KLAMATH BASIN NATIONAL WILDLIFE REFUGES
4009 HILL ROAD
TULELAKE, CA 96134

COMMERCIAL (530) 667-2231 **FAX (530) 667-3299**

Dear Interested Party: June 12, 2001

Enclosed is the final Environmental Assessment (EA) regarding the development of groundwater production wells to augment the water supply for the Lower Klamath National Wildlife Refuge.

The EA analyzes the development of seven groundwater wells spread around the perimeter of the refuge, along with acquisition of an existing well and/or water supplies from refuge neighbors. Based on a test drilling program conducted during the summer of 2000, an engineering analysis was developed which indicates that 23,000 acre feet can be produced during the critical months of June through October, supplying about one third of the refuge need during that period. This development is expected to occur between July and December, 2001. This action would be a significant step towards addressing a portion of the predicted shortfall of water in 70% of future years, as per the U.S. Bureau of Reclamation's 2001 Operations Plan.

Other alternatives analyzed were the no action alternative and the construction of the formerly proposed Unit 13 storage reservoir.

Public comments on the draft EA were accepted through May 15, 2001. Based on the comments received, the refuge wishes to emphasize that ground water monitoring at the Lower Klamath NWR well sites will be done in cooperation with the California Department of Water Resources, Siskiyou County and in conformance with the Siskiyou County Groundwater Monitoring Plan. This will allow all the entities involved to determine if the pumping is impacting the aquifer and nearby private wells. If adverse impacts to the aquifer are observed, the refuge will modify its pumping program.

Sincerely:

Phil Norton
Refuge Manager

FINDING OF NO SIGNIFICANT IMPACT

Development of Water Supply Production Wells for Lower Klamath National Wildlife Refuge
(Title of Project)

Klamath Basin National Wildlife Refuges
4009 Hill Road
Tulelake, California 96134
(Name and Address of FWS Facility)

The U.S. Fish and Wildlife Service proposes to:

Drill up to seven new wells on Lower Klamath National Wildlife Refuge (LKNWR), acquire an additional neighboring well, and purchase water from one or more additional neighboring wells for the purpose of providing water to critical refuge wetlands during periods when surface water sources are limited or unavailable to the refuge.

FWS has analyzed a number of alternatives to the proposal, including the following: (List)

1. No action - no development of onsite augmentary water supplies

2. Develop a water storage reservoir and facilities to serve LKNWR wetlands

The proposal was selected over the other alternatives because:

1. Wells will provide an emergency water supply to maintain critical wetlands in critically dry periods when surface water is not available.

2. Wells can be made operational in the shortest period of time to immediately address critical wildlife habitat needs.

3. Wells will minimize the negative effects on endangered species, cultural resources, and scenic vistas.

4. Wells offer the greatest benefit to cost ratio of the action alternatives.

Implementation of the preferred alternative would be expected to result in the following environmental and socioeconomic effect: (List)

1. The maintenance of critical wetlands on LKNWR will provide habitat for the threatened Bald Eagle as well as many other trust migratory bird resources.

2. Potential to impact cultural resources during the construction phase of the project.

3. Potential to impact underground water resources by over utilization of the aquifers.

4. Maintenance of outdoor recreational and educational opportunity.

5. Some employment opportunity will be associated with the well drilling and facilities construction.

Measures to mitigate and/or minimize adverse effects have been incorporated into the proposal. These measures include: (List)

1. All well locations and associated facilities corridors will be located to avoid impacting cultural resources in coordination with the State Historic Preservation Officer.

2. All power lines and other facilities will be assessed for effects on the threatened Bald Eagle in coordination with the Klamath Falls Fish and Wildlife Office and will be constructed so as to minimize effects on eagles and other raptors.

3. A separate groundwater monitoring well will be drilled adjacent to each production well in an effort to document the effects of groundwater extraction on the local aquifer.

4. A refuge groundwater monitoring plan will be developed in coordination with the California Department of Water Resources and Siskiyou County to assess groundwater reserves and effects on neighboring wells. Refuge groundwater pumping will be modified if long-term effects to the aquifer are noted.

5. Groundwater pumped within the LKNWR will be consumptively used within the California portion of the refuge in accordance with the Siskiyou County Groundwater Ordinance.

The proposal is not expected to have any significant effects on the human environment because:

1. Wells are located in remote areas well away from any homes.

2. The groundwater monitoring plan will insure that LKNWR wells do not negatively effect neighboring wells.

The proposal has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include: (List)

Senator Dianne Feinstein
Senator Barbara Boxer
Senator Gordon Smith
Senator Ron Wyden
Representative Wally Herger
Representative Greg Walden
California Department of Fish and Game
Oregon Department of Fish and Wildlife
Siskiyou County Board of Supervisors
Klamath County Board of Commissioners
Klamath Water Users Association
Tulelake Irrigation District
Klamath Drainage District
Tulelake Growers Association
National Wildlife Refuge Association
National Audubon Society
The Nature Conservancy
Oregon Natural Resources Council
Klamath Forest Alliance
California Waterfowl Association
Oregon-California Wetlands Association
The Klamath Tribes

Therefore, it is my determination that the proposal does not constitute a major Federal action significantly affecting the quality of the human environment. As such, an environmental impact statement is not required. An environmental assessment has been prepared in support of this finding and is available upon request to the FWS facility identified above.

Reference: (List title of EA)

Development of Water Supply Production Wells for Lower Klamath National Wildlife Refuge

Acting California/Nevada Operations Manager — June 5, 2001 — Date

FINAL ENVIRONMENTAL ASSESSMENT

Development of Water Supply Production Wells for Lower Klamath National Wildlife Refuge

Klamath Basin National Wildlife Refuges

National Environmental Policy Act (1969)
National Wildlife Refuge System Administration Act of 1966
National Wildlife Refuge Improvement Act of 1997

(Legal Mandate under which Action Will be Carried Out)

Lower Klamath National Wildlife Refuge

(Location of Action)

James L. Hainline
(Author of Document)

May 17, 2001
(Date Prepared)

Section I: PURPOSE AND NEED FOR ACTION

1. Why is action being considered? (Discuss problems, opportunities, needs)

Lower Klamath National Wildlife Refuge (LKNWR) (Figure 1) was established as the Nation's first waterfowl refuge in 1908 by President Theodore Roosevelt because of its tremendous wildlife resources. Wetland wildlife resources are maintained on approximately 30,000 acres of intensively managed habitat. Water for this management program is provided by the U.S. Bureau of Reclamation's Klamath Project (Project) via an intricate system of canals, drains and lift pumps. Habitat management programs on LKNWR support the largest fall population of staging waterfowl in the Pacific Flyway (1.8 million birds in fall 1997), winters the largest concentration of bald eagles (200-900 birds) in the Lower 48 states, and supports 20-30% of the Central Valley population of sandhill cranes during fall migration. In addition, the refuge hosts large numbers of colonial nesting waterbirds and a diverse array of "sensitive' wildlife species.

Because the natural hydrology of Lower Klamath Lake has been lost to reclamation and other demands for water in the watershed, current habitat management on LKNWR is dependent upon the Project for its supply of water. Increased recognition of tribal treaty rights for subsistence on both Upper Klamath Lake and the Klamath River coupled with federal listing of suckers in the lake and salmon in the river under the Endangered Species Act placed additional demands on traditional irrigation supplies in the Project. New delivery priorities for the Klamath Project were described in a Solicitor's Opinion dated July 25, 1995. The historic "irrigation first" was replaced with a new priority system with endangered species first followed by tribal trust responsibilities, agriculture, and National Wildlife Refuges. The development of new priorities for Project water will likely result in significant water shortages to refuge wetlands on LKNWR in a large proportion of future years. Despite its value to migratory birds of the Pacific Flyway, the refuge faces the potential for severe water shortages in future years. This has become increasingly apparent as the Klamath Project plans future water delivery priorities in the Upper Klamath Basin. In addition to traditional water demands for irrigation of agricultural lands, increased water allocations for the protection of endangered fish and Native American trust responsibilities in Upper Klamath Lake and the Klamath River, will likely result in significant water shortages to LKNWR in future years. It is estimated that >70% of the wetland habitat (including more than 50% of permanently flooded marshes) on the refuge may be dry during the peak fall waterbird migration (1-2 million birds) in 70% of future years.

In an effort to offset reduced water delivery from the Klamath Project, the refuge has investigated the potential to develop alternative refuge water sources including construction of an onsite storage reservoir (Alternative C) and ground water production wells (Alternative B). Each has shown potential to supplement existing water supplies, but

in the final analysis, ground water pumping appears to have the greatest possibility for successfully providing some water for refuge wetland management during periods of critical need. The initial costs associated with wells would be only about 10% of the cost of developing the reservoir and the annual operating costs would be slightly less.

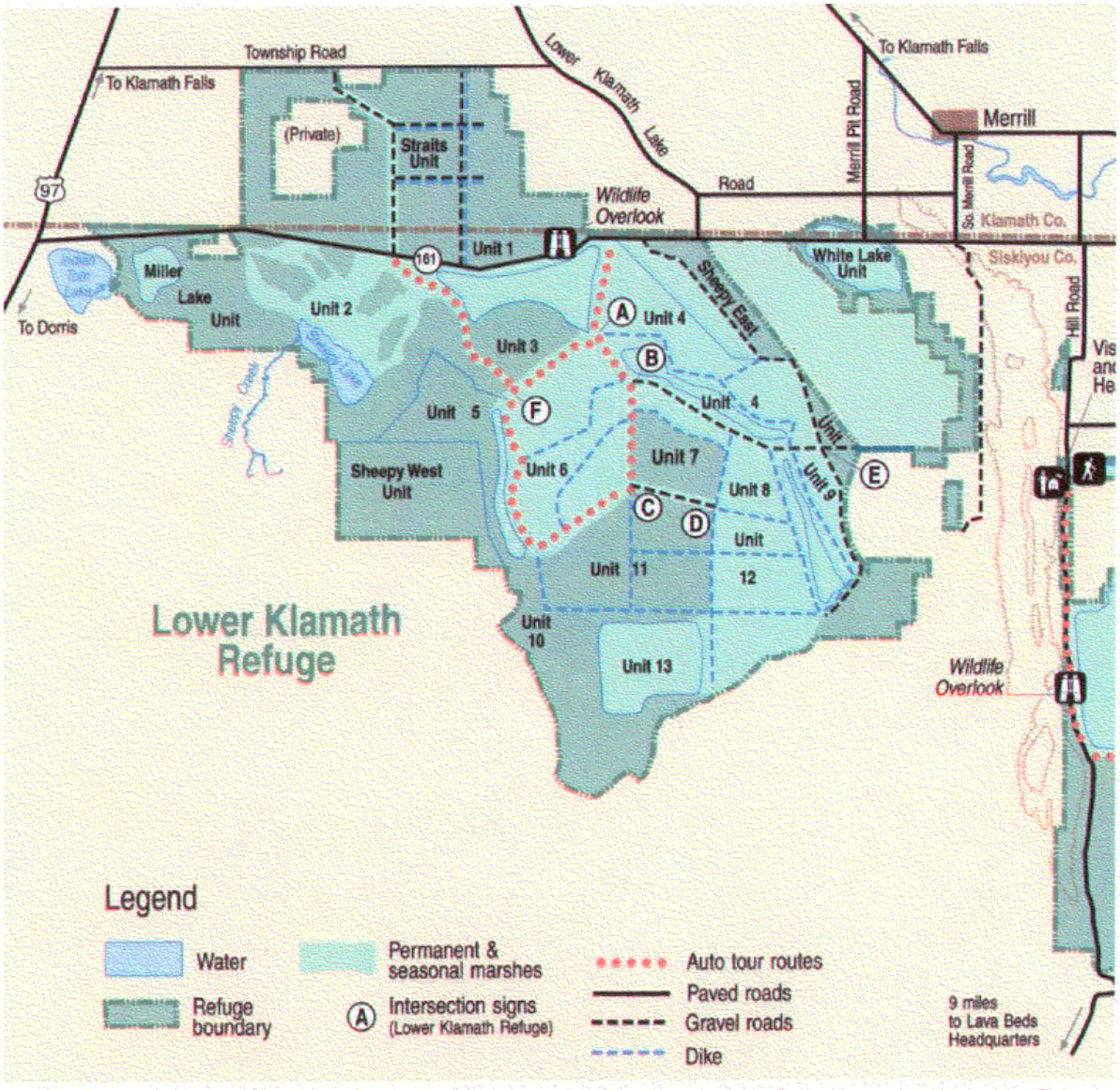

Figure 1. Lower Klamath National Wildlife Refuge

2. How does the action relate to Service objectives?

The objectives for LKNWR are:

1. Manage for the conservation, enhancement, and recovery of threatened, endangered, and sensitive species and the natural habitats on which they depend.

