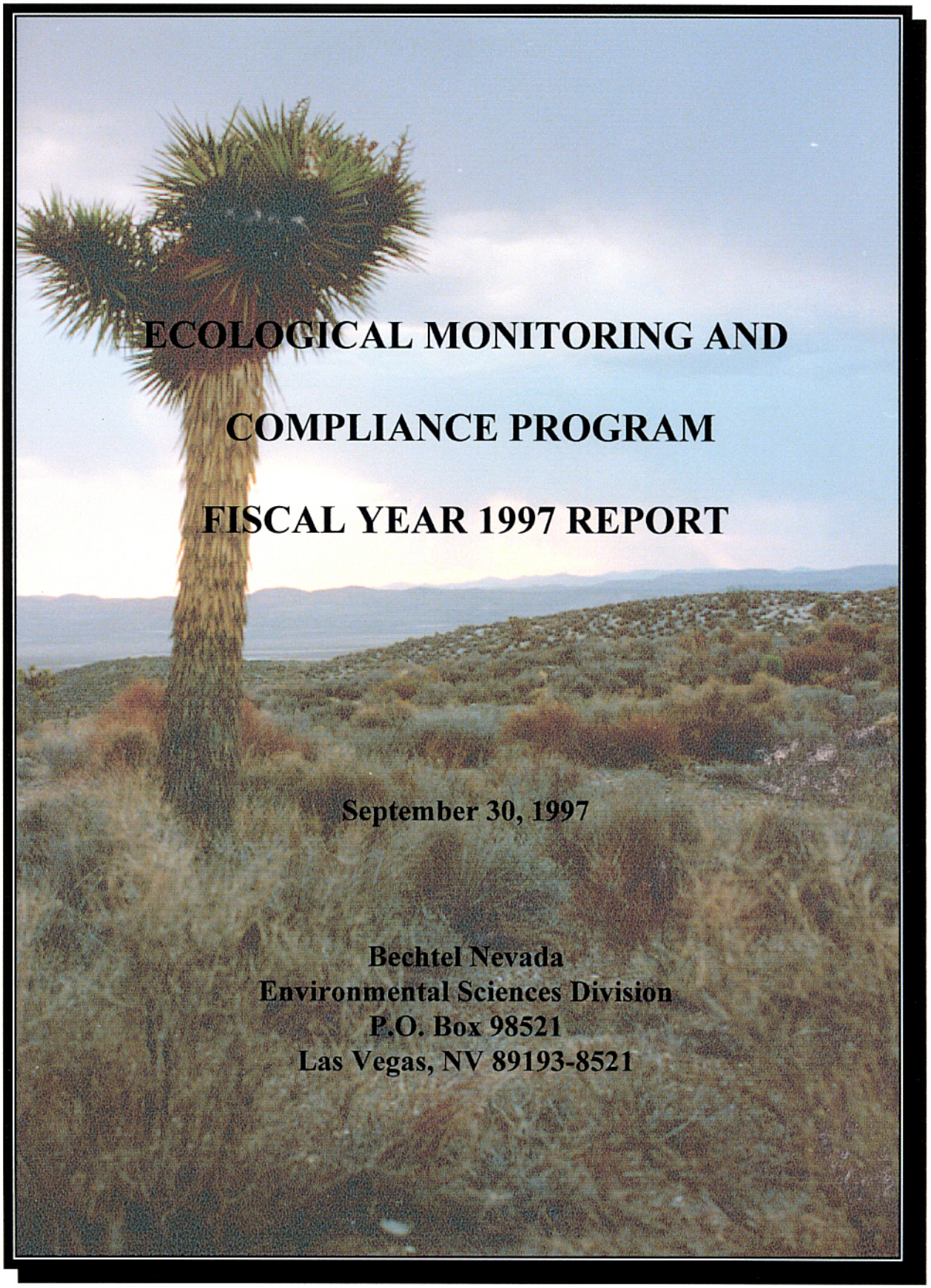

ECOLOGICAL MONITORING AND COMPLIANCE PROGRAM FISCAL YEAR 1997 REPORT

September 30, 1997

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Submitted to

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1.0 INTRODUCTION

The Environment Safety and Health Division (ESHD) of the U.S. Department of Energy/Nevada Operations Office (DOE/NV) provides ecological monitoring and biological compliance support for programs conducted at the Nevada Test Site (NTS). ESHD has implemented the Ecological Monitoring and Compliance (EMAC) program to provide this support. EMAC 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 programs on those ecosystems.

In January 1996, Bechtel Nevada (BN) Ecological Services developed an internal guidance document entitled *Guiding Principles and Prioritization Criteria for Ecological Monitoring at the Nevada Test Site.* This document, submitted to and approved by ESHD, identifies multiple ongoing, as well as unfunded, monitoring tasks. The document describes a priority ranking system by which these tasks are evaluated each fiscal year and assigned a rank of either high, medium, or low priority. The priority status of a task is based on its (1) usefulness in achieving regulatory compliance, (2) responsiveness to stakeholder goals and objectives, (3) degree of current completeness, (4) complexity of activity and amount of effort needed to complete, (5) cost of implementation, and (6) the criticality of current versus future implementation.

The ecological monitoring tasks which were assigned high or medium priority and were funded in Fiscal Year (FY) 1997 (October 1, 1996, through September 30, 1997) included: (1) Preactivity Surveys, (2) Desert Tortoise Compliance, (3) Ecosystem Mapping, (4) Sensitive Species and Habitat Monitoring, and (5) HAZMAT Spill Center Monitoring. This report documents work conducted by BN Ecological Services within these four program areas during FY 1997. In FY 1997, support was also provided to National Environmental Research Park (NERP) investigators using the NTS, as well as to ESHD for EMAC project control, and these efforts are documented in this report under the task title of General Biological Support.

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2.0 BIOLOGICAL SURVEYS

2.1 Task Description

Biological surveys are performed at proposed NTS project sites where land disturbance will occur. The goal is to minimize negative impacts of land disturbance on sensitive plant and animal species, their associated habitat, and important biological resources. Sensitive species include those protected under state or federal regulations which are known or suspected to occur on the NTS (Table 1). Important biological resources include such things as cover sites, nest or burrow sites, roost sites, or water sources important to sensitive species. Biological surveys are also a required mitigation measure under the Mitigation Action Plan for the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE, 1996). Survey reports are written to document species and resources found and to provide mitigation recommendations.

2.2 Task Progress Summary

Six biological surveys were conducted on the NTS and one was conducted near Beatty, Nevada (Figure 1). Of these, five were funded through EMAC, and two were funded by the Environmental Restoration Division (ERD). A total of approximately 438.9 hectares (ha) (1,084 acres [ac]) were surveyed for the six projects on the NTS, and 0.12 ha (0.29 ac) for the project near Beatty (Table 2).

Three biological surveys on the NTS were conducted within the range of the threatened desert tortoise (*Gopherus agassizii*) (Figure 1). Four unoccupied, questionable tortoise burrows were found within the project areas at the proposed sites (Table 2). Sensitive species (or their sign) and important biological resources found within proposed project boundaries included wild horses, a man-made well pond, Joshua trees, an historic ecological study plot, and sanicle biscuitroot (*Cymopterus ripleyi* var. *saniculoides*) plants, a species of concern (Table 2). BN submitted seven preactivity survey reports to ESHD with recommendations to mitigate construction and operating impacts, where appropriate (Table 2).

Table 1 Sensitive species which are protected under state or federal regulations which are known or suspected of occurring on the Nevada Test Site

Plant Species:	Common Name	Status[a]
Arctomecon merriamii	White bear poppy	SOC
Astragalus beatleyae	Beatley milkvetch	SOC, NV-E
Astragalus funereus	Black woollypod	SOC
Astragalus oophorus var. *clokeyanus*	Clokey's egg-vetch	ESA-C
Camissonia megalantha	Cane Spring evening primrose	SOC
Cymopterus ripleyi var. *saniculoides*	Sanicle biscuitroot	SOC
Frasera pahutensis	Pahute Mesa green gentian	SOC
Galium hilendiae ssp. *kingstonense*	Kingston bedstraw	SOC
Opuntia whipplei var. *multigeniculata*	Blue Diamond cholla	ESA-C
Penstemon albomarginatus	White-margined beardtongue	SOC
Penstemon fruticiformis var. *amargosae*	Death Valley beardtongue	SOC
Penstemon pahutensis	Pahute Mesa beardtongue	SOC
Phacelia beatleyae	Beatley phacelia	SOC
Phacelia parishii	Parish's phacelia	SOC
Members of the Agavaceae and Cactaceae Family	Yuccas and cacti	NV-P

Reptile Species:	Common Name	Status
Gopherus agassizii	Desert tortoise	ESA-T, NV-P
Sauromalus obesus	Chuckwalla	SOC

Bird Species[b]:	Common Name	Status
Alexis chukar	Chukar	NV-G
Athene cunicularia hypugea	Western burrowing owl	SOC, NV-P
Aquila chrysaetos	Golden eagle	EA, NV-P
Buteo regalis	Ferruginous hawk	SOC, NV-P
Callipepla gambelii	Gambel's quail	NV-G
Charadrius montanus	Mountain plover	ESA-C
Chlidonias niger	Black tern	SOC
Falco peregrinus anatum	American peregrine falcon	ESA-E, NV-E
Haliaeetus leucocephalus	Bald eagle	ESA-T, EA
Ixobrychus exilis hesperis	Least bittern	SOC
Plegadis chihi	White-faced ibis	SOC
Zenaida macrora	Mourning dove	NV-G

Table 1 (continued)

Mammal Species:	Common Name	Status
Antilocapra americana	Prong-horned antelope	NV-G
Equus asinus	Burro	H&B
Equus caballus	Horse	H&B
Euderma maculatum	Spotted bat	SOC, NV-T
Felis concolor	Mountain lion	NV-G
Lynx rufus	Bobcat	NV-F
Myotis ciliolabrum	Small-footed myotis	SOC
Myotis evotis	Long-eared myotis	SOC
Myotis thysanodes	Fringed myotis	SOC
Myotis volans	Long-legged myotis	SOC
Myotis yumanensis	Yuma myotis	SOC
Odocoileus hemionus	Mule deer	NV-G
Ovis canadensis	Desert bighorn sheep	NV-G
Plecotus townsendii pallescens	Pale Towsend's big-eared bat	SOC
Sylvilagus audubonii	Desert cottontail	NV-G
Vulpes velox macrotis	Kit fox	NV-F

[a] - Status codes

ESA - Endangered Species Act; E - Endangered; T - Threatened; C - Candidate
SOC - Species of concern - Category 1 and 2 species under the ESA which were removed from candidate status, but may still be under consideration for listing as candidates, proposed Threatened, or proposed Endangered
NV-E - Listed as endangered by the state of Nevada
NV-F - Regulated as furbearer by state of Nevada
NV-G - Regulated as game by state of Nevada
NV-P - Protected by the state of Nevada
NV-T - Listed as threatened by the state of Nevada
H&B - Protected under Wild Free Roaming Horses and Burros Act
EA - Protected under Bald and Golden Eagle Act

[b] - Does not include all bird species that may occur at the study area which are protected by the Migratory Bird Treaty Act or by Nevada Administrative Code 503.050.

