Balcones Canyonlands National Wildlife Refuge

Comprehensive Conservation Plan 2001-2016

September 2001

U.S. Fish and Wildlife Service
P.O. Box 1306
Albuquerque, New Mexico 87103

COMPREHENSIVE CONSERVATION PLAN APPROVAL
for the
Balcones Canyonlands National Wildlife Refuge, Austin, TX
September 2001

The attached Comprehensive Conservation Plan for the Balcones Canyonlands NWR has been prepared by Regional Office and Refuge Staff. The contents and format are found to be in compliance with Service Policy on the preparation of Comprehensive Conservation Plans, and is hereby submitted for approval.

Submitted by:

John R. Slown, AICP, Biologist/Natural Resource Planner — Date: August 29, 2001

Approved by:

Deborah Holle, Refuge Project Leader — Date: August 28, 2001

Concurrence by:

Rod Krey, Refuge Supervisor, OK/TX — Date: 9/17/01

Dom Ciccone, Chief, NWR System, R2 — Date: 9/18/01

Concurrence by:

Nancy Kaufman
Regional Director, Region 2
U.S. Fish and Wildlife Service — Date: 9/19/01

Balcones Canyonlands National Wildlife Refuge Comprehensive Conservation Plan

Table of Contents

Refuge Vision Statement 1
Planning Caveat 1

I. Introduction, Planning Approach, and Regional History and Setting 3
Introduction 3
Ecosystem Approach to Fish and Wildlife Conservation 5
The Purpose of and Need for Planning 6
Planning Perspectives 8
Goals of Comprehensive Conservation Planning 9
Refuge Resource Management Goals 10
The Area of Ecological Concern 11
Climate 11
Physiography and Soils 12
Water Resources 12
Vegetation 13
Endangered and Threatened Species and Other Wildlife 14
Air Quality 15
Mineral, Oil and Gas Reserves 15
Human History and Cultural Resources 15
a. Paleo-Indian Stage 15
b. Archaic Stage 16
c. Neo-American Stage 17
d. Historic Stage 17
Socioeconomic Setting 18

II. Legal and Regulatory Mandates and Guidelines 21
Legal Mandates 21
Agency-Wide Policy Directions 21
The Fish and Wildlife Service Mission 21
Mission of the National Wildlife Refuge System 22
Refuge Purpose Statements 22

III. Long-range Management Strategy 25
Introduction 25
Delineation of Management Divisions and Units & Associated Conservation Approaches 25
Post Oak Ridge Division 26
Canyonlands Division 27
Cow Creek Corridor 28
San Gabriel Watershed Division 29

Refuge-wide General Habitat Conservation Approaches 30
Watershed Management Strategy 30
a. Rivers and Streams 30
b. Standing Water 31
Grassland and Savannah Management Strategy 31
Forest, Woodland, and Shrubland Management Strategy 33
Native Plant Conservation & Invasive Plant Control 35
Wildlife Conservation 36
a. Endangered and Threatened Species and Species of Concern 36
Golden-cheeked Warbler 36
Black-capped Vireo 38
Other Listed and Candidate Species .. 39
b. Migratory Birds 40
Neotropical Migrant Birds 40
Raptors 40
Waterfowl 41
Other Migratory Birds 41
Resident Upland Game Birds 42
c. Mammals 42
d. Amphibians and Reptiles 43
e. Fish 43
f. Invertebrates 44
Karst Invertebrates 44
Monarch Migration 44
Other Invertebrates 45
g. Feral and Exotic Animals 45
Feral Hogs 45
Cats and Dogs 45
Exotic Ungulates 45
Non-native and Urban-adapted Birds . 46
Emu 46
Fire Ants 46
Wilderness Review 47
Recreational Use Approaches 48
Administrative Needs and Approaches 50
Cultural Resources 50
Research and Investigations 50
Mineral, Oil and Gas Resources and Economic Uses .. 51
Staffing Pattern 51

IV. Management Goals and Objectives 53
Goal 1: Restoration and enhancement of threatened and endangered species habitat on Refuge lands 53
Goal 2: Protection and enhancement of habitat for a diversity of wildlife including other migratory birds 59
Goal 3. Restoration of watershed health to minimize erosion and siltation, enhance seasonal stream flow, and maximize ground and surface water recharge 67

Goal 4: Development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation 68
Goal 5: Protection of habitat within approved Refuge boundaries by fee acquisition or conservation easement 76
Goal 6: Accurate, up-to-date data on roads, other physical infrastructure, habitats, and wildlife and plant species 79
Goal 7: Compliance with historic and archeological resource protection laws and regulations 82
Goal 8: Efficient Administration that Supports Refuge Objective Accomplishments 83

Appendix A: Legal, Policy and Administrative Guidelines and Other Special Considerations 89
Acts of Congress: 89
Regulations: 95

Appendix B: References 97

Appendix C: Maps 109

Appendix D: Public Comments on Draft CCP/EA 117

Appendix E: Intra-Service Section 7 Biological Evaluation Form 121

Appendix F: Compatibility Determinations 129

List of Figures

Figure 1: Balcones Canyonlands National Wildlife Refuge in the Context of the Edwards Plateau. 2

Figure 2: Balcones Canyonlands National Wildlife Refuge, Regional Context 4

Figure 3: Lands acquired within Balcones Canyonlands National Wildlife Refuge. 5

Figure 4: Balcones Escarpment and Canyonlands Region 11

Figure 5: Extent of ashe-juniper/oak woodlands on the Refuge . 36

Figure 6: Public Use Areas at Balcones Canyonlands NWR 68

Refuge Vision Statement

As the Balcones Canyonlands National Wildlife Refuge grows it will become a focus of conservation efforts in the Austin area. The Refuge will continue to play a key role in conservation of the endangered golden-cheeked warbler and black-capped vireo and protection of karst habitat. Ongoing efforts to manage habitat for the two endangered songbirds on the Refuge will result in innovations useful to surrounding private and institutional landowners, as well Refuge management. Protection of caves and other karst features on the Refuge will assure that populations of the cave fauna remain viable. Conservation of these poorly understood and largely uncatalogued species and their habitats is consistent with overall conservation of regional ecological integrity. Future scientific study should yield greater understanding of these obscure organisms. Management actions aimed at the golden-cheeked warbler and black-capped vireo will benefit other neo-tropical song birds as well, restoring vigor and diversity to the avi-fauna of central Texas. The Refuge will be a demonstration area for adaptive management techniques focusing on habitat and wildlife.

The Refuge will develop education and interpretation programs for local school children, as well as visitors from other states and nations. These programs will foster increased public knowledge and appreciation of the unique natural resources of the Edwards Plateau, particularly its rare and endangered species. As the population of the hill country continues to grow and develop, the importance of the Refuge to regional rare species conservation and natural ecological integrity will only increase. The Refuge will also be valued by area residents and visitors alike as a window on the area's natural heritage.

Planning Caveat

This Comprehensive Conservation Plan details program planning levels that are substantially above current budget allocations and, as such, are for Fish and Wildlife Service strategic planning and program prioritization purposes only. This plan does not constitute a commitment to staffing increases, construction projects or operational and maintenance increases.

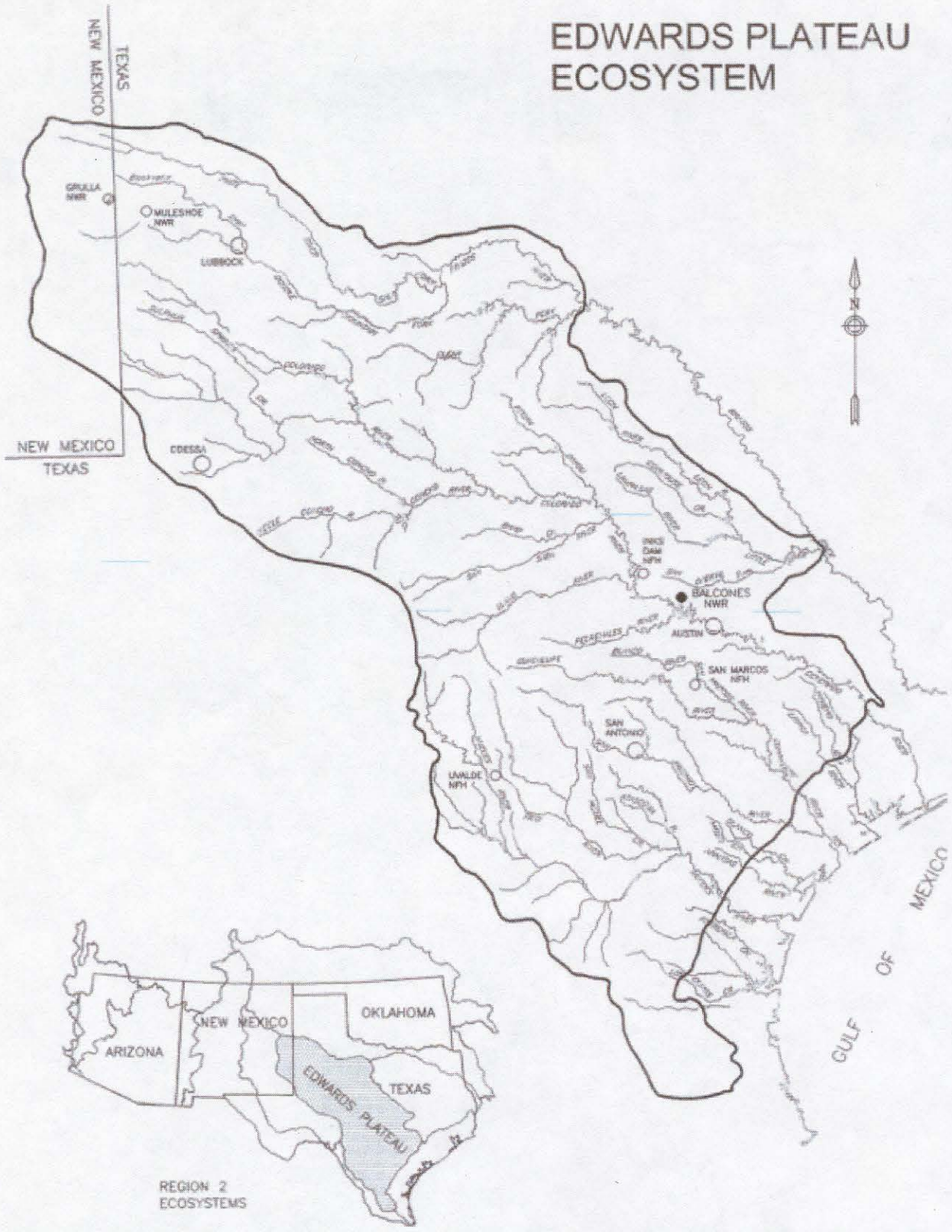


Figure 1: Balcones Canyonlands National Wildlife Refuge in the Context of the Edwards Plateau Ecosystem Unit.

I. Introduction, Planning Approach, and Regional History and Setting

Introduction

This comprehensive conservation plan is prepared for the Balcones Canyonlands National Wildlife Refuge (the Refuge) in central Texas. It provides a framework for management of the Refuge as it exists today and as it grows in the future.

The Refuge was established in 1992 under the authority of the Endangered Species Act of 1973, as part of a larger conservation strategy in the Austin area (City of Austin, 1991a). The focus of this strategy is preservation and restoration of habitat for two endangered migratory songbirds, as well as numerous other species of concern, in the Balcones Canyonlands ecological region on the eastern edge of the Edwards Plateau Ecosystem Unit[1] (See Figure 1, maps also available at Appendix C). The Edwards Plateau Ecosystem Unit is one of 53 such units established throughout the United States under the U.S. Fish and Wildlife Service's 1994 Ecosystem Approach to Fish and Wildlife Conservation. Populations of the federally-listed endangered black-capped vireo (*Vireo atricapillus*) and golden-cheeked warbler (*Dendroica chrysoparia*) have been declining. A primary reason for these declines is impact on nesting habitat resulting from development and other changes in land use on the Edwards Plateau of Texas (Benson, 1990; Grzybowski, 1985). These two species are neotropical migratory birds, that is, birds that nest and breed in North America, and then migrate to the Central American tropics during the winter. The Refuge also preserves karst habitat, an underground honeycomb of caves, sinkholes, and streams created by naturally occurring mildly acidic water dissolving the limestone substrate. This habitat typically supports several endangered, endemic species of invertebrates, salamanders, and fish. While karst habitats on the Refuge have not yet been fully surveyed for rare species, eleven cave invertebrates, or troglobites, were identified during preliminary surveys of caves on the Refuge. Nine of these species are considered rare or endemic to the Refuge area (Reddell, 1999). Several other rare cave species have been identified in similar, more thoroughly surveyed, habitat nearby in the Edwards Plateau area (Veni and Associates, 1988). This biological diversity, along the area's rugged natural beauty, led the Nature Conservancy, an international conservation organization, to list the Edwards Plateau area as one of the 200 'last great places' worldwide. Other areas so designated by the

[1] In addition to the formation of the Refuge this effort resulted in the creation of the Balcones Canyonlands Conservation Plan. This Plan provides for systematic, effective, mitigation of impacts of development in habitat used by the endangered species in a manner that complies with requirements of the Endangered Species Act.

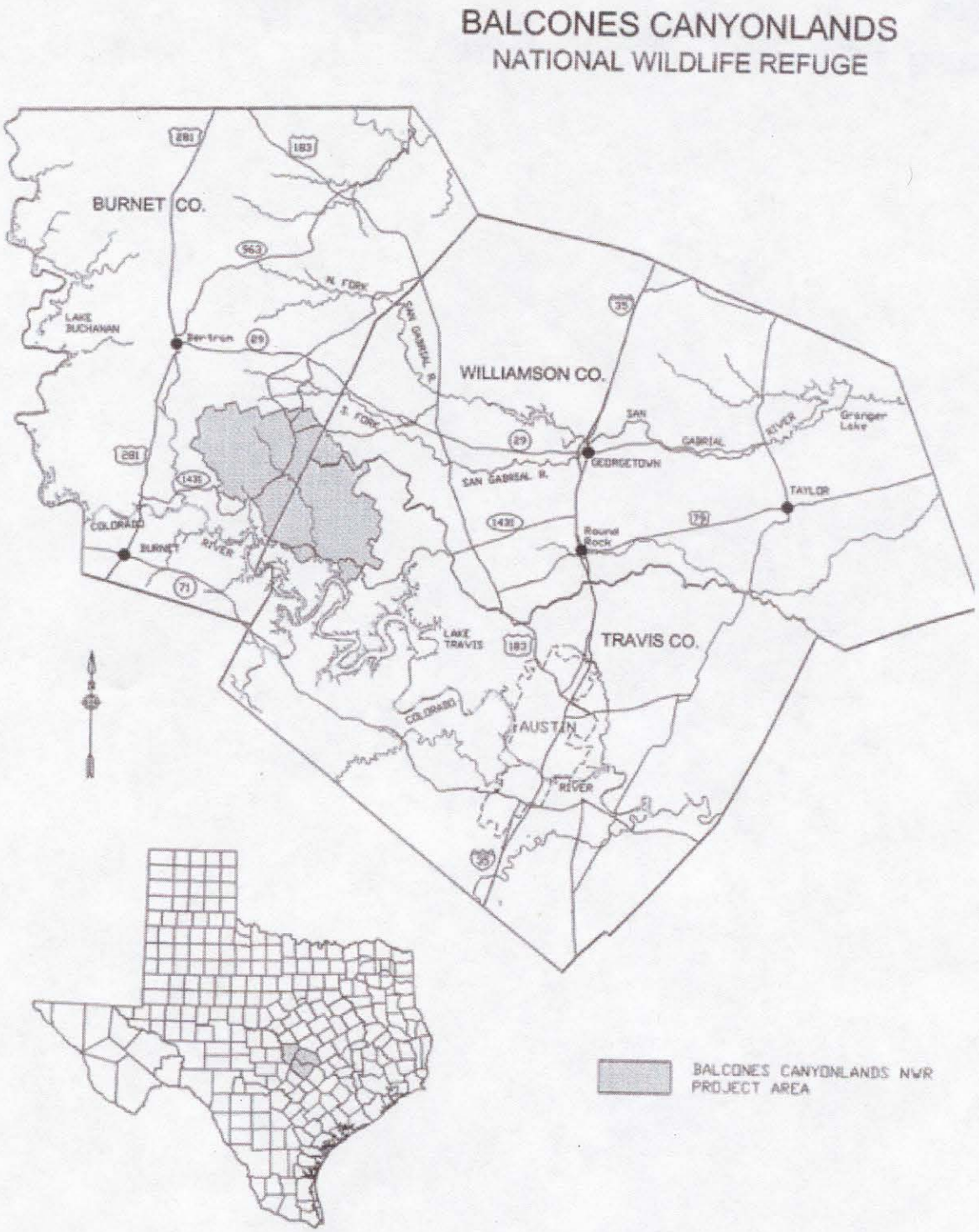


Figure 2, Balcones Canyonlands National Wildlife Refuge, Regional Context

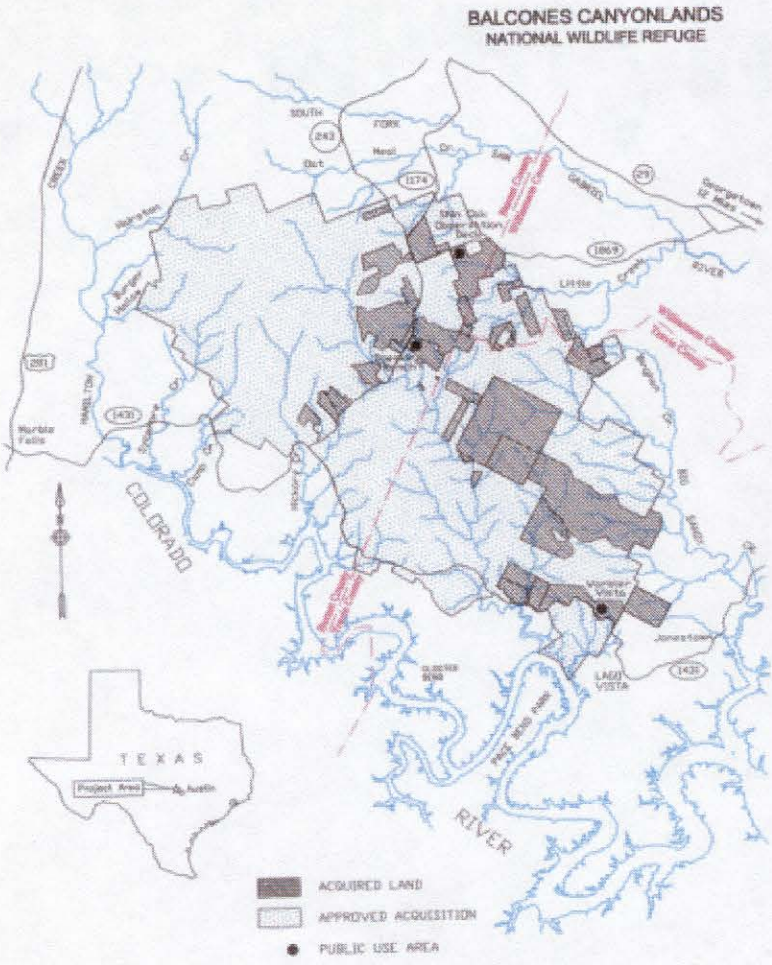


Figure 3, Lands acquired within Balcones Canyonlands National Wildlife Refuge

Nature Conservancy include the Florida Keys and Oklahoma tallgrass prairie.

The Refuge was originally designated as encompassing 41,000 acres. The Secretary of the Interior approved addition of 5,000 acres in 1996, because the need for protection of additional golden-cheeked warbler habitat was identified. In 2000 a Refuge boundary expansion was approved that includes an additional block of 34,000 acres to the west of the previously existing Refuge (USFWS, 2000). The 34,000 acre boundary expansion will allow protection of additional habitat for endangered species and other species, and may facilitate acquisition of several large parcels, reducing the potential for habitat fragmentation. With these additions the Refuge boundary, as currently approved, includes 80,000 acres of land in Travis, Williamson, and Burnet counties (Figure 2). Currently 17,730 acres have been acquired within the Refuge 0boundary (Figure 3). Additional lands will continue to be acquired as they are available from willing sellers.

Ecosystem Approach to Fish and Wildlife Conservation

In 1994 the US Fish and Wildlife Service implemented an Ecosystem Approach to Fish and Wildlife Conservation in order to facilitate conservation planning at the landscape level. Under this program, 53 Ecosystem Units were established throughout the 50 states and US Carribean Islands, based upon US Geological Survey watershed boundaries. All of the Service's field units (National Wildlife Refuges, National Fish Hatcheries, Law Enforcement, Ecological Services Offices, Fishery Resources Offices) within a Ecosystem Unit are involved in preparing a resource management plan for the Unit. The Ecosystem Approach also mandates cooperation between the Service and the various entities that control land or make decisions about land management within the Ecosystem Unit, including other federal agencies, state agencies, municipalities, private interests, organizations and individual landowners.

Balcones Canyonlands National Wildlife Refuge lies within the Edwards Plateau Ecosystem Unit. The Plan for that Ecosystem Unit establishes four goals: 1) Conserve the full range of natural biological diversity within the Edwards Plateau ecosystem including landscapes,

communities, populations and species; 2) Promote conservation of water quality and quantity for human and natural resource benefits; 3) Provide high quality recreational experiences to the extent these activities support the resource and priorities identified by the ecosystem team; and 4) Promote an awareness, understanding, and appreciation of natural resources and the human role in the environment (USFWS, 1994a). In developing goals and objectives for the Balcones Canyonlands National Wildlife Refuge in this CCP, each of these ecosystem goals was considered and addressed to greatest extent feasible within in the purposes of the Refuge.

While management activities on the Refuge can potentially play an important role in achieving each of these goals, specific objectives to some of the goals mention Refuge programs directly supporting the goals. Refuge activities or programs cited in the Ecosystem Plan include the following. Ecosystem Goal 1, Objective #2 Provide technical assistance to landowners that supports reliable wildlife management practices that are economical, legal, and biologically sound, includes reference to the development of a prescribed burning program at the Refuge. Ecosystem Goal 1, Objective #3, Conserve and monitor significant and unique natural resources in the Edwards Ecosystem, calls for initiating plant and animal community surveys at the Refuge. Such surveys are mandated at Goal 6, Objective 2 of this CCP. Ecosystem Goal 1, Objective #3 also cites ongoing monitoring studies of golden-cheeked warbler on the Refuge conducted with the Texas Parks and Wildlife Department. This work and surveys of rare cave fauna will continue under the provisions of this CCP(CCP Goal 2, Objective 6). Ecosystem Goal 1, Objective #4, Develop a Geographic Information System (GIS) database to monitor the status of key natural resources in Edwards Plateau Ecosystem, cites ongoing Global Positioning System recording of all golden-cheeked warbler and black-capped vireo sightings on the Refuge. This program will continue, as will additional resource mapping on the Refuge (CCP Goal 1, Objective 1; Goal 6, Objective 1 & 2). Ecosystem Goal 3, Objective # 2, Assist private landowners in developing traditional and non-traditional economic wildlife opportunities from recreational activities on their land, discusses the Refuge working with local ranchers to provide technical assistance on wildlife management and hosting workshops on wildlife management. These strategies are addressed in CCP Goal 5, Objective 2 and Goal 4, Objective 1. Ecosystem Goal 4, Objective # 1, Develop and disseminate education and outreach materials for various audiences on various natural resources issues, cites conservation brochures published by the Refuge and calls for interpretive tours. CCP Goal 4, Objectives 1, 2 and 3 address this need.

The Purpose of and Need for Planning

Long-term planning is needed to ensure that management actions will achieve identified goals for restoration and maintenance of habitat for the endangered black-capped vireo and golden-cheeked warbler. Balancing the needs of these two species will require an evaluation of the current status of suitable habitat and potential habitat within the boundary of the Refuge and determination of management technologies that will

balance benefits to both species. Increasing nesting habitat for the black-capped vireo can be accomplished through manipulation of vegetation; providing the climax oak-juniper woodland needed by the golden-cheeked warbler will require an evaluation of sub-climax areas that have potential for providing the best quality habitat.

Historically, black-capped vireo and golden-cheeked warbler were widespread over much of the Edwards Plateau, where they nest and rear young from March through July, with some individuals lingering through October. The birds spend the balance of the year in Central America. Although grazing and other agricultural development impacted native habitat to some degree, conversion of habitat for residential and other development has raised serious concerns about the long-term survival of these two endangered migratory bird species (USFWS, 1988). The Austin area has grown rapidly in recent years, with its accompanying development of "bedroom" and recreational communities in the "Hill Country", as the Balcones Canyonlands are called locally.

Good nesting habitat for the black-capped vireo consists of mid-successional shrub oak or other shrub vegetation (Grzybowski, 1985). Such habitat is patchily distributed in the Edwards Plateau. The Post Oak Ridge area of the Refuge contains the largest known concentrations of black-capped vireo in the eastern portion of the Edwards Plateau (Sexton, 1989). Lands within the Refuge boundary will provide protection to an estimated total of 6,500 acres of actual or potential vireo nesting habitat.

The golden-cheeked warbler prefers mixed oak-juniper woodlands with tree heights between 10 and 20 feet for nesting habitat (Benson, 1990). In the Edwards Plateau area, this woodland type is a climax community[2] on hill sides and in ravines. The southern and eastern edges of the Edwards Plateau support the largest populations of the golden-cheeked warbler. Travis County contains more golden-cheeked warbler nesting habitat than any other county; habitats in this area are the least fragmented (USFWS, 1996). Lands within the Refuge boundary will provide protection to an estimated total of 17,500 acres of actual or potential golden-cheeked warbler nesting habitat.

There are an estimated 19,810 acres of karst habitat within the 1996, 46,000 acre, boundary of the Refuge. Additional karst habitat may occur within the 34,000 acre addition to the Refuge approved in 2000, but the extent of any such habitat is not yet known. Preliminary surveys have identified endemic cave fauna within the refuge (Reddell, 1999). There is a strong need for protection of nutrient flows, water quality, and surface vegetation for karst habitats locally and on a regional basis.

Much of the land within the identified Refuge boundaries has been subject to grazing over many years by cattle, sheep, and goats. Continuous grazing by livestock has favored the brown-headed cowbird (*Molothrus ater*),a bird that parasitizes the nests of songbirds. This native bird of the great plains was once associated with bison, but is now often

---

[2] A "climax community" of woodland or forest is one in which the existing mature trees are replaced by seedlings of essentially the same species composition as the current stand. A climax community is self-sustaining unless a major natural or human induced disturbance (e.g., wildfire, clear cutting) occurs.

found in conjunction with domestic livestock. Nest parasitism by cowbird is a major contributing factor in the decline of vireo populations in the area (EH&A, 1991). There is a need for planning to mitigate the impacts of cattle on Refuge lands, and minimize the impact of cowbirds on nesting black-capped vireo.

The Fish and Wildlife Service has responsibility for trust species[3], including endangered species and migratory birds. The Balcones Canyonlands National Wildlife Refuge was created to preserve and restore habitat for endangered species and to help the Service meet its goals for preserving and restoring populations of two endangered migratory birds. By acquiring lands for the Balcones Canyonlands National Wildlife Refuge, the Service has an opportunity to manage a large contiguous block of habitat for two endangered species and other species that inhabit the Edwards Plateau. Planning is needed to maximize the benefits of management actions for the two endangered species and other indigenous species on lands that are acquired.

The Service is also in a unique position to cooperate with local universities and communities in providing opportunities for educational, interpretive, and research use of refuge lands and to work with private land owners in managing private lands for wildlife. Comprehensive conservation planning will identify the appropriate role of the Service in contributing toward those educational, interpretive, and research opportunities.

Under the National Wildlife Refuge Improvement Act of 1997[4], the Service has a responsibility for providing compatible[5] wildlife-dependent recreational opportunities on wildlife refuges. The planning process will include identifying potential recreational opportunities on the refuge, and evaluating if and how they might be offered in a manner which is compatible with the purposes for which the refuge was established.

Planning Perspectives

This comprehensive conservation plan identifies goals and objectives for the management of the Refuge and strategies to achieve those goals and objectives. The plan establishes a practical foundation for preparing realistic and justifiable budgetary requests. Its implementation will ensure consistency of management over time while providing the flexibility needed to address particular issues as they arise.

---

[3]Federal Trust Species include: federally-listed endangered and threatened species and candidates, migratory birds, anadromous fish, and marine mammals.

[4]The National Wildlife Refuge System Improvement Act of 1997 defines the mission of the national wildlife refuges and identifies wildlife-dependent recreational activities, including hunting, fishing, wildlife observation and photography, and environmental education and interpretation as "priority public uses," when those activities are compatible with the purposes for which the specific refuge was established.

[5]A use may be determined to be compatible if it will not have a detrimental effect upon fulfillment of the purposes of the refuge unit and the National Wildlife Refuge System mission.

The comprehensive conservation plan is designed to prompt management actions that enhance and sustain habitat for the black-capped vireo and the golden-cheeked warbler on the Refuge through an approach to management that considers factors beyond the immediate Refuge boundaries that may affect, or be affected by, the Refuge and its management. In addition, the proposed actions presented in this plan are intended to enhance the diversity of wildlife habitat and provide protection for other species found on the Refuge. The plan:

1) Relates the Service's responsibilities for protecting and restoring habitat on the Refuge for threatened and endangered species, migratory and resident birds, as well as other wildlife species. It also addresses regional and area concerns for the overall health of the Edwards Plateau ecosystem.

2) Relates Refuge management to matters of environmental and social concern, including contaminants; water quality and watershed management; endangered species; biological diversity; wildlife dependent outdoor recreation; community needs; socioeconomic needs and development; and other concerns.

3) Relates activities on the Refuge to policies, and legal and regulatory responsibilities of the Service.

4) Focuses on the needs of the lands and wildlife of the Refuge to ensure Refuge purposes and objectives are met and to promote optimal productivity and health of the biotic communities of Balcones Canyonlands National Wildlife Refuge.

5) Identifies opportunities for compatible wildlife dependent outdoor recreation on the Refuge and opportunities for effective outreach to neighboring communities and landowners.

Goals of Comprehensive Conservation Planning

The goals of comprehensive conservation planning are:

A. To help ensure that the Service manages the National Wildlife Refuge System (System) for the conservation of fish, wildlife, plants, and their habitats; and that refuge management accomplishes Service policies, the System mission, and the purposes for which the refuge was established.

B. To help ensure that System administration contributes to the conservation of biological diversity and integrity and to the structure and function of the ecosystems of the United States.

C. To help ensure that other Service programs; Federal State, and local agencies; Tribal governments; conservation organizations; adjacent landowners; and the public have opportunities to participate in the refuge planning process.

D. To provide a basis for adaptive management by monitoring progress, evaluating plan implementation, and updating refuge plans accordingly.

E. To promote efficiency, effectiveness, continuity and national consistency in refuge management.

F. To help ensure consistent Systemwide consideration of the six priority wildlife dependent public uses – hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation – established by the Refuge Administration Act (USFWS, 1999).

Refuge Resource Management Goals

GOAL 1: Restoration and enhancement of threatened and endangered species habitat on Refuge lands.

GOAL 2: Protection and enhancement of habitat for a diversity of wildlife including other migratory birds.

GOAL 3. Restoration of watershed health to minimize sheet runoff and siltation, enhance seasonal stream flow, and maximize ground and surface water recharge.

GOAL 4: Development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation.

GOAL 5. Protection of habitat within approved Refuge boundaries by fee acquisition or conservation easement.

GOAL 6. Accurate, up-to-date data on roads, other physical infrastructure, habitats and wildlife, and plant species.

GOAL 7: Compliance with historic and archeological resource protection laws and regulations.

GOAL 8: Efficient Administration that Supports Refuge Objective Accomplishments.

The Area of Ecological Concern

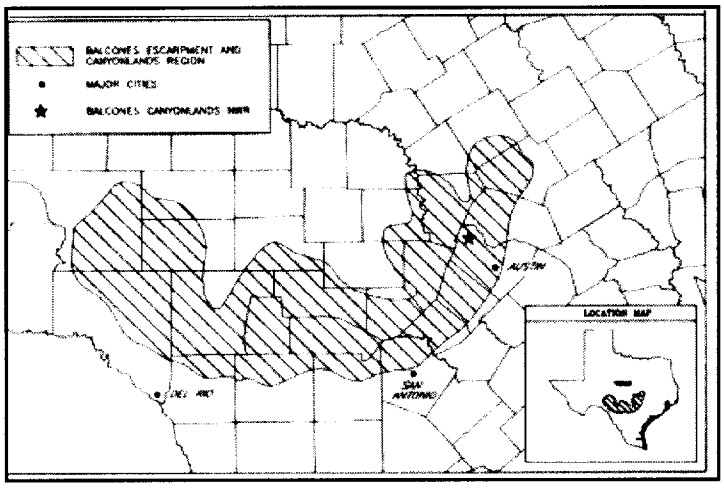


Figure 4: Balcones Escarpment and Canyonlands Region.

The larger area of ecological concern for the Refuge is the entire Balcones Escarpment and Canyonlands Region. This geologic feature extends west, north and south of Austin, Texas (Figure 4). The Balcones Canyonlands and Escarpment Region was formed from limestone layers that were compacted to stone from marine sediments during a time when the entire area was under a great inland sea. When the region was uplifted across Central Texas, variations in the rate of uplift caused the rocks to buckle, forming a hinge between the emerging continental landmass and the subsiding gulf, out of which erosion created the Balcones Escarpment (Rose, 1971). The geological uplift left the interior of Central Texas, known as the Edwards Plateau, or locally as the Texas Hill Country, tilted slightly toward the southeast. Newly formed stream channels cut into the dipping limestone substrate, carving canyons that reached far into the plateau. The moist, shady canyon bottoms and dry uplands provide a diverse habitat for a variety of animals.

The Balcones Escarpment separates the Great Plains from the Gulf Coastal Plains. It is at this point where eastern deciduous forest meets vegetation typical of more arid conditions of the west. This area of Texas is the east-west range limit for many species as well as home to numerous endemic species (Amos and Rowell,1988). It is also important to neotropical migrants and supports North American waterfowl in migration (being located on the Central Flyway, one of four main waterfowl migration routes in North America). Beneath the plateau underground streams of naturally mildly acidic water have dissolved the limestone substrate to form the karst habitat. This karst habitat is home to several endangered endemic species of invertebrates, salamanders, and fish, and possibly more organisms yet to be discovered. Eleven species of troglobites, nine of them rare or not previously described, have been identified in caves on the Refuge. Additional surveys of karst habitat may identify additional rare cave fauna on Balcones Canyonlands National Wildlife Refuge.

Climate

Balcones Canyonlands National Wildlife Refuge lies within a humid, subtropical climate with hot summers and mild winters and is subject to periodic droughts. The Edwards Plateau, including the Balcones Canyonlands ecosystem, is known for extremes in wet and dry years, severe thunderstorms in the summer, and frequent "northers" or cold fronts of short duration in the fall and winter. Lightning is relatively uncommon in the region in comparison to other areas of the country. Prevailing winds across the canyonlands plateaus are from the south,

except during seasonal cold fronts when winds switch and come from the north for a few days.

Mean annual rainfall in the Refuge area is about 34 inches. Rainfall is generally distributed evenly throughout the year, with peaks in May and September. July is normally the driest and hottest month, with a mean daytime high temperature of 96 degrees Fahrenheit. January is the coolest month, with a mean daytime high of 60 degrees Fahrenheit. Temperatures rarely reach below 20 degrees in winter (Soil Conservation Service, 1974). Temperatures on the Edwards Plateau tend to be two to five degrees cooler than in Austin and other lower areas.

Physiography and Soils

The Refuge is located on the southeastern part of the Edwards Plateau, at the southern end of the Great Plains. The elevation drops about 300 feet at the Balcones Escarpment near Austin. Terrain on the Refuge ranges from rough along the escarpment, with canyons and steep slopes, to gently rolling on Post Oak Ridge and in the bottoms. The area is underlain by limestone and contains numerous springs and seeps.

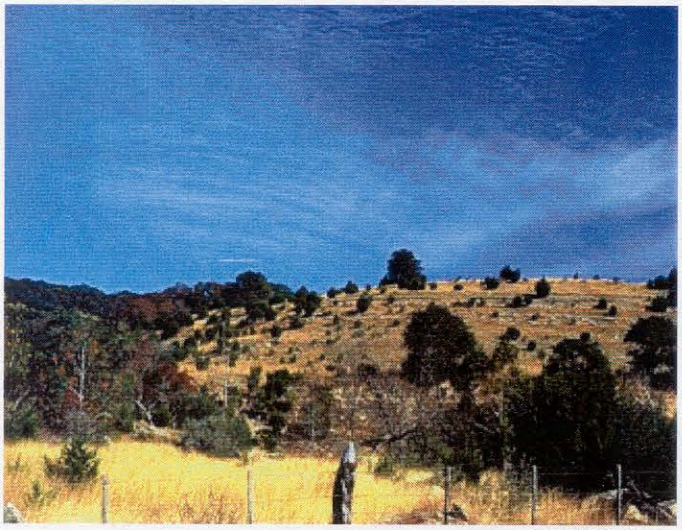
Soils are diverse because of the variety in sites, including ridge tops, slopes, outcrops, and bottoms. Soils are mostly clays and loams and are sometimes very shallow with significant amounts of stones or cobbles. Historically, much of the top soil was washed away from ridgetops and hillsides, leaving rocky outcrops and exposed subsoils (Soil Conservation Service, 1974, 1979, & 1983).

Water Resources

Two aquifers, sub-formations of the Edwards Aquifer, underlie the Post Oak Ridge area, the Glen Rose formation and the Houston member of the Travis Peak formation (Klert, 1975). Cow Creek, a major stream in the area, is fed by rainfall runoff and spring water. Most of the Cow Creek Watershed lies within the identified boundary of the Refuge. The Refuge has all or part of four important watersheds within its boundary: the Cow Creek, Big Sandy Creek, Hamilton Creek, and San Gabriel River watersheds. The Cow Creek, Hamilton Creek and Big Sandy Creek Watersheds all flow to the Colorado River. The San Gabriel River flows northeast to the Brazos River. The Colorado River provides drinking water and recreational water to the city of Austin and many other cities both upstream and downstream.

Three smaller watersheds, those of hickory Creek, Sycamore Creek, and Camp Creek, lie within the western portion of the Refuge. These creeks drain into Lake Travis on the Colorado. The southeast portion of the Refuge is drained by intermittent and perennial streams that also drain into LakeTravis. Springs and seeps provide flow on the few perennial streams and provide intermittent flow in some of the other dry stream terraces.

At least one cave system in the northern part of the Refuge, the Simons Water Cave, is known to have a fairly extensive underground stream; its full extent is not known.



USFWS Photo

Oak Savannah on Post Oak Ridge at Balcones Canyonlands National Wildlife Refuge

Vegetation

The plant community of the Refuge represents an ecotone, that is, the mixing of species where different ecological communities overlap. At the Balcones Canyonlands the prairies of the Great Plains, the forests of the southeastern United States, the desert of the southwest and the tropics of the south converge. Species representative of these ecotypes, as well as numerous species unique to the Texas Hill Country, create the diverse, species-rich vegetation of the Refuge. To date over 600 species of plants have been identified from the Refuge. The plant communities on the Refuge range from open grasslands to dense forest and woodland. Although most of the Refuge is a limestone-dominated terrain, the diversity of plant communities results from variation in soils, topography, fire history, and history of human disturbance (including farming, woodcutting, and grazing by goats, sheep, and/or cattle).

The majority of the Refuge is dominated by a variety of juniper-oak woodlands. Ashe juniper (*Juniperus ashei*) is conspicuous in nearly all areas, either as a mature component in the woodlands or as an invading shrub in open areas. The oaks vary by site: Spanish oak (*Quercus buckelyi*) is most abundant on steep slopes and along ravines; plateau live oak (*Q. fusiformis*) may occur almost anywhere but grows best on plateau tops and in deep soils in valleys; post oak (*Q. stellata*) is present in open savannahs on the higher areas of the Refuge, giving that high ridge its name; shin oak, also known as scaleybark oak (*Q. sinuata* var. *breviloba*), forms characteristic thickets or "shinneries" on very rocky plateau sites. Other tree species which are typically mixed in with the junipers and oaks include cedar elm (*Ulmus crassifolia*), hackberry (*Celtis laevigata*), escarpment black cherry (*Prunus serotina var. eximia*), Texas ash, (*Fraxinus texensis*) Arizona walnut, (*Juglans major*) and gum bumelia (*Bumelia lanuginosa*).

Open grasslands and savannahs have a diverse mixture of native and non-native grasses and forbs. Tall grass prairies probably dominated these areas 150 years ago. There are no remaining extensive stands of true prairie, although most of the species from those prairies are present here and there. Little bluestem (*Schizacrhyrium scoparium*), silver bluestem (*Bothriochloa laguroides* var. *torreyana*), sideoats grama (*Bouteloua curtipendula*), buffalograss (*Buchloe dactyloides*), and Texas wintergrass (*Stipa leucotricha*) are the most common native grasses. Many pastures have become dominated by the non-native King Ranch bluestem (*Bothriochloa ischaemum*). A great diversity of wildflowers can be conspicuous in open areas at the peak of the spring and fall flowering seasons.

Canyon bottoms and the narrow valleys along creeks have riparian woodland corridors which may include American elm (*Ulmus americana*), cedar elm, sycamore (*Platanus occidentalis*), and hackberry, along with

Photo by Greg Lasley;
Used by Permission
Black capped vireo on nest in oak.

Photo by Greg Lasley; Used by Permission
Golden-cheeked warbler on hand

live oaks and junipers. Such areas may have a diverse understory of shrubs where they are not impacted by excessive grazing. Because of the steep gradients of streams such as Cow Creek and the destructive nature of periodic rainfall events, no extensive bottomland forests occur in the Refuge area.

The Hill Country is known as a center of "endemism" or the occurrence of uniquely adapted plant (and animal) species (Amos and Gehlbach, 1988). Among these special Hill Country plants occurring on the Refuge are twisted leaf yucca (*Yucca rupicola*), plateau anemone (*Anemone edwardsiana*), low loosestrife, (*Lythrum ovalifolium*) sycamore-leaf snowbells (*Styrax platanifolia*), and Texabama croton (*Croton alabamensis* var. *texensis*). The last of these was described new to science in 1991 in part from plants discovered on the Refuge. The Gainer tract in the Central Post Oak Divisionof the Refuge was designated as that shrub's "type locality" or most typical location.

Endangered and Threatened Species and Other Wildlife

The Refuge is home to a great variety of wildlife species due to its ecotonal location in the Colorado River drainage at the junction of the Edwards Plateau and the Gulf Coastal Prairie ecological types. In addition, the contrasting topography of Balcones Canyonlands provides for a great diversity of vegetation types and associated animal species (USFWS, 1991).

At least 55 species of mammals are thought to be present in the Balcones Canyonlands, of which 32 have been confirmed as occurring on the Refuge. Of the 30 species of bats in Texas, 18, or 60 percent, occur in the Canyonlands. Nine of these species roost in caves and several others roost in woodlands. Nine of the bat species known from the area are neotropical migrants. The bats found on the Refuge have not yet been studied.

More than 215 species of birds have been identified on the Refuge, many of which are known to nest in the region. Nearly half are neotropical migrants that depend on local habitats for migration and breeding, and spend the remainder of the year in Central or South America. Two of these, the black-capped vireo and the golden-cheeked warbler are federally listed as endangered.

Although the cave fauna on the Refuge have not yet been thoroughly inventoried, the highest cave fauna diversity (about 64 species) occurring in the southwestern United States has been recorded in one cave in western Travis County. Similar diversity may occur on the Refuge.

Eight amphibian species and 32 reptile species have been found on the Refuge to date. Since more than 70 species of reptiles and amphibians are known to occur in the Balcones Canyonlands region, it is anticipated that additional species will be documented on the Refuge in the future.

Lands acquired to date include only limited segments of perennial streams. Several stock ponds located on the Refuge have a variety of fish, composed primarily of sunfish, bass, and catfish. Many of the stock ponds dry up in drought years, and all of the fish have been introduced into the ponds. Some eighty species of fish occur in the streams and rivers of the

Canyonlands area and a number of these, including both native and introduced fish, can be found in streams that are included within the Refuge boundary but not yet acquired. The Guadalupe bass (*Micropterus treculi*), an endemic species, occupies streams and reservoirs in the canyonlands region and may be found in Cow Creek.

Air Quality

The Refuge is situated in a rural environment. Air quality is considered good, although dust from unpaved roads may cause localized problems during periods of drought and high winds. Continued development and urbanization may contribute to higher concentrations of vehicle and industry air emissions in the future within the three-county area. However, the City of Austin generally has emphasized development of high-tech, non-polluting industries so industrial impacts may be limited.

Mineral, Oil and Gas Reserves

There are at least three active quarries on private ranchlands within the Central Unit of the Post Oak Ridge Division of the refuge. A fourth quarry is proposed. They most commonly produce limestone blocks for building stone and jetty/levee construction.

No oil or gas resources have been developed or are known to occur within the Refuge; however, oil and gas leases exist on a number of tracts throughout the refuge.

Human History and Cultural Resources

A "cultural overview and assessment" of the Refuge was completed in 1998 (Tomka & Leffler, 1998). The area of ecological concern is situated within the central Texas archeological region. The cultural history of the region includes four general chronological stages of possible occupation of the region over thousands of years (EH&A, 1990). The three prehistoric stages have been defined on the basis of ecological adaptation and recovered archeological materials. Each stage reflects a change in subsistence as exhibited by material remains and settlement patterns (EH&A, 1990). The historic period reflects the effects of European immigration and the settlement of the region by native populations. The historic stage includes ranching and farming activities and their influence on the present day land use patterns in the region. Many documented sites occur within the Refuge boundary and in the general vicinity, but no known site specific studies have been conducted on the Refuge.

a. Paleo-Indian Stage (pre-12,000 to 6550 BC)

The earliest well-defined prehistoric cultural sequence in the area of ecological concern coincides with the decline of the Wisconsin glaciation and a period of relatively cool, moist climate. Beginning prior to 12,000 BC, it continued to 6550 BC. Subsistence may have been based, in part, upon hunting now extinct megafauna of the late Pleistocene, including

mammoths and a now extinct species of bison, augmented by use of plants and small animals. Diagnostic tool kits consisted of a variety of finely-chipped, sometimes fluted, lanceolate projectile points, such as Clovis, Folsom, Scottsbluff, Angostura, and Plainview (Willey, 1966).

The earliest of the diagnostic point types, Clovis and Folsom, have been found in association with extinct fauna. These points can be recognized by a manufacturing technique known as fluting. Fluting is the removal of a single long flake from the base to the mid-section on both sides of the point. The resulting scar was used as the point of attachment for the shaft.

No intact Paleo-Indian sites exhibiting Clovis or Folsom occupations have been recorded in this region of Central Texas; however, surface finds of Angostura, Meserve, and Plainview dart points have been recovered in the area (Kelly and Hester, 1976; Luke, 1980; Voellinger, 1984).

Several later Paleo-Indian sites associated with Plainview and Angostura occupations have been dated. The Levi site, located in Travis County west of Lakeway, has been radiocarbon dated to 5350± 150 BC (Alexander, 1963). At the Loeve-Fox site in Williamson County, absolute dates range from 7000 to 5000 BC (Prewitt, 1974).

During the later part of the Paleo-Indian stage, human subsistence patterns changed as the large mammal populations began to decline or shift their ranges further north. Humans diversified their subsistence strategies with an increased use of plants, small land animals, and aquatic organisms. A hunting and gathering economy was associated with the Archaic Stage, which began around 6550 BC.

b. Archaic Stage (6550 BC to 700 AD)

Following the Pleistocene, the central Texas archaeological region experienced a trend toward a warmer and drier climate known as the Altithermal. As the large animals began to decline or shift their ranges northward, there was an increase in use of plants that could be gathered. A tool kit adapted to a hunting and gathering economy was developed. These tools, as well as sites in which they are found, exhibit much more regional diversity than those of the Paleo-Indian stage. This stage known as the Archaic, represents a lifestyle which began about 8,000 years ago and lasted in some areas of Texas until the time of European contact (EH&A, 1990).

The subsistence pattern during this period was probably diversified and was dependent on hunting species of game including deer and rabbit, and aquatic organisms, and by gathering edible roots, nuts, and fruits. Many sites suggest a transient occupancy. Sites are found on river or stream terraces and limestone promontories, frequently exhibiting varying amounts of burned and cracked limestone fragments. Site types including rock shelters, camp sites, and quarry sites were typically located near a reliable water source.

Burned rock middens are a characteristic feature found throughout the Central Texas Archaic (Weir, 1976). However, their development appears to have climaxed during the Middle Archaic (Prewitt, 1981). Accumulations of burned rock may be a direct result of prehistoric cooking activities or possibly trash pits. Mixed with these burned rock

accumulations area scattered cultural remains including lithic debitage (flakes, chips, and cores) together with functional tools. Occasionally, the deposits of burned rock are so deep that actual mounds have been formed.

