San Bernardino and Leslie Canyon National Wildlife Refuges Comprehensive Management Plan

1995 - 2015

Environmental Assessment

U. S. Fish and Wildlife Service
Region 2
Albuquerque, New Mexico

U.S. FISH AND WILDLIFE SERVICE

ENVIRONMENTAL ACTION MEMORANDUM

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 have determined that the action of: Implementation of a programmatic Comprehensive Management Plan for the San Bernardino and Leslie Canyon National Wildlife Refuges

____ is a categorical exclusion as provided by 516 DM 6, Appendix 1, Section B(4). No further documentation will be made.

____ is found not to have significant environmental effects as determined by the attached Environmental Assessment and Finding of No Significant Impact.

__X__ is found to have special environmental conditions as described in the attached Environmental Assessment. The attached Finding of No Significant Impact will not be final nor any actions taken pending a 30-day period for public review (40 CFR 1501.4(e)(2)).

____ is found to have significant effects, and therefore a "Notice of Intent" will be published in the Federal Register to prepare an Environmental Impact Statement before the project is considered further.

____ is denied because of environmental damage, Service policy, or mandate.

____ is an emergency situation. 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, Environmental Assessment for San Bernardino and Leslie Canyon National Wildlife Refuges Comprehensive Management Plan.

ling Lynn B. Starnes 7/15/95
Regional Director Date

(1) [signature] 7/11/95
Initiator Date

(2) [signature] 7/11/95
ARD RW Date

(3) Floyd A. Nudi 7/11/95
NEPA Coordinator, Region 2 Date

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Decision Notice
and
Finding of No Significant Impact
regarding
Implementation of a Comprehensive Management Plan
for the
San Bernardino and Leslie Canyon
National Wildlife Refuges

The U.S. Fish and Wildlife Service has developed a Final Draft Comprehensive Management Plan focusing on two National Wildlife Refuges in southeastern Arizona: San Bernardino and Leslie Canyon NWRs. Through an extensive program consultation, the Service has outlined the various problems and opportunities (i.e., issues) confronting these refuges and their surrounding areas. The Comprehensive Management Plan and the Environmental Assessment outline these issues and specify how the Service intends to address them over the next 20 years through a set of proposed goals, objectives, and strategies.

The following three alternatives were considered:

Alternative A: Ecosystem Approach (Proposed and Preferred)
Alternative B: No Action
Alternative C: Maximize Habitat Developments and Public Use Program

Alternative A was selected because it supports the Service's ecosystem approach to management. Much emphasis is placed on working cooperatively with the local community, private landowners, and other jurisdictions, including Mexico. Developing partnerships with these various entities would lead to overall land and water protection and is a primary focus throughout this alternative. Habitat management would be centered around the water resources for the protection and enhancement of native fish populations and other threatened, endangered, and candidate species that rely on these wetland environments. Additionally, native grassland restoration to reduce invading woody species and increase overall biological diversity would be emphasized.

Based on the analysis and evaluation of the Comprehensive Management Plan (CMP) and the Environmental Assessment, I have determined that an Environmental Impact Statement (EIS) will not be prepared. The goals, objectives, and strategies outlined in the CMP do not call for any major developments or actions that would impact the environment. Therefore, formal approval and implementation of the proposed CMP is not a major Federal action which would significantly affect the quality of the human environment, there are no major cumulative or secondary environmental effects, and there are no adverse effects on endangered and threatened species. It is the intent of the Service, however, to revisit questions of potential significant environmental consequences in accordance with NEPA upon considering the implementation for site specific proposals called for and discussed in any final plan document pertaining to the aforementioned National Wildlife Refuges.

Implementation may take place 30 days after the date of this document.

Acting Lynn B. Starnes 7/15/95
Regional Director Date

ENVIRONMENTAL ASSESSMENT
SAN BERNARDINO AND LESLIE CANYON
NATIONAL WILDLIFE REFUGES
COMPREHENSIVE MANAGEMENT PLAN PROPOSAL

EXECUTIVE SUMMARY

It is the policy of the U.S. Fish and Wildlife Service (Service) that National Wildlife Refuges will have approved Comprehensive Management Plans to guide refuge management decisions in response to the goals, objectives, and long-range plans of the Service.[1]

This document presents an analysis of the Service's proposal to implement long-range management framework changes on two National Wildlife Refuges in southeastern Arizona including San Bernardino and Leslie Canyon NWRs. The Service proposes the adoption of a management framework that considers the two refuges' shared needs as well as their individual needs. This proposed framework would also address management of each of the refuges using an ecosystem approach within the context of a larger defined "Area of Ecological Concern."[2]

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[1]Please refer to Refuge Manual 4RM 1.1 - 1.6 for a citation of the major objectives of refuge master planning. Also refer to Refuge Manual 2RM 1.1 - 1.4 for the goals of the National Wildlife Refuge System.

[2]An "Area of Ecological Concern" can be defined as: "An essentially complete ecosystem (or set of interrelated ecosystems) of which one part cannot be discussed without considering the remainder." [Malheur NWR Master Plan and Environmental Assessment, 1985, pg. 7]. For purposes of the San Bernardino and Leslie Canyon NWRs, the Area of Ecological Concern for the U.S. portion of the Yaqui watershed is defined as the watersheds and ground water basins that are directly associated with the management of the Yaqui fishes.

I. PURPOSE AND NEED FOR ACTION

A. Introduction

The San Bernardino and Leslie Canyon National Wildlife Refuges (NWRs), located in Cochise County, Arizona, were set aside to conserve fish and wildlife species that are listed as threatened or endangered. Specifically, the refuges play an important role in the protection of four threatened and endangered Yaqui fishes including the Yaqui chub, Yaqui topminnow, Yaqui catfish, and beautiful shiner. Numerous other threatened and candidate species are found on the refuges as well. Habitat conservation and protection both on the refuges and in the surrounding areas will continue to be a major factor in the continued existence of many of these species.

B. Purpose and Need For Action

The purpose of this Environmental Assessment (EA) is to analyze and evaluate the environmental effects of implementing a proposed Comprehensive Management Plan (CMP) for the San Bernardino and Leslie Canyon NWRs,[3] as required by the National Environmental Policy Act (NEPA).[4]

Comprehensive Management Plans are a valuable tool that refuge managers use to "provide long-range guidance for the management of National Wildlife Refuges."[5] The San Bernardino and Leslie Canyon NWRs are important elements in the overall program of endangered species recovery and programs for wetland conservation and habitat management in the desert southwest. Planning is necessary to strengthen this role relative to fulfillment of the refuges purposes and to the overall ecological health within the Area of Ecological Concern. The Service has identified a need to improve on existing refuge goals and objectives that address the various issues that are affecting the refuge's programs, other jurisdictions, and surrounding landowners. Not considering alternatives to the existing management strategy framework would result in missed opportunities for bettering each of the refuges contributions to the ecological health of the region. Without a CMP, decision-making on the refuges could potentially adversely impact the natural resources both on the refuges and in the surrounding areas.

C. The Issues

The following is a list of the issues that surfaced as a result of the comprehensive management planning process. The CMP details considerable analyses of each of these issues separately.

1. Ecosystem Sustainability
2. Biological Diversity and Habitat Management
3. Endangered Species Management
4. Water Rights, Water Management, and Wetlands Protection
5. Compatibility and Public Use

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[3]Copies of the CMP are made available upon request from the Service's Region 2 Regional Office, Albuquerque, NM.

[4]NEPA requires of all Federal planning activities that the basic components of the planning process be documented to insure that effects on the environment are considered.

[5]Refuge Manual, 4RM 1.1.

6. Environmental Education and Public Outreach
7. Cultural Resources Preservation and Management
8. Interagency Coordination
9. Land Protection
10. Staffing and Funding

For the purposes of this EA, the following issues are considered.[6] Some are presented in combination because in fact, many of the issues are interrelated. Additionally, for NEPA purposes, other concerns not listed above are also given consideration.

1. Climate
2. Air Quality
3. Water Quantity and Quality
4. Geology and Soils
5. Vegetative Habitats and Habitat Management
6. Wildlife and Biological Diversity
7. Candidate, Threatened, and Endangered Species
8. Public Use, Compatibility, and Environmental Education
9. Cultural Resources
10. Socioeconomic Aspects

II. THE AFFECTED ENVIRONMENT

A. Climate

San Bernardino and Leslie Canyon NWRs exhibit a semi-arid climatic regime with a mean annual precipitation of 12.5 inches (Tashjian 1992). A biseasonal pattern of winter precipitation (December through March), spring drought, summer precipitation (July through September), and fall drought can usually be expected. The summer rains account for the majority of the precipitation that falls on the refuges and are usually monsoonal, intense, late-afternoon thunderstorms that originate from convectional storms to the south. Moisture during the winter originates from the southern displacement of cyclonic storm centers originating from the Eastern Pacific. The spring drought, which is associated with high temperatures, generally has more severe biological effects than the fall period. Maximum summer temperatures average above 95° F and the winter mean minimum is 40° F.

B. Air Quality

The air quality of the San Bernardino and Leslie Canyon NWRs is generally good, and probably has improved in recent years due to the closure of all active smelters in Douglas. Also, the refuges are situated in rural areas and therefore, are generally not affected by air pollution. Strong spring winds have been known to carry large amounts of dust into the area; however, this problem has improved with the

[6]Please note that not all of the issues addressed in the CMP are given consideration in the EA. NEPA guidelines require that only the environmental impacts be considered, therefore, issues such as Staffing, Funding, and Coordination and Interagency Coordination are not discussed in the EA. Also, although they are not given separate consideration, the issues of Ecosystem Sustainability and Land Protection are key themes throughout and are integrated within other issues.

construction of paved roads throughout the Douglas area. Occasionally, the refuges air quality is affected by smelters immediately across the border in Mexico. It is quite possible that subsequent development on either side of the border related to the passage of the North American Free Trade Agreement (NAFTA) could impact the air quality of the Douglas area.

C. Water Quantity and Quality

Because management of San Bernardino and Leslie Canyon NWRs centers around protection of threatened and endangered fishes, water is their most valuable resource. Springs and artesian wells occurring on the refuges were enhanced by an earthquake that occurred in 1887, causing a fault to develop south of San Bernardino NWR in Mexico. This provided an impervious barrier and created an artesian reservoir that centers just above the border in the central sector of the refuge.

