

Draft
Environmental Assessment
Balcones Canyonlands NWR
Invasive and Feral Animal Management Plan

United States Department of Interior
Fish and Wildlife Service
Region 2

July 01, 2013

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1.0 PURPOSE OF AND NEED FOR PROPOSED ACTION ALTERNATIVE

1.1 Introduction:

The United States Fish and Wildlife Service (Service), is proposing to implement the Balcones Canyonlands National Wildlife Refuge Invasive and Feral Animal Management Plan. This Environmental Assessment (EA) is being prepared to evaluate the effects associated with this proposal and complies with the National Environmental Policy Act (NEPA) in accordance with Council on Environmental Quality regulations (40 CFR 1500-1508) and Department of the Interior (516 DM 8) and Service (550 FW 3) policies (see Section 1.7 of this document for a list of additional regulations that this EA complies with). NEPA requires examination of the effects of proposed actions on the natural and human environment. In the following sections, three alternatives are described and environmental consequences of each alternative are analyzed. Two additional alternatives were also considered, but dismissed from detailed analysis.

1.2 Location:

Balcones Canyonlands National Wildlife Refuge is located in Travis, Williamson, and Burnet Counties, Texas and its headquarters is approximately 3 miles west of Lago Vista Texas (Figure 1). The Balcones Canyonlands National Wildlife 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 to protect and enhance populations of two endangered songbirds, the golden-cheeked warbler (*Setophaga chrysoparia*) and the black-capped vireo (*Vireo atricapilla*) along with other listed and candidate species (City of Austin and Travis County 1996, USFWS 2001). As of July 2013, the Refuge consists of 7,989 ha (19,742 ac) of federally-owned lands and 1,901 ha (4,699 ac) of conservation easements on private lands within a 32,375-ha (80,000-ac) acquisition boundary.

The Refuge actively participates in land management and restoration activities that are designed to improve habitats for golden-cheeked warblers, black-capped vireos, other migratory songbird populations, as well as other native wildlife. Restoration of these habitats is on-going as funding and personnel allow.

In addition to providing sanctuary and breeding ground habitat for migratory birds and other wildlife, the Refuge also provides wildlife-oriented recreational activities for the public. Wildlife observation, photography, hunting, and interpretive programs are available. An estimated 20,000 visitors annually use the Refuge for recreation and education.

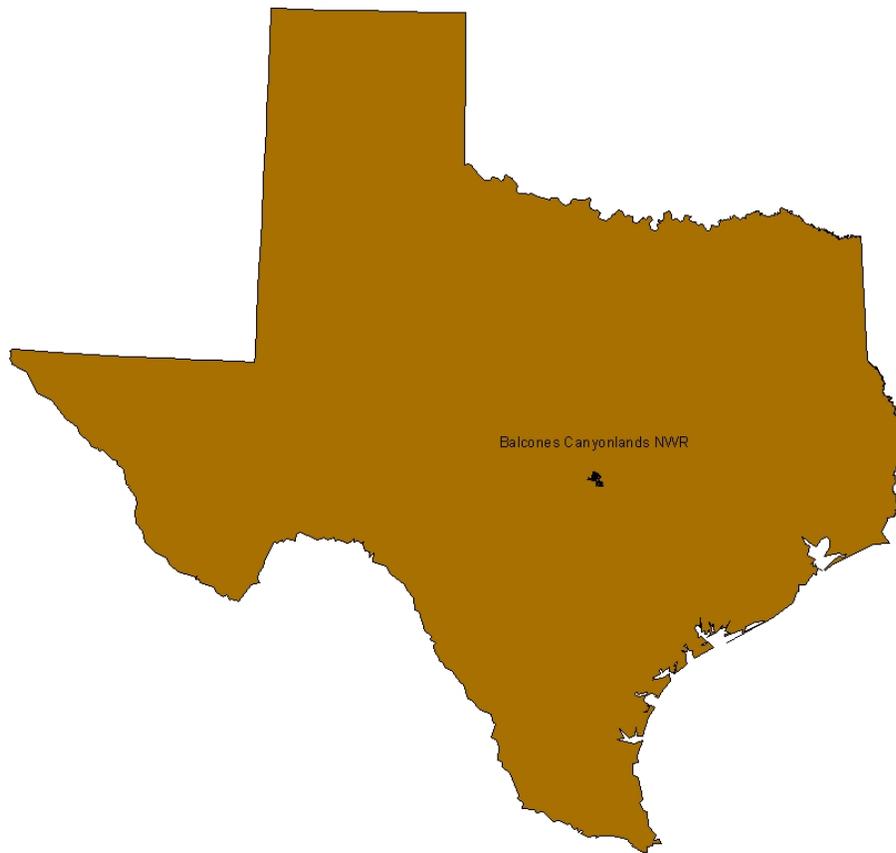


Figure 1: Location of Balcones Canyonlands National Wildlife Refuge

1.3 Background:

The negative impacts of invasive and feral animals have been well documented throughout Texas and around the world. In response to potential human health and safety, economic, and environmental impacts, the Balcones Canyonlands National Wildlife Refuge has developed the Management Plan to identify general guidelines that will direct management of these species. The purpose of the Invasive and Feral Animal Management Plan is to:

1. recognize that threats may be posed by these species;
2. recognize that their presence hinders management activities for the Refuge's two primary species (golden-cheeked warbler and black-capped vireo)
3. outline appropriate management strategies; and
4. direct implementation of measures to minimize these threats.

The goal of the Management Plan is to control, and where feasible/necessary, eliminate populations of invasive and feral animals on the Balcones Canyonlands National Wildlife Refuge in the most efficient, effective, and humane way possible. For the purposes of this document, feral animals are defined as wild

populations of otherwise domesticated species that have, through release or escape, reverted to a wild condition. Among others, feral species found in Texas include house cats, dogs, goats and hogs. Since all of the species considered under this plan are not indigenous or native to Texas, by definition, they are considered alien (exotic) and as defined by Executive Order 13112. Additionally, feral animals considered under this plan are also considered an invasive species. As defined by Executive Order 13112 an invasive species is an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

In order to meet the species protection and enhancement goals for the Refuge, Refuge staff will strive to maintain feral species at zero population levels. Management to avoid predation and habitat destruction by feral animals has been directed by the U.S. Fish and Wildlife Service as a part of the recovery plans for endangered golden-cheeked warbler and black-capped vireo (USWFS 1991c, 1992). Control may also be deemed appropriate if public health and safety threats or habitat damage becomes evident.

This Management Plan is intended to provide direction to Refuge staff and is anticipated to represent a continually updated and flexible set of directives that are able to meet the needs of a changing environment. As new species or conditions are discovered, this information will be incorporated to provide current status of the conditions and challenges faced by the Refuge. Nothing in the Management Plan is intended to limit the Refuges ability to control feral animals, but rather is intended to provide guidance on their control. Ultimately every situation will be dealt with on a case-by-case basis utilizing the best available information to assure control techniques are as effective, efficient, and humane as reasonably possible.

All techniques discussed in the Management Plan represent currently legal and widely accepted methods of control. Additionally, control of feral animals was contemplated and a National Environmental Policy Act (NEPA) assessment was completed under the Balcones Canyonlands National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment (2001). Many other approved Federal regulations and policies identified throughout this document also pertain to the control of feral animals. The proposed Management Plan simply provides more comprehensive information related to control of these species and assures the Refuge utilizes this information when making decisions to control these species.

Biological and life history information related to all feral animals considered under this EA can be found in the proposed Balcones Canyonlands National Wildlife Refuge Invasive and Feral Animal Management Plan.

