State of California
Department of Fish and Wildlife

Memorandum

Date: April ~~8~~ 25, 2013

To: Sonke Mastrup
Executive Director
Fish and Game Commission

From: Charlton H. Bonham
Director

Subject: **Petition from the Center for Biological Diversity to List the Townsend's Big-Eared Bat Under the California Endangered Species Act**

The Department of Fish and Wildlife (Department) prepared the attached petition evaluation report in response to a petition from the Center for Biological Diversity, dated October 18, 2012, received by the Fish and Game Commission (Commission) on November 1, 2012 (Petition), to list the Townsend's big-eared bat (*Corynorhinus townsendii*) as a threatened or endangered species under the California Endangered Species Act (CESA). (See generally Fish and Game code §2073.5, subd. (a); Cal Code Regs., title 14, §670.1, subd. (d)(1).)

In accordance with CESA, the attached petition evaluation report delineates the categories of information required in a petition, evaluates the sufficiency of the information in the Petition, and incorporates additional relevant information that the Department possessed or received during the review period. Based upon the information contained in the Petition, the Department has determined that there is sufficient information to indicate that the petitioned action may be warranted. The Department recommends that the Petition be accepted.

If you have any questions or need additional information, please contact Dan Yparraguirre, Deputy Director of Wildlife and Fisheries Division at 916-653-4673 or Eric Loft, Chief, Wildlife Branch at 916-445-3555.

Attachment

State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

EVALUATION OF THE PETITION FROM THE CENTER FOR BIOLOGICAL DIVERSITY TO LIST TOWNSEND'S BIG-EARED BAT (*Corynorhinus townsendii*) AS THREATENED OR ENDANGERED UNDER THE CALIFORNIA ENDANGERED SPECIES ACT

March 2013

Charlton H. Bonham, Director
Department of Fish and Wildlife

EVALUATION OF THE PETITION TO LIST THE TOWNSEND'S BIG-EARED BAT (*Corynorhinus townsendii*) AS THREATENED OR ENDANGERED CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

EXECUTIVE SUMMARY

The subject of this petition evaluation is the Townsend's big-eared bat (*Corynorhinus townsendii*), which was petitioned for listing as threatened or endangered under the California Endangered Species Act by the Center for Biological Diversity in a document dated October 18, 2012. The petition accurately describes the biology and ecology of Townsend's big-eared bat.

Townsend's big-eared bat (Class Mammalia, Order Chiroptera) is in the Microchiropteran bat family Vespertillionidae. In California, the species is found throughout most of the state, from the inland deserts to the cool, moist coastal redwood forests, in oak woodlands of the inner Coast Ranges and Sierra Nevada foothills, and lower to mid-elevation mixed coniferous-deciduous forests. Distribution is patchy, and strongly correlated with the availability of caves and cave-like roosting habitat, with population centers occurring in areas dominated by exposed, cavity forming rock and/or historic mining districts. Townsend's big-eared bat prefers open surfaces of caves or cave-like structures, such as subsurface hard rock mines, and large undisturbed spaces in buildings, bridges, and water diversion tunnels.

Specific roosts may be used only one time of year or may serve different functions throughout the year (such as for maternity roosts, hibernation, or during the breeding season). Maternity colonies may use multiple sites for different stages (pregnancy, birthing, and rearing). Males remain solitary during the maternity season. Townsend's big-eared bat appears to have fairly restrictive roost requirements with temperature appearing to be critical. Townsend's big-eared bat is highly sensitive to human disturbance, however, in some instances it can become habituated to reoccurring and predictable human activity.

Foraging associations include edge habitats along streams and areas adjacent to and within a variety of wooded habitats. It is likely that Townsend's big-eared bat in California is a Lepidopteran specialist, feeding primarily on medium-sized moths.

Townsend's big-eared bat is a colonial species with maternity colonies forming between March and June (based on local climate and latitude). Colony size ranges from a few dozen to several hundred. Mating generally takes place in both migratory sites and hibernacula between September or October and February. A single pup is born between May and July. Nursery colonies start to disperse in August about the time the young are weaned, and break up altogether in September and October. Annual survival has been estimated at about 50% for young, and about 80% for adults. A longevity record of more than 21 years has been reported.

Townsend's big-eared bat is a relatively sedentary species, for which no long-distance migrations have been reported. The longest movement known for this species in California is 32.2 km (20 mi). The species may undertake local migrations to different elevations.

Hibernation sites are generally caves or mines, although animals are occasionally found in buildings. Winter roosting is typically composed of mixed-sexed groups from a single individual to several hundred or several thousand. In areas with prolonged periods of non-freezing temperatures, Townsend's big-eared bat tends to form relatively small hibernating aggregations of single to several dozen individuals). Larger aggregations (75-460) are confined to areas which experience prolonged periods of freezing temperatures. The species selects winter roosts with stable, cold temperatures.

The petition relies heavily on a state-wide survey of Townsend's big-eared bat colonies conducted from 1987-1991 to describe population trend in California. That work showed a large decline in the population size of Townsend's big-eared bat. Eighteen historically known maternity colonies with population counts were assessed in the study. Six of the colonies appeared to have been extirpated, five had declined in number of females by more than 20%, four had remained relatively constant in numbers, and three colonies had increased by more than 20%. The historical-period population estimate was 3,004 adult females and the authors estimated these colonies had declined by 55% to a total of 1,365 adult females. The authors also found a 52% decline in the total number of colonies known from the historical period to the resurveys. The recent colony size was 32% smaller than the historic colony size. Of five historically-known hibernation colonies in California, four had shown large declines in the numbers of bats present. Observations by other workers suggested a decline in the numbers of Townsend's big-eared bats in California during the 20th century.

The petition and other information on Townsend's big-eared bat abundance and distribution indicate that, although widely distributed in the state, the species occurs at higher densities in some regions than in others. The abundance of Townsend's big-eared bat in a given ecoregion seems to be primarily a function of the availability of suitable roosting habitat. Natural roost sites are caves and large old-growth trees with basal hollows. Where these occur(red), such as in the Southern Cascades and North Coast, Townsend's big-eared bat abundance is (or was) high. Anthropogenic roosts are important in many ecoregions. These human-made roosts include mines and old buildings, which are especially abundant in the Mother Lode country of the Sierra Nevada Foothills and the Deserts ecoregions.

The petition summarizes several instances in which human activities have directly impacted Townsend's big-eared bat individuals, and because of the species' life history traits, likely impacted their populations. These include loss of traditional roosting sites, both through destruction or adverse modification and disturbance, which in some cases led to abandonment of dependent young and in other cases forced the colonies to use lower quality roost sites. Disturbance at hibernacula has caused Townsend's big-eared bat to arouse and use energy reserves essential for over-winter survival. Humans have set fires in old mines and caves used as roost sites, killing individuals.

