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# Getting The Biggest Bang For Your Buck: Wildlife Monitoring On Shrublands Of The Nevada Test Site

Derek B. Hall<sup>1</sup> and Paul D. Greger<sup>1</sup>

## ABSTRACT

*The Nevada Test Site (NTS) covers 3,561 km<sup>2</sup> and extends over portions of both the Mojave and Great Basin Deserts. The resulting diverse and complex flora and fauna exhibit elements of both deserts. There are 20 vegetation associations, composed primarily of shrubs, nested within 10 vegetation alliances. Of the more than 1,200 invertebrate and 339 vertebrate species found in these shrubland habitats, 267 are considered sensitive or protected/regulated by federal or state laws. Wildlife and wildlife habitat monitoring ensures NTS activities comply with all federal and state laws enacted for the protection of these valuable biological resources and provides ecological information that can be used to predict and evaluate the potential impacts of proposed projects and current activities on these resources. This paper describes the monitoring approach used at this large site. Monitoring strategies include conducting preactivity surveys, proactively monitoring sensitive species, monitoring long-term population trends, and collaborating with other agencies and biologists. Ways to make monitoring more efficient and examples of successful monitoring and collaborations are discussed.*

## INTRODUCTION

The Nevada Test Site (NTS) is situated over portions of both the Mojave and Great Basin Deserts. Elements of both deserts are found in a diverse and complex flora and fauna. A transitional area (transition region) between the two deserts is also present. There are 20 vegetation associations nested within 10 vegetation alliances composed primarily of shrubs. Over 750 vascular plant species have been identified (Wills and Ostler 2001) of which 44 are sensitive and protected/regulated (National Security Technologies, LLC [NSTec 2008]) based on Nevada Natural Heritage Program's (NNHP) Animal and Plant At-risk Tracking List. More than 1,200 invertebrate and 339 vertebrate species are found in these shrubland habitats including one tortoise, 16 lizard, 17 snake, 241 bird, 44 terrestrial mammal, and 15 bat species (Wills and Ostler 2001). Of these, 267 are considered sensitive or protected/regulated (NSTec 2008) by federal or state laws including the desert tortoise (*Gopherus agassizii*) which is designated as threatened under the Endangered Species Act, 236 bird species protected under the Migratory Bird Treaty Act, and numerous other species protected by Nevada state law (for

example, game and furbearer species, rare or sensitive species) or other federal laws (for example, wild horses and burros).

Wildlife and habitat monitoring is required to (1) protect wildlife and their habitat, (2) ensure NTS activities comply with all federal and state laws, (3) keep NTS open for business, and (4) be environmentally responsible. This paper describes the monitoring approach used at this large site, discusses ways to make monitoring more efficient, and highlights some examples of successful monitoring and collaborations.

## STUDY AREA

The NTS is administered by the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO). The NTS is located in south-central Nevada, approximately 105 km northwest of Las Vegas, and encompasses approximately 3,561 km<sup>2</sup> (figure 1). Despite drastic changes to localized areas of the NTS due to nuclear testing activities for more than 40 years, biological resources over much of the NTS remain relatively pristine and undisturbed. NNSA/NSO estimates that only 7 percent of the site has been disturbed (U.S. Department of Energy, Nevada Operations [DOE/NV] 1996).

The southern two-thirds of the NTS is dominated by three large valleys or basins: Yucca, Frenchman, and Jackass Flats. Mountain ridges and hills rise above sloping alluvial fans to enclose these basins. Pahute and Rainier Mesas and Timber and Shoshone Mountains occupy the northern, northwestern, and west central sections of the NTS. Elevation on the NTS ranges from less than 1,000 m above sea level in Frenchman and Jackass Flats to about 2,340 m on Rainier Mesa.

The NTS has a climate characteristic of high deserts with little precipitation, hot summers, mild winters, and large diurnal temperature ranges. Monthly average temperatures in the NTS area range from 7°C in January to 32°C in July (DOE/NV 1996). The average annual precipitation on the NTS ranges from 15 cm at the lower elevations to 23 cm at the higher elevations (DOE/NV 1996). Most of the precipitation is received between December and March in the form of rain or snow with lesser amounts of rain usually received during July and August.

