



United States Department of the Interior

FISH AND WILDLIFE SERVICE
10711 Burnet Road, Suite 200
Austin, Texas 78758
512 490-0057
FAX 490-0974



SEP 20 2005

John H. King
Superintendent
Big Bend National Park
P.O. Box 129
Big Bend National Park, Texas 79834-0129

Consultation # 2-15-00-F-0572

Dear Mr. King:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed June 2005 Fire Management Plan (FMP) for the National Park Service's (NPS) Big Bend National Park (BBNP) located in Brewster County, Texas, and its effects on the black-capped vireo (*Vireo atricapilla*), Chisos Mountain hedgehog cactus (*Echinocereus chisoensis* (=reichenbachii) var. *chisoensis*), and the Mexican long-nosed bat (*Leptonycteris nivalis*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act)(16 U.S.C. 1531 et seq.). Your June 1, 2005, request for formal consultation was received on June 3, 2005.

BBNP determined, and the Service concurs, that the bunched cory cactus (*Coryphantha ramillosa*), Lloyd's Mariposa cactus (*Neolloydia mariposensis*), southwestern willow flycatcher (*Empidonax traillii extimus*), northern aplomado falcon (*Falco femoralis septentrionalis*), and Big Bend gambusia (*Gambusia gaigei*) may be affected, but are not likely adversely affected, by the proposed project.

This biological opinion is based on the June 2005 Biological Assessment (BA) for the FMP, the Environmental Assessment (EA) for the FMP, telephone conversations, site visits, and other sources of information. A complete administrative record is on file at this office.

Consultation History

- April 13, 2000: The Service wrote BBNP's March 8, 2000, information and species request.
- October 4, 2000: The Service letter to BBNP with concerns for four prescribed fire projects.
- September 19, 2002: The Service responded to the August 13, 2002, EA on the Management Ignited Prescribed Burns for 2002-2003.
- October 16, 2002: Phone conversation with BBNP fire staff about a "Finding of No Significant Impact (FONSI)."

**TAKE PRIDE
IN AMERICA** 

- June 2003: Site visit to BBNP by Service biologists Jana Milliken, Paige Najvar, Tim Schumann, and Robert Pine.
- November 13, 2003: BBNP letter outlined the five-year FMP. A series of e-mails followed between Jana Milliken (Service) and Susan Moodie (University of Arizona), who was contracted to write the BA.
- April 1, 2004: An updated Brewster County species list was faxed to Susan Moodie.
- April 13, 2004: The Service met with BBNP staff to discuss the section 7 consultation process on the FMP.
- April 20, 2004: Phone conversation between the Service, Susan Moodie and Raymond Skyles determined that prescribed burns in known black-capped vireo habitat would be avoided.
- April 26, 2004: The Service provided comments on the draft BA.
- July 23, 2004: The Service provided comments on the black-capped vireo section of the BA.

BIOLOGICAL OPINION

Proposed Action

The NPS is updating their 1994 FMP to reflect advances in knowledge of fire ecology and NPS policy. The FMP ultimately should reduce the need for prescribed fire and allow wildfire to restore BBNP's historical vegetation structure. Drought, grazing, and fire suppression have resulted in high fuel load buildup, particularly in the Chisos Mountains that lie along the west side of the center of BBNP. The careful use of prescribed fire and non-suppression of wildfire in low-risk areas are planned to reduce the risk of catastrophic wildfire. The FMP proposed burning schedule is from 2004-2012; this Biological Opinion addresses burning from the remainder of 2005 (from the date of this Biological Opinion) through 2012.

The FMP divides BBNP into two fire management units (FMUs) (Figure 1). FMU #1 includes buildings and other structures, cultural resource sites, federally listed species locations, and a 1.6-kilometer (1-mile) buffer around the park boundary. BBNP plans to work with neighboring landowners to reduce the buffer to allow fire to burn to existing natural or man made boundaries, such as rivers, roads, bare areas, and cliffs. Prescribed fire, fuel reduction treatments without the use of fire, and allowance of wildfire that does not exceed wind and moisture limits will all be permitted in FMU #1. FMU #2 includes the rest of BBNP. Wildfires will be allowed to burn uncontrolled in this unit as long as they do not exceed wind and moisture limits, to allow safe and ecologically effective burns.

In addition, FMU #2 includes the Chisos Basin, a valley near the center of the park, as a special treatment zone. The Basin will be allowed to burn within prescriptions and be monitored very closely. Research burns are planned in the Basin to study the effects of fire on sensitive species, including the black-capped vireo, Chisos Mountain hedgehog cactus, and the Mexican long-nosed bat (Figure 2). These burns will be introduced on a limited level, and depending on the

results, fire may be used to achieve management objectives on a wider scale. Specifically, these burns may answer questions related to the adaptability of black-capped vireos to burned areas.

The only site in the U.S. known to contain the candidate species Guadalupe fescue (*Festuca ligulata*) is located in Boot Canyon in the Chisos Basin. The population numbers about 500, and was previously addressed in a Candidate Conservation Agreement between NPS and the Service. Fire is being considered to remove duff over small areas (approximately 1 square meter [11 square feet]). Natural ignitions will be allowed in certain circumstances. The BA states that all prescribed fires in areas where Guadalupe fescue occur will be coordinated with the Service prior to burning.

The following conservation measures proposed by BBNP are summarized from the BA:

All species

- Firebreaks, staging areas, and spike camps will be in place in advance of fire to minimize disturbance.
- Areas impacted by fire will be rehabilitated by replanting, handbrushing lines, removing trash, and preventing erosion around habitat.

Black-capped vireo

- Researchers experienced with black-capped vireos will assess potential habitat and habitat management using fire.
- Conduct and study research burns exclusively outside of the breeding season.
- Avoid very small burns to reduce browsing pressure.
- Prevent burns from coming closer than 0.4 kilometers (0.25 miles) to vireo habitat to avoid breaking up territories and intrusion by brown-headed cowbirds (*Molothrus ater*), except at Green Gulch, in the center of the park, where burning is proposed to prevent damage from human-caused fires. A 100-meter (300-foot) break will be burned from the road in Green Gulch.
- Maintain a current map of occupied vireo habitat, to determine areas appropriate for prescribed fire and suppression or non-suppression of wildfire.
- Maintain close coordination between fire management and natural resource staff when planning prescribed burns in, or near, vireo habitat.
- Manually and/or mechanically remove ladder fuels in the Chisos Basin to reduce accidental fire and limit fire intensity.
- Establish permanent vegetation photo points to compare vegetation changes prior to fire or fuel management efforts.
- Proceed methodically, to allow data on plant succession (particularly in vireo habitat), and other research results to be accurately assessed.
- Develop a comprehensive black-capped vireo monitoring program to determine population dynamics and study why unoccupied areas remain unoccupied.