2. Conserve and enhance wildlife habitats with an emphasis on high quality production and migration habitat for migratory birds.

3. Protect and restore native habitats and associated populations of wildlife representative of the natural biological diversity of the Klamath Basin.

4. Integrate the maintenance of productive wetland habitats and sustainable agricultural systems consistent with waterfowl management and ensure agricultural practices will conform to the principles of integrated pest management.

5. Provide high quality, wildlife-dependent visitor services with emphasis on environmental education, interpretation, wildlife observation, hunting, and photography opportunities which are compatible with refuge purposes.

The management objectives for LKNWR require that the lands be primarily managed as wetland habitats. This demands that a plentiful and secure supply of water of reasonable quality be available throughout the year. In order to insure that some water is available, an alternative water source such as ground water needs to be developed. Investigation of the ground water resources on the refuge with test well drilling and ground water pumping research has indicated that it is feasible to develop onsite ground water production wells for refuge habitat management purposes.

3. What is the action supposed to accomplish?

This action will provide LKNWR with a secure supply of at least 23,000 acre feet of water during the critical June through October period. This water would be used to flood or maintain up to 10,000 acres of wetland habitats. It is anticipated that ground water would only be pumped in dry and critically dry years and would serve as an emergency water source for critical wetland units until alternative surface supplies can be secured.

Section II: ALTERNATIVES INCLUDING THE PROPOSED ACTION
(Identify one of the alternatives as the preferred alternative.
Add alternatives as necessary.)

Alternative A. <u>No Action Alternative</u>

1. Describe this alternative.

Lower Klamath refuge would continue to rely on the traditional practice of surface water delivery from the Klamath Project. There would be no development of alternative sources of water or water storage facilities.

2. To what extent would this alternative satisfy the problems, opportunities or needs identified in Section I?

There would be no change in the predicted water shortages and associated habitat degradation that will occur on LKNWR in 70% or more of future years. There would be further deterioration of wetland habitat conditions occurring in most years. Endangered species, waterfowl maintenance and production, and refuge biological diversity would all decrease due to the decreased vigor and acreage of refuge wetland habitats.

3. What is the principal environmental (biophysical) effects associated with implementation of this alternative? (Summarize effects from Section IV.)

The reduced summer and fall water delivery that would occur in 70% of future years would result in the loss or serious impairment of over one half the wetlands on LKNWR. This would result in negative impacts to the threatened Bald Eagle, up to 40% of the trust waterfowl resources of the Pacific Flyway, numerous sensitive species of special concern such as sandhill cranes, white pelicans, white-faced ibis, and western pond turtles. Wetlands will degrade in quality without sufficient water to accomplish management. Water manipulation serves to control unwanted vegetation in wetland units and dry wetlands will rapidly convert to large tracts of undesirable noxious weeds such as pepperweed, Canada thistle, and others. Reduced water quality will result in refuge units when insufficient water is available for proper management. This will create ideal conditions for the outbreak of serious wildlife diseases such as avian botulism. The reduction of wetland and cropland components on the refuge will result in major loss of habitat and associated wildlife diversity.

4. What are the principal socioeconomic effects associated with implementation of this alternative? (Summarize effects from Section IV.)

LKNWR is a National Historic Place designated to acknowledge efforts by earlier generations that certain special areas such as these wetlands should be preserved for the future. As one of the nation's earliest refuges and the first for wetlands and waterfowl, society would expect LKNWR to be preserved perpetually to serve the needs of wildlife for the enjoyment of the people. Degradation of a major part of these important wetlands in the majority of future years would be unacceptable to the public at large as well as the local community. Recreational opportunity, both consumptive and non- consumptive, will be diminished in a great many years when wetlands and croplands remain unflooded and that would affect local businesses and secondary services. Local economic revenues associated with recreation and farming on the refuge would likely be reduced. Flooded wetlands with the associated wildlife contribute greatly to the scenic vistas of LKNWR. In many years, this wildlife spectacle would be impaired.

5. Would implementation of this alternative likely result in significant controversy? Explain.

Environmental and conservation groups have a strong interest in LKNWR and to allow the wetlands of the refuge to be significantly degraded would cause widespread controversy within those groups. The inability to maintain wetlands and other habitats on the refuge would be highly controversial not only to recreational users, but by the local secondary services and businesses that rely on these refuge users.

Alternative B: <u>Drill and improve ground water wells to develop a reliable water supply for Lower Klamath refuge wetlands (preferred).</u>

1. Describe this alternative.

Seven wells would be drilled on LKNWR (Table 1) (Figure 2) for the purpose of developing a reliable auxiliary water supply for wetland management for use during periods when insufficient water is available from the Klamath Project to flood critical wetlands. Additionally, well water purchase or rights to well water production from adjacent neighboring well owners will be pursued. According to a test study by WESCORP (2001) preliminary pumping tests on test holes and neighboring wells indicate that a combined output of up to 23,000 acre feet could be expected during the critical months of June through October. This is approximately one third of the water need during that period. In addition to the drilling and purchase of wells, there would be a need for a substantial infrastructure for the delivery and perhaps cooling of the water obtained. This would entail not only the drilling and purchase of wells, but the easements for and construction of power supply lines, surface conveyance (ditches), pipelines, treatment bays, and other equipment needed for delivery and to make these waters usable for wetland management purposes. Easements for seven power lines ranging from less than .1 mile up to 1.25 miles will be required. Only one easement will be required outside the boundary of LKNWR. All power lines passing through wetland areas will be routed underground to eliminate adverse impacts on wildlife. Routing through upland sites may be either underground or overhead lines constructed as necessary to reduce impacts on wildlife, particularly raptors, and cultural resources. The delivery system of these wells would have a direct outlet to adjacent wetland units as well as the option to utilize the interior water conveyance system to serve other refuge units.

Table 1. Lower Klamath Production Well Yields and Completion Timetable

Well	**Expected Yield**	**Annual Volume**	**Completion Date**
Buy/Develop Blake Well	5,000 gpm	3,300 AF	Aug. 2001
Drill Otey Island Well	5,000 gpm	3,300 AF	Aug. 2001
Drill Unit 12 Wells (2)	10,000 gpm	6,600 AF	Sept. 2001
Drill Chalk Bluff Well	5,000 gpm	3,300 AF	Oct. 2001
Drill Unit 9c Well	5,000 gpm	3,300 AF	Oct. 2001
Drill Orem Pit Well	3,000 gpm	2,000 AF	Nov. 2001
Drill White Lake Well	2,000 gpm	1,300 AF	Nov. 2001

2. To what extent would this alternative satisfy the problems, opportunities or needs identified in Section I?

The estimated combined production of 43,000 gallons of water per minute from the seven newly drilled refuge wells along with the purchase of additional water from neighboring wells would maintain over 8,000 acres of wetland during July which is the month of highest evaporative water loss. This would allow LKNWR to retain key

permanent marshes throughout the summer months. With the onset of fall and cooler temperatures with an attendant lowered evaporative rate, an additional 2,000 acres of seasonal wetland habitat could be flooded during the months of September and October to serve the fall migrating waterfowl and other wildlife. After November, Project water normally becomes available for refuge purposes and pumping could be curtailed or at least greatly reduced. In the winter and spring months, precipitation and non-Project surface inflow considerably exceeds evaporative losses. As winter water in excess to other Project purposes becomes available, winter and spring flooding of seasonal wetland habitats and crop lands could likely be accomplished and maintained in all but the driest of years.

Normal water conditions of the past on LKNWR have allowed the maintenance of up to 9,600 acres of permanent marshes during the summer months and the flooding during the September and October period of an additional 8,000 acres of seasonal marsh. Generally, after November, large volumes of water from a variety of sources both Project and non-Project become available during the winter and spring period and an additional 14,000 acres are flooded for wetland management or crop land irrigation. This alternative will continue to maintain 80% of the normal summer permanent marshes and provide for 25% of the normal September and October seasonal marsh flooding. Except in the dry and critically dry years, winter and spring flooding could continue in a near normal fashion as water in excess to Project purposes becomes available.

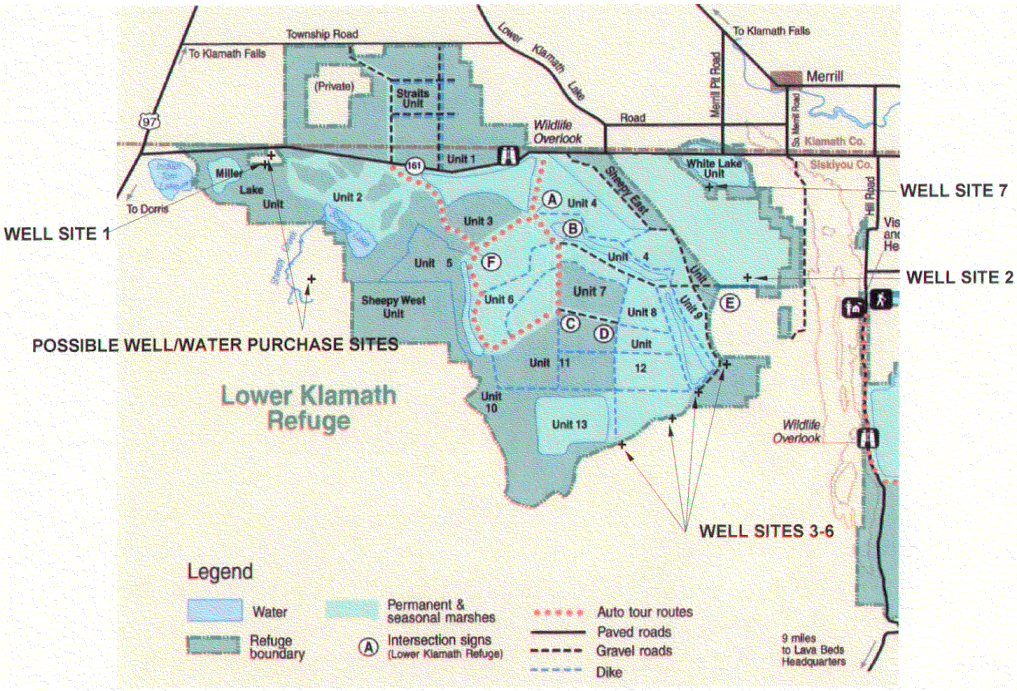

Figure 2. Lower Klamath NWR Production Well Sites

3. What are the principal environmental (biophysical) effects associated with implementation of this alternative? (Summarize effects from Section IV.)

