BALCONES CANYONLANDS PRESERVE
LAND MANAGEMENT PLAN

TIER II-A

CHAPTER VI
FIRE MANAGEMENT

August 2007

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1.0 INTRODUCTION

On May 2, 1996, the City of Austin and Travis County were jointly issued a U.S. Fish and Wildlife Service (USFWS) regional permit referred to as the "Balcones Canyonlands Conservation Plan" (BCCP). The permit allows incidental "take" of eight locally occurring endangered species under Section 10(a)(1)(B) of the Endangered Species Act (USFWS 1996). The thirty-year permit covers western Travis County outside of proposed Preserve boundaries identified in the Habitat Conservation Plan (HCP) (USFWS 1996). The permit also covers incidental take of 27 species of concern, should any become listed as threatened or endangered during the life of the permit.

The terms of the permit require the City of Austin and Travis County (the Permit Holders) to assemble and manage a minimum of 30,428 acres of suitable habitat for the golden-cheeked warbler and the black-capped vireo, and to protect and manage populations of canyon mock-orange and Texabama croton. The Permit Holders are also to acquire and manage or implement management agreements on 35 karst features supporting populations of endangered invertebrates and 27 features known to harbor species of concern. This system of managed and protected habitats is known as the Balcones Canyonlands Preserve (BCP). The locations of habitat areas and karst features proposed for protection are delineated in the HCP (USFWS 1996).

Private landowners, organizations, or agencies managing designated preserve lands in accordance with the BCCP are considered BCP Partners. BCP Partners include private landowners, the Lower Colorado River Authority (LCRA), the Travis Audubon Society (TAS), and the Nature Conservancy of Texas (TNCTX).

The BCP Land Management Plan (LMP) guides management actions throughout the preserve. The USFWS approved 1999 LMP directed the BCP Partners to establish a Fire Management Committee, and provided guidance for addressing human safety as well as natural and cultural resource needs for the Preserve. The BCP Fire Management Committee initiated a series of meetings to improve coordination of fire management activities and responses while providing for achievement of resource management objectives. A Fire Management Template was generated that serves as a guideline for land and resource managers as they generate fire management documents tailored to the specific needs of their individual preserve tracts.

The BCP Fire Management Plan contains a detailed course of action to implement fire management guidelines and objectives. The plan incorporates adaptive management

strategies, and may be updated at any time; however, an annual review and five-year revision schedule is planned.

This document was based in part upon a plan authored by former TNCTX Fire Planner Margot Booth. Significant portions were adapted from the USFWS Balcones Canyonlands National Wildlife Refuge (BCNWR) 2001 Fire Management Plan written by BCNWR Fire Manager Carl Schwope.

The BCP Fire Management Plan Template was drafted by the members of the BCP Fire Management Committee, comprised of representatives from each BCP managing agency. The plan was created with assistance from individuals representing a number of private landowners, volunteer, local, county, state, and federal entities.

2.0 FIRE MANAGEMENT ADMINISTRATION

2.1 Fire Management Goals

The primary goal of the BCP Fire Management guidelines will always be to protect human health and safety. All planning and action related to fire management within the BCP will adhere to the following Fire Management goals as outlined by the BCP Fire Management Committee:

1. Ensure that firefighter and public safety are always the first priorities for all fire management activities.
2. Protect property from unwanted fire.
3. Protect endangered species habitat from loss due to catastrophic wildland fire.
4. Where possible, use fire as a natural ecological process to restore and maintain habitat of identified endemic and rare plant and animal species and communities.

2.2 AGENCY POLICIES AND GUIDELINES

All fire management activities on the preserve will be carried out in compliance with the policies and procedures of the managing agency and according to the guidelines established in this BCP Fire Management document.

BCP Land Managers may use prescribed burning when and where it contributes to the perpetuation of species, communities, and ecosystems targeted for preservation. The authority for review and approval of Fire Management Plans and prescriptions resides with the Land Manager of the managing agency. All prescribed burns carried out on the BCP must have written prescriptions. Only individuals meeting agency standards may

author prescribed burn plans and participate on prescribed burn or wildfire response teams.

2.3 Legal Considerations

The Texas Commission on Environmental Quality (TCEQ, formerly the Texas Natural Resources Conservation Commission, or TNRCC) administers the outdoor burning regulations found in Title 30 of the Texas Administrative Code Sections 111.201-111.221. The stated purpose of the Outdoor Burning Rule is "to protect the environment, promote public health and safety, and avoid nuisance conditions through the sensible regulation of outdoor burning" (TNRCC 1997).

This legislation prohibits outdoor burning in the state of Texas with the exception of specific situations in which burning is necessary or poses no threat to the environment. Exceptions include firefighter training, fires for disposal or land clearing, and prescribed burns.

Prior to conducting a prescribed burn, the following steps are required:

1. A burn plan must be written, reviewed and approved for each tract (see Appendix F for the BCP Prescribed Fire Template).
2. Compliance with local ordinances and notification of other governmental entities having jurisdiction over the area (including county Fire Marshal, local fire department(s), and local law enforcement officials) must be verified.
3. TCEQ must be notified.

2.4 Memoranda of Understanding and Mutual Aid Agreements

Mutual aid is a vital tool for firefighters and emergency responders, as no single agency has sufficient resources to single-handedly respond to every incident. Memoranda of Understanding (MOA) and Mutual Aid Agreements (MAA) regarding fire management are currently in place between a number of the BCP partners and responding agencies. These documents allow the organizations to assist one another in wildfire suppression, prescribed burning, equipment procurement, and training. Land Managers are responsible for maintaining contact with Emergency Service Districts having jurisdiction over lands within the BCP and cooperating to ensure that appropriate MOA or MAA documentation is in place.

2.5 Annual Work Plan

Each BCP Partner will assign fire management responsibilities to staff as Annual Work Plan goals. These responsibilities include, but are not limited to identifying training needs and opportunities for staff, maintenance of equipment and supplies, maintaining current inventories of and re-supplying the Agency's fire cache, public education and outreach efforts, and supplying revisions to the Agency's Fire Management Plan(s). The BCP Fire Management Committee and the BCP Partner agencies will complete an annual review and update of this plan as a component of the annual report submitted to the USFWS by January 31st of each year. Copies of these annual revisions are to be distributed to each partner agency and each Emergency Service District with responsibilities for portions of the BCP, as well as to Travis County's Director of Emergency Management Services, the Texas Forest Service and the Fire Manager of the Balcones Canyonlands National Wildlife Refuge.

The Fire Management Committee encourages all BCP staff to pursue fire behavior and response training. Coursework is available through the Texas Forest Service, the Texas Interagency Coordination Center Fire Academy and other cooperating agencies. When possible, the BCP Fire Management Committee may coordinate with the BCP Partners and other agencies to host or facilitate training opportunities.