Two basic diagnostic traits identify Archaic sites: large stemmed dart points and accompanying collections of tools. Associated tool forms include ovoid, unstemmed dart points; triangular and leaf-shaped knives; side, oval, and end scrapers; and a wide variety of flake an core tools (Usrey, 1980). Manos and metates (grinders and grinding stones) also have been found in Archaic contexts. The variety of dart point types increased dramatically during this stage, perhaps as the population increased and diversified regionally. Dart point chronology, based on previous work in the Central Texas region, includes: Early Archaic - wells, Gower, Bandy, Martindale, and Tortugas; Middle Archaic - Nolan, Bulverde, Pedernales, Lange, and Marshall; and late Archaic - Castroville, Marcos, Darl, and Rio (Prewitt, 1981). The last two are sometimes classified as Transitional Archaic. The Archaic stage terminated with the introduction of the bow and arrow and ceramics.

c. Neo-American Stage (700 AD to European Contact)

This stage is defined by the advent of incipient agriculture; however, in Central Texas a hunting and gathering form of subsistence appears to have continued throughout the Neo-American stage. A distinguishing assemblage of arrow points marks the early part of the Neo-American stage. The late part of his stage is evidenced by the addition of ceramic storage and service vessels. Cemeteries are included as diagnostic features of the Neo-American stage (Filson and Prewitt, 1978). The Neo-American stage is represented in the study area by the Austin and Toyah foci of the Central Texas aspect. The earlier Austin focus (ca. Ad 500-1200) is recognized by expanding stemmed (Scallorn) and subtriangular (Granbary) arrow points, serrated flakes, and Firday-type knives (Jelks, 1962). Recovered diagnostic artifacts indicating the later Toyah focus (ca. AD 1200-1750) occupation include pointed stemmed arrow points (Perdiz and Cliffton), Covington-type knives, tools made from bison bone, and flint drills (Jelks, 1962). Two types of diagnostic ceramics associated with this stage are Leon Plain and Doss Red, both tempered with bone.

d. Historic Stage (time of European Contact to Present)

During the early Historic period, the time of European contact and settlement, the area was inhabited by numerous aboriginal groups including the Jumano, Tonkawa, Lipan Apache, and Comanche (Newcomb, 1961). The Jumano initiated extensive trading activities with the Caddo in east Texas and the Trans Pecos groups to the west (Suhm, 1958). The Lipan Apache and Comanche entered the area from the Plains in pursuit of food. Their weapons included the bow and arrow and lance. Trade items such as glass beads, European-made ceramics, gun parts, and metal arrow points indicate a contact period occupation.

The area of ecological concern may have been along the path for some of the earliest Spanish explorers. Cabeza de Vaca may have reached the escarpment as he traveled west in 1535. In 1691, Domingo Teran de los

Rios crossed the area on his way to the east Texas missions and the Red River. Domingo Ramon and the Marquis de Aguayo followed the same route in 1716 and 1721. The missions of San Francisco de los Neches, Nuestra Senora de la Purisima Concepcion de los Hainai, and San Jose de los Nazonis were located on the Colorado River at Barton Springs in 1730. In 1732, Juan Antonio Bustillo y Zevallos crossed Travis County to campaign against the Apache, and Pedro de Rabago y Teran traversed the area in 1754-1755 on his way to Apache country. The area, originally occupied by the Tonkawa, was visited by the Comanche for a considerable length of time after Anglo-American settlement began (Webb, 1952).

Socioeconomic Setting

Balcones Canyonlands National Wildlife Refuge is located in portions of three counties: Burnet, Travis, and Williamson. The economy of each of these counties is distinctly different, with Burnet county being primarily rural, Williamson County containing both rural areas and areas influenced by the Greater Metropolitan Area of Austin with its population in excess of one million people , and Travis County influenced predominantly by Austin. Travis County has also seen the development of some recreation-oriented communities, such as Lago Vista and Jonestown and several communities south of the Refuge. Over the past 15 years, subdivision of large ranch holdings and development occurring in Williamson County has been shifting its economy from a rural, agricultural area to one characterized by bedroom communities for the Austin area, such as Cedar Park, Leander, Round Rock, and Georgetown. Located the farthest from Austin, the Burnet County economy remains dominated by rural, agricultural and cattle ranching communities, with a smattering of production of other livestock such as sheep and goats. Some high tech industry is beginning to move into the area. There are two retirement communities, Marble Falls and Granite Shoals, along the Highland Lakes.

Much of the growth and change of Williamson County is the result of rapid growth and change in the Austin Area resulting from numerous industries relocating to Texas in response to an available employment pool and an oversupply in the real estate market from the decline in the oil industry in the early 1980s. In the period from 1980 to 1986, Travis County added almost 57,000 residences and more than 40 million square feet of nonresidential buildings, as the population increased at an average annual rate of more than 3.4%. The influx of people and development of new housing communities changed the character of the previously rural "cattle country" (City of Austin, 1989). Throughout the 1990s this growth continued in the Austin Metropolitan Statistical Area (MSA), consisting of Travis, Williamson, and Hays Counties, largely due to the growth of the high tech industry in Austin. During this decade the Austin MSA added more than 130,000 units of new housing. The MSA's population grew at an annual rate of more than 4%, increasing from 781,872 to 1,156,836 over the decade (US Census Bureau, 2001).

The Austin MSA is predominantly young adult, comparatively well educated, and with a median household income of just more than $42,000. The majority of the population is white (some 72%), with persons of

Hispanic or Latino origin constituting about 20%, Black or African American persons about 9%, and smaller numbers of Asian Americans, and Native Americans (the percentages do not add up to 100 due to inclusion of some individuals also listed as white or Black/African American within the persons of Hispanic or Latino origin Census category). Unemployment in the MSA is considerably lower than, and has been consistently lower than, that elsewhere in the State of Texas.

Burnet County, outside of the Austin MSA, has also experienced rapid growth over the last census period, experiencing a population change of 50.6 % between 1990 and 2000. The county population remains relatively small, however at 34,147 with a population density of 34.3 persons per square mile. This is less than one half of Texas' statewide population density of 79.6 persons per square mile, reflecting Burnet County's rural nature (US Census Bureau, 2001). The majority of the population is white (some 90%) with persons of Hispanic or Latino origin constituting about 15% and other ethnic groups representing a small fraction of the overall population. The County median household income, $31,146, is slightly lower than the Texas statewide median of $34,478. Compared with the Austin MSA, the Burnet County population has lower incidence of post-secondary education and lower median household income, but considerably higher home ownership rates.

II. Legal and Regulatory Mandates and Guidelines

Legal Mandates

Administration of national wildlife refuges is governed by various federal statues, as well as by regulations and Presidential executive orders. A list of the most pertinent statutes establishing legal parameters and policy direction for the National Wildlife Refuge System is included in Appendix A, along with a summary of those laws that provide special guidance and have strong implications for the Service and for national wildlife refuges. For the bulk of laws and other mandates, specific legal summaries are available upon request.

Agency-Wide Policy Directions

The Fish and Wildlife Service Mission

While the Service's mission and purpose have been evolving since the early 1900s, they have always been tied to a national commitment to wildlife. President Theodore Roosevelt established the first national wildlife refuge in 1903 by executive order. That refuge, Pelican Island, became a sanctuary for herons and egrets -- then under threat of extinction due to the demands for their plumes for the millinery trade.

Establishment of several other refuges to preserve nesting islands and rookeries or special habitat followed in rapid succession. In 1905, 2 years before Oklahoma became a state, Wichita Mountains Wildlife Refuge joined Yellowstone National Park (established in 1872) as a second preserve for the American bison, whose numbers had diminished during the 19th century from millions to a few hundred. Thus began the commitment of public lands for the preservation of migratory birds and other wildlife.

The Service's responsibilities broadened during the 1930s. As a result of drought, drainage of wetlands for agriculture, and unregulated hunting, waterfowl populations nationwide became severely depleted. Passage of the Migratory Bird Hunting and Conservation Stamp Act in 1934 made funds available to purchase acreage for waterfowl habitat. During the next several decades, the special emphasis of the Service (then called the Bureau of Sport Fisheries and Wildlife) became the restoration of migratory waterfowl populations.

The passage of the Endangered Species Act in 1973 refocused the activities of the Service and other government agencies. This Act mandated the protection and conservation of threatened and endangered species of fish, wildlife, and plants, both through federal action and by encouraging the establishment of state programs. In 1974, the Bureau of Sport Fisheries and Wildlife was renamed the U.S. Fish and Wildlife Service and was assigned new responsibilities for endangered and nongame species. Lands continued to be added to the Refuge System for various wildlife protection purposes including endangered species conservation.

Several additional environment and conservation-related laws were passed throughout the 1970s. The Fish and Wildlife Conservation Act of 1980 emphasized the conservation of nongame species and broadened management responsibilities for non-game migratory birds on national wildlife refuges.

The Fish and Wildlife Service's mission is derived from a multitude of laws (see Appendix A), and treaties with Canada and Mexico that collectively outline the role of the federal government with respect to wildlife conservation. The Department of the Interior Departmental Manual states:

> The U.S. Fish and Wildlife Service's mission is, working with others, to conserve, enhance, and protect fish, wildlife, and plants and their habitats for the continuing benefit of the American people through Federal programs relating to migratory birds, endangered species, certain marine mammals, inland sport fisheries, and specific fishery and wildlife research activities.[6]

Mission of the National Wildlife Refuge System

The National Wildlife Refuge System Improvement Act of 1997 defines the mission of the national wildlife refuges as:

> 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. [7]

Refuge Purpose Statements

The legislation, executive order or administrative action that establishes each refuge defines the purposes for its creation. Purpose statements are used as the basis for determining primary management activities, and for determining allowable uses of refuges through a formal "compatibility" process.[8]

The Refuge was established in 1992 under the authority of the Endangered Species Act of 1973, to conserve fish, wildlife or plants which are listed as endangered species or threatened species. Upon Refuge establishment, the Service stated four criteria for the location of Refuge boundaries. These are:

---

[6]Departmental Manual, 2 AM 2, Organization, 142 DM 1.1

[7] National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, October 9, 1997.

[8]A use may be determined to be compatible if it will not have a detrimental effect upon fulfillment of the purposes of the refuge unit and the mission of the National Wildlife Refuge System. Compatibility determinations for several public uses on the Refuge are attached at Appendix D.

1. A sufficient representation of golden-cheeked warbler and black-capped vireo habitat is included;
2. Watersheds and water quality are protected;
3. Destroyed or fragmented nesting habitats acquired have high potential for ecological restoration; and
4. A protective buffer zone for nesting habitat and nesting populations is in place within the Refuge boundary.

III. Long-range Habitat Conservation

Introduction

This section briefly breaks out the Refuge's habitat and landscape variations into management units and divisions. Each of the various landscape and habitat types calls for a diversity of long range habitat conservation approaches that are very generally discussed below. More specific approaches, however, are reflected in greater detail in Section IV: Management Goals Objectives and Strategies, later in this document. Nevertheless, this section attempts to describe the uniqueness of the mix of resources that needs to be managed, conserved, and protected in an effort to achieve the Refuge's purposes and the Mission of the National Wildlife Refuge System.

Delineation of Management Divisions and Units & Associated Conservation Approaches

A map in Appendix C delineates management divisions and units for the 46,000-acre portion Balcones Canyonlands NWR that existed prior to the 34,000-acre refuge expansion approved in June, 2000. The basic concepts behind their configuration are as follows.

The refuge lies within a landscape mosaic that is beset with a number of complex management and conservation challenges. To address these challenges this document lays out a number of management objectives and strategies. The delineation of management divisions and units helps simplify the effort of addressing these challenges. The divisions and units of the Refuge are based on variations in the existing landscape and integrated ecosystem management concepts, goals and objectives. The management units collect together areas of generally similar soils, geology, topography and terrain which lend themselves to common land management techniques. As lands are acquired within the 34,000-acre Refuge expansion, management divisions and management units will be established within the expansion area. These new management units are anticipated to be managed similarly to the current units described below, based upon existing land use and other site characteristics.

The four fundamentally distinct management divisions into which the management units are grouped include:

(1) Post Oak Ridge Division
(2) Canyonlands Divisions
(3) Cow Creek Corridor
(4) San Gabriel Watershed Division

Management units within each of these divisions share some distinctive characteristics, offer similar challenges, and thus, can share management objectives. However, individual management units within each division are delineated on convenient geographical limits, most often topographic breaks and watershed boundaries, so habitats vary among and within the management units. Some habitat types, such as golden-

cheeked warbler habitat, are shared across two or more divisions, so management objectives for the divisions may overlap. Other habitat types and ecosystem components such as caves or vireo habitat are predominantly confined to one management division.

The defining limits of each of the management divisions, its existing habitats, challenges, and anticipated conservation approaches available are described below. (See maps, Appendix C.)

Post Oak Ridge Division

This division includes level to gently sloping upland plateau tops and ridges, with moderate to very shallow soils and stony terrain underlain by the Edwards, Whitestone, and Cedar Park limestones. Sharp slope breaks (rimrocks) define the southern margin of the division and mark the headwaters of innumerable canyons that drain into the Colorado River system. The Refuge boundary marks the north and northeast limit of the division.

The Post Oak Ridge division is broken into four management units. County Road 1869 and FM 1174 separate the **North** and **Central Post Oak Ridge Units**. The Central Unit extends to the southeast to include the Gainer Ranch and the Armadillo Ranch. The northern boundary of the Rodgers tract marks the edge of the historic Sunset Ranch group of properties and separates the Central Unit and the **South Post Oak Ridge Unit.** The **West Ridge Unit** consists of the narrow ridgetops west of Cow Creek.

Habitats within the Post Oak Ridge Division range from dense juniper-oak woodlands preferred by golden-cheecked warbler, through various oak savannahs and shrublands to open grasslands. There are some narrow riparian corridors along drainage ways; these include a few headwater springs in the North and Central Units. Essentially the entire existing oak shinnery habitat for the black-capped vireo and all planned vireo management areas are found within this management division. Additionally, habitat includes caves and karst features. Most of them lie within the Post Oak Ridge Division. As noted earlier in this document, cave fauna have not yet been thoroughly inventoried. Yet 64 species of cave fauna have been recorded in one cave in western Travis County alone.

Within the Post Oak Ridge Division, those areas that contain climax woodland warbler habitat differ from warbler habitat in the Canyonlands Division in that they lack significant slopes. Historically, fire precluded invasion of juniper on the plateau tops, so warbler habitat was less common there.

a. Conservation Approaches

Woodland Habitat Protection – Today, however, some excellent warbler habitat exists in the Post Oak Ridge Division that will be mostly protected by virtue of not being developed, thus improving the Service's ability to protect the warbler. In a few rare instances, where marginal (but occupied) warbler habitat would be better managed for black-capped

vireo, small areas may be actively converted into vireo habitat, under a Section 7 consultation[9].

Prescribed Fire – As is described in the *Balcones Canyonlands National Wildlife Refuge Fire Management Plan* (FMP), prescribed fire will be a particularly important management tool within the Post Oak Ridge Division to maintain black-capped vireo habitat and savannahs and for fuel reduction for wildfire control (USFWS, 2001).

Cave and Karst Protection – It is important to incorporate a solid data gathering component into cave and karst management approaches for the entire refuge, and in particular for this division. There are a few caves in canyons on the Armadillo Ranch and on the Nagel tract (and perhaps elsewhere) in the Canyonlands units that can be managed individually.

USFWS Photo

Golden-cheeked Warbler habitat in mature oak woodlands

Canyonlands Division

This set of management units encompasses the rugged terrain within the Refuge boundary that is within the Colorado River drainage system. The steep rimrocks and slope breaks of the Edwards limestone define their northern limits and set them off from the level plateau tops. The stair-stepped Glen Rose limestones shape the middle and lower slopes of the Canyonlands. Slopes range from very steep to moderate. There is very little level terrain in this Division. Soils vary from shallow and stony on steep slopes and benches to moderately deep in ravines and small creek corridors.

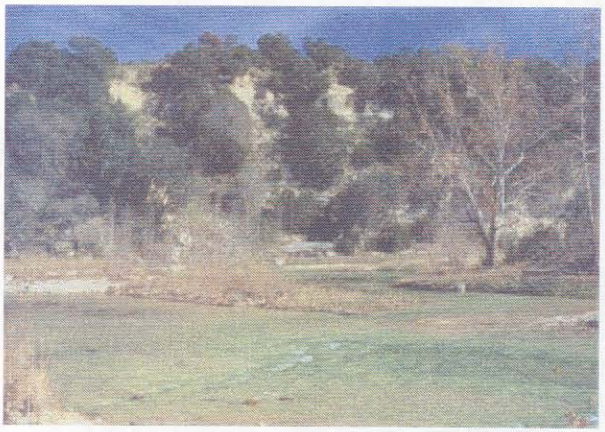
Heavy woodlands and shrublands predominate within the Canyonlands Division. The vast majority of the Refuge's high quality golden-cheeked warbler habitat (mature juniper-oak woodlands) is found within this Division. Approximately 500 warbler territories have been identified on 16,000 acres of the Refuge.

On mid-slopes in many drainages in this Division, warbler habitat gives way to a semi-open juniper shrubland with less woody plant diversity. These slopes may once have been open shrublands and grasslands. In some areas, such as on the Nagel tract, the shrubland was cleared years ago, creating an open grassland habitat. Oak savannahs exist only on some ridgelines and lower terraces. Warbler habitat also occurs in lower canyons and along riparian corridors in the Canyonlands units.

---

[9] A Section 7 Consultation is required by the Endangered Species Act of 1973 whenever a federal agency action may affect a listed threatened or endangered species. Actions which would jeopardize the continued existence of the species or adversely modify its critical habitat are specifically prohibited. A Section 7 Consultation has been completed for all management actions proposed in this CCP, and a determination of no adverse effects has been granted. See Appendix E for the Biological Evaluation Form.

Waterways and drainages of the Canyonlands Division flow intermittently. Streams with semipermanent flow, only drying under severe drought conditions, include the lower reaches of Doe Branch, Bee Creek, and Post Oak Creek. Small springs and pools (e.g., Mason Hollow) are found locally elsewhere in upper canyon heads.



USFWS Photo
View across Cow Creek from Cow Creek Road

a. Conservation Approaches

Woodlands Protection. Protection and enhancement of mature juniper-oak woodlands as these present themselves as the best warbler habitat (See Goal 1, Objective 3).
Grassland and Savannah Protection. Open grasslands and oak savannahs on middle and lower slopes are to be maintained and enhanced generally by cutting and prescribed burning. This will perpetuate hardwood establishment and control juniper. Additionally, lower warbler habitat blocks should be protected from fragmentation. Habitat blocks should be expanded where possible (Goal 2, Objective 1).
Water Quality Protection. Water quality monitoring and protection, along with erosion control will be employed to protect waterways and drainages, thus protecting and conserving endangered species and other wildlife resources (Goal 3).

Cow Creek Corridor

This Division is defined by the riparian[10] area of Cow Creek, the largest waterway within the main body of the Refuge. Cow Creek is a near permanent, low flow creek prone to flashy runoff after heavy rainstorms. Only rarely, under severe drought conditions, does the Creek cease to flow for periods of, perhaps, several weeks. Large permanent pools at intervals along the creek provide important aquatic habitat and important wildlife watering areas, especially in drought conditions.

The Corridor is divided into three units for practical purposes. The **Upper Cow Creek Unit** includes that portion of the creek upstream of FM 1174. The **Middle Cow Creek Unit** extends downstream from that point to include the various low-water crossings, ending at the southmost crossing, about three miles north of FM 1431 at the Lyda tract. The **Lower Cow Creek Unit** extends southward from the southmost low-water crossing to the Refuge boundary on the south. The latter unit includes sandy and sandstone substrates in the lower 0.5 mile of the creek just north of FM 1431.

Riparian woodland habitats are found intermittently along Cow Creek. Periodic scouring by flash floods limits the density and diversity of woodland along the creek. Nonetheless, important corridors of

[10]Riparian means relating to or living or located on the bank of a natural watercourse (such as a river or stream.)

sycamore, elm, oak, and hackberry woodlands exist. The understory vegetation along portions of Cow Creek is very sparse and poorly developed, seemingly the result of prolonged grazing by domestic livestock.

Old floodplain terraces flank Cow Creek on one or both sides along much of its length. The terrace deposits represent relatively level, deep-soiled pockets in an otherwise shallow-soiled landscape. At present they are almost entirely used for cropland, hay production, and improved pastures. The Lyda and Shaw tracts contain small segments of such terrace areas.

Habitat for the golden-cheeked warbler occurs in the Cow Creek Corridor only on slopes and terraces adjacent to the creek where juniper-oak woodlands exists. There is no nesting habitat for the black-capped vireo in the corridor, although is it possible that vireo use the corridor in post-nesting foraging activities. Naturally, the Cow Creek Corridor contains the most extensive fisheries resources and habitat for various amphibians and reptiles.

a. Conservation Approaches

Riparian Woodland Habitats – The Refuge will protect the important, albeit intermittent, corridors of sycamore, elm, oak, and hackberry woodlands within the riparian corridor, to offer avian species continued areas to nest and move (Goal 2, Objective 2).

Old Floodplain Terraces – The specific long-term conservation approaches for such areas have not yet been determined, but the areas might be appropriate for conversion to floodplain tallgrass prairie and savannah habitats. Reseeding with native grasses as well as prescribed burning and selective juniper removal could be used to accomplish such restoration (See Goal 2, Objective 1, for grassland restoration strategies).

San Gabriel Watershed Division

In the northern portion of the Refuge, a number of tributaries of the San Gabriel River system drain eastward off of the level upland regions. This area, including unnamed branches of Oatmeal Creek and Little Creek, constitutes the San Gabriel Watershed Division. Where these waterways cross the Bee Creek Marl and Glen Rose geologic substrates, there are relatively extensive floodplain terraces and gently sloping clay substrates. For habitat classification and management objectives, they may be distinguished from the adjacent higher areas of the Post Oak Ridge area by their deeper soils and lack of an underlying massive limestone substrate. The waterways are narrow but have permanent or near permanent flow. The Refuge's tallest riparian woodlands, corridors of pecan, elm, hackberry, and oak, are found along these waterways.

An important component of the San Gabriel Watershed Division are the relatively gently sloping, deep-soiled clay terraces along the creek corridors. These are likely to have historically supported dense tall-grass prairie. This is an important and rare habitat type which has disappeared in most of Texas. Most of these areas within the Refuge

boundary were converted to improved pasture seeded with KR bluestem, and cropland while in private ownership. Some areas not actively managed for pasture or cropland have been invaded extensively by second-growth juniper.

Locally a dense growth of juniper may have created patches of warbler habitat in the San Gabriel Watershed Division but this is very local and of minor importance to overall populations on the Refuge. Black-capped vireo habitat is not found in these deep-soiled areas although their preferred shinnery oak habitat may occur nearby on the stony upland plateaus. Fisheries resources are present but limited by the small size of the waterways in the San Gabriel Watershed Units. An important narrow corridor of herbaceous wetland habitat and wet prairie exists along Little Creek on the Eckhardt tract within this unit.

a. Conservation approaches

Woodland Protection – Protection of woodland corridors is essential, as the Refuge's tallest riparian woodlands are found along waterways in this division (Goal 1, Objective 3).

Wetlands – Protection of narrow herbaceous wetlands and wet prairie on the Eckhardt tract along Little Creek (Goal 2, Objective 2).

Prairie Restoration – On approximately 500 acres or of these management units on the Eckhardt and Arnold tracts, an important objective will be restoration of the native tall grass prairie for grassland songbird habitat, through use of prescribed fire and reseeding where feasible (Goal 2, Objective 1).

Refuge-wide General Habitat Conservation Approaches

Watershed Conservation

a. Rivers and Streams

The Refuge will protect the quantity and quality of surface flows along the Refuge's perennial flowing sources of surface water, including the few permanent streams within the Refuge. Rainfall, infiltration, and runoff patterns affect surface water quantity. Additionally, water quantity is affected by human activities such as surface and subsurface withdrawal, surface capture and diversion (ponds, dams) and certain land use practices (e.g. grazing and farming) that affect the type and abundance of vegetation cover in a watershed.

Significant threats to surface water quality within the Refuge may arise from certain farming and ranching practices (tilling, chemical use on farmlands or pasture land, livestock stocking rates, grazing systems and locations, etc.), improper functioning of individual septic systems, and toxic material spills on roadways, homesites or elsewhere.

Conservation Approaches – Conservation techniques will include erosion control and revegetation, physical protection of springs and

stream banks, and selective management of vegetation (which may locally include either enhancement or removal) in watersheds (Goal 3).

Water quality benefits will result indirectly from removal of second-growth juniper to restore and enhance black-capped vireo habitat, as well as from prairie restoration and fire management. Although planned active habitat management will result in the removal of substantial amounts of small juniper, juniper will not be targeted for removal for large scale watershed benefits due to its potential habitat benefits for the golden-cheeked warbler.

Protection of water quantity and quality off of Federally-owned lands that may affect Refuge surface or ground water is largely beyond the scope of Refuge management. Applicable Federal, state, regional, and local water quality statutes apply in those areas and are administered by such agencies as the U.S. Army Corps of Engineers, Natural Resource Conservation Service, Texas Natural Resource Conservation Commission, Lower Colorado River Authority and county authorities.

b. Standing Water

Permanent lakes and ponds did not occur naturally on the Refuge prior to European settlement. In the twentieth century, small numbers of ponds and lakes have been constructed for water supply and flood control. Water levels in such ponds on the Refuge are not managed and vary widely with precipitation and other weather factors.

Conservation Approaches - Existing ponds on the Refuge will be maintained to benefit waterfowl and other wildlife. Pond improvements, such as renovating existing dam structures, revegetating banks and berms, or other structural improvements will be considered on a case by case basis for potential benefits. New ponds or moist-soil management areas may be created in the future but will remain secondary to other habitat management activities.

Grassland and Savannah Conservation

Native grasslands on the Edwards Plateau were probably historically present on the uplands areas and broader, deep soiled valleys. Tallgrass species would occur in the wetter valleys, with short- and mid-grass species occurring on some slopes and badly eroded areas (Dunlap, 1983). Interspersed with the grasses of the uplands were scattered clumps of trees (sometimes referred to as mottes) that formed a savannah or parkland prior to settlement. On the Balcones Canyonlands area, these mottes are a mixture of live oak, cedar elm, hackberry, mesquite (*Prosopis glandulosa*) , gum bumelia, Ashe juniper, pecan (*Carya illinoinensis*), Arizona walnut, Texas ash, wafer-ash (*Ptelea trifoliata*), post oak, blackjack oak (*Quercus marilandica*), Spanish oak, and shin oak. Shrubs in these mottes include Mexican (Texas) persimmon (*Diospyros texana*), agarita (*Berberis trifoliolata*), sumacs (*Rhus* spp.), madrone (*Arbutus xalapensis*), and mountain laurel (*Sophora secundiflora*). Historically, common grasses included Indian grass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii)*, little

bluestem, tall dropseed (*Sporobolus asper*), silver bluestem, Texas wintergrass, sideoats grama, black grama (*Bouteloua eriopoda*), blue grama (*B. gracilis*), Texas grama (*B. rigidiseta*), curlymesquite (*Hilaria belangeri*). switchgrass (*Panicum virgatum*), and eastern gamagrass (*Tripsacum dactyloides*). Herbaceous plants include the Maximillian sunflower (*Helianthus maximiliani*) and Mexican hat (*Ratibida columnaris*). Prior to settlement, mottes likely occurred on Post Oak Ridge and plateau tops throughout the area.

Photo by Chuck Sexton

Refuge biological technicians document the first flowering of the rare Prairie Coneflower (Echinacea angustifolia). Reintroduction of such native species is a component of prairie restoration efforts at the Refuge.

Permanent settlers in the Balcones Canyonlands area, as in other areas of the Edwards Plateau, fenced and plowed the soils of the floodplains and valleys for crop production. They used the slopes of the hills for livestock grazing, often with unsustainable stocking rates. Unable to endure overgrazing, the native grasses declined, and the topsoil eroded away, sometimes to the point that the original grasses could not be supported. Fires that had formerly been carried by those grasses now had insufficient fuel. In the absence of fires, the brushy species (Ashe juniper, mesquite, etc.), previously confined to rocky outcrops and canyonlands, invaded the weakened grasslands and savannahs (Fonteyn, Store, Yancy, Baccus and Nadkami, 1988). Fire suppression also played a role where range management practices allowed sufficient grass (fuel) to accumulate. As demands of grazing on the grasslands continued into the twentieth century, some exotic[11] grasses, more resilient to overgrazing, were introduced into the Balcones Canyonlands area in an effort to support livestock operations.

Conservation Approaches –For the grasslands and savannahs, the Refuge will attempt to reverse the effects of past improper livestock grazing on the vegetation and soils. With the irreversible loss of topsoil, attempts to return some areas to pre-settlement conditions may not be feasible in the foreseeable future.

Per the guidelines of the FMP, savannah areas will be managed with prescribed fires to maintain the grass without eliminating oak trees. Some savannah areas have become too overgrown with shrub juniper to carry a prescribed fire; in others, now heavily encroached upon with larger, dense juniper, a fire would be of such intensity that it could eliminate almost all trees. These areas may be prepared for management with fire through the use of mechanical clearing. Extreme care will be taken to avoid using habitat management methods that could jeopardize remaining shallow soils.

---

[11] I.e., non-native species. The introduction of exotic species into native communities often causes problems, as diseases, parasites and other natural controls of exotic species are lacking. Exotics sometimes thus proliferate aggressively, to the cost of natural diversity.

On some grasslands and savannah areas, a combination of carefully timed prescribed fire, mechanical manipulation of the soils (discing and plowing to facilitate reseeding), herbicide application, and reintroduction of native grass and forb species will be applied in attempt to control exotic grass and native brush species. Reintroduction of native grass and forb species using seed drills and other planting methods will be considered for recently farmed fields in alluvial bottomlands acquired for the Refuge.

To enhance dove hunting on the Refuge, some limited seeding of food plots will be implemented. The plant species used will likely include sunflower and croton. No exotic plant seed will be used.

Rotational grazing by domestic livestock or native grazing and browsing animals has been considered as a management tool for grassland savannah areas of the Refuge, but is not proposed for use in the near future. Refuge management has determined that grazing would currently not be an effective grassland management tool, given the existing degraded condition of many grassland areas on the Refuge. Existing conditions that do not favor use of grazing include extreme loss of topsoil from many areas, and dominance of King Ranch bluestem grass, an exotic species planted to improve range conditions in the past. Properly managed grazing can be an effective grassland management, however, and its implementation on the Refuge will be reconsidered as grasslands are restored. Any domestic livestock grazing program implemented in the future will incorporate controls for brown-headed cowbirds, to mitigate nest parasitism by these birds, a species associated with domestic cattle.

It is doubtful that extirpated grazing and browsing species such as bison (*Bison bison*) and pronghorn antelope (*Antilocapra americana*) will be reintroduced on the Refuge due to the size of tracts necessary to support genetically diverse breeding populations, fencing necessary to keep those species within the Refuge confines, and problems associated with the disposal of excess animals.

Forest, Woodland, and Shrubland Conservation

Since European settlement in the mid-nineteenth century, forests and woodlands within the Balcones Canyonlands have been so altered that a definitive description of presettlement conditions is argued by historians and ecologists alike (Bray, 1904). In most areas, the broader floodplains were cleared of timber and, where suitable for agriculture, converted to farmland and pasture. Most believe that the forests and woodlands, once predominantly features of the slopes and canyons, have invaded adjacent, flatter grassland areas. Except for the steepest and rockiest canyons, slopes have been grazed and frequently cut for fenceposts and charcoal production.

For purposes of the following discussion, several definitions are useful. **Forests** consist of trees greater than 16 feet tall whose crowns usually interlock (called a closed canopy), or would cover at least 61% of the ground surface when viewed from above. **Woodlands** are more open, with tree canopy cover between 26% and 60%. **Sparse Woodlands** or **Savannahs** consist of grassland interspersed with trees. **Shrublands** consist of woody, usually multiple-stemmed perennial shrubs from 1.6 to

16 feet high having canopy cover of 26% or more and with tree canopy cover of 25% or less[12].

The forests, woodlands, and shrublands of the Refuge are of several different types, and include: juniper-oak forests, usually associated with canyons, valleys and drainages; shin oak woodlands, usually associated with upland areas; juniper encroachment woodlands, where juniper has begun to mature in former grasslands due to fire suppression and improper livestock management; and oak-elm-juniper savannahs, found both on upland sites and broad floodplains. Most grasslands on the Refuge would progress through successional stages from grasslands, through shrubland and woodland to forest, if allowed to progress without human intervention. In pre-settlement times, naturally occurring or Native American-ignited wildfires maintained the grasslands in an early successional stages, rather than succeeding through shrublands to woodlands or forests.

Mature juniper-oak forests on the Refuge consist of many species of trees, including escarpment black cherry, live oak, cedar elm, hackberry, gum bumelia, Ashe juniper, pecan, Arizona walnut, Texas ash, post oak, blackjack oak, Spanish oak, and shin oak. Shrubs within the understory include Mexican (Texas) persimmon, sumac, redbud (*Cercis canadensis*), skunkbush (*Rhus aromatica*), and mountain laurel.

Usually associated with canyons, valleys, and drainages, these forests may also occur on slopes and uplands, and are the preferred breeding and forage habitat of the endangered golden-cheeked warbler. They reach their greatest height in bottomlands and in areas where water seeps out along slopes (boundary layers within the geology of the slope force water to move horizontally through the substrate).

Conservation Approaches – Conservation of juniper-oak forests will consist of any of the following: Protecting the forests from wildfires; reducing logging slash within the forests (from past fence post cutting activities) to help prevent catastrophic wildfires; reducing browsing by native and feral species[13] within the Refuge to encourage seedling recruitment of hardwood species; reestablishing forests through tree planting in any forest canopy openings created by oak wilt (*Ceratocystis fagacearum*)[14] (or other tree diseases), wildfires, storm events, etc.; and reducing juvenile juniper stand density around mature hardwoods in forests. The Refuge operates a small greenhouse to raise plants for revegetation when necessary.

Succession in shin oak woodlands on the Refuge usually progresses from dense stands of shrubs with 80 to 100% canopy cover to single stem woodlands over a period of 10 to 15 years. During that intermediate successional stage, these woodlands are the breeding and foraging habitat of the endangered black-capped vireo. Much of the management of this

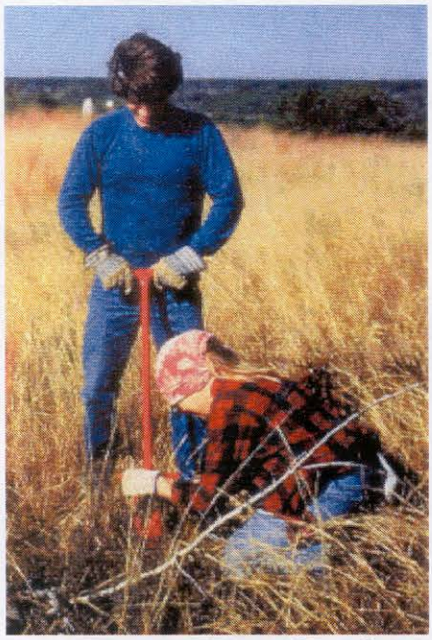


Photo by Chuck Sexton

Volunteers plant shin oak seedlings in the Doeskin Ranch area to create future habitat for Black-capped vireo. In 1999 over 3,000 seedlings were planted through volunteer efforts

---

[12]National Biological Survey/National Park Service Vegetation Mapping Program Standardized National Vegetation Classification System - Final Draft, 1994.

[13] I.e., domestic animals which have escaped captivity and become naturalized.

[14]Oak wilt is a fungal disease which can weaken and kill live oak and Spanish oak trees.

woodland will be to maintain the preferred successional stage for this bird, through the use of mechanical clearing and/or prescribed fire.

In some areas juniper have invaded grasslands. Unfortunately, some invaded slopes are so eroded of topsoil that their restoration to grasslands would be difficult. In other locations, young junipers may be removed through mechanical clearing in an effort to let the grasslands recover to a point that they can be maintained with prescribed fire. Still other areas may be left to mature into juniper-oak forests (if biologically possible).

Native Plant Conservation & Invasive Plant Control

While less than 10% of the species (about 60 spp.) on the Refuge's plant list are not native to central Texas, these include a variety of grasses, forbs, shrubs, and even trees which have the potential to take over habitats and alter their ecological health. Included in this set are everything from noxious "weeds" like hedge-parsley (*Torilis arvensis*) which dominates acres of ground cover in open and shaded habitats, to grasses such as King Ranch bluestem (*Bothriochloa ischaemum*) and soft cheat (*Bromus tectorum*) which put native grasslands at risk, to aggressive vines such as Japanese honeysuckle (*Lonicera japonica*) and periwinkle (*Vinca* sp.) which can literally cover other habitats, and exotic shrubs and trees such as Chinaberry (*Melia azedarach*) and tree-of-heaven (*Ailanthus altissima*) which crowd out native woody species. Most of these invaders offer reduced habitat values for native wildlife species. Most of these invasive species typically become established initially on disturbed sites, but others (such as the berry-producing trees) can be introduced into the middle of otherwise healthy native habitat stands by birds or mammals and thereafter get dispersed far and wide.

Conservation Approaches – This suite of plant species, collectively, can impact several of the other habitat management strategies and goals discussed elsewhere, including degradation of endangered species habitat, creation of fire-prone fuels, loss of groundwater recharge, displacement of high-wildlife value plants, and loss of overall biological diversity. While it may impractical to eliminate all non-native plant species, all other habitat management strategies should be geared towards minimizing disturbances which allow for the establishment of aggressive non-native plants and to selectively remove invasive plant species where important native habitats and species are impacted and as resources allow. The Refuge is developing an integrated pest management plan for invasive weed control. Integrated pest management is method or controlling unwanted plants or animals that combines use of mechanical removal, biological agents and chemical pesticides and aims at reducing pest infestations to an acceptable level, rather than complete elimination (Goal 2, Objective 4).

Wildlife Conservation

a. Endangered and Threatened Species and Species of Concern

Conservation strategies for the two federally-listed songbirds on the Refuge differ substantially, particularly with respect to habitat manipulation needs. The specific threatened and endangered species conservation strategies proposed in this plan are found in Goal 1.

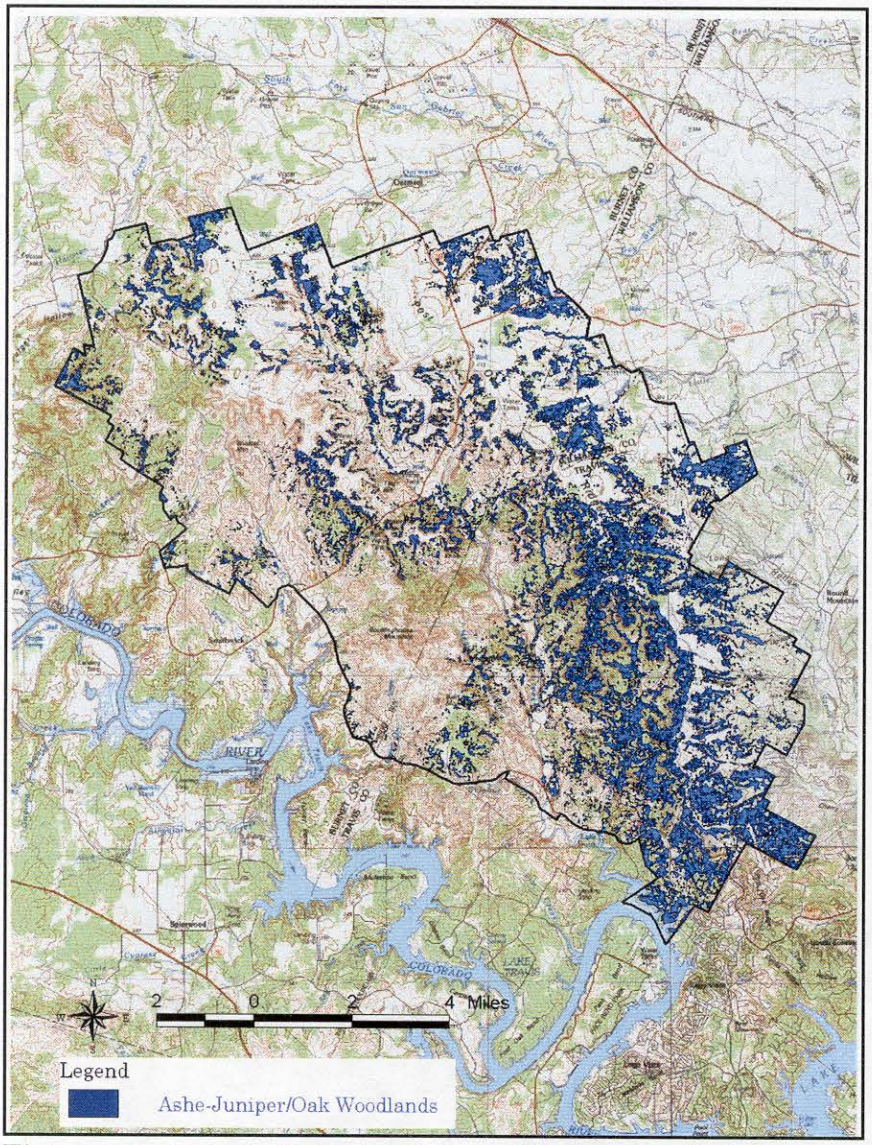


Figure 5: Extent of ashe-juniper/oak woodlands on the Refuge

Golden-cheeked Warbler Conservation Approaches

Most existing and future warbler habitat on the Refuge is within the Canyonlands Division, with lesser amounts in the Post Oak Ridge Division and areas within the recent 34,000 acre Refuge expansion (see Figure 5 for location of juniper-oak woodlands). Because it is principally a climax type habitat, the mature juniper-oak woodlands occupied by the golden-cheeked warbler requires little attention or manipulation, other than protection from natural or human-caused disturbance. Bringing further warbler habitat online where it currently does not exist will require ensuring that younger woodlands are allowed to mature. Protection and enhancement of warbler and their habitat will principally involve five activities other than vegetation manipulation:

1. Deer herd management;
2. Detection, monitoring, and possibly control of oak wilt centers;
3. Brown-headed cowbird control;
4. Wildfire control; and
5. Public use constraints to minimize disturbance of nesting warbler.

Deer Herd Management – The hunt plan for the Refuge addresses the need for maintaining a moderate and healthy deer herd to minimize impacts on vegetation. Deer herd management will be important in all Refuge divisions, not just those that include warbler habitat.

Oak Wilt Control – Oak wilt centers have been detected in scattered locations in all management divisions. Their threat to the long term abundance of oaks in warbler habitat has not been assessed although there are examples elsewhere in Texas (e.g., Kerrville State Park) where the loss of oaks to oak wilt caused major changes in woodland composition and the subsequent decline of warbler populations. Techniques for controlling the spread of oak wilt include trenching to prevent spread through the root zone, and spot clearing of infected red oaks.

Brown-headed Cowbird Management – Brown-headed cowbird parasitism can affect the productivity of nesting warbler but apparently not as seriously as it affects vireo productivity (Szaro, 1982). Nest parasitism is the practice of laying eggs in the nests of other species. In species susceptible to nest parasitism the adult birds are unable to distinguish the parasite eggs or nestlings from their own offspring. The aggressive parasite nestlings out-compete those of the host birds and greatly reduce reproductive success. Cowbird parasitism of warbler nests will be monitored late in the nesting season, when nest sites are checked for number of golden cheeked-warblers. Any young brown-headed cowbirds among the golden cheeked-warblers are noted and counted. At present, cowbird trapping within the Refuge is focused in the Post Oak Ridge division near existing vireo colonies in the North and Central Units. Budget and staffing limitations preclude widespread trapping of cowbirds, although it is likely that the trapping near vireo colonies throws a "protective net" over the general passerine bird community for a considerable radius, including any warbler habitat which may be nearby. Improper use of grazing as a management tool can potentially attract cowbirds. There is little potential for the use of grazing as a management tool for golden-cheeked warbler in the Canyonlands Division, due to poor rangeland.

Fire Management – Uncontrolled wildfire in the Canyonlands division and elsewhere on the Refuge could result in catastrophic loss of large amounts of warbler habitat. Although some wildfires are inevitable, proper attention to fuel load reduction, fire access and monitoring, and fire preparedness can minimize potential habitat loss. Careful design and implementation of the Refuge's prescribed fire program in non-warbler areas will be essential in order to minimize the risks of wildfire.

Recreational Uses – Public uses during the nesting season, roughly early March through July, potentially could conflict with breeding and nesting activities of warbler. As adult warblers conduct most of their feeding and nesting activities in the upper portion of the woodland canopy, opportunities for direct disturbance of birds are limited. Birding trails and public access points will be located at the periphery of Refuge tracts and along major public roads to further minimize the risks of harm while still providing an opportunity to view the birds. Interpretive signs to educate the public and constraints on

visitor activities can further reduce the possible impacts. Common sense rules for visitors will be necessary. Some activities may be inappropriate at any time in warbler habitat to prevent potential harm to birds and their habitat. Activities involving use of heavy equipment or producing loud noise will be prohibited on or near warbler habitat during the period when birds are present.

Black-capped Vireo Conservation Approaches

Habitat Manipulation – Creation, restoration and enhancement of habitat for the vireo will require considerable staff effort. Active vegetation manipulation will be needed to create a continuing (and increasing) supply of the mid-successional shrublands preferred by the vireo. It is anticipated that all active vireo habitat management will be done in the Post Oak Ridge Division, with the largest habitat blocks in the North and Central Units and smaller areas of habitat management in the South Unit and West Ridge Unit. The creation of vireo habitat in the South Post Oak Ridge Unit is particularly important. Habitat in this location will provide a bridge of suitable habitat between major vireo populations further north in the Refuge and vireo populations and habitat anticipated to come on line in the future on the units of the (non-federal) Balcones Canyonlands Preserve complex closer to Austin.

Vireo habitat creation will involve selecting suitable substrates, evaluating potential vegetation, and implementing the combination of disturbance regimes that will most effectively set the successional processes toward vireo habitat in motion. Decisions regarding which areas to put into active management, and in what sequence, will be based on the potential for short-term success with the least effort. The most suitable geologic and soil types on the Post Oak Ridge are very rocky, shallow-soiled areas underlain by massive Whitestone, Edwards, and Cedar Park limestone and related strata. The best potential vegetation sites will include those areas that already have shin oak in a shrubland or woodland matrix.

Prescribed Burning – Prescribed fire and mechanical clearing (by hand and/or with light equipment) are the preferred tools for large scale creation of vireo habitat. Site by site evaluations will be required to plan the best combination and sequence of activities. Based on available research, it is anticipated that after selective clearing and/or a prescribed fire, the habitat may become suitable for vireo within two to five years and thereafter may have a duration of suitability of ten to twenty years before it becomes over mature for vireo (e.g., too tall, too dense, or too much juniper). As browsing by deer can severely reduce growth of oak needed to develop vireo habitat, management of white tailed deer within the managed vireo habitat is important. This will be accomplished through the Refuge hunt program. It is anticipated that vireo will colonize new habitat from adjacent existing habitat areas.

Acquisition of New Tracts – Initially (i.e., for the first five to fifteen years), most of the effort will address bringing new areas into management in order to increase the gross acreage of vireo habitat. Eventually, as further tracts are acquired and a large amount of vireo habitat is being managed, older areas which vireo have abandoned will be

"recycled" (manipulated) to set successional patterns back to an earlier seral stage and start the processes in motion once again. Succession can be set back using a combination of mechanical means, fire, and carefully controlled grazing.

Deer Herd Management – Many of the habitat management strategies described for the golden-cheeked warbler (above) apply to the vireo as well. Deer herd management and cowbird control will directly affect the success of habitat creation efforts and vireo nesting productivity, respectively. Because (a) hunting had been initially excluded from new Refuge tracts, and (b) grazing and browsing pressure from domestic livestock were eliminated in oak shinneries in the North and Central Post Oak Ridge Units, certain Refuge tracts literally have become havens for deer herds which naturally favor the Refuge areas (better deer habitat) over adjacent private rangeland (often lower quality deer habitat due to competition with livestock). Proper deer herd management will have to involve a combination of deer herd reduction in vireo habitat on Refuge lands and a private lands outreach and initiative to improve deer habitat on adjacent private lands. The net effect of such a strategy will be to reduce the numbers of deer on the Refuge while supporting huntable populations on adjacent lands.

Vireo are quite sensitive to human disturbance during their nesting period, roughly late March through September. The vireo observation deck is closed each spring from March 25 through late April to prevent disturbance of the birds during initial territorial establishment. As additional trails and user facilities are located in or near black-capped vireo habitat, additional seasonal restrictions will be appropriate. Activities involving use of heavy equipment or producing loud noise will be prohibited on or near vireo habitat during the period when birds are present.

Cowbird Control – Brown-headed cowbird trapping is likely to be a long-term, ongoing need within vireo colonies. Trapping success will be constrained by limited staffing and fiscal resources to sustain the required effort from year-to-year. To date, cowbird trapping at the Refuge and in nearby areas of Travis County has been done on an ad hoc short-term basis under a variety of mitigation conditions (required as mitigation for habitat destruction on private lands) or by individual agency efforts. Subsequent to the issuance of the Section 10(a) regional permit for the Balcones Canyonlands Plan, land managers from all participating entities began to develop a strategy to accomplish long-term cowbird management. When this strategy is completed, the Refuge will implement its portion of the strategy as budget and personnel allow. Cowbird trapping might be accomplished through a contract with Texas Animal Damage Control or another public or private entity, with service contract(s) with one or more private landowners in the Refuge area, or by Refuge staff.

