



National Park Service
U.S. Department of the Interior
Zion National Park
Springdale, Utah

Bighorn Sheep Management Environmental Assessment

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*Zion National Park
Desert Bighorn Sheep (NPS Photo 2017)*

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TABLE OF CONTENTS

TABLE OF CONTENTS	I
PURPOSE AND NEED	3
Purpose and Need for Action.....	3
Project Objectives.....	4
Impact Topics Retained for Further Analysis.....	4
Impact Topics Dismissed from Further Analysis.....	5
Air Quality & Green House Gas Emissions.....	5
Archeological Resources	6
Cultural Landscapes.....	6
Environmental Justice.....	7
ETHNOGRAPHIC RESOURCES	7
Historic Structures	8
Indian Trust Resources and Sacred Sites	8
MIGRATORY BIRDS	8
SOCIOECONOMICS	9
STATE LISTED SPECIES OF CONCERN	9
Vegetation.....	9
Visitor Use and Experience.....	10
Wild and Scenic Rivers	11
ALTERNATIVES	13
Alternatives Carried Forward.....	13
Alternative A – No Action	13
Alternative B – DBHS Management (Proposed Action and NPS Preferred)	13
Mitigation Measures.....	18
Archeological Resources	18
Lightscapes and Soundscapes.....	18
Vegetation.....	18
Visitor Use and Experience.....	19
Wildlife & Special Status Species	19
Alternatives Considered and Dismissed	19
1. No Capture Efforts in Wilderness	19
2. Lethal Removal Only	20
3. Fertility Control.....	21
4. Managed Hunt/Public Hunting	21
5. Eliminate Disease Vectors Outside Park.....	21
6. Allow only Natural Fluctuations in DBHS Populations.....	22
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES	22
<i>Past Actions</i>	22
<i>Present Actions</i>	23
<i>Foreseeable Future Actions</i>	23
Soundscape.....	23
Affected Environment	23

Impacts of Alternative A – No Action..... 25
 Impact of Alternative B..... 26
 Special Status Species.....27
 Affected Environment 27
 Impacts of Alternative A..... 29
 Impact of Alternative B..... 31
 Wilderness..... 35
 Affected Environment 35
 Impacts of Alternative A..... 36
 Impacts of Alternative B 38
 Wildlife: DBHS.....39
 Affected Environment 39
 Impacts of Alternative A—No Action 43
 Impacts of Alternative B — Proposed Action and NPS Preferred 44
COMPLIANCE REQUIREMENTS, CONSULTATION, AND COORDINATION .46
 List of Agencies and Persons Contacted 46
REFERENCES46

LIST OF FIGURES

FIGURE 1. ZION DBHS PROJECT AREA.....12
FIGURE 2. UDWR ZION WILDLIFE MANAGEMENT UNIT (WMU) #29.....13
FIGURE 3. DESERT BIGHORN SHEEP PRIMARY USE AREA WITHIN ZION.....42
FIGURE 4. DBHS Aerial Survey Counts in ZION.....43

PURPOSE AND NEED

PURPOSE AND NEED FOR ACTION

Desert bighorn sheep (DBHS), *Ovis canadensis nelsoni*, are a charismatic and much loved animal, well adapted to the canyon country. Humans and DBHS have long interacted in the Utah desert, as evidenced by pictographs, petroglyphs, explorers and pioneer accounts. However, the introduction of domestic sheep and goats brought on land use change, non-native disease, and overhunting which almost led to the extirpation of the species (UDWR 2013b). The current success of the species is largely due to intensive DBHS management programs and human mediated relocations, yet various threats continue to threaten the species, especially disease. In 2012, the Western Association of Fish and Wildlife Agencies (WAFWA) published DBHS management recommendations stating, “wild sheep populations should have pre-determined population objectives and should be managed at agreed-upon densities to minimize the potential for dispersal” (WSWG 2012). National Park Service (NPS) efforts to reduce the risk of disease transmission within the Zion National Park (ZION) DBHS population are necessary to: help protect the continuation of the species in the event of future DBHS population die-offs, aid in maintaining a healthy DBHS metapopulation across the western United States, and ensure this important natural resource and essential part of the wilderness ecosystem remains viable for future generations.

Pneumonia related epizootics are currently the greatest challenge to the persistence of DBHS populations throughout the western United States; numerous examples of DBHS pneumonia die-offs have occurred throughout the intermountain west, including several more recent events in Utah (UDWR 2016; Wildlife News 2016). Currently, no treatment or immunization exists for this illness which leaves natural resources managers with little to no options once a die-off begins. Reducing risk of exposure is currently the best available management option for DBHS management. Singer (2001) suggests that the recovery and subsequent persistence of DBHS herds subject to epizootics are correlated with larger population size. Increasing population size and density of DBHS herds also increase the chance of an epizootic outbreak occurring. Natural resources managers must, therefore, carefully balance multiple variables to secure the best chances for the long term health and persistence of a herd.

The NPS has played an important role in the stewardship of DBHS. Today’s population of DBHS in ZION is the result of the successful reintroduction of the species that took place in the 1970s (McCutchen 1975). The first DBHS reintroduction in the state occurred in Zion National Park. Canyonlands’ Island in the Sky district has also provided 196 sheep for 14 transplants to Capitol Reef National Park and Arches National Park between 1982 and 2013 (UDWR 2013). After introduction at ZION numbers increased steadily over the next three decades, culminating into a rapid increase in the past eight years. Aerial surveys completed by the Utah Division of Wildlife Resources (UDWR), in 2009, 2013, and 2015 throughout ZION yielded population estimates of 194, 405, and 527 DBHS, respectively (UDWR 2009; UDWR 2013; UDWR 2015). Under these conditions, individual DBHS from the ZION population have been observed exhibiting dispersal behaviors. Consequently, these dispersal behaviors can have important disease implications that need be addressed.

As described, disease transmission of pneumonia epizootics pose a grave threat to ZION DBHS.

Domestic sheep and goats are often unaffected by pneumonia epizootics and transmit the disease to DBHS populations that have not yet adapted to survive these pathogens. Disease transmission occurs through nose-to-nose contact between domestic sheep and goats with native DBHS. Nose-to-nose contact is common when DBHS use habitat adjacent to domestics as they are behaviorally attracted to one another. Furthermore, in arid environments such as ZION, water resources are limited which increases the risk of domestic and wild sheep sharing the same water resources. Once exposed, an exposed DBHS can easily pass these pathogens to other DBHS upon contact. The majority of pneumonia die-offs occur when populations are at or near peak numbers (Monello et al. 2001). These events are 15 times more likely to occur in herds at high densities versus low densities (Sells et al. 2015). As contact rates between individuals increase with increased density, pathogens can quickly spread through an entire herd. Die-offs related to this pathogen exposure have been observed throughout the western United States in both DBHS and Rocky Mountain Bighorn Sheep (WAFWA 2010). After the initial all-age die-off, which can result in mortality rates up to 50-90% of the herd, reduced lamb recruitment may persist for decades, often preventing rapid population recovery to previous numbers (Monello et al. 2001).

There are several areas surrounding the park that are of particular concern for disease transmission. Much attention has been focused on the role of domestic sheep grazing allotments in these epizootics, however, recent research has indicated that hobby farms and domestic sheep/goat operations on private land also play a major role (Sells et al. 2015). Although domestic sheep grazing allotments do occur on U.S. Forest Service (USFS) and Bureau of Land Management (BLM) lands near ZION, these allotments are not immediately adjacent to the core DBHS habitat within the park and do not contain suitable habitat for DBHS. However, there are many hobby farms and domestic sheep/goat operations on private land bordering core DBHS habitat within ZION which does contain suitable habitat for DBHS. Presently, the most apparent risk for pathogen exposure to ZION DBHS populations is through hobby farms located throughout Springdale, the gateway town bordering the South Entrance of ZION. Several Springdale private landowners regularly keep domestic sheep and/or goats. Desert DBHS have been observed by NPS staff at the ZION South Entrance and along the foothills to the east of town. Additionally, livestock or domestic sheep/goat grazing occurs on private land in many areas surrounding the park including a large domestic sheep operation near Kolob Reservoir, within immediate proximity to ZION. All of these factors present increased risks of exposure as the ZION DBHS herd continues to grow and disperse.

PROJECT OBJECTIVES

- Manage DBHS at Zion as a healthy herd and as part of a larger metapopulation by decreasing the risk of disease transmission through population assessment, density reduction, and capture activities.
- Restore historic and establish new interagency partnerships to provide healthy DBHS to supplement diminishing populations within the species historic range.
- Protect the opportunity for current park visitors and future generations to enjoy wild DBHS in their native habitat.

IMPACT TOPICS RETAINED FOR FURTHER ANALYSIS

The following topics are carried forward for further analysis in this EA:

- Soundscape

-
- Special Status Species
 - Wilderness
 - Wildlife

IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

The following topics are dismissed from further analysis in this EA for the reasons provided. Unless otherwise noted, there are no impacts associated with Alternative A (No Action).

AIR QUALITY & GREEN HOUSE GAS EMISSIONS

Zion National Park is designated as a Class I air quality area under the Clean Air Act (Perkins 2010); meaning, this area receives the highest level of protection with only a small amount of additional air pollution allowed. Air pollutants (i.e. ozone, nitrogen, sulfur, and mercury) directly impact ZION by reducing visibility, contaminating vegetation, soils, and surface waters, as well as disrupting lifecycle and behavior patterns of certain wildlife species (NPS 2016a).

The project would result in a limited increase of Green House Gas emissions (GHGs) from the use of a helicopter and other ground based vehicles for crew and DBHS transport. Aerial and ground based vehicle operations would result in a localized increase of exhaust, emissions, and fugitive dust throughout the project period.

Throughout the life of this plan capture work would be anticipated to be conducted intermittently as needed to achieve ZION DBHS population objectives. Initially, the project would focus on capturing and removing as many as 60 individuals per year. This level of capture activity would be expected to continue until the Zion DBHS population was reduced to a lower desired level of abundance that approaches, yet remains above the park's established population management limit as identified in the proposed action (see Alternatives section). Once this desired population level was achieved, the recurring level of capture activity would be reduced considerably both in frequency and duration, but would still be required occasionally in order to maintain the population within a range that reflects the lower desired level of abundance over time.

A few weeks before the translocation activities, there would be a disease testing phase. This would entail helicopter use to search for and capture bighorn, taking biological data and samples, ear-tagging and placing a satellite collar on up to 30 animals, followed by release. Capture work for both disease testing and translocation would be expected to last 7 hours each day for up to 6 days. It is estimated that approximately 12 takeoffs/landings would occur each day within the park. Searching for, locating, capturing, landing, taking off, and flying back to the staging area would take more than 30 minutes of each hour and would likely occur during for 7 hours each day.

Intermittent use (i.e. hourly) of helicopters and transport vehicles for capture work, disease testing, and DBHS relocation transport would produce emissions that very small relative to those produced from highway transportation and search and rescue operations within the park, and would make an inconsequential contribution to the park's overall emissions profile. Any increase in GHGs would cease once the project is complete; therefore no long-term contribution of GHGs would occur under either Alternative discussed in this EA.

ARCHEOLOGICAL RESOURCES

According to the Zion Archeologist and Cultural Program Manager, approximately 19 percent of the park has been surveyed for archeological resources. Parkwide, over 520 sites, both prehistoric and historic, have been documented (NPS, Horton, pers. Comm., 2016b).

Prehistoric era resources include rock art, artifact scatters of flaked stone, ground stone, and ceramics, habitation structures (pueblos) in open settings and in rock alcoves. Historic era resources include remnants of work camps and trash scatters, sawmill sites, historic inscriptions, homestead cabins, miles of irrigation ditches and other miscellaneous structures. In addition to individual archaeological sites, there is the Parunuweap Canyon Archaeological District, listed in the NRHP in 1996. Parunuweap Canyon is also a designated Research Natural Area, which will be avoided for helicopter landings.

Archeological resources would not be disturbed by any actions proposed in the alternatives discussed in this document. No ground excavating activities are associated with the no action; however, supplemental translocation actions, specifically drop-net sites, may incur some ground disturbance. If drop-net sites are executed, sites would be selected in coordination with the ZION Cultural Program Manager and monitored for archeological resources throughout installation as required (see Mitigation Measures: Archaeological Resources). Prior to capture activities discussed in Alternative B, helicopter pilot(s) would be provided with graphic information coordinated and maps detailing landing areas to avoid, such as potentially culturally significant landscapes, the Parunuweap Canyon Archaeological District and Research Natural Area, or other significant sites within the area. The footprint of helicopter landing zones (including disturbance from downdraft and low frequency vibration) and ground crews would occur outside of any known culturally sensitive areas and would thus avoid disturbing archeological resources. Additionally, all helicopter landing site coordinates would be reported to the ZION Cultural Program Manager for record keeping purposes and to pursue archeological survey of the areas as warranted, post project. This topic is dismissed from further analysis as no permanent or long-term impacts to archeological resources would occur. In the event any unknown archeological resources are inadvertently discovered through the implementation of the alternatives discussed in this EA, appropriate steps would be taken to protect these resources and notify the ZION Cultural Program Manager immediately upon discovery (see Mitigation Measures).

CULTURAL LANDSCAPES

According to the NPS Director's Order-28: *Cultural Resource Management Guideline*, a cultural landscape is a reflection of human adaptation and use of natural resources, and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. Two cultural landscape inventories have been completed in the project area, both of which are located in Zion Canyon. The Zion Canyon Cultural Landscape extends from the Pine Creek Housing area to Temple of Sinawava and up to the canyon rim. The Zion Lodge/Birch Creek Cultural Landscape encompasses both of these park facility locations and is nested within the larger Zion Canyon landscape.

A cultural landscape inventory has not been conducted for other areas outside the main canyon. Relying on results of parkwide archaeological surveys to characterize the distribution of cultural resources, reported and recorded historic structures and their associated or potential landscapes occur sparsely throughout the project area and capture area. Within the capture area, potential locations of resources that may be contributing features of a cultural landscape

are currently documented as archaeological sites and subject to the avoidance and mitigation measures described above in Impact Topics Dismissed from Further Analysis: Archaeological Resources. Since potential cultural landscape contributing features will be avoided or protected, a cultural landscape inventory will not be pursued as part of the implementation for either alternative discussed in this EA.

ENVIRONMENTAL JUSTICE

As defined by the U.S. Environmental Protection Agency (EPA), environmental justice is, “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (USEPA 2017). Achieving environmental justice necessitates all communities and persons across the nation receiving the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work. Presidential Executive Order 12898 - *General Actions to Address Environmental Justice in Minority Populations and Low-Income Population*” requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.

In accordance with the National Office of Environmental Policy and Compliance (OEPC) Environmental Compliance Memorandum 95-3, Rockville, Springdale, Hurricane, Virgin, and other surrounding communities were assessed to contain both minority and low-income populations. This environmental assessment demonstrates that the impacts that could result from implementation of the alternatives would be few and would not be disproportionately high with regard to human health or environmental impacts on minorities or low-income populations. Access to ZION and wildlife viewing would remain available for use by all people regardless of race or income throughout and any workforces would not be hired based on race or income. Furthermore, the park staff and planning team actively solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors.

ETHNOGRAPHIC RESOURCES

According to the NPS Director’s Order-28: *Cultural Resource Management Guideline*, ethnographic resources are defined as any “site, subsistence, or other significance in the cultural system of a group traditionally associated with it.” According to NPS professional staff and the ZION General Management Plan (NPS 2001), to date no ethnographic resources within the park have been determined eligible for listing in the National Register. In collaboration with Southern Paiute tribal members, Zion participated in the completion of an ethnographic overview and assessment in the mid-1990s (Stoffle et. al 1997). The goal of the overview was to develop a broad understanding of Southern Paiute perspectives on natural and cultural resources in the park. The Southern Paiute recognize all the land and resources within ZION to be culturally significant and have determined that NPS park managers can best protect these places and resources in consultation with tribal leaders (Stoffle et. al 1997).