Leslie Creek supplies both the vital baseflow and flushing flow waters that are essential for the survival of the Yaqui fishes and their habitat. Although the base flow of the creek is low, the native fishes and related riparian areas depend on these flows for their existence. Surface water rights exist for Leslie Canyon NWR and consist of instream flow rights for Leslie Creek within the refuge. Ground water rights do currently exist for San Bernardino NWR; however, the nature and quantity of these rights are uncertain and are currently being investigated.

The surface waters within the San Bernardino and Leslie Canyon NWRs are of excellent quality (Phoenix Ecological Services Field Office 1988). With two exceptions, water quality is within state surface water quality standards for protected uses associated with the Rio Yaqui Basin. Dissolved oxygen and lead are the only two parameters that exceed allowable limits for the aquatic and wildlife protected use.

Sodium was the dominant cation found in springs on San Bernardino, while calcium was more prevalent in Leslie Creek. Phosphorus and nitrogen were determined not to be limiting nutrients to primary production.

The refuges waters are virtually absent of dissolved trace metals and are near neutral or slightly alkaline (pH 7.78 $\pm$ 0.75). Although 4 of 23 organochlorine pesticides were detected in tissue samples taken from resident aquatic organisms occurring on the San Bernardino NWR, all values were less than the National Academy of Sciences total DDT criterion for aquatic wildlife protection. Resident biota exhibit no symptoms of acid-stress or pesticide and trace metal toxicity.

D. Geology and Soils

San Bernardino Valley was formed during the middle to late Tertiary Period by steep, normal faulting that occurred near the present basin edges. The Chiricahua, Pedregosa, Perilla, and Peloncillo Mountains were formed when rock was displaced upward along the faults. Sedimentation of the basin was simultaneous with basin subsidence. This resulted from deposition of locally derived sediments and outpourings of basalt. Basin-fill sediments and stream alluvium overlie pre-basin and range deposits and bedrock on the Valley floor. The mountains surrounding the Valley are composed of igneous, metamorphic, and sedimentary rocks of Paleozoic to middle Tertiary age. Some preexisting faulted and folded sedimentary and volcanic rock was displaced in mountain and basin blocks during basin formation. The consolidated rocks store and transmit small quantities of water through fractures, but generally act as barriers to ground water flow in the basin sediments. Limestone crops out in several places east of the refuge and north of

the international boundary, but the subsurface extent is unknown.

Leslie Canyon is situated in the Swisshelm Mountains and dissects layers of deformed Paleozoic sedimentary rocks and intrusions of Tertiary age volcanic rhyolite. Between the Swisshelm and the Chiricahua range lies a basin that is filled with thick, permeable, alluvial sediments and is an excellent catch basin for water which ends up in Leslie Creek.

The soils of the Valley floor belong to the Karro Association which are characteristically deep, well-drained, light-colored, calcareous, and nearly level. The upland soils to the east and west of the bosques belong to the Bonita-Sontag Association and are deep, well-drained, level to hilly, and cobble and gravelly clay soils.

E. Vegetative Habitats and Habitat Management

Eight major habitat types have been described for the San Bernardino and Leslie Canyon NWRs (Marrs-Smith 1983). They include:

Chihuahuan Desert Scrub -- This represents the most contiguous habitat type found on both refuges. Predominant plants include creosote bush, tar bush, white-thorn, ocotillo, snakeweed, honey mesquite, soaptree yucca, agave, and thornbush.

Desert Grassland -- Grasslands occur mainly on the mesa and between vegetative communities. Dominant grasses include tobosa, bush muhly, side-oats grama, black grama, alkali sacaton, and burrowgrass.

Mesquite Bosque -- Mesquite bosques are characterized by mesquite, creosote, netleaf hackberry, graythorn, catclaw, and desert sumac. Secondary woody plants include mexican elder, wait-a-minute bush, gum bumelia, and mulberry.

Fallow Fields -- Fallow fields are areas that were previously disturbed as a result of cultivation practices and are now mostly dominated by weedy annuals such as tumbleweed, Palmer's amaranth, slimleaf bursage, common sunflower, yellow tansy-mustard, flixweed, and goathead.

Riparian Forest/Woodland -- The dominant trees represented in this habitat include cottonwood, willow, alder, ash, and walnut.

Riparian Scrub -- Cottonwood and willow are the dominant overstory species associated with riparian scrub areas on the refuge. Seepwillow, burrobush, and occasionally salt cedar are also integrated within the more predominant species.

Marshland -- Marshlands or cienegas are those areas of land that are permanently flooded by non-impounded artesian water. Two distinct vegetative zones occur, including one directly in and around the water source, and one that is away from the water source but within its area of inundation. Prevalent emergents in the former zone include bulrush, bur marigold, and southern cattail. Submergents such as common pool mat and sage pondweed can also be found. The second zone is characterized by spikerush, flat sedge, marsh alkali aster, awlleaf aster, western cudweed, and water parsnip. Grasses found growing in these wet areas include knotgrass, scratchgrass, rabbitfoot grass, and giant reed.

Aquatic -- The aquatic habitats differ from those of marshlands in that the water is contained. Plant species found in association with aquatic areas include white water-lily and holly-leaved water nymph.

Currently, habitat management centers around the water resources for the protection and enhancement of native fish populations and other threatened, endangered, and candidate species that rely on the wetlands.

F. Wildlife and Biological Diversity

San Bernardino and Leslie Canyon NWRs support a wide array of wildlife species (Lanning 1981). The various habitats support over 250 species of birds, including 90 species of neotropical migrants as well as numerous species of waterfowl, marsh and waterbirds, shorebirds, gulls, terns, raptors, and other migratory birds. Refuge records indicate the presence of 42 mammals, 27 reptiles, 9 fishes, and 10 amphibians. The following information lists some of the more common species of wildlife found on the refuges.

Waterfowl -- Snow geese, greater white-fronted geese, tundra swan, sandhill crane, northern shoveler, cinnamon teal, green-winged teal, blue-winged teal, mallard, Mexican duck, canvasback, redhead, ring-neck, American widgeon, gadwall, bufflehead, ruddy duck, and American coot.

Marsh and Waterbirds -- Great blue heron, green-backed heron, black crowned night heron, great egret, sora, Virginia rail, pied-billed grebe, western grebe, double-crested cormorant, belted kingfisher, green kingfisher, and American Bittern.

Shorebirds, Gulls, Terns, and Allied Species -- American avocet, black tern, killdeer, black-necked stilt, ring-billed gull, Wilson's phalarope, red knot, and solitary sandpiper.

Raptors -- Red-tailed hawk, Swainson's hawk, gray hawk, sharp-shinned hawk, Cooper's hawk, northern harrier, golden eagle, American kestrel, prairie falcon, black-shouldered kite, black vulture, turkey vulture, Chihuahuan raven, great-horned owl, western screech owl, and barn owl.

Neotropical Birds -- Yellow warbler, blue grosbeak, Vermillion flycatcher, ash-throated flycatcher, summer tanager, loggerhead shrike, phainopepla, mockingbird, white-crowned sparrow, ruby-crowned kinglet, Audubon's warbler, Lucy's warbler, green-tail towhee, western kingbird, Cassin's kingbird, Say's phoebe, Gamble's white-crowned sparrow, vesper sparrow, Lincoln sparrow, song sparrow, and lesser goldfinch.

Game Birds -- Gambel's quail, Mearn's quail, scaled quail, mourning dove, white-winged dove, common ground dove, and Gould's turkey.

Mammals -- Mule deer, white-tail deer, javelina, mountain lion, bobcat, coyote, kit fox, gray fox, raccoon, badger, spotted skunk, stripped skunk, hooded skunk, hognose skunk, long-tailed weasel, coati, ringtail, porcupine, jack rabbit, cottontail rabbit, antelope ground squirrel, rock squirrel, pocket gopher, and a wide variety of mice and rats.

Reptiles -- Lesser earless lizard, Clark's spiny lizard, eastern fence lizard, tree lizard, Texas horned lizard, desert grassland whiptail, coachwhip, western patchnose snake, gopher snake, common kingsnake, longnose snake, Mexican garter snake, checkered garter snake, western diamondback rattlesnake, and

Mojave rattlesnake.

Amphibians -- Couch's spadefoot, western spadefoot, red-spotted toad, Great Plains toad, and bullfrog.

Fish -- There are eight species of native fishes that historically inhabited the Rio Yaqui Basin. These include Yaqui chub, Yaqui topminnow, Yaqui catfish, beautiful shiner, Yaqui sucker, Mexican stoneroller, roundtail chub, and longfin dace. Today, only four of these occur on the refuges (Yaqui chub, Yaqui topminnow, beautiful shiner, and longfin dace). The remaining four species maintain populations in Mexico, but their population numbers and conditions are unknown. Additionally, Yaqui catfish are being propagated at Dexter National Fish Hatchery and Technology Center (DNFHTC). In the past, a number of non-native fishes (mosquitofish, bullhead, sunfish) have been introduced into the refuge's waters, causing severe problems for the native fish species. Fortunately, the Service was able to remove them to prevent further damage.

G. Candidate, Threatened, and Endangered Species

Four out of the eight native fishes that historically inhabited the Rio Yaqui Basin in the United States and Mexico are federally classified as either threatened or endangered. These include the Yaqui chub (endangered), Yaqui topminnow (endangered), Yaqui catfish (threatened), and beautiful shiner (threatened). Currently, wild populations are limited to San Bernardino and Leslie Canyon NWRs with the exception of the Yaqui catfish, which have been extirpated from the wild in the United States. The catfish do, however, maintain populations in Mexico and are also being raised at DNFHTC for future stockings onto the refuges.

The remaining four native fish species are all listed as candidate species, which means that they are being considered for listing under the Endangered Species Act; however, more data are needed to determine their status before they can be listed. These include the Yaqui sucker, longfin dace, Mexican stoneroller, and roundtail chub. Out of these species, only the longfin dace still maintains populations on the refuges. The others can still be found in Mexico; however, they remain unprotected under Mexican jurisdiction.