The availability of a reliable well water source to maintain critical permanent wetlands and provide flooding for some fall seasonal wetlands will provide support for a large number of waterfowl which will provide a source of food for 300-900 threatened Bald Eagles during the winter months. This will reduce or eliminate adverse impacts to wintering bald eagles. The location of the wells and associated water delivery structures are located away from bald eagle use areas. These wells will provide about 75% of the water necessary on LKNWR to meet the requirements of bald eagles as stated in the Klamath Project operations Biological Opinion (USFWS, 2001). The power supply line routing, well drilling and water handling system will require both surface and subsurface disturbance in the form of wells, trenches, auger holes, ditches, and underground piping. All construction will be cleared with the State Historic Preservation Officer before any earth disturbing work commences. According to the refuge ground water study (WESCORP, 2001), the level of groundwater pumping proposed is sustainable and long term effects on the water table should not occur. Ground water will only be withdrawn when surface water is not available. The test wells constructed immediately adjacent to each production well will be used to periodically measure the water levels of the aquifer. The measured water levels will be analyzed to determine the effect of ground-water withdrawals on aquifer levels. LKNWR will prepare and execute a monitoring program for measuring and analyzing water levels. In addition to the refuge test wells, other area wells may be included in the monitoring program, and, on a long-term basis, water levels in the new wells will be compared with nearby private wells to determine if the LKNWR wells are having an impact . If adverse impacts to the aquifer are observed, LKNWR will modify its pumping program. Water quality in the wetland units served by this project will be maintained at an adequate level to serve the plants and animals using them. This alternative will support the refuge's most critical wildlife habitats by maintaining many permanent marshes and certain critical fall flooded seasonal wetlands necessary for the maintenance of fall migrating waterfowl. It must be emphasized that this alternative will alleviate and in some cases eliminate critical wildlife impacts, but will be unable to serve the normal full range of needs for all wildlife species served by the refuge. A reliable source of summer and fall water is necessary to provide habitat management flexibility. Habitat management flexibility maintains a healthy vegetative species abundance and diversity. Production wells will maintain good habitat diversity that will continue to support refuge wildlife species diversity and abundance. In addition to the bald eagle, maintaining habitat diversity and especially permanent wetlands will alleviate negative impacts on sensitive species such as the sandhill crane, white pelican, white-faced ibis, and western pond turtle. Impacts to game and non-game wildlife will be reduced or eliminated by having a reliable supply of water for refuge habitat management purposes. This alternative will supply an adequate water quantity of sufficient quality to properly manage wetland habitats so that the outbreak of wildlife diseases such as avian botulism can be prevented or controlled.

4. What are the principal socioeconomic effects associated with implementation of this alternative? (Summarize effects from Section IV.)

LKNWR is a National Historic Place and that designation was to acknowledge the recognition by earlier generations that certain special areas such as these wetlands should be preserved for the future and not be allowed to disappear. As one of the nation's earliest refuges and the first for wetlands and waterfowl, society expects LKNWR to be preserved perpetually to serve the needs of wildlife for the enjoyment of the people. Perpetually maintaining the function of these important wetlands will meet the expectations of the public at large as well as the local community. As one of the most important and well-known wildlife refuges in the Pacific Flyway and the National Wildlife Refuge System, the maintenance of critical wetland habitats will help reduce long-term negative effects to migratory bird trust resources. LKNWR is well known for the recreational opportunity, both consumptive and non-consumptive, that it offers. This alternative can maintain a large percentage of the present summer flooded acreage, but only about 20% of the usual fall seasonally flooded marshes. Non-consumptive recreation could likely be continued at the present level in most years, but in years when no surface water is available and all flooding is accomplished with the wells, the hunting program may well have to be reduced to insure that wildlife could take full advantage of the very limited habitat available. The construction phase of this alternative would provide contract employment for skilled workers associated with well drilling, pump installation, and water conveyance and treatment facility construction. There is a great deal of local pride in LKNWR for its esthetics and abundant wildlife and there would be strong support for the effort to maintain those values. The farm community will likely be supportive of this production well program and view it as an effort by the refuge to try to solve a part of the Klamath Basin's water quantity issues. Flooded wetlands with their associated wildlife contribute greatly to the scenic vistas of LKNWR. In most years, this scenery would be maintained at least to a minimum extent because of the ability to flood them on a regular basis from the wells.

5. Would implementation of this alternative likely result in significant controversy? Explain.

This well water alternative should not generate substantial controversy as could the other alternatives. The groundwater studies associated with the test well program on the refuge (WESTCORP, 2001) identified no long-term impacts on neighboring ground water developments by the refuge groundwater developments. Water or well purchase from neighboring landowners would be only on a willing seller basis. Compliance with the Siskiyou county groundwater ordinance will be insured since the water will be consumptively used within the immediate basin within the county.

Alternative C: <u>Develop a water storage reservoir and facilities to serve Lower Klamath Refuge wetlands.</u>

1. Describe this alternative.

This alternative would require the impounding of excess winter water in a 3500 acre reservoir located in Unit 13 at the extreme southern end of LKNWR (Figure 3). As detailed in a USFWS engineering feasability study (1998) this impoundment would provide up to 30,000 acre feet (af) of usable water in the April through October period if fully filled during winter. Impounding dikes up to 14 feet high would be required to provide the necessary storage. Two large pumping plants totaling 1500 horsepower would be required to provide 300 cubic feet per minute(cfs) to the reservoir. Major extensions to the Ady canal and the P canal along with the pump stations will provide up to 600 af daily to the reservoir. It is estimated that development costs for this reservoir would be nearly $20,000,000 and operational costs of the pump station would be $160,000 to $200,000 annually.

2. To what extent would this alternative satisfy the problems, opportunities or needs identified in Section I?

In wet years, it would be likely that the reservoir would fill and up to 30,000 af of water would be available for refuge flooding during the April through October period. In normal and dry years, the reservoir would not be filled and little to no water would be available for refuge wetlands. In critically dry years, there would be so little water stored that none would be available for refuge flooding.

The initial cost of the reservoir and the associated canal improvements and pumping stations was estimated to be over $19,300,000. Additionally, the earth at the site was considered to be unacceptable for such a large dike and all construction material would have to be obtained off site. Finally, the LKNWR area is considered to be a seismic zone which would present an unacceptable risk for a reservoir construction site.

3. What are the principal environmental (biophysical) effects associated with implementation of this alternative? (Summarize effects from Section IV.)

The reduced summer and fall water delivery that are projected to occur in below average, dry and critically dry years which (likely 70% of future years) could result in the loss or serious impairment of over one half the wetlands on LKNWR. This would result in negative impacts in many years to the threatened Bald Eagle, up 40% of the trust waterfowl resources of the Pacific Flyway, numerous sensitive species of special concern such as sandhill cranes, white pelicans, white-faced ibis, and western pond turtles. Wetlands will degrade in quality when sufficient water to accomplish management is unavailable. Water manipulation serves to control unwanted vegetation in wetland units and dry wetlands will rapidly convert to large tracts of undesirable noxious weeds such as pepperweed, Canada thistle, and others in years when the reservoir cannot support critical

wetlands. Reduced water quality will result in refuge units when insufficient water is available for proper management. This will create ideal conditions for the outbreak of serious wildlife diseases such as avian botulism. The reduction of wetland and cropland components on the refuge will result in major loss of habitat and associated wildlife diversity.

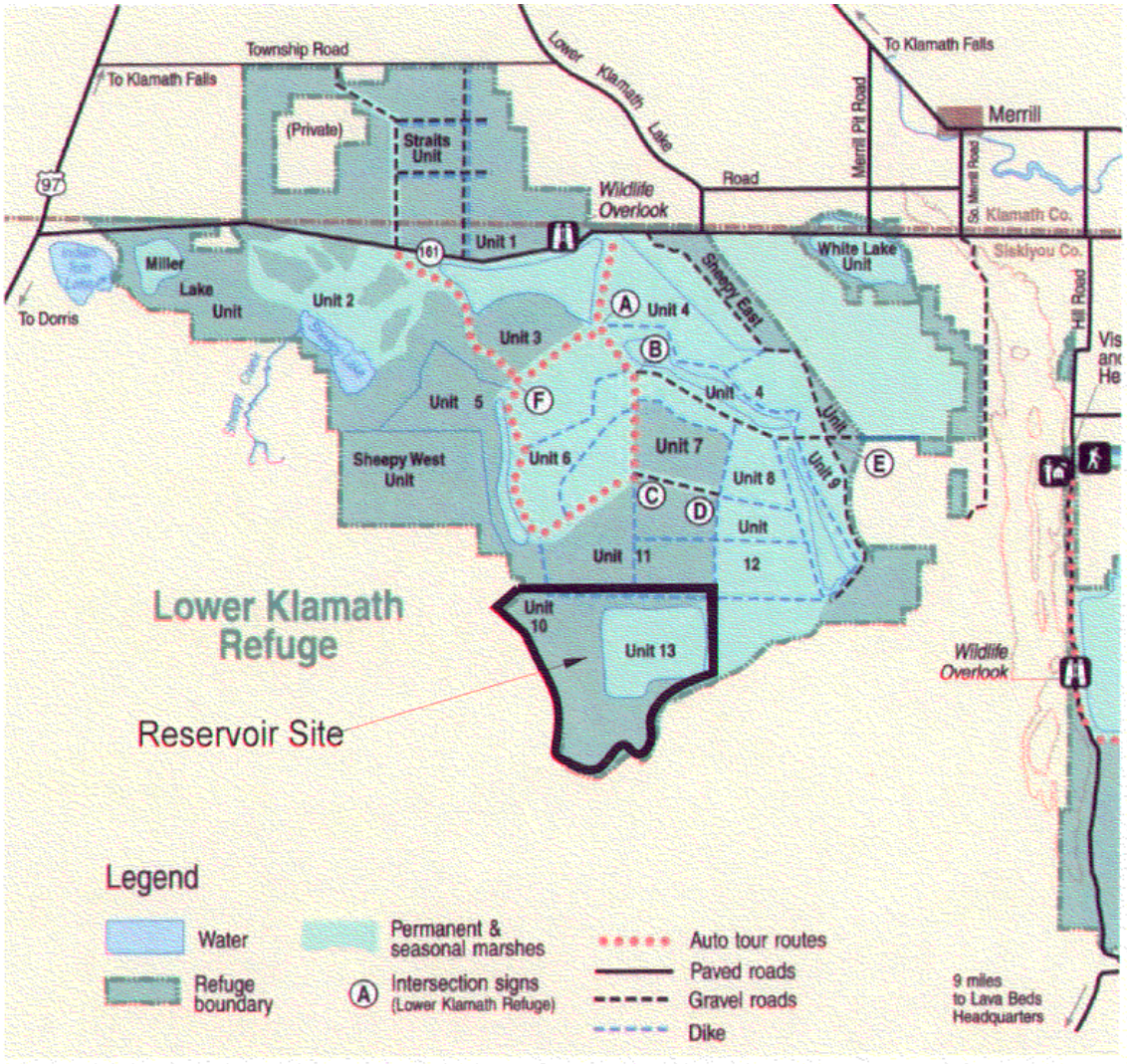

Figure 3. Lower Klamath NWR Reservoir Site

4. What are the principal socioeconomic effects associated with implementation of this alternative? (Summarize effects from Section IV.)

LKNWR is a National Historic Place and that designation was to acknowledge the recognition by earlier generations that certain special areas such as these wetlands should be preserved for the future and not be allowed to disappear. As one of the nation's earliest refuges and the first for wetlands and waterfowl, society would expect LKNWR to be preserved perpetually to serve the needs of wildlife for the enjoyment of the people. Degradation of a major part of these important wetlands in up to 70% of future years would be unacceptable to the public at large as well as the local community. Recreational opportunity, both consumptive and non-consumptive, will be diminished in a great many years when wetlands and croplands remain unflooded and that would effect local businesses and secondary services. Reduced employment associated with reduced recreation on the refuge would be expected. Flooded wetlands with the associated wildlife contribute greatly to the scenic vistas of LKNWR. In many years, this scenery would be impaired because of the inability to flood them from a less than filled reservoir.