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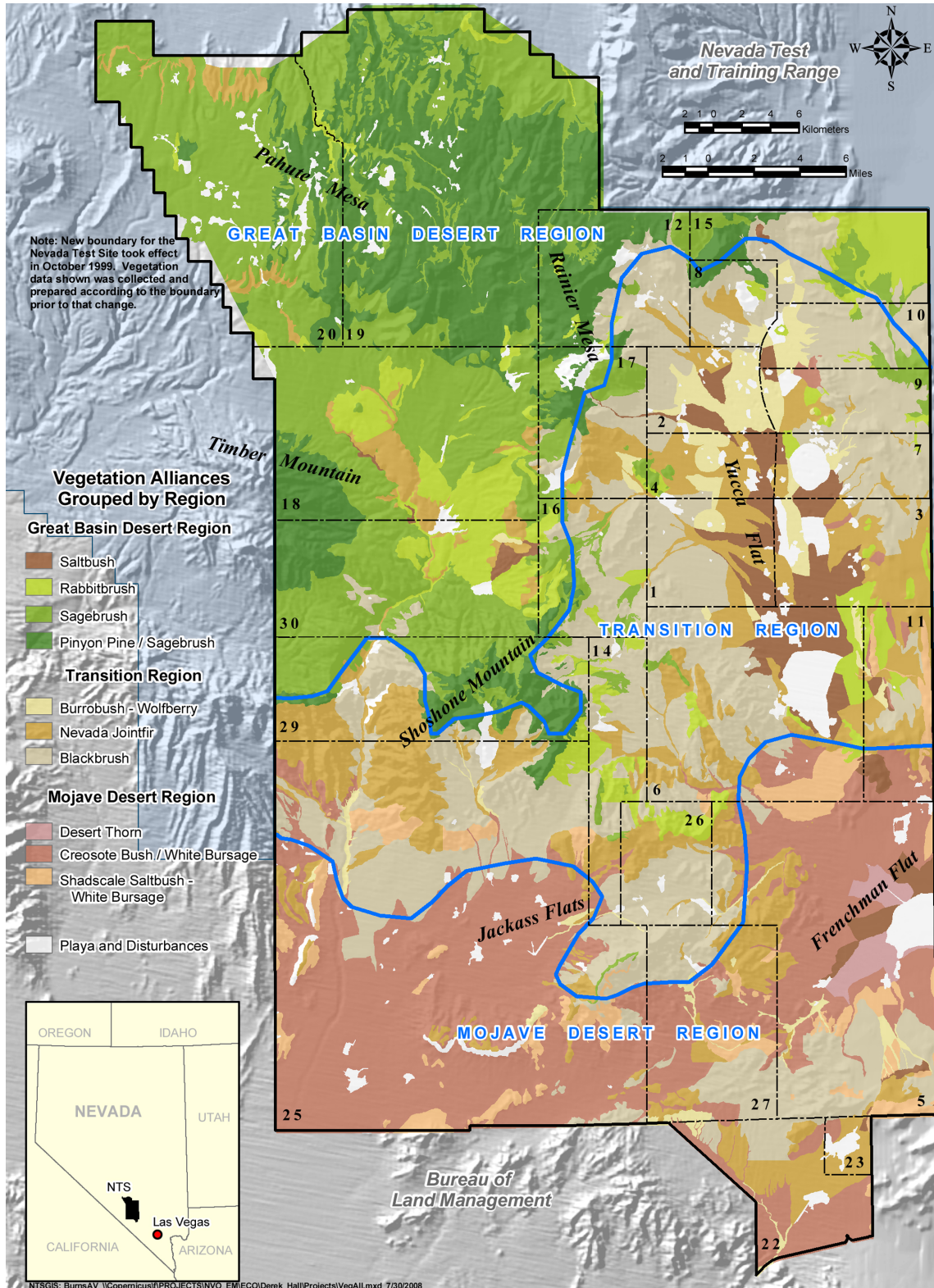


Figure 1—Location, major topographic features, and vegetation alliances and regions of the Nevada Test Site.

