FOD that would allow the use of irrigation water in seasonal wetlands and change the period of use to year round 	<p>Water Management:</p> <ul style="list-style-type: none"> -Irrigation water deliveries used for Lease Land and cooperatively farmed grain and pasture -Federal Reserved water used to flood seasonal and permanent wetlands 	<p>Wetland Management:</p> <ul style="list-style-type: none"> -Use disking, plowing, prescribed burning, grazing, and rotation through grain to set back vegetative succession and improve habitat conditions 	<p>Agricultural Habitat Management:</p> <ul style="list-style-type: none"> -Maintain Lease Land and Cooperative farming programs to provide food for waterfowl, consistent with the Kuchel Act
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..... Approved acquisition boundary Private land Developed

Management Unit Rotations

Big Pond Unit permanent/seasonal marsh	Wet meadow
Seasonal marsh	Grain
Seasonal marsh/Grain	Pasture/hay
	Upland

Figure 4.7. Alternative D Habitat Management

Lower Klamath Refuge

0 0.75 1.5 3 Miles

nearly or completely fill in 8 out of 10 years under the KBRA scenario and in fewer than 2 out of 10 years under the 2013 BiOp scenario. However, the predicted number of years of filling is dependent on lake levels, river flows, and Klamath Reclamation Project deliveries and would need to be re-evaluated in the future. If sufficient water deliveries were available for this area in winter/spring, need for April-October water deliver would be sharply reduced.

After filling in spring, seepage and evaporation would gradually reduce water elevations (as occurred in historic Lower Klamath Lake). By fall, approximately 50% of the area would remain flooded. This management strategy is currently in use on the Orem's Units on the east side of Lower Klamath Refuge; however, due to the shallower depths of this area, it is typically dry by late August.

Tables 4.6 and 4.7 summarize how monthly water deliveries would be prioritized for use among different habitats under both water delivery scenarios (2013 BiOp [NMFS and Service 2013] and KBRA [2010]).

Wetland Habitat Management

Seasonal wetland habitat management would be the same as under Alternative C except seasonal wetland units would no longer be cycled through permanent wetland management. The area within the Big Pond unit would be the only area where permanent wetlands are provided.

Management of vegetation within the Big Pond unit would be the same as described under the other alternatives.

Upland Habitat Management

Same as Alternative A.

Agricultural Habitat Management

Farming

Same as Alternative C.

Haying

Same as Alternative C.

Grazing

Same as Alternative C.

Integrated Pest Management

Same as Alternative C.

Land Conservation

Same as Alternative C.

Table 4.6. Alternative D: Priorities for Use of Delivered Water by Month and Habitat Type Under the Current Water Allocation System (2013 BiOp)

<i>Month</i>	<i>Habitat</i>					
	<i>Permanent Wetland</i>	<i>Seasonal Wetland</i>	<i>Co-op Grain</i>	<i>Lease Land Grain</i>	<i>Co-op Pasture</i>	<i>Lease Land Pasture</i>
March	FFFF	FFF	0	0	II	II
April	FFFF	FFF	0	0	0	0
May	0	F	0	0	0	0
June	0	0	0	0	0	II
July	0	0	0	0	0	0
August	0	0	0	0	0	0
September	0	FFF	II	II	0	0
October	0	FFFF	III	III	II	II
November	FFFF	FFF	FF	F	0	0
December	FFFF	FFF	FF	F	F	0
January	FFFF	FFF	FF	0	F	0
February	FFFF	FFF	FF	0	FF	FF

Federal Reserved Water

FFFF Highest Priority
 FFF Medium High Priority
 FF Medium Priority
 F Low Priority
 0 No water

Irrigation Water (in above box, March through October)

III Highest Priority
 II Medium High Priority
 I Medium Priority
 0 Low Priority
 0 No water

Cultural Resources

Same as Alternative B.

Visitor Services

Refer to Figure 4.4 above for a summary of the visitor services and facilities that would be offered under Alternative D.

Wildlife Observation and Photography

Same as Alternative B.

Environmental Education

Same as Alternative B.

Interpretation

Same as Alternative B.

Hunting

The hunt program under Alternative D would be the same as Alternative C except the Service would revise hunt and sanctuary areas as the Big Pond unit is developed. The hunt plan would be revised through a separate NEPA process.

Table 4.7. Relative Priorities for Use of Delivered Water by Month and Habitat Type Under KBRA or Similar Settlement

<i>Month</i>	<i>Habitat</i>					
	<i>Permanent Wetland</i>	<i>Seasonal Wetland</i>	<i>Co-op Grain</i>	<i>Lease Land Grain</i>	<i>Co-op Pasture</i>	<i>Lease Land Pasture</i>
March	++++	+++	0	0	++	0
April	++++	++	0	0	0	0
May	++	+	0	0	0	0
June	++	0	0	0	0	0
July	++	0	0	0	0	0
August	++	0	0	0	0	0
September	++	+	0	+	+	+
October	++	+++	++	++	+	+
November	++++	+++	+++	++	0	0
December	++++	+++	+	0	0	0
January	++++	+++	++	0	0	0
February	++++	+++	+++	0	+	0

All Deliveries

- ++++ Highest Priority
- +++ Medium High Priority
- ++ Medium Priority
- + Low Priority
- 0 No water

Law Enforcement

Same as Alternative B.

4.2.6 Comparison of Alternatives

A comparative summary of the alternatives for the Lower Klamath Refuge is provided in Table 4.8.

Table 4.8. Summary of the Alternatives for Lower Klamath Refuge

	<i>Alternative A</i> <i>Current Program (No Action)</i>	<i>Alternative B</i>	<i>Alternative C</i> <i>(Preferred Alternative)</i>	<i>Alternative D</i>
Adaptive Management Approach	<ul style="list-style-type: none"> ■ Habitat management would generally follow the 1994 Habitat Management Plan for Lower Klamath Refuge (Service 1994). ■ Annual habitat plans are developed each spring based on habitat conditions, water delivery projections, and the results of monitoring. ■ Provide 60% of the Lower Klamath Refuge land base as disturbance-free sanctuary area. ■ Implement the wildlife disease management plan. ■ Protect all colonial nesting waterbird breeding sites from disturbance. ■ Maintain the Lower Klamath Refuge species catalog. ■ Maintain GIS layers including boundaries, management units, grassland management units, fire perimeters, wetlands, and water infrastructure. 	<p>Same as A and:</p> <ul style="list-style-type: none"> ■ Habitat objectives (Appendix F) support achievement of proper waterfowl management as defined in Appendix M. ■ Waterfowl population objectives: 75th percentile of 1970s duck and 1990s goose populations. ■ Annual habitat plans and specific objectives are developed each spring based on habitat conditions, water delivery projections, and the results of monitoring. ■ Update Lower Klamath Refuge Habitat Management and Inventory and Monitoring Plans. ■ Monitor changes in the environment, such as vegetation communities, wildlife trends, and surface water and groundwater levels, to assess the effects of climate change on the refuge. 	Same as B.	Same as B.
Water Rights	<ul style="list-style-type: none"> ■ Maintain 1905 irrigation right and Federal Reserved water rights pursuant to 2013 FOD. ■ Pursue exceptions to the FOD that would allow the use of irrigation water in seasonal wetlands, the flood fallow agricultural practice, and change the period of use for irrigation water to year-round. 	<p>Same as A and:</p> <ul style="list-style-type: none"> ■ If KBRA or some comparable agreement is not implemented, pursue changes in the type, place of use, and period of use for Lower Klamath and Tule Lake water rights to ensure sufficient water is available for refuge wetlands. 	Same as B.	Same as B.

Table 4.8. Summary of the Alternatives for Lower Klamath Refuge

	<i>Alternative A</i> <i>Current Program (No Action)</i>	<i>Alternative B</i>	<i>Alternative C</i> <i>(Preferred Alternative)</i>	<i>Alternative D</i>
Water Deliveries	<ul style="list-style-type: none"> ■ The range of projected water delivery scenarios under the current allocation system (2013 BiOp) and KBRA are presented in Figure 4.2. ■ Improve water conservation and efficiencies to optimize water use. ■ Seek opportunities to offset increasing power and pumping rates. 	Same as A.	Same as A.	Same as A.
Water Management	<ul style="list-style-type: none"> ■ Given volume and timing of deliveries, manage water to achieve habitat objectives in accordance with Tables 4.2 and 4.3. ■ Irrigation water (1905) used to flood leased land and cooperative farmed grain and hay units. ■ Water from D Plant and Federal Reserved water deliveries would be used to flood seasonal and permanent wetland units. ■ Maintain existing water delivery facilities. ■ Monitor water quality of delivered water supplies, pass through water, and spill water. ■ Identify water quality issues and implement BMPs with the assistance of partners and other agencies. 	Same as A.	Same as A.	<p>Same as A, except:</p> <ul style="list-style-type: none"> ■ Given volume and timing of deliveries, manage water to achieve habitat objectives in accordance with Tables 4.6 and 4.7. ■ Water would be distributed to flood the southern one-fourth of Lower Klamath Refuge (up to 9,000 acres to a maximum of 7 feet; summer/fall evaporation would reduce this acreage by 50% if summer/fall water deliveries were unavailable). ■ Remove up to 31 water control structures within Big Pond footprint. ■ Abandon/remove up to 29 miles of interior levees/roads. ■ Abandon 100 miles of interior drain fields.

Table 4.8. Summary of the Alternatives for Lower Klamath Refuge

	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i> <i>(Preferred Alternative)</i>	<i>Alternative D</i>
Wetland Habitat Management	<p>Current Program (No Action)</p> <ul style="list-style-type: none"> ■ Use disking, plowing, prescribed burning, and rotation through grain in seasonal wetland units to set back vegetative succession and improve habitat conditions for waterfowl. ■ Amount of wetlands dependent on water delivery. In an average water year, Lower Klamath Refuge would provide: <ul style="list-style-type: none"> ○ 700 acres of permanent wetlands and 8,100 acres of seasonal wetlands under the current water allocation system. ○ 8,400 acres of permanent wetlands and 13,800 acres of seasonal wetlands under KBRA. 	<p>Same as A, except:</p> <ul style="list-style-type: none"> ■ Amount of wetlands dependent on water delivery. In an average water year, Lower Klamath Refuge would provide: <ul style="list-style-type: none"> ○ 700 acres of permanent wetlands and 8,300 acres of seasonal wetlands under current water allocation system. ○ 8,100 acres of permanent wetlands and 14,100 acres of seasonal wetlands under KBRA. ■ Update Refuge Habitat Management Plan. 	<p>Same as B, except:</p> <ul style="list-style-type: none"> ■ Amount of wetlands dependent on water delivery. In an average water year, Lower Klamath Refuge would provide: <ul style="list-style-type: none"> ○ 700 acres of permanent wetlands and 9,700 acres of seasonal wetlands under the current water allocation system. ○ 8,100 acres of permanent wetlands and 14,100 acres of seasonal wetlands under KBRA. 	<p>Same as B, except:</p> <ul style="list-style-type: none"> ■ Amount of wetlands dependent on water delivery. In an average water year, Lower Klamath Refuge would provide: <ul style="list-style-type: none"> ○ 200 acres of permanent wetlands and 12,200 acres of seasonal wetlands under the current water allocation system. ○ 4,500 acres of permanent wetlands and 17,000 acres of seasonal wetlands under KBRA.
Upland Habitat Management	<ul style="list-style-type: none"> ■ Continue to use haying on approximately 2,000 acres in Area K, Unit 2, and the Miller Lake Unit. ■ Continue to use grazing on up to 12,500 acres in Area K and Units 2, 3B, 5A, 10, and 13A; Miller Lake; and Sheepy West. 	<p>Same as A.</p>	<p>Same as A, except:</p> <ul style="list-style-type: none"> ■ Expand the use of grazing in uplands and dry seasonal wetland units by 2 to 3,000 acres per year to improve habitat conditions, limit wildfire danger, and control invasive plants. 	<p>Same as B.</p>

Table 4.8. Summary of the Alternatives for Lower Klamath Refuge

	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C</i> <i>(Preferred Alternative)</i>	<i>Alternative D</i>
Agricultural Habitat Management	<p>Current Program (No Action)</p> <ul style="list-style-type: none"> ■ Amount of cropland dependent on water delivery. In an average (0.5 percentile) water year, Lower Klamath Refuge would provide: <ul style="list-style-type: none"> ○ 4,800 acres of grain and 1,400 acres of pasture under the current water allocation system. ○ 4,700 acres of grain and 1,600 acres of pasture under KBRA. ■ At least 25% of cooperatively farmed unharvested grains are left standing for wildlife benefit. ■ Maintain fall flooding in Area K. ■ Expand cooperative farming program in dry years by up to 4,000 acres to control invasive plant species in dry management units. 	<p>Same as A, except:</p> <ul style="list-style-type: none"> ■ Amount of cropland dependent on water delivery. In an average water year, Lower Klamath Refuge would provide: <ul style="list-style-type: none"> ○ 3,800 acres of grain and 2,500 acres of pasture under the current water allocation system. ○ 4,000 acres of grain and 2,300 acres of pasture under KBRA. ■ To support dabbling duck and geese population objectives during winter and spring, increase unharvested grain by approximately 500 acres and convert an additional 1,300 acres of unharvested grain to pasture/green browse (subject to water availability). ■ Leverage more wetland habitat on private lands in the basin by expanding the use of preferential permits for cooperatively farmed grain and hay units for farmers that participate in the Walking Wetlands Program on their private lands. ■ 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. ■ Require annual SUPs for Reclamation with stipulations and prescribed habitat mixture based on the energetics modeling. ■ Require annual SUPs for commercial contractors (i.e., fertilizer, pesticide applications). ■ Require stipulations and all other specific requirements from the SUPs be included as part of lease contracts. 	<p>Same as B, except:</p> <ul style="list-style-type: none"> ■ Amount of cropland dependent on water delivery. In an average water year, Lower Klamath Refuge would provide: <ul style="list-style-type: none"> ○ 4,300 acres of grain and 2,400 acres of pasture under the current water allocation system. ○ 4,000 acres of grain and 2,300 acres of pasture under KBRA. ■ Structure lease land contracts so that if habitat objectives for unharvested standing grain cannot be met on cooperatively farmed units, lease land contract holders would be required to leave 25% of their fields as unharvested standing grain. ■ Expand area of lease land and cooperatively farmed units that are managed organically. ■ Expand incentives such as lease extensions for farmers that manage fields organically. ■ Use flood fallow agricultural practice on fields with expiring contracts if needed to achieve habitat objectives. 	<p>Same as C.</p>

Table 4.8. Summary of the Alternatives for Lower Klamath Refuge

	<i>Alternative A</i> <i>Current Program (No Action)</i>	<i>Alternative B</i>	<i>Alternative C</i> <i>(Preferred Alternative)</i>	<i>Alternative D</i>
Integrated Pest Management	<ul style="list-style-type: none"> ■ Pest management on the lease land farming units is guided by the 1998 Refuge Integrated Pest Management Plan. ■ Chemical applications are evaluated and permitted according to Service and DOI policies, and PUPs. ■ Continue to scout, map, and control priority weed species with an emphasis on protecting high-priority wildlife habitats. ■ Reduce populations of perennial pepperweed, scotch thistle, purple loosestrife, hemlock, and other nuisance species. ■ Use flood fallow agricultural practice in management units every 5 to 8 years as needed to manage invasive plants. 	<p>Same as A, except:</p> <ul style="list-style-type: none"> ■ Formalize ongoing pest management for cooperatively farming and general pest management activities under an IPM program. ■ Use GPS to monitor weed populations. ■ Expand use of non-pesticide tools to control invasive species in wetland and upland units (e.g., grazing, restoration plantings). ■ Develop program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species. 	<p>Same as B, and:</p> <ul style="list-style-type: none"> ■ Prevent the introduction of aquatic invasive species by pursuing partnerships with the states of California and Oregon to develop and operate a portable decontamination station(s) near boat launches on the refuge. 	Same as B.
Fire Management	<ul style="list-style-type: none"> ■ Continue to implement the Refuge Complex Fire Management Plan. ■ Suppress all wildfires. ■ Focus fuel reduction projects on a 5- to 10- year cycle or more frequent if needed for invasive plant control or other resource reasons. ■ Allow lease land farmers to contract for prescribed burning of fields. 	Same as A.	Same as A.	Same as A.
Land Conservation	<ul style="list-style-type: none"> ■ Continue to pursue acquisition of lands within the approved acquisition boundary from willing sellers. ■ No easement program exists. 	<ul style="list-style-type: none"> ■ Coordinate with local, state, and federal agencies to explore development of an easement program. 	Same as B.	Same as B.

Table 4.8. Summary of the Alternatives for Lower Klamath Refuge

	<i>Alternative A</i> <i>Current Program (No Action)</i>	<i>Alternative B</i>	<i>Alternative C</i> <i>(Preferred Alternative)</i>	<i>Alternative D</i>
Cultural Resources	<ul style="list-style-type: none"> ■ Continue to manage and conserve cultural and archaeological resources in accordance with all applicable laws, policies, and regulations. ■ Identify historic properties that coincide with existing and planned roads, facilities, public use areas, and habitat projects. ■ Evaluate the NRHP eligibility of threatened and impacted sites. ■ Prepare and implement activities to mitigate impacts to sites as necessary. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Implement a cultural resources management program to evaluate the NRHP eligibility of cultural resources that may be impacted by Service undertakings, management activities, erosion, or neglect. ■ Develop partnerships with The Klamath Tribes for cultural resources inventory, evaluation, and project monitoring. ■ Perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility. ■ Develop partnerships (e.g., University of Oregon, NPS, etc.) to assist in the stabilization and restoration of archaeological and historic sites and structures. ■ Create and use a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act. 	Same as B.	Same as B.
Wildlife Observation and Photography	<ul style="list-style-type: none"> ■ Maintain public opportunities for wildlife observation and nature photography via photo blinds, vehicle pull-offs, a wildlife overlook, and a 10-mile auto tour route. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Provide additional observation opportunities by developing another vehicle pull-off on State Line Road. ■ Re-letter auto tour route. 	Same as B.	Same as B.

Table 4.8. Summary of the Alternatives for Lower Klamath Refuge

	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C (Preferred Alternative)</i>	<i>Alternative D</i>
Interpretation	<p><i>Current Program (No Action)</i></p> <ul style="list-style-type: none"> ■ Maintain public opportunities for nature interpretation via entrance kiosks and signs along auto tour route. ■ Continue to provide staffed periodic nature interpretive programs to the public. ■ Continue to provide brochures, maps, and visitor information to the public. ■ Maintain website to include current information. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Provide additional interpretive programs to the public. ■ Provide a contact station at the entrance of Lower Klamath Refuge to greet visitors. ■ Update general brochure to include current boundaries. ■ In consultation with The Klamath Tribes, prepare interpretive media (e.g., pamphlets, signs, exhibits) that relate the cultural resources. 	<p>Same as B.</p>	<p>Same as B.</p>
Hunting	<ul style="list-style-type: none"> ■ Maintain a diversity of waterfowl and pheasant hunting opportunities. ■ Maintain waterfowl-only hunt areas, pheasant-only hunt areas, and joint waterfowl and pheasant hunting areas. ■ Maintain hunting opportunities via large free roam areas, flooded pit blinds, and mobility-impaired hunt areas. ■ Maintain hunt area accessibility via automobiles, motor boats, canoe style boats, and walk-ins. ■ Maintain hunt areas in a variety of habitats including flooded marsh, dry and flooded grain fields, and upland fields. ■ Maintain a hunt program consistent with California and Oregon state hunting dates and regulations. ■ Maintain existing hunting fee. 	<p>Same as A, except:</p> <ul style="list-style-type: none"> ■ Provide drive-in, boat-in mobility-impaired accessible hunting opportunities. ■ Evaluate guide program (i.e., maintain, modify, or eliminate guide program). ■ Analyze hunting area and auto tour route (i.e., maintain or separate in time or space). Analyze cost-effectiveness of current hunt fees (i.e., maintain or increase fee). 	<p>Same as B, and:</p> <ul style="list-style-type: none"> ■ Phase in a new requirement allowing only 4-stroke or direct injection 2-stroke boat engines to be used on the refuge. 	<p>Same as C, and:</p> <ul style="list-style-type: none"> ■ Revise hunt and sanctuary areas as remnant historic hydrology unit is developed.

Table 4.8. Summary of the Alternatives for Lower Klamath Refuge

	<i>Alternative A</i>	<i>Alternative B</i>	<i>Alternative C (Preferred Alternative)</i>	<i>Alternative D</i>
Environmental Education	<p><i>Current Program (No Action)</i></p> <ul style="list-style-type: none"> ■ Maintain environmental education programs from the Visitor Center facility with an emphasis on wetland habitats and birds. ■ Maintain kindergarten through 12th grade bird curriculum and kindergarten through 8th grade wetlands curriculum and match to California and Oregon state standards. ■ Continue to offer workshops to train teachers on how to use the curriculum. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Develop a Walking Wetlands Program curriculum. ■ Create partnerships with schools to develop schoolyard habitat programs. 	Same as B.	Same as B.
Outreach	<ul style="list-style-type: none"> ■ Maintain public outreach about natural resources in the eco-region and the NWRS by hosting special events at the Refuge Complex, participating in community events, and offering off-site presentations upon request. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Develop an outreach event on waterfowl identification for youth hunters. ■ Incorporate cultural resource messages into outreach events in the area, including National Wildlife Refuge Week and appropriate local festivals. 	Same as B.	Same as B.
Public Safety and Law Enforcement	<ul style="list-style-type: none"> ■ Current law enforcement staff (one full-time refuge officer) to maintain safe conditions at all visitor facilities at Lower Klamath Refuge. 	<ul style="list-style-type: none"> ■ If funding is available, hire one to two additional law enforcement officers to improve public safety and protect resources. 	Same as B.	Same as B.

4.2.7 Management Actions Considered but Eliminated from Detailed Alternatives Analyses

Based on comments received during internal and external scoping, refuge staff evaluated a broad range of management actions for inclusion in the alternatives. The management actions described below were eliminated from evaluation in any of the alternatives. The rationale for elimination is also described below.

Klamath Basin Restoration Agreement

A suggestion was made to develop alternatives that reflect positive and negative Secretarial Determinations on the KBRA. The Service understood this comment to mean that one alternative should include implementation of the KBRA while another alternative should not include implementation of the KBRA. Because the KBRA had to be authorized and implemented by Congress, the Service determined that a more prudent approach to alternative development would be to analyze a range of flow conditions in each alternative. As of December 31, 2015, Congress took no action on the KBRA which leaves any increased water supply reliability on the refuge uncertain. The CCP covers a 15-year period during which future agreements could be made that increase the water supply reliability for seasonal and permanent wetlands.

Consider a Voluntary Buyout for Agribusiness Leases

The Service understood this comment to consist of eliminating lease land farming on the Lower Klamath Refuge followed by restoration of the lease land area to native habitat. The Service did not include this management action for the following reasons.