Impacts to roost sites are highlighted in the petition as an important threat to Townsend's big-eared bat. The loss of old-growth conifers with large, cavernous basal hollows during the 20th century is presented as a likely explanation for the apparent decline of Townsend's big-eared bat populations in the coastal forest of northern and central California. New and

renewed mining operations are described in the petition as having the potential to impact Townsend's big-eared bat roosting in old shaft/adit mines. The petition documents several cases in which mines were collapsed or closed without mitigation for the direct or indirect impacts to Townsend's big-eared bat colonies. Although generally considered a cave/mine roosting bat, Townsend's big-eared bat also roosts in large spaces in old buildings and in cavernous spaces in bridges and dams. Bats in such sites are subject to disturbance when humans enter for inspections or other activities. The roost sites themselves are subject to eventual deterioration or demolition. Loss of riparian habitat, which is important for foraging Townsend's big-eared bat, has been extensive in California. The petition describes the extensive urban and suburban development in California as essentially extirpating Townsend's big-eared bat from those areas.

The petition describes the emergent fungal disease White Nose Syndrome (WNS) as a potential threat to Townsend's big-eared bat. The petition describes predation on Townsend's big-eared bat by non-native species (domestic cats and black rats) as a potential threat to the species.

The petition states that, while Townsend's big-eared bat has been designated as a sensitive or special management species by several agencies, none of these designations is adequate to ensure the long-term viability of the species in California. The petition also describes the Federal Cave Resources Protection Act and associated regulations as inadequate to protect many Townsend's big-eared bat roost sites, either due to lack of enforcement (on federal lands) or lack of applicability (on private lands). The California Cave Protection Act is also described as inadequate to protect many Townsend's big-eared bat roosts, either in application or enforcement. The two major environmental review laws in effect in California, the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), are described in the petition as primarily intended to ensure disclosure of the potential impacts of proposed projects on federal, state, and private lands. The petition suggests that, because Townsend's big-eared bat does not have status as a listed species, most projects reviewed under NEPA or CEQA do not adequately address potential impacts to the species nor are meaningful mitigation measures or more benign alternative projects implemented.

As described in the petition, human disturbance in caves and mines is the most widely cited reason for the abandonment of historical Townsend's big-eared bat roost sites. The primary threats to Townsend's big-eared bat of recreation in caves and mines listed in the draft California Bat Conservation Plan are disturbance of roosting bats that results in displacement of the colony, reduced reproductive success, or death; deliberate vandalism that kills or injures bats; and the introduction of pathogens, particularly the fungus that causes White Nose Syndrome. The petition suggests that, as California's human population continues to grow, the impact of recreational activities and vandalism in and near Townsend's big-eared bat roost sites will continue to increase.

Other potential threats described in the petition include loss of native vegetation, environmental contamination of water and prey through the application of pesticides and chemicals for mineral processing, wind energy developments, artificial lighting, pest control activities, small population size, and climate change. A lack of a comprehensive conservation or

management strategy for Townsend's big-eared bat across all California agencies and landowners is described as a threat to the species.

The petition recommends 12 actions intended to reduce the identified threats to the species and to monitor the status of the species in the future.

Having reviewed and evaluated relevant information, including the material referenced in the petition and other information in the Department's possession, the Department believes there is sufficient scientific information available at this time to indicate that the petitioned action may be warranted.

INTRODUCTION

Candidacy Evaluation Process

CESA sets forth a two-step process for listing a species as threatened or endangered. First, the Commission determines whether a species is a candidate for listing by determining whether "the petition provides sufficient information to indicate that the petitioned action may be warranted" (Fish & Game Code, § 2074.2, subd. (a)(2)). Within 10 days of receipt of a petition, the Commission must refer the petition to the Department of Fish and Wildlife (Department) for evaluation (Fish & Game Code, § 2073). The Commission must also publish notice of receipt of the petition in the California Regulatory Notice Register. (Fish & Game Code, § 2073.3) . Within 90 days of receipt of the petition, the Department must evaluate the petition on its face and in relation to other relevant scientific information and submit to the Commission a written evaluation report with one of the following recommendations:

- Based upon the information contained in the petition, there is not sufficient information to indicate that the petitioned action may be warranted, and the petition should be rejected; or

- Based upon the information contained in the petition, there is sufficient information to indicate that the petitioned action may be warranted, and the petition should be accepted and considered (Fish & Game Code, § 2073.5, subd. (a)(1)).

If the petition is accepted for consideration, the second step requires the Commission to determine, after a year-long "scientific-based review of the subject species," whether listing as endangered or threatened is or is not actually warranted (Fish & Game Code, § 2075.5.).

In *Center for Biological Diversity v. California Fish and Game Commission* (2008) 166 Cal.App.4th 597, the California Court of Appeals addressed the parameters of the Commission's discretion in its application of the threshold candidacy test. The court began its discussion by describing the candidacy test previously set forth in *Natural Resources Defense Council v. California Fish and Game Commission* (1994) 28 Cal.App.4th 1104, 1114:

As we explained in *Natural Resources Defense Council* [citation], "the term 'sufficient information' in section 2074.2 means that amount of information, when considered with the Department's written report and the comments received, that would lead a reasonable person to conclude the petitioned action may be warranted." The phrase "may be warranted" "is appropriately characterized as a 'substantial possibility that listing could occur.'" [citation] "Substantial possibility," in turn, means something more than the one-sided "reasonable possibility" test for an environmental impact report but does not require that listing be more likely than not. (*Center for Biological Diversity*, at pp. 609-10.)

The court acknowledged that "the Commission is the finder of fact in the first instance in evaluating the information in the record." (*Id.* at p. 611.) However, the court clarified:

[T]he standard, at this threshold in the listing process, requires only that a substantial possibility of listing could be found by an objective, reasonable person. The Commission is not free to choose between conflicting inferences on subordinate issues and thereafter rely upon those choices in assessing how a reasonable person would view the listing decision. Its decision turns not on rationally based doubt about listing, but on the absence of any substantial possibility that the species could be listed after the requisite review of the status of the species by the Department[.] (*Ibid*.)

The subject of this petition evaluation is the Townsend's big-eared bat (*Corynorhinus townsendii*), which was petitioned for listing as threatened or endangered under the California Endangered Species Act by the Center for Biological Diversity in a document dated October 18, 2012. The petition was received by the Fish and Game Commission on November 1, 2012. The petition was forwarded to the Department for evaluation on November 9, 2012. The Department requested of the Commission, and was granted, a 30-day extension to the 90-day petition evaluation period. This petition evaluation report is due to the Commission 120 days from the date of referral, or March 9, 2013.

The Department evaluated the sufficiency of the scientific information presented in the Petition, using information in the Petition as well as other relevant scientific information available at the time of review. Pursuant to Fish and Game Code section 2072.3 and Section 670.1(d)(1) of Title 14 of the California Code of Regulations, the Department evaluated whether the Petition includes sufficient scientific information regarding each of the following petition components:

- Population trend;
- Range;
- Distribution;
- Abundance;
- Life history;
- Kind of habitat necessary for survival;
- Factors affecting ability to survive and reproduce;
- Degree and immediacy of threat;
- Impacts of existing management;
- Suggestions for future management;
- Availability and sources of information; and
- A detailed distribution map.

