

**United States Fish and Wildlife Service
Environmental Action Statement**

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA), and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and determined that the action of continuing farming on the Havasu National Wildlife Refuge (NWR):

Check One:

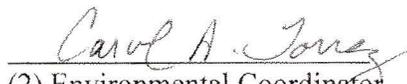
- is a categorical exclusion as provided by 516 DM Chapter 8 [*specify CE category and include text of the citation*]. No further NEPA documentation will therefore be made.
- is found not to have significant environmental effects as determined by the attached environmental assessment and finding of no significant impact.
- is found to have significant effects and, therefore, further consideration of this action will require a notice of intent to be published in the Federal Register announcing the decision to prepare an EIS.
- is not approved because of unacceptable environmental damage, or violation of Fish and Wildlife Service mandates, policy, regulations, or procedures.
- is an emergency action within the context of 40 CFR 1506.11. Only those actions necessary to control the immediate impacts of the emergency will be taken. Other related actions remain subject to NEPA review.

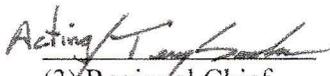
Other supporting documents:

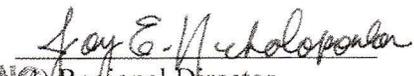
Finding of No Significant Impact and Environmental Assessment for Farming at Havasu National Wildlife Refuge

Signature Approval:


(1) Originator 12/13/10
Date


(2) Environmental Coordinator,
R2 NWRS 12/21/10
Date


(3) Regional Chief,
R2 NWRS 12/21/10
Date


(4) Regional Director 12/21/2010
Date

FINDING OF NO SIGNIFICANT IMPACT

ENVIRONMENTAL ASSESSMENT FOR FARMING

AT

HAVASU NATIONAL WILDLIFE REFUGE MOHAVE COUNTY, ARIZONA and SAN BERNADINO COUNTY, CALIFORNIA

The U.S. Fish and Wildlife Service is proposing to continue farming on the Havasu National Wildlife Refuge (NWR), between Needles, California, and Lake Havasu City, Arizona. An Environmental Assessment (EA) was prepared in compliance with the National Environmental Policy Act (NEPA) to provide decision-making framework that 1) explores a reasonable range of alternatives to meet project objectives, 2) evaluates potential issues and impacts to the refuge, resources and values, and 3) identifies mitigation measures to lessen the degree or extent of these impacts. The EA evaluated the effects associated with three alternatives.

Alternatives Considered and Analyzed

Alternative A – No Action (Proposed Action)

This alternative is to continue force account farming on 245 acres within the Pintail Slough Management Unit and the Bermuda Field. The total amount of acreage within the farming program will continue to include 100 acres grown in crops, 75 acres managed as moist-soil units, and 70 acres of perennial Bermuda grass with a winter crop of ryegrass. The 100 acres of agricultural fields will be planted in wheat, barley, oats, forage mix (wheat, oats, barley, peas, etc.), ryegrass, and, occasionally, a sorghum crop (e.g., milo). Through adaptive management, the Refuge will keep one field fallow with the previous crop's residue left behind to prevent soil erosion. The Refuge will plant Japanese millet and watergrass within the 75 acres of moist-soil units to enhance food production as well. Under this alternative, the Refuge may use adaptive management to potentially grow a nitrogen-fixing crop in one field and conduct routine soil samples on all fields to determine more precise fertilizer and soil amendment requirements. Agricultural practices will continue to be used to fulfill one of the primary purposes for which the Refuge was established, i.e., to serve as a refuge and breeding ground for migratory birds and other wildlife. In addition, this action will continue benefitting soils by increasing organic matter while reducing the potential for soil erosion.

Alternative B – Conversion of Agricultural Fields to Native Vegetation with Creation of Additional Moist-Soil Units

Under this alternative, the Refuge would convert the 100 acres of agricultural fields in the Pintail Slough management Unit to native habitat while continuing to use farming techniques on the 70-acres of Bermuda Field and the 75-acres of moist-soil units. The existing vegetation in the agricultural fields would be cleared and replaced by trees such as cottonwoods, willows, mesquite, and potentially other native shrubs. The restored habitat would be valuable to neotropical birds by providing nesting, feeding, resting, and escape cover. In addition, the Refuge would increase moist-soil units up to 100 acres adjacent to the existing moist-soil units under this alternative. This would entail a combination of chemical and mechanical salt cedar removal, leaching, and leveling of land. Ultimately, this alternative would meet the Refuge's establishment purpose, but it would benefit an entirely different suite of bird species than those that benefit from the current management. In addition, the Refuge would face management challenges due to limitations of topographical features, cost, staffing requirements, and the water entitlement.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

Under this alternative, the Refuge would convert the existing 100 acres of agricultural fields and 70 acres of Bermuda Field to native vegetation while maintaining the existing 75 acres of moist-soil units.

Revegetation would include planting of cottonwoods, willows, mesquite, and potentially other native shrubs. This alternative would increase habitat quality and quantity for neotropical birds but decrease the amount of habitat available to waterfowl. Ultimately, this action would add 170 acres to the mosaic of native habitat scattered throughout the lower Colorado River Basin, but management challenges associated with this action would include creating functional wildlife habitat, limitations due to topographical features, cost, staffing requirements, and limited water supply.

Proposed Action

Alternative A, continuation of the existing farming program, was selected because it best satisfies the purpose and need for the project. Although Alternatives B and C provide food and restored habitat for wildlife, the proposed action will result in continued production of green browse and seed crops for the migratory and wintering waterfowl for which the Refuge was established. This action will continue to benefit geese, granivorous birds (most notably Gambel's quail, white-winged doves, and mourning doves), and small mammals and their predators, including owls, hawks, falcons, and coyotes, while simultaneously benefitting soil conditions in the long-term.

Detailed descriptions and range of effects for all alternatives can be found in Section 2.0 and 4.0 of the EA respectively.

Summary of Effects

Implementation of the Agency's decision would be expected to result in the following environmental, physical, and social and economic effects. Continuation of current farming activities, including plowing and tilling, will result in negligible direct impacts to soils on 245 acres due to ground disturbance. Short-term effects to air and water quality are also possible due to production of exhaust gas, fugitive dust, and chemical drift. These impacts are expected to be insignificant to soils as well as air and water quality.

As crops are planted and left standing for wildlife consumption, the potential for soil erosion and other negative impacts decreases. Tilling crop residue under at the end of the farming season increases organic matter in the soils, thereby providing long-term benefits outweighing any of the negative impacts. In addition, this action would maintain the current level of benefits to habitat for migratory waterfowl, shorebirds, waterbirds, and resident wildlife for which the Refuge was established, while simultaneously providing a source of green browse and grain for wildlife consumption. Additional beneficial impacts to socioeconomics and public use opportunities will remain minor under this alternative.

The proposed action will have negligible effects to water quantity, as the Refuge will continue to utilize a portion of their water entitlement to irrigate the 100 acres of agricultural fields and 70-acre Bermuda Field. This use is a designated beneficial use as described by the Refuge's water right.

The proposal is not expected to have any effects on wetlands and floodplains, pursuant to Executive Orders 11990 and 11988, because the project area (existing farm fields) does not contain jurisdictional wetlands or floodplains. No cultural resource concerns were identified because all farming occurs on lands that were previously farmed. In addition, the threatened and endangered species that occur on the Refuge do not occupy or utilize farm fields; therefore, these resources will not be impacted by the proposed action.

The proposal is not expected to have any significant effects on the human environment because: (1) this proposal is compatible with the general Service policy regarding invasive species management on National Wildlife Refuges; (2) this proposal is compatible with the purposes for which Havasu NWR was established; (3) this proposal does not initiate widespread controversy or litigation; and (4) there are no conflicts with local, regional, state, or federal plans or policies.

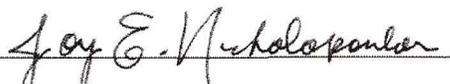
Public Review

The proposal has been thoroughly coordinated with all interested and/or affected parties, including the general public, Service staff biologists, and the immediate neighbors adjacent to the site. The FWS has encouraged public participation throughout the NEPA process during which the public had two opportunities to comment on this project; once during initial project scoping and again following the release of the Draft EA. On July 1, 2010, the Service released a News Release to 16 media outlets and posted a public notice soliciting comments on the Refuge's farming program. The Service also sent a letter soliciting feedback on all of the farming programs on refuges in the region to 263 interested parties. A two-month scoping period was established, which ceased on August 31, 2010. Two comments were received as a result of public scoping, and the Service incorporated those comments into the EA.

The Draft EA was released for a 30-day public review period, which ended December 5, 2010. Copies of the Draft EA were provided in the Havasu NWR office in Needles, CA, and online at the National Wildlife Refuge System Southwest Region Division of Planning website. The Refuge received one comment from the Arizona Department of Environmental Quality informing the Refuge of their intent to enforce a new permitting program regarding pesticide use. When this regulation is formalized, the Refuge will follow the new permitting process as appropriate. In addition, ADEQ suggested best management practices for mitigating nonpoint source pollution, which the Refuge already implements.

Determination

Based upon a review and evaluation of the information contained in the EA as well as other documents and actions of record affiliated with this proposal, the Service has determined that the proposal to control hogs on the refuge does not constitute a major Federal action significantly affecting the quality of the human environment under the meaning of section 102 (2) (c) of the National Environmental Policy Act of 1969 (as amended). 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 U.S. Fish and Wildlife Service facility identified above.