- The Lower Klamath and Tule Lake Refuges are estimated to support more than 50% of the waterfowl in the Upper Klamath Basin (Service 2008). For migrating and wintering waterfowl, food is believed to be the most limiting resource. As a result, conservation planning for waterfowl outside of the breeding season is largely focused on providing sufficient foraging habitat. A Service review of waterfowl management (see Appendix M) on Lower Klamath and Tule Lake Refuges determined that leased agricultural lands represent a component of the overall refuge habitat mosaic and contribute to proper waterfowl management.
- Also, as described in Section 3.3.2, through the Klamath River Basin Adjudication in 2013 the Service received Klamath Reclamation Project water rights with a 1905 priority date only for irrigation uses for agricultural lands, including both leased and cooperative farm lands, and Federal Reserved rights with a much later priority date of 1925 for wildlife management purposes at Lower Klamath Refuge. This means that agriculture on the refuge is generally assured of receiving water in most years whereas wetland areas are not. Without some degree of water supply reliability, which is provided through irrigation water, sufficient food resources for waterfowl could not be produced. Although the Service has filed exceptions to the adjudication in court, the issue likely will not be resolved for many years.

Although elimination of lease land farming is not considered in any of the alternatives, modifications of the lease land program are considered in the action alternatives.

Move Water from Tulelake Irrigation District on September 1 of Each Year to Fill the Refuge

To implement this management action, the refuge would need to work with the TID and Reclamation to pump water from the Tule Lake sumps through the D Plant (a 1.25-mile tunnel

from Tule Lake Refuge to Lower Klamath Refuge) into Lower Klamath Refuge. Until 2006, this scenario was feasible because the Klamath Reclamation Project had access to inexpensive electrical power, so lifting and moving large quantities of water was practical. Because this is no longer true, the Service would need to pay to move excess water in the Tule Lake sumps and given the current and projected future refuge budget, this is infeasible. The situation is exacerbated by a cost-related overall reduction of return flows available in Tule Lake which has in turn lessened the need for TID to pump excess water from the sumps into Lower Klamath Refuge. Finally, because the Tule Lake sumps are part of the Klamath Reclamation Project, the Service cannot unilaterally remove water from the sumps. **In addition, yearly drawdowns of the sumps could reduce habitat suitability for the suckers. Minimum sump elevations prescribed in the 2013 BiOp would need to be revised.**

Connect a Road from Intersection D to the Southern Part of the Refuge to Allow Access for Visitor Uses

To implement this management action the Service would need to extend the current auto tour route to the southern part of the refuge. This management action was not included in any of the alternatives because of the need to protect remaining sanctuary areas for waterfowl. The auto tour route already provides year-round access to a portion of the refuge, including some of the best habitat on the refuge for eagles, waterfowl, and shorebirds, the birds most popular with visitors. A gravel road that extends to the southern part of the refuge is open to the public 3 months of the year during pheasant season. Although it is not part of the auto tour route, it is accessible to the general public during pheasant season.

Stop the Quarry Operation

Gravel generated from the quarry is used to maintain levee roads and parking areas. Because material from the quarry is needed for refuge management, this action was not included in any of the alternatives.

Increase Populations of Pheasants to Improve Hunting Opportunities

Pheasants are a non-native species. Therefore, taking steps to increase the pheasant population on a national wildlife refuge is inconsistent with the Service's Biological Integrity, Diversity, and Environmental Health (BIDEH) Policy (601 FW 3). However, the BIDEH policy does not require a refuge manager to take actions to reduce or eradicate self-sustaining populations of non-native, noninvasive species such as pheasants unless those species interfere with accomplishing refuge purpose(s). However, the Service does not manage habitats to increase populations of these species unless such habitat management supports accomplishing refuge purpose(s). Accordingly, the Service will not actively improve pheasant hunting on the refuge.

4.3 Clear Lake National Wildlife Refuge Alternatives

4.3.1 Features Common to All Alternatives – Clear Lake Refuge

A number of current management actions would be implemented for Clear Lake Refuge under both the No Action Alternative and Alternative B. Alternative B proposes additional management actions to improve refuge conditions. Actions that are common to all alternatives are described below and are not repeated in each alternative description.

Adaptive Management Approach

Habitat management on Clear Lake Refuge would be primarily guided by the purposes of the refuge identified in Chapter 1 (Section 1.6.2). To achieve these purposes in a dynamic and sometimes unpredictable environment, Clear Lake Refuge would be managed adaptively, with managers and biologists able to adjust management as on-the-ground monitoring reveals the results of previous habitat management practices, as other new information is developed, or as the needs of wildlife populations change. The Service would also monitor priority species such as American white pelicans and greater sage-grouse populations to help inform habitat management decisions. Research activities would continue to be allowed on a case-by-case basis.

Water Management

The refuge is also the primary source of water for the agricultural program of the eastern half of the Klamath Basin with water levels regulated by Reclamation. The Service does not have jurisdiction over water in Clear Lake. Reclamation manages water in Clear Lake for Klamath Reclamation Project needs for flood control and irrigation and in accordance with the 2013 BiOp. The minimum lake level in Clear Lake at the start of the winter period from October to February is 4,520.6 feet. This level is anticipated to provide adequate water depths for protection against winter-kill of suckers (Service 2008).

Habitat Management

Wetland Habitat Management

The wetland habitat at Clear Lake Refuge over which the Service has management responsibility is primarily shoreline habitat. Seasonal fluctuations in Clear Lake water levels result in shoreline areas that provide brood-rearing habitat for sage-grouse and high-energy seeds during spring and fall migrations for dabbling ducks (e.g., pintails). Under all alternatives, the Service would use grazing practices and herbicides to promote native forbs and perennial grasses with sufficient canopy cover and height to provide food (plant material and insects) and protection for sage-grouse during the brood-rearing season.

Upland Habitat Management

Islands in Clear Lake Refuge provide important nesting habitat for species such as American white pelicans, Caspian terns, double-crested cormorants, and ring-billed and California gulls. These islands represent the largest and one of the few nesting areas for American white pelicans nesting in California. White pelicans are particularly prone to abandon nests and early hatched chicks if disturbed. As such, the remoteness of Clear Lake and its islands make this location ideal for the breeding species mentioned above. Under all alternatives, the Service would work with Reclamation to protect these important nesting islands from human disturbance during the breeding season.

The Service would use a variety of management techniques to promote sage-steppe and reduce the expansion of invasive annual grasses and western juniper (*Juniperus occidentalis*) to improve habitat quality for the greater sage-grouse. The two alternatives differ in how the upland habitat would be managed and so are discussed below under each alternative description.

Fire Management

The Service would continue to implement the Klamath Basin National Wildlife Refuge Complex Fire Management Plan. All wildland fires on the refuge would be suppressed. Firefighter and public safety would be the highest priority for every incident. The Service would prioritize wildfire suppression activities to protect the “U” (the peninsula in the lake) to allow for accelerated sagebrush restoration and prevent further destruction of this desired habitat.

Integrated Pest Management

IPM is used at Clear Lake to manage all habitats. The two alternatives differ in how the IPM would be managed and so are discussed below under each alternative description.

Cultural Resources Management

Cultural resources would be managed and conserved in accordance with all applicable laws, policies, and regulations. More information about cultural resources management is provided in the refuge-specific sections of this chapter and Chapter 5.

Visitor Services

The Service would continue to provide outreach to the public about Clear Lake Refuge, and natural resources in the ecoregion and the NWRs by hosting special events at the Refuge Complex Visitor Center and participating in off-site special events; continue to provide environmental education programs in the Refuge Complex Visitor Center facility or in the classroom about greater sage-grouse and sage-steppe habitat; and continue to monitor visitor use of the refuge.

Law Enforcement and Public Safety

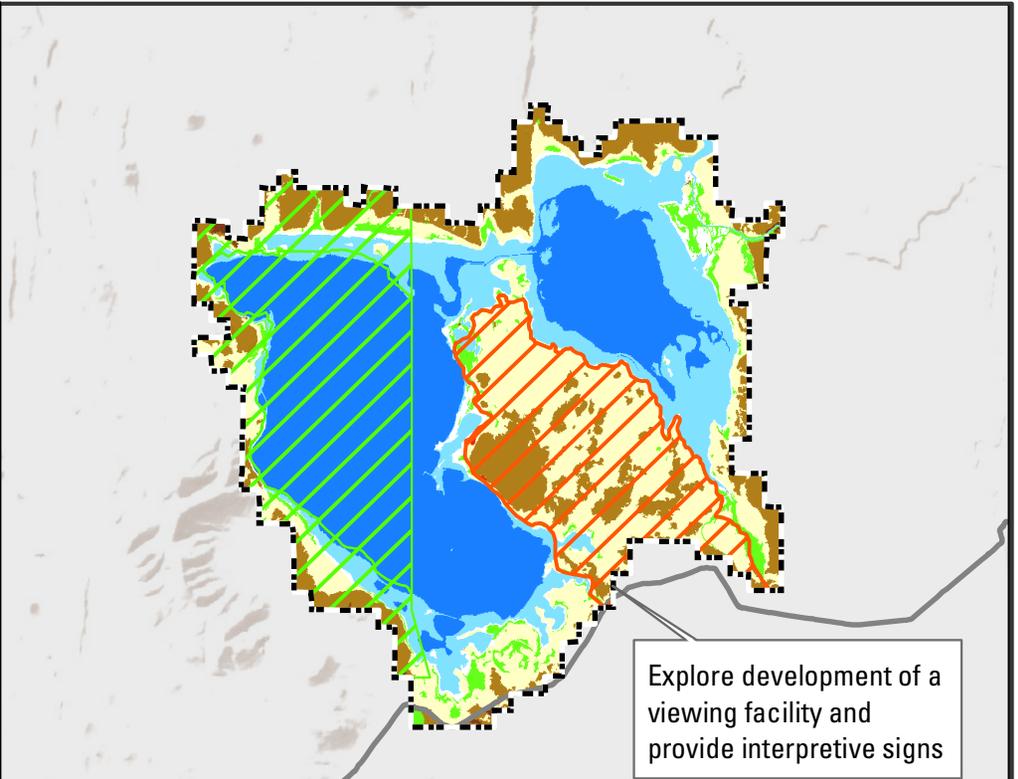
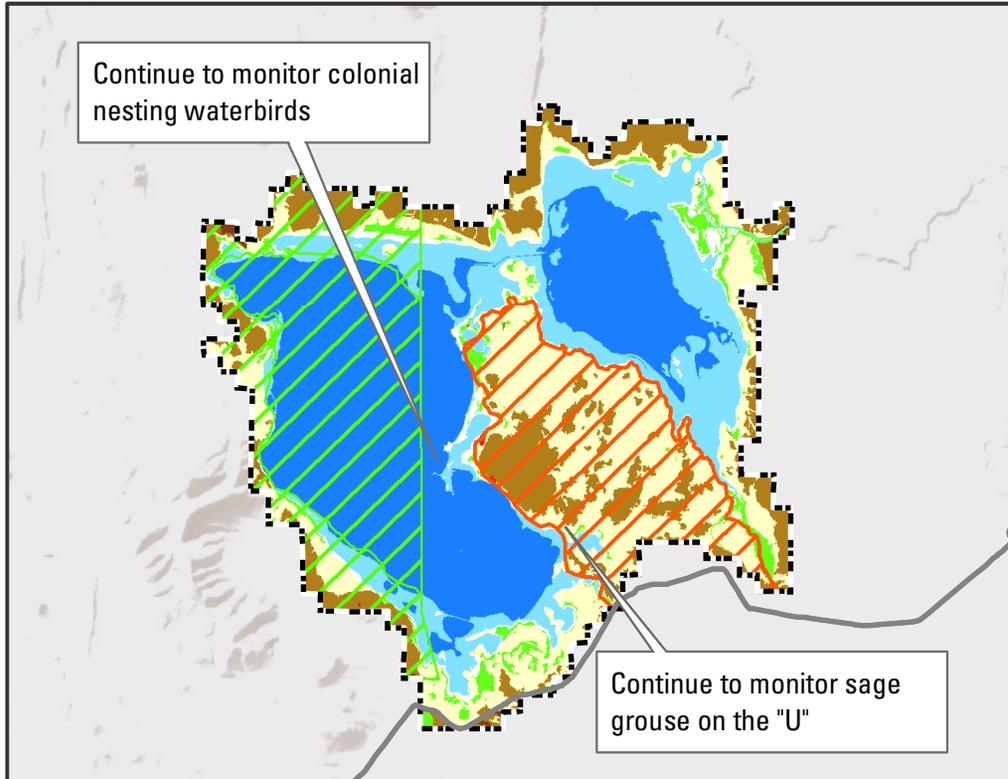
The Service would maintain safe conditions at all visitor facilities at the refuge and provide adequate law enforcement.

4.3.2 Alternative A - No Action: Current Management Program – Clear Lake Refuge

The No Action Alternative describes the current management for the refuge and assumes it would continue for the lifetime of the CCP. It serves as a baseline with which the objectives and management actions of the action alternative, Alternative B, can be compared and contrasted. Because this alternative reflects current management, it would not result in substantial changes to the way the refuge would be managed in the future. Figure 4.8 summarizes the major features of this alternative.

Adaptive Management Approach

Under Alternative A, the Service would continue to conduct a variety of wildlife surveys to inform management. Table 4.9 summarizes the period of record, frequency, and timing of current and historic surveys on Clear Lake Refuge. These data in conjunction with the biologist’s judgment are used in determining whether wildlife use is meeting objectives for a particular habitat.



Alternative A (No Action)

Continue to reduce populations of invasive annual grasses

Continue management practices to promote sage-steppe habitat including cattle grazing, herbicide treatments, combination grazing with herbicide treatment and juniper removal

Maintain waterfowl & pronghorn hunting opportunities

Suppress all wildfires

Alternative B

Same as Alternative A and:

- develop control strategies with Intermountain Research & Extension Station for invasive grasses; develop a rapid assessment & control program for invasives; implement an IPM plan

Same as Alternative A and:

- develop a habitat management plan

Same as Alternative A and:

- revise hunt plan to require non-toxic ammunition for pronghorn hunting

Same as Alternative A and:

- prioritize wildfire suppression to protect the "U"

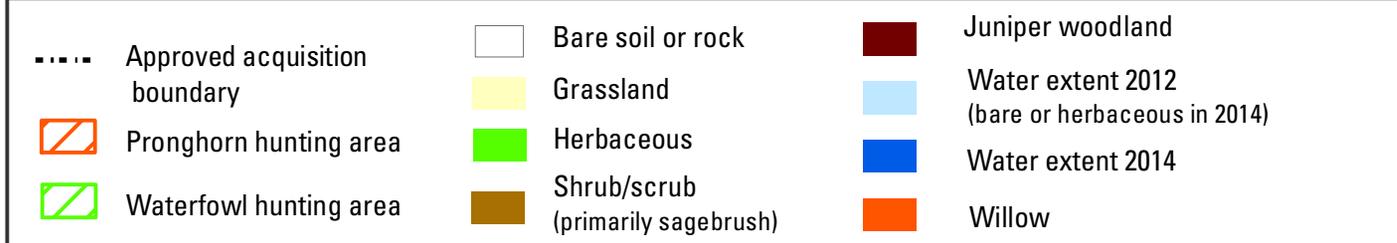


Figure 4.8. Alternatives - Clear Lake Refuge



Table 4.9. Clear Lake Refuge Period of Record, Frequency, and Timing of Current and Historic Surveys

<i>Survey Name</i>	<i>Start Year</i>	<i>End Year</i>	<i>Frequency of Survey</i>	<i>Survey Timing</i>	<i>Status</i>
Breeding Canada Goose Pairs	1950	Indefinite	Recurring - every year	Mid-March	Current
Breeding Duck Pairs Survey	1950	Indefinite	Recurring - every year	Mid-May	Current
Caspian Tern Survey	1997	Indefinite	Recurring - every year	Mid-June	Current
Colonial Waterbird Surveys	1970	Indefinite	Recurring - every year	Methods and timing depend on the species	Current
Greater Sage-grouse Telemetry	2000	Indefinite	Recurring - every year	Year-round	Current
Mid-Winter Waterfowl Survey	1960	Indefinite	Recurring - every year	Early January	Current
Periodic Waterfowl Surveys	1950	Indefinite	Recurring - every year	September through April	Current
Sage-grouse Lek Survey	1950	Indefinite	Recurring - every year	April 1 to June 1	Current
Sage-Steppe Vegetation Survey	2010	Indefinite	Recurring - every year	Mid-June	Current

Habitat Management

Under Alternative A, the Service would continue the present pattern of habitat management actions at Clear Lake Refuge. Terrestrial management would include intensively managed cattle grazing, herbicide application, combination cattle grazing and herbicide treatments, and juniper removal to promote sage-steppe habitat to benefit greater sage-grouse. Because these are all primarily pest management activities, they are discussed in more detail in the IPM section below.

Integrated Pest Management

Under this alternative, the Service would continue to scout, map, and control priority weed species with an emphasis on protecting high-priority wildlife habitat; and conduct baseline monitoring of invasive annual grasses. Refuge roads would continue to be closed to use by the public and overland travel would be limited to reduce the spread of invasive plants. The current IPM practices that would be continued under this alternative are summarized in Table 4.10.

Invasive annual grasses like cheatgrass (*Bromus tectorum*) and medusahead (*Taeniatherum caput-medusae*) quickly infest disturbed areas (e.g., areas burned in wildfires or overgrazed areas) and spread rapidly. These annual invasive grasses grow quickly in the spring and out-compete perennial bunchgrasses and some other native plants (e.g., forbs and sagebrush) that provide valuable wildlife habitat. These invasive grasses also provide an abundance of fine fuels for wildfires and can increase the intensity and severity of wildfires, and consequently increase firefighting costs, potential for economic losses, and potential for losses of livestock and human lives. Intense wildfires also encourage the establishment and further spread of these invasive annual grasses. More information about the risk of high-severity fires at Clear Lake Refuge is provided in Chapter 5, in the Post-Settlement Fire History section (Section 5.1.1).

Table 4.10. Summary of Integrated Pest Management Practices at Clear Lake National Wildlife Refuge

<i>Clear Lake</i>	<i>IPM Practices</i>	<i>Description</i>	<i>Purpose</i>
Weed Control	Cultural or agronomic	Grazing (cattle) used to reduce invasive grasses and fire fuels (cheatgrass and western juniper seedlings).	Habitat management and cooperative grazing
	Mechanical	Hand cutting using pruners and/or chainsaw to remove invasive trees (western juniper).	Habitat management
	Chemical	Not used at this time; future use may be required to manage invasive species (cheatgrass, juniper, etc.).	Habitat management

Additionally, juniper, although native, has expanded beyond its historic range regionally and in the Clear Lake Refuge. Juniper out-competes desirable vegetation (e.g., sagebrush, other shrubs, forbs, and grasses) for precipitation, groundwater, and nutrients, and reduces diversity of plant communities. Juniper expansion has been documented as one cause for greater sage-grouse to abandon leks (Bedell et al. 1993; Clear Lake Sage Grouse Working Group 2010).

The Service would use a variety of methods to manage invasive species (especially exotic annual grasses) on the refuge, including use of pruners and chainsaws to remove western juniper; grazing; application of pesticides; and use of pesticides combined with grazing. Chemical applications would be evaluated and permitted according to the Service and DOI policies, and the Service’s PUP process (see Appendix Q for more information on the PUP process).

Grazing would continue to be used to manage vegetation at Clear Lake Refuge. Although grazing is discussed under Agricultural Habitat Management in other refuges, because the primary purpose of the grazing program would be to control invasive species, it is included under the IPM topic here.

Grazing is used now as a means to control invasive annual grasses and juniper seedlings, reduce wildfire fuels, and create a mosaic of short-grass habitat to meet wildlife objectives. As in recent years, grazing would continue to be used on approximately 5,500 acres (600 AUMs) in the peninsula area (“U” Unit) of the refuge each year from mid-August to mid-November (refer to Chapter 5 for a discussion and map of refuge grazing). This acreage comprises approximately 23% of the 24,124 acres under Service management jurisdiction.

Grazing would involve the use of a variety of equipment and infrastructure on the refuge, potentially including trucks, trailers, off-road vehicles, horses, dogs, loading/unloading ramps, corrals, water pumps, off-stream watering facilities, and temporary (likely electric) and permanent (including barbed-wire) fences and gates; and the personnel to operate these machines and manage the livestock. Ranching personnel would be on site as needed throughout the season to manage the livestock and perform appropriate ranching-related functions, including fence maintenance, providing and positioning any watering facilities and mineral blocks, and operating the equipment. Some or all of this equipment could be on the refuge throughout the season.

Generally, the grazing program operates without the need for pesticides. If livestock grazing on the refuge were to experience a substantial outbreak of flies or other bothersome livestock pests, ranchers could request permission to apply pesticides to livestock. Consistent with DOI and Service policies, the Service would use the PUP process to evaluate the rancher’s request, explore alternative pest management methods, evaluate potential effects of pesticide use, and either approve, approve with modification, or deny the request to use pesticides.

With the exception of the small-scale study described below, no areas on Clear Lake Refuge have been chemically treated for invasive plant control in recent years. Sagebrush plant communities have not recovered following a wildfire on the refuge (the Clear Fire) in 2001. For the past several years, research has been conducted on site in an attempt to determine how best to control invasive annual grasses in burned areas and allow for the recovery of sagebrush, native perennial grasses, and forbs (which are valuable for pronghorn and critical for sage-grouse). Pest species of concern include Japanese brome (*Bromus japonicus*), cheatgrass, and medusahead, whose populations exploded following the wildfire. In 2012, researchers conducted a small-scale experiment on the refuge with high-intensity, short-term (24-day) cattle grazing. This study demonstrated that a program of this nature could result in a reduction in annual grasses, an increase in perennial grasses and forbs, and no change in bare ground when compared with an ungrazed control. An associated seeding effort (with kochia [*Bassia prostrata*], sainfoin [*Onobrychis viciifolia*], and rose clover [*Trifolium hirtum*]) was not successful. The principal investigator stated that this type of a grazing program might be more effective at a larger scale if sheep were used for grazing instead of cattle (Merrill-Davies undated). A more recent several-year, multi-plot study evaluated the effects on invasive grasses and native vegetation of applying three herbicides (glyphosate, imazapic, and rimsulfuron), with and without reseeding with native species (Wilson et al. 2015). There were temporary benefits from some treatments, but the cover of invasive annual grasses returned to pre-treatment levels for all herbicides and all sites at the end of the study. Under either alternative, research would continue and the findings possibly applied over a wider area than is currently the case.

Cultural Resources Management

Cultural resources would be managed and conserved in accordance with all applicable laws, policies, and regulations. The Service would identify historic properties that coincide with existing and planned roads, facilities, public use areas, and habitat projects and evaluate threatened and impacted sites for eligibility to the NRHP. As required, the Service would prepare and implement activities to mitigate impacts to sites.