1.4 Purpose of Action:

The purpose of the Environmental Assessment is to evaluate the effects of implementing the proposed Management Plan and other identified alternatives. The U.S. Fish and Wildlife Service is proposing this action to help reduce damage to refuge wildlife and habitat resources, including endangered species by controlling the population of these invasive species.

Due to the intensity of concern regarding invasive species, The National Invasive Species Council (NISC) was established by Executive Order (EO) 13112 to ensure that Federal programs and activities that are designed to prevent and control invasive species are coordinated, effective and efficient. NISC members are the Secretaries and Administrators of 13 federal departments and agencies to provide high-level coordination on invasive species and is co-chaired by the Secretaries of Commerce, Agriculture, and the Interior. The U.S. Fish and Wildlife Service is the only agency of the U.S. Government whose primary

responsibility is the conservation of fish, wildlife, and plants. Because of its responsibilities, the U.S. Fish and Wildlife Service is very concerned about the impacts that invasive species are having across the Nation. Invasive plants and animals have many impacts on fish and wildlife resources. Invasive species degrade, change or displace native habitats and compete with native wildlife for food, water, shelter and space, and are thus harmful to our fish, wildlife and plant resources.

1.5 Need for Action:

Feral and invasive species have over time hindered management practices on the Refuge and adjacent private properties, and have negatively affected recovery efforts for two endangered species. The practices discussed in the proposed Management Plan are directed toward the conservation of ecological resources to assure the preservation of native plants and animals, particularly the endangered golden-cheeked warbler and black-capped vireo. Of utmost concern is the constant threat these species pose to the long-term viability and sustainability of the warbler and vireo habitat, damage to property, and public and staff safety. In addition, they compete with native wildlife for food, water, and other resources, as well as cause disturbance to soils allowing for the invasion of exotic plant species and siltation of area springs and water-ways. These animals can serve as disease reservoirs and pose a threat to the health of both humans and other animals. As an example, feral hogs (*Sus scrofa*) are known to carry at least 13 diseases, including brucellosis, pseudorabies, tuberculosis, bubonic plague and anthrax (Burns and Loven 1998). The development and implementation of an effective and humane management plan to remove these animals is essential to achieving the Service's goal of conserving and preserving native wildlife.

The proposed management plan combines several forms of control techniques to maximize the potential for success.

1.6 Decision to be Made:

This EA is an evaluation of the environmental impacts of the alternatives considered and provides information to help the Service fully consider these impacts and any proposed actions to minimize/avoid impacts. Using the analysis in this EA, the Service will decide whether there would be any significant effects associated with the alternatives that would require the preparation of an environmental impact statement, or whether the proposed action alternative can proceed. If the selected alternative has no significant impacts, a Finding of No Significant Impact will be prepared.

1.7 Regulatory Compliance:

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

The mission of the Refuge System is:

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

The goals of the Refuge System are to:

- *Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered;*
- *develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges;*
- *conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts;*
- *provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation); and*
- *foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.*

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

- Administrative Procedures Act (5 U.S.C. 551-559, 701-706, and 801-808) as Amended
 - American Indian Religious Freedom Act of 1978 (Public Law 95-341, 42 U.S.C. 1996)
 - American Antiquities Act of 1906 (16 U.S.C. 431-433)
 - Archaeological Resources Protection Act of 1979 (Public Law 96-95, 16 U.S.C. 470)
 - Balcones Canyonlands National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment, and NEPA analysis documents (2001)
 - Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) as amended
 - Clean Air Act of 1972, as amended (42 U.S.C. 7401 *et seq.*)
 - Clean Water Act of 1972, as amended (33 U.S.C. 1251 *et seq.*)
 - Endangered Species Act of 1973, (ESA) Public Law 93-205, as amended by Public Law 100-478 (16 U.S.C. 1531 *et seq.*)
 - Executive Order 11514, Protection and Enhancement of Environmental Quality, as amended by Executive Orders 11541 and 11991 (March 5, 1970)
 - Executive Order 11987, Exotic Organisms (May 24, 1977)
 - Executive Order 12898, Federal Action Alternatives to Address Environmental Justice in Minority Populations and Low Income Populations, 1994.
 - Executive Order 13112, Invasive Species (issued in February 1999)
 - Federal Land Policy and Management Act of 1976, as amended, Public Law 94-579 (43 U.S.C. 1701 *et seq.*);
 - Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661 *et seq.*)
 - Fish and Wildlife Improvement Act of 1978 (16 U.S.C. 7421)
 - Floodplain Management (Executive Order 11988)
- Migratory Bird Treaty Act (16 U.S.C. 703-712) as amended
- National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee) as amended
 - National Environmental Policy Act (NEPA) of 1969, Public Law 91-190 as amended (42 U.S.C. 4321 *et seq.*)
 - Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 *et seq.*)
 - National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 *et seq.*)

- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 *et seq.*)
- Protection and Enhancement of the Cultural Environment (Executive Order 11593)
- Protection of Wetlands (Executive Order 11990)
- National Pollutant Discharge Elimination System, as amended (33 U.S.C. 1251 *et seq.*)
- Soil and Water Resources Conservation Act of 1977 (16 U.S.C. 2001-2009) as amended

The policy of the Service is to engage in the necessary control of wildlife within the National Wildlife Refuge System to assure balance of wildlife and fish populations consistent with the optimum management of refuge habitat. All control methods will be accomplished by the most humane manner and in accordance with Service directives, Refuge Manual (7RM 14.2), Service Manual (601 FW1, 602 FW1, 603 FW1), and Service Manual in preparation (751 FW1 and FW2).

Title 50 CFR Part 30, Section 11 – Control of feral animals.

Feral animals, including horses, burros, cattle, swine, sheep, goats, reindeer, dogs, and cats, without ownership that have reverted to the wild from a domestic state may be taken by authorized Federal or State personnel or by private persons operating under permit in accordance with applicable provisions of Federal or State law or regulations.

Title 50 CFR Part 30, Section 12 – Disposition of feral animals.

Feral animals taken on wildlife refuges may be disposed of by sale on the open market, gift or loan to public or private institutions for specific purposes, and as otherwise provided in section 401 of the act to June 15, 1935 (49 Stat. 383, 16 U.S.C. 715s).

Title 50 CFR Part 31, Section 14 – Official animal control operations.

Animal species which are surplus or detrimental to the management program of a wildlife refuge area may be taken in accordance with Federal and State laws and regulations by Federal or State personnel or by permit issued to private individuals. Animal species which are damaging or destroying Federal property within a wildlife refuge area may be taken or destroyed by Federal personnel.

Executive Order 13112 - Invasive Species

Issued in February, 1999 instructs Federal Agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health.

Further, this EA reflects compliance with applicable State of Texas and local regulations, statutes, policies, and standards for conserving the environment and environmental resources such as water and air quality, endangered plants and animals, and cultural resources. The proposed action will not involve any ground disturbing activities; therefore, no permits or other compliance documents are necessary.