The Chiricahua leopard frog is a candidate species found in Leslie Creek on Leslie Creek NWR. Leopard frog populations throughout the southwest have been steadily declining in recent decades, probably due to the introduction of the predatory, non-native bullfrog (Rosen and Schwalbe 1993). Current refuge management regarding leopard frog recovery includes active removal of bullfrogs through trapping and gigging. The refuge is also involved in a cooperative effort to capture tadpoles from Leslie Creek and raise them at the Arizona Sonora Desert Museum. Four small, fenced impoundments were recently created for use as reintroduction sites for the frogs in hopes that a viable population can once again be established on the refuge.

The Mexican garter snake is another candidate species that has been affected by the bullfrog's predatory nature. Capture efforts that consistently catch primarily older snakes indicate that bullfrogs prey on younger snakes (Rosen and Schwalbe 1993). Again, bullfrog removal and control is warranted to ensure future recruitment of garter snakes.

Populations of the San Bernardino spring snail, also listed as a candidate species, probably declined in the past due to gambusia predation and control efforts to eliminate non-native fish species. Today, limited habitat poses their largest threat. Only the San Bernardino Spring Snail outflow, located on the historical

site, provides the shaded, hillside seeps necessary for their survival.

Although aplomado falcons have not been sighted on the refuges, they are known to have historically occupied the San Bernardino Valley. Consequently, San Bernardino NWR is being considered as a possible reintroduction site for this endangered raptor. The refuge offers typical habitats used by aplomados, namely mesquite bosques or riparian areas for nesting and native grasslands for hunting. Grassland and riparian woodland habitat restoration to increase the quality of the habitat, as well as increase the prey base for the falcons, will need to be implemented to meet recovery goals and objectives of any proposed reintroductions.

The Huachuca water umbel is the only known plant species of concern on the refuges. It is listed as a candidate species and is found growing in Black Draw, Oasis Pond, and the north end of Evil Twin Pond on San Bernardino NWR. It fairs well in disturbed areas with shallow water depths; however, other habitat types/requirements warrant further studies. The Arizona Nature Conservancy has experimented with plug transplants with only limited success. Alternative methods for the restoration of this plant need to be explored.

H. Public Use, Compatibility, and Environmental Education

The San Bernardino and Leslie Canyon NWRs are open to the public under a special use permit system. Certain public use activities are allowed and have been determined to be compatible with the purposes for which the refuges were established. Hunting is permitted, and includes the taking of cottontail rabbit, dove, and quail only. Fishing is prohibited due to conflicts with the threatened and endangered fishes. In addition to hunting, birdwatching, wildlife viewing, and hiking are also permitted. The refuges do not have a visitor center, nor are there any developed hiking trails or auto tour routes. The refuge headquarters, located in Douglas, serves as the contact station for issuance of permits and for distribution of information and brochures. Environmental education programs are provided to various groups upon request.

Visitation data for the refuges are limited. Estimates are based on current and expected use of similar areas in the immediate vicinity of San Bernardino and Leslie Canyon NWRs: Guadalupe Canyon and the Johnson Historical Museum of the Southwest. Guadalupe Canyon is visited by birdwatchers from throughout the United States. The road leading to the canyon is also the access route to San Bernardino NWR. Because the refuges offer birdwatching opportunities and bird species not seen in the canyon, an estimated 90 percent of the canyon visitors may stop at the refuges. Guadalupe Canyon, however, is privately owned and use of the area has not been recorded, which makes it difficult to assess visitation to San Bernardino and Leslie Canyon NWRs. The Johnson Museum estimates annual visitation at 3,000, with the majority of visitors probably visiting the refuges as well.

I. Cultural Resources

San Bernardino NWR is recognized as a distinctive cultural transition zone. Investigations into human occupance of the San Bernardino Valley indicate habitation in excess of 10,000 years. San Bernardino NWR is most noteworthy for two important components: the National Historic Landmark Slaughter Ranch complex on the adjoining Johnson Museum property and the prehistoric Animas Phase/Casas Grandes and Salado culture pueblos.

The Historical Landmark represents the episode for which the San Bernardino is most famous. In 1884, "Texas" John Slaughter purchased approximately 65,000 acres of the San Bernardino Land Grant and proceeded to build up one of the largest cattle operations in Arizona. Surviving the earthquake and severe drought, the Slaughter Ranch was steadily farmed from 1900 until 1979 when The Nature Conservancy purchased the property. It was in 1982, when the Service acquired San Bernardino NWR, that the Johnson Historical Museum of the Southwest assumed control of the Historic Landmark. They have since painstakingly restored the Slaughter Ranch Headquarters to its near original condition.

In 1982, an intensive archaeological survey of the 131-acre San Bernardino Ranch National Historic Landmark was conducted (Stone and Ayres 1982). Twenty-four historic and prehistoric sites were recorded in the survey. Another study two years later recorded 33 prehistoric and historic sites and 99 isolated cultural features and artifacts (Neily and Beckwith 1985).

Other known cultural resources relate to the "Animas Phase" or "Casas Grandes" cultures who possessed architectural and material culture traits pointing to strong ties with advanced societies in Chihuahua. Of the nine pueblo period sites recorded at San Bernardino, the largest appears to be the Slaughter Ranch Site. Although the extent of the village is unknown, it may have consisted of 100 rooms with detached room blocks and one or more plaza areas. As many as 11 burials are reported from the pueblo. Artifacts number in the thousands, including complete effigy vessels and other decorated vessels exhibiting strong ties to 14th century populations in Chihuahua.

Additionally, 10 Archaic era sites have been identified on San Bernardino NWR. These sites and associated isolated artifacts are evidence of a widespread hunting-gathering lifestyle. The most extensive of the Archaic group is a high density artifact scatter with numerous hearth-like features and roasting pits possibly representing a semi-permanent campsite above Hay Hollow Wash. The projectile points (e.g., arrowheads) recovered from the study area include Pinto, Chiricahua, and San Pedro styles, plus unnamed triangular concave-base and unnamed corner-notched points, all presumed to be Archaic.

J. Socioeconomic Aspects

San Bernardino NWR is located in Cochise County, 16 miles east of Douglas, Arizona along the Mexican border. Leslie Canyon NWR, also in Cochise County, lies to the north of San Bernardino NWR and is situated in the Swisshelm Mountains. The county is chiefly populated in such towns and municipalities as Benson on the extreme north, and Douglas to the extreme south. The economy of the area at one time was based almost solely on smeltering operations from large copper mines in Bisbee. These mines began to close in the early 1980s and efforts were then made to attract light industries into the area. As a result, mining and mining-related employment fell to only 4.2 percent of the workforce and today, light industry and service-oriented businesses are the primary components of the economy. Agriculture and ranching also contribute significantly to the local economy and rank first in the county in both employment and product value.

The population base servicing this economy is primarily in Douglas and Douglas' sister city in Mexico, Agua Prieta. Currently, Douglas supports a population of 19,000 people. Agua Prieta has a continually growing population of approximately 80,000. The total market area population, including populations in Mexico, is approximately 180,000 and projections for the year 2010 indicate that the population for the area will have increased to 250,000.

Tourism plays an important role in the Cochise County economy and affects visitorship of the San Bernardino and Leslie Canyon NWRs. The county is the home of Tombstone, Boothill, and the OK Corral. Many tourists venture south to Douglas to catch the international flavor of the famous and historical Gadsden Hotel. Also, the Slaughter Ranch Headquarters Site, operated by the Johnson Historical Museum of the Southwest, adjoins the San Bernardino NWR. The ranch interprets the history of human occupancy in the San Bernardino Valley which is most famous for its colorful namesake, "Texas" John Slaughter.

III. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

The following three alternatives were considered by the Service prior to the selection of the preferred course of action:

Alternative A: Ecosystem Approach (Preferred and Proposed Alternative)

The Service would implement a CMP for the San Bernardino and Leslie Canyon NWRs that would provide long range guidance for management of the refuges over the next 20 years. The plan discusses in full detail 10 issues that confront the refuges. The end result is a set of goals, objectives, and strategies related to each of these issues which would assist in making management decisions. Day to day management of the refuges would not change significantly; however, there would be considerably more emphasis placed on working with the local community, private landowners, and other jurisdictions, including Mexico. Developing partnerships with various entities that would lead to overall land and watershed protection and good stewardship of the resources would be a primary focus.

Habitat management would still be centered around the water resources for the protection and enhancement of native fish populations and other threatened, endangered, or candidate species that rely on the wetlands. Additionally, grassland restoration to reduce invading woody species and increase overall biological diversity would be emphasized.

Due to the sensitive nature of the endangered species associated with the refuges, the environmental education and public use programs would not be expanded significantly in that no trails or auto tour loops would be developed. Instead, this alternative advocates more of an "off-refuge" approach which would still meet interpretive and educational goals. Special use permits for public use activities would continue to be issued for those people interested in bird watching, hiking, and small game hunting.

Alternative B: No Action

In this alternative, the CMP would advocate that the San Bernardino and Leslie Canyon NWRs continue to be managed under their current management direction. Current management guidance comes from the previous master plan that was developed in 1985.

Day to day activities would continue to revolve around intensive field work regarding management of Yaqui fishes and other species such as the Chiricahua leopard frog. Routine field work includes monitoring and observing fish populations, taking water readings on wells, netting fishes to conduct survey work, and aquatic vegetation manipulation such as reducing cattails. Other timely field work relates to reducing

bullfrog numbers for the benefit of the leopard frogs.

The public use program would remain under its current special use permit requirement and would not be expanded. Allowed and compatible uses include wildlife observation and photography, hiking, and limited hunting. Opportunities for increased environmental education and interpretation would not be promoted.

Alternative C: Maximize Habitat Developments and Public Use Program

Under this alternative, intensive habitat management practices would be employed in attempts to restore a more historic occurrence of native vegetation. Aquatic and wetland habitats would be extensively developed and recreated to maximize the water resources for the benefit of native wildlife. Native desert grassland restoration would be another focus of the San Bernardino and Leslie Canyon NWRs. This would be achieved through thinning and opening of dense mesquite bosque areas, prescribed burns to reduce woody invader vegetation, and mowing, burning, and strip planting on abandoned farm fields.

Public use and environmental education programs would be stepped up considerably. Facilities such as parking lots, paved roads, trails, auto loops, and restrooms would be developed on the refuges to accomodate increased public use.