Successful completion of National Wildfire Coordinating Group coursework includes certification (positions including Firefighter Type 2, Squad Boss, Crew Boss, Initial Attack Incident Commander, Prescribed Fire Burn Boss II, etc.) and provides career advancement opportunities for staff.

2.6 Reporting

2.6.1 Wildfire

After containment of a wildfire, a report describing the incident will be completed by the managing agency and forwarded to the BCP Fire Management Committee. This report should include safety issues, cause of the fire, fire weather, topography, fuel conditions, a description of the suppression effort, fire effects, and rehabilitation needs. Managing agencies may require additional reporting not listed here.

2.6.2 Prescribed Fire

The Agency Prescribed Fire Burn Boss will provide a qualitative evaluation of each burn objective as well as a report summarizing safety and operational aspects of the incident. The Prescribed Fire Report will recommend any changes for future burns, and will be

sent to the Fire Management Committee to be recorded in the Fire History for the Preserve. Monitoring protocols and results of short and long-term evaluations will be summarized annually. All debris burns will be reported to the Fire Management Committee. Managing agencies may require additional reporting not listed here.

2.6.3 Annual Summary to BCCP Coordinating Committee

The BCP Fire Management Committee will present an annual summary of all fire activities to the BCCP Coordinating Committee. This report will include fire management planning, public education and outreach, as well as a compilation of prescribed burn and wildfire response activities throughout the BCP.

2.7 Education and Outreach

Although public awareness of the role of fire in natural ecosystems has increased in recent years, fire danger in Texas and throughout the Western U.S. has continued to fuel concerns related to fire management in the BCP. To generate public support and to help resolve these concerns, BCP staff will cooperate with local responding agencies and the Texas Forest Service to communicate fire management goals, policies and procedures, and management activities to the public. Outreach measures such as press releases and community meetings may be held in cooperation with responding agencies to further address public concerns. Dissemination of information about the natural role as well as the danger of fire is an important step in establishing public support for management activities (Stankey 1976, McCool and Stankey 1986). BCP Land Managers are encouraged to cooperate with Emergency Service Districts to support the implementation of nationally recognized fire safety programs such as Firewise (see www.firewise.org). For more information concerning Education efforts, see Tier II-A Chapter 13.

2.8 Research

The BCP Fire Management Committee is committed to cooperating with researchers and experts in the field to continually evaluate urban-interface and wildland fire risks throughout the area and to implement best practices within personnel and budget constraints. Fire Management Plans and programs will be based on sound science.

3.0 GENERAL DESCRIPTION OF THE PRESERVE

3.1 Location

The BCP is a component of the Balcones Canyonlands Conservation Plan (BCCP), a regional habitat conservation plan encompassing 561,000 acres in western Travis County, Texas. To date, the BCP Partners have assembled greater than 92% of the 30,428 acres

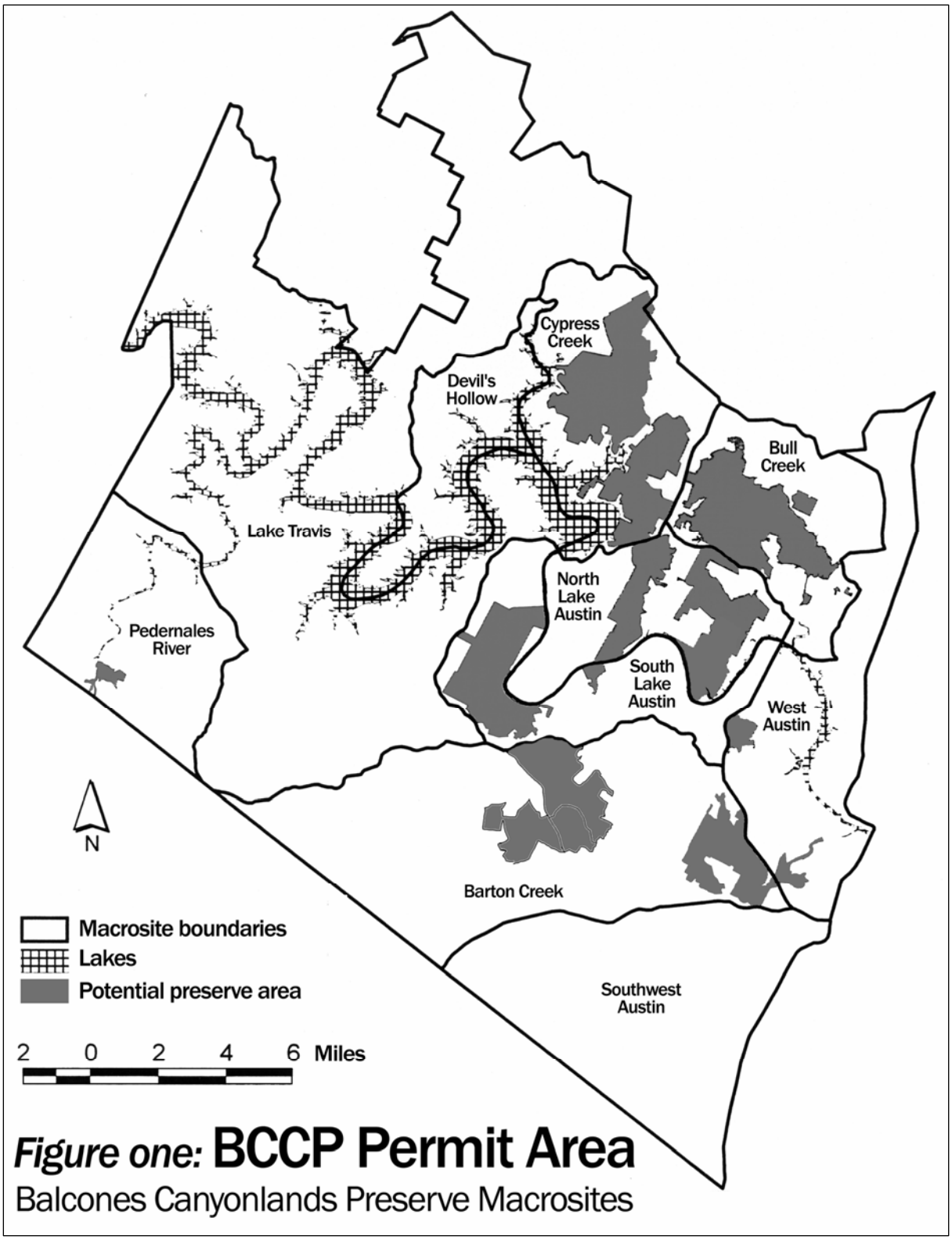

***Figure one:* BCCP Permit Area**
Balcones Canyonlands Preserve Macrosites

required by the permit as described in the HCP (USFWS 1996). The BCP is composed of individually managed tracts within seven unique "Macrosites" (see Figure 1) considered important for the continued survival of the species covered by the permit.