Chisos Mountain hedgehog cactus

- Buffelgrass (*Pennisetum ciliare*) will be removed by hand from around Chisos Mountain hedgehog cactus and along roadsides.
- Continue research with other scientists to better understand the genetics, reproductive biology, and habitat requirements of this species. Efforts are continuing between BBNP, Sul Ross State University, the Chihuahuan Desert Research Institute, and the Desert Botanical Garden in Phoenix, Arizona.
- A resource advisor (preferably a botanist) will be assigned to any fire (prescribed or wildfire) that may affect this species.
- No fire retardant drops will be allowed over habitat for the Chisos Mountain hedgehog cactus to prevent establishment of buffelgrass. Fire retardant may contain phosphate, which may serve as fertilizer for buffelgrass.
- Burned areas will be rehabilitated by recontouring soils, repositioning rocks, or planting additional plants.

Mexican long-nosed bat

- Eighty percent of agaves (*Agave* sp.) in the foraging range for the Mexican long-nosed bat will be maintained.
- Aircraft will not fly over Emory Cave when bats are present (June through August).
- A 0.4 kilometer (0.25 mile) buffer from fire will be retained downslope from Emory Cave.
- Fire retardant will not be dropped over Emory Cave except to save roosting bats during severe fires.
- High-fuel vegetation will be reduced around the entrance to Emory Cave to minimize the chance of fire entering the cave.
- Per recommendations in Howell (1996) and Johnson (2001), post-fire monitoring for agave survival/mortality will begin two years after any fire.
- Monitoring of populations in Emory Cave and demographic and feeding studies will take place as funding becomes available.

Status of the Species

Black-capped vireo

The black-capped vireo was federally listed as endangered in 1987 (52 FR 37420 - 37423). The vireo is a 11.4 centimeters (4.5 inches) long, insectivorous songbird. Mature males are olive green above and white below with faint greenish-yellow flanks. The crown and upper half of the head is black with a conspicuous white eye-ring. The iris is brownish-red and the bill is black. The mature females are generally duller in color than the males, and have a dark slate gray head (Service 1991).

Although vireo habitat throughout Texas is quite variable with respect to plant species, soils, and rainfall, habitat types generally have a similar overall appearance. Vireos typically inhabit patchy shrublands and open woodlands with a distinctive patchy structure in an early to mid-successional state, and are considered “disturbance dependent”. The shrub vegetation structure generally extends from the ground to about 1.8 meters (6 feet) above ground and covers about 30 to 60 percent of the total area. In the Edwards Plateau, common plants in vireo habitat include Texas oak, shin oak (*Q. sinuata*), live oak, mountain laurel (*Sophora secundiflora*), sumac (*Rhus* sp), redbud (*Cercis canadensis* var. *texana*), Texas persimmon (*Diospyros texana*), mesquite (*Prosopis glandulosa*), and agarita (*Mahonia trifoliata*). Densities of Ashe juniper are usually low. In the Edwards Plateau, suitable habitat for the vireo is early successional scrub/shrub created by fire or woodland clearing. Vireos are opportunistic foragers, however, they prefer insect larvae and seeds (Grzybowski 1995). A description of breeding, nesting, and feeding characteristics can be found in Grzybowski 1995, Graber 1961, and Service 1991.

Vireos breed from Oklahoma south through central Texas and west to the Trans-Pecos and south to central Coahuila, Mexico (Graber 1961, Oberholser 1974, Farquhar 2005) and winter on the Pacific slope of Mexico. See Farquhar 2005 for description of vireo habitat and distribution in Mexico. By mid-September, vireos begin their migration south, beginning with females and young and followed by adult males (Graber 1957, Oberholser 1974).

Vireo populations have been extirpated in Kansas, and have been reduced in Oklahoma, suggesting habitat loss and parasitism by the brown-headed cowbird may be particularly prevalent in this part of the species’ range (Grzybowski 1995). The Service (1991) lists the two main threats to this species as cowbird parasitism and suppression of natural processes, like fires.

No comprehensive population estimates for black-capped vireos have been done due to variable and incomplete sampling. Sexton et al. (1989) summarizes the historical status of the vireo in the Texas. Surveying for occurrence is limited by the ability to gain access to private property (Marshall et al. 1985). The Service is currently completing a comprehensive status review and expects to have a better understanding of black-capped vireo populations in Texas.

The recovery plan (Service 1991) divides the range into six regions in Texas and one each in Oklahoma and Mexico. In order to be reclassified from endangered to threatened, it calls for protection of: (1) sufficient habitat to support at least one self-sustaining population in four of the six Texas regions and one each in Oklahoma and Mexico, and (2) sufficient and sustainable area and habitat on the winter range exists to support the breeding population. The Service (1996) suggests a minimum population of 1,000 breeding pairs would be necessary to conserve one viable population with a low probability of extinction, and Hayden et al. (2001) suggests these pairs occupy about 4,166 hectares (10,290 acres). Currently, there are only four black-capped vireo populations receiving some degree of protection: Fort Hood Military Reservation in Bell and Coryell counties, Kerr Wildlife Management Area in Kerr County, Camp Bullis in Bexar County, and BBNP. Habitat protection and management to support populations must include elements of both breeding and non-breeding habitat, like associated uplands and migration corridors.

Population viability analyses on this species have indicated the most sensitive factors affecting their continued existence are brood parasitism by brown-headed cowbirds and loss and fragmentation of habitat, including certain range management practices, fire suppression, and urbanization (Service 1996).

Chisos Mountain hedgehog cactus

The Chisos Mountain hedgehog cactus was federally listed as endangered in 1988 (53 FR 38453 - 38456). Single, cylindrical stems are green to blue-green in the spring and summer, which turn reddish-maroon in the winter (Service 1993). Typically, this species grows to about 25 centimeters (10 inches) high. Spines are relatively sparse. The flower petals are deep red at the base and have white tips (Evans 1986). This species flowers from March to early June, and fruits from May to August (Heil and Anderson 1982b). The conspicuous fruits are fleshy and green-red (Heil and Anderson 1982a). Little else is known about the phenology or reproductive biology. A pollinator has not been identified (Heil and Anderson 1982a), and seed dispersal mechanisms are unknown.

The known range of this species in the U.S. is restricted to BBNP. Heil and Anderson (1982b) and Heil and Brack (1988) stated that the species had not been found in Mexico. However, Taylor (1985) and Anderson (2001) describe the distribution of the cactus as west Texas and south into Coahuila and Durango, Mexico. TPCC (2003) and Jackie Poole (Texas Parks and Wildlife Department, pers. comm. 2004) state the specimens in Mexico are of the variety *fobeanus*, not *chisoensis*.

This species is threatened by infestation of non-native buffelgrass, particularly along arroyos. Guertin and Halvorson (2004) found buffelgrass growing in proximity to the cactus, particularly on the north side of Route 12. While this species is normally not threatened by fire due to the lack of flammable fuel load in its typical habitat, buffelgrass is flammable, and there is concern that it could carry a fire and threaten individual cacti in close proximity. Typically, Chisos Mountain hedgehog cactus is found growing under creosote bush (*Larrea tridentate*) or among dog cholla (*Opuntia schottii*) (Kathy Rice, Desert Botanical Garden, pers. comm. 2005, Service 1988).