IV. ENVIRONMENTAL CONSEQUENCES

The following discussion addresses the environmental impacts associated with the approval and implementation of a CMP for the San Bernardino and Leslie Canyon NWRs. Each alternative is discussed separately. The issues identified in the Affected Environment section above, as well as some of the issues identified in the planning process for the CMP, are considered below.[7] Some of the issues are presented in combination with others for the sake of reducing duplication.

Alternative A: Ecosystem Approach (Proposed and Preferred Alternative)

A. Climate

This alternative would have no impacts on the climate.

B. Air Quality

Some short-term impacts are likely to occur due to the implementation of prescribed burns that this alternative advocates. Burning is required for habitat improvement to reduce the invasion of dense, woody vegetation and allow for native grass restoration. Although burning would cause a temporary degradation of the local air quality, the area is sparsely populated and therefore, would have little effect on the human environment. No long-term or significant adverse impacts to the air quality would result.

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[7]This section of the EA concerns only the implications of broad management framework changes, and not specific refuge management strategies set out in the CMP. Specific plan goals, objectives, and strategies listed in the CMP may be subject to additional NEPA compliance prior to implementation. Because of the broad perspective of this EA, the analysis did not lend itself to quantitative measures. The analysis attempts to narratively describe anticipated measures of change with regard to the issues based upon the alternative management frameworks discussed.

C. Water Quantity and Quality

The water quantity and quality under the Preferred Alternative would be further protected. Strategies would be developed that would ensure sound use of the aquifer by private landowners. The restoration of native cottonwood and willow trees to slow down the erosion and downcutting of Black Draw would, over time, help to raise the water table, resulting in increased water yields. Any future water developments or improvements such as recreating cienega habitat would proceed with caution until a better understanding is reached as to the extent and limits of the aquifer.

The computer model being developed in cooperation with the University of Arizona Department of Hydrology will aid significantly in developing water management guidelines for the refuges and calls for regular monitoring of baseline information (pH, total dissolved oxygen, contaminants). Ultimately, the model will be able to predict the impacts that development will have on the aquifer so that a plan of action can be strategically developed to protect the valuable water supply.

The surface waters within the San Bernardino and Leslie Canyon NWRs are already of superior quality. It is anticipated that the water quality would remain the same or would improve under this alternative. In creating partnerships and working cooperatively with private landowners in the United States and Mexico, strategies would be employed that would minimize impacts of land and water use practices that could potentially affect water resources (e.g., reduced sedimentation as a result of sound grazing practices).

Gold prospecting and mining has occurred in the region since the late 1800s. This is a direct threat to the water quality because of the use of mercury and cyanide in extraction procedures. This alternative would halt mining activities associated with certain BLM lands by withdrawing both Federal and private hard rock mineral rights from public domain. These are lands that the BLM intends to dispose of, some of which directly contribute to the watershed. Ultimately, this would lead to further protection of the water quality.

D. Geology and Soils

The management activities described in the Preferred Alternative will have minimal effects on the geology and soils of the San Bernardino and Leslie Canyon NWRs. Any mechanical control methods used to remove or open up dense stands of woody, invader vegetation could negatively impact refuge soils. However, restoring these areas to their native grassland state would ultimately result in reduced soil loss. No removal of vegetation would occur along stream banks or arroyo margins to ensure continued bank stabilization. Because fire historically played an important role in maintaining desert grasslands, any implemented prescribed burns should have minimal effects on refuge soils. To prevent soil loss and erosion after burning, slope factors would be carefully considered.

There are no proposed developments such as trails, roads, or buildings on either refuge that would affect refuge soils. Recreational uses such as hiking are expected to remain minimal and will not result in significant, if any, impacts to the soils. Existing refuge roads would continue to be maintained with little to no impacts.

E. Vegetative Habitats and Habitat Management

Many changes in habitat types are desirable and planned and would result in more natural, diverse habitats which in turn would effect overall increased biological diversity on the San Bernardino and Leslie Canyon

NWRs. Habitat management practices would be employed that would restore various habitats (dense mesquite stands, fallow fields, desert scrub) to their native grassland states. Encouraging desert grasslands would provide an increased forage and cover base for native wildlife and would also increase infiltration rates and reduce runoff and evapotranspiration rates. All of this would help maintain spring flows that the Yaqui fishes and other wildlife depend on for their survival.

Under this alternative, riparian forests, cienegas, and aquatic habitats would continue to be managed and protected with beneficial results. As mentioned previously, water management strategies would be developed as a result of the computer model. Additionally, partnerships with private landowners that effect sound use of the aquifer would be implemented. Routine maintenance work such as removing dense cattail stands would ensure continued water flows. Development of existing springs and wells to encourage constant flows through drilling of replacement wells, rehabilitation existing wells, and installing electrical or solar powered pumps would continue to be employed.

F. Wildlife and Biological Diversity

The Preferred Alternative is designed to enhance fish and wildlife populations, resulting in overall increased diversity. The ecosystem approach would provide an opportunity for maximizing land and habitat protection for the benefit of native wildlife populations. Strategies would be developed in conjunction with private landowners to preserve the open space nature of the land to support diverse, flourishing communities of plant and animal species. It also calls for management practices that would optimize historical habitat characteristics to improve wildlife diversity. Water development and enhancement, thinning of mesquite bosques, mowing of abandoned fallow fields, restoration of native grasslands, and protection of the cottonwood-willow galleries would all further enhance species richness.

G. Candidate, Threatened, and Endangered Species

Candidate, threatened, and endangered species populations would benefit in this alternative. Active management practices would center around the recovery and enhancement of these species, with major emphasis on the Yaqui fishes.

Management strategies to aid in Yaqui fishes recovery would include cooperating with Mexico, managing existing habitats and populations, determining biological requirements of listed fish species, protecting historic habitat in the United States, assessing habitats for reintroduction into historic ranges, and developing information and education programs for the Yaqui fishes.

Chiricahua leopard frogs would benefit under this alternative. Removal of predatory bullfrogs via trapping and gigging would aid in the recovery of leopard frog populations. Captive breeding of the frogs would continue, as would reestablishing populations in fenced impoundments, created to prevent bullfrog invasions, so that viable populations could be established. Mexican garter snakes, also suffering due to expanding bullfrog numbers, would benefit from bullfrog removal as well.

In a cooperative agreement with the Johnson Museum regarding management of the spring snail outflow, populations of the San Bernardino spring snail would fair better. Alternative sites of appropriate habitat would be explored.

Grassland and riparian woodland restoration would increase the quality and quantity of aplomado falcon

habitat so that introduction of this endangered bird could occur.

Because not much is known about habitat requirements of the Huachuca water umbel, management would continue to be experimental. Additional habitat types as well as alternative methods for the restoration of this plant would be explored.

H. Public Use, Compatibility, and Environmental Education

Implementation of this alternative would result in the disallowing of all uses that are not wildlife-oriented. It would ensure that only compatible uses occur on the San Bernardino and Leslie Canyon NWRs, resulting in negating activities that could be harmful to fish and wildlife resources on the refuges. Impacts would be kept to a minimum as a result of monitoring recreational uses and setting law enforcement/patrolling efforts accordingly. Allowed and compatible uses would continue to include wildlife observation, photography, hiking, and small game hunting of quail, dove, and cottontail rabbit. Special use permits would still be issued to those people wanting to visit the refuges. This requirement allows for additional visitor contact and provides an avenue for refuge staff to talk about the refuges resources and disseminate educational materials. A visitor center would not be developed due to lack of funds; however, improvements would be made to the existing office headquarters to serve as a visitor contact station as well.

Opportunities for environmental education would be promoted in an "off refuge" approach due to the sensitive nature of the threatened and endangered species on the refuges. Under an agreement with the Johnson Museum, interpretive panels would be displayed on the Museum property which adjoins the San Bernardino NWR. Additionally, a self-guided trail would be developed that would interpret Yaqui fishes ecology and management and other important environmental messages related to the refuges.

Outreach to children and other segments of the population would be improved by designing environmental programs tailored to fit the needs of the local schools from elementary to high school levels and by giving presentations at local community events and to various interest groups.

This alternative would also provide educational programs regarding sound grazing and farming practices, conservative use of the aquifer, and riparian protection and restoration to effect sound land use practices by private landowners.

I. Cultural Resources

Implementation of the Preferred Alternative would result in compliance with all Service and other applicable federal laws to provide the fullest protection possible to the cultural resources on San Bernardino NWR. It would ensure that all appropriate measures are taken to protect the resources prior to any undertakings that could potentially impact them. Visitor use and their associated effects would be monitored through appropriate law enforcement efforts. Any new cultural resource sites and objects found on either refuge would be reported immediately to the Regional Historical Preservation Officer in order to ensure investigation in a timely manner.

J. Socioeconomic Aspects

Impacts to socioeconomic aspects would not be significant. If visitation to the refuges and the Slaughter Ranch Headquarters Site are to increase, it would bring increased monies to the local economy for lodging,

food, gas, etc. Local contractors would be provided the opportunity to bid on any refuge construction and development projects (e.g., well drilling).

The refuges environmental education and outreach program would increase public awareness regarding environmental issues related to the San Bernardino and Leslie Canyon NWRs in the local area.

Alternative B: No Action

A. Climate

This alternative would have no impacts on the climate.

B. Air Quality

This alternative would have no impacts on the air quality.

C. Water Quantity and Quality

Under the No Action Alternative, the quantity and quality of the water could be negatively impacted over the long run. Currently, the refuges have no water management guidelines to aid in setting management objectives. Wells and springs would continue to be maintained in their present state, with occasional rehabilitation projects implemented as deemed necessary.

This alternative would not provide any direction for the refuges to actively develop partnerships and cooperative agreements with other jurisdictions and private landowners in developing strategies to protect the water resources in the San Bernardino Valley. Additionally, no measures to protect the watershed from mining activities would be developed, therefore, mining would continue to be a threat that could seriously impact water quality.

D. Geology and Soils

The soils of the San Bernardino and Leslie Canyon NWRs could be subjected to accelerated soil loss under this alternative. Without native grassland restoration on abandoned farm fields, these areas would be subject to wind and sheet erosion during the lengthy natural successional recovery to desert grassland conditions.