Visitor Services

Wildlife Observation and Photography

Currently, there are no developed facilities for wildlife viewing or photography within Clear Lake Refuge.

Interpretation

The Service would maintain existing opportunities for nature interpretation by providing information about Clear Lake Refuge at the Refuge Complex Visitor Center.

Hunting

The Service would maintain existing hunting opportunities at Clear Lake Refuge including maintaining waterfowl hunting opportunities by offering a large free-roam hunt area. The Service would maintain walk-in only hunting opportunities, maintain no hunting fees, continue to provide special draw antelope hunting, maintain a hunt program consistent with California State hunting dates and regulations, and continue coordinating with California Department of Fish and Wildlife to maintain special drawing and fees regulated through the State of California.

Environmental Education

The Service would continue environmental education opportunities with education programs and brochures focused on sage-grouse and sage-steppe habitat at the Refuge Complex Visitor Center and in school classrooms.

Outreach

The Service would continue outreach opportunities about Clear Lake Refuge, natural resources in the ecoregion, and the NWRS by hosting special events at the Refuge Complex Visitor Center and by participating in off-site special events.

4.3.3 Alternative B – Clear Lake Refuge (Preferred Alternative)

Figure 4.8, above, summarizes the major features of this alternative.

Adaptive Management Approach

Under Alternative B, the Service would follow the adaptive management approach outlined under Actions Common to All Alternatives and Alternative A. Under Alternative B, the goals, objectives, and strategies identified for Clear Lake Refuge in Appendix F would guide management over the next 15 years.

The habitat objectives in Appendix F are designed to achieve refuge purposes listed in Chapter 1. Appendix F also includes monitoring elements which are the surveys that are used to track achievement of the objectives. Finally, the appendix lists the management strategies which are the specific actions, tools, or techniques that are necessary to accomplish each objective.

The goals, objectives, and strategies for Clear Lake Refuge in Appendix F would form the basis of a new habitat management plan which the Service would develop. This plan would include more specific objectives for each refuge habitat, monitoring programs that track achievement of both population and habitat objectives, and thresholds for taking management actions.

Under Alternative B, the Service would also develop a new inventory and monitoring plan for Clear Lake Refuge. The purpose of the plan would be to identify and prioritize existing and new inventories and monitoring needed to inform adaptive management of priority refuge resources.

Habitat Management

Same as Alternative A, **except that the Service would also work with the U.S. Forest Service to find a new water source and location for cattle grazing on the adjacent Tucker Allotment that currently uses Clear Lake as a water source.**

Integrated Pest Management

In Alternative B, in addition to the actions described under Alternative A, the Service would work with the University of California Davis, Intermountain Research and Extension Station to develop control strategies that target exotic annual grasses while protecting native grasses, shrubs, and forbs. Also the Service would implement an Integrated Pest Management Program (Appendix Q) and rapid assessment and control program for Clear Lake Refuge like that described for Lower

Klamath Refuge. The IPM principles, practices, and general program described for Lower Klamath Refuge (see Section 4.2.3, Integrated Pest Management) would also apply to this alternative for Clear Lake Refuge. If necessary, modest pest management actions (perhaps using a brush cutter) would be taken to reduce the height of grasses or shrubs around a potential new viewing facility for refuge visitors.

Under Alternative B, the Service would use grazing to control exotic annual grasses and assist with restoration of habitat on the east side of the “U” that was damaged by the Clear Fire in 2001. Two pastures of approximately 1,500 acres each (total acreage equals approximately 12% of the refuge) would be created in this area and grazed with 300 to 500 cattle from March 1 to mid-April. Based on monitoring data, either both pastures would be grazed each year or one would be rested while the other was grazed. The pastures would be enclosed with flagged, electric wire fencing and water troughs would be installed at the upper ends of the pastures away from Clear Lake (reservoir). Experimental plots would initially be established to fine-tune this strategy (e.g., number of cattle, duration, and timing). This grazing program would be phased out if it reduced the presence of exotic annual grasses to a great enough extent that native perennial grasses, forbs, and shrubs were successfully reestablished.

Cultural Resources Management

Alternative B would include the cultural resources management actions under Alternative A. In addition, the Service would implement a proactive cultural resources management program to evaluate the NRHP eligibility of cultural resources that may be impacted by Service undertakings, management activities, erosion, or neglect. The Service would also develop partnerships with The Klamath Tribes for cultural resources inventory, evaluation, and project monitoring. The Klamath Tribes include the Klamath, Modoc, and Yahooskin Peoples. The Service would perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility and develop partnerships (e.g., University of Oregon, NPS, etc.) to assist in the stabilization and restoration of archaeological and historic sites and structures. Finally, the Service would create and use a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act.

Visitor Services

Wildlife Observation and Photography

Under Alternative B, the Service would consider creating opportunities for wildlife observation and photography and the potential for siting a viewing facility on the southern boundary of Clear Lake Refuge. When sufficient site-specific information is available, the applicable environmental analysis will be completed for future proposed improvements.

Interpretation

In addition to nature interpretation features in Alternative A, the Service would increase interpretive information and provide more exhibits related to Clear Lake ecosystems and wildlife species at the Refuge Complex Visitor Center. The Service would develop an interpretive pamphlet to help educate users about how to prevent introduction of invasive species.

Hunting

In addition to hunting opportunities in Alternative A, the Service would revise the hunt plan to require non-toxic ammunition for pronghorn hunting.

Environmental Education

In addition to environmental education features in Alternative A, the Service would work with local high schools to develop a sage-grouse monitoring program.

Outreach

In Alternative B, the outreach features would be the same as Alternative A.

4.3.4 Comparison of Alternatives

A comparative summary of the alternatives for the Clear Lake Refuge is provided in Table 4.11.

Table 4.11. Summary of the Alternatives for Clear Lake Refuge

	<i>Alternative A Current Program (No Action)</i>	<i>Alternative B (Preferred Alternative)</i>
Habitat Management	<ul style="list-style-type: none"> ■ Continue present program of intensively managed cattle grazing, herbicide application, combination cattle grazing/herbicide treatments, and juniper removal to promote sage-steppe habitat. 	Same as A, and: <ul style="list-style-type: none"> ■ Develop habitat management plan. ■ Work with the U.S. Forest Service to identify an alternative location/source of water for cattle grazing on the adjacent Tucker Allotment.
Integrated Pest Management	<ul style="list-style-type: none"> ■ Continue to reduce populations of invasive annual grasses. ■ Chemical applications are evaluated and permitted according to Service and DOI policies, and PUPs. ■ Continue to scout, map, and control priority weed species with an emphasis on protecting high-priority wildlife habitats. ■ Maintain baseline monitoring for invasive annual grasses. ■ Maintain current roads for administrative access only and limit overland travel to reduce spread of invasive plants. ■ Continue to use grazing to control invasive annual grasses and juniper seedlings, reduce wildfire fuels, and create a mosaic of short-grass habitat on approximately 5,500 acres in the “U” Unit. 	Same as A, and: <ul style="list-style-type: none"> ■ Formalize pest management practices under an IPM program. ■ Work with Intermountain Research and Extension Station to develop control strategies targeted toward exotic annual grasses while protecting native grasses, shrubs, and forbs. ■ Develop a rapid assessment and control program for new invasive species. ■ Use grazing on approximately 3,000 acres to control exotic annual grasses and assist with restoration of habitat on the east side of the “U” Unit that was damaged by the Clear Fire.
Fire Management	<ul style="list-style-type: none"> ■ Continue to implement the Refuge Complex Fire Management Plan. ■ Suppress all wildfires. ■ Prioritize wildfire suppression activities to protect the “U” which will allow for accelerated sagebrush restoration and prevent further destruction of this desired habitat. 	Same as A.

Table 4.11. Summary of the Alternatives for Clear Lake Refuge

	<i>Alternative A Current Program (No Action)</i>	<i>Alternative B (Preferred Alternative)</i>
Monitoring and Inventory	<ul style="list-style-type: none"> ■ Maintain the Clear Lake Refuge species catalog. ■ Develop and maintain GIS layers including boundaries, management units, grassland management units, fire perimeters, wetlands, and water infrastructure. ■ Continue to monitor colonial nesting waterbirds and the sage-grouse lek on the “U”. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Develop wildlife Inventory and Monitoring Plan focused on priority species including sage-grouse and colonial nesting waterbirds on the islands.
Cultural Resources	Same as Lower Klamath Refuge Alternative A.	Same as Lower Klamath Refuge Alternative B.
Wildlife Observation and Photography Interpretation	<ul style="list-style-type: none"> ■ No opportunities exist for viewing wildlife within Clear Lake Refuge. ■ Continue to provide information about Clear Lake Refuge at the Refuge Complex Visitor Center. 	<ul style="list-style-type: none"> ■ Explore development of a viewing facility on the boundary of the refuge. <p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Consider providing interpretive signs and a viewing platform on the boundary of the refuge. ■ Increase interpretive information at the Refuge Complex Visitor Center. ■ Develop interpretive pamphlet to educate users on how to prevent invasive species. ■ Provide exhibit and increase interpretive information at Refuge Complex Visitor Center.
Hunting	<ul style="list-style-type: none"> ■ Maintain waterfowl hunting opportunities by offering a large free-roam hunt area. ■ Maintain walk-in only hunting opportunities. ■ Maintain a hunt program consistent with California State hunting dates and regulations. ■ Maintain no hunting fee. ■ Continue to provide special-draw pronghorn hunting opportunities for big game hunters. ■ Continue to coordinate with California Department of Fish and Wildlife to maintain special drawing and fees regulated through the State of California. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Revise hunt plan to require non-toxic ammunition for pronghorn hunting, consistent with state regulations.
Environmental Education	<ul style="list-style-type: none"> ■ Continue to provide environmental education programs in the Refuge Complex Visitor Center facility or in the classroom about sage-grouse and sage-steppe habitat. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Work with local high schools to develop sage-grouse monitoring program.
Outreach	<ul style="list-style-type: none"> ■ Continue to provide outreach to the public about Clear Lake Refuge, natural resources in the ecoregion, and the NWRS by hosting special events at the Refuge Complex Visitor Center and participating in off-site special events. 	Same as A.
Public Safety and Law Enforcement	<ul style="list-style-type: none"> ■ Maintain safe conditions at all visitor facilities at the refuge and ensure adequate law enforcement is available. 	Same as A.
Monitor Public Use	<ul style="list-style-type: none"> ■ Continue to monitor visitor use of refuge lands including the six priority public uses. 	Same as A.

Management Actions Considered but Eliminated from Detailed Alternatives Analyses

Based on comments received during internal and external scoping, Refuge staff evaluated additional management actions for inclusion in the alternatives. The following management action was suggested during scoping.

Enhance and sustain sucker populations

The Service does not control the water levels in Clear Lake. Clear Lake water levels are presently regulated by Reclamation for flood control and irrigation. The minimum lake elevation for Clear Lake is dictated by the 2013 BiOp. This level was determined to be sufficient for the Lost River and shortnose suckers. In addition, Clear Lake dam was screened in 2003 to prevent the entrainment of juvenile and adult suckers. Therefore, there is no management action for the Service to implement related to sucker populations.

4.4 Tule Lake National Wildlife Refuge Alternatives

4.4.1 Features Common to All Alternatives – Tule Lake Refuge

A number of current management actions would be implemented for Tule Lake Refuge under each of the alternatives. The two action alternatives propose additional management actions to improve refuge conditions. Actions that are common to all alternatives are described below and are not repeated in each alternative description.

Adaptive Management Approach

Habitat management on Tule Lake Refuge primarily would be guided by the purposes of the refuge identified in Chapter 1 (Section 1.6.3). In order to achieve these purposes in a dynamic and sometimes unpredictable environment, Tule Lake Refuge would be managed adaptively, with managers and biologists able to adjust management as on-the-ground monitoring reveals the results of previous habitat management practices, as other new information is developed, or as the needs of waterfowl populations change. 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 would be used to evaluate actual waterfowl populations and habitat use as part of an adaptive management process.

Refuge managers and biologists would seek to provide a mosaic of habitats sufficient to support the population objectives of migrating, breeding, and molting waterfowl. A variety of habitat types are required to meet the needs for both migratory species and those species that remain during spring and summer to breed. Habitats would include seasonal and permanent wetlands, agricultural lands, and uplands.

In addition to the refuge's primary focus of waterfowl management, the Service and refuge have a legal mandate to provide for migratory birds. In the case of Tule Lake Refuge, wetland-oriented non-game migratory birds are of primary importance. Similar to waterfowl, refuge managers and biologists would strive to provide a mosaic of wetland habitats sufficient to support objective

numbers of priority non-game waterbird species during both the migratory and spring/summer breeding period (Appendix F).

The final focus of habitat management would be to support a full range of endemic fish and wildlife species with an emphasis on “sensitive” species. This would allow the refuge to provide for the full range of endemic biological diversity that was historically present in the Tule Lake Basin. To achieve this, the refuge would provide habitats to support endemic wildlife species with an emphasis on federal- or state-listed species, or those species considered rare or declining in numbers.

Figure 4.9 depicts the basic stepwise process of prioritizing habitat management among the above three focus areas. It is important to note there is considerable overlap between habitats among the three. For example, providing habitats for waterfowl would also achieve a large proportion of the habitat needs for non-game waterbirds and endemic fish and wildlife species.

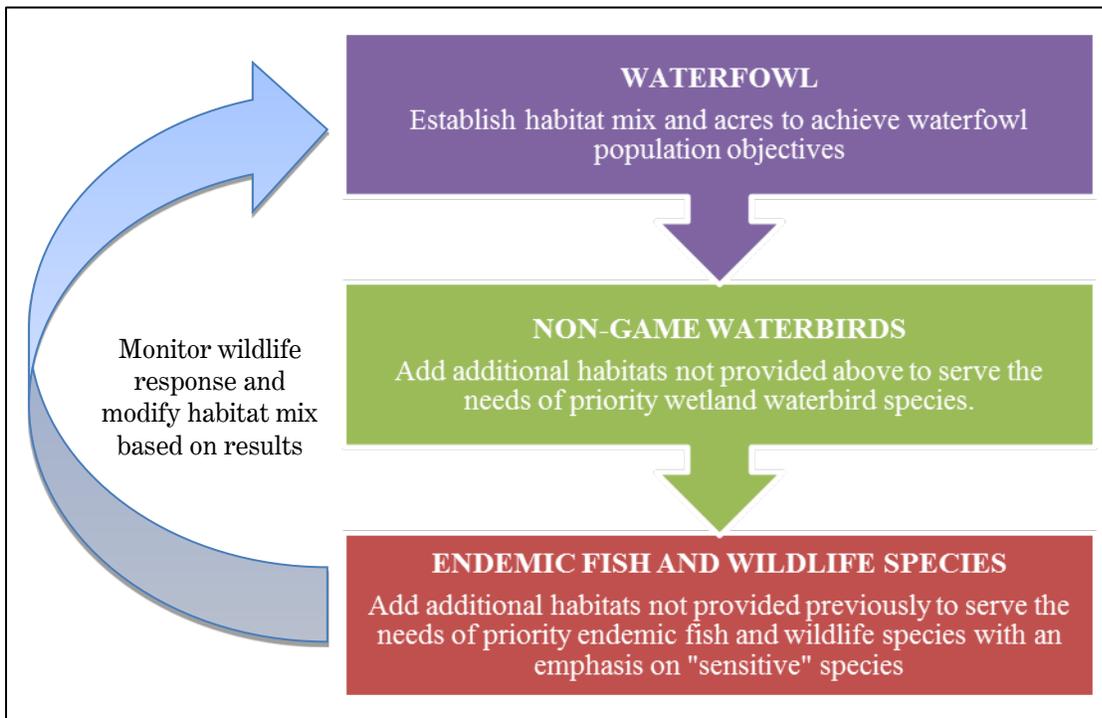


Figure 4.9. Habitat management prioritization process for Tule Lake Refuge.

Water Resources Management

Under all alternatives, the Service would maintain its 1905 irrigation water rights and 1928 Federal Reserved water rights. Sumps 1A and 1B would continue to be managed in accordance with the 2013 BiOp under agreement among the Service, Reclamation, and TID. These sumps function to capture return flows during the spring/summer irrigation season, protect private property from flooding, and provide wildlife habitat. Tule Lake Sumps 1A and 1B (13,021 acres) would continue to receive water from the Lost River via Anderson Rose Dam spills; N Canal spills; return flow pumps adjacent to the lake; and precipitation. Farm lands in Sump 2 (5,657 acres) would continue to be served by the Q and R Canals. Both canals divert water from a single source: Tule Lake. Farm lands in Sump 3 (11,275 acres) would continue to be served by the N Canal system.

Day-to-day water management on the refuge is conducted by TID under a 1956 contract with Reclamation. Water elevations would continue to be tightly controlled to primarily serve uses considered priorities, such as for flood control, as a water source for refuge agricultural lands and walking wetlands, and to provide suitable habitat for endangered Lost River and shortnose suckers which are found in Sump 1A. Excess water from irrigation return flows and winter run off would continue be pumped to Lower Klamath Refuge through the D Plant.

The Tule Lake Refuge lease lands receive water from Upper Klamath Lake via Klamath Reclamation Project facilities. The refuge exists within the TID and currently **growers on the lease lands and cooperative lands are required by their contracts with the United States to pay TID directly for the cost of irrigation and drainage service, which recently has been approximately \$100 per acre.** The Service, however, owns the water rights on the refuge with a 1905 priority date for agricultural use. This water right (Claim 317) has a period of use from February 15 to November 15 on 16,000 acres for a total of 49,902 acre-feet of water (this water right includes cooperative farm lands). Most water is applied to the leased lands during April through October. There is an increasing trend to pre-irrigate some lots in the fall and winter, a practice that both charges the soil profile with water for the subsequent farming season and increases the attractiveness of fields to waterfowl.

Under the current water allocation system (2013 BiOp), water shortages to Project agricultural lands would occur more frequently than under KBRA (or similar agreement) if it were implemented. In addition to directly affecting production, shortages to Project agriculture reduce the availability of return flows to Tule Lake Refuge; thus under the KBRA, more water would be available to refuge lands than under the current allocation system. Under either scenario, return flows from upstream agricultural use would continue as the major source of refuge water. However, if KBRA or a similar agreement were implemented, water for lease lands and Sumps 1A and 1B would come from the irrigator's allocations. Water for walking wetlands in Sumps 2 and 3 would be shared (two-thirds from the irrigator, one-third from the Lower Klamath Refuge allocation), ensuring more reliable water supplies for this important management practice.

Under all alternatives, the Service would continually seek to improve water conservation and efficiencies to optimize existing water use. The Service would work with Reclamation and TID to maintain water control facilities throughout the refuge to most efficiently and effectively deliver water to refuge wetlands. The Service would continue to work with Reclamation to monitor water quality of delivered water supplies, pass through water, and spill water. The Service would identify water quality issues and implement BMPs with the assistance of partners and other agencies. In addition, the Service would continue to assist with Lost River total maximum daily load (TMDL) planning and implementation.

Agricultural Habitat Management

Farming

To the extent consistent with proper waterfowl management, the Service would continue the lease lands program on 14,800 acres on 168 lots in "...the Southwest sump, the League of Nations unit, the Henzel lease, and the Frog Pond unit..." in accordance with the Kuchel Act. The Service would continue to delegate management of the lease lands program to Reclamation under the 1977 Cooperative Agreement. Consistent with the Kuchel Act, no more than 25% of the leased area would be planted to row crops and the leases "...for these lands shall be at a price or prices designed to obtain the maximum lease revenues." Leasing of the 168 lots would continue to be by

competitive bid with leases awarded in 5-year increments with the annual option to renew. Primary crops include barley, oats, wheat, onions, potatoes, and alfalfa. Barley, wheat, and oats comprise most of the acreage with potatoes the dominant row crop. In fiscal year 2015, gross lease revenues for Tule Lake Refuge totaled approximately 5.29 million dollars (gross lease revenues for Lower Klamath Refuge totaled approximately \$403,285). All revenues are collected by Reclamation, and distributed between local counties, TID, and Reclamation fund in accordance with federal laws.

Typically, annual row crops, onions or potatoes, are grown in a 3-year crop rotation with small grains (e.g., small grain–row crop–small grain). Irrigation practices depend on the crop grown. Row crops are irrigated using solid set sprinklers. Irrigation events occur routinely on a 4- to 5-day schedule from June through mid-September. Alfalfa is flood irrigated with irrigation events following each harvest. Three or four irrigation events occur during the crop-growing season depending on harvest schedules. Small grains are flood or wheel line irrigated. There are usually two irrigation events for small grains; the first being a pre-plant irrigation typically starting in November.

For a detailed description of the management practices and types of crops grown on the lease lands that are expected to continue in the future, see the draft compatibility determination for the Lease Land Farming Program (Appendix G).

Cooperative farming takes place on 2,300 acres divided among 18 lots. In this program the grower does not make a lease payment to the government for use of refuge lands. Instead, a portion of the small grain crop is left standing for wildlife use. This percentage ranges from 25% to 33%. **In all alternatives, on cooperative farm lands, cereal grains (e.g., barley, wheat) and potatoes would be allowed and the pesticide regulations discussed below would apply.**

Cooperative farm lots are used extensively by fall and spring migrating waterfowl. This use is enhanced by the pre-irrigation of fields during the fall and winter period and the large acreage of unharvested grain. In addition, this program provides waterfowl a food resource away from private lands thus reducing the potential for crop depredation. Similar to the leased lands, water rights are held by the Service with a priority date of 1905 (Claim 317).

A variety of management techniques would be used on the refuge's farmlands to combat pests and help ensure successful crop yields, including pre-plant flood irrigation, rotation of crops, pre-plant tilling, pre-plant prescribed burning, and application of pesticides. These are the primary practices used as the Service pursues an IPM approach to farming and pest management on the refuge. Pest management activities on lease land units are done in accordance with the 1998 EA IPM Plan, which is incorporated by reference (Service 1998a).

Walking Wetlands

A portion of the leased lands would be managed as flood fallow units (termed "walking wetlands") on a 1- to 3-year basis (see sections above and Section 5.1.9 for further information on walking wetlands).

Periodically inserting wetlands into commercial crop rotations on the refuge as well as private lands has been found to suppress soil pathogens and weeds and enhance soil fertility and crop yields. This program would provide an important tool in the expanding Klamath Basin organic farming effort, especially since no organic products are available to control weeds and organic fertilizers are expensive.

The Service would also continue a separate private lands walking wetlands program in conjunction with the cooperative farming program. Under this program, farm lots within the refuge would be awarded to growers based on their ability to provide wetlands on private lands outside the refuge. This allows them a tool to enhance agricultural (and wildlife) values on private lands and transition to organic crop production. A portion of the cooperatively farmed lands are also managed as wetlands on a 1- to 3-year basis. The Service would also continue granting some longer term (more than 5-year) agreements with farmers with the provision that they transition to organic production using walking wetlands on both their private lands as well as refuge cooperative farm lands.