1.8 Scoping/Public Involvement and Issues Identified:

The first Refuge hunt plan was approved in 1997. This plan made feral hogs a harvestable species with no limit on sex, age, or number. Later, as hog damage was observed at a higher frequency, corral type traps were used to remove some animals. The Refuges Comprehensive Conservation Plan (2001) or CCP listed removal of feral hogs during all public hunts and by refuge staff as opportunities allowed. The Refuge was to consider hiring a trapper to remove hogs if other methods proved insufficient. In 2008, a Feral Hog Plan was written. It included hunting, trapping, night shooting, and shooting via a helicopter. The latter method was considered to be too expensive and not effective given the dense brush and full canopy vegetation at the Refuge. However, after discussions with other refuges with similar habitat constraints and APHIS/Wildlife Services personnel it was decided to try this method. At that time it was

thought the Refuge would use that opportunity to evaluate the effectiveness of such action which would constitute research and would therefore meet the definition of a Categorical Exclusion from NEPA. However, due to the sensitive nature of aerial gunning, the public was invited to comment on the amendment to the hog control plan.

On January 24, 2011, the Service announced its intent to modify the Refuge's Feral Hog Control plan to include aerial hunting of hogs by employees of USDA/APHIS/Wildlife Services. The Public Comment period was for 10 days. A news release was sent to local media. Copies of the amendment to the 2008 plan were included. This information was also made available on the Refuge's web page. Media interest was high and the Associated Press (AP) did an article on the amendment. Due to the large number of comments, the Refuge decided to complete an Environmental Assessment and completely rewrite a new Feral Hog Management Plan rather than amend the old one. The comments received have been taken into consideration in the more comprehensive 2013 Balcones Canyonlands National Wildlife Refuge Invasive and Feral Animal Management Plan.

During the public scoping period, the Refuge received approximately 161 emails, 3 letters, and 7 phone calls concerning the proposed amendment. Some comments were difficult to classify pro or con as some wanted more public hunting opportunities rather than paid contractors, or wanted the hogs trapped and meat donated to local food banks. Some people sent in more than 1 email to clarify or ask for additional information or mentioned several topics.

Major issues identified were:

1. Aerial gunning was cruel and should not be allowed - 99 comments plus a detailed letter from the USPCA.
2. Pro aerial hunting – 8 comments
3. Waste of tax payer's money to contract for hog hunting rather than increasing public hunting opportunities, including a special archery season to eliminate hogs - 33 comments
4. Waste of hog meat that would could be donated to local food banks or hunters - 5 comments
5. In addition to the general concerns, 5 helicopter companies wanted to contract with the Refuge to fly for the aerial gunning, 1 man wanted to sell us use a better trap design, 1 was from an air ambulance company wanting to know the flight schedule, 1 person did not want the helicopter to fly over their home, 2 people wanted copies of our environmental assessment to help with their hog control plans, 2 emails were sent telling us that hogs carry Tularemia. A science teacher in Austin used our request for public comment as a school project. His students wrote letters to him with 8 being in support of the proposal, 2 were opposed, and 2 wanted the Refuge to consider other options.

Issues identified during this public scoping period were considered and addressed as appropriate in the Draft Environmental Assessment, and Management Plan. An additional 30 day public comment period will be provided on the Draft documents and will be considered when/if finalized.

ALTERNATIVES

2.1 Alternative A—Continuation of Current Feral Animal Control Efforts (No Action)

Under Alternative A, Refuge staff would continue to implement feral animal control as it has been done

since the Refuge began operations in 1992. Currently, the only Management Plan document related to feral animal control that the Refuge operates under is the 2008 Balcones Canyonlands National Wildlife Refuge Feral Hog Management Plan. This document is specifically related to feral hogs and does not contain information related to other feral animals that may be encountered on the Refuge. Other guidance is obtained from the 2001 Balcones Canyonlands National Wildlife Refuge Comprehensive Conservation Plan and Environmental Assessment. This document only provides general information on the need to control of feral animals, not on how to control them. Additionally, while not specific to feral hogs, harvesting of feral hogs is authorized under the 1997 Refuge Public Hunting Plan (USFWS 1997). As with the Comprehensive Conservation Plan, no information is provided regarding feral animal harvest techniques.

While not limited by the guidance documents, feral hog control techniques currently utilized by the Refuge are limited to trapping (both box and pen traps), opportunistic shooting, and public hunts. Table one provides the total number of feral hogs removed from the Refuge. It should be noted public hunts result in very few feral hogs harvested from the Refuge (2 during the 2011 hunt and 5 during the 2012 hunt).

Year	Number of feral hogs removed
2005	5
2006	9
2007	3
2008	0
2009	20
2010	17
2011	143
2012	93
2013	38 (as of June 27, 2013)

Table 1: Feral Hogs Removed from the Refuge

Currently no plan exists that identifies guidelines for the control of other feral animal, one issue the proposed Feral Animal Management Plan attempts to address. Issues related to other feral animals (cats, dogs, livestock, etc.) are handled under existing National and local policy, and are dealt with on a case-by-case basis. These issues only occur on a relatively infrequent basis (~2/year).

2.2 Alternative B—Implementation of the Balcones Canyonlands National Wildlife Refuge Invasive and Feral Animal Management Plan: (Proposed Action):

All techniques discussed in the Management Plan represent currently legal and widely accepted methods of control. With the exception of aerial shooting, all methods contemplated have been implemented at the Refuge under current policy and regulations. This alternative, in essence, represents a continuation of current activities, with the addition of aerial shooting of feral hogs. It should be noted that no funding currently exists for aerial shooting, and its use as a control tool is only speculative. To assure the Refuge utilizes the most current and widely accepted methods of control, the proposed Management Plan was developed. This document provides more comprehensive information related to control of all feral animal species that are anticipated to occur on the Refuge, and provides guidance on when and how to control these species.

Under the Balcones Canyonlands National Wildlife Refuge Invasive and Feral Animal Management Plan alternative, Refuge staff, contractors, and hunters would employ a variety of control measures to reduce

the feral and invasive species populations on the Refuge. Feral hog population reduction would benefit conservation and protection of Refuge resources and assuring feral cats, dogs and other feral animals are maintained at their current population levels would assure minimal impacts to Refuge resources.

Effective management of species included in this plan will require long-term commitment by Refuge staff and may require multiple concurrent management actions. Methods selected will vary based upon laws and regulations, public use, nature/intensity of the threat, existing land management directives/plans, and the particular circumstances of each tract. No single management recommendation can be made that would apply equally to each species in every location. In all cases, animal removal must be discreet and as humane as possible. Any animals taken will be dispatched in a swift, effective and humane manner. No cruelty will be tolerated. Control activities will be selected based upon practicality of achieving management goals. Among others, the following methods could be selected alone or in combination to achieve management goals.

1. Trapping, shooting (including aerial shooting), and removal or relocation (not including feral hogs) by Refuge staff or other cooperating Agencies. This may be accomplished in cooperation with other Agencies, including, but not limited to the Texas Parks and Wildlife Department and the U. S. Department of Agriculture's Wildlife Services.
2. Contracted services. The Refuge may elect to enter into a contract with an appropriate Agency or individual to provide removal, relocation, or other management services.
3. Recreational hunting opportunities in accordance with the Texas Parks and Wildlife Code, Service policies and procedures, and Refuge Hunt/Management Plans.
4. Habitat modifications to minimize or eliminate the desirability of an area.
5. Fencing or otherwise excluding such species from certain areas.
6. Education and outreach programs that inform the public about the impacts of feral animals.

2.3 Alternative C—Utilization of Third-Party Professionals to Implement the Balcones Canyonlands National Wildlife Refuge Invasive and Feral Animal Management Plan

Under this alternative the Refuge would contract with USDA-Wildlife Services or other similar third party to implement all or a portion of the proposed Invasive and Feral Animal Management Plan. Proposed actions and impacts under this alternative would be substantially the same as the Proposed Action. However, it is likely this alternative would cost the Refuge more money. As an example, in 2009 the City of Austin, Wildland Conservation Division contracted with Wildlife Services for hog control (trapping only) at a cost of \$75,000 per year (COA 2009). Additionally, since this position would likely be located offsite, response time to safety issues would be greater.