The recovery plan (Service 1993) cites illegal collecting as the most immediate threat to the Chisos Mountain hedgehog cactus. There is evidence that poaching of rare cactus species in BBNP is continuously occurring (Betty Alex 2005 and Mike Fleming 1993, Big Bend National Park, pers. comm.). Rees (1988) also speculates that habitat degradation from former grazing, climate change, or other unknown factors may be limiting seed establishment. The decline of grasses due to fire suppression and overgrazing may have resulted in the cactus becoming associated with “nurse plants” (Heil and Anderson 1982b, Service 1988). Delisting criteria in the recovery plan state that 50 distinct populations of at least 100 reproductive individuals are established within a minimum area of 4-8 hectares (10-20 acres). These populations must demonstrate stability and reproductive success over a period of at least 10 years (Service 1993).

Mexican long-nosed bat

The Mexican long-nosed bat was federally listed as endangered in 1988 (53 FR 38456 – 38460) by the U.S, and as endangered by Mexico in 1991. It is about 70-90 millimeters (2.75-3.75 inches) long, and weighs 18-30 grams (0.5-1.0 ounces) (Wilson 1985). The coloration is usually yellowish-brown or gray above, and cinnamon brown below (Service 1995). Diagnostic features which distinguish this species from the lesser long-nosed bat include a long snout and tongue, a short tail, and hairs extending beyond the edge of the interfemoral membrane (Service 1994). Hensley and Wilkins (1988) provides a complete species description.

The bat was first discovered in the U.S. in 1937 at Emory Cave, at an elevation of 2,286 meters (7,500 feet), in the Chisos Mountains in BBNP (Borell and Bryant 1942). This is the only known roosting location for this species in Texas, and the only known maternity roost site in the U.S. One other day roost site was discovered in 2004 in the Animas Mountains in Hidalgo County, New Mexico (Bogan et al. 2004). The numbers of Mexican long-nosed bats using Emory Cave fluctuates annually from zero to 13,650 (Davis and Schmidly 1994). This species has also been reported from the Chinati Mountains in Presidio County, Texas (Mollhagen 1973, Schmidly 1977) and New Mexico (Jones and Findley 1963), but no roost sites are known at either of these locations. This species is found in Emory Cave from June through August (Campbell 1995, Service 1995).

Mexican long-nosed bats are found in desert scrub vegetation containing agaves, mesquite (*Prosopis glandulosa*), and a variety of cacti. At BBNP, they are associated with (1) arroyo-mesquite-acacia at 549-1,219 meters (1,800-4,000 feet); (2) lechuguilla-creosotebush-cactus at 549-1,067 meters (1,800-3,500 feet); (3) deciduous woodland at 1,128-2,377 meters (3,700-7,800 feet); (4) pinyon-juniper-oak woodland at 1,128-2,377 meters (3,700-7,800 feet); and (5) cypress-pine-oak at 1,768-2,195 meters (5,800-7,200 feet) (Campbell 1995).

Peak years for this species in BBNP may be the result of low flower production of agaves in Mexico (Easterla 1972). These bats feed on agave nectar and cross-pollinate the flowers of the agave, resulting in a mutualistic relationship that both species depend on to survive (Davis and Schmidly 1994). Most of the agave populations in the Chisos Mountains occur above 1,200 meters (4,000 feet) in elevation (England et al. 2003). This species probably feeds on lechuguilla (*Agave lechuguilla*) at lower elevations, and century plants (*Agave harvardiana*) at higher elevations in the Chisos Mountains (Higginbotham and Ammerman 2002). Bat Conservation International (BCI) confirmed the existence of a “nectar corridor”, stretching approximately 530 kilometers (330 miles) from the El Infierno maternity roost in Nuevo Leon, Mexico to Emory Cave, which the Mexican long-nosed bat may use on its northward migration (England et al. 2003).

There are no records of pregnant females in Emory Cave (Schmidly 1977). It is thought that young are born April through June in central Mexico (Easterla 1972, Schmidly 1977) and migrate with their mothers to northern Mexico and southern Texas and New Mexico (Campbell 1995). The normal litter size is one (Davis 1974). Howell (1988) describes their wintering

grounds in central Mexico as a lush central valley which include the *Ipomoea* and *Ceiba* tree varieties.

A recent search by BCI for potential roost structures and caves in several mountain ranges of Texas, Coahuila, western Nuevo Leon, and Tamaulipas resulted in no new Mexican long-nosed bat roosts (England et al. 2003). The only known maternity roost in Mexico is the El Infierno Cave in Cumbres de Monterrey National Park in Nuevo Leon (Arnulfo Moreno-Valdez, Instituto Tecnológico de Cd. Victoria, pers. comm. 2005). Two roosts in Tamaulipas are proposed for protection by the Mexican government (Campbell 1995).

There are indications of substantial decline in numbers of this species (Campbell 1995, Schmidly 1991, Service 1994), although the species appears stable in Mexico (Arnulfo Moreno-Valdez pers. comm. 2005). Schmidly 1991 lists disturbance of roost sites, loss of agaves, and direct killing by humans (in Mexico) as primary threats. Other probable threats include pesticides, competition, natural catastrophes, disease, and predation (Service 1994). The Recovery Plan outlines downlisting criteria that at least six populations of Mexican long-nosed bats should be protected, one in each of six regions that encompass approximately 80 percent of the species range (Service 1994). BBNP occurs in the region that includes the Trans-Pecos of Texas, northern Coahuila, and eastern Chihuahua. All other regions are in Mexico, with one in western Chihuahua that extends into southwestern New Mexico.

Environmental Baseline

The environmental baseline includes past and ongoing impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of state and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a basis to assess the effects of the FMP.

The Service recognizes the action area (the area that may be directly or indirectly affected by the proposed action) to be BBNP and a 1.6-kilometer (1 mile) buffer around the boundary to account for effects from smoke and uncontrolled fire that may cross the park boundary.

Status of the species within the action area:

Black-capped vireo

This species was first reported at BBNP by Cruickshank (1950), and the first documented breeding was by Barlow (1967). Surveys have been conducted at BBNP since 1986. Vireos have been found in Juniper Canyon, Pine Canyon, Green Gulch, Blue Creek Ranch, Casa Grande, Panther Canyon, Laguna Meadows, and the Chisos Basin (Figure 3). Casa Grande, the Chisos Basin, and Blue Creek Ranch contain portions of FMU #1. The remaining vireo habitat

is in FMU #2. Habitat in BBNP appears to be “static”, and reliant on soil factors and drier conditions (Farquhar and Maresh 1996).