Fire Management

The Service would continue to implement the Complex Fire Management Plan. All wildfires would be suppressed. Fuel projects would focus on a 5- to 10-year cycle or more frequently if needed for invasive plant control or other resource reasons. Prescribed burning would be used in a variety of ways on Tule Lake Refuge. As a stand-alone tool, it would be used in wetlands when they dry in the late summer and on uplands. Prescribed fire would be used in wetlands to open up dense stands of emergent vegetation, thereby creating open water areas for use by fall and spring migrant waterfowl. Shallow flooded burn areas are also used extensively by shorebirds during spring migration and as night roosts by sandhill cranes. Flooded burn areas warm quickly in the spring and are heavy producers of aquatic invertebrates, key food items of spring migrant ducks and shorebirds. Although fire is useful for creating openings in dense stands of emergent plants, this effect is short-lived because these plants re-sprout quickly from below the ground the subsequent spring. Long-term control would require follow-up treatments of disking or plowing.

Prescribed fire in uplands invigorates grass nesting cover for waterfowl and other ground-nesting birds and creates green browse for spring migratory geese. Fire in upland habitats reduces brush species and increases the proportion of an area in grasses and forbs.

Burning would also continue to be used to remove residual vegetation prior to farming operations. Removal of residual vegetation ensures a clean seed bed for optimal production of small grains.

Prescribed fire on Tule Lake Refuge would be conducted by trained and experienced personnel following national and regional fire policies. Burn plans would be written for each fire and include goals and objectives of the burn, staffing needs, required environmental conditions (wind speed, relative humidity, air temperature, etc.), and safety considerations.

The Service would continue to allow lease land farmers to contract for prescribed burning of fields rather than being burned by Service fire staff.

Research

Research activities would continue to be allowed on a case-by-case basis using SUPs.

4.4.2 Alternative A - No Action: Current Management Program – Tule Lake Refuge

The No Action Alternative describes the current management for the refuge which would continue over the 15-year life of the CCP if selected for implementation. It serves as a baseline with which the objectives and management actions of the two action alternatives, Alternatives B and C, can be compared and contrasted. Because this alternative reflects current management, it would not result in substantial changes to the way the refuge would be managed in the future.

Adaptive Management Approach

Under Alternative A, the Service, **in cooperation with Reclamation, would continue to manage Tule Lake Refuge as it has in the recent past (see Section 5.4.5)**. The diversity and juxtaposition of potential habitats in each management unit under Alternative A are depicted in Figure 4.10.

The Service would continue to set aside 60% of the refuge land base as a disturbance-free sanctuary area (no public use) (Figure 4.11). Additionally all colonial nesting waterbird breeding sites would be protected from disturbance. Sanctuaries are areas on the refuge that are closed to public use. They provide places where human-caused disturbances are reduced, thereby reducing the interruption of wildlife activities, such as foraging, resting, breeding, feeding nestlings, and other maintenance activities. Sanctuaries are especially important during high visitor use periods. They are also important for wildlife to avoid predation by other wild animals, as they can devote less energy to avoiding humans and more to avoiding predators.

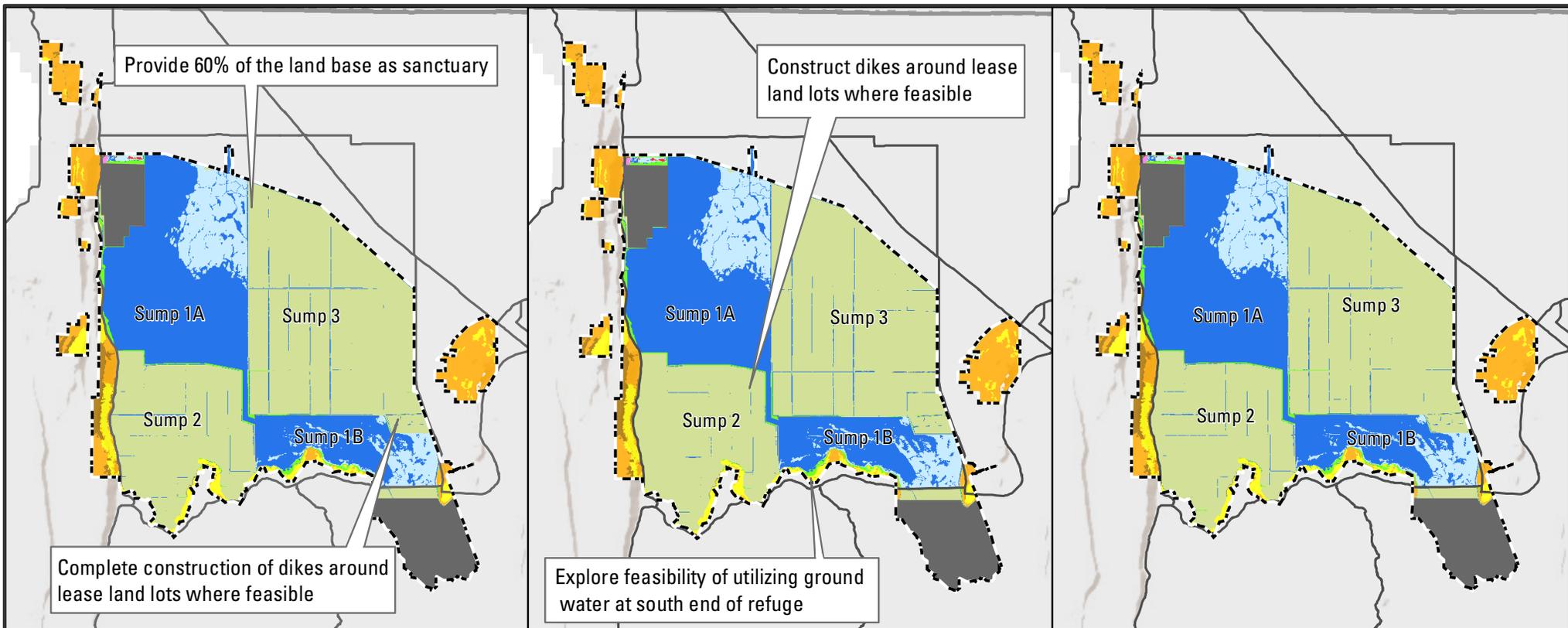
In some cases, short-term sanctuaries may be established on the refuge to protect a sensitive nesting colony or site. These seasonal sanctuaries may impose public access restrictions at some nesting sites for species with a low tolerance for human disturbance.

Under Alternative A, the Service would continue to conduct a variety of surveys to monitor trends in wildlife populations. Aerial bird surveys would be conducted two times per month from September through April, and bird numbers would be recorded by management unit. Species counted would include all waterfowl, bald eagles, sandhill cranes, and white pelicans. In addition, refuge staff would conduct spring and fall shorebird surveys on selected units of the refuge. Additional surveys would include waterfowl pair counts, waterfowl brood surveys, colonial waterbird surveys, tricolored blackbird surveys, eared grebe surveys, and others. These data in conjunction with the biologist's professional judgment would be used in determining whether wildlife use is meeting objectives for a particular habitat. Table 4.12 below summarizes the frequency and timing of surveys on Tule Lake Refuge that would continue under Alternative A.

Waterfowl diseases are a major concern on Tule Lake Refuge. Similar to other monitoring activities, disease data are collected by management unit. Ultimately, this information is used to determine if particular management activities precipitate disease outbreaks or if certain geographical areas are prone to disease.

Water Management

Under the No Action Alternative, the Service would maintain 1905 irrigation rights and 1928 Federal Reserved rights pursuant to the FOD. In addition, the Service would continue to pursue exceptions to the FOD that would allow the use of irrigation water in seasonal wetlands, the flood fallow agricultural practice, and change the period of use for irrigation water to year-round.



Alternative A (No Action)

Wetlands are provided in Sumps 1A and 1B. Reclamation maintains static water levels according to 2008 BiOp.

Management of upland habitat units currently limited to wildfire suppression.

Maintain up to 2,300 acres of cooperatively farmed crops with at least 25% grains on 250 acres; maintain up to 14,800 acres of lease land crops such as small grains, alfalfa, onions and potatoes

Maintain 0-2,700 acres of Walking Wetlands

Pest management on lease land units is guided by the 1998 Refuge Integrated Pest Management Plan

Alternative B

Same as Alternative A and:

- create habitat management and wildlife inventory & monitoring plan

Same as Alternative A and :

- expand invasive species control; Implement temporary closures and/or buffer zones to protect nesting raptors

Increase unharvested standing grain to ~ 1,500 acres; Leverage more wetland habitat on private lands

Increase acreage and interspersion of Walking Wetlands

Implement IPM Program; develop program for managing berms to reduce invasive species and improve cover for nesting waterfowl & other species; prevent the introduction of aquatic invasives by pursuing a partnership with the state of CA to operate portable decontamination stations

Alternative C

Same as Alternative B and:

- develop & implement plan to manipulate water levels in both sumps to improve productivity

Same as Alternative B

Same as Alternative B and:

- increase attractiveness of ag lands to waterfowl with fall flooding; expand incentives and area of leased lands that are managed organically

Same as Alternative B

Same as Alternative B

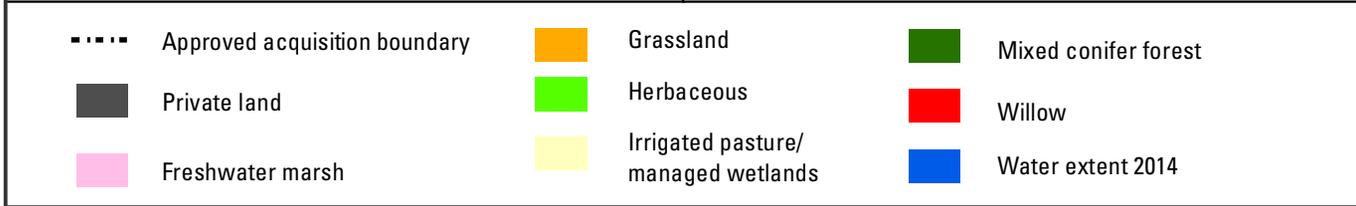
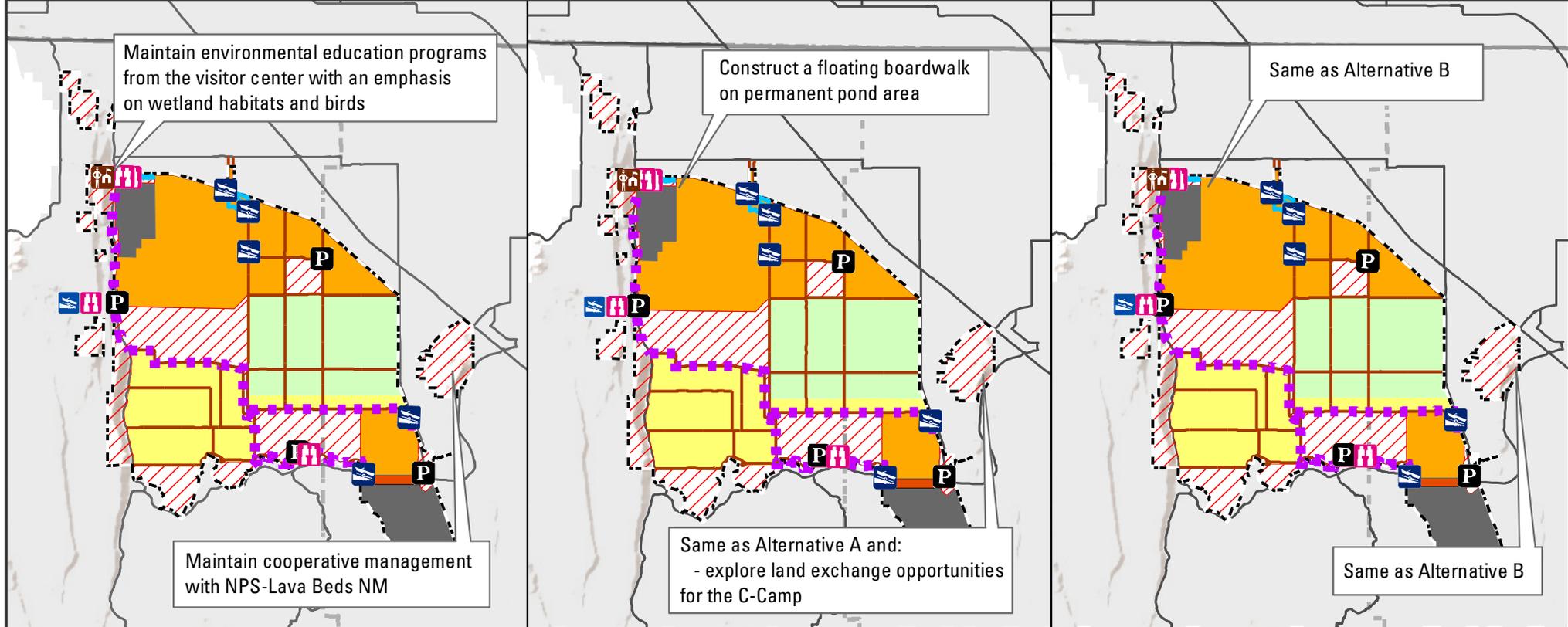


Figure 4.10. Habitat Management Alternatives - Tule Lake Refuge

0 2 4 8 miles



Alternative A (No Action)

Maintain current visitor services infrastructure: 2 hiking trails, 2 canoe trails, photo blinds, vehicle pull-offs, a wildlife overlook, a wildlife observation platform and an auto tour route

Maintain public opportunities for nature interpretation via information kiosks, interpretive signs along auto-tour route and nature trails, and visitor center.

Maintain a diversity of waterfowl and pheasant hunting opportunities

Alternative B

Same as Alternative A and:

- incorporate pull-off areas on existing auto-tour route; open peninsula unit to wildlife observation & photography, in partnership with the National Park Service

Same as Alternative A and:

- provide additional interpretation about Walking Wetlands programs to the public
- improve visitor center

Same as Alternative A and:

- evaluate guide program (i.e. maintain, modify or eliminate guide program)
- analyze cost effectiveness of current hunt fees (i.e. maintain or increase fee)

Alternative C

Same as Alternative B

Same as Alternative B

Same as Alternative B and :

- phase in new requirement allowing only 4-stroke or direct injection 2-stroke boat engines on Refuge waters

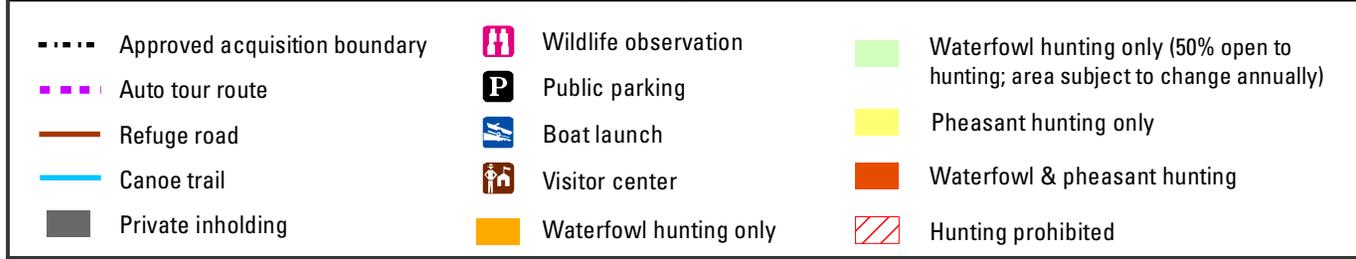


Figure 4.11. Visitor Services Alternatives - Tule Lake Refuge

0 2 4 8 miles

Table 4.12. Ongoing Wildlife Surveys and Monitoring on Tule Lake National Wildlife Refuge

<i>Survey Name</i>	<i>Frequency of Survey</i>	<i>Survey Timing</i>
Breeding Canada Goose Pairs	Recurring – every year	Mid-March
Breeding Duck Pairs Survey	Recurring – every year	Mid-May
Colonial Waterbird Surveys	Recurring – every year	Methods and timing depend on the species
Fall Staging Waterbird Survey	Recurring – every year	Mid-August
Mid-Winter Waterfowl Survey	Recurring – every year	Early January
Nongame Waterbird Breeding Population Survey	Recurring – every year	Mid-June
Periodic Waterfowl Surveys	Recurring – every year	September through April
Secretive Marshbird Surveys	Recurring – every year	May through July
Spring Shorebird Survey	Recurring – every year	Late April
Staging Black Tern Survey	Recurring – every year	July and August
Vegetation Mapping	Recurring – every year	August and September
Water Records	Recurring – every year	
Wintering Raptor Surveys	Recurring – every year	January and February
Wintering Tule Goose Survey	Recurring – every year	October and November

Wetland Habitat Management

Sumps 1A and 1B would continue to be managed under agreement among the Service, Reclamation, and TID. The sumps would function to capture return flows during the spring/summer irrigation season, protect private property from flooding, and provide wildlife habitat. Most of the area is composed of open water dominated by submergent plant communities with extensive periodic blooms of filamentous green algae. Minimum water levels in the sumps would continue to be mandated by the 2013 BiOp to protect the endangered Lost River and shortnose suckers (Service 1992).

The Service would continue to implement the wildlife disease management plan by patrolling wetland areas that have been historically associated with botulism in order to quickly detect and respond to outbreaks. In addition, sick and dead birds would be removed from wetlands.

Agricultural Habitat Management

Under Alternative A, the Service would continue to maintain up to 2,500 acres of cooperatively farmed crops and wetlands under crop share agreements. Under these agreements, at least 25% to 33% of grains on 400 acres would be left standing for wildlife benefit. Refuge cooperative farming participants would continue to be selected based on ability to provide conservation benefits on private lands. Subject to water availability, the Service would maintain an average of 1,100 acres (range 0–2,700 acres) of walking wetlands on Tule Lake Refuge lease land and cooperatively farmed units. Finally, the Service would complete construction of dikes around lease land lots in Sump 3 where walking wetlands management is feasible (units that can be flooded with gravity flow).

Integrated Pest Management

The Service would continue to manage pests on the refuge consistent with policies of the Service and DOI (see 569 FW 1 and 517 DM 1) using an IPM approach. Under this alternative, the Service

would continue to scout, map, and control priority weeds especially in priority wildlife habitats. The Service would continue to combat plant and animal pests alongside roads and trails; around parking lots and restrooms; around administrative and visitor buildings; and around visitor overlooks, kiosks, and signs. The purposes of these pest management actions would be to control early infestations of invasive species; minimize the spread of established invasive species; facilitate maintenance of administrative and visitor facilities; allow visitors to readily observe signs and access and enjoy trails, overlooks, restrooms, and other visitor facilities; and help ensure visitor safety (e.g., associated with poisonous plants or disease-carrying animals).

Pest control to reduce adverse effects to wildlife/habitat and infrastructure would include the following practices: manipulation of water levels, mowing with brush/deck mower and cutting with a sickle bar mower, variation in the timing of these practices, hand pulling of weeds, prescribed burning, bag-type repellents, trapping and removal, and application of pesticides.

In addition to providing off-refuge wetland habitat for wildlife, walking wetlands (flood following) also enhances soil fertility and crop yields, and suppresses soil pathogens and weeds. This reduces the need for fertilizers and pesticides on private and public farmlands, including the refuge's lease land and cooperative farmlands. A variety of other management techniques are used on the refuge's cooperative farmlands to reduce pests and help ensure successful crop yields, including pre-plant flood irrigation; pre-plant tilling; rotation of crops; pre-plant prescribed burning; and application of compost, fertilizers, and pesticides.

Pesticides would continue to be applied using hand wands or backpack sprayers; boomless sprayers mounted on all-terrain vehicles, utility-terrain vehicles, or trucks; and occasionally from aircraft (e.g., to treat large infestations of invasive species, like purple loosestrife in Sump 1A). Table 4.13 below summarizes current IPM practices on Tule Lake Refuge that would continue under the No Action Alternative. IPM involves using methods based on effectiveness, cost, and minimal ecological disruption (which consider minimum potential effects to non-target species and the refuge environment). As noted in Table 4.13, pesticides are an IPM method and are used when other IPM methods are impractical or incapable of providing adequate control, eradication, or containment. When pesticides are needed on the refuge, the Service allows only the most specific (selective) chemical available for the target species unless considerations of persistence or other environmental and/or biotic hazards preclude it. Consistent with DOI policy (517 DM 1), the Service allows only pesticides registered with the Agency in full compliance with the FIFRA, which further restricts the spectrum of pesticides used on the refuge.

When pesticides are used on the refuge the Service follows standard BMPs (see Appendix L), including adherence to all USEPA and California Environmental Protection Agency warning labels and application requirements, as well as the Service's PUP process. Pesticides are to be applied only by certified/licensed pesticide applicators or individuals under the direct supervision of such applicators. While on the refuge, all pesticides are stored, transported, and otherwise handled in accordance with label specifications. In addition, written contingency plans are prepared for all sites where pesticides would be used or stored, and appropriate materials and supplies (e.g., shovels, disposal containers, absorbent materials, first aid supplies, and clean water) are available on site to clean up any small-scale accidental hazardous spill. Hazardous material spills are then reported to the appropriate state environmental quality agency.

The use of pesticides on the refuge is initiated at the field-station level and documented using a PUP. Field-station personnel identify the pesticide product(s) proposed for use and describe the

associated use pattern; target pest(s); alternative management practices that may be integrated into the overall management action; location of use including factors important to the environmental fate of the pesticide post-application; and sensitive non-target resources that may be exposed. The refuge manager or refuge project leader reviews the PUP and may approve some pesticide uses where that authority has been delegated by the Regional Office. Uses that normally can be approved at the field-station level typically are pesticides that are inherently low risk to wildlife resources. Field-station-level reviewers also have to consider all applicable federal, state, and local laws, regulations, policies, and court decisions applicable to pesticide use on the refuge. PUPs that cannot be approved at the field-station level are elevated to the regional level to the Regional IPM Coordinator or possibly to the national headquarters office for review and final decision (i.e., approval, approval with modification, or disapproval).