3.2 Climate

The climate in the Austin area is generally humid subtropical with hot summers. The region is known for extremes in both wet and dry years and is subject to periodic droughts (Riskind and Diamond 1988). The area experienced recent significant drought periods in 1993, 1996, and 1998 (Travis County 2003). Extreme humidity fluctuations are common. Temperature fluctuations of 40°F are possible during periods of low humidity.

Daytime high temperatures in summer commonly exceed 95°F, and July is typically the warmest month. The cool and generally mild winters typically record below-freezing temperatures less than 25 days per year. Mean first frost date is in late November and mean last freeze is in mid-March. Temperatures rarely fall below 20° F. January is generally the coldest month.

Precipitation is bimodal with rainfall maxima occurring in late spring (May) and early fall (September) and minima occurring in midwinter (January) and early summer (June) (Woodruff 1975). The average annual precipitation is 31.9 inches. Precipitation occurring from April through September is usually from thundershowers, while most winter precipitation occurs as light rain (N.O.A.A., 1993).

Lightning and lightning-ignited fires are relatively uncommon in comparison to other areas of the country. Lightning frequency in the region peaks in late spring and in early fall (Pyne 1984, Schroeder and Buck 1970).

Prevailing winds are southerly from April through September, and often northerly October through March (N.O.A.A. 1993, U. S. Department of Agriculture Soil Conservation Service 1974). Northerly winds that accompany cold air masses in winter often shift to southerly winds as these air masses move out over the Gulf of Mexico. Area temperatures often warm between fronts.

3.3 Air Quality

The U. S. Environmental Protection Agency (EPA) and the TCEQ monitor and enforce air quality standards to protect public health under the federal Clean Air Act. Travis

County and the additional four counties that make up the Austin/Round Rock Metropolitan Statistical Area (MSA) have been designated in attainment for all six of the "criteria pollutants" regulated under this legislation.

Nevertheless, ground-level ozone has been a concern in Central Texas during recent years. This pollutant is created when nitrogen oxide (NOx) gases generated through combustion of fossil fuels combine with volatile organic compounds (VOCS) in the presence of heat and sunlight. In 1997, EPA adopted a human health-based "rolling 8-hour average" ozone standard and assessment as part of the Clean Air Act's National Ambient Air Quality Standard (NAAQS). Under this assessment, ozone levels are averaged over 8-hour blocks of time during each 24-hour period. The standard is exceeded if the fourth highest reading at a single monitor for a given year, when averaged with the fourth highest monitor readings for the previous two years reaches 85 parts per billion (ppb) or higher. This three-year average is called a "design value." Since 1998, the design value in the Austin/Round Rock MSA has consistently violated the 85 ppb standard, except in 2003, when it equaled 84 ppb. Although the 2004 design value has not yet been determined at this writing, air quality monitors in the MSA have detected ozone concentrations high enough to ensure the 2004 design value for the Travis County region will again exceed the 85 ppb standard.

Anticipating these events, the Travis County Commissioners Court volunteered, along with 11 other local political jurisdictions in the MSA, to sign an Early Action Compact (EAC) with EPA and TCEQ. The Compact commits the region to proactively reduce monitored ozone concentrations to protect human health throughout the region through 2012. By signing the Early Action Compact in December 2002, the 12 local jurisdictions committed to develop and implement a regional Clean Air Action Plan (CAAP). Travis County Commissioners Court, along with the other 11 local jurisdictions, adopted and submitted the region's CAAP to TCEQ for review and implementation in March 2004. The CAAP contains numerous emission reduction measures each jurisdiction has committed to implement by 2005, as well as a dozen air quality specific state rules the region has asked the state to impose throughout the five counties that make up the MSA. Photochemical modeling verifies these measures, once fully implemented, should ensure the region will be in compliance with the federal ozone standard by the end of 2007 and remain in compliance through 2012.

In exchange for voluntarily agreeing to reduce emissions earlier than EPA's traditional nonattainment designation process would have required, the effective date of an official

nonattainment designation will be deferred as long as the terms of the compact and its milestones are met, even if the area continues to monitor violations of the ozone standard prior to the end of 2007. Once fully implemented, the CAAP should lower NOx emissions by approximately 10 percent and VOC emissions by approximately 11 percent in the region. Photochemical modeling indicates these emission reductions will result in future design values below 85 ppb through the year 2012.

3.4 Vegetation

Pollen and fossil evidence indicate that forests and woodland environments were widespread in central Texas through the Pleistocene (Axelrod 1985). Analyses show alder, ash, basswood, birch, dogwood, hazel, hickory, maple, oak, pine and spruce pollen present in the area as recently as 15,000 years ago (Bryant and Holloway 1985). As the climate warmed and became more xeric through the late glacial period (14,000 to 10,000 years ago), woodland areas retreated and were slowly replaced by grasslands and oak savannas. The highly dissected topography of the area provided refugia for remnant populations of the more mesophytic mixed hardwood communities.

Historical records describe vegetation ranging from open grasslands to closed-canopy woodlands (Smeins 1980). Dense stands of juniper were described, but were usually discussed as discrete portions of large open grasslands. Many lands that once hosted grassland communities now host woody vegetation or a woody/herbaceous matrix (Hart and Price 1988, Schlesinger et al. 1990, Smeins 1980, Woodruff et al. 1993). The extent of the increase of woody components and the impact of these changes on woodland communities are unclear (Diamond 1997).

The BCP is located on the eastern edge of the Balconian biotic province and hosts a mosaic of plant communities influenced by the mesophytic forests of the eastern United States, the evergreen woodlands of Mexico, and the grasslands of the Great Plains (Blair 1950, Hatch et al. 1990, Weniger 1988). The vegetation of the region is diverse and characterized by a high incidence of endemism (Correll and Johnston 1979).

Principal plant communities observed today include (l) grasslands dominated by little bluestem (*Schizachyrium scoparium*), (2) Ashe juniper (*Juniperus ashei*) dominated associations usually found on steep, dry, south and west-facing slopes and (3) mixed deciduous woodlands and shrub lands dominated by Ashe juniper and Texas oak (*Quercus buckleyi*) on more mesic, north and east facing canyon slopes and narrow

canyon bottoms (Carr 1996, Riskind and Diamond 1988, Simpson 1988). A comprehensive list of the vegetation of the BCP is found in Appendix J.

The grassland areas of the BCP are typified by little bluestem (*Schizachyrium scoparium* var. *frequens*), silver bluestem (*Bothriochloa saccharoides*), threeawn (*Aristida* sp.), buffalograss (*Buchoe dactyloides*), indiangrass (*Sorghastrum nutans*), sideoats gramma (*Bouteloua curtipendula*), as well as herbs and forbs including Engelmann daisy (*Engelmannia pinnatifida*), orange zexmenia (*Zexmenia hispida),* western ragweed (*Ambrosia psilostachya*), and sneezeweed (*Helenium* sp.) (Enquist 1987, Gould 1975b, Hatch et al. 1990).