The Department's review finds the petition accurately describes the biology and ecology of Townsend's big-eared bat. The following overview is primarily taken from the draft California Bat Conservation Plan (CBCP, CDFW in prep.) species account for Townsend's big-eared bat (Pierson et al. 2010):

Taxonomy and Species Distribution

Townsend's big-eared bat (Class Mammalia, Order Chiroptera) is in the Microchiropteran family Vespertillionidae, which contains the most species of the four bat families in the United States. There are two other species of *Corynorhinus*: *Corynorhinus rafinesquii,* Rafinesque's big-eared

bat and *Corynorhinus mexicanus,* the Mexican big-eared bat. The North American genus of big-eared bats now known as *Corynorhinus* was for several decades known as *Plecotus*, and much of the older scientific literature used that name.

There are five currently recognized subspecies of Townsend's big-eared bat in the United States (Handley 1959). Two of the subspecies (*C. t. townsendii* and *C. t. pallescens*) occur throughout much of western North America (including California), two (the Ozark big-eared bat, *C. t. ingens* and the Virginia big-eared bat, *C. t. virginianus*) occur in the east, and one (*C. t. australis*) is distributed primarily in Mexico, but also extends into Texas. Both of the eastern subspecies of Townsend's big-eared bat (the Ozark and Virginia big-eared bats) are listed by the U.S. Fish and Wildlife Service as Endangered.

C. t. townsendii occurs in California, Oregon, Washington, Nevada, Idaho, and possibly southwestern Montana and northwestern Utah. *C. t. pallescens* occurs in all the same states as *C. t. townsendii*, plus Arizona, Colorado, New Mexico, Texas, and Wyoming (Handley 1959). Throughout much of their range in California, Idaho, Nevada, Oregon and Washington there are extensive zones of intergradation for the two subspecies and it is often not possible assign individuals to one subspecies or the other. In California, the species is found throughout most of the state, with populations concentrated in areas offering caves (commonly limestone or basaltic lava) or mines as roosting habitat. The species is found from sea level along the coast to 1,820 m (6,000 ft) in the Sierra Nevada (Dalquest 1947, Pearson et al. 1952, Pierson and Rainey 1998). In the White Mountains, summer records for males extend up to 2,410 m (7,900 ft), and hibernating groups have been found in mines as high as 3,188 m (10,460 ft) ((Szewczak et al. 1998). Maternity colonies are more frequently found below 2,000 m (6,560 ft) (Pierson and Fellers 1998, Szewczak et al. 1998).

Outside California it has been found to 2,400 m (7,900 ft) (Jones 1965, Jones and Suttkus 1971) and 2,900 m (9,500 ft) (Findley and Negus 1953).

Habitat Associations

Townsend's big-eared bat occurs from the inland deserts to the cool, moist coastal redwood forests, in oak woodlands of the inner Coast Ranges and Sierra Nevada foothills, and lower to mid-elevation mixed coniferous-deciduous forests. Distribution is patchy, and strongly correlated with the availability of caves and cave-like roosting habitat, with population centers occurring in areas dominated by exposed, cavity forming rock and/or historic mining districts (Genter 1986, Graham 1966, Humphrey and Kunz 1976, Kunz and Martin 1982, Perkins et al. 1994, Pierson and Rainey 1998). Its habit of roosting on open surfaces makes it readily detectable, and it is often the species most frequently observed (but often in low numbers) in caves and abandoned mines throughout its range.

<u>Roosting Habitat</u>. Townsend's big-eared bat prefers open surfaces of caves or cave-like structures, such as mine adits and shafts (Barbour and Davis 1969, Graham 1966, Humphrey and Kunz 1976). It has also has been reported in such structures as buildings, bridges, and water diversion tunnels that offer a cavernous environment (Barbour and Davis 1969, Dalquest 1947, Howell 1920, Kunz and Martin 1982, Pearson et al. 1952, Perkins and Levesque 1987, Brown et al. 1994, Pierson and Rainey 1998). It has been found in rock crevices and, like a

number of bat species (Gellman and Zielinksi 1996), in large hollow trees (Fellers and Pierson 2002, Mazurek 2004). Roosting structures often contain multiple openings. The species seems to prefer dome-like areas, possibly where heat or cold is trapped (warm pockets for maternal roosting, cold pockets for hibernation).

Specific roosts may be used only one time of year or may serve different functions throughout the year (such as for maternity roosts, hibernation, or during the breeding season). Roosting surfaces often occur in locations with partial light during the day; however, some roost surfaces have been found very deep inside caves or mines. There is evidence that maternity colonies may use multiple sites for different stages (pregnancy, birthing, and rearing) (Pierson et al. 1991). Males remain solitary during the maternity season.

Townsend's big-eared bat appears to have fairly restrictive roost requirements (Humphrey and Kunz 1976, Perkins et al. 1994, Pierson et al. 1991). Roost temperature appears to be critical (Lacki et al. 1994, Pearson et al. 1952, Pierson and Rainey 1998). Temperatures vary in maternity roosts throughout California from 19°C (66°F) in cooler regions to 30°C (86°F) in warmer southern regions (Pierson et al. 1991). Some colonies are known to change roosts during the maternity season, using cooler roosts earlier in the year (Pierson et al. 1991, P. Brown pers. comm., V. Dalton pers. comm.) and using warmer roosts after pups are born. Roost dimensions are also important. The majority of the roosts examined in California are fairly spacious, at least 30 m (100 ft) in length, with the roosting area located at least 2 m(6.5 ft) above the ground, and a roost opening at least 15 cm by 62 cm (6 inches by 24 inches) (Pierson et al. 1991). Maternity clusters are always situated on open surfaces, often in roof pockets or along the walls just inside the roost entrance, within the twilight zone.

Townsend's big-eared bat is highly sensitive to disturbance from the sight and sound of human activity in or near roosting locations. Human disturbance of roost sites has been documented to cause temporary or permanent abandonment of roost sites, however, in some instances the species can become habituated to reoccurring and predictable human activity.

<u>Foraging Habitat</u>. Foraging associations include edge habitats along streams and areas adjacent to and within a variety of wooded habitats (Brown et al. 1994, Fellers and Pierson 2002, Pierson et al. 2002). Recent radiotracking and light-tagging studies have found Townsend's big-eared bat foraging in a variety of habitats. Brown et al. (1994) showed that on Santa Cruz Island in California, they avoided the lush introduced vegetation near their day roost, and traveled up to 5 km (3 mi) to feed in native oak and ironwood forest. P. Brown (pers. comm.) also documented *Corynorhinus* foraging in desert canyons with water on the west slopes of the Panamint Mountains in Inyo County. Radiotracking and light-tagging studies in northern California have found Townsend's big-eared bat foraging within forested habitat (Rainey and Pierson 1996), within the canopy of oaks (E. Pierson and W. Rainey unpubl. data), and along heavily vegetated stream corridors, avoiding open, grazed pasture land (G. Fellers pers. comm.). In Oklahoma, *C. t. ingens* preferred edge habitats (along intermittent streams) and open areas (pastures, agricultural fields, native grass) over wooded habitat (Clark et al. 1993). Light-tagging studies in West Virginia (V. Dalton pers. comm.) showed a bimodal foraging pattern for *C. t. virginianus*, with animals foraging over hayfields during the first part of the night, and within the forest later in the night, traveling up to 13 km (8 mi) from the day roost. Townsend's big-

eared bat has been known to travel up to 24 km (15 m) from their roost sites while foraging (Dobkin et al. 1995). They forage as long as weather permits in the fall, and are periodically active in winter (Pierson et al. 1991). They have been observed flying in a snowstorm (G. Tatarian, pers. comm.).