5. Would implementation of this alternative likely result in significant controversy? Explain.

Filling the reservoir may conflict with the ability to winter irrigate other refuge croplands and that would impact the farmers that share crop farm over 4,000 acres on the refuge as well as the secondary business and services they use which would cause controversy within the local community. It would be likely that in order to fill the reservoir to a level that would provide enough water for summer and fall wetland flooding, the water used for cropland flooding would be unavailable in most winters. In other years when the reservoir could not be filled, summer and fall wetlands would be left dry. When fall wetlands could not be flooded, normal populations of migrating waterbirds, particularly waterfowl, would not be present and this would impact both consumptive and non-consumptive recreational users to a great degree. Greatly reduced recreational opportunity would be highly controversial within this group.

Section III: AFFECTED ENVIRONMENT

Established by President Theodore Roosevelt in 1908, Lower Klamath National Wildlife Refuge is our nation's first waterfowl refuge. Over 50,000 acres in size, it is a varied mix of shallow freshwater marshes, open water, uplands, and croplands that are intensively managed to provide habitat for waterfowl and other wetland dependent wildlife. The predominant habitat component provided is the seasonally flooded wetland. Other important habitats provided are permanently flooded wetlands, seasonally flooded uplands, agricultural cropland units, and unflooded uplands.

Seasonally Flooded Wetlands

This component of Lower Klamath NWR covers about 1/3 of the refuge land area or approximately 15,000 acres. Seasonally flooded wetlands are characterized by a flooding regime extending less than year round, but greater than 6 months of which 2 months must be during the growing season.

Normal management of seasonally flooded wetlands requires flooding of the habitat unit during the early fall to early winter period and then dewatering the unit in late spring to early summer by gradually lowering the water level either by draining or by evaporation or a combination of both. This water management develops a productive wetland habitat that can be optimally utilized by migratory waterfowl and other wildlife.

The slow draw down of water during the growing season results in the development of a complex mosaic of vegetative communities. This is the result of the uneven bottom contour being dewatered by a declining plane of water. As these "patches" of the bottom are dewatered, they warm and the plant seeds in them germinate. Since these "patches " are drying out at slightly different times of the spring, a specific plant association develops on each of them and results in a "patchwork" of differing plant associations in the unit.

There are several key plant communities that are the object of seasonally flooded wetland water management. Most provide excellent production of seeds and the foliage supports excellent substrate for the development of invertebrate life. Both the seeds and the invertebrates are critical food items for migrating and breeding waterfowl, shorebirds, and other marsh birds.

One of the most important plant associations in the seasonally flooded wetland is the red goosefoot (Chenopodium botryodes) community. This plant provides excellent seed production which is highly desirable to fall migrating mallards, pintails, and other dabbling ducks. The invertebrate populations that develop on the foliage after flooding are sought after by many species of migrating waterfowl, shorebirds, and other marsh birds during the spring migration as well as during the breeding season. This invertebrate resource is critical to the nutrition of young waterfowl and shorebirds produced on the refuge.

Another important plant produced by seasonal flooding is smartweed (Polygonum lapathifolium). This plant may be in association with other plant species or in rather extensive monotypic stands. It is readily used by migrating waterfowl during the fall months for food and cover as it is a robust plant that produces a large seed crop. It, like other seasonally flooded

wetland plants, provides good substrate for invertebrates and those invertebrate populations support spring wildlife use as noted in the red goosefoot discussion.

Over time considerable areas of alkali bulrush (Scirpus maritimus) develop in the seasonally flooded wetlands. Although this plant may have other species of plants associated with it, it often is found in large monotypic patches. The plant is a prolific producer of seeds but they are not taken in significant amounts by waterfowl or other wildlife. The vegetative parts of the plant provide excellent cover for migrating and breeding waterfowl. Other species such as redwing and yellow-headed blackbirds, sora and Virginia rails, and sandhill cranes make considerable use of alkali bulrush for nesting and brood rearing.

Seasonally flooded marshes have a finite productive life. The units generally evolve to a largely monotypic stand of alkali bulrush scattered with clumps and patches of hardstem bulrush (Scirpus acutus) and cattail (Typhus latifolia). 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 seasonally flooded wetland is to be retained for breeding habitat for waterfowl and other wetland species, a management change is usually implemented at this point. A number of options may be employed. The spring drawdown may be accelerated to allow mechanical control (disking or plowing) of the offending alkali bulrush stands and encourage the production of the desirable food plants such as smartweed and goosefoot. The unit could be returned to cereal grain farming for a period of time thus eliminating all natural wetland plants in the unit. After the farming period, a return to the seasonally flooded wetland water management regime would result in very productive early succession wetland. A third alternative management would be to manage the unit as a permanently flooded wetland. Year around flooding would eliminate all the seasonal marsh plants except hardstem bulrush and cattail and develop a submergent plant community as well. This management option could be employed only if a sufficient summer water supply is available and the unit is free from history of avian botulism, a serious and devastating waterfowl disease.

Species which are especially dependent on seasonally flooded wetlands include the following:

Species	Migrant transients	Breeding birds
Mallard	*	*
Gadwall	*	*
Pintail	*	*
Green-wing Teal	*	
Cinnamon Teal		*
Shoveller	*	*
Canada Goose		*
White-fronted Goose	*	
Sandhill Crane	*	*
White-faced Ibis		*
Blk-crowned Nt.Heron		*
Greater Egret		*
Am. Avocet		*
Blk-necked Stilt		*
Sht-billed Dowitcher	*	
Gtr. Yellow-legs	*	
Lesser Yellow-legs	*	
Western Sandpiper	*	
Least Sandpiper	*	
Dunlin	*	
Semi-palmated Plover	*	
Snowy Plover		*
Blk-bellied Plover	*	
Red-winged Blackbird		*
Ylw-headed Blackbird		*

Permanently Flooded Wetlands

There are approximately 10,000 acres of permanently flooded wetlands maintained on Lower Klamath NWR. These wetland units are characterized by year round flooding and contain three distinct plant communities adapted to permanent flooding. The emergent plant community is composed of those species rooted in the bottom substrate, but with stems and leaves extending above the water surface into the air. The submergent community has plants rooted in the bottom, but has no part of the plant extending above the water column. The third community is composed of the floating plants whose roots extend only into the water column and not into the bottom substrate.

Emergent vegetation is composed of hardstem bulrush, cattail, and occasional minor inclusions of river bulrush (Scirpus fluviatilis). Emergent stands range from pure cattail to pure hardstem bulrush or more likely a mixture of both. The emergent vegetation provides excellent

nesting substrate for many species of waterfowl, wading birds, and passerine birds. It provides excellent cover for resting waterfowl during all seasons of the year by shielding the interspersed areas of open water from the wind.

The submergent plant community is dominated by sago pondweed (Potamogeton pectinatus) with lesser amounts of interspersed baby pondweed (Potamogeton pusillus) and coontail (Ceratophyllum demersum). This community flourishes in the open water zones of the permanently flooded marsh where water depths range from 6 inches to 3 feet.

Sago pondweed is a primary source of food to several species of ducks as well as tundra swans. It is of critical importance to migrating canvasback ducks which feed almost exclusively on sago tubers (root parts) during their 3 month stay in the fall. Other species of waterfowl such as wigeons, scaup, mallards, and coots consume the vegetative parts and seeds of this as well as other submergent plants.

The submergent plant community supports a diverse and productive invertebrate community. These are eagerly sought by many species of migratory waterfowl and other marsh birds and serve as a vital food source. During the summer months, these invertebrates are a critical food requirement of breeding waterfowl and most ducklings. Breeding eared and western grebes as well as coots utilize vegetative parts of submergent plants to construct their nests.

The floating plant community is composed of a single species, common duckweed (Lemna minor). This species is a food source utilized coots, rails, and several species of ducks.

Colonial nesting species such as white pelicans, double-crested cormorants, great blue herons, eared grebes, and western grebes utilize only permanent wetland units for nesting. Not only do these units provide the secure and remote sites they require for nesting, but provide an abundant supply of fishes these birds need for food.

One of the most critical summer uses of the permanently flooded wetlands on Lower Klamath NWR is by molting waterfowl. Because these birds are flightless during this period, they need food, water, and cover in close proximity. They seek large permanently flooded marshes for this purpose and the large marshes of the Lower Klamath NWR are ideal. Ducks have been documented to travel over 300 miles from their nesting areas to these marshes to molt.

Many species of wildlife are dependent on the permanently flooded wetlands of the Lower Klamath refuge . A partial listing follows.

Species	Migrant transients	Breeding wildlife
Mallard	*	*
Gadwall	*	*
Pintail	*	*
Cinnamon Teal	*	*
Green-wing Teal	*	
Shoveller	*	*
Wigeon	*	
Redhead	*	*
Canvasback	*	*
Lesser Scaup	*	*
Ruddy Duck	*	*
Eared Grebe	*	*
Western Grebe	*	*
Pied-billed Grebe	*	*
White Pelican		*
Double-crested Cormorant		*
Great blue Heron		*
Greater Egret		*
Blk-crowned Nt. Heron		*
Tri-colored Blackbird		*
Red-winged Blackbird		*
Yellow-headed Blackbird		*
Sandhill Crane		*
River otter		*
Muskrat		*
Western Pond Turtle		*

Agricultural Croplands

There are approximately 4,000 acres of cooperatively farmed cropland on Lower Klamath NWR. Acres farmed by refuge co-op farmers are dedicated exclusively to cereal grain (usually barley) production. The farmer is allowed to harvest three-quarters of the crop in consideration of his expense and labor for tilling, seeding, and fertilizing the crop. The one-fourth he is not allowed to harvest is left standing in the field for the benefit of wildlife. The farmer provides all seed, fertilizer, pesticide, equipment, fuel, and labor while the Service provides the land, water, and irrigation services. These fields are normally flood irrigated only once in early winter and dewatered in early spring in preparation for planting. No additional irrigation during summer is used. Cooperatively farmed lands used for cereal grain production are subject to infestation by competing "weeds" such as quackgrass, mustard (Sisymbrium sp.), pepperweed (Lepidium sp.), and Bassia sp.. To control those species, farmed fields are subjected to permanent flooding for a period of 18 months every 5 to 8 years. During that period, these units develop dense and

productive beds of sago pondweed and are highly used by many species of waterfowl as previously discussed in the permanently flooded wetland section of this document.

The standing and waste grain left in farmed fields provides a highly sought high energy food source for certain waterfowl species, pheasants, and sandhill cranes during the fall and early winter months. During the period when these fields are flooded for pre-irrigation in early winter, they are used not only by waterfowl, but by bald eagles and other raptors, herons, egrets, gulls, and coyotes that are attracted to the large concentration of meadow voles displaced by the water. After these units are fully covered with water, they often show heavy use in the early spring by waterfowl especially tundra swans.

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

Many species of wildlife are found associated with refuge croplands. A partial listing follows:

Species	Migrant transients	Breeding wildlife
Mallard	*	*
Gadwall	*	*
Pintail	*	*
Green-wing Teal	*	
Shoveller	*	
Wigeon	*	
Redhead	*	*
Canvasback	*	
Lesser Scaup	*	
Ruddy Duck	*	
Eared Grebe	*	*
Western Grebe	*	*
White Pelican		*
Great blue Heron		*
Greater Egret		*
Black-crowned Nt. Heron		*
Ring-billed Gull	*	*
California Gull	*	*
Sandhill Crane	*	*
Ring-necked Pheasant		*
Bald Eagle	*	
Golden Eagle		*
Rough-legged Hawk	*	
Red-tailed Hawk		*
Harrier		*
Mule Deer		*
Pronghorn Antelope		*
Coyote		*

Seasonally Flooded Uplands

There are approximately 5,700 acres of seasonally flooded uplands on Lower Klamath NWR. This vegetation type differs from the seasonally flooded marshes in that they are flooded for less than 6 months annually and less than a month during the growing season. The resultant vegetation is dominated by uplands grasses and forbs and very little bulrush or cattail develops.