Cornelius (2004) reported his impression that available habitat is not a limiting factor on black-capped vireos at BBNP, and that there are small but suitable habitat patches that are not occupied. Cornelius shows that at Fort Hood this species will readily relocate in response to disturbance. However, whether vireos will relocate to unoccupied areas in response to a fire is unclear. In addition, Armstrong (Kerr Wildlife Management Area, pers. comm. 2004) noted that due to the ruggedness of the terrain, there are probably areas of vireo habitat that are not being monitored.

The following is a summary of survey results from Maresh 2005:

Year	Territories	Nests	# fledged	Source
2000 ¹	7	?	?	Peck and Barlow 2000
2001	3	1	0	Maresh and Rowell 2001
2002	4	2	3-4	Maresh and Rowell 2002
2003	7	2	2-3	Maresh 2003
2004	11	3	5-6	Maresh 2004

In 2005, a total of 8 males and 1 female were detected in Pine Canyon, Juniper Canyon, and Green Gulch (Service 2005).

Chisos Mountain hedgehog cactus

Previous surveys of this species are detailed in Evans (1986), Alex and Norland (1987), and Norland (1987). The BA lists the cactus currently occurring in 12 populations with a total of about 1,000 plants in a 48-square kilometer (30-square mile) area within the park. The Texas Biological Conservation Data System (TBCD 2005) lists 12 element of occurrence records for this species, all within BBNP. All known cactus locations and habitat are located within FMU 2.

It appears that known populations in BBNP are declining (Heil and Anderson 1982a, Poole 1987). In accordance with the criteria outlined in the Recovery Plan, reintroduction efforts were initiated in BBNP in 2004 (Service 1993). To date, 560 seedlings and over 12,000 seeds were distributed, with an approximate survival rate of 30 percent.

Mexican long-nosed bat

Easterla 1972 provides a summary of surveys of Emory Cave since 1937. England et al. (2003) provides the following summary of surveys of Emory Cave:

- 2001: 3,000-5,000 Mexican long-nosed bats in the visually accessible portions;

¹ Surveys were completed prior to completion of nesting period. One nest with a pair incubating eggs was discovered, but the others had just started laying, were still building nests, or possibly had abandoned their nests.

- 2002: None seen, but an undetermined number heard in the inaccessible portions;
- 2003: This species was positively identified among 50-75 bats emerging, but an approximate number of Mexican long-nosed bats was not provided.

Effects of the Action

Effects of the action refer to direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

There are no previous formal consultation or endangered species take permits issued in the action area. Two prescribed fires at BBNP have escaped in the past: at Casa Grande in the Chisos Basin, burning approximately 93 hectares (230 acres); the other in the Rio Grande Village wetland, burning approximately 8 hectares (19 acres).

Direct effects:

Black-capped vireo

Individual black-capped vireos may be affected by uncontrolled wildfire through direct mortality of nestlings and fledglings which cannot fly away. It is unlikely adult vireos would be affected due to their mobility. However, nestlings and fledglings, which cannot fly, may be affected by smoke inhalation.

Anecdotal evidence suggests that fire can benefit the black-capped vireo over the long term at BBNP. Most of the potential habitat at the park is at a post-successional (“climax”) stage. Bringing vegetation to an earlier successional stage may result in a higher density of vireos breeding in the available habitat. However, this hypotheses needs to be further studied.

The area burned in the 1999 Casa Grande fire is described as “an upslope, headfire burn which virtually removed all canopy”. This area probably contained vireo habitat prior to 1999. Despite the severity of the burn, six years later this area is showing signs of being suitable for habitation by vireos (Armstrong pers. comm. 2004). However, the rate of vegetation growth is dependent on climatic factors, such as precipitation patterns and temperature. During drought periods, vegetation recovery following a fire could be impeded. Armstrong (pers. comm. 2004) suggests it may take 7-12 years for habitat in this drier west Texas area to be suitable for vireos following a burn.

A net benefit to the vireo can result from the restoration of areas as small as 8 hectares (20 acres) if it is within 30 kilometers (19 miles) of occupied habitat patches (Wolfe 2004). As noted

before, not all potential habitat at BBNP is occupied, so restoration through the use of controlled burns or wildfire of unoccupied areas may not benefit this species in the park. The amount of unoccupied habitat is probably the result of the location of BBNP, which is at the western edge of the species breeding range. Nevertheless, vireo density in occupied habitat at the park probably closely resembles that at Rancho La Escondida in neighboring Coahuila, Mexico, where an estimated 3.29 singing males per hectare (approximately 1.28 singing males per acre) was recorded in 2003. This is approximately three times the commonly accepted density in central Texas (Farquhar et al. 2003). Habitat at BBNP probably more closely resembles that in Coahuila, resulting in a higher density of occupation at BBNP than what is typical in central Texas.

Chisos Mountain hedgehog cactus

Individual cacti may be directly affected by fire from buffelgrass burning in proximity. Currently, it is unknown how much of the areas occupied by Chisos Mountain hedgehog cactus are infested with buffelgrass. Only those areas that are infested with buffelgrass have enough fuel to carry a fire that may adversely affect this species.

Mexican long-nosed bat

Although Mexican long-nosed bats in Emory Cave could be directly affected by smoke, fire, or embers that occur from wildfires, no controlled burns (as described in the FMP) will occur during the roosting season of the bat. The threat from fire should be reduced by the proposed thinning of vegetation outside Emory Cave as part of the fuels reduction treatments.

Because it is nectarivorous, this species' guano is more like "bird droppings" (liquid-like) (Loren Ammerman, Angelo State University, pers. comm. 2005). This results in guano that does not accumulate in piles, but evaporates quickly leaving residue that is easily dispersed. Other bats, such as fringed myotis (*Myotis thysanodes*) and Townsend's big-eared bats (*Corynorhinus townsendii*), also use Emory Cave (England et al. 2003), and are insectivorous, which may result in more flammable guano. Embers or flames can ignite these piles of guano, which may smolder for years, discouraging or eliminating bats from roosting in the cave.

Emory Cave has two openings: one "main" entrance and one "skylight" which bats use to escape when disturbed. This results in a constant "breeze" through the cave. Mexican long-nosed bats roost in an upper level of the cave on a high ceiling (Service 1994), which may make it easier to escape through the "skylight" if disturbed by smoke from fires or burning embers. However, young bats may not be able to escape. It is unclear if these openings provide sufficient ventilation to prevent the bats from being affected by smoke inhalation.

*Indirect effects:*Black-capped vireo

Black-capped vireos may be indirectly affected by inhaling smoke from a nearby fire, even if it does not directly encroach on their habitat. It is unlikely adult black-capped vireos will be affected by smoke inhalation from wildfire due to their high mobility.

The primary food source for black-capped vireos are insects associated with the deciduous trees in which the species nests. The vireo could be indirectly affected by loss of the prey base as trees are burned.