Conservation Approaches for Other Listed and Candidate Species

The only other federally-listed species known to occur on the Refuge is the peregrine falcon which occurs as an uncommon spring and fall

migrant. These falcons are transients over the Refuge and have not been observed to roost or feed in any Refuge habitats.

Although a number of federally-listed cave invertebrates occur in the general Austin area, none have yet been documented on the Refuge.

Texabama Croton is a rare shrub in the Refuge area which is a "species of concern" (an informal designation) for the Service due to its very local distribution. Other rare and potentially threatened plant species, including the bracted twistflower (*Streptanthus bracteatus*), canyon mock-orange (*Philadelphus ernestii*), and Texas amorpha (*Amorhpa texana*) may occur in the Post Oak Ridge canyonlands.

While no specific conservation approaches have been designed for these species, improved monitoring and data gathering in future years may call for development of specific strategies.

b. Migratory Birds

Neotropical Migrant Bird Conservation Approaches

Among the Refuge's 78 known breeding bird species are 25 classified as neotropical migratory birds (NTMBs) that nest in central Texas and winter primarily south of the United States. (This includes both the golden-cheeked warbler and black-capped vireo.) Maintaining a healthy and diverse array of nesting habitats will be the primary conservation approach for this group of species. The cowbird trapping program which is targeted to protect nesting black-capped vireo also benefits several NTMBs which nest in the same areas.

Surveys are conducted twice annually to monitor the populations of breeding birds on the Refuge, including most of the NTMBs. Refuge staff and volunteers participate annually in the North American Migratory Bird Day counts to help monitor populations of migratory birds. Ad hoc surveys during the spring and fall migration also track the abundance of migrants in Refuge habitats. These strategies will continue. The strategies proposed for general wildlife habitat conservation are found in Goal 2 of this plan.

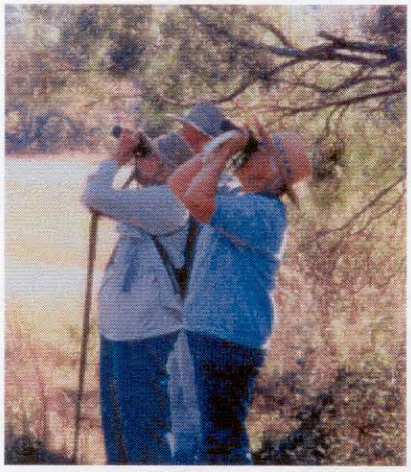


Photo by Chuck Sexton

Hawkwatchers on the Refuge during National Wildlife Refuge Week, 1999

Raptor Conservation Approaches

An important fall raptor migration corridor passes through central Texas and the Refuge. Based on data compiled in the Austin area over many years, several thousand broad-winged hawks (*Buteo platypterus*) and Swainson's hawks (*B. swainsoni*) can be expected to travel this corridor annually. The primary movement of these hawks follows the sharp ridges and hills in the eastern edge of the Texas Hill Country. The migrants then proceed south through eastern Mexico to wintering areas in Central and South America.

Preliminary hawk watches held at the Refuge during late September and early October, often in conjunction with National Wildlife Refuge Week, have detected several hundred migrant raptors of about a dozen species. The potential for detecting much larger flights is very high. Small numbers of red-tailed hawks (*Buteo jamaicensis*), red-shouldered hawks (*Buteo lineatus*), and Cooper's hawks (*Accipiter*

cooperii) nest on the Refuge. Refuge staff make periodic observations on the locations and nesting success of such species.

Little active management is needed for migrating hawks. Nevertheless, the raptor migration is a spectacular wildlife phenomenon for which the geographic setting of the Refuge can provide viewing opportunities for the public. Hawk monitoring will continue on high ridges within the Refuge, and steps will be taken to make these viewing sites accessible to the public at the appropriate season.

Waterfowl Conservation Approaches

Relatively small numbers of migratory and wintering waterfowl use the ponds and other seasonally available water sites within the Refuge. Fourteen species of ducks have been detected on the Refuge to date; wintering populations, as suggested by Audubon Christmas Bird Counts, probably number only a few hundred. Waterfowl provide seasonal wildlife viewing opportunities but they are not sufficiently abundant to warrant public hunting. The installation of wood duck nest boxes on the refuge could enhance interpretive and educational opportunities for the public.

Conservation Approaches for Other Migratory Birds

A variety of other upland bird species migrate through and winter within the Refuge. Seedeaters such as sparrows , juncos, and towhees (*Pipilo maculatus*) and fruit-eaters such cedar waxwings (*Bombycilla cedrorum*) are regularly abundant in the winter months. Refuge staff and volunteers annually participate in an Audubon Christmas Bird Count centered on the Refuge to monitor populations of wintering species.

Locally, some areas on the Refuge provide important habitats for certain bird groups. As one example, grasslands in the San Gabriel Division and parts of the North and Middle Units of the Post Oak Ridge Division harbor numerous wintering grassland sparrows such as grasshopper (*Ammodramus savannarum*) and Le Conte's sparrows (*A. leconteii*) which occur only locally in the Austin area. Certain wet grasslands along Little Creek on the Eckhardt tract regularly have a small wintering population of sedge wrens (*Cistothorus platensis*), a rare wintering species in the Austin area. Northern harriers (*Circus cyaneus*), chestnut-collared longspurs (*Calcarius ornatus*) and Sprague's pipits (*Anthus spragueii*) are other uncommon species that have been detected in migration and winter on Refuge grasslands. Existing native grassland habitat will be improved with the use of prescribed fire or mechanical means. Populations of wintering grassland birds will be monitored to determine the effect of habitat changes due to management actions.

Several native bird species reach the limit of the their range at or near the Refuge. These include the bushtit (*Psaltriparus minimus*), cactus wren (*Campylorhynchus brunneicapillum*), black-throated sparrow (*Amphispiza bilineata*), and canyon towhee (*Pipilo fuscus*), all of which are of southwestern distribution. The cactus wren and, to a lesser degree the black-throated sparrow, are associated with abundant growth of invasive prickly-pear cactus which has increased in certain pastures due

to long term grazing practices. Although prickly-pear is a native component of Edwards Plateau shrublands, it is likely that it will gradually decline on the Refuge as the prescribed fire program returns the areas where it is found to tallgrass prairie, oak savannah, and oak shinnery habitats. Ongoing breeding bird surveys and Christmas bird counts will be used to monitor the abundance of these and other resident bird species.

In some portions of its range, the eastern bluebird (*Sialia sialis*) has faced serious competition for nest sites from the introduced European starling (*Sturnus vulgaris*) and has declined in many areas. A bluebird nest box program was initiated on the Refuge in 1993 to enhance nest site opportunities for bluebirds and other cavity nesting species. Additional bluebird boxes will be provided in future seasons. Maintaining a "route" of bluebird boxes will enhance public wildlife viewing experiences.

Resident Upland Game Bird Conservation Approaches

Several upland game birds occur on the Refuge. Among the most common of these are wild turkey (*Meleagris gallopavo*), northern bobwhite (*Colinus virginianus*), and mourning dove (*Zenaida macroura*). Other than possible planting of food plots for dove, no specific management actions are proposed for these species. Some of the general habitat conservation approaches mentioned earlier (i.e., protection of riparian areas, restoration of native prairie) should benefit these species. Hunting of upland game birds, including doves, will be allowed on the Refuge in compliance with the state regulations and the Refuge hunt plan.

c. Mammals

Most of the medium to large mammals found on the Refuge are common in central Texas. These include white-tailed deer (*Odocoileus virginianus*), eastern cottontail (*Sylvilagus floridanus*), black-tailed jackrabbit (*Lepus californicus*), nine-banded armadillo (*Dasypus novemcinctus*), striped skunk (*Mephitis mephitis*), and eastern fox squirrel (*Sciurucus niger*). The Texas mouse (*Peromyscus attwateri*) is limited to limestone terrain in the middle regions of Texas; the species is likely to occur on the Refuge.

The collared peccary, or javelina (*Tayassu tajacu*), reaches its northeastern range limit on a line from about San Angelo to Kerrville to San Antonio in the Texas Hill Country, although it formerly occurred further north. Refuge staff have heard of occasional sightings in the Cow Creek area, and a peccary skull was found on the Refuge.

White-tailed deer populations will be managed to reduce damage to black-capped vireo and golden-cheeked warbler habitat. (See Goal 2, Objective 5.) A Refuge Hunting Plan has been written and is a major component for managing the Refuge's deer herd. Public deer hunts will be based on data and monitoring to maintain deer herds at levels compatible with goals for habitat creation for the endangered bird species.

Other than the current hunt plan for white-tailed deer, feral hog control and installation of artificial bat houses, no specific management practices are anticipated for native mammals. The bat houses are located in suitable habitat and should provide an additional source of public wildlife viewing. Fox squirrel hunting may be permitted on the Refuge in the future.

Several native mammals have been extirpated from the Texas Hill Country in the last 150 years. Species which are likely to have occurred in or near the Balcones Canyonlands area include the black bear (*Ursus americanus*), gray wolf (*Canis lupus*), bison, and pronghorn antelope. The jaguar (*Felis onca*) and ocelot (*F. pardalis*) may have very rarely occurred in the area as well. Present land settlement patterns and the existing habitat mix (even with anticipated habitat management) preclude reintroducing these species at the Refuge.

d. Amphibians and Reptiles

Among the central Texas endemic reptiles and amphibians known to occur on the Refuge are the whitethroat slimy salamander (*Plethodon glutinosus albagula*) and cliff chirping frog (*Syrrhophus marnocki*), both occur in moist crevices of ravines and caves, and the Central Texas whipsnake (*Masticophis taeniatus girardi*) which inhabits dense tangles of oaks and junipers in rugged canyons. The ranges of the Eastern blackneck garter snake (*Thamnophis cyrtopsis ocellatus*) and red stripe ribbon snake (*T. proximus rubrilineatus*) are generally confined to the Texas Hill Country. Several other species are at the eastern or western edge of their range in the Refuge area. Karst protection strategies and water quality enhancement will support viable habitat for the salamander and chirping frog.

The Texas horned lizard, the Texas State Reptile, which was once found commonly throughout the Hill Country, has declined drastically in abundance. It has yet to be detected on the Refuge, but may yet be found. Open habitats on the Refuge may provide suitable areas for protection and/or reintroduction of this species and for research on the species.

Many of the amphibians and reptiles on the Refuge may be suffering effects of imported red fire ants *(Solenopsis invicta)*. Control measures for fire ants, including biological control, will be implemented in order to benefit both reptiles and amphibians.

e. Fish

No native fish are targeted for active management within the Refuge. Public fishing opportunities may be provided on selected artificial ponds which may be stocked occasionally. The Texas Parks and Wildlife Department is currently engaged in active conservation of the Guadalupe bass (*Micropterus treculi*). This species, the Texas state fish, is endemic to the Edwards Plateau. Should Texas Parks and Wildlife determine that streams on the Refuge are suitable for Guadalupe bass introduction, Refuge staff will cooperate with their efforts.

f. Invertebrates

Karst Invertebrate Conservation Approaches

Caves and karst features in the Refuge area have a diversity of species varying from species which take occasional refuge in the caves to those specialists which are adapted solely to life in the cave environment. The array of species in caves within the Refuge is poorly studied to date; this is a major research need. One preliminary survey identified four aquatic and seven terrestrial troglobites in caves on the Refuge. Two of these, a millipede (*Cambala speobia*) and an amphipod (*Stygobromus russelli*), are abundant throughout Central Texas. Four of the species, an asellid isopod (*Caecidotea reddilli*), an amphipod (*Stygobromus bifurcatus*), a pseudoscorpion (*Tartarocreagris* sp.) and a mold beetle (*Batrisodes reyesi*) are species of special concern in Texas. One of the remaining species, the ground beetle *Rhadine russelli* is endemic to the Post Oak Ridge. The remaining four species, a flatworm possibly of the genus *Sphalloplana,* a spider of the genus *Cicurina,* a centipede of the genus *Theatops,* and a millipede of genus *Speodesmus,* are believed to be unstudied species, likely endemic to the Post Oak Ridge area (Reddell, 1999). The presence of several unstudied species suggests the importance and rarity of karst habitats on the Refuge. Additional surveys of karst habitats on the Refuge will be undertaken.

As mentioned earlier, cave protection strategies will involve the inventory, mapping and physical protection of cave features. Refuge activities including brush clearing, prescribed fire, and fire ant control will be conducted in a manner to avoid physical damage to, or pollution of, Refuge cave features. Public use activities will be kept away from known cave locations to the extent practical although interpretive information on the cave ecosystem of the Refuge will be integrated into educational materials (Goal 1, Objective 4).

Photo by Chuck Sexton
Monarch Butterfly

Monarch Butterfly Conservation Approaches

The Refuge is located within a major migration corridor for monarch butterflies (*Danaus plexippus*) moving southward toward their wintering roost areas in the mountains of central Mexico. This passage of monarchs in the Fall is an amazing wildlife phenomenon that often garners press attention. Major flights of monarchs have been documented annually at the Refuge and observation of these flights corresponds with the hawk movements and the celebration of National Wildlife Refuge Week. Prescription burning and other prairie restoration management actions should benefit monarchs by increasing wildflower density and diversity on the refuge. Additionally, the inclusion of this event in monitoring activities and public use activities will be a worthwhile interpretive offering. Quantitative data on the passage of monarchs over the Refuge are collected by staff and volunteers and forwarded annually to the Monarch Watch, a nonprofit organization which promotes the conservation of this species. This approach will continue.

Conservation Approaches for Other Invertebrates

Preliminary surveys on the Refuge suggest that it harbors a remarkable diversity of species of butterflies, dragonflies and other groups. Inventory work will be implemented on these groups in order to better the refuge's understanding of its various ecosystems. For example, the species of dragonflies and damselflies frequenting the Refuge's aquatic habitats can offer insights into water quality.

Feral and Exotic Animal Control and/or Removal

a. Feral Hogs

Feral or released hogs are fairly common on certain Refuge units. They may occur anywhere from lower canyons to the highest plateaus. During drier months they tend to concentrate around perennial water sources and will frequently visit water sources year around. Because of the habitat damage which feral hogs can cause, they will be targeted for control and elimination as staffing and funding allow. This will include making them a legal species during public hunts and consideration of hog trapping on the Refuge. Based on the experience at other refuges and public lands, it will be difficult to completely eliminate the species. Refuge management will explore the feasibility of contracting with a trapper to remove feral hogs, if such trapping can be accomplished with minimal impact to non-target species.

b. Cats and Dogs

Roaming pets from adjacent subdivisions and farm houses are occasionally seen on Refuge tracts. Feral populations of house cats may occur on the Refuge. The Refuge will provide educational information to area residents about the detrimental effects of pets and feral dogs and cats on native wildlife and to increase control efforts. Nuisance animals will be removed.

c. Exotic Ungulates

Blackbuck antelope (*Antelope cervicapra*) and barbary sheep (*Ammotragus lervia*) have occasionally escaped the confines of stocked game ranches and moved onto the Refuge. Numbers of these species are very small and neither appears to be reproducing in the wild. Other species such as red deer (*Cervus elaphus*), axis deer (*Axis axis*), and sika deer (*Cervus nippon*) may occur in the region as well. Populations of exotic ungulates on Refuge tracts will be monitored by opportunistic observations and deer censuses. Removal of exotic ungulates will generally be allowed incidental to deer hunts, consistent with State regulations. Should rapid population growth be identified among any of the exotic ungulates on the Refuge, control measures will be implemented.

d. Non-native and Urban-adapted Birds

Certain non-native and urban-adapted native bird species commonly show increased populations around human-made structures and heavily altered habitats. These include house sparrow (*Passer domesticus*), European starling, rock dove (*Columba livia*), great-tailed grackle (*Quiscalus mexicanus*), American crow (*Corvus brachyrhyncos*), and blue jay (*Cyanocitta cristata*). This set of species constitutes a barometer of the influence of urbanization being exerted on native habitats and wildlife in and around the refuge. In some instances, such as with blue jays and western scrub jays (*Aphelocoma californica*), increased populations may negatively impact sensitive native species such as the golden-cheeked warbler in habitat near urban areas. The non-native and urban-adapted birds may compete with native birds for food or nest-sites or may affect native birds by predation (actual or threatened) of eggs or young birds. A few native species such as chimney swifts (*Chaetura pelagica*), common nighthawks (*Chordeiles minor*), and swallows (*Hirundinidae*) may benefit from man-made habitats with little or no impact on other species.

Population trends of these various non-native and urban-adapted bird species will be monitored through the breeding bird surveys, Christmas Bird Counts, and other opportunistic surveys.

e. Emu

Several ranches in and around the Refuge have been attempting to raise emus (*Dromiceius novae-hollandiae*) as a ranching enterprise in recent years. At present the market is so poor for emu products that some ranchers have been releasing the animals. Observations of apparently released or escaped emus have been increasing. Emus may be fairly long-lived and an occasional pair may even attempt to nest away from protected pens. However it is unlikely that emus will become established in the Refuge area; successful nesting is probably precluded due to the abundance of potential nest predators such as feral cats, dogs, hogs, coyotes, etc. Should emus successfully breed on the Refuge and become problematic, a trapping plan will be initiated for population control.

f. Fire Ants

The imported red fire ant is common across the entire Refuge although it is more prevalent in certain disturbed habitats such as roadsides, around habitations, and along stream banks. Research in Texas suggests that the species may be having a serious effect on certain wildlife populations including reptiles, ground-nesting birds, and others. The effects on Refuge wildlife species are unknown. The abundance of fire ants on the Refuge and the costs of treatment preclude large scale control measures at present. Fire ants will be controlled by environmentally acceptable means around key Refuge facilities (ranch houses, pumps, wells) on a case by case basis. If future research identifies an effective treatment for large areas, such treatment will be considered for the Refuge.

Wilderness Review

The Wilderness Act of 1964 created the National Wilderness Preservation System. This system sets aside federal lands having wilderness qualities in protected status for preservation. The National Wilderness Preservation System includes federal lands managed by the National Park Service, Bureau of Land Management, Forest Service, and Fish and Wildlife Service. 643 Wilderness areas comprise over 105 Million acres in 44 states, with somewhat more than one half of the total area occurring in Alaska.

Areas nominated for Wilderness designation must exhibit special characteristics listed in the Wilderness Act. Such an area:

> (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Designated Wilderness areas are set aside for preservation through strict limitations on use of mechanized transportation or tools. Motorized vehicle use is generally prohibited within Wilderness, as is use of power tools. Exceptions to these restrictions are typically allowed only for emergency or other unusual conditions, on a case-by-case basis.

Per the policies of the National Wildlife Refuge System Improvement Act of 1997, all Refuge CCPs must include a review of the Refuge's potential suitability for Wilderness designation. There is little potential for Wilderness designation of lands within Balcones NWR. Only a few small blocks of land within the Refuge have not been extensively altered by agricultural use, and a network of county and state roads traverses the Refuge. Additionally, the management activities proposed in this CCP for conservation of endangered species require fairly aggressive habitat management, not consistent with Wilderness designation.

Recreational Use Approaches

When Balcones Canyonlands National Wildlife Refuge was established, it set aside a portion of the Texas Hill Country to preserve the natural splendor of the unique ecosystem for future generations. With rugged charm that is uniquely Central Texas, the canyons of the Refuge are not only visually stunning, but comprise a large area supporting endemic plants and animals characteristic of the region. The Refuge exhibits unique qualities known from all parts of Texas: North, South, East and West. The survival of federally listed endangered wildlife, including the black-capped vireo and golden-cheeked warbler, and a variety of other species will be better assured by preserving habitat within the Refuge to compensate for the effects of ever-increasing urbanization.

Wildlife and future human generations will ultimately benefit from the decision to conserve this piece of the Texas Hill Country as a national wildlife refuge. Public facilities and programs developed on the Refuge will be designed to facilitate use and understanding of the many Refuge resources. Facilities and programs at the Refuge will be developed with consideration given to the needs, interests, and expectations of those most likely to visit and/or be affected by the Refuge. These groups will include:

1. People interested in observing and learning about wildlife--particularly endangered songbirds--found on the refuge;

2. People interested in viewing and learning about the Texas Hill Country and its rich natural and cultural history;

3. Students of all ages interested in learning about wildlife and habitat found on the Refuge and beyond;

4. People interested in outdoor recreational opportunities; and

5. Owners of lands adjacent to and within the Refuge boundary.

Tourism is the third largest industry in Texas, and nature-based tourism is the fastest rising component. As a member of the National Wildlife Refuge System, the Balcones Canyonlands National Wildlife Refuge will provide visitors with wildlife-dependent recreational opportunities, including environmental education. Facilities will welcome and orient visitors, as well as interpreting the Refuge mission and the natural and cultural resources of the Refuge area.

The Refuge's recreational use program is intended to serve a broad audience. Because of its physical location, the primary market area for the Refuge has been identified as the Austin Metropolitan Statistical Area (generally consisting of Travis, Williamson, and Hays counties), and Burnet county. As a national wildlife refuge, however, the Refuge is anticipated to draw visitors from a nationwide and worldwide audience, as well as local residents.

The greatest challenge will be to plan and develop recreational uses that allow Refuge enjoyment and attract visitors without causing

adverse impacts to wildlife populations and their habitat. Thus, most recreational use will be located along the periphery of Refuge tracts and along major public roadways, in an effort to minimize disturbance to wildlife. Because potential exists for conflicts to arise between uses, consideration will be given during planning to avoid such conflicts.

Planning of facilities and programs will incorporate a 15-year horizon. Because land is still being acquired and recreational use management planning is in process, locations and designs of programs and facilities will be only generally identified in the initial Recreational Use Management Plan, with periodic reevaluations provided to incorporate the evolution of Refuge acquisition.

Partnerships and volunteers will be essential in effectively implementing on- and off-site recreational, educational, and outreach programs. Accordingly, opportunities for partnerships will be thoroughly explored. For example, the Refuge will develop guidelines outlining how volunteers will be recruited and trained, as well as what activities and programs might involve and benefit from volunteers. Establishment of a Friends Group will also be pursued to solicit support and increase public awareness of Refuge issues.

Photo by Chuck Sexton

Participants in a Refuge National Fishing Week fishing derby display their catch.

The Balcones Canyonlands National Wildlife Refuge will implement a customer-oriented approach to the Refuge's vital role in conserving a representative sample of the natural diversity of the Texas Hill Country, including the endangered species of the region and their habitats. Outreach is essential for reaching key interest groups and targeted publics, strategies will thus be developed to facilitate effective outreach program management. Some of these strategies are identified in the Objective Documentation Section (Goal 4, Objective 3).

A variety of recreational programs will be offered at the Refuge, including wildlife observation and photography, environmental education, interpretation, hunting, and fishing. A Recreational Use Management Plan will be prepared to ensure an appropriate level of development. (Goal 8, Objective 1).

Interpretive programs and facilities will be designed to avoid or minimize adverse impacts to wildlife. Recreational uses will be monitored to evaluate impacts, in addition to their effectiveness in meeting visitor expectations. For example, public visitation to view the black-capped vireo is anticipated to be seasonally heavy at the Refuge. To maximize viewing opportunities while protecting the resource, carefully designed and monitored access to specific vireo sites on the perimeter of the Refuge will be provided. The remainder of vireo habitat management areas will be generally closed to public visitation (exceptions may be made for special staff-led events such as International Migratory Bird Day activities, guided tours, etc.). Adjustments to program designs will be made as needed. All public use activities will be evaluated to ensure they are compatible with the purposes for which the Refuge was established.

Recreational hunting will be offered as a tool for wildlife and habitat management. For example, opportunities to hunt deer and feral

hogs will be provided as a management strategy to reduce disturbance to habitat for black-capped vireo, golden-cheeked warbler, and other wildlife. Turkey and dove hunting are historical recreational uses of lands within the Refuge, and will be allowed consistent with the Refuge hunt plan, and in accordance with State regulations.

As part of the planning process, the Refuge Project Leader reviewed all compatibility determinations for recreational use activities currently approved on the Refuge. All of the activities were determined to be compatible. The Compatibility Determinations are attached as Appendix F.

Administrative Needs and Approaches

Cultural Resources

To comply with the Departmental and U.S. Fish and Wildlife Service policy, the Refuge will follow established policies and procedures in the following areas: (1) Refuge construction projects, (2) law enforcement, (3) visitor use, (4) special use permits, research referral, (5) special-use permits, non-Service land use, (6) reporting new cultural resources, (7) reporting maintenance, stabilization, and protection needs, (8) National Register nominations, and (9) archives and collections.

Management actions will be evaluated for their potential impacts on archeological and cultural resources. This will include examination of sites slated for road and other facility development to ensure that archeological and historical resources are not damaged by these developments. Where resources are located, the Refuge will preserve these in place to the extent possible.

Research and Investigations

Natural science information is necessary for the proper management of any wildlife refuge. It is the policy of the Service and this Refuge to encourage and support research and management studies in order to provide scientific data upon which decisions regarding management of the Refuge can be based. The Refuge will also permit the use of Refuge lands for other scientific investigations when compatible with the objectives for which the Refuge was established. Priority will be given to studies that contribute to the enhancement, protection, use, preservation, and management of our endangered wildlife and their habitats as well as other native wildlife populations and habitats. As examples, studies completed to date have included a baseline geological survey, a study of Spanish oak acorn germination and mortality, sediment transport in karst systems, and fire effects on native grasslands.

Mineral, Oil and Gas Resources and Economic Uses

When available, all surface and subsurface mineral rights will be acquired with purchase of the land. However, if the mineral rights have been severed and are owned by a third party they will not be acquired unless offered by that third party. There is limited gas and oil potential on the Refuge. Oil leases in the area generally have been purchased by oil companies. If oil and gas drilling becomes profitable, normal Service regulations, policies, and guidelines for gas and oil exploration and extraction will be followed (50 CFR 29 and 31).

Staffing Pattern

Current permanent staffing of the Refuge is as follows:

Refuge Manager	GS-14
Refuge Operations Specialist	GS-12
Outdoor Recreation Planner	GS-11
Fire Management Officer	GS-12
Urban-Wildland Interface Specialist	GS-09/11
Assistant Fire Management Officer	GS-09
Wildlife Biologist	GS-12
Office Assistant	GS-05/06
Range Technician	GS-04/05/06
Fire Program Technician	GS-05
Heavy Equipment Operator	WG-09

IV. Management Goals and Objectives

Goal 1:

Restoration and enhancement of threatened and endangered species habitat on Refuge lands

Objective 1:

Restore and enhance 500 acres of black-capped vireo habitat within 10 years.

Current Status:

Populations of the black-capped vireo and golden-cheeked warbler have been declining in the Edwards Plateau largely due to human impacts on their habitat. Livestock grazing altered plant communities required by these species for feeding and nesting. Residential and commercial development have displaced native plant communities and resulted in human disturbance.

At the writing of this plan there are two large and one small nesting colonies of black-capped vireo on the Refuge, as well as a few scattered birds. Prior to acquisition, most of the Refuge was grazed by livestock (cattle, sheep, and goats). Range improvement practices, including brush clearing (cutting cedar for posts, chaining, and bull dozing) caused changes in native plant communities that both adversely and positively affected the vireo. Natural fires were suppressed and few controlled burns were conducted. For administrative reasons, deer hunting initially was prohibited on all tracts as they were acquired by the Refuge, although adjacent lands continued to be hunted. The Edwards Plateau is noted for high deer populations, and heavy browsing of shinoak by deer reduced its availability for nesting by the black-capped vireo. The Refuge hunting program, initiated in 1997, has reintroduced deer management on Refuge lands.

Rationale for Objective:

The Fish and Wildlife Service has trust responsibility for migratory birds and endangered species. Acquisition and improvement of habitat for these species is necessary to meet that responsibility. The Refuge was established to conserve threatened and endangered species. Protection of habitat for the endangered black-capped vireo as well as the endangered golden-cheeked warbler supports that refuge purpose.

Excessive stocking of cattle, sheep and goats, and removal of shrub cover as a range management practice is frequently detrimental to the black-capped vireo. The vireo occupies nesting habitat that is in an intermediate successional stage. Suitable habitat succeeds naturally into a less suitable state, but heavy grazing has kept replacement habitat from becoming established. In other areas, lack of natural fires has

Goal 1: Restoration and enhancement of threatened and endangered species habitat on Refuge lands.

resulted in growth of vegetation too tall for vireo use. Fire suppression has resulted in significant areas being invaded by Ashe juniper, and overgrazing has resulted in a lack of adequate grass to carry a fire. Active habitat management will be needed to maintain nesting areas. Subdivision development of private lands within the Refuge boundary also will threaten black-capped vireo habitat.

Strategies for Accomplishing Objective:

1. Identify and map black-capped vireo nesting habitat and potential restoration areas. (These will be primarily in the Post Oak Ridge Division).

2. Implement a prescribed burning program to set back succession and stimulate appropriate woody plant growth (e.g. shin oak and other hardwoods) in potential black-capped vireo restoration areas.

3. Implement mechanical clearing (tree shear, chain saw, bush axe, roller chopping, hydroaxe) of Ashe juniper that cannot be controlled with prescribed fire in areas with deep soils that would not otherwise eventually support golden-cheeked warbler.

4. Discontinue livestock grazing on Refuge lands except when and where it can assist in achieving habitat management objectives.

5. Implement a deer hunt program to keep deer numbers at one per 20 or more acres to reduce browse of black-capped vireo habitat.

6. Encourage the removal of feral hogs during all public hunts and by Refuge staff, as opportunities allow. Consider hiring a trapper to remove hogs if other methods prove insufficient.

Objective 2:

Maintain brown-headed cowbird parasitism on black-capped vireo nests below 10%.

Current Status:

Brown-headed cowbirds parasitize vireo nests. Refuge staff conducts brown-headed cowbird control in accordance with an established protocol to ensure humane treatment and to protect non-target species.

Rationale for Objective:

Nest parasitism is considered the most immediate threat to the vireo. Enhancing black-capped vireo populations will require control of nest parasitism, particularly through control of brown-headed cowbirds. (See

Goal 1: Restoration and enhancement of threatened and endangered species habitat on Refuge lands.

the Black-capped Vireo Recovery Plan[15] for further discussion of information behind this rationale.)

Strategies for Accomplishing Objective:

1. Continue existing trapping efforts in the Central and North Post Oak Ridge Units using staff, or through contracting.

2. Monitor nest parasitism of black-capped vireo on the Refuge and adjust the trapping program as necessary.

Objective 3:

Protect existing golden-cheeked warbler habitat on Refuge lands and enhance additional areas for golden-cheeked warbler where appropriate.

Current Status:

Approximately 500 warbler territories have been identified on 16,000 acres of the Refuge. A minimum of 6,000 acres of potential golden-cheeked warbler habitat are expected to be added to the Refuge over the next 10 years through land acquisition from willing sellers. Vegetation supporting the warbler is varied. However, juniper-oak woodlands with greater than 50% of the canopy cover[16] over 15 feet tall can support nesting birds. Excessive grazing by cattle and browsing by deer have inhibited regeneration of hardwoods in warbler habitat on the Refuge. Several centers of oak wilt have been noted on the Refuge and may present a threat to golden-cheeked warbler habitat. Vegetation succession for development of golden-cheeked warbler habitat is a slow process, requiring 20 to 50 years.

Rationale for Objective:

The golden-cheeked warbler is an endangered species. The Refuge was established for conservation of endangered species. Although the Refuge currently contains good golden-cheeked warbler habitat, there is considerable potential for enhancement of habitat over the next 10 years through proper management.

Excessive numbers of domestic livestock and deer can be harmful to warbler habitat. Management practices can be targeted at reducing browse to promote regeneration of hardwood species, thereby enhancing the value of the habitat for golden-cheeked warbler.

---

[15]Black-capped Vireo Recovery Plan. U.S. Fish and Wildlife Service (1991)

[16]Canopy cover is a term used to describe the leafy area that would create a shadow at high noon when viewed from above. In general it refers to tree cover.

Goal 1: Restoration and enhancement of threatened and endangered species habitat on Refuge lands.

Strategies for Accomplishing Objective:

1. Define and map potential mature woodland areas suitable for golden-cheeked warbler nesting and fledgling dispersal.

2. Encourage growth of woodland areas in the Canyonlands Division into mature woodland suitable for golden-cheeked warbler nesting.

3. Maintain white-tailed deer at one per 20 or more acres and attempt to eliminate feral hogs to reduce impacts on recruitment of hardwood trees.

4. Protect warbler habitat from wildfire and reduce hazardous fuel loads.

5. Monitor the level of cowbird nest parasitism on golden-cheeked warbler and implement cowbird control if nest parasitism exceeds 10%.

6. Monitor for oak wilt and seek controls for any outbreaks.

Objective 4:

Within five years design and begin to implement a plan to locate and map caves and other karst features, monitor changes occurring in them, and take actions as needed to protect them.

Current Status:

Little is known regarding the extent of karst habitat on the Refuge or species that use the karst formation on Refuge lands. Eleven karst invertebrates have been identified in a preliminary survey of Refuge karst habitat. Additional species are known to occur in similar habitat elsewhere in the Edwards Plateau; those species may or may not be found on the Refuge. The Refuge has learned of karst entrances on Refuge lands from landowners and local citizens, and through staff field work. Some of the entrances (usually cracks or holes through the rock in the ground) have been located. Others undoubtedly exist and need to be located.

Rationale for Objective:

The number of karst invertebrate species in the Balcones Canyonlands may exceed 200 as new species are described. The potential for so many new species results from the isolation of karst habitats from each other through ground faulting and river terrace erosion. Some of these species may be threatened or endangered. Some karst cave openings are large enough to attract the curiosity of Refuge visitors, creating a potential hazard for both visitors and cave species. Imported red fire ants occur commonly on the Refuge and have been documented preying on cave invertebrates. Fire ant impacts need to be monitored and evaluated, and

Goal 1: Restoration and enhancement of threatened and endangered species habitat on Refuge lands.

control actions taken if needed to minimize negative impacts on karst species.

Strategies for Accomplishing Objective:

1. Map known cave locations and new locations as they are discovered.
2. Talk to previous land owners to determine location of caves.
3. Monitor caves for fire ants and implement control measures if warranted. Encourage use of biological and other nonchemical control of fire ants with the aid of university researchers; use poison baits that target fire ants as an additional control measure, if needed.
4. Conduct periodic surveys of cave biota.
5. Protect areas of known karst cave openings from public access.

Objective 5:

Continue to support and promote the conservation of the golden-cheeked warbler and black-capped vireo in their migration and wintering areas through coordination with Central American ornithologists and participation in the Nature Conservancy's International Program.

Current Status:

Refuge staff communicates with researchers who are conducting studies elsewhere in Texas, and in Mexico, Guatemala and Honduras, which target the golden-cheeked warbler and black-capped vireo. The Refuge Wildlife Biologist undertook a survey in 1996 for potential new breeding populations of the warbler in Coahuila in northern Mexico.

Rationale for Objective:

A common criticism of protection efforts for the warbler and vireo breeding grounds in Texas is their questionable efficacy in the absence of similar efforts to protect the birds migration and wintering grounds. While the Refuge will be seriously limited in supporting these latter efforts, staff can offer support on a limited scale.

Strategies for Accomplishing Objective:

1. Maintain and enhance contacts with researchers studying the warbler and vireo on other parts of their range.
2. Establish contacts with land managers and agencies that work with or control important areas of migration and wintering habitat.

Goal 1: Restoration and enhancement of threatened and endangered species habitat on Refuge lands.

3. Investigate the potential for establishing sister refuge links with key tracts located on the migration and winter ranges.

4. Within staffing and funding limitations, participate in research efforts related to warbler and vireo outside of their breeding ranges in Texas.

5. Cooperate with Recovery Teams (consisting of a cross-section of scientists from a variety of disciplines) for the black-capped vireo and golden-cheeked warbler.

Goal 2:

Protection and enhancement of habitat for a diversity of wildlife including other migratory birds

Objective 1:

Within ten years restore and manage at least 1,000 acres of existing and former native grassland and savannah habitat on the Refuge and increase the amount and diversity of native annual and perennial grasses and forbs on the refuge.

Current Status:

Native midgrass and tallgrass prairies are among the most endangered of all habitats in Texas. In the Refuge area, only very small remnants of original prairie or savannah remain. Most of the desirable native prairie species are still found on the Refuge in small corners, edges, and other protected spots but are nowhere common. Many grasslands on the Refuge have been converted to non-native species (King Ranch (KR) bluestem, for example) for cattle grazing when they were in private ownership. Fire suppression has led to juniper encroachment in some grasslands. Other grasslands have deteriorated from previous grazing practices and drought. Grass cover loss is exacerbated by the erosion of topsoil. The few native grasslands remaining on the Refuge are in poor condition. A prescribed fire program was initiated in 1996-97 which has resulted in removal of young invading junipers and improved growth of native grasses and forbs on refuge tracts.

Rationale for Objective:

Native prairie grasslands and savannahs typically have several dominant perennial species such as big bluestem, Indian grass, foxglove (*Penstemon cobaea*), and Indian paintbrush (*Castilleja purpurea*) which are lost when the areas are plowed or heavily grazed over a period of many years. Several nesting and wintering bird species, some specialized invertebrates and a variety of other wildlife are dependent on the presence of large tracts of prairie and savannah habitats with their diverse structure and composition of grasses and forbs. Most grasslands on the Refuge lack a full complement of these prairie-dependent wildlife species that normally would be found in a native grassland.

The US Fish & Wildlife Service has responsibility for protecting migratory birds under International Migratory Bird Treaties with Mexico and Canada (Appendix A.) Providing grassland for declining species will preserve habitat as a buffer against loss of habitat elsewhere.

Goal 2: Protection and enhancement of habitat for a diversity of wildlife including other migratory birds.

Strategies for Accomplishing Objective:

1. Conduct controlled burns on the grassland areas where KR bluestem is dominant, consistent with the long-term prescribed fire program described in the FMP (USFWS, 2001).

2. Seed areas with native prairie species where necessary for restoration.

3. Use mechanical means (mowing, disking, re-seeding) if needed to control exotic grasses and encourage replacement with native prairie species.

4. Evaluate grazing as a management tool to enhance diversity. Introduce or maintain grazing only where it will be beneficial to endangered species habitat with minimum attraction of cowbird populations.

5. Monitor effectiveness of restoration efforts

6. Use integrated pest management methods[17], where feasible, to control exotic species.

Objective 2:

Within 10 years, design and implement a plan to restore wetlands and riparian corridors.

Current Status:

There are few riparian and wetland areas on the Refuge although historically bottomland hardwood forests occurred in the canyons. It is likely that many of the hardwood species, such as sumac, hackberry, and pecan were prevented from reestablishing due to excessive browsing by livestock (primarily goats and cattle) and deer. Deer populations are probably much higher now than they were at the turn of the century. Degradation of the riparian corridor has impacted water flow, evaporation rates, and soil formation and reduced wetlands that originally occurred on lands now included in the Refuge. Colonization of hillsides and hilltops by juniper has also contributed to a loss of ground water flows, altering wetland hydrology.

Rationale for Objective:

Riparian woodlands typically harbor some of the highest density and diversity of songbirds and other wildlife of any habitat in semiarid

[17]Integrated pest management combines use of chemical herbicides, natural controls and mechanical means to achieve acceptable levels of nuisance plants.

Goal 2: Protection and enhancement of habitat for a diversity of wildlife including other migratory birds.

portions of the Southwest. This includes substantial numbers of neotropical migrant birds. Riparian corridors provide important wildlife cover where they are adjacent to open and semi-wooded habitats; they provide shady moist habitat, especially during drought conditions, even in heavily wooded landscapes such as in the Canyonlands Division of the Refuge.

Strategies for Accomplishing Objective:

1. Remove cattle grazing from bottomland areas as lands are acquired, to allow regrowth of bottomland hardwood species. Cattle grazing may be reimplemented in restored bottomland areas on rotational systems once hardwood species are restored, if Refuge management determines that grazing is compatible with the Refuge's mission.

2. Implement a big-game hunt for white-tailed deer and feral hogs to reduce their populations and thereby reduce interference with restoration efforts.

3. Research potential benefits of replanting hardwoods to accelerate recovery.

4. Protect riparian areas from catastrophic wildfires.

5. Restore small wetlands and springs as funding allows.

Objective 3:

Within ten years rehabilitate and improve existing wells for wildlife water sources for public viewing sites using wind and solar power.

Current Status:

Existing water sources for wildlife include the near-perennial Cow Creek, numerous intermittent wet weather creeks, small natural springs and about 12 to 15 man-made ponds (on current Refuge tracts). Few of these resources are located in areas planned as public wildlife viewing areas.

Rationale for Objective:

The patterns of wildlife use among many habitats in the Refuge are dependent to some degree on the location and predictability of open water resources. In addition to strictly aquatic species, many species of songbirds, game species, and medium to large mammals seek out water daily. Their distribution on the Refuge reflects their use of and response to these often variable water sources. During moderate to severe droughts, which are natural conditions in this semiarid landscape, wildlife distribution and movements may be altered greatly to adjust to declining availability of water.

While it is not the objective of the Refuge to significantly alter the natural patterns of animal distribution nor to interfere with natural

Goal 2: Protection and enhancement of habitat for a diversity of wildlife including other migratory birds.

processes of drought and water abundance, supplemental water can benefit wildlife locally and provide for enhanced wildlife viewing for the general public. Refurbishing existing water wells can provide a suitable source for supplemental water at carefully selected sites. This will be coupled with efforts to ensure the safety of the water supply and to avoid detrimental impacts to local wildlife populations or area water supplies. Due to the expense and possibly intrusive nature of electrical water pumps, it is desirable to convert or construct solar- or wind-powered water pumps.

Strategies for Accomplishing Objective:

1. Refurbish water wells on Refuge, particularly those at/near potential public wildlife viewing areas and create small scale wildlife watering stations.

2. Where feasible, convert such wells from electric to solar or wind power.

3. Periodically monitor well levels and well water quality to ensure that a sufficient supply of suitable water is available.

4. Qualitatively monitor wildlife populations and habitats around supplemental water sources for any long-term detrimental impacts.

Objective 4:

Control invasive species (e.g. second-growth juniper, prickly pear and false-willow) on at least 50 acres per year to improve ground cover and plant diversity.

Current Status:

In a qualitative survey prepared in March 1996, staff estimated the following acreages of invasive shrub and tree species on Refuge tracts:

Ashe juniper	3000 acres
Prickly-pear cactus	200 acres
Honey mesquite	200 acres
Chinaberry tree	50 acres

In addition, false-willow (*Baccharis neglecta*) is found on various disturbed sites and is locally common in all but the Canyonlands Division. Malta starthistle (*Centaurea melitensis*), an annual weed, is established on some areas of the Refuge. This species has the potential to dominate large areas. Mowing is used to control annual plant. A few other invasive, non-native species such as tree-of-heaven (*Ailanthus altissima*), ligustrum (*Ligustrum* sp.) and nandina (*Nandina nandina*) occur very locally. (The juniper acreage listed above excludes areas of actual and potential habitat for the golden-cheeked warbler, where junipers are an important part of the habitat.)

Goal 2: Protection and enhancement of habitat for a diversity of wildlife including other migratory birds.

Rationale for Objective:

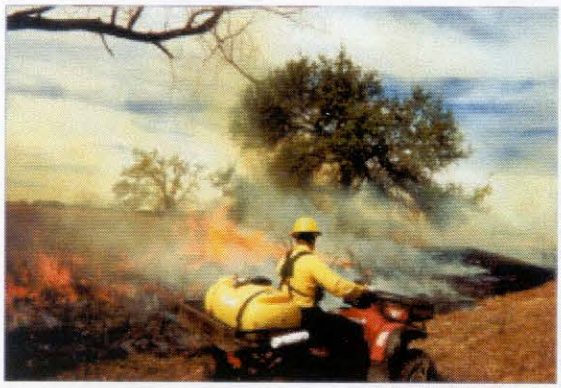
Whether native or non-native, these invasive species have a tendency to take over an area and thus lower the plant and habitat diversity available for wildlife. Their presence and abundance is often the result of past disturbance of the habitat or an imbalance in natural habitat factors such as a lack of natural fires.

Strategies for Accomplishing Objective:

1. Implement an effective prescribed fire program consistent with the Refuge FMP to reintroduce fire into the Refuge's ecosystems.

2. Where practical and feasible, remove invasive species by hand and/or by mechanical means.

3. Coordinate with other land managers and the scientific community to identify the latest available control methods.



USFWS Photo

Refuge staff managing a prescribed fire.

Objective 5:

Reduce the Refuge white-tailed deer herd to achieve and maintain a density of one deer per 20 or more acres within five years to reduce adverse effects on Refuge habitat.

Current Status:

White-tailed deer populations in the Texas Hill Country are among the densest in the country. Although there have been local, severe die-offs, populations remain very high. Evidence of heavy deer browsing is present on the Refuge and it is believed to be harming black-capped vireo nesting habitat. Starting in 1997, the Refuge implemented an approved hunting plan, and hunting occurs on adjacent private lands as well. Biologists with Texas Parks and Wildlife Department have recommended that the Refuge allow removal of a significant portion of the deer herd to reduce browsing impacts on vireo nesting habitat and permit greater mast (acorn) availability for use by other wildlife species.

Rationale for Objective:

Large deer herds have a negative impact on the recruitment and growth of native vegetation, particularly the hardwood tree species which are important components of the habitat for vireo and warbler. Spanish oak sprouts in warbler habitat are frequently eaten before they can grow

Goal 2: Protection and enhancement of habitat for a diversity of wildlife including other migratory birds.

beyond the reach of an adult deer. Shin oak sprouts are frequently browsed and kept lower than ideal for black-capped vireo.

The Refuge was established in part to protect black-capped vireo. Deer browsing may reduce available nesting habitat for the black-capped vireo, retard succession, and could result in a reduction in successful nests. Reducing the number of deer will protect and possibly enhance existing nesting habitat for the vireo and protect areas newly planted for vireo habitat.

Strategies for Accomplishing Objective:

1. Monitor the Refuge deer population through spotlight counts and check-station data to determine the number of deer per acre.

2. Conduct public deer hunts to reduce deer numbers to desired levels.

3. Monitor vegetation changes through use of deer exclosures, transects and photo plots.

Objective 6.

Maintain and increase herbarium collection and print a Refuge Plant list within three years. Identify native plant and wildlife species that are unique to the Balcones Canyonlands region for potential restoration and enhancement on the Refuge.

Current Status:

The Refuge has a variety of species, both plants and animals, that are unusual for its location. The Texabama croton, a large, woody plant, for example, was thought only to occur in Alabama. It was found on lands now in the Refuge less than 10 years ago. The Texas madrone is also found on the Refuge and in a few scattered stands elsewhere in Travis County, although generally it is found only in extreme western Texas. Other species found on the Refuge that are unusual for the area include the Eastern shooting star (*Dodecahteon meadia*), Carolina basswood (*Tilia americana* var. *caroliniana*), javelina, and black-throated sparrow. A variety of unusual, uncommon, and unique cave-adapted invertebrates may occur on the Refuge.

Rationale for Objective:

One of the purposes of the Refuge is to preserve part of the Hill Country natural heritage with its representative flora and fauna. The Refuge is located at an ecotone, where eastern and western species converge and join a number of species unique to the Hill Country. While some of the

Goal 2: Protection and enhancement of habitat for a diversity of wildlife including other migratory birds.

unique plant and animal species are common and may need no special attention (e.g. twisted-leaf yucca, Texas mouse), other special species may either be rare or occur in sensitive habitats (e.g. Texabama croton, cave myotis bats (*Myotis velifer*). The tremendous variety of plants and animals on the Refuge, including the unique species, contributes toward the overall biological diversity and stability of this ecosystem. There are opportunities to restore habitats to presettlement conditions.

Strategies for Accomplishing Objective:

1. Inventory unusual and unique species found on the Refuge and, where possible, identify factors that contribute toward their presence.

2. Identify management actions that can be taken to support populations of these species on the Refuge.

3. Identify extirpated species and evaluate the feasibility of their reintroduction on the Refuge.

Objective 7:

Control feral, exotic and domestic animals that can compete with native wildlife and damage its habitat (e.g. dogs, cats, feral hogs, emu, etc.). Complete hog control plan within three years.

Current Status

The Texas Parks & Wildlife Department reports that feral hogs are increasing in numbers throughout Central Texas. Numbers on the Refuge also appear to be increasing as more and more physical sign is observed. Some feral cats and dogs have also been observed on the Refuge, as well as wandering domestic pets. Blackbuck antelope have occasionally been sighted on the Refuge.

Rationale for Objective:

Feral animals can inflict damage to wildlife populations and habitat. Feral cats feed on birds, mammals, reptiles and insects. Feral hogs cause direct and indirect damage through feeding, rooting and wallowing activities; they also compete with deer and turkey for food and possibly prevent reestablishment of oak trees. Exotic, non-native species can also serve as reservoirs for diseases such as rabies, pseudo rabies, and brucellosis.

Goal 2: Protection and enhancement of habitat for a diversity of wildlife including other migratory birds.

Strategies for Accomplishing Objective:

1. Reduce feral hog populations by making them legal game during Refuge hunts.

2. Plan and implement a program to educate the public about harm caused to wildlife and its habitat by free ranging dogs and other domestic animals on and near the Refuge.

3. Remove feral animals by live trapping where feasible, or by lethal means where necessary.

4. Permit certain exotic animals to be taken on the Refuge during deer hunts.

Goal 3.