Including the Southern Paiute, twelve affiliated American Indian tribes are traditionally associated with Zion. The tribal contacts were sent an informational letter on February 13, 2014 describing the proposed project with a request to receive their comments. No scoping

comments have been received from American Indian tribes as of the date of this EA. Each tribe will be notified of the completion of this EA and will be asked for their review and comment. If new information about ethnographic resources, Tribal concerns, or other subsequent issues are identified as a result of this consultation, the NPS will reconsider this determination.

HISTORIC STRUCTURES

Section 106 of the NHPA of 1966, as amended (16 USC 470, et seq.) and its implementing regulations under 36 CFR 800 require all federal agencies to consider effects of federal actions on historic properties, including historic structures eligible for or listed in the National Register of Historic Places (NRHP). In order for a structure to be listed in the National Register, it must be associated with an important historic event, person(s), or that embodies distinctive characteristics or qualities of workmanship. A review of the NPS database of historic structures, the List of Classified Structures (LCS), reveals that Zion has 95 structures listed in the NRHP. These structures include a roadway and associated structures (i.e., masonry curbing and retaining walls, tunnels, bridges, etc.), hiking trails, and several individual buildings.

Vehicular use of historic roadways and parking areas, and ground crews on hiking trails are activities commensurate with the intended and designed purpose of these structures. Proposed activities involve the use of infrastructure provided for all park visitors. The footprint of helicopter landing zones (including disturbance from downdraft and low frequency vibration) and ground crews would occur outside of developed areas nor within close proximity to historic buildings and would thus, avoid disturbing historic structures. This topic is dismissed from further analysis as no permanent or long-term impacts to historic structures would occur.

INDIAN TRUST RESOURCES AND SACRED SITES

Trust resources are those natural resources reserved by or for Indian tribes through treaties, statutes, judicial decisions, and executive orders, which are protected by fiduciary obligation on the part of the United States (NPS 2006). There are no Indian trust resources in ZION. Sacred sites are those places having established religious meaning and as locales of private ceremonial activities (NPS 2006). Through consultation efforts (see Ethnographic Resources), the park has not been made aware of any Indian sacred sites at or near the project site. In summary, no Indian Trust Resources nor Sacred sites would be impacted as a result of implementing either Alternative discussed in this EA.

MIGRATORY BIRDS

A federal Migratory Bird list (consultation code 06E23000-2017-SLI-0211) was obtained from the U.S. Fish and Wildlife Service (USFWS) Information and Planning and Conservation (IPaC) website (<https://ecos.fws.gov/ipac/>) on June 26, 2017. The list identified 29 migratory birds with the potential to occur in the project area. Of the species listed, 12 may be present within or near the proposed project area during the fall and winter months (September 1 to February 28) including: Bald Eagle (*Haliaeetus leucocephalus*), Cassin's Finch (*Carpodacus cassinii*), Ferruginous Hawk (*Buteo regalis*), Golden Eagle (*Aquila chrysaetos*), Juniper titmouse (*Baeolophus ridgwayi*), Lewis's Woodpecker (*Melanerpes lewis*), Loggerhead Shrike (*Lanius ludovicianus*), Pinyon Jay (*Gymnorhinus cyanocephalus*), Prairie Falcon (*Falco mexicanus*), Rufous Hummingbird (*Selasphorus rufus*), Rufous-crowned Sparrow (*Aimophila ruficeps*) and Short-eared Owl (*Asio flammeus*).

Helicopter activities occurring during survey, capture and disease testing may temporarily create a short-term (generally less than 25 minute) auditory and visual disturbance to these species. There would be no substantial impact to migratory birds or their behavior, particularly nesting or rearing of young. None of the impacts would be permanent or long-term and would not affect migratory birds at the individual or population level. These impacts will not measurably increase existing impacts to migratory birds, therefore migratory birds were dismissed from detailed analysis.

SOCIOECONOMICS

The park staff and planning team does not anticipate any impacts on the socioeconomic environment to alter the physical or social structure of nearby communities because the implementation of either alternative they would neither change local or regional land use, alter the physical and social structure of nearby communities, nor appreciably impact local business or other agencies.

STATE LISTED SPECIES OF CONCERN

An official State of Utah species list was obtained from the UDWR, on June 9, 2017. The list identified 26 state species of concern or a species under a conservation agreement to preclude from federal listing (historic and recent observations) with the potential to occur in the project area. Of the listed species, 17 state-listed species of concern may be present within or near the proposed project area during the fall and winter months (September 1 to February 28) including: Arizona Toad (*Bufo microscaphus*), Common chuckwalla (*Sauromalus ater*), Gila monster (*Heloderma suspectum*), Western Banded Gecko (*Coleonyx variegatus*), Zebra tailed lizard (*Callisaurus draconoides*), Bald Eagle (*Haliaeetus leucocephalus*), Black swift (*Cypseloides niger*), Ferruginous Hawk (*Buteo regalis*), Lewis's Woodpecker (*Melanerpes lewis*), Long-billed curlew (*Numenius americanus*), Mountain plover (*Chardrius montanus*), Northern goshawk (*Accipiter gentilis*), Short-eared Owl (*Asio flammeus*), Wet-rock Phya (*Phyella zionis*), Big Free-tailed Bat (*Nyctinomops macrotis*), Fringed Myotis Bat (*Myotis thysanodes*), and Townsend's Big-eared Bat (*Corynorhinus townsendii*). All other state listed species with the potential to occur within the project area have been dismissed from further analysis for one or more of the following reasons: project area occurs outside of the known distributional range of the species; no habitat is present in the action area; project area occurs outside of the elevation range of the species; and/or the species is not expected to occur during the season of use/impact.

Helicopter activities during the survey, disease testing and relocation would create a short-term (generally less than 25 minute) auditory and visual disturbance to bird species. Roosting bats may be temporarily disturbed from helicopter overflight noise. Helicopter overflight activity may create a short-term visual disturbance to amphibian and reptiles. The landing of the helicopter during the disease testing and relocation phases of the proposed action may briefly interrupt normal activity patterns of amphibians and reptiles (i.e., sun basking, hunting). None of the impacts would be permanent or long-term and would not substantively affect state-listed species at the individual or population level. These impacts will not measurably increase existing impacts to state-listed species, therefore state-listed species were dismissed from detailed analysis.

VEGETATION

Vegetative communities are varied throughout ZION and consist of desert scrub at the lowest elevations, pinyon-juniper woodland and mountain shrub communities at middle elevations,

and coniferous forest at the highest elevations. Rock crevice communities cover large portions of the east side where opportunistic vegetation grow in slickrock cracks. Hanging gardens are unique communities that grow on vertical rock walls hosting seeps and springs. The numerous watercourses, including the North and East Forks of the Virgin River are lined with riparian vegetation consisting largely of Fremont cottonwood (*Populus fremontii*), velvet ash (*Fraxinus velutina*), box elder (*Acer negundo*), and seepwillow (*Baccharis* spp.). Over 1,050 species of vascular plants have been identified throughout ZION (NPS 2017).

Vegetation would not be disturbed under the no action alternative (Alternative A). Aerial surveys would be conducted over ZION to estimate the DBHS population; however, no helicopter landings would occur. Disease testing and translocation activities proposed under the action alternative (Alternative B) would result in negligible adverse impacts to vegetation. Prior to capture activities discussed in Alternative B, helicopter pilot(s) would be provided with graphic information coordinates and maps detailing landing areas to avoid, such as designated Research Natural Areas and vegetation communities of special concern (e.g. riparian/wetlands) within the proposed capture area. DBHS processing sites would be distributed throughout the capture area to prevent repeat landing and ground crew disturbance. Any disturbance caused by helicopter downdraft would be intermittent and cease following each capture event; capture and handling time is estimated at approximately 15 minutes per DBHS. Two to four crew members are expected on the ground to conduct disease testing and translocation phases of the project, and approximately 80 landing may occur in a year. Landings would target core slick rock habitat and existing disturbed areas to avoid trampling of undisturbed, vegetated areas. Supplemental translocation actions would position processing crews in designated vehicle pull-out areas along ZION roadways. Supplemental translocation actions, specifically drop-net sites, may incur some ground disturbance. If drop-net sites are executed, sites would be selected in coordination with the ZION Vegetation Program Manager. Post-project areas would be raked to mitigate any trampling and/or revegetated if needed (see Mitigation Measures: Vegetation). This topic is dismissed from further analysis as no permanent or long-term impacts to vegetative communities would occur.

VISITOR USE AND EXPERIENCE

Visitation to Zion National Park has been increasing for decades, but especially large increases have been experienced in the last few years. The peak season in the park is now beginning to extend into early spring and late fall. In 2016, a record total of 4,317,028 people visited the park (NPS 2017), most of whom remain in developed areas such as roads, campgrounds, and front country trails. A few more adventurous visitors took advantage of the wilderness opportunities the park offers. In 2016, 16,294 wilderness permits were issued to 55,689 visitors for overnight backpacking; day use and overnight canyoneering; and overnight technical climbing. Permits are not required for day use hiking on developed wilderness trails or hiking cross country (other than canyoneering). For this reason the park does not have reliable data for the number of day use wilderness users, other than canyoneering. The project area is mainly accessed for day use cross country hiking opportunities.

Under the no action alternative, visitors would continue to have the ability to view DBHS from their vehicles on the Zion Mt. Carmel Highway. While the visitors viewing the wildlife see this as a positive experience, other motorists may see this activity differently. Those visitors viewing wildlife may stop in the travel lane or do not fully pull off the road posing a safety concern.

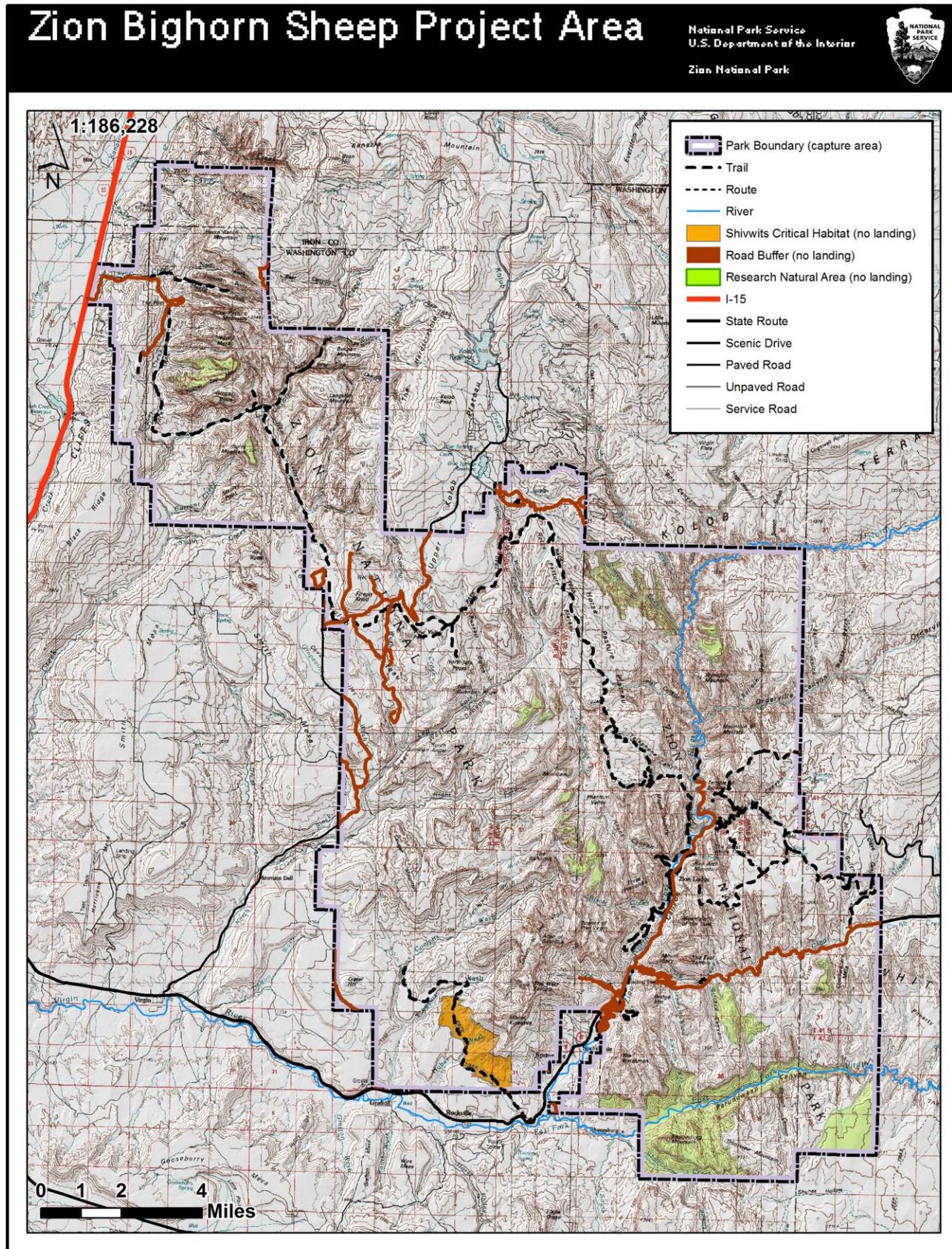
These “wildlife jams” are occurring more frequently as the herd grows and the animals disperse to areas of the park with fewer bighorn.

Under the action alternative, visitors would likely continue to see DBHS from the road; however, frequency may be reduced. If there are fewer bighorn sightings the instances of “wildlife jams” would decrease. For safety purposes, small sections of the project area would be closed temporarily to visitors during the helicopter (i.e. landing) and DBHS handling operations. Closures may inconvenience some visitors because they could not access the area; however, these areas receives very minimal visitor use, particularly during the time of year the proposed action would take place (late fall/winter). Visitors outside the closed area may be able to see or hear the helicopter, which would diminish their experience in Zion Wilderness. These effects are anticipated occur each year until the herd reaches the desired population. The disease-testing phase of the action would be completed in 2-3 days and the translocation phase would be completed in 5-6 days (daytime flights only). Efforts to inform and educate visitors about the project would help reduce any adverse impacts perceived by visitors but, overall, these impacts are expected to cease immediately following the disease testing and translocation phases (see Mitigation Measures); therefore, this topic has been dismissed from further analysis in this document.

WILD AND SCENIC RIVERS

The Omnibus Public Land Management Act of 2009 (Public Law 111-11) designated over 140 miles of river and tributaries within ZION as wild and scenic rivers, including the East Fork Virgin River and Shunes Creek. DBHS are identified as an outstandingly remarkable value (ORV) for both these watercourses, as they provide year-round habitat for the successful rearing of bighorn young (NPS 2013). Proposed capture operations, however, would not occur along river corridors. Neither would any of the proposed actions adversely impact the free-flowing condition, water quality, or the other outstandingly remarkable values for which they were designated.

Figure 1. ZION DBHS Project Area & Potential Capture Areas



ALTERNATIVES

Two alternatives, action and no action, are carried forward for evaluation in this EA. A number of suggestions and alternatives were also considered and dismissed (see the Alternatives Considered and Dismissed section).

ALTERNATIVES CARRIED FORWARD

ALTERNATIVE A – NO ACTION

Under Alternative A, the current conditions and protocols would persist, no modifications to DBHS management activities would be made nor would DBHS be translocated from ZION.

