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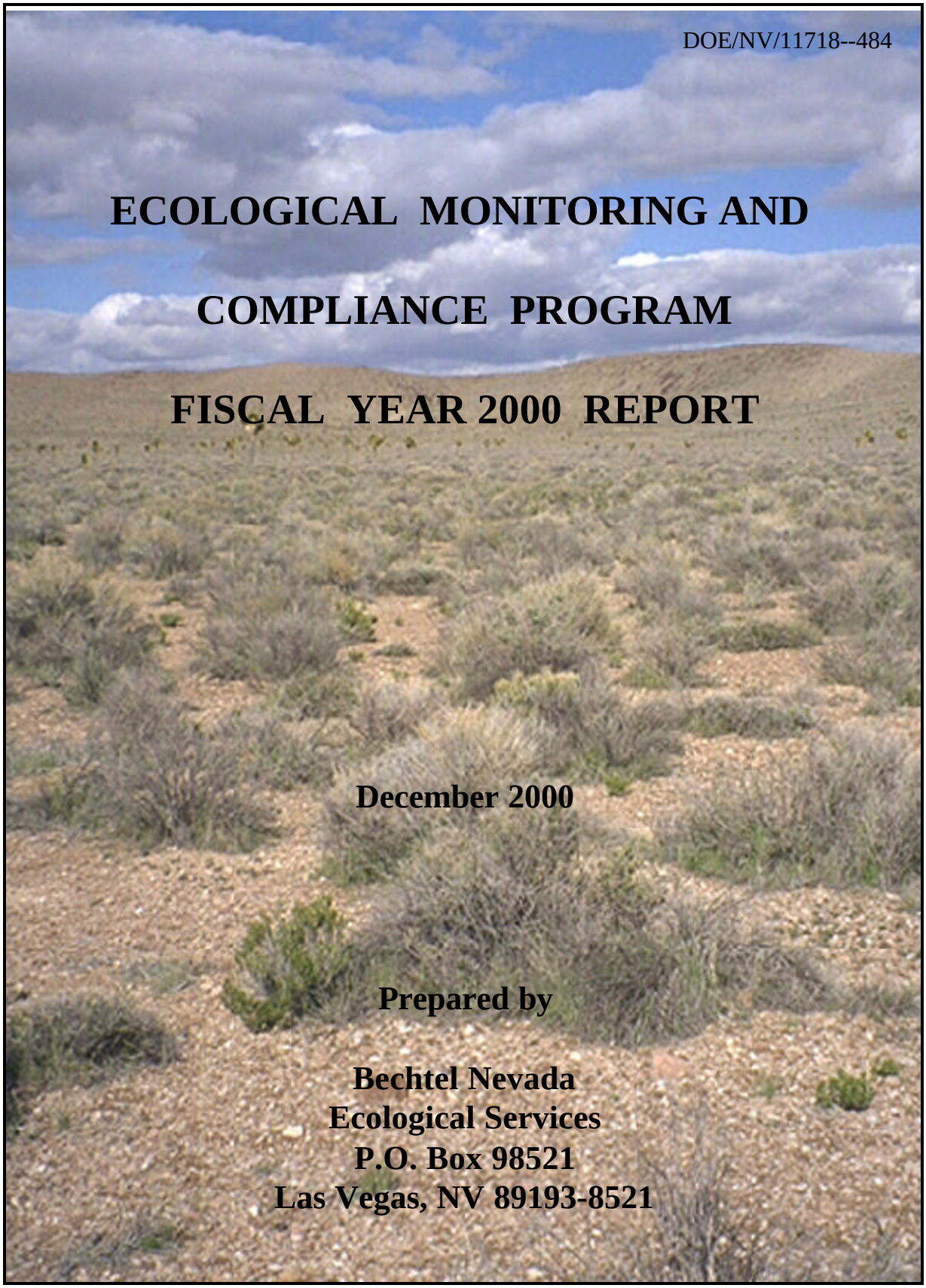