The NTS is located in an area of southern Nevada that lies between the Great Basin Desert and the Mojave Desert as defined by Jaeger (1957). Within the site boundaries are found both of these desert types. Transitional areas between the two deserts are also present having been created by gradients in precipitation, elevation, temperature, and soils. Unique combinations of physical site conditions have resulted in several different vegetation communities (Ostler and others 2000). Based on these vegetation communities, three distinct vegetation regions occur on the NTS: the Great Basin Desert, Mojave Desert, and Transition regions (figure 1). The Great Basin Desert region is a cold desert with dominant plant species consisting of sagebrush species (*Artemisia* spp.), singleleaf pinyon (*Pinus monophylla*), and Utah juniper (*Juniperus osteosperma*) and includes 10 associations nested within four alliances (41 percent of NTS). The Mojave Desert region is a hot desert with dominant plant species being creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) with three associations nested within three alliances (southern 22 percent of NTS). The Transition region is transitional between the Great Basin and Mojave Desert regions with dominant plant species consisting of blackbrush (*Coleogyne ramosissima*), Nevada jointfir (*Ephedra nevadensis*), and burrobrush (*Hymenoclea salsola*) and includes seven associations nested within three alliances (37 percent of NTS) (Ostler and others 2000).

## MONITORING APPROACH

The Ecological Monitoring and Compliance Program (EMAC) is funded by the U.S. Department of Energy, National Nuclear Security Administration, Nevada Site Operations Office, and is designed to ensure compliance with applicable laws and regulations, delineate and define NTS ecosystems, and provide ecological information that can be used to predict and evaluate the potential impacts of proposed projects and current activities on those ecosystems. Wildlife and habitat monitoring is a large part of EMAC. Monitoring serves several purposes including (1) protecting important resources (for example, desert tortoise clearance and preactivity surveys), (2) identifying human health and safety risks (for example, West Nile Virus, mountain lion or puma [*Puma concolor*] attacks), (3) defining species distributions (for example, fairy shrimp, skinks [*Eumeces* spp.]) and sampling in previously non-sampled areas), (4) identifying important habitat features (for example, bat roost sites and raptor nest sites), (5) assessing long-term population trends (for example, mule deer [*Odocoileus hemionus*]), and (6) detailing natural history and ecology information (for example, western burrowing owls [*Athene cunicularia hypugaea*]). Habitat monitoring is also conducted to document long-term vegetation changes and evaluate revegetation success in desert tortoise habitat, after large wildland fires, on revegetated cleanup sites, and on vegetated waste cover caps. Restoring wildlife habitat is a major goal of revegetation efforts.

While all species are inherently valuable to the ecosystems in which they are found, certain species have been afforded legal protection or are more vulnerable to becoming threatened or endangered than other species due to their rarity, economic value, or threats to their existence. These species make up the NTS Sensitive and Protected/Regulated Species List and have monitoring priority based on “Guiding Principles and Prioritization Criteria for Ecological Monitoring at the Nevada Test Site” and the NTS Resource Management Plan (DOE/NV 1998). Other species are also monitored to fill in data gaps or when deemed necessary. A sensitive species is defined as a species that is on the NNHP Animal and Plant At-risk Tracking List or designated as having a High or Moderate ranking in the Western Bat Species: Regional Priority Matrix (Western Bat Working Group 1998). A sensitive species is considered sensitive because it is rare or has some level of imperilment. A Protected/Regulated species is a species that is protected and/or regulated by federal or state law for various reasons (for example; rarity, economic value, cultural icon). For example, all but five bird species that occur on the NTS are protected under the Migratory Bird Treaty Act but relatively few of them are rare or in danger of becoming threatened or endangered. Some species are considered both sensitive and protected/regulated (for example, spotted bat [*Euderma maculatum*], desert tortoise, LeConte’s thrasher [*Toxostoma lecontei*]).

The Sensitive and Protected/Regulated Species List is reviewed annually and updated as necessary. Several sources are checked to determine if changes to the list are warranted including the NNHP Animal and Plant At-risk Tracking List, U.S. Fish and Wildlife Service (FWS) threatened and endangered species website, and Nevada Administrative Code 503. Additionally, NTS biologists are involved in working groups and professional societies (for example, Nevada Native Plant Society, Nevada Bat Working Group and Western Bat Working Group) that largely determine the status of certain plant and animal species in Nevada.