2.4 Alternatives Considered But Dismissed From Detailed Analysis:

Conducting no control of feral animals, including not allowing feral hogs to be harvested under the currently authorized public hunt was considered as an alternative. Due to the fact that this does not meet the purpose and need for action, Executive Order 13112, or the Service's policy, this alternative was not analyzed in detail.

Developing an even more extensive management plan to include all exotic, non-native, feral, and nuisance animals was also considered as an alternative. This alternative was dismissed since the document would have become too cumbersome and the anticipated control of other animals was so limited that it appeared to be unnecessary. Additionally, the limited control that would be needed is currently authorized under existing policy and regulations.

3.0 AFFECTED ENVIRONMENT

The Refuge supports a variety of wetland (primarily seeps, springs, and creeks) and upland vegetation within the 19,842 acres of Federally-owned lands and 4,325 acres of Conservation Easements on private lands that are managed for resident and migratory fish and wildlife species. A complete description of Refuge resources can be found in the Balcones Canyonlands NWR Comprehensive Conservation Plan (USFWS 2001). The following resources are not discussed in this EA because the proposed action, implementation of the Invasive and Feral Animal Management Plan, is not expected to have any impacts on them: physiography, geology, minerals, visual resource, and wilderness. The resources described below are those that could be impacted (directly or indirectly) by the alternatives discussed in this document.

3.1 Physical Environment:

Balcones Canyonlands NWR is located in Travis, Williamson, and Burnet Counties, Texas, approximately 30 miles northwest of Austin, Texas. It lies within the Edwards Plateau woodlands and Balcones Canyonlands Ecoregions of Texas (Griffith, et. al 2004). This area is characterized by relatively flat plateau tops with steep canyons and broad valleys. The moist, shady canyon bottoms and dry uplands provide a diverse habitat for a variety of plants and animals. Elevation throughout the Refuge varies from about 1,000 to 2,000 feet above mean sea level.

3.1.1 Air Quality:

Although no air quality monitoring stations are located on the Refuge, the air quality is assumed to be good since the Refuge is located in a relatively rural environment. TCEQ monitors air quality and ozone levels. The closest monitor to the Refuge is the Audubon C38 station and can be accessed on TCEQ's website at http://www.tceq.texas.gov/cgi-bin/compliance/monops/daily_summary.pl?cams=38.

3.1.2 Soils / Geology:

Soils are diverse because of the variety in topography, 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 ridge-tops and hillsides, leaving rocky outcrops and exposed sub-soils (Soil Conservation Service, 1974, 1979, &1983).

The Balcones Canyonlands and Escarpment Region were 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 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, tilted slightly toward the southeast. Newly formed stream channels cut into the dipping limestone substrate carving canyons that reached far into the plateau. Beneath the plateau underground streams of naturally mildly acidic water have dissolved the limestone substrate to form a honeycomb network of karst habitat. This karst habitat is home to several rare endemic species.

Feral animals, particularly feral hogs, are currently impacting soil resources on the Refuge. This is primarily through their rooting behavior.

3.1.3 Water Quality and Quantity:

Water Quality sampling was conducted by Sissel and Sarkar (2009) at 14 sites on 5 creeks across the Refuge. Most chemical results corresponded with healthy water conditions. One site on Post Oak Creek near the Refuge Headquarters contained coliform on an initial test, but not on a second test. On both dates, the site appeared to be healthy and contained fish such as largemouth bass, perch, and minnows. Cow Creek crossing number 6 was the only site in which over 80 colonies of *E. coli* were present and recorded as too many to count. About sixty nine percent (9 of 13) of all sampled sites were below the standards set by USEPA for *E. coli* criteria for full body contact recreation water. Sissel and Sarkar (2009) identified possible causes for high *E. coli* as cattle and feral hogs. As identified in Sissel and Sarkar 2009, in 2005 the U.S. Geological Survey, in cooperation with TCEQ, evaluated Cow Creek as part of a broader analysis of nutrient and biological conditions in small streams of the Edwards Plateau. The location of the Cow Creek site for the 2005 survey yielded very close results in corresponding criteria. Cow Creek was designated as one of the five “least disturbed” sites of 15 total sites.

The Refuge has numerous creeks and drainages, most of which drain into Lake Travis (Colorado River). The Colorado River provides drinking water for most Austin area residents.

Feral animals, particularly feral hogs, are currently impacting water resources on the Refuge. This is primarily through their wallowing behavior, particularly within springs on the Refuge. Most springs are typically small (5 meter diameter) and a single feral hog wallowing one time can have dramatic adverse impacts on the spring.

3.2 Biological Environment

3.2.1 Vegetative Communities

As identified in the website below, an extensive discussion of the vegetation classifications for the Refuge is provided in the Ecological Systems Project: Phase 1 Interpretive Booklet prepared for Texas Parks and Wildlife and the Texas Natural Resources Information System. Phase one of this project includes all of central Texas. Within this publication, ecological systems are defined as groupings of plant communities that tend to co-occur on the landscape and share similar ecological processes, substrates, and/or environmental gradients. This booklet identifies 31 ecological systems that are within the Edwards Plateau, most of which occur within the Refuge. Please see this publication for a thorough discussion related to vegetative communities within the Refuge at <http://www.tpwd.state.tx.us/landwater/land/maps/gis/tescp/index.phtml>.

Feral animals including livestock and hogs, consume mast, seeds, and plants, and uproot plants and consume their roots. Doing so causes considerable disturbance and exposes the soil making the conditions more favorable to less desirable vegetation, including exotic plant species.

3.2.2 Wildlife:

The Refuge supports a diversity of wildlife native to the Balcones Canyonlands region of Texas. Over 270 species of birds, 56 species of mammals, and 55 species of reptiles and amphibians have been documented. Of special concern for the Refuge are two endangered species, golden-cheeked warbler and black-capped vireo, the primary purpose for establishment of the Refuge. Additionally, the Refuge

provides habitat for extremely rare karst related species. Many karst features are known to occur on the Refuge. Despite this, no endangered karst invertebrates or salamanders have been identified on the Refuge, but further investigation is warranted since only limited surveys have been conducted. The Refuge also provides important habitat for declining grassland bird species, and much of the Refuge is managed for their benefit. For a more in-depth review of wildlife, please review the Refuge Comprehensive Conservation Plan, 2001.

While not specifically documented on the refuge, feral cats are known predators of birds, small mammals, reptiles, and other wildlife. Additionally, through the rooting, wallowing, and foraging behaviors described above, feral animals have adverse impacts on habitat resources for all wildlife, including the threatened and endangered species described below.

3.2.3 Threatened and Endangered Species and Other Special Status Species:

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 to protect and enhance populations of two endangered songbirds, the golden-cheeked warbler and the black-capped vireo, along with other listed and candidate species (City of Austin and Travis County 1996, USFWS 1991a, 1991b, 1996, and 2000). The first goal listed in the Comprehensive Conservation Plan for the Refuge is to “restor(e) and enhance...threatened and endangered species habitat on Refuge lands” (USFWS 2001). Additionally, the Plan discussed the need to control feral animals in an effort to promote endangered species conservation efforts. These efforts are currently being hindered by the fact that feral animals (particularly feral hogs) regularly cause upturned rocks, rooting, wallowing and other destructive activities throughout the Refuge.