Mexican long-nosed bat

Fire may affect this species by reducing the amount of agaves used as food. There are approximately 20,775 hectares (51,337 acres) of primary and 28,839 hectares (71,263 acres) of secondary agave habitat available for the Mexican long-nosed bats to feed from in BBNP (Betty Alex pers. comm. 2005). It appears agaves are fire-adapted. They reproduce sexually and asexually, and they commonly resprout from rhizomes after a fire (Benson and Darrow 1981, Freeman 1973, Gentry 1972). The apical meristem (growing point) of agaves is usually protected from fire by leaves that cluster around it (McPherson 1995). Fire may open up areas of dense vegetation, leaving larger areas for agave seeds to land and favoring recruitment by reducing competition with other plants (Howell 1996).

A study on *Agave palmeri* in Arizona showed that agaves burned in a hot June fire had a faster stalk growth rate and produced a higher volume and concentration of nectar than in a control plot. This suggests that fire occurring within the reproductive period may release nutrients which agave quickly take up, reflecting a more robust growth stalk and more flowers, which may benefit the MLNB. However, the same study also found higher mortality of young plants which were not protected from fire by leaves. Visitation by animals was also higher in burned plots, resulting in pressure on seedlings from feeding and trampling (Howell 1996).

The primary bat foraging areas for Mexican long-nosed bats are in the Chisos Basin in FMU #2. The areas of highest concern are those closest to Emory Cave, as it appears visitation rates to agaves are directly correlated to distance from the roost site; that is, bats more frequently visit agaves closest to the roost site. It is thought that the bats visit these closer areas of agaves first to gain energy before beginning their nightly commute to more remote areas (Ober and Steidl 2004). Therefore, hot, destructive wildfire in those foraging areas closest to Emory Cave could cause the most negative effects to the species.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Almost no cumulative effects are expected to occur in the portion of the action area within the park boundaries. The remaining 1.6-kilometer (1-mile) buffer is not expected to experience significant development due to its remote location from major metropolitan areas. The only towns within or near this buffer are Terlingua and Lajitas, both located near the western boundary of the park. Most, if not all, of the buffer area is privately owned. Big Bend Ranch State Park and Big Bend State Natural Area occur in proximity, but not within this buffer.

Brewster County is sparsely populated with 9,247 residents in 2003, a 4.3 percent increase from the 2000 population (U.S. Census Bureau 2005). There were about 1.4 persons per square mile in Brewster County in 2000, compared to the state average of 79.6 persons per square mile.

CONCLUSION

The conclusion of this biological opinion is based on full implementation of the project as described in the BA, EA, and the Summary of the Proposed Action in this document. This includes the conservation measures that were incorporated into the project design.

The Service has determined that the project, as proposed, is not likely to jeopardize the continued existence of the black-capped vireo, Chisos Mountain hedgehog cactus, or the Mexican long-nosed bat. No critical habitat has been designated for any of the species, therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act

provided that such taking is in compliance with the terms and conditions of this incidental take statement.

As discussed above, sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act and the implementing regulations prohibit the removal and reduction to possession of federally listed threatened or endangered plants or the malicious damage of endangered plants on areas under federal jurisdiction, or the destruction of endangered plants on non-federal areas in violation of state law or regulation or in the course of any violation of a state criminal trespass law.

Amount or Extent of Take Anticipated

Black-capped vireo

Incidental take that may result from prescribed burning is expected to be in the form of harm through habitat alteration or destruction, which may cause vireos to avoid breeding or feeding in recently burned areas. Direct take may result from the non-suppression of wildfire if it encroaches upon occupied habitat during the March 1-August 15 breeding season.

Based on Figures 2 and 7 of the BA, it appears most areas of occupied habitat are not proposed for prescribed burning. Based on our estimate of 297 hectares (735 acres) of total habitat, an estimated density of 1 territory per 0.8 hectares (2 acres), and the staggered schedule of prescribed fire over 8 years, the Service anticipates up to 2 black-capped vireo territories could be taken from loss of habitat per year in BBNP, for a total of 14 (beginning in 2005 through 2012), as a result of prescribed fire.

No take from wildfire should occur, assuming suppression occurs before wind and moisture limits are exceeded and fuel reduction efforts are successful at averting a catastrophic wildfire. In the event of a wildfire under conditions that exceed wind and moisture criteria (see Table II-7 of the EA), the Service should be notified immediately to determine if emergency consultation is necessary.

Mexican long-nosed bat

The Service anticipates incidental take of Mexican long-nosed bats will be difficult to detect due to the following reasons: the species roosts in habitat (i.e., Emory Cave) that makes detection difficult; the amount and extent and feeding (agave) habitat is extensive; and the species can travel far distances from Emory Cave to feed. However, the following level of take of this species can be anticipated by loss of an unquantifiable amount of feeding habitat and effects to roosting individuals in Emory Cave from naturally-ignited and prescribed fire. The Service anticipates take in the form of harm, harassment, or direct take of up to 5 Mexican long-nosed bats per year from the proposed action. Because the population of this species varies widely year

to year at Emory Cave, we are unable to determine a percentage of the overall population this amount of take entails.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize incidental take of black-capped vireos and Mexican long-nosed bats:

1. Harm and harassment of black-capped vireos or Mexican long-nosed bats during activities associated with burn implementation and wildfire suppression will be minimized; and,
2. Effects of temporary losses and degradation of breeding and foraging habitat for black-capped vireos and Mexican long-nosed bats will be minimized.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, BBNP must comply with the following terms and conditions, which implement the RPMs described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

The following terms and conditions implement both RPMs:

- All conservation measures outlined in the BA will be strictly adhered to. If any deviation from these measures occurs, the Service must be consulted.
- BBNP fire and science and resource management staff must closely coordinate on wind and moisture criteria for wildfire suppression and prescribed burns to reduce unintended impacts to vireo and bat habitat.
- Avoid all prescribed burning within 1.6 kilometers (1 mile) of black-capped vireo habitat during vireo breeding season (March 15 – August 31) to avoid direct take. Do not burn more than half of the habitat outside of the breeding season in any of the currently or previously occupied areas (Juniper Canyon, Pine Canyon, Green Gulch, Blue Creek Ranch, Casa Grande, Panther Canyon, Laguna Meadows, and the Chisos Basin).

The RPMs, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the RPMs provided. NPS must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the RPMs.

Reporting requirements:

- The Service will be notified immediately of any wildfires or prescribed fires that escape or otherwise exceed wind and moisture criteria within known or potential black-capped vireo or Mexican long-nosed bat breeding, feeding, or foraging habitat.
- Written annual reports of the year's activities will be submitted by October 1 of each year (until the next revision of the FMP) to our office and to the U.S. Fish and Wildlife Service, P.O. Box 1306, Room 4102, Albuquerque, New Mexico 87103. These reports must include: schedule of prescribed burns, research results from prescribed and wildfire, and survey results (including maps of surveyed areas) for black-capped vireos and Mexican long-nosed bats.