ACTING Regional Director

12/21/2010
Date

Environmental Assessment

Havasu National Wildlife Refuge Farming Program

December 13, 2010

Prepared by

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Table of Contents

1.0 PURPOSE OF AND NEED FOR PROPOSED ACTION ALTERNATIVE	4
1.1 Introduction	4
1.2 Location.....	4
1.3 Background	4
1.4 Purpose of Action.....	8
1.5 Need for Action.....	8
1.6 Decision to be Made.....	9
1.7 Regulatory Compliance.....	9
1.8 Scoping/Public Involvement and Issues Identified	11
2.0 ALTERNATIVES.....	14
2.1 Alternative A – Current Management (Proposed Action).....	14
2.2 Alternative B – Conversion of Agricultural Fields to Native Vegetation with Creation of Additional Moist-Soil Units	17
2.3 Alternative C— Conversion of Agricultural Fields and Bermuda Field to Native Vegetation	18
2.4 Comparison of Alternatives	19
2.5 Alternatives Considered But Dismissed From Detailed Analysis:	20
3.0 AFFECTED ENVIRONMENT	22
3.1 Physical Environment	22
3.1.1 Air Quality	22
3.1.2 Soils / Geology	22
3.1.3 Water Resources and Quality	24
3.2 Biological Environment	24
3.2.1 Vegetative Communities	24
3.2.2 Wildlife.....	25
3.2.3 Threatened and Endangered Species and Other Special Status Species	25
3.3 Human Environment	25
3.3.1 Cultural Resources.....	25
3.3.2 Socioeconomic Resources	26
3.3.3 Visitor Services/Public Uses	26
3.3.5 Visual Resources	26
4.0 ENVIRONMENTAL CONSEQUENCES	27
4.1 Physical Environment	28
4.1.1 Impacts on Air Quality	28
4.1.2 Impacts on Water Quality and Quantity	29
4.1.2 Impacts on Soils.....	30
4.2 Biological Environment	31
4.2.1 Impacts on Habitat.....	31
4.2.2 Impacts on Wildlife	32

4.2.3 Impacts on Threatened and Endangered Species and Special Status Species	33
4.3 Human Environment	33
4.3.1 Impacts on Cultural Resources	33
4.3.2 Impacts on Socioeconomics	34
4.3.3 Impacts on Visitor Services/Public Uses	34
4.3.2 Impacts on Aesthetic and Visual Resources	35
4.4 Assessment of Cumulative Impacts	35
4.5 Environmental Justice	37
4.6 Indian Trust Assets	38
4.7 Unavoidable Adverse Effects	38
4.8 Irreversible and Irretrievable Commitment of Resources	38
4.9 Table 1 - Summary of Environmental Effects by Alternative	39
5.0 CONSULTATION, COORDINATION AND DOCUMENT PREPARATION	44
5.1 Agencies and individuals consulted in the preparation of this document include:	44
5.2 References	44
Appendix A: Havasu National Wildlife Refuge Location Map.....	45

1.0 PURPOSE OF AND NEED FOR PROPOSED ACTION ALTERNATIVE

1.1 Introduction

The United States Fish and Wildlife Service (Service) is proposing to continue farming on the Havasu National Wildlife Refuge. This Environmental Assessment (EA) is being prepared to evaluate the effects associated with this proposal and complies with the National Environmental Policy Act (NEPA) in accordance with Council on Environmental Quality regulations (40 CFR 1500-1509) and Department of the Interior (516 DM 8) and Service (550 FW 3) policies (see Section 1.7 for a list of additional regulations that this EA complies with). NEPA requires examination of the effects of proposed actions on the natural and human environment. In the following chapters, three alternatives are described and environmental consequences of each alternative are analyzed.

1.2 Location

Havasu National Wildlife Refuge (NWR) encompasses 37,515 acres of land adjacent to the Colorado River (See Appendix A). Lying along the Arizona-California border within Mohave County, AZ and San Bernardino County, CA County, the Refuge spans 300 miles of shoreline from Needles, California, to Lake Havasu City, Arizona. One of the last remaining natural stretches of the Colorado River flows through the 20-mile long Topock Gorge. The gorge along with Topock Marsh and the Havasu Wilderness are the three major portions of the Refuge. The Refuge farm fields are situated at the north end of Topock Marsh in the Pintail Slough Management Unit and Bermuda Field is located just northeast of the Refuge Shop.

1.3 Background

As demonstrated throughout history, the lower Colorado River basin plays a defining and central role for desert and riparian ecosystems in western Arizona and eastern California. Modern technological development beginning in the early 1900s quickly began altering the River basin's natural flows, thereby changing the natural ecosystem and affecting many of the wildlife species that depended on this oasis in the vast desert. Dam building, specifically, has produced many issues for both wildlife and human ecology. Since the 1930s, natural resource values, especially riparian habitat, have been consistently declining along the lower Colorado River. When Hoover Dam was constructed, natural flows and flooding cycles were eliminated from portions of the Colorado River being channelized. Natural waterfowl habitat was therefore reduced.

After the Fish and Wildlife Coordination Act was passed in 1934, a shift in awareness began emphasizing that not only economic factors, but also fish and wildlife values, should be considered when making decisions on government actions. Capturing the essence of this new understanding, President Franklin Roosevelt established Havasu National Wildlife Refuge through Executive Order 8647 on January 22, 1941 “. . . as a refuge and breeding ground for migratory birds and other wildlife.” At the time of establishment, the entirety of Lake Havasu, Topock Gorge, and Topock Marsh were within the Refuge. Since then, the area comprising the Refuge has changed to exclude most of Lake Havasu, but additions of other (mostly upland) areas have kept the overall size near the established acreage of 37,000.

Habitat management on Havasu NWR to benefit waterbirds has a long history. Reports indicate that there was limited use of the Refuge by migrating/wintering waterfowl at the time of establishment due to lack of forage. Therefore, the U.S. Fish and Wildlife Service began using habitat management including farming on Havasu NWR to benefit waterfowl, shorebirds, and other waterbirds. In the mid-1940s, Refuge staff first conducted extensive seeding of aquatic plants from Bill Williams River all the way to Topock Swamp to provide food for migrating birds.

With the development of canals, drains, and pumps, water management and farming capabilities have improved over the decades. Some water management milestones include the completion of Davis Dam on the Colorado River in 1950, the completion of the Refuge Farm Ditch in 1959-60, and the completion of the Inlet Canal in 1966. In 1964, the U.S. Supreme Court Decree per *Arizona vs. California* solidified water rights for Havasu National Wildlife Refuge. The Refuge has a current entitlement to use water as reasonably necessary to fulfill the purposes of the refuge, not to exceed 41,839 acre-feet/year of water diverted from the Colorado River, or 37,339 acre-feet/year of consumptive use, whichever is less.

These developments facilitated the movement of Colorado River water to various areas of the Refuge and provided the ability to more efficiently cultivate wildlife food crops.

As technology facilitated increased irrigation and farming capabilities, the Refuge expanded its habitat management activities. In 1963, Bermuda grass was grown in what is now called the Bermuda Field to provide forage for geese as well as to provide erosion control. In 1966, millet and barley were added to production at the Bermuda Field to provide additional goose forage. Farming in the Pintail Slough Management Unit fields began in 1976 and increased in the 1980s when an irrigation ditch was constructed and later lined with concrete.

Initially, the farming operations were conducted by a cooperative farmer. After the 1983 floods, however, the farmer did not return and the Refuge took over management of these lands. In 1987, the Refuge attempted to turn the farm fields into moist soil units, but soil texture was too

porous to hold water. Therefore, the Refuge began using the fields to grow wheat. Millet, wheat, sorghum, and other crops were grown by the Refuge in the farm fields and slough area of Pintail Slough to provide food for migrating and resident birds.

In 1994, the four national wildlife refuges along the lower Colorado River (Havasu, Bill Williams, Cibola, and Imperial) developed one 20-year Comprehensive Management Plan (CMP) in accordance with Service policy. This document guides overall management of the refuges.

The Lower Colorado River CMP identified the following goals for these four refuges:

1. In cooperation with other resource management agencies, to restore and maintain the natural diversity of the Colorado River Area of Ecological Concern, especially on refuge lands.
2. To achieve threatened and endangered species recovery and to strengthen the role of the lower Colorado River national wildlife refuges in the recovery of all applicable endangered species, threatened species, all candidate species, and all species of concern to the States of California and Arizona.
3. In cooperation with the Service Fisheries Resource Office, and other state and federal agencies with joint jurisdiction to restore, enhance, and protect fish ecosystems on the lower Colorado River refuges.
4. To improve ongoing refuge management programs that enhance migratory waterfowl populations and health on each of the four River refuges and other jurisdictions within the Area of Ecological Concern.
5. To achieve protection and enhancement of existing wetland areas on the four river refuges and rehabilitation of former wetlands where possible.
6. In cooperation with the Bureau of Reclamation (BR) and the lower basin states, to enhance use of Colorado River water by the refuges, protect existing Refuge water rights holding in the Area of Ecological Concern, and obtain additional rights when possible without adversely affecting other entitlement holders in the lower basin states.
7. In cooperation with the BR and the Army Corps of Engineers, improve the efficiency of water delivery systems and more effectively gauge water use for the ultimate benefit and enhancements to habitat and wildlife.
8. In cooperation with the BR, revegetate substantial amounts of habitat with native mixes of vegetation leading to biological diversity.
9. To improve overall refuge water quality and protect refuge waters from all contamination.
10. To ensure that only compatible and appropriate activities occur on the lower Colorado River national wildlife refuges, and to regulate, as provided by law, all activities,

- uses, and practices on and off the refuges that are potentially harmful to refuge resources.
11. To clarify each of the Colorado River refuges' jurisdictional authorities as they relate to any concurrent or related authorities vested in other Federal, state, local, and Native American governments with natural resource interests within the Area of Ecological Concern; to ensure refuge boundary integrity relative to adjacent lands; and when the opportunities, funding, and rationale are present, to acquire additional lands to further protect fish and wildlife resources.
 12. To reduce levels of non-wildlife-oriented recreation on the River channel that runs through the lower Colorado River refuges, eliminate all non-wildlife-oriented recreation that is not compatible, increase the quality experience related to natural values by all River visitors, and raise public awareness of the lower Colorado River ecosystem values.
 13. To establish a formal program for public outreach, identify important public resources, and improve educational and interpretive programs for refuge habitat, wildlife, and cultural resources.
 14. To achieve optimum levels of wildlife observation, fishing, and hunting recreation opportunities where such use is legally compatible with the purposes of the refuges and the goals of the National Wildlife Refuge System.
 15. To strengthen interagency and jurisdictional coordination of lower Colorado River issues, resulting in decisions benefiting fish and wildlife resources, while avoiding duplication of effort.
 16. To strengthen Service working relationships with the various Native American governments situated along the lower Colorado River, resulting in decisions that benefit fish and wildlife resources.
 17. To effect improvements to funding and staffing that will result in long lasting enhancements to habitat and wildlife resources in the Area of Ecological Concern and the lower Colorado River national wildlife refuges, leading to the achievement of the goals of this plan and the goals of the National Wildlife Refuge System.