Restoration of watershed health to minimize erosion and siltation, enhance seasonal stream flow, and maximize ground and surface water recharge

Objective 1:

Restore native plant growth on eroded and disturbed sites to increase water holding capacity of the soils. Restore 50 acres per year.

Current Status:

Decades of excessive grazing by livestock have resulted in eroded soils and increased runoff and siltation in the Balcones area. Streams and creeks are "flashy" and run dry in the summer. Many of the tanks created for livestock watering do not hold water during dry periods. Ashe juniper has invaded, reducing grass cover, with subsequent erosion of soils.

Rationale for Objective:

Sheet runoff and erosion degrade water quality and reduce the amount of soil moisture and groundwater. Conservation of ground and surface water is important, especially during drought situations. Restoration of vegetative cover and accompanying topsoil will result in higher absorption and water holding capacity, restore groundwater, and improve the quality of surface water.

Strategies for Accomplishing Objective:

1. Establish a monitoring and sampling program for water wells on the Refuge to measure where changes in water quality and quantity are occurring.

2. Control invasive plant species (e.g. second-growth juniper, prickly pear, false-willow) by use of prescribed fire and other integrated pest control methods to improve ground cover and plant diversity.

3. Restore native grasslands in former farm and grazing lands.

Goal 4:

Development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation

Objective 1:

Through increasing visitation to 5,000 visitors per year, provide public opportunities to view and learn about Refuge wildlife species and representative habitat characteristics of the Texas Hill Country, and to promote a conservation ethic.

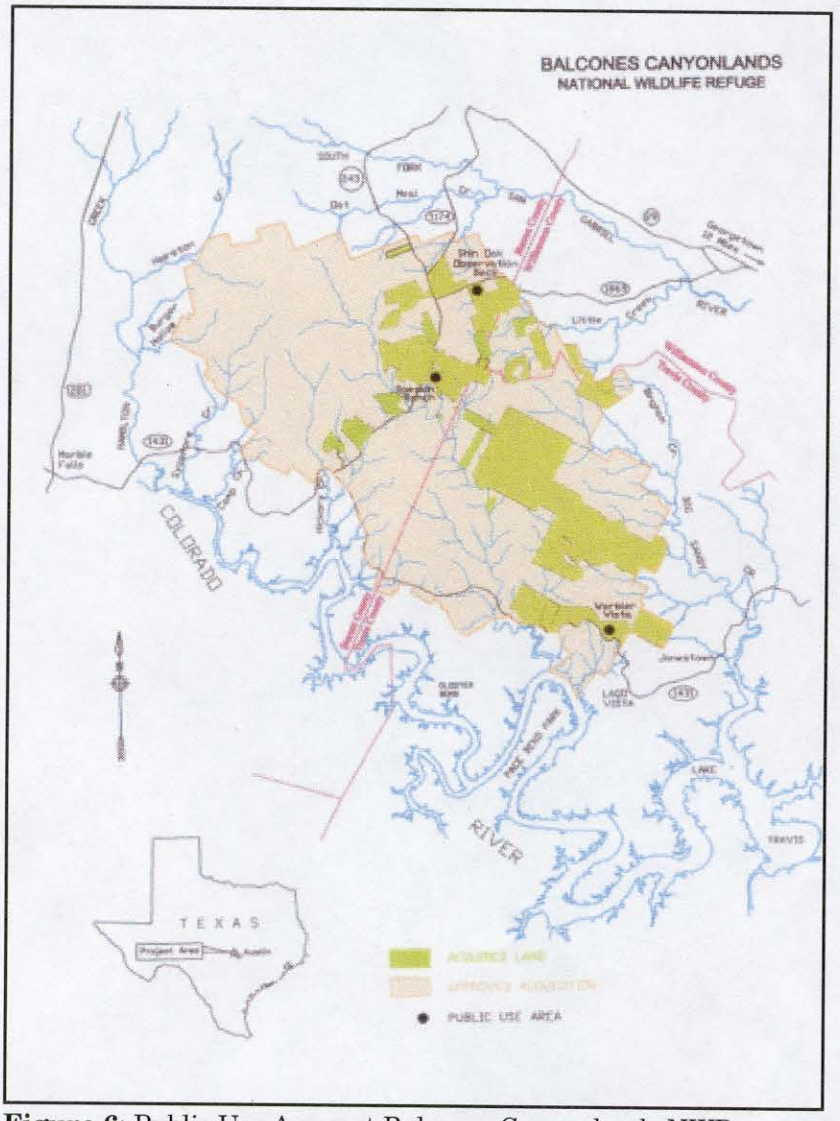


Figure 6: Public Use Areas at Balcones Canyonlands NWR

Current Status:

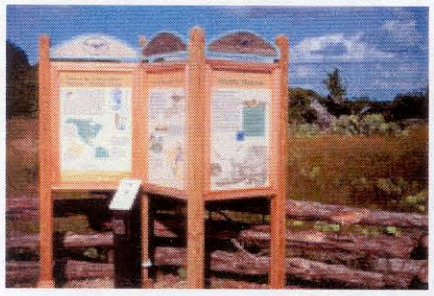
The Refuge currently operates an observation deck overlooking black-capped vireo nesting habitat in the Central Post Oak Unit. The deck includes an interpretive sign board, parking and a shaded viewing area. Additionally, an interpretive trail and outdoor classroom are currently being developed on the Doeskin Branch Unit to interpret the area's natural and cultural heritage and provide environmental education opportunities. A gravel parking lot with gate and primitive trails have been developed on South Post Oak Ridge Division along FM1431. These trails provide visitors a view of golden-cheeked warbler habitat (Figure 6 shows the location of public use facilities).

Other public use facilities and interpretive facilities are being expanded as land is acquired. Currently,

Goal 4: Development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation.

Photo by Chuck Sexton

View of vireo observation deck from accessible walkway.



USFWS Photo

Interpretive kiosk at vireo overlook

access to and interpretive opportunities available within the Doeskin Ranch Unit and at the north edge of the Central Post Oak Unit make these the most logical sites for public use. Other opportunities include scenic vistas adjacent to country roads and state highways and interpretation of karst caves and the geological history of the area.

Rationale for Objective:

The Service has stewardship responsibility for both migratory birds and species listed under the Endangered Species Act, including the black-capped vireo and the golden-cheeked warbler. This stewardship can only be accomplished with the understanding and support of citizens. Because nature-based tourism is the fastest rising leisure pursuit in the United States, there is a demand for wildlife observation and other wildlife dependent enjoyment of natural resources. In fact, the Refuge System Mission calls for providing opportunities for the enjoyment of wildlife, when they can be offered without conflicting with Refuge purposes. The intent of this objective is to meet the identified need for opportunities to view wildlife, interpret Refuge resources, increase public understanding and appreciation for the species and their habitats.

Impacts of birding tours, including small commercial tours, upon golden-cheeked warbler and black-capped vireo would be minimized since they would be permitted only under very controlled conditions. Construction and use of wildlife observation decks in black-capped vireo and golden-cheeked warbler habitat would also be highly controlled. Certain public use facilities would be closed during periods of high sensitivity to prevent impacts to the endangered songbirds. For example, the vireo observation deck is annually closed for three to four weeks from mid-March through April to allow male vireo time to establish breeding territories without disturbance. Other facilities may also be seasonally closed. Monitoring of the effects of the public on the black-capped vireo colonies would ensure that the colonies were not being adversely affected, by permitting modification of deck design, or other actions to be taken before a colony is impacted.

Strategies for Accomplishing Objective:[18]

1. Develop a public use plan to guide development and management of opportunities to view, experience, and learn about key resources on the Refuge. Periodically evaluate effectiveness of

[18]An Environmental Assessment (EA) will be prepared for each significant construction activity and made available to the public for review and comment. Additionally, an intra-service consultation under Section 7 of the Endangered Species Act will be completed prior to any activity that may potentially effect the habitat of any endangered or threatened species.

Goal 4: Development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation.

developments in meeting target audience needs through visitor surveys.

2. Develop a plan for placement of signs to identify the Service as the managing agency, and to welcome and orient visitors to the refuge.

3. Develop and provide Refuge brochures and information for a variety of audiences at key visitor access points, and within the primary market distribution area.

4. Design, construct, and maintain observation decks in the central Post Oak Ridge Unit for viewing songbirds, focusing on the endangered black-capped vireo. Construction projects will be scheduled to occur during the fall and winter months when black-capped vireo and golden-cheeked warbler are not present.

5. Develop observation opportunities for viewing migratory songbirds, particularly the endangered golden-cheeked warbler, on the Lake Unit, Post Oak Creek Unit, and/or the Southern Unit of the Post Oak Ridge division. In addition, a trail is currently being developed on the Doeskin Ranch Unit. These opportunities should be provided in a manner that will minimize impact to the birds.

6. Develop interpretive materials for the prairie grassland restoration and enhancement efforts on the Little Creek Unit.

7. Provide vehicle pullouts and interpretive signage at scenic vistas.

8. Develop interpretive materials for karst (cave) habitat and associated wildlife in a manner that will provide protection to caves, to avoid impacts on possible sensitive species.

9. Coordinate with entities to facilitate planning a Texas Hill Country Birding Trail, analogous to the Texas Coastal Birding Trail. The birding trail will increase access and enhance enjoyment of birds, including endangered songbirds, and other wildlife.

10. Construct trails and outdoor classroom at Doeskin Ranch Unit to interpret natural and cultural heritage of the Texas Hill Country and provide Environmental Education opportunities.

11. Coordinate with area schools to determine types of outdoor environmental education materials or opportunities would most fit into their curriculums.

Goal 4: Development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation.

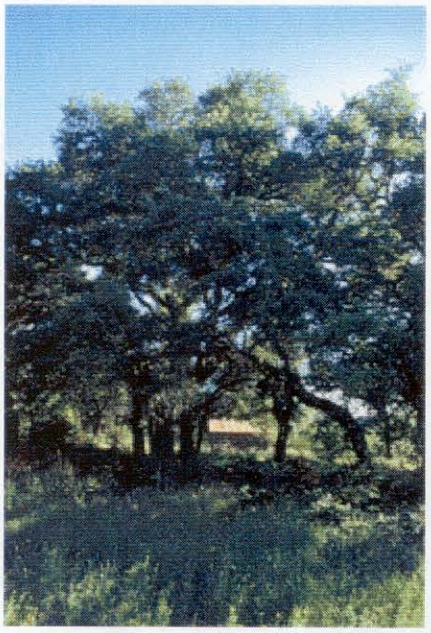
12. Schedule guided tours of the Refuge for owners of neighboring lands to inform them of habitat needs for the endangered species and demonstrate applicable management options.

13. Cooperate with the communities of Lago Vista, Marble Falls and other local communities on the Texas Songbird Festival and other similar events.

14. Develop stipulations and guidelines for issuance of Special Use Permits for commercially lead tours.

Objective 2:

Provide compatible wildlife dependent outdoor recreational opportunities for the public on the Refuge to include wildlife viewing access, while striving for a balance between conflicting user groups. Annually evaluate hunting program to include newly acquired tracts.



USFWS Photo
Old corn crib near outdoor classroom site at Doeskin Ranch

Current Status

The black-capped vireo observation deck on the Post Oak Unit is currently available to the public. The interpretive trail and outdoor classroom on the Doeskin Ranch Unit are anticipated to be open to the public in the fall of 2000. The Refuge is otherwise currently closed to public except for special events and guided tours. No bicycle, or horseback riding events have been conducted on the Refuge since its inception and none are planned at this time. The Refuge annually conducts a managed public hunt to reduce deer populations for habitat protection.

All public activities on the Refuge currently are, and will continue to be, restricted to prevent impacts to nesting black-capped vireo or golden-cheeked warbler. Such restriction may include closure of some trails and facilities during all portions the nesting season for the birds (roughly March through August).

Rationale for Objective:

The area around the Refuge is rural. At the present, most interest in recreational pursuits is centered around hunting and fishing. The population of the Austin Metropolitan Area is growing rapidly. With the lack of accessible public lands in the area, there is a growing demand and need for opportunities for outdoor recreational activities including wildlife/wildlands observation. In addition, the Texas Wildlife Association has identified the need for affordable hunting opportunities for Texas residents. In accordance with the National Wildlife Refuge System Improvement Act of 1997, the Refuge will provide wildlife-dependent recreational opportunities (the six priority wildlife dependent public uses

Goal 4: Development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation.

for Refuges, as defined in the Act are: hunting, fishing, wildlife observation and photography and environmental education and interpretation) when they do not conflict with the primary purpose for which the Refuge was established.

***Strategies for Accomplishing Objective*:**

1. Acquire or develop a visitor center on or near the Refuge.

2. Provide information, in the form of maps and posting of Refuge boundary signs, to identify Refuge lands and protect adjacent private lands from trespass.

3. Develop parking areas in recreational areas to identify authorized public access points and avoid or minimize potential impacts to wildlife habitat.

4. Provide universal access for facilities and developments.

5. In conjunction with Texas Parks and Wildlife Department, provide opportunities for hunting deer and feral hogs as a means for managing habitat for black-capped vireo, golden-cheeked warbler and other wildlife.

6. In conjunction with Texas Parks and Wildlife Department, and in accordance with State Regulations, provide turkey hunting concurrent with deer hunts and dove hunting. Plant food crops to attract doves, such as sunflowers and croton, on a limited basis.

7. In conjunction with Texas Parks and Wildlife Department, evaluate the potential for other small game hunting opportunities, where compatible with other priority goals and objectives.

8. Provide fishing opportunities as lands are acquired within the Cow Creek Corridor which permit access to Cow Creek.

9. Continue to hold fishing derbies during National Fishing Week.

10. Allow commercial guides to lead small group birdwatching events under a special use permit, to supplement Refuge staff-led events.

11. Hold other wildlife compatible special events, as opportunities arise.

Goal 4: Development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation.

Objective 3:

Within five years develop a public outreach program to aid in the understanding of Refuge purposes, issues specific to Balcones Canyonlands NWR.

***Current Status*:**

Due to limited staffing, communication with the surrounding landowners and communities has been limited. To date, no outreach strategy specific to Balcones Canyonlands NWR has been prepared. Refuge staff have and will continue to participate the Region 2 Refuge Ambassador Program, a program of outreach and customer service training aimed at developing staff skills in these areas.

***Rationale for Objective*:**

Public support is essential for endangered species recovery, land acquisition, and Refuge management activities. A public that understands the need for regulations is more accepting of them.
Strategies for Accomplishing Objective:

1. Develop a Public Outreach Strategy to:
   - ♦ Assess public perception and outreach needs, particularly those related to existing and potential issues of concern;
   - ♦ Identify target audiences;
   - ♦ Identify goals and messages specific to issues and programs;
   - ♦ Identify outreach tools to be used; and
   - ♦ Develop and implement the outreach program and evaluate its effectiveness.
2. Train staff in outreach techniques, and use such techniques during daily Refuge management activities when feasible.
3. Maintain effective communication channels with media.

Objective 4:

Within five years design and Implement Partnership and Volunteer programs to facilitate meeting Refuge management objectives.

Goal 4: Development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation.

Current Status:

Currently there is only a small volunteer program. However, public interest in doing volunteer work and developing a Friends of the Refuge organization has been expressed. While some effort to contact in-holding and adjacent landowners has been made, there has been no organized effort to provide technical assistance for wildlife habitat management which will directly or indirectly benefit the Refuge.

Rationale for Objective:

Funding and staff constraints, the Service Mission, and issues surrounding acquisition and management of the Refuge all point to a need for volunteers and partnerships. Volunteers tend to better understand the need for the Refuge and its management policies than do members of the public at large. As a result, a cadre of volunteers becomes advocates for the Refuge and its management. Such advocacy can contribute to local community-based support for the refuge, and ultimately to support for the National Wildlife Refuge System. Visitors to the Refuge also benefit from the work of volunteers, from the enthusiasm and dedication exhibited by volunteers, and from personal contact with those volunteers. Partnerships formed with environmental groups will facilitate the education of the public regarding Refuge needs and values. Partnerships with in-holding and adjacent landowners will enhance the benefits of the Refuge, whether by providing wildlife corridors to facilitate movement of wildlife across property lines, by improving scenic vistas, or in other ways.

Strategies for Accomplishing Objective:

1. Identify staff to coordinate the volunteer program.

2. Develop a Volunteer Management Plan that identifies volunteer opportunities and includes descriptions of tasks that will benefit the volunteer, the refuge, and the public.

3. Recruit, train, and evaluate volunteers, providing them a unique learning experience on the Refuge.

4. Encourage and support development of a Friends of the Refuge support group.

5 Express appreciation for volunteers verbally, through letters, and with awards.

6. Establish and enhance partnerships with federal, state, and local governments, conservation organizations, in-holding and adjacent landowners, and volunteers.

Goal 4: Development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation.

Objective 5:

Improve five miles of public or administrative roads per year to improve access to the Refuge for public and administrative use.

Current Status:

Many of the roads leading to Refuge tracts are in poor condition and cross private lands; entry is through locked gates, making lands inaccessible to the public. Many roads are too steep for vehicles without 4-wheel drive. Junipers are growing on the road shoulders and their branches are closing in over many of the roads.

Rationale for Objective:

Good, all-vehicle roads are needed for public access. Specific areas, such as endangered species habitat, will need controlled access points to minimize impacts to sensitive habitat. Refuge staff need access to meet wildlife, habitat, and fire management goals, and enforcement of regulations.

Strategies for Accomplishing Objective:

1. Develop a Road Access Plan using Global Positioning System (GPS) coordinates, that incorporates management strategies for sensitive resources and other management objectives, including controlled access points.

2. Identify and post service roads and public access roads to ease identification of each.

3. Purchase road maintenance equipment.

4. Grade and maintain roads for vehicle use in areas identified for public use.

5. Maintain Refuge service roads for administrative use.

6. Identify appropriate materials and construction techniques for steep and rocky road conditions found on the Refuge.

Goal 5:

Protection of habitat within approved Refuge boundaries by fee acquisition or conservation easement

Objective 1:

Annually review and update the land protection plan priorities. Acquire lands according to revised priorities.

***Current Status*:**

The Land Protection Plan priorities were established in 1991 based on several criteria. These criteria included (1) biological significance; (2) short and long-term threats to habitat alteration; (3) management efficiency; and (4) opportunity to purchase from willing sellers.

In general, only lands available from willing sellers are considered for purchase. Before steps are taken to purchase a tract, aerial photographs are examined and an inspection of the property is made with the landowner or their representative to assess wildlife habitat.

The June, 2000, boundary expansion of 34,000 acres, increased the total area encompassed by the Refuge boundary to 80,000 acres. Acquisitions to date include 17,019 acres, or only about 21 percent of the lands within the current Refuge boundary.

Rationale for Objective:

A number of the tracts initially identified in 1991 have been acquired. Additionally, the recent boundary expansion has added considerably to the land base for potential acquisition. Refuge staff knowledge of tracts within the earlier, 46,000 acre, Refuge boundary has increased over the past several years. Updating the Land Protection Plan priorities to reflect the additional Refuge area, increased knowledge of local conditions and acquisition history is thus appropriate.

Acquiring lands based on these priorities will ensure that the best quality habitat will be purchased as quickly as possible to provide protection and habitat for endangered species and other wildlife.

Strategies for Accomplishing Objective:

1. Document resource values of tracts available from willing sellers at fair market value.

2. Review and acquire available tracts based on criteria identified above, and revise the Land Protection Plan accordingly.

Goal 5: Protection of habitat within approved Refuge boundaries by fee acquisition or conservation easement.

3. Acquire lands based on the updated Land Protection Plan.

Objective 2:

Meet with five private owners of lands within the Refuge per year to exchange information and provide assistance on management of wildlife populations and endangered species habitat.

Current Status:

Within the 80,000-acre approved acquisition boundary, only about 17,019 acres are currently owned and managed by the Service. The remainder of the lands, including extensive areas of endangered species habitat and an abundance of other wildlife and other sensitive resources, are privately owned and managed. While land management goals and practices on these lands vary widely, most landowners share a common sensibility for the protection of wildlife. Land management efforts often include consideration of supplemental water sources and feeding. A concern for the health and abundance of game species has lead to the creation of the nonprofit Oatmeal Wildlife Management Association in the Refuge area to help landowners share information and resources.
This may allow conversion of some marginal agricultural operations on private land within the Refuge boundary to wildlife management practices. Implementation of wildlife habitat conservation management practices in the place of existing heavy grazing and browsing by domestic livestock could greatly benefit many song bird species on the Refuge, including the black-capped vireo. The Texas Parks & Wildlife Department advises local taxing authorities on which management practices comply with the statute. Protection and enhancement of endangered species habitat are explicitly included among the possible wildlife enhancements available to a landowner.

Rationale for Objective:

It is unlikely that the Service will ever acquire the entirety of the designated 80,000-acre land area approved for purchase. Nonetheless, progress toward the conservation goals of the Refuge can be attained by interacting with private landowners within the Refuge boundary who share similar goals and perspectives on wildlife conservation. A great deal of practical land management wisdom and history is available from the collective experience of land managers in the Refuge area. In addition, to the extent feasible under current staff and budgetary limitations, it is obviously advantageous for Refuge staff to share their -expertise in such areas as endangered species habitat management with receptive land managers and to gain insights on local land management trends and issues. Some landowners may find that agricultural production is

Goal 5: Protection of habitat within approved Refuge boundaries by fee acquisition or conservation easement.

unprofitable in such rugged terrain or may view it as undesirable as a long-term land management goal.

Two administrative policies also give reason for the Refuge to help other landowners in the area. The regional Section 10(a) permit for Travis County (known as the "Balcones Canyonlands Plan"), which was approved in 1996, does not cover the area within the Refuge boundary. Thus landowners within the Refuge acquisition boundary do not have that Section 10(a) permit available to mitigate for endangered species impacts; they must seek individual approval from the Service for any actions which may cause the "take" of endangered species, including habitat destruction. The Austin Ecological Services office is responsible for issuing these permits. It is logical, however, that Refuge staff should be available to offer technical guidance in such instances to landowners and to the Austin Ecological Services Field Office, particularly with respect to providing information on habitat management goals for adjacent/nearby federal lands.

Additionally, a mitigation policy has been established by the Service's Washington Office which precludes the use of private lands within a Refuge as potential mitigation lands (to offset habitat loss) where such mitigation would work against a regional Section 10(a) permit in the same area. Thus Travis County landowners and developers who wish to participate in the Balcones Canyonlands Plan and who would like to purchase (the less expensive) lands in the Refuge boundary as mitigation are precluded from doing so. Seeking the wildlife exemption under Texas law may benefit such landowners

Strategies for Accomplishing Objective:

1. Communicate with area landowners to learn about effective land management practices.

2. Maintain and enhance contacts with landowners through such groups as the Oatmeal Wildlife Management Association and other local groups in order to facilitate sharing of information on wildlife populations.

3. To the extent feasible under staffing limitations, share technical information with landowners within and near the Refuge who are seeking wildlife exemptions for their land.

4. Develop a demonstration area on the refuge to serve as a model for private landowners in habitat improvement for golden-cheeked warbler and black-capped vireo, using prescribed fire, mechanical controls and other management methods.

Goal 6:

Accurate, up-to-date data on roads, other physical infrastructure, habitats, and wildlife and plant species

Objective 1:

Within five years map roads, inspect ponds, map and monitor Refuge habitats and species distributions.

Current Status:

To date, golden-cheeked warbler and black-capped vireo habitats have been identified on Refuge maps. These will need updating as management actions increase available habitat. Preliminary work has been done toward obtaining coordinates for roads and other facilities but there is no general Refuge road map available. Breeding bird census points, prescribed burn sites and photo plots have been identified on existing USGS quadrangle maps but without GPS accuracy.

Rationale for Objective:

Mapping of endangered species habitat areas and potential habitat areas is needed to ensure that road and facilities improvement and development do not negatively impact nesting and use areas. Road maps are needed for administrative purposes. Effective monitoring requires sampling in the same areas over time. Thus breeding bird surveys, prescribed burn plots and photo plots must be accurately located to ensure reliability of monitoring data continuity with personnel changes over time.

Strategies For Accomplishing Objective:

1. Conduct aerial photography every three to four years to identify changes occurring in vegetation.

2. Complete a GPS-based Refuge road and boundary line map.

3. Develop GPS-based vegetation and species distribution maps for use in making management decisions.

4. Provide adequate signage for all Refuge roads, particularly service roads.

5. Enlist assistance from volunteers and researchers for inventory and monitoring efforts.

Goal 6: Accurate, up-to-date data on roads, other physical infrastructure, habitats and wildlife and plant species.

6. Apply best available technologies including Geographic Information System (GIS) and GPS systems, and enlist experts for assistance.

Objective 2:

Within three years, create and maintain a database of Refuge biological resources for use in making management decisions and documenting changes in habitat and wildlife composition.

Current Status:

While various surveys are conducted annually on the Refuge, there is no single, standardized data repository for survey results.

Rationale for Objective:

A good database is useful for preventing unintended impacts of management actions on species and habitats presented on the Refuge. The database will also be useful in establishing broad management strategies, evaluating compatibility, and monitoring changes in the ecosystem over time.

Strategies for Accomplishing Objective:

1. Develop standard data sheets for all ongoing and proposed inventory and monitoring programs at the Refuge (e.g., bird surveys, deer census, species lists, habitat condition surveys,. . . etc.).

2. Develop or purchase software program to support Refuge database.

3. Using volunteer labor, if possible, input all appropriate existing data to database.

4. Explore feasibility of in-field data entry using portable computer/GPS for future surveys and inventories.

Objective 3:

Conduct baseline surveys and monitor species occurrence on a regular basis.

Current Status:

Surveys of black-capped vireo and golden-cheeked warbler are conducted annually. Bird and plant lists have been prepared, and are updated periodically. Species lists for amphibians, reptiles and mammals have

Goal 6: Accurate, up-to-date data on roads, other physical infrastructure, habitats and wildlife and plant species.

been compiled but are incomplete. Data on populations are limited to endangered species, breeding bird populations and white-tailed deer.

Several types of long-term vegetation studies, including transects, plots and photo points, have been implemented to monitor general vegetation changes, prescribed fire effects, etc.

Rationale for Objective;

Baseline surveys and ongoing monitoring will allow early detection of any population changes. Regular monitoring will also facilitate adaptive management of the Refuge by tracking the efficiency of various management treatments.

Strategies for Accomplishing Objective:

1. Continue surveys of the black-capped vireo, the golden-cheeked warbler and other birds.

2. Continue breeding bird surveys, Christmas bird counts and migrating bird counts, hawk counts and butterfly counts, with assistance from conservation groups, as feasible.

3. Continue annual deer census.

4. Maintain and update lists of birds, mamals, reptiles, amphibians and plants found on the Refuge.

5. Identify other species lists appropriate for compilation.

6. Continue vegetation surveys of habitat conditions, including oak wilt.

7. Conduct surveys and inventories of other resources as needed.

8. Monitor vegetation in areas where prescribed burning has occurred to document long-term effects of such burns on plant community composition.

Goal 7:

Compliance with historic and archeological resource protection laws and regulations

Objective 1:

Maintain files on all archeological and cultural resource sites. Annually inspect all sites and record conditions.

Current Status:

The Refuge has a variety of archeological and cultural resources such as burnt rock middens, other evidence of Native American occupation, turn of the century rock walls, and other remnants of the pioneer ranching era. These cultural resources are managed by the Service in compliance with national laws, regulations, and policy in order to protect, preserve, and maintain the resources as appropriate.

Rationale for Objective:

The National Historic Preservation Act of 1966, Department of the Interior policy and U.S. Fish and Wildlife Service policy require protection of valuable archeological and cultural resources on lands of the National Wildlife Refuge System. The Fish and Wildlife Service Manual, Chapter 614, establishes compliance procedures with respect to: (1) refuge construction projects, (2) law enforcement, (3) visitor use, (4) special use permits, research referral, (5) special-use permits, non-Service land use, (6) reporting new cultural resources, (7) reporting maintenance, stabilization, and protection needs, (8) National Register nominations, and (9) archives and collections.

Strategies for Accomplishing Objective:

1. Contact the Regional Archeologist prior to demolition of buildings or development of public use facilities on the Refuge, or other construction such as roads, fire breaks, and other facilities.

2. Record archeological or cultural resources found on the Refuge,

3. Post archeological areas with Area Closed and archeological resources signs, as appropriate.

4. Develop a Refuge Cultural Resources Plan.

Goal 8:

Efficient Administration that Supports Refuge Objective Accomplishments

Objective 1:

Within three years complete plans for implementation of objectives and strategies identified in this comprehensive conservation plan.

Current Status:

The Fire Management Plan, Hunting Plan and Fishing Plan have been completed. Preparation of a draft Public use Plan has been initiated. A Safety Plan was completed in 1997.

Rationale for Objective:

All management actions on the Refuge must comply with the requirements of NEPA and be compatible with the primary purposes for which the Refuge was established. As a result, plans are needed for Refuge management programs. Plans pending are as follows (listed in priority order with estimated dates for submission of plans for approval, by fiscal year):

- Recreational Use Management Plan Draft - 2001
- Draft Wildlife Inventory Plan - 2002
- Road Access Plan - 2002
- Integrated Pest Management Plan - 2002
- Habitat Management Plan - 2003
- Law Enforcement Plan - 2003

Objective 2:

Within five years increase Refuge staff to meet minimal needs for implementation of Refuge objectives and strategies identified in this comprehensive conservation plan.

Current Status:

Refuge Manager	GS-14
Refuge Operations Specialist	GS-12
Wildlife Biologist	GS-11
Outdoor Recreation Planner	GS-11
Fire Management Officer	GS-09/11
Urban-Wildland Interface Specialist	GS-09/11

Goal 8: Efficient Administration that Supports Refuge Objective Accomplishments.

Assistant Fire Management Officer	GS-09
Office Assistant	GS-07
Budget Analyst	GS-09/11
Heavy Equipment Operator	WG-09
Career Seasonal Range Technicians (4)	GS 04/05[19]
Career Seasonal Range Technician	GS-06
Fire Program Technician	GS-05/06
Career Seasonal Administrative Program Assistant	GS-05
Temporary Biological Technicians (2)	GS-05

Rationale for Objective:

Current staffing patterns are inadequate to meet the requirements of expanded activity on the Refuge. While full staffing is not needed immediately, as improvements are made, as habitat improvement programs are implemented, and as public use increases, additional staffing will be necessary.

The future development and direction of the refuge, based on the comprehensive conservation plan, will require an addition of 4 staff. New programs and facilities, such as the office/visitor center will require the addition of a maintenance worker. A Heavy Equipment Operator, WG-8, 9 or 10 is needed to improve and maintain Refuge roads, fences, and other facilities.

Strategies for Accomplishing Objective:

Additional staff will be added as funding permits. The following positions are anticipated to be required:

2 Biological Technicians	GS-05/07
Maintenance Worker	WG -10
Law Enforcement Specialist	GS-09
Receptionist	GS-05
2 Heavy Equipment Operators	WG-08/10

Objective 3:

Conduct, encourage and support research and management studies that will increase scientific data available for use in making Refuge management decisions.

[20]Salaries of seasonal fire control personnel are paid with fire funds.

Goal 8: Efficient Administration that Supports Refuge Objective Accomplishments.

Current Status:

A variety of ongoing monitoring and data gathering tasks are accomplished at present by Refuge staff. These include the breeding bird surveys, endangered species mapping, hawk watches, deer censuses, vegetation transects, photo plots (to evaluate effects of browsing, fire, etc.), and others. Staff also collects general observations on plants and animals on the Refuge; these are maintained in Refuge files. The degree of effort and scientific rigor of these studies varies with the rarity or importance of the species or resource concerned. Also, the Refuge supports natural history research, to the extent practical and consistent with available resources.

Rationale for Objective:

Natural science information is necessary for the proper management of any wildlife refuge. It is the policy of the Service and this Refuge to encourage and support research and management studies in order to provide scientific data upon which decisions regarding management of the Refuge can be based. The Refuge will also permit the use of Refuge lands for other scientific investigations when compatible with the objectives for which the Refuge was established. Priority will be given to studies that contribute to the enhancement, protection, use, preservation, and management of our endangered wildlife and their habitats as well as other native wildlife populations and habitats. As examples, studies completed to date have included a baseline geological survey, a study of Spanish oak acorn germination and mortality, sediment transport in karst systems, and fire effects on native grasslands.

Strategies for Accomplishing Objective:

1. Design and implement basic monitoring and scientific investigations which contribute to knowledge of important resources on the Refuge.

2. Ensure that all research conducted on the Refuge applies the level of scientific and statistical rigor required for answering management questions.

3. Keep abreast of the latest and best available scientific data related to Refuge resources.

4. Support research on the Refuge by outside researchers where it:

   - Does not conflict with Refuge goals,

   - Is consistent with protection of critical resources,

Goal 8: Efficient Administration that Supports Refuge Objective Accomplishments.

- Supports fundamental understanding of Refuge resources, and
- Is within the staffing and fiscal constraints of the Refuge.

5. Grant priority to non-Service researchers whose research will contribute directly to achievement of Refuge goals.

Objective 4:

Within five years obtain adequate equipment and storage facilities to implement management strategies to meet objectives identified in this management plan.

Current Status:

The Refuge has acquired a digital radio system, road grading equipment, a backhoe, a bulldozer, a tree shear, a front end loader, a trailer, and several vehicles, including four-wheel-drives and pickups. Some equipment was acquired from other federal agencies through excess property procedures.

Several private residences have been acquired incidental to land acquisition and are currently used to house Refuge staff, temporary employees, volunteers and graduate students.

Maintenance facilities have also been acquired. These are used for equipment storage, as work headquarters, and for fire program operations.

Rationale for Objective:

Refuge management requires vehicles for conducting day-to-day duties. Vehicles must be replaced periodically. Four wheel drive vehicles are needed for use on some Refuge roads and terrain. The roads that cross ridge tops require regular maintenance with a road grader or bull dozer because of erosion. Road maintenance equipment is needed to ensure continued access to the Refuge for management and public use.

Strategies for Accomplishing Objective:

1. Acquire other equipment as needed, through purchase or excess property.

2. Contract for other equipment use as needed.

Goal 8: Efficient Administration that Supports Refuge Objective Accomplishments.

Objective 5:

Within five years plan acquisition, remodeling and/or construction of a permanent Refuge Office and Visitor Contact Station to be located on Refuge lands.

Current Status:

The Refuge office is located in Austin at the Compass Bank Building. The site does not permit efficient contact with Refuge visitors because of the distance from the Refuge. Driving time between the Refuge and the office is between 45 minutes and one hour. This does not allow for efficient use of staff time and causes extra wear and tear on Refuge vehicles.

Rationale for Objective:

An office/visitor center located on the Refuge will provide the public with easy access to information and provide the Refuge with quick accessibility in the event of problems or emergencies.

Strategies for Accomplishing Objective:

1. Identify possible location and/or construction sites, with assistance from Engineering.
2. Contact the General Services Administration to investigate the possibilities of leased space in the Lago Vista Area.
3. Evaluate the feasibility of converting existing Refuge buildings into an office.

Appendix A: Legal, Policy and Administrative Guidelines and Other Special Considerations

Administration of national wildlife refuges is governed by bills passed by the United States Congress and signed into law by the President of the United States, and by regulations promulgated by the various branches of the government. Following is a brief description of some of the most pertinent laws and statutes establishing legal parameters and policy direction for the National Wildlife Refuge System:

Acts of Congress:

National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, October 9, 1997, Amendment to the National Wildlife Refuge System Administration Act of 1966).

This Act defines the mission of the National Wildlife Refuge System:

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.

Key provisions include the following:

1. a requirement that the Secretary of the Interior ensures maintenance of the biological integrity, diversity, and environmental health of the National Wildlife Refuge System;

2. the definition of compatible wildlife-dependent recreation as "legitimate and appropriate general public use of the [National Wildlife Refuge] System;"

3. the establishment of hunting, fishing, wildlife observation and photography, and environmental education and interpretation as "priority public uses" where compatible with the mission and purpose of individual national wildlife refuges;

4. the refuge managers' authority to use sound professional judgment in determining which public uses are compatible on national wildlife refuges and whether or not they will be allowed (a formal process for determining "compatible use"is currently being developed); and

5. the requirement of open public involvement in decisions to allow new uses of national wildlife refuges and renew existing ones, as well as in

the development of Comprehensive Conservation Plans for National Wildlife Refuges.

Fish and Wildlife Conservation Act of 1980 (Public Law 96-366, September 29, 1980, 16 U.S.C. §§ 2901-2911, as amended 1986, 1988, 1990 and 1992)
Created a mechanism for federal matching funding of the development of state conservation plans for non-game fish and wildlife. Subsequent amendments to this law require that the Secretary monitor and assess migratory nongame birds, determine the effects of environmental changes and human activities, identify birds likely to be candidates for endangered species listing, and identify conservation actions that would prevent this from being necessary. In 1989, Congress also directed the Secretary to identify lands and waters in the Western Hemisphere, the protection, management or acquisition of which would foster conservation of migratory nongame birds. All of these activities are intended to assist the Secretary in fulfilling the Secretary's responsibilities under the Migratory Bird Treaty Act and the Migratory Bird Conservation Act, and provisions of the Endangered Species Act implementing the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere.

Refuge Revenue Sharing Act of 1978 (Public Law 95-469, October 17, 1978, [amended 16 U.S.C. 715s]; 50 CFR, part 34).
Changed the provisions for sharing revenues with counties in a number of ways. It makes revenue sharing applicable to all lands administered by the Service, whereas previously it was applicable only to areas in the National Wildlife Refuge System. The new law makes payments available for any governmental purpose, whereas the old law restricted the use of payments to roads and schools. For lands acquired in fee simple, the new law provides a payment of 75 cents per acre, 3/4 of 1 percent of fair market value or 25 percent of net receipts, whichever is greatest, whereas the old law provided a payment of 3/4 of 1 percent adjustment cost or 25 percent of net receipts, whichever was greater. The new law makes reserve (public domain) lands entitlement lands under Public Law 94- 565 (16 U.S.C. 1601-1607), and provides for a payment of 25 percent of net receipts.

The new law authorizes appropriations to make up any shortfall in net receipts, to make payments in the full amount for which counties are eligible. The old law provided that if net receipts were insufficient to make full payment, payment to each county would be reduced proportionately.

Endangered Species Act of 1973 and recent amendments (16 U.S.C. 1531-1543; 87 Stat. 884) as amended. (Establishing legislation.)

Provides for conservation of threatened and endangered species of fish, wildlife, and plants by federal action and by encouraging state programs. Specific provisions include:

1. the listing and determination of critical habitat for endangered and threatened species and consultation with the Service on any

federally funded or licensed project that could affect any of these agencies;

2. prohibition of unauthorized taking, possession, sale, transport, etc., of endangered species;

3. an expanded program of habitat acquisition;

4. establishment of cooperative agreements and grants-in aid to states that establish and maintain an active, adequate program for endangered and threatened species; and

5. assessment of civil and criminal penalties for violating the Act or regulations.

Refuge Recreation Act of 1966 (Public Law 87-714; 76 Stat. 653-654; 16 U.S.C. 460k et seq.).

Authorizes appropriate, incidental, or secondary recreational use on conservation areas administered by the Secretary of the Interior for fish and wildlife purposes.

Section 404 of the Federal Water Pollution Control Act of 1972 (Public Law 92-500, 86 Stat. 816).

Authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits, after notice and opportunity for public hearings, for discharge of dredged or fill material into navigable waters of the United States, including wetlands, at specified disposal sites. Selection of disposal sites will be in accordance with guidelines developed by the Administrator of the Environmental Protection Agency in conjunction with the Secretary of the Army. Furthermore, the Administrator can prohibit or restrict use of any defined area as a disposal site whenever she/he determines, after notice and opportunity for public hearings, that discharge of such materials into such areas will have an unacceptable adverse effect on municipal water supplies, shellfish beds, fishery areas, wildlife, or recreational areas.

Section 401 of the Federal Water Pollution Control Act of 1972 (Public Law 92-500; 86 Stat. 816, 33 U.S.C. 1411).

Requires any applicant for a Federal license or permit to conduct any activity which may result in a discharge into navigable waters to obtain a certification from the state in which the discharge originates or will originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over navigable waters at the point where the discharge originates or will originate, that the discharge will comply with applicable effluent limitations and water quality standards. A certification obtained for construction of any facility must also pertain to subsequent operation of the facility.

The National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347).

Declares national policy to encourage a productive and enjoyable harmony between humans and their environment. Section 102 of that Act directs that "to the fullest extent possible:

(i) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and

(ii) all agencies of the Federal Government shall . . . insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations. . . ."

Section 102(2)c of NEPA requires all federal agencies, with respect to major federal actions significantly affecting the quality of the human environment, to submit to the Council on Environmental Quality a detailed statement of:

1. the environmental impact of the proposed action;

2. any adverse environmental effect which cannot be avoided should the proposal be implemented;

3. alternatives to the proposed action;

4. the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and

5. any irreversible and irretrievable commitments of resources which would be involved in the proposed action, should it be implemented.

National Historic Preservation Act of 1966 (16 U.S.C. 470- 470b, 470c-470n, 80 Stat. 915), as amended.

Provides for preservation of significant historical features (buildings, objects, etc.) through a grant-in-aid program to the states. Establishes a National Register of Historic Places. Federal agencies are required to take into account effects of their actions on buildings, etc., included or eligible for inclusion on the National Register.

National Wildlife Refuge System Administration Act of 1966 (Public Law 89-669; 80 Stat. 929; 16 U.S.C. 668dd-668ee), as amended.

Authorizes the Secretary of the Interior to "permit the use of any area within the System for any purpose including, but not limited to, hunting, fishing, public recreation and accommodations, and access whenever he determines that such uses are compatible with the major purposes for which such areas were established." Consolidates authorities for the various categories of areas previously established that are administered by the Secretary of the Interior for conservation of fish and wildlife, including species that are threatened with extinction, all lands, waters, and interests therein administered by the Secretary as wildlife refuges, etc., which are hereby designated as the National Wildlife Refuge System. Provides that the Secretary may authorize hunting and fishing to the extent practicable and consistent with State fish and wildlife laws and regulations.

Land and Water Conservation Fund Act (LWCFA) of 1965.

Provides funds from leasing bonuses, production royalties and rental revenues for offshore oil, gas and sulphur extraction to the Bureau of Land Management, the U.S. Service, and the U.S. Fish and Wildlife Service, and State and local agencies for purchase of lands for parks, open space, and outdoor recreation.

Wilderness Preservation and Management (50 CFR 35; 78 Stat. 890; 16 U.S.C. 1131-1136; 43 U.S.C. 1201).

Provides procedures for establishing wilderness units under the Wilderness Act of 1964 on units of the National Wildlife Refuge System.

Fish and Wildlife Act of 1956 (70 Stat. 1119; 16 U.S.C. 742a- 742J), as amended.

Establishes a comprehensive fish and wildlife policy and directs the Secretary of the Interior to provide continuing research; extension and information service; and directed development, management, and conservation of fish and wildlife resources.

Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41. Stat 686) -- Section 41 of the Criminal Code, title 18.

Consolidates the penalty provisions of various acts from January 24, 1905 (16 U.S.C. 684-687; 33 Stat. 614), through March 10, 1934 (16 U.S.C. 694-694b; 48 Stat. 400) and restates the intent of Congress to protect all wildlife within Federal sanctuaries, refuges, fish hatcheries and breeding grounds. The Act provides that anyone (except in compliance with rules and regulations promulgated by authority of law) who hunts, traps or willfully disturbs any wildlife on such areas, or willfully injures,

molests or destroys any property of the United States on such lands or waters, shall be fined, imprisoned, or both.

Criminal Code of Provisions of 1940 as amended, (18 U.S.C. 41).

States the intent of Congress to protect all wildlife within federal sanctuaries, refuges, fish hatcheries, and breeding grounds. Provides that anyone (except in compliance with rules and regulations promulgated by authority of law) who hunts, traps, or willfully disturbs any such wildlife, or willfully injures, molests, or destroys any property of the United States on such land or water, shall be fined up to $500 or imprisoned for not more than 6 months or both.

Bald Eagle Act of 1940 (16 U.S.C. 668-668d; 54 Stat. 250; 50 CFR Subchapter), as amended.

Provides for protection of the bald eagle (the national emblem) and the golden eagle.

Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-718h; 48 Stat. 51), as amended.

Requires that all waterfowl hunters, sixteen (16) years of age or older, possess a valid duck stamp. Net revenues from the sale of duck stamps are used to acquire migratory bird refuges and waterfowl production areas.

Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-s, 45 Stat.1222), as amended.

Authorizes acquisition, development, and maintenance of migratory bird refuges; cooperation with other agencies in conservation; and investigations and publications on North American birds. Authorizes payment of 25 percent of net receipts from administration of national wildlife refuges to the country or counties in which such refuges are located.

Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 50 CFR Subchapter B), as amended.

Implements treaties with Great Britain (for Canada) and Mexico for protection of migratory birds whose welfare is a federal responsibility. Provides for regulations to control taking, possession, selling, transporting, and importing of migratory birds and provides penalties for violations.

Refuge Trespass Act of June 28, 1906 (18 U.S.C. 41; 43 Stat. 98, 18 U.S.C. 145).

Provided first Federal protection for wildlife on national wildlife refuges. This Act made it unlawful to hunt, trap, capture, willfully disturb, or kill any bird or wild animal, or take or destroy the eggs of any such

birds, on any lands of the United States set apart or reserved as refuges or breeding grounds for such birds or animals by any law, proclamation, or executive order, except under rules and regulations of the Secretary. The Act also protects government property on such lands.

Regulations:

National Wildlife Refuge Regulations for the most recent fiscal year (50 CFR 25-35, 43 CFR 3103.2 and 3120.3-3).

Provides regulations for administration and management of national wildlife refuges including mineral leasing, exploration, and development.

Rights-of-Way General Regulations (50 CFR 29.21; 34 FR 19907, December 19, 1969).

Provides for procedures for filing applications. Provides terms and conditions under which rights-of- way
over, above, and across lands administered by the Service may be granted.

Use of Off-Road Vehicles on Public Lands (Executive Order 11644, Federal Reg. Vol. 37, No. 27, February 9, 1972).

Provides policy and procedures for regulating off-road vehicles.

Implementation of Refuge Revenue Sharing Act of 1978

The Refuge Revenue Sharing Act affected Balcones Canyonlands National Wildlife Refuge for the first time in 1992. The rate of payment is based on a Revenue Sharing appraisal done every 5 years for each county. The percentage of the value which is used to determine the payment is set by Congress each year. The payment must be based on at least 60% of the total value, however.[20]

---

[21]For refuges that receive fees, the payment may be based upon a percent of net receipts, if the value of the net receipts is higher than market value.

Revenue Sharing Payments to Counties				
Year	**County**	**Acres**	**Amount**	**Percent Full Entitlement**
1992	Burnet Travis Williamson	205 929 291	$13,060 4,706 1,734	81.6
1993	Burnet Travis Williamson	2,315 5,298 291	15,995 30,850 2,124	77.9
1994	Burnet Travis Williamson	2,427 8,159 372	12,898 35,356 1,947	77.08
1995	Burnet Travis Williamson	2,427 10,289 835	10,992 39,760 4,187	65.7
1996	Burnet Travis Williamson	2,868 10,291 903	14,716 43,881 6,051	72.5
1997	Burnet Travis Williams	2,868 10,291 903	13,434 40,060 5,524	66.1
1998	Burnet Travis Williamson	2,868 10,555 996	12,771 41,903 6,186	62.0
1999	Burnet Travis Williams	4,138 10,968 1,376	18,740 38,956 7,420	57.9
2000	Burnet Travis Williams	4,585 10,968 1,376	19,863 34,173 6,509	50.8

Appendix B: References

Alexander, H.L., Jr. 1963. "The Levi Site: A Paleo-indian campsite in Central Texas." *American Antiquity* 28(4):510-528.

Amos, B.B. and C. M. Rowell, Jr. 1988. "Floristic geography of woody and endemic plants." In Amos, B.B. and F. R. Gehlbach (eds). 1988. *Edwards Plateau vegetation - Plant ecological studies in Texas*. Baylor University Press, Waco, Texas, 144pp.

Amos, B.B. and F.R. Gehlbach (eds.). 1988. *Edwards Plateau Vegetation - Plant ecological studies in Central Texas*. Baylor University Press, Waco, Texas. 144 pp.

Benson, L. 1969. "Cactaceae." In. *Flora of Texas. Vol. 2*. Texas Research Foundation, Renner, Texas.

Austin, City of. 1989. *Growth Watch: Annual Edition 1987.* Department of Planning and Development. Austin, Texas. January, 1989.

_____. 1990. *Growth Watch: Annual Edition 1988.* Department of Planning and Development. Austin, Texas. January, 1990.

_____. 1991a. Planning Department presentation to City Council in comments on Draft Balcones Canyonlands Conservation Plan, February, 1991. Austin.

_____. 1991b. *Growth Watch: Annual Edition 1989.* Department of Planning and Development. Austin, Texas. February, 1991.

_____. 1991c. Unpublished Memorandum. ATS Interagency Staff. May 7, 1991; December 7,1990.

Austin, City of and Travis County, Texas. 1996. *Habitat Conservation Plan and Final Environmental Impact Statement*. Austin, Texas. ix +313 pp. +figures + appendices.

Benson, R. 1990. *Habitat area requirements of the Golden-cheeked warbler on the Edwards Plateau*. Draft Report. Texas A&M University, College Station, Texas.