Current public use activities at their existing levels will have little to no impact on the refuges soils, nor will the routine maintenance of refuge roads.

E. Vegetative Habitats and Habitat Management

Under the No Action Alternative, habitat management would remain focused on the aquatic environments on the refuges. Cienegas, marshes, and riparian areas would continue to improve under current management.

Mesquite bosques would continue to provide important habitat for various songbirds and other wildlife but

at levels considerably below their potential. Encroachment of woody vegetation would continue to the detriment of native desert grasslands, and fallow fields would give way to increased levels of weedy, undesirable vegetation.

F. Wildlife and Biological Diversity

Yaqui fishes would remain the primary focus and presumably, fish populations would increase due to active management practices. Chiricahua leopard frog populations would also increase as a result of active management to encourage frog reestablishment.

Biological diversity would not be maximized under this alterative due to the loss of historical habitat conditions that has occurred on the landscape. Native grasslands would continue to be lost to encroaching woody vegetation and weedy annuals. Biological values of mesquite bosque areas, which have formed dense, impenetrable stands, would continue to be stifled.

Missed opportunities to improve habitat, wildlife, and overall biological diversity on non-refuge lands would result because there would be no strategies developed to coordinate with other jurisdictions and private landowners.

G. Candidate, Threatened, and Endangered Species

Certain species of concern would benefit under this alternative, namely, the Yaqui fishes, Chiricahua leopard frogs, and Mexican garter snakes. As noted, most management projects would revolve around the protection and enhancement of Yaqui fishes and their habitats. Also, active bullfrog control would continue to the benefit of the native leopard frogs and garter snakes.

Because management would primarily focus on native fishes, it would result in missed opportunities to achieve cumulative enhancement of biological diversity and threatened and endangered species management. Populations of the remaining candidate species, including the San Bernardino spring snail and Huachuca water umbel, would probably remain at current levels because management would focus more on the native fishes and leopard frogs. Unless major grassland restoration projects are undertaken, suitable habitat would not be attained for future aplomado falcon introductions.

Again, there would be no strategies developed to work cooperatively with landowners in the surrounding areas to effect sustainable resource management. Management practices on private lands have a significant effect to the overall health of the watershed. If unsound land and water use practices were employed, threatened and endangered species on the refuges could be impacted.

H. Public Use, Compatibility, and Environmental Education

Under the No Action Alternative, the public use and environmental education programs would be operated in their current state. All public use activities that occur on the refuges were determined to be compatible with the purposes for which the refuges were established. Therefore, birdwatching, hiking, and limited small game hunting would be allowed to continue and would still require a special use permit. Because visitation is limited, impacts from recreational activities would continue to remain insignificant.

This alternative would result in limited environmental education and public outreach opportunities for the

public. Educational programs would be given upon request, but no formal outreach would be employed. The office headquarters would serve as the visitor contact station; however, no efforts would be made to enhance the existing educational materials or displays. Missed opportunities to work in conjunction with the Johnson Museum on an interpretive trail would result.

I. Cultural Resources

Under this alternative, the current program does not provide for the implementation of specific cultural resource protection strategies. Lack of clear direction on how to handle cultural resource issues could have a negative impact to the cultural resource sites on the refuge.

J. Socioeconomic Aspects

This alternative would not provide for increased revenues to the local economy because public use would remain at minimal levels. The refuges would be unable to improve the local environmental and refuge awareness substantially due to the small public outreach program. Public goals for endangered fish preservation and enhancement would not be achieved.

Alternative C: Maximize Habitat Developments and Public Use Program

A. Climate

This alternative would have no impacts on the climate.

B. Air Quality

This alternative would temporarily impact the air quality as a result of implementation of intense prescribed burns to restore native grassland habitats. No long-term impacts would result.

C. Water Quantity and Quality

This alternative makes the assumption that the aquifer will support increased development and use in the future. Without knowledge of the size, configuration, and limitations of the aquifer, extreme development of the water resources could ultimately have negative impacts.

Springs and wells would be developed for maximum output and would be augmented by new wells if needed. Sites lacking adequate artesian flow would be pumped through appropriate measures. Flows would be channeled into a system of streams and ponds to support a wide variety of wildlife species.

D. Geology and Soils

Maximum water development would create more extensive ponds and marshes than the No Action or Preferred Alternative. Soils would be disturbed by the construction of dikes and excavation would be necessary to create small ponds for wildlife.

This alternative would call for more developed facilities to accommodate increased public use on the

refuges. The construction of facilities such as a small visitor station, trails, parking areas, and restrooms would have significant impacts to the soils on the refuges.

E. Vegetative Habitats and Habitat Management

The various habitats on the San Bernardino and Leslie Canyon NWRs would be managed intensely in attempts to restore the natural landscape characteristics. Formerly, much of the Chihuahuan desert scrub habitats were classified as grasslands. Restoration of these areas to their previous state would be encouraged. Mesquite bosque areas would be opened up using mechanical means and prescribed burning. Native grasslands would then be encouraged to reestablish these cleared areas. Fallow fields, many of which are overrun with weedy annuals, would also undergo intense management. Mowing, burning, strip plantings, and other viable methods would be employed to revert them to their native grassland state.

Riparian areas would be augmented with pole plantings of native cottonwood and willow trees to further stop the downsizing and erosion of Black Draw. As mentioned above, aquatic areas would be developed to maximize the water resources for the benefit of fish and wildlife.

F. Wildlife and Biological Diversity

With the expansion of aquatic and wetland habitats, significant benefits to wildlife diversity would occur. Yaqui fishes populations would increase as there would be more available habitat for reintroductions. The refuges would experience increased diversity of avifauna such as waterfowl, shorebirds, and other waterbirds. With the restoration of native grasslands, overall biological diversity would increase. As stands of mesquite bosques are opened up to allow for more wildlife use, biological values would be improved considerably.

G. Candidate, Threatened, and Endangered Species

If the assumption that the aquifer can withstand intensive development holds true, this alternative should have beneficial impacts to threatened and endangered species on the refuges. Most of these species, including the Yaqui fishes, leopard frogs, garter snakes, spring snails, and water umbels rely on the aquatic environments for their survival and would therefore expand their populations due to increased available habitats. Species that utilize grassland areas such as the aplomado falcon would benefit as well.

H. Public Use, Compatibility, and Environmental Education

The main impact from this alternative would be more intense development of facilities to accommodate increased visitation by the public. This would require a significant increase in base funding and staff in order to effectively manage the program. Building of the facilities would result in disturbance and loss of some habitat types. Expansion of the numbers and kind of users permitted could create conflict between user groups such as hunters and wildlife observers.

The environmental education program would be actively promoted and developed on the refuges. Self-guided trails and an auto loop would be developed with appropriate interpretive material displayed along the way. Tours of the refuges would be given to groups interested in the management of native habitats and their associated fish and wildlife species.

Increases in the public use and environmental education programs could negatively impact refuge resources. The refuges would be susceptible to trampling of aquatic, riparian, and other habitats due to increased foot traffic, as well as littering and disturbance to native wildlife. Another threat is the possibility of exotic fish introductions which have occurred in the past. This poses a significant threat to the threatened and endangered fishes inhabiting San Bernardino and Leslie Canyon NWRs.

I. Cultural Resources

This alternative would provide for greater public interpretation of historic and archaeological resources on San Bernardino NWR. Refuge interpretation would mostly be in conjunction with the exhibits associated with the Slaughter Ranch Historical Site; however, other cultural resource sites associated with the refuge would be opened up for interpretation as well. This would require the development of roads, trails, exhibits, and displays. Increased visitation to these sites could increase vandalism, pot hunting, and casual taking of artifacts. Law enforcement activities would need to be stepped up considerably in order to prevent such violations.

J. Socioeconomic Aspects

This alternative would have significant impacts on socioeconomic aspects related to the local community. Increased visitation to the refuges would bring increased revenues to the local economy for lodging, food, gas, etc. Additionally, this alternative would provide economic benefit to local contractors for construction of the extensive aquatic/wetland developments and the public use and educational facilities. With the enhancement of environmental education programs, the San Bernardino and Leslie Canyon NWRs would be able to meet their public outreach goals and objectives.

SUMMARY TABLE OF IMPACTS BY ALTERNATIVE

San Bernardino and Leslie Canyon
National Wildlife Refuges
Comprehensive Management Plan Draft
Environmental Assessment

Alternatives Issues	Ecosystem Approach	No Action	Maximize Habitat Developments and Public Use Program
A. Climate	0	0	0
B. Air Quality	- *	0	- *
C. Water Quality and Quantity	++	-	++ or -- **
D. Geology and Soils	+	-	-
E. Vegetative Habitats and Habitat Management	++	+ and -	++
F. Wildlife and Biological Diversity	++	+ and -	++
G. Candidate, Threatened, and Endangered Species	++	+	++ or -- **
H. Public Use, Compatibility, and Environmental Education	++	-	+
I. Cultural Resources	++	-	+
J. Socioeconomic Aspects	+	-	++

KEY:

0	=	No impacts
+	=	Possible minimal positive impacts
++	=	Maximum positive impacts
-	=	Possible minimal negative impacts
--	=	Maximum negative impacts
*	=	Temporary impacts only
**	=	Impacts could be positive or negative due to uncertainty of the aquifer limitations

V. CUMULATIVE IMPACTS

All of the above alternatives were evaluated as to their cumulative impacts. It was determined that adoption and implementation of any of the three alternatives, when added to other past, present, or future actions, would not result in any significant cumulative impacts to the refuges or the surrounding areas.

VI. MITIGATION AND RESIDUAL IMPACTS OF THE PROPOSED/PREFERRED ACTION

No mitigation action would be necessary in the adoption and implementation of the proposed/preferred alternative. Where site development activities will be proposed during the next 20 years, each activity would be given the appropriate NEPA consideration. At that time, any required mitigation activities would be designed into the specific project to reduce any significant adverse impacts to the environment.

VII. CONSULTATION AND COORDINATION WITH OTHERS

Formal consultation for the writing of this EA did not occur. However, this planning effort and the refuge manager's ongoing dialogue with various jurisdictions, including the Arizona Game and Fish Department, BLM, The Nature Conservancy, The Conservation Fund, Malpai Borderlands Group, and private landowners has provided important elements in the synthesis of the proposed goals, objectives, and strategies appended in this EA. Implementation of the CMP will necessitate further coordination and cooperation with these entities.