Havasu NWR uses farming as a tool to assist in meeting their purpose and achieving their goals, objectives, and strategies outlined in the CMP, Water Management Plan, and other planning documents. Now, all farming is conducted using Refuge personnel only (force account). Providing forage for waterfowl and other birds continues to be a priority for the refuge. Agricultural practices on the Havasu NWR are designed to fulfill one of the primary purposes for which the Refuge was established, which is to serve as a refuge and breeding ground for migratory birds and other wildlife. Currently, 245 acres of land is farmed on the refuge. In the Pintail Slough Management Unit, Refuge staff farm 100 acres of wheat, barley, oats, forage mix, ryegrass, and, occasionally, a sorghum crop such as milo. The agricultural units provide green browse for wintering geese as well as a seed source for resident and migratory granivorous birds.

In the moist-soil units, also located within the Pintail Slough Management Unit, Japanese millet and watergrass are grown in open areas to enhance food production. The 75 acres of moist-soil units are seasonally flooded to provide feeding, loafing, and escape habitat for wintering waterfowl, migrating shorebirds, sandhill cranes, and waterbirds. Lastly, the Refuge grows 70 acres of Bermuda grass with an additional winter crop of ryegrass in the Bermuda Field in order to provide green graze for wintering geese.

1.4 Purpose of Action

The purpose of the proposed action is to provide food in adequate amounts and concentrations to fulfill the needs of migratory birds and resident wildlife for which the Refuge was established, thereby supplementing shallow water habitat that was lost when the river was developed to meet human needs.

The purpose of the Environmental Assessment (EA) is to determine the adequacy of the current farming practices in meeting the purpose of Havasu National Wildlife Refuge and fulfilling the needs of migratory birds and resident wildlife. Additionally, the purpose of the EA is to remain consistent with current law, regulation, and policy (National Environmental Policy Act of 1969 and National Wildlife Refuge System Improvement Act of 1997).

1.5 Need for Action

There is a need to thoroughly evaluate the farming program, in conjunction with the purpose of the Refuge and current law, regulation, and policy, and to determine if the current farming program is the most biologically efficient means of meeting our wildlife management objectives. In accordance with the Service's Biological Integrity policy, the Refuge and their farming activities must maintain and restore, where appropriate, the biological integrity, diversity, and environmental health of the National Wildlife Refuge System.

There is a need to conduct farming to accomplish the goals, objectives, and strategies outlined within the CMP and subsequent Annual Habitat Work Plans. In accordance with Goal #4 of the CMP (page 51), there is a need "to improve ongoing refuge management programs that enhance migratory waterfowl populations and health on each of the four River refuges and other jurisdictions within the Area of Ecological Concern." Strategies to accomplish this on Havasu NWR include holding farm management acreage stable and increasing moist-soil management acreage. In accordance with findings in Annual Habitat Work Plans, there is a need to continue to provide feeding, loafing, and escape habitat for wintering waterfowl, migrating shorebirds, sandhill cranes, and waterbirds through the use of moist-soil units. The Refuge's farming program also helps meet these wildlife needs by providing and enhancing food sources (green browse and cereal grain) for migratory and wintering waterfowl.

1.6 Decision to be Made

This EA is an evaluation of the environmental impacts of the alternatives and provides information to help the Service fully consider these impacts and any proposed mitigation. Using the analysis in this EA, the Regional Director of the Southwest Region (Region 2 of the U.S. Fish and Wildlife Service) will decide which alternatives to implement and whether there would be any significant effects associated with the selected alternative that would require the preparation of an environmental impact statement. If no significant impacts are identified, a Finding of No Significant Impact (FONSI) will be prepared.

1.7 Regulatory Compliance

National wildlife refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Service policy, and laws and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations and Fish and Wildlife Service Manual.

The mission of the Refuge System is:

“... to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (National Wildlife Refuge System Improvement Act of 1997, Public Law 105-57).

The goals of the Refuge System are to:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered;
- develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges;
- conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts;

- provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation); and
- foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

The NWRS Improvement Act of 1997 provides guidelines and directives for the administration and management of all areas in the NWRS. It states that national wildlife refuges must be protected from incompatible or harmful human activities to ensure that Americans can enjoy Refuge System lands and waters. Before activities or uses are allowed on a national wildlife refuge, the uses must be found to be compatible. A compatible use "... will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the refuges." The farming program on Havasu NWR does not require a compatibility determination, however, because this activity is a management activity performed solely by the Refuge.

This EA was prepared by the Service and represents compliance with applicable Federal statutes, regulations, Executive Orders, and other compliance documents, including the following:

- Administrative Procedures Act (5 U.S.C. 551-559, 701-706, and 801-808) as Amended
- American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)
- Antiquities Act of 1906 (16 U.S.C. 431-433)
- Archaeological Resources Protection Act of 1979 (16 U.S.C. 470)
- Bald Eagle Protection Act (16 U.S.C. 668-668d) as amended
- Clean Air Act of 1972, as amended (42 U.S.C. 7401 *et seq.*)
- Clean Water Act of 1972, as amended (33 U.S.C. 1251 *et seq.*)
- Endangered Species Act of 1973, (ESA) as amended (16 U.S.C. 1531 *et seq.*)
- Executive Order 12898, Federal Action Alternatives to Address Environmental Justice in Minority Populations and Low Income Populations, 1994.
- Executive Order 13112, Invasive Species (issued in February 1999)
- Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661 *et seq.*)
- Fish and Wildlife Improvement Act of 1978 (16 U.S.C. 7421)
- Floodplain Management (Executive Order 11988)
- National Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee) as amended
- National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 *et seq.*)
- Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 *et seq.*)
- National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 *et seq.*)
- National Pollutant Discharge Elimination System, as amended (33 U.S.C. 1251 *et seq.*)

- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 *et seq.*)
- Protection and Enhancement of the Cultural Environment (Executive Order 11593)
- Protection of Wetlands (Executive Order 11990)
- U.S. Fish and Wildlife Service Manual 601 FW 3, Biological Integrity, Diversity, and Environmental Health
- The Final Comprehensive Management Plan and Environmental Assessment for Lower Colorado River National Wildlife Refuges (1994).

Further, this EA reflects compliance with applicable State of Arizona and local regulations, statutes, policies, and standards for conserving the environment and environmental resources such as water and air quality, endangered plants and animals, and cultural resources.

1.8 Scoping/Public Involvement and Issues Identified

Scoping was initiated on July 1, 2010. The Refuge distributed a news release to 16 local media outlets including the Manataba Messenger, Needles Desert Star, Parker Pioneer, Today's News-Herald, and 12 radio stations. The Refuge simultaneously posted a public notice that established a 30-day scoping period with a scheduled culmination date of August 1, 2010. The public notice was posted at Havasu and Bill Williams River National Wildlife Refuges; and sent to the Needles, CA, Fort Mohave, AZ, and Bullhead City, AZ Post Offices; the Needles, CA, Bullhead City, AZ, and Lake Havasu City Libraries; the Arizona Game and Fish Department in Kingman, AZ; the Needles, CA and Lake Havasu City, AZ Bureau of Land Management (BLM) District Offices; and the BR Office in Boulder City, NV for posting. The Service determined that additional time was necessary to involve the many interested parties in the EA process, and the public scoping period was extended through August 31, 2010. Public notices were reposted to reflect this change.

The Service also developed a scoping letter explaining all of the farming programs on the national wildlife refuges in the Southwest Region. On July 29, 2010, this letter was distributed to 263 potentially interested parties including federal, state, and local agencies; nearby irrigation districts; soil and water conservation districts; cooperative extensions; volunteer groups; private landowners; local chambers of commerce; county commissioners; members of Congress; and U.S. Representatives. The letter solicited comments and included a brief description of all of the farming programs throughout the region, including the program on the Havasu NWR.

During the scoping period, which lasted until August 31, 2010, the Service received no response letters and emails with comments from the local community that were considered as part of the analysis for Havasu NWR. Two letters were received in response to the regional scoping letter and were considered in development of the Havasu NWR Farming EA. One commenter

recommended that all farming on national wildlife refuges should be conducted organically; no genetically modified crops should be used; focus should be on removal of invasive species such as Johnson grass, buffelgrass, salt cedar, etc.; and our first concern should be the health of wildlife. Another commenter, the Center for Food Safety, requested that Havasu NWR continue its current ban on genetically engineered crops, issue a moratorium on the planting of such crops on the Refuge, and comply with federal laws by requiring completion of compatibility determinations, NEPA review, and an “essentiality” determination before planting of any said crops. This response both discussed the commenter’s view that genetically engineered crops harm wildlife and the ecosystem and expressed concern over the potential for herbicide-resistant crops to foster evolution of resistant weeds and increase use of pesticides.

Internal scoping of Refuge and regional office staff was also conducted to identify issues, concerns, and management opportunities. Based on internal and external scoping, the following issues were identified and considered in the development of the alternatives in Chapter 2 of this EA:

Use of Genetically Modified Crops

In accordance with the FWS Biological Integrity Policy, the use of genetically modified crops (GMCs) is allowed on national wildlife refuges if their use is deemed essential to meet the purpose of the refuge. The Havasu NWR has never used GMCs in the past and has no intention to propose their use in the future. One member of the public has stated that no GMCs should be used on any refuge, and the Center for Food Safety has requested that the Refuge issue a moratorium on all genetically engineered crop cultivation. Since the Refuge has made it explicitly clear that no genetically modified crops will be used under any of the alternatives evaluated in this EA, no further discussion of this issue regarding Havasu NWR is necessary.

Use of Chemicals to Control Pests and/or Invasive Species

Chemicals are routinely used on refuges to assist with the management of invasive species as part of Integrated Pest Management. There is concern that chemicals used as part of farming programs could adversely impact the physical, biological, or human environment. One commenter recommends that all farming on refuges should be done organically. Refuges only use chemicals that have been approved through the Pesticide Use Proposal (PUP) process. Glyphosate, Imazapyr, and Triclopyr are the pesticides that have been approved through the PUP process for Havasu NWR and are currently utilized on Refuge farmlands, as needed, to treat invasive species and maintain crop yields. As better chemicals are developed, the Refuge will only utilize those that are approved through the PUP process and have lesser or equal environmental effects. This EA will evaluate the impacts of the chemicals currently used in association with the farming program at Havasu NWR.

Management Consideration/Alternatives

It is important to determine the management scheme that will best meet the biological needs of wildlife on a particular refuge. Therefore, the Refuge will evaluate whether the current management is the most biologically efficient way to meet the Refuge's management goals and objectives as well as the Refuge purpose and consider an appropriate range of alternatives including reducing and/or eliminating the farming program if other management tools will more effectively meet the purpose of the Refuge.