The UDWR would continue density-reduction efforts on BLM land within the Zion Wildlife Management Unit (WMU) (Figure 2) in order to preserve that portion of the population within their management objective. Currently, the UDWR's management objective for DBHS within the Zion herd, but outside NPS lands, is to retain a population estimate at or near 375 animals. Given the complex and rugged terrain being surveyed, the UDWR would continue to use a 60% sightability index to estimate the population from aerial survey count totals. The UDWR currently completes these surveys on a biennial basis and plans to continue this into the future.

Figure 2. UDWR ZION Wildlife Management Unit (WMU) #29



Source:

<https://wildlife.utah.gov/range/wmu29.htm> (Accessed June 29, 2017).

Bighorn sheep numbers would likely continue to increase from the last estimate of 527 within ZION boundaries in 2015. This increase makes the probably of a population crash and large scale herd reduction more probable.

ZION wildlife staff would continue to monitor the health of DBHS within the park through visual observations. Upon observation of symptoms associated with pneumonia epizootics, ZION staff would work closely with both the UDWR and the NPS Wildlife Health Branch to lethally remove and collect samples from symptomatic individuals for disease testing. When possible, a necropsy would be completed for lethally removed animals. This would also apply to DBHS observed wandering in high risk areas or comingling with domestic sheep or goats. NPS staff would use the results of such necropsies to assess population health as well as the effectiveness of such management actions at mitigating the risk of disease exposure. Wandering or comingling bighorn observed outside the park would be lethally removed by the UDWR. DBHS that are known to have come in contact with domestic sheep or goats will be removed by NPS staff. ZION would continue educational outreach efforts in Springdale to inform local citizens of this complex issue and to promote timely reporting of DBHS observations.

ALTERNATIVE B – DBHS MANAGEMENT (PROPOSED ACTION AND NPS PREFERRED)

Under Alternative B, current management action described in Alternative A would continue, inside and outside the park. Additionally, the NPS proposes to manage the long-term health and viability of ZION's DBHS population by maintaining the estimated population within the park

at or above approximately 350 individuals. ZION will routinely adjust population goals based on current conditions and assessments. To achieve this population goal, the NPS would employ population assessment and density reduction management actions, utilizing capture techniques as necessary, to reduce the risk of disease transmission and disease-related impacts. Capture work would be anticipated to be conducted intermittently as needed throughout the fall and winter months (September 1 to February 29) to achieve ZION DBHS population objectives. Each phase, and specific capture zones would be closely coordinated with UDWR staff, who would regularly lead implementation of planned activities throughout the state of Utah. The NPS would also commit to monitoring the frequency of watchable wildlife experiences involving DBHS within the park annually and would maintain opportunities to observe DBHS in their natural habitat within the developed areas of the park on a majority of days during peak visitation and thus balance disease management issues with public viewing desires.

Implementation of the proposed action would simultaneously allow for increased levels of monitoring of population health, habitat use, and movement patterns, and present opportunities to restore healthy DBHS populations in other areas of their historic range. Lethal removal actions would be taken as needed on a case-by-case basis, when interaction between domestics and DBHS are observed and safe action can be taken. DBHS capture and translocation activities would initially be focused in areas where densities are highest, with the goal of maintaining or reducing the density of bighorn and emphasizing areas where contact with domestic sheep are likely to occur. These activities may occur as frequently as annually until park population estimates for DBHS approach 350, after which such activities could occur an estimated every 3-4 years, or as necessary.

Due to the complex and rugged terrain, aerial surveys have traditionally been used. Furthermore, aerial access by manned aircraft is required for capture, disease testing, and removal of bighorn sheep. Monitoring, and other tracking tasks could also be performed using an Unmanned Aerial System, when such use is practical and beneficial. This may reduce some of the drawbacks associated with helicopter use including noise and safety concerns.

For both the disease testing and the translocation phase, bighorn would be captured using a helicopter capture company contracted by the UDWR. To reduce stress, helicopter chase times would not exceed five minutes. Helicopter capture activities would be focused on the core slick rock habitat on the east side of the park; multiple passes could occur on each day. Upon the successful capture of one or more DBHS, the helicopter would land or hover nearby to allow capture personnel to exit the aircraft and immediately remove captured animals from the net.

1. POPULATION ASSESSMENTS

A) AERIAL SURVEYS

In order to estimate the DBHS population occurring within the park, fall aerial surveys would be completed utilizing the UDWR protocols, as described in the Affected Environment, Wildlife: DBHS section of this document. In partnership with the NPS, the UDWR currently completes these surveys approximately every other year, and would continue these efforts into the future.

Under the action alternative, it would be important to monitor the population's status on an ongoing basis and adjust management actions accordingly. Such adjustments could

include alterations in the targeted sex/age class cohorts for any given year as well as the frequency (every year versus once every 2, 3 or 4 years) or intensity (removal of 60, 50, 40 individuals etc.), and location of planned actions. In addition to monitoring population size, the aerial surveys would also help to monitor the population's ram to ewe and lamb to ewe ratios. The NPS would strive to manage the population within the park toward a 1:1 ram to ewe ratio and would use the lamb to ewe estimates to assess recruitment. When the park DBHS population estimates reach 350 individuals or greater, reduction efforts could be triggered. Prior to implementation of any reduction efforts, the written approval of the ZION Superintendent would be required.

Meetings between ZION and UDWR personnel would be scheduled before and after the completion of these surveys to ensure sensitive areas of the park are avoided, review collected survey data, and plan for future translocation efforts. The aerial surveys would be completed on either an annual or biennial basis. The survey would be completed using a low-flying helicopter (e.g. L3, L4, A-Star, or similar) and the helicopter would make only a single pass during a given survey. When practical, use of an Unmanned Aerial System will be considered for monitoring, as such systems may offer greater capabilities and provide less risk to operators.

B) DISEASE TESTING & COLLARING

As previously mentioned, monitoring of the population's overall disease profile will be conducted prior to each planned capture and relocation effort and the results used to inform appropriate management actions on an ongoing basis which, depending on the results, could range from stopping all activities to informing which areas would be appropriate to receive individuals from the population.

During disease testing, the UDWR would capture and test up to 30 bighorn annually to ensure that the population is healthy in preparation for translocations. The disease-testing and collaring phase of the action would be completed in 2-3 days at least three weeks prior to the translocation to allow for completion of lab work. All bighorn would be captured using a net gun from a low-flying helicopter, such as a Robinson 44, Hughes 500, or similar model. Captured bighorn would be hobbled, blindfolded, placed in the sternal or left lateral recumbent position to prevent bloat, and held by capture personnel on the ground at the capture site.

During disease testing, the animals would be placed in the sternal or left lateral recumbent position to prevent bloat. A brief physical exam would be conducted to check for signs of respiratory disease and capture-related injuries. Heart rate, respiratory rate, and rectal temperature would be monitored and recorded approximately every five minutes. The following samples would be collected from each captured bighorn: blood, fecal, nasal swab, and oropharyngeal swab. Antibiotic and anti-inflammatory drugs as well as drugs for treatment of internal/external parasites and selenium deficiencies would be administered under the supervision of UDWR's Wildlife Disease coordinator or Wildlife Veterinarian and/or the NPS Wildlife Health Branch veterinary staff. All captured animals would be ear-tagged and some would be fitted with satellite GPS collars.

After collection of biological data and samples, these animals would be ear-tagged, fitted with satellite collars, and released on site. Up to 30 collars could be deployed in each of

the first two years of disease testing. The spatial data collected from these collars would provide a better understanding of movement patterns and habitat use, which would inform disease risk assessments and future management decisions. Should any DBHS be severely injured during capture, it would be humanely euthanized in accordance with the 2013 American Veterinary Medical Association (AVMA) euthanasia policy.

2. DENSITY REDUCTION

A. TRANSLOCATION

Depending on annual survey results, DBHS targeted for translocation would be adjusted in order to appropriately manage the residual population in the park. The number of bighorn, location, as well as sex and age class ratios of individuals targeted for capture, would be adjusted in future translocations to maintain a sufficient number of breeding-age ewes in the population and minimally maintain an approximate 1:1 ram to ewe ratio within the park's residual population.

The translocation phase would be completed in 5-6 days, where the UDWR could capture and remove as many as 60 bighorn annually. As previously described, all bighorn would be captured using a net gun from a low-flying helicopter (e.g. Robinson 44, Hughes 500, or similar model) and would be hobbled, blindfolded, placed in the sternal or left lateral recumbent position to prevent bloat, and held by capture personnel on the ground at the capture site.

Captured animals would then be transported to a staging area in bags slung beneath the helicopter. Up to four bighorn could be transported at one time. Individual animals would be held on the ground for no more than 15 minutes before transport and capture personnel would remain with each bighorn continuously while on the ground. If circumstances were likely to extend holding times beyond 15 minutes, bighorn would be released at the capture site to prevent excessive stress. If animals repeatedly show excessive temperatures upon arrival at staging areas, the helicopter crew would be notified and asked to further reduce chase and holding times. They would also start dowsing bighorn with an alcohol-water mixture prior to transport to facilitate cooling.

The staging area for translocation efforts would be located on a School and Institutional Trust Lands Administration (SITLA) section to the east of ZION along State Highway 9, or in other areas outside the park's boundaries. As described above in the disease testing section, DBHS would be removed from the helicopter by UDWR personnel, moved to the translocation processing area, and placed in the sternal or left lateral recumbent position. A brief physical exam would be conducted to check for signs of respiratory disease and capture-related injuries. Animals arriving at the translocation staging area with temperatures above 104°F would be cooled externally and immediately placed in a trailer to cool down before processing. Biological data and disease testing samples would be also be collected. Some of the translocated individuals may also be collared to collect spatial data. This data would be used to develop a better understanding of movement patterns and habitat use, which would inform disease risk assessments and future management decisions across the historic DBHS range (AZ, NV, and UT).

Following processing, bighorn captured for translocations would be placed in a trailer. Ewes and lambs would be grouped together in compartments and rams would be

separated into small groups of two to three to minimize injuries. Trailers would have suitable bedding such as wood chips or straw, and drinking water. Captive DBHS would be transported to the release location when trailer capacity is reached or the capture operation is concluded. The bighorn captured during this project would be translocated to one of several areas identified in the Utah Statewide DBHS Management Plan (UDWR 2013) to either augment existing herds or reintroduce bighorn into unoccupied habitat with the historic DBHS range. Should any DBHS be severely injured during translocation, it would be humanely euthanized in accordance with the 2013 American Veterinary Medical Association (AVMA) euthanasia policy.

B. SUPPLEMENTAL TRANSLOCATION ACTIONS

If aerial captures fail to adequately reduce density, efforts could be augmented in the future with drop-net or chemical immobilization activities (i.e., ground darting). These techniques alone would not meet the purpose and need of the project but could be used to bolster helicopter DBHS management efforts.

1. Drop-nets to capture DBHS

Utilizing drop-nets to capture groups of DBHS is a very time-consuming process. A suitable flat area near the road would be baited for several weeks or months to habituate animals to the location. Once a group of bighorn are habituated to the area, a large elevated net would be placed above the area on trees or installed posts, and the bighorn would be further habituated with baiting. Once this has been accomplished, the capture could be scheduled. This type of capture would require a significant number of personnel because several animals could be captured at once. Injuries to bighorn are also more common during this type of capture because of the number of individuals captured at once and the amount of time that the animals must remain in the net and then wait for processing. Bighorn would be removed from the net, hobbled, and blindfolded. Bighorn would then be moved to a processing area located in one of the larger pull-offs on the east side of the park. The area would have to be large enough for several vehicles including the trailer used to translocate the animals after processing. From this point, the project would follow the same disease testing and translocation protocols as described above.

2. Chemical Immobilization

Utilizing chemical immobilization to capture individual DBHS would require the use of a dart gun and darts containing anesthetizing drugs. Bighorn located near the Zion-Mount Carmel Highway would be selected individually for capture and darted. The anesthetized animal would then be moved to a processing area located in one of the larger pull-offs. From this point, the project would follow the same disease testing and translocation protocols as described above.

Due to the complexity of the roadside processing area, it is not reasonable to consider translocation for each capture. This would limit the effectiveness of this method and would likely result in a low number of captures. Dart captures can also increase the risk to sheep because drugged sheep can move in any direction could be exposed to cliffs and drop offs while in an altered mental state. Other bighorn would likely be flushed from the area during this process which would hinder subsequent capture attempts.

C. LETHAL REMOVAL

Upon observation of DBHS with symptoms associated with pneumonia epizootics, ZION staff would work closely with both the UDWR and the NPS Wildlife Health Branch to lethally remove and test symptomatic individuals. This would also apply to DBHS observed wandering in high risk areas or comingling with domestic sheep or goats. Comingling is most likely to occur outside NPS lands and would be managed by the UDWR. Bighorn would be lethally removed if there is significant concern that they have made contact with domestic sheep or goats. As the DBHS range continues to expand within the park, risk assessments would be completed and corresponding management actions planned on a case by case basis. At all times, the NPS would strive to minimize those instances when lethal management of bighorn is required. Individual DBHS would be euthanized using non-lead ammunition and, if a sheep is lethally managed, carcass recovery would be considered. The goal is to minimize the risk of a potentially infected bighorn to return to herds inside the Park and subsequently infect a large number of DBHS.

MITIGATION MEASURES

The following mitigation measures would be implemented during the project to minimize the degree and/or extent of adverse impacts.

ARCHEOLOGICAL RESOURCES

- All project participants would be informed of the procedures to follow in the event of archeological, ethnographic, and paleontological resource discovery, as well as the penalties for illegally collecting artifacts or intentionally damaging paleontological materials, archeological sites, or historic properties.
- Prior to the implementation of management activities, coordinates would be supplied to helicopter pilots to ensure landings do not occur in culturally sensitive areas.
- All helicopter landing site coordinates would be reported to the ZION Cultural Program Manager for record keeping purposes and to pursue archeological survey of the areas as warranted, post project.
- All drop-net sites would be selected in coordination with the ZION Cultural Program Manager. Archeological surveys would be conducted prior to implementation and monitored for archeological resources throughout installation as required.

LIGHTSCAPES AND SOUNDSCAPES

- All helicopter activity would be completed during daylight hours, starting no earlier than one hour after sunrise and ending no later than one hour before sunset. Helicopter staging area and animal processing area for translocation would be outside designated or proposed Wilderness areas.

VEGETATION

- All equipment, including the helicopter and nets, would be inspected prior to use. Any weeds, seeds, or soil would be removed prior to project activities.
- All fueling activities would occur outside of the park.

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- Helicopters would avoid netting or landing in vegetation. Landings would target core slick rock habitat within the proposed capture area.
 - All drop-net sites would be selected in coordination with the ZION Vegetation Program Manager. Prior to implementation, sensitive plant surveys would be conducted. Any sensitive species located would be avoided or protected and made identifiable for DBHS ground crews.

VISITOR USE AND EXPERIENCE

- Signs, alerts, bulletins, press releases, and notifications would be issued to inform visitors prior to and throughout the duration of management activities.