The Ashe juniper dominated community often contains Texas oak, plateau live oak (*Quercus fusiformis*), shin oak (*Q. sinuata* var. *breviloba*), sacahuista *(Nolina texana*), yuccas (*Yucca* sp.), tasijillo (*Opuntia leptocaulis*), and white brush (*Aloysia gratissimia*). Stands consisting solely of Ashe juniper are sometimes found, and are referred to locally as cedar brakes.

The oak-juniper woodland areas often include Texas oak, plateau live oak, shin oak, Ashe juniper, Texas redbud (*Cercis canadensis*), Texas persimmon (*Diospyros texana*), Texas mountain laurel (*Sophora secundiflora*), evergreen sumac (*Rhus virens*), yaupon (*Ilex* sp.), Lindheimer's silk-tassel (*Garrya ovata* var. *lindheimeri*), green-briar (*Smilax bona-nox*) and agarita (*Berberis trifoliolata*). More mesic areas and canyons often contain cedar elm (*Ulmus crassifolia*), hackberry (*Celtis* sp.), Arizona walnut (*Juglans major*), Elbowbush (*Forstiera pubescens*), Texas ash (*Fraxinus texana*), Mexican buckeye (*Ungnadia speciosa*) and escarpment black cherry (*Prunus serotina* var. *eximia*) (Carr 1996, Gould 1975a, Jones et al. 1997).

3.5 Wildlife

Though established to protect populations of a narrowly defined list of species, the BCP supports a wide diversity of habitats and wildlife.

3.5.1 Mammals

The Edwards Plateau is second only to the Trans-Pecos region in mammalian species diversity in the state of Texas (Davis and Schmidly 1994), and has been said to support the largest white-tailed deer (*Odocoileus virginiana*) population in North America (Hatch et al. 1990). Common mammals occurring in the BCP include raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginianus*), eastern cottontail (*Sylvilagus floridanus*), gray

fox (*Urocyon cinereoargenteus*), nine-banded armadillo (*Dasypus novemcinctus*) and fox squirrel (*Sciurus niger*) (Davis and Schmidly 1994, Kutac and Caran 1994).

3.5.2 Birds

The region supports over 200 species of birds, almost one-third of which nest in the area. Of primary concern within the BCP are the two endangered songbirds (the golden-cheeked warbler and the black-capped vireo) which nest on the preserve. In addition, the USFWS currently lists 21 species from the Edward Plateau as "birds of conservation concern" (USFWS 2003).

Common birds occurring in the BCP include Northern mockingbird (*Mimus polyglottos*), red-tailed hawk (*Buteo jamaicensis*), Northern cardinal (*Cardinalis cardinalis*), turkey vulture (*Cathartes aura*), killdeer (*Charadrius vociferus*), mourning dove (*Zenaida macroura*), black-and-white warbler (*Mniotilta varia*), Carolina chickadee (*Poecile carolinensis*), black-crested titmouse *(Baeolophus bicolor*), Bewick's wren (*Thryomanes bewickii*), and Carolina wren (*Thryothorus ludovicianus*).

3.5.3 Reptiles and Amphibians

More than 70 species of reptiles and amphibians occur in the area, including some 45 snake species, 16 lizard species, and 11 species of turtles. Of special concern among the herpetofauna of the BCP are the poorly understood karst and spring-associated salamanders of the genus *Eurycea*. The BCP includes significant portions of the known habitat of one member of this genus, the Jollyville Plateau salamander (*Eurycea tonkawae*).

Common reptiles occurring in the BCP include the great-plains rat snake (*Elaphe guttata emoryi*), Texas rat snake (*Elaphe obsoleta lindheimeri*), western coachwhip *(Masticophis flagellum*), northern fence lizard (*Sceloperus undulatus*), and ground skink *(Scinella lateralis*) (Kutac and Caran 1994, Werler and Dixon 2000).

3.5.4 Invertebrates

The University of Texas Brackenridge Field Laboratory houses collections including more than 1,960 invertebrate species from the area. Life history and range information is poorly understood for most of these species. The unique geology of the region provides habitat for six karst-associated invertebrates listed as endangered and 25 others considered species of concern, all of which are provided protections under the BCCP.

3.5.5 Fish

Some eighty species of native and introduced fish occur in the area. While no bodies of water supporting significant fish populations exist within the BCP, a number of the BCP tracts are adjacent to or compose significant portions of watersheds within western Travis County.

3.6 Cultural Resources

The HCP (USFWS 1996) addresses cultural resources including historical and archaeological sites, buildings, objects, structures, and features in accordance with the requirements of the National Historic Preservation Act. The preserve system has not been systematically inventoried for potential archaeological sites to date, though the HCP inventory of cultural resources lists known historic sites within the BCP. The Texas Historical Commission (THC) maintains a database of recorded cultural sites, and the Texas Archaeological Research Laboratory (TARL) houses maps showing locations of identified archaeological sites throughout the BCP. These locations are not identified here, as Section 191.004 of the Antiquities Code of Texas prohibits revealing archaeological site locations in public documents.

4.0 NATURAL AND HISTORICAL ROLE OF FIRE

4.1 Natural Fire

The fire history of the Edwards Plateau prior to European settlement is poorly recorded, though historical and experimental data suggest that fire likely maintained the dominant grassland oak savanna plant community (Axelrod 1985, Fonteyn et al 1988, Gehlbach 1988, Rasmussen 1986, U. S. Department of Agriculture 2002). The potential for large wildland fires is due in part to local climatic conditions that allow significant amounts of fine fuels to accumulate during wet periods and then persist through periodic droughts. The arrival of humans in the area likely increased fire incidence through both accidental and intentional ignitions (Hester 1980).

4.2 Historical Uses of Fire

European settlement in central Texas dates to the Spanish missions established in the 1740’s. Few historic accounts describing native vegetation at the time have survived, though most researchers agree that the region likely hosted grassland mosaics with mixed hardwood-juniper habitats. Wooded areas were likely most prevalent along rocky scarps, riparian areas and steep canyons (U.S. Department of Agriculture 2002, Weniger 1988).

Northern Europeans began moving into the area by 1820, and the livestock that accompanied early settlers fared well on the grasses of the Texas Hill Country. Ranchers often set fires to clear woody vegetation and to improve the growth and quality of grass and crops (Schlesinger et al. 1990). As settlement and resulting populations increased, so did attempts to control fire. Increasing livestock densities contributed to the decline of the native grasses on the Edwards Plateau. Woody species previously confined to the canyonlands by natural fires began to encroach upon grasslands in areas where fire was controlled.