ECOLOGICAL MONITORING AND COMPLIANCE PROGRAM FISCAL YEAR 2000 REPORT

December 2000

Prepared by

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Prepared for the
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Nevada Operations Office
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ACRONYMS AND ABBREVIATIONS

ac	Acre(s)
BLM	U.S. Bureau of Land Management
BN	Bechtel Nevada
CAU	Corrective Action Unit
CWA	Clear Water Act
DRI	Desert Research Institute
DEM	Digital Elevation Model
DOE/NV	U.S. Department of Energy, Nevada Operations Office
ELU	Ecological Landform Unit
EMAC	Ecological Monitoring and Compliance
E-MAD	Engine Maintenance, Assembly, and Disassembly
ESA	Endangered Species Act
ESHD	Environment, Safety, and Health Division
FWS	U.S. Fish and Wildlife Service
FY	Fiscal Year
GIS	Geographic Information System
km	Kilometer(s)
m	Meter(s)
m^2	Square meter(s)
NAFR	Nellis Air Force Range
NNNPS	Northern Nevada Native Plant Society
NTS	Nevada Test Site
R-MAD	Reactor Maintenance, Assembly, and Disassembly
RMP	Resource Management Plan
SERDP	Strategic Environmental Research and Development Program

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ABSTRACT

The Ecological Monitoring and Compliance program, funded through the U.S. Department of Energy, Nevada Operations Office, monitors the ecosystem of the Nevada Test Site (NTS) and ensures compliance with laws and regulations pertaining to NTS biota. This report summarizes the program's activities conducted by Bechtel Nevada during fiscal year 2000. Program activities included: (1) biological surveys at proposed construction sites, (2) desert tortoise compliance, (3) ecosystem mapping, (4) sensitive species and unique habitat monitoring, and (5) biological monitoring at the HAZMAT Spill Center. Biological surveys for the presence of sensitive species were conducted for 24 NTS projects. Seventeen sites were in desert tortoise habitat, and six acres of tortoise habitat were documented as being disturbed this year. No tortoises were found in or displaced from project areas, and no tortoises were accidentally injured or killed. A topical report describing the classification of habitat types on the NTS was completed. The report is the culmination of three years of field vegetation mapping and the analysis of vegetation data from over 1,500 ecological landform units. A long-term monitoring plan for important plant species that occur on the NTS was completed. Sitewide inventories were conducted for the western burrowing owl, bat species of concern, wild horses, raptor nests, and mule deer. Fifty-nine of 69 known owl burrows were monitored. Forty-four of the known burrows are in disturbed habitat. As in previous years, some owls were present year round on the NTS. An overall decrease in active owl burrows was observed within all three ecoregions (Mojave Desert, Transition, Great Basin Desert) from October through January. An increase in active owl burrows was observed from mid-March to early April. A total of 45 juvenile owls was detected from eight breeding pairs. One nest burrow was detected in the Mojave Desert, one in the Great Basin Desert, and six in the Transition ecoregion. Seventy bats, representing four bat species of concern, were captured in mist-nets at water sources in the Great Basin Desert ecoregion. Bats were detected with the Anabat II call-recording system at selected tunnel and mine entrances verifying that some NTS mines and tunnels are used as bat roosts. Thirty-seven adult horses and 11 foals were counted this year. Four of the five foals observed last year have survived to yearlings. A monitoring plan for NTS horses was completed. Six active red-tailed hawk nests and 10 nestling red-tailed hawks were detected this year. Two spotlighting surveys for mule deer were conducted, each over three consecutive nights in October 1999 and August 2000. The mean sighting rate in October was 1.2 deer/10 kilometers (km) and 1.6 deer/10 km in August. Selected wetlands and man-made water sources were monitored for physical parameters and wildlife use. No dead animals were observed this year in any plastic-lined sump. Pahute Mesa Pond was confirmed to have vegetation, hydrology, and soil indicators that qualify the site as a jurisdictional wetland. The chemical spill test plan for one experiment at the HAZMAT Spill Center was reviewed for its potential to impact biota downwind of spills on Frenchman Lake playa.

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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) requires ecological monitoring and biological compliance support for activities and programs conducted at the Nevada Test Site (NTS). Bechtel Nevada (BN) Ecological Services 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.