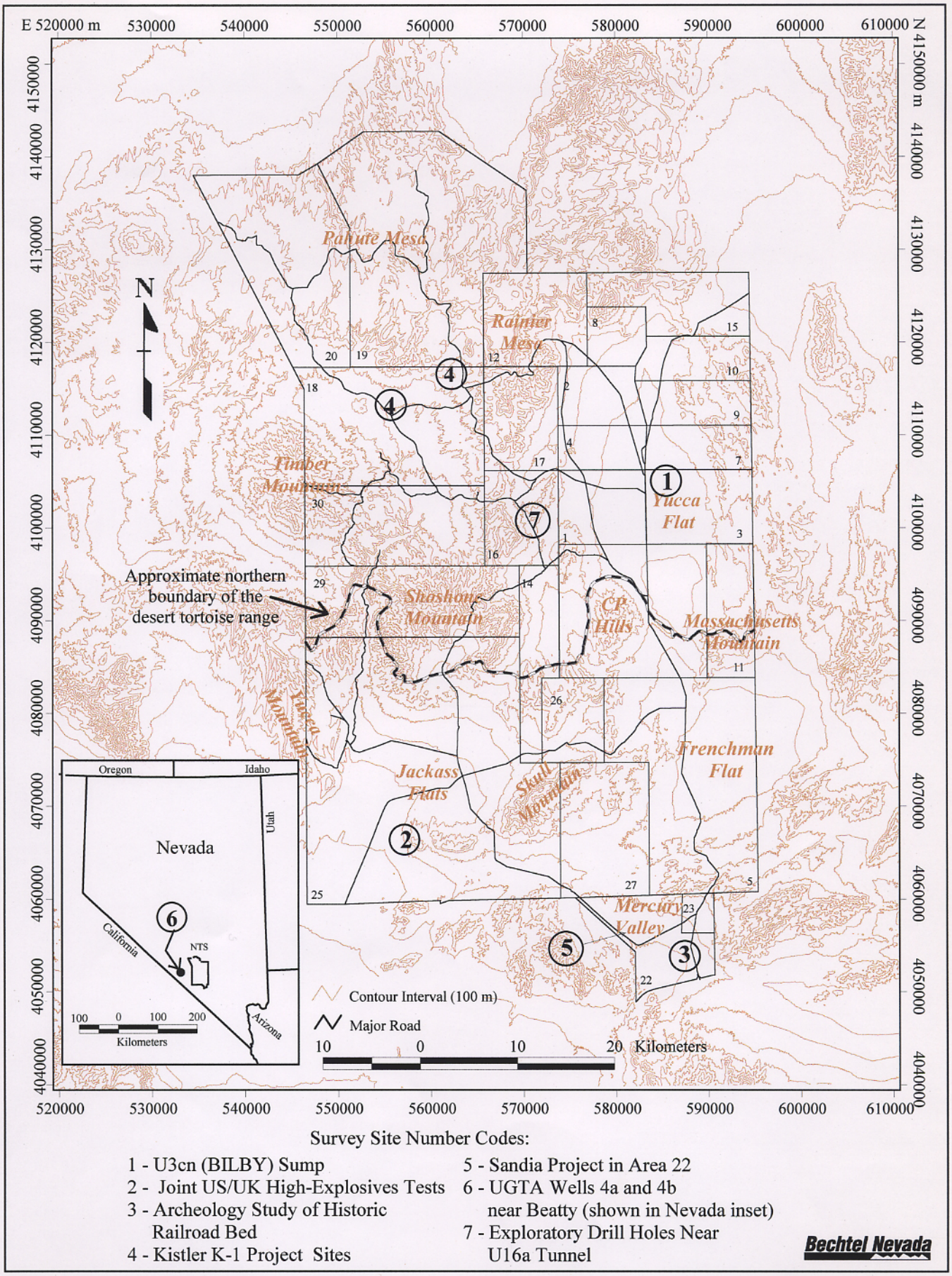

Figure 1. Locations of seven biological surveys conducted on and off the Nevada Test Site in FY97.

Table 2 Summary of seven biological surveys conducted during FY 1997

Project	Sponsor[1]	Important Species/ Resources Found	Area Surveyed (ha)	Mitigation Recommendations
U3cn (BILBY) Sump	ER/UGTA	Joshua trees, raven nest, historic ecological study plot	43.1	Avoid resources during construction; flag and fence sump to deter wildlife usage; monitor wildlife usage
Joint U.S./U.K. High-Explosives Tests	ESHD/EMAC	None	12.6	N/A
Archeological Study of Railroad Bed	ESHD/EMAC	None	7.2	N/A
Kistler K-1 Project	ESHD/EMAC	Horses, well pond used by numerous wildlife species, widely scattered sanicle biscuitroot plants	310.0	To denude project recovery area, conduct a controlled burn (versus blading); identify impacts and mitigation, if necessary, associated with rocket launch operations
Sandia Project in Area 22	ESHD/EMAC	Questionable tortoise burrows	0.9	N/A
Beatty, NV UGTA Wells 4a, 4b	ER/UGTA	None	0.12	N/A
Exploratory Drill Holes	ESHD/EMAC	None	65.0	N/A
Total			438.9	

[1]Sponsors:
ESHD/EMAC- Environment Safety and Health Division/Environmental Monitoring and Compliance program
ER/UGTA- Environmental Restoration Division/Underground Test Area program

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3.0 DESERT TORTOISE COMPLIANCE

3.1 Task Description

The threatened desert tortoise occurs within the southern one-third of the NTS and could be affected by DOE/NV operations. To comply with the Endangered Species Act (ESA), DOE/NV reinitiated formal consultation with the U.S. Fish and Wildlife Service (FWS) in December 1995 on programmatic activities at the NTS over the next ten years. In August 1996, FWS issued a Biological Opinion (Opinion) to DOE/NV (FWS, 1996) which allows incidental take of the desert tortoise on the NTS if the terms and conditions of the Opinion are followed to minimize impacts on the species.

The Desert Tortoise Compliance task of EMAC was developed to implement the terms and conditions of the FWS Opinion, to document compliance actions taken by DOE/NV, and to assist DOE/NV in FWS consultations. The terms and conditions that were conducted for DOE/NV by BN staff biologists in FY 1997 included: (1) conducting clearance surveys at project sites within 24 hours from the start of project construction, (2) conducting zone-of-influence surveys to determine presence/absence of tortoises within poor habitat or habitat along the boundary of the species' range, (3) ensuring that environmental monitors are on site during heavy equipment operation, (4) ensuring that required tortoise-proof fencing is maintained around open excavations and water impoundments, and (5) preparation of an annual compliance report for submittal to FWS.

3.2 Task Progress Summary

3.2.1 Project Surveys and Compliance Documentation

Biologists conducted clearance surveys at three proposed NTS project sites: the Joint U.S./U.K. High-Explosives Tests site in Area 25, a portion of an historic railroad bed in Area 22, and the Sandia Project site in Area 22 (Figure 1). Several questionable tortoise burrows were observed within the buffer area surrounding the Sandia Project site. No tortoises or other sign were found during these three surveys. Zone-of-influence transect surveys were conducted near Beatty, Nevada, for the Underground Test Area (UGTA) Well 4a and 4b project to determine if the wells were within or outside the geographic range of the desert tortoise. Twenty-one hectares (52 ac) of transects were surveyed for the two UGTA wells, and no tortoises or definite tortoise sign were found. BN ensured that on-site construction monitoring was conducted by the designated environmental monitor at the Sandia Project site.

To ensure the maintenance of required tortoise-proof fences, quarterly monitoring was conducted at the ER-5-2 Well and at sewage treatment ponds in Areas 6, 22, 23, and 25. Fence monitoring was discontinued at the Gate 100 sewage treatment ponds in Area 22 and at the primary, secondary, and Reactor Control Point sewage treatment ponds in Area 25. Their side slopes were measured and found to be less steep than 1:3 (1-foot rise to 3-foot length); therefore, they do not require fencing according to the Opinion. Quarterly fence monitoring reports were prepared and submitted to ESHD throughout the fiscal year.

The Desert Tortoise Protection brochure was revised during the last quarter of FY 1996 to reflect changes in the terms and conditions between the old 1992 Opinion and the current

1996 Opinion. During the first quarter of FY 1997, the brochure was distributed to BN employees and DOE/NV contractors. The brochure is part of the Desert Tortoise Training Program for NTS workers required under the Opinion.

In October, two BN biologists attended the Desert Tortoise Handling Techniques Workshop in California sponsored by the Desert Tortoise Council. The survey and handling techniques covered in the workshop are in accordance with those prescribed in *Procedures for Endangered Species Act Compliance for the Mojave Desert Tortoise* (FWS, 1992). Experience in using FWS-accepted survey techniques is a requirement of biologists performing mitigation on the NTS under the Opinion. In April, two BN biologists attended the annual Desert Tortoise Council Symposium in Las Vegas. Also in April, three BN biologists attended an ESA training workshop which the FWS conducted in Las Vegas for DOE/NV.

On January 13, 1997, BN submitted to ESHD the annual report that summarized tortoise compliance activities conducted on the NTS from September 1, 1996, through December 31, 1996 (BN, 1997). This report was the first report for 1996 calendar-year activities conducted under the current Opinion and contains (1) the location and size of land disturbances that occurred within the range of the desert tortoise during the reporting period; (2) the number of desert tortoises injured, killed, or removed from project sites; (3) a map showing the location of all tortoises sighted on or near roads on the NTS, and (4) a summary of construction mitigation and monitoring efforts.

3.2.2 Transect Surveys to Determine Relative Tortoise Abundance

The current Opinion includes a map, prepared by BN biologists in FY 1996, which delineates NTS areas of none-to-very-low and low tortoise abundance. According to the Opinion, tortoise clearance surveys and on-site construction monitoring are optional in none-to-very-low abundance areas, but are required in areas of higher or unknown tortoise abundance. The Opinion allows for updates of this map as better data become available. Field surveys, begun during the last quarter of FY 1996 and completed in the first quarter of FY 1997, were conducted to determine tortoise abundance in previously unsampled areas and to produce an updated map for the Opinion.