Although diet has not been examined in detail for any California populations, it is likely that Townsend's big-eared bat here, as elsewhere, is a Lepidopteran specialist, feeding primarily (>90% of the diet) on medium-sized moths (Dalton et al. 1986, Ross 1967, Sample and Whitmore 1993, Whitaker et al. 1977, 1981).

Life History

Reproduction. Townsend's big-eared bat is a colonial species with maternity colonies forming between March and June (based on local climate and latitude). Colony size ranges from a few dozen to several hundred. Mating generally takes place in both migratory sites and hibernacula between September or October and February. "Swarming" has been observed in the Mojave Desert in the latter half of September (P. Brown pers. comm.). Females are generally reproductive in their first year, whereas males do not reach sexual maturity until their second year. Gestation length varies with climatic conditions, but generally lasts from 56 to 100 days (Pearson et al. 1952). Some evidence shows that maternity colonies may have up to three different sites for given stages – one each for pregnancy, birthing, and rearing. A single pup is born between May and July (Easterla 1973, Pearson et al. 1952, Twente 1955). Townsend's big-eared bat pups average 2.4 g at birth, nearly 25% of the mother's postpartum mass (Kunz and Martin 1982). Young bats are capable of flight at 2.5 to 3 weeks of age and are fully weaned at 6 weeks (Pearson et al. 1952). Nursery colonies start to disperse in August about the time the young are weaned, and break up altogether in September and October (Pearson et al. 1952, Tipton 1983). Pearson et al. (1952) estimated annual survival at about 50% for young, and about 80% for adults. Band recoveries have yielded longevity records of 16 years, 5 months (Paradiso and Greenhall 1967) and 21 years, 2 months (Perkins 1994).

Migration/Hibernation. Townsend's big-eared bat is a relatively sedentary species, for which no long-distance migrations have been reported (Barbour and Davis 1969, Humphrey and Kunz 1976, Pearson et al. 1952). The longest movement known for this species in California is 32.2 km (20 mi) (Pearson et al. 1952). There is some evidence of local migration, perhaps along an elevational gradient.

Hibernation sites are generally caves or mines (Pearson et al. 1952, Barbour and Davis 1969), although animals are occasionally found in buildings (Dalquest 1947, E. Pierson pers. obs.). Deep mine shafts, known to provide significant hibernating sites in New Mexico (Altenbach and Milford 1991), may also be important in California (P. Brown pers. comm.). Winter roosting is typically composed of mixed-sexed groups from a single individual to several hundred or several thousand, however, behavior varies with latitude. In areas with prolonged periods of non-freezing temperatures, Townsend's big-eared bat tends to form relatively small hibernating aggregations of single to several dozen individuals (Barbour and Davis 1969, Pierson et al. 1991, Pierson and Rainey 1998). Larger aggregations (75-460) are confined to areas which experience prolonged periods of freezing temperatures (Pierson and Rainey 1998).

Studies in the western U.S. have shown that Townsend's big-eared bat selects winter roosts with stable, cold temperatures, and moderate air flow (Humphrey and Kunz 1976, Kunz and Martin 1982). Individuals roost on walls or ceilings, often near entrances (Humphrey and Kunz 1976, Twente 1955). If undisturbed, individuals will frequently roost less than 3 m (10 ft) off the ground (Perkins et al. 1994), and have been found in air pockets under boulders on cave floors (E. Pierson, pers. obs.). Temperature appears to be a limiting factor in roost selection. Recorded temperatures in Townsend's big-eared bat hibernacula range from -2.0°C to 13.0°C (28°F to 55°F) (Humphrey and Kunz 1976, Genter 1986, Pearson et al. 1952, Pierson et al. 1991, Twente 1955), with temperatures below 10°C (50°F) being preferred (Perkins et al. 1994, Pierson and Rainey 1998). In the Mojave Desert ecoregion in the winter, hibernating Townsend's big-eared bat have been found at temperatures of 15.5°C (60°F) as these might be the coolest temperatures available (P. Brown, pers.obs). The period of hibernation is shorter at lower elevations and latitudes.

SUFFICIENCY OF SCIENTIFIC INFORMATION TO INDICATE THE PETITIONED ACTION MAY BE WARRANTED

Population Trend *(pages 26 – 29 of the petition)*
To describe Townsend's big-eared bat population trend in California, the petition relies heavily on the work conducted by Pierson and Rainey (1998) for the Department of Fish and Game. Pierson and Rainey conducted surveys of Townsend's big-eared bat maternity colonies and hibernacula throughout much of the species' range in California during the period 1987 to 1991. The authors focused primarily on maternity colonies as the best indicator of population trend. In addition to visiting and assessing the numbers of bats at all known large (> 30 females) Townsend's big-eared bat maternity colony roost sites in California, the authors also searched for additional or alternate roost sites within 15 km (9.3 mi) of the known sites. The authors also visited five known Townsend's big-eared bat hibernation sites in California and described the observations of other researchers at several other hibernation sites.

As described in the petition, the work by Pierson and Rainey (1998) showed a marked decline in the population size of Townsend's big-eared bat over the period between the original surveys of the maternity colony roost sites and the re-surveys conducted by the authors. Eighteen historically known maternity colonies with population counts were assessed in the study. The original survey years ranged from 1918 to 1974, with most of the original surveys conducted in the 1930s through 1960s. Six of the colonies appeared to have been extirpated, five had declined in number of females by more than 20%, four had remained relatively constant in numbers, and three colonies had increased by more than 20%. The authors lumped all 18 colonies' original survey counts to get a historical-period population estimate of 3,004 adult females. Based on their counts during the 1987-1991 surveys, they estimated these colonies had declined by 55% to a total of 1,365 adult females.

The authors found a 52% decline in the total number of colonies known from the historical period to the resurveys. Of 46 historically-known maternity colonies, the authors could not find 24 (either at the original site or within 15 km (9.3 mi) of the original site), which represents a 52% decrease in the number of historically-known colonies.

Additional maternity colonies were located in the period after 1980, either by the authors or reliably reported to the authors by other researchers. These colonies were sufficiently distant from historically-known colonies for the authors to conclude they were not part of the historical set. Although no conclusion about population trend could be made based on the inclusion of the additional colonies, Pierson and Rainey's (1998) point estimate for the total known adult female Townsend's big-eared bat population size in California was 4,252, distributed among 39 colonies. The authors cited reliable reports of four other colonies of unknown size. The petition cites reports and personal communications of an additional 4 maternity colonies known as of 2003, as well as observations of lactating females in areas without known colonies, suggesting there are additional maternity colonies not yet discovered.

As cited in the petition, Pierson and Rainey (1998) also compared the average size of the 18 historically-known maternity colonies to the 38 colonies with population estimates known at the time of their study. They found average number of adult females in the historical colonies to be 164, while the currently-known colonies averaged 112 females. The recent colony size was 32% smaller than the historical colony size.