The ecological monitoring tasks conducted in fiscal year (FY) 2000 (October 1, 1999, through September 30, 2000) included: (1) Biological Surveys, (2) Desert Tortoise Compliance, (3) Ecosystem Mapping, (4) Sensitive Species and Habitat Monitoring, and (5) HAZMAT Spill Center Monitoring. The five sections of this report document work performed under these five program areas.

Last FY, EMAC program tasks were evaluated for their ability to detect if the goals of the NTS Resource Management Plan (RMP) (DOE/NV, 1998) are being met. The RMP goals for biological resources are to: (1) protect and conserve significant biological resources and (2) minimize the cumulative impacts to biological resources. The EMAC task evaluation, which continued this year, involved identifying threshold limits for monitoring parameters for those species for which sufficient baseline data had been collected. It also involved identifying a suite of possible management actions which could be taken if threshold limits were reached. As a result of these efforts, monitoring plans were completed for sensitive plants and wild horses. Baseline data continued to be collected during the year for other sensitive species of the NTS.

This year, work also continued toward archiving and documenting geospatial EMAC data to allow its distribution to agencies and scientists. These efforts included producing metadata for the NTS ecosystem mapping data and creating geospatial coverages of historical preactivity survey sites. Also, computerized photographic files of sensitive habitats (e.g., wetlands, sensitive plant locations) and species (e.g., horses) were updated and organized to facilitate retrospective analysis of the data. Some data sharing and collaboration with other agencies and scientists occurred throughout the year and these efforts specific to each EMAC sub-task are mentioned in this report.

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2.0 BIOLOGICAL SURVEYS

Biological surveys are performed at proposed NTS project sites where land disturbance will occur. The goal is to minimize adverse effects 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. Survey reports are written to document species and resources found and to provide mitigation recommendations.

2.1 Sites Surveyed and Sensitive Species Observed

Biological surveys for 24 projects were conducted on or near the NTS (Figure 1, Table 2). For some of the projects, multiple sites were surveyed (Figure 1). A total of 291.30 acres (ac) was surveyed for the projects (Table 2).

Seventeen of the projects had sites within the range of the threatened desert tortoise (*Gopherus agassizii*) (Figure 1). Sensitive species (or their sign) and important biological resources found within proposed project boundaries included tortoise burrows, predator burrows, Joshua trees, and cacti (Table 2). A population of Pahute Mesa beardtongue (*Penstemon pahutensis*) was found in Area 19 along Pahute Mesa Road. This population was known to occur at this site from previous plant surveys and can be easily avoided during the project to repair an access road to a new anemometer site. No other candidate species or species of concern were found during the surveys. BN completed 17 biological survey reports (BN, 1999b; 2000c-g; i-n; p; q; t-w) with conservation recommendations, where appropriate (Table 2).

2.2 Potential Habitat Disurbance

Ten of the projects for which surveys were conducted were entirely on sites previously disturbed (e.g., industrial waste sites, existing borrow areas, existing well pads), and therefore no pristine habitat was, or will be, disturbed at these sites (Table 2). Surveys are conducted at old industrial sites or nuclear weapons testing sites whenever vegetation has re-invaded a site or it is suspected that a sensitive species may be found. For example, tortoises may move through revegetated earthen sumps and may be concealed under vegetation during activities where heavy equipment is used. Preactivity surveys are conducted at such revegetated sites to ensure they are not in harm's way. Also, burrowing owls frequently inhabit burrows and culverts at disturbed sites, so preactivity surveys are conducted to ensure that adults, eggs, and nestlings in burrows are not harmed.