WILDLIFE & SPECIAL STATUS SPECIES

- All proposed management activities described in this document will adhere to UDWR established DBHS capture and handling protocols, as approved and/or reviewed by the NPS Wildlife Branch.
- Flights over Mexican Spotted Owl protected activity centers (PACs) would be restricted from March 1 through August 31.
- Prior to the implementation of management activities, coordinates would be supplied to helicopter pilots to ensure landings do not occur in designated Natural Resource Areas or other environmentally sensitive areas, such as Parunuweap Canyon and/or riparian zones.
- The Peregrine Fund and park biologists would be contacted prior to the helicopter activity to obtain current condor activity patterns and possible roosting or nesting locations that could be affected, and these areas would be avoided. Netting activity would likely occur in fall after fledging has occurred. Condors would be avoided if present in the project area.
- Aircraft operation would be limited to daylight hours, starting no earlier than one hour after sunrise and ending no later than one hour before sunset.
- Helicopter and capture personnel will be briefed on California Condors identification, current locations, and nest sites to avoid prior to flights.
- If active condor nests exist in the action area, a one-mile flight buffer would be provided around the nest.
- Capture personnel will be made aware of the location of tortoise habitat in ZION; if capture occurs in tortoise habitat, personnel will closely monitor through visual observation presence of desert tortoise in the immediate area of capture in order to eliminate the potential of injury or disturbance.

ALTERNATIVES CONSIDERED AND DISMISSED

The following suggestions and/or alternative locations for the project were considered but dismissed from further consideration. These include suggestions from public scoping as well as the project planning team.

1. NO CAPTURE EFFORTS IN WILDERNESS

Under this alternative capture efforts would be limited to areas of the park that are not within designated or recommended wilderness. This would limit capture activities to within

500 feet of the Zion-Mt. Carmel Highway on the east side of the park, and other high visitor use areas. Attempting to use the helicopter/net gun capture method in this area would prove very challenging due to the limited space to maneuver the helicopter and availability of bighorn to capture outside wilderness. However, two other capture techniques could be used in this area.

The first technique would be to use drop nets to capture groups of DBHS. This is a very time-consuming process. A suitable flat area near the road would be baited for several weeks to months to habituate animals to the location. Once a group of bighorn are habituated to the area, a large elevated net would be placed above the area and the bighorn would be further habituated with baiting. Once this has been accomplished, the capture could be scheduled. Injuries to bighorn are more common during this type of capture because of the number of individuals captured at once and the amount of time that the animals have to remain in the net and wait for processing. Bighorn would be removed from the net, hobbled, and blindfolded. Bighorn would then be moved to a processing area located in one of the larger pull offs on the east side of the park or to an area just outside the park. The area would have to be large enough for several vehicles including the trailer used to translocate the animals after processing. From this point, the project would follow the same protocol as described in the proposed action alternative for processing captures.

The second technique would be to use chemical immobilization to capture individual DBHS. This technique would require the use of a dart gun and darts containing anesthetizing drugs. Bighorn would be selected individually for capture and darted by UDWR personnel. The anesthetized animal would then be moved to a processing area located in one of the larger pull offs or to an area just outside the park. Other bighorn would likely be flushed from the area during this process which would hinder subsequent capture attempts. Because of the complexity of the processing area, it is not reasonable to consider relocating for each capture. This would limit the effectiveness of this method and would likely result in a low number of captures. From this point, the project would follow the same protocol as described in the proposed action alternative for processing captures.

Both of these methods, even if combined, would result in a low number of captures, and higher risk of injury or death to sheep and, therefore, this alternative would not meet the purpose and need for this project.

2. LETHAL REMOVAL ONLY

Under this alternative, the park would rely solely on the lethal removal of DBHS from the park to reduce density, risk of disease transmission, and disease-related impacts. This would be accomplished through coordination with Zion law enforcement. Individual DBHS would be shot using non-lead ammunition and the resulting carcass would be left to scavengers or to decompose naturally. This method would be very controversial and would not contribute to the conservation of the species. Most DBHS populations are struggling in Utah, as well as in many other western states. Lethal removal would eliminate an opportunity for the NPS to contribute to the restoration of healthy DBHS populations in other areas of their historic range. Thus, lethal removal by any means (including the use of skilled volunteers and NPS sharpshooters) would not meet the purpose and need for action and the project objectives.

3. FERTILITY CONTROL

In 2015, experts reviewed ungulate fertility control experiences in 10 NPS units and concluded that for population management, target animals must be relatively easily accessible, reside within functionally closed populations and managers should have estimates of population vital parameters (Powers and Moresco 2015). Fertility control techniques often have proved uneconomical or infeasible for practical implementation even in small, localized populations (Fagerstone 2002). Fertility control can take a long time, and require repeated applications to achieve population reduction consistent with objectives. Fertility control measures would not, in the near term, sufficiently reduce the population to low levels; meanwhile, the increased likelihood and risk of disease exposure would continue. Thus, a fertility control alternative is not technically or economically feasible nor does it meet the purpose and need for this project.

4. MANAGED HUNT/PUBLIC HUNTING

Throughout the years, the NPS has taken differing approaches to wildlife management, but has maintained a strict policy of not allowing hunting in units of the national park system where it is not congressionally authorized. In 1970, Congress passed the General Authorities Act and in 1978 the “Redwood Amendment,” which clarified and reiterated that the single purpose of the NPS Organic Act is conservation. Although the Organic Act gives the Secretary of the Interior the authority to destroy plants or animals for the purposes of preventing detriment to park resources, it does not give the Secretary authority to permit the destruction of animals for recreational purposes. In 1984, after careful consideration of congressional intent with respect to hunting in national parks, the NPS promulgated a rule that allows public hunting in national park areas only where “specifically mandated by Federal statutory law” (36 CFR 2.2). The NPS reaffirmed this approach in the NPS *Management Policies 2006* (NPS 2006).

During public scoping, some commenters advocated the use of hunting in the park to manage ZION’s DBHS population. Public hunting would be inconsistent with existing laws, policies, and regulations for the park and all other units of the national park system where hunting is not authorized. As a result, this alternative would require a major change to a law, regulation, or policy and has, therefore, been dismissed from further consideration.

5. ELIMINATE DISEASE VECTORS OUTSIDE PARK

As described in the Purpose and Need section, many hobby farms and domestic sheep/goat operations on private land adjacent to the core DBHS habitat within the park contain habitat suitable for DBHS and, therefore, present the most immediate risk for disease transmission. However, because the vectors of disease occur on private lands, the NPS has no authority to implement efforts to eliminate them. Although this alternative addresses issues beyond the scope of the NEPA review and has been eliminated from further consideration for this reason, both ZION and UDWR will continue to focus educational outreach efforts on these areas of private land. The Wild Sheep Working Group of WAFWA has outlined suggested management practices on private lands within their “Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat.” These management practices will continue to be the focus of educational outreach efforts.

6. ALLOW ONLY NATURAL FLUCTUATIONS IN DBHS POPULATIONS

Natural fluctuations in DBHS populations can be attributed to a variety of factors including predation, precipitation, forage quantity/quality, density-dependent recruitment, and disease. The pathogens that lead to pneumonia epizootics in DBHS are not naturally occurring in native bighorn populations. They are present in domestic sheep and goats, and introduced to DBHS through nose-to-nose contact. Since native DBHS did not evolve in the presence of these pathogens, pneumonia epizootics lead to unnatural fluctuations in the population. Pneumonia epizootics in DBHS lead to all age die-offs with up to 90% mortality occurring in the initial event and then reduced lamb recruitment that can last for years.

Mountain Lions can be primary predators on DBHS, and at low population levels may contribute to local extirpation. At higher DBHS numbers lions could potentially impact population densities and size. Mountain Lions in the park are protected, but are hunted outside the park. Zion is included in the Zion Hunt Unit which is managed as harvest objective unit with a quota of 18 cats (UDWR 2017). NPS does not manage hunt activities occurring outside the park. For these reasons and because the alternative does not resolve the purpose and need for action, the NPS has dismissed this alternative from full evaluation in this EA.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment (existing setting or baseline conditions) and analyzes the potential environmental consequences (direct, indirect, and cumulative impacts) that would occur as a result of implementing the proposed alternatives.

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). In order to determine the cumulative impacts of the preferred alternative it was necessary to examine past, present, and reasonably foreseeable future actions at Zion National Park. Cumulative impacts are considered for the no action and the preferred alternative. The following projects were identified for the purpose of conducting the cumulative impacts analysis:

PAST ACTIONS

- **1930:** Estimated Zion area DBHS population ranges from 6 to 25 individuals.
- **1953:** Last documented DBHS sighting.
- **Mid-1950s:** Probable extirpation of ZION DBHS Population.
- **1964:** DBHS Reintroduction Planning.
- **1973:** Twelve DBHS from Nevada released into ZION.
- **2008-Present:** UDWR DBHS State-wide Monitoring and Management – In collaboration with multiple federal agencies and various state partners, UDWR actively manages DBHS populations to increase individual numbers within the state and maintain or improve sufficient DBHS habitat utilizing a variety of techniques, such as aerial surveys and translocation efforts (UDWR 2013b). Currently, only biennial helicopter surveys are conducted to assess population levels within ZION (NPS PEPC #s: 24161, 49350, & 54125).

PRESENT ACTIONS

- ZION Exotic Vegetation Removal - Mechanical removal, including the use of chainsaws and/or chemical herbicides, of exotic vegetation throughout ZION frontcountry and wilderness areas (NPS PEPC #: 68494).
- ZION Fire Management Activities – Wildland fire management supports park-specific resource management objectives, including a wide range of strategic options available to park managers that can be modified to adapt to the diversity of ecosystems found within the NPS. Responses and planned actions to wildfire include: suppressing wildlife, managing unplanned ignitions, prescribed fire, manual and mechanical fuel treatment, herbicide application, and/or the use of biological agents (i.e. species-specific defoliators) (NPS Healthy Forest Initiative Categorical Exclusion).
- ZION Search and Rescue Operations (SAR): Park Rangers and SAR personnel respond to approximately 250 emergency incidents in ZION each year. Operations occur intermittently and at all times of year within the park boundary, some of which may include helicopter use.
- ZION Trail Repair and Maintenance – Repair and maintenance, including the use of mechanized equipment, of trails throughout ZION frontcountry and wilderness areas (NPS PEPC #s: 64180 & 69747).
- Increasing Human Use within ZION - Visitation to Zion National Park has been increasing for decades, but especially large increases have been experienced in the last few years. From 2006 to 2016, visitation has increased 60% to 4.3 million people. The peak season in the park is now extends into early spring and late fall.
- Increased Non-NPS Overflights – Authorized and unauthorized air traffic over ZION is increasing, to include: high flying jets, commercial air tours, and other forms of private aviation.

FORESEEABLE FUTURE ACTIONS

- Utah Group Fire Management Environmental Assessment – Preparation a programmatic EA for all Utah Group Parks is currently ongoing. Fire Management plans would be completed after a decision document is signed and will allow the Utah Group Parks to fulfill agency policies and requirements for strategic and terminology updates, and allow the NPS parks to continue applicable fire management programs (NPS PEPC #: 55395).
- Visitor Use Management Plan-NEPA process is underway to plan and implement new guidance for managing increasing visitor use. Draft expected in 2018

SOUNDSCAPE**AFFECTED ENVIRONMENT**

An important part of the NPS mission is preservation of natural soundscapes within national parks as indicated in *NPS Management Policies 2006* and *DO-47: Sound Preservation and Noise Management*. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all natural sounds within the park, together with the

physical capacity for transmitting natural sound through air, water, or solid material. Acceptable frequencies, magnitudes, and durations of human-caused sound varies among national park system units, as well as potentially throughout each park unit, but are generally greater in developed areas and less in undeveloped areas. Zion strives to preserve the natural soundscape associated with the physical and biological resources of the park.

Zion developed a Soundscape Management Plan (SMP) to protect sound resources in the park (NPS 2010). The SMP identifies a frontcountry zone and a wilderness zone for the purposes of soundscape management. The project area occurs within the wilderness zone, which has the following management objectives:

- Only natural sounds are audible and discernible, except for short duration, infrequent human-caused sounds.
- Noise levels that interfere with general conversation are very rare and are of limited duration except when caused by emergency services, search and rescue operations (aircraft), and approved park operations (aircraft, motorized/mechanical tool use).
- Noise levels that mask important auditory signals for wildlife should be rare.
- Noise levels that affect wildlife behavior, distribution, and numbers should be rare.

The median existing ambient sound level in the wilderness zone ranges from 26 to 37 A-weighted decibels (dBA) during the day and from 20 to 38 dBA during the night. The wind rustling through leaves on a tree would be about 20 dBA, a person whispering at 5 meters would be about 30 dBA, and a quiet office or library would be about 40 dBA. In other words, very quiet.

The SMP establishes the following thresholds for the wilderness zone during daytime hours (one hour after sunrise to one hour prior to sunset). If the thresholds are exceeded then the objectives, as described above, are not being met and natural soundscapes are not being protected:

1. Time Audible

The hourly percent time audible (the amount of time that a human-caused sound is audible to an animal with normal hearing) is less than 25% for 90% of the day. The hourly percent time audible never exceeds 50%. This threshold ensures that natural sounds predominate in Zion Wilderness and that visitors have opportunities to experience solitude.

2. Sound Level

The hourly change in exposure is less than or equal to 3 dBA for 75% of the day and does not exceed 6 dBA for 90%. Human-caused sound events never exceed 60 dBA. This threshold ensures that human-caused sound levels are not likely to mask natural sounds.

3. Noise Free Interval

The daily maximum noise-free interval is at least 60 minutes (over a 12-hour period). The daily median noise-free interval is at least 7 minutes (over a 12-hour period). This threshold ensures that enough time occurs between human-caused noise events for visitors to Zion Wilderness to have the opportunity to experience solitude and to provide wildlife needed time between noise events.

4. Time Above Speech Interference

General Threshold: Human-caused sound levels are less than or equal to 60 dBA for more than 1% of the 12-hour period. Rock Climbing/Canyoneering Threshold: Human-caused sound levels are less than or equal to 44 dBA for more than 5% of the day in commonly used rock climbing and canyoneering areas.

Notably, human-caused sounds, such as vehicular traffic or motorized equipment are infrequent in the project area. As a result, aircraft noise is the most prominent human-caused sound in most areas of wilderness. Past acoustic monitoring in the project area has shown that noise from high flying jet aircraft can be heard during almost every hour of the day and night, peaking from 8am to 11am. Park managers have noted an increase in air traffic over ZION by high flying jets, commercial air tours, and other forms of private aviation; however, no mechanism currently exists to quantifiably document the increase in overflights.

IMPACTS OF ALTERNATIVE A – NO ACTION

Under Alternative A, the sounds of nature would continue to be interrupted by exotic vegetation removal activities, trail maintenance activities, as well as authorized and unauthorized aircraft activities. Exotic vegetation removal and trail maintenance activities using mechanized equipment are limited annually and only occur in prescribed areas on a seasonal, as needed basis. Likewise, SAR and fire management aviation activities occur only as necessary and are executed in confined or prescribed areas. Current UDWR efforts to monitor the ZION WMU DBHS population would also continue. Periodic monitoring of the bighorn herd using a helicopter occurs approximately once every 2 years, over a 2 day period. Under the existing monitoring activities, the survey helicopter flies over the entire park which interrupts natural quiet in wilderness throughout the park which disrupts the ability for animals and visitors to hear natural sounds. At any specific location, this disturbance would be for a short period of time (approximately 1 minute or less) since the helicopter continues to move. Monitoring actions are not expected to exceed three of the four thresholds established in the Zion Soundscape Management Plan; however, the helicopter would exceed the sound level threshold of 60 dBA since an “average” helicopter flying at 400 feet above the ground would be at 77 dBA. At 1,600 feet from the helicopter in flight it is expected that sound would have attenuated to or below the 60 dba threshold (using attenuation data from NPS 2007). Less than 1% of wilderness would be expected to be impacted at a time, and only for short durations.