Biological Advisory Team (BAT) of the Austin Regional Habitat Conservation Plan. 1990. *Comprehensive report of the Biological Advisory Team*. Austin, Texas. 80 pp.

Blair, W. F. 1950. "The biotic provinces of Texas." *Texas Journal of Science*. 2:93-117.

Bray, W.L. 1904. *The timber of the Edwards Plateau of Texas; its relation to climate water supply, and soil.* U.S.D.A., Bureau of Forestry Bulletin No. 49.

_____. 1906. *Distribution and adaptation of the vegetation in Texas.* University of Texas Bulletin, Sci. Ser. No. 10, Austin.

Brune, G. and G. L. Duffin. 1983. *Occurrence, Availability, and Quality of Ground Water in Travis County, Texas.* Texas Department of Water Resources Report 276. Austin, Texas. 219 pp.

Bureau of Economic Geology (BEG), 1974. *Geologic Atlas of Texas, Austin Sheet.* University of Texas at Austin.

_____. 1981. *Geologic Atlas of Texas, Llano Sheet.* University of Texas at Austin.

Bureau of the Census. 1988. *City and County Data Book: 1988.* U.S. Department of Commerce, Washington, D.C.

_____. 1989. *State Summary.* U.S. Department of Commerce, Washington, D.C.

_____. 1991. *Statistical Abstract of the United States: 1990.* U.S. Department of Commerce. Washington, D.C.

_____. 1991. Unpublished Tape Files. U.S. Department of Commerce, Washington, D.C.

Butler/Espey, Huston & Associates (EH&A). 1991. *Balcones Canyonlands Habitat Conservation Plan.* Revised Draft, February, 1991. EH&A Document No. 910028. Austin, Texas.

Caran, S.C., C.M. Woodruff, Jr., and E.J. Thompson. 1982. *Lineament analysis and inference of geologic structure: Examples from the Balcones / Ouachita Trend of Texas.* Bureau of Economic Geology. Circular 82-1. University of Texas at Austin.

Cathey, K.C. and M.H. Legg. 1986. *Background Information: Economic Development Element.* Planning and Growth Management Department. Austin, Texas. May 1986.

_____. 1989. "Importance of Interpreting Wilderness Management Policies to Visitors." *-Proceedings: 1989 National Association of Interpretation Research Symposium, San Diego, California.*

Correll, D. and M. Johnston. 1979. *Manual of the Vascular Plants of Texas.* University of Texas at Dallas. Austin. 1881 pp.

Council on Environmental Quality (CEQ). 1990. Personal communication to Bruce Halstead, October, 1990, Fish and Wildlife Service, Albuquerque, New Mexico.

Davis, W.B. 1974. *The mammals of Texas*. Texas Parks and Wildlife Department, Bulletin No. 41. 294 pp.

Department of Environmental Protection (DEP). 1988. *Current status of the Black-capped vireo in the Austin region*. May, 1988. City of Austin, DEP.

Dixon, J.R. 1987. *Amphibians and Reptiles of Texas*. Texas A&M University Press. College Station, Texas. 434 pp.

DLS Associates. 1988. *Black-capped vireo investigations in the vicinity of the proposed RM 620 project, Travis County, Texas. Final Report.* Austin, Texas.

_____. 1990. *Black-capped vireo monitoring program, Travis County, Texas: Final Report*. November, 1990. Austin, Texas.

Dunlap, D.W. 1983. *A quantitative descriptive study of the grassland vegetation and soils of the eastern Edwards Plateau*. Texas Master of Arts Thesis, University of Texas, Austin.

Elliot, W.R. 1990. "Endangered species, endangered caves." *NSS News*, September, 1990. Pp 225-231.

Elliot, W.R. and J.R. Redell. 1989. *The status and range of five endangered arthropods from caves in the Austin, Texas Region*. (BAT Comprehensive Report, Appendix A).

Enquist, M. 1987. *Wildflowers of the Texas Hill Country*. Lone Star Botanical, Austin, Texas. 275 pp.

Espey, Huston & Associates (EH&A). 1989a. *Results of the 1989 Brown-headed cowbird trapping program of the Austin Regional Habitat Conservation Plan*. EH&A Doc. No. 890419. December, 1989 (BAT Comprehensive Report, Appendix H).

_____. 1989b. *Existing environment of the region of interest for the proposed Kerr County project.* Volume 1. EH&A Documci-it No. 890196. Austin, Texas.

_____. 1990. *Environmental Assessment and alternative route analysis for the Lytton Springs - Slaughter Lane 138-kv transmission line project*. EH&A Document No. 890501. Austin, Texas.

_____. 1991. *Results of 1990 surveys for* Streptanthus bracteatus. Philadelphus emestii. *and* Amorpha roemerana *in Travis County, Texas.* EH&A Doc. No. 900555. Austin, Texas.

Fermeman,N.M. 1931. *Physiography of western United States.* McGraw-Hill Book Co., Inc. 534 pp.

Filson R.E. and E.R. Prewitt, 1978. *Archeological investigations of the San Antonio Ranch, New Town Park, Bexar County, Texas.* Reports of Investigations, No. X. Kapp Grafix, Austin.

Fonteyn, P.J., M.W. Store, M.A. Yancy, J.T. Baccus, and N.M. Nadkami. 1988. "Determination of Community Structure by Fire." in B.B. Amos and F.R. Gehlbach (eds.) 1988. *Edwards Plateau Vegetation - Plant Ecological Studies in Central Texas.* Baylor University Press, Waco, Texas.

Garrett, J.M. and D.G. Barker. 1987. *A field guide to reptiles and amphibians of Texas.* Texas Monthly Press. Austin, Texas. 225 pp.

Gould, F.W. 1975a. *Texas Plants: a checklist and ecological summary.* Texas A&M University Agricultural Experimental Station. MP-585/Rev., College Station, Texas. 121 pp.

_____. 1975b. *The grasses of Texas.* Texas A&M University Press. College Station, Texas. 653 pp.

Grzybowski, J.A. 1985. *Final Report: population and nesting ecology of the Black-capped vireo (*Vireo atricapillus*). Part 1: nesting ecology of the Black-capped vireo.* Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico. 50 pp.

Horned Lizard Conservation Society (HLCS). 1991. Draft Public News Release. *Texans saddle up for round up of information about horny toads.* HLCS, Austin, Texas.

Hubbs, C. 1957. *Distributional patterns of Texas freshwater fishes.* Southwestern Naturalist. 2:89-104.

_____.1982. *A checklist of Texas freshwater fish.* Texas Parks and Wildlife Department Technical Series No. II. Austin, Texas.

Jelks, E.B., 1962. *The Kyle Site: a stratified Central Texas aspect site in Hill County, Texas.* Archaeology Series No. 5, Department of Anthropology, the University of Texas. Austin.

Kelly, T.C. and T. R. Hester. 1976. *Archaeological investigations at sites in the upper Cibolo Creek watershed, Central Texas.* Center for Archaeological Research., The University of Texas at San Antonio, Arch. Surv. Rept. No. 17.

Klernt, W.B. 1975. "Ground-water Resources of Part of Central Texas with Emphasis on the Antlers and Travis Peak Formations." *Texas Water Development Board Report 195, Vol. 2.* Austin, Texas. 529 pp.

Kutac, E.A. and S.C. Caran. 1976. *A bird finding and naturalist's guide for the Austin,Texas area*. Oasis Press. Austin, Texas. 145 pp.

Luke, C.J. 1980. *Continuing archaeology on State Highway 16, the Shep Site (41KR109) and the Wounded Eye Site (41KR107)*. Texas Department of Highways and Public Transportation, Publications in Archaeology Report No. 16.

Lynch, B.D. 1981. *Native and naturalized woody plants of Austin and the Hill Country*. Acorn Press, Austin. 165 pp.

Lyndon B. Johnson (LBJ) School of Public Affairs. 1978. *Preserving Texas' natural heritage*. LBJ School of Public Affairs, Pol. Res. Pro). Rep. 31(1).

_____.1991. *Global warming and Texas: Impacts and policies.* Presented at theThird Annual Texas and Global Warming Conference, April 26, 1991. Austin, Texas.

McCarl. B. 1991. *Global climate change and Texas agriculture*. Presented at the Third Annual Texas and Global Warming Conference, April 26, 1191. Austin, Texas.

McMahan, C.A., R.G. Frye and K.L. Brown. 1984. *The vegetation types of Texas, including cropland*. Texas Parks and Wildlife, Wildlife Division, Austin.

McNeal, P. 1989. *Status of* Streptanthus bracteatus, Philadelphus emestii *and* Amprpha roemerana *in Travis County: a report for the Austin Regional Habitat Conservation Plan*. Texas Natural Heritage Program, Texas Parks and Wildlife Department, Austin, Texas.

National Oceanographic and Atmospheric Administration (NOAA). 1990a. *Airport/Facility Directory. South Central United States*. U.S. Department of Commerce. NOAA, Washington, D.C.

_____. 1990b. *San Antonio Aeronautical Chart, Scale 1:500,000.* U.S. Department of Commerce. NOAA, Washington, D.C.

National Research Council (NRC). 1982. *Impacts of emerging agricultural trends on fish and wildlife habitat*. National Academy of Sciences. National Academic Press, Washington, D.C.

Native Plant Society of Texas News (NPST). 1987. Volume V, Number 6, November/December. 1987. Native Plant Society of Texas, Decator, Texas.

Newcomb, W.W., Jr. 1961. *Indians of Texas from prehistoric to modern times.* University of Texas Press, Austin.

Oberholser,H.C. 1974. *The bird life of Texas*. 2 vol. University of Texas Press, Austin, Texas. 1069 pp.

Palmer, E.J. 1920. *The canyon flora of the Edwards Plateau of Texas.* J.Arnold Arboretum 1:233-239.

Pearsall, J. 1991. Personal communication to Shirley Shadix. Texas Railroad Commission. Austin, Texas.

Prewitt, E.R. 1974. *Archaeological investigations of the Loeve-Fox Site, Williamson County, Texas.* Texas Archaeological Survey, Res. Rept. No. 49, Austin.

_____. 1981. *Cultural chronology in Central Texas.* Bulletin of the Texas Archeological Society. 52. Austin.

Reddell, J.R. Personal Communication to Deborah Holle regarding preliminary results of cave invertebrate surveys on and proximate to the Balcones Canyonlands National Wildlife Refuge, October 28, 1999. Invertebrate Curator, Texas Memorial Museum, Austin, Texas.

_____. *1991. Preliminary report on the cave and cave fauna of the W.B. Simons Ranch, Bumet County, Texas.* Austin, Texas.

Riskind, D.R. and D.D. Diamond. 1988. "An introduction to environments and vegetation." in B.B. Amos and F.R. Gehlbach (eds) *Edwards Plateau Vegetation, Plant Ecological Studies in Central Texas.* Baylor University Press, Waco, Texas.

Rose, P. 1971. "Edwards group, surface and subsurface, Central Texas." Bureau of Economic Geology. *Report of Investigations No. 74.* University of Texas at Austin. 198 pp.

Russell, Leland. 1998. Unpublished manuscript *Deer herbivory on Spanish oaks.* Ph.D. dissertation . University of Texas at Austin.

Schmidly, D.J. 1977. *The mammals of Trans-Pecos Texas.* Texas A&M University Press. College Station, Texas.

Schmidly, D. J. 1983. *Texas mammals east of the Balcones Fault Zone.* Texas A&M University Press. College Station, Texas. 400 pp.

Sellards, E.H. 1952. *Early man in America: a study in prehistory.* University of Texas Press. Austin.

Senger, R.K., E.W. Collins, and C.W. Kreitler. 1991. *Hydrogeology of the northern segment of the Edwards Aquifer, Austin Region.* Bureau of Economic Geology. Report of Investigations No. 192. University of Texas at Austin. 58 pp.

Sexton, C.W. 1989. *Draft report: field investigation of the Black-capped vireo (*Vireo atricapillus*) in the Post Oak Ridge - CR 1869 region of Travis, Williamson, and Bumet Counties, 1989.* (BAT Comprehensive Report, Appendix D).

Sexton, C.W., G. E. Lasley, J.A. Grzybowski, and R.B. Clapp. *Distribution and status of the Black-capped vireo in Texas.* In preparation.

Simpson, B.J. 1988. *A Field Guide to Texas Trees.* Texas Monthly Press. Austin. 372 pp.

Soil Conservation Service (SCS). 1974. *Soil survey of Travis County, Texas.* In cooperation with the Texas Agricultural Experiment Station. U.S. Department of Agriculture. Washington, D.C.

_____. 1979. *Soil survey of Blanco and Bumet Counties, Texas.* In cooperation with the Texas Agricultural Experiment Station. U.S. Department of Agriculture. Washington, D.C.

_____. 1983. *Soil survey of Williamson County, Texas.* In cooperation with the Texas Agricultural Experiment Station. U.S. Department of Agriculture. Washington, D.C.

Stricidin, Jr., F.L., C.I. Smith, and F.E. Lozon. 1971. *Stratigraphy of Lower Cretaceous Trinity Deposits of Central Texas.* Bureau of Economic Geology. Report of Investigations No. 71. University of Texas at Austin.

Suhm, D.A. 1958. "A review of Central Texas archeology." *Bulletin of the Texas Archeological Society* 29:63-108.

Sweet, S.S. 1982. *A distributional analysis of epigean populations of Eurycea neotenes in Central Texas, with comments on the origin of troglobitic populations.* Herpetologica 38(3): 430-444.

Szaro, R.C. *1980.* "Factors influencing bird populations in southwestern riparian forests." In *Management of western forests and grasslands for nongame birds.* Workshop Proceedings. U.S.D.A. Forest Service Gen. Tech. Rept. INT-86. September, 1980.

Tennant, A. 1984. *The snakes of Texas.* Texas Monthly Press. Austin, Texas. 561 pp.

_____. 1985. *A field guide to Texas snakes.* Texas Monthly Press. Austin, Texas. 260 pp.

Texas Aeronautics Commission (TAG). 1990. *Texas Airport Directory.* TAG. Austin, Texas.

Texas Agricultural Extension Service. 1990. *Texas Livestock Enterprise Budgets, South Central Texas District.* Austin, Texas.

Texas Comptroller of Public Accounts (TCPA). 1989. *The Texas Input-Output Model.* 1986 Update. State of Texas. Austin, Texas. December 1989.

Texas Department of Health. 1986. *County Populations in Texas, Total.* Texas Department of Health Population Data System. Austin, Texas. July 1986.

Texas Employment Commission. 1990. *Covered Employment and Wages: By Industry and County*. Economic Research and Analysis Department. Austin, Texas 1990.

_____.1991a. *Texas Labor Market Review*. Texas Employment Commission. Austin, Texas. January 1991.

_____. 1991b. *Average Annual Data For 1990.* Economic Research and Analysis Department. Austin, Texas. February 1991.

Texas Natural Heritage Program (TNHP). 1991a. *Special plant list*. Texas Parks and Wildlife Department. April 1, 1991. Austin, Texas.

_____. 1991b. *Special Animal List*. Texas Parks and Wildlife Department. April 9, 1991. Austin, Texas.

Texas Organization for Endangered Species (TOES). 1987. *Endangered, threatened and watch lists of plants of Texas*. TOES Publication 5. Austin, Texas. 9 pp.

_____. 1988. *Endangered, threatened, and watch list of vertebrates of Texas*. TOES Publication 6. Austin, Texas. 16 pp.

Texas Ornithological Society (TOS). 1984. *The TOS checklist of the birds of Texas*, 2nd edition. 147 pp.

Texas Parks and Wildlife Department (TPWD). 1989. *Texans Outdoors*. Comprehensive Planning Branch, Parks Division. Austin, Texas. November 1989.

_____. 1990a. *1990 TORP - Assessment and Policy Plan*. Comprehensive Planning Branch, Parks Division. Austin, Texas. June 1990.

_____.1990b. *Big Game Harvest Survey Results, 1980-81 Thru 1989-90*. Austin, Texas. March 15,1990.

_____. 1991. *Endangered resources annual status report*. Resource Protection Division. Austin, Texas. January 1991.

Texas Water Development Board. 1986. *Population Projections*. Austin, Texas. February 1986.

_____. 1990. *Water for Texas Today and Tomorrow*. Austin, Texas

Thomas, G.W. 1975. "Texas Plants - an ecological summary." In Gould, F.W. 1975. *Texas Plants - a checklist and ecological summary*. Texas A&M University Agricultural Experiment Station. MP 585 Rev., College State, Texas. 121 pp.

Tomka, S.A. and J. Leffler. 1998. *A Cultural Overview and Assessment of Balcones Canyonlands National Wildlife Refuge*. University of Texas at San Antonio, Spec. Rept. No. 24.

Tuttle. M. 1988. *America's neighborhood bats*. University of Texas Press, Austin, Texas. 104 pp.

U.S. Census Bureau. 2001. Census Reports. http://www.census.gov.

U.S. Fish and Wildlife Service.1979. *Concept plan, unique wildlife ecosystems: Texas.* U.S. Department of the Interior. Fish and Wildlife Service, Region 2,Albuquerque, New Mexico.

_____.1982. *Refuge Manual. National Wildlife Refuge System*. U.S. Department of the Interior. Fish and Wildlife Service, Washington, D.C.

_____. 1988. *Endangered and threatened species of Texas and Oklahoma,* 1987 (with 1988 addendum). U.S. Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico.

_____. 1989. *Endangered and threatened wildlife and plants; animal notice of review*. Federal Register 54(4):554-579.

_____. 1990. *Endangered and threatened wildlife and plants*. 15 April 1990. 50 CFR 17.11 and 17.12. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 34 pp.

_____. 1991a. *Land Protection Plan for Balcones Canyonlands National Wildlife Refuge, Travis, Burnet, and Williamson Counties, Texas*. Albuquerque, New Mexico. I + 46 pp.

_____. 1991b. *Black-capped Vireo (*Vireo atricapillus*) Recovery Plan*. Austin, Texas. vi + 74 pp.

_____. 1991c. *Commonly Asked Questions Related to the Establishment of the Balcones Canyonlands National Wildlife Refuge*. Information Handout at Public Open Houses, Oatmeal and Austin, Texas. February 19-20, 1991.

_____. 1992a. *Golden-cheeked Warbler (*Dendroica chrysoparia*) Recovery Plan.* Albuquerque, New Mexico. 88 pp.

_____. 1992b. *Balcones Canyonlands National Wildlife Refuge Environmental Assessment*, Albuquerque, New Mexico. vi + 85 pp.

_____. 1994a. *Edwards Ecosystem Plan*. Edwards Ecosystem Team, Albuquerque, New Mexico. 14 pp.

_____. 1994b. *Endangered Karst Invertebrate Recovery Plan in Travis and Williamson Counties, Texas*. Albuquerque, New Mexico. 154 pp.

_____. 1996a. *Golden-cheeked warbler population and habitat viability assessment report.* Compiled and edited by Carol Beardmore, Jeff Hatfield, and Jim Lewis in conjunction with workshop participants. Report of a August 21-24, 1995 workshop arranged by the U.S. Fish and Wildlife Service in partial fulfillment of U.S. Biological Service Grant No. 80333-1423. Austin, Texas. xii + 48 pp. + appendix.

_____. 1996b. *Black-capped Vireo population and habitat viability assessment report.* Compiled and edited by Carol Beardmore, Jeff Hatfield, and Jim Lewis in conjunction with workshop participants. Report of a September 18-21, 1995 workshop arranged by the U.S. Fish and Wildlife Service in partial fulfillment of a U.S. Biological Service Grant No. 8033-1423. Austin, Texas. ix +57 pp.

_____. 1996c. *Balcones Canyonlands National Wildlife Refuge, final land acquisition compliance document,* Albuquerque, New Mexico. 49 pp.

_____. 2000. *Balcones Canyonlands National Wildlife Refuge Environmental Assessment on Proposed Additions.* Albuquerque, New Mexico. 52pp.

_____. 2001. *Balcones Canyonlands National Wildlife Refuge Fire Management Plan.* Albuquerque, New Mexico. 47pp.

Usrey, S. 1980. *Archaeological investigations at seven sites in Atascosa County, Texas*. Anthropology Research Laboratory. Texas A&M University Report No. 48.

Veni, G. and Associates. 1988. *Hydrogeologic investigation of the Jollyville Plateau Karst, Travis County, Texas*. Report prepared for Parke Investors Ltd., 620 Investors Ltd., and U.S. Fish and Wildlife Service.

Voellinger, M.W. 1984. *A cultural resources survey of the proposed St. Michael's Academy Tract, Travis County, Texas*. EH&A Document No. 84124. Austin.

Webb, W.P. (ed). 1952. *The handbook of Texas Vols. I and 2.* The Texas State Historical Association. Austin.

Weir, F.A. 1976. *The Central Texas archaic*. Unpublished Ph.D. Dissertation. Washington State University. Pullman.

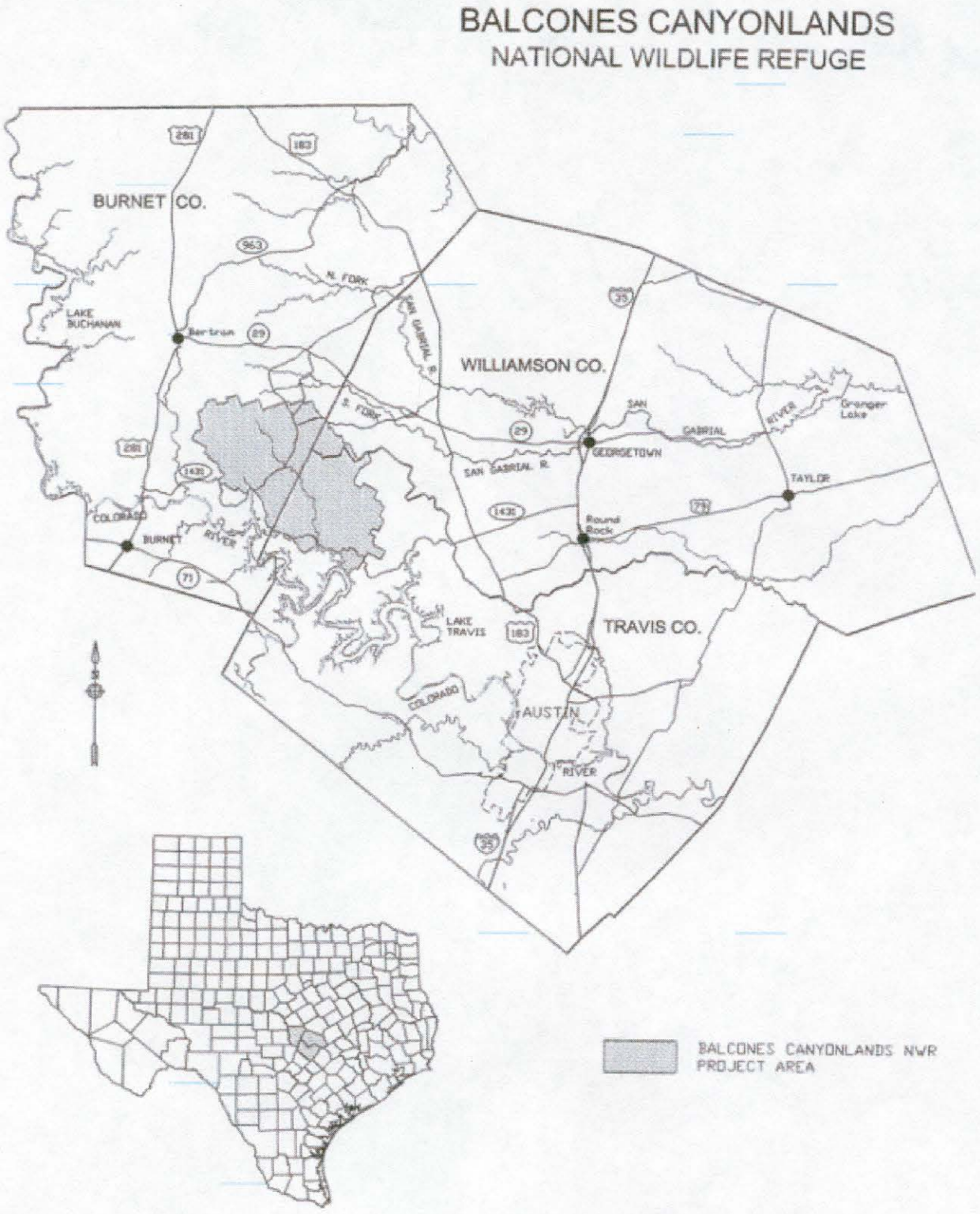
Weniger, D. 1984. *Cacti of Texas and neighboring states.* University of Texas Press, Austin.

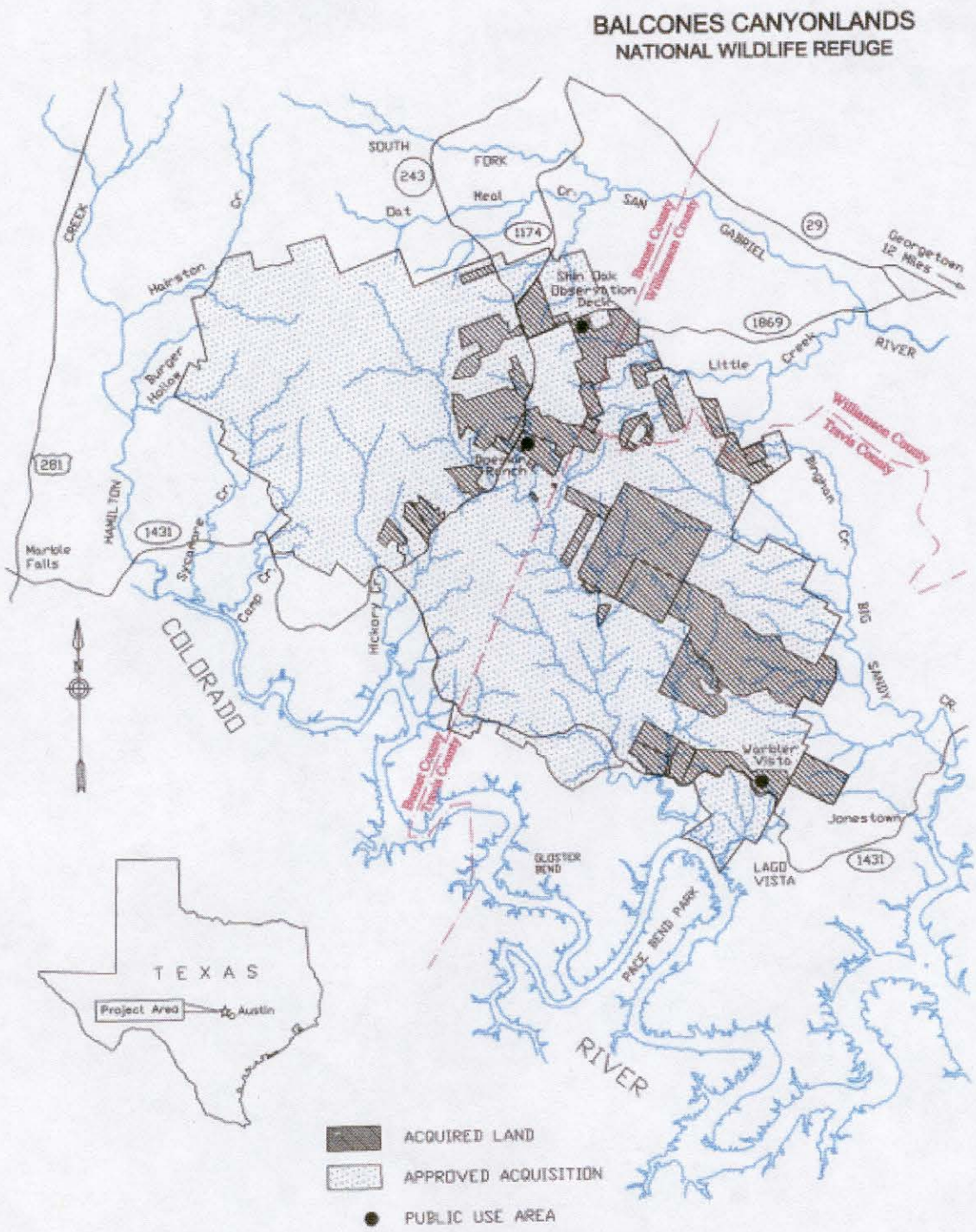
Wheeler, F. 1991. Personal Communication to Steve Helfert on prime farmlands for Bumet, Travis, and Williamson Counties, Texas, March 7, 1991. State Resource Inventory Specialist, Soil Conservation Service, Temple, Texas.

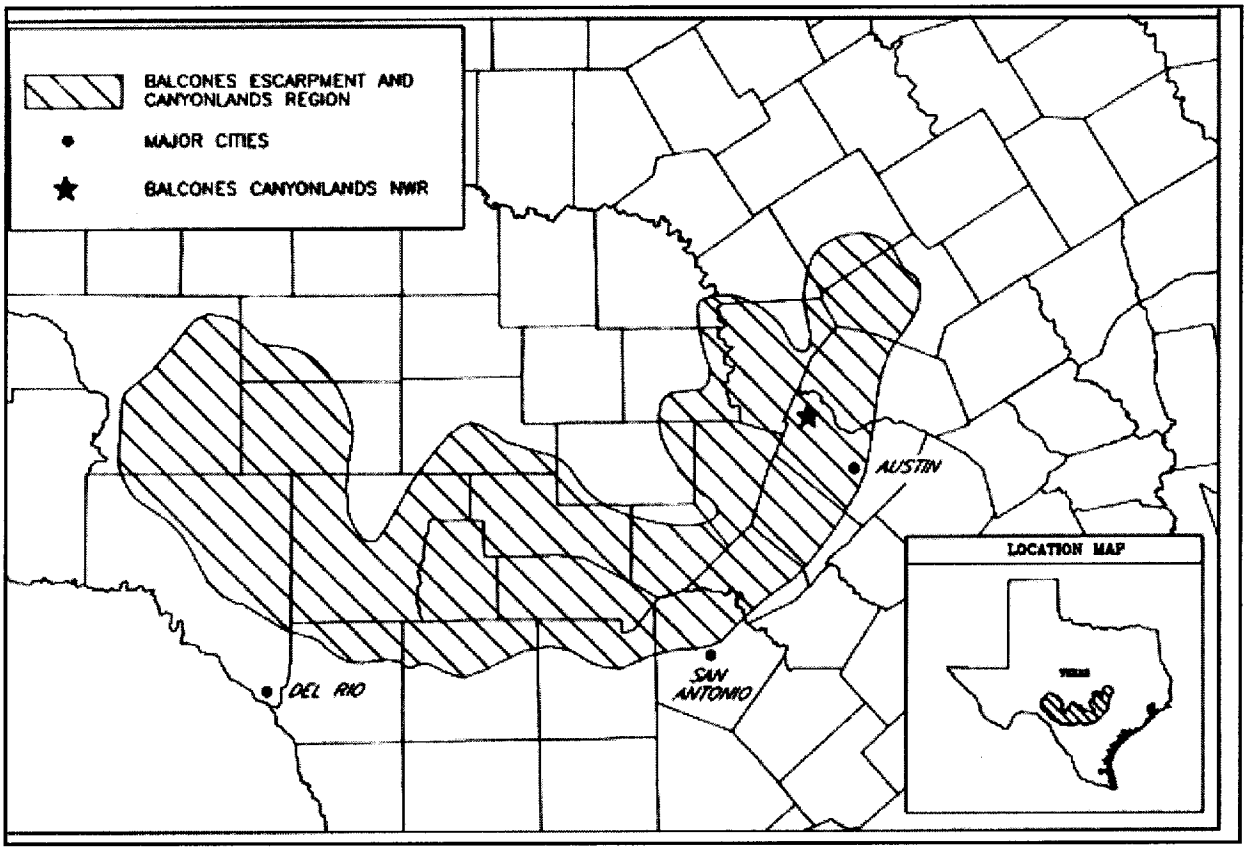
Willey, G.R. 1966. *An introduction to archaeology.* Prentice Hall, Inc.

Appendix C: Maps

EDWARDS PLATEAU
ECOSYSTEM
NEW MEXICO
TEXAS
GRULLA NWR
MULESHOE NWR
LUBBOCK
NEW MEXICO
TEXAS
ODESSA
INKS DAM NFH
BALCONES NWR
AUSTIN
SAN MARCOS NFH
SAN ANTONIO
UVALDE NFH
GULF OF MEXICO
N
ARIZONA
NEW MEXICO
OKLAHOMA
TEXAS
EDWARDS PLATEAU
REGION 2
ECOSYSTEMS

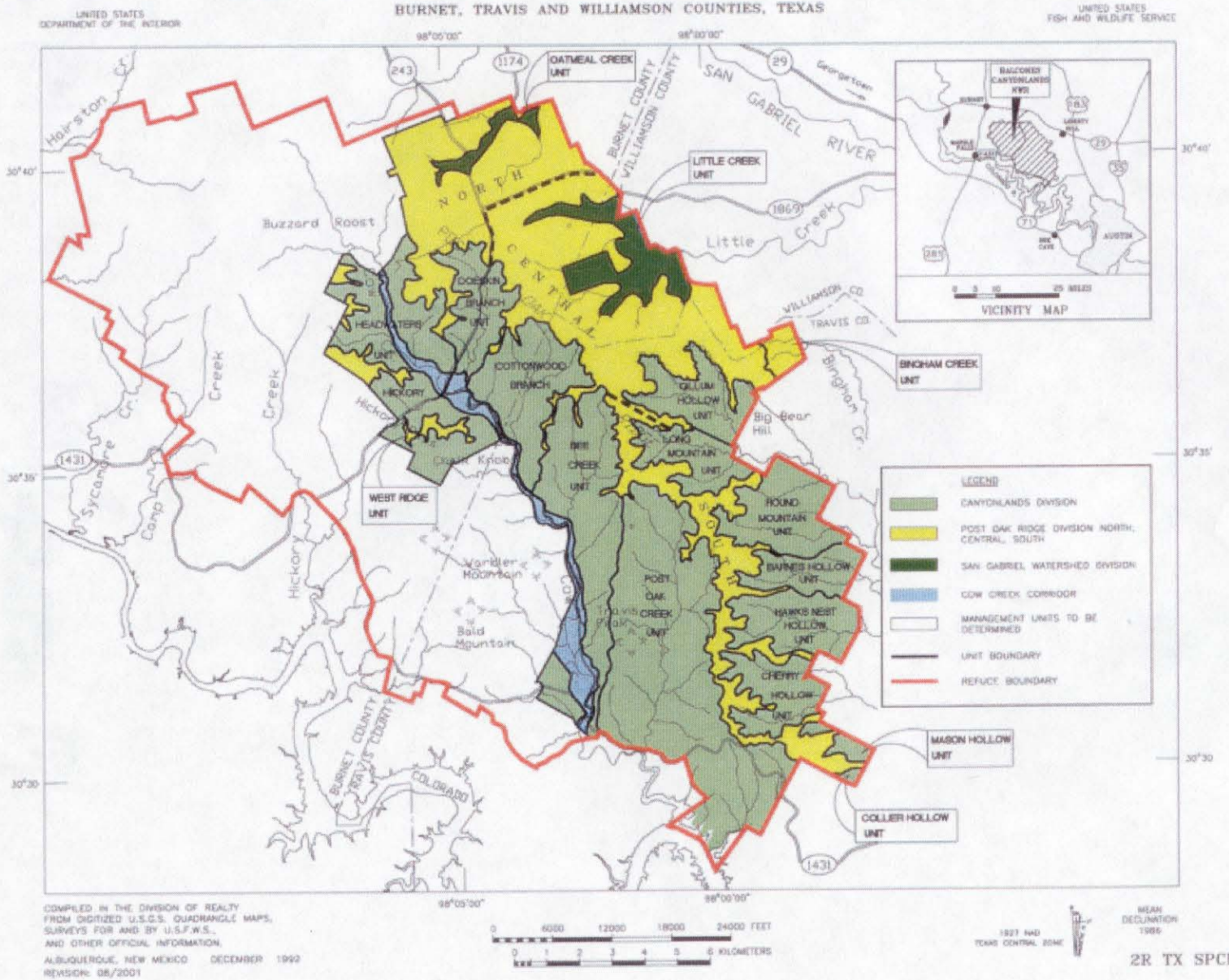

BALCONES CANYONLANDS
NATIONAL WILDLIFE REFUGE
BURNET CO.
WILLIAMSON CO.
TRAVIS CO.
LAKE BUCHANAN
Bertram
N. FORK
SAN GABRIAL R.
S. FORK
GEORGETOWN
SAN GABRIAL RIVER
Granger Lake
TAYLOR
Round Rock
COLORADO
BURNET
RIVER
LAKE TRAVIS
COLORADO RIVER
AUSTIN
BALCONES CANYONLANDS NWR
PROJECT AREA


BALCONES CANYONLANDS
NATIONAL WILDLIFE REFUGE
SOUTH
FORK
243
Oat
Meal
Cr.
SAN
GABRIEL
29
Georgetown
12 Miles
1174
Shin Oak
Observation
Deck
Bastrop County
Williamson County
1869
Little
Creek
RIVER
Hairston
Cr.
CREEK
Burger
Hollow
281
HAMILTON
1431
Marble
Falls
Sycamore
Cr.
Camp
Cr.
Hickory
Cr.
COLORADO
Williamson County
Travis County
Bingham
Cr.
BIG
SANDY
CR.
Warbler
Vista
Jonestown
1431
LAGO
VISTA
GLOSTER
BEND
PACE BEND PARK
RIVER
TEXAS
Project Area
Austin
ACQUIRED LAND
APPROVED ACQUISITION
PUBLIC USE AREA


BALCONES ESCARPMENT AND CANYONLANDS REGION
MAJOR CITIES
BALCONES CANYONLANDS NWR
AUSTIN
SAN ANTONIO
DEL RIO
LOCATION MAP

BALCONES CANYONLANDS NATIONAL WILDLIFE REFUGE

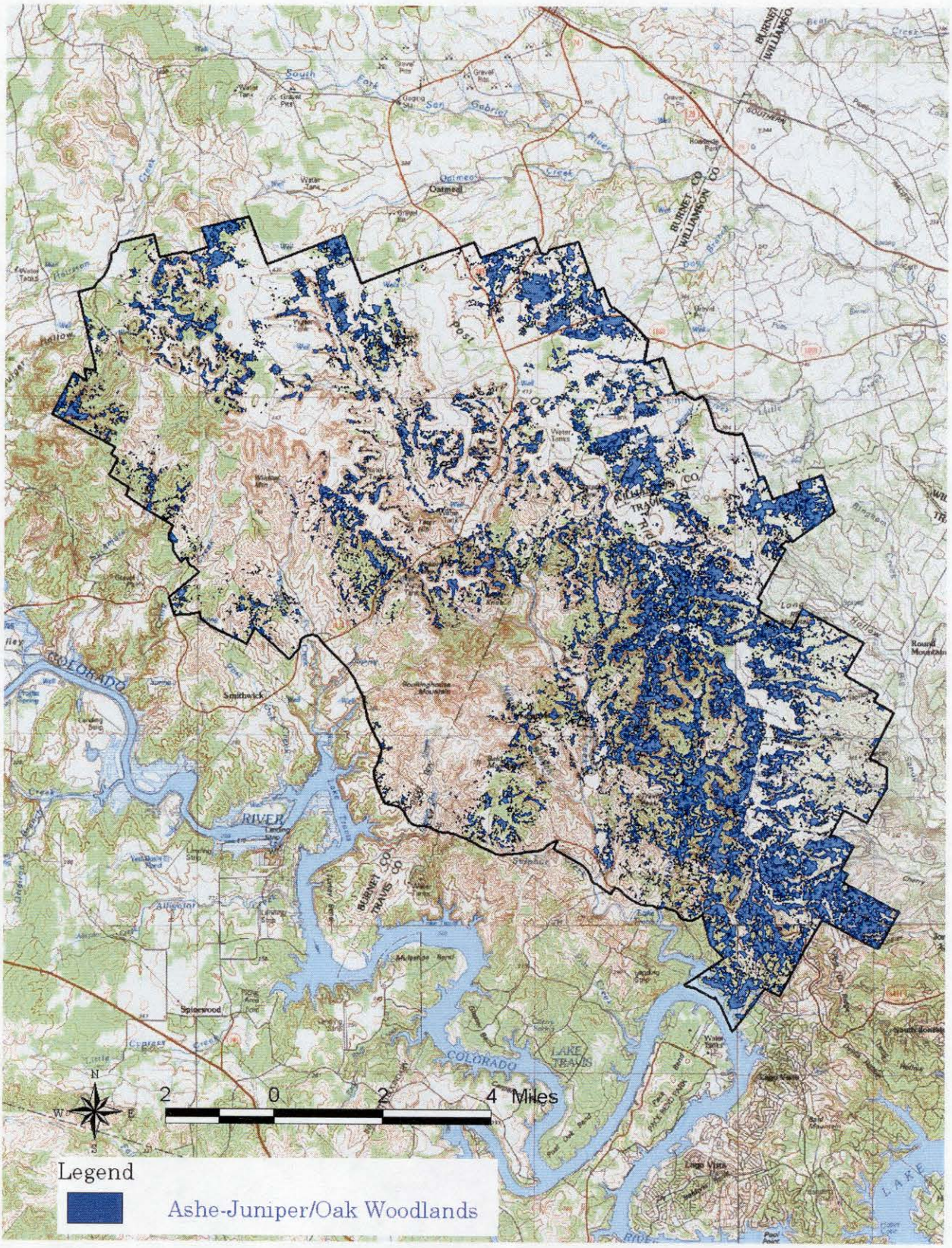
BURNET, TRAVIS AND WILLIAMSON COUNTIES, TEXAS

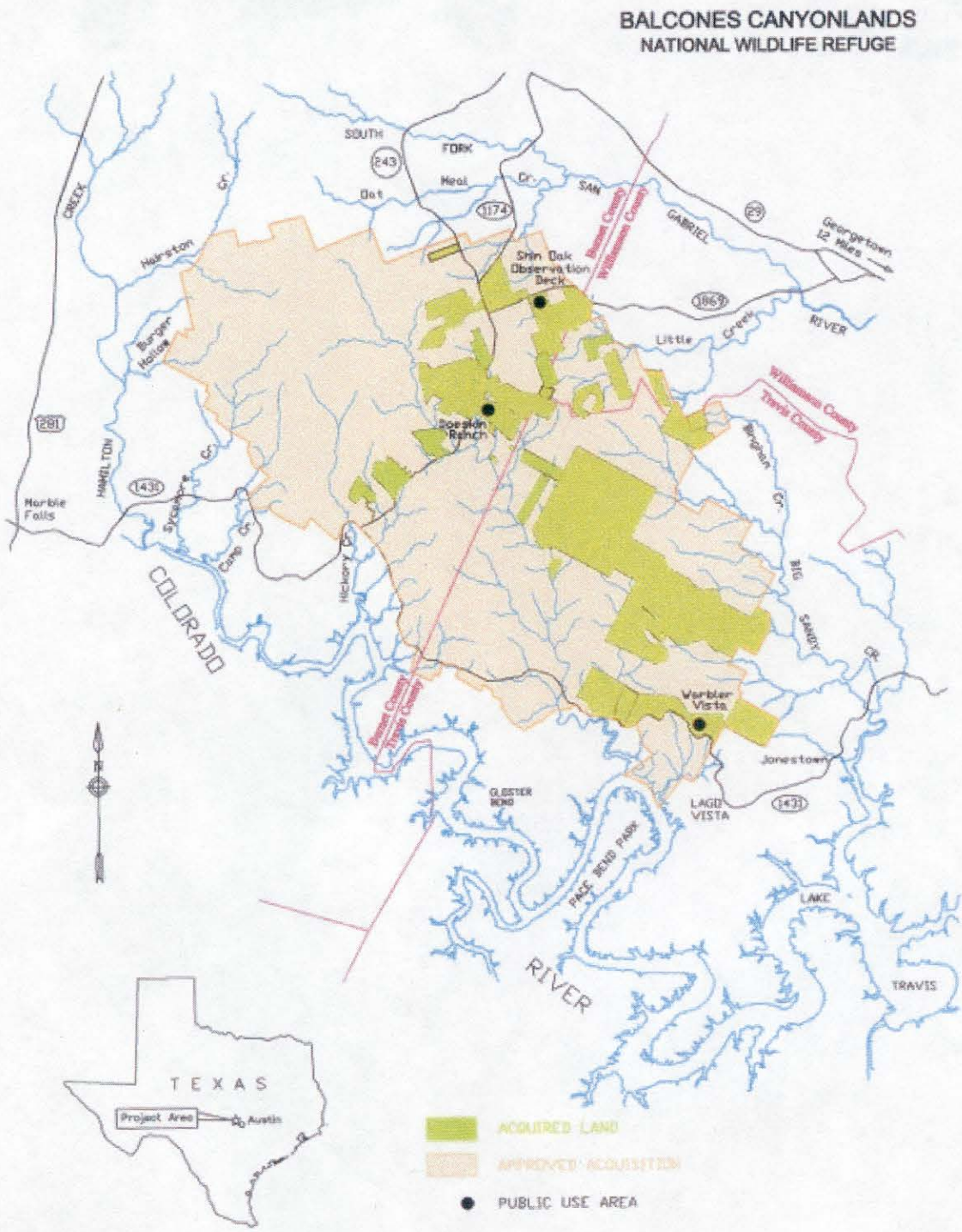


COMPILED IN THE DIVISION OF REALTY FROM DIGITIZED U.S.G.S. QUADRANGLE MAPS, SURVEYS FOR AND BY U.S.F.W.S., AND OTHER OFFICIAL INFORMATION.

ALBUQUERQUE, NEW MEXICO DECEMBER 1992
REVISION: 08/2001

2R TX SPCL


N
W
E
S
2
0
2
4 Miles
Legend
Ashe-Juniper/Oak Woodlands


BALCONES CANYONLANDS
NATIONAL WILDLIFE REFUGE
SOUTH
FORK
SAN
GABRIEL
RIVER
Georgetown
12 Miles
Shin Oak
Observation
Deck
Doeskin
Ranch
Warbler
Vista
Jonestown
LAGO
VISTA
LAKE
TRAVIS
PACE BEND PARK
GLOSTER
BEND
COLORADO
RIVER
Marble
Falls
HAMILTON
CREEK
Hairston
Burger
Hollow
Sycamore
Camp
Hickory
Little
Creek
Bingham
BIG
SANDY
Williamson County
Travis County
Burnet County
Williamson County
Burnet County
Travis County
TEXAS
Project Area
Austin
ACQUIRED LAND
APPROVED ACQUISITION
PUBLIC USE AREA

Appendix D:
Public Comments on Draft CCP/EA

On December 6, 2000 the U.S. Fish and Wildlife Service (Service) placed a notice in the *Federal Register* informing readers that the Draft Balcones Canyonlands National Wildlife Refuge Comprehensive Plan and Draft Environmental Assessment (CCP/EA) were available for public review upon request. On December 8, 2000 a similar notice was mailed to more than 500 individuals and institutions on Balcones Canyonlands CCP/EA mailing list. The notice provided instructions for requesting a copy of the document, in print or CD-ROM format, by telephone, letter or e-mail and announced that the Service would accept comments on the Draft CCP/EA until March 5, 2001. Print format copies of the document were sent to libraries in the project area and public officials on December 10. 2000.

The Service held a public meeting in Lago Vista, Texas on January 17, 2001to present the Draft CCP/EA and receive comments. A summary of all comments received, either in public testimony or in writing, along with the Service's response, follows.

1. Several speakers at the January 17 public meeting, and some written comments expressed opposition to a 34,000 acre refuge boundary expansion approved by the Service in June, 2000.

Response: The comments are noted; however, the boundary expansion is complete, and is not an action being considered in the context of this CCP.

2. Several speakers at the January 17 public meeting expressed opposition to hunting or use of other lethal means of wildlife management on the Refuge.

Response: Hunting is one of the six priority wildlife-dependent public uses of National Wildlife Refuges, and is to be provided at Refuges when compatible with the Refuge purposes. For problem wildlife, such as brown-headed cowbirds or feral hogs, lethal means of management are often the only feasible method of control. Non-lethal alternatives such as capture and relocation are extremely difficult to implement, due to impacts caused to any receiving area.

3. One speaker at the January 17 public meeting inquired whether the management actions proposed in the Draft CCP would be feasible, given current staffing levels and the diffuse patterns of Service landownership within the Refuge.

Response: The management actions proposed in the CCP will require additional staff for implementation. Goal 8, Objective 2 of the CCP identifies current staffing levels, as well as additions to staff required for full implementation of the CCP's recommendations. The piecemeal pattern of federal landownership within the Refuge does create some operational inefficiency. Continued land acquisition within the Refuge boundary from willing sellers should allow connection of federal parcels into larger contiguous blocks, facilitating land management.

4. One speaker at the January 17 meeting suggested that the Service has not compiled sufficient white-tailed deer population data to demonstrate that hunting is necessary to reduce deer density.

Response: The proposed hunting plan was developed based upon deer population information developed by the Texas Parks and Wildlife Department, as well as evidence of damage to vegetation on the Refuge typical of deer browsing. Texas Parks and Wildlife has been consulted on the proposed hunting plan. Annual deer population surveys are conducted on the Refuge. The effect of the hunt program will be monitored and changes made to the plan as necessary.