Fourteen of the projects were located either partially or entirely in areas that had not been previously disturbed or, in the case of one site (Project No. 00-19), in an area that was revegetated enough to be considered undisturbed tortoise habitat. These projects are expected to disturb a total of 77.83 ac (Table 2). Three of these projects are expected to disturb six areas

Table 1. Sensitive species that are protected under state or federal regulations which are known to occur on or adjacent to the NTS

Plant Species	Common Names	Status [a]
Arctomecon merriamii	Desert bearpoppy	<C2
Astragalus beatleyae	Beatley's milkvetch	<C1, CE
Astragalus funereus	Funeral Mountain milkvetch	<C2
Astragalus oopherus var. *clokeyanus*	Clokey's egg vetch	RA
Camissonia megalantha	Largeflower suncup	<C2
Cymopterus ripleyi var. *saniculoides*	Ripley's springparsley	<C2
Frasera pahutensis	Modoc elkweed	<C2
Galium hilendiae ssp. *kingstonense*	Hilend's bedstraw	<C2
Penstemon albomarginatus	Whitemargin beardtongue	<C2
Penstemon fruticiformis var. *amargosae*	Death Valley beardtongue	<C2
Penstemon pahutensis	Paiute beardtongue	<C2
Phacelia beatleyae	Beatley's scorpionweed	<C2
Phacelia parishii	Parish's scorpionweed	<C2
Reptile Species		
Gopherus agassizii	Desert tortoise	LT, NPT
Sauromalus obesus	Chuckwalla	<C2
Bird Species[b]		
Athene cunicularia hypugea	Western burrowing owl	<C2, P
Alectoris chukar	Chukar	G
Aquila chrysaetos	Golden eagle	EA, P
Buteo regalis	Ferruginous hawk	<C2, P
Callipepla gambelii	Gambel's quail	G
Charadrius montanus	Mountain plover	PT, P
Falco peregrinus anatum	American peregrine falcon	<LE, P
Ixobrychus exillis hesperis	Western least bittern	<C2, P
Plegadis chihi	White-faced ibis	<C2, P
Mammal Species		
Antilocapra americana	Pronghorn antelope	G
Corynorhinus townsendii pallescens	Townsend's big-eared bat	<C2

Table 1. (Continued)

Mammal Species	Common Name	Status [a]
Equus asinus	Burro	H&B
Equus caballus	Horse	H&B
Euderma maculatum	Spotted bat	<C2, NPT
Felis concolor	Mountain lion	G
Lynx rufus	Bobcat	F
Myotis ciliolabrum	Small-footed myotis	<C2
Myotis evotis	Long-eared myotis	<C2
Myotis thysanodes	Fringed myotis	<C2
Myotis volans	Long-legged myotis	<C2
Nyctinomops macrotis	Big free-tailed bat	<C2
Ovis canadensis nelsoni	Desert bighorn sheep	G
Odocoileus hemionus	Mule deer	G
Sylvilagus audubonii	Desert cottontail	G
Urocyon cinereoargenteus	Gray fox	G
Vulpes velox macrotis	Kit fox	F

[a]Status Codes:

Endangered Species Act (ESA), U.S. Fish and Wildlife Service (USFWS)
LT - Listed Threatened
PT - Proposed for listing as Threatened
RA - Former Candidate or Proposed species; current information does not support proposal to list because species has proven more abundant or widespread, or to lack identifiable threats; a species of concern
<LE - Former listed endangered species
<C1 - Category 1 Candidate prior to 28 February 1996, currently no formal status, a species of concern
<C2 - Category 2 Candidate prior to 28 February 1996, currently no formal status, a species of concern

U.S. Department of Interior
H&B - Protected under Wild Free Roaming Horses and Burros Act
EA - Protected under Bald and Golden Eagle Act

State of Nevada
CE - Critically Endangered
NPT - Protected Threatened
G - Regulated as game
F - Regulated as fur-bearer
P - Protected bird

[b]Does not include all bird species that are protected by the Migratory Bird Treaty Act or by the State. Additionally, there are 26 birds which have been observed on the NTS, which are all protected by the State.