Table 4.13. Summary of Integrated Pest Management Practices at Tule Lake National Wildlife Refuge

<i>Tule Lake</i>	<i>IPM Practices</i>	<i>Description</i>	<i>Purpose</i>
Weed Control	Cultural or agronomic	Pre-plant flood irrigation and rotational flood fallow to reduce undesirable/invasive vegetation. Rotation of crops within and between units. Pre-plant soil tillage. Use of compost/fertilizer.	Cooperative farming – potatoes and cereal grains
	Cultural or agronomic	Water management (water level manipulation) and variation in timing to produce desirable native vegetation.	Habitat management
	Mechanical	Mowing with brush/deck mower and cutting with sickle bar mower to reduce invasive and undesirable vegetation and seed bank.	Habitat management and general maintenance
	Physical	Prescribed burning to reduce all vegetation prior to tillage and planting.	Cooperative farming – potatoes and cereal grains
	Physical	Prescribed burning to decrease areas of thick, dead under-layer vegetation which impedes wildlife use.	Habitat management
	Chemical	Hand and utility-terrain vehicle boomless spraying to reduce noxious and pest weed species.	Habitat management and general maintenance
	Chemical	Ground and aerial spraying to reduce noxious and pest weed species.	Cooperative farming

Potential effects of pesticide use on the physical environment, biological resources (including mammals, birds, and fish), and potentially humans; and environmental fate (including mobility, persistence, translocation, bioaccumulation, and degradation) of these chemicals are evaluated during the PUP review process. Summaries of this information and an ecological risk assessment are contained in pesticide-specific chemical profiles. Chemical profiles are prepared for active ingredients (e.g., glyphosate and imazapic) that are contained in one or more trade name products registered and labeled with the USEPA. The chemical profiles provide basic information about pesticide formulations, including active ingredients and other chemicals to improve the pesticide’s storage, handling, safety, application, and effectiveness; quantitative assessment/screening tools and threshold values to evaluate potential effects of pesticide uses on the physical environment and biological resources; and BMPs. The completed chemical profiles provide a structured

decision making process utilizing quantitative assessments/screening tools with threshold values that are used to evaluate potential biological and other effects on refuge resources.

Under the No Action Alternative ongoing pest management for the leased lands on Tule Lake Refuge would continue as described in the 1998 EA IPM Plan (Service 1998a). The 1998 EA IPM Plan was prepared by the Service and Reclamation with the goal of minimizing the use of pesticides associated with agricultural practices on the leased lands over time. The 1998 EA IPM Plan does not eliminate the use of pesticides, but attempts to have them used as a last line of defense against pests, not as the first option of control. As with non-leased land areas of the refuge, all pesticides proposed for use on the leased lands are reviewed under the PUP process. However, the PUP review and approval process for leased lands on the Lower Klamath and Tule Lake Refuges was modified in 1995. In 1995, the Regional Director requested and received a delegation of authority for the review and approval of all pesticides and application methods for all pest species on the leased lands (farmed by Reclamation lessees) on both the Lower Klamath and Tule Lake Refuges. The rationale for this request was based on:

- the Kuchel Act of September 2, 1964;
- large-scale crop production as a purpose of the Lower Klamath and Tule Lake Refuges;
- the extensive acreage of the federal leased lands on both refuges; and
- local knowledge needed to necessitate numerous adjustments to local conditions given the diversity of crops grown and wildlife management techniques involved.

Based on this delegation of authority, a PUP Committee was formed with members from both the Service and Reclamation who could collectively provide expertise in the agricultural lease lands program, refuge management, agronomy, IPM, environmental toxicology, endangered species, and local agronomic practices.

The PUP Committee also uses the chemical profiles prepared for the active ingredients to assess each pesticide proposed for use on the refuge and determine whether to allow its use. If approved, the PUP includes BMPs to ensure that pesticides are used effectively, safely, and in a manner designed to minimize potential effects on the environment (e.g., soils, water, and air) and non-target organisms. For administrative purposes and to ensure cohesive pest control, pesticides that are approved for use on the leased lands are also approved for use on cooperative farm units.

Cultural Resources Management

Cultural resources would be managed and conserved in accordance with all applicable laws, policies, and regulations. The Service would identify historic properties that coincide with existing and planned roads, facilities, public use areas, and habitat projects and evaluate threatened and impacted sites for eligibility to the NRHP. If necessary, the Service would prepare and implement activities to mitigate impacts to sites.

Visitor Services

Following is a summary of the visitor services that would continue under the No Action Alternative. More detailed descriptions of current visitor opportunities are included in the Visitor Services section (Section 5.4.4) of Chapter 5. Figure 4.11, above, summarizes the major visitor services features of Alternative A compared to the other alternatives.

Wildlife Observation and Photography

Under Alternative A, the Service would maintain existing opportunities for wildlife observation and nature photography at Tule Lake Refuge, including two hiking trails, two canoe trails, five photo blinds, vehicle pull-offs, wildlife overlook, and a wildlife observation platform along the existing 16.7-mile auto tour route.

Interpretation

Under Alternative A, the Service would maintain existing opportunities for nature interpretation at Tule Lake Refuge, including information kiosks and interpretive signs along the auto tour route, nature trails, and visitor center. In addition, the Service would continue to provide periodic staffed nature interpretation programs to the public. The Service would also provide brochures and maps, maintain websites, and provide current information to the public.

Environmental Education

Under Alternative A, the Service would maintain existing opportunities for environmental education and its current emphasis on wetland habitats and bird education programs at the visitor center. This includes kindergarten through 12th grade bird biology curriculum and kindergarten through 8th grade wetlands curriculum to match California and Oregon State standards. The Service would maintain existing opportunities for outreach about natural resources in the ecoregion and the NWRS. The Service would continue to host special events at the Refuge Complex, participate in community events, and offer off-site presentations on request.

Hunting

Under Alternative A, the Service would maintain existing hunting opportunities at Tule Lake Refuge; including diverse waterfowl and pheasant hunting opportunities such as waterfowl-only hunt areas, pheasant-only hunt areas, and joint waterfowl and pheasant hunt areas. These opportunities would be offered in a variety of habitats including deep and shallow flooded marshes, dry grain fields, and upland fields. The Service would maintain hunting opportunities via large free-roam areas, lottery drawn spaced blinds, and lottery drawn open units. Accessibility via automobiles, motor boats, canoe style boats, and walk-ins would continue. The hunt program would continue to be consistent with California State hunting dates and regulations. Existing hunt fees would be maintained as well.

Law Enforcement and Public Safety

The Service would maintain safe conditions at all visitor facilities at the refuge with current law enforcement staffing.

Co-management of World War II Valor in the Pacific National Monument

The Service would continue to cooperatively manage two units of the World War II Valor in the Pacific National Monument with the NPS: the Peninsula, also known as Castle Rock (1,293 acres), southeast of Newell, California, on Highway 139; and Camp Tulelake Civilian Conservation Corps Camp on Hill Road east of Tulelake, California.

4.4.3 Alternative B – Tule Lake Refuge

Adaptive Management Approach

Under Alternative B, the Service would follow the adaptive management approach outlined under Actions Common to All Alternatives and Alternative A. Under Alternative B, the goals, objectives, and strategies identified for Tule Lake Refuge in Appendix F would guide management over the next 15 years.

The habitat objectives in Appendix F are designed to achieve proper waterfowl management as defined in Appendix M. Objectives for wetland and agricultural habitats are based on providing sufficient food to support the 75th percentile of 1970s duck and 1990s goose populations. Appendix F also includes monitoring elements which are the surveys that are used to track achievement of the objectives. Finally, the appendix lists the management strategies which are the specific actions, tools, or techniques that are necessary to accomplish each objective.

The goals, objectives, and strategies for Tule Lake Refuge in Appendix F would form the basis of a new habitat management plan which the Service would develop. This plan would include more specific objectives for each refuge habitat, monitoring programs that track achievement of both population and habitat objectives, and thresholds for taking management actions.

Annual habitat plans would continue to be developed each spring based on habitat management objectives (Appendix F), current habitat conditions, water delivery projections, and the results of monitoring. The diversity and juxtaposition of potential habitats in each management unit under Alternative B are depicted above in Figure 4.10.

Under Alternative B, the Service would also develop a new inventory and monitoring plan for Tule Lake Refuge. The purpose of the plan would be to identify and prioritize existing and new inventories and monitoring needed to inform adaptive management of priority refuge resources. The Service would also monitor changes in the environment, such as vegetation communities, wildlife trends, and surface and groundwater levels, to assess the effects of climate change on the refuge.

Water Management

Water management under Alternative B would be the same as Alternative A, except the Service would also explore the feasibility of pumping groundwater at the south end of refuge to supply refuge habitats. Specific use of groundwater would be analyzed in a separate step-down NEPA document.

Wetland Habitat Management

Same as Alternative A.

Upland Habitat Management

Same as Alternative A.

Agricultural Habitat Management

Farming

Farming under Alternative B would be the same as Alternative A, with the following exceptions. Under Alternative B, the Service would require annual SUPs for Reclamation that include stipulations and a prescribed mixture of habitat types based on the energetics models (Appendix N) to ensure the stipulations in the compatibility determinations are effectively implemented **in new leases**. The Service would also require annual SUPs for commercial contractors (i.e., for fertilizer and pesticide applications). Additionally, stipulations and all other specific requirements from the SUPs shall be included as part of the lease contracts. To support dabbling duck and geese population objectives during winter and spring, the Service would increase the acreage of unharvested grain by 1,100 acres to 1,500 and reduce the acreage of harvested grain accordingly. To disperse waterfowl use and lessen the potential for avian diseases, one half of this grain leave would occur on cooperative farm lands (750 acres) and the other half on the leased lands. In addition, approximately 2,700 acres of harvested potatoes and 3,400 acres of green browse would also be available as forage for waterfowl each year. Green browse could be provided as alfalfa, hay, or fall planted small grains.

The Service would also work with Reclamation to increase the acreage and interspersion of walking wetlands **by striving to ensure** that all agricultural fields are within 1 mile of wetland habitat. To achieve this, a minimum of approximately 1,380 acres of walking wetlands would be needed each year. To expand the opportunities for walking wetlands within the lease lands, the Service would construct dikes around lease land lots in Sump 2 where such management is feasible (fields that can be flooded via gravity flow). In addition, the Service would seek to leverage more wetland habitat on private lands in the basin by expanding the use of preferential permits for cooperatively farmed grain and hay units for farmers that participate in the Walking Wetlands Program on their private lands. Finally, the Service would 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.

Integrated Pest Management

Under Alternative B, the Service would continue to manage pests on the refuge consistent with policies of the Service and DOI (see 569 FW 1 and 517 DM 1) using an IPM approach as described under the No Action Alternative. Under Alternative B, the Service would use GPS and other appropriate tools to map and monitor invasive plant populations and treatment actions to determine effectiveness. The Service would also develop a rapid assessment and control program for new invasive species as well as develop a program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species. A partnership (or multiple partnerships) would be pursued with the State of California to develop and operate a portable decontamination station(s) near boat launches to reduce the likelihood that boats would contribute to invasive species problems.

In addition, under Alternative B, the Service would formalize the ongoing pest management for habitat, maintenance, and cooperative farming into an IPM program as described in Appendix Q. Although Service Policy (569 FW 1.12) does not require an IPM plan prior to pesticide application, doing so may allow multi-year approvals of certain proposed pesticide uses that would normally require regional or national level review. Pest control on leased lands would continue to follow the

1998 EA IPM Plan for leased lands at Lower Klamath and Tule Lake Refuges described under the No Action Alternative.

Both the 1998 EA IPM Plan for leased lands and the 2016 IPM for cooperative farmland, habitat management, and general maintenance (Appendix Q) are focused on using a range of tools to manage pests, not simply chemical methods. Prior to pesticide application on the refuge, an approved PUP is required (see 569 FW 1.10 and 1.12). The Service would continue to use the PUPs authorized through the Lease Land PUP Committee as the master set of pesticides that can be used on Tule Lake Refuge cooperative farm units. On cooperative farm units that are farmed organically, only pesticides that meet the standards outlined by the National Organic Program criteria are used. However, if environmental or economic forces affect the attractiveness of refuge cooperative farmland to organic growers, then the spectrum of PUPs approved by the PUP Committee for leased land crops may be used on cooperative farm fields. Although desirable, the Service would not make organic agriculture a strict requirement of either lease land or cooperative farm units because organic agriculture is dependent on a consistent water supply and external economic forces.

Under Alternative B, the Service would also work with Reclamation to periodically conduct water, sediment, and fish and wildlife tissue monitoring in Tule Lake Sump 1A to ensure pesticides are at concentrations below those having an adverse effect to listed species and other wildlife.

Cultural Resources Management

Alternative B would include the cultural resources management actions described under Alternative A. In addition, the Service would implement a proactive cultural resources management program to evaluate the NRHP eligibility of cultural resources that may be impacted by Service undertakings, management activities, erosion, or neglect. The Service would also develop partnerships with The Klamath Tribes for cultural resources inventory, evaluation, and project monitoring. The Service would also perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility and develop partnerships (e.g., University of Oregon, NPS) to assist in the stabilization and restoration of archaeological and historic sites and structures. Finally, the Service would create and use a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act.

Visitor Services

Following is a summary of the visitor services that would be added under Alternative B. Figure 4.11, above, summarizes the major visitor services features of Alternative B compared to the other alternatives.

Wildlife Observation and Photography

In addition to wildlife observation features in Alternative A, the Service would incorporate pull-off areas on existing auto tour routes to improve wildlife viewing opportunities.

Environmental Education

Environmental education under Alternative B would include all the elements of Alternative A. In addition, the Service would develop a Walking Wetlands Program curriculum and create partnerships with schools to develop schoolyard habitat programs. The Service would also develop teacher training workshops to train teachers on how to use the curriculum. In addition, the Service would create partnerships with schools to develop schoolyard habitat programs. Finally, the Service would construct a floating boardwalk next to the education center on the permanent pond.

Interpretation

In addition to the actions under Alternative A, the Service would provide additional interpretation about the Walking Wetlands Program to the public. The Service would also develop hands-on exhibits in the visitor center. The visitor center entrance would be updated to be more visitor-friendly. Finally, the Service would update the visitor center to be compliant with the Americans with Disabilities Act.

Hunting

In addition to the actions under Alternative A, the Service would evaluate the existing hunt guide program (i.e., maintain, modify, or eliminate); analyze hunt area and auto tour route (i.e., maintain or separate in time or space); and analyze cost-effectiveness of current hunt fees (i.e., maintain or increase fee).

Law Enforcement

Under Alternative B, the Service would seek to hire one to two additional law enforcement officers (for all refuges in the Refuge Complex) to improve public safety and resource protection.

Co-management of World War II Valor in the Pacific National Monument

In addition to actions under Alternative A, the Service would explore land exchange/transfer opportunities for the Civilian Conservation Corps Camp with the NPS Lava Beds National Monument. The Service would also cooperate with the NPS to develop visitor opportunities on the Peninsula Unit of Tule Lake Refuge.

4.4.4 Alternative C – Tule Lake Refuge (Preferred Alternative)

Adaptive Management Approach

Same as Alternative B. The diversity and juxtaposition of potential habitats in each management unit under Alternative B are depicted above in Figure 4.10.

In addition to the inventory and monitoring actions under Alternative B, Alternative C would include additional monitoring related to proposed drawdowns of Sump 1A. Water quality monitoring would need to be conducted to determine potential effects on the endangered Lost River and shortnose suckers. Water quality (dissolved oxygen, temperature, and pH) would be monitored at the same locations that were previously monitored during the late 1990s. Effects of reduced water levels in Sump 1A on the survival and movements of suckers would be monitored

by radio-marking adult shortnose and Lost River suckers in January and February. Fish would be located and fates determined periodically during spring and summer from boats and or aircraft. In addition, pre- and post-project monitoring of nesting populations and success of western/Clark's grebes would be conducted.

Water Management

Same as Alternative B.

Wetland Habitat Management

In addition to the actions under Alternative B, the Service would develop and implement a plan to manipulate water elevations in Sumps 1A and 1B to improve wetland diversity and productivity. Currently, the water level in Sump 1A is strictly managed between a minimum elevation of 4034.00 feet in winter to 4034.60 feet minimum elevation in summer. Maximum allowable elevation is 4035.50 feet. As a result of these relatively static water levels, there is little or no seasonal wetland habitat. The Service in partnership with TID, Westside Improvement District, and Reclamation would conduct a series of water drawdowns on Sump 1A (9,500 acres) similar to the drawdowns conducted in Sump 1B that began in 2000. As a part of Alternative C, the Service would request an amendment to the 2013 BiOp to address the drawdowns in Sump 1A and identify any new terms and conditions including monitoring requirements. Because Sump 1A is the primary source of water to adjacent agricultural lands and is habitat for the endangered Lost River and shortnose suckers, and because the effects of a drawdown on both are uncertain, the Klamath Reclamation Project would occur in two phases. The first phase would involve lowering Sump 1A water elevations to approximately 4,033 feet by using the D Plant **to pump water to Lower Klamath Refuge**. Effects on the ability of TID to effectively deliver water at this elevation would be assessed. Based on monitoring conducted to determine effects on both suckers and the irrigation system, the second phase would be designed. Based on bathymetric maps of Sump 1A, it is expected that a drawdown to an elevation of 4,033.5 feet would provide germination conditions for emergent marsh plants across approximately 860 acres. The second phase, should it occur, would likely create an additional 1,700 acres of emergent marsh. The series of drawdowns would be considered complete when approximately 20% to 30% of the areas exposed by water removal are established in emergent wetland vegetation, most likely hardstem bulrush. The cycle of water removal and reflooding would likely require 4 years to accomplish. However, desired results may occur in as few as 2 or as many as 8 years.

Upland Habitat Management

Same as Alternative A.

Agricultural Habitat Management

Farming

Alternative C would include all the actions under Alternative B. In addition, the Service would periodically evaluate the existing lease lands program administration cooperative agreement with Reclamation to determine if revisions are necessary to ensure the program is consistent with Kuchel Act mandates (Appendix M). In addition, the Service would increase the attractiveness of agricultural lands to waterfowl by increasing the number of fields that are pre-irrigated (**fall**

flooding). The Service would also work with Reclamation and growers to expand the area of lease land and cooperatively farmed units that are managed organically. This would be facilitated by expanding incentives such as lease extensions for farmers that manage fields organically.

Integrated Pest Management

Same as Alternative B.

Land Conservation

Same as Alternative B.

Cultural Resources

Same as Alternative B.

Visitor Services

Figure 4.11, above, summarizes the major visitor services features of Alternative C compared to the other alternatives.

Wildlife Observation and Photography

Same as Alternative B.

Environmental Education

Same as Alternative B.

Interpretation

Same as Alternative B.

Hunting

The hunt program under Alternative C would be the same as Alternative B except the Service would phase in a new requirement allowing only 4-stroke or direct injection 2-stroke boat engines to be used on the refuge.

Law Enforcement

Same as Alternative B.

Co-management of World War II Valor in the Pacific National Monument

Same as Alternative B.

4.4.5 Comparison of Alternatives

A comparative summary of the alternatives for Tule Lake Refuge is provided in Table 4.14.

Table 4.14. Summary of the Alternatives for Tule Lake Refuge

	<i>Alternative A Current Program (No Action)</i>	<i>Alternative B</i>	<i>Alternative C (Preferred Alternative)</i>
Adaptive Management Approach	<ul style="list-style-type: none"> ■ Set annual habitat objectives each spring based on March water delivery projections. ■ Waterfowl population objectives: mean 1990s abundance for all guilds. ■ Maintain the species catalog for Tule Lake Refuge. ■ Develop and maintain GIS layers including boundaries, management units, grassland management units, fire perimeters, wetlands, and water infrastructure. 	<p>Same as A except:</p> <ul style="list-style-type: none"> ■ Set annual habitat objectives to achieve proper waterfowl management as defined in Appendices M and N. ■ Waterfowl population objectives: 75th percentile of 1970s duck and 1990s goose populations. ■ Prepare habitat management plan. ■ Update Refuge Inventory and Monitoring Plan. ■ Monitor changes in the environment, such as vegetation communities, wildlife trends, and surface and groundwater levels, to assess the effects of climate change on the Refuge. 	<p>Same as B, and:</p> <ul style="list-style-type: none"> ■ Monitor effects of Sumps 1A and 1B drawdowns on water quality. ■ Monitor effects of Sumps 1A and 1B drawdowns on endangered Lost River and shortnose suckers.
Wildlife Management	<ul style="list-style-type: none"> ■ Provide 60% of the Tule Lake Refuge land base as disturbance-free sanctuary area. ■ Protect all colonial nesting waterbird breeding sites from disturbance. ■ Implement the wildlife disease management plan. ■ Monitor and manage for all resident native wildlife, including federally endangered Lost River and shortnose suckers. Provide disturbance-free areas for these species. 	Same as A.	Same as A.

Table 4.14. Summary of the Alternatives for Tule Lake Refuge

	<i>Alternative A Current Program (No Action)</i>	<i>Alternative B</i>	<i>Alternative C (Preferred Alternative)</i>
Water Quantity Management	<ul style="list-style-type: none"> ■ Maintain 1905 irrigation water rights and 1928 Federal Reserved water rights pursuant to the 2013 FOD. ■ Reclamation delivers water to lease lands and Sumps 1A and 1B according to Reclamation’s within-Project priority ranking. ■ Water is delivered during irrigation season to lease lands by TID. ■ Excess water from irrigation return flows and winter run off is pumped to Lower Klamath Refuge through D Plant. ■ Continue to improve water conservation and efficiencies to optimize existing water use. ■ If KBRA is implemented: <ul style="list-style-type: none"> ■ water for lease lands and Sumps 1A and 1B would come from the irrigator’s allocation. ■ water for walking wetlands is shared, 2 acre-feet from irrigator, 1 acre-foot from Lower Klamath Refuge allocation. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Explore feasibility of using groundwater at south end of refuge. 	<p>Same as B.</p>
Water Quality Management	<ul style="list-style-type: none"> ■ Continue to work with Reclamation to monitor water quality of delivered water supplies, pass through water, and spill water. ■ Continue to identify water quality issues and implement BMPs. ■ Continue to assist with Lost River TMDL planning and implementation. 	<p>Same as A.</p>	<p>Same as A.</p>
Wetland Habitat Management	<ul style="list-style-type: none"> ■ Wetlands are provided in Sumps 1A and 1B. Reclamation maintains static water levels according to 2013 BiOp. ■ Sedimentation and stable water levels have reduced wetland habitat quality. 	<p>Same as A, except:</p> <ul style="list-style-type: none"> ■ Create habitat management and wildlife inventory and monitoring plan. 	<p>Same as B, and:</p> <ul style="list-style-type: none"> ■ Develop and implement plan to manipulate water elevations in Sumps 1A and 1B to improve wetland diversity and productivity. ■ Amend 2013 BiOp to address the drawdowns in Sump 1A.
Upland Habitat Management	<ul style="list-style-type: none"> ■ Management of upland habitat units (Sheepy Ridge and the Peninsula Unit) limited to wildfire suppression. 	<ul style="list-style-type: none"> ■ As public use facilities are developed on the Peninsula Unit, expand invasive species control efforts on adjacent areas. ■ Implement temporary closures and/or buffer zones as needed to protect nesting raptors. 	<p>Same as B.</p>

Table 4.14. Summary of the Alternatives for Tule Lake Refuge

	<i>Alternative A Current Program (No Action)</i>	<i>Alternative B</i>	<i>Alternative C (Preferred Alternative)</i>
Agricultural Program	<ul style="list-style-type: none"> ■ The Service has authority to administer the lease land program and has delegated the authority to the Reclamation according to 1977 Cooperative Agreement. ■ Cooperative farm land participants are selected based on ability to provide conservation benefits on private lands. ■ Maintain up to 2,500 acres of cooperatively farmed crops and wetlands under a crop share agreement. At least 25% to 33% of grains on 400 acres are left standing for wildlife benefit. ■ Maintain up to 15,500 acres of lease land crops such as small grains, alfalfa, onions, and potatoes. ■ Maintain 0 to 2,700 acres of walking wetlands on Tule Lake Refuge lease land and cooperatively farmed units. ■ Complete construction of dikes around lease land lots in Sump 3 where walking wetlands management is feasible. 	<p>Same as A, except:</p> <ul style="list-style-type: none"> ■ Require annual SUPs for Reclamation with stipulations and prescribed habitat mixture based on the energetics modeling. ■ Require annual SUPs for commercial contractors (i.e., fertilizer, pesticide applications). ■ Require stipulations and all other specific requirements from the SUPs be included as part of lease contracts. ■ Increase unharvested standing grain to approximately 1,500 acres to support dabbling duck and geese population objectives during winter and spring. ■ Leverage more wetland habitat on private lands in the basin by expanding the use of preferential permits for cooperatively farmed grain and hay units for farmers that participate in the Walking Wetlands Program on their private lands. ■ Strive to increase acreage and interspersion of walking wetlands within lease lands so that all fields are within 1 mile of a wetland (minimum of approximately 1,380 acres). ■ Construct dikes around lease land lots in Sump 2 where walking wetlands management is feasible. 	<p>Same as B, and:</p> <ul style="list-style-type: none"> ■ Evaluate existing leased lands program administration agreement with Reclamation. ■ Increase attractiveness of agricultural lands to waterfowl with fall flooding. ■ Expand area of lease land and cooperatively farmed units that are managed organically. ■ Expand incentives such as lease extensions for farmers that manage fields organically.