The main strategies used to monitor wildlife and their habitat on the NTS include (1) conducting preactivity surveys and desert tortoise clearance surveys, (2) conducting proactive surveys for sensitive and protected/regulated species, (3) monitoring long-term population trends, and (4) collaborating with other agencies.

Preactivity surveys are conducted in areas where surface-disturbing work will occur as part of a project. These surveys are conducted by biologists who search the project area for sensitive or protected/regulated species or their sign. Historic data is also referenced to see if there are known sensitive or protected/regulated species in the

project area. Pre-activity surveys are specifically designed to protect sensitive and protected/regulated species from being harmed. If a project occurs within desert tortoise habitat, a desert tortoise clearance survey is conducted in addition to the preactivity survey (see desert tortoise section below).

Proactive surveys are conducted for sensitive and protected/regulated species in order to define their distribution on the NTS and learn more about their natural history including identifying important habitat features that are necessary for their survival (for example, bat roosts, nesting sites). Proactively monitoring sensitive and protected/regulated species can provide data that limits mitigation measures to the known distribution of a species in the event it becomes listed (for example, desert tortoise) or prevents the listing of certain species such as Beatley milkvetch (*Astragalus beatleyae*). Historic data collected by other researchers (for example, Brigham Young University, Nevada Applied Ecology Group, International Biome Program, Basic Environmental Compliance and Monitoring Program) has proved to be invaluable and a great foundation on which to build. Opportunistic sighting data is also used to help understand distribution patterns, although it is understood that there are limitations to these data because they are not collected systematically and uniformly across the NTS. Most of the historic data and recently collected data have been entered into electronic databases that can be linked to a geographic information system to produce distribution maps and delineate geographic areas or habitat types where sampling is incomplete.

Monitoring long-term population trends in wildlife and their habitat is necessary to determine if NTS activities are impacting these resources. However, because natural variability is high in NTS ecosystems due to limited and unpredictable moisture it can be difficult to determine if a downward population trend is caused by NTS activities or is just due to natural variability. Results from long-term monitoring have helped biologists understand some of these patterns but ongoing monitoring is still needed. Learning from other researchers and being familiar with the historic and current literature is also a big part of monitoring population trends. New techniques and statistical analyses for monitoring wildlife populations are continually being developed. Some of these (for example, program PRESENCE, MacKenzie and others [2002]) are being evaluated to see if they are applicable for monitoring certain species on the NTS. Long-term habitat monitoring helps to understand natural changes in the vegetation (for example, substantial decline in spiny hopsage (*Grayia spinosa*) and the impacts of revegetation and succession on wildlife after natural or human-caused disturbance.

Collaborating with other agencies and biologists is critical to wildlife monitoring success on the NTS due to limited funding, a reduced work force, and lack of expertise in certain areas. Many agencies and institutions face similar challenges, and working together creates a win-win situation for everyone. Attending and presenting at professional meetings and involvement with professional societies is a great way to meet and collaborate with other biologists. Additionally, having a good working relationship with regulatory agencies such as FWS and state wildlife agencies can result in expedited consultations and facilitates the issuing of permits. Another way we collaborate with other agencies is to produce an annual report that summarizes our work for each calendar year as well as topical reports on specific studies that have been completed. These reports are distributed to other land management agencies in Nevada and are available to the public through the Office of Scientific and Technical Information (OSTI). The following sections contain information about ways NSTec biologists have made monitoring more efficient and detail examples of successful monitoring and collaborations.

#### **Fairy Shrimp**

Fairy shrimp are unique organisms that only hatch under the right conditions (for example, after significant precipitation events). Eggs may lay dormant in sediments and can be viable for years. They are not sensitive or protected/regulated but more needs to be done to determine their temporal and spatial distribution. Surveys were initiated to determine what species were present and where they occurred. Specimens were sent to Christopher Rogers with EcoAnalysts Incorporated for identification and verification. Mr. Rogers is a fairy shrimp expert and agreed to collaborate with us. Based on his preliminary analysis, it is possible that a new species of the genus *Branchinecta* has been discovered, but further work is needed to verify the new species.