VIII. LIST OF PREPARERS

Colleen McNerney, Natural Resource Planner
Kevin Cobble, Refuge Manager, San Bernardino and Leslie Canyon NWRs
Dick Steinbach, Program Specialist, Arizona Refuges
Tom Baca, Natural Resource Planner

IX. REFERENCES

Lanning, Dirk V. 1981. The vertebrates of San Bernardino Ranch, Cochice County, Arizona. Arizona Natural Heritage Program, Tucson, Arizona. 88 pp.

Marrs-Smith, Gayle. 1983. Vegetation and flora of the San Bernardino Ranch, Cochice County, Arizona. 93 pp.

Neily, Robert and Ronald Beckwith. 1985. A cultural resource inventory of the San Bernardino National Wildlife Refuge. Arizona State Museum. University of Arizona. 88 pp.

Phoenix Ecological Services Field Office. 1988. San Bernardino National Wildlife Refuge contaminant study - final report.

Rosen, Philip C. and Cecil R. Schwalbe. 1993. Interim report on bullfrog impacts on sensitive wetland herpetofauna and herpetology of San Bernardino National Wildlife Refuge. University of Arizona, Tucson. 11 pp.

Stone, Lyle and James Ayres. 1982. A description and evaluation of archaeological resources, San Bernardino Ranch National Historic Landmark, Cochice County, Arizona. Archaeological Research Services, Inc. Tempe, AZ.

Tashjian, Paul. 1992. Leslie Canyon National Wildlife Refuge instream flow request for Leslie Creek in Leslie Canyon. U.S. Fish and Wildlife Service, Division of Water Management, Region 2. 66 pp.

APPENDIX

GOALS, OBJECTIVES, AND STRATEGIES

A. Introduction

This section presents refuge goals, objectives, and strategies developed in consideration of: (1) the legal mandates including statutes, policies, and other administrative directives; (2) the purposes for which the refuges were established; (3) the goals of the National Wildlife Refuge System; and (4) an analysis of the defined issues listed on page 3 of this document. Programmatic objectives were developed in consideration of field level analyses offered by the San Bernardino and Leslie Canyon NWRs refuge manager. These objectives are intended to address the major issues that surfaced during the planning process.

B. Refuge Goals, Objectives, and Strategies

The 10 issues outlined on pages 3 and 4 of this document are repeated on the following pages, each with a goal and a set of objectives and/or strategies. The objectives and strategies are not exclusive to any one issue, as many are considered in combination with other issues. For instance, the recovery of threatened and endangered native fishes is considered within the context of biological diversity and habitat management, water management, land protection, and environmental education. In fact, all of the issues are in some way interrelated.

As the planning horizon is 20 years, the Service has much latitude with respect to project phasing and land implementation. Funding considerations will also affect project accomplishments.

ISSUE #1: Ecosystem Sustainability

Goal Statement: To conserve fish and wildlife species and their habitats by protecting and restoring the function, structure, and species composition of the Area of Ecological Concern while still providing for sustainable socioeconomic use.

Objectives/Strategies:

(1) Help achieve ecosystem sustainability by creating partnerships and working cooperatively with the Malpai Borderlands Group for the overall protection of the watershed through establishing non-development and conservation easements on land and water use in the Valley.

(2) Strengthen the refuges contribution to the Malpai Borderlands efforts by continuing involvement in their coordinated efforts to improve watershed stability, hydrologic function, and historical habitat characteristics as well as to coordinate the refuges interests in relation to the goals of the project.

(3) While remaining sensitive to private property rights, continue efforts to work cooperatively with private landowners in developing protective measures for the watershed.

(4) Increase inventorying and monitoring efforts to demonstrate socioeconomic impacts on the resources. Synthesize data and apply appropriate management strategies to ensure ecosystem sustainability.

ISSUE #2: Biological Diversity and Habitat Management

Goal Statement: To restore and maintain the natural diversity of San Bernardino and Leslie Canyon NWRs Area of Ecological Concern.

Objectives/Strategies:

(1) Reverse the loss of natural biological diversity by striving to meet the objectives of Region 2's plan for restoring biological diversity to include: monitoring fish and wildlife populations, identifying factors contributing to species declines, implementing management actions that promote biological diversity, educating the public on the values of biodiversity, enhancing technical capabilities of Service employees related to conservation of biological diversity, and fostering partnerships to include international cooperative efforts.

(2) Enhance habitat diversity by restoring native habitats to their natural conditions. Implement special projects to include:

a) prescribed burns to stimulate native grass growth
b) mechanical control to remove or open up dense stands of woody, invader vegetation
c) planting plugs of desirable vegetation or seeding with native grass seeds
d) mowing of abandoned farm fields to reduce noxious weed cover
e) maintenance and construction of gabion structures, and hand planting of cottonwoods and willows to prevent erosion processes
f) maintenance of artesian wells to ensure water flows to critical habitats

(3) Preserve the natural diversity and abundance of neotropical birds and other native wildlife by maintaining the unique ash-willow-cottonwood riparian woodlands in the Area of Ecological Concern. The refuges should monitor for exotic plant infiltration accordingly.

(4) Restore the native, historic diversity of the Area of Ecological Concern by developing and implementing a prescribed natural fire management plan to reduce undesirable woody vegetation and stimulate native grass growth.

(5) Sustain sufficiently large and diverse habitats to maintain all plant and animal diversity by supporting the Malpai Borderlands Group in their efforts to obtain conservation easements on private lands in the valley so that subdivision and development cannot occur.

(6) Achieve broader ecosystem management goals of the Service by working cooperatively with all interests in the watershed, especially other landowners, through establishing conservation easements, partnerships, and other agreements that will lead to biodiversity

preservation.

(7) Improve long-term viability of fish and wildlife resources by developing and fostering research that improves management and monitoring of fish and wildlife, certain types of habitats, and other elements that contribute to overall biological diversity.

(8) Achieve improved levels of international habitat conservation by enhancing dialogue with Mexico, using the appropriate channels and legal mechanisms, concerning biological diversity on the San Bernardino and Leslie Canyon NWRs.

(9) Enhance public awareness and appreciation of natural biological diversity by developing new and strengthening existing interpretive and educational programs that emphasize these values.

(10) Determine specific scientific research data needs for the San Bernardino and Leslie Canyon NWRs, produce an inventory of those needs, and develop a coordinated strategy for meeting those needs. Whenever appropriate, the inventory of needs should be prepared in cooperation with other resource management agencies and institutions of higher learning and research. Research is a specific priority and promotes a better understanding of the habitat requirements of the various threatened and endangered species.

ISSUE #3: Endangered Species Management

Goal Statement: To achieve threatened and endangered species recovery, as well as to assist in the recovery of all candidate species so that viable, self-sustaining populations are maintained in the Area of Ecological Concern.

Objectives/Strategies:

(1) Achieve Yaqui fishes survival, recovery, and maintenance by striving to meet the goals as outlined in the Yaqui Fishes Recovery Plan through implementing the recommended actions and strategies.

(2) Enhance viability of threatened and endangered species, with main consideration to be given to native Yaqui fishes, by determining specific scientific research data needs including biological requirements, food habits, reproductive habits, and habitat preferences. Manage endangered populations accordingly.

(3) Ensure viability of threatened and endangered species by preventing introduction of non-native species onto the refuges and exercising control methods on exotic species already introduced including bullfrogs, mosquitofish, Johnson grass, and salt cedar.

(4) Establish a cooperative agreement with the Mexican government and develop long-term management strategies to ensure proper management and habitat protection for threatened and endangered Yaqui fishes.

(5) Increase awareness of fish and aquatic values to overall biological diversity by developing new and strengthening existing interpretive and educational programs that emphasize aquatic fishery resources on San Bernardino and Leslie Canyon NWRs.

(6) Improve interjurisdictional and organizational knowledge and understanding of endangered fish and wildlife species through cooperative agreements with other jurisdictions. Cooperative special habitat development goals and objectives would be set for endangered species, threatened species, and species of special concern.

(7) Protect historic habitat of Yaqui fishes and other endangered wildlife. Strategies include: maintaining subsurface and surface water flows, protecting or acquiring essential habitats, maintaining "core habitats" and special protection areas, restoring native habitats, curtailing erosion processes, and preventing overuse of water from the aquifer.

(8) Ensure long-term survival of threatened and endangered Yaqui fishes by developing culture techniques in conjunction with Dexter National Fish Hatchery and Technology Center and stocking fish into suitable habitats when appropriate.

(9) Prepare appropriate refuge lands for the aplomado falcon through restoration of native grasslands and riparian woodlands to increase the quality and quantity of falcon habitat, should reintroduction occur.

(10) Increase candidate species populations by determining and implementing restoration methods for the Chiracahua leopard frog, Mexican garter snake, San Bernardino spring snail, and Huachuca water umbel. Monitor results for success or failure.

(11) In conjunction with Johnson Museum management, ensure continued survival of the San Bernardino spring snail by preserving the spring outflow located on the museum property to ensure habitat is provided for this candidate species. Explore the refuges for additional habitat and/or create suitable habitat for snail occupancy.

(12) Ensure continued survival of Chiracahua leopard frogs through bullfrog control efforts in order to prevent bullfrog invasion and predation in and around the newly established impoundments designed for the reintroduction and protection of the frogs. Continue working with the Arizona Game and Fish Department, the National Biological Service, the University of Arizona, and the Phoenix Ecological Services Field Office in the cooperative effort to capture leopard frogs and breed them in captivity for their subsequent release onto the refuges.

(13) Monitor NAFTA-related development (construction/infrastructure) on both sides of the border and determine potential impacts on the refuges and surrounding area resources. Provide recommended actions such as petitioning for NAFTA or other appropriate funds to implement recommended projects and protection strategies.

ISSUE #4: Water Rights, Water Management, and Wetlands Protection

Water Rights Goal Statement: To protect existing water rights holdings in the Area of Ecological Concern and obtain additional water rights, to the extent possible, to ensure continued water flows for the protection of native fish and wildlife species and their associated habitats.

Objectives/Strategies:

(1) Determine if acquiring instream flow rights for Black Draw is feasible with the State of Arizona's Department of Water Resources.