A total of 339 transects (187 in FY 1996, 152 in FY 1997), totaling 902 kilometers (km) (559 miles [mi]) were sampled (Figure 2). Transects were placed within a total of 206 ecological landform units (ELUs) (see Section 4.0). All tortoises and their sign observed on each transect were recorded using the methods of Berry and Nicholson (1984). Also, the relative abundance of shrubs, a visual estimate of annual plant production, and numerous abiotic factors were measured on the 212 ELUs as part of the FY 1996 ecosystem mapping task (see Section 4.0). Data analysis of survey results began in January. Relative tortoise abundance was computed for each ELU sampled and an update of the abundance map was produced (Figure 3). Stepwise discriminant function analysis was performed to determine whether the measurements of vegetation and abiotic factors collected on ELUs could be used to predict the relative abundance of desert tortoises. A report was prepared during August and September

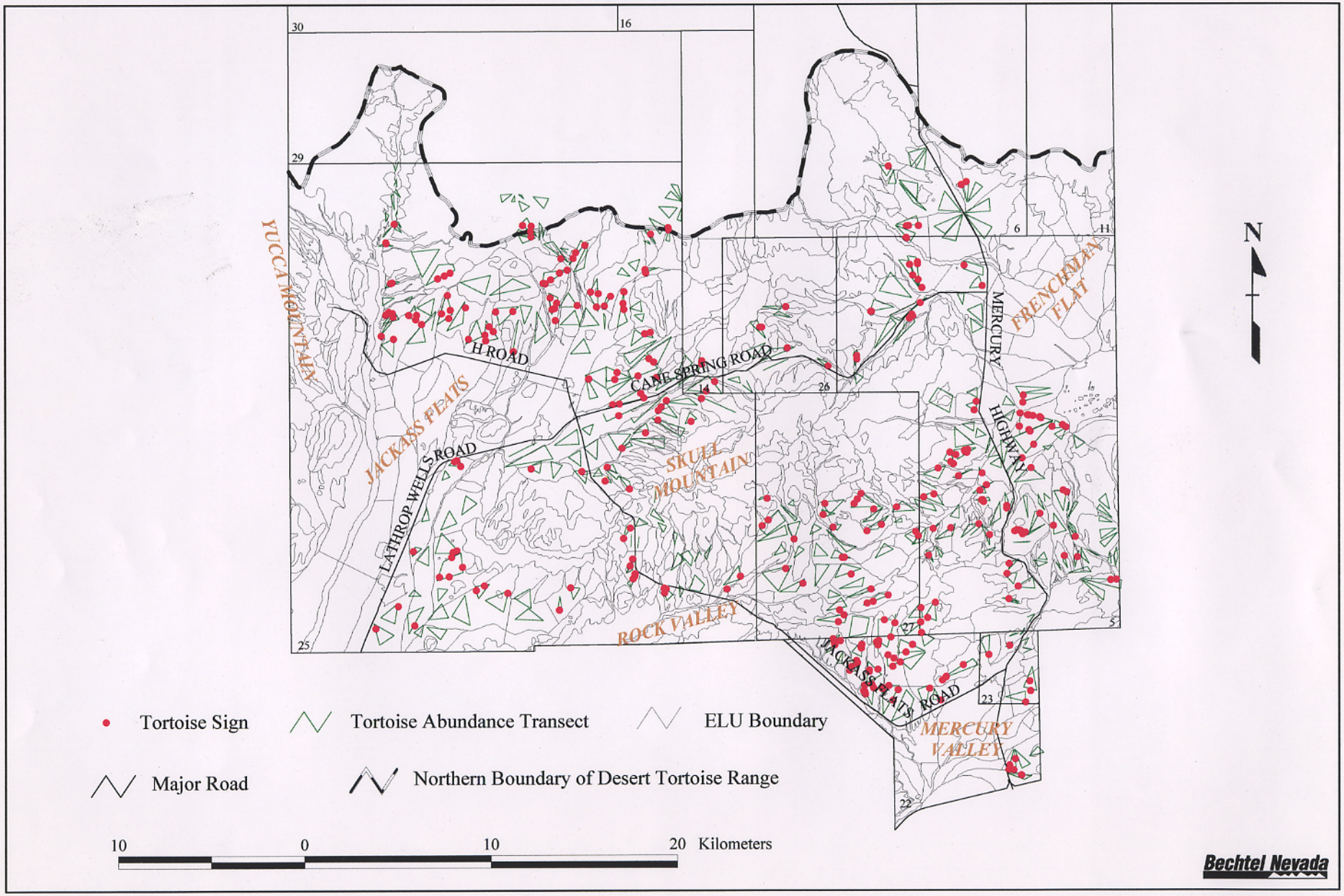

Figure 2. Tortoise abundance transects sampled on the Nevada Test Site in FY96 and FY97.

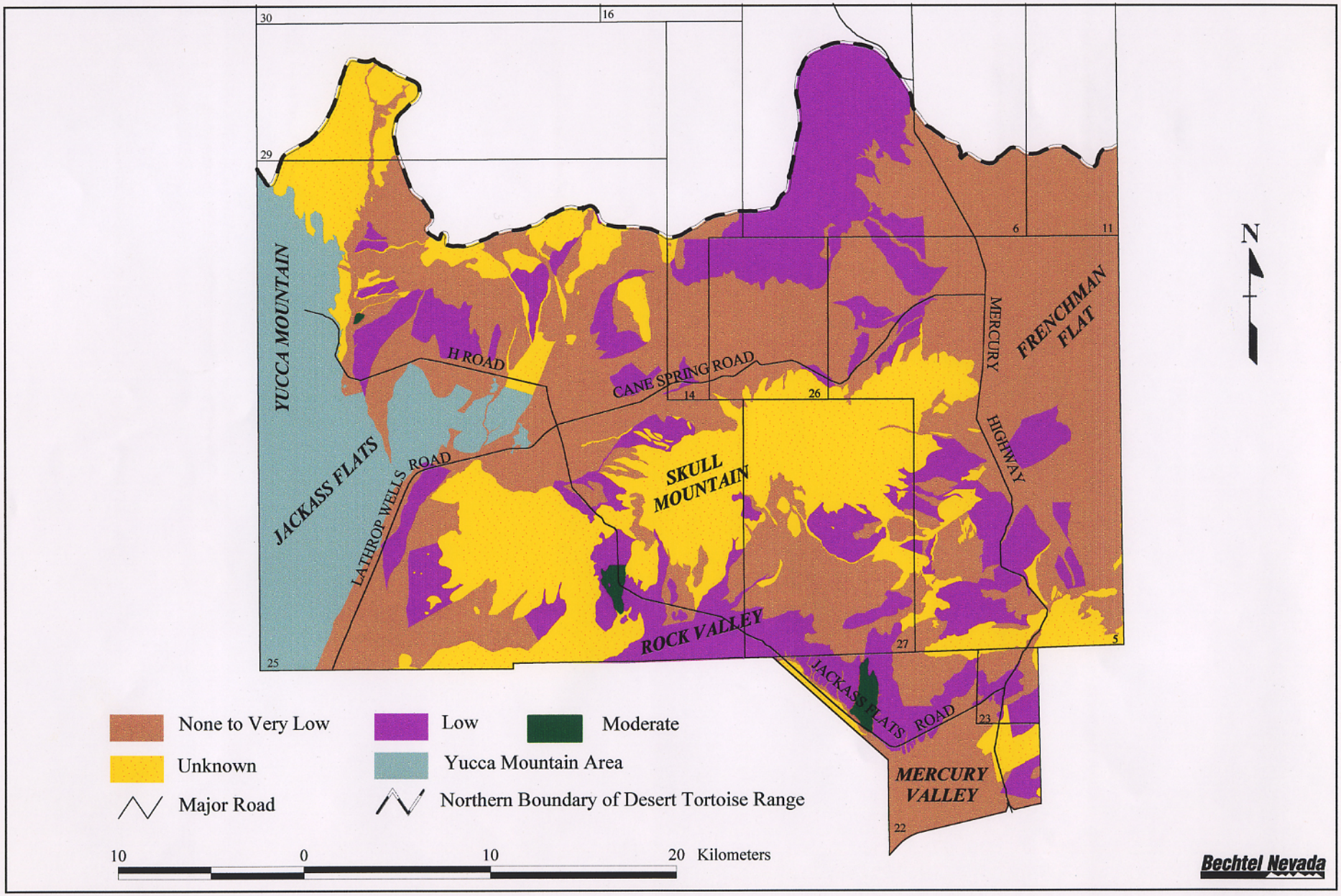

Figure 3. The revised tortoise abundance map for the Nevada Test Site based on FY96 and FY97 surveys and historic data (FWS, 1996: Appendix A).

which summarizes the survey objectives, methods, and results. The first draft of this report, entitled *Determining the Relative Abundance of Desert Tortoises on the Nevada Test Site Using Ecological Landform Units*, was submitted to ESHD on September 30, 1997. The publication and distribution of the final report will be completed during FY 1998.

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4.0 ECOSYSTEM MAPPING

4.1 Task Description

In FY 1996, efforts began to map the wildlife and plant habitat of the NTS. The field mapping units, in which data on selected biotic and abiotic habitat features are collected, are ELUs. ELUs are landforms with visually similar soils, slope, and hydrology and are defined using existing aerial photographs, satellite imagery, and field confirmation. They are considered to be the most feasible mapping unit by which sensitive plant and animal habitats on the NTS can be described. By the end of FY 1996, the field work associated with defining ELUs and collecting ELU-specific data was completed for the southern one-third of the NTS, and the workscope for FY 1997 was to continue field work associated with mapping the remainder of the NTS. Mapping will be completed by the end of FY 1998.

Completion of this task will allow the integrated presentation, archiving, and analysis of NTS species distribution and abundance data with other geospatial habitat data from the NTS. The Geographic Information System (GIS)-based map products and database produced will facilitate ecosystem management of the NTS, the preparation of future environmental assessments and impact statements, and siting of new NTS projects and facilities. The map products to be completed next fiscal year will be the base vegetation and species habitat maps used in the NTS Resource Management Plan (RMP) currently being written by DOE/NV.

4.2 Task Progress Summary

4.2.1 Field Sampling

From April through September, approximately one-half of the northern NTS was partitioned into 500 ELUs using regular and multispectral aerial photographs of the NTS and SPOT (Satellite Pour l'Observation de la Terre) satellite imagery. ELUs were then visited to confirm unit boundaries, describe vegetation and other physical and biological characteristics of the unit (Table 3), and photograph the site vegetation. The majority of the ELUs sampled were within the Yucca Flat drainage basin (Figure 4). Much of the area sampled had been previously disturbed by ground clearing and historic nuclear testing activities, creating great diversity in habitats.

4.2.2 Production of GIS Coverages and Map Products and Data Analysis

No GIS spatial coverages were developed for ELUs sampled in FY 1997 because emphasis was placed on conducting field work. Habitats in the remaining one-third of the NTS (mountains and mesas in the northwest portion of the NTS) will be sampled, and GIS spatial coverages and RMP map products will be completed in FY 1998. Habitat and species range maps will also be prepared for inclusion in BN's Ecosystem Geographic Information System (EGIS).

Table 3 Habitat and vegetation parameters measured on ecological landform units (ELUs) on the Nevada Test Site during FY 1997

Parameter	Definition
Landform	Landform categories included: Basin Floor-Playa, Basin Floor-Alluvial Flat, Piedmont Slope-Fan Skirt, Piedmont Slope-Fan Piedmont, Piedmont Slope-Inset Fan, Piedmont Slope-Ballena, Piedmont Slope-Alluvial Fan, and Mountain.
Aspect	Aspect of ELU measured in degrees from north (0-360), and converted to a ranked measurement based on the amount of solar insolation that a site would receive.
Elevation	Meters above sea level.
Soil Texture	The percentage of sand, silt, and clay estimated based on soil type.
Geology	Surficial geology obtained from U.S. Geological Survey (USGS) geologic quadrangle maps of the NTS.
Slope	Degrees, from 0 to 90°.
Desert Pavement	Desert pavement rock size, recorded as None, Fine (<5 cm), Medium (5-15 cm), or Coarse (>15 cm).
Desert Pavement Cover	Percentage of shrub interspace ground surface covered by desert pavement.
Cryptogams	The relative cover of cryptobiotic crust, recorded as None, Low, Medium, or High.
Production	The productivity of annual plants, recorded as Low, Medium, or High.
Rodent Abundance	The abundance of rodents, recorded as None, Poor, Fair, Abundant, or Very Abundant.
Horse Sign	The amount of horse sign (tracks, trails, scat) observed, recorded as None, Fair, Abundant.
Vegetative Cover	Percentage of ground covered by perennial plants.
Vegetation	Relative abundance, in percent, of 39 shrub species.