Water Rights

Water is often described as the "lifeblood" of the Refuge System, but it is also the lifeblood of agriculture, industry, energy production, and municipalities. This resource is vital to supporting management actions occurring on Refuge lands, especially those along the lower Colorado River where water supply is limited. Havasu NWR has water rights that authorize the diversion of 41,839 acre-feet per year or the consumption of 37,339 acre-feet per year, whichever is less. As water resources are limited in this area, the Refuge currently utilizes an average between 85 and 90 percent of their allocated water supply to accomplish their wide variety of management activities. If a management action that requires consumption of water resources is changed, the Refuge's ability to supply sufficient amounts of water for all other management activities may be impaired. Therefore, the Refuge will consider the impacts that any change in proposed management could have on water rights.

2.0 ALTERNATIVES

Alternatives are different approaches designed to meet the purpose and need for the proposed action. NEPA requires federal agencies to consider a reasonable range of alternatives that meet the purpose and need for the proposed action. Based on the issues, concerns, and opportunities heard during the scoping process, the following alternatives were identified. Three management scenarios that could meet the purpose and need of the proposed action were identified and analyzed in detail in the EA. Three other scenarios/alternatives were also considered but were found to be infeasible (do not meet the stated purpose and need); therefore, they were eliminated from detailed analysis for the reasons listed in Section 2.4.

2.1 Alternative A – Current Management (Proposed Action)

Under the No Action Alternative, the current farming management direction would continue. The Refuge would continue to use force account farming on 245 acres within the Pintail Slough Management Unit and the Bermuda Field. Agricultural practices would continue to fulfill one of the primary purposes for which the Refuge was established, i.e., to serve as a refuge and breeding ground for migratory birds and other wildlife. Genetically modified crops (GMCs) have not and will not be utilized on the Refuge.

The Refuge farming program would continue to involve a combination of fields in crop production, moist-soil management, and grass production. A total of 245 acres of land would continue to be farmed on the Refuge. The agricultural fields and the moist-soil units total 175 acres and are located within the Pintail Slough Management Unit in the northern part of the Refuge. Refuge staff would continue to grow 100 acres of wheat, barley, oats, forage mix (wheat, oats, barley, peas, etc.), ryegrass, and, occasionally, a sorghum crop such as milo. Unless the results from soil sampling dictate otherwise, the croplands would continue to be fertilized once during the growing season with pellet fertilizer that is flown on the fields. In the 75 acres of moist-soil units, Japanese millet and watergrass would continue to be grown in open areas to enhance food production. These farmed areas may have pellet fertilizer disked into the ground once annually if needed. Further south, the approximately 70-acre Bermuda field supports a perennial growth of Bermuda grass, and a winter crop of annual ryegrass is grown within this cover crop. Liquid nitrogen, UN-32, is used only at the Bermuda field and is delivered through a center-pivot irrigation system.

The Refuge uses a combination of mechanical treatments and pesticides to control nuisance or invasive species on an as needed basis throughout the year. Mechanical treatments include disking, mowing, tilling, plowing, and hand-pulling; however, this is labor intensive and cannot

be implemented on a large-scale basis. Therefore, herbicides are necessary to control nuisance and invasive species that reduce crop yields and degrade habitat quality. The Refuge uses pesticides approved through the PUP process, which currently include glyphosate, imazapyr, and triclopyr. On the farm fields, canals, and drains, these herbicides are used to treat Johnson grass, Mexican devil weed, Russian thistle, camelthorn, cocklebur, morning glory, and salt cedar. In the moist-soil units, canals, and drains, herbicides treat bulrush, salt cedar, cattails, phragmites, and sesbania. Herbicides are typically applied through backpack sprayers, tractor pulling sprayer, and ATV mounted sprayer and most applications are spot treatments. Best management practices as specified in the PUPs are implemented. Through adaptive management, newer and better chemicals may be used as they are developed.

Green browse and seed crops are planted for and used by migrating and wintering waterfowl. Occasionally a small number of migrating sandhill cranes use the crop fields or moist-soil units for a short time. The wheat, barley, ryegrass, oats, and forage mix provide a green browse for geese. When planted, milo provides grain for waterfowl. Japanese millet and watergrass provide seeds and green vegetation for consumption by waterfowl and waterbirds. Incidental use of the croplands includes a variety of other granivorous birds that use the crops after they have cured, most notably Gambel's quail, white-winged doves, and mourning doves. Also, small mammals, and their predators, such as owls, hawks, falcons, and coyotes indirectly benefit from the crops produced. The crops also prevent wind erosion of the soil. In Refuge farmed lands, nothing is harvested and all remaining residue is tilled under to increase organic matter in the soils.

In the Bermuda field, bermuda grass is no longer planted, but it returns on its own with irrigation in late summer. The bermuda grass is an erosion control tool and provides a green browse for geese in the early fall and rhizomes for snow geese in the winter. Annual ryegrass is sown within the bermuda grass shoots; when the bermuda grass goes dormant in the late fall, the ryegrass is available as a green browse for geese.

The irrigation water used for the crops and moist-soil units in the Pintail Slough Management Unit comes from the Colorado River. The water in the river is managed by the U.S. Bureau of Reclamation. For the Pintail Slough Management Unit, water is gravity-flowed from the Colorado River to the east via the four-mile long Inlet Canal. The Inlet Canal is becoming unusable due to downgrading of the river, and a new water delivery canal (the Fire Break canal) is under construction that will replace the Inlet Canal. After this replacement, the Inlet Canal will only be used for backup situations. In the present Inlet Canal, just before the water enters Topock Marsh, it is either gravity-flowed or pumped to the north where it can enter the moist-soil units and/or one or more of the four crop fields. After the Fire Break Canal is in operation, the water from the canal will be used to raise the level of Topock Marsh, thereby making that water available for pumping or gravity-flowing to the moist-soil units and crop fields in the

Pintail Slough Management Unit. These areas are flood irrigated. Further south, the Bermuda field is irrigated from a well. The water is pumped to a center-pivot irrigation system that delivers the water to the field. Overall, the Refuge utilizes 1-2 percent of their water entitlement in support of the farming program.

The irrigation season begins in mid-July for the planted crops grown in the moist-soil units. The moist-soil units are flooded up and drained or pumped dry again several times until they are seasonally flooded in mid-October. Then the water stays on the moist-soil units until late winter or early spring when it is drawn down, pumped out, or allowed to evaporate. In the Bermuda field, the irrigation generally begins in mid-August and continues as needed throughout the winter. In the Pintail Slough Management Unit crop fields, irrigation begins in early to mid October and continues through late winter and early spring until the crops go to seed. If a sorghum crop is planned, seeding would be in late June or July with irrigation starting at that time and continuing until the crop goes to seed in October or November.

Through adaptive management, the Refuge would implement the following minor adjustments to ongoing farming practices. These additional farming practices would include the following:

- ***Adaptive Management***
The Refuge would continue to become more aggressive about pursuing farming methods over time that enhance soil resources and contribute to the ecological integrity of the Refuge.
- ***Soil Sampling***
The Refuge would conduct more routine soil samples to determine more precise fertilizer and soil amendment requirements.
- ***Rotating Crops***
Crop rotations would occur in the Pintail Slough Management Unit and would include: a) keeping one field fallow every year (includes zero tillage of the previous crop residue that would leave straw stubble on the ground to prevent soil erosion), and b) depending upon soil conditions and irrigation capabilities, growing a nitrogen-fixing crop in one of the fields on a regular basis. Crop rotation techniques are proven methods for promoting soil conservation, building soil fertility, increasing soil organic matter, as well as controlling weeds, pests, and diseases that can become established in the soil over time.

The above practices would continue to allow for crop production that is sustainable over the long-term, thereby benefiting the wildlife that use the fields. The Refuge has determined that

this management approach will continue to adequately meet the purpose and need described in Chapter 1 of this document.

2.2 Alternative B – Conversion of Agricultural Fields to Native Vegetation with Creation of Additional Moist-Soil Units

Under this alternative, the Refuge would continue to farm the Bermuda Field and the moist-soil units in the Pintail Slough Management Unit as described in Alternative A. The Refuge would convert the 100 acres of agricultural fields in the Pintail Slough Management Unit to native vegetation. The Refuge would sample the soils to determine if and what amendments need to be added prior to planting. The Refuge would clear the existing vegetation by mowing and/or disking to prepare the fields for planting. A mechanical tree planter or manual planting would be used to plant trees such as cottonwoods, willows, mesquite, and potentially other native shrubs.

This vegetation is valuable to neotropical birds as nesting, feeding, resting, and escape cover. Native vegetation has declined along the Colorado River due to management of the river for human uses, and this alternative would add to the mosaic of native habitat scattered throughout the lower Colorado River Basin.

In addition, the Refuge would increase moist-soil units up to 100 acres adjacent to the existing moist-soil units or off the Fire Break Canal. In these areas, this would entail a combination of chemical and mechanical salt cedar removal, leaching, and leveling of land. This may involve burning of slash piles. Salt cedar treatments would be conducted during late fall and winter months.

Overall, chemical use is expected to increase as compared to Alternative A. Conversion of agricultural fields to native vegetation is expected to require the same level of chemicals until trees are established. However, with the addition of up to 100 acres of moist-soil units, there would be a need to increase use of chemicals for salt cedar removal and subsequent maintenance. After moist-soil units are established, this would entail the same spot treatments as described in Alternative A.

Triclopyr use to control salt cedar would initially increase until native trees and shrubs are established. Imazapyr and glyphosate use would increase due to the addition of moist-soil units.

Water supply is one major factor that largely restricts management opportunities on Havasu NWR and the other refuges across the landscape of the lower Colorado River. Currently the Refuge utilizes an average of 85-90 percent of their allocated water entitlement. Alternative B would require roughly the same amount of water dedicated to restoration as the current management requires for farming. Initially, native plant species would be planted in the former

crop production areas and would require substantial amounts of water to successfully develop root systems. The Refuge would be required to continue to provide water to these stands in an effort to assist with their establishment. After 5-10 years, it would be expected that the trees would grow roots that could reach the water table, and the Refuge would have the ability to reduce the amount of water applied to the newly developed habitat. However, trees on the Refuge are often difficult to maintain in a healthy condition due to the lack of flooding events that historically occurred on this former flood plain prior to construction of dams on the Colorado River. Therefore, the Refuge may be required to continue to supply water to this area over the long-term. In addition, there may be higher water needs for certain habitat types; for example, the Refuge would need to provide a wet understory to attract a diverse insect community in order to provide habitat for Southwestern willow flycatcher.