(2) Develop a strategy for the protection of surface and near surface flows within Black Draw on San Bernardino NWR. Include meeting with private landowners in the Valley to address valid concerns about competing water rights.

(3) Support the the Malpai Borderlands Group in their efforts to establish conservation easements on water use with private landowners in the Valley for the protection of the aquifer.

(4) Develop international land use and water management strategies for the protection of the water resources to propose for inclusion into future agreements between the United States and Mexico.

Water Management Goal Statement: To improve the efficiency of water delivery systems and more effectively gauge water use for the benefit and enhancement of native fish and wildlife species and their habitats.

Objectives/Strategies:

(1) Develop a water use plan for San Bernardino and Leslie Canyon NWRs.

(2) Improve, monitor, and maintain wells to ensure artesian flows and surface waters.

(3) Maintain subsurface waters to protect artesian well flows and surface waters. Strategies include: clearing out dense vegetation, initiating use of electrical or solar powered water pumps to regain flow of wells should artesian flow be lost; rehabilitating and maintaining artesian wells; and removing woody vegetation to encourage native grass regrowth, which will increase infiltration rates into the water table.

(4) Improve watershed stability and hydrologic function by implementing prescribed burns to improve grass and herbaceous plant cover.

(5) Establish monitoring devices (pressure gauges, peizometers) in Mexico and on the refuges to gauge the extent of water use and determine the effects of such usage on the aquifer.

(6) In cooperation with the University of Arizona Department of Hydrology, create a

computer model of the San Bernardino Valley aquifer to aid in development of water management guidelines for the refuges.

(7) As detailed in the Preliminary Project Proposal, seek to protect additional lands through establishing conservation easements, partnerships, or other agreements regarding land and water use with private landowners in the Valley for the overall protection of the watershed. Pursue land acquisitions on a willing-seller basis only.

(8) Evaluate and monitor water quality to obtain baseline information including total dissolved solids, dissolved oxygen, and pH levels.

Wetlands Protection Goal Statement: To achieve wetlands protection, enhancement, and rehabilitation in the Area of Ecological Concern.

Objectives/Strategies:

(1) Improve wetland protection efforts through acquisition of water rights where possible.

(2) Enhance and maintain existing and former wetlands through special projects and habitat manipulation such as clearing out old, dense, emergent vegetation from springs, ponds, and wells.

(3) Continue erosion control efforts that contribute to rebuilding the water table, allowing for more recharge into the aquifer.

ISSUE #5: Compatibility and Public Use

Goal Statement: To achieve appropriate levels of wildlife observation, photography, hiking, and other recreational opportunities where such uses are legally compatible with the purposes for which the refuges were established and with the goals of the National Wildlife Refuge System; and to regulate, as provided by law, all activities, uses, and practices that are potentially harmful to refuge resources.

Objectives/Strategies:

(1) Ensure the primacy of wildlife and habitat resource protection by performing annual compatibility analyses on all secondary use activities that occur on the San Bernardino and Leslie Canyon NWRs.

(2) Ensure reasonable levels of wildlife observation, photography, hiking, and small game hunting opportunities that do not place harmful pressure on the wildlife populations and sensitive habitat areas and that do not conflict with other refuge goals and objectives.

(3) Ensure minimum impacts to refuge habitat and wildlife resources by monitoring recreational use and subsequent impacts on the refuge by the public and setting law enforcement/patrolling efforts accordingly.

(4) Ensure public safety by adequately maintaining refuge access roads and other public use facilities.

(5) Develop a Public Use/Environmental Education Management Plan for the San Bernardino and Leslie Canyon NWRs.

ISSUE #6: Environmental Education and Public Outreach

Goal Statement: To establish a program for public outreach, identify important public resources, and implement educational and interpretive programs for refuge habitat, wildlife, and cultural resources.

Objectives/Strategies:

(1) Improve public appreciation of wildlife resources and awareness of ecological values by developing an environmental education and public outreach program that demonstrates the role of San Bernardino and Leslie Canyon NWRs in such efforts. These efforts should include involving Mexican organizations such as Centro Ecologico and SEDESOL.

(2) Improve outreach to children and schools by designing an environmental education and interpretive program tailored to fit the needs of the local schools from elementary grades through high school levels. Included in this program would be the proposal to stock endangered Yaqui fishes in the local high school pond to teach students fish ecology and habitat needs as well as the importance of species preservation.

(3) Increase educational and interpretive opportunities by giving presentations to local interest groups and setting up displays and/or exhibits at local community events.

(4) To effect land use practices by private landowners, including those in Mexico, that are ecologically healthy through offering technical assistance and providing educational programs, such as giving presentations and tours of the refuges, that interpret sound grazing and farming strategies, conservative use of the aquifer, and riparian protection/restoration.

(5) Develop a Public Use/Environmental Education Management Plan for the San Bernardino and Leslie Canyon NWRs.

(6) In a partnership with the Johnson Museum, develop interpretive trail and other interpretive panels for the historical site to include themes such as Yaqui fishes ecology and management, candidate species awareness (San Bernardino spring snail, Mexican garter snake, Chiracahua leopard frog), biodiversity associated with cottonwood-willow riparian habitats, and cultural resources interpretation.

ISSUE #7: Cultural Resources Preservation and Management

Goal Statement: To protect, maintain, and plan for Service managed cultural resources on San Bernardino NWR for the benefit of present and future generations.

Objectives/Strategies:

(1) Ensure compliance with all Service and other applicable Federal laws and regulations to provide the fullest protection possible to the cultural resources on San Bernardino NWR and avoid the inadvertent loss of archaeological and historical sites.

(2) Fully utilize the expertise of the Regional Historical Preservation Officer to ensure appropriate measures are taken to protect the cultural resources on the refuge prior to any undertakings that could potentially affect those resources.

(3) Through administration of the appropriate special use permits, allow only necessary and appropriate research with respect to the cultural resources on the refuge to avoid unnecessary disturbance to such resources.

(4) Monitor visitor use and the associated effects of such use on the cultural resources located on the refuge through appropriate law enforcement efforts.

(5) Document any new cultural resources sites and objects found on the refuge and report them immediately to the Regional Historical Preservation Officer so that further investigation can be conducted in a timely manner.

(6) Ensure that any and all archaeological and historical materials and archives are maintained according to professional standards of curation for scientific use and public interpretation.

ISSUE #8: Interagency Coordination

Goal Statement: To strengthen interagency and jurisdictional relationships in order to coordinate efforts with respect to refuge and surrounding area issues, resulting in decisions benefiting fish and wildlife resources, while at the same time avoiding duplication of effort.

Objectives/Strategies:

(1) Strengthen the role of the Service in the Malpai Borderlands Group's land protection and habitat management efforts by continuing involvement in their coordinated efforts for overall land and water protection in the Valley.

(2) Improve interagency coordination, planning, communication, and decision-making by maintaining MOU's with the appropriate agencies, jurisdictions, landowners (including those in Mexico), and surrounding leaders to coordinate efforts on an array of issues including water management, endangered species management, fire management, habitat manipulation, and environmental education and interpretation.

(3) Establish cooperative agreements with Mexico and other private landowners adjacent to the refuges to initiate cooperative management efforts for the recovery and long- term protection of Yaqui fishes and their native habitatst.

(4) Strengthen coordination with the Johnson Museum to improve the management of Yaqui fishes inhabiting House Pond.

ISSUE #9: Land Protection

Goal Statement: To protect existing lands associated with the refuges and additional lands for the protection and maintenance of fish and wildlife resources; and to ensure the integrity of the refuges boundaries relative to adjacent lands.

Objectives/Strategies:

(1) Initiate necessary actions including planning studies, public involvement, environmental assessments, etc., in efforts to expedite protection strategies for the various lands associated with the proposed 24,000-acre protection area.

(2) Consider a range of protection strategies for the various land ownerships (Slaughter Ranch Headquarters Site, BLM lands, 99 Bar Ranch, Bar-Boot Ranch) including cooperative agreements, conservation/non-development easements, Partners for Wildlife programs, technical assistance, and withdrawal of public domain lands. Pursue acquisitions on a willing-seller basis only.

(3) Work cooperatively with the landowner of the 99 Bar Ranch to protect the perennial stretch upstream from Leslie Creek from development or uses which could threaten the year round flows.

(4) Ensure habitat protection from potential mining activities by acquiring all Federal and private mineral rights, including surface and sub-surface rights.

(5) Ensure more effective and efficient management control of Leslie Canyon NWR boundaries by obtaining the appropriate BLM lands that lie adjacent to the current refuge fenceline.

(6) Work with the Malpai Borderlands Group to sustain the "open space nature" of the land by encouraging conservation easements on all private lands in the valley so that subdivision and development is prohibited.

ISSUE #10: Staffing and Funding

Goal Statement: To effect improvements to staffing and funding that will result in long-lasting enhancement to habitat and wildlife resources in the Area of Ecological Concern, leading to the achievement of the goals of this plan and the goals of the National Wildlife Refuge System.