Normal management of seasonally flooded uplands requires that flooding commence in the winter months usually starting in mid-December, 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 is highly variable from year to year and the vegetative response is equally variable. There are five vegetative communities which predominate this habitat type. They are the swamp scenecio-baltic rush, low grass-forb, whitetop-foxtail barley, bluegrass-hairgrass, and saltgrass-spikerush types.

The senecio-baltic rush community covers perhaps 20% of the seasonally flooded uplands. It is a tall forb community with swamp senecio (Senecio hydrophilus) and cinquefoil (Potentilla gracilis) dominating the overstory and baltic rush(Juncus balticus), whitetop (Cardaria pubescens), and tarweed (Hemizonia sp.) providing the lower ground cover. Although not highly used by waterfowl while flooded during the spring months, it is one of the most highly utilized type for nesting by ducks and other birds.

The low grass-forb community also covers about 20% of this habitat type and is characterized by short height and low vertical density. The substrate of this type is often highly pitted with shallow depressions which hold water longer into the spring than other areas and the soil is extremely soft when wet. Vegetation growth occurs later in the spring in these areas. Plants common to this community include foxtail barley (Hordeum jubatum), rabbitfoot grass (Polypogon monspeliensis), Muhlenbergia sp., whitetop, Nevada bluegrass (Poa nevadensis), and paintbrush (Castilleja sp.). When flooded, this is one of the most used types by spring migrant geese, ducks, and swans. Later during the season, it is a preferred nesting site for some shorebird species such as long-billed curlew and willet.

An additional 1/5 of the seasonally flooded upland type is covered by the whitetop-foxtail barley community. This vegetative type develops on slightly elevated areas that dewater slightly earlier in the spring. It is low in height, but quite dense at ground level. When this type is flooded in the spring, it is used by waterfowl in a similar fashion to the low grass-forb community. During the summer months, it is used for nesting by a few renesting ducks and some other ground-nesting species such as the savanna sparrow.

The bluegrass-hairgrass community covers from 10-15% of the seasonally flooded upland units. As the name implies, the most common components are Nevada bluegrass and annual hairgrass (Dechampsia amphibium). Other commonly found plants include whitetop, desert saltgrass (Distichlis spicata), and silverweed (Potentilla anserina). Coverage by this type is often sparse and bare ground is often present. Because of the elevated sites this type grows on, it is often not flooded or for a very limited period. Spring use by waterfowl is limited, but it is used for nesting by several species of waterfowl including gadwall, pintail, shoveller, and cinnamon teal.

The saltgrass-spikerush community covers over 25% of the seasonally flooded uplands. Common components include desert saltgrass, spikerush(Eleocharis palustris), Atriplex sp., and poverty weed (Iva axillaris). This community occurs in areas that retain water late into the spring. When flooded there is considerable use by migrating waterfowl and shorebirds. It offers good brood feeding habitat for early nesting species of ducks and is used extensively by shorebirds such as avocets and black-necked stilts for nesting and brood rearing.

Since much of the use of the seasonally flooded upland type occurs in the areas of low vegetative cover, grazing is used in the fall and early winter to remove decadent vegetative growth and stimulate new spring growth. Grazed areas also tend to develop excellent populations of aquatic invertebrates that are eagerly sought by the spring migrant waterfowl and shorebirds.

A wide variety of wildlife species make used of the seasonally flooded uplands. A partial listing follows:

Species	Migrant transients	Breeding wildlife
Mallard	*	*
Gadwall	*	*
Pintail	*	*
Wigeon	*	
Green-wing Teal	*	
Cinnamon Teal		*
Shoveller	*	*
Snow Goose	*	
Ross' Goose	*	
White-fronted Goose	*	
Cackling Canada Goose	*	
Gt. Basin Canada Goose		*
Sandhill Crane	*	*
Killdeer		*
Long-billed Curlew	*	*
Willet	*	*
American Avocet	*	*
Black-necked Stilt	*	*
Bald Eagle	*	
Peregrine Falcon	*	
Rough-legged Hawk	*	
Kestrel		*
Northern Harrier		*
Short-eared Owl		*
Pronghorn Antelope		*
Coyote		*
Badger	*	

Uplands

There are about 6,500 of uplands on Lower Klamath NWR. Of that acreage, only 850 are capable of receiving irrigation and the remainder receives only precipitation. As a result, the vegetation is sparse and typical of the high desert. The irrigated area is maintained in mixed grass cover.

The unirrigated area is typically vegetated with shrubs and grasses. The overstory is composed of greasewood (Sarcobatus vermiculatus), gray rabbitbrush (Chrysothamnus nauseosus), and Great Basin wildrye (Elymus cinereus). The understory is a mixture of grasses including cheat grass (Bromus tectorum), foxtail barley, and Nevada bluegrass. This habitat type offers cover for many species of birds and small mammals. It is to some extent by waterfowl for nesting, but the primary nesting species are passerine birds and upland game. It is a preferred location for coyote dens. Other common mammals include badger, jackrabbit, cottontail rabbit, wood rat, and deer mice.

The 850 irrigated acres are vegetated with a mixture of "domesticated" grasses including brome grass, meadow fescue, orchard grass, timothy, and tall wheatgrass. These grasses are burned in midwinter and irrigated in early April. They provide spring migrant sandhill cranes, snow geese, Ross' geese, cackling Canada geese, Great Basin Canada geese, and several species of ducks including mallard, pintail, and wigeon with important spring forage. After the area dries in early April, several species of ducks as well as long-billed curlews, willets, pheasants, shorteared owls, and northern harriers use the area extensively for nesting. Some fields are traditionally among the highest density waterfowl nesting areas on the refuge.

Alternative A: <u>No Action</u>
Significance questions:

Federally listed species- Reduced water delivery especially during the fall months may greatly reduce the number of overwintering waterfowl on the refuge which are the primary food source for the threatened Bald Eagle. LKNWR supports from 300-900 bald eagles during winter. The loss of wetland habitat will reduce the waterfowl use of the refuge and may adversely impact the well being of the wintering eagles.

National Register of Historic Places- LKNWR is on the National Register of Historic Places. The inability to preserve the wetlands of this refuge is in direct opposition for the purpose of the designation which recognizes an early example of man's preservation of natural wetlands and its wildlife for the future.

Major loss of natural wetlands- In 70% of future years, over one half the wetlands in LKNWR will not be flooded resulting in large decreases in biological productivity and habitat diversity.

Society as a whole- As one of the nation's first and most important national wildlife refuges, society expects LKNWR to perpetually serve the needs of wildlife. The inability to provide water to its marshes will greatly diminish its value to the people.

National interests- As one of the most important and well known waterfowl refuges in the Pacific Flyway and the national refuge system, dry wetland habitats on LKNWR could have far reaching effects on the nation's migratory bird trust resources. Since over 75% of the waterfowl using the Pacific flyway pass through the Klamath Basin and well over 50% of the waterfowl using the Klamath Basin are found on LKNWR, wetland losses on that refuge could result in serious impact on the Nation's trust migratory bird resources.

State and regional interests- The wetlands of LKNWR are very important to Oregon and California recreationalists for both consumptive and non-consumptive uses. Wetland losses could greatly impact these uses. The crops grown on the refuge by local agriculturalists contribute to the local economy. Reduction in water for irrigation will diminish or eliminate this agricultural use.

Widespread controversy- There would be widespread controversy within the conservation and environmental interest groups if LKNWR was allowed to be significantly degraded because of insufficient water. It is one of the best known areas in the western states for nature study and waterfowl hunting with visitor use exceeding 150,000 annually.

General Environmental Checklist

Surface and ground water quality/quantity- With the early curtailment of freshening flows to refuge wetland units in 70% of years, water quality within those units will be degraded by increased temperature, salts, and bacteria levels. Elevated risk of waterfowl diseases such as botulism is likely when water levels cannot be controlled effectively.

Critical wildlife habitat- Most of the habitat and food for waterfowl and other birds is the result of water applied to permanently or seasonally flooded wetland units. In order to maintain the character and quality of this wetland vegetation type, timely application of water of sufficient quantity and quality is imperative. Under this no action alternative, there would be no assurance of water for wetlands in most years.

Plant species diversity and abundance- Habitat diversity on LKNWR is dependent on water management flexibility. Water shortages falling at critical times will make water management practices ineffective and the production and presentation of wetland food and cover plants for all aquatic dependent species will become irregular at best.

Noxious and exotic plants- The control of unwanted exotic and noxious plants within the wetland units on LKNWR is primarily due to the precise application and removal of water from those units. If the water supply is inconsistent or nonexistant, noxious, generally terrestrial, plants such as perennial pepperweed, mustards, Bassia sp., Kochia sp., Canadian thistle, and others will invade dry wetland units. The only recourse for control would the increased application of chemical herbicides.

Wildlife species of special concern- The threatened bald eagle uses the refuge in great numbers during the midwinter months. LKNWR is the primary winter feeding area for eagles in the Klamath Basin. The primary food source is waterfowl. If water is not available in the summer and fall months to flood marshes that attract large numbers of waterfowl, it is likely there will be inadequate forage for wintering bald eagles and they will be forced to move to less reliable and higher risk feeding areas. This is presented in the biological opinion for the Klamath Project operations (USFWS, 2001), as well as the internal paper by Mauser and Thomson (2001) detailing minimum habitat requirements for wintering bald eagles on LKNWR. Other species of special concern that will be negatively affected by this no action alternative are the greater sandhill crane, white pelican, white-faced ibis, river otter, and western pond turtle. All are summer resident breeding species highly dependent on the managed marshes of LKNWR.

Wildlife species diversity and abundance- The inability to manage water will result in a considerable decrease in the habitat diversity available to wildlife on LKNWR in most years. This is especially true of wetland habitats. The great wildlife diversity and abundance associated with the great habitat diversity that normally exists on the refuge will be lost. The greatly decreased refuge wetland component that will occur in most years will almost certainly cause a decreased abundance of wildlife, particularly waterfowl and colonial nesting fish eating birds, using LKNWR as well as the Klamath Basin.

Game and non-game species- LKNWR has one of the highest populations of migratory waterfowl in the Pacific Flyway. Most of these waterfowl species are highly sought game species. This is the result of a high diversity of managed wetland units. The wetland loss in most future years on LKNWR would be a serious impact on waterfowl populations. The refuge supports a wide variety of non-game wetland dependent species which would be greatly diminished with the wetland losses expected with this alternative.

Pests and pathogens- The inability to properly manage water levels in marsh impoundments can greatly enhance the likelihood of the occurrence of a serious outbreak of avian botulism, caused by a toxin produced by an anerobic bacteria. This disease can be devastating to local water bird populations if unchecked with the potential to kill tens of thousands in a single episode. Good control of water levels in impoundments can greatly reduce or eliminate the risk of this disease. The refuge water shortages that will be experienced in 70% of future years under this alternative will insure the increased prevalence of this disease due to the inability to manage water properly.

Educational and recreational opportunities- LKNWR has experienced over 150,000 visitor use days annually. It has been identified as one of the best bird watching and nature study sites in the country, and innumerable school groups take advantage of the area for environmental education. The public waterfowl hunting program is the largest in the refuge system. All of these activities would need to be greatly curtailed or eliminated during the years of water shortage on the refuge that would occur under this alternative in 70% of future years.

Economic cost- There are 4,000 acres of irrigated crop lands that are farmed by local agriculturalists on a share crop basis. In many years, some or all of these lands would remain fallow because of lack of irrigation resulting in a significant economic loss to the local community. The recreational users of the refuge utilize many support services of the local community. In years with little or no water, the visitor use would be expected to be greatly diminished with attendant reduced revenue to the local community.

Employment- As identified above, the reduced economic benefits to the local communities would be expected to reduce to some extent employment opportunities associated with refuge operations.