Table 4.14. Summary of the Alternatives for Tule Lake Refuge

	<i>Alternative A</i> <i>Current Program (No Action)</i>	<i>Alternative B</i>	<i>Alternative C</i> <i>(Preferred Alternative)</i>
Integrated Pest Management	<ul style="list-style-type: none"> ■ Pest management on the lease land farming units is guided by the 1998 Refuge Integrated Pest Management Plan. ■ Chemical applications are evaluated and permitted according to Service and DOI policies, and PUPs. ■ Reduce populations of perennial pepperweed, scotch thistle, purple loosestrife, hemlock, and other nuisance species. ■ Continue to scout, map, and control priority weed species with an emphasis on protecting high-priority wildlife habitat. ■ Periodically monitor refuge waterbodies for pesticides. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Formalize ongoing pest management for cooperative farming and general pest management activities under an IPM program. ■ Develop program for managing berms to reduce invasive species cover and improve cover for nesting waterfowl and other species. ■ Use GPS and other appropriate tools to map and monitor invasive plant populations and treatment actions. ■ Prevent the introduction of aquatic invasive species by pursuing a partnership with the State of California to develop and operate a portable decontamination station(s) near boat launches on the refuge. ■ Periodically conduct water, sediment, and fish and wildlife tissue monitoring in in refuge waterbodies to ensure pesticides are at concentrations below those having an adverse effect to listed species and other wildlife. 	Same as B.
Fire Management	<ul style="list-style-type: none"> ■ Continue to implement Refuge Complex Fire Management Plan. ■ Suppress all wildfires. ■ Focus fuel projects on a 5- to 10-year cycle or more frequent if needed for invasive plant control or other resource reasons. ■ Allow lease land farmers to contract locally for prescribed burning of fields. 	Same as A.	Same as B.
Cultural Resources	Same as Lower Klamath Refuge Alternative A.	Same as Lower Klamath Refuge Alternative B.	Same as Lower Klamath Refuge Alternative B.
Wildlife Observation and Photography	<ul style="list-style-type: none"> ■ Maintain public opportunities for wildlife observation and nature photography via two hiking trails, two canoe trails, photo blinds, vehicle pull-offs, a wildlife overlook, a wildlife observation platform, and an auto tour route. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Incorporate up to four pull-off areas on existing auto tour route. ■ Improve/redesign the Sheepy Ridge Trail to decrease the slope, improve drainage, and reduce erosion. ■ Work with NPS to develop a trail to the top of the Peninsula Unit. 	Same as B.

Table 4.14. Summary of the Alternatives for Tule Lake Refuge

	<i>Alternative A Current Program (No Action)</i>	<i>Alternative B</i>	<i>Alternative C (Preferred Alternative)</i>
Interpretation	<ul style="list-style-type: none"> ■ Maintain public opportunities for nature interpretation via information kiosks, interpretive signs along auto-tour routes and nature trails, and visitor center. ■ Continue to provide staffed periodic nature interpretive programs to the public. ■ Continue to provide brochures, maps, and visitor information to the public. ■ Maintain website to include current information. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Provide additional interpretation about Walking Wetlands Program to the public. ■ Provide hands-on exhibits in visitor center. ■ Update visitor center entrance to be more visitor-friendly. ■ Update visitor center to be compliant the Americans with Disabilities Act. 	Same as B.
Hunting	<ul style="list-style-type: none"> ■ Maintain a diversity of waterfowl and pheasant hunting opportunities. ■ Maintain waterfowl-only hunt areas, pheasant-only hunt areas, and areas of joint waterfowl and pheasant hunting. ■ Maintain hunting opportunities via large free-roam areas, lottery drawn spaced-blinds, and lottery drawn open units. ■ Maintain hunt area accessibility via automobiles, motor boats, canoe style boats, and walk-ins. ■ Maintain hunt areas in a variety of habitats including deep and shallow flooded marshes, dry grain fields, and upland fields. ■ Maintain a hunt program consistent with California State hunting dates and regulations. ■ Maintain existing hunting fee. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Evaluate guide program (i.e., maintain, modify, or eliminate guide program). ■ Analyze hunting area and auto tour route (i.e., maintain or separate in time or space). ■ Analyze cost-effectiveness of current hunt fees (i.e., maintain or increase fee). 	<p>Same as B, and:</p> <ul style="list-style-type: none"> ■ Phase in a new requirement allowing only 4-stroke or direct injection 2-stroke boat engines to be used on the refuge.
Environmental Education	<ul style="list-style-type: none"> ■ Maintain environmental education programs from the visitor center facility with an emphasis on wetland habitats and birds. ■ Maintain kindergarten through 12th grade bird curriculum and kindergarten through 8th grade wetlands curriculum and match to California and Oregon State standards. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Develop a high school Walking Wetlands Program curriculum. ■ Continue to offer teacher training workshops to train teachers on how to use the curriculum. ■ Create partnerships with schools to develop schoolyard habitat programs. ■ Construct a floating boardwalk next to education center on the permanent pond at Discovery Marsh. 	Same as B.

Table 4.14. Summary of the Alternatives for Tule Lake Refuge

	<i>Alternative A</i> <i>Current Program (No Action)</i>	<i>Alternative B</i>	<i>Alternative C</i> <i>(Preferred Alternative)</i>
Outreach	<ul style="list-style-type: none"> ■ Maintain public outreach about natural resources in the ecoregion and the NWRS by hosting special events at the Refuge Complex, participating in community events, and offering off-site presentations upon request. 	Same as A, and: <ul style="list-style-type: none"> ■ Develop an outreach event on waterfowl identification for youth hunters. ■ Develop a friends group. 	Same as B.
World War II Valor in the Pacific National Monument	<ul style="list-style-type: none"> ■ Maintain cooperative management with NPS Lava Beds National Monument. 	Same as A, and: <ul style="list-style-type: none"> ■ Explore land exchange opportunities for the C-Camp with the National Park Service. ■ Maintain cooperative management of peninsula with NPS Lava Beds National Monument. 	Same as B.
Public Safety and Law enforcement	<ul style="list-style-type: none"> ■ Maintain safe conditions at all visitor facilities at the refuge and ensure adequate law enforcement is available. 	Same as A.	Same as A.
Monitor Public Use	<ul style="list-style-type: none"> ■ Continue to monitor visitor use of refuge lands including the six priority public uses. 	Same as A.	Same as A.

4.4.6 Management Actions Considered but Eliminated from Detailed Alternatives Analyses

Based on comments received during internal and external scoping, refuge staff evaluated a broad range of management actions for inclusion in the alternatives. Some of the general suggestions made for Lower Klamath Refuge also applied to Tule Lake Refuge. The management actions described below were eliminated from evaluation in any of the alternatives. The rationale for elimination is also described below.

Consider a voluntary buyout for agribusiness leases

The Service understood this comment to consist of eliminating lease land farming on the Tule Lake Refuge followed by restoration of the lease land area to native habitat. The Service did not include this management action for the following reasons.

- The Lower Klamath and Tule Lake Refuges are estimated to support more than 50% of the waterfowl in the Upper Klamath Basin (Service 2008). For migrating and wintering waterfowl, food is believed to be the most limiting resource. As a result, conservation planning for waterfowl outside of the breeding season is largely focused on providing sufficient foraging habitat. A Service review of waterfowl management (see Appendix M) on Lower Klamath and Tule Lake Refuges determined that leased agricultural lands represent a component of the overall refuge habitat complex and contributes to proper waterfowl management.
- As described in Section 3.3.2, in 2013 the Oregon water rights adjudication allocated water rights to the Service. The Service received Klamath Reclamation Project water rights with a 1905 priority date for irrigation uses for the leased and cooperative farm lands and Federal Reserved water rights with a priority date of 1928 and 1936 for Tule Lake Refuge. The adjudication established the relative priority of water rights within the Klamath Basin. The “within-Project priority” has also been established for Tule Lake. The irrigated lands on Tule Lake Refuge have an A, or first right, to Project water, as identified in the 1956 TID contract. This means that agriculture on the refuge is assured of receiving water each year while wetland areas are not. Without some degree of water supply reliability, which is provided through irrigation water, sufficient food resources for waterfowl could not be produced.

Although elimination of lease land farming is not considered in any of the alternatives, modifications of the lease land program are considered under each alternative.

Curtail agriculture in years when only partial water deliveries are made

Following several years of water shortages to refuge wetlands in the late 1990s and with the expectation that water shortages could become more common in the future, the Service prepared an EA evaluating the agricultural program on Tule Lake Refuge. In the EA the Service evaluated alternatives that would have curtailed agriculture on the Refuge in years when only partial water deliveries were made. In 2002, the Service selected the No Action Alternative and signed a FONSI. The Service selected the No Action Alternative because any water savings from a reduced irrigation program on the refuge would simply make more water available to higher priority Project water users rather than to refuge wetlands. **In addition, changes in the purpose of water rights to allow use of the water in wetlands are not permitted until the Klamath River Basin adjudication is finalized. Given that the first phase of the Klamath Adjudication took 38 years to complete, it is reasonable to assume that the judicial phase of the**

adjudication will not be completed during the 15-year life of this CCP. As a result, such changes are not considered feasible. In addition, curtailing agriculture is also likely to result in large weed infestations on lease lands. Weed-infested fields are seldom used by fall migratory waterfowl. The 2013 water rights adjudication does not change any of the conclusions reached in the 2002 EA/FONSI. Therefore, this management action was not included in any of the alternatives.

Flood the southwest sump with winter water to mimic a portion of historic hydrology

In accordance with the Kuchel Act (1964), the Southwest Sump is part of the reserved lands set aside for agricultural leasing consistent with proper waterfowl management. The Service determined lease lands are consistent with proper waterfowl management (see Appendix M). Therefore, in accordance with Section 4 of the Kuchel Act, the Service will continue the present pattern of leasing the reserved lands in the Southwest Sump as well as other reserved lands on the refuge.

Integrated Land Management Plan

A draft ILM Plan was developed in 2000 (Service 2000). The ILM Plan called for integrating agricultural areas more fully with wetlands on the refuge. Wetlands would be inserted within cropping rotations to improve soil tilth and fertility and reduce populations of plant parasitic nematodes. Farming would be used as a tool to maintain wetlands in an early successional stage (“moist soil” wetland plants). Water on croplands would be routed through wetlands to improve water quality. This management action would greatly modify the present pattern of leasing of reserved lands within the refuge. Section 4 of the Kuchel Act specifies that consistent with proper waterfowl management the Service is to continue the present pattern of leasing the reserved lands within the refuge. As described in Appendix M, the Service has determined that lease lands are consistent with proper waterfowl management if certain conditions are met. Therefore, the present pattern of leasing will be continued. In addition, Section 5 of the Kuchel Act states that Sumps 1A and 1B are not to be reduced to less than 13,000 acres. Implementing the ILM would reduce these areas to less than 13,000 acres by reclaiming and farming portions of Sumps 1A and 1B. In addition to conflicts with the Kuchel Act, this management strategy would require construction of a number of levees throughout the refuge which is likely to be cost prohibitive.

Although the ILM Plan was not included as part of any alternative, the Walking Wetlands Program is included under each alternative. The rotational nature of walking wetlands is similar to the ILM Plan, although on a much smaller scale. In addition, the area of Sumps 1A and 1B would be maintained, consistent with Section 5 of the Kuchel Act.

Increase populations of pheasants to improve hunting opportunities

Pheasants are a non-native species. Therefore, taking steps to increase the pheasant population on a national wildlife refuge is inconsistent with the Service’s Biological Integrity, Diversity, and Environmental Health (BIDEH) Policy (601 FW 3). However, the BIDEH policy does not require a refuge manager to take actions to reduce or eradicate self-sustaining populations of non-native, noninvasive species such as pheasants unless those species interfere with accomplishing refuge purpose(s). However, the Service does not manage habitats to increase populations of these species unless such habitat management supports accomplishing refuge purpose(s). Accordingly, the Service will not actively improve pheasant hunting on the refuge.

4.5 Upper Klamath National Wildlife Refuge Alternatives

4.5.1 Features Common to All Alternatives – Upper Klamath Refuge

A number of current management actions would be implemented for Upper Klamath Refuge under either of the alternatives. The one action alternative proposes additional management actions to improve refuge conditions. Actions that are common to all alternatives are described below and are not repeated in each alternative description.

Adaptive Management Approach

Habitat management on Upper Klamath Refuge would be primarily guided by the purposes of the refuge identified in Chapter 1 (Section 1.6.4). To achieve these purposes in a dynamic and sometimes unpredictable environment, Upper Klamath Refuge would be managed adaptively, with managers and biologists able to adjust management as on-the-ground monitoring reveals the results of previous habitat management practices, as other new information is developed, or as the needs of wildlife populations change.

Water Management

The extent of wetlands at Upper Klamath Refuge is entirely dependent on water levels in Upper Klamath Lake. Reclamation manages water in Upper Klamath Lake for Klamath Reclamation Project purposes in accordance with the 2013 BiOp.

Refuge wetlands are largely dry below lake elevations of 4,139.50 feet. The potential to reach this lake elevation occurs in 11 of 12 months under the current water allocation system (e.g., 2013 BiOp) and in 6 of 12 months if the KBRA were implemented.

Habitat Management

The Service would use a variety of management techniques to promote wetland and emergent marsh habitats including cattle grazing, haying, and use of prescribed fire. Intensively managed cattle grazing, haying, and prescribed fire would be used to create suitable habitat conditions. Wetland plants which have been undisturbed become decadent and less usable as green browse and as nesting and brooding habitat for waterfowl and other wildlife species. Using the management tools above the Service can effectively open up areas choked with vegetation, control invasive plants, and create a mosaic of emergent wetland habitats for wildlife.

Grazing

The Service would continue to use prescribed grazing as a management tool on refuge lands with domestic livestock, primarily cattle (*Bos taurus*), but possibly including goats (*Capra aegagrus hircus*) and/or sheep (*Ovis aries*). Grazing has occurred intermittently on the refuge for decades. In recent years, approximately 200 to 400 acres (approximately 100 AUMs) in the northwest corner and approximately 1,200 to 1,800 acres (approximately 460 AUMs) in the northern portion of the refuge (Barnes-Agency Unit) have been grazed annually (refer to Chapter 5, particularly Figure 5.21, for areas grazed in recent years). Together, these acreages comprise approximately 6% to 10% of the almost 23,100 acres within the approved refuge boundary. Plants grazed include grasses (e.g., *Agropyron* spp., *Agrostis* spp., *Poa palustris*, *Poa pratensis*, and *Hordeum* spp.); sedges (e.g., *Carex nebrascensis*, *Carex rostrata*, *Elocharis acicularis*, and *Juncus balticus*);

rushes; a mixture of forbs; and similar species. Especially in the Barnes-Agency Unit, invasive plants such as reed canary grass (*Phalaris arundinacea*), poison hemlock (*Conium maculatum*), perennial pepperweed (*Lepidium latifolium*), Canada thistle (*Cirsium arvense*), and musk thistle (*Carduus nutans*) are also targeted for grazing. All of these species grow on the refuge without the need for planting, irrigation, fertilization, or pest management/pesticide use. Grazing, along with other management techniques such as haying and mowing would be used to help achieve habitat and associated wildlife objectives (Appendix F). **Grazing is used to achieve the following CCP objectives: 1.1 marsh objective and 1.3 short-grass objective for interim management of the Barnes-Agency Unit. Grazing introduces an environmental disturbance event to create openings in** dense emergent or other vegetation, to set back vegetative succession, and thereby enhance habitat and wildlife diversity. This benefits foraging and breeding waterfowl, other water birds, and other wildlife. Because the emergent wetland habitat over much of the refuge is closely packed with vegetation, it is logistically difficult to accomplish small fires to open up the wetlands (Service 2008). **This standard practice of grazing decadent emergent marsh vegetation is allowed when the units are dry.** Grazing and the other habitat management techniques, as appropriate, are used on varying acreages and rotated around different parts of the refuge to ensure that a diversity of habitat types, qualities, and successional stages are always available for use by refuge wildlife. The mixture, acreage, locations, and timing of management techniques deployed during any particular year is based on an assessment of current and likely future habitat conditions and wildlife needs, including the potential availability of water; the availability of adequate funding, staff, and equipment; air quality restrictions; the availability of local farmers, ranchers, and livestock; forage quality; and site conditions (e.g., access, roughness of the terrain, fencing, and other infrastructure). Depending on precipitation and lake levels, grazing would be permitted in the spring, summer, and/or fall. The acreage available for grazing in the northwest corner of the refuge during any particular year depends on how much of the seasonal marsh was flooded by waters from Upper Klamath Lake. The Service does not control water levels in the lake.

Grazing practices at Upper Klamath Refuge would involve the use of a variety of infrastructure existing on the refuge and the personnel to manage the livestock. As a result of a past property acquisition in the northwest corner of the refuge (Barnes-Agency Unit), the Service already owns and makes available some of this infrastructure to a rancher, as appropriate. In the Barnes-Agency Unit, this includes barns, corrals, a loading/unloading ramp, and permanent fencing and gate(s) (which prevent livestock from trespassing between refuge and other public and private lands) along the west side of Fourmile Canal and the south side of Brown Road. Ranching personnel are on site as needed throughout the season to monitor the livestock and perform appropriate ranching-related functions, including fence maintenance, providing and positioning any watering facilities and mineral blocks, and operating the equipment. Some or all of this equipment is on the refuge throughout the season.

The area grazed on the Barnes-Agency Unit is currently protected by levees and due to subsidence, is at a lower elevation than the lake. Livestock would not be allowed to graze in or drink water from the lake or canals that drain to the lake. Instead, livestock would continue to be watered from seeps or springs within existing levees or from stock tanks within the levees that ranchers fill with water pumped from the lake or a canal.

Grazing on a refuge is conducted through use of a SUP issued by the Service. Under such a permit, a rancher pays the Service, on an AUM basis, to graze a particular location(s) on the refuge for a specified period of time. AUM fees would be based on local fair market values or set through a bidding process.

Haying

Haying of refuge lands includes the cutting, drying/curing, raking, baling, temporary storage (stacking of bales), and removal of vegetation (including plant heads, leaves, and stems), usually for livestock fodder. The most common plants hayed on the refuge include pasture grasses, rushes, and sedges. All of these plants grow on the refuge without the need for planting, irrigation, fertilization, and/or pest management. There have been haying programs on the refuge for decades. In recent years, approximately 200 acres in the northwest corner of the refuge have been hayed annually (refer to Chapter 5, particularly Figure 5.21). Because one of the principal purposes of haying would be to create openings in vegetation and thereby enhance habitat diversity, haying operations are rotated around different areas of the refuge.

Haying, along with other management techniques such as grazing, mowing, and prescribed fire, are used to help achieve habitat and associated wildlife objectives (Appendix F). An example objective could be to introduce an environmental disturbance event by using haying to open up dense emergent or other vegetation, to set back vegetative succession, and thereby enhance habitat and wildlife diversity. This could benefit foraging and breeding birds and other wildlife. Because the emergent wetland habitat over much of the refuge is closely packed with vegetation, it is logistically difficult to accomplish small fires to open up the wetlands (Service 2008). Therefore, the other habitat management techniques are used more frequently. The mixture, acreage, locations, and timing of management techniques deployed during any particular year is based on an assessment of current and likely future habitat conditions and wildlife needs, including the potential availability of water; the availability of adequate funding, staff, and equipment; air quality restrictions; the availability of local farmers, ranchers, and livestock; forage quality; and site conditions (e.g., access, roughness of the terrain, fencing, and other infrastructure). In the northwest corner of the refuge, the area that is hayed is a seasonal wetland that includes various plant species such as grasses (e.g., *Agropyron* spp., *Agrostis* spp., *Poa palustris*, *Poa pratensis*, and *Hordeum* spp.); sedges (e.g., *Carex nebrascensis*, *Carex rostrata*, *Elocharis acicularis*, and *Juncus balticus*); rushes; a mixture of forbs; and similar species. The amount of this area potentially available for haying during any particular year would depend on how much of the seasonal marsh was flooded by waters from Upper Klamath Lake. The Service does not control water levels in the lake.

Haying would require use of a variety of farm machines on the refuge (potentially including tractors, swathers/windrowers, hay rakes, hay balers, and trucks) and the personnel to operate these machines. Personnel would be on site as needed throughout the season to monitor the field(s) and perform appropriate farming-related functions, including operating the machines. Some or all of these machines could be on the refuge throughout the season.

Haying on refuge would be conducted through the SUP issued by the Service. Under the SUP, the farmer is required to record and submit to the Service the number and weights of hay bales removed from the refuge. The farmer pays the Service for the tonnage of hay harvested and the price is based on local market rates.

Fire Management

The Service would continue to implement the Complex Fire Management Plan. All wildland fires on the refuge would be suppressed. Fire fuels projects would be planned on a 5- to 10-year cycle, or more frequently if needed for invasive plant control or concern for other resource values. Firefighter and public safety would be the highest priority for every incident.