Objectives/Strategies:

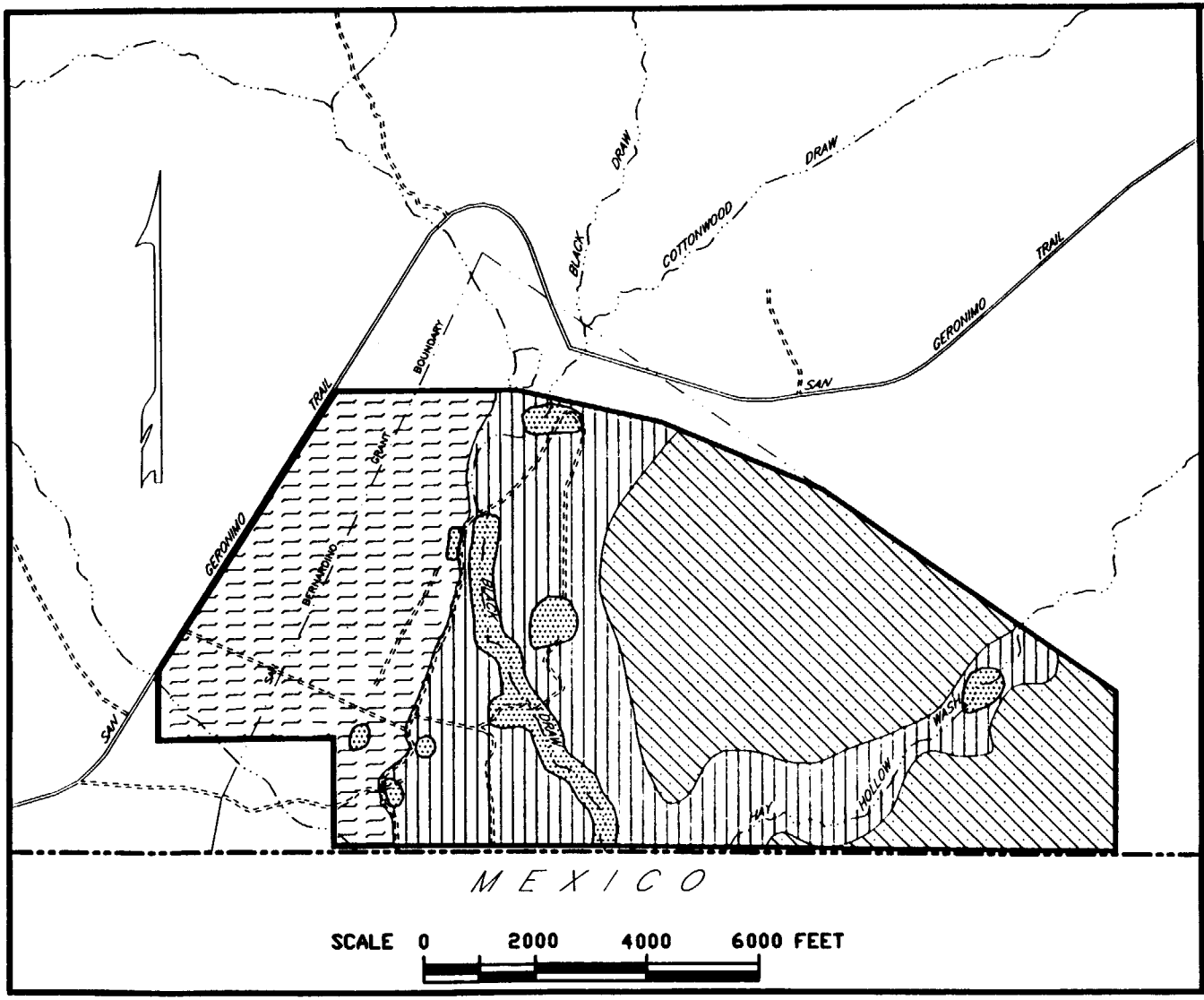
(1) Expand biological capabilities of the refuges by continuing efforts to hire a permanent, full-time biologist with expertise in fisheries and herpetology ecology/management.

(2) Improve consistency of management of refuge programs by annually assessing individual program funding needs, prioritize them, and preparing a budget supported by the goals and objectives of this plan.

(3) Ensure Comprehensive Management Plan applicability and flexibility for future years by reviewing the document for currency (possibly updating it every 5 years), assessing objective achievement progress, and making suggested amendments to the document.

(4) Consistent with Regional requests, promote existing, continuing, and proposed Service programs, conduct compatibility reviews, and prepare annual narratives of refuge accomplishments.

MANAGEMENT UNITS
SAN BERNARDINO NATIONAL WILDLIFE REFUGE



LEGEND

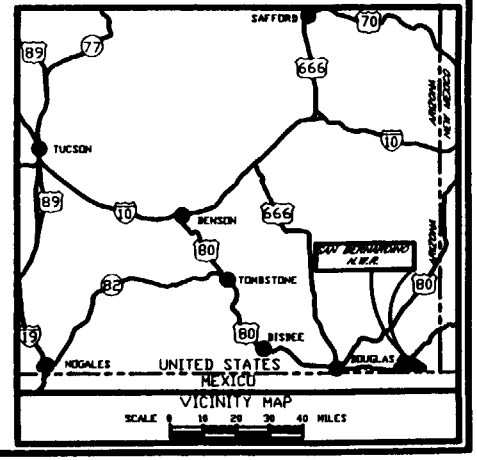
SUBUNIT I - WEST MESA
This area is predominantly tobosa grasslands mixed with acacia, blackbrush and mesquite - covers old lava flows.

SUBUNIT II - FLOODPLAINS, BLACK DRAW, HAY HOLLOW WASH
Includes sacaton bottoms, mesquite bosques, riparian and aquatic areas. Most management activities are directed in this area.

SUBUNIT III - UPLANDS
Hills and ridges on east part of refuge covered predominantly with creosote, blackbrush, small mesquite, 4-wing saltbush and various grasses. Less management emphasis is anticipated in these areas. Some prescibed burning.

SPECIAL PROTECTION AREAS

REFUGE BOUNDARY



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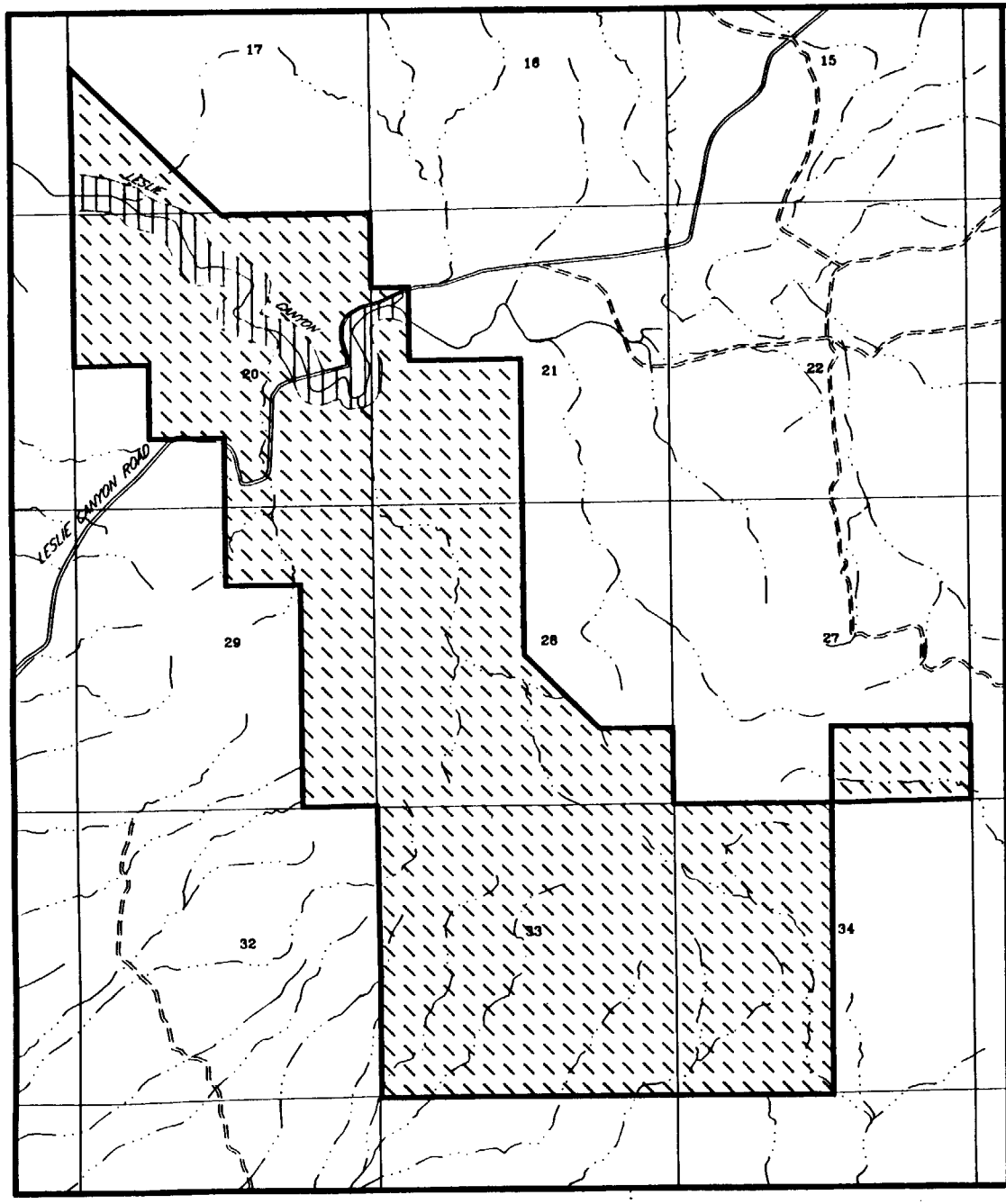
MANAGEMENT UNITS
LESLIE CANYON
NATIONAL WILDLIFE REFUGE



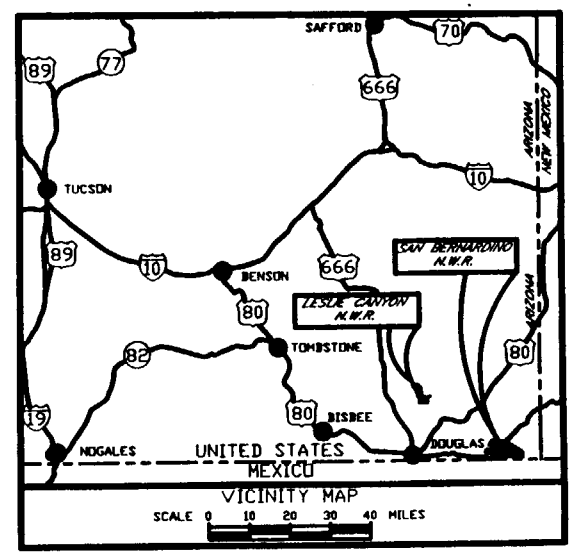
SUBUNIT I - ENDANGERED FISH MANAGEMENT AREA
Riparian habitat along Leslie Creek.
Most management occurs here.

SUBUNIT II - UPLANDS
Make up the majority of the refuge.
Less management emphasis other
than prescibed burning.

SPECIAL PROTECTION AREAS
All of Subunit I along Leslie Creek.

SCALE 0 2000 4000 6000 8000 FEET

SCALE 0 .5 1 2 KILOMETERS



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