Conservation Recommendations

Section 7(a)(1) of the Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

- Implement further study on effects to black-capped vireos from cowbirds. Cowbirds have been seen in areas of occupied habitat (Cornelius 2004), and parasitism on vireos has been documented in BBNP (Maresh and Hernandez 1999, Peck and Barlow 2000, Wauer 1973) and in neighboring Coahuila (Farquhar 2005). Cowbird control has been shown to reduce parasitism rates at Fort Hood (Summers and Norman 2003).
- BBNP should consider using call boxes to attract black-capped vireos to areas of potential, but unoccupied habitat, following prescribed fire and when the habitat is determined to be suitable for occupation by this species. Call boxes should not be placed in or adjacent to habitat that is threatened by severe stand-replacing wildfire, i.e. areas with high fuel load. This method has proven successful at Fort Hood at attracting vireos to potential habitat.
- Continue the efforts to eradicate buffelgrass from those areas that support Chisos Mountain hedgehog cactus.
- Work with Bat Conservation International for the benefit of the Mexican long-nosed bat.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of implementation of any conservation recommendations.

Reinitiation Notice

As provided in 50 CFR Sec. 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new

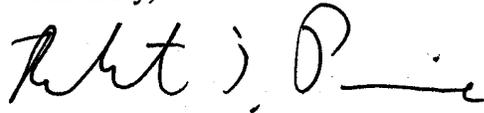
Mr. John H. King

17

information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this biological opinion; or, (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

This concludes formal consultation on the proposed Big Bend National Park Fire Management Plan. If you have any questions regarding this draft Biological Opinion, please contact Jana Milliken at 512-490-0057, extension 243, or jana_milliken@fws.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert T. Pine". The signature is written in a cursive style with a large initial "R" and a long horizontal stroke at the end.

Robert T. Pine
Supervisor

Literature Cited

Alex, T. and J.E. Norland. 1987. Survey of *Echinocereus Riechenbachii* var. *Chisoensis* on the River Road East. Report for Big Bend National Park, Texas.

Anderson, E.F. 2001. The Cactus Family. Timber Press. Portland, Oregon.

Barlow, J.C. 1967. Nesting of the black-capped vireo in the Chisos Mountains, Texas. Condor 69: 605-606.

Benson, L.D. and R.A. Darrow. 1981. Trees and shrubs of the southwestern deserts. 3rd edition, University of Arizona, Tucson.

Bogan, M.A., R. Sherwin, J.S. Altenbach, and P.M. Cryan. 2004. Conservation studies of long-nosed bats (*Leptonycteris* spp.) in New Mexico. Unpublished data, 2004 annual report to U.S. Fish and Wildlife Service under Federal permit no. TE008233-0. Albuquerque, New Mexico.

Borell, A.E. and M.D. Bryant. 1942. Mammals of the Big Bend area of Texas. University of California Publ. Zool. 48:1-62.

Campbell, Linda. 1995. Endangered and Threatened Animals of Texas – Their Life History and Management. Texas Parks and Wildlife Department.

Cornelius, J. 2004. Report on Black-capped vireos in Big Bend National Park – Appendix II. Environmental Division – Fort Hood, Texas.

Cruickshank, A. 1950. Records from Brewster County, Texas. Wilson Bulletin 62:217-219.

Davis, W.B. 1974. The Mammals of Texas. Bulletin of Texas Parks and Wildlife Department 41: 1-294.

Davis, W.B. and D. J. Schmidly. 1994. The Mammals of Texas (Revised). Texas Parks and Wildlife Department.

Easterla, D.A. 1972. Status of *Leptonycteris nivalis* (Phyllostomatidae) in Big Bend National Park, Texas. Southwestern Naturalist 17:287-292.

England, A.E., A. Moreno-Valdez, D. Dalton, S. Wolf, M. Goodman, and B. Keeley. 2003. Identification and Protection of Roosts and Foraging Areas for the Mexican long-nosed bat: Northeastern Mexico and the Trans-Pecos Region of Texas. Section 6 report, WER 68, Grant No. E-18, submitted to Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, and the National Park Service.

Evans, D.B. 1986. Survey of Chisos pitaya (*Echinocereus reichenbachii* var. *chisoensis*). U.S. Park Service, Big Bend National Park, Texas.

Farquhar, C.C. and J.P. Maresh. 1996. Population biology and habitat characterization of black-capped vireo population at Dolan Falls Ranch Preserve, Val Verde County, Texas. A year one final report to the Nature Conservancy of Texas.

Farquhar, C.C., J.I. Gonzalez, M.A. Guerrero, and O. Ballesteros. 2003. Breeding habitat, distribution, and population status of the black-capped vireo in northern Mexico. INTERIM Section 6 report, WER 65, Grant No. E-17, submitted to Texas Parks and Wildlife Department and U.S. Fish and Wildlife Department.

Farquhar, C.C. 2005. Breeding habitat, distribution, and population status of the black-capped vireo in northern Mexico. DRAFT Final Section 6 report, WER 65, Grant No. E-17, submitted to Texas Parks and Wildlife Department and U.S. Fish and Wildlife Service.

Freeman, C.E. 1973. Some germination responses of lechuguilla (*Agave lechuguilla*). Southwestern Naturalist 18:125-134.

Gentry, H.S. 1972. The agave family in Sonora. U.S. Department of Agriculture, Agricultural Research Service Handbook, No. 399.

Graber, J.W. 1957. A bioecological study of the black-capped vireo (*Vireo atricapillus*). Ph.D. Dissertation, University of Oklahoma, Norman.

Graber, J.W. 1961. Distribution, habitat requirements, and life history of the black-capped vireo. Ecological Monographs 31: 313-336.

Grzybowski, J.A. 1995. The Birds of North America: Black-capped vireo (*Vireo atricapillus*). No. 181.

Guertin, P. and W. Halvorson. 2004. Report on field mapping of *Pennisetum ciliare* in Big Bend National Park, 2003 & 2004.

Hayden, T.J., J.D. Cornelius, H.J. Weinberg, J.L. Jette, and R.H. Melton. 2001. Endangered species management plan for Fort Hood, Texas; FY 01-05. Construction Engineering Research Laboratory ERDC/CERL TR-01-26.

Heil, K.D. and E.F. Anderson. 1982a. Determination that *Echinocereus chisoensis* is threatened. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

_____. 1982b. Status Report (Contract 14-16-0003-81-216). U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Heil, K.D. and S. Brack. 1988. The cacti of Big Bend National Park. *Cactus and Succulent Journal* 60(1):17-34.

Hensley, A.P. and K.T. Wilkins. 1988. *Leptonycteris nivalis*. The American Society of Mammalogists Publication No. 307:1-4.

Higginbotham, J.L. and L.K. Ammerman. 2002. Chiropteran community structure and seasonal dynamics in Big Bend National Park. Special Publication, Museum of Texas Tech University, No. 44.

Howell, D.J. 1988. Report on *Leptonycteris nivalis* for Big Bend National Park – Population estimate for 1988, census methods, management recommendations, general biology, and bibliography. Wilcox, Arizona.