CUMULATIVE IMPACTS

Past, present and reasonably foreseeable future actions under Alternative A that have or could impact the natural soundscape include: exotic vegetation removal, trail maintenance, ZION SAR operations, ZION fire management activities, and UDWR DBHS monitoring efforts. In summary, the impacts of, present and reasonably foreseeable future actions will periodically interrupt natural quiet in wilderness throughout ZION, including wilderness areas (< 1% at any given time). Collectively, all of these actions have had and would continue to have intermittent adverse cumulative impacts on the natural soundscape. Noise associated with equipment and aircraft of each listed actions would exceed sound level thresholds and continue to obstruct the ability for visitors to experience the sounds of nature and for wildlife to be able to hear predators, find food or mates, etc. As previously stated, exotic vegetation removal and trail maintenance activities are limited in size and scope annually. From 2011 through 2016 there were 91 days that helicopters were used by the park for search and rescue and fire management activities over wilderness. Three bighorn sheep surveys have occurred between 2008 and 2015, with 4 flight days over the park. When the impacts of Alternative A are combined with other

past, present, and reasonably foreseeable future impacts, the total cumulative impact on the natural soundscape would be an inconsequential increase in the annual number of hours and/or days that human-caused sound has an undesirable effect on the soundscape experienced by visitors and wildlife. The incremental impact of the increase in the number of NPS flight hours and/or days associated with DBHS monitoring would contribute slightly to, but would not substantially change the impacts that already occur.

IMPACT OF ALTERNATIVE B

Under Alternative B, the natural soundscape would continue to be interrupted by exotic vegetation removal activities, trail maintenance activities, as well as authorized and unauthorized aircraft activities as described in the Soundscape: Impacts of Alternative A – No Action section. Additionally, helicopter noise associated with DBHS population assessment, density reduction (translocation and lethal removal), and capture activities would adversely impact the natural soundscape.

A few weeks prior to the implementation of translocation activities, a disease testing phase would occur and require the use of helicopters to search for and capture bighorn to collect biological data and samples, ear-tag, and attach satellite collars to no more than 30 individual animals. Capture work for both disease testing and translocation would be expected to last 7 hours each day for up to 6 days. Searching for, locating, capturing, landing, taking off, and flying back to the staging area would take more than 30 minutes of each hour. It is estimated that approximately 12 takeoffs/landings would occur each day within the park. Takeoffs and landings are generally the loudest noise generated by the helicopter. Human-cause noise generated during an “average” helicopter take-off and landings is approximately 97 dBA at 100 feet which exceeds the sound level standard identified in the SMP.

The percent time audible standard would be exceeded due to the noise generated by the amount of helicopter use required for active capture efforts. As previously discussed, capture work throughout the life of this plan would be anticipated to be conducted intermittently as needed throughout the fall and winter months (September 1 to February 29) to achieve ZION DBHS population objectives. Initially, the project would focus on capturing and removing as many as 60 individuals per year. This level of capture activity would be expected to continue until the Zion DBHS population was reduced to a lower desired level of abundance that approaches, yet remains above the park’s established population management limit as identified in the proposed action. Once this desired population level was achieved, the recurring level of capture activity would be reduced considerably both in frequency and duration, but may still be required periodically in order to maintain the population within a range that reflects the lower desired level of abundance over time. Overall, there would be short-term adverse impacts associated with the proposed action, but the impacts are reduced by the mitigation measures and are not substantial.

CUMULATIVE IMPACTS

Past, present and reasonably foreseeable future actions under Alternative B that have or could impact the natural soundscape include: exotic vegetation removal, trail maintenance, ZION SAR operations, ZION fire management activities, and UDWR DBHS monitoring efforts in addition to DBHS population assessment, density reduction, and capture efforts. In summary, the impacts of past, present, and reasonably foreseeable future actions will periodically interrupt

natural quiet in wilderness throughout ZION, including wilderness areas (< 1% at any given time). Collectively, all of these actions have had and would continue to have intermittent adverse cumulative impacts on the natural soundscape. Noise associated with equipment and aircraft of each listed actions would continue to obstruct the ability for visitors to experience the sounds of nature and for wildlife to be able to hear predators, find food or mates, etc. As described in the Impacts of Alternative A section, direct and indirect impacts on the natural soundscapes exceed the sound level thresholds. The percent time audible threshold would also be exceeded during the population assessment, density reduction, and capture activities as proposed in Alternative B. When the effects of the proposed alternative are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on the natural soundscape would be a moderate increase in the number of hours and/or days that human-caused sound has an undesirable effect on visitors and wildlife, and in days that park's natural soundscape objectives could be exceeded. The incremental impact of the annual increase in the number of NPS flight hours and/or days associated with DBHS management activities (i.e. population assessments, density reduction, and capture) would contribute slightly to, but would not substantially change the impacts that already occur.

SPECIAL STATUS SPECIES

AFFECTED ENVIRONMENT

An official federal species list (consultation code 06E23000-2017-SLI-0211) was obtained from the U.S. Fish and Wildlife Service (USFWS) Information and Planning and Conservation (IPaC) website (<https://ecos.fws.gov/ipac/>) on June 26, 2017. The list identified 14 threatened, endangered, or candidate species with the potential to occur in the project area and one critical habitat within the proposed action area: Utah prairie dog (*Cynomys parvidens*); California condor (*Gymnogyps californianus*); Mexican spotted owl (*Strix occidentalis lucida*); Southwestern willow flycatcher (*Empidonax traillii extimus*); Yellow-billed Cuckoo (*Coccyzus americanus*); Mojave Desert tortoise (*Gopherus agassizii*); Virgin River chub (*Gila seminuda* (=robusta)); Woundfin (*Plagopterus argentissimus*); Dwarf bear-poppy (*Arctomecon humilis*); Gierisch mallow (*Sphaeralcea gierischii*); Holmgren milk-vetch (*Astragalus holmgreniorum*); Jones cycladenia (*Cycladenia humilis* var. *jonesii*); Shivwits milk-vetch (*Astragalus ampullarioides*); and Siler pincushion cactus (*Pediocactus* (=echinocactus,=utahia) *sileri*). Additionally, critical habitat designations for the Mexican Spotted Owl (MSO) and Shivwits Milk-vetch wholly or partially occur within the proposed project area. Of the species listed, four have been retained for further analysis: Shivwits milk-vetch, California condor, Mexican Spotted owl, and Mojave Desert tortoise. All other listed species with the potential to occur within the project area have been dismissed from further analysis for one or more of the following reasons: project area occurs outside of the known distributional range of the species; no habitat is present in the action area; project area occurs outside of the elevation range of the species; and/or the species is not expected to occur during the season of use/impact.

A detailed analysis, or Biological Assessment (BA), of the four species and two designated critical habitat identified with potential to occur in the project area was prepared by the ZION resource management staff and submitted to USFWS in August, 2017. The BA contains more detailed information on potential project impacts to special status species. A **may affect, but is not likely to adversely affect** (NLAA) determination was applied to three species and one designated critical habitat. A **No affect** determination was made for Shivwits milk-vetch, and milk-vetch Critical habitat. This means all direct and indirect effects from the proposed action and its interrelated or interdependent actions to these listed species and designated critical habitat are

insignificant and/or discountable. Below is a summary of biological and environmental concerns for special status species.

1. **California Condor**

California condors were listed as endangered in 1967, but by 1987 the last free flying condor had been captured for breeding programs. In 1996, condors were re-released into the wild. Although they are listed as a 10(j) non-essential experimental population, Zion National Park manages the species as Threatened.

Condors are obligate scavengers that feed only on carrion. Typical foraging behavior includes long-distance reconnaissance flights, lengthy circling over a carcass, and hours of waiting at a perch or on the ground near a carcass, possibly watching for predators. Condors maintain wide-ranging foraging patterns throughout the year, an important adaptation for a species with unpredictable food supplies.

There are currently approximately 80 condors in the Arizona/Utah population. All of these birds spend some of their time in and around ZION. Most of the activity in ZION occurs during spring and summer as the condors shift their focus from the Kaibab Plateau in Northern Arizona to ranching areas north of the park. They move back to the Kaibab Plateau in the fall to take advantage of food sources made available during deer and elk hunting seasons. There have been nesting attempts by a condor pair for the past three years in ZION, but these have failed for unknown reasons. Lead poisoning is currently the greatest obstacle to the recovery of this species and is a result of condors inadvertently ingesting spent lead ammunition while consuming carcasses and gut piles left in the field.

2. **Mexican Spotted Owl**

Mexican Spotted Owls are medium sized owls who live and nest primarily in deep slot canyons in the park. Owls are monitored according to USFWS protocols every year, or every other year depending on the area. The owls tend to use the same area year after year, and there are currently 21 known Primary Activity Centers (PACS), where most of the owl breeding and rooting activity occurs.

3. **Mojave Desert Tortoise**

The Mojave Desert tortoise occurs north and west of the Colorado River in California, Nevada, Arizona, and Utah. Desert tortoises spend up to 95% of their life underground and live in a variety of habitats from sandy flats to rocky foothills, including alluvial fans, washes, and canyons where suitable soils for den construction might be found. ZION's tortoise population is the northern most and highest elevation population and occurs within the vicinity of the town of Springdale, Utah. Thirty-three tortoises have been observed within/near ZION and breeding has been confirmed. Seasonal movements have been monitored since 2008.

4. **Critical Habitat - Mexican Spotted Owl**

All of the park and project area has been designated as Critical Habitat for Mexican Spotted Owl by the USFWS.

5. **Critical Habitat - Shiwits milk-vetch**

A portion of the project area contains designated Critical Habitat for the Shivwits milk-vetch. No landing will be permitted in Critical Habitat and, and no ground impact is anticipated.

IMPACTS OF ALTERNATIVE A

1. *California Condor*

The no action alternative would cause no change to current conditions. Consequently, this alternative would have no direct impacts on California condors in the action area. The risk of disease transmission and a pneumonia die-off in the bighorn herd could increase under this alternative and, therefore, could have a short term beneficial impact on California condors in the action area should a die-off occur by providing a large number of lead-free carcasses for condors to feed on in the project area. The scale of this benefit would depend on the intensity of the initial die-off event which could affect 50-90% of the herd. This would likely occur over several months, so would be short-term in nature. After the die off and high number of carcasses to consume a smaller sheep population would result in fewer carcasses available long term, limiting forage availability with potential negative impacts. Because condors are long lived species, the potential short term increase in number of carcasses is not likely to have a discernable impact.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions that have or will impact condors include increased park visitation, wilderness permits management, and the visitor use management plan. Wilderness permits and the forthcoming visitor use management plan serve to mitigate the impacts of increased visitation. Other projects include prescribed fire and search rescue operations. Because the project area is primarily wilderness, the number of cumulative projects is small. In summary, the impacts of past, present, and reasonably foreseeable future actions have had non-measurable impacts to condors. Collectively, all of these actions have had and would continue to have non-detectable impacts on condors. As previously described in this EA, the direct and indirect impacts of alternative A on condors would be noise from helicopter survey overflights. When the effects of alternative A are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on condors would continue to be negligible. The incremental impacts of alternative A would contribute slightly to, but would not substantially change, the any visual of noise impacts that could be occurring.

2. *Mexican Spotted Owl*

Alternative A would cause no change to current conditions. Helicopter surveys would occur for population counts, but activity would be brief and outside of breeding season. Therefore, this alternative would have no measurable impact on Mexican spotted owls in the action area. High population levels could have adverse impacts on plant habitat if overgrazing occurred, impacting food base for owls. Alternative A *may affect, but is not likely to adversely affect* Mexican Spotted Owls.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions that have or will impact MSO include increased park visitation, wilderness permits management, and the visitor use management plan. Wilderness permits and the forthcoming visitor use management plan serve to mitigate the impacts of increased visitation. Other projects include prescribed fire

and search rescue operations. Because the project area is primarily wilderness, the number of cumulative projects is small. In summary, the impacts of past, present, and reasonably foreseeable future actions have had no measurable impacts to MSO. Collectively, all of these actions have had and would continue to have no detectable impacts on MSO. As previously described in this EA, the direct and indirect impacts of alternative A on MSO would be noise from helicopter overflights. When the effects of alternative A are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on MSO would continue to be negligible. The incremental impacts of alternative A would contribute slightly to, but would not substantially change, the impacts that are already occurring.

3. *Mojave Desert Tortoise*

Alternative A would cause no change to current conditions. Helicopter surveys would continue to occur for population counts which would have no measurable impact on Mojave Desert tortoises in the action area. An increasing bighorn population could have negative impacts on vegetation if overgrazing occurred, therefore Alternative A *may affect, but is not likely to adversely affect* Mojave Desert tortoise.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions that have or will impact Desert Tortoise include increased park visitation, wilderness permits management, and the visitor use management plan. Wilderness permits and the forthcoming visitor use management plan serve to mitigate the impacts of increased visitation. Other projects include prescribed fire and search and rescue operations. Because the project area is primarily wilderness, the number of cumulative projects is small. In summary, the impacts of past, present, and reasonably foreseeable future actions have had non-measurable impacts to desert tortoise. Collectively, all of these actions have had and would continue to have non-detectable impacts on condors. As previously described in this EA, the direct and indirect impacts of alternative A on tortoise would be noise from helicopter overflights. When the effects of alternative A are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on tortoise would continue to be negligible. The incremental impacts of alternative A would contribute slightly to, but would not substantially change, the impacts that are already occurring

4. *Critical Habitat - Mexican Spotted Owl*

MSO critical habitat also occurs in the project area, but no land based activities are expected and helicopter noise would be infrequent and of short duration, with no impacts to the principal components of the habitat.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions that have or will impact MSO Habitat include increased park visitation, wilderness permits management, and the visitor use management plan. Wilderness permits and the forthcoming visitor use management plan serve to mitigate the impacts of increased visitation. Other projects include prescribed fire and search and rescue operations. Because the project area is wilderness, the number of cumulative projects is small. In summary, the impacts of past, present, and reasonably foreseeable future actions have had no measurable impacts to MSO habitat. Collectively, all

of these actions have had and would continue to have no detectable impacts on condors. As previously described in this EA, the direct and indirect impacts of alternative A on MSO habitat would be noise from helicopter overflights. When the effects of alternative A are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on MSO habitat would continue to be negligible.

5. Critical Habitat - Shivwits milk-vetch

Helicopter overflights will have no measurable impacts on Shivwits milk-vetch critical habitat.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions that have or will impact milk vetch habitat include increased park visitation, wilderness permits management, and the visitor use management plan. Wilderness permits and the forthcoming visitor use management plan serve to mitigate the impacts of increased visitation. Other projects include prescribed fire and search rescue operations. Because the project area is wilderness, the number of cumulative projects is small. In summary, the impacts of past, present, and reasonably foreseeable future actions have had non-measurable impacts to milk-vetch habitat. Collectively, all of these actions have had and would continue to have non-detectable impacts on condors. As previously described in this EA, the direct and indirect impacts of alternative A on milk-vetch habitat would be noise from helicopter overflights. When the effects of alternative A are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on milk-vetch habitat would continue to be negligible. The incremental impacts of alternative A would contribute slightly to, but would not substantially change, the impacts that are already occurring

IMPACT OF ALTERNATIVE B

1. California Condor

The helicopter activity associated with the proposed action would create an auditory and visual disturbance to California condors in the action area. There would be a maximum of 11 days of helicopter activity from this project in any given year of project implementation. Condors are wide-ranging and any current condor high use areas could be avoided. If California condors perched within the action area during the proposed action, the direct effects could include flushing from perch or roost sites. If flushed, condors would then likely leave the area of helicopter activity removing themselves from the potential stressor. This could range from a few minutes to a few hours in any specific area.