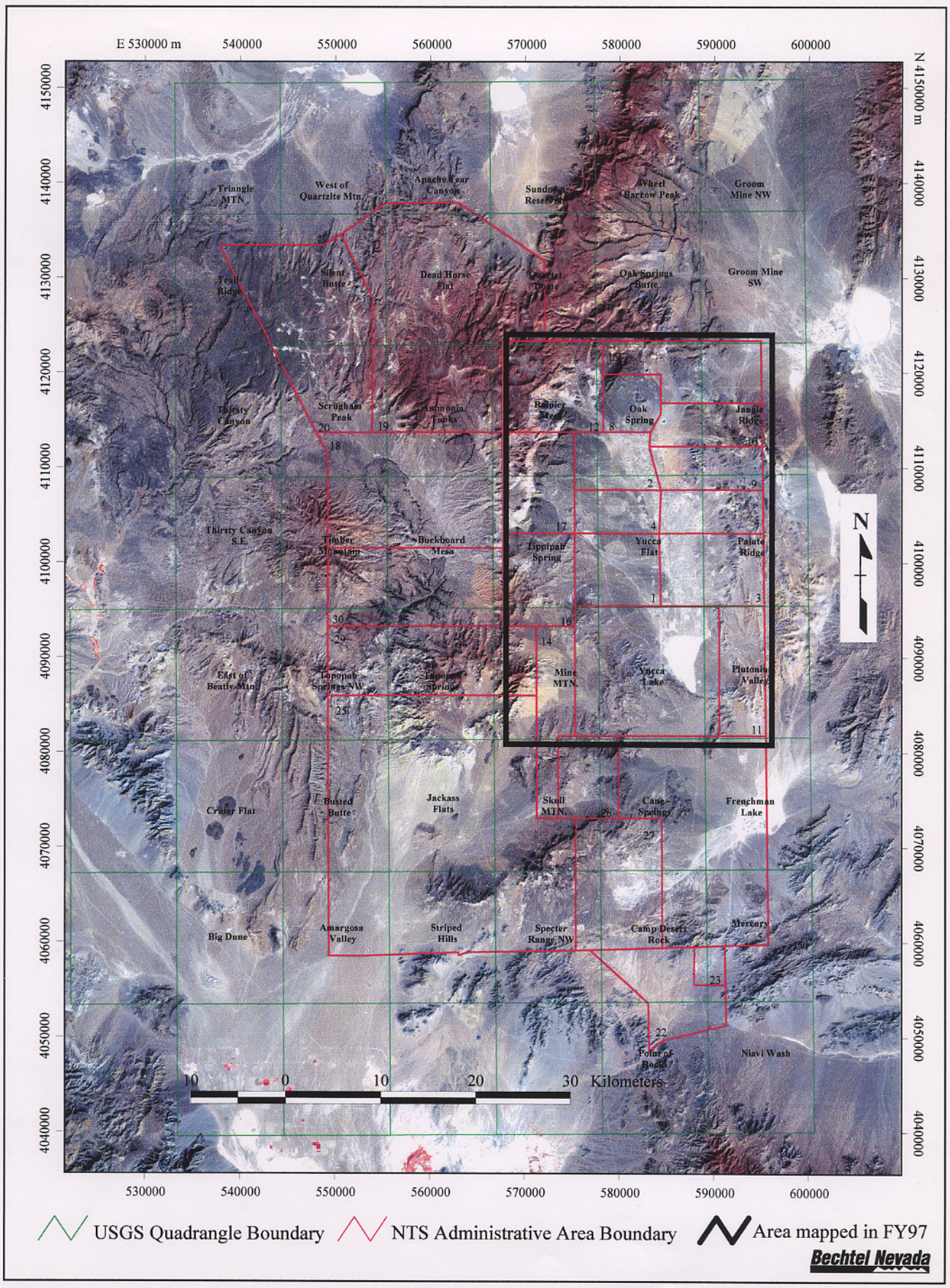

Figure 4. Area in which ELUs were identified and sampled on the Nevada Test Site during ecosystem mapping in FY97.

New multispectral aerial photographs of the NTS were requested by BN biologists and were taken this fiscal year by the GIS Support Group of BN. These new photographs will be used to generate orthophoto maps at a scale of 1:12,000 and will provide a better base image for ecosystem mapping than the SPOT satellite imagery previously used.

In FY 1997, all ELU data collected in FY 1996 were entered into a Paradox™ database, verified, and summarized. The data were then transferred into an Access™ database in September, and an interactive Access™ data entry form was created. Data from approximately 200 ELUs sampled this fiscal year were entered into Access™ using this form. Data entry, verification, and analysis will continue next fiscal year.

Perennial shrub frequency data collected in FY 1996 were analyzed to identify major vegetation associations within the southern one-third of the NTS. Multivariate Cluster Analysis identified over 20 distinct associations which were mapped by ArcView™ software. This analysis was conducted in support of the Desert Tortoise Compliance task (see Section 3.2.2) to determine those vegetation parameters among ELUs that may characterize good tortoise habitat. Results of the cluster analysis were inconclusive and were therefore not included in the draft topical report *Determining the Relative Abundance of Desert Tortoises on the Nevada Test Site Using Ecological Landform Units* prepared in September. FY 1996 ELU data were also analyzed to generate range maps for the dominant shrub species in the southern one-third of the NTS and maps of other biotic and abiotic parameters sampled (e.g., annual productivity, rodent abundance, and desert pavement cover).

5.0 SENSITIVE SPECIES AND HABITAT MONITORING

5.1 Candidate Species and Species of Concern

5.1.1 Task Description

Sitewide surveys for candidate animal and plant species under the ESA are conducted to determine their distribution and abundance on the NTS and to identify potential threats to these species and their habitat. Information from these surveys is used to determine if further protection is required, or if the species can be removed from candidate status.

On February 28, 1996, the FWS issued a revised list of species proposed for listing and species regarded by the FWS as candidates for listing under the ESA. As a result, 11 of 12 animals and all 12 plants that had been Category 1 or 2 species known to occur on the NTS were removed from the candidate list. The FWS considers former candidate species as "species of concern" that belong to a "pool" of species from which new candidates will be selected if warranted. The 12 former candidate plant species on the NTS were assessed during past surveys (Blomquist *et al.*, 1995) and no further assessments of these species have been scheduled within the EMAC program. However, the FWS's 1996 revised list of plants included two new candidate species that may occur on the NTS: Clokey's eggvetch (*Astragalus oophorus* var. *clokeyanus)* and the Blue Diamond cholla (*Opuntia whipplei* var. *multigeniculata)*. Surveys to determine the occurrence and distribution of these two species on the NTS were initiated in FY 1996 and continued this fiscal year.

The mountain plover (*Charadrius montanus*) is the only candidate animal species observed on the NTS which was not removed from the list of candidate animals in February 1996. This bird, however, is an uncommon transient in Nevada (Alcorn, 1988); therefore, surveys for this species on the NTS have been assigned a very low priority. Those former candidate animal species which occur on the NTS include the chuckwalla (*Sauromalus obesus*); western burrowing owl (*Speotyto cunicularia*); and six species of bats: small-footed myotis (*Myotis ciliolabrum*), long-eared myotis (*M. evotis*), fringed myotis (*M. thysanodes*), long-legged myotis (*M. volans*), pale Townsend's big-eared bat (*Plecotus townsendii pallescens*), and the spotted bat (*Euderma maculatum*). Field surveys to determine their distribution on the NTS were initiated in FY 1996 and a topical report of survey results was scheduled for completion this fiscal year.

5.1.2 Task Progress Summary

5.1.2.1 *Clokey's Eggvetch*

Until 1995, the distribution of Clokey's eggvetch was thought to be confined to the Spring Mountains west of Las Vegas, Nevada. In 1995, a new population of this species was encountered during plant surveys conducted by Nellis Air Force Base, Nevada Natural Heritage Program, and The Nature Conservancy (TNC) on the Nellis Air Force Range (NAFR). The population was found at Indian Springs located in the Belted Range, directly north of the NTS. In FY 1996, BN botanists conducted limited surveys for the species in Mouse Meadows north of Rainier Mesa, Kawich Canyon in the southern Belted Range near the northern NTS boundary in Area 19, Grass Spring Canyon in the northwestern portion of Dead Horse Flat, a southeasterly drainage off of Echo Peak (Pahute Mesa), and Silent Canyon

(BN, 1996a). These sites were selected based on reported occurrences of egg milkvetch (*A. oophorus* var. *oophorus)* by Janice Beatley. TNC botanists suspected that these populations may in fact be Clokey's eggvetch rather than egg milkvetch. During the 1996 surveys, BN botanists confirmed that Clokey's eggvetch occurred at one site in a drainage east of Echo Peak. A second specimen found in Kawich Canyon in FY 1996 could not be positively identified. Specimens collected at Echo Peak were verified by Dr. Stanley Welsh at Brigham Young University. Because of the poor growing conditions in FY 1996, only a few days were spent in conducting surveys for this species.

The scope of work for FY 1997 included surveys for the species in areas where it would most likely occur, primarily at sites where egg milkvetch had previously been collected. Good winter and spring precipitation created favorable growing conditions for Clokey's eggvetch in FY 1997. Between May 12 and 22, 1997, approximately 50 survey days were spent in search of the plant. Botanists conducting the surveys first visited the site located in FY 1996 near Echo Peak to become familiar with the habitat of the species and gain confidence in recognition of this particular variety. Surveys were then conducted over the next two weeks.

Five major populations of Clokey's eggvetch were found on the NTS (Figure 5). Four populations were found in Area 19 and one in Area 12. One additional population was located at Cedar Pass on the Tonopah Test Range. The four populations in Area 19 were located in the Echo Peak-Falcon Canyon vicinity: at the head of Lamb's canyon, at scattered sites in Kawich Canyon, and at the head of Gritty Gulch (a drainage located between Kawich Canyon and Lamb's Canyon). The population found in Area 12 is in the vicinity of Captain Jack Spring. The population at Cedar Pass is on the eastern boundary of the Tonopah Test Range and is the northernmost known population of the species.

Ecological information was taken from several sites within each major population. There was an average of 130 individual plants at each site sampled, ranging from as few as 13 to over 500. The plants were found primarily in a Pinyon-Juniper-Sagebrush (*Pinus monophylla-Juniperus osteosperma-Artemisia tridentata*) habitat. Most populations were found above 1,890 m (6,200 ft), although the populations at Captain Jack Spring were between 1,645 and 1,750 m (5,400 and 5,740 ft). Many sites are characterized by a shallow, whitish, tuffaceous soil, while others are in darker and deeper soils. No NTS activities threaten any of the sites. There are two sites where plants were growing in a roadbed and several sites occur in the bottom of washes where the soils are frequently washed out. These observations indicate that the species is tolerant of some degree of disturbance. Several specimens of Clokey's eggvetch were collected and deposited in the NTS herbarium. All ecological data collected during the surveys were entered into the computerized EMAC plant database. The locations of all areas surveyed and the known population sites were plotted on 7.5-minute topographic maps and will be digitized and entered into the EGIS database in FY 1998.