5. One written comment, and several speakers at the January 17 meeting, suggested that the Service's management of the Refuge could benefit from considering the knowledge of local of landowners. Many such landowners are members of families that have managed adjacent lands for several generations.

Response: Goal 5, Objective 2 of the CCP calls for meeting with at least 5 private landowners annually to exchange information and work cooperatively on wildlife and endangered species management. The Service recognizes that species conservation requires cooperative work with neighbors and others. This CCP should be an agent change toward increased local interaction on the part of Refuge staff.

6. Several speakers at the January 17 meeting expressed concern that additional public use on the Refuge, as proposed in the CCP, would result in increased road congestion, private property trespass and other security problems to adjacent landowners.

Response: Most of the additional public use proposed in the CCP will occur on developed facilities, such as the interpretive trail at Doeskin Ranch and the vireo overlook blind. While

outreach and activities are intended to increase overall visitation to the Refuge, anti-social activities should be kept to a minimum. An increase of legitimate visitors may actually have the consequence of reducing anti-social behaviors such as game poaching and private property trespass by increasing the visibility of such activities.

7. One written comment questioned whether proposed upland game bird hunting, specifically a spring turkey hunt, would compromise the breeding success of the Golden-cheeked warbler. This questioner also expressed a hope that administering hunt programs would not seriously detract from the Refuge's primary purposes of endangered species recovery/conservation.

Response: All recreational public uses of National Wildlife Refuges must be compatible with the purpose of the Refuge. In the case of the Balcones Canyonlands NWR, this is endangered species conservation. Hunting, as well as other public uses of the Refuge, will be planned to avoid and conflict with the Refuge's purpose and monitored to assure compatibility. Spring turkey hunts are not planned. The final CCP has been modified to more clearly reflect this.

8. One written comment and several speakers suggested that off-road bicycling should be considered at Doeskin Ranch and that equestrian use should be generally allowed within the Refuge..

Response: Bicycling and horseback riding are not among the six priority wildlife dependent public uses to be provided at Refuges when compatible (hunting, fishing, wildlife observation, wildlife photography, environmental education and interpretation). While non-priority uses can be provided on National Wildlife Refuges, they are usually considered appropriate only when essential to facilitate one of the priority uses. (e.g., horse packing to accomplish hunts or wildlife observation on refuges with extensive, otherwise inaccessible, wilderness areas). Off-road bicycling and horseback riding were evaluated in Alternative 4 of the EA (attached, at end of document), but determined non-essential to wildlife dependent public uses, as well as to have negative impacts on wildlife. These uses were thus not considered to be appropriate.

Appendix E:
Intra-Service Section 7
Biological Evaluation Form

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

[Note: This form provides the outline of information needed for intra-Service consultation. If additional space is needed, attach additional sheets, or set up this form to accommodate your responses.]

Originating Person: Deborah Holle, Refuge Manager
Telephone number: (512) 339-9432 ext. 27
Date: April 17, 2001

I. Region: Southwest

II. Service Activity (Program): Refuges

III. Pertinent Species and Habitat:

A. Listed species and/or their critical habitat within the action area:

Burnet County

Black-capped vireo	(E) *Vireo atricapillus*
Golden-cheeked warbler	(E) *Dendroica chrysoparia*
Northern aplomado falcon	(E) *Falco femoralis septentrionalis*
Bee Creek Cave harvestman	(E) *Texella reddelli*
Bald eagle	(T) *Haliaeetus leucocephalus*

Travis County

Black-capped vireo	(E) *Vireo atricapillus*
Golden-cheeked warbler	(E) *Dendroica chrysoparia*
Whooping crane	(E w/CH) *Grus americana*
Barton Springs salamander	(E) *Eurycea sosorum*
Bee Creek Cave harvestman	(E) *Texella reddelli*
Bone Cave harvestman	(E) *Texella reyesi*
Kretschmarr Cave mold beetle	(E) *Texamaurops reddelli*
Tooth Cave pseudoscorpion	(E) *Tartarocreagris texana*
Tooth Cave ground beetle	(E) *Rhadine persephone*
Tooth Cave spider	(E) *Neoleptoneta (=Leptoneta) myopica*

Williamson County

Black-capped vireo	(E) *Vireo atricapillus*
Golden-cheeked warbler	(E) *Dendroica chrysoparia*
Whooping crane	(E w/CH) *Grus americana*
Bone Cave harvestman	(E) *Texella reyesi*
Coffin Cave mold beetle	(E) *Batrisodes texanus*
Tooth Cave ground beetle	(E) *Rhadine persephone*

B. Proposed species and/or proposed critical habitat within the action area:

Travis/Williamson

Mountain plover	(P/T) *Charadrius montanus*

C. Candidate species within the action area:

Burnet County

Loggerhead shrike	(SOC) *Lanius ludovicianus*
Texas garter snake	(SOC) *Thamnophis sirtalis annectans*
Texas homed lizard	(SOC) *Phrynosoma cornutum*
Bifurcated cave amphipod	(SOC) *Stygobromus bifurcatus*
Edwards' Plateau cornsalad	(SOC) *Valerianella texana*
Rock quillwort	(SOC) *Isoetes lithophila*
Texabama (Fort Hood) croton	(SOC) *Croton alabamensis* var. *texensis*

Travis County

Warton's cave spider	(C) *Cicurina wartoni*
Texas olive sparrow	(SOC) *Arremonops rufivirgatus rufivirgatus*
White-faced ibis	(SOC) *Plegadis chihi*
Jollyville Plateau salamander	(SOC) *Eurycea sp.*
Texas garter snake	(SOC) *Thamnophis sirtalis annectans*
Texas horned lizard	(SOC) *Phrynosoma cornutum*
Blue sucker	(SOC) *Cycleptus elongatus*
Balcones cave amphipod	(SOC) *Stygobromus balconis*
Bifurcated cave amphipod	(SOC) *Stygobromus bifurcatus*
Big red sage	(SOC) *Salvia penstemonoides*
Bracted twistflower	(SOC) *Streptanthus bracteatus*
Canyon mock orange	(SOC) *Philadelphus ernestii*
Correll's false dragon-head	(SOC) *Physostegia correllii*
Glass Mountain coral-root	(SOC) *Hexalectris nitida*
Texabama (Fort Hood) croton	(SOC) *Croton alabamensis* var. *texensis*

Williamson County

Buttercup Creek salamander	(SOC) *Eurycea sp.*
Georgetown salamander	(SOC) *Eurycea sp.*
Jollyville Plateau salamander	(SOC) *Eurycea sp.*
Texas garter snake	(SOC) *Thamnophis sirtalis annectans*
Texas homed lizard	(SOC) *Phrynosoma cornutum*

In addition, because the Refuge in general has numerous karst features with potential for containing multiple cave-related species that are endemic to the cave, Refuge, or Edward's Plateau, impacts to these karst habitats were considered below under "Species of Concern".

D. Include species/habitat occurrence on a map: See attached map.

IV. Geographic area or station name and action: Balcones Canyonlands NWR

V. Location (attach map):

A. Ecoregion Number and Name: Edwards Plateau

B. County and state: Burnet, Travis, Williamson Counties, Texas

C. Section, township, and range (or latitude and longitude):98° 00'W, 30° 30'N

D. Distance (miles) and direction to nearest town: 1 mile north of Lago Vista

E. Species/habitat occurrence: Golden-cheeked Warbler/Ashe juniper-oak woodlands
Black-capped Vireo/Ashe juniper-oak woodlands

VI. Description of proposed action (attach additional pages as needed):

Adopt and implement Comprehensive Conservation Plan (15-year management master plan) for Balcones Canyonlands National Wildlife Refuge

VII. Determination of effects:

A. Explanation of effects of the action on species and critical habitat in items III A, B, and C (attach additional pages as needed):

(short-term)

Programs and management actions proposed in the goals and objectives of this plan are consistent with the purpose of the Balcones Canyonlands National Wildlife Refuge: conservation of endangered species. Efforts to provide habitat for endangered species on the Refuge will continue.

(Long-term)

Long term effects of implementing the Comprehensive Conservation Plan will include increased public appreciation and understanding of Refuge resources, particularly endangered and threatened species. Overall effects should include an increase in endangered species habitat on Refuge lands.

Endangered Black-capped Vireo: Habitat management practices may result in conversion of some small areas of marginal black-capped vireo habitat to golden-cheeked warbler habitat. Implement prescribed burning and other management actions to create additional habitat. Management activities and public use will be timed to avoid any taking or other direct impacts to black-capped vireo.

Endangered Golden-cheeked Warbler: Management actions will be aimed at protecting all existing golden-cheeked warbler habitat and facilitating natural forest succession to create additional habitat. Management activities and public use will be timed to avoid any taking or other direct impacts to golden-cheeked warbler.

Peregrine Falcon, Whooping Crane, and Bald Eagle: None.

Endangered Karst Invertebrates: No karst invertebrates have been positively verified to occur within the Refuge. The Comprehensive Conservation Plan includes specific provisions to protect caves and other karst features from non-point source pollution and calls for monitoring for fire ant infestations.

B. Explanation of actions to be implemented to reduce adverse effects:

No adverse effects anticipated with most actions. Individual consultations will be initiated if possible adverse effects are anticipated. Resulting Biological Opinion will detail reasonable and prudent actions to mitigate adverse effects.

VIII. Effect determination and response requested: **[* = optional]**

A. Listed species/designated critical habitat:

Determination	Response Requested
No effect on species/critical habitat	
(species: Peregrine Falcon, Whooping Crane, Bald Eagle)	✓ *Concurrence
May affect, is not likely to adversely affect species/critical habitat	
(species: Golden-cheeked Warbler, Black-capped Vireo)	✓ Concurrence
May affect, is likely to adversely affect species/critical habitat (species: NONE) Form	

8. Proposed species/proposed critical habitat

Determination	Response Requested
No effect on proposed species/critical habitat (species: NONE)	✓ *Concurrence
Is not likely to jeopardize proposed species/ adversely modify proposed critical habitat (species: NONE)	✓ Concurrence
Is likely to jeopardize proposed species/ adversely modify proposed critical habitat (species: NONE)	_____ Conference

C. Candidate species

Determination	Response Requested
No effect on candidate species (species: Edwards Plateau cornsalad, Rock guillwork, Texabama croton)	✓ Concurrence _____ *Conference
Is not likely to jeopardize candidate species (species: Loggerhead Shrike, Texas homed lizard, Texas gartersnake, Buttercup Creek salamander, Jollyville Plateau salamander, Georgetown salamander, bifurcated cave amphipod)	✓ Concurrence
Is likely to jeopardize candidate species (species: NONE)	_____ Conference

Deborah Hale 4/17/2001
Signature Date

Refuge Manager
Title

IX. Reviewing ESFO Evaluations:

A. Concurrence: ✓ Nonconcurrence: _____

B. Formal consultation required: _____

C. Conference required _____

D. Informal conference required _____

E. Remarks (attach additional pages as needed):

William Seawell 4/18/01
Signature Date

Assistant Field Supervisor
Title

Appendix F:
Compatibility Determinations

COMPATIBILITY DETERMINATION

OF

RELOCATION OF PEDERNALES ELECTRIC COOPERATIVE

RIGHT-OF-WAY EASEMENT ON

BALCONES CANYONLANDS NATIONAL WILDLIFE REFUGE

STATION NAME: Balcones Canyonlands National Wildlife Refuge

DATE ESTABLISHED: February 25, 1992

ESTABLISHING AUTHORITY: Endangered Species Act of 1973 (ESA), as amended, the Fish and Wildlife Act of 1956, as amended, the Land and Water Conservation Fund Act of 1965, as amended.

PURPOSES FOR WHICH THE REFUGE WAS ESTABLISHED: ". . . to conserve (A) fish or wildlife which are listed as endangered species or threatened species. . . or. . . plants" 16 U.S.C. §1534 (Endangered Species Act of 1973).

REFUGE OBJECTIVES: As defined in 16 USC 668dd, Title 50 of the Code of Federal Regulations (50CFR), Subchapter C, Part 25, Subpart A, 25.11.b:. . . refuges are established for the restoration, preservation, development and management of wildlife and wildlands habitat; for the protection and preservation of endangered or threatened species and their habitat; and for the management of wildlife and wildlands to obtain the maximum benefits from these resources. The goals and objectives of the National Wildlife Refuge System, as defined in the Refuge Manual (RM) and the National Wildlife Refuge System Improvement Act of 1997, provide the framework for refuge objectives. These objectives as (1) Threatened and endangered species maintenance and production, (2) Migratory bird maintenance and production, (3) Maintenance of native habitat types and their associated wildlife species, (40 Compatible wildlife dependent recreation, including hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

OTHER APPLICABLE LAWS, REGULATIONS AND POLICES:

Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
Antiquities Act of 1906 (34 Stat 335)
Migratory Bird Treaty Act of 1918 (16 U.S. C. 703-711; 40 Stat. 755)
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715r; 45 Stat.1222)
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-718h; 48 Stat.451)
Criminal Code Provision of 1940 (18 U.S.C. 41)
Bald and Golden Eagles Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat.250)

Fish and wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 119)
Refuge Recreation Act of 1972 (Public Law 87-114; 76 Stat 53-654; 16 U.S.C.)
Wilderness Preservation and Management Act (50 CFR 35; 16 U.S.C. 1131-1136; 78 Stat. 890; 43 USC 1201)
Land and Water Conservation Fund Act of 1965
National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.; 80 Stat.915)
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat. 927)
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq.; 83 Stat. 927)
Refuge Rights-of-Way General Regulations (50 CFR 29.21)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 11989)
Refuge Revenue Sharing Act of 1935m as amended 1978 (16 U.S.C. 715s; 92 Stat. 1319)
Management and General Public Use of The National Wildlife Refuge System (Executive Order 12996, March 25, 1996)
National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, October 9, 1997)
National Wildlife Refuge Regulations for the most recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3)

DESCRIPTION OF PROPOSED USE: Pedernales Electric Cooperative (PEC) has agreed to relocate the existing power line right-of-way and line from Refuge tracts # 54 and #58 across FM 1174 on to Refuge tracts #60 and #70. PEC will abandon the right-of-way easement on tracts #54 and #58 in exchange for the right-of-way easement on tracts #60 and #70.

ANTICIPATED IMPACTS ON REFUGE PURPOSES: This action will remove the PEC utility easement from the interior of the Refuge and put it on periphery next to the right-of-way for Farm to Market road 1174. While portions of the initial 20' right-of-way will be cleared, it will also allow the abandoned easement to become more vegetated. By consolidating or putting easements side by side, less habitat will be impacted. An Intra-Service Section 7 Consultation had a finding of No Effect. An archeological survey of the easement area did not identify any archeological sites or artifacts.

DETERMINATION: This use is compatible _X_ This use is not compatible _____

NEPA COMPLIANCE: (Environmental Action Memorandum Attached)

_✓_ Categorical Exclusion
_____ Environmental Assessment
_____ Environmental Impact Statement
_____ Finding of No Significant Impact (FONSI)

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY: A Special Use Permit will be issued to PEC that states that construction and maintenance of power line will use normal and reasonably expected methods. Cutting and trimming of all oak species within the easement will involve due care to prevent infection and spread of oak wilt. Mitigating measure will include a) fungicide used on all cutting tools b) all wounds immediately painted with tree coating c) trimming conducted during the periods of July - September and November - January only.

JUSTIFICATION: Tract # 54 is being developed as a public use area, Doeskin Ranch. It was not appropriate to have electrical lines and power poles in the middle of the public use and environmental education area. The guy wires which support the power poles pose a safety hazard for the visiting public along the hiking trails. At a later date it is planned to put the smaller electric line that services the potable water well at the tract underground.

Deborah Holle 4/30/2000

Deborah Holle, Refuge Manager — Date

Rodney J. Krey 5/4/00

Rod Krey, Refuge Supervisor, Texas/Oklahoma — Date

J. W. Larkin (acting) 5/16/00

Dom Ciccone, PARD-RW — Date

5/18/00

Acting Regional Director — Date

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:

relocating existing electric right-of-way for Pedernales Electric Cooperative from refuge tracts #54 and #58 to tracts # 60 and #70

Check One:

✓ is a categorical exclusion as provided by FWS citation 30 AM 2/516.C Permit and Regulatory Function, 4) Issuance of permits for limited additional use and for permitting a new right-of-way where no negligent environmental disturbances are anticipated. No further NEPA documentation will therefore be made.

_____ is found not have a 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 (list):

Environmental Assessment for Establishment of Balcones Canyonlands National Wildlife Refuge, January, 1992

Scoping meetings for preparation of Balcones Canyonlands NWR Comprehensive Conservation Plan held in Lago Vista, May 22, 1996. Additional public meeting on recreational uses June 23, 1997 in Lago Vista.

Intra-Service Consultation with Austin Ecological Services Office, December 20, 1999

Agreement to relocate Electric Power Line Easement, Special Use Permit #7520 with Compatibility Determination

Archeological Survey of proposed right-of-way

Signature Approval:

Deborah Holle 4/28/2000
(1) Originator Date

(2) WO/RO Environ. Coord. 5/12/2000 Date

COMPATIBILITY DETERMINATION

FOR

CONSTRUCTION OF BLACK-CAPPED VIREO VIEWING DECK

ON

BALCONES CANYONLANDS NATIONAL WILDLIFE REFUGE

STATION NAME: Balcones Canyonlands National Wildlife Refuge

DATE ESTABLISHED: February 25, 1992

ESTABLISHING AUTHORITY: Endangered Species Act of 1973 (ESA), as amended, the Fish and Wildlife Act of 1956, as amended, the Land and Water Conservation Fund Act of 1965, as amended.

PURPOSES FOR WHICH THE REFUGE WAS ESTABLISHED: ". . . to conserve (A) fish or wildlife which are listed as endangered species or threatened species. . . or. . . plants" 16 U.S.C. §1534 (Endangered Species Act of 1973).

REFUGE OBJECTIVES: As defined in 16 USC 668dd, Title 50 of the Code of Federal Regulations (50CFR), Subchapter C, Part 25, Subpart A, 25.11.b:. . . refuges are established for the restoration, preservation, development and management of wildlife and wildlands habitat; for the protection and preservation of endangered or threatened species and their habitat; and for the management of wildlife and wildlands to obtain the maximum benefits from these resources. The goals and objectives of the National Wildlife Refuge System, as defined in the Refuge Manual (RM) and the National Wildlife Refuge System Improvement Act of 1997, provide the framework for refuge objectives. These objectives as (1) Threatened and endangered species maintenance and production, (2) Migratory bird maintenance and production, (3) Maintenance of native habitat types and their associated wildlife species, (40 Compatible wildlife dependent recreation, including hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

OTHER APPLICABLE LAWS, REGULATIONS AND POLICES:

Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
Antiquities Act of 1906 (34 Stat 335)
Migratory Bird Treaty Act of 1918 (16 U.S. C. 703-711; 40 Stat. 755)
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715r; 45 Stat.1222)
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-718h; 48 Stat.451)
Criminal Code Provision of 1940 (18 U.S.C. 41)

Bald and Golden Eagles Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat.250)
Fish and wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 119)
Refuge Recreation Act of 1972 (Public Law 87-114; 76 Stat 53-654; 16 U.S.C.)
Wilderness Preservation and Management Act (50 CFR 35; 16 U.S.C. 1131-1136; 78 Stat. 890; 43 USC 1201)
Land and Water Conservation Fund Act of 1965
National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.; 80 Stat.915)
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat. 927)
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq.; 83 Stat. 927)
Refuge Rights-of-Way General Regulations (50 CFR 29.21)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 11989)
Refuge Revenue Sharing Act of 1935m as amended 1978 (16 U.S.C. 715s; 92 Stat. 1319)
Management and General Public Use of The National Wildlife Refuge System (Executive Order 12996, March 25, 1996)
National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, October 9, 1997)
National Wildlife Refuge Regulations for the most recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3)

DESCRIPTION OF PROPOSED USE: Construction of a wildlife viewing deck and related parking facilities on the Eckhardt tract # 10 for the public to learn about the endangered Black-capped Vireo and conservation measures needed to insure it's continued survival. The deck will also facilitate bird watching. Plans for the deck and parking area were designed by Robert Anderson, Austin, Texas.

ANTICIPATED IMPACTS ON REFUGE PURPOSES: This action will require a formal Intra-Service Section 7 Consultation and Biological Opinion with the Austin Ecological Services Office because construction will be adjacent to endangered species habitat. It is anticipated that no habitat will be destroyed and any disturbance to the Vireo colony can be adequately mitigated. An archeological survey of the area will not be necessary because the area is underlain with an almost solid formation of whitestone limestone with almost no vegetation being removed. The area will be visually inspected prior to construction activities for archeological artifacts.

DETERMINATION: This use is compatible _X_ This use is not compatible _____

NEPA COMPLIANCE: (Environmental Action Memorandum Attached)

_✓_ Categorical Exclusion
_____ Environmental Assessment
_____ Environmental Impact Statement
_____ Finding of No Significant Impact (FONSI)

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY: The deck and related parking facilities will be constructed when the endangered birds are on their wintering grounds in Mexico. All recommendations in the Biological Opinion will be followed and the colony will be monitored for several

years following construction to insure that disturbance to the colony is at a minimum.

JUSTIFICATION: Wildlife Observation is a recreation use deemed appropriate on National Wildlife Refuges if compatible with the purpose. Balcones was established to protect the nesting habitat and the Black-capped Vireo and Golden-cheeked Warblers, as well as native flora and fauna of the Edwards Plateau. These facilities will assist in educating the public on the Vireo and measures needed to insure their survival. While the recovery plan for the Vireo does not list increasing public awareness as a priority recovery task, it is essential to educate the public and surrounding landowners about the value of the bird and it's role in the ecosystem. Allowing the public to see what Vireo habitat looks like will aid in management of the Vireo and control of Brown-headed Cowbirds on private lands. The Environmental Assessment that established the Refuge called for the development of a refuge public use program designed to interpret the ecosystem values and characteristics of the region without adversely impacting refuge resources. The Refuge Improvement Act of 1997 provides for wildlife dependent recreation, including interpretation, wildlife observation, wildlife photography, and environmental education if the use is compatible with the refuge purpose.

Deborah Holle 7/22/97

Deborah Holle, Refuge Manager Date

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:

constructing and operating a wildlife viewing deck, specifically for Black-capped Vireos

Check One:

✓ is a categorical exclusion as provided by 516 DM 2, Appendix 1 and 516 DM 6, Appendix 1. No further NEPA documentation will therefore be made.

_____ is found not to have a 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 to 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 (list):

Environmental Assessment for Establishment of Balcones Canyonlands National Wildlife Refuge, January, 1992

Scoping Meetings for preparation of Balcones Canyonlands NWR Comprehensive Conservation Plan held in Lago Vista, May 22, 1996. Additional public meeting on recreational uses June 23, 1997 in Lago Vista.

Intra-Service Section 7 Biological Evaluation and Consultation- July 22, 1997

Biological Opinion for the Proposed Black-capped Vireo Observation Deck, dated May 5, 1998

Endangered Species Subpermit PRT - 676811 issued through June 15, 1998 and December 31, 2003.

Signature Approval:

Deborah Holle 7/27/97

(1) Originator Date

_____ _____

(2) WO/RO Environ. Coord. Date

COMPATIBILITY DETERMINATION

FOR

CONSTRUCTION OF HIKING TRAILS AND RELATED FACILITIES AT DOESKIN RANCH PUBLIC USE AREA

ON

BALCONES CANYONLANDS NATIONAL WILDLIFE REFUGE

STATION NAME: Balcones Canyonlands National Wildlife Refuge

DATE ESTABLISHED: February 25, 1992

ESTABLISHING AUTHORITY: Endangered Species Act of 1973 (ESA), as amended, the Fish and Wildlife Act of 1956, as amended, the Land and Water Conservation Fund Act of 1965, as amended.

PURPOSES FOR WHICH THE REFUGE WAS ESTABLISHED: ". . . to conserve (A) fish or wildlife which are listed as endangered species or threatened species. . . or. . . plants" 16 U.S.C. §1534 (Endangered Species Act of 1973).

REFUGE OBJECTIVES: As defined in 16 USC 668dd, Title 50 of the Code of Federal Regulations (50CFR), Subchapter C, Part 25, Subpart A, 25.11.b:. . . refuges are established for the restoration, preservation, development and management of wildlife and wildlands habitat; for the protection and preservation of endangered or threatened species and their habitat; and for the management of wildlife and wildlands to obtain the maximum benefits from these resources. The goals and objectives of the National Wildlife Refuge System, as defined in the Refuge Manual (RM) and the National Wildlife Refuge System Improvement Act of 1997, provide the framework for refuge objectives. These objectives as (1) Threatened and endangered species maintenance and production, (2) Migratory bird maintenance and production, (3) Maintenance of native habitat types and their associated wildlife species, (40 Compatible wildlife dependent recreation, including hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

OTHER APPLICABLE LAWS, REGULATIONS AND POLICES:

Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
Antiquities Act of 1906 (34 Stat 335)
Migratory Bird Treaty Act of 1918 (16 U.S. C. 703-711; 40 Stat. 755)
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715r; 45 Stat.1222)
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-718h; 48 Stat.451)
Criminal Code Provision of 1940 (18 U.S.C. 41)

Bald and Golden Eagles Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat.250)
Fish and wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 119)
Refuge Recreation Act of 1972 (Public Law 87-114; 76 Stat 53-654; 16 U.S.C.)
Wilderness Preservation and Management Act (50 CFR 35; 16 U.S.C. 1131-1136; 78 Stat. 890; 43 USC 1201)
Land and Water Conservation Fund Act of 1965
National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.; 80 Stat.915)
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat. 927)
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq.; 83 Stat. 927)
Refuge Rights-of-Way General Regulations (50 CFR 29.21)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 11989)
Refuge Revenue Sharing Act of 1935m as amended 1978 (16 U.S.C. 715s; 92 Stat. 1319)
Management and General Public Use of The National Wildlife Refuge System (Executive Order 12996, March 25, 1996)
National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, October 9, 1997)
National Wildlife Refuge Regulations for the most recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3)

DESCRIPTION OF PROPOSED USE: Construction of a several hiking trails, parking areas, kiosks, interpretive signs, decks, benches, bathrooms, and other miscellaneous facilities at Doeskin Ranch Public Use Area, Tract # 54. Minimal destruction or removal of vegetation will be required as the parking are will be in a grassland. All efforts to preserve native vegetation will be taken. Trails will be placed to avoid any clearing of vegetation, except for trimming to allow safe passage of refuge visitors.

ANTICIPATED IMPACTS ON REFUGE PURPOSES: No endangered species habitat on this tract will be disturbed and only a few Golden-cheek Warblers have been observed on the tract. The habitat for the Warblers on the tract is not high quality, but the habitat should get better as the juniper-oak woodlands mature and the canopy continues to close. This action will not require a Intra-Service Consultation or Biological Opinion with the Austin Ecological Services Office as no construction or development is planned for the potential endangered species habitat. An archeological survey of the area will be completed prior to construction of any trails or parking areas. The Environmental Assessment that established the Refuge called for the development of a refuge public use program designed to interpret the ecosystem values and characteristics of the region without adversely impacting refuge resources. The Refuge Improvement Act of 1997 provides for wildlife dependent recreation, including interpretation, wildlife observation, wildlife photography, and environmental education if the use is compatible with the refuge purpose.

DETERMINATION: This use is compatible _X_ This use is not compatible _____

NEPA COMPLIANCE: (Environmental Action Memorandum Attached)

_✓_ Categorical Exclusion
_____ Environmental Assessment
_____ Environmental Impact Statement
_____ Finding of No Significant Impact (FONSI)

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY: The trails and related facilities will be carried out in accordance with Regional Office Public Use Planning staff to ensure that trails and parking areas are located in appropriate areas. Disturbance to vegetation will be kept to a minimum, except for removal of invasive Ashe junipers in the grasslands. Measure to control the spread of Oakwilt will be undertaken before and during development of the area.

JUSTIFICATION: Wildlife Observation is a recreation use deemed appropriate on National Wildlife Refuges if compatible with the purpose. Balcones was established to protect the nesting habitat and the Black-capped Vireo and Golden-cheeked Warblers, as well as native flora and fauna of the Edwards Plateau. These facilities and trails will educate the public on the role of fire in the ecosystem as a management tool, cultural interpretation of ranching, and an appreciation of the wildlife resources in the area and the value of protecting endangered species, and the role that the National Wildlife Refuge System and the U.S. Fish and Wildlife Service plays in wildlife management and conservation.

Deborah Holle 12/6/99

Deborah Holle, Refuge Manager Date

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:

constructing and operating trails, exhibits, signs, parking area, decks, foot paths, fences, bathrooms, and other related facilities on Doeskin Ranch Public Use Facility, tract # 54.

Check One:

__✓__ is a categorical exclusion as provided by FWS citation 30 AM 2/516.C Permit and Regulatory Function, 4) Issuance of permits for limited additional use and for permitting a new right-of-way where no negligent environmental disturbances are anticipated. No further NEPA documentation will therefore be made.

_____ is found not have a 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 (list):

Environmental Assessment for Establishment of Balcones Canyonlands National Wildlife Refuge, January, 1992

Scoping meetings for preparation of Balcones Canyonlands NWR Comprehensive Conservation Plan held in Lago Vista, May 22, 1996. Additional public meeting on recreational uses June 23, 1997 in Lago Vista.

Archeological Survey of proposed trails, parking areas and other facilities.

Signature Approval:

Deborah Hill 12/6/99

(1) Originator Date

_____ _____

(2) WO/RO Environ. Coord. Date

COMPATIBILITY DETERMINATION
OF
BALCONES CANYONLANDS NATIONAL WILDLIFE REFUGE MIGRATORY UPLAND GAME BIRD HUNTING PLAN

STATION NAME: Balcones Canyonlands NWR

DATE ESTABLISHED: February 1992

ESTABLISHING AUTHORITY: Endangered Species Act of 1973 (ESA), as amended, the Fish and Wildlife Act of 1956, as amended, and the Land and Water Conservation Fund Act of 1965, as amended.

PURPOSES FOR WHICH THE REFUGE WAS ESTABLISHED: "... to conserve (A) fish or wildlife which are listed as endangered species or threatened species... or plants..." 16 U.S.C. § 1534 (Endangered Species Act of 1973).

REFUGE OBJECTIVES: As defined in 16 USC 668dd, Title 50 of the Code of Federal Regulations (50CFR), Subchapter C, Part 25, Subpart A, 25.11.b:...refuges are established for the restoration, preservation, development and management of wildlife and wildlands habitat; for the protection and preservation of endangered or threatened species and their habitat; and for the management of wildlife and wildlands to obtain the maximum benefits from these resources. The goals and objectives of the National Wildlife Refuge System, as defined in the Refuge Manual (RM) and the National Wildlife Refuge System Improvement Act of 1997, provide the framework for refuge objectives. These objectives are: (1) Threatened and endangered species maintenance and production, (2) Migratory bird maintenance and production, (3)Maintenance of native habitat types and their associated wildlife species, (4) Environmental education, (5) Wildlife interpretation, (6) Compatible wildlife dependent recreation.

OTHER APPLICABLE LAWS, REGULATIONS AND POLICIES:
Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
Antiquities Act of 1906 (34 Stat. 225)
Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755)
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715 -715r; 45 Stat. 1222)
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718 -718h; 48. Stat. 451)
Criminal Code Provisions of 1940 (18 U.S.C. 41)
Bald and Golden Eagles Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat. 250)
Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 stat. 1119)
Refuge Recreation Act of 1962
Wilderness Act (16 U.S.C. 1131; 78 Stat. 890)
Land and Water Conservation Fund Act (LWCFA) of 1965
National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.; 80 Stat. 915)

National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat. 927)
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq.; 83 Stat. 852)
Refuge Rights-of-Way General Regulations (50 CFR 29.21)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 11989)
Refuge Revenue Sharing Act of 1935, as amended 1978 (16 U.S.C. 715s; 92 Stat. 1319)
National Wildlife Refuge Regulations for the most recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3)
Executive Order # 12996, Management and General Public Use of the National Widlife Refuge System
National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57, 10/09/97)

DESCRIPTION OF PROPOSED USE: Balcones Canyonlands NWR (Refuge) Upland Game Bird Hunting Plan (dove hunting).

ANTICIPATED IMPACTS ON REFUGE PURPOSE:The permitted use will cause minor disturbance to other wildlife, and the effects are not expected to be permanent. Otherwise, the anticipated impacts on the purpose for which the Refuge was established are insignificant.

DETERMINATION:This use is compatible _X_ This use is not compatible ___

NEPA COMPLIANCE: (Environmental Action Memorandum Attached)

_X_ Categorical Exclusion
___ Environmental Assessment
___ Environmental Impact Statement
___ FONSI

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

1. Hunting season dates and regulations will be coordinated with biologists on staff, in the Regional Office, and employed with Texas Parks and Wildlife Department.

2. Law enforcement will ensure regulation compliance and protection of Refuge resources.

4. Vehicle use by hunters will be restricted to prevent damage to Refuge resources.

JUSTIFICATION: Dove hunting will provide outdoor recreation consistent with the purposes for which the Refuge was established. 16 USC 668dd,50 CFR, 26.31 states: " Public recreation will be permitted on National Wildlife Refuges as a appropriate incidental or secondary use, only after it has been determined that such recreational use is

practicable and not inconsistent with the primary objectives for which each particular area was established or with other authorized federal operations..." It has been determined that dove hunting is a compatible use of the Refuge and would not violate any provisions of this code. Dove hunting will provide quality hunting opportunities and satisfy provisions of 50 CFR, the Refuge Manual, Executive Order #12996, signed by President Bill Clinton and the National Wildlife Refuge System Improvement Act of 1997. The public was given opportunities to comment through phone conversations, and one-on-one meetings. Public notices requesting comments on the Refuge Migratory Upland Game Bird Hunting Plan were published in local newspapers. Copies of the proposed hunt plan were mailed to interested individuals and organizations. There will be no notable, permanent negative impacts to any Refuge wildlife, and dove hunting should enhance Refuge purposes through public support and public education.

Deborah Holle 1/13/2000

Deborah Holle, Refuge Manager **Date**

L. Theresa Villanueva 2/18/2000

Regional Office Review, Chief, Div. of Refuges **Date**

Rodney F. Kuy, Refuge Supervisor

Regional Office Review **Date**

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 amending the existing 1997 Balcones Canyonland NWR Hunting Plan to include the hunting of upland game birds:

Check One:

XXX is a Categorical Exclusion (CatEx) as provided by 516 DM 2, Appendix 1, Section 1.4 (B) (7) and 516 DM 2, Appendix 1, Section 1.4 (B) (10). 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 Environmental Impact Statement (EIS).

_____ is not approved because of unacceptable environmental damage, or violation of Fish and Wildlife Service mandates, policies, 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.

Supporting Documents (list):

1997 Balcones Canyonland NWR Hunting Plan
Compatibility Statement
Section 7 Consultation

Signature Approval

Larry Marcusse — 2-9-00
(1) Originator — Date

[signature] — 2/23/00
(2) Regional Environmental Coordinator — Date

L. Theresa Villanueva — 2/18/2000
acting (3) Programmatic ARD — Date

Rodney F. Knox — 2/24/00
Acting for (4) Geographic ARD — Date

Marcos Sanchez Jr — 2/28/2000
ACTING (5) ~~Regional~~ Director — Date

COMPATIBILITY DETERMINATION
OF
BALCONES CANYONLANDS NATIONAL WILDLIFE REFUGE SPORT FISHING PROGRAM

STATION NAME: Balcones Canyonlands NWR

DATE ESTABLISHED: February 1992

ESTABLISHING AUTHORITY: Endangered Species Act of 1973 (ESA), as amended, the Fish and Wildlife Act of 1956, as amended, and the Land and Water Conservation Fund Act of 1965, as amended.

PURPOSES FOR WHICH THE REFUGE WAS ESTABLISHED: "... to ensure that (1) A sufficient representation of Golden-cheeked Warbler and Black-capped Vireo habitat is included; (2) Watersheds and water quality will be protected; (3) Destroyed or fragmented nesting habitats acquired have high potential for ecological restoration; (4) A protective buffer zone for nesting habitat and nesting populations is in place within the Refuge boundary."

REFUGE OBJECTIVES: As defined in 16 USC 668dd, Title 50 of the Code of Federal Regulations (50CFR), Subchapter C, Part 25, Subpart A, 25.11.b:"...refuges are established for the restoration, preservation, development and management of wildlife and wildlands habitat; for the protection and preservation of endangered or threatened species and their habitat; and for the management of wildlife and wildlands to obtain the maximum benefits from these resources." The goals and objectives of the National Wildlife Refuge System, as defined in the Refuge Manual (RM), provide the framework for refuge objectives. These objectives are: (1) Threatened and endangered species maintenance and production, (2) Migratory bird maintenance and production, (3) maintenance of native habitat types and their associated wildlife species, (4) Environmental education, (5) Wildlife interpretation, (6) Compatible wildlife oriented recreation.

OTHER APPLICABLE LAWS, REGULATIONS AND POLICIES:
Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686)
Antiquities Act of 1906 (34 Stat. 225)
Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755)
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715 -715r; 45 Stat. 1222)
Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718 -718h; 48. Stat. 451)
Criminal Code Provisions of 1940 (18 U.S.C. 41)
Bald and Golden Eagles Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat. 250)
Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119)
Refuge Recreation Act of 1962
Wilderness Act (16 U.S.C. 1131; 78 Stat. 890)

Land and Water Conservation Fund Act (LWCFA) of 1965
National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.; 80 Stat. 915)
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat. 927)
National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq.; 83 Stat. 852)
Refuge Rights-of-Way General Regulations (50 CAR 29.21)
Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 11989)
Refuge Revenue Sharing Act of 1935, as amended 1978 (16 U.S.C. 715s; 92 Stat. 1319)
National Wildlife Refuge Regulations for the most recent Fiscal Year (50 CAR Subchapter C; 43 CAR 3101.3-3)

DESCRIPTION OF PROPOSED USE: Balcones Canyonlands NWR (Refuge) sport fishing program.

ANTICIPATED IMPACTS ON REFUGE PURPOSE: None is expected.

DETERMINATION: This use is compatible _X_ This use is not compatible ___

NEPA COMPLIANCE: (Environmental Action Memorandum Attached)

_X_ Categorical Exclusion
___ Environmental Assessment
___ Environmental Impact Statement
___ FONSI

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

1. Data will be collected and analyzed to ensure that fishery resources on the Refuge are managed in a biologically sound manner.

2. Fishing season dates and regulations will be coordinated with biologist on staff, in the Regional Office, and employed with Texas Parks and Wildlife Department.

3. Law enforcement will ensure regulation compliance and protection of Refuge resources.

4. Vehicle use by ~~fisherpersons~~ anglers will be restricted to prevent damage to Refuge resources.

5. Fishing will not be allowed during peak waterfowl usage of ponds. Typically, this occurs during December, January and February. On large ponds anglers and waterfow can coexist (>3acres)

JUSTIFICATION: Allowing fishing on the Refuge satisfies provisions in the Refuge Manual and a recent Executive Order (E.O. #12996) signed by President Bill Clinton.

Executive Order # 12996, Section 2. a. allows public uses of refuges that are wildlife dependent ("The Refuge System provides important opportunities for compatible wildlife-dependent recreation activities involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation"). The public was given opportunities to comment through scoping meetings recently held for Refuge Master Planning, through phone conversations, and one on one meetings. Public notices requesting comments on Refuge Master Planning were published in local newspapers. Copies of the proposed fishing plan were mailed to interested individuals and organizations.

There will be no notable, permanent negative impacts to any Refuge wildlife, and fishing should enhance Refuge System purposes.

Deborah Holle 8/20/96

Deborah Holle, Refuge Manager Date

Regional Office Review Date

Regional Office Review Date

COMPATIBILITY DETERMINATION

USE: RESIDENTIAL HOUSING

STATION NAME: Balcones Canyonlands National Wildlife Refuge

DATE ESTABLISHED:

Balcones Canyonlands National Wildlife Refuge, located in Burnet, Travis, and Williamson Counties was established on February 25, 1992.

ESTABLISHING AND ACQUISITION AUTHORITIES:

The Refuge was established under the authority of the Endangered Species Act, 1973 as amended (16 U.S.C. 1531-1543; 87 Stat. 884) with funds appropriated under the Land and Water Conservation Fund Act (16 U.S.C. 715k-3-715k-5; 75 Stat. 813).

PURPOSES FOR WHICH THE REFUGE WAS ESTABLISHED:

Specifically, the Refuge was established to protect the nesting habitat of two endangered neotropical birds, the Black-capped Vireo and Golden-cheeked Warbler.

In addition lands acquired under the Endangered Species Act for the purpose: "...to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants.

REFUGE OBJECTIVES:

The Balcones Canyonlands National Wildlife Refuge Environmental Assessment, dated December, 1991 listed the primary objective of the Refuge as: Conservation of the natural diversity of the Balcones Canyonlands Ecosystem, including the endangered, threatened, and unique species of the region and the habitats on which they depend.

Further goals and objectives of the National Wildlife Refuge System provide the framework for refuge objectives which are: 1) preserve, restore, and enhance endangered or threatened species, 2) perpetuate the migratory bird resource, 3) preserve a natural diversity and abundance of fauna and flora on refuge lands, 4) provide an understanding and appreciation of fish and wildlife ecology (environmental education) and compatible wildlife oriented recreation.

OTHER APPLICABLE LAWS, REGULATIONS AND POLICIES:

Other laws include **1)** Antiquities Act of 1906 (34 Stat. 225) **2)** Bald and Golden Eagles Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat. 250) **3)** Criminal Code Provisions of 1940 (18 U.S.C. 41) **4)** Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119) **5)** Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715R; 45 Stat. 755) **6)** Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-718h; 48 Stat. 451) **7)** Migratory Bird Treat Act of 1918 (16 U.S.C.703-711; 40 Stat.755) **8)** National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.; 80 Stat. 915) **9)** National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat.927) **10)** Refuge Recreation Act of 1962, (16 U.S.C. 460k-460k-4; 76 Stat. 653) **11)** Refuge Revenue Sharing Act of 1935, as amended 1978 (16 U.S.C. 715s; 92 Stat. 1319 **12)** Refuge Rights-of-Way General Regulations (50 CFR 29.21) **13)** Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686) **14)** The National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq.; 83 Stat 852) **15)** Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 11989). **16)** National Wildlife Refuge Regulations for the Most Recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3).

DESCRIPTION OF USE:

A large modern ranch house exists on the Rodgers Tract. The building is used as a quarters and/or bunk house for refuge volunteers and student researchers. This helps defray costs for graduate students. This past year Texas Parks & Wildlife Department (TPW) housed 2 biological technicians in the Rodgers House during their Golden-cheeked Warbler Study. This allowed the technicians to accept a lower wage because housing was provided.

Volunteers are permitted to stay at the house in exchange for volunteering. Last winter the volunteer took care of minor household repairs, derelict interior fence removal, gate repair and other work projects.

ANTICIPATED BIOLOGICAL IMPACTS OF THE USE:

There are minimal if any biological effects on wildlife or their habitats. The building could be removed and the area replanted with grass. However, this is the site that has been selected as a refuge subhead quarters, where equipment and supplies will be stored. Also, work projects that benefit wildlife, would not be accomplished without volunteer help.

NEPA COMPLIANCE:

Categorical Exclusion X Environmental Assessment_____

Environmental Impact Statement_____FONSI_____

DETERMINATION: (Check One)

THIS USE IS COMPATIBLE X THIS USE IS NOT COMPATIBLE_____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Special Use Permits are issued to non-Service employees that list the permitted and prohibited activities. The Refuge Manual also lists activities and actions that are prohibited. For example unleashed pets are not allowed and cats are not permitted on Balcones Canyonlands NWR.

JUSTIFICATION:

Continued use of the Rodgers house and related facilities provide the Refuge with a place to store vehicles, equipment, and supplies. This negates the need to construct other facilities when they are not needed at this time. In addition, due to the limited operations and management funds, utilization of volunteers is a way to achieve needed work at the Refuge. By providing housing the Refuge is not restricted to using only local volunteers. Volunteers on fixed or limited incomes are able to volunteer because they do not have to pay housing costs.

PROJECT LEADER: Deborah Holle, Refuge Manager 9/6/94
(Signature/Title/Date)

REVIEWED BY: Gary Burke Assoc Mgr OK/TX 9/9/94
(Signature/Title/Date)

[illegible] 9/14/94
(Signature/Title/Date)

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 (describe): Compatibility of a Residence at Balcones Canyonlands NWR

__X__ is a categorical exclusion as provided by 516 DM 6 Appendix 1. 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.

_____ 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 (list): Compatibility of allowing a Residence at Balcones Canyonlands NWR

*

_____
Director/Regional Director Date

(1) Deborah Holle 9/6/94
Initiator Date

(2) Kathleen Wood 9/16/94
Refuges/NEPA Coord. Date

(3) [signature] 9/14/94
ARD Date

(4) _____
Regional NEPA Coord. Date

* As delegated by 4 AM 4.1 Director Order No.5 (2/94)

COMPATIBILITY DETERMINATION

USE: RESEARCH

STATION NAME: Balcones Canyonlands National Wildlife Refuge

DATE ESTABLISHED:

Balcones Canyonlands National Wildlife Refuge, located in Burnet, Travis, and Williamson Counties was established on February 25, 1992.

ESTABLISHING AND ACQUISITION AUTHORITIES:

The Refuge was established under the authority of the Endangered Species Act, 1973 as amended (16 U.S.C. 1531-1543; 87 Stat. 884) with funds appropriated under the Land and Water Conservation Fund Act (16 U.S.C. 715k-3-715k-5; 75 Stat. 813).

PURPOSES FOR WHICH THE REFUGE WAS ESTABLISHED:

Specifically, the Refuge was established to protect the nesting habitat of two endangered neotropical birds, the Black-capped Vireo and Golden-cheeked Warbler.

In addition lands acquired under the Endangered Species Act for the purpose: "...to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants.

REFUGE OBJECTIVES:

The Balcones Canyonlands National Wildlife Refuge Environmental Assessment, dated December, 1991 listed the primary objective of the Refuge as: Conservation of the natural diversity of the Balcones Canyonlands Ecosystem, including the endangered, threatened, and unique species of the region and the habitats on which they depend.

Further goals and objectives of the National Wildlife Refuge System provide the framework for refuge objectives which are: 1) preserve, restore, and enhance endangered or threatened species, 2) perpetuate the migratory bird resource, 3) preserve a natural diversity and abundance of fauna and flora on refuge lands, 4) provide an understanding and appreciation of fish and wildlife ecology (environmental education) and compatible wildlife oriented recreation.

OTHER APPLICABLE LAWS, REGULATIONS AND POLICIES:

Other laws include **1)** Antiquities Act of 1906 (34 Stat. 225) **2)** Bald and Golden Eagles Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat. 250) **3)** Criminal Code Provisions of 1940 (18 U.S.C. 41) **4)** Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119) **5)** Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715R; 45 Stat. 755) **6)** Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-718h; 48 Stat. 451) **7)** Migratory Bird Treat Act of 1918 (16 U.S.C.703-711; 40 Stat.755) **8)** National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.; 80 Stat. 915) **9)** National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat.927) **10)** Refuge Recreation Act of 1962, (16 U.S.C. 460k-460k-4; 76 Stat. 653) **11)** Refuge Revenue Sharing Act of 1935, as amended 1978 (16 U.S.C. 715s; 92 Stat. 1319 **12)** Refuge Rights-of-Way General Regulations (50 CFR 29.21) **13)** Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686) **14)** The National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq.; 83 Stat 852) **15)** Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 11989). **16)** National Wildlife Refuge Regulations for the Most Recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3).

DESCRIPTION OF USE:

Texas Parks and Wildlife Department (TPW) is conducting a Golden-cheeked Warbler research project on the Webster and Victoria Bank tracts of the Refuge. This project is funded through Section 6 of the Endangered Species Act. TPW submitted a proposal to the Austin Ecological Services Office (ES) in Austin. ES biologists reviewed the proposal and the Southwest Regional Office for the Fish & Wildlife issued a Section 10. (a)(1)(A) permit allowing TPW to survey, census, and study Golden-cheeked Warblers.

Several other research projects, conducted by graduate students at various colleges and universities are permitted on the Refuge. These include a geological and hydrological study, two botanical studies and two other Golden-cheeked Warbler studies that are being done in conjunction with TPW's Section 6 research project. Each investigator is supervised by either a biologist from TPWD or a professor at the various universities. All studies are over-seen by the Refuge Biologist and Refuge Manager.

ANTICIPATED BIOLOGICAL IMPACTS OF THE USE:

Projects that will add information for refuge management are given priority and even solicited. While there may be short term disturbances to wildlife and the vegetation, the biological impacts are minimal. None of the projects that are presently permitted on the Refuge allow collecting of animals. Only minimal collecting of plant material is permitted to aid in the identification.

NEPA COMPLIANCE:

Categorical Exclusion__X__ Environmental Assessment_____

Environmental Impact Statement_____FONSI_____

DETERMINATION: (Check One)

THIS USE IS COMPATIBLE__X__ THIS USE IS NOT COMPATIBLE _____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

All projects are reviewed by the Refuge Biologist and the Refuge Manager to insure that the projects are appropriate for the Refuge. Special Use Permits are issued that list the permitted and prohibited activities. If endangered species are involved a permit from the Regional is issued and a Section 7 consultation is conducted by the Austin Ecological Services Office.