Pierson and Rainey (1998) also assessed the size of five historically-known hibernation colonies in California. One of the colonies (at Lava Beds National Monument) had remained stable at approximately 30 individuals. The other four, which had original counts of between 55 and 177 bats, showed dramatic declines of between 70% and 94%. These sites were in Shasta, Lake, and Napa counties.

The petition also cited observations by Williams (1986), who was an active researcher of the conservation status of mammals in California in the latter half of the 20th century. As mentioned in the petition, Williams (1986) stated his impression that Townsend's big-eared bat had been common in central California through the 1960s, but had dramatically declined by the early 1970s. Williams (1986) mentioned that he had only captured one individual Townsend's big-eared bat during his 14 years of work in central California in the 1970s and 1980s. Other published observations of declines in Townsend's big-eared bat colonies in the Sierra Nevada and lower Colorado River area (Graham 1966, Stager 1939) are mentioned in the petition.

The information presented in the petition demonstrates that, of the 18 historically-known maternity roost sites with population counts, six of the colonies had been extirpated by the time Pierson and Rainey conducted their work. Another six colonies showed a decline in the number of adult female Townsend's big-eared bat present. Although five colonies had increased in size (and one remained stable at 50 females), the overall decline in numbers from the historical period appeared to be substantial.

The comparisons Pierson and Rainey (1998) make between historical and recent colony numbers, colony size, and total population counts suggested there had been a decline in the total population of Townsend's big-eared bat in California since the early 20th century. This decline may be substantial, but given the limited historical data set the magnitude of the population decline cannot be determined. Other information, including that cited here for population trend, in combination with other aspects of the species biology and observations of human disturbance at Townsend's big-eared bat roost sites, lead to the inference that the California Townsend's big-eared bat population has declined over the past several decades.

The Department is aware of recent or ongoing efforts to monitor or revisit several important Townsend's big-eared bat maternity and hibernation roosts in California. These efforts include monitoring at both hibernation and maternity colonies at Lava Beds National Monument (Thomas, pers. comm.), revisiting known Townsend's big-eared bat hibernacula in the White and Inyo Mountains (Szewczak et al. 1999, Morrison, pers. comm.), long-term annual counts of a maternity colony in a historical building in Shasta County (Copren, pers. comm.). There are also a number of informal efforts that compare capture and acoustical activity levels for Townsend's big-eared bat at intervals of multiple years, such as at Lava Beds National Monument (Tyburec, unpubl. data), that could be used to assess population trends.

It is important to consider that historical mining and building construction added to the total available roost habitat to the state. Assuming roost habitat is a limiting factor for Townsend's big-eared bat, it is likely that the carrying capacity for the species increased in the state with the advent of historical mining and construction of buildings. It is unknown, however, to what degree the documented populations losses at natural roost sites have been offset by presumed historical population increases at "artificial" roost sites, which have themselves have been impacted since the historical period. These tasks could be addressed as part of a 12-month status review for Townsend's big-eared bat, should it be advanced to candidacy by the Commission.

In summary, the Department concludes there is evidence indicating a possibly large population decline of Townsend's big-eared bat in California in recent decades. Analysis of existing data and synthesis of all available information would help determine whether the trend is continuing.

Range *(pages 12 – 13 of the petition)*

The petition accurately describes the geographic range of Townsend's big-eared bat as encompassing much of western North America, where it occurs from southern British Columbia, south through the Pacific Northwest and California, and extending eastward through the intermountain region to east of the Rocky Mountains and south into the Mexican mainland, where it ranges throughout the Sonoran Desert and Central Mexican Plateau. Within California, the petition correctly describes the geographic range of Townsend's big-eared bat as throughout the state, except for the highest elevations of the Sierra Nevada.

The petition does not suggest there has been a reduction in the geographic range of Townsend's big-eared bat in California, but that the abundance of Townsend's big-eared bat within its range has declined and that it distribution has become more scattered as important roost sites and colonies have been lost (see below). The Department concurs with the petition's presentation of the current geographic range of Townsend's big-eared bat as essentially unchanged since historical times.

Distribution and Abundance *(pages 14 – 26 of the petition)*

The petition bases its description of the important population areas for Townsend's big-eared bat in California on the work of Pierson and Rainey (1998), and provides a regional summary of Townsend's big-eared bat abundance and distribution based on the draft California Bat Conservation Plan (CDFW in prep.). As mentioned in the petition, Pierson and Rainey (1998) described several areas in California that had substantial populations of Townsend's big-eared bat in the past. This assessment was based on historical collection localities, descriptions of historical maternity colonies, and landform and land-use information. The areas include: the North Coast and inner coast range, the Central Coast and inner coast range, Northeastern California, the Western Sierra Nevada, the Owens Valley and East of the Sierra Nevada, the Providence Mountains, the Low Desert surrounding the lower Colorado River, San Diego County, and Santa Cruz Island. Of these, the areas with both the largest number of extant colonies (as of 1991) and the greatest loss of historical colonies were the North Coast (7 historical colonies lost, 9 colonies extant), the Central Coast (7 lost, 2 extant), Northeastern

California (1 lost, 6 extant), Western Sierra (4 or 5 lost, 7 extant), and East of the Sierra (1 lost, 11 extant).

The petition summarizes the distribution and abundance information for Townsend's big-eared bat presented in the draft California Bat Conservation Plan ([CBCP] CDFW, in prep.). The draft plan combines information from published and unpublished sources with the professional opinions of a team of California bat experts. It describes the important conservation issues affecting all bats species in the state and provides a relative ranking of conservation status and threats for the bats on a regional basis. The following table is an overview of the more detailed information on distribution and abundance contained in the petition and the draft CBCP. Both the CBCP and the petition use the U.S. Forest Service system of ecoregions as the geographic framework for describing the Townsend's big-eared bat distribution and abundance.

Ecoregion	Known Colonies	Notes
Northern Coast and Ranges	Coast – 3 maternity colonies known Coast Ranges – 3 maternity colonies known	Townsend's big-eared bat was formerly more common, now considered rare in the ecoregion. Roosts in old-growth basal hollows and old buildlings (few caves and mines).
Klamath Mountains	Lake Shasta, Cecilville, Hyampom, Hayfork, BLM land in Siskiyou County	Townsend's big-eared bat is considered rare in the ecoregion, though abundant limestone caves and abandoned mines exist.
Southern Cascades		Largest populations of Townsend's big-eared bat in California roost in abundant lava caves in this ecoregion.
Modoc Plateau		Townsend's big-eared bat is considered extremely rare here, despite old lava flows and historic mining districts.
Northwestern Basin and Range		Townsend's big-eared bat is little studied in this ecoregion -- only one Townsend's big-eared bat record known, from a historic mining district.
Northern Interior Coast Ranges	2 maternity colonies (Homestake Mine at Knoxville and Sulphur Creeks)	Townsend's big-eared bat distribution is limited in this ecoregion and depends on abandoned mines and old buildings for roosts.
Great Valley		Few natural roost sites for maternity colonies or hibernation, other than at Sutter Buttes.
Sierra Nevada Foothills	Moss Cave formerly contained the largest maternity colony in the Mother Lode country, but Townsend's big-eared bat no longer use it.	Important and abundant limestone caves and abandoned mines, as well as bridges and old buildings. Townsend's big-eared bat apparently lost from or greatly diminished at several historical roost sites.
Sierra Nevada	Important Townsend's big-eared bat roosts include Boyden Cave, Clough Cave, and	Natural caves are the primary roost structure for Townsend's big-eared bat in