The population sites of Clokey's eggvetch found this spring bridge a gap in the species' distribution between the populations in the Spring Mountains and the population encountered in 1995 by TNC botanists in the Belted Range at Indian Springs. This information, along

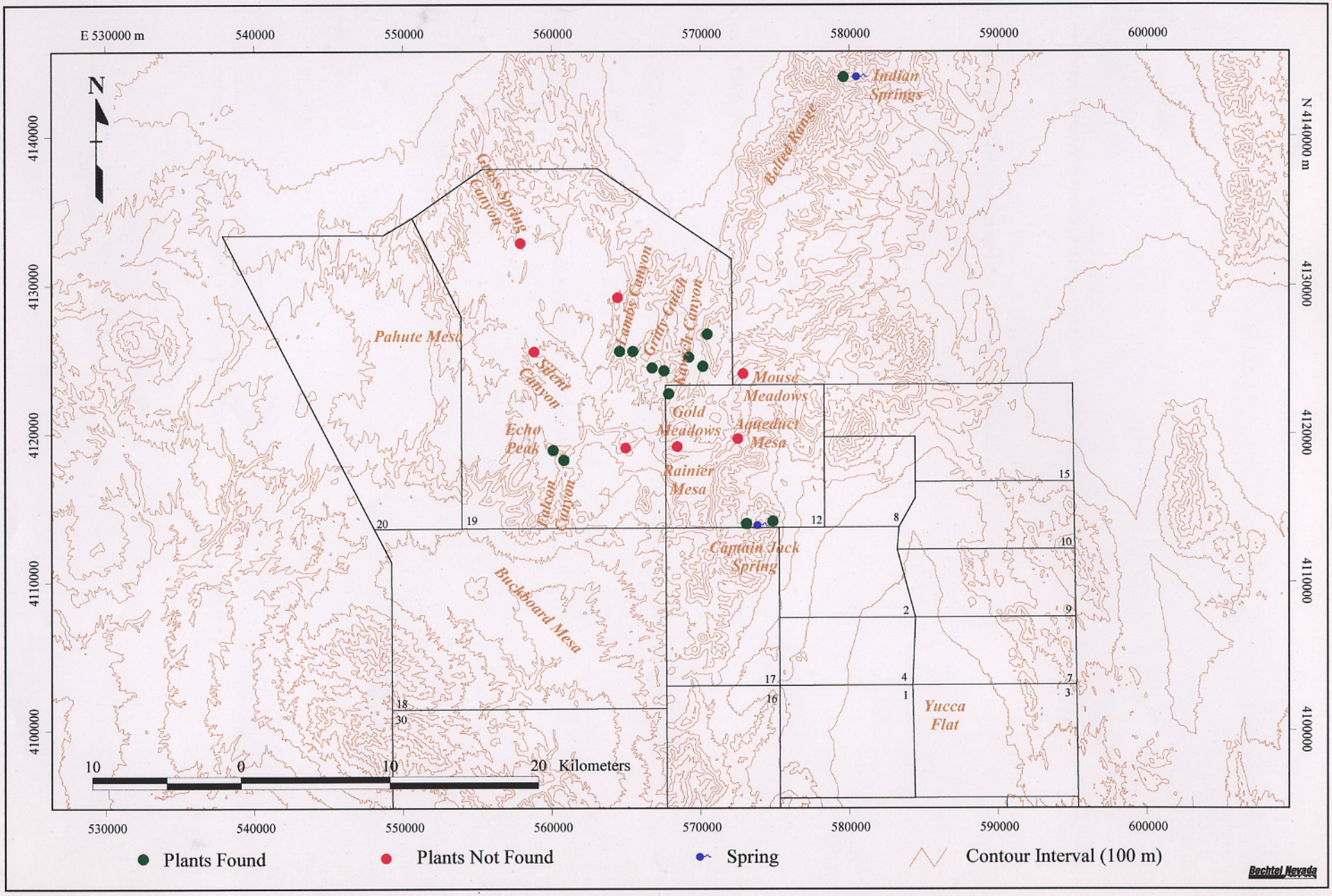

Figure 5. Areas surveyed for Clokey's eggvetch on and adjacent to the Nevada Test Site in FY96 and FY97.

with information on the ecology of the species, should aid state and federal natural resource agencies in developing appropriate conservation measures for the species.

5.1.2.2 *Blue Diamond Cholla*

A herbarium specimen of a golden cholla, which was collected near Mercury and previously identified as staghorn cholla (*Opuntia echinocarpa),* was sent to Janet Bair of the FWS in FY 1996 for identification. It was thought that the specimen could be the Blue Diamond cholla. Species identification has not yet been received from the FWS. Flower and fruit characteristics distinguish this species from other, more commonly occurring chollas. This fiscal year, BN botanists examined the flowers of a live cholla believed to be from the same collection site near Mercury. The flowers did not fit the description of those of the Blue Diamond cholla, and are believed to be those of staghorn cholla. Because of the lack of spring rainfall, chollas at the collection site did not produce fruits; thus, comparisons of fruit characteristics and positive species identification were not possible.

5.1.2.3 *Coordination With Natural Resource Agency Botanists*

Collaboration and coordination with other botanists conducting surveys on threatened, endangered, and candidate species continued as in years past. Frank (Buddy) Smith, a botanist for TNC, accompanied NTS survey crews on two of the survey days. Information which BN botanists obtained on the population of Clokey's eggvetch in the Kawich Range near Cedar Pass was also provided to him. He later visited the site and confirmed that the species was Clokey's eggvetch. As in past years, copies of FY 1997 field survey forms and location maps were sent to the FWS and the Nevada Natural Heritage Program.

5.1.2.4 *Chuckwalla*

Chuckwalla surveys were initiated in May 1996 and continued through June 1997 to better define the distribution and northern boundary range of this species on the NTS. Areas of rock outcrops within the southern one-half of the NTS were visually sampled for the presence of chuckwalla by searching the outcrops for active chuckwalla with the aid of binoculars and spotting scopes. The majority of these sites were also surveyed on foot to record the presence of chuckwalla scat. Nineteen chuckwallas and 118 scat locations were found. A GIS-produced chuckwalla distribution map was developed based on the survey results. This species' NTS distribution corresponds roughly with that of the desert tortoise on the NTS. This map and all survey results were compiled into a topical report (see Section 5.1.2.7).

5.1.2.5 *Western Burrowing Owl*

Western burrowing owl surveys were conducted between April and June 1996. The playback of recorded western burrowing owl calls was the method used for determining the presence of this species at each of 250 regularly spaced "call stops" along existing roads throughout the NTS. Eighteen owls were found at 12 sighting locations in dry, open areas with flat to gradually sloping terrain in most of the major valleys of the NTS. Nearly two-thirds of the burrows found were man-made and usually consisted of partially buried pipes and culverts with an open end at ground level. Sufficient data were collected in FY 1996 to describe the distribution of these owls on the NTS; therefore, call stop surveys were not continued this fiscal year.

In FY 1997, BN biologists repeatedly observed a pair of owls near the inactive Area 3 Mud Plant Pond in May and June during ecosystem mapping of Yucca Flat (see Section 4.0). BN biologists also opportunistically revisited several burrow sites in Yucca and Frenchman Flats where burrowing owls were observed or known to occur in FY 1996. No owls were seen and only one burrow in Yucca Flat appeared to be active (i.e., fresh owl pellets and tracks around the burrow). Survey results were summarized and a GIS-produced distribution map of owl sighting locations were included in a topical report (see Section 5.1.2.7).

5.1.2.6 *Bat Species of Concern*

Mist net trap surveys were conducted from May through July 1996 to determine the presence of bat species of concern on the NTS. Trapping occurred over a total of 11 trap nights at 8 water sources. Of 11 bat species of concern which might occur on the NTS, five, and possibly six, were captured during the survey. Presence of the small-footed myotis on the NTS is questionable due to the difficulty of being able to distinguish it from the California myotis (*M. californicus*) in the field. Specimens of bats believed to be the small-footed myotis were submitted to a qualified mammalogist for identification in FY 1996, but positive identification is still pending. The spotted bat, which is also a state-protected threatened species, was captured for the first time on the NTS. Excluding the questionable small-footed myotis captures, a total of 145 individuals of bat species of concern were captured during the 1996 field study.

In FY 1997, the survey results were summarized and a GIS-produced map showing the trap locations of all bat species of concern were included in a topical report (see Section 5.1.2.7). Also, a BN biologist attended the Natural History and Management of Bats in California and Nevada conference in November. A letter was submitted to DOE/ESHD which summarized topics discussed at the conference which are germane to managing sensitive bat species on the NTS.

5.1.2.7 *Topical Report of Animal Species of Concern*

During the first half of FY 1997, the results of all field surveys conducted for the chuckwalla, western burrowing owl, and six bat species were summarized. All survey data were entered into the EGIS database, and maps were produced displaying the sighting locations of these species. Literature reviews, survey methods and results, and DOE/NV management actions for these species of concern were compiled into a topical report. The draft report was prepared and submitted to DOE/NV for review on April 28, 1997. Review comments were addressed in May, and the final document, entitled *Distribution of the Chuckwalla, Western Burrowing Owl, and Six Bat Species on the Nevada Test Site* (Steen *et al.*, 1997), was published and distributed in September 1997.

5.2 Special Interest/Game Species

5.2.1 Task Description

Wild horses (*Equus caballus*) and the game bird chukar (*Alectoris chukar*) both occur on the NTS and ongoing monitoring tasks were scheduled in FY 1997 for these species. The Wild Free-Roaming Horse and Burro Act of 1971 calls for the management and protection of wild horses and burros on public lands in a manner that is designed to achieve and maintain a thriving natural ecological balance. Although the NTS is on land withdrawn from public use,

DOE/NV entered a Five-Party Cooperative Agreement in 1976 with the Air Force, the Nevada State Department of Fish and Game (currently the Nevada Division of Wildlife [NDOW]), the Bureau of Land Management (BLM), and the FWS to maintain favorable habitat on federally withdrawn lands for wild horses and burros and other species of wildlife. The agreement calls for cooperation in conducting resource inventories and developing resource management plans for these animals based on inventory data. The Air Force allows BLM to conduct periodic horse roundups and removals on the NAFR to ensure sustainable populations of wild horses and wildlife forage species on the range, and DOE/NV conducts an annual horse census on the NTS. The NTS horse population has not increased in size over time as on the NAFR and, in the past three years, a decline in horse numbers on the NTS has been observed. The NTS horse population appears to be isolated from that on NAFR and is known to be dependent in the summer on several natural and man-made water sources in Areas 18, 12, and 2.

In FY 1997, BN biologists performed three subtasks related to horse monitoring.

- Annual horse abundance was estimated to assess population stability based on two survey techniques (discussed in Section 5.2.2.1).
- Horse sign (tracks or scat) were recorded whenever they were observed in order to better define the geographic range of horses on the NTS.
- Selected natural and man-made water sources were visited in the summer to determine their use by horses. Water source usage data is important because the closure or addition of NTS water impoundments may significantly alter horse movements, horse usage of vegetation communities near water sources, and horse impacts on NTS wetlands, which are protected habitats.