By the 1850's the increasing settlement pressure was widely reported and even described by newspapers as responsible for rising land prices (Smeins 1980). Once shrub and brush species began competing on the grassland savannas, the quality of the range for cattle decreased. Sheep and goats were found to thrive in areas no longer capable of supporting high densities of cattle. By the late 1800's, sheep and goats were the primary livestock in the region (Schmid 1969, Smeins 1980).

By the 1880's, barbed wire and woven wire fencing and deep-water wells allowed ranchers to concentrate livestock densities never before possible (Schmid 1969). This intensive grazing further reduced native grasses and permitted additional invasion by woody species (Hart and Price 1990). The resulting reduction of soil-anchoring grasses resulted in widespread erosion as well as the loss of fine fuels available to support the light and flashy fires previously common in the area.

Settlers fought to extinguish fires to protect their homes and their livestock, further contributing to the spread of woody species (Schmid 1969, Fonteyn et al. 1988, Riskind and Diamond 1988). Local residents understood the role of fire in controlling woody growth and by the turn of the century were accurately describing the changes to the surrounding Hill Country:
"…Indians burned over the country repeatedly and thus prevented any extension of forest areas. With the settlement of the country grazing became the only important industry. Large ranches in time were divided into smaller ranches and farms with a consequent fencing of ranges and pastures... The practice of burning has during the recent years disappeared. The few fires which start are usually caused by carelessness, and with alternating wooded and open spaces and the closecropped grass, they burn only small areas. These conditions have operated to bring about a rapid extension of woody growth. Almost unquestionably the spread of timbered areas received its impetus with the gradual disappearance of grassland fires (Foster 1917)."

As settlement continued, fire was increasingly controlled and was eventually eliminated as a natural component of local ecosystems (Smeins 1997). According to the Texas Division of Emergency Management, fires in Texas today burn an average of 1.5 million acres each year (Texas Department of Public Safety 2000). The Travis County Office of Emergency Management characterizes the risk of wildland grass and brush fires as "high" based upon qualitative data and historical records for the area (Travis County 1999).

4.3 Fire History of the BCP

No large wildfires have occurred within the boundaries of the BCP since its inception in 1996. Travis County is, however, at risk for wildfire year-round. Though no annual total of wildfire incidents in the county is available, records from mid-1997 through October of 1998 found that 698 reported fires burned over 500 acres. The potential for the rapid spread of wildfire in the area is illustrated by the Dessau Road Fire, which in 1994 quickly burned over 600 acres including two abandoned buildings (Travis County 2003).

The rugged terrain of the western half of the county tends to concentrate development in areas with easily developable land. In areas near the Preserve, this pattern of development has resulted in wildland-urban interface concerns.

Prescribed fire is also a component of the recent fire history of the area. Both the City of Austin and Travis County have used prescribed fire on lands under their management, and LCRA has used fire as a management tool on properties within their service area. While each of these BCP Partners has experience with prescribed fire, none of these agencies has used fire within the BCP to date.

The Nature Conservancy of Texas (TNCTX) has an active wildland fire program and conducts an average of 20 prescribed fires and 4 wildfire responses each year throughout the state. TNCTX conducts prescribed burns to restore and maintain habitat on the 4,084 acre Barton Creek Habitat Preserve within the BCP, and has burned approximately 420 acres since 1999.

5.0 THE FIRE ENVIRONMENT

5.1 Fire Weather

Wildland fire behavior is influenced greatly by weather effects. Frontal passages, thunderstorms, and relative humidity may all impact fire behavior on the preserve.

Cold fronts, the boundary line between cooler and warmer air masses, may lead to potentially dangerous wind direction changes and rapid drops in relative humidity. Strong southerly winds typically observed ahead of cold fronts drive fire to the north or northeast, while winds shifting to the west or northwest after frontal passage tend to drive fire to the east or southeast. Approaching cold fronts may be indicated by a line of cumulus clouds approaching from the west or northwest, and by increasing southerly wind velocities. Large dust clouds sometimes precede cold fronts, and gusty and erratic winds are common at the frontal boundary (NWCG 1994).

Thunderstorms are violent localized storms produced by cumulonimbus clouds accompanied by strong gusty winds, thunder, and lightning. Thunderstorms typically produce strong gusty surface winds that affect fire direction, intensity and rate of spread. Thunderstorms often produce strong downdraft winds of 25 to 35 miles an hour. These erratic wind bursts usually spread radially in all directions, and wind speeds of 60 miles an hour have been recorded. Lightning produced by these storms presents an additional hazard to firefighters, as well as a potential ignition source (NWCG 1994).

Relative humidity is a measure of the amount of moisture in the air relative to the maximum amount of moisture which the air could carry at a given temperature and pressure. Relative humidity is generally inversely related to daily temperature fluctuations. Low humidity results in low moisture content of fine fuels, making these light and flashy materials more prone to ignition. Low humidity is often a factor in extreme fire behaviors (Geiger 1965, NWCG 1994, Schroeder and Buck 1970).

Real time fire weather conditions are available from the following sources:
National Fire Weather Page:
http://www.boi.noaa.gov/firewx.htm
U. S. Weekly Hazard Maps:
http://www.cpc.ncep.noaa.gov/products/predictions/threats/threats.html
Monthly Fire Weather Forecast:
http://met.rfl.psw.fs.fed.us/met/MFWF.html
Wildland Fire Assessment System:
http://www.fs.fed.us/land/wfas/
National Drought Summary Maps:
http://www.drought.unl.edu/dm/monitor.html
National Weather Service Forecast:

http://www.srh.noaa.gov/ewx/
National Interagency Fire Center:
http://www.nifc.gov/

5.2 Fuels

The habitats found throughout the BCP create a mosaic of vegetation types and structures often closely associated with the region's highly variable topography. Fire management units may contain one or more fuel models. The diversity and distribution of these fuels may create a highly complex environment for fire suppression.

Natural fuels within the Preserve generally fall into one of five fuel models:
FBPS Fuel Model 1
These fuel models represent open grassland areas composed primarily of perennial grasses. Normal fire behavior consists of surface fires with wind influenced rate of spread. Head fires in these conditions may exhibit extreme rates of spread for short periods. Under extreme conditions, the rate of spread is rapid and erratic, and highly responsive to wind influences.

FBPS Fuel Model 2
This fuel model is composed of grasslands with some woody species encroachment. Shrub species, Ashe juniper, oaks and elms are the primary woody species in this model. Under normal fire conditions, rate of spread may be mitigated somewhat by wind protection provided by woody species. Surface fire typically spreads through fine herbaceous fuels and litter accumulations. Torching of some species may be present and may produce firebrands. Under extreme conditions, fire brands create spotting and woody overstory species burn with ground fuels.