Many management challenges would surround implementation of Alternative B. Specifically, the creation of functional and high-quality wildlife habitat is a difficult goal to meet. Wildlife typically prefer native habitat that encompasses vast areas of contiguous acreage with the appropriate density of trees that have reached various stages of succession. Refuge management actions, including a substantial conversion of Refuge lands to a landscape of native habitat, are limited by topographical features, cost, staffing requirements, and the water entitlement. In addition, the Refuge would be forced to take substantial steps to prevent the spread of undesirable invasive species that could destroy the newly established habitat.

Pursuing this alternative would meet the Refuge's establishment purpose, "as a refuge and breeding ground for migratory birds and other wildlife"; however, it would benefit an entirely different suite of bird species than those that benefit from the other alternatives.

2.3 Alternative C— Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

This alternative would convert the existing 100 acres of agricultural fields and 70 acres of Bermuda Field to native vegetation and maintain the existing 75 acres of moist-soil units. Revegetation would include planting of cottonwoods, willows, mesquite, and potentially other native shrubs. Methods of revegetation would be the same as those described under Alternative B.

This vegetation is valuable to neotropical birds as nesting, feeding, resting, and escape cover. Native vegetation has declined along the Colorado River due to management of the river for human uses, and this alternative would add 170 acres to the mosaic of native habitat scattered throughout the lower Colorado River Basin. This alternative is expected to increase habitat quality and quantity for neotropical birds but decrease the amount of habitat available to migratory waterfowl.

Chemical use on the former agricultural fields would be the same as that described under Alternative B. Since bermuda grass is such a persistent species it will require increased use of chemicals to set it back until native vegetation can be established.

Water use would be similar to Alternative A.

Management benefits and challenges are similar to those described under Alternative B.

2.4 Comparison of Alternatives

Issue	<u>Alternative A</u> Current Management (Proposed Action)	<u>Alternative B</u> Conversion of Agricultural Fields to Native Vegetation and Additional Moist-Soil Units	<u>Alternative C</u> Conversion of Agricultural Fields and Bermuda Field to Native Vegetation
Use of Genetically Modified Crops	No GMCs would be used.	No GMCs would be used.	No GMCs would be used.
Use of Chemicals to Control Pests and/or Invasive Species	Only chemicals approved through the Pesticide Use Proposal process would be utilized. Currently, glyphosate is used to control nuisance species in agricultural fields and moist-soil units.	Overall, chemical use is expected to stay the same as Alternative A. The use of glyphosate would be reduced in the former agricultural fields but increased on additional moist-soil units. Triclopyr use to control salt cedar would initially increase until trees are established. Imazapyr use would increase due to the addition of moist-soil units.	Similar to Alternative B, except no increase in treatments on moist-soil units.

Issue	<u>Alternative A</u> Current Management (Proposed Action)	<u>Alternative B</u> Conversion of Agricultural Fields to Native Vegetation and Additional Moist-Soil Units	<u>Alternative C</u> Conversion of Agricultural Fields and Bermuda Field to Native Vegetation
Management Considerations	100 acres would remain in agricultural production, 75 acres would remain as moist-soil units, and 70 acres of Bermuda grass with a winter crop of ryegrass would be allowed to grow on the Bermuda Field	Maintain the 75 acres of moist-soil units and 70 acres of bermuda grass. The 100 acres currently in agricultural production would be converted to native vegetation, and an additional acreage of mostly saltcedar habitat (up to 100 acres) would be converted to moist-soil units.	Maintain the 75 acres of moist-soil units. Convert 70 acres of bermuda grass in the Bermuda Field and 100 acres currently in agricultural production to native vegetation.
Water Rights	Use of allocated water rights would not change.	Any increases in water used to provide habitat for native vegetation and/or to provide moist-soil management units is expected to be minimal, except in instances where understory moisture is required as a habitat component.	Same as Alternative B.

2.5 Alternatives Considered But Dismissed From Detailed Analysis:

The Refuge considered eliminating the entire farming program (including moist-soil management) at Havasu NWR, but it was determined that this alternative action would not meet the purpose of the Refuge. Because the Refuge was established “as a refuge and breeding ground for migratory birds and other wildlife,” migratory waterfowl have always been part of the fundamental management of the Refuge. In order to fulfill their purpose, the Refuge is reliant on providing supplemental forage to migratory waterfowl and other wildlife. Farming is necessary

not only to accomplish this purpose but also to fulfill the purpose and need defined in this EA. Therefore, this alternative was determined to be unfeasible and was eliminated from further study.

The Refuge also considered expanding the farming program, but this action would not be feasible due to staffing, funding, and land limitations. Expanding farming would likely necessitate cooperative farming. Native habitat would be lost as acreage is converted to farm fields. Also, other Refuge lands are not suitable for crop production due to soil conditions.

The Refuge considered converting their farm program to organic farming but determined this action to not be feasible. This action would be labor intensive and expensive as mechanical treatments to control invasive and nuisance species would have to be increased. The Refuge does not currently have adequate staffing and funding for this approach.

3.0 AFFECTED ENVIRONMENT

This section provides a description of the affected resources determined to be applicable to the range of alternatives. Havasu NWR encompasses 37,515 acres adjacent to the Colorado River between Needles, California, and Lake Havasu City, Arizona. Topock Marsh, Topock Gorge, and the Havasu Wilderness comprise the three major units of the Refuge. The habitat varies from thick cattail/bulrush stands and mixed riparian vegetation found along the Colorado River and Topock Marsh, to steep cactus-strewn cliffs and mountains found along Topock Gorge and Havasu Wilderness to the open waters of upper Lake Havasu. The project area is located in Arizona on the Colorado River floodplain within the larger Topock Marsh Management Unit.

3.1 Physical Environment

Within the project area, the topography is generally flat, with slight slopes toward the south and east. Along the Arizona shore, the river is contained by the Colorado River levee. The agricultural fields and moist-soil units are located within the Pintail Slough Management Unit in the most northeastern portion of the Refuge. The Bermuda Field, however, sits near the most northwestern corner of the Refuge, adjacent to the Farm Ditch canal. A map of the area is provided in Appendix A, and a satellite image of the area is provided in Figure 1 below.

3.1.1 Air Quality

The project area has excellent air quality, due to the rural land uses in most of the surrounding area. It lies within the U.S. Environmental Protection Agency's Clark-Mohave Intrastate Air Quality Control Region 13, which is an attainment area for National Ambient Air Quality Standards.

3.1.2 Soils / Geology

Refuge soils consist primarily of coarse alluvium (sand and sandy loam) deposited by the river prior to construction of the river's extensive levee system. Finer texture soils (silts and clays) occur to a lesser extent, mostly in association with low areas and sloughs. The close proximity of the Colorado River and the generally coarse soil textures result in a strong correlation between groundwater depths and river elevation. The project area overlies the geological feature loosely referred to as the "river aquifer", which is composed of largely saturated deposits of sand, silt, and clay, laid down by the late prehistoric and historic Colorado River. The area is typified by the presence of several former river meanders and by multiple sand dunes created by river channeling and dredging.



Figure 1. The Pintail Slough Management Unit and Bermuda Field within the larger Topock Marsh on Havasu National Wildlife Refuge. The neon green line is the Refuge boundary.

3.1.3 Water Resources and Quality

The entirety of the project area is located within the 100-year floodplain of the Colorado River Valley. The Colorado River is the primary source of water for the Refuge, both in terms of surface water and groundwater resources. The Refuge diverts surface waters from the Colorado River through a series of earthen ditches and several groundwater wells, with typical depths to groundwater ranging from essentially zero to 10 feet (distance from the ground surface).

The Refuge's water rights were established through the 1964 Arizona v. California Supreme Court Decree. The decree language is as follows: "*Havasu Lake National Wildlife Refuge in annual quantities reasonable to fulfill purposes of the Refuge, not to exceed (i) 41,839 acre-feet of water diverted from mainstream, or (ii) 37,339 acre-feet of consumptive use of mainstream water, whichever of (i) or (ii) is less, with a priority date of 1/22/41, for lands reserved by Executive Order of said date of 2/11/49, for land reserved by the Public Land Order of said date (No.559)*". These rights are administered by the U.S. Bureau of Reclamation, as the duly authorized representative of the Secretary of the Interior.

Water quality conditions within the project area are characterized by moderately saline water that has a history of observed high levels of turbidity when winds mobilize fine soils in the shallows of the marsh. Dissolved oxygen levels within the marsh are variable, with observations occasionally being below the 5.0 mg/L level (considered a lower threshold for healthy biological processes).

3.2 Biological Environment

3.2.1 Vegetative Communities

The physical environments near the agricultural units on Havasu NWR are typified as dry, relatively higher elevation sand dunes (depth to groundwater greater than five feet), seasonally moist flats and sloughs (depth to groundwater less than five feet), and predominately wet emergent marsh (depth to groundwater approximately zero). Saltcedar and arrowweed dominate the higher and drier areas. Saltcedar, with occasional mesquite, willow, and cottonwood form thick stands in the moist low areas. Cattail and bulrush are the most common (macrophytic) vegetation in the marsh proper and along its perimeter.

Habitat types in the Pintail Slough Management Unit include farmlands, mesquite, salt cedar woodland, marsh, cattail, and bulrush. Within the cropland portion of the Pintail Slough Management Unit, crops include wheat, barley, oats, forage mix (wheat, oats, barley, peas, etc.), ryegrass, and occasionally, a sorghum crop such as milo. The crops grown in the moist-soil units

include millet and watergrass. The Bermuda Field supports the bermuda grass habitat type with ryegrass sown in.

3.2.2 Wildlife

Wildlife present in the project area is typical of the Lower Colorado River ecosystem. Due to the southerly location of the Refuge, it is primarily a wintering area and stopover point for migratory birds. Common birds include egrets, herons, flycatchers, and seasonal raptors, waterfowl, passerines, and shorebirds. The Refuge provides important habitat not only for a wide variety of migrating birds but also marsh birds. Higher elevation areas contain habitat elements for various terrestrial mammals and reptiles. Common species of small mammals that are likely to occur in or adjacent to the project area include pocket mice, cottontail rabbits, and packrats. Coyotes, bobcats, and feral pigs are common larger mammals. Reptiles that inhabit the upland areas include whiptail lizards, rattlesnakes, and kingsnakes. Beavers and muskrats frequent the canal, ditch, and marsh. The most widespread fish are common carp, largemouth bass, bluegill, and catfish. Species of special interest found on the Refuge include California leaf-nosed bat, cave myotis, Clark's grebe, peregrine falcon, bald eagle, desert tortoise, and flannelmouth sucker.