To avoid or minimize these potential negative effect, the Peregrine Fund and park staff would be contacted prior to the proposed action to obtain current activity patterns and possible regular roosting or nesting locations that could be affected by the proposed action. Flight plans would be altered to avoid areas of current activity, however, California condors are very large birds, easily sighted and avoided by helicopter pilots. Work could occur at the end of nesting season. If active condor nests exist in the project area, these would be avoided by project work and closely monitored through visual observation. The movements of condors tending those nests would also be monitored with visual observations in addition to radio-telemetry, so that capture activity can be kept at a safe distance (one mile buffer, adjusted for site conditions and topography).

Suitable condor habitat in the park will not be impacted by this action.

Potential consequences could include individual birds flushing from perches, or temporarily avoiding the work area while helicopters are present. This alternative *may affect, but is not likely to adversely affect* California Condors.

CUMULATIVE IMPACTS

Helicopter activity related to Search and Rescue (SAR) and Fire Management operations occurs irregularly during the year. The number of days of helicopter activity varies from year to year. These activities could occur at any time of day throughout the year and anywhere in the park. Over the last six years, helicopter activity took place somewhere in the park an average of 15 days per year (ZION Aviation Use tracking). When all three phases of the proposed action alternative are completed in the same year, annual helicopter activity would be increased by 9-11 days. Most of this activity would be focused on the east side of the park. Comprised mainly of slick rock with little vegetation, this area is not prone to fires. In addition, very few SARs occur in this area. Although overall days of helicopter activity would double in some years, most of this activity would be focused in an area of the park that does not receive regular helicopter activity. The proposed action alternative would add to the potential short-term negative impacts to California condors associated with helicopter activity.

2. *Mexican Spotted Owl*

Helicopter activity associated with the proposed action alternative would occur adjacent to and within 21 designated Mexican spotted owl PACs in ZION. These activity centers are delineated around known owl sites and include the best nesting and roosting habitat in the area. For aerial surveys, a Robinson R44, Bell Model 47G, or similar helicopter would be used (see noise table below). A Hughes 500C/D, MD 500E, Bell 206L, or similar helicopter would be used for captures (see noise table below). For most of these helicopters, when hovering within 1,000 feet of MSO nesting sites, estimated noise levels within 50 m (165 ft) of those nesting sites could exceed the 69 dBA breeding season noise disturbance threshold in the MSO Recovery Plan. Influences of wind, topography vegetation, speed and flight pattern can all affect sound levels. Helicopter activity would occur for parts of up to 11 days in a calendar year, but not over the same area for all of the days, and not during breeding season.

Aircraft	Flight Condition	Distance CPA* / AGL, ft	Maximum Sound Level, dBA
Bell 47G ¹ (2 blade helicopter; similar to Robinson R44)	Low Angle Hover (Stationary Hover)	200	86.8
		400	80.0
		600	75.3
		1,000	68.0
		2,000	58.5
Bell 206L ¹ (2 blade helicopter)	Low Angle Hover (Stationary Hover)	4,000	49.7
		200	88.0
		400	81.2
		600	76.5

		1,000	69.1
		2,000	59.5
		4,000	50.4
Hughes 500C ¹ (4 blade helicopter; similar to 5 blade MD 500E)	Low Angle Hover (Stationary Hover)	200	89.8
		400	83.0
		600	78.2
		1,000	70.6
		2,000	60.8
		4,000	51.1

¹ – (FAA 1982)

* CPA – closest point of approach

During aerial surveys, a low-flying helicopter (or UAS) would systematically search all bighorn habitat in the park and all 21 designated PACs would be in the flight area. Auditory disturbance during surveys would be minimal and short-term in nature as the helicopter would make only a single pass during a given survey and surveys would occur on an annual or biennial basis. Since helicopter flight and capture activities would be primarily focused on the core slick rock habitat on the east side of the park (included in the survey area), three PACs would be more exposed during this portion of the proposed action. Auditory disturbance during capture activities would also be negligible and short-term in nature, however, multiple passes could occur on each day. The disease-testing phase of the action would be completed in 2-3 days and the translocation phase would be completed in 5-6 days. These activities would occur on an annual basis until population estimates for DBHS near the established objective of 350, after which activities could occur every 3-4 years.

All helicopter activity associated with the proposed action alternative would be completed during daylight hours, starting no earlier than one hour after sunrise and ending no later than one hour before sunset. These restrictions would eliminate disturbance during times when owls are more active. In ZION, Mexican spotted owls roost within narrow slot canyons during daylight hours. This roosting habitat is inaccessible by helicopter, so disturbance would be from above. The complex nature of the canyon systems would create a buffer to both visual and auditory disturbance, minimizing potential disturbance to roosting owls. The proposed action would be implemented outside of the breeding period (March 1 - August 31) to avoid negative impacts to breeding owls.

Mexican spotted owl critical habitat should not be affected by this action (survey and capture activity) as auditory and visual disturbance would be temporary.

In summary, Spotted Owls do occur in the project area. Noise from helicopter survey and capture work is the most likely possible impact, but will be mitigated by project timing (during the day, outside the breeding season) and the short duration of helicopter presence in any particular area. A study on helicopter impacts to spotted owls (Delaney et al 1999) suggests that brief helicopter overflights outside of a 105 meter (344 foot hemispherical radius) are unlikely to cause owls to flush, but it also suggested greater spotted owl response would have occurred for slower maneuvers such as hovering. This alternative *may affect, but is not likely to adversely impact* Mexican Spotted Owls.

CUMULATIVE IMPACTS

Helicopter activity related to Search and Rescue (SAR) and Fire Management operations has occurred and would continue to occur irregularly throughout the year. The number of days of helicopter activity varies from year to year. These activities could occur at any time of day and anywhere in the park. Over the last six years, helicopter activity took place somewhere in the park an average of 15.2 days per year (NPS 2017c). This helicopter activity is likely to continue at current or increased levels into the future. Increased visitor use may also impact owls, but overnight visits will remain limited and controlled by permit. Because most owl habitat is wilderness, projects and impacts are limited and collectively, the impacts of past, past, present and reasonably foreseeable future actions on the Mexican spotted owl would be minimal and not likely to adversely affect.

When combined with existing helicopter impacts in ZION, the cumulative impacts of the proposed action alternative on Mexican spotted owls would remain negligible and *may affect, but is not likely to adversely affect* Mexican Spotted Owls.

3. Mojave Desert Tortoise

Helicopter activity associated with the proposed action alternative would occur adjacent to and within occupied desert tortoise habitat and may occur during seasons when desert tortoise are active (i.e., fall, spring). During the DBHS capture activities associated with the disease testing and relocation phases of the proposed action, the helicopter may need to land within tortoise habitat. The disease-testing phase of the action would be completed in 2-3 days and the translocation phase would be completed in 5-6 days. These activities would occur on an annual basis until population estimates for DBHS near the established objective of 350, after which activities could occur every 3-4 years. Tortoises could be disturbed by noise and prop wash during helicopter landings, however the landing of a helicopter will likely not occur in the same location more than once and therefore impacts to tortoises would be short-term (less than 25 minutes) in nature and would not be measurable. The action alternative's objective of reducing the DBHS population will likely help reduce the potential for vegetation overgrazing and thus provide a beneficial impact to the desert tortoise. This alternative *may affect, but is not likely to adversely impact* Mojave Desert tortoise.

CUMULATIVE IMPACTS

Helicopter activity related to Search and Rescue (SAR) and Fire Management operations has occurred and would continue to occur irregularly throughout the year. The number of days of helicopter activity varies from year to year. These activities could occur anywhere in the park. Over the last six years, helicopter activity took place somewhere in the park an average of 15.2 days per year (NPS 2017c). This helicopter activity is likely to continue at current or increased levels into the future. Increasing visitation may also impact tortoises, including indirectly increasing tortoise predator populations (e.g., ravens). ZION's desert tortoise population crossovers into the town of Springdale which routinely experiences construction activity for urban development. A portion of the town of Springdale is identified as a desert tortoise take area under the Washington County Habitat Conservation Plan (2009) due to its proximity to urban development and its isolation from the main desert tortoise population in the County. Collectively, the impacts of past, present, and reasonably foreseeable future actions on the desert tortoise would be minimal.

Annual helicopter activity could increase by 9-11 days in years if all three phases of the proposed action alternative were completed in the same year. Most of this activity would be focused on the east side of the park and outside tortoise habitat. Comprised mainly of slick rock with little vegetation, this area is not prone to fires. In addition, very few SARs occur in this area. When combined with existing helicopter impacts in ZION, the cumulative impacts of the proposed action alternative on Mojave Desert tortoise would remain negligible and are not likely to adversely affect the species.

4. *Critical Habitat - Mexican Spotted Owl*

MSO critical habitat also occurs in the project area. Landings may occur, but will not result in detectable change to owl habitat or its primary components,

CUMULATIVE IMPACTS

Helicopter activity related to Search and Rescue (SAR) and Fire Management operations has occurred and would continue to occur irregularly throughout the year. The number of days of helicopter activity varies from year to year. These activities could occur at any time of day and anywhere in the park. Over the last six years, helicopter activity took place somewhere in the park an average of 15.2 days per year (NPS 2017c). This helicopter activity is likely to continue at current or increased levels into the future. Increasing visitation may also impact owl habitat, but overnight numbers will remain controlled by limited permits. There are no other proposed projects predicted to have impacts to MSO. Collectively, the impacts of past, present, and reasonably foreseeable future actions on the Mexican spotted owl would be minimal and not likely to adversely affect.

Annual helicopter activity could increase by 9-11 days in years if all three phases of the proposed action alternative were completed in the same year. Most of this activity would be focused on the east side of the park. Comprised mainly of slick rock with little vegetation, this area is not prone to fires. In addition, very few SARs occur in this area. When combined with existing helicopter impacts in ZION, the cumulative impacts of the proposed action alternative on Mexican spotted owl habitat are not likely to adversely affect the species.

5. *Critical Habitat - Shiwits milk-vetch*

Helicopter overflights will have no impacts on Shiwits milk-vetch critical habitat. Landings will not be permitted on Milk-vetch habitat.

CUMULATIVE IMPACTS

Since there are no direct or indirect impacts to Shiwits Milk-vetch habitat from the action alternative there can be no cumulative impacts from this alternative.

WILDERNESS

AFFECTED ENVIRONMENT

On March 30, 2009, the Omnibus Public Land Management Act (Public Law 111-11) designated the vast majority of ZION as wilderness. A total of 124,406 acres of ZION is designated as wilderness (84% of the park), and an additional 9,047 acres in Kane County (6% of the park) are recommended for wilderness designation. This means that more than 90% of the park is managed as wilderness, as per NPS policy. Another 4,067 acres are potential wilderness (3% of the park) and would become wilderness once nonconforming uses are removed. The proposed

project area would occur in recommended and designated wilderness, and has been further analyzed in a Wilderness Minimum Requirements Decision Guide.

The 1964 Wilderness Act Section 2(a) states that wilderness areas “. . . shall be administered for the use and enjoyment of the American people in such a manner as will leave them unimpaired for future use and enjoyment as wilderness, and so to provide for the protection of these areas, the preservation of their wilderness character. . .” Agencies that manage wilderness, including the NPS, have defined five tangible qualities of wilderness character:

1. *Natural*

Wilderness maintains ecological systems are substantially free from the *effects* of modern civilization.

2. *Untrammeled*

Wilderness is essentially unhindered and free from the intentional *actions* of modern human control or manipulation.

3. *Undeveloped*

Wilderness is essentially without permanent improvements or the sights and sounds of modern human occupation.

4. *Opportunities for Solitude or Primitive & Unconfined Recreation*

Wilderness provides opportunities for solitude or a primitive and unconfined type of recreation.

5. *Other features of value*

Wilderness may also contain ecological, geological, or other features of scientific, education, scenic, or historical value. Generally, these qualities are not universal and may not apply to all NPS wilderness areas. Cultural resources have been identified as integral to the fabric of the ZION wilderness (NPS 2013).

All actions proposed for wilderness are evaluated to determine that are necessary in wilderness, that they meet the “minimum requirements for the administration of the area for the purpose of this Act (Wilderness Act of 1964), and for their potential impacts to the traits defining wilderness character. A wilderness minimum requirement analysis was completed for this alternative.

Desert DBHS are a very important wilderness resource in ZION and are often referred to as a “wilderness species” because they inhabit some of the most remote and rugged habitat found in the country. Many wilderness users find their time in the wilderness improved by being in the presence of these well adapted masters of the canyon country, and have watched in awe as even young lambs navigate steep cliff faces. Their persistence in this landscape is an important component of the wilderness character of the park. The majority of ZION DBHS populations occur within wilderness, thus effective action to manage the reintroduced native population must occur where the animals are located.

IMPACTS OF ALTERNATIVE A

1. *Natural*

Under Alternative A, the DBHS population would likely continue to grow. The herd would continue to exhibit density dependent dispersal behavior, which disperses some of the animals outside the park where they could come into contact with domestic sheep and goats. If these bighorn contract pneumonia epizootics from the domestic animals and go back to the herd, they could transmit this fatal disease to the herd which could cause a drastic reduction in or eradication of the ZION DBHS population. If transmission of this unnatural disease occurs, the presence of DBHS in Zion Wilderness could be reduced, which would adversely affect the natural conditions of wilderness into the future.

2. *Untrammelled*

Under Alternative A, the introduction of a non-native pathogen could be considered a trammel under the no action alternative.

3. *Undeveloped*

UDWR DBHS monitoring efforts using low flying aircraft would degrade the undeveloped quality of wilderness and introduce the sights and sounds of human occupation. These effects would occur over any specific area for a short time because the helicopter would continue to move, so intensity and duration are both likely to be low.

4. *Opportunities for Solitude or Primitive & Unconfined Recreation*

Under Alternative A the project area would remain open to visitors, maintaining the opportunity for visitors to access recreation opportunities in ZION wilderness within the proposed capture zone.

5. *Other features or values: cultural resources*

No cultural or archeological sites would be impacted by helicopter overflights. No landings associated with UDWR DBHS monitoring would occur in wilderness areas.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions under Alternative A that have or could impact wilderness character include: exotic vegetation removal, trail maintenance, ZION SAR operations, ZION fire management activities, and UDWR DBHS monitoring efforts. In summary, these uses and activities diminish the visitor's ability to experience the natural, untrammelled, undeveloped, and primitive nature of wilderness but would maintain visitor access to wilderness areas. Collectively, all of these actions have and would continue to have adverse and beneficial impacts on the Zion wilderness. As previously described, the direct and indirect impacts of Alternative A on wilderness would allow DBHS populations to grow, increasing the risk of disease transmission; allow the periodic introduction of sight and sounds of human occupation and manipulation in wilderness areas; and maintain access for visitor's to experience ZION wilderness areas and related qualities. DBHS potential population reduction from disease would degrade the natural and untrammelled qualities of wilderness, thereby diminishing visitor wilderness experiences and compromising natural environmental cycles involving DBHS. UDWR DBHS monitoring efforts throughout the entire park using low flying aircraft would degrade the undeveloped quality and the ability for visitors to have outstanding opportunities for solitude but would maintain visitor access to ZION wilderness areas within the proposed DBHS capture zone. Impacts to wilderness qualities resulting from helicopter use are likely to occur over any specific area for a short time (approximately < 1 minute) since the helicopter continues to move. When the effects of Alternative A are combined with other past,

present, and reasonably foreseeable future impacts, the total cumulative impact on wilderness would continue to be degraded into the future. The incremental impact of Alternative A would contribute slightly to, but would not substantially change the impacts that are already occurring.