Quality of life- LKNWR contributes greatly to the quality of life of a great number of people by providing an educational, recreational and inspirational experience in a natural setting filled with abundant wildlife resources. This alternative would see that experience greatly reduced or eliminated in 70% of future years.

Scenery- The scenic values of LKNWR would be greatly diminished if the wetlands could not be flooded.

Alternative B: Drill and improve ground water wells to develop a reliable water supply for Lower Klamath refuge wetlands (preferred).

Federally listed species- Water delivery especially during the fall months is critical to maintain the number of overwintering waterfowl on the refuge which are the primary food source for the threatened Bald Eagle. LKNWR supports from 300-900 bald eagles during winter. The maintenance of critical wetland habitats will help maintain waterfowl use of the refuge and reduce or eliminate adverse impacts on the wintering eagles. The location of the wells and associated infrastructure will not effect the bald eagle as it is located well away from primary use areas.

National Register of Historic Places- LKNWR is on the National Register of Historic Places. The ability to preserve the wetlands of this refuge is necessary for the purpose of the designation which recognizes an early example of man's preservation of natural wetlands and its wildlife for the future.

Surface and subsurface disturbance- It will be necessary to drill wells, run power lines to the wells, provide for water conveyance, and possibly water cooling. All of these activities will require surface and subsurface disturbance. Clearance from the State Historic Preservation Office will be obtained before construction activity commences.

National interests- As one of the most important and well known waterfowl refuges in the Pacific Flyway and the national refuge system, the maintenance of wetland habitats on LKNWR could have far reaching effects on the nation's migratory bird trust resources. Since over 75% of the waterfowl using the Pacific flyway pass through the Klamath Basin and well over 50% of the waterfowl using the Klamath Basin are found on LKNWR, maintenance of critical wetlands on that refuge could result in reducing or eliminating serious impacts on the Nation's trust migratory bird resources.

State and regional interests- Siskiyou county has an ordinance concerning the exportation of groundwater outside Siskiyou county to other areas. These groundwater developments will be used specifically on refuge wetland units lying within Siskiyou county and no conflict with county groundwater ordinances will arise. The wetlands of LKNWR are very important to Oregon and California recreationalists for both consumptive and non-consumptive uses. Maintaining critical refuge wetlands would allow the continuance of these uses. The crops grown on the refuge by local agriculturalists contribute to the local economy. Wells will not provide sufficient surplus water quantities for the irrigation of refuge farm lands in critically dry years, but could supplement irrigation in other year types.

General Environmental Checklist

Cuts and fills- It will be necessary to make some cuts and fills to build the water conveyance infrastructure as well as access roads to well sites and facilities.

Surface and ground water quality/quantity- The maintenance of freshening flows to refuge wetland units will maintain water quality within those units and reduce risk of waterfowl diseases such as botulism that occur when water levels cannot be controlled effectively. According to the work by WESCORP (2001) in the course of the test well project on LKNWR, the aquifers under the refuge can be pumped at the proposed levels without long term effects. LKNWR will maintain monitoring wells adjacent to each new production well and will record bi-monthly water levels in each monitoring well. In addition, LKNWR will arrange for the California Department of Water Resources (DWR) to have the new wells added to the network of wells that DWR currently monitors on a semi-annual basis. Ground water monitoring will be done in cooperation with Siskiyou County and the Siskiyou County Groundwater Monitoring Plan. This will allow LKNWR to determine if the pumping is impacting the aquifer and nearby private wells. Pumping volumes will be reduced if impacts are noted. If warmer than desired water is encountered in the new wells, it will be blended with existing surface waters or cooler water from other wells before it is delivered to refuge wetlands. The blending and cooling may occur in dedicated cooling ponds or within existing ditches and conveyance facilities.

Critical wildlife habitat- Most of the habitat and food for waterfowl and other birds is the result of water applied to permanently or seasonally flooded wetland units. In order to maintain the character and quality of this wetland vegetation type, timely application of water of sufficient quantity and quality is imperative. With this preferred alternative, there would be assured water for critical wetlands in all years.

Plant species diversity and abundance- Habitat diversity on LKNWR is dependent on water management flexibility. Secure supplies of water at critical times will make water management practices in critical wetlands effective and the production and presentation of wetland food and cover plants for all aquatic dependent species will be optimized.

Wildlife species of special concern- The threatened bald eagle uses the refuge in great numbers during the midwinter months. LKNWR is the primary winter feeding area for eagles in the Klamath Basin. The primary food source is waterfowl. By assuring that water is available in the summer and fall months to flood marshes that attract large numbers of waterfowl, it is likely there will be adequate forage for most, although not all, wintering bald eagles and they will not be forced to move to less reliable and higher risk feeding areas. This minimum water need is presented in the biological opinion for the Klamath Project operations (USFWS, 2001), as well as the internal paper by Mauser and Thomson (2001) detailing minimum habitat requirements for wintering bald eagles on LKNWR (Table 2). Other species of special concern whose critical habitat will be maintained because of well water development are the greater sandhill crane, white pelican, white-faced ibis, and western pond turtle. All are summer resident breeding species highly dependent on the managed marshes of LKNWR.

Table 2. Minimum habitat needs to support wintering bald eagles on Lower Klamath National Wildlife Refuge.

Habitat	**Acres**	**Water needs** (cfs)	**Rationale**
Seasonally flooded wetland. Units 4B, 4C, 9A, 11AN, 12A	2,482	September = 61 October = 61 November = 14 **Total = 8,131 a-f**	Flooding of seasonal marshes attracts and holds preferred waterfowl prey species (mallard, pintail, wigeon) and maintains Lower Klamath NWR as a traditional waterfowl and eagle staging and wintering location.
Permanent wetland Units 2, 8B, 12C	6,053	Apr = 28 May = 41 Jun = 55 Jul = 69 Aug = 60 Sep = 45 Oct = 24 **Total = 17,719 a-f**	Provide feeding and loafing habitat for waterfowl using seasonal wetlands and flooding grain fields. Unit 2 is a primary staging area for waterfowl using KDD lands and LKNWR and is close to the Bear Valley NWR night roost. Unit 8B and 12C are close to the Mt. Dome eagle night roost. These locations are intended to minimize distance eagles travel to forage.
Small grains Units 7B, 12B, 11C	2,431	Dec = 30 Jan = 38 Feb = 36 **Total = 6,405 a-f** **Grand total = 32,255 a-f**	Flooding of small grain fields in winter provides important food and open water to waterfowl when seasonal marshes have frozen. This practice also makes mice available to feeding eagles. Some avian cholera in waterfowl traditionally occurs in flooding grainfields making them attractive to foraging eagles.

Wildlife species diversity and abundance- Water management flexibility will result in the maintenance of habitat diversity available to wildlife on LKNWR in all years. This is especially true of wetland habitats. The great wildlife diversity and abundance associated with the great habitat diversity that normally exists on the refuge will be maintained.

Game and non-game species- LKNWR has one of the highest populations of migratory waterfowl in the Pacific Flyway. Most of these waterfowl species are highly sought game species. This is the result of a high diversity of managed wetland units. Eliminating critical wetland loss on LKNWR would reduce or eliminate serious impact on waterfowl populations. The refuge supports a wide variety of non-game wetland dependent species which would be supported by maintaining critical wetlands in all years.

Pests and pathogens- The inability to properly manage water levels in marsh impoundments can greatly enhance the likelihood of the occurrence of a serious outbreak of avian botulism, caused

by a toxin produced by an anerobic bacteria. This disease can be devastating to local water bird populations if unchecked with the potential to kill tens of thousands in a single episode. Good control of water levels in impoundments can greatly reduce or eliminate the risk of this disease. The refuge production wells could insure that sufficient water would be available to manage water properly for disease prevention in critical wetland units.

Archaeologic and historic sites- There are numerous archaeological sites on LKNWR. The production wells and associated water handling facilities will be designed to avoid negative impacts to such sites. The development plan will be approved by the State Historic Preservation Officer before construction.

Educational and recreational opportunities- LKNWR has experienced over 150,000 visitor use days annually. It has been identified as one of the best bird watching and nature study sites in the country, the public waterfowl hunting program is the largest in the refuge system, and innumerable school and other groups take advantage of the area for environmental education. All of these activities would be maintained in the future with the use of well water flooding of critical wetland habitats.

Economic cost- It is expected to cost about $2.3 million to develop the production wells and provide the necessary water handling and treatment facilities.

Employment- There will be employment opportunities associated with the well drilling contract and construction of the water conveyance facilities.

Community cohesion- There is a great deal of local pride in LKNWR for its esthetic and wildlife values. There should be farm support for the LKNWR production wells because it is an effort by the refuge to try to solve some water quantity issues that will ultimately help everyone.

Scenery- Many of the scenic values of LKNWR will be maintained with the critical wetlands flooded. The production wells and facilities will be located and designed so as to not greatly impact the view scape.

Alternative C: Develop a water storage reservoir and facilities to serve Lower Klamath refuge wetlands.

Federally listed species- Water delivery especially during the fall months is critical to maintain the number of overwintering waterfowl on the refuge which are the primary food source for the threatened Bald Eagle. LKNWR supports from 300-900 bald eagles during winter. The inability to maintain critical wetlands and the associated waterfowl in the early fall months presents a major impact to wintering bald eagles because of reduction in their prey base. This alternative would not likely service critical fall flooded seasonal wetlands necessary to provide bald eagle habitat below average years.

National Register of Historic Places- LKNWR is on the National Register of Historic Places. The ability to preserve the wetlands of this refuge is necessary for the purpose of the designation which was as an early example of man's desire to preserve natural wetlands and its wildlife for the future. This alternative would not maintain wetlands in all years.

Surface and subsurface disturbance- It will be necessary to do major surface and subsurface disturbance over a large area of the refuge to fully develop this reservoir alternative. Clearance from the State Historic Preservation Office would need to be obtained before construction activity commences.

Discharge of dredged or fill materials in wetlands- The proposed reservoir site is presently a wetland. Fill for the impounding dikes would be placed in the present wetland on three of the four sides of the impoundment. Corps of Engineers Section 404 permit process would be undertaken before construction could occur.

National interests- As one of the most important and well known waterfowl refuges in the Pacific Flyway and the national refuge system, the maintenance of wetland habitats on LKNWR could have far reaching effects on the nation's migratory bird trust resources. Since over 75% of the waterfowl using the Pacific flyway pass through the Klamath Basin and well over 50% of the waterfowl using the Klamath Basin are found on LKNWR, maintenance of critical wetlands on that refuge is necessary to reduce or eliminate serious impacts to the Nation's trust migratory bird resources. This proposal does not adequately address the refuge water needs for the fall migration period in many years.

State and regional interests- The wetlands of LKNWR are very important to Oregon and California recreationalists for both consumptive and non-consumptive uses. Critical refuge wetlands would need to be maintained to allow the continuance of these uses and this alternative would provide that only in about half the years. The crops grown on the refuge by local agriculturalists contribute to the local economy. This reservoir alternative will not provide sufficient surplus water quantities for the irrigation of refuge farm lands in dry and critically dry years, but might supply partial or supplemental irrigation in other year types.

General Environmental Checklist

Cuts and fills- It will be necessary to make major cuts and fills to build the impounding dikes, water conveyance infrastructure as well as access roads to facilities. Large amounts of fill and rip-rap material will be trucked in from off site.

Earthquake and landslide risk- The proposed reservoir site is located in a seismic area considered to active to safely locate a reservoir.

Surface and ground water quality/quantity- The maintenance of freshening flows to refuge wetland units in years when the reservoir is producing will maintain water quality within those units and reduce risk of waterfowl diseases such as botulism that occur when water levels cannot be controlled effectively. However, in most future years, insufficient water will be available from the reservoir to accomplish freshening flows in critical wetland units.

Critical wildlife habitat- Most of the habitat and food for waterfowl and other birds is the result of water applied to permanently or seasonally flooded wetland units. In order to maintain the character and quality of this wetland vegetation type, timely application of water of sufficient quantity and quality is imperative. With this preferred alternative, there would be assured water for critical wetlands in only a limited number of future years.