Of all central Texas threatened and endangered species, only the black-capped vireo, golden-cheeked warbler, bald eagle, and whooping crane have been documented as occurring within the Refuge. Only the warbler and vireo regularly occur within the Refuge. There are three sightings of single bald eagles over the Refuge in the past 16 years; none has stopped to use any Refuge habitats or resources (Refuge files). Since the first sighting in October 2003, there have been a total of three sightings of small groups of southbound whooping cranes migrating over the Refuge in October (M. Klym, TPWD; S. Edler, USFWS; K. Kilfeather; pers. comm.). No suitable foraging, resting, or roosting habitat for either the eagle or the crane occurs in the Refuge and no impacts, either positive or negative, are expected and will not be discussed further.

While the Refuge has a considerable number of caves and karst features, none of the threatened and endangered cave, aquifer, and stream-related species known to occur within the Austin area have been detected within the Refuge (Elliott and Reddell 1989, Reddell 1991, Elliott 1992, USFWS 1994, TPWD 1995b). Several caves in the Refuge area were mapped and explored for biological resources in the late 1980s and early 1990s by local experts. Veni (1991) placed the Refuge in an isolated “Post Oak Ridge” cave faunal region, separate from those occupied by the listed cave species. Reddell (undated) described the occurrence of four aquatic and seven terrestrial troglobitic invertebrates which occur on the Refuge, most of which have very limited ranges and some of which may be restricted to the Post Oak Ridge. While none of the listed *Eurycea* sp. salamanders are expected to occur on the Refuge, suitable habitat for this species group occurs in at least one spring on the Refuge (Mason Hollow, Victoria tract) and *Eurycea* sp. salamanders may yet be documented there; the expected taxon at that location would be the Jollyville Plateau Salamander (*Eurycea tonkawae*), a candidate for listing under the Endangered Species Act (City of Austin, Watershed Protection Dept. 1999).

Black-capped Vireo:

The endangered black-capped vireo occupies secondary successional shrublands on stony plateau tops (Graber 1961, Grzybowski 1991). In the Refuge area, the best habitat (i.e. most densely occupied) consists of shin oak (*Quercus sinuata* var. *breviloba*) thickets approximately 1 to 3 m tall with dense low foliage layer and with canopy cover in the range of 30-70%. Early environmental documents for the Refuge indicated that approximately 8,200 ha (18,000 ac) of potential habitat for the Black-capped Vireo occurred within the original 18,640-ha (41,000-ac) acquisition boundary (e.g. USFWS 1991a, b). Subsequent research has indicated that a much smaller portion of the Refuge--possibly on the order of 900 ha (2,000 ac)--is expected to be suitable for vireo habitat (Rowin 2012, unpubl. data). From 2010 to 2012 vireo research efforts headed by Texas A&M University, Washington State University and Refuge staff have provided the best information of vireo distribution and numbers. This effort identified approximately 100 vireo territories on refuge lands.

Golden-cheeked Warbler:

The endangered golden-cheeked warbler occupies old-growth closed-canopy woodlands dominated by Ashe junipers and hardwoods such as Spanish oak, shin oak, and live oak (*Quercus fusiformis*), Texas ash, cedar elm, and escarpment cherry (*Prunus serotina* var. *eximia*). Canopy cover is usually 70% to 100% with canopy height usually 5 to 8 m (TPWD 1995a, Ladd and Gass 1999, USFWS 1992). Understory and ground cover are often sparse in the heavily shaded woodlands. The habitat is best developed on steep rocky slopes and canyons but may develop on level upland areas in the absence of long-term disturbance. Warblers may occur in more open woodlands (50% to 70% canopy cover) or in tall riparian groves if old-growth junipers occur intermixed with, or adjacent to, the woodland stand.

Early environmental documents for the Refuge indicated that approximately 2,400 ha (5,300 ac) of "actual or potential" warbler habitat were in the original 18,600 ha (41,000 ac) boundary. Based on a review of the satellite classification on which that estimate was based, and maturation of some marginal habitat, a substantially larger area of warbler habitat is probably now in existence in the previous Refuge boundary. A 2012 draft map of "Golden-cheeked Warbler Habitat Management Areas" for the draft Habitat Management Plan shows approximately 7,287 ha (18,000 ac) of warbler habitat management area within Refuge lands. Additional acreage of suitable warbler habitat occurs on many private tracts within the 36,400-ha (80,000 ac) Refuge acquisition boundary (USFWS 2001).

Warblers occur almost throughout the Refuge. It is a fairly common and characteristic species in juniper-oak woodlands on all sizable Refuge tracts. In 2009, Sexton updated the estimate on Refuge tracts and indicated that a minimum of 810 warbler territories were present on about 16,000 acres of the Refuge managed for the warbler (Sexton 2009).

3.3 Human Environment:

3.3.1 Cultural Resources:

A "cultural overview and assessment" of the Refuge was completed in 1998 (Tomka & Leffler, 1998). 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. Additional information related to cultural resources may be found in the Refuge's Comprehensive Conservation Plan (2001). Archeological sites on the Refuge are provided full protection under the Archaeological Resources Protection Act. On the Refuge, there have been no known impacts to cultural resources by feral animals to date.

3.3.2 Socioeconomic Resources:

The socioeconomic impact of Balcones Canyonlands NWR operations is primarily in the neighboring communities of Marble Falls, Burnet, and Lago Vista, Texas. The Refuge's annual budget as of 2011 was just over \$2,000,000 and much of this amount is recycled in the local economy through Refuge staff salaries, purchases from local vendors, and service contracts. Additionally, under the Refuge Revenue Sharing Act, refuges contribute money to each county in which they occur. This payment is in lieu of property taxes and is based upon the appraised value of the refuge property. In 2010 Balcones Canyonlands NWR provided \$155,381 to Burnet, Travis, and Williamson Counties.

Various recreational activities offered by the Refuge attract visitors who participate in wildlife observation, photography, hiking, and hunting. The majority of visitors are from the central Texas area, but the number out of state and out of country persons who visit the Refuge has been increasing.

Revenues generated by Refuge hunts amount to about \$10,000 annually. The majority of these funds are put back into the economy through expenditures on supplies and equipment to support the visitor services program.

The current economy and employment in the Austin area is driven by Government and the high-tech industry with the size of nonagricultural labor at 652,300 (<http://www.city-data.com/us-cities/The-South/Austin-Economy.html>). Unemployment is currently at 7.4% (<http://www.deptofnumbers.com/unemployment/texas/austin/>)

3.3.3 Public Use/Recreation:

Providing recreational opportunities and interpreting the unique natural features of the Refuge for visitors, in compliance with the Refuge Improvement Act of 1997, are important elements of the Visitor Services Program. It has been determined that the following public uses are compatible with the purpose for which the Refuge was established: dove, hog, turkey, and deer hunting; wildlife observation; photography; and hiking. There are three established public use areas on the Refuge: Warbler Vista trails and observation deck, Shin Oak Observation Deck, and Doeskin Ranch hiking trails.

Friends of Balcones Canyonlands, a not-for profit group organized to support the Refuge, has more than 90 members and hosts a number of free and fee events, including the Songbird Festival which hosts approximately 500 visitors annually. They also conduct offsite outreach programs and are a strong voice of support in the community. The Friends of Balcones Canyonlands maintain a website at <http://www.friendsofbalcones.org/>.