	Bower Cave. Hibernacula likely occur at higher elevations, but none are currently known.	this ecoregion, though some old buildings may also serve as roost sites. Colony sizes reported in the 1990s appeared to be smaller than historical numbers.
Central Coast	Eight historically-known colonies were known; of these, only one remains. An additional colony was discovered after 1980.	Townsend's big-eared bat was likely always rare in this ecoregion due to low abundance of natural roost sites. Old buildings and other structures are the primary roost type in this ecoregion.
Central Coast Ranges	Bear's Gulch Cave in Pinnacles National Monument is the most significant known maternity colony.	Cave and mine roost structures are rare in this ecoregion. Townsend's big-eared bat is likely extirpated from most or all of the urbanized area.
Mono and Southeastern Great Basin	Twelve known maternity colonies and two known hibernacula.	Abundant roosting habitat in historical mines. As of the early 1990s, one-third of the known Townsend's big-eared bat population in California occurred in this ecoregion
Southern Coast and Southern Mountains/Valleys	Six historical roost sites in San Diego County were unavailable or not occupied as of 1990.	Limited and patchy distribution of Townsend's big-eared bat in this ecoregion due to rarity of natural roost sites and historical mines. Likely extirpated from most or all of the urbanized area.
Mojave Desert	Mitchell Caverns (Providence Mountains), Macedonia Canyon, Kokoweef Caverns, Castle Mountains.	Abundant historical mines provide the most common roost site for Townsend's big-eared bat in this ecoregion, but natural limestone caves and lava tubes also exist.
Sonoran and Colorado Deserts	Three historical maternity colonies were known, including one with more than 1000 adult females. These colonies were lost by the early 1990s, though one small colony at the Mountaineer Mine was found.	Abundant roosting habitat in historical mines, but natural roost sites are limited. Conversion of riparian habitat to agricultural lands along the Colorado River likely diminished foraging habitat.
Channel Islands	One maternity colony known from Santa Cruz Island. It was much reduced in size and displaced from multiple roosts.	Old buildings and sea caves provide limited habitat for Townsend's big-eared bat on the Channel Islands.

As described in the petition, a combination of scientific observation and inference has led to the conclusion that the largest populations of Townsend's big-eared bat occur in the Southern Cascades, Sierra Nevada Foothills, and Mono/Southwestern Great Basin ecoregions. Of these, the Sierra Nevada Foothills ecoregion populations have been much reduced. Townsend's big-eared bat in the North Coast and North Coast Ranges ecoregions may be less abundant than before the removal of most of the old-growth conifer forests that provided roosting structures in basal hollows (Mazurek 2004). Abundance of Townsend's big-eared bat in urban settings in the South Coast and Central Coast ecoregions is likely dramatically reduced from historical times (Pierson and Rainey 1998). Old mines in the Mojave, Sonoran, and Colorado Desert ecoregions probably allowed greater numbers of Townsend's big-eared bat to occur there, compared with a time prior to the advent of mining. However, suitable conditions at many mine sites have been lost or impacted; agricultural practices in the Colorado River corridor have

reduced foraging habitat availability in that area. Other ecoregions are either less important population areas for Townsend's big-eared bat (e.g., the Central (Great) Valley) or are little studied (e.g., Northwestern Basin and Range).

The petition and other information on Townsend's big-eared bat abundance and distribution indicates that, although widely distributed in the state, the species occurs at higher densities in some regions than in others (Pierson and Rainey 1998, Pierson and Fellers 1998). The abundance of Townsend's big-eared bat in a given ecoregion seems to be primarily a function of the availability of suitable roosting habitat. Natural roost sites are caves and large old-growth trees with basal hollows. Where these occur(red), such as in the Southern Cascades and North Coast, Townsend's big-eared bat abundance is (or was) high. Anthropogenic roosts are important in many ecoregions. These human-made roosts include mines and old buildings, which are especially abundant in the Mother Lode country of the Sierra Nevada Foothills and the Deserts ecoregions.

Life History *(pages 4 – 8 of the petition)*
As mentioned above, the petition accurately describes the life history of Townsend's big-eared bat. Several of the species' life history attributes are relevant to the assessment of its conservation status. These include a naturally high survival rate, which confers a long average lifespan, and low reproductive rate. The species is also relatively sedentary and exhibits apparently high fidelity to its roost sites. Hibernation in regions with cold winters is an essential behavior to conserve energy during the winter period when insect prey is not available. A behavioral attribute of Townsend's big-eared bat important to its conservation status is its susceptibility to disturbance while roosting, both in maternity roosts and hibernacula (Pearson et al. 1952, Graham 1966, Stebbings 1966, Mohr 1972, Humphrey and Kunz 1976, Stihler and Hall 1993, Pierson and Rainey 1998).

The petition summarizes several instances in which human activities have directly impacted Townsend's big-eared bat individuals (Pierson and Rainey 1998, and references cited therein), and because of the species' life history traits, likely impacted their populations. These include loss of traditional roosting sites, both through destruction or adverse modification and disturbance, which in some cases led to abandonment of dependent young and in other cases forced the colonies to use lower quality roost sites. Disturbance at hibernacula has caused Townsend's big-eared bat to arouse and use energy reserves essential for over-winter survival. Humans have set fires in and vandalized old mines and caves used as roost sites, killing individuals (Pierson and Rainey 1998, and references cited therein).

It is reasonable to conclude the cumulative impact of human activities in and around maternity roosts and hibernacula in California, over the past several decades and on-going, has had a population-level impact on the status of Townsend's big-eared bat. The known incidents of disturbance to colonies and destruction of roost sites described in the petition (and considering that other similar, but unreported, incidents have probably occurred), combined with the life history attributes of Townsend's big-eared bat, help explain the general decline in colony numbers and size described in the petition.

Kind of Habitat Necessary for Survival *(pages 9 – 11 of the petition)*
The petition describes the kinds of habitat used by Townsend's big-eared bat in California for foraging and cover (roosting). As summarized in the petition and in the species overview presented above, Townsend's big-eared bat depends on undisturbed large (cavernous) roost sites during both the reproductive and hibernation seasons. The right combination of temperatures and safety from predators are essential. Because the species does not migrate long distances, suitable maternity roost sites must occur in proximity to hibernacula. Proximity of summer roost sites to suitable foraging habitat with abundant insect prey and open sources of drinking water (in the case of desert-dwelling populations, at least) is also important.

The Department considers the petitions assessment of necessary habitat to be reasonably accurate as evidenced by the loss or decline of historical colonies where roost site quality has been compromised.

Factors Affecting the Ability to Survive and Reproduce / Degree and Immediacy of Threat *(pages 29 – 53 of the petition)*
The petition categorizes the factors affecting Townsend's big-eared bat into the following threat categories: present and threatened loss or adverse modification of habitat or range; collection for scientific purposes; disease or predation; inadequacy of existing regulations; and other factors. The petition's information on each of these threat categories is summarized below. Although much of the petition's information on these threat factors is anecdotal, it is based on the observations of professional conservation and bat biologists. The Department generally accepts all these factors are of conservation concern to Townsend's big-eared bat; however, the magnitude of these threats is unknown.