_____. 1996. *Agave palmeri* on Ft. Huachuca – five years of research on natural history and response to fire. Report for the U.S. Army Garrison at Ft. Huachuca, Arizona. Contract # DAEA 1890C0079.

Johnson, R. 2001. Effects of fire on *Agave palmeri*. Masters thesis. Biochemistry and Molecular Physics, University of Arizona, Tucson, Arizona.

Jones, C. and C.J. Findley. 1963. The long-nosed bat in New Mexico. *Southwestern Naturalist* 8: 174-5.

Maresh, J.P. 2003. Survey of black-capped vireo, Big Bend National Park, Brewster County, Texas. Spring 2003. Section 6, WER 61, Grant No. E-15 files.

_____. 2004. Survey of black-capped vireo, Big Bend National Park, Brewster County, Texas. Spring 2004. Environmental Defense, Austin. Section 6, WER 61, Grant No. E-15 files.

_____. 2005. Census and Monitoring of Black-capped Vireo in Texas. DRAFT Final Section 6 report, WER 61, Grant No. E-15, submitted to Texas Parks and Wildlife Department and U.S. Fish and Wildlife Service.

Maresh, J.P. and D. Hernandez. 1999. Census of black-capped vireo, Big Bend National Park, Brewster County, Texas. Spring 1999. Report to National Park Service.

Maresh, J.P. and G. Rowell. 2001. Survey of black-capped vireo, Big Bend National Park, Brewster County, Texas. Spring 2001. Texas Parks and Wildlife Department. Section 6, WER 61, Grant No. E-15 files.

_____. 2002. Survey of black-capped vireo, Big Bend National Park, Brewster County, Texas. Spring 2002. Texas Parks and Wildlife Department. Section 6, WER 61, Grant No. E-15 files.

- Marshall, J.T., G.W. Lasley, C.W. Sexton, J.A. Grzybowski, and R.B. Clapp. 1985. Status Report: *Vireo atricapillus* Woodhouse, Black-capped vireo. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.
- McPherson, G.R. 1995. The role of fire in the desert grasslands. The Desert Grasslands, University of Arizona Press, Tucson.
- Mollhagen, T. 1973. Distributional and taxonomic notes on some west Texas bats. Southwestern Naturalist 17:427-430.
- Norland, J.E. 1987. Survey of *Echinocereus Riechenbachii* var. *Chisoensis* at Ernst Tinaja. Report for Big Bend National Park, Texas.
- Ober, H.K. and R.J. Steidl. 2004. Foraging rates of *Leptonycteris curasoae* vary with characteristics of *Agave palmeri*. Southwestern Naturalist 49(1):68-74.
- Oberholser, H.C. 1974. The bird life of Texas (Edgar Kincaid, editor). The University of Texas Press. Austin, Texas.
- Peck, M.K. and J.C. Barlow. 2000. Survey of the status of the black-capped vireo in Big Bend National Park, Brewster County, Texas for 2000. Royal Ontario Museum, Toronto. Section 6, WER 61, Grant No. E-15 files.
- Poole, J.M. 1987. Field survey of Big Bend National Park. Texas Natural Heritage Program.
- Rees, M.D. 1988. Final Listing Rules Approved for 25 Species. Endangered Species Technical Bulletin Vol. 13 No. 9-10.
- Schmidly, D. J. 1977. The Mammals of Trans-Pecos Texas – Including Big Bend National Park and Guadalupe Mountains National Park. Texas A&M University Press, College Station.
- Schmidly, D.J. 1991. The Bats of Texas. Texas A&M University Press, College Station.
- Sexton, C.W., G.W. Lasley, J.A. Grzybowski, and R.B. Clapp. 1989. Distribution and Status of the black-capped vireo in Texas. Draft manuscript.
- Summers, S.G. and G.L. Norman. 2003. Brown-headed cowbird removal at Fort Hood, Texas, 2002-2003. In *Endangered species monitoring and management at Fort Hood, Texas: 2003 annual report*. The Nature Conservancy, Fort Hood Project, Fort Hood, Texas.
- Taylor, N.P. 1985. The Genus *Echinocereus*. The Royal Botanic Gardens, Kew. Timber Press, Portland, Oregon.

Texas Biological Conservation Data System. 2005. Texas Parks and Wildlife Department. Special species and natural community data files and TBCD data on USGS topographic maps.

Texas Plant Conservation Conference (TPCC). Proceedings from September 17-19, 2003. Lady Bird Johnson Wildlife Center, Austin, Texas.

U.S. Census Bureau. 2005. State and County Quick Facts (Texas). Website address: <http://quickfacts.census.gov/qfd/index.html>

U.S. Fish and Wildlife Service (Service). 1988. Endangered and threatened wildlife and plants; Determination of threatened status for *Echinocereus chisoensis* var. *chisoensis*. Fed. Reg. 53 (190): 38453.

_____. 1991. Black-capped vireo (*Vireo atricapillus*) Recovery Plan. Austin, Texas.

_____. 1993. Chisos Mountain hedgehog cactus (*Echinocereus chisoensis* var. *chisoensis*) Recovery Plan. Albuquerque, New Mexico.

_____. 1994. Mexican long-nosed bat (*Leptonycteris nivalis*) Recovery Plan. Albuquerque, New Mexico.

_____. 1995. Threatened and endangered species of Texas handbook. Revised June 1995.

_____. 1996. Black-capped vireo population and habitat viability assessment report. Austin, Texas.

_____. 2005. Black-capped vireo surveys, Big Bend National Park, Brewster County, Texas, Spring 2005. Unpublished report.

Wauer, R.H. 1973. Birds of Big Bend National Park and vicinity. University of Texas Press, Austin and London.

Wilson, D.E. 1985. Status report: *Leptonycteris nivalis* (Saussure) Mexican long-nosed bat. U.S. Fish and Wildlife Service.

Wolfe, D. 2004. Black-capped vireo safe harbor in central Texas. Section 6 report, WER 82, Grant No. E-30, submitted to Texas Parks and Wildlife Department and U.S. Fish and Wildlife Service.