IMPACTS OF ALTERNATIVE B

1. Natural

As the DBHS population grows, individuals would seek additional habitat outside of the park. These animals may come in contact with domestic sheep that carry non-native disease that could infect bighorn. Once a bighorn is infected it can spread the disease to other bighorn. Higher densities could cause the disease can spread quickly, resulting in a large DBHS die off. Reducing herd size by capturing and translocating does not grantee protection from die off, but it could help in reducing the possibility of disease transmission, which would help improve the natural wilderness quality, since a viable, healthy herd contribute to naturalness in Zion wilderness.

2. Untrammelled

Capturing, and transporting sheep, and reducing the population of DBHS in Zion Wilderness would adversely impact the untrammelled quality of Zion Wilderness. These impacts would be localized and of short duration. These actions could prevent the trammeling influence of non-native pathogens.

3. Undeveloped

Population assessment, density reduction, and capture activities using low flying aircraft and helicopter landings would degrade the undeveloped quality. These activities would also introduce the sights and sounds of human occupation within wilderness. These effects would occur over any specific area for a short time, so intensity and duration are both likely to be low, although the activity will occur over several years. Attaching radio collars to sheep will be a temporary installation, until the drop-off is triggered and the collar falls off of the animal (4-5 year maximum per collar). Dropped collars would be tracked and removed, to the extent feasible, from wilderness areas.

4. Opportunities for primitive and unconfined recreation

Population assessment, density reduction, and capture activities utilizing aircraft may impact the visitor's ability to experience solitude. Temporary closures of wilderness areas may be necessary; therefore, visitor experience may be temporarily confined. Safety closures would be limited to work zones planned on a daily basis.

5. Other features or values: cultural resources

No cultural or archeological sites would be impacted by helicopter overflights. Helicopter landings would not occur at known sites or other culturally sensitive areas where impacts are likely. Unknown sites could be impacted by rotor wash on landing or by vibrations, but impacts are not anticipated.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions under Alternative B that have or could impact wilderness character include: exotic vegetation removal, trail maintenance, ZION SAR operations, ZION fire management activities, and UDWR DBHS monitoring efforts in addition to DBHS population assessment, density reduction, and capture efforts. In summary, these

activities are expected to have both adverse and beneficial impacts on the following qualities of wilderness character: natural, untrammeled, undeveloped, outstanding opportunities for solitude or a primitive and unconfined type of recreation. Collectively, all of these actions have and would continue to have adverse and beneficial impact on the ZION wilderness. In addition to the impact described in Alternative A, the direct and indirect impacts of Alternative B on wilderness would diminish the visitor's ability to experience the natural, untrammeled, undeveloped, and primitive nature of wilderness as a result of introduced noises and activities associated with human occupation and manipulation. Daily wilderness area closures within the capture area are also likely to be necessary to establish safe landing zones for helicopters. However, work to protect ZION DBHS populations from non-native disease and augment DBHS populations throughout their historic range is expected to improve opportunities for primitive and unconfined recreation. When the effects of the proposed action are combined with other past, present, and reasonably foreseeable impacts, the total cumulative impact on wilderness character would intermittently degraded ZION wilderness qualities during project activities for the immediate area around the project area but would likely benefit wilderness qualities long-term. The incremental impact of Alternative B would contribute slightly to, but would not substantially change the impacts that are already occurring.

WILDLIFE: DBHS

AFFECTED ENVIRONMENT

DBHS are native to Utah. Archeological evidence indicates they were well known to the prehistoric inhabitants of Utah, since bighorn are depicted in pictographs and petroglyphs more than any other form of wildlife. Historical records of the first white men in the state also confirm the presence of bighorn. Father Escalante noted in his journal as he crossed the Colorado River in Utah - "through here wild sheep live in such abundance that their tracks are like those of great herds of domestic sheep" (Rawley 1985). Explorers, trappers, pioneers and settlers also recorded numerous observations of DBHS throughout the state (UDWR 2013). DBHS struggled to survive the effects of pioneer settlement and civilization. It is inconclusive as to which factors specifically contributed to the extirpation of the DBHS from the habitat in and adjacent to ZION. Unregulated hunting, diseases from the introduction of domestic livestock, and habitat conversion due to excessive grazing and fire suppression are all pressures that may have contributed to the loss of DBHS from their native habitat (Shields 1999).

DBHS were reintroduced to ZION in 1973 through a joint effort with state/federal agencies and universities, when 12 bighorn were transplanted into the park from Nevada. It was hoped that a successful transplant would establish a thriving population that could become the source for augmenting or establishing other populations in Utah. Ground surveys completed in the late 1970s showed little growth in the population and the reintroduction was deemed a failure by the early 1980s. Observations increased over the next decade and a helicopter survey in 1991 detected 36 bighorn in the southeastern section of the park (McCutchen 1994). UDWR performed a 2-hour helicopter survey in 2008, funded by the NPS, which resulted in 75 bighorn observed in the core area surrounding the Zion Mt. Carmel Highway corridor through the park. The result of the survey was the impetus to survey all suitable habitat in the following years.

UDWR aerial monitoring and population survey estimates have demonstrated rapid expansion of DBHS population within ZION. UDWR aerial surveys completed in 2009, 2013, and 2015 yielded population estimates of 194, 405, and 527 bighorn, respectively, within park boundaries. The ZION DBHS population represents a portion of a larger population that occurs across the

multijurisdictional landscape of the Zion WMU, comprised of NPS, BLM and private lands. This larger population is managed cooperatively between multiple federal and state wildlife management agencies. These three comprehensive surveys also covered bighorn habitat located on BLM land southeast of ZION. For these areas outside the park these surveys yielded population estimates of 190, 425, and 297, respectively. These UDWR aerial surveys indicate that most DBHS within ZION currently occur in the southeastern portion of the park (Figure 3). However, DBHS are known to occur in other areas of the park as well. Since not all bighorn can be observed during aerial surveys, those observed represent a minimum population for the area surveyed and the actual population size is expected to be larger. The UDWR uses a 60% sightability index for the Zion WMU DBHS population; meaning they estimate that an additional 40% of the population is not observed during a survey. The 60% sightability index was established by UDWR and verified through field tests using tagged and radio marked bighorn within the ZION WMU.

The UDWR began translocating DBHS in the ZION WMU in January 2013, when 21 bighorn were captured on BLM land southeast of the park and moved to a low density area of the unit. Additional translocations have occurred since that time, with a total of 75 bighorn moved to two other WMUs in the state. Translocation efforts appear effective at stalling overall population growth but while density on BLM land dropped below UDWR's objective, density within the park continued to rise.

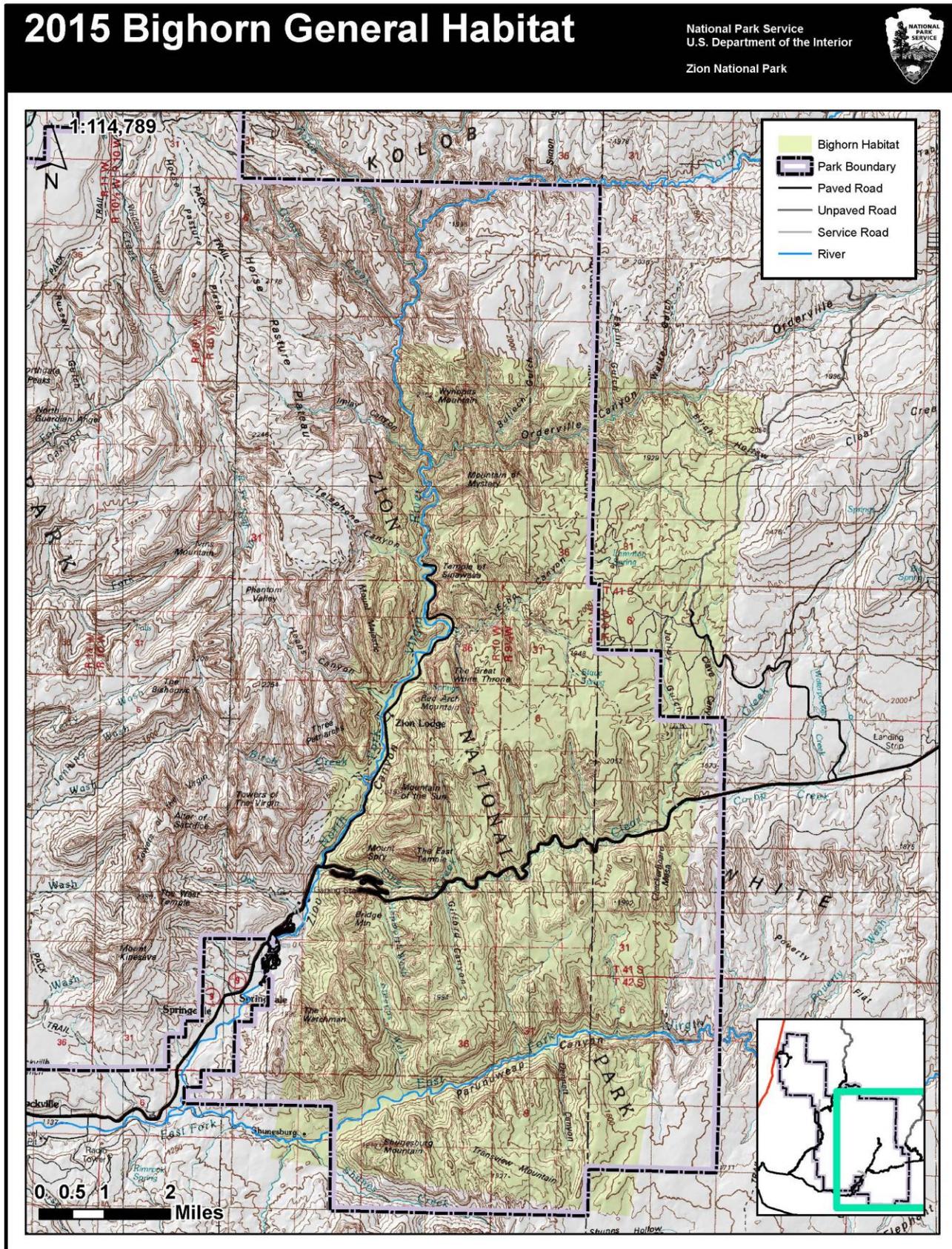
Although indicative of a successful reintroduction, this increase in numbers causes concern for the health of the ZION DBHS herd. In recent years, DBHS have been increasingly observed in areas outside the core slick rock habitat found on the east side of the park. While dispersal and wandering by rams may occur at any density, the total number of such events increases with increased density simply because there are more individuals that display such behavior and because they may seek new breeding opportunities or habitat. These are natural processes for a growing herd of DBHS and should be expected with the number of bighorn in ZION. Unfortunately, the potential for disease transmission from domestic sheep and goats also increases with these behaviors, substantially increasing the risk to the health of the population.

Current health of the desert DBHS herd in ZION is stable. Disease testing performed by UDWR most recently in 2015 on bighorn captured outside the park and one symptomatic bighorn culled inside the park have yielded excellent results, with no detection of *Mycoplasma ovipneumoniae*, the pathogen thought to play a primary role in pneumonia die-offs. Although there has been no positive test result for this or other diseases to date, as noted in the Purpose and Need, there remains a high potential risk of future transmission from other populations of domestic sheep and goats to this population, due to the high number of animals in close proximity to domestic sheep, and to each other.

There are several areas surrounding the park that are of concern for disease transmission. Much attention has been focused on the role of domestic sheep grazing allotments in these epizootics; however, recent research has indicated that hobby farms and domestic sheep/goat operations on private land also play a major role (Sells et al. 2015). Although domestic sheep grazing allotments do occur on USFS and BLM lands near the park, these allotments are not directly adjacent to the core DBHS habitat within the park and do not contain habitat suitable for DBHS. There are, however, many hobby farms and domestic sheep/goat operations on private land adjacent to the core DBHS habitat within the park that do contain habitat suitable for DBHS. Presently, one apparent risk for pathogen exposure is hobby farms in the gateway community of

Springdale which lies at the southern edge of the park. There are several private landowners that regularly keep domestic sheep or goats in Springdale. Desert DBHS have been observed at the south entrance to the park and along the foothills to the east of town. Additionally, grazing occurs on private land in many areas surrounding the park including a large domestic sheep operation near Kolob Reservoir, just outside the park, where contact could occur between a growing DBHS herd and disease vectors.

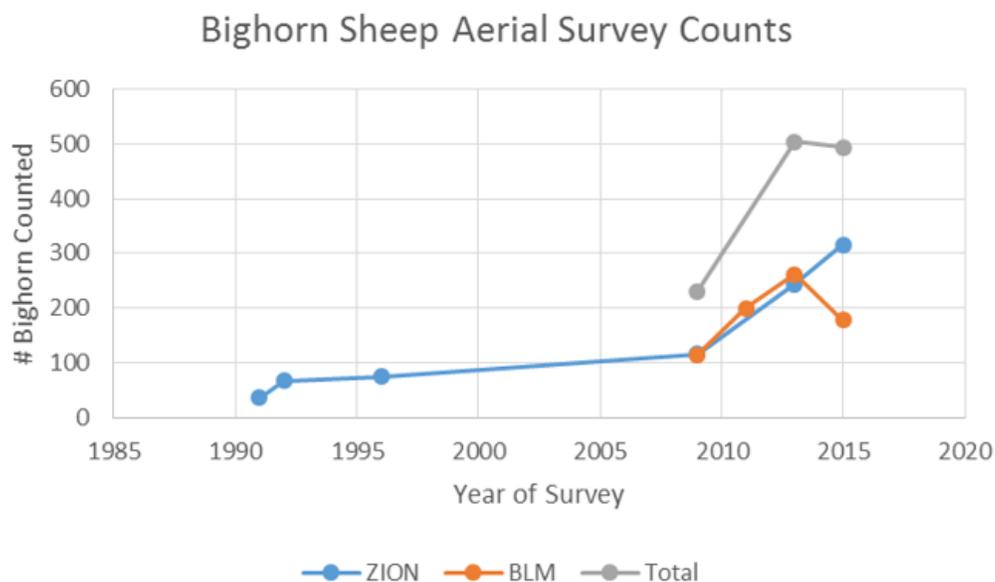
Figure 3. DBHS Habitat within ZION



Current population conditions

In 2015 the herd in Zion was approximately 526 individuals. A population model was constructed using parameters derived from recent surveys conducted by UDWR. Reproductive rate for breeding age females is averaged at approximately 60% and the annual natural mortality rate was set at 18%, being distributed according to a 3:1:1 lamb: sub-adult: adult ratio because it is believed that natural mortality disproportionately affects the very young members of the population while individuals in the sub adult and adult age classes tend more frequently to survive into the next age class. This could result in an annual population growth rate of approximately 4% under the no action alternative. If disease, habitat, or other carrying capacity limiting event did not occur the herd could reach 900 animals by 2030. This increasing density and extent makes a disease related die off much more likely. If sheep are translocated out of the herd then population growth rate will be slowed and stabilized, reducing the risk of disease transmission, and benefitting adjacent herd areas, providing for a stronger regional sheep population.