As a stand-alone tool, prescribed fire would be used in wetlands and uplands. It would be used in wetlands to open up dense stands of emergent vegetation, thereby creating open water areas for use by fall and spring migrant waterfowl. Shallow flooded burn areas are also used extensively by shorebirds during spring migration and as night roosts by sandhill cranes. Flooded burns warm quickly in the spring and are heavy producers of aquatic invertebrates, key food items of spring migrant ducks and shorebirds. Although fire is useful for creating openings in dense stands of emergent plants, this effect is short-lived as these plants re-sprout quickly from below the ground during the subsequent spring. Long-term control would require follow-up treatments of disking or plowing.

Prescribed fire in uplands invigorates grass nesting cover for waterfowl and other ground-nesting birds and creates green browse for spring migratory geese. Fire in upland habitats reduces brush species and increases the proportion of an area in grasses and forbs.

Prescribed fire on Upper Klamath Refuge would be conducted by trained and experienced personnel following national and regional fire policies. Burn plans would be written for each fire and include goals and objectives of the burn, staffing needs, required environmental conditions (wind speed, relative humidity, air temperature, etc.), and safety considerations.

Visitor Services

The Service would continue to monitor visitor use of the refuge.

Cultural Resources Management

Cultural resources would be managed and conserved in accordance with all applicable laws, policies, and regulations. More information about cultural resources management is provided in the Affected Environment and Environmental Consequences chapters, by refuge. In all alternatives The Klamath Tribes would be allowed to gather wocus plant materials as specified in SUPs.

Research

Research activities would continue to be allowed on a case-by-case basis as specified in SUPs.

Law Enforcement and Public Safety

The Service would maintain safe conditions at all visitor facilities at the refuge and provide adequate law enforcement.

4.5.2 Alternative A - No Action: Current Management Program – Upper Klamath Refuge

The No Action Alternative describes the current management for the refuge. It serves as a baseline with which the objectives and management actions of the action alternative, Alternative B, can be compared and contrasted. Because this alternative reflects current management, it would not result in substantial changes to the way the refuge would be managed in the future. Figure 4.12 summarizes the major features of Alternatives A and B.

Adaptive Management Approach

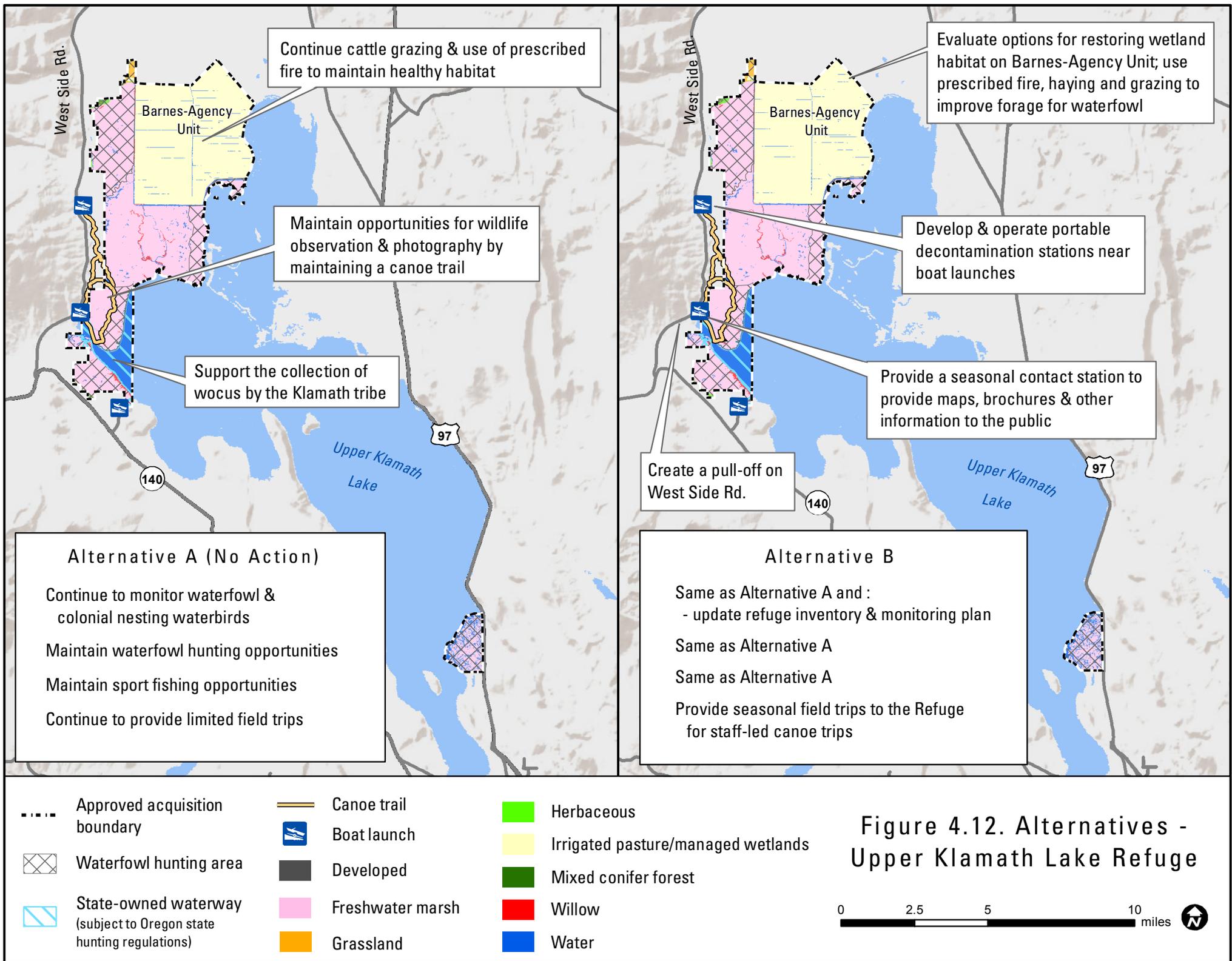
Habitat management on Upper Klamath Refuge would be primarily guided the purposes of the refuge identified in Chapter 1 (Section 1.6.4). To achieve these purposes in a dynamic and sometimes unpredictable environment, Upper Klamath Refuge would be managed adaptively, with managers and biologists able to adjust management as on-the-ground monitoring reveals the results of previous habitat management practices, as other new information is developed, or as the needs of wildlife populations change.

Under Alternative A, the Service would continue to conduct a variety of wildlife surveys to inform management. Periodic aerial waterfowl surveys would be conducted in September through April, ideally twice a month, but often only once a month and sometimes not at all depending on conditions. Areas surveyed off-refuge would include wetlands from Wood River Ranch north of Upper Klamath Lake down south to the Fall River Valley. For aerial surveys, the pilot and one observer fly in a high-wing airplane at less than 80 miles per hour and about 150 feet above the ground. A small voice recorder is used to capture the data. Transects are flown 0.5 mile apart. When large mixed flocks are present, which is common during migration, a first pass is made to estimate the total numbers followed by a second pass to determine the percentages of the various species. No visibility correction factor or doubling of numbers is done; the actual numbers counted are used to tally the total number of birds. By taking the average of the number of surveys in the month and multiplying by the number of days in the month, the waterfowl use days by species can be calculated (i.e., one mallard present for 30 days equals 30 use days).

Duck pair counts typically would be completed in mid-May or after migrant ducks have left. Two observers on each side of the plane would count singles, pairs, and groups of drakes 0.125 mile (660 feet) out from the plane in transects 0.500 mile apart and about 100 to 150 feet off the ground. Data are captured via a small voice recorder. Once the numbers are tallied by species they are multiplied by 2 (to account for only 0.25 mile of the 0.50-mile-wide transect being surveyed and the assumption that birds are evenly distributed) and the number of each species is then multiplied by a visibility correction factor to account for the difficulty of spotting them from the airplane.

Canada goose breeding pair counts would be done using the same protocol and in the same manner as the duck pair counts in mid- to late March.

Bald eagles would be observed on Upper Klamath Refuge throughout the year including the spring/summer breeding period and the wintering period when local birds are joined by migratory populations.



A general ground survey would be conducted annually to estimate use of colonial waterbirds on the refuge. These species are considered representative groups of colonial waterbirds that are relatively common on the refuge (see Appendix H).

The Service would also continue to maintain the Upper Klamath Refuge species catalog. The Service would develop and maintain GIS layers including boundaries, management units, grassland management units, fire perimeters, wetlands, and water infrastructure. The Service would continue to monitor waterfowl and colonial nesting waterbirds.

Habitat Management

Under Alternative A, the Service would continue the present pattern of habitat management actions at Upper Klamath Refuge as described in Features Common to All Alternatives. Habitat management would include prescribed livestock (primarily cattle) grazing, haying, and use of prescribed fire to maintain wetland and marsh habitats and help achieve habitat and associated wildlife objectives.

Water Management

The Service would continue to exercise its water right at Agency Lake Ranch and Barnes Ranch to divert water from Agency Lake tributaries for irrigation under the following water right certificates.

- Certificate 42581 (Wood River) has 4,005.7 acres inferior and 1,297.7 acres with 1910 priority (all primary acres)
- Certificate 42582 (Fourmile Creek, Sevenmile Creek, and Anna Slough) has 2,483.8 acres inferior and 1,611.6 acres with 1920 priority (all primary acres)
- Certificate 42583 (Wood River) has 24 primary acres with 1955 priority
- Certificate 42583 has 2,830.8 acres inferior and 1,297.8 acres with 1955 priority (all supplemental acres)

The priority date for water rights described above would be subsequent in time and interior to all rights for appropriation of waters of Wood River, Fourmile Creek, Sevenmile Creek, and Anna Slough Drain, with diversion points located upstream from the diversions under certificates numbered 309, 4791, and 23396, and perfected under certificates bearing dates of priority between January 26, 1910, and July 7, 1966, for Wood River; and between September 13, 1920, and July 7, 1966, for Fourmile Creek, Sevenmile Creek, and Anna Slough Drain.

Integrated Pest Management

The Service would continue to manage pests on the refuge consistent with policies of the Service and DOI (569 FW1 and 517 DM 1) using an IPM approach. The Service would continue to scout, map, and control priority invasive weed species with an emphasis on protecting high-priority wildlife habitat, particularly from new infestations. The Service uses a variety of methods to manage invasive species, with special attention to purple loosestrife (*Lythrum salicaria*), on the refuge. Chemical applications would be evaluated and permitted according to Service and DOI policies, and PUPs. Table 4.15 summarizes the current IPM practices on Upper Klamath Refuge.

Under this alternative, the Service would continue to use a variety of methods to manage invasive species (purple loosestrife and other plants) on the refuge, including mowing with deck mower and

application of pesticides. This includes monitoring and treating existing infestations, and monitoring for and quickly treating new infestations. In recent years, no areas have been chemically treated annually for invasive species control on the refuge. Grazing is used to target invasive plants such as reed canarygrass, poison hemlock, perennial pepperweed, Canada thistle, and musk thistle.

Table 4.15. Summary of Integrated Pest Management Practices at Upper Klamath National Wildlife Refuge

<i>Upper Klamath</i>	<i>IPM Practices</i>	<i>Description</i>	<i>Purpose</i>
Weed Control	Cultural or agronomic	Prescribed grazing. In the future water manipulation would be used to encourage native and desirable vegetation.	Habitat management
	Mechanical	Mowing with deck mower to reduce invasive and undesirable vegetation and limit seed bank.	Habitat management
	Chemical	Hand and utility-terrain vehicle boomless spraying to reduce noxious and pest weed species. See individual PUPs for chemical specific descriptions.	Habitat management

Cultural Resources Management

Cultural resources would be managed and conserved in accordance with all applicable laws, policies, and regulations. The Service would identify historic properties that coincide with existing and planned roads, facilities, public use areas, and habitat projects and evaluate threatened and impacted sites for eligibility to the NRHP. If necessary, the Service would prepare and implement activities to mitigate impacts to sites.

Visitor Services

Wildlife Observation

Under Alternative A, the Service would continue public opportunities for wildlife observation and photography by maintaining a canoe trail through the wetlands.

Photography

The Service would continue existing opportunities for nature interpretation by continuing to provide canoe trail maps and brochures at the Refuge Complex Visitor Center and Rocky Point Resort; provide canoe trail maps and interpretive signs at Rocky Point and Malone Springs boat launches; and provide information and interpretive programs to the public by hiring seasonal volunteers.

Interpretation

The Service would continue to provide canoe trail maps and brochures at the refuge headquarters and at the Rocky Point Resort. The Service would continue to provide a canoe trail map and interpretive signs at Rocky Point and Malone Springs boat launches. The Service would continue to provide information and interpretive programs to the public by hiring seasonal interpretation volunteers.

Hunting

The Service would continue existing hunting opportunities by offering diverse waterfowl hunting; offering a large free-roam hunt area; maintain hunt area accessibility via motor boats, canoe style boats, and walk-in only hunting opportunities; maintain hunt areas in a variety of habitats including flooded marsh, and dry and flooded pasture lands; maintain no hunting fees; and maintain a hunt program consistent with Oregon State hunting dates and regulations.

Fishing

The Service would continue opportunities for fishing and offer a diversity of fishing opportunities; offer motorboat or canoe style boat accessibility; and maintain a fishing program consistent with Oregon State fishing regulations.

Environmental Education

The Service would maintain environmental education opportunities by providing limited field trips on request to Upper Klamath Refuge and surrounding national forest lands.

Outreach

Although no outreach specific to Upper Klamath Refuge would be offered at the refuge, the Service would maintain outreach opportunities about natural resources in the ecoregion and the NWRS by hosting special events at the Refuge Complex Visitor Center, participating in community events, and offering off-site special events.

4.5.3 Alternative B – Upper Klamath Refuge (Preferred Alternative)

Adaptive Management Approach

Under Alternative B, the Service would follow the adaptive management approach outlined under Actions Common to All Alternatives and Alternative A. Under Alternative B, the goals, objectives, and strategies identified for Upper Klamath Refuge in Appendix F would guide management over the next 15 years.

The habitat objectives in Appendix F are designed to achieve refuge purposes listed in Chapter 1. Appendix F also includes monitoring elements which are the surveys that are used to track achievement of the objectives. Finally, the appendix lists the management strategies which are the specific actions, tools, or techniques that are necessary to accomplish each objective.

The goals, objectives, and strategies for Upper Klamath Refuge in Appendix F would form the basis of a new habitat management plan which the Service would develop. This plan would include more specific objectives for each refuge habitat, monitoring programs that track achievement of both population and habitat objectives, and thresholds for taking management actions.

Annual habitat plans would continue to be developed each spring based on habitat management objectives (Appendix F), current habitat conditions, and the results of monitoring.

Under Alternative B, the Service would also develop a new inventory and monitoring plan for Upper Klamath Refuge. The purpose of the plan would be to identify and prioritize existing and

new inventories and monitoring needed to inform adaptive management of priority refuges resources.

Wildlife Habitat Management

In addition to the actions described under Features Common to All Alternatives, the Service would collaborate with adjoining landowners and other organizations to enhance and restore fringe wetland habitats on Upper Klamath Lake adjacent to Upper Klamath Refuge. Additionally the Service would support implementation of recovery actions in the Revised Lost River Sucker and Shortnose Sucker Recovery Plan (Service 2012). The goal of these actions is to restore or enhance spawning and nursery habitat and reduce the negative impacts of poor water quality. Project details would be evaluated under a separate NEPA analysis.

The Service would expand its use of habitat management by using prescribed fire, haying (**up to an additional 2,500 acres**), and grazing in the Barnes-Agency Unit to improve habitat structure and provide green browse and nesting and brooding habitat for migrating waterfowl. Prescribed burning would not be conducted during times of the year when peat soils are dry enough to ignite.

Additionally, the Service would evaluate options for restoring wetland habitat in the Barnes-Agency Unit. Project details would be evaluated under a separate NEPA analysis. The long-term goals would be to restore wetlands on these areas and reconnect them with Upper Klamath and Agency Lakes. Currently the ranches are separated from Upper Klamath and Agency Lakes by large containment levees. The Service has done some preliminary planning for levee breaching options, but the NEPA process has not yet commenced. The Service is also working with adjacent landowners to address potential benefits of wetland restoration at the Barnes-Agency Unit which could include:

- reconnecting the full gradient of wetlands (open water, submergent, emergent, and seasonal fringe) to Upper Klamath and Agency Lakes;
- expanding and improving refugial habitat for shortnose and Lost River suckers;
- fully restoring spring-fed Fourmile and Sevenmile Creeks to their historic channels, delivering clear cold water to Upper Klamath Lake, restoring fish passage, and improving the important redband rainbow trout and bull trout fisheries;
- improving water quality in Upper Klamath and Agency Lakes by eliminating drainage ditches and allowing drain water to naturally pass through large-scale functioning wetlands;
- expanding water storage in Upper Klamath Lake;
- improving habitat for waterfowl; and
- relieving the Service from operation and maintenance costs related to levee construction and maintenance.

Integrated Pest Management

In addition to the actions described under Alternative A, the Service would formalize the ongoing pest management for habitat management and maintenance under an IPM program as described in Appendix Q. Although Service Policy (569 FW 1.12) does not require an IPM plan prior to pesticide application, doing so may allow multi-year approvals of certain proposed pesticide uses that would normally require regional or national level review. Under Alternative B, the Service would also work to prevent the introduction or spread of aquatic invasive species by pursuing partnerships with the State of Oregon and the U.S. Forest Service to develop and operate a portable decontamination station(s) near boat launches on U.S. Forest Service lands.

Cultural Resources Management

Alternative B would include the cultural resources management actions listed under Alternative A. In addition, the Service would implement a proactive cultural resources management program to evaluate the NRHP eligibility of cultural resources that may be impacted by Service undertakings, management activities, erosion, or neglect. The Service would also develop partnerships with The Klamath Tribes for cultural resources inventory, evaluation, and project monitoring. The Service would also perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility and develop partnerships (e.g., University of Oregon, NPS) to assist in the stabilization and restoration of archaeological and historic sites and structures. Finally, the Service would create and use a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act.

Visitor Services

Wildlife Observation and Photography

Under Alternative B, in addition to wildlife observation and photography features of Alternative A, the Service would create a pull-off on West Side Road to view the refuge.

Interpretation

Under Alternative B, in addition to nature interpretation features of Alternative A, the Service would collaborate with the U.S. Forest Service and U.S. Bureau of Land Management (BLM) to provide interpretation about Upper Klamath Refuge, specifically about Barnes-Agency Unit parcels which border the BLM Wood River Wetlands. The Service would provide a seasonal contact station to provide maps, brochures, and other information to the visiting public; develop a more permanent solution to having a seasonal point of contact during peak user visitation; develop interpretative signs along the canoe trails; and develop an interpretive kiosk at the pull-off on West Side Road.

Hunting and Fishing

Under Alternative B, the hunting and fishing features would be the same as Alternative A.

Environmental Education

In addition to environmental education features in Alternative A, the Service would provide four seasonal field trips to lead canoe tours on the refuge.

Outreach

Under Alternative B, the outreach features would be the same as Alternative A.

Law Enforcement and Public Safety

In addition to features in Alternative A, the Service would install and maintain more directional signs along canoe trails to increase public safety.

4.5.4 Comparison of Alternatives

A comparative summary of the alternatives for the Upper Klamath Refuge is provided in Table 4.16.

Table 4.16. Summary of the Alternatives for Upper Klamath Refuge

	<i>Alternative A Current Program (No Action)</i>	<i>Alternative B (Preferred Alternative)</i>
Wetland Habitat Management	<ul style="list-style-type: none"> ■ Wetland water elevation throughout Upper Klamath Refuge is dependent on the operation of the Klamath Reclamation Project consistent with the 2013 BiOp. ■ Refuge wetlands largely dry below lake elevation of 4,139.50 feet. ■ The potential to reach this lake elevation occurs in 11 of 12 months under the current water allocation system (2013 BiOp) and in 6 of 12 months if the KBRA were implemented. ■ Continue present program of managed cattle grazing and use of prescribed fire to maintain wetland and marsh habitats. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Collaborate with adjoining landowners and other organizations to enhance and restore fringe wetland habitats on Upper Klamath Lake adjacent to Upper Klamath Refuge. ■ Support implementation of recovery actions in the Revised Lost River Sucker and Shortnose Sucker Recovery Plan (Service 2012).
Barnes-Agency Unit Management	<ul style="list-style-type: none"> ■ Continue to control priority invasive species. ■ Exercise water rights. ■ Use haying and grazing to control invasive plants and improve habitat structure and provide green browse for migrating waterfowl (dabbling ducks and geese). 	<ul style="list-style-type: none"> ■ Evaluate options for restoring wetland habitat on Barnes-Agency Unit (project details will be evaluated under a separate environmental analysis). ■ Collaborate with BLM to integrate subsidence reversal.
Integrated Pest Management	<ul style="list-style-type: none"> ■ Monitor for purple loosestrife. ■ Continue to monitor and treat existing invasive weed infestations with an emphasis on new infestations. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Formalize pest management practices under an IPM program. Prevent the introduction of aquatic invasive species by pursuing partnerships with the State of Oregon and U.S. Forest Service to develop and operate a portable decontamination station(s) near boat launches on U.S. Forest Service lands.
Fire Management	<ul style="list-style-type: none"> ■ Continue to implement Refuge Complex Fire Management Plan. ■ Suppress all wildfires. 	<ul style="list-style-type: none"> ■ Same as A.
Inventory and Monitoring	<ul style="list-style-type: none"> ■ Maintain the species catalog for Upper Klamath Refuge. ■ Develop and maintain GIS layers including boundaries, management units, grassland management units, fire perimeters, wetlands, and water infrastructure. ■ Continue to monitor waterfowl and colonial nesting waterbirds. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Update refuge inventory and monitoring plan with an emphasis on priority wildlife species and habitats.