Approximately once per year feral animals, typically feral hogs and dogs, threaten the public and/or Refuge staff. Occasionally, staff has had to climb a tree to avoid direct conflict.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter analyzes and discusses the potential environmental effects or consequences that can reasonably be expected due to the implementation of the alternatives described in Chapter 2.0 of this EA. An analysis of the effects of management actions has been conducted on the physical environment (air quality, water quality, and soils); biological environment (vegetation, wildlife, and threatened and endangered species); and socioeconomic environment (cultural resources, socioeconomic features including public use/recreation). The direct, indirect, and cumulative impacts of each alternative are considered, and discussed as appropriate. Definitions of terms used in this analysis are provided in Appendix A.

4.1 Physical Environment:

4.1.1 Impacts on Air Quality

Alternative A – Continuation of Current Feral Animal Control: No Action

Current management (limited trapping, shooting and public hunts) has negligible impacts on current air quality conditions. Typically, traps are checked while conducting other Refuge related activities and the current number of vehicular trips would continue to be minimal. Current levels of emissions and dust created by driving rural roads for current management does not appear to have a negative impact on air quality. Aerial shooting would not be conducted under this alternative, so there would be no additional impacts from this activity (i.e., exhaust from the helicopter).

Alternative B – Comprehensive Control Methods: Proposed Action

This alternative could result in a slight increase in impacts to air quality over time due to emissions and dust from additional vehicles and equipment used in management activities. In addition, aerial shooting may be conducted under this alternative, so there would be additional exhaust from the helicopter use. It should be noted though no funding currently exists for aerial shooting, so the increase in emissions from a helicopter is only speculative. It is expected that over time control efforts will only increase. Regardless, these impacts would likely be negligible.

Alternative C – Comprehensive Control Methods by Third Party

Impacts to air quality may be slightly greater than the Proposed Action because of additional driving needed to and from the third party office site.

4.1.2 Impacts on Water Quality and Quantity

Alternative A – Continuation of Current Feral Animal Control: No Action

This alternative would likely result in increased water quality impacts. Current management activities do not result in negative impacts to water quality or quantity; however, the rooting and digging behavior of feral hogs increases the potential for soil erosion which could lead to decreased water quality due to sediment deposition. Under this alternative feral hog populations are likely to expand, thereby increasing the probability of adverse water quality impacts. Rooting and wallowing in a spring can cause direct impacts to spring resources and associated species. The result could cause substantial adverse effects to short-term and long-term water quality at the wetland/spring site and could substantially impact resources for spring adapted (dependent) species, such as the yet to be documented *Eurycea* sp. salamanders. Negligible impacts to water quantity, either direct or indirect, are expected under this alternative as a result of direct consumption and use by feral animals.

Alternative B – Comprehensive Control Methods: Proposed Action

None of the proposed increased feral hog control actions will result in negative impacts to either water quality or quantity. The alternative will likely improve water quality as the feral hog population is further reduced and there are fewer hogs to cause turbidity and soil disturbance. The result would be beneficial to long-term water quality and could substantially improve resources for spring adapted (dependent) species, such as the yet to be documented *Eurycea* sp. salamanders. There would be no direct or indirect impact to water quantity.

Alternative C – Comprehensive Control Methods by Third Party

Impacts on Water Quality and Quantity would likely be the same as the Proposed Action.

4.1.3 Impacts on Soils

Alternative A – Continuation of Current Feral Animal Control: No Action

Under this alternative current impact to soils would likely increase as feral hog populations increased. The feral hogs currently do moderate damage to most Refuge tracts, with localized extensive damage which leads to increased soil destabilization and erosion. Also, continued disruption of soil resources will hinder the establishment and maintenance of native habitats, such as endangered species woodlands and shrublands, tall grass prairie, and wetlands by allowing invasive plant species to become established on disturbed sites.

Current management activities result in negligible impacts from limited off-road access to move, set, and check traps. Typically, vehicles used by staff remain on or in close proximity to gravel roads and do not impact soils.

Alternative B – Comprehensive Control Methods: Proposed Action

This alternative could result in a slight increase in impacts to soils due to additional vehicles and equipment used in management activities, but these impacts would be offset by a reduction in feral hog population and associated rooting and wallowing. The expected negative impacts would be negligible, while the likely positive impacts could be substantial.

Alternative C – Comprehensive Control Methods by Third Party

Impacts on soil would likely be the same as Alternative B (the Proposed Action).

4.2 Biological Environment:

4.2.1 Impacts on Habitat

Alternative A – Continuation of Current Feral Animal Control: No Action

One of the primary concerns for the Refuge is the long-term sustainability of its endangered species habitat for both the warbler and vireo. As identified in the proposed management plan, feral hogs are known to consume mast and other seeds, root up and consume tree seedling and cause substantial disturbance to soils. Such actions over time will likely reduce the probability of the Refuge being able to sustain habitat for the two endangered species the Refuge is charged with protecting. Any increase in invasive species population only increases the likelihood that the habitat will not be sustainable. Under the No Action alternative, damage to all habitats would continue and likely increase. Feral hogs and other invasive species may induce the spread of exotic plant species because most exotics typically favor disturbed areas and colonize more quickly than many native plants. As disturbed areas increase, the occurrence of exotic plants would also increase. Physical damage, as well as the establishment of exotic plant species, would degrade habitat quality.

Alternative B – Comprehensive Control Methods: Proposed Action

Under this alternative, all impacts to habitat will be beneficial. This includes improving the probability of endangered species habitat being more sustainable over the long-term by reducing the spread of exotic plant species, fewer native plants and seeds being uprooted and/or consumed, and fewer disturbances to soils.

Alternative C – Comprehensive Control Methods by Third Party

Impacts on Habitat would likely be the same as the Proposed Action.

4.2.2 Impacts on Wildlife

Alternative A – Continuation of Current Feral Animal Control: No Action

As identified in the proposed management plan, invasive and feral animal species compete with native wildlife for resources and cause direct wildlife mortality through nest predation and opportunistic consumption of birds, reptiles and amphibians. This would affect the plant, arthropod, and small mammal communities, which in turn may affect the overall food chain. Feral animals often have an extremely high reproductive rate and their populations can increase quickly over a short period of time if left uncontrolled. As discussed in the impacts on soil and water resources, degradation in water quality can have an adverse effect on aquatic dependent wildlife species as well. Feral animals also vector many diseases that can be contracted by other animal species. Any increase in population would lead to adverse impacts on other wildlife species.

Alternative B – Comprehensive Control Methods: Proposed Action

Under this alternative, the methods used to remove feral hogs could result in increased disturbance to wildlife in the areas where work is being performed. This includes temporary displacement due to vehicle or foot traffic, or from noise from the helicopter used for aerial shooting. The use of aerial shooting would be timed to avoid impacts to the warbler, vireo and most other nesting songbirds. The short-term disturbance related to aerial work could be direct and intense in specific areas for the short duration the helicopter would be operating above that area. Once the helicopter leaves the area, the disturbance would cease. Minimal effects on non-target species such as deer, small mammals, turkey, and other animals are possible. The traps utilized by the Refuge either allows non-target species to escape while feral animals are contained - or in the instance where a cage trap is used - any non-target animal would be released unharmed.

Alternative C – Comprehensive Control Methods by Third Party

Impacts on wildlife would likely be the same as the Proposed Action.

4.2.3 Impacts on Threatened and Endangered Species

Alternative A – Continuation of Current Feral Animal Control: No Action

As identified above, one of the Refuge's primary concerns is the long-term sustainability of golden-cheeked warbler and black-capped vireo populations and habitat. Any activity that reduces the long-term sustainability of their habitat and population is ultimately detrimental to the Refuge's mission. Feral animals are known to adversely affect habitat, and indirectly affect endangered species populations. There have been no documented nest or individual predations of warblers or vireos on the Refuge, but since feral animal are relatively elusive the probability of documenting such occurrences is remote. Any reduction in the level of management effort on feral animals would only result in an increase in their population and likely result in an increase in the direct and indirect impacts to endangered species.