JUSTIFICATION:

It is only through scientific research projects that Refuge Managers and Wildlife Biologists can increase their knowledge of wildlife and their habitats. Research projects designed to result in management implications are the most beneficial to Refuges.

PROJECT LEADER: Deborah Holle, Refuge Manager 9/6/94
(Signature/Title/Date)

REVIEWED BY: Gary Burke Assoc Mgr OC/TX 9/9/94
(Signature/Title/Date)

9/14/94
(Signature/Title/Date)

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 (describe): Compatibility of Research Activities on Balcones Canyonlands NWR.

__X__ is a categorical exclusion as provided by 516 DM 6 Appendix 1. 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.

_____ 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 (list): Compatibility Determination for conducting research activities at Balcones Canyonlands NWR

*

_____
Director/Regional Director Date

(1) Deborah Holle 9/6/94
Initiator Date

(2) _____
Refuges/NEPA Coord. Date

(3) [signature] 9/14/94
ARD Date

(4) _____
Regional NEPA Coord. Date

* As delegated by 4 AM 4.1 Director Order No.5 (2/94)

COMPATIBILITY DETERMINATION

USE: COWBIRD CONTROL

STATION NAME: Balcones Canyonlands National Wildlife Refuge

DATE ESTABLISHED:

Balcones Canyonlands National Wildlife Refuge, located in Burnet, Travis, and Williamson Counties was established on February 25, 1992.

ESTABLISHING AND ACQUISITION AUTHORITIES:

The Refuge was established under the authority of the Endangered Species Act, 1973 as amended (16 U.S.C. 1531-1543; 87 Stat. 884) with funds appropriated under the Land and Water Conservation Fund Act (16 U.S.C. 715k-3-715k-5; 75 Stat. 813).

PURPOSES FOR WHICH THE REFUGE WAS ESTABLISHED:

Specifically, the Refuge was established to protect the nesting habitat of two endangered neotropical birds, the Black-capped Vireo (BCV) and Golden-cheeked Warbler (GCW).

In addition lands acquired under the Endangered Species Act for the purpose: "...to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants.

REFUGE OBJECTIVES:

The Balcones Canyonlands National Wildlife Refuge Environmental Assessment, dated December, 1991 listed the primary objective of the Refuge as: Conservation of the natural diversity of the Balcones Canyonlands Ecosystem, including the endangered, threatened, and unique species of the region and the habitats on which they depend.

Further goals and objectives of the National Wildlife Refuge System provide the framework for refuge objectives which are: 1) preserve, restore, and enhance endangered or threatened species, 2) perpetuate the migratory bird resource, 3) preserve a natural diversity and abundance of fauna and flora on refuge lands, 4) provide an understanding and appreciation of fish and wildlife ecology (environmental education) and compatible wildlife oriented recreation.

OTHER APPLICABLE LAWS, REGULATIONS AND POLICIES:

Other laws include **1)** Antiquities Act of 1906 (34 Stat. 225) **2)** Bald and Golden Eagles Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat. 250) **3)** Criminal Code Provisions of 1940 (18 U.S.C. 41) **4)** Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119) **5)** Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715R; 45 Stat. 755) **6)** Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-718h; 48 Stat. 451) **7)** Migratory Bird Treat Act of 1918 (16 U.S.C.703-711; 40 Stat.755) **8)** National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.; 80 Stat. 915) **9)** National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat.927) **10)** Refuge Recreation Act of 1962, (16 U.S.C. 460k-460k-4; 76 Stat. 653) **11)** Refuge Revenue Sharing Act of 1935, as amended 1978 (16 U.S.C. 715s; 92 Stat. 1319 **12)** Refuge Rights-of-Way General Regulations (50 CFR 29.21) **13)** Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686) **14)** The National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq.; 83 Stat 852) **15)** Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 11989). **16)** National Wildlife Refuge Regulations for the Most Recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3).

DESCRIPTION OF USE:

The Texas Animal Damage Control Service (ADC), U.S. Department of Agriculture maintains 4-5 Brown-headed Cowbird traps on the Eckhardt and Simons tracts of the Refuge. These tracts have Black-capped Vireo nesting habitat, although the Simons tract is not used by Vireos at this time. The Simons tract does have a 69 acre inholding (privately owned) that supports a small cattle operation and is within 2-3 miles of the Eckhardt tract. The Eckhardt tract supports a nesting colony of Vireo's, 29-34 pairs on roughly 200 acres. Of the 7 family groups observed on the Eckhardt tract, only 1 nest was found to be parasitized by a Brown-headed Cowbird. A pair of Vireos was also observed feeding a cowbird fledging

ANTICIPATED BIOLOGICAL IMPACTS OF THE USE:

Nest parasitism has been identified as a threat to the BCV. The BCV Recovery Plan, 1991 lists trapping of cowbirds as a recovery action on a site-specific area. Trapping cowbirds reduces the amount of parasitism on a nesting colony.

The Texas Department of Transportation (TexDOT) wrote an Environmental Impact Statement (EIS) to widen R.R. 620. Widening of this road would destroy BCV nesting habitat. As a mitigation measure, TexDOT funded a project for ADC to trap cowbirds at various locations to increase productivity of vireos. The Austin Ecological Services Office in Austin reviewed the EIS and is responsible for the Section 7 which allowed the road to be widened.

NEPA COMPLIANCE:

Categorical Exclusion__X__ Environmental Assessment_____

Environmental Impact Statement_____FONSI_____

DETERMINATION: (Check One)

THIS USE IS COMPATIBLE_X_ THIS USE IS NOT COMPATIBLE_____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Employees from ADC drive on selected roads to the traps every other day. This allows for the humane treatment of captured birds and minimal disturbance of BCV and other wildlife species.

JUSTIFICATION:

ADC was trapping cowbirds on Eckhardt prior to refuge ownership. Trapping is a task that is listed in the Black-capped Vireo Recovery Plan. Increasing the nesting productivity of BCV helps the refuge achieve it's objectives for endangered species.

PROJECT LEADER: Deborah Holle, Refuge Manager 9/6/94
(Signature/Title/Date)

REVIEWED BY: Gary Burke Assoc Mgr OE/TX 9/9/94
(Signature/Title/Date)

[illegible] 9/14/94
(Signature/Title/Date)

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 (describe): Compatibility of Cowbird Trapping Activities on Balcones Canyonlands NWR

__X__ is a categorical exclusion as provided by 516 DM 6 Appendix 1. 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.

_____ 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 (list): Compatibility Determination on Cowbird Trapping Activities on Balcones Canyonlands NWR

*

_____
Director/Regional Director Date

(1) Deborah Holle 9/6/94
Initiator Date

(2) Kathleen Wood 9/16/94
Refuges/NEPA Coord. Date

(3) _____ 9/14/94
ARD Date

(4) _____
Regional NEPA Coord. Date

* As delegated by 4 AM 4.1 Director Order No.5 (2/94)

COMPATIBILITY DETERMINATION

USE: GRAZING

STATION NAME: Balcones Canyonlands National Wildlife Refuge

DATE ESTABLISHED:

Balcones Canyonlands National Wildlife Refuge, located in Burnet, Travis, and Williamson Counties was established on February 25, 1992.

ESTABLISHING AND ACQUISITION AUTHORITIES:

The Refuge was established under the authority of the Endangered Species Act, 1973 as amended (16 U.S.C. 1531-1543; 87 Stat. 884) with funds appropriated under the Land and Water Conservation Fund Act (16 U.S.C. 715k-3-715k-5; 75 Stat. 813).

PURPOSES FOR WHICH THE REFUGE WAS ESTABLISHED:

Specifically, the Refuge was established to protect the nesting habitat of two endangered neotropical birds, the Black-capped Vireo and Golden-cheeked Warbler.

In addition lands acquired under the Endangered Species Act for the purpose: "...to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants.

REFUGE OBJECTIVES:

The Balcones Canyonlands National Wildlife Refuge Environmental Assessment, dated December, 1991 listed the primary objective of the Refuge as: Conservation of the natural diversity of the Balcones Canyonlands Ecosystem, including the endangered, threatened, and unique species of the region and the habitats on which they depend.

Further goals and objectives of the National Wildlife Refuge System provide the framework for refuge objectives which are: 1) preserve, restore, and enhance endangered or threatened species, 2) perpetuate the migratory bird resource, 3) preserve a natural diversity and abundance of fauna and flora on refuge lands, 4) provide an understanding and appreciation of fish and wildlife ecology (environmental education) and compatible wildlife oriented recreation.

OTHER APPLICABLE LAWS, REGULATIONS AND POLICIES:

Other laws include **1)** Antiquities Act of 1906 (34 Stat. 225) **2)** Bald and Golden Eagles Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat. 250) **3)** Criminal Code Provisions of 1940 (18 U.S.C. 41) **4)** Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119) **5)** Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715R; 45 Stat. 755) **6)** Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-718h; 48 Stat. 451) **7)** Migratory Bird Treat Act of 1918 (16 U.S.C.703-711; 40 Stat.755) **8)** National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.; 80 Stat. 915) **9)** National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat.927) **10)** Refuge Recreation Act of 1962, (16 U.S.C. 460k-460k-4; 76 Stat. 653) **11)** Refuge Revenue Sharing Act of 1935, as amended 1978 (16 U.S.C. 715s; 92 Stat. 1319 **12)** Refuge Rights-of-Way General Regulations (50 CFR 29.21) **13)** Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686) **14)** The National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq.; 83 Stat 852) **15)** Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 11989). **16)** National Wildlife Refuge Regulations for the Most Recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3).

DESCRIPTION OF USE:

Grazing is allowed on the Refuge on two areas with 2 Special Use Permits issued to 2 separate individuals. A 13 acre corner of the Victoria Bank property is grazed by 3 horses through 1995. The unfenced Shaw property, 200 acres, is grazed year-round with a stocking rate of 10 AUM's.

ANTICIPATED BIOLOGICAL IMPACTS OF THE USE:

There are both negative and positive aspects of grazing. Grazing, the clipping and removal of leafs from grasses, forbs and legumes by cattle, horses, goats, etc. tends to maintain the vigor of perennial grasses. Grazing reduces the amount of fine fuels necessary to start wildfires whereby reducing the frequency and intensity of wildfires. While grazing, livestock can cause beneficial animal impacts to the land. Their hooves break up capped soils and return plant materials to the soil from the related physical actions or in the form of dung and urine. However, one of the important assets of grazing is that it is a dependable, predictable, and affordable management tool especially if used in combination with other management tools such as prescribed burning.

Grazing has also been used in combination with other management tools to suppress encroachment of brush into grasslands and marshes.

Detrimental effects of grazing include excessive vegetation removal (overgrazing), excessive livestock trampling compacts the soil and increases water runoff, and the deposition of dung and urine in areas where livestock concentrate have been identified as pollutants that contaminate local waters.

There is no Black-capped Vireo habitat on or near the two grazed areas. Initial surveys of both tracts revealed limited habitat for Golden-cheeked Warblers that was categorized as low quality. Cursory inspections by Wildlife Biologists from the Austin Ecological Services Office felt that Section 7 Consultations with the Refuge were not needed concerning the issuance of Special Use Permits to allow cattle grazing.

NEPA COMPLIANCE:

Categorical Exclusion_____Environmental Assessment__X__

Environmental Impact Statement_____FONSI_____

DETERMINATION: (Check One)

THIS USE IS COMPATIBLE__X__ THIS USE IS NOT COMPATIBLE_____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Before Special Use Permits are issued to allow grazing on the Refuge again, more detailed biological data concerning the effects of grazing will be collected and analyzed. In addition, data on the amount of Cowbird nest parasitism will be collected and more data on habitat utilization by Golden-cheeked Warblers will be collected. A grazing management plan will be written that explains the management objectives and habitat conditions that grazing will achieve. The infrastructure (fencing, availability of water, etc.) to support grazing will also be evaluated to insure that the accrued benefits are worth the operations and maintenance dollars.

JUSTIFICATION:

Texas Parks and Wildlife Department (TPW) use a combination of grazing and prescribed burning on the Kerr Wildlife Management Area to manage their Black-capped Vireo and Golden-cheeked Warbler habitats. They have shown that with adequate controls (rotation, timing, type of animal, etc.) grazing is an affordable management tool to maintain endangered species habitat in the Texas Hill Country of the Edwards Plateau.

However, while grazing in certain instances is a compatible habitat management tool, it is inappropriate to graze the Shaw and Victoria Bank tracts with out biological justification and management objectives. During the preparation of the Environmental Assessment on grazing it was apparent that there was not enough information to make an adequate determination on grazing. Based on the information received, it is an inappropriate activity to allow at this time. Balcones Canyonlands NWR is being grazed as a convenience, grazing will be phased out during 1995 and not permitted again without adequate biological study and management justification.

PROJECT LEADER: Deborah Holle, Refuge Manager 9/4/94
(Signature/Title/Date)

REVIEWED BY: Gary Burke Assoc Mgr OK/TX 9/9/94
(Signature/Title/Date)

[illegible] 9/14/94
(Signature/Title/Date)

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 (describe): Compatibility of Grazing at Balcones Canyonlands NWR

_____ is a categorical exclusion as provided by 516 DM 6 Appendix 1. No further documentation will be made.

__X__ 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 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 (list): Environmental Assessment on Grazing, Balcones Canyonlands NWR, September, 1994

* _____ 11/27/94
~~Assistant Director~~/Regional Director Date

(1) Deborah Holle 9/6/94 (2) Kathleen Ward 9/8/94
Initiator Date Refuges/NEPA Coord. Date

(3) _____ 11/27/94 (4) Floyd A. Nudi 11/16/94
ARD Date Regional NEPA Coord. Date

* As delegated by 4 AM 4.1 Director Order No.5 (2/94)

COMPATIBILITY DETERMINATION

USE: ENVIRONMENTAL EDUCATION

STATION NAME: Balcones Canyonlands National Wildlife Refuge

DATE ESTABLISHED:

Balcones Canyonlands National Wildlife Refuge, located in Burnet, Travis, and Williamson Counties was established on February 25, 1992.

ESTABLISHING AND ACQUISITION AUTHORITIES:

The Refuge was established under the authority of the Endangered Species Act, 1973 as amended (16 U.S.C. 1531-1543; 87 Stat. 884) with funds appropriated under the Land and Water Conservation Fund Act (16 U.S.C. 715k-3-715k-5; 75 Stat. 813).

PURPOSES FOR WHICH THE REFUGE WAS ESTABLISHED:

Specifically, the Refuge was established to protect the nesting habitat of two endangered neotropical birds, the Black-capped Vireo and Golden-cheeked Warbler.

In addition lands acquired under the Endangered Species Act for the purpose: "...to conserve (A) fish or wildlife which are listed as endangered species or threatened species...or (B) plants.

REFUGE OBJECTIVES:

The Balcones Canyonlands National Wildlife Refuge Environmental Assessment, dated December, 1991 listed the primary objective of the Refuge as: Conservation of the natural diversity of the Balcones Canyonlands Ecosystem, including the endangered, threatened, and unique species of the region and the habitats on which they depend.

Further goals and objectives of the National Wildlife Refuge System provide the framework for refuge objectives which are: 1) preserve, restore, and enhance endangered or threatened species, 2) perpetuate the migratory bird resource, 3) preserve a natural diversity and abundance of fauna and flora on refuge lands,

4) provide an understanding and appreciation of fish and wildlife ecology (environmental education) and compatible wildlife oriented recreation.

OTHER APPLICABLE LAWS, REGULATIONS AND POLICIES:

Other laws include **1)** Antiquities Act of 1906 (34 Stat. 225) **2)** Bald and Golden Eagles Protection Act of 1940 (16 U.S.C. 668-668d; 54 Stat. 250) 3) Criminal Code Provisions of 1940 (18 U.S.C. 41) **4)** Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119) **5)** Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715R; 45 Stat. 755) **6)** Migratory Bird Hunting Stamp Act of 1934 (16 U.S.C. 718-718h; 48 Stat. 451) **7)** Migratory Bird Treat Act of 1918 (16 U.S.C.703-711; 40 Stat.755) **8)** National Historic Preservation Act of 1966 (16 U.S.C. 470, et seq.; 80 Stat. 915) **9)** National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat.927) **10)** Refuge Recreation Act of 1962, (16 U.S.C. 460k-460k-4; 76 Stat. 653) **11)** Refuge Revenue Sharing Act of 1935, as amended 1978 (16 U.S.C. 715s; 92 Stat. 1319 **12)** Refuge Rights-of-Way General Regulations (50 CFR 29.21) **13)** Refuge Trespass Act of June 25, 1948 (18 U.S.C. 41; 62 Stat. 686) **14)** The National Environmental Policy Act of 1969, NEPA (42 U.S.C. 4321, et seq.; 83 Stat 852) **15)** Use of Off-Road Vehicles on Public Lands (Executive Order 11644, as amended by Executive Order 11989). **16)** National Wildlife Refuge Regulations for the Most Recent Fiscal Year (50 CFR Subchapter C; 43 CFR 3101.3-3).

DESCRIPTION OF USE:

Those activities which seek to increase the public's knowledge and understanding of wildlife and contribute to the conservation of such wildlife. Activities would include traditional environmental education activities (teacher-led or staff-led on-site field trips), off-site programs in classrooms, and nature study, such as teacher and student workshops, and interpretation of the wildlife resource and support facilities such as visitor centers, interpretive trails, and visitor contact stations. National Fishing Day is celebrated in conjunction with the Pathway to Fishing Program. The Pathway to Fishing Program and Fishing Day activities are supervised by Service employees.

ANTICIPATED BIOLOGICAL IMPACTS OF THE USE:

The use of on-site, hands-on action-oriented activities by groups of 10-45 students/teachers/adults to accomplish environmental education objectives may have low level impacts on the sites used for these activities.

Impacts may include trampling of vegetation and temporary disturbance to wildlife species in the immediate area during the activity. It is not anticipated, however, that such impacts would be permanent or long-lasting.

Off-site activities, such as classroom visits, booths, slide presentations etc. conducted off-refuge, would not create any biological impacts on the resource.

NEPA COMPLIANCE:

Categorical Exclusion__X__Environmental Assessment_____

Environmental Impact Statement_____FONSI_____

DETERMINATION: (Check One)

THIS USE IS COMPATIBLE__X__ THIS USE IS NOT COMPATIBLE_____

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Activities will be held at sites where non-sensitive wildlife and or plants occur. Environmental education sites will be evaluated to assess the effect on the resources. Tours of endangered species areas will be conducted according to the conditions of the Endangered Species Permit issued by the Southwest Regional Office of the Fish & Wildlife Service, Albuquerque, New Mexico

JUSTIFICATION:

Balcones Canyonlands NWR is a new refuge and has limited facilities. Tours of the Refuge and related activities are an easy way to provide students, teachers, and others an understanding and appreciation of fish and wildlife ecology and man's role in his environment.

PROJECT LEADER: Deborah Holle, Refuge Manager 9/6/94
(Signature/Title/Date)

REVIEWED BY: Gary Burke Assoc Mgr OC/TX 9/9/94
(Signature/Title/Date)

[illegible] 9/14/94
(Signature/Title/Date)

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 (describe): Compatibility of conducting Environmental Ed. Activities on Balcones Canyonlands NWR

__X__ is a categorical exclusion as provided by 516 DM 6 Appendix 1. 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.

_____ 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 (list): Compatibility Determination on Environmental Education Activities at Balcones Canyonlands NWR

*

_____
Director/Regional Director Date

(1) Deborah Helle 9/6/94 (2) _____
Initiator Date Refuges/NEPA Coord. Date

(3) _____ 9/14/94 (4) _____
ARD Date Regional NEPA Coord. Date

* As delegated by 4 AM 4.1 Director Order No.5 (2/94)

FINDING OF NO SIGNIFICANT IMPACT

To: All Interested Governmental Agencies and Public Groups

Based on a review and evaluation of the information contained in the references enumerated below, I have determined that not re-issuing a Special Use Permit to graze 200 acres of Balcones Canyonlands National Wildlife Refuge, is not a major Federal action which would significantly affect the quality of the human environment within the meaning of Section 201(2)(C) of the National environmental Policy Act of 1969. Accordingly, the preparation of an Environmental Impact Statement on the proposed action is not required.

Supporting References

An Environmental Assessment has been prepared which summarizes the environmental impacts, the alternatives considered and the reason why a statement is not required. Alternatives considered included construction of a fence by Refuge staff, issue Special Use Permits to allow grazing on the 200 acre tract, adjacent rancher responsible for preventing cattle trespass, and cost share fencing by Refuge staff and adjacent rancher. The 200 acres represents less than 2% of the entire refuge. While grazing has been shown to be a viable and valuable wildlife management tool, the Refuge Manager has determined that grazing the 200 acres is an inappropriate activity. These documents are on file in this office and are available for public inspection upon request.

Assistant Regional Director

10/27/94
Date

BALCONES CANYONLANDS NATIONAL WILDLIFE REFUGE

FINAL DRAFT

Environmental Assessment

on

Secondary Uses

Grazing

September 2, 1994

TABLE OF CONTENTS

INTRODUCTION 1

1.0 NEED AND PURPOSE FOR THE PROPOSED ACTION 1

1.1 PROPOSAL 1

1.2 NEED FOR PROPOSAL 1

1.21 SUMMARY OF PUBLIC INPUT 2

1.3 PURPOSE OF PROPOSED ACTION 3

1.4 PROPOSED REFUGE OBJECTIVES 3

2.0 DESCRIPTION OF THE ALTERNATIVES 4

2.1 Alternative 1 - No Action - Preferred Alternative 4

2.2 Alternative 2 - Construction of Fence by Refuge 4

2.3 Alternative 3 - Issue Special Use Permits to allow grazing on selected tracts 5

2.4 Alternative 4 - Cost Share Fence Construction by Refuge and Adjacent Rancher 5

3.0 AFFECTED ENVIRONMENT 5

3.1 Climate 7

3.2 Physiography, Geology, and Soils 8

3.3 Vegetation 8

3.4 Water Resources 9

3.5 Wetlands 9

3.6 Wildlife 9

3.7 Land Use 10

3.8 Socioeconomics 11

4.0 ENVIRONMENTAL CONSEQUENCES 11

4.1 Climate 12

4.2 Physiography, Geology, and Soils 12

4.3 Vegetation 12

4.4 Water Resources 13

4.5 Wetlands 13

4.6 Wildlife 13

4.7 Land Use 14

4.8 Socioeconomics 14

5.0 INFORMATION SOURCES 15

Appendix 1. Public Comments Received

Introduction

The U.S. Fish & Wildlife Service is reviewing secondary uses on national wildlife refuges across the country this summer, to determine if they are compatible with the purposes for which the refuges were established. This action is the result of the Compatibility Lawsuit Settlement between environmental groups and the Department of Interior. Several environmental groups took the Fish & Wildlife Service to court in 1992 to enforce better compliance of the Service standards used to determine if uses are compatible with refuge purposes. Under terms of the lawsuit settlement, all uses on refuges for which the Service has legal jurisdiction to control, must be reviewed and, if found to be incompatible, modified, or eliminated. Uses may also be modified or eliminated if personnel or funding is not sufficient to continue the use. Public uses most likely to be modified or eliminated are nonwildlife-oriented uses unrelated to the refuge purpose.

Balcones Canyonlands NWR was established on February 25, 1992 to protect nesting habitat for two neotropical migrants, Black-capped Vireos (Vireo articapillus) and Golden-cheeked Warblers (Dendrocica chrysoparia), and the natural biological diversity of the Edwards Plateau region of Central Texas. All activities on National Wildlife Refuges are prohibited unless permitted. Grazing by animals not under a refuge permit are considered trespass animals. Animal trespass is a violation of 50 CFR.

1.0 NEED AND PURPOSE FOR THE PROPOSED ACTION

1.1 Proposal

The Service proposes not to reissue Special Use Permits (SUP) to allow livestock grazing on 2 areas of the Refuge. The SUP's will expire in 1995. The location of the areas are shown on Figure 1. The Victoria Bank Tract, 585 acres, has a 13 acre portion that is being grazed. The Shaw property is approximately 200 acres in size. Grazing approximately 213 acres represents less than 2% of the refuge acreage to date (10,968 acres in fee title).

The requirement to prepare an Environmental Assessment (EA) for a proposed Federal action is contained in the National Environmental Policy Act (NEPA) of 1969, as amended.

1.2 NEED FOR PROPOSED ACTION

Prior to refuge acquisition, the areas in question were grazed and developed. After acquisition all secondary uses on the property were prohibited unless permitted. Special Use Permits were issued to permit grazing by the adjacent landowners on the Shaw tract and the previous lessee on the Victoria Bank property.

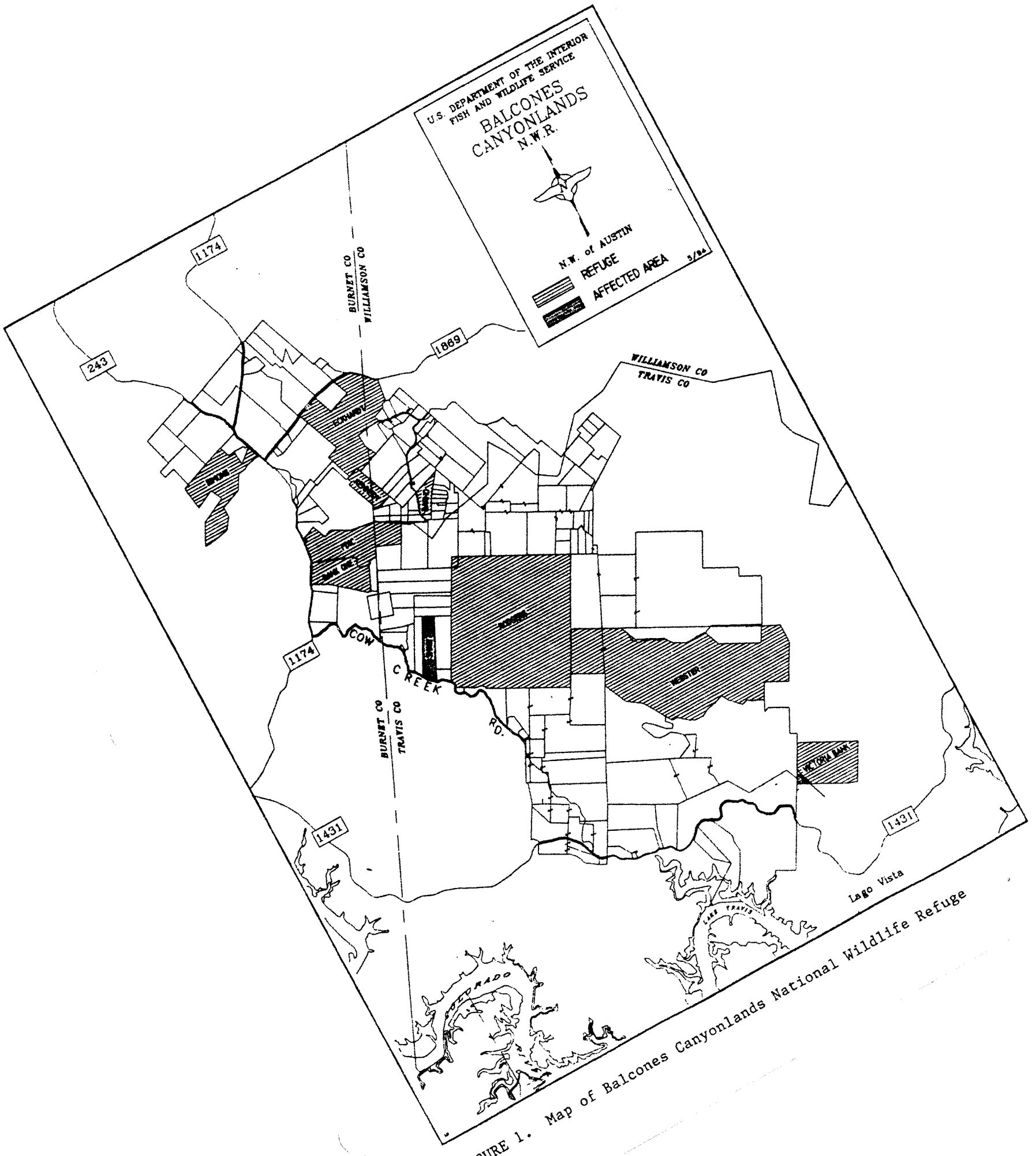


FIGURE 1. Map of Balcones Canyonlands National Wildlife Refuge

Before grazing is permitted on a national wildlife refuge it must be found to be compatible with the purpose that the refuge was established. Secondary uses on a refuge, even if compatible, do not have to be allowed. The manager may decide that the action or activity is inappropriate. This is especially true if funds and personnel to administer the use is limited or there is not sufficient information on the effect the activity will have on the refuge. Compatibility Determinations were made prior to issuance of the Special Use Permits. Permits were issued because at that time and with the information available, the uses were found to be in the best interest of the Refuge and did not materially interfere with or detract from the purposes for which Balcones Canyonlands NWR was established.

A condition of the settlement of the lawsuit on compatibility, requires that an EA be completed for certian secondary uses occurring on national wildlife refuges, including grazing.

A draft EA was completed in June and sent out for review. In addition, news releases and EA's were mailed to local newspaper reporters and 2 papers, Austin American-Statesman and The North Lake Travis Log ran articles on the EA and asked for public input on grazing.

1.21 SUMMARY OF PUBLIC INPUT

Written comments were received from the Lone Star Chapter of the Sierra Club, Texas Committee on Natural Resources, Dean P. Keddy-Hector, Texas Parks and Wildlife Biologist, Marianne Siller and Charles Siller, Lago Vista. Verbal comments were received from Dee Dee Armentrout, National Aubudon Society, and two Austinites who felt that if grazing was permissible then mountain bike riding should be allowed. Written comments are appended to this document.

Due to the interest expressed by some of the environmental groups a meeting was held on 15 July 1994 to discuss the grazing issue. Attendees included: Scott Royder, Sierra Club, Dee Armentrout, National Audubon Society, Terry Cook, The Nature Conservancy of Texas, Susan Peterson, Texas Committee on Natural Resources, Dean P. Keddy-Hector and David Diamond, Texas Parks and Wildlife Department.

All comments received were highly critical of allowing grazing on a national wildlife refuge without supporting biological data or specific management objectives for wildlife. Owing to the public input and questions raised, the Refuge Manager determined that while grazing can be a compatible activity on Balcones Canyonlands NWR, it is an inappropriate activity at this time. It is inappropriate because adequate biological information needed to make a Compatibility Determination is lacking.

Grazing will be curtailed on the Shaw and Victoria Bank tracts after the present SUP's expire. Before grazing is again permitted, adequate biological information for specific wildlife management objectives will be reviewed. A Compatibility Determination will be made that addresses how grazing will achieve specific wildlife objectives that support the purposes for which Balcones Canyonlands NWR was established. Public input will again be solicited.

1.3 PURPOSE OF PROPOSED ACTION

The purpose of this EA is to evaluate the environmental impacts of the proposed issuance of Special Use Permits to allow grazing and the compatibility of these actions with the overall purpose of Balcones Canyonlands NWR.

Grazing of these tracts is a convenience to the Refuge. The Refuge would not have to remove fencing from the Shaw property when surrounding property is acquired. There are no plans to acquire the property in the near future because the landowner has not expressed a desire to sell the property. However, acquisition of these tracts is a high priority.

The 13 acre portion of the Victoria Bank Tract had large quantities of garbage removed and was secured. The 3 year permit will allow the permittee to find other suitable acreage for the horses.

1.4 PROPOSED REFUGE OBJECTIVES

The following are the objectives that are listed in the Balcones Canyonlands National Wildlife Refuge Environmental Assessment, December, 1991 that was written to allow the establishment of the Refuge. They are used to guide refuge plans and activities until quantitative objects are formulated in a Refuge Master Plan.

Primary Objective:

1) Conservation of the natural diversity of the Balcones Canyonlands Ecosystem, including the endangered, threatened, and unique species of the region and the habitats on which they depend.

Secondary Objectives:

1) Contribution to recovery of endangered species of the Edwards Plateau Ecosystem by leading recovery planning for endangered species and by implementation of international agreements and studies for migratory species;

2) Conservation of the natural heritage of the Edwards Plateau through cooperation with other public land managers;

3) Conservation of the natural heritage of the Edwards Plateau through development of an education and voluntary lands protection program to be implemented throughout the region;

4) Development of a refuge public use management plan designed to interpret the ecosystem values and characteristics of the region without adversely impacting refuge resources;

5) Implementation of research programs designed to provide information necessary for management and recovery of endangered species of the Edwards Plateau; and

6) Protection and enhancement of water quality and quantity.

2.0 DESCRIPTION OF THE ALTERNATIVES

2.1 Alternative A - No action - Preferred Alternative

Under the No Action Alternative, the Service would not re-issue Special Use Permits for grazing on the Shaw or Victoria tracts. The rancher adjacent to the Shaw property would be required to keep his cattle from trespassing on to the 200 acre refuge tract after his permit expires in April, 1995. The rancher could prevent trespass through several means including construction of a fence. Costs incurred by fencing the tract could increase the value of the ranch. This improvement may reduce the incentive to sell the property to the Refuge because of the increased economic investment. Fencing would result in a 200 acre pasture. After acquisition by the Refuge, this fence would be removed as funds and personnel permitted.

The permit for the Victoria property would not be renewed after 1995.

2.2 Alternative B - Construction of Fence by Refuge

Construction of a fence in the rocky soils of the Hill Country are difficult and costly. Limited Refuge operating monies would be better spent on restoration and research efforts. This would also set a precedent of the government building numerous fences to keep cattle off the refuge.

2.3 Alternative C - Issue Special Use Permits to allow grazing on selected refuge tracts

Under Alternative C, the Refuge would issue Special Use Permits for selected refuge tracts based on a biological or habitat need. Grazing would be allowed only if there were specific wildlife or habitat management goals that could be achieved by grazing. In addition, sufficient biological information would be collected and analyzed to allow for a Compatibility Determination.

2.4 Alternative D - Cost Share Fence Construction by Refuge and Adjacent Rancher

This alternative is feasible. Again, at the present time, there are no funds available to accomplish this task. Balcones Canyonlands NWR is presently in a custodial status with limited funds.

Cost sharing fencing would set a precedent for all other adjacent landowners. There are not enough funds currently available for normal refuge operations and maintenance. If limited funds were available for fencing, it would be difficult to set priorities for which property would be fenced. This could result in even more acreage being grazed by adjacent cattle ranchers as they waited for adjoining fences to be constructed to prevent cattle tresspass.

Objections could be raised that refuge funds would be better spent restoring endangered species habitat rather than fencing cattle out of the refuge. This is especially true since cattle ranchers are responsible for preventing their cattle from trespassing on neighboring privately owned property.

3.0 AFFECTED ENVIRONMENT

Shaw Tract

The Shaw tract is 200 acres and unfenced. It is surrounded on 3 sides by an active cattle ranch in private ownership. The Shaw property was previously part of this cattle ranch and was grazed by cattle. The property is rectangular in shape. The north side also borders private property, but cattle have not been observed.

Fencing cattle from this area would create a pasture where cattle would be excluded. To date the refuge staff has observed 3 white-tailed deer on the Refuge that were killed by either running into or becoming entangled in a fence as they attempted to jump over it. The Refuge is in the process of removing interior fences on property that it has acquired.

Due to the small acreage involved the Refuge Manager feels that creating a small fenced area could impede movement patterns of deer and possibly other wildlife. However, white-tailed are extremely abundant in the Edwards Plateau and the loss of so few a number would be insignificant to the overall population in the surrounding counties. White-tail deer are not hunted on the Refuge at this time.

The adjoining rancher was issued a Special Use Permit on a yearly basis and pays $800 per year to graze 10 AUMs on the property. An AUM is an animal unit month and measures how many cattle can be grazed on a piece of property.

A range conservationist from the Soil Conservation Service inspected the area in 1993 and recommended 10 AUM's for year-round grazing. This stocking rate is lower than the stocking rate used by the previous owner. The majority of the property, 75%, is an open savannah that has been heavily grazed for years. The southwestern boundary borders Cow Creek Road. The elevation of the property rises to the east. The eastern edge of the property is very steep and rugged (40-60 acres) and has little if any use by cattle.

Golden-cheeked warblers have been seen at the eastern boundary. The Refuge does not feel grazing the 200 acres is having a significant impact on Golden-cheek Warbler compared to the surrounding grazing operation. Cattle only graze on the lower portion of the tract that does not contain Golden-cheek Warbler habitat. Current policy by the Ecological Services Office in Austin is, that if there is no change (i.e. goats vs cattle) or an increase in grazing use after the listing of the Golden-cheeked Warbler, there is no violation of the Endangered Species Act.

Victoria Bank Tract

The Victoria tract is 585 acres and includes a 300' wide easement across the southwestern corner for the Bar K Airport. The runway cuts off a 13 acre corner from the rest of the property. Prior to refuge ownership, a few horses were grazed on the 570+ acre portion. After acquisition the lessor was allowed to graze 3 horses on the 13 acre portion. The lessee was issued a Special Use Permit that will not be renewed after 1995. Rather than pay a fixed fee for use of the property, the permittee was required to remove trash and debris from the area and secure the property to prevent further dumping.

The Victoria Bank tract is covered by a thick forest of Ashe junipers with other deciduous trees. Numerous territories of Golden-cheek Warblers have been observed. An inspection of the 13-acre tract in 1992 by a biologist from Ecological Services revealed that it was low quality habitat and grazing would not need a Section 7 consultation. In the Spring of 1993, a pair of Golden-cheek warblers were observed on the property. The permit to graze horses on the tract will not be renewed after 1995.

Public Input on the Affected Environment

Susan Peterson, Texas Committee on Natural Resources, stated that the EA does not address the cumulative impacts of grazing. Grassland species could re-invade the area as more habitat would be available for wildlife for nesting, feeding, and loafing areas. Ungrazed areas provide more habitat for small mammals and reptiles thereby conserving the biodiversity and natural heritage of the area.

The Sierra Club felt that if cattle grazing were permitted, the EA must address how grazing would affect recovery time of a badly degraded habitat, water quality, soil erosion, impacts associated with cowbirds and cowbird trapping, ground nesting bird loss due to trampling, soil compaction, impacts on riparian vegetation, etc.

Dean P. Keddy-Hector believed that most of the refuge can become suitable for Golden-cheeked Warblers in 20-50 years if given a chance to vegetate. The key factor is the promotion of woody vegetation. Recovery of endangered species habitat is likely to be delayed by even light grazing pressure, since cattle also a) browse heavily on hardwoods, b) remove grassy ground cover, and c) improve conditions for browsing animals such as white-tailed deer by diversifying ground cover vegetation. The Refuge Manager agrees with the above comments, but notes that while Balcones was established to provide habitat for endangered species, Balcones also has objectives to preserve the biodiversity of the area. This includes habitat for grassland bird species, whose populations in the Central United States are declining.

3.1 Climate

The Refuge, located on the southeastern edge of Edwards Plateau is known for extremes in wet and dry years. Mean annual rainfall in the three-county area is about 34 inches. Rainfall is generally distributed evenly throughout the year, with peaks in May and September. Droughts are cyclic and occur at various intervals.

3.2 Physiography, Geology, and Soils

The Refuge is located in a subsection called Lampasas cut-Plain which is characterized by broad, flat-topped and often steep sided mesas occurring as a line of remnants on a striped plain or plateau in the later stages of erosion. Principal streams in the area are the Colorado and the South Fork of San Gabriel.

Rock outcrops forming the plateaus in the Refuge include the thin to thick dolomites and massive marls and limestones of the Cretaceous Fredericksburg group. The less resistant limestones, shales, and sandstones (Travis Peak and Glen Rose formations) form the major valleys. Recent alluvium and terrace deposits of sand, silt, and gravel occur along stream courses.

Approximately 44 percent of the soils occur on high ridges and are thin, stony clays to clay loams overlying rock. Large limestone fragments cover 30 to 70 percent of the surface. Almost 45 percent of the soils occur on rolling benches and side slopes developed on limestone and marl. All of these soils are "better suited to range or wildlife habitat".

3.3 Vegetation

The Balcones Canyonlands segment of the Edwards Plateau includes a high diversity of plant species, several endemic plants, and a unique blend of vegetation communities.

The unique combination of geology, climate, hydrology, and juncture of the Edwards Plateau and the southern edge of the Lampasas Cut Plain contribute to the variety of vegetation communities found in the area.

Vegetation communities include oak-juniper woodlands along slopes and ridges; post oak-grassland savannahs along plateaus and some canyon floors; more mesic deciduous forests in north-facing, steep canyons; stream bottom riparian forests; springs and seeps; and low shrub communities on drier, rocky, limestone outcrops.

The oak-juniper association may include plateau live oak (Quercus fusiformis), Texas oak (Q. buckleyi), shin oak (Q. sinuata var. breviloba), blackjack oak (Q. marilandica), Ashe juniper (Juniperus ashei); Texas redbud (Cercis canadensis), Texas persimmon (Diospyros texana); Texas madrone (Arbutus xalapensis), mountain laurel (Sophora secundiflora), and agarita (Berberis triofoliolata). Drier west or south facing slopes may be dominated by Ashe juniper which may form pure stands known locally as cedar brakes.

The post oak-grassland savannah association includes post oak (Q. stellata), shin oak, and other woody species which may form clumps or motts or occur as scattered individuals. Most grasslands of the Balcones Canyonlands area have been heavily grazed by livestock and subjected to various brush control measures, resulting in patchy and dynamic communities. Moderately grazed grasslands may include little bluestem (Schizachyrium scoparium), Texas wintergrass (Stipa leucotricha), white tridens (Tridens species), sideoats grams (Bouteloua curtipendula), tall dropseed (Sporobolus asper), and several other grass species. Drier, west or sough-facing , post oak-grassland savannahs may include xeric shrub species as sacahuista (Nolina texana), yucca (Yucca sp.), sotol (Dasylirion texanum), and white brush (Aloysia gratissimia).d

3.3.1. Threatened and Endangered Plant Species

There are no federally listed endangered plant species known to be present within the refuge. Several candidate species are known to exist on the Refuge, but none have been located on the Shaw or 13-acre section of the Victoria tract.

3.4 Water Resources

The Post Oak Ridge and Jollyville Plateau form the stream divides between the tributaries of the Colorado and Brazos rivers in the area. The northeastern portion of the refuge is drained by intermittent and perennial streams that feed the South Fork of the San Gabriel River (part of the Brazos river Basin).

The majority of the Refuge is drained by intermittent and perennial streams such as Cow Creek that feed into Lake Travis on the Colorado River. Most streams in the study area are seasonal in flow. Springs and seeps provide flow in the few perennial streams and provide intermittent flow in some of the other dry stream terraces.

3.5 Wetlands

There are no wetlands within the affected tracts.

3.6 Wildlife

The Balcones Canyonlands area supports some 375 species of birds, a little more than a third of which are known to nest in the region. About 110 of these bird species are neotropical migrants.

At least 55 species of mammals occur in the Balcones Canyonlands. Of the 30 species of bats in Texas, 18, or 60 percent, occur in the canyonlands.

Over 70 species of reptiles occur in the area including some 45 snake species, 16 lizard species, and 11 turtle species. In addition, four salamander species in the Balcones Canyonlands area are Category 2 species under review for potential listing.

Eighty species of fish occur and can be characterized as transitional, including a mixture of native and introduced game fish found in the intermittent and permanent streams of the Colorado and San Gabriel river basins. The Guadalupe bass (Micropterus treculi), an endemic species, occupies stream and reservoir habitats in the canyonlands region.

3.61 Threatened, Endangered, Rare and Endemic Species

Golden-cheeked Warbler habitat is often characterized as steep canyons with a mature forest of oaks and Ashe juniper. Hardwoods are important in the warbler habitats and include oak, cedar elm (Ulmus crassifolia), escarpment blackcherry (Prunus serotina var. eximia), sycamore (Platanus occidentalis), Arizona walnut (Juglans major), pecan (Carya illinoiensis), Texas ash (Fraxinus texensis), sumacs (Rhus species), mountain laurel and Texas redbud.

Warbler densities in steep canyon, mature forest habitat may range from 15-30 pairs/250 acres. Warblers have been observed at the northern boundary of the Shaw property and at least 7 territories have been mapped on 40-50 acres of habitat. These birds were also observed flying over the north boundary on to private land. A pair of warblers were observed on the 13 acre portion of the Victoria property. No nests were found.

Black-capped Vireo habitat in the study area may be characterized as a mid-successional, shrub-dominated stage of oak-juniper woodlands. The shrub-dominated community is a transitional stage between a canopy of mature oak and/or Ashe juniper. Dominant shrubs and scattered small trees amy include shin oak, Ashe juniper, Texas oak, plateau live oak (Q. fusiformis), and other woody vegetation growing in open or partially closed canopy.

Black-capped vireo habitat is distributed sporadically within the study area. Densities of breeding pairs in the Refuge varies considerably. No vireos have been sighted within the grazed areas.

3.7 Land Use

There is no longer open range in Central Texas, specifically in Travis, Burnet, and Williamson counties. Landowners in Travis, Burnet, and Williamson counties must confine cattle to their property to prevent trespass on neighboring lands. Generally, this is accomplished by fencing property with 3-7 strands of barbed wire or by using a combination of barbed wire and woven fencing.

The Shaw property was originally part of the Turner Ranch. In the mid 1980's numerous parcels were sold. The property has had continued grazing before and after it was sold.

The 13-acre Victoria Tract was used as a area to store excess equipment and junk. There was a boat, pickup, burned out house, refrigerators, construction debris, air conditioning units, outboard motors, floating dock, and miscellaneous items that were on the property. The permittee has removed the majority of the above mentioned items and will continue to remove debris.

3.8 Socioeconomics

The rate charged to graze the Shaw property is based on current rates charged by landowners in the area. There is an exchange for service on the Victoria tract rather than a fee.

4. ENVIRONMENTAL CONSEQUENCES

Grazing can have both positive and negative consequences on the environment and native wildlife species. Beneficial effects of grazing include maintenance of perennial grasses and their root systems and increased plant productivity. Grazing reduces the amount of fine fuels necessary to start wildfires thereby reducing the frequency and intensity of wildfires. While grazing, livestock can have beneficial impacts. Their hooves break up capped soils and return plant materials to the soil from related physical actions or in the form of dung and urine.

Grazing may also have detrimental effects. This is especially true if the area is too heavily stocked or grazed during drought conditions. Overgrazing reduces the diversity of plants and animals in grasslands, can reduce plant vigor and reverse plant succession. Infrastructure to support grazing such as fences may act as barriers to some wildlife and cause accidental injury or death to others. Excessive livestock trampling compacts the soil and increases water runoff. Greater runoff results in soil erosion and increases transport of plant nutrients. The net effect of these changes is to reduce the availability of soil moisture and nutrients in landscape. Grazing also alters nutrient distribution patterns by deposition of dung in areas where livestock tend to concentrate. Runoff from these areas contribute to water pollution and have been identified as pollutants.

The impact of grazing by 3 horses on the 13-acre Victoria tract will have an impact on the grassland portions of the property. However, the impact will be short term in nature and in the absence of grazing the area will restore itself. Currently, the refuge does not have the staff or budget to clean up the area.

It is felt the short term negative effects outweigh the longer term effects of getting the tract cleaned up and in compliance with environmental standards.

4.1 Climate

None of the 5 alternatives under consideration are expected to have an effect on area climate.

4.2 Physiography, Geology, and Soils

The thin, stony soils, typical of the area, are fragile, susceptible to erosion, and difficult to restore. Removal of vegetation through overgrazing could result in soil erosion. No effects on the physiography or geology are expected.

4.3 Vegetation

Shaw Tract

According to the report from the Soil Conservation Service dated April 13, 1994, the site can be described as low stony hill. Climax vegetation is live oak, shin oak, sumac; with little bluestem, indiangrass, sideoats grama, fall witch grass, wildrye, sprangletop, sagewort, dalea, woollyshite, bush sunflower, snoutbean, sundrop, and engelmann daisy.

Due to heavy grazing pressure, the lower end of the tract near Cow Creek has minimal late-successional midgrasses and forbs. Mexican Hat or Coneflower (Ratibida columnaris) is the predominate perennial on the lower half of the tract. King Ranch Bluestem (Bothriochloa ischaemum), is a vigorous warm-season perennial that provides fair grazing for livestock. This grass has been seeded over most of the Post Oak Ridge and is present on both tracts.

Grazing will keep the area in mid-successional stages. Ashe juniper is common on the dry slopes. Live Oak and Texas oak are also present. Alternative A, B, and D would eliminate continued effects of grazing on the vegetation. Under Alternative C a Special Use Permit could be reissued.

Victoria Bank Tract

This tract is almost covered with mature Ashe Junipers, live oak and other oak species are present in limited numbers. King Ranch bluestem is the predominate grass. The 3 horses are fed and watered daily. Continued grazing will favor mid-successional species of grasses and forbs. Effects on this tract will be short term and the area will quickly restore itself.

4.3.1 Threatened and Endangered Plant Species

There are no federally listed endangered plant species known to be present within the Refuge. A variety of Croton alabamensis var. texensis is present on the Refuge, but none has been found on either the Shaw or Victoria tracts. Designated Category 2 species that may occur in the Post Oak Ridge are include bracted twistflower (Streptanthus bracteatus), canyon-mock orange (Philadelphus ernestii), and Texas amorpha (Amorpha texan). None have [not] been located on either the Shaw or Victoria tracts.

4.4 Water Resources

The cattle on the Shaw property get water from Cow Creek. The Refuge does not own the creek nor have any control over its use. Overgrazing could result in increased runoff and soil erosion.