3.2.3 Threatened and Endangered Species and Other Special Status Species

Special status species found within the Topock Marsh Unit that are listed as being either *threatened* (T), *endangered* (E) or as *candidates* (C) for being listed include: southwestern willow flycatcher (E), western yellow-billed cuckoo (C), Yuma clapper rail (E), razorback sucker (E) and bonytail (E). None of these species utilize the agricultural fields or Bermuda Field. The Yuma clapper rail has been detected just south of the moist-soil units.

3.3 Human Environment

3.3.1 Cultural Resources

Given that the project area is within the 100-year flood plain of the Colorado River, much of the ground surface has historically been flooded and reworked, making the location of archeological sites an infrequent occurrence. This is especially true in terms of long-term habitation/village sites, which would normally be expected in an area with a record of continuous occupation of at least a thousand years (as is true of the Colorado River Valley). Indeed, perhaps more than any other region of the Southwest, the native tradition of the lower Colorado River is defined almost entirely through modern ethnography and historic accounts rather than by evidence of prehistoric archeology.

In broad terms, conventional measures of archeological significance typically do not apply here. The significance of the archeology does not stem from the material richness or depositional complexity of the sites themselves. More relevant in defining the value of the cultural resources within the Colorado River Valley is the recognition that a cultural continuum exists between the prehistoric and modern Native American presence on the river. Although the millennia-old systems of subsistence and settlement no longer exist, it is important to note that many traditional practices survived quite late into the historic era, and that Native American communities on the river continue to regard national wildlife refuge lands with a profound reverence for religious and ancestral values.

3.3.2 Socioeconomic Resources

The Refuge is located between the small town of Needles, California, and Lake Havasu City, Arizona, which has a population of about 56,000. Several other small towns are also within thirty to ninety miles away. The predominate land uses in the Refuge vicinity are irrigated farming and some oil and gas development. The Refuge is tied to the local economy largely through the public's use of the Refuge for recreational opportunities. These opportunities typically come in the form of boating, fishing, hunting, wildlife viewing and sightseeing. Limited undeveloped beach recreation occurs along the Colorado River within the Refuge. The Refuge also plays a role in the local economy as relates to the fact that Refuge employees typically live in the community, own property and support local businesses through their routine purchases.

3.3.3 Visitor Services/Public Uses

The Refuge offers a variety of public use opportunities, including hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Within the Pintail Slough Management Unit, farm fields and moist-soil units provide valuable opportunities for waterfowl hunting and wildlife observation. The Bermuda Field offers wildlife observation but no hunting.

3.3.5 Visual Resources

While the Colorado River and river valley are the most notable natural features and by themselves provide a visual resource, natural views are limited within the project area. Within the general vicinity, there exists an Interstate, two state highways, a two-rail rail line, three communities as well as numerous water development infrastructure components and energy transmission facilities. Pristine natural views within the proposed project area are not considered to exist because of significant man-made developments (i.e., water infrastructure components such as levees and roads) in the area.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter analyzes and discusses the potential environmental effects or consequences that can be reasonably expected by the implementation of the alternatives described in Chapter 2.0 of this EA. An analysis of the effects of management actions has been conducted on the physical environment (air quality, water quality, and soils); biological environment (vegetation, wildlife, and threatened and endangered species); and socioeconomic environment (socioeconomic features including public use/recreation and visual and aesthetic resources). It has been determined that the current management and its alternatives will not have appreciable impacts on climate, hydrology, geology, mineral resources, and cultural resources; therefore, there will be no further discussion of these resources in the analysis. Potential impacts to all other resources are addressed below.

The direct, indirect, and cumulative impacts of each alternative are considered in the Environmental Assessment.

- **Direct effects** are the impacts that would be caused by the alternative at the same time and place as the action.
- **Indirect effects** are impacts that occur later in time or distance from the triggering action.
- **Cumulative effects** are incremental impacts resulting from other past, present, and reasonably foreseeable future actions, including those taken by federal and non-federal agencies, as well as undertaken by private individuals. Cumulative impacts may result from singularly minor but collectively significant actions taking place over a period of time.

The Refuge also considered various types of impacts during the Environmental Assessment. These include beneficial and adverse impacts.

- **Beneficial impacts** are those resulting from management actions that maintain or enhance the quality and/or quantity of identified refuge resources or recreational opportunities.
- **Adverse impacts** are those resulting from management actions that degrade the quality and/or quantity of identified refuge resources and recreational opportunities.

The Environmental Assessment also evaluates the reasonably expected duration of each impacts, whether short-term or long-term.

- **Short-term impacts** affect identified refuge resources or recreational opportunities and occur during implementation of the project but last no longer.

- **Long-term impacts** affect identified refuge resources or recreation opportunities and occur during implementation of the management action and are expected to persist in the 1-5 years following implementation.

Lastly, the Refuge considered the intensity of impact when evaluating the alternatives presented in the Environmental Assessment.

- **Negligible impacts** result from management actions that cannot be reasonably expected to affect identified refuge resources or recreational opportunities at the identified scale.
- **Minor impacts** result from a specified management action that can be reasonably expected to have detectable though limited effect on identified refuge resources or recreation opportunities at the identified scale.
- **Moderate impacts** result from a specified management action that can be reasonably expected to have apparent and detectable effects on identified refuge resources or recreation opportunities at the identified scale.
- **Major impacts** result from a specified management action that can be reasonably expected to have readily apparent and substantial effects on identified refuge resources and recreation opportunities at the identified scale.

Scale of impact is an additional consideration evaluated in this EA. Geographic scale can refer to effects at the site-specific level, local level, or Refuge-wide.

- **Site-specific** effects are those impacts that occur solely within the project area croplands.
- **Local** effects are those impacts that can be reasonably expected to have detectable effects within and immediately surrounding the project area croplands.
- **Refuge-wide** effects are those impacts that can be reasonably expected to have noticeable effects across the entire Refuge landscape.

4.1 Physical Environment

4.1.1 Impacts on Air Quality

Alternative A – Current Management (Proposed Action)

The current farming operations would continue to result in some minor short-term negative impacts to air quality at a local scale. Exhaust gas and fugitive dust produced by the use of agricultural equipment (e.g., tractors, ploughs) may produce short-term direct effects to air quality. In addition, spraying of chemicals to control invasive flora may result in chemical drift that could negatively affect air quality. Overall, however, experience shows that any impacts to air quality would be minor, short-term, and local in scale.

Alternative B – Conversion of Agricultural Fields to Native Vegetation with Additional Moist-Soil Units

The types of impacts on air quality would be the same as described for Alternative A; however, additional moist-soil units would require increased use of machinery for mechanical clearing and potentially burning of slash piles. Impacts would remain minor, short-term, and local in scale under this alternative. In addition, newly planted trees have the potential to sequester carbon which would ultimately provide for long-term beneficial impacts to air quality; these effects are likely to be negligible due to the small amount of acreage converted to native vegetation.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

Management of farm fields versus management of native habitat would result in the same types and intensities of short-term impacts as described under Alternative A. In the long-term, there would be less negative effects to air quality as native vegetation is established since this action will not require ongoing equipment use. The potential beneficial impacts of native vegetation sequestering carbon are expected to be minor.

4.1.2 Impacts on Water Quality and Quantity

Alternative A— Current Management (Proposed Action)

Crop production and moist-soil management on the Pintail Slough Management Unit would require some ground-disturbing farming operations as crops are planted and as fields are disked and fertilized; disturbance to soils may result in an increased amount of soil particles suspended in the marsh water. Therefore, ground preparation activities would result in negligible short-term effects to the water quality of Topock Marsh. Past Refuge farming activities have not been known to contribute to increased erosion or degraded water quality in the Colorado River.

Chemical applications as applied on the Refuge are not expected to negatively impact water quality based on past experience. The Refuge utilizes only those pesticides approved through the PUP process, follows the manufacturer's labels, and implements best management practices. Therefore, it is unlikely that this will result in chemical drift.

Farming on the Refuge requires the application of water diverted from the lower Colorado River; therefore, farming on the Refuge reduces the quantity of water available in the river. To provide water to the Pintail Slough Management Unit, water is gravity-flowed from the Colorado River through the Inlet Canal. Just before water enters Topock Marsh, it is either gravity-flowed or pumped to the north to flood irrigate the moist-soil units or croplands. To provide water to the Bermuda Field, water is pumped from a well to a center-pivot irrigation system that delivers the water to the field. The majority of the Refuge's consumptive use of water is associated with providing water to the Topock Marsh and not the farm fields. These uses are within the

designated beneficial use described by the Refuge's water rights. Therefore, this would result in negligible effects to water quantity relative to the water use across the Refuge.

Alternative B – Conversion of Agricultural Fields to Native Vegetation and Creation of Additional Moist-Soil Units

The types of impacts to water quality resulting from Alternative B are expected to be similar to those described under Alternative A. The short-term impacts are expected to be more intense as initial planting of native vegetation requires increased chemical use and ground-disturbance. The long-term impacts would be less intense as native habitat is established. Effects to water quality from existing and additional moist-soil units would remain the same as Alternative A.

An increase of up to 100 acres of moist-soil units would require additional water use, but the effects on water quantity are still expected to be minor because the Refuge will continue to operate within the limits of its water rights.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

The short-term impacts on water quantity are expected to be more intense than Alternative A as initial planting of native vegetation requires increased chemical use and ground-disturbance. The long-term impacts would be less intense as native habitat is established. Effects on water quality from existing moist-soil units would remain the same as Alternative A.

Effects on water quantity would be similar to those described under Alternative A.

4.1.2 Impacts on Soils

Alternative A – Current Management (Proposed Action)

Continuation of current farming activities (plowing, tilling, etc.) would result in short-term direct impacts to soils on 245 acres. On the 100 acres that are in crop production and the 75 acres of moist-soil management, the farming program would involve ground disturbance that would produce negligible effects to soil texture and short-term minor effects to soil structure. As crops are planted and left standing for wildlife consumption, the potential for soil erosion and other negative impacts decreases. At the end of the farming season, all remaining crops are tilled under to increase organic matter in the soils, resulting in long-term minor beneficial impacts that outweigh any of the negative impacts. These activities help to prevent soil erosion in the long-term on these historically farmed agricultural fields. At the 70-acre Bermuda Field, the growing of Bermuda grass provides long-term minor beneficial impacts to soils by preventing soil erosion. Experience has shown that the current management produces both negative and beneficial impacts occurring solely at the local (project site) scale. Proposed increased sampling of soils may allow the Refuge to minimize negative impacts to soils.