FBPS Fuel Model 4
This fuel model is comprised of stands of mature shrub species. Fires in this environment typically spread quickly through fine woody materials in the crowns of the nearly continuous secondary overstory. These fuels include shrub species such as yaupon, evergreen sumac, and agarita mixed with Ashe juniper, oaks and elms. Cured woody material and the volatile fire behavior of some of these species contribute to fire intensities.

FBPS Fuel Model 6
This fuel type is composed of moderate density oak brush and young juniper associations. Small runs typically drop to ground fires under low wind speeds. Torching of junipers and spotting is common, though sustained crown fires are not likely under normal fire conditions. In extreme conditions torching and sustained crown fires are expected, with possible spotting distances of one-quarter mile.

FBPS Fuel Model 9
Composed of closed-canopy deciduous forest areas, these fuels are composed primarily of Ashe juniper and Texas and live oaks. Other common species in this model include cedar elm, hackberry, Texas ash, pecan, Arizona walnut, and escarpment black cherry. Under normal fire conditions, surface fire will carry through the litter layer, with occasional torching of deadfall materials. Rate of spread is moderate due to the wind protection provided by overstory growth. Extreme fire conditions may include continuous crown fires with flame lengths of 50 feet or more (Anderson 1982, NWCG 1993).

5.3 Topography

Topography is an important factor in assessing potential fire behavior. The three primary components of topography (aspect, slope, and landform) have major impacts on fire behavior (Rothermal 1972). The highly varied landscape of the BCP presents significant challenges to fire responders.

Aspect, defined as the direction that a slope faces, generally determines the amount, condition and type of fuels present as well as the amount of heating a slope receives. South and southwest facing slopes are generally dry, with light fuel types, high temperatures, low humidity, and low fuel moisture content. The potential for ignition and rapid spread of wildfires is often highest on these slopes. North facing slopes typically contain more heavy fuels, lower temperatures, higher humidity and higher fuel moisture content (NWCG 1994).

Slope is the amount of inclination of the land. Fire burns more rapidly up-slope than down-slope due to fuel proximity to flame fronts as well as to pre-heating and drying of fuels. An additional concern on steep slopes is the potential for burning material to roll downhill igniting fuels below the fire (NWCG 1994). Slopes may pose access and safety concerns for firefighters. Slopes on the preserve vary from nearly flat to extremely steep (>75%) grades.

Landform may influence wind speed and direction as well as fire intensity, direction and rate of spread. Box canyons and narrow canyons tend to draw air from the canyon bottom creating strong upslope drafts. These conditions can generate extreme fire behavior and are very dangerous to firefighters. Radiant heat and spotting may be responsible for igniting fuels across narrow canyons. Wide canyons and large topographic features may have significant influences on wind direction (NWCG 1994; Rothermal 1972).

5.4 Fire Season

Wildland fires can take place in any month of the year on the BCP. Under normal conditions, fire danger increases with annual greening and drying of fuels. Fine cured grassland fuels are available when dry frontal passages are common in late winter. Late frosts can extend the fire season before vegetation begins to green and fuel moisture content increases through springtime. The region's typically hot and dry summer conditions quickly reduce fuel moisture content. Prevailing summer winds are from the south, and the common southwesterly breezes are often very low in humidity. Lightning frequency in the area peaks in late spring and early fall (Schroeder and Buck 1970). Drought conditions may generate extreme fire conditions at any time of the year.

6.0 EFFECTS OF FIRE

6.1 Vegetation Response to Fire

Wildland fire has been called the "single most important non-edaphic factor controlling patterns of vegetation" on the Edwards Plateau (Gelbach and Amos 1988). Periodic wildland fires likely maintained pre-settlement grassland savannas with mosaics of woody species. The steep canyons and rocky outcrops of the area are associated with hardwood-juniper woodlands.

During periods between fires, woody species colonized and encroached upon grasslands. Periodic light fires and occasional severe fires burning under extreme conditions served to reduce fire-intolerant invaders such as young Ashe juniper. Many woody species of the region re-sprout after top-kill fires, and likely survived all but the most intense fires. These fire tolerant species maintained the characteristic woody mosaic physiognomy of the Edwards Plateau's grassland savannas (Scifres 1980, Smeins 1997, Wright and Bailey 1982).

6.2 Wildlife Response to Fire

Wildlife responses to fire have been reported to range from panic to calm movement away from flame fronts (Lyon et al. 1978). Response is generally related to mobility of

the species in question and the size of the fire. Mobile animals may find refuge in unburned vegetation mosaics or in previously burned areas. Some species may find shelter underground as the heat of most fires penetrates only a few inches into the soil (Chandler et al. 1983). Wildlife mortality by fire has been recorded (Ahlgren and Ahlgren 1960, Lutz 1956, Hakala et al. 1971), though a number of researchers have remarked at the relative scarcity of dead animals after fire events (Keith and Surrendi 1971, Sims and Buckner 1973, Stoddard 1963). A number of wildlife species have been known to demonstrate an attraction to fire events, most notably accipiters, buteos, and some invertebrates (Lyon et al. 1978).

Fire effects on invertebrates have been poorly studied. A wide range of responses to fire events have been recorded for those species that have been the focus of some research (Lyon et al. 1978). Invertebrates may display different vulnerabilities to fire during various life stages. Studies of some Lepidoptera have demonstrated that species with broad habitat niches are most abundant in recently burned areas though they are usually scarcest in the areas longest left unburned (Swengel 1996). Some flying insects appear to be attracted by heat, smoke and by damaged trees, and populations of these species may increase during and after a fire (Lyon et al. 1978).

Little information about fire effects on amphibians and reptiles is available. Many of these species may escape fire by leaving an area, remaining underground in burrows, or in sub-surface soil layers. Reptiles and amphibians may be more susceptible to mortality from fire during dormant seasons due to their slow movement in cold weather (Means and Campbell 1981).

The indirect effects of fire on upland game birds appear more significant than direct mortalities due to fire. Fire may improve habitats and increase food availability for some species. Mature trees killed by fire provide foraging areas for insectivorous birds as well as perching and roosting sites. The biggest danger to bird species is potential loss of active nests, though re-nesting may occur. Fires attract birds of prey, many insectivorous birds, quail, and turkeys (Komarek 1967, Phillips 1965, Stoddard 1963). Little research is available on the effects of fire on non-game bird species.

Small rodents such as squirrels and mice are most often seen demonstrating panic responses, while larger mammals such as deer and raccoons are often reported to move more calmly away from fire (Hakala et al. 1971, Sunquist 1967, Tevis 1956, Udvardy

1969). Most researchers agree that vertebrate mortality is limited, and that impacts to populations are usually negligible (Stoddard 1963, Vogl 1973).