#### **West Nile Virus**

West Nile Virus (WNV), a potentially deadly disease transmitted through mosquito bites, was first detected in southern Nevada during the spring of 2004. During the summer of 2004, Southern Nevada Health District (SNHD) personnel came to the NTS and trained NSTec biologists to trap mosquitoes, and they also provided all the trapping equipment. NSTec biologists have continued trapping mosquitoes every year since 2004. Mosquitoes collected from trapping are given to SNHD personnel who identify the mosquitoes and test them to see if they have WNV. Results are used to evaluate the risk of NTS workers contracting WNV, and SNHD includes the NTS data in their reports to document the presence of WNV throughout southern Nevada. Results are also used to document mosquito distribution on the NTS which has not been done before.

### Western Red-tailed Skink

The western red-tailed skink (*Eumeces gilberti rubricaudatus*) is a sensitive species that was historically known from four locations on the NTS. Monitoring was initiated in 2006 to define its distribution and determine the best technique for capturing them. In 2007 and 2008, systematic sampling across the NTS was conducted. There are now 13 known skink locations on the NTS. In the process of trapping for western red-tailed skinks, other reptile species are also captured. This greatly expands the known distribution of several species, especially since trapping is conducted in many parts of the NTS and in habitats that have never been sampled before. One example of this is the capture of three Great Basin skinks (*Eumeces skiltonianus*) on Pahute Mesa where it was previously only known to occur on Rainier Mesa. Additionally, in order to maximize our time in the field small mammal trapping is conducted in conjunction with reptile trapping activities. This greatly reduces the time and effort required to document species distributions, especially since many trapping locations are in rugged, remote areas. Opportunistic sighting records of other species such as birds or large mammals are also documented during reptile trapping to better define species distributions.

Additionally, we are collaborating with Dr. Jonathan Richmond, a skink expert at Cornell University. This has benefited both Dr. Richmond and NSTec biologists by providing him with tissue samples of both western red-tailed and Great Basin skinks for genetic testing and NSTec biologists with the results of the genetic testing and the potential for future identification of family groups and dispersal in NTS populations. He is discovering new information about the evolutionary ecology and phylogenetic relationships of these two skink species and filling in data gaps where no data had been collected before. Dr. Richmond also visited the NTS in May 2008, taught NSTec biologists new techniques for capturing skinks and helped identify locations to sample for skinks, and was able to expand his knowledge of western red-tailed skink habitat.

### Desert Tortoise

The desert tortoise is listed as Threatened under the Endangered Species Act. Therefore, NTS activities must comply with the terms and conditions in a FWS Biological Opinion. For instance, before any surface-disturbing work occurs in tortoise habitat, a desert tortoise clearance survey is conducted in which 100 percent of the project area and a buffer area is surveyed to determine if tortoises occur in the project area. If a tortoise is present and the project cannot be postponed or moved, the tortoise is moved to a new burrow a safe distance away from the project area. The presence of other sensitive and protected/regulated species is also documented, and mitigation actions are taken to protect these as well.

The desert tortoise monitoring program is a good example of how proactive monitoring can save a lot of time and money. Surveys were conducted to determine the distribution of the desert tortoise before it became listed as "Threatened" under the Endangered Species Act. Thus, when it became listed, the previously gathered data was used in consultation with FWS and the mitigation actions and terms and conditions of the Biological Opinion were limited to the known tortoise distribution.

### Western Burrowing Owl

The western burrowing owl is protected under the Migratory Bird Treaty Act, and is a FWS National Species of Conservation Concern because it is declining in many parts of its range. We monitored this species for several years and produced a topical report entitled "Ecology of the Western Burrowing Owl on the Nevada Test Site." (Bechtel Nevada 2003). It covered several aspects of western burrowing owl natural history and ecology including information about the distribution of this species on the NTS, burrow occupancy patterns based on monthly burrow monitoring, reproduction (in other words, number of breeding pairs and number of young per breeding pair) using motion-activated cameras, food habits based on pellet analysis, disturbance effects, and burrow temperatures using data loggers.

The last few years we have collaborated with Dr. Courtney Conway (University of Arizona) who is conducting a study on migratory patterns and relatedness among western burrowing owls throughout the western United States. He provides the training, the necessary permits, and all the supplies and we provide the labor. This collaboration benefits us by providing data on philopatry and potential wintering sites for NTS owls, and he benefits by getting data that would be difficult and costly to obtain.