Alternative B – Comprehensive Control Methods: Proposed Action

The proposed action would assure control measure would continue for feral animals. The only action that is contemplated that currently is not occurring on the Refuge is aerial shooting of feral hogs. While there are currently no plans to implement such action, such management options could be done in the future. Should such action occur, in order to avoid impacts to the endangered golden-cheeked warbler and black-capped vireo, aerial shooting would be scheduled such that it only occurred during the time of year when the species has migrated and is no longer present on the Refuge. Trapping of feral animals, reducing the desirability of an area, excluding them from certain areas, and other similar management actions described in the proposed Management Plan would continue during the time of year when the warbler and vireo are present on the Refuge. Impacts associated with driving, and walking through habitat to conduct these activities may result in minimal and temporary direct impacts to warblers and vireos. Indirectly, white-tailed deer populations, raccoons, and fox squirrels may locally increase as a result of using corn feeders to attract feral hogs into a trap. However, feeders are typically moved about every 2-3 months to a new location and such local population increase would resume to normal levels once the feeder is moved. Additionally, game cameras are used to monitor their activity around the trap and the amount of feed and time of day is adjusted accordingly to minimize their activity. As such, any increase would likely be minimal, temporary, and only as a result of increased food availability during stressful periods. Raccoons and fox squirrels are nest predators and white-tailed deer consume hardwood seedlings. Such temporary increase in their populations could result in minimal adverse indirect effects to the warbler and vireo. Those potential indirect impacts though are expected to be off-set by the reduction and/or control of feral animal populations and their associated impacts.

Alternative C – Comprehensive Control Methods by Third Party

Impacts on threatened and endangered species would likely be the same as the Proposed Action.

4.3 Human Environment

4.3.1 Impacts on Socioeconomics

Alternative A – Continuation of Current Feral Animal Control: No Action

Under this alternative the feral animal population may increase and the potential for damage to adjacent lands would also increase. The Refuge maintains a close relationship with many adjacent landowners and has been told of and has seen the damage caused by feral hogs. Several landowners have also reported damage to livestock from feral dogs.

Hunting of feral hogs on some nearby private ranches generates income for these landowners. Implementing the No Action alternative would likely result in an increase in the feral hog population and as such could indirectly result in additional opportunities for landowners to sell feral hog hunts. Conversely, hunts on adjacent private lands are *typically* conducted to reduce their population and thereby reduce the damage and associated repair costs caused by these animals. The same holds true for the Refuge. Most adjacent landowners also trap feral hogs. An increase in the population could increase the needed level of effort by these landowners to control the feral hog population.

Alternative B – Comprehensive Control Methods: Proposed Action

Under this alternative, active control of feral hogs and feral dogs would reduce the overall property losses incurred by adjacent landowner and the Refuge. This result will not only minimize the economic loss experienced by adjacent landowners and the Refuge, but would contribute positively to the relationships between neighboring landowners and Refuge personnel. Good relationships with neighboring landowners will help to establish and maintain cooperative efforts to control feral hogs on lands adjacent to the

Refuge. Socioeconomic impacts from the return of lost livestock could be substantial, whereas socioeconomic impact from other feral animal are expected to be negligible.

Alternative C – Comprehensive Control Methods by Third Party

Under alternative C less money would be spent on control supplies by the Refuge within the local area, and development of positive relationships with neighboring landowners would occur less often than under the Proposed Action.

4.3.2 Impacts on Human Health and Safety

Alternative A – Continuation of Current Feral Animal Control: No Action

Under this alternative, feral animals would continue to be a threat (disease, attack, and potential vehicle collisions) to human health and safety. To date there have been only been a few instances where feral dogs and hogs have threatened Refuge staff and the public's safety. As feral animal populations increase, which is likely without control, then the risk of disease, attacks, and accidents will also likely increase.

Alternative B – Comprehensive Control Methods: Proposed Action

Under this alternative the risks of feral animals transmitting disease or causing accidents will be reduced due to the availability of multiple control options, and being able to maintain their population at acceptable levels.

Alternative C – Comprehensive Control Methods by Third Party

Impacts on Human Health and Safety would likely be the same as the Proposed Action.

4.3.3 Humaneness and Animal Welfare Concerns

Alternative A – Continuation of Current Feral Animal Control: No Action

While humane treatment of feral animals has always been of utmost concern to the Refuge, the No Action alternative could result in increased animal welfare concerns since the current management plan (Service 2008) does not address this issue. Additionally, less guidance would be provided under this alternative for dealing with feral cats, dogs, and other animals.

At the present time, feral hogs are trapped using large walk-in traps baited with corn, feral cats and dogs are trapped in smaller enclosed cage traps, and adjacent landowners are contacted to retrieve feral livestock. Trapped feral animals are not to be relocated, but rather are taken to an animal care facility when possible, or particularly in the case of feral hogs, are quickly and humanely destroyed by shooting with a firearm at close range by a qualified employee. Carcasses are left in remote areas where they are consumed by other wildlife. While not required under the current (2008) Feral Hog Management Plan, whenever feasible feral animals are shot with lead-free nontoxic bullets in an effort to avoid secondary impacts (indirect) to non-target animals that may consume the carcass.

Alternative B – Comprehensive Control Methods: Proposed Action

As stated above, humane treatment of feral animals has always been of utmost concern to the Refuge. However, the current management plan (Service 2008) provides little information in this regard. The proposed alternative improves upon current humaneness and animal welfare concerns by addressing these in the proposed Management Plan and allows for adaptive management decisions to assure humane treatment of an animal is a priority. By including it in the proposed Management Plan, it assures such actions become Refuge policy and disciplinary actions could occur if they are disregarded. Under the proposed Management Plan, animal cruelty is not tolerated.

Traps as described above would continue to be used. Whereas, Indiscriminant traps such leg-hold traps are not authorized for use under the proposed Management Plan. The proposed Management Plan assures all active traps are checked first thing each morning. Most animals discussed in the Management Plan are nocturnal, feeders are timed to go off at night, and game cameras are used to pattern animal. Utilization of such techniques assures the animal(s) is only in the trap for a few hours. Additionally, game cameras are used to minimize the probability of catching non-target animals. The Management plan specifies that all traps are to be placed in shade and/or have water provided to assure any trapped animal is not exposed to excessive heat should it enter during the daytime. The plan identifies animal care facilities that feral cats and dogs can be taken to, and discusses alternative management actions that can be taken to reduce the probability a feral animal would occur within and/or cause damage to Refuge resources (i.e. excluding an animal from certain areas, reducing the attractiveness of an area, public education, etc.).

Under the Proposed Alternative, trapped feral animals would continue to not be relocated, but rather would be taken to an animal care facility when possible, or particularly in the case of feral hogs, would be quickly and humanely destroyed by shooting with a firearm at close range by a qualified employee. Carcasses would continue to be left in remote areas where they are consumed by other wildlife. By finalizing the proposed Management Plan it would establish Refuge policy that requires the use of lead-free, nontoxic bullets, whenever feasible. Such action would help avoid secondary impacts (indirect) to non-target animals that may consume the carcass and inadvertently consume the bullet.

For aerial control, shooting from a helicopter would be conducted by a professional sharpshooter employed or contracted by USDA - APHIS Wildlife Services, or similar agency. Accurate shots are taken from the lowest safe altitude at which the helicopter can operate.