The locations of horses, horse sign, and water sources were recorded in the field using a Global Positioning System unit (Magellan™ ProMark V) and entered into the EGIS database.

Chukar populations on the NTS provide NDOW with a source of chukars for transplanting to areas in Nevada open to hunting. ESHD allows NDOW to capture chukars on the NTS for relocation when populations are high enough to support this program. ESHD requests an annual chukar census to determine if capture and relocation of this game bird is feasible year to year. In FY 1997, NDOW did not request permission to remove chukar from the NTS. Therefore, no chukar census was performed and only opportunistic sightings of chukar are presented in this report.

5.2.2 Task Progress Summary

5.2.2.1 *Wild Horses*

Annual Horse Abundance Survey–Two techniques for estimating horse abundance on the NTS were compared again in FY 1997: mark-recapture sampling and a count of all individuals observed. The surveys were conducted from July through September. For the mark-recapture method, a standard road course on the NTS was driven to locate and identify horses. Individuals were not marked, but were identified by their unique physical features. Individual horses observed more than one time during the sampling period were considered recaptures. The population estimate based on this method was 40 individuals and took 11 days of sampling. The 95 percent confidence interval for this population estimate was 40 to 47 animals. Based on the nonstandardized method of searching for horses in an attempt to obtain

a total count, a total of 40 different horses was also obtained and was also based on 11 days of field surveys. The mark-recapture sampling method continues to provide as accurate a population estimate as the direct count method, with equal or less field effort as the direct count method. This year, the number of survey days required to provide the mark-recapture estimate was the same as for the direct count (11 days), but in the previous two years, mark-recapture estimates were obtained in about half the number of field days as a direct count. The mark-recapture technique will continue to be used in the future to estimate changes in horse population size.

Three foals were observed during the summer; however, the total number of foals born this spring is unknown. Six adults observed in FY 1996 were missing in FY 1997, representing a 13 percent decline in the population. One horse, which was not observed this year or in FY 1996, drowned in Camp 17 pond in October. This is the first known occurrence of horse drowning on the NTS. Over the past three years, the feral horse population at the NTS has declined about 29 percent, from 56 to 40 individuals. Natural processes (e.g., predation, emigration) may be the cause of this population decline, but data to verify this have not been collected. Next fiscal year, work is scheduled to test the hypothesis that natural processes are the cause of decreasing horse numbers, and not DOE/NV activities (e.g., loss of habitat from land disturbance; mortality due to contaminated water or removal of water sources).

Horse Sign Observations–The annual population census of horses has routinely been conducted in the summer when horses are nearer to water sources and thus easier to find. These census surveys provide an adequate estimate of the summer range of horses on the NTS but are not useful for estimating their annual range. Efforts were made this year to collect data on horse and horse sign sightings to better estimate their annual range.

Horse sign were recorded in each ELU sampled as part of the ecosystem mapping task (see Section 4.0) and during surveys for sensitive plant species (see Section 5.1.2.1). Next fiscal year, these horse sign data will be entered into the EGIS database and analyzed to characterize those vegetation communities used by horses and to map their annual range. This fiscal year, selected roads were also driven within the suspected annual horse range and all fresh sign (estimated to be < 1 year old) observed adjacent to the roads were recorded. Only two field days of effort were expended for the road surveys. Data collected indicate that the 1997 NTS horse range includes Kawich Canyon, Gold Meadows, Rainier Mesa, Big Burn Valley, Buckboard Mesa, Redrock Valley, the Eleana Range, the southwestern foothills of the Eleana Range, and northwest Yucca Flat (Figure 6). One horse scat was found on Pahute Mesa near Echo Peak Road, indicating some use of southeastern Pahute Mesa. Roads further north and west on Pahute Mesa were not driven, however, so horse use in most of Areas 19 and 20 could not be determined.

Horse Usage of NTS Water Sources –Only two natural water sources (Captain Jack Spring in Area 12 and Gold Meadows Spring in Area 19) and one man-made pond (Camp 17 Pond in Area 18) were used by horses this summer. Camp 17 Pond and Captain Jack Spring appeared to be used the most based on the presence and quantity of horse tracks, trampled and grazed vegetation, and fresh scat. The only other water sources near the known summer range of NTS horses that contained water during the time of the surveys were Whiterock Spring, E Tunnel Containment Ponds, and Area 12 Sewage Ponds (Figure 6). Horse sign or horses have never been observed at these sources since horse monitoring began in 1988,

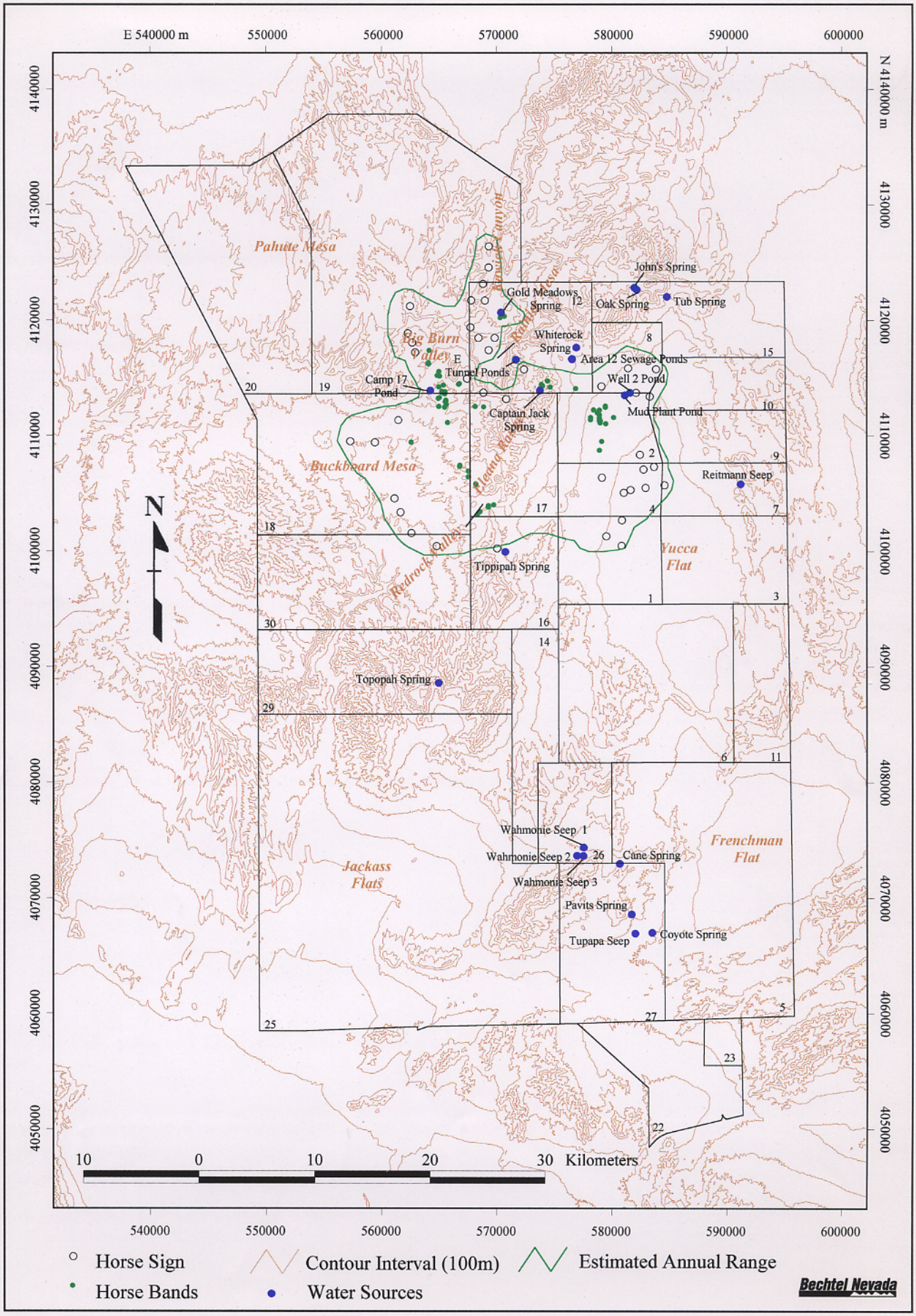

Figure 6. Horses and horse sign observed on the Nevada Test Site in FY97.

although Giles (1976) reported horse use of Whiterock Spring. Tippipah Spring also contained water this summer, but no records or observations of horse use of this spring exist, although horse sign occurs within 1 km to the northwest of the spring (Figure 6).

Two man-made water impoundments, Well 2 Pond and the Mud Plant Pond, both in Area 2 (Figure 6), have been used by horses in past years when they contained water. Well 2 Pond was heavily used by horses in FY 1995, but has been dry since then. The Mud Plant Pond was used in FY 1996, but its water volume dropped during FY 1997 from a surface area of about 955 square meters (m^2) (10,279 square feet [ft^2]) in May to 400 m^2 (4,305 ft^2) in August, making it unusable by horses. As a result, 11 to 13 horses relied completely on Captain Jack Spring for summer water. An estimated 25 to 29 horses appeared to be dependent on Camp 17 pond during summer-fall and Gold Meadows Spring during the summer until it dried up in late August. Field surveys indicate that the FY 1997 summer distribution of horses has not changed significantly from that observed in previous years. This is due to their continued dependence on water sources in Areas 18 and 12.

5.2.2.2 *Chukar*

NDOW did not request permission to trap and remove chukar from the NTS in FY 1997. Therefore, summer brood surveys were not conducted. However, BN biologists recorded all sightings of chukar while performing other field tasks on the NTS. Generally, low numbers of adults and no young were observed around springs and the forward areas of the NTS. The largest group of chukar observed was at Topopah Spring on August 13 and numbered greater than 100 adult birds (see Section 5.3.2.1; Table 5 [page 30]). Chukar surveys are still planned during years when NDOW personnel request permission to trap and remove them.

5.3 Wetlands and Wildlife Water Sources

5.3.1 Task Description

Natural wetlands and man-made water sources on the NTS provide unique habitats for mesic and aquatic plants and animals and attract a variety of other wildlife. Natural NTS wetlands may qualify as jurisdictional wetlands under the Clean Water Act (CWA). Characterization of these mesic habitats to determine their status under the CWA and periodic monitoring of their hydrologic and biotic parameters are components of the EMAC program which was implemented in FY 1997. Periodic wetlands monitoring may help identify annual fluctuations in measured parameters that are natural and unrelated to DOE/NV activities. Also, if a spring classified as a jurisdictional wetland were to be unavoidably impacted by a DOE/NV project, mitigation for the loss of wetland habitat would be required under the CWA. Under these circumstances, wetland hydrology, habitat quality, and wildlife usage data collected at the impacted spring over several previous years can help to develop a viable mitigation plan and demonstrate successful wetland mitigation.

Man-made excavations constructed to contain water occur on the NTS and also attract wildlife. Along with natural water sources, these man-made sources can affect the movement patterns of some species (e.g., wild horses). However, they can also cause accidental wildlife mortalities from entrapment and drowning if not properly constructed or maintained. Quarterly visits to these water sources were implemented in FY 1997 to document wildlife use and mortality.