Habitat Loss or Adverse Modification. Impacts to roost sites are highlighted in the petition as an important threat to Townsend's big-eared bat. The loss of old-growth conifers with large, cavernous basal hollows during the 20th century is presented as a likely explanation for the apparent decline of Townsend's big-eared bat populations in the coastal forest of northern and central California. The association of Townsend's big-eared bat with large basal hollows has been demonstrated by the work of Pierson and Fellers (1998) and Mazurek (2004). The petition also discusses other forestry practices that plausibly could impact Townsend's big-eared bat, such as disturbance associated with timber operations, increased access to roost sites by human visitors, loss of oak woodlands (which may provide roost sites and certainly provide foraging habitat), conversion of forest to agriculture such as vineyards, and application of chemicals.

New and renewed mining operations are described in the petition as having the potential to impact Townsend's big-eared bat roosting in old shaft/adit mines, either through disturbance of roosting bats or by destroying the old mine by conversion to open pit-style mining. Four examples of the destruction or loss of Townsend's big-eared bat roost sites are listed in the petition.

Abandoned mines are generally considered a human safety concern by landowners and land management agencies, and an extensive organization of government and private industry

efforts has been created to identify and address open mines across the western United States. Although the environmental impacts of proposed mine closures (including impacts to Townsend's big-eared bat roost sites) are supposed to be addressed prior to implementing mine closures, the petition documents several cases in which mines were collapsed or closed without mitigation for the direct or indirect impacts to Townsend's big-eared bat colonies.

Dam construction or modification can result in the inundation of Townsend's big-eared bat roost sites and the petition mentions one large colony that was displaced by construction of the New Melones Dam on the Stanislaus River. As stated in the petition, much of the dam-building, reconstruction, and license renewal in California occurs at the same elevations in the foothills of the Sierra Nevada and Klamath and Trinity mountains optimal for Townsend's big-eared bat roost sites.

Although generally considered a cave/mine roosting bat, Townsend's big-eared bat also roosts in large spaces in old buildings and in cavernous spaces in bridges and dams. Bats in such sites are subject to disturbance when humans enter for inspections or other activities. The roost sites themselves are subject to eventual deterioration or demolition. The petition mentions several Townsend's big-eared bat roost sites in buildings lost documented by Pierson and Rainey (1998).

Loss of riparian habitat, which is important for foraging Townsend's big-eared bat, has been extensive in California (Katibah 1984). Although data quantifying the impact of this loss on Townsend's big-eared bat populations are not available, the petition makes the plausible argument that such an impact has occurred.

As stated in the petition, the extensive urban and suburban development in California, especially in the Bay Area and along the South Coast, as essentially extirpating Townsend's big-eared bat from that portion of its range. Although individual Townsend's big-eared bat may still make forays into these areas, the likelihood of a colony persisting there is very small.

Scientific Collection. The petition describes the historical practice of collecting bat specimens for scientific purposes as likely having a large impact on some Townsend's big-eared bat populations. Two examples of populations that were severely impacted are mentioned, and the advent of studies aimed at understanding the disease White Nose Syndrome is mentioned as possible catalyst for more scientific work on Townsend's big-eared bat. Overall, the petitioner regards scientific collecting as a minor threat to the species due to the oversight of such activities by agencies and universities.

Disease and Predation. The petition describes the emergent fungal disease White Nose Syndrome (WNS) as a potential threat to Townsend's big-eared bat. Although the disease, which appeared in eastern North America in 2006, has killed more than 5 million bats to date, apparently it has not yet spread to the western U.S., nor has it infected either of the Townsend's big-eared bat subspecies that occur in the east (Ozark big-eared bat and Virginia big-eared bat).

The petition describes predation on Townsend's big-eared bat by native species as not a significant factor affecting population dynamics. However, two published accounts of non-native species (domestic cats and black rats) preying on Townsend's big-eared bat are mentioned. In one case, an entire colony's output of young were killed by rats (Fellers 2000).

Existing Regulations. The petition states that, while Townsend's big-eared bat has been designated as a sensitive or special management species by several agencies, none of these designations is adequate to ensure the long-term viability of the species in California. The petition also describes the Federal Cave Resources Protection Act and associated regulations as inadequate to protect many Townsend's big-eared bat roost sites, either due to lack of enforcement (on federal lands) or lack of applicability (on private lands). The California Cave Protection Act is also described as inadequate to protect many Townsend's big-eared bat roosts, either in application or enforcement. The two major environmental review laws in effect in California, the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), are described in the petition as primarily intended to ensure disclosure of the potential impacts of proposed projects on federal, state, and private lands. The petition suggests that, because Townsend's big-eared bat does not have status as a listed species, most projects reviewed under NEPA or CEQA do not adequately address potential impacts to the species nor are meaningful mitigation measures or more benign alternative projects implemented.

Other Natural and Anthropogenic Factors. As described in the petition, human disturbance in caves and mines is the most widely cited reason for the abandonment of historical Townsend's big-eared bat roost sites. The primary threats to Townsend's big-eared bat of recreation in caves and mines listed in the draft California Bat Conservation Plan are disturbance of roosting bats that results in displacement of the colony, reduced reproductive success, or death; deliberate vandalism that kills or injures bats; and the introduction of pathogens, particularly the fungus that causes White Nose Syndrome.

The petition provides several examples from studies showing that disturbance of roost sites has caused abandonment of some sites and the death of adult and young bats. The petition suggests that, as California's human population continues to grow, the impact of recreational activities and vandalism in and near Townsend's big-eared bat roost sites will continue to increase.

Changes in the availability of the insect prey of Townsend's big-eared bat is mentioned in the petition as a threat to the species. In particular, conversion of native vegetation communities to agricultural use, use of pesticides to reduce populations of some moth species, and the effects of artificial lighting on the distribution of moths are all mentioned as potentially significant threats.
The development of wind energy as a renewable energy source in California is described in the petition as a threat to Townsend's big-eared bat; however, the petition acknowledges that little information about the impact of wind farms on this species is available.

The petition suggests that a variety of environmental contaminants pose a threat to Townsend's big-eared bat. Townsend's big-eared bat are particularly susceptible to toxins

because they are long-lived, have the opportunity to encounter toxic sites due to their high mobility, and have a high metabolic rate. Cyanide ingested from open ponds associated with gold mining and pesticide drift or run-off into drinking water can kill or compromise the health of bats. Low air quality in some regions of California may affect the health of bats, including Townsend's big-eared bat, just as it does humans. Townsend's big-eared bat may also absorb some pesticides directly through the skin, either by flying through droplets of aerially-applied chemicals at first light, or by landing on or gleaning from foliage after pesticide application. The petition suggests the degree of threat from environmental contamination is unknown.

The petition suggests that pest control operations also pose a threat to Townsend's big-eared bat by inappropriately managing roosting behavior. Bats roosting in attics of houses or other buildings can usually be excluded outside the maternity and hibernation seasons, during which periods the animals are most susceptible to impacts. However, many operators and property owners are not aware that they can wait a relatively short time and then exclude the bats with no direct impacts to them.