In addition, spraying of chemicals has the potential to alter soil conditions. Past management shows that none of these effects are significant in nature and result in only short-term minor negative effects to soils at the site-specific scale.

Alternative B – Conversion of Agricultural Fields to Native Vegetation with Additional Moist-Soil Units

Soils will be exposed when agricultural fields are cleared and moist-soil units are created. Initially, there would be a slight to moderate increase in erosion but this area receives very little annual precipitation and the potential for water erosion is low. If leaching is required, there could be an initial increase in water use. Subsequently, soil structure would become more stable, water and chemical use would likely decrease, but there may be a gradual increase in soil salinity.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

The effects to soils would be the same as Alternative B with increased use of chemicals to remove Bermuda grass. Removing Bermuda grass would result in short-term increase in erosion until native vegetation is established.

4.2 Biological Environment

4.2.1 Impacts on Habitat

Alternative A – Current Management (Proposed Action)

Current habitat conditions on the Refuge would be maintained under the current farming program. Continued crop production on 100 acres, moist-soil management on 75 acres, and grass production on 70 acres would maintain the current level of benefits to habitat for migratory waterfowl, shorebirds, waterbirds, and resident wildlife for which the Refuge was established.

Alternative B – Conversion of Agricultural Fields to Native Vegetation with Additional Moist-Soil Units

Alternative B would result in an increase of native vegetation and moist-soil units providing habitat for migratory birds and resident wildlife. In the long-term, there would be less artificially created habitat than Alternative A.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

Effects on habitat would be the same as Alternative B with the exception of additional moist-soil units. More riparian habitat would be created and less wetland habitat than Alternative B.

4.2.2 Impacts on Wildlife

Alternative A –Current Management (Proposed Action)

Continuation of current farming practices would cause short-term disturbances and long-term benefits to both resident and migratory wildlife using the Refuge. Short-term direct impacts would include disturbance and displacement of wildlife during planting, fertilizing, and chemical spraying due to operation of farming equipment. Alternatively, these operations would ultimately result in beneficial impacts through the production of green browse and seed crops for migratory and wintering waterfowl. Specifically, winter wheat, barley, ryegrass, oats, and forage mix provide a source of green browse for geese during the fall and winter months. The occasional production of milo would continue to provide grain for waterfowl. Japanese millet and watergrass would continue to provide seeds and green vegetation for consumption by waterfowl and waterbirds. Bermuda grass would continue to provide a source of green browse for geese in the early fall and rhizomes for snow geese in the winter; in the late fall, after bermuda grass is dormant, ryegrass production provides an additional source of green browse for geese. Other species that indirectly benefit from the croplands on Havasu NWR include a variety of other granivorous birds that use the crops after they have cured (most notably Gambel's quail, white-winged doves, and mourning doves) and small mammals and their predators, including owls, hawks, falcons, and coyotes. Larger scale long-term beneficial impacts resulting from the current management include the potential to sustain or even increase populations of migratory waterfowl and resident wildlife.

Alternative B – Conversion of Agricultural Fields to Native Vegetation with Additional Moist-Soil Units

Alternative B would result in similar short-term direct impacts to wildlife including disturbance and displacement as described under Alternative A for restoration activities and moist-soil unit creation. Elimination of agricultural fields would initially reduce habitat and supplemental food for waterfowl and other seed-eating birds such as doves; this would have a long-term negative impact on geese that may not utilize the additional moist-soil units as much as they do croplands. Ducks would be negatively impacted in the short-term as well, but they would utilize moist-soil units in the long-term. Creation of additional moist-soil units would compensate for some of the foods produced in the agricultural fields. This would also result in beneficial impacts for waterbirds and shorebirds. Conversion to native vegetation would provide long-term beneficial impacts to other species such as neotropical migrants.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

Conversion of agricultural fields to native vegetation would result in the same effects to wildlife as Alternative B. In addition, converting the Bermuda Field to native vegetation would further reduce goose habitat but would increase habitat for neotropical migrants and other resident wildlife.

4.2.3 Impacts on Threatened and Endangered Species and Special Status Species

Alternative A – Current Management (Proposed Action)

Under the No Action Alternative, the existing habitat conditions for threatened and endangered species would be maintained. Current management would not produce beneficial or negative effects for any of the listed or candidate species occurring in the area. None of the listed species that occur on the Refuge are known to occupy or utilize farm fields. There would be no direct, indirect, or cumulative impact to Threatened and Endangered Species from continuation of current management.

Alternative B – Conversion of Agricultural Fields to Native Vegetation with Additional Moist-Soil Units

Alternative B would potentially produce long-term beneficial effects at the site-specific scale to special status species such as the southwestern willow flycatcher and yellow-billed cuckoo.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

Alternative C would result in greater beneficial effects to special status species than Alternative B due to the increased amount of native vegetation.

4.3 Human Environment

4.3.1 Impacts on Cultural Resources

Alternative A – Current Management (Proposed Action)

The current management involves farming on previously farmed lands. Therefore, it is not expected that cultural resources will be affected.

Alternative B – Conversion of Agricultural Fields to Native Vegetation with Additional Moist-Soil Units

As with Alternative A, no impacts on cultural resources are anticipated for those areas that have been previously disturbed. Previously undisturbed areas that could be converted to moist-soil units could impact cultural resources. However, the Refuge will survey the areas and consult with appropriate parties.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

Alternative C would have the same effects to cultural resources as Alternative A.

4.3.2 Impacts on Socioeconomics

Alternative A –Current Management (Proposed Action)

By continuing the current farming management, the economic and social condition of the area would remain the same. Current farming operations require that the Refuge purchase equipment, seeds, and chemicals in nearby communities as well as providing maintenance to farming machinery, thereby providing short-term minor beneficial impacts to such areas. In addition, the Refuge farming program minimizes crop depredation on surrounding area lands, thus preventing economic loss to private landowners. Visitors that utilize the Refuge bring revenue to the local communities. Overall, the current management would continue to provide long-term minor beneficial impacts to the socioeconomic resources of the Refuge's nearby communities.

Alternative B – Conversion of Agricultural Fields to Native Vegetation with Additional Moist-Soil Units

Changes to management under Alternative B are expected to have minor impacts to the socioeconomic condition of the area. There may be short-term negative effects that result from reduced investments in farming operations; however, new operations are likely to result in continued cycling of funds into the local economy. In addition, Alternative B could result in increased crop depredation on surrounding private lands as geese use alternate food sources.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

Alternative C would result in the same effects to socioeconomics as Alternative B.

4.3.3 Impacts on Visitor Services/Public Uses

Alternative A –Current Management (Proposed Action)

Under the current management, opportunities for visitor use would be maintained. Currently, the Refuge has 9 blinds in the moist-soil units and limited goose hunting is allowed on the agricultural fields. The Pintail Slough Management Unit is in high demand for limited-opportunity hunting. Hunting is offered on other areas on the Refuge, but the access and quality are not as convenient as this location. During non-hunting periods, this area also provides wildlife observation and photography opportunities.

The Bermuda Field provides opportunities for wildlife observation and photography. Another wildlife viewing platform, like the one at Bermuda Field, exists on the Refuge, but Bermuda Field is one of the best locations on the Refuge to view geese and other birds.

Alternative B – Conversion of Agricultural Fields to Native Vegetation with Additional Moist-Soil Units

Alternative B would eliminate the opportunities for goose hunting described under Alternative A. In the short-term (5-10 years), this would also reduce opportunities for wildlife observation and photography. Once new native vegetation and moist-soil units are established, such opportunities for wildlife observation and photography would return although attracting a different suite of wildlife species. As moist-soil units are established, it will be re-evaluated whether they will provide additional hunting opportunities.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

Alternative C would eliminate the opportunities for goose hunting and wildlife observation of geese and other waterfowl (Bermuda Field) described under Alternative A. Elimination of the Bermuda Field will also change the type of wildlife viewing opportunities in that area as visitors have less opportunity to view large concentrations of geese. This would enhance viewing opportunities for neotropical migrants.

4.3.2 Impacts on Aesthetic and Visual Resources

Alternative A – Current Management (Proposed Action)

The use of equipment, such as tractors, utilized during farming operations would produce some negligible effects to the visual resource of the Refuge. This impact would occur at the local (project site) scale.

Alternative B – Conversion of Agricultural Fields to Native Vegetation with Additional Moist-Soil Units

Implementation of Alternative B is expected to cause the same effects to aesthetic and visual resources as Alternative A because the change is so negligible. It is a value judgment; some individuals will prefer seeing large concentrations of geese utilizing agricultural fields whereas others will prefer seeing stands of native vegetation and the wildlife that may be found in this type of habitat.

Alternative C – Conversion of Agricultural Fields and Bermuda Field to Native Vegetation

Effects to visual resources will be the same under Alternative C as Alternative B.

4.4 Assessment of Cumulative Impacts

A cumulative impact is defined as an impact on the environment that results from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future action regardless of what agency (federal or nonfederal) or person undertakes

such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Cumulative impacts are the overall, net effects on a resource that arise from multiple actions. Impacts can “accumulate” spatially, when different actions affect different areas of the same resource. They can also accumulate over the course of time, from actions in the past, the present, and the future. Occasionally, different actions counterbalance one another, partially cancelling out each other’s effects on a resource. However, more typically, multiple effects add up, with each additional action contributing an incremental impact on the resource.

This analysis considered an area larger than the Refuge, within the Lower Colorado River Valley, as well as considering cumulative impacts resulting from the variety of projects (past, present, and reasonably foreseeable) occurring on private, state, and other federal lands in the area. Generally, lands surrounding the Refuge are owned by either Indian tribes or other Federal or state agencies. Activities on tribal lands include farming and management of a power plant.

Havasu NWR is located approximately 170 miles south of Lake Mead National Recreation Area, 150 miles east of Joshua Tree National Park, and 130 miles southeast of the Mojave National Preserve. In closer proximity to the Refuge, Big Bend of the Colorado State Recreation Area is about 65 miles north of Havasu. The Refuge is merely 10 miles north of Windsor State Park and 15 miles north of the Lake Havasu State Park. The Bureau of Land Management has a field office located in Lake Havasu City, and the majority of their recent environmental assessments evaluate recreational uses and land acquisition. On all of these nearby public lands, the primary land use is recreation and millions of people come to recreate in this area each year. Additionally, there are some privately owned lands adjacent to Havasu NWR that are primarily used for agriculture.