5.3.2 Task Progress Summary

5.3.2.1 *Characterization and Monitoring of Natural Water Sources*

Wetlands Characterization–Field surveys of the known natural water sources of the NTS were initiated in FY 1996 and completed in FY 1997. A total of 25 water sources were visited from June 1996 through January 1997, including 15 springs, 5 seeps, 4 tank sites (natural rock depressions that catch and hold surface runoff), and 1 ephemeral playa pond. Data on the presence or absence of hydrophytic vegetation, hydric soils, and wetland hydrology were collected, along with observed wildlife use and cursory physical and chemical water quality measurements. Field data were used to identify those water sources which may be classified as "jurisdictional wetlands" and "waters of the United States" regulated under the CWA of 1977.

A draft topical report of wetland survey objectives, methods, and results was written and submitted to DOE/NV in February 1997. The final report, *Nevada Test Site Wetlands Assessment* (Hansen *et al.*, 1997) was printed and distributed in September 1997. The report identifies 16 NTS natural water sources that may be classified as jurisdictional wetlands and identifies 8 water sources that may be classified as waters of the United States. The report also identifies and summarizes previous studies on NTS natural water sources; describes their known physical, chemical, and biological features; identifies the current DOE management practices related to the protection of NTS wetlands; and identifies the information needed to develop and implement resource management objectives for NTS wetlands.

Periodic Monitoring–Periodic monitoring of selected NTS wetlands was continued this fiscal year. Fourteen water sources were visited between January and August. They included Cane, Captain Jack, Cottonwood, Gold Meadows, John's, Oak, Twin, Tippipah, Topopah, Tub, Whiterock, and Yellow Rock springs; Reitmann Seep, and Yucca Playa Pond. Selected hydrology, water quality, and wildlife usage data were collected (Tables 4 and 5).

Cane, Gold Meadows, and Twin Springs and Reitmann Seep had no visible surface flow, while the nine other springs exhibited some surface flow (Table 4). Three locations had some limited physical disturbance (Cane, Captain Jack and Gold Meadows Springs), notably from horse activity (grazing and trampling of vegetation) at the latter two. Most water quality parameters varied moderately between sites, particularly water temperature (range of 1.7° to 26°C [35° to 79°F) and dissolved oxygen which was low (< 3.0 parts per million [ppm]) at six springs and higher (> 6 ppm) at eight other natural water sources (Table 4). Total dissolved solids (TDS) were moderately low at most springs (within a range of 33 to 435 ppm) compared to TDS at the Yucca Playa Pond (> 1,000 ppm), probably due to evaporation and concentration of salts at Yucca Playa Pond. The surface area of water at this ephemeral pond was greatly reduced during early June (3,000 m^2 [32,292 ft^2]) from the surface area measured in January (23,000 m^2 [23,011 ft^2]) when TDS was much lower (162 ppm).

Three species of mammals and 18 species of birds were detected at ten water sources (Table 5). The most abundant and widely distributed species was the mourning dove, observed at eight sites. The highest number of individual birds was observed at Topopah Spring, and included predominately mourning doves and chukar. The most abundant passerine species were ravens, observed at Gold Meadows Spring, and house finches which

Table 4 Physical and chemical water quality data collected at selected NTS springs during FY97.

Data Collected	Cane Spring	Captain Jack Spring	Cottonwood Spring	Gold Meadows Spring	John's Spring	Oak Spring	Reitmann Seep	Tippipah Spring	Topopah Spring	Tub Spring	Twin Spring	Whiterock Spring	Yellow Rock Springs	Yucca Playa Pond	
Date	8/13/97	8/14/97	1/8/97	7/8/97	2/24/97	2/24/97	8/21/97	8/13/97	8/13/97	8/14/97	1/8/97	8/14/97	1/30/97	1/7/97	6/5/97
Physical Data															
Surface area (m^2)	4	1	1	36	5	1.0	0.5	100	1	0.05	4	4	2	23,000	3000
Surface flow rate (l/min)	0	Yes[a]	Yes	0	Yes	Yes	0	Yes	Yes	0.06	0	1.7	Yes	0	0
Water depth (cm)	100	20	20	50	5	5	10	30	15	20	10	6	30	unknown	unknown
Disturbance observed	small cave-in at cave entrance	horse trampling of vegetation	none	horses grazing aquatic plants	none	none	none	none	none	none	none	none	none	none	none
Chemical Data[b]															
Water temperature (°C)	17.1	20.1	7.3	23.5	14.2	14.0	24.3	19.8	17.6	26.0	16.8	17.4	6.6	1.7	18.5
Dissolved oxygen (ppm)	6.1	2.7	3.5	13.6	2.5	1.8	11.3	1.3	0.6	6.0	1.0	6.6	11.3	13.6	6.5
Total dissolved solids (ppm)	226	107	53	146	123	67	435	139	77	158	137	128	33	162	1046
Conductivity (u/S)	453	207	107	293	245	134	843	266	159	325	271	256	68	328	2176
pH	7.1	7.0	7.1	8.5	6.9	6.9	8.2	7.1	6.8	7.4	7.1	7.5	8.1	8.1	8.3

[a] Yes indicates surface flow was present but was not measured.

[b] All values are an average of three replicates.

Table 5 Wildlife use of selected springs at NTS observed during FY97. Numbers of birds by species was visually estimated. For mammals, "P" indicates use of a water source inferred from animal sign.

Wildlife Observed	Cane Spring	Captain Jack Spring	Gold Meadows Spring	Twin Spring	Reitmann Seep	Tippipah Spring	Topopah Spring	Tub Spring	Whiterock Spring	Yucca Playa Pond		
Date	8/13/97	8/14/97	6/5/97	1/8/97	8/21/97	8/13/97	8/13/97	8/14/97	8/14/97	4/1/97	4/17/97	6/5/97
Mammals												
Feral horse (*Equus caballas*)		P	P									
Mule deer (*Odocoileus hemionus*)	P				P	P		P				P
Coyote (*Canis latrans*)					P							P
Birds												
American robin (*Turdus migratorius*)			1									
American coot (*Fulica americana*)										1		
Brown-headed cowbird (*Molothrus ater*)			>5									
California gull (*Larus californicus*)										1		
Chipping sparrow (*Spizella passerina*)			>5									
Chukar (*Alectoris chukar*)	10	15		P			>100	15				
Common raven (*Corvus corax*)			>150									
Cooper's hawk (*Accipiter cooperii*)									1			
Gambel's quail (*Callipepla gambelii*)	40								30			
House finch (*Carpodacus mexicanus*)			>10				>50		1			>100
Killdeer (*Charadrius vociferus*)										3		
Mourning dove (*Zenaida macroura*)		5	>30		>10	>5	>300	30	>20			>100
Pinyon jay (*Gymnorhinus cyanocephalus*)		1					>5					
Snowy egret (*Egretta thula*)											1	
Unidentified ducks											10	
Unidentified owl									1			
Western bluebird (*Sialia mexicana*)		2										
Yellow-headed blackbird (*Xanthocephalus xanthocephalus*)										2		

were found at four water sources. Hydrobiid springsnails were present at Cane Spring inside the cave pool. No animals were observed during site visits to Cottonwood, John's, Oak, and Yellow Rock Springs.

5.3.2.2 *Monitoring of Man-Made Water Sources*

BN biologists conducted quarterly monitoring of man-made water sources. These sources, located throughout the NTS (Figure 7), include 35 plastic-lined sumps, 46 sewage treatment ponds, 13 unlined well ponds, 2 cement-lined ponds, and 4 radioactive containment ponds. Several ponds or sumps are located next to each other at the same project site. They are monitored to assess their use by wildlife and to develop and implement mitigation measures to prevent them from causing significant harm to wildlife. Many NTS animals rely on these man-made structures as sources of free water. Wildlife and migratory birds may drown in steep-sided or plastic-lined sumps as a result of entrapment, or ingest contaminants in drill-fluid sumps or evaporative ponds. Mitigation measures, required under the Mitigation Action Plan for the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE, 1996), include placing flag lines over contaminated water sources to repel birds, or fencing or covering them. Quarterly monitoring ensures that all flag lines, fencing, or covers are checked for their integrity and repaired when needed. All of the 16 plastic-lined drill-fluid sumps have been either flagged and/or fenced to deter their use by wildlife.

The water sources were visited in November, February, May, and August. At each site, a BN biologist recorded the presence or absence of standing water and the presence of animals or their sign around the water source. At plastic-lined sumps, the biologist also estimated the surface area of water and the presence, absence, and condition of fences and flag lines. Some type of ramps or ladders, which allow animals to escape if they fall in, have also been installed at many plastic-lined sumps, and the presence, absence, and condition of these structures were also noted. All dead animals (or any remains of an animal) in or adjacent to a man-made water source were recorded. Use of unlined sumps and ponds by migratory birds and mammals such as coyotes and deer was common. Up to ten different species of birds, including migratory waterfowl and passerines, were observed at a site. The highest bird use was during August. Only two man-made ponds (the cement-lined Mud Plant Pond in Area 2 and Camp 17 Pond in Area 18) were used by wild horses. The fences installed around the plastic-lined sumps do not exclude coyotes or deer, as their tracks were observed commonly inside many of the fences. Birds were observed much less at the plastic-lined sumps compared to the unlined ponds.

A total of eight dead animals were found in plastic-lined sumps. In November, five mule deer, which apparently drowned as a result of entrapment, were observed in several sumps (sumps 4, 5, and 6) at drillhole ER-20-6 in Area 20 (Figure 7). No mule deer drownings were observed for the remainder of the fiscal year. The other three dead animals included one duck in a sump at ER 6-1 in February, one ground squirrel in a sump at U-7ba in February, and one woodpecker (northern flicker) found along the fence around the ER19-1 sumps in November. The ground squirrel appeared to have drowned, but the cause of death for the birds is unknown. No animal mortalities at unlined or cement-lined ponds were observed during the surveys. However, in October, a wild horse drowned in the unlined Camp 17 pond. It is suspected that the horse was unable to climb out of the pond. This is the first known occurrence of a horse entrapment and drowning on the NTS.