Other threats of unknown significance mentioned in the petition include the impacts of exotic invasive plants, especially those that alter riparian ecosystems, small population size of Townsend's big-eared bat, which makes further populations declines more likely, and climate change.

Of the threats mentioned in the petition, the Department considers the effects of human disturbance at roost sites and destruction or adverse modification of roost sites to be the most important (CDFW in prep.). Other traditional threats, such as habitat conversion through residential development, agriculture, and exotic invasive plants; environmental toxins, pest control activities, and timber harvest operations are fairly well understood and likely of less significance individually than the impacts to roost sites. Other potential threats are less well understood or more unpredictable in their impacts to Townsend's big-eared bat. These include the effects of climate change and White Nose Syndrome.

Impact of Existing Management Efforts *(pages 53 – 55 of the petition)*
The petition lists the management of the cave and mine roosts of Townsend's big-eared bat as the primary means by which the species could be managed and conserved. Adequately minimizing disturbance of maternity colonies and hibernacula and minimizing the potential for introduction or spread of the fungus causing White Nose Syndrome are essential to the long-term conservation of Townsend's big-eared bat in California.

According to the petition, land management agencies and their subunits, as well as private landowners, vary in their commitment to manage cave and mine biological resources, including Townsend's big-eared bat colony roost sites. The petition cites several examples of roost sites that have been managed poorly, with the subsequent loss or decline of the bat colony. Other examples are provided in which the installation of a properly-designed gate and well-managed access allowed the return and growth of a Townsend's big-eared bat colony.

As stated in the petition, there is no single repository or database that catalogs all of the caves and mines used by Townsend's big-eared bat in California. This information would be helpful in

determining the priorities for installation of gates, as well as for assessing the overall consequences to California's Townsend's big-eared bat population of the current management of the species.

Suggestions for Future Management *(pages 55 – 56 of the petition)*
In addition to requesting listing of Townsend's big-eared bat as endangered, the petition recommends 12 actions intended to reduce the identified threats to the species and to monitor the status of the species in the future. In abbreviated form, the petitioner's recommended actions are:

1. Immediately prohibit unnecessary human access to known and historic Townsend's big-eared bat roosting sites during the period when bats use or may use these sites.
2. Promptly and systematically survey all caves, mines, and structures for Townsend's big-eared bat populations, and for potential habitat for the species.
3. Install bat-accessible gates for all caves and mines with potential habitat that are subject to human disturbance and do not close mines that are currently unoccupied if they provide potential habitat and can be gated.
4. Amend or prepare land management plans to include appropriate measures for Townsend's big-eared bat.
5. Monitor cave and mine roosts regularly and enforce regulations regarding public access, maintaining gates as needed.
6. Survey and evaluate the status of known populations regularly.
7. Monitor (e.g., with track plates or hair traps) predator activity at roosts, and institute measures for control where necessary.
8. Avoid broadcast of pesticides (insecticides, herbicides, fungicides) in forests, including spraying of *Bacillus thuringiensis* (Bt). Permitting for pesticide application should be evaluated for effects on Townsend's big-eared bat and effects mitigated by the establishment of buffer zones, use of least harmful chemical agents, and by contributions to roost protection efforts.
9. The California Department of Pesticide Regulation should develop information regarding pesticide effects on Townsend's big-eared bat, recommendations for minimization of effects, and conduct or fund research on effects of pesticides on the survival and reproduction of Townsend's big-eared bats or related species, including sublethal behavioral, developmental, and endocrine effects. Based on the results of such research, Department of Pesticide Regulation should develop regulations to ensure that pesticide effects on Townsend's big-eared bats are insignificant.
10. The California Department of Forestry (CDF) and California Department of Fish and Wildlife (CDFW) should develop protocols for evaluating forest areas for Townsend's big-eared bat use and regulating timber harvest in such areas.
11. CDF and the California Department of Parks and Recreation, in coordination with CDFW, bat experts and the public, should develop a larger system of old-growth redwood reserves and a long-term strategy for encouraging development of basal hollows in large redwoods on State lands, to provide increased roosting habitat–including maternity roosts–for Townsend's big-eared bat.

12. Surveys for Townsend's big-eared bat should consider external exit surveys as a first option, rather than entering a mine, cave, building, or tree hollow and potentially disturbing a colony.

The Department considers all of these recommendations to be worthy of consideration as actions that could result in better management and conservation of Townsend's big-eared bat. Implementation of these actions should be prioritized based on the expected benefit to the species, feasibility, and cost.

A first step in determining the state-wide status of Townsend's big-eared bat would be to assess the current condition of all known colonies. The Department has compiled a geographic database of bat observations in California as part of the development of the CBCP. The records for Townsend's big-eared bat maternity roosts and hibernacula have not been systematically reviewed, but the individual landowners, agencies, and researchers responsible for the sites should be contacted to determine their current condition as habitat. Review of the spatial and temporal distribution of Townsend's big-eared bat sites could help elucidate whether the general pattern of diminished distribution and abundance of the species described in the petition has continued since the last state-wide assessment was completed in the early 1990s.

Detailed Distribution Map

The petition provided a distribution map based on occurrences of Townsend's big-eared bat recorded within the California Natural Diversity Database. The general distribution depicted in the map is accurate.

STATUS OF THE SPECIES

The status of Townsend's big-eared bat in California is uncertain. However, at the time of the only state-wide assessment of the species (Pierson and Rainey 1998) it was apparent that declines in the known population of the species in the state had occurred in recent decades when compared against known historical information. The decline in population occurred concurrently with the loss of several maternity colonies, the loss or degradation of a number of important roost sites, and decreases in average colony size. Inadequate protection of roost sites has allowed a variety of legal and illegal human activities (such as recreation, vandalism, building maintenance or demolition) to occur at a number of roost sites which has impacted Townsend's big-eared bat. The data upon which the 1998 assessment was made is now more than 20 years old, and there have been no statewide assessments for Townsend's big-eared bat in California since surveys were concluded in 1991.

A variety of threats are either known to have already impacted the species or are plausible but as yet not documented to have impacted the species. These include loss of maternity roosts, hibernation roosts, foraging habitat, and travel corridors. The loss of habitat has occurred through dam construction, bridge and dam renovation, mine closures, renewed mining, regular disturbance at roost sites, timber harvest, building demolition, loss of riparian vegetation, urban/suburban development, drainage of ponds and other open water. Other known or postulated threats include climate change, environmental contaminants, pest control operations, White Nose Syndrome, take related to scientific research, small population size, predation by non-native predators, and wind energy farms.

Having reviewed and evaluated relevant information, including the material referenced in the petition and other information in the Department's possession, the Department believes there is sufficient scientific information available at this time to indicate that the petitioned action may be warranted. In making this recommendation to the Commission, the Department emphasizes that information on current population size is uncertain. However, the Department believes there is sufficient scientific information at this time, particularly with respect to the most biologically critical factors (loss of colonies and/or their roost sites, uncertainty regarding the management of roost sites to indicate that the petitioned action may be warranted. (See Fish & G. Code, § 2073.5, subd. (a)(2); Cal. Code Regs. tit. 14, § 670.1, subd. (d).)

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