Water is transported to the horses on the Victoria property on a daily basis because there is no source of available water at the site.

4.5 Wetlands

No wetlands occur on either site.

4.6 Wildlife

Alternatives A,B, D, and E would eliminate grazing on the refuge and undesirable effects of the associated vegetation changes would reverse. Grassland species could re-invade the area as more habitat became available to wildlife for nesting, feeding, and loafing areas. Ungrazed areas provide more habitat for small mammals and reptiles. Both sites are xeric and limited habitat for amphibians is thought to exist.

4.6.1 Threatened and Endangered, Rare and Endemic Species

Due to the shape and small acreage involved on the Shaw property, selection of alternative A, B, C, or D would little impact on Golden-cheek warblers. Lands surrounding the Shaw property on the east, south, and west are heavily grazed. The area is fragmented and has been grazed for decades.

Brown-headed Cowbirds are commonly found on the Shaw property and are known to parasitize Golden-cheeked Warbler nests. Elimination of grazing would not eliminate the Brown-headed Cowbirds because of the shape and small acreage involved. Birds would simply fly from adjacent areas which are grazed and parasitize birds nesting on the refuge.

Trapping of Cowbirds to reduce the amount of nest parasitism is a viable mitigation. The degree of impact of Cowbird parasitism on Golden-cheeked Warbler productivity is not determinable at this time and research to determine whether Cowbirds are a threat to warbler recovery should be done. Current information indicates that it may be prudent to design management strategies that would reduce the chance of nests being parasitized by Cowbirds. However, trapping is not recommended unless data collected over a 2-year period indicated a given warbler population is unable to sustain itself without human intervention or unless cowbird parasitism is extreme the first year. Preliminary data collected by TPWD does not show parasitism of Golden-cheeked Warbler nests to be a problem at this time. However, data is still being collected on the Refuge and is not conclusive.

The Refuge has collected data on the Victoria Bank property for 3 years. There is no direct evidence of nest parasitism on Golden-cheek Warblers at this time. Furthermore, it is apparent that the population is able to sustain itself without human intervention. However, Cowbirds have been observed in the area and one can assume that there is some nest parasitism.

Limited information on Golden-cheek Warblers exists for birds on the Shaw property. This property has limited habitat and the habitat present is not high quality. While trapping Cowbirds could reduce nest parasitism on resident and neotropical birds there is no evidence that it would increase the productivity of warblers in the area.

4.7 Land Use

The Shaw property was grazed prior to refuge acquisition. Issuance of the permit to allow grazing would not change the land use. Grazing on the Victoria Bank tract was eliminated when the 3 horses were moved to the 13-acre portion. While not grazed by cattle or goats immediately prior to refuge acquisition, the area had been grazed in previous years.

Alternatives which eliminate grazing, A, B, D, and E, would change land uses for the area. However, due to previous land uses recovery of the areas would take decades to develop desirable vegetation.

4.8 Socioeconomics

There would be minimal if any socioeconomic impacts with alternative C. Alternative A, C and D would result in increased operating costs to the adjacent landowner to build and maintain fences. If the Service had not purchased property in the Post Oak Ridge area, fences would eventually be replaced or new fences constructed as land ownership patterns changed. Fencing is considered a normal operating cost in the cattle business.

Fees charged under Alternative C are based on what private landowners charge for grazing.

5. Information Sources

Dee Dee Armentrout, Vice President, National Audubon Society, SE Regional Office, Austin, Texas

Bryan Arroyo, Biologist, U.S. Fish & Wildlife Service, Department of the Interior, Ecological Services Office, Austin, Texas

Terry Cook, Biologist, The Nature Conservancy of Texas, Hill Country BioReserve, Austin, Texas

David Diamond, PhD., Ecologist, Texas Parks and Wildlife Department, Austin, Texas

Dean P. Keddy-Hector, Wildlife Biologist, Texas Natural Heritage Program, Texas Parks and Wildlife Department, Austin, Texas

Deborah Holle, Project Leader, U.S. Fish & Wildlife Service, Department of Interior, Balcones Canyonlands National Wildlife Refuge, Austin, Texas.

Linda Kissock, Range Conservationist, Soil Conservation Service, U.S. Department of Agriculture, Austin, Texas

Susan Petersen, Chairman, Texas Committee On Natural Resources, Austin, Texas

Scott Royder, State Conservation Director, Lone Star Chapter Sierra Club, State Office, Austin, Texas.

Tim Schumann, Wildlife Biologist, Lower Colorado River Authority, Austin, Texas.

James J. Siegel, Wildlife Biologist, U.S. Fish & Wildlife Service, Department of Interior, Balcones Canyonlands National Wildlife Refuge, Austin, Texas

Marianne and Charles Siller, Lago Vista, Texas

Amos, Bonnie B. and Frederick R. Gehlbach (eds.). 1988. Edwards Plateau Vegetation - Plant ecological studies in Central Texas. Baylor University Press, Waco, Texas. 144 pp.

U.S. Fish & Wildlife Service. 1991. Balcones Canyonlands National Wildlife Refuge Environmental Assessment. Albuquerque, New Mexico. 85 pp.

_____. 1991. Black-capped vireo (Vireo articapillus) Recovery Plan. Austin, Texas. pp. vi+74.

_____. 1992. Golden-cheeked Warbler (Dendrocica chrysoparia) Recovery Plan. Albuquerque, New Mexico. 88 pp.

_____. 1994. Environmental Assessment of Alternatives for Management of Grasslands on the Anahuac National Wildlife Refuge Complex, Chambers and Jefferson Counties, Texas. Anahuac, Texas. 38 pp.

U.S. 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 have determined that the action of approval of the proposals reflected in the Balcones Canyonlands National Wildlife Refuge Comprehensive Conservation Plan and in the proposed management framework alternative in the attached Environmental Assessment:

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

__X__ 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 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, Balcones Canyonlands NWR Comprehensive Conservation Plan and Environmental Assessment**

ACT _____ 9/19/01
Director/Regional Director Date

(1) _____ 09-04-01
Initiator/ Date
John Slown, AICP, Biologist/Natural Resource Planner

(2) _____ 9/18/01
Chief, NWR System, R2 Date

(3) G. Dean Watkins 9/18/01
acting NEPA Coordinator/ Region 2 Date

Finding of No Significant Impact

Comprehensive Conservation Plan and Environmental Assessment for Balcones Canyonlands National Wildlife Refuge

To: All Interested Governmental Agencies and Organizations

In the proposed agency action, as outlined in the attached Balcones Canyonlands National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, the U. S. Fish and Wildlife Service establishes a set of management strategies to promote the conservation goals of the Balcones Canyonlands National Wildlife Refuge (the Refuge) during a period of 10 to 15 years. The Refuge lies along the Balcones Canyonlands Escarpment in Burnet, Travis and Williamson Counties, Northwest of Austin, Texas. The proposed refuge boundary incloses 80,000 acres of land; currently the Service has acquired a fee interest in approximately 17,730 acres of this land. Additional privately held lands within the proposed refuge boundary will be acquired by the Service as they become available from willing sellers.

This Comprehensive Conservation Plan (CCP) and Environmental Assessment (EA) have been prepared as required by the National Wildlife Refuge System Improvement Act of 1997 and the National Environmental Policy Act of 1969 (NEPA) and its implementation regulations (40 CFR 1500 *et seq.*). The CCP establishes eight goals for management of the Refuge: 1) restoration and enhancement of threatened and endangered species habitat on Refuge lands; 2) protection and enhancement of habitat for a diversity of wildlife including other migratory birds; 3) restoration of watershed health to minimize sheet runoff and siltation, enhance seasonal stream flow, and maximize ground and surface water recharge; 4) development of interpretive programs that enable the public to (1) enjoy the fish and wildlife resources found on the refuge, (2) understand these resources and issues related to them, and (3) act to promote fish and wildlife conservation; 5) protection of habitat within approved Refuge boundaries by fee acquisition or conservation easement; 6) accurate, up-to-date data on roads, other physical infrastructure, habitats and wildlife, and plant species; 7) compliance with historic and archeological resource protection laws and regulations; and 8) efficient Administration that Supports Refuge Objective Accomplishments.

The CCP outlines long-range management objectives to be met to achieve these goals. The strategies address management of habitats, forests, waters, grassland, wildlife, administration and public use within the Refuge. Each strategy includes a summary of existing conditions, identifies any ongoing data needs and recommends actions to achieve one or more of the ten refuge goals.

The CCP also divides the Refuge into discrete management units, based upon existing natural and artificial boundaries (e.g., the Cow Creek riparian area, roadways) and documents existing conditions in each unit. Management strategies are applied differently in the various management units, depending upon physical conditions, such as ground level elevation, depth of soil and plant cover, as well as cultural considerations such as ease of access.

The EA evaluates the four alternative scenarios for overall management of the Refuge, as

proposed in the CCP. The effects of each alternative upon the physical, biological and human environment are examined, as well as each alternative's potential to achieve the goals of the CCP. Analysis of these alternatives is summarized below:

Alternative 1: No Action

This alternative considers no change in current Refuge management practices, funding or staffing, and no adoption of a management plan. This alternative would result in continued protection of endangered songbirds that nest on the Refuge, but conservation actions would have no over-arching plan context. Public visitation of the Refuge and environmental interpretive programs would increase only moderately under this program. Alternative 1 was not selected because management strategies to enhance, monitor, and protect Refuge habitats and wildlife populations would have been limited. The Refuge's ability to offer public use and economic benefit to the local economy would have been limited as well.

Alternative 2: Active habitat management to enhance habitat for golden-cheeked warbler and black-capped vireo while increasing public understanding and appreciation of the purposes for which the Refuge was established (Proposed Alternative).

Under this alternative management of habitat to benefit endangered species and other species would be expanded to include additional use of prescribed fire, increased vegetation manipulation and integrated pest management. Black-capped vireo and golden-cheeked warbler would be managed according to guidelines in the Recovery Plans for those species. Compatible public use and education opportunities would also be increased. Technical assistance would be expanded to provide additional help to interested, private landowners whose land offer, or could potentially offer, suitable habitats for the black-capped vireo or golden-cheeked warbler. If feasible, a visitor center/administrative office would be developed on or near the Refuge.

Alternative 3: Enhance endangered species habitat and close all habitat areas which are used by endangered species.

Under this alternative management of habitats would be similar to that proposed in Alternative 2. All endangered species habitats would be closed to public access when endangered species are present. This alternative would provide endangered species protection similar to that of Alternative 2, but would offer far less public use, outreach and education. Alternative 3 was not selected as it provides less opportunity to interpret the endangered species which use Refuge habitats. Such interpretation can be important to gaining public support for recovery activities, and is consistent with the National Wildlife Refuge System Improvement Act of 1977.

Alternative 4: Active habitat management to enhance habitat for golden-cheeked warbler and black-capped vireo while providing additional recreational opportunities on the Refuge.

Under this alternative management of habitats would be similar to that proposed under

alternative 2. Public use opportunities would be increased to include off-road bicycling, horseback riding and hiking, as requested in public meetings. Refuge trails would be developed to enhance recreational use, with environmental interpretation less emphasized. This alternative offers protection of endangered species habitat, but would result in greater human activity levels on the Refuge. This alternative was not selected due to potential impacts to endangered species from recreational public use not directly related to species interpretation, and due to the increased staff time that managing such public use would require.

Summary:

Adoption and implementation of the proposed alternative, as described the in the CCP and EA, will formally establish a set of programmatic comprehensive goals, objectives and strategies for management of the Refuge. Based on a review and evaluation of the information contained in the CCP and the EA, I have determined that the formal approval of refuge management goals and objectives as described in the Proposed Alternative of the EA (Alternative 2) is not deemed a major Federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2) (c) of NEPA. Therefore, an Environmental Impact Statement is not required. However, it is the intent of the Service to revisit questions of significant environmental consequences in accordance with NEPA upon consideration of the implementation of site specific proposals called for and discussed in the final CCP document.

9/19/01 _____ 9-19-01

Regional Director, Region 2 — Date
U.S. Fish and Wildlife Service

Balcones Canyonlands National Wildlife Refuge Comprehensive Conservation Plan

Environmental Assessment

September 2001

U.S. Fish and Wildlife Service
P.O. Box 1306
Albuquerque, New Mexico 87103

Balcones Canyonlands National Wildlife Refuge Comprehensive Conservation Plan Environmental Assessment

I. Purpose

One purpose of the management actions proposed in the Balcones Canyonlands National Wildlife Refuge Comprehensive Conservation Plan (CCP) is to facilitate achievement of the Refuge Purpose. The actions are designed to result in the restoration, maintenance, and management of habitats to protect and enhance populations of the endangered black-capped vireo (*Vireo atricapillus*) and golden-cheeked warbler (*Dendroica chrysoparia*). Another purpose is to guide development of opportunities for Refuge visitors to enjoy compatible[1] wildlife-dependent outdoor recreational activities on Refuge lands.

The plan is intended to provide for long-term management based on careful consideration of the physical and biological characteristics of the Refuge, and to ensure that Refuge habitat management meets the long-term needs of species that use the Refuge. It is designed to facilitate achievement of U.S. Fish and Wildlife Service and Refuge goals for the protection and enhancement of endangered species, and promote public appreciation of endangered wildlife and other species native to the Balcones Canyonlands region.

[1] A "compatible use" is one which will not negatively impact resources nor conflict with the purposes for which the refuge was established.

II. Needs

The U.S. Fish and Wildlife Service has responsibility for stewardship of endangered species and migratory birds, as well as other species that occupy Service lands. The Balcones Canyonlands National Wildlife Refuge was established in 1992, under the authority of the Endangered Species Act of 1973, to conserve fish or wildlife which are listed as endangered species or threatened species. Two endangered migratory songbirds that nest in the area, the black-capped vireo and the golden-cheeked warbler, have been a focus of conservation efforts at the Refuge.

These birds were historically widespread over much of the region, but conversion of their habitat for residential and other development has raised serious concerns about their long-term survival. As described in the CCP, management actions at the Refuge support protection and restoration of habitat for these two bird species. Also implicit in the Refuge purpose statement is protection of any other listed species that may be present. Caves on the Refuge are believed to have the potential of harboring unique or rare animal species, and are thus afforded protection in the CCP.

A secondary mandate of the National Wildlife Refuge System is provision of wildlife-dependent recreational public uses wherever such uses are compatible with the purposes of the National Wildlife Refuge System and the individual Refuge. The National Wildlife Refuge System Improvement Act of 1997 enumerates six priority wildlife-dependent wildlife uses: hunting, fishing, wildlife observation, wildlife photography, interpretation and education. These are considered appropriate at Refuges when compatible. The CCP also addresses the appropriate level of public use on the Refuge.

III. Issues

Residents of local communities, including the City of Austin, need additional opportunities for outdoor recreation. The area is developing very rapidly, and open lands are being converted to residential or commercial uses. Many local citizens fought strongly for conservation of natural resources throughout the Balcones Canyonlands region and protection of the black-capped vireo and the golden-cheeked warbler. Those individuals, and much of the general public, now want an opportunity to enjoy what they have supported. They want interpretive trails, opportunities to view endangered species - the black-capped vireo and the golden-cheeked warbler - and they want to enjoy the Canyonlands and scenery of the Refuge. School teachers are interested in Refuge lands for their environmental education opportunities. Some citizens want opportunities for hunting deer and other game animals on the Refuge.

IV. Alternatives Including Proposed Action

Alternative 1: No action

Under the No Action Alternative current management practices would be maintained. These are outlined in detail in the CCP under "Current Status" in the Objective Documentation section.

Current practices involve both mechanical removal of invasive juniper and use of fire in the ecosystem. The goals of these actions are control of exotic species, creation of additional black-capped vireo habitat, and enhancement of plant species diversity. Juniper invades grasslands and savannahs, resulting in loss of diversity and closure of open canopy areas. In areas where oak and brush dominate, fire can be used to set back successional stages and stimulate growth of desired species, thereby enhancing the habitat available to black-capped vireo. This alternative would maintain the recent frequency and areal extent of prescribed fires, rather than implementing the more aggressive program proposed in the *Balcones Canyonlands National Wildlife Refuge Fire Management Plan* (FMP).

Black-capped vireo and golden-cheeked warbler would be managed according to guidelines in the Recovery Plans for those species. In addition, any activity in occupied habitats would be coordinated with the Austin Ecological Services Office through a Section 7 Consultation process.

Public use under Alternative 1 would be limited to special events occurring on the periphery of acquired Refuge lands, and to occasional staff-lead birdwatching events. Special hunts for the purpose of controlling white-tailed deer (*Odocoileus virginianus*) populations and minimizing damage to brush species needed by the black-capped vireo would continue to be offered each year. Under this alternative, no new trails would be opened or developed, roads would not be improved for public use, and wildlife viewing opportunities would be limited to the wildlife viewing deck that has already been constructed on the Post Oak Ridge Division, the existing trail at Doeskin Ranch, the trails overlooking warbler habitat, and a potential future shin oak observation deck.

In summary, this alternative would result in additional habitats for both the black-capped vireo and the golden-cheeked warbler. It would provide excellent protection for both species from disturbance by visitors.

Alternative 2: Active habitat management to enhance habitats for golden-cheeked warbler and black-capped vireo while increasing public understanding and appreciation of the purposes for which the Refuge was established (Preferred Alternative)

Under this alternative, management of habitat would continue as under Alternative 1 with the addition of an expanded prescribed burn program described in the FMP, increased mechanical vegetation management,

preparation and implementation of an integrated pest management plan for invasive weed control, investigation and implementation of biological control of imported red fire ants and potential re-introduction of extirpated species such as the Texas horned lizard and Guadalupe Bass. Implementing this alternative would accelerate habitat restoration for black-capped vireo and golden-cheeked warbler. Planting of oak trees and acorns for black-capped vireo habitats would be accelerated, with planting extended to additional areas (the Cottonwood Branch Unit, and perhaps the Bee Creek and Post Oak Creek Units) beyond the current planted areas in the Doeskin Branch Unit. In addition, wetland areas would be improved and/or expanded to benefit neotropical migratory birds, waterfowl, and waterbirds. The potential for water development on the Refuge would be investigated to provide increased riparian habitat and enhanced water quality and quantity. Management of several areas on the Refuge where large scale caliche removal has occurred could create and enhance small wetlands. While livestock grazing is not currently allowed, this alternative would permit evaluation of potential benefits of grazing by either cattle, goats, sheep or bison if data collection on the Refuge indicate it might be an effective management tool for grasslands. Haying, or removal of grass, could be considered if the Refuge staff determined that grass posed a significant fire hazard during dry spells. Planting of trees, reintroduction of rare plants, and removal of second growth Ashe juniper trees in selected habitats would be allowed when consistent with Refuge management objectives. Hunting white-tailed deer, feral pigs, and turkey would occur under this alternative. The addition of other hunting programs would be allowed, such as dove hunting and possible small game hunting, if lands with sufficient habitats are acquired.

Black-capped vireo and golden-cheeked warbler would be managed according to guidelines in the Recovery Plans for those species. In addition, any activity in occupied habitats would be coordinated with the Austin Ecological Services Office through a Section 7 Consultation process.

Under this alternative, public use and educational opportunities would be enhanced. Specifically, a public use area would continue to be developed in the Doeskin Branch Unit, with trails that provide interpretation for (1) the habitat restoration efforts being carried out on the Refuge to enhance populations of endangered species, and (2) the natural and cultural heritage of the hill country and the Balcones Canyonlands. Development of such an area would provide the public additional opportunities for viewing black-capped vireo, golden-cheeked warbler, and other bird and wildlife species. Facilities in the public use area would be developed to be universally accessible. Environmental education opportunities and materials would be developed for use by local area school groups. Road access would be improved for scheduled events and seasonal hunting, particularly into the Bee Creek and Little Creek Units.

Technical assistance would be expanded to provide additional help to interested, private landowners whose lands offer, or could offer, suitable habitats for the black-capped vireo and/or the golden-cheeked warbler. A part of the Refuge would be developed as a demonstration

area to assist staff in working with landowners in developing habitats on their own lands. Outreach efforts would be expanded to increase public awareness of the values offered by the Balcones Canyonlands National Wildlife Refuge, and a Friends of the Refuge Group would be developed and supported.

Under this alternative, the possibilities of an office/visitor center on or near the Refuge would be explored and evaluated, and construction would be pursued if feasible and compatible.

In summary, this alternative would result in additional habitats for both the black-capped vireo and the golden-cheeked warbler. While visitor numbers and activity levels would increase, facilities would be designed to limit the impact of public use upon endangered species and their habitats.

Alternative 3: Enhance endangered species habitat and close all habitat areas to the public which are used by endangered species.

Under this alternative current habitat management practices would be maintained to enhance habitats for golden-cheeked warbler and black-capped vireo. To provide protection for those species from all public disturbance, all endangered species habitat areas would be closed to the public. This alternative would result in additional habitats for both the black-capped vireo and the golden-cheeked warbler and greatly reduce the potential for human disturbance of both species.

Black-capped vireo and golden-cheeked warbler would be managed according to guidelines in the Recovery Plans for those species. In addition, any activity in occupied habitats would be coordinated with the Austin Ecological Services Office through a Section 7 Consultation process.

Public access to the Refuge could be allowed for compatible wildlife-dependent recreation during the fall and winter period (roughly late September through early March) when the endangered songbirds have migrated away from the Refuge. All such activities would be restricted to prevent any lasting alteration of, or damage to golden-cheeked warbler and black-capped vireo habitat.

Alternative 4: Active habitat management to enhance habitats for golden-cheeked warbler and black-capped vireo while providing additional public recreational opportunities on the Refuge.

Under this alternative, management of habitats would be similar to that proposed in Alternative 2. Public use opportunities would be increased to include off-road bicycling, horseback riding and hiking, as requested at public meetings held in Lago Vista. Trails would be developed to accommodate those recreational uses, and facilities supporting those uses (e.g., bicycle racks, hitching posts) would be installed at trailhead areas. Prior to adopting this alternative, determination of whether bicycle riding and horseback riding are appropriate uses on the Refuge would be required, as these are not priority wildlife-dependent uses.

Black-capped vireo and golden-cheeked warbler would be managed according to guidelines in the Recovery Plans for those species.

In addition, any activity in occupied habitats would be coordinated with the Austin Ecological Services Office through a Section 7 Consultation process.

The primary purpose of trails developed under this alternative would be to provide additional outdoor recreation. Some interpretive materials would be placed along the trails to provide users information about the purposes for which the Refuge was established, and life history information about the golden-cheeked warbler and black-capped vireo. The trails would be routed to avoid habitat areas to limit impacts on resident wildlife, particularly the golden-cheeked warbler and black-capped vireo.

This alternative would result in additional habitats for both the black-capped vireo and golden-cheeked warbler. Some disturbance of both species by Refuge visitors would be unavoidable

V. Affected Environment

The Balcones Canyonlands NWR is located on the eastern part of the Edwards Plateau region northwest of Austin, Texas. This area is an ecotone, or mixed community formed by overlap of adjacent ecological communities. Plant and wildlife species typical of eastern deciduous forest, southwestern desert, Texas coastal plains and interior great plains are all represented on the Refuge. Additionally, the region supports numerous endemic species. It is an important area for neotropical migratory birds. Beneath the plateau and the Refuge, underground streams of naturally occurring, mildly acidic water have dissolved the limestone substrate to form karst habitats. Karst habitats support several endangered endemic species of invertebrates, salamanders, and fish, and possibly more organisms not yet discovered.

Vegetation on the Refuge includes species typical of the prairies of the Great Plains, the forests of the southeastern United States, the deserts of the Southwest and the tropics of the south. Some species are unique to the Texas Hill Country (as the Edwards Plateau Area is called). Plant communities on the Refuge range from open grassland to dense woodlands and forests. The majority of the Refuge is dominated by a variety of juniper-oak woodlands, with Ashe juniper (*Juniperus ashei*) a strong component. Oak species vary by site, including the abundant Spanish oak (*Quercus buckelyi*), plateau live oak (*Q. fusiformis*), post oak (*Q. stellata*), and shin oak (*Q. sinuata* var. *breviloba*). Other species include cedar elm (*Ulmus crassifolia*), hackberry (*Celtis laevigata*), escarpment black cherry (*Prunus serotina var. eximia*), Texas ash, (*Fraxinus texensis*) Arizona walnut, (*Juglans major*) and gum bumelia (*Bumelia lanuginosa*). Grasslands and savannahs include a mixture of native and non-native grasses and forbs. Little bluestem (*Schizachrium scoparium*), silver bluestem (*Bothriochloa laguroides* var. *torreyana*), sideoats grama (*Bouteloua curtipendula*), buffalograss (*Buchloe dactyloides*), and Texas wintergrass (*Stipa leucotricha*) are the most common native grasses. Riparian woodland corridor species include American elm (*Ulmus americana*), cedar elm, sycamore (*Platanus occidentalis*), and hackberry, along with liveoaks and junipers.

The Refuge supports a variety of wildlife species due to its ecotonal location at the junction of the Great Plains and the Gulf Coastal Plains. Thirty-two of the fifty-five species of mammals known to occur in the Balcones Canyonlands have been confirmed as occurring on the Refuge. Several bat species occupy the area. Over 215 species of birds have been identified on the Refuge, many of which are known to nest in the region. Nearly half of these use the Refuge during migration and breeding, spending the remainder of the year in Mexico, Central America, or South America. Two of these, the black-capped vireo and the golden-cheeked warbler are federally listed as endangered.

Eight amphibian species and thirty-two reptile species have been found on the Refuge to date; and numerous species of cave fauna occupy the karst habitat beneath the surface of the Refuge.

A full description of the Refuge, its resources, and its socioeconomic setting are included in Section III of the CCP.

VI. Environmental Consequences

Alternative 1: No Action

Under this alternative, current management practices on the Refuge would not change. The restoration of habitat and protection and enhancement of golden-cheeked warbler and black-capped vireo would continue at current levels. Public use and level of access to Refuge lands would remain very limited.

Impacts on Wildlife and Habitat Management.

Current management practices are resulting in a gradual but steady reduction in invasive juniper, enhancement of grassland and oak savannah, and opening of the canopy in woodland areas not habitat to the endangered golden-cheeked warbler. These management activities would continue at their past rate and intensity under Alternative 1, thus yielding less enhancement of native communities than would the more aggressive prescribed fire program proposed in the FMP. Enhancement of grasslands through clearing of invasive junipers in non-endangered species habitat will increase spring flows, improving water availability for wildlife. Controlling deer populations through special hunts would provide protection for brush species needed by the black-capped vireo, and greater recruitment of oaks needed by golden-cheeked warbler, resulting in enhancement of habitat for those species over time. Species that use juniper berries as a primary food source, such as wintering cedar waxwings (*Bombycilla cedrorum*) and American robins (*Turdus migratorius*), would have fewer juniper berries available as a food source.

Impacts on Endangered and Threatened Species.

Management of the Refuge's endangered species in accordance with guidelines in the Recovery Plans for the black-capped vireo and golden-cheeked warbler, as well as consultation with the Fish and Wildlife Service's Austin Ecological Services Office, as required by Section 7 of the Endangered Species Act, would ensure best habitat management practices for those species. Current management practices enhance habitat for black-capped vireo and golden-cheeked warbler through protection of existing habitat areas and vegetation manipulation to favor creation additional habitat. Any additional habitat available to black-capped vireo and golden-cheeked warbler should help to increase populations of those endangered species and help protect them from extinction.

Impacts on Air and Water Quality.

Prescribed fire under this alternative would cause short-term, negative effects on air quality in the local area. Each prescribed fire takes into account the effect of smoke through a prescribed fire plan, so impacts can be reduced. Each prescribed fire must comply with burning regulations

enforced by (or promulgated by) the Texas Natural Resources Conservation Commission, Air Quality Division.

The quantity and quality of ground water would presumably increase as Refuge land acquisition reduces the development of ground water for agricultural and domestic use. The Refuge would not develop new water wells for either wildlife or public use. In general, conserving native vegetation communities and habitats would enhance ground water recharge areas (zones) and the quality and quantity of the water. As lands currently under private ownership are acquired, the potential risk of ground water contamination from application of pesticides, herbicides, and fertilizers is reduced. Additionally, old abandoned water wells on acquired lands would be plugged or sealed as they are discovered and funds permit, thus eliminating potential paths of ground water contamination.

The conservation of water quality in watersheds draining into Lake Travis and the South San Gabriel River could enhance the regional water supply. With reduced erosion resulting from restoration of grasses and forbs in savannah areas, water draining into the ponds and tanks on the Refuge could also be of higher quality. Enhancement of grasslands could increase spring flows in area streams through reduction of water use by woody species.

Impacts on Aesthetic and Visual Resources.

The no action alternative would not impact the existing aesthetic and visual resources on and near the Refuge.

Impacts on Archeological and Historical Resources.

This alternative would provide protection to sites within the Refuge in accordance with national laws, regulations, and policies intended to protect and preserve these resources. Habitat improvements eventually could make the landscape more attractive to members of the public using public roadways

Impacts on Socioeconomic Resources.

As lands are purchased for inclusion in the Refuge they are removed from local tax rolls. This impact is mitigated through payments in lieu of taxes made to counties under the Refuge Revenue Sharing Act. The payments vary with congressional funding, and may not always fully compensate for lost property tax revenues. The quarry operations, organic farm, and cattle ranching operations on privately owned lands within the Refuge boundary would not be affected.

The Operations and Maintenance budget of the Refuge is approximately $400,000 per year, of which 80 percent goes to staff salaries and benefits. Much of the Refuge and staff expenditures go for purchases in the local communities and benefit the regional economy. In addition to the Refuge budget, a fire management program also exists. That program provides fire suppression for the Refuge, and for surrounding lands if needed. The annual operating budget for the fire

program is approximately $200,000. Again, most of those funds are spent in the area and benefit the local economy.

Alternative 2: Active habitat management to enhance habitat for golden-cheeked warbler and black-capped vireo while increasing public understanding and appreciation of the purposes for which the Refuge was established (Preferred Alternative)

This alternative would protect Refuge habitat while providing the public with opportunities for wildlife-dependent outdoor recreation. As indicated below, the outreach elements could result in protection and/or restoration of additional habitat to protect and enhance populations of black-capped vireo and golden-cheeked warbler.

Impacts on Wildlife and habitat Management

This alternative would offer adequate wildlife protection while providing high quality wildlife-dependent recreational opportunities on the Refuge. More specific and intensive management activities, including enhancement of grassland and oak savannah, and opening of the canopy, would result in enhanced habitat for endangered species and other wildlife species occurring on the Refuge. Research on management techniques would be encouraged, resulting in better data to evaluate management effectiveness. Cooperative activities with the Texas Parks and Wildlife Department would also be encouraged. Surveying, monitoring, and control of oak wilt (*Ceratocystis fagacearum*) would occur, resulting in protection of oaks from the spread of that disease. Allowing haying could reduce the risk of wildfire on the Refuge near Refuge facilities (roads, operations center).

Under this alternative, wildlife disturbance along Refuge trails and roads would increase as Refuge visitation increases. Disturbance would be minimized by locating Refuge trails and public use facilities in carefully selected areas. Hunting white-tailed deer, feral pigs, and turkey on the Refuge could seasonally increase wildlife disturbance. Wildlife disturbance from hunting on the Refuge could be reduced by the design of the hunting program. If determined necessary, contracted trapping of feral pigs would also be undertaken to reduce populations of this introduced animal. Any trapping would be scheduled while migratory birds were not present.

Impacts on Endangered and Threatened Species

Management of the Refuge's endangered species in accordance with guidelines in the Recovery Plans for the black-capped vireo and golden-cheeked warbler, as well as consultation with the Fish and Wildlife Service's Austin Ecological Services Office, as required by Section 7 of the Endangered Species Act, would ensure best habitat management practices for those species. Creation and enhancement of endangered species habitat would be accelerated under this alternative and allow for an increase in endangered species populations. Encouragement of research on the golden-cheeked warbler and black-capped vireo and their

habitats could result in information and data that could improve management for those species.

Impacts of birding tours, including small commercial tours, upon golden-cheeked warbler and black-capped vireo would be minimized since they would be permitted only under very controlled conditions. Construction and use of wildlife observation decks in black-capped vireo and golden-cheeked warbler habitat would also be highly controlled. Certain public use facilities would be closed during periods of high sensitivity to prevent impacts to the endangered songbirds. For example, the vireo observation deck is annually closed for three to four weeks from mid-March through April to allow male vireo time to establish breeding territories without disturbance. Other facilities may also be seasonally closed. Monitoring of the effects of the public on the black-capped vireo colonies would ensure that the colonies were not being adversely affected, by permitting modification of deck design, or other actions to be taken before a colony is impacted. Public hunts on the Refuge are not anticipated to affect golden-cheeked warbler or black-capped vireo populations, as these birds are not present on the Refuge during the hunting season.

Impacts on Air and Water Quality

Prescribed fire under this alternative would cause short-term, negative effects on air quality in the local area. Each prescribed fire takes into account the effect of smoke through a prescribed fire plan, so impacts can be controlled. Each prescribed fire must comply with burning regulations enforced by (or promulgated by) the Texas Natural Resources Conservation Commission, Air Quality Division.

Under this alternative the feasibility of water development will be examined. If feasible, such development could improve riparian habitat, water quality and water quantity. Management of several areas on the Refuge where large scale caliche removal has occurred could create and enhance small wetlands, providing benefits to plant and animal species that depend upon wetland habitats for all or part of their life cycles. Implementation of habitat management techniques that increase the amount of grasses and forbs would decrease erosion and resulting sedimentation in area streams.

This alternative would not adversely affect regional air quality.

Impacts on Aesthetic and Visual Resources

Under this alternative some viewscapes would be altered by the construction of visitor services facilities such as interpretive panels, trails, parking areas and wildlife viewing blinds. These facilities would be designed and located for minimal visual intrusion and attractive appearance to the extent possible. Habitat improvement in general would alter views by changing the character of vegetation cover. Many areas currently supporting dense scrub growth would be managed to favor a more open savannah cover type.

Impacts on Cultural, Archeological, and Historical Resources

This alternative would allow for increased restoration and rehabilitation of archeological and historical sites. These sites as well as cultural sites could be integrated into environmental education and interpretation activities on the Refuge, if additional funding can be secured. Construction of a visitor center/office, if found feasible and compatible, would provide for interpretation of the cultural, archaeological and historic resources in the area as well as wildlife and habitat resources, and result in an increase in public understanding and appreciation of the cultural, archaeological and historical values of the Refuge.

Impacts on Socioeconomic Resources

Under this alternative, increased visitation to the Refuge for both consumptive and non-consumptive uses of the Refuge would benefit the local economy. Development would include construction of wildlife viewing areas on the Eckhardt tract as well as other areas, nature trails for wildlife interpretation on the Doeskin Ranch public use area, construction of photo blinds for wildlife photography, and an area for environmental education activities. An increase in public use facilities and programs would increase the number of visitors coming to the Refuge. As more lands are added to the Refuge, controlled hunting opportunities would increase. The Refuge does not have sufficient acreage to support unrestricted hunting. Fishing opportunities on the Refuge are limited. The Refuge lacks large water resources and superior fishing opportunities are available near the Refuge in Lake Travis and other areas. Little fishing is anticipated on the Refuge, other than organized events such as National Fishing Day fish derbies. Should any of the Refuge tracts with lake frontage are purchased, a fishing pier and/or boat ramp into Lake Travis would be considered.

The initial estimate for annual visitation to the Refuge developed upon Refuge creation in 1992 was approximately 153,000 visits per year during the first several years of its operation. This estimate assumed that an office and related public use facilities would be developed on the Refuge. These facilities have not been developed to the level anticipated, and visitation is considerably lower than the initial estimates. The numbers of Refuge visitors can be expected to increase as facilities are developed.

A study of the economic impact of State Park visitors on the Texas economy showed that day visitors to nature facilities spent an average of $6.96 per person on transportation, lodging, food, and miscellaneous items in association with their visit to the park facility. Among visitors to park facilities in Travis, Williamson and Burnet counties, where day visitors traveled an average of 30-40 miles to reach the park facility, day visitors spent an average of $4.35 per person [pre-1992 data]. Assuming that visitors to the Refuge spend similar amounts on local purchase, the estimate of annual Refuge visitor expenditures is approximately $359,300. Tourism is the 3rd largest industry in Texas with nature

tourism being the fastest growing component. The opportunity for bird-watchers to view the golden-cheeked warbler and black-capped vireo at Refuge facilities should contribute to the local economy.

As lands are purchased for inclusion in the Refuge they are removed from local tax rolls. This impact is mitigated through payments in lieu of taxes made to counties under the Refuge Revenue Sharing Act. The payments vary with congressional funding, and may not always fully compensate for lost property tax revenues. The quarry operations, organic farm, and cattle ranching operations on privately owned lands within the Refuge boundary would not be affected. The Operations and Maintenance budget of the Refuge is approximately $400,000 per year, with 80 percent of this being budgeted for staff salaries and benefits. Specific maintenance management projects would be funded separately. These monies would contribute directly to the regional economy. In addition to the Refuge budget, a fire management program also exists. The annual operating budget for the fire program is approximately $200,000. Staff working in this program provide fire suppression for the Refuge and on surrounding lands if needed.

Alternative 3: Enhance endangered species habitat and close all habitat areas which are used by endangered species.

This alternative would establish the Refuge as an inviolate sanctuary, undisturbed by any public visitation except that needed for wildlife and habitat management purposes.

Impacts on Wildlife and Habitat Management

This alternative would maximize habitat and wildlife protection. Public hunting of white-tailed deer and feral pigs would be allowed to control their numbers and prevent habitat degradation in endangered species areas. Other than hunting to control populations of deer and feral pigs, the Refuge would be operated as an inviolate sanctuary and would be entirely closed to the public. Disturbance from hunting and human activity on adjacent lands would continue, but be insignificant. This off-Refuge hunting could also help control the deer herd size depending on the amount of hunting pressure. Wildlife would be subject to only minimal disturbance under this alternative.

It is doubtful that this alternative would provide greater protection to endangered species on the Refuge than that which could be provided through carefully controlled public use as identified under Alternative #2. Activities such as prescribed burning, restoration of habitat through mechanical clearing, planting and seeding would continue and be unaffected.

Impacts on Endangered and Threatened Species

The Refuge would be managed for endangered and threatened species in accordance with guidelines in the Recovery Plans for the black-capped vireo and golden-cheeked warbler, as well as consultation with the Fish and Wildlife Service's Austin Ecological Services Office, as required by

Section 7 of the Endangered Species Act, under this alternative. As no public access to identified habitats of golden-cheeked warbler and black-capped vireo would be permitted during the nesting season, there would be no disturbance to the birds from the visiting public. The only access to these areas would occur during big game hunting, which occurs during the winter months, when these species have migrated to their winter habitats in Mexico, Central America, and South America.

Impacts on Air and Water Quality

Air quality would not be impacted under this alternative.

Under this alternative the potential for water development on the Refuge would be investigated to provide for increased riparian habitat and enhanced water quality and quantity. Management of several areas on the Refuge where large scale caliche removal has occurred could create and enhance small wetlands. This would benefit wetland plant and animal species dependent upon wetland habitats for part or all of their life cycles. Implementation of habitat management techniques that increase the amount of grasses and forbs would decrease the non-point source pollution from erosion and sedimentation.

Impacts on Aesthetic and Visual Resources

Habitat improvement in general would alter views by changing the character of vegetation cover. Many areas currently supporting dense scrub growth would be managed to favor a more open savannah cover type.

Impacts on Archeological and Historical Resources

This alternative would have no known impact on archeological and historical resources. Sites within the Refuge would be protected and managed by the Refuge in compliance with national laws, regulations, and policies in order to protect and preserve these resources.

Impacts on Socioeconomic Resources

Wildlife-dependent recreational opportunities on the Refuge would be limited to hunting only when neo-tropical migratory birds are not in the area. There would be very few visitors to the Refuge and very little revenue would be generated from such a small hunting program.

As lands are purchased for inclusion in the Refuge they are removed from local tax rolls. This impact is mitigated through payments in lieu of taxes made to counties under the Refuge Revenue Sharing Act. The payments vary with congressional funding, and may not always fully compensate for lost property tax revenues. The quarry operations, organic farm, and cattle ranching operations on privately owned lands within the Refuge boundary would not be affected. The Operations and Maintenance budget of the Refuge is approximately $400,000 per year, with 80 percent of this being budgeted for staff salaries and benefits. Specific maintenance management projects would be funded separately.

These monies would contribute directly to the regional economy. In addition to the Refuge budget, a fire management program also exists. The annual operating budget for the fire program is approximately $200,000. Staff working in this program provide additional fire suppression for the Refuge and on surrounding lands if needed.

Alternative 4: Active habitat management to enhance habitat for golden-cheeked warbler and black-capped vireo while providing additional public recreational opportunities on the Refuge.

This alternative would require investment of financial and staff resources for development, maintenance, and law enforcement related to recreational uses not identified as wildlife-dependent priority public uses in the National Wildlife Refuge System Improvement Act of 1997. All public uses of Refuge lands are subject to a compatibility determination. The uses proposed under this alternative may not be determined to be compatible with the Service's mandate to protect Refuge habitat.

Impacts on Wildlife and Habitat Management

This alternative would offer a reduced level of wildlife and habitat conservation than that offered by the Preferred Alternative. While specific management activities, including enhancement of grassland and oak savannah, and opening of the canopy, would occur, staff time would be required for visitor services and facilities management unrelated to wildlife-dependent uses.

Under this alternative, wildlife disturbance along Refuge trails and roads would increase as Refuge visitation increases. The use of horses and bicycles on Refuge trails would introduce higher speed , increased soil compaction, and increased levels of activity over that proposed in other alternatives. The use of horses could also create a source of exotic seed in manure. While disturbance would be minimized by locating Refuge trails and other public use facilities in carefully selected areas, including non-wildlife dependent uses with negative impacts on wildlife is not appropriate.

Impacts on Endangered and Threatened Species

The Refuge management in accordance with guidelines in the Recovery Plans for the black-capped vireo and golden-cheeked warbler, as well as consultation with the Fish and Wildlife Service's Austin Ecological Services Office, as required by Section 7 of the Endangered Species Act, would ensure best habitat management practices for those species. Creation and enhancement of endangered species habitat would be accelerated under this alternative and allow for an increase in endangered species populations. Encouragement of research on the golden-cheeked warbler and black-capped vireo and their habitats could result in information and data that could improve management for those species.

Impacts on Air and Water Quality

Prescribed fire under this alternative would cause short-term, negative effects on air quality in the local area. Each prescribed fire takes into account the effect of smoke through a prescribed fire plan, so impacts can be reduced. Each prescribed fire must comply with burning regulations enforced by (or promulgated by) the Texas Natural Resources Conservation Commission, Air Quality Division.

Under this alternative the potential for water development on the Refuge would be investigated to provide for increased riparian habitat and enhanced water quality and quantity. Management of several areas on the Refuge where large scale caliche removal has occurred could create and enhance small wetlands, providing benefits to plant and animal species dependent upon wetland habitats for all or part of their life cycles. Implementation of habitat management techniques that increase the amount of grasses and forbs would decrease erosion and resulting sedimentation in area streams.

This alternative would not adversely affect regional air quality.

Impacts on Aesthetic and Visual Resources

Under this alternative some viewscapes would be altered by the construction of visitor services facilities such as interpretive panels, trails, parking areas and wildlife viewing blinds. These facilities would be designed and located for minimal visual intrusion and attractive appearance to the extent possible. Habitat improvement in general would alter views by changing the character of vegetation cover. Many areas currently supporting dense scrub growth would be managed to favor a more open savannah cover type.

Impacts on Cultural, Archeological, and Historical Resources

This alternative would allow for increased restoration and rehabilitation of archeological and historical sites. These sites as well as cultural sites could be integrated into environmental education and interpretation activities on the Refuge, if additional funding can be secured. Construction of a visitor center/office, if found feasible and compatible, would provide for interpretation of the cultural and historic resources in the area as well as wildlife and habitat resources, and result in an increase in public understanding and appreciation of the historical and cultural values of the Refuge.

Impacts on Socioeconomic Resources

Under this alternative, increased visitation to the Refuge for both consumptive and non-consumptive uses of the Refuge would benefit the local economy. The bicycle and equestrian trails proposed under this alternative would likely be used primarily by local area residents, and are not anticipated to increase local economic benefits related to eco-tourism.

As lands are purchased for inclusion in the Refuge they are removed from local tax rolls. This impact is mitigated through payments

in lieu of taxes made to counties under the Refuge Revenue Sharing Act. The payments vary with congressional funding, and may not always fully compensate for lost property tax revenues. The quarry operations, organic farm, and cattle ranching operations on privately owned lands within the Refuge boundary would not be affected. The Operations and Maintenance budget of the Refuge is approximately $400,000 per year, with 80 percent of this being budgeted for staff salaries and benefits. Specific maintenance management projects would be funded separately. These monies would contribute directly to the regional economy. Additionally, a fire management program with an annual operating budget of approximately $200,000 also exists. This program provides fire suppression for the Refuge and on surrounding lands if needed.

VII. Cumulative Impacts, Mitigation, Consultation and Coordination

Cumulative Impacts

Cumulative impacts include impacts on the environment from incremental effects of the proposed action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. Implementing Alternative 2 would reduce the potential for cumulative impacts because of the strategic approach to managing refuge programs. This would be a change from the issue-by-issue, problem-by-problem fragmented approach inherent in the No Action Alternative.

The management actions proposed in Alternative 2 should complement the Balcones Canyonlands Conservation Plan (BCCP). The BCCP is a multi-species habitat conservation plan in place for the Burnet, Hays, Travis, Williamson County area. This plan uses permit fees and grant funding to acquire private habitat preserves for a variety of Endnagered or Threatened species, including the black-capped vireo, the golden-cheeked warbler and a variety of rare cave fauna, while allowing otherwise legal activities that might affect these species or their habitat. The Balcones Canyonlands NWR is distinct from the BCCP, but focuses on conserving many of the same species and habitat types.

Where site development activities are to be proposed during the next 15 years, each activity may be given additional NEPA consideration, where appropriate. At that time, mitigation activities, as appropriate, would be designed into each specific project to reduce the level of impacts to the human environment and protect fish, wildlife and their habitats.

Mitigation Measures

Mitigation measures are necessary when effects are anticipated to be at the threshold of significance. Nothing proposed in Alternative 2 would produce environmental impacts that are near any level of significance to warrant mitigation measures. The following measures have been programmed into the activities proposed in Alternative 2 to limit overall impacts to the environment, and particularly to endangered songbirds that nest on the Refuge:

- All construction or vegetation management activities in or near black-capped vireo or golden-cheeked warbler habitat will be scheduled to occur during the fall and winter months when the birds have migrated away from the region.

- Visitor service facilities will be located outside of, or at the margins of, any endangered species habitats.

- Some visitor service facilities will be closed seasonally during critical time periods.

- Ongoing monitoring should detect any negative impacts to endangered species on the Refuge and allow modification of management to limit such impacts.

Consultation and Coordination

The planning process for Balcones Canyonlands National Wildlife Refuge actually began with public involvement for the Balcones Canyonlands Habitat Conservation Plan in the late 1980's for preservation of habitat for golden-cheeked warbler and black-capped vireo and other species. That effort resulted in the issuance of a regional permit on May 2, 1996 under Section 10(A) (1) (b)of the Endangered Species Act to establish conditions under which land development in Travis County can go forward in compliance with the Act. This permit authorizes direct and indirect loss of endangered or threatened species and their habitat due to otherwise legally permitted activity. A regional habitat conservation plan was written and habitat preserve areas were designated. The Refuge was established as the Federal Government's contribution to the preserve system of habitat conservation (development in endangered species habitat within the Refuge acquisition boundary is not covered under the Regional Permit and a separate permit must be obtained).

Public scoping meetings for the preparation of the Balcones Canyonlands National Wildlife Refuge Comprehensive Conservation Plan were initially held May 22, 1996, with two meetings held at Lago Vista. The meetings were well attended, although exact numbers are not recorded since many people did not sign in. Many ideas offered by citizens at those meetings were incorporated into this Plan. Because the staff felt that some recreational uses had not been adequately addressed, two additional meetings were held on June 3, 1997, also in Lago Vista. More than 50 people attended. Issues of horseback riding, mountain biking, commercial tourism and hiking were reviewed and discussed at those meetings. The Draft CCP and EA was released to the Public on December 8, 2000. The Service accepted written comments on the Draft CCP until March 5, 2001 and also held a public meeting in Lago Vista, Texas, on January 17, 2001. More than 20 area residents attended this meeting.

VIII. Document Preparation

Service staff that contributed to the preparation of this plan include: *John Slown,* AICP, Biologist/Refuge Planner, U.S. Fish and Wildlife Service; *April Fletcher*, Refuge Planner, U.S. Fish and Wildlife Service; *Deborah Holle,* Manager, Balcones Canyonlands National Wildlife Refuge; *Chuck Sexton*, Wildlife Biologist, Balcones Canyonlands National Wildlife Refuge; *Larry Narcisse*, Assistant Manager, Balcones Canyonlands National Wildlife Refuge; *Karen Cathey*, formerly Outdoor Recreation Planner, Balcones Canyonlands National Wildlife Refuge; *Bob Simpson,* FMO, Balcones Canyonlands National Wildlife Refuge; and *Rafael Fernandez*, Maps and Surveys, U.S. Fish and Wildlife Service, Regional office.