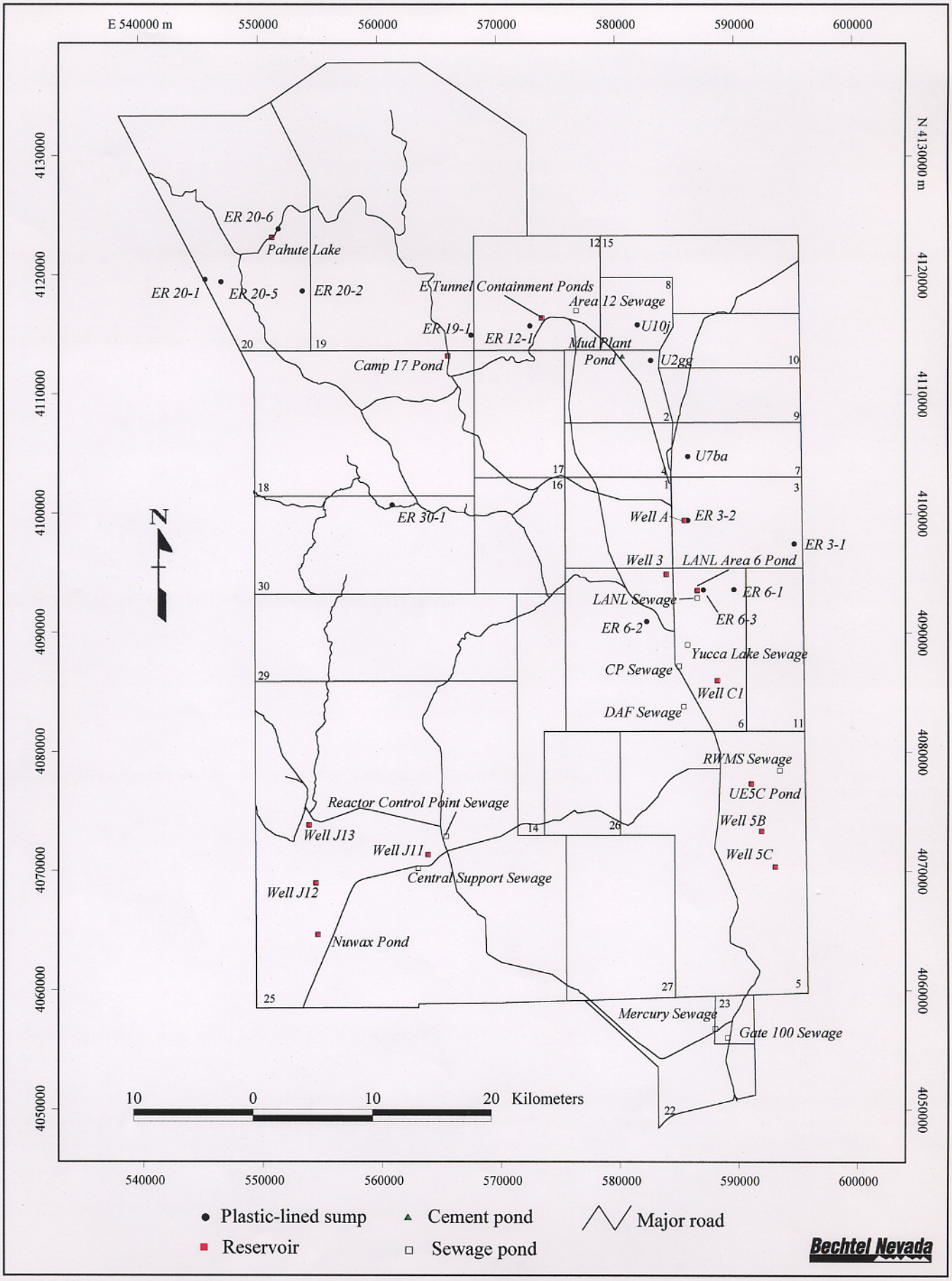

Figure 7. Man-made water sources monitored for wildlife use and mortality on the Nevada Test Site in FY97.

All survey observations were summarized in quarterly reports that were submitted to DOE/NV. Recommendations were included in the reports to install animal escape ramps in plastic-lined sumps and to assess the need for wildlife exclusion fences and flag lines at these sumps based on ecological risk assessments of wildlife exposure to potential contaminants in the water. Soil placed in mounds over the plastic lining in the corners of sumps were determined to be the most practical and effective way to limit animal mortalities.

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6.0 HAZMAT SPILL CENTER MONITORING

6.1 Task Description

Biological monitoring at the Hazardous Materials (HAZMAT) Spill Center on the playa of Frenchman Lake in Area 5 is required for certain types of chemicals under the center's programmatic Environmental Assessment. These chemicals have either not been tested before, have not been tested in large quantities, or have uncertain modeling predictions of downwind air concentrations. In addition, ESHD has requested that BN monitor (downwind) any test which may impact plants or animals off the playa.

A document entitled *Biological Monitoring Plan for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility on the Nevada Test Site* was prepared in FY 1996 (BN, 1996b) and describes how field surveys will be conducted to determine test impacts on plants and animals and verify that the spill program complies with pertinent state and federal environmental protection legislation. The design of the monitoring plan calls for the establishment of three control transects and three treatment transects at three distances from the chemical release point which have similar environmental and vegetational characteristics. In FY 1997, EMAC funded the establishment of these transects and baseline sampling of the control transects. BN biologists are tasked to review spill test plans to determine if field monitoring along the treatment transects is required for each test as per the monitoring plan criteria. All test-specific field monitoring is funded through the HAZMAT Spill Center.

6.2 Task Progress Summary

In FY 1997, control and treatment transects surrounding the HAZMAT Spill Center were established. Treatment transects are each 1,000 m (3,280 ft) long and at three distances (1, 3, and 5 km [0.6, 1.9, and 3.1 mi]) downwind from the spill site. Control transects are similar lengths and at similar distances upwind (Figure 8).

The control transects were selected to contain similar plant species as the treatment transects. Seasonal baseline sampling of the control transects was conducted in March and September. Data collected included the presence of any dead animals, observations of wildlife or their sign (i.e., scat, burrows, nests, tracks), and any damage to vegetation. Data was entered into an Access™ database and verified.

BN reviewed chemical spill test plans for two experiments: (1) Remote Sensor Test Range-Lynx Episode using 28 materials, and (2) Effluent Tracking Experiment using ten materials. It was determined that all experiments would represent minimal risk and no field biological monitoring of treatment transects would be required. Letters documenting these reviews were submitted to ESHD on April 23 and September 15, 1997.

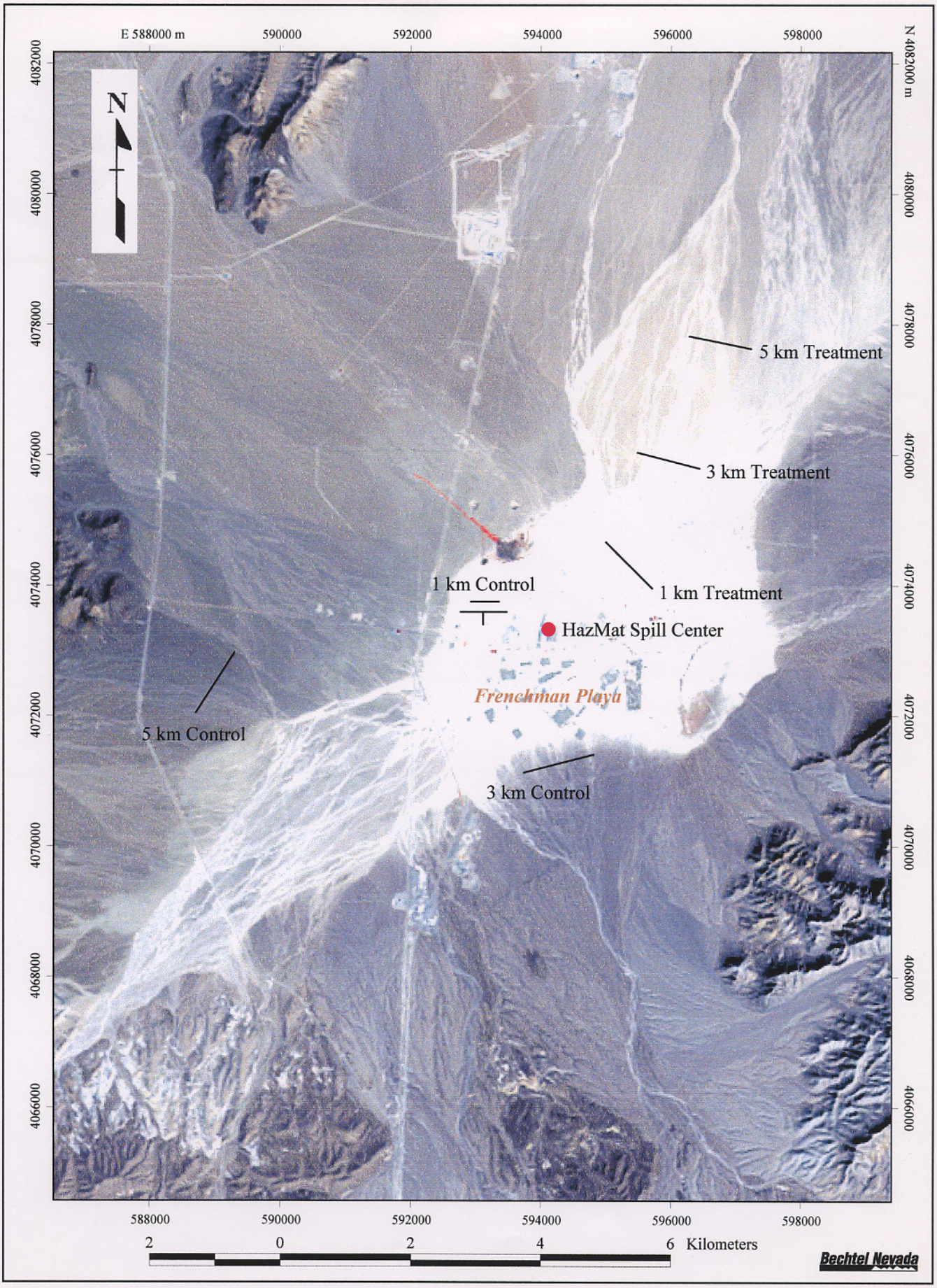

Figure 8. Biological monitoring transects established for the HazMat Spill Center in FY97.

7.0 GENERAL BIOLOGICAL SUPPORT

7.1 Task Description

General EMAC program support is provided and includes preparation of workscope and budget plans for outgoing years, and tracking and reporting current fiscal year program tasks and costs. Ancillary maintenance of biological permits and facilities to perform EMAC tasks are included as well. NERP support that is provided through EMAC includes on-site biological, logistical, and administrative assistance, upon request from ESHD, to NERP investigators. Assistance may include providing Q-cleared escorts, a photographer, or a guide to particular biological study sites; conducting desert tortoise conservation training; and assistance in obtaining property removal passes. Field radios and laboratory space for NERP investigators are also included.

7.2 Task Progress Summary

In January, portions of the 1996 Annual Site Environmental Report (ASER) which pertain to wildlife and ESA permits, ESA compliance activities, and ecological monitoring were prepared. In August, progress reports on ESA compliance, ecological monitoring, and land reclamation on the NTS were written for the ASER first quarter calendar year 1997 progress report. All portions of the ASER were submitted to Bechtel Nevada Analytical Services, Environmental Monitoring Group, for technical editing and publication.

NERP support was provided, as requested from ESHD, to Phil Medica of the National Biological Service in October to capture tortoises located in the Rock Valley enclosures for the purpose of collecting morphometric measurements. In the spring, a BN biologist escorted a Desert Research Institute (DRI) technician to Rock Valley to service a DRI communications relay station.

In September, a BN biologist escorted two research scientists from Michigan State University to Rock Valley to sample desert soils for bacterial analysis.

The BN annual scientific animal handling and collection permit from NDOW (number S12888) was renewed in January. Also, BN prepared and submitted to NDOW in January a report of all collection activities conducted during calendar year 1996.

FY 1997 costs accrued for the use of Building 790 in Mercury were reviewed, and it was determined that consolidation of space within the building was feasible. As a result, two laboratories and two offices within the building were closed.

Draft statements of work for FY 1998 and FY 1999 in support of the EMAC program were prepared and submitted to ESHD in April. Task planning sheets for the approved FY 1998 EMAC work scope were submitted to ESHD and signed in September.

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