Cumulative Impacts to the Physical Environment

As illustrated in Figure 1, some lands adjacent to and upstream from the Refuge are currently in agricultural production. It is likely that farming operations occurring on nearby lands includes similar farming practices to those used on the Refuge. However, because these farming operations are conducted on private lands, sustained yield is likely an integral part of their practices. Similar to the effects described in the EA, private farming operations may also cause detrimental effects to air quality, water quality, and soils; however, the Refuge operates under best management practices to prevent any substantial adverse impacts to the physical environment. When these external factors are added to similar environmental effects produced by each of the Refuge’s farming alternatives, the overall impact to the physical environment is still expected to be minor due to the small proportion of land in the surrounding area that is farmed.

Cumulative Impacts to the Biological Environment

The alternatives analyzed in this EA are likely to result in primarily beneficial impacts to the biological environment by providing food and habitat for wildlife, including threatened and endangered species. Providing a mosaic of habitat types under any of the alternatives may counteract any adverse impacts to wildlife and habitat that could occur from future development actions in the nearby areas. The proposed action will continue management as it has been conducted for many years, and, therefore, it is highly unlikely that this action would incrementally add to impacts resultant from actions on nearby lands and cause any cumulative impacts to the biological environment.

Cumulative Impacts to the Human Environment

Recreation is one of the primary land uses in the area surrounding the Refuge. These available recreational activities may attract visitors to the area, thereby providing beneficial impacts to socioeconomics through the travel industry. Although Alternative B and C may reduce opportunities for wildlife observation, photography, and hunting, the Service is not aware of any actions occurring on nearby lands that would eliminate or reduce these opportunities on other state and federal lands. The Proposed Action, Alternative A, will maintain the current condition of the human environment including cultural resources, socioeconomics, visitor uses, and visual resources. Therefore, none of the actions described in this EA will result in adverse or beneficial impacts to the human environment.

4.5 Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low-Income Populations; February 11, 1994) was designed to focus the attention of Federal Agencies on the environmental and human health conditions of minority and low-income populations, with the goal of achieving environmental protection for all communities. The order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority and low-income populations. The order is intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low income communities with access to public information and opportunities for participation in matters related to human health and the environment.

None of the alternatives described in this EA will disproportionately place any adverse environmental, economic, social, or health impacts on minority and low income populations. Implementation of the proposed action is anticipated to benefit the environment and people in the surrounding communities.

4.6 Indian Trust Assets

Although Indian Trust Assets have been identified in the Lower Colorado River Valley and the Colorado River Indian Reservation is located in close proximity to the Refuge, it is expected that no Indian Trust Assets will be affected by any of the alternatives outlined in this EA. All proposed farming activities or reduction in such would occur on previously disturbed lands, and none of these alternatives involve the breaking of new ground. Therefore, no impacts are anticipated to result from implementation of any of the alternatives described in the EA.

4.7 Unavoidable Adverse Effects

None of the alternatives would result in any unavoidable adverse impacts to Refuge resources. Farming operations may result in some short-term disturbance to migratory and resident wildlife, but these impacts are expected to be negligible.

4.8 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that this use could have on future generations. Irreversible effects primarily result from the use or destruction of specific resources that cannot be replaced within a reasonable time frame, such as energy or minerals. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action, such as extinction of a threatened or endangered species or the disturbance of a cultural resource.

None of the alternatives would result in a large commitment of nonrenewable resources. Project implementation would require the irretrievable commitment of fossil fuels (diesel and gasoline), oils, and lubricants used by heavy equipment and vehicles. Since the Proposed Action is a continuation of an ongoing activity, no unavoidable harm or harassment to wildlife is expected. The Service would implement best management practices to minimize potential negative impacts.

4.9 Table 1 - Summary of Environmental Effects by Alternative

Environmental Resource	<u>Alternative A</u> Current Management (Proposed Action)	<u>Alternative B</u> Conversion of Agricultural Fields to Native Vegetation with Creation of Additional Moist-Soil Units	<u>Alternative C</u> Conversion of Agricultural Fields and Bermuda Field to Native Vegetation
Impacts to Air Quality	Adverse impacts to air quality would be minor, short-term, and local in scale.	Impacts would remain minor, short-term, and local in scale under this alternative. In addition, newly planted trees have the potential to sequester carbon which would ultimately provide for long-term beneficial impacts to air quality; these effects are likely to be negligible due to the small amount of acreage converted to native vegetation.	Management of farm fields versus management of native habitat would result in the same types and intensities of short-term impacts as described under Alternative A. In the long-term, there would be less negative effects to air quality as native vegetation is established since this action will not require ongoing equipment use. The potential beneficial impacts of native vegetation sequestering carbon are expected to be minor.

Environmental Resource	<u>Alternative A</u> Current Management (Proposed Action)	<u>Alternative B</u> Conversion of Agricultural Fields to Native Vegetation with Creation of Additional Moist-Soil Units	<u>Alternative C</u> Conversion of Agricultural Fields and Bermuda Field to Native Vegetation
Impacts to Water Quality and Quantity	Minor, short-term, and local in scale.	Impacts would remain minor, short-term, and local in scale under this alternative. In addition, newly planted trees have the potential to sequester carbon which would ultimately provide for long-term beneficial impacts to air quality; these effects are likely to be negligible due to the small amount of acreage converted to native vegetation.	Management of farm fields versus management of native habitat would result in the same types and intensities of short-term impacts as described under Alternative A. In the long-term, there would be less negative effects to air quality as native vegetation is established since this action will not require ongoing equipment use. The potential beneficial impacts of native vegetation sequestering carbon are expected to be minor.

Environmental Resource	<u>Alternative A</u> Current Management (Proposed Action)	<u>Alternative B</u> Conversion of Agricultural Fields to Native Vegetation with Creation of Additional Moist-Soil Units	<u>Alternative C</u> Conversion of Agricultural Fields and Bermuda Field to Native Vegetation
Impacts to Soils	Continuation of current farming activities (plowing, tilling, etc.) would result in short-term direct impacts to soils on 245 acres. Experience has shown that the current management produces both negative and beneficial impacts occurring solely at the local (project site) scale. Proposed increased sampling of soils may allow the Refuge to minimize negative impacts to soils.	Initial clearing would result in adverse short-term impacts to soils. Long-term adverse impacts may be expected from a gradual increase in salinity as irrigation continues. Some long-term benefits from soil stability.	The effects to soils would be the same as Alternative B; increased use of chemicals to remove Bermuda grass. Removing bermuda grass would result in short-term increase in erosion until native vegetation is established.
Impacts on Habitat	Current habitat conditions on the Refuge would be maintained under the current farming program resulting in short-term adverse impacts during farming operations; long-term, beneficial impacts.	Short-term adverse impacts during moist-soil creation; long term benefits for wildlife habitat.	Short-term adverse impacts during Bermuda Field preparation; long term benefits for habitat for specific wildlife species. More riparian habitat would be created but less wetland habitat would be available than Alternative B.

Environmental Resource	<u>Alternative A</u> Current Management (Proposed Action)	<u>Alternative B</u> Conversion of Agricultural Fields to Native Vegetation with Creation of Additional Moist-Soil Units	<u>Alternative C</u> Conversion of Agricultural Fields and Bermuda Field to Native Vegetation
Impacts of Wildlife	Continuation of current farming practices would cause short-term adverse impacts but large scale, long-term benefits to both resident and migratory wildlife using the Refuge.	Alternative B would result in similar short-term adverse, direct impacts to wildlife including disturbance and displacement as described under Alternative A for restoration activities and moist-soil unit creation. Long-term beneficial impacts to wildlife.	Conversion of agricultural fields to native vegetation would result in the same effects to wildlife as Alternative B. In addition, converting the Bermuda Field to native vegetation would further reduce goose habitat but would increase habitat for neotropical migrants and other resident wildlife.
Impacts on Threatened and Endangered Species	Existing habitat conditions for threatened and endangered species would be maintained. Current management would not produce beneficial or negative impacts for any of the listed or candidate species occurring in the area. None of the listed species that occur on the Refuge are known to occupy farm fields; no direct, indirect, or cumulative impact to Threatened and Endangered Species from continuation of current management.	Alternative B could potentially produce long-term beneficial effects at the site-specific scale to special status species such as the southwestern willow flycatcher and yellow-billed cuckoo.	Alternative C may result in greater beneficial effects to special status species than Alternative B due to the increased amount of native vegetation.

Environmental Resource	<u>Alternative A</u> Current Management (Proposed Action)	<u>Alternative B</u> Conversion of Agricultural Fields to Native Vegetation with Creation of Additional Moist-Soil Units	<u>Alternative C</u> Conversion of Agricultural Fields and Bermuda Field to Native Vegetation
Impacts on Cultural Resources	<p>The current management consists of farming on previously farmed lands. Therefore, it is not expected that cultural resources will be affected.</p>	<p>As with Alternative A, no impacts on cultural resources are anticipated for those areas that have been previously disturbed. Previously undisturbed areas that could be converted to moist-soil units could impact cultural resources. However, the Refuge will survey the areas and consult with appropriate parties.</p>	<p>Alternative C would have the same effects to cultural resources as Alternative A.</p>
Impacts on Socioeconomic Resources	<p>Overall, the current management would continue to provide long-term minor beneficial impacts to the socioeconomic resources of the Refuge’s nearby communities.</p>	<p>Alternative B is expected to have minor impacts to the socioeconomic condition of the area. There may be short-term negative effects that result from reduced investments in farming operations; however, new operations are likely to result in continued cycling of funds into the local economy. In addition, Alternative B could result in increased crop depredation and economic loose to on surrounding private lands as geese use alternate food sources.</p>	<p>Alternative C would result in the same effects to socioeconomics as Alternative B.</p>

5.0 CONSULTATION, COORDINATION AND DOCUMENT PREPARATION

5.1 Agencies and individuals consulted in the preparation of this document include:

Document prepared by Division of Planning Staff, National Wildlife Refuge System, Southwest Region, Albuquerque, New Mexico, and Refuge Staff, Havasu National Wildlife Refuge, U.S. Fish and Wildlife Service, Needles, California.

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Appendix A: Havasu National Wildlife Refuge Location Map