### Mule Deer

Mule deer are protected and regulated by the state of Nevada as a game species, although hunting has not been allowed on the NTS since the 1940s. In order to document long-term population trends based on relative abundance, spotlight surveys have been conducted periodically since 1989 (NSTec 2008). Survey routes were designed based partly on a study by Giles and Cooper (1985) who used radiotelemetry to determine distribution patterns of mule deer on the NTS. Based on survey counts, the population of mule deer appears to have declined from 1989 to 1994 reaching its lowest point in 1999 and 2000. In 2006, the population was greatest and then declined by half in 2007. Drought, water source availability, predation, and habitat modification from wildfire appear to have had the greatest influence on relative abundance. Knowing the long-term population trends of mule deer is instructive and may be correlated with puma numbers.

## Puma

Pumas are also protected and regulated by the state of Nevada as a game species. No formal study has been conducted on pumas on the NTS before. In fact, very few puma studies have been conducted in Nevada. We have 87 opportunistic records of puma sightings or sign on the NTS, and over the last few years, several records of puma presence around active projects and facilities have been documented. Since 2005, we have collaborated with Dr. Erin Boydston, a United States Geological Survey research scientist, who purchased several motion-activated cameras to investigate puma abundance and distribution on the NTS. Almost 60 photographs of pumas have been taken at six sites with as many as five to ten individuals occurring at one site. There appears to be a healthy, reproductive population of pumas in the northern portion of the NTS as evidenced by pictures of mature males, mature females, lactating females, and subadults. We are currently in the process of collaborating with Nevada Division of Wildlife and University of Nevada, Reno to conduct a radiotelemetry study to track puma movements and identify how much time they are spending around active projects and facilities to assess potential risk to NTS workers and learn more about puma natural history and ecology. The NTS is an ideal place to study pumas because they have not been hunted for several decades so data from this area can be compared to other areas where hunting is allowed. This is one reason why Nevada Division of Wildlife is very interested in collaborating with us.

In conclusion, we have found that a major key to successful wildlife monitoring is collaboration with other agencies and biologists. Sharing resources and knowledge saves time and money and usually results in better studies. Another key to success is to monitor multiple species when possible to make the most of your time in the field. Proactive monitoring of sensitive and protected/regulated species is also very important and can result in reducing mitigation impacts and even prevent the listing of some species.

Other aspects of successful monitoring include building on existing or historic data, knowing the literature pertaining to

the species you are monitoring, and being involved with professional organizations. These allow you to learn from other people's mistakes and successes and help avoid unnecessary repetition.

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## REFERENCES

- Bechtel Nevada. 2003. Ecology of the western burrowing owl on the Nevada Test Site. DOE/NV/11718--701, Las Vegas, 73 p.
- DOE/NV. 1996. Final Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the state of Nevada. Volume 1, Chapters 1-9. DOE/EIS 0243. U.S. Department of Energy, Nevada Operations Office, Las Vegas, NV.
- DOE/NV. 1998. Nevada Test Site Resource Management Plan. DOE/NV--518, Las Vegas, NV.
- Giles, K.R., Cooper, J. 1985. Characteristics and migration patterns of mule deer on the Nevada Test Site. DOE/DP/00539-054 Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Las Vegas, NV. 17 p.
- Jaeger, E.C. 1957. The North American Deserts. Stanford: Stanford University Press. 308 p.
- MacKenzie, D.I., Nichols, J.D., Lachman, G.B., Droege, S., Royle, J.A., Langtimm, C.A. 2002. Estimating site occupancy rates when detection probabilities are less than one. *Ecology* 83(8):2248-2255.
- NSTec. 2008. Ecological Monitoring and Compliance Program 2007 Report. DOE/NV/25946--402, Las Vegas, NV. 125 p.
- Ostler, W.K., Hansen, D.J., Anderson, D.C., Hall, D.B. 2000. Classification of vegetation on the Nevada Test Site. DOE/NV/11718--477. Bechtel Nevada, Las Vegas, NV.
- Western Bat Working Group. 1998. Western Bat Species: Regional Priority Matrix. Reno, NV. 4 p.
- Wills, C.A., Ostler, W.K. 2001. Ecology of the Nevada Test Site: an annotated bibliography. DOE/NV/11718--594. Bechtel Nevada, Las Vegas, NV. 386 p.