Table 4.16. Summary of the Alternatives for Upper Klamath Refuge

	<i>Alternative A Current Program (No Action)</i>	<i>Alternative B (Preferred Alternative)</i>
Cultural Resources	Same as Lower Klamath Refuge Alternative A.	Same as Lower Klamath Refuge Alternative B.
Tribal Trust Resources	<ul style="list-style-type: none"> ■ Continue to support the collection of wocus within the refuge by The Klamath Tribes. 	Same as A.
Wildlife Observation and Photography	<ul style="list-style-type: none"> ■ Maintain public opportunities for wildlife observation and photography by maintaining a canoe trail through the wetland. 	Same as A, and: <ul style="list-style-type: none"> ■ Create a pull-off on West Side Road for views of the refuge.
Interpretation	<ul style="list-style-type: none"> ■ Continue to provide canoe trail maps and brochures at the refuge headquarters and Rocky Point Resort. ■ Continue to provide a canoe trail map and interpretive signs at Rocky Point and Malone Springs boat launches. ■ Continue to provide information and interpretive programs to the public by hiring seasonal volunteers. 	Same as A, and: <ul style="list-style-type: none"> ■ Collaborate with U.S. Forest Service and BLM to provide interpretation about the refuge, specifically Barnes-Agency Unit, which borders the Wood River Wetlands. ■ Establish a seasonal contact station to provide maps, brochures, and other information to visiting public. ■ Develop a more permanent solution to having a seasonal point of contact during peak visitation. ■ Develop interpretive signs along the canoe trail. ■ Develop an interpretive kiosk on West Side Road at a pull-off.
Hunting	<ul style="list-style-type: none"> ■ Maintain a diversity of waterfowl hunting opportunities. ■ Maintain hunting opportunities via large free-roam areas. ■ Maintain hunt area accessibility via motorized and non-motorized boats. ■ Provide hunt opportunities in a variety of habitats including flooded marsh. ■ Maintain a hunt program consistent with Oregon State hunting regulations. ■ No hunting fee required. 	Same as A.
Fishing	<ul style="list-style-type: none"> ■ Maintain a diversity of sport fishing opportunities. ■ Maintain fishing opportunities via motor boat or canoe style boat accessibility. ■ Maintain a fishing program consistent with Oregon State fishing regulations. 	Same as A.
Environmental Education	<ul style="list-style-type: none"> ■ Continue to provide limited field trips to the refuge and bordering U.S. Forest Service public lands upon request. 	Same as A, and: <ul style="list-style-type: none"> ■ Provide seasonal field trips to the refuge to lead canoe tours. ■ Collaborate with U.S. Forest Service to provide educational programs on site and around refuge year-round.
Outreach	<ul style="list-style-type: none"> ■ Maintain public outreach about natural resources in the ecoregion and the NWRS by hosting special events at the Refuge Complex, participating in community events, and offering off-site presentations upon request. 	Same as A.

Table 4.16. Summary of the Alternatives for Upper Klamath Refuge

	<i>Alternative A</i> <i>Current Program (No Action)</i>	<i>Alternative B</i> <i>(Preferred Alternative)</i>
Public Safety	<ul style="list-style-type: none"> ■ Maintain safe conditions at all visitor facilities. 	Same as A, and: <ul style="list-style-type: none"> ■ Install more directional signs and maintenance to ensure safety on canoe trail.

4.5.5 Management Actions Considered but Eliminated from Detailed Alternatives Analyses

Based on comments received during internal and external scoping, refuge staff evaluated a range of management actions for inclusion in the alternatives. The following management action was suggested for Upper Klamath Refuge during scoping.

Remove dikes in Barnes-Agency Unit in terms of wetland production

The Service considered addressing the Barnes-Agency Unit wetland restoration options in this CCP process. However, insufficient site-specific information is available to thoroughly evaluate the impacts of this development as part of the CCP. This will occur in a separate step-down planning and environmental analysis.

4.6 Bear Valley National Wildlife Refuge Alternatives

4.6.1 Features Common to All Alternatives – Bear Valley Refuge

A number of current management actions would be implemented for Bear Valley Refuge under both the action alternative (Alternative B) and No Action Alternative. The one action alternative proposes additional management actions to improve refuge conditions and meet wildlife and habitat objectives. Actions that are common to all alternatives are described below and are not repeated in each alternative description.

Adaptive Management Approach

Habitat management on Bear Valley Refuge would be primarily guided by the purposes of the refuge identified in Chapter 1 (Section 1.6.5). To achieve these purposes in a dynamic and sometimes unpredictable environment, Bear Valley Refuge would be managed adaptively, with managers and biologists able to adjust management as on-the-ground monitoring reveals the results of previous habitat management practices, as other new information is developed, or as the needs of wildlife populations change.

Habitat Management

The Service would use a variety of methods to manage vegetation on the refuge, including mechanical control, prescribed fire, and application of pesticides. The aim of these tools would be to promote fire-resilient mixed conifer forest with mature and old growth stands of ponderosa pine (*Pinus ponderosa*), incense cedar (*Calocedrus decurrens*), white fir (*Abies concolor*), and Douglas-fir (*Pseudotsuga menziesii*) that support nesting and roosting bald eagles.

The Service would continue to implement the existing Complex Fire Management Plan. All wildland fires on the refuge would be suppressed. Although native, through decades of aggressive fire suppression, white fir has expanded beyond its historical range regionally and throughout the Bear Valley Refuge. White fir is a shade-tolerant species which allows it to grow as a dense understory, eventually out-competing other mixed conifer species including Douglas fir, incense cedar, and ponderosa pine. Dense stands of white fir create more fire fuels increasing the likelihood of intense wildfire. The Service would use mechanical tree removal to reduce overall tree density and particularly of white fir, reduce wildfire risk, and encourage mature growth of ponderosa pine, incense cedar, and Douglas fir.

Prescribed fire in upland habitats at the refuge reduces brush species and increases the proportion of an area in grasses and forbs. Prescribed fire on Bear Valley Refuge would be conducted by trained and experienced personnel following national and regional fire policies. Burn plans would be written for each fire and include goals and objectives of the burn, staffing needs, required environmental conditions (wind speed, relative humidity, air temperature, etc.), and safety considerations.

The Service would monitor wintering roosting bald eagle populations via twice-monthly morning fly out counts and nest occupation to help inform habitat management decisions.

Visitor Services

The Service would continue to provide outreach to the public about Bear Valley Refuge, and natural resources in the ecoregion and the NWRS by hosting special events at the Refuge Complex Visitor Center and participating in off-site special events; continue to provide environmental education programs in the Refuge Complex Visitor Center facility or in the classroom about bald eagle and mature mixed conifer forests; and continue to monitor visitor use of the refuge.

Cultural Resources Management

Cultural resources would be managed and conserved in accordance with all applicable laws, policies, and regulations. More information about cultural resources management is provided in the Affected Environment and Environmental Consequences chapters.

Research

Research activities would continue to be allowed on a case-by-case basis using SUPs.

Law Enforcement and Public Safety

The Service would maintain safe conditions at all visitor facilities at the refuge and provide adequate law enforcement.

4.6.2 Alternative A - No Action: Current Management Program – Bear Valley Refuge

The No Action Alternative describes the current management for the refuge. It serves as a baseline with which the objectives and management actions of the action alternative, Alternative B, can be compared and contrasted. Because this alternative reflects current management, it

would not result in substantial changes to the way the refuge would be managed in the future. Figure 4.13 summarizes the major features of Alternatives A and B for Bear Valley Refuge.

Adaptive Management Approach

Under Alternative A, the Service would maintain the Bear Valley Refuge species catalog. The Service would develop and maintain GIS layers including boundaries, management units, grassland management units, fire perimeters, wetlands, and water infrastructure.

Under Alternative A, the Service would implement the long-term monitoring program for bald eagles. An observation point near the main entrance of the refuge is used to view bald eagles flying out of Bear Valley during the winter months. The age, time, and the number of eagles observed for each morning survey is recorded. The survey starts 45 minutes prior to sunrise and is completed over the next hour.

Bald eagle nesting activity would also be monitored on the refuge during the spring.

Habitat Management

Under Alternative A, the Service would continue the present program of habitat management actions at Bear Valley Refuge. Primary management actions would take place in upland forest habitats, and would include silvicultural thinning, prescribed fire, and understory mowing to reduce fire fuels loading, promote fire-resistant conifer species, and allow forested habitats to develop old growth and mature forest characteristics. Forested habitats would be primarily managed as winter roosting habitat for bald eagles.

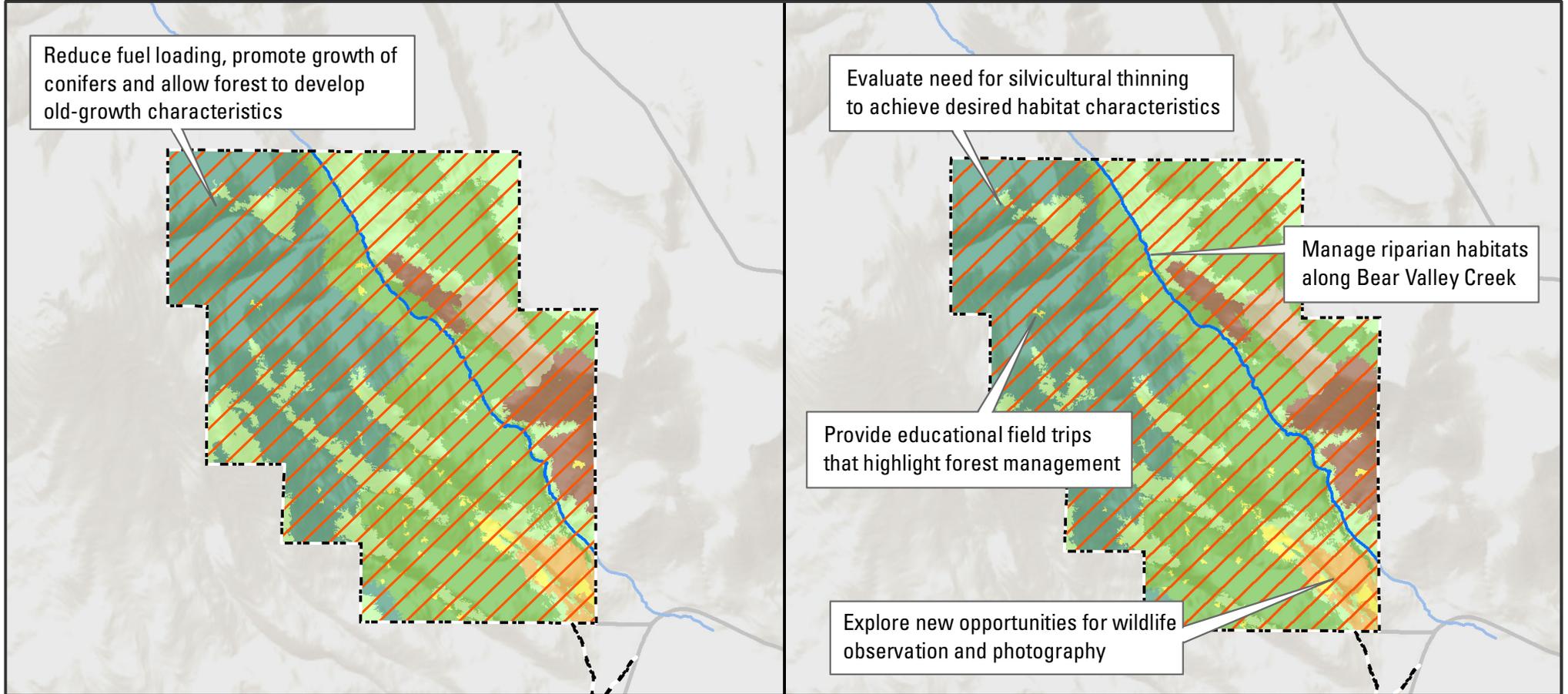
Riparian areas would remain largely unmanaged.

Integrated Pest Management

Under all alternatives, the Service would continue to periodically monitor and treat invasive species. In addition to fish and wildlife habitat, invasive species management on the refuge would also target roadside corridors. In recent years, approximately 1 to 10 acres have been treated with pesticides annually for invasive species control on the refuge. Chemical applications would be evaluated and permitted according to the Service and DOI policies, and the Service’s PUP process. Table 4.17 summarizes the current IPM practices on Bear Valley Refuge.

Table 4.17. Summary of Integrated Pest Management Practices at Bear Valley National Wildlife Refuge

<i>Bear Valley</i>	<i>IPM Practices</i>	<i>Description</i>	<i>Purpose</i>
Weed Control	Mechanical	Hand cutting using chainsaw to reduce density of trees and other vegetation to encourage large trees for bald eagle nesting.	Habitat management
	Physical	Prescribed burning used to reduce understory vegetation.	Habitat management
	Chemical	Hand and utility-terrain vehicle boomless spraying to reduce noxious and pest weed species.	Habitat management



Alternative A (No Action)

Continue periodic monitoring & treatment of invasive species

Continue to monitor winter roosting bald eagles via twice-monthly morning fly-out counts; continue to monitor eagle nests

Maintain deer hunting consistent with state of Oregon regulations

Alternative B

Same as Alternative A

Same as Alternative A and:

- develop a wildlife inventory & monitoring plan

Same as Alternative A and:

- establish parking for designated hunting access points
- consider allowing additional hunting opportunities
- revise hunt plan to require non-toxic ammunition

<ul style="list-style-type: none"> Approved acquisition boundary Bear Valley Creek Deer hunting permitted Bunchgrass grassland Sagebrush shrubland 	<ul style="list-style-type: none"> Mtn. mahogany/juniper woodland Juniper woodland Open Ponderosa pine forest with shrub understory Ponderosa pine forest Mixed conifer forest 	<p style="font-size: 1.2em; margin: 0;">Figure 4.13. Alternatives - Bear Valley Refuge</p> <div style="display: flex; align-items: center; justify-content: flex-end; margin-top: 10px;"> <div style="margin-right: 20px;"> <p>0 0.5 1 2</p> <hr style="border: 1px solid black; width: 100%;"/> <p>miles</p> </div> <div style="text-align: center;"> </div> </div>
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Cultural Resources Management

Cultural resources would be managed and conserved in accordance with all applicable laws, policies, and regulations. The Service would identify historic properties that coincide with existing and planned roads, facilities, public use areas, and habitat projects and evaluate threatened and impacted sites for eligibility to the NRHP. If necessary, the Service would prepare and implement activities to mitigate impacts to sites.

Visitor Services

Under Alternative A, public road access and parking does not exist, but walk-in public access for hunting without a public parking area at the north entrance would be continued. The Service would maintain administrative use only road access at the south entrance; and would not develop public access or permit parking at the south entrance.

Wildlife Observation and Photography

Currently, Bear Valley Refuge is not opened to the public for wildlife observation and photography, and there are no developed facilities for wildlife viewing or photography within Bear Valley Refuge.

Wildlife Interpretation

The Service would maintain existing opportunities for nature interpretation by providing information about Bear Valley Refuge at the Refuge Complex Visitor Center.

Hunting

The Service would maintain existing hunting opportunities at Bear Valley Refuge by maintaining walk-in only deer hunting; and maintaining hunting consistent with Oregon State hunting tags, dates, and regulations.

Environmental Education

The Service would maintain off-site environmental education opportunities by providing kindergarten to 12th grade curriculum about wintering bald eagle ecology.

Outreach

The Service would maintain outreach opportunities to provide information about the refuge and bald eagles by participating in the annual Winter Wings Festival in Klamath Falls.

4.6.3 Alternative B – Bear Valley Refuge (Preferred Alternative)

Adaptive Management Approach

Under Alternative B, the Service would follow the adaptive management approach outlined under Actions Common to All Alternatives and Alternative A. Under Alternative B, the goals, objectives, and strategies identified for Bear Valley Refuge in Appendix F would guide management over the next 15 years.

The habitat objectives in Appendix F are designed to achieve refuge purposes listed in Chapter 1. Appendix F also includes monitoring elements which are the surveys that are used to track achievement of the objectives. Finally, the appendix lists the management strategies which are the specific actions, tools, or techniques that are necessary to accomplish each objective.

The goals, objectives, and strategies for Bear Valley Refuge in Appendix F would form the basis of a new habitat management plan which the Service would develop. This plan would include more specific objectives for each refuge habitat, monitoring programs that track achievement of both population and habitat objectives, and thresholds for taking management actions.

Under Alternative B, the Service would also develop a new inventory and monitoring plan for Bear Valley Refuge. The purpose of the plan would be to identify and prioritize existing and new inventories and monitoring needed to inform adaptive management of priority refuge resources.

Habitat Management

Under Alternative B, in addition to features in Alternative A, the Service would evaluate potential to manage forests for a wider array of wildlife species while continuing to promote old grown and mature mixed conifer forest characteristics. The Service would evaluate the need for future silvicultural thinning to achieve desired habitat characteristics. **The Service would coordinate with partners that are leading efforts to assess the effects of climate change on the rate of snag creation and deterioration, and development of snag retention guidelines to benefit tree cavity-dependent wildlife.**

The Service would also manage riparian areas in Bear Valley Creek for more optimized use by priority wildlife species as identified in the Partners in Flight East Slope Cascades Plan. This largely involves the mechanical thinning of ponderosa pine to encourage increased water flow in Bear Valley Creek and growth of more grasses and forbs.

Integrated Pest Management

In addition to the actions described under Alternative A, the Service would formalize the ongoing pest management for habitat management under an IPM program as described in Appendix Q. Although Service Policy (569 FW 1.12) does not require an IPM plan prior to pesticide application, doing so may allow multi-year approvals of certain proposed pesticide uses that would normally require regional or national level review.

Cultural Resources Management

Alternative B would include the cultural resources management actions under Alternative A. In addition, the Service would implement a proactive cultural resources management program to evaluate the NRHP eligibility of cultural resources that may be impacted by Service undertakings, management activities, erosion, or neglect. The Service would also develop partnerships with The Klamath Tribes for cultural resources inventory, evaluation, and project monitoring. The Service would also perform an inventory and assessment of archaeological and historic sites to determine NRHP eligibility and develop partnerships (e.g., University of Oregon, NPS) to assist in the stabilization and restoration of archaeological and historic sites and structures. Finally, the Service would create and use a Memorandum of Agreement with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act.

Visitor Services

Wildlife Observation and Photography

Under Alternative B, the Service would consider creating opportunities for wildlife observation and photography and the potential for siting a viewing facility at the southern entrance of Bear Valley Refuge. If Alternative B is approved for implementation through the CCP, the Service would consider site-specific planning and environmental analysis before implementing future proposed improvements.

Interpretation

In addition to nature interpretation features under Alternative A, the Service would increase interpretive information and provide more exhibits at the Refuge Complex Visitor Center related to Bear Valley Refuge forested ecosystems and wildlife species. The Service would develop an interpretive pamphlet to help educate users about how to prevent introduction of invasive species. The Service would explore options for future development of a viewing facility on the southern boundary of the refuge and would explore opportunities to develop and present interpretive programs.

Hunting

In addition to hunting opportunities under Alternative A, the Service would consider allowing additional hunting opportunities. The Service would revise the hunt plan and refuge-specific regulations to require non-toxic ammunition for deer hunting. The Service would establish parking for designated hunting access points at the north and south entrances.

Environmental Education

In addition to environmental education activities under Alternative A, the Service would provide on-site educational field trips that highlight refuge forest management practices.

Outreach

Under Alternative B, the outreach features would be the same as under Alternative A.

4.6.4 Comparison of Alternatives

A comparative summary of the alternatives for the Bear Valley Refuge is provided in Table 4.18.

Table 4.18. Summary of the Alternatives for Bear Valley Refuge

	<i>Alternative A Current Program (No Action)</i>	<i>Alternative B (Preferred Alternative)</i>
Forest Habitat Management	<ul style="list-style-type: none">■ Continue present program of prescribed fire and understory mowing to reduce fuel loading, promote fire-resistant conifer species, and allow forested habitats to develop old growth and mature forest characteristics.■ Forested habitats are primarily	Same as A, and: <ul style="list-style-type: none">■ Evaluate potential to manage forests for a wider array of wildlife species while continuing to promote old growth and mature forest characteristics.■ Evaluate need for future silvicultural thinning to achieve desired habitat

Table 4.18. Summary of the Alternatives for Bear Valley Refuge

	<i>Alternative A</i> <i>Current Program (No Action)</i> managed as winter roosting habitat for bald eagles.	<i>Alternative B</i> <i>(Preferred Alternative)</i> characteristics.
Riparian Habitat Management	<ul style="list-style-type: none"> ■ Riparian habitats would remain largely unmanaged. 	<ul style="list-style-type: none"> ■ Coordinate with partners on snag retention guidelines to benefit tree cavity-dependent wildlife. ■ Manage riparian habitats along Bear Valley Creek to optimized use by priority species as identified in the Partners in Flight East Slope Cascades Plan.
Invasive Species Management	<ul style="list-style-type: none"> ■ Continue periodic monitoring and treatment of invasive species on a yearly basis. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Formalize pest management practices under an IPM program.
Fire Management	<ul style="list-style-type: none"> ■ Implement Refuge Complex Fire Management Plan. ■ Suppress all wildfires. ■ Focus fuel projects on a 5- to 10-year cycle or more frequent if needed for invasive plant control or other resource reasons. 	<p>Same as A.</p>
Inventory and Monitoring	<ul style="list-style-type: none"> ■ Maintain the species catalog for Bear Valley Refuge. ■ Develop and maintain GIS layers including boundaries, management units, grassland management units, fire perimeters, wetlands, and water infrastructure. ■ Continue to monitor winter roosting bald eagles via twice per month morning fly-out counts. ■ Continue to monitor eagle nests. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Develop wildlife inventory and monitoring plan which would include all priority wildlife species (in addition to bald eagles).
Cultural Resources	<p>Same as Lower Klamath Refuge Alternative A.</p>	<p>Same as Lower Klamath Refuge Alternative B.</p>
Wildlife Observation and Photography	<ul style="list-style-type: none"> ■ Bear Valley Refuge is not open for wildlife observation and photography. 	<ul style="list-style-type: none"> ■ Explore new opportunities for wildlife observation and photography (e.g., viewing area at the south entrance for bald eagle viewing).
Interpretation	<ul style="list-style-type: none"> ■ Maintain public opportunities for nature interpretation via media at Refuge Complex Visitor Center and Refuge Complex website. 	<ul style="list-style-type: none"> ■ Explore opportunities to develop and present interpretive programs and associated facilities on site.
Hunting	<ul style="list-style-type: none"> ■ Maintain deer hunting consistent with Oregon State hunting dates and regulations. ■ Tags provided by State of Oregon. ■ Maintain walk-in access only. ■ No other hunting opportunities are available on Bear Valley Refuge. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Establish parking for designated hunting access points on north and south sides of the refuge. ■ Consider allowing additional hunting opportunities. ■ Revise hunt plan and refuge-specific regulations to require non-toxic ammunition.
Environmental Education	<ul style="list-style-type: none"> ■ Maintain kindergarten through 12th grade curriculum about wintering bald eagle biology. 	<p>Same as A, and:</p> <ul style="list-style-type: none"> ■ Provide on-site educational field trips that highlight refuge forest management practices.

Table 4.18. Summary of the Alternatives for Bear Valley Refuge

	<i>Alternative A Current Program (No Action)</i>	<i>Alternative B (Preferred Alternative)</i>
Outreach	<ul style="list-style-type: none"> ■ Continue to participate in annual Winter Wings Festival in Klamath Falls. 	Same as A.
Public Safety and Law Enforcement	<ul style="list-style-type: none"> ■ Maintain safe conditions at all visitor facilities at the refuge and ensure adequate law enforcement is available. 	Same as A, and: <ul style="list-style-type: none"> ■ Install additional directional and boundary signs.
Monitor Public Use	<ul style="list-style-type: none"> ■ Continue to monitor visitor use of refuge lands. 	Same as A.

4.6.5 Management Actions Considered but Eliminated from Detailed Alternatives Analyses

The Service considered all management actions identified for Bear Valley Refuge during internal and external scoping. No proposed management actions were eliminated from analysis.