Alternative C – Comprehensive Control Methods by Third Party

Impacts on Humaneness and Animal Welfare would likely be the same as the Proposed Action.

4.4 Assessment of Cumulative Impacts

Cumulative effects are incremental impacts resulting from other past, present, and reasonably foreseeable future actions, including those taken by federal and non-federal agencies, as well as undertaken by private individuals. The proposed action essentially represents a continuation of ongoing actions on the Refuge, and merely provides additional information that Refuge staff should consider when implementing the Refuge's feral animal control program. By completing this environmental assessment, it assures the Refuge has contemplated all reasonable environmental effects and provides for public input. No direct or indirect adverse impact discussed above is substantial and as such, it is reasonable to assume the cumulative impacts of continuing feral animal operations on the Refuge would not result in substantial adverse cumulative impacts.

As identified above, cumulative impacts resulting from these control efforts will be beneficial to refuge soils, habitats, native wildlife, water quality and quantity, and government infrastructure by maintaining and where possible reducing the numbers of feral animals available to damage resources or cause human health and safety concerns. A reduction in the hog population will also benefit the public and Refuge staff by helping to minimize the chance of hog/vehicle collisions that result in numerous accidents, sometimes fatal, and millions of dollars in property damage throughout the United States annually.

The adverse direct and indirect effects of the proposed action on air, water, soil, habitat, wildlife, aesthetic/visual resources, and wilderness values are expected to be minor and short-term. The benefits to long-term ecosystem health that these efforts will accomplish far outweigh any of the short-term adverse impacts discussed in this document.

There are not now nor have there been additional State or Federal activities occurring within or around the refuge that could contribute to either negative or positive cumulative impacts related to feral animal control. Several private landowners adjacent to the refuge have in the past, and likely will continue to trap and/or shoot feral hogs on their lands as an effort to help reduce the hog population. Also, some adjacent landowners may have in the past or now currently charge a fee to lease their lands for hunting privileges that could include taking feral hogs. Many refuge's and other publicly held lands throughout the United States are controlling invasive/feral animals and are encouraged to control them through the Federal Regulations and Policies identified in this document. Cumulatively this is likely having a beneficial effect.

The proposed action is intended to reduce negative economic and environmental impacts caused by feral animals. Cumulative effects to an exotic, invasive species are not a concern. It is the objective of the Service to eradicate invasive species when possible.

4.5 Environmental Justice:

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

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

4.6 Indian Trust Assets:

No Indian Trust Assets have been identified on Balcones Canyonlands NWR. There are no reservations or ceded lands present. Because resources are not believed to be present, no impacts are anticipated to result from implementation of either alternative described in the EA.

4.7 Unavoidable Adverse Effects

Implementation of feral animal control on the refuge may result in some temporary, unavoidable adverse impacts. Some feral hogs would be killed; however, this species is considered an extremely invasive, non-native species that should be controlled and/or eradicated whenever possible to minimize adverse impacts on native species and habitats. There would also be some short-term disturbance to other resident wildlife, but these impacts are expected to be minimal. Opportunities for public viewing and photography of wildlife on the refuge would not be impacted.

4.8 Irreversible and Irretrievable Commitment of Resources:

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

None of the alternatives would result in a large commitment of nonrenewable resources. Project implementation would require the irretrievable commitment of a small amount of fossil fuels (gasoline and oil) used by vehicles.

4.9 Summary of Environmental Effects by Alternative

It is anticipated that competition between feral and invasive animals, and native wildlife would continue and would likely increase under the No Action alternative, and as the area continues to develop issues related to other feral animals will increase. Adverse impacts to Refuge resources including soil erosion, decreased water quality and damage to wildlife habitat along with direct killing and consumption of wildlife would continue and likely increase. This alternative does not fully meet the purpose and need for action identified in sections 1.4 and 1.5 of this document, whereas the proposed action, implementation of the Invasive and Feral Animal Management Plan does.

<u>Environmental Resource</u>	<u>Alternative A:</u> Continuation of Current Feral Animal Control Efforts – No Action	<u>Alternative B:</u> Implementation of Invasive and Feral Animal Management Plan - Proposed Action	<u>Alternative C</u> Implementation of Invasive and Feral Animal Management Plan by Third Party
Impacts to Air Quality	Negligible impacts	Minor negative short term impacts	May have slightly higher emissions than Alternative B
Impacts to Water Quality and Quantity	Adverse impacts, some substantial, especially for spring adapted species	Beneficial impacts, particularly for springs	Beneficial impacts, particularly for springs
Impacts to Soils	Increased adverse impacts	Minor increased impacts which are off-set by reduction in feral hog population and associated impacts. Ultimately, beneficial impacts	Minor increased impacts which are off-set by reduction in feral hog population and associated impacts. Ultimately, beneficial impacts
Impacts on Habitat	Possible substantial long-term impacts to the sustainability of habitat, including endangered species habitat and an increase in exotic plants	Impacts substantially beneficial	Impacts substantially beneficial
Impacts on Wildlife and Threatened and Endangered Species	Adverse impacts to wildlife including the endangered golden-cheeked warbler,	Minimal indirect impacts that are off-set by a reduction in the feral animal population and	Minimal indirect impacts that are off-set by a reduction in the feral animal population and

	and black-capped vireo	associated impacts. Ultimately beneficial impacts.	associated impacts. Ultimately beneficial impacts.
Impacts on Socioeconomic Resources	Increased opportunity to generate money from hunting, but increased costs associated with larger feral hog population	Beneficial impacts by reducing property damage and improved relations with neighbors	Beneficial impacts by reducing property damage and improved relations with neighbors. Slightly less money spent within local economy. More money spent by Refuge to implement proposal.
Human Health and Safety	Possible increase in human health and safety issues	Possible reduction in human health and safety issues as a result of fewer feral animals	Possible reduction in human health and safety issues as a result of fewer feral animals
Humaneness and Animal Welfare	Humaneness and animal welfare concerns not addressed in current management plans	Humaneness and animal welfare concerns addressed in proposed management plan. Such concerns become Refuge policy once approved.	Humaneness and animal welfare concerns addressed in proposed management plan. Such concerns become Refuge policy once approved.

5.0 CONSULTATION, COORDINATION AND DOCUMENT PREPARATION

Document prepared by Scott Rowin, Balcones Canyonlands National Wildlife Refuge, U.S. Fish and Wildlife Service, Marble Falls, Texas. All Draft Documents will be provided to Texas Parks and Wildlife Department, and USFWS Austin Ecological Services Field Office for review and comment.

5.1 REFERENCES CITED/LITERATURE REVIEWED

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DEFINITION OF TERMS

Effects

Direct effects are the impacts that would be caused by the alternative at the same time and place as the action.

Indirect effects are impacts that occur later in time or distance from the triggering action.

Cumulative effects are incremental impacts resulting from other past, present, and reasonably foreseeable future actions, including those taken by federal and non-federal agencies, as well as undertaken by private individuals. Cumulative impacts may result from singularly minor but collectively significant actions taking place over a period of time.

Impact Type

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

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

Intensity of Impact

Negligible impacts result from management and feral animal actions that cannot be reasonably expected to affect identified refuge resources at the identified scale.

Minor impacts result from a specified management or feral animal action that can be reasonably expected to have detectable, though limited effect on identified refuge resources at the identified scale.

Major/substantial/ect. impacts result from a specified management or feral animal action that can be reasonably expected to have readily apparent effects on identified refuge resources at the identified scale.