Indirect effects of fire on animal behavior include loss of shade and cover, resulting in greater temperature extremes. Loss of cover also influences temperature and relative humidity, to which some animals are sensitive (Chandler et al 1983).

6.3 Effects on Cultural Resources

Fire-caused damage to cultural resources is typically due to one or more of four factors: fire suppression techniques, fire intensity, duration of heat impingement upon the resource, and heat penetration into the soil. Considered and careful use of fire fighting equipment can minimize equipment impacts on both wildfire suppression actions as well as on prescribed burns. Carefully written prescriptions can minimize each of the remaining impacts for planned burn activities (BBNP 1994).

It is the responsibility of the Land Manager to direct the Incident Commander and/or fire fighters with regard to cultural and archaeological resources located on each tract. To minimize direct impact to cultural resources, use of hand tools and heavy equipment should be controlled. Suppression activities, fire-line construction, and mop-up operations may all result in damage to cultural sites. Fire control strategies and techniques that may alter archaeological sites or site features should be minimized to the fullest extent possible.

Creation of fire-breaks to protect specific cultural sites such as historic structures may be considered, and will be addressed by Land Managers on a tract-by-tract basis.

6.4 Effects on Air Quality

The primary byproducts of burning fuels are gases (including aldehydes, benzene, carbon dioxide, carbon monoxide and nitrous oxides) and smoke. The emissions generated by most prescribed and wildland fires disperse throughout the air column causing little impact to overall air quality.

Reduced visibility due to smoke may be a serious concern. Smoke quality and quantity are determined by efficiency of combustion, fuel types and fuel loads. These factors vary with the type of fire (head, flank or backfire) and with moisture levels and characteristics of involved fuels. Atmospheric stability and wind speed govern smoke dispersal.

Weather, fire behavior and fuel conditions dictate smoke management actions when responding to wildland fire incidents. Smoke hazards are addressed in each prescribed fire plan, and accepted smoke management techniques will be employed on each incident.

7.0 FIRE OPERATIONS

7.1 Personnel

BCP Staff will fill the role of Resource Managers/Agency Representatives in assisting Incident Command on wildfire events. All personnel involved with fire management will meet their agency's qualification standards, as outlined in Section IX: BCP Partners and Fire Management Units. The BCP Fire Management Committee will annually review and recommend personnel requirement changes to the BCP Partner Agencies based on NWCG standards.

7.2 Safety

The safety of firefighters, staff, neighboring residents, and the general public takes priority over all fire operations and is the responsibility of the Incident Commander on all wildfires and the Burn Boss on all prescribed burns. Supervisors will review safety concerns with incident personnel at all operational briefings and provide safety briefings throughout fire operations.

BCP Land Managers may close any portion of the Preserve when wildfire or prescribed fire poses a threat to public safety. The Land Manager will coordinate with and assist the Incident Commander and law enforcement officials as appropriate during closures, public evacuations, or in any other public management situations.

Standard safety procedures will be taken on all fires:

1. All actions will be based on the National Wildfire Coordinating Group's "Fire Orders" and the "18 Watch-Out Situations" (NWCG 1998).
2. L.C.E.S. principals (Lookouts, Communications, Escape Routes, and Safety Zones) will be applied at all times (NWCG 1998).
3. Mechanized equipment is often used on fire lines. Firefighter safety guidelines will be practiced at all times by firefighters of all levels.

7.3 Equipment

A current Agency equipment inventory for fire suppression and prescribed burning will be maintained by each Land Manager. Necessary additional equipment will be purchased

as funding allows. Required Personal Protective Equipment (PPE) will be issued by the managing Agency to all personnel qualified for fire management activities. The BCP Fire Management Committee will annually review and recommend PPE changes to the BCP Partner Agencies based on NWCG standards. The BCP Fire Management Committee will assist Partners and Responding Agencies in seeking additional support to meet equipment needs.

7.4 Communications

Clear communications are vital to insure the safety of firefighters and support personnel on any fire incident. It is important that all staff remain in open contact with each other and their supervisors. BCP staff serving as Resource Advisors must remain in clear contact with the Incident Commander until relieved of this responsibility. All BCP personnel responding to an incident will be equipped with hand-held radios. Land Managers are responsible for maintaining call down lists, BCP Agency contacts, radio frequencies and contact information for neighboring landowners for each BCP tract.

8.0 FIRE MANAGEMENT

8.1 Wildfire

Any non-structural fire, other than a prescribed fire, that occurs on the preserve will be considered a wildfire.

8.1.1 Preparedness

Preparedness activities are carried out to ensure appropriate suppression response to fire incidents. Preparedness activities include, but are not limited to, training, equipment acquisition and maintenance, budget planning, coordination with local suppression agencies, fire danger evaluations, and public education and outreach. Each BCP Partner Agency will assign fire management responsibilities to staff as Annual Work Plan goals. BCP Land Managers will meet annually with responding agencies in order to discuss suppression issues. Topics of concern include inter and intra-Agency communications, radio frequencies, preserve access, sensitive areas, and resource availability. It is critical that Agency Land Managers and responding agencies are clear about expected suppression response. If extended attack actions are necessary, BCP staff will assist Incident Command with advisory, planning and logistics duties as appropriate.

8.1.2 Dispatch

Dispatch begins once a fire report is received. BCP staff will initially verify that the Agency Land Manager has been notified. Staff will then contact the Incident Commander

and will remain in a Resource Advisor/Agency Representative role until relieved of this responsibility.

8.1.3 Suppression Response

The goal in all suppression actions is to insure the safety of firefighters and the public. Where possible, these goals are to be pursued while limiting damage to property and habitats.

Fire management activities within the BCP will attempt to minimize impacts to natural and cultural resources wherever possible. Minimum Impact Suppression Tactics (MIST) encourage techniques that least alter the landscape or disturb the natural and cultural resources of a site while achieving fire management objectives (U. S. Department of Agriculture, Forest Service 1995). The implementation of MIST concepts requires sensitivity to the impacts of suppression tactics and their long-term effects when determining appropriate suppression responses.

Examples of Minimum Impact Suppression Tactics include, but are not limited to:

- The use of water, foam, or cold-trailing is preferred over hard lines, except near wetlands or karst features, where foam will not be used.
- Protective tactics should be used in areas identified as containing sensitive natural or cultural resources.
- Fire line width should be kept to the minimum necessary to stop a fire's spread. Natural barriers should be used when possible to avoid unnecessary fire line construction. Where appropriate for low intensity fires, trails and roads should be utilized as fire lines in lieu of constructing new lines.
- If heavy equipment is required, the Land Manager should advise the Incident Commander in line location.
- An attempt to use low impact tools (such as swatters/flappers) will be made whenever safe and feasible.
- During fire line construction and mop-up, tree felling, bucking and cutting should be minimized. Fire lines should be built around logs and snags whenever possible, in order to provide for wildlife habitat. Snags adjacent to fire lines should be fireproofed.
- Soil disturbance by digging and smothering should be minimized during mop-up operations.
- Trees, limbs, and brush should be scattered and not left in piles. Debris may be used in rehabilitation efforts by placing it over previously constructed fireline.