Plant species diversity and abundance- Habitat diversity on LKNWR is dependent on flexible water management capability. Secure supplies of water at critical times will make water management practices in critical wetlands effective and the production and presentation of wetland food and cover plants for all aquatic dependent species will be optimized. This alternative will only accomplish this in wetter years and species diversity and abundance will suffer in most future years do to the inability to reliably flood critical wetlands.

Wildlife species of special concern- The threatened bald eagle uses the refuge in great numbers during the midwinter months. LKNWR is the primary winter feeding area for eagles in the Klamath Basin. The primary food source is waterfowl. This alternative cannot assure that water will be available in the summer and fall months of many years to flood marshes that attract large numbers of waterfowl, and it is likely there will be inadequate forage for wintering bald eagles in those years and they will not be forced to move to less reliable and higher risk feeding areas. This minimum water need is presented the biological opinion for the Klamath Project operations (USFWS, 2001), as well as the internal paper by Mauser and Thomson (2001) detailing minimum habitat requirements for wintering bald eagles on LKNWR (Table 2). Other species of special concern that will be negatively effected when water for wetland maintenance is unavailable are the greater sandhill crane, white pelican, white-faced ibis, and western pond turtle. All are summer resident breeding species highly dependent on the managed marshes of LKNWR.

Wildlife species diversity and abundance- The ability to reliably manage water in critical habitats in all years allows the maintenance of habitat diversity available to wildlife on LKNWR. This is

especially true of wetland habitats. The great wildlife diversity and abundance associated with the great habitat diversity that normally exists on the refuge can be maintained only if enough water is available to service critical habitats in a timely manner. In a great many future years, this alternative will provide inadequate water to maintain critical habitat components necessary to support continued wildlife diversity.

Game and non-game species- LKNWR has one of the highest populations of migratory waterfowl in the Pacific Flyway. Most of these waterfowl species are highly sought game species. These populations are the result of a high diversity of managed wetland units. Eliminating the loss of critical wetland components on LKNWR is necessary to reduce or eliminate serious impact on waterfowl populations. In a great many future years, this reservoir alternative would not provide sufficient summer or fall water to maintain these necessary and critical components. The refuge supports a wide variety of non-game wetland dependent species which would be impacted negatively when critical wetlands could not be maintained.

Pests and pathogens- The inability to properly manage water levels in marsh impoundments can greatly enhance the likelihood of the occurrence of a serious outbreak of avian botulism, caused by a toxin produced by an anerobic bacteria. This disease can be devastating to local water bird populations if unchecked with the potential to kill tens of thousands in a single episode. Good control of water levels in impoundments can greatly reduce or eliminate the risk of this disease. In years when the reservoir could insure that sufficient water would be available to manage water properly for disease prevention in critical wetland units, waterfowl disease would be minimized. In a great many future years, the reservoir would be unable to sustain adequate water control necessary for disease prevention in critical wetland units

Archaeologic and historic sites- There are numerous archaeological sites on LKNWR. The reservoir, pump stations, and associated water handling facilities would have to be designed to avoid as many negative impacts to such sites as possible. The development plan would be approved by the State Historic Preservation Officer before construction.

Educational and recreational opportunities- LKNWR has experienced over 150,000 visitor use days annually. It has been identified as one of the best bird watching and nature study sites in the country, the public waterfowl hunting program is the largest in the refuge system, and innumerable school and other groups take advantage of the area for environmental education. With inadequate or no water available from the reservoir in many future years to maintain critical wetlands, all these activities would be impacted both quantitatively and qualitatively in those years..

Economic cost- It is expected to cost about $19.3 million to develop the reservoir, pump stations, associated necessary water handling facilities. Annual power costs would be expected to reach $200,000 in years when the reservoir can be filled.

Employment- There would be some employment opportunity associated with the construction of this reservoir alterative and the continued maintenance will require the addition of at least one and perhaps two staff maintenance persons to keep the system functional.

Community cohesion- There is a great deal of local pride in LKNWR for its esthetic and wildlife values. There will be community support for any project that is seen to alleviate water supply problems within the Klamath Basin, but this initiative would receive little support because of the possibility of it being a competitive project with other water users and the very high cost of development and operation..

Scenery- Many of the scenic values of LKNWR could be impacted with this alternative. The impounding dikes would be considerably larger than other landscape features on the refuge and the large pump stations will also likely be large visible features. If built, attempts would be made to blend these new features with the surrounding landscape to the extent possible.

Table 3. Alternative Effects Matrix

	No Action Alternative A	Drill Wells, Alternative B	Refuge Reservoir, Alternative C
Conservation of sensitive, threatened and endangered species and their habitats	Poor	Best	Fair
Maintain production and migration habitats for waterfowl and other migratory birds	Poor	Best	Fair
Protect the native habitats and wildlife representative of the local natural diversity	Poor	Best	Fair
Provide wildlife dependent visitor services such as observation, education, hunting, photography	Poor	Best	Fair
Reduces competition with other water users for limited surface water resources	Poor	Best	Poor
Project cost versus wildlife and habitat benefits	Poor	Best	Poor

Section V: CONSULTATION AND COORDINATION WITH OTHERS

List below parties contacted during the planning process. Summarize results of consultation or coordination with these parties. If the EA was circulated for public comment, also provide a summary of any significant issues raised and how they were resolved.

Draft EA was circulated to governmental agencies, organizations, and any other interested public including the following:

Senator Dianne Feinstein
Senator Barbara Boxer
Senator Gordon Smith
Senator Ron Wyden
Representative Wally Herger
Representative Greg Walden
California Department of Fish and Game
Oregon Department of Fish and Wildlife
Siskiyou County Board of Supervisors
Klamath County Board of Commissioners
Klamath Water Users Association
Tulelake Irrigation District
Klamath Drainage District
Tulelake Growers Association
National Wildlife Refuge Association
National Audubon Society
The Nature Conservancy
Oregon Natural Resources Council
Klamath Forest Alliance
California Waterfowl Association
Oregon-California Wetlands Association
The Klamath Tribes

A total of 23 comments to the draft EA were received. Comments expressing a preference for an alternative were in favor of Alternative B (wells).

The primary concern expressed by most respondents was how the effects of groundwater pumping as proposed in the Lower Klamath Lake basin would be monitored and if long term effects are noted, what would be the action by the refuge. According to the refuge ground water study (WESCORP, 2001), the level of groundwater pumping proposed is sustainable and long term effects on the water table should not occur. Ground water will only be withdrawn when surface water is not available. The test wells constructed immediately adjacent to each production well will be used to periodically measure the water levels of the aquifer. LKNWR

will prepare and execute a monitoring program for measuring and analyzing water levels. In addition to the refuge test wells, other area wells may be included in the monitoring program, and, on a long-term basis, water levels in the new wells will be compared with nearby private wells to determine if the LKNWR wells are having an impact. Ground water monitoring will be done in cooperation with California DWR, Siskiyou County and the Siskiyou County Groundwater Monitoring Plan. This will allow LKNWR to determine if the pumping is impacting the aquifer and nearby private wells. If adverse impacts to the aquifer are observed, LKNWR will modify its pumping program.

Many comments were concerned with the export of groundwater for use outside Siskiyou County. LKNWR will comply with the Siskiyou County Groundwater Ordinance and consumptively use all groundwater within the Lower Klamath Lake Basin and Siskiyou County.

Several respondents thought that a comprehensive study of groundwater resources within the entire Upper Klamath Basin be completed before groundwater development be accomplished. The wells on LKNWR will be subject to comprehensive monitoring which will be shared with California DWR, Siskiyou County, U. S. Geological Survey, and any other interested party. These data will be useful in the development of the larger Upper Klamath Basin groundwater models. Furthermore, LKNWR will modify groundwater pumping if long term effects on the aquifer is noted.

Section VI: CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis contained in this document, I find that implementation of the proposed action:

_X_ Is compatible with the major purposes for which the area was established.

____ Is not compatible with the major purposes for which the area was established.

____ Would constitute an action significantly affecting the quality of the human environment and, therefore, recommend an EIS be prepared. (Forward EA to RO for review.)

_X_ Would not constitute an action significantly affecting the quality of the human environment and therefore, recommend a Finding of No Significant Impact (FONSI) be prepared.

Project Leader — Date: 5/31/01

Klamath/Central Valley Refuge Supervisor — Date: 6/04/01

Bibliography

Mauser, D. M. and D. Thomson. 2001. Minimum Habitat Needs for Wintering Bald Eagles on Lower Klamath NWR. U. S. Department of Interior, Fish and Wildlife Service, Klamath Basin National Wildlife Refuges, Tulelake, California 17pp.

_____. 1998. Lower Klamath National Wildlife Refuge California Engineering Feasibility Study for a Water Storage Project. U. S. Department of Interior, Fish and Wildlife Service, Portland, Oregon 200pp.

_____. 2001. Biological/Conference Opinion regarding the Effects of Long Term Operation of the Bureau of Reclamation's Klamath Project on the Endangered Lost River Sucker (Deltistes luxatus), Endangered Shortnose Sucker (Chasmistes brevirostris), and Threatened Bald Eagle (Haliaeetus leucocephalus) and Proposed Critical Habitat for the Lost River and Shortnose Suckers. U. S. Department of Interior, Fish and Wildlife Service, Klamath Falls, Oregon 330pp.

WESCORP. 2001. Lower Klamath National Wildlife Refuge Groundwater Investigation - Final Report. WESCORP, Mercer Island, Washington 250pp.

Appendix A
SIGNIFICANCE CHECKLIST

This checklist is intended to help determine whether a given alternative would affect environmental features of special legal or policy significance. The list of 23 questions can be answered with a "yes" or "no" response. For any item answered "yes," discuss under the appropriate alternative in Section IV. The more items answered "yes," the stronger the likelihood that an EIS is necessary.

Alternative A: <u>No Action</u>

Would the implementation of the alternative be expected to affect or involve:

1. Federally listed threatened or endangered species or their critical habitats? (If "yes," Section 7 internal consultation is required.) Yes

2. Properties either listed in or eligible for listing in the National Register of Historic Places? (If "yes," consult with State Historic Preservation Office.) Yes

3. Either surface or subsurface disturbance? (If "yes," consult with SHPO.) No

4. Major loss or alteration of natural wetlands that would adversely affect biological productivity, habitat diversity, flood storage capacity, or aquifer recharge capacity? (If "yes," see FWS floodplain/wetland regulations in November 20, 1979, issue of Federal Register.) Yes

5. Areas within the 100-year floodplain, in terms of increasing the flood hazard potential? (If "yes," see November 20, 1979, issue of Federal Register.) No

6. Natural resources within the officially designated boundary of the State coastal zone? (If "yes," consult with State Coastal Zone Management Office.) No

7. Discharge of dredged or fill materials in waters of the U.S. or adjacent wetlands? (If "yes," Corps of Engineers' Section 404 permit is required.) No

8. Structures or facilities within, under or above a navigable waterway? (If "yes," Corps of Engineers' Section 10 permit is required.) No

9. River segments designated for inclusion within the National Wild and Scenic Rivers System? (If "yes," consult with National Park Service.) No

10. Any area included within the National Wilderness Preservation System? No

11. Use of toxic or environmentally hazardous substances, such as pesticides, herbicides, rodenticides, etc? (If "yes," consult with Environmental Contaminant Specialist, OR.) No

12. Significant degradation of water quality? (If "yes," consult with State water quality agency and/or U.S. Environmental Protection Agency.) No

13. Significant degradation of air quality? (If "yes," consult with State air quality agency and/or EPA.) No

14. Society as a whole? Yes

15. National interests? Yes

16. State or regional interests? Yes

17. Long-term irreversible or irretrievable commitments of resources? No

18. Public health or safety hazards? No

19. Widespread controversy? Yes

20. Highly uncertain effects with unique or unknown risks? No

21. Establishment of a precedent for future actions with significant effects, or a decision in principle about a future consideration? Yes