Figure 4. DBHS Aerial Survey Counts in ZION



IMPACTS OF ALTERNATIVE A—NO ACTION

Under Alternative A, no change to the current management activities would result. The bighorn population would continue to grow, as depicted in Figure 4, the associated increased risk of dispersal behaviors would increase the risk of disease transmission and the possibility of a pneumonia die-off as previously described in the Purpose and Need section. Based on population tracking described above, the ZION sheep population could continue to increase in size and density, leading to a high probability of a pneumonia outbreak, which could result in large scale population die-offs affecting 50-90% of the herd. This die-offs could be followed by a sustained period of poor recruitment due at least in part to the persistent presence of disease in

the residual population. Such events would have long term negative health and viability implications for the population.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions under Alternative B that have or could impact wilderness character include: exotic vegetation removal, trail maintenance, ZION SAR operations, ZION fire management activities, increasing human use/visitation within ZION, and UDWR DBHS monitoring efforts. In summary, the impacts of past, present, and reasonably foreseeable future actions have or would continue to adversely impact wildlife. Noise associated with equipment and aircraft of each listed actions would continue to obstruct the ability for wildlife to hear predators, find food or mates, etc. Increasing visitation and human use throughout the park and in sheep habitat may also influence sheep behavior and distribution (Schoenecker & Krausman 2002).

As described in this EA, the direct and indirect impacts of the Alternative A include large scale population die-offs followed by a sustained period of poor recruitment, which would have long term negative health and viability implications for the population. Continued UDWR management of the portion of the bighorn herd found on BLM land adjacent to ZION may also unnaturally increase the number of bighorn found within the park as animals from outside park boundaries exhibit preference for areas within the park to avoid hunting pressure as well as harassment from capture operations on adjacent lands. This would exacerbate current conditions by increasing bighorn density within the park and promote dispersal toward areas identified as high risk for disease transmission. Due to the long-lasting effects of pneumonia die-offs on DBHS populations, these adverse impacts would be long-term in nature. Generally, UDWR data shows that DBHS already exhibit a preference for park areas and this is likely due in part to the influence of management actions on adjacent lands. Collectively, all of these actions have had and would continue to have adverse cumulative impacts on wildlife, particularly DBHS. When the effects of Alternative A are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on DBHS would continue to be adverse, with the incremental impact of the no action alternative substantially and adversely altering the impacts that are already occurring.

IMPACTS OF ALTERNATIVE B — PROPOSED ACTION AND NPS PREFERRED

Under the proposed action alternative, suitable habitat would be surveyed and desert DBHS would be captured for disease testing and translocation. These actions would be completed using a low-flying helicopter. One negative impact of these actions would be increased stress levels in DBHS during helicopter activity. For aerial surveys, helicopters would hover near groups of bighorn for approximately 1 minute to gather necessary demographic information. Impacts to bighorn would be minimal during this part of the proposed action and conditions would return to normal once the helicopters departed the area. During captures, helicopter chase times typically would not exceed five minutes, so this stress would be also short-term. For those bighorn pursued but not captured, conditions and stress levels would return to normal after another five to ten minutes.

For captured animals, increased stress levels could continue for the duration of the process. To reduce stress, blindfolds would immediately be placed on captured animals and bighorn would be placed in an upright position during transport to staging areas. Over-heating is the most common issue associated with DBHS captures. Capture activities would be scheduled during

late fall, when temperatures are lower and over-heating is less of a concern. Rectal temperature would be monitored throughout processing to ensure the safety of captured bighorn. Bighorn would be processed as quickly as possible and placed into the trailer for translocation. In the trailer they would be separated into separate compartments based on age and sex to prevent further stress. In rare instances, death of individual sheep due to accident, capture myopathy, or exacerbation of a preexisting condition could result from capture activities, but, in general, sheep would exit from this process with no long-term stress-related health effects.

The deployment of satellite collars on up to 30 DBHS would have negligible effects on collared animals. Collars would be equipped with drop-off mechanisms. These would be programmed to drop after up 4 years of data collection. There would likely be hair loss along the animals' neck due to rubbing of the collar, but no behavioral effects have been documented. Research on mountain goats showed that collars had no effect on productivity, survival, foraging efficiency, or vigilance behavior (Cote et al. 1998).

By reducing the density of sheep populations in the park to above but closer to 350 individuals, this alternative would greatly increase the probability of maintaining a healthy and viable DBHS population in ZION over the long-term. Some risk of disease occurrence in DBHS populations would always be present given the known possible sources of disease; however, DBHS management agencies have developed strategies and recommendations that have been designed to minimize such risks (WAFWA 2010; WSWG 2012). The proposed action alternative would be consistent with these strategies and recommendations, because it would help to prevent or minimize epizootics by managing towards a reduced sheep density in the park that in turn would reduce behaviors that would otherwise favor epizootics and by monitoring for and removing suspect sheep before they come into contact with the population.

The Zion WMU herd is currently the largest desert DBHS population in Utah and translocations would also provide opportunities to restore depressed and extirpated populations of this native species elsewhere in Utah.

CUMULATIVE IMPACTS

Past, present, and reasonably foreseeable future actions under Alternative B that have or could impact wilderness character include: exotic vegetation removal, trail maintenance, ZION SAR operations, ZION fire management activities, increasing human use/visitation within ZION, and UDWR DBHS monitoring efforts in addition to DBHS population assessment, density reduction, and capture efforts. In summary, the impacts of past, present, and reasonably foreseeable future actions have or would have adverse and beneficial impacts wildlife. Noise associated with equipment and aircraft of each listed actions would continue to obstruct the ability for wildlife to hear predators, find food or mates, etc. Increasing visitation and human use throughout the park and in sheep habitat may also influence sheep behavior and distribution.

As described in this EA, the direct and indirect impact of Alternative B would increase stress levels in DBHS during helicopter and capture activities. Collars would also be placed on no more than 30 DBHS which may result in some hair loss around an animal's neck. Reducing DBHS population density is also expected to benefit the ZION herd by reducing the risk of disease. Collectively, all of these actions have and would continue to have temporary adverse cumulative impacts DBHS but over the long-term would improve the prospects of maintaining a healthy and viable DBHS population in ZION. When the effects of the proposed action

alternative are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impact on DBHS would be beneficial, with the incremental impacts of the proposed action alternative substantially and positively changing the impacts that are already occurring.

COMPLIANCE REQUIREMENTS, CONSULTATION, AND COORDINATION

LIST OF AGENCIES AND PERSONS CONTACTED

Name	Title, Agency
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Jenny Powers	Wildlife Veterinarian, NPS IMR Wildlife Health Branch
Tracy Thompson	Veterinarian & NPS IACUC Committee Chair, NPS Biological Resources Division
Heather Rice	NEPA Specialist, NPS IMR Environmental Quality
Jeff Bradybaugh	Superintendent, Zion National Park
Cass Bromley	Chief Resource Mgmt. & Research, Zion National Park
Sarah Horton	Cultural Program Manager, Zion National Park
Kezia Nielson	Environmental Protection Specialist, Zion National Park
Janice Stroud-Settles	Wildlife Biologist, Zion National Park (2017-Present)
Cassie Waters	Wildlife Biologist, Zion National Park (2013-2016)
Laura Schrage	Vegetation Program Manager, Zion National Park
Shauna Ertolacci	Environmental Protection Specialist, Zion National Park

REFERENCES

Bell Helicopter Textron (BHT). 2001. *Helicopter External Noise Levels: Information Letter GEN-01-78*. Accessed April 10, 2017.

<https://www.bellcustomer.com/files/Storage/IL%20GEN-01-78.pdf>

Connor, M.A. and S.M. Vetter. 1986. *Archeological Investigations at Zion National Park*. Midwest Archeological Center Occasional Studies Anthropology No. 19. United States Department of the Interior, National Park Service. Midwest Archeological Center, Lincoln, Nebraska.

Cote, Steve D., Marco Festa-Bianchet and François Fournier. 1998. "Life-History Effects of

- Chemical Immobilization and Radio collars on Mountain Goats.” *The Journal of Wildlife Management*, Vol. 62, No. 2, pp. 745-752. Accessed April 10, 2017.
<https://www.jstor.org/stable/pdf/3802351.pdf>
- Delaney, D.K., T.G. Grubb, P. Beier, L.L. Pater, and M. Hildegard Reiser. 1999.
“Effects of Helicopter Noise on Mexican Spotted Owls.” *The Journal of Wildlife Management* 63(1):60-76. Accessed April 10, 2017.
<https://www.jstor.org/stable/pdf/3802487.pdf>
- Federal Aviation Administration (FAA)
1982 “Helicopter Noise Exposure Curves for Use in Environmental Impact Assessment.” Prepared by J. S. Newman et al. U.S. Department of Transportation, FAA, Report No. DOT-FAA-EE-82-16, November 1982.
Accessed August 17, 2017. <http://www.dtic.mil/dtic/tr/fulltext/u2/a123467.pdf>
- MD Helicopters. 2014. *MD 500E Helicopter Technical Description*. Report No. MD14022801-500ETD. Accessed April 10, 2017.
https://www.mdhelicopters.com/files/Models/MD500E_Tech_Desc.pdf
- Monello, R.J., D.L. Murray, and E.F. Cassirer. 2001. “Ecological Correlates of Pneumonia Epizootics in DBHS Herds.” *Canadian Journal of Zoology* 79:1423-1432.
- McCutchen, H.E. 1975. “Desert Bighorn Sheep Restoration at Zion National Park.” *Desert Bighorn Council Transactions* 19:19-29. Accessed April 11, 2017.
<https://www.desertbighornCouncil.com/transactions/download-past-dbc-transactions/>
- National Park Service (NPS)
2001 “Zion National Park General Management Plan.” Denver Service Center. U.S. Department of the Interior. Washington, D.C.
Accessed April 10, 2017. <http://www.nps.gov/zion/parkmgmt/index.htm>
- 2006 “NPS Management Policies.” U.S. Department of the Interior. U.S. Government Printing Office. Washington D.C. ISBN: 0-16-076874-8. Accessed April 10, 2017.
<https://www.nps.gov/policy/mp2006.pdf>
- 2007 “Sound Levels of helicopters used for administrative purposes at Grand Canyon National Park.” Prepared by S. Falzarano & L. Levy. NPS report No. GRCA-07-05. Accessed April 10, 2017.
<https://www.nps.gov/grca/learn/nature/upload/GRCA-07-05-SoundLevels-Helicopters.pdf>
- 2010 “Soundscape Management Plan.” Zion National Park, Utah (September 2010). U.S. Department of the Interior. Accessed April 10, 2017.
<http://www.nps.gov/zion/parkmgmt/index.htm>
- 2013 Foundation Document: Zion National Park. 2013. National Park Service. U.S. Department of the Interior. Accessed April 12, 2017.

https://www.nps.gov/zion/learn/management/upload/ZION_Foundation_Overview_SP-2.pdf

- 2016a “Air Pollution Impacts: Zion National Park.” *Explore Nature: Air Resources* (December 30, 2016). Accessed April 12, 2017. <https://www.nature.nps.gov/air/permits/aris/zion/impacts.cfm>
- 2016b Discussion with Sarah Horton, archeologist and Zion Cultural Program Manager to Shauna Ertolacci, NPS Environmental Protection Specialist. November 18, 2016, regarding cultural resources throughout the project area.
- 2017a “Park Species List: Zion National Park.” *NPSpecies: Information on Species in National Parks*. Accessed June 2, 2017. <https://irma.nps.gov/NPSpecies/>
- 2017b Zion National Park Visitation. Figures provided by Zion Visitor and Resource Protection Fee Program. Revised Jan. 3, 2017. Unpublished data.
- 2017c Zion National Park Aviation. Figures provided by SAR and Fire Programs. Revised June 2017. Unpublished data
- Sells, S. N., M. Mitchell, J.J. Nowak, P.M. Lukacs, N.J. Anderson, J.J. Ramsey, J.A.Gude, P.R. Krausman. “2015 Modeling Risk of Pneumonia Epizootics in Bighorn Sheep.” *Journal of Wildlife Management* 97(2): 195-210
- Shields, W. 1999. “Rocky Mountain Bighorns – Utah” in *Return of Royalty – Wild Sheep of North America*. Boone- and Crocket Club Foundation for North American Wild Sheep, Missoula, Montana, USA: 108-111.
- Singer, F.J. , L.C. Zeigenfuss and L. Spicer 2001. “Roll of Patch Size, Disease and Movement in Rapid Extinction of Bighorn Sheep.” *Society for Conservation Biology* 15(5) pp 1347-1354.
- Schoenecker, K.A. and P.R. Krausman. 2002. “Human Disturbance in DBHS Habitat, Pusch Ridge Wilderness, Arizona.” *Journal of Arizona-Nevada Academy of Science* 34(1): 63-68. Accessed April 11, 2017. <https://www.jstor.org/stable/pdf/40024904.pdf>
- Stoffle, R.W., D.E. Austin, D.B. Halmo, and A.M. Phillips III. 1997. *Ethnographic Overview and Assessment: Zion National Park, Utah and Pipe Springs National Monument, Arizona*. Revised 2013. Bureau of Applied Research in Anthropology. Accessed March 27, 2017. <http://arizona.openrepository.com/arizona/handle/10150/271052>
- United States Environmental Protection Agency (EPA). 2017. *Environmental Justice*. Accessed April 12, 2017. <https://www.epa.gov/environmentaljustice>
- United State Fish and Wildlife Service (USFWS)
1995 *Recovery plan for the Mexican Spotted Owl, Volume I*. Southwest Region. Albuquerque, New Mexico, USA. 172pp. Accessed April 10, 2017.

<https://www.fws.gov/southwest/es/arizona/Documents/RecoveryPlans/MexicanSpottedOwl.pdf>

- 1996 *Recovery Plan for the California Condor, Third Revision*. Portland, Oregon. 62 pp. Accessed April 10, 2017. https://www.fws.gov/cno/es/CalCondor/PDF_files/USFWS-1996-Recovery-Plan.pdf
- 2012 *Final Recovery Plan for the Mexican Spotted Owl (Strix occidentalis lucida), First Revision*. Southwest Region. Albuquerque, New Mexico, USA. 413pp. Accessed April 10, 2017. <https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=8196>
- 2013a *Mexican Spotted Owl (Strix occidentalis lucida), 5 Year Review*. Arizona Ecological Services Office. Phoenix, Arizona, USA. 16 pp. Accessed April 10, 2017. https://ecos.fws.gov/docs/five_year_review/doc4262.pdf
- 2013b *California condor (Gymnops californianus), 5-year review: Summary and evaluation*. Pacific Southwest Region. 64 pp. Accessed April 10, 2017. https://ecos.fws.gov/docs/five_year_review/doc4163.pdf

Utah Division of Wildlife Resources (UDWR).

- 2009 DBHS Aerial Survey Data, 2009 Survey Flight. Unpublished.
- 2013a DBHS Aerial Survey Data, 2013 Survey Flight. Unpublished
- 2013b *Utah Desert Bighorn Sheep Statewide Management Plan 2013-2018*. Final Report, UDWR Department of Natural Resources, Salt Lake City, UT. 29 pp. Accessed April 10, 2017. <https://wildlife.utah.gov/hunting/biggame/pdf/bighorn-plan.pdf>
- 2015 DBHS Aerial Survey Data, 2015 Survey Flight, Unpublished
- 2017 *Utah Cougar Harvest Objective*. Accessed June 26, 2017 <https://wildlife.utah.gov/hunting-in-utah/935-cougar-harvest-objective-hunting-units.html>

Western Association of Fish and Wildlife Agencies. Western Association of Fish and Wildlife Agencies (WAFWA). 2010. *Summary on Nine DBHS Die-offs in Five Western States 2009-2010*. Accessed 5 July 2017. <http://www.wafwa.org/Documents%20and%20Settings/37/Site%20Documents/Working%20Groups/Wild%20Sheep/Reports/Summary%20on%209%20DBHS%20die-offs%20in%205%20western%20states,%20winter%202009-10.pdf>

Wild Sheep Working Group (WSWG). 2012. *Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat*. Wester Association of Fish and Wildlife Agencies. Western Association of Fish and Wildlife Agencies. Accessed April 11, 2017. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5385708.pdf

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