- Personnel should avoid using rehabilitated firelines as travel corridors whenever possible to minimize soil compaction and detrimental impacts to rehabilitation efforts. Creation of new trails during suppression efforts should be discouraged.

8.1.4 Rehabilitation

Rehabilitation planning and implementation is the responsibility of the Agency Land Manager. Rehabilitation efforts may be undertaken where the impacts of the fire or the associated suppression actions are significant and can be mitigated. No rehabilitation actions that will cause additional damage to the resource will be attempted. Only minimal rehabilitation should be necessary if MIST procedures are employed (U. S. Department of Agriculture, Forest Service 1995).

8.2 Prescribed Fire

8.2.1 Background

Prescribed fire has been defined as, "The skillful application of fire to natural fuels under conditions of weather, fuel moisture, soil moisture etc. that will allow the fire to be contained to a predetermined area and at the same time will produce the intensity of heat and rate of spread required to accomplish certain planned benefits to one or more objectives of silviculture, wildlife management, grazing, hazard reduction, etc." (Biswell 1977).

A fire prescription is a plan specifying conditions under which fires can be ignited in order to meet specific management objectives. Fire behavior prescription elements specify a range of weather, fuel moisture, and fire behavior prediction values that are dependent upon fuel models and firing techniques. Operational elements specify the equipment and manpower needed to successfully conduct the burn, as well as an ignition plan, holding plan and contingency plan. An individual prescription will be prepared by the Agency Land Manager for each burn to be conducted.

Prescribed fires fall into two categories, natural and management ignited. Wildland Fire for Resource Benefit (also referred to as "Prescribed Natural Fire" or PNF) is any fire of natural origin (e.g. caused by lightning) allowed to burn under prescribed conditions. The wildland-urban interface that characterizes much of the BCP precludes this management tool for most of the preserve. Agency Land Managers deeming PNF appropriate for a given tract will provide a written prescription that adheres to the policies and procedures of the managing agency and the BCP LMP. Only fires falling within written and approved prescriptions will be allowed to burn. All PNF actions require close supervision

and monitoring, and suppression actions will be enacted if these incidents exceed pre-established parameters. Management-ignited prescribed fires may be implemented in order to accomplish specific objectives relating to ecological restoration, hazard fuel reduction, research, and/or debris disposal.

8.2.2 Smoke Management

Fire management activities that result in the discharge of pollutants such as smoke and carbon monoxide must comply with all applicable state and local requirements as well as those specified in the TCEQ Outdoor Burning Rule.

Smoke from burning fuels primarily consists of small-size particles made up of ash, partially consumed fuel, and liquids. Other by-products of burning include carbon monoxide, carbon dioxide, aldehydes, acrolein, benzene and nitrogen oxides. The small particles and gases are of the greatest concern to health and visibility. Once the smoke containing these particulates and gases rises, mixes in the air column and disperses, the potential health hazard is significantly reduced.

The amount of smoke produced by a fire is dependent upon the amount and types of fuel, and on the completeness of the combustion process. The degree of combustion is dependent upon the type of fire (i.e. backing, flanking, or heading) and on the amount of smoldering present. The dispersal of smoke is determined by atmospheric stability and wind speed.

For prescribed burns, smoke management will be addressed through a smoke sensitive area screening process and the development of weather parameters, ignition procedures, and mitigation processes to mitigate negative impacts from smoke or other fire by-products. The Burn Boss is responsible for smoke management and mitigation actions on all prescribed burns.

8.2.3 Evaluation and Monitoring

All BCP Partners will develop and implement monitoring programs to assess the short and long-term effects of prescribed fire on the natural and cultural resources of the BCP. These findings shall be submitted as described with reporting requirements outlined in Section II F above.

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APPENDIX A

BALCONES CANYONLANDS PRESERVE SYSTEM MAP

Balcones Canyonlands National Wildlife Refuge

RM 1431

Lake Travis

FM 2769

US HWY 183

RM 620

RM 2222

LOOP 360

FM 2244

FM 3238

LOOP 1

Southwest Pkwy

SH 71 W

US HWY 290 E

To Hamilton Pool Preserve and Westcave Preserve

N

W

E

S

FM 3238

0 0.5 1 2 3 4 5 6 Miles

BCP

Potential Future Preserve

Unavailable

Balcones Canyonlands NWR

Major Roads

County Line

Rivers, lakes, and creeks

Balcones Canyonlands Preserve System

Travis County, Texas

Map prepared by Travis County Natural Resources staff. Map created on 4/17/07; Data sources - Travis County & Travis Central Appraisal District; File location Nootsie server, Q:/Park_NR/NatRes/Common/GIS Projects/ArcMap/BCP Parcels/Maps/2007_stoplight 18x24.pdf

APPENDIX B

FIRE MANAGEMENT TEMPLATE

For each BCP tract, the Agency Land Manager will create a Fire Management Plan that includes the following:

1. Emergency contact list to include agency personnel, surrounding landowners, etc.
2. Fire cache location and contents
3. Radio frequencies used by BCP staff
4. Agency policies and guidelines
5. Personnel qualification guidelines
6. Agency PPE requirements
7. Agency Accident/Incident Report Forms
8. Fire Management Units and Pre-Attack Plans, including:
    - Physical characteristics of each Fire Management Unit, including tract size, physical description, unique cultural and natural resources, and real property.
    - Brief discussion of Agency MOAs/MOUs and where copies are located.
    - Description of values to be protected, adjacent landowners and agencies, etc.
    - Delineated Fire Management Units on topographic and aerial photographic maps.
    - Preserve specific safety concerns (old ranch dump sites, steep terrain, etc.).
    - Preferred response to a wildfire in the unit.

If Prescribed Fire is appropriate for a given Unit:

1. Present rationale for the use of prescribed fire.
2. List specific management objectives for prescribed fire.
3. List constraints specific to the preserve, such as smoke management, personnel and/or equipment concerns, safety issues, fuel loads, opportunities to increase public awareness, etc., and define how these concerns will be addressed.
4. Review the number of acres to be burned, the fire return interval, and the season when these units will be burned.
5. Discuss Agency monitoring protocols designed to assess the short and long term effects of prescribed fire on the natural and cultural resources of the Preserve.
6. Update annually with current copies of Prescribed Burn Plans for each tract.

Fire Management Plans will be reviewed by the Fire Management Committee and the Emergency Service District with jurisdiction over each BCP tract.

Fire Management Plans may be incorporated into BCP LMP Tier III documents, or may be created as separate documents.