22. Other actions with individually insignificant but cumulatively significant impacts? No

23. Potential violation of Federal, State or local law or requirements imposed for the protection of the environment? Yes

Alternative B: <u>Drill and improve ground water wells to develop a reliable water supply for Lower Klamath refuge wetlands (preferred).</u>

Would the implementation of the alternative be expected to affect or involve:

1. Federally listed threatened or endangered species or their critical habitats? (If "yes," Section 7 internal consultation is required.) Yes

2. Properties either listed in or eligible for listing in the National Register of Historic Places? (If "yes," consult with State Historic Preservation Office.) Yes

3. Either surface or subsurface disturbance? (If "yes," consult with SHPO.) Yes

4. Major loss or alteration of natural wetlands that would adversely affect biological productivity, habitat diversity, flood storage capacity, or aquifer recharge capacity? (If "yes," see FWS floodplain/wetland regulations in November 20, 1979, issue of Federal Register.) No

5. Areas within the 100-year floodplain, in terms of increasing the flood hazard potential? (If "yes," see November 20, 1979, issue of Federal Register.) No

6. Natural resources within the officially designated boundary of the State coastal zone? (If "yes," consult with State Coastal Zone Management Office.) No

7. Discharge of dredged or fill materials in waters of the U.S. or adjacent wetlands? (If "yes," Corps of Engineers' Section 404 permit is required.) No

8. Structures or facilities within, under or above a navigable waterway? (If "yes," Corps of Engineers' Section 10 permit is required.) No

9. River segments designated for inclusion within the National Wild and Scenic Rivers System? (If "yes," consult with National Park Service.) No

10. Any area included within the National Wilderness Preservation System? No

11. Use of toxic or environmentally hazardous substances, such as pesticides, herbicides, rodenticides, etc? (If "yes," consult with Environmental Contaminant Specialist, OR.) No

12. Significant degradation of water quality? (If "yes," consult with State water quality agency and/or U.S. Environmental Protection Agency.) No

13. Significant degradation of air quality? (If "yes," consult with State air quality agency and/or EPA.) No

14. Society as a whole? No

15. National interests? Yes

16. State or regional interests? Yes

17. Long-term irreversible or irretrievable commitments of resources? No

18. Public health or safety hazards? No

19. Widespread controversy? No

20. Highly uncertain effects with unique or unknown risks? No

21. Establishment of a precedent for future actions with significant effects, or a decision in principle about a future consideration? No

22. Other actions with individually insignificant but cumulatively significant impacts? No

23. Potential violation of Federal, State or local law or requirements imposed for the protection of the environment? No

Alternative C: <u>Develop a water storage reservoir and facilities to serve Lower Klamath refuge wetlands.</u>

Would the implementation of the alternative be expected to affect or involve:

1. Federally listed threatened or endangered species or their critical habitats? (If "yes," Section 7 internal consultation is required.) Yes

2. Properties either listed in or eligible for listing in the National Register of Historic Places? (If "yes," consult with State Historic Preservation Office.) Yes

3. Either surface or subsurface disturbance? (If "yes," consult with SHPO.) Yes

4. Major loss or alteration of natural wetlands that would adversely affect biological productivity, habitat diversity, flood storage capacity, or aquifer recharge capacity? (If "yes," see FWS floodplain/wetland regulations in November 20, 1979, issue of Federal Register.) No

5. Areas within the 100-year floodplain, in terms of increasing the flood hazard potential? (If "yes," see November 20, 1979, issue of Federal Register.) No

6. Natural resources within the officially designated boundary of the State coastal zone? (If "yes," consult with State Coastal Zone Management Office.) No

7. Discharge of dredged or fill materials in waters of the U.S. or adjacent wetlands? (If "yes," Corps of Engineers' Section 404 permit is required.) Yes

8. Structures or facilities within, under or above a navigable waterway? (If "yes," Corps of Engineers' Section 10 permit is required.) No

9. River segments designated for inclusion within the National Wild and Scenic Rivers System? (If "yes," consult with National Park Service.) No

10. Any area included within the National Wilderness Preservation System? No

11. Use of toxic or environmentally hazardous substances, such as pesticides, herbicides, rodenticides, etc? (If "yes," consult with Environmental Contaminant Specialist, OR.) No

12. Significant degradation of water quality? (If "yes," consult with State water quality agency and/or U.S. Environmental Protection Agency.) No

13. Significant degradation of air quality? (If "yes," consult with State air quality agency and/or EPA.) No

14. Society as a whole? No

15. National interests? Yes

16. State or regional interests? Yes

17. Long-term irreversible or irretrievable commitments of resources? No

18. Public health or safety hazards? No

19. Widespread controversy? No

20. Highly uncertain effects with unique or unknown risks? No

21. Establishment of a precedent for future actions with significant effects, or a decision in principle about a future consideration? No

22. Other actions with individually insignificant but cumulatively significant impacts? No

23. Potential violation of Federal, State or local law or requirements imposed for the protection of the environment? No

Appendix B

GENERAL ENVIRONMENTAL CHECKLIST

This checklist is intended to facilitate effect analysis for the various alternatives under consideration. The list of physical, biological and social considerations can be answered with a "yes" or "no" response. For any item answered "yes," discuss under the appropriate alternative in Section IV.

Alternative A: No Action

Would implementation of the alternative be expected to affect any of the physical, biological or social considerations listed below?

PHYSICAL CONSIDERATIONS

A. Climate - No

B. Air Quality - No

C. Topography - No
   1. Relief
   2. Cuts/Fills

D. Geology - No
   1. Earthquake/Landslide
   2. Minerals
   3. Energy Resource Depletion/Conservation
   4. Radioactive and Toxic Substances/Heavy Metals
   5. Erosion/Deposition
   6. Siltation
   7. Soil Quality

E. Hydrology
   1. Surface and Ground Water Quality/Quantity - Yes
   2. Absorption/Drainage
   3. Flooding
   4. Hydro/Geothermal Energy Source

BIOLOGICAL CONSIDERATIONS

A. Vegetation
    1. Species of Special Concern -Yes
    2. Critical Wildlife Habitat - Yes
    3. Species Diversity/Abundance - Yes
    4. Noxious Weeds/Exotic Plants/Pathogens - Yes

B. Wildlife
    1. Species of Special Concern - Yes
    2. Species Diversity/Abundance - Yes
    3. Game/Non-Game Species - Yes
    4. Pests/Pathogens/Vectors/Predators/Feral or Exotic Animals - Yes

SOCIAL CONSIDERATIONS

A. Cultural
    1. Archaeologic/Historic Sites - No
    2. Educational/Recreational Opportunities - Yes
    3. Public Access - No

B. Economic
    1. Cost - Yes
    2. Employment - Yes
    3. Commercial/Industrial Buildings - No
    4. Taxes/Property Values - No

C. Land Use
    1. Plans/Policies/Controls - No
    2. Development/Growth - No
    3. Farmland/Open Space, Natural Areas - No
    4. Transportation Facilities/Public Utilities - No

D. Social
    1. Quality of Life - Yes
    2. Community Cohesion - No
    3. Residents/Residences - No
    4. Population Change - No
    5. Human Health/Safety - No
    6. Public Services - Yes
    7. National Defense - No

E. Aesthetics
    1. Scenery - Yes
    2. Noise - No
    3. Odor - No

Alternative B: Drill and improve ground water wells to develop a reliable water supply for refuge wetlands (preferred).

Would implementation of the alternative be expected to affect any of the physical, biological or social considerations listed below?

PHYSICAL CONSIDERATIONS

A. Climate -No

B. Air Quality -No

C. Topography
   1. Relief -No
   2. Cuts/Fills -Yes

D. Geology
   1. Earthquake/Landslide -No
   2. Minerals -No
   3. Energy Resource Depletion/Conservation -No
   4. Radioactive and Toxic Substances/Heavy Metals -No
   5. Erosion/Deposition -No
   6. Siltation -No
   7. Soil Quality -No

E. Hydrology
   1. Surface and Ground Water Quality/Quantity -Yes
   2. Absorption/Drainage -No
   3. Flooding -No
   4. Hydro/Geothermal Energy Source -No

BIOLOGICAL CONSIDERATIONS

A. Vegetation
   1. Species of Special Concern -Yes
   2. Critical Wildlife Habitat -Yes
   3. Species Diversity/Abundance -Yes
   4. Noxious Weeds/Exotic Plants/Pathogens -No

B. Wildlife
   1. Species of Special Concern -Yes
   2. Species Diversity/Abundance -Yes
   3. Game/Non-Game Species -Yes
   4. Pests/Pathogens/Vectors/Predators/Feral or Exotic Animals -Yes

SOCIAL CONSIDERATIONS

A. Cultural
   1. Archaeologic/Historic Sites -Yes
   2. Educational/Recreational Opportunities -Yes
   3. Public Access -No

B. Economic
   1. Cost -Yes
   2. Employment -Yes
   3. Commercial/Industrial Buildings -No
   4. Taxes/Property Values -No

C. Land Use
   1. Plans/Policies/Controls -No
   2. Development/Growth -No
   3. Farmland/Open Space, Natural Areas - No
   4. Transportation Facilities/Public Utilities -No

D. Social
   1. Quality of Life -No
   2. Community Cohesion -Yes
   3. Residents/Residences -No
   4. Population Change -No
   5. Human Health/Safety -No
   6. Public Services -No
   7. National Defense -No

E. Aesthetics
   1. Scenery -Yes
   2. Noise -No
   3. Odor -No

Alternative C: <u>Develop a water storage reservoir and facilities to serve Lower Klamath refuge wetlands.</u>

Would implementation of the alternative be expected to affect any of the physical, biological or social considerations listed below?

PHYSICAL CONSIDERATIONS

A. Climate -No

B. Air Quality -No

C. Topography
   1. Relief -No
   2. Cuts/Fills -Yes

D. Geology
   1. Earthquake/Landslide -Yes
   2. Minerals -No
   3. Energy Resource Depletion/Conservation -No
   4. Radioactive and Toxic Substances/Heavy Metals -No
   5. Erosion/Deposition -No
   6. Siltation -No
   7. Soil Quality -No

E. Hydrology
   1. Surface and Ground Water Quality/Quantity -Yes
   2. Absorption/Drainage -No
   3. Flooding -No
   4. Hydro/Geothermal Energy Source -No

BIOLOGICAL CONSIDERATIONS

A. Vegetation
   1. Species of Special Concern -Yes
   2. Critical Wildlife Habitat -Yes
   3. Species Diversity/Abundance -Yes
   4. Noxious Weeds/Exotic Plants/Pathogens -Yes

B. Wildlife
   1. Species of Special Concern -Yes
   2. Species Diversity/Abundance -Yes
   3. Game/Non-Game Species -Yes
   4. Pests/Pathogens/Vectors/Predators/Feral or Exotic Animals -Yes

SOCIAL CONSIDERATIONS

A. Cultural
   1. Archaeologic/Historic Sites -Yes
   2. Educational/Recreational Opportunities -Yes
   3. Public Access -No

B. Economic
   1. Cost -Yes
   2. Employment -Yes
   3. Commercial/Industrial Buildings -No
   4. Taxes/Property Values -No

C. Land Use
   1. Plans/Policies/Controls -Yes
   2. Development/Growth -No
   3. Farmland/Open Space, Natural Areas -No
   4. Transportation Facilities/Public Utilities -No

D. Social
   1. Quality of Life -No
   2. Community Cohesion -No
   3. Residents/Residences -No
   4. Population Change -No
   5. Human Health/Safety
   6. Public Services -No
   7. National Defense -No

E. Aesthetics
   1. Scenery -Yes
   2. Noise -No
   3. Odor -No