Figure 1

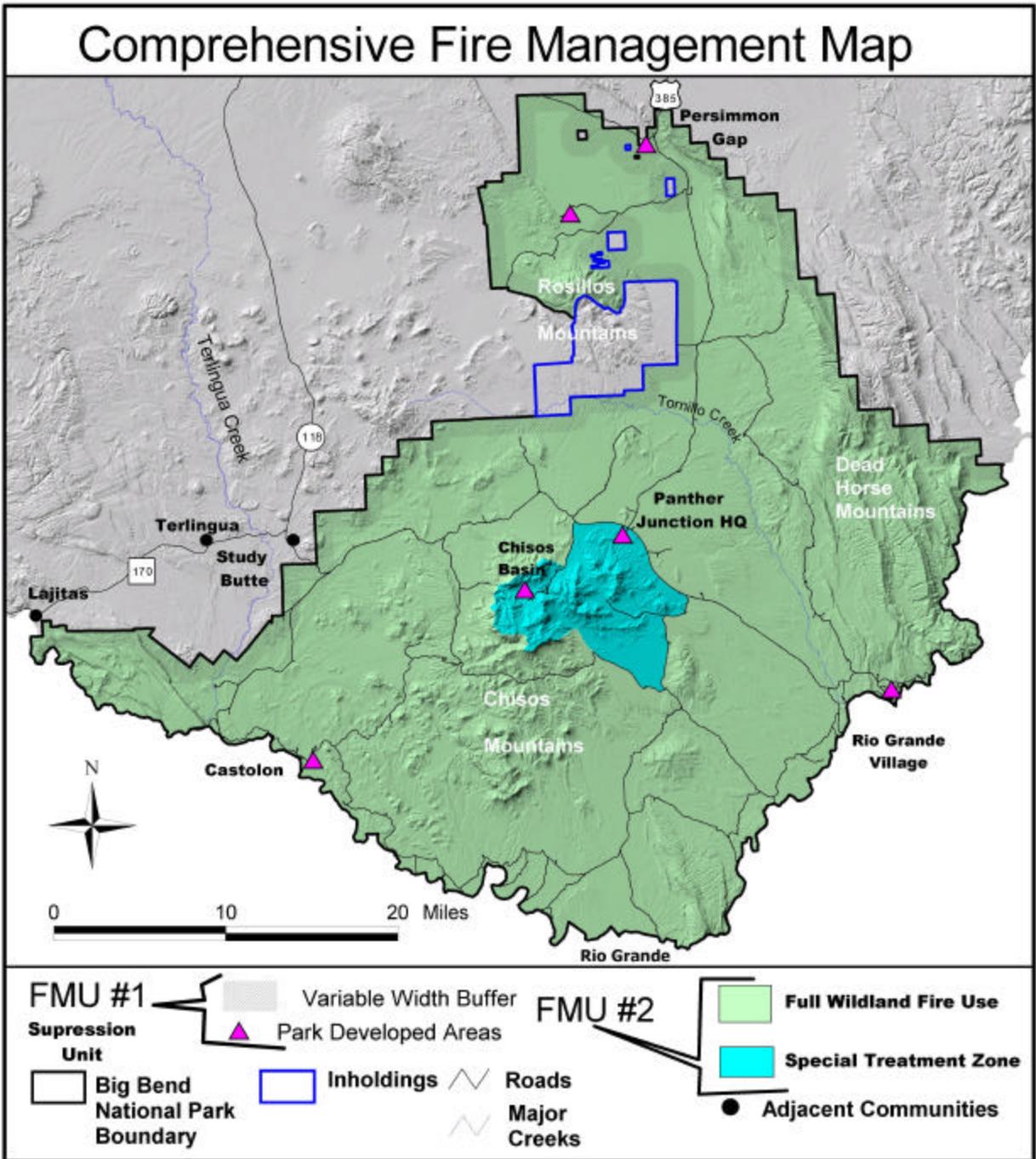


Figure 2

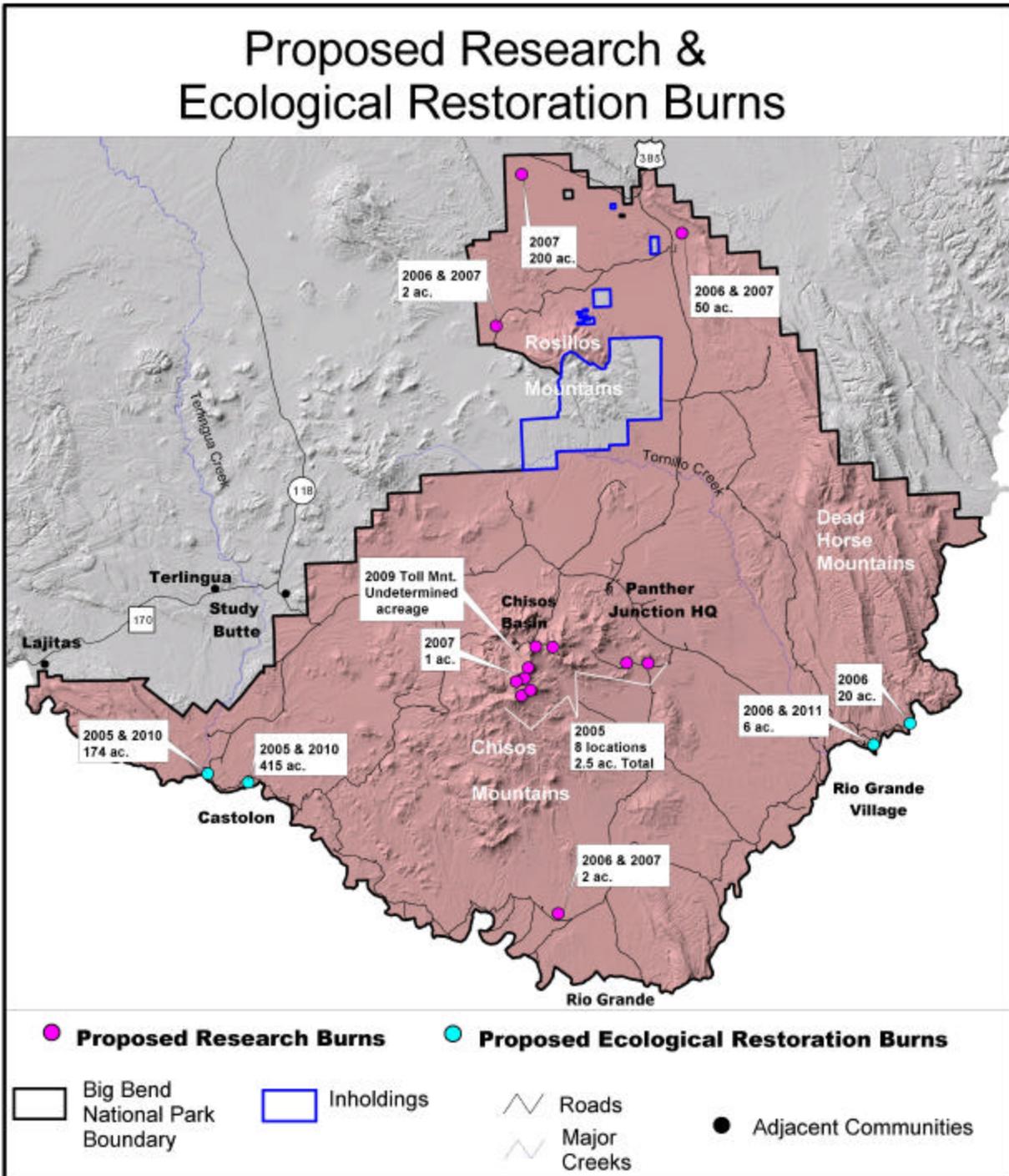


Figure 3