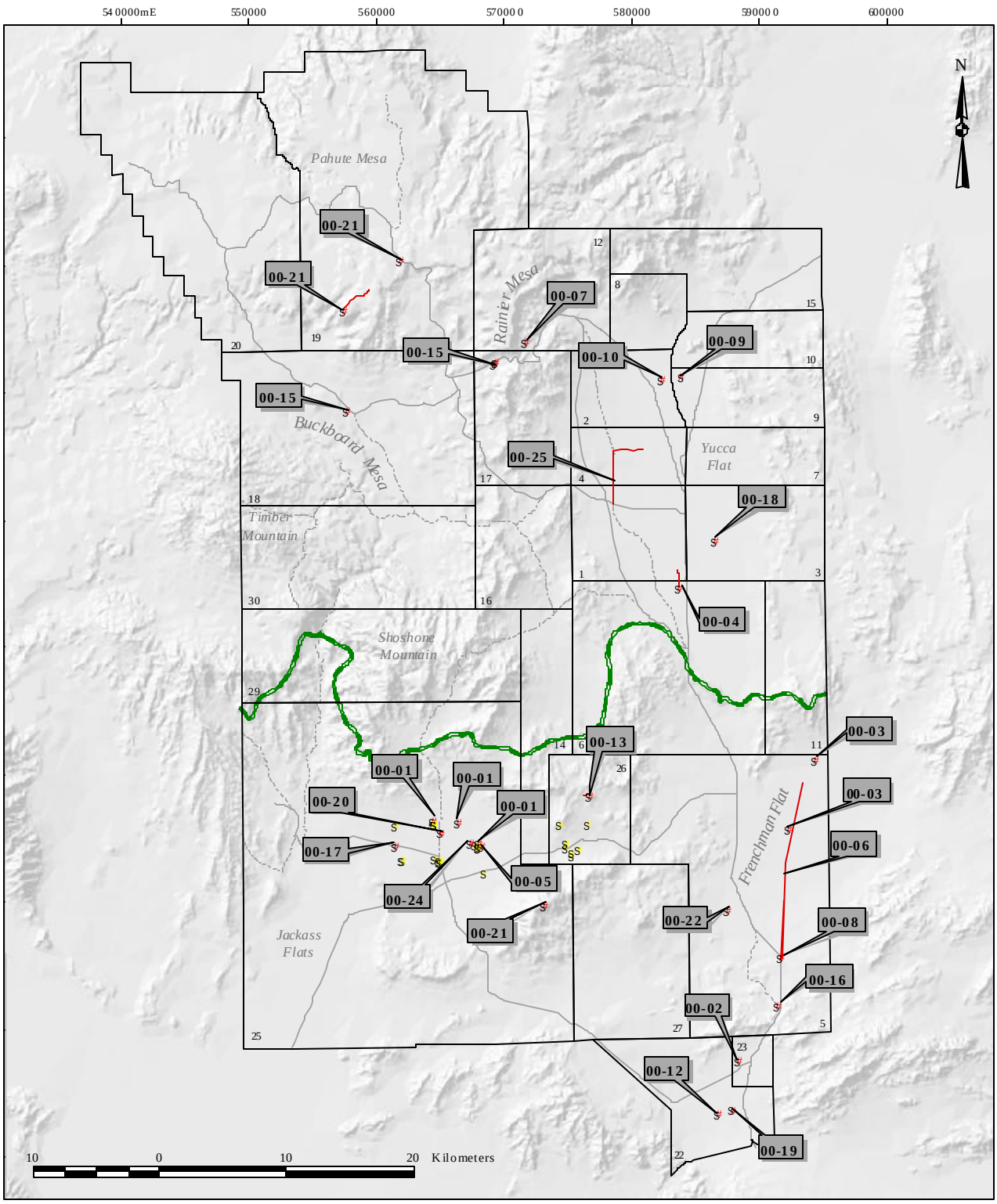

Figure 1. Biological surveys conducted on the NTS in FY 2000

Table 2. Summary of biological surveys conducted on the NTS during FY 2000

Project No.	Project	Important Species/ Resources Found	Area Surveyed (ac)	Proposed Project Area in Undisturbed Habitat (ac)	Conservation Recommendations
00-01	Deactivation and Decommissioning at Test Cell A, C, & Reactor Maintenance Assembly and Disassembly (R-MAD)	None	24.21	0	None
00-02	Pesticide Release Site & Mercury Fire Training Pit (Corrective Action Unit [CAU] 340 & 342)	Predator burrows	3.46	0.80	Avoid burrows
00-03	Wells ER-5-3 and ER-5-4	Joshua trees	31.62	20.76	Avoid Joshua trees
00-04	U1A Pipeline	None	4.70	4.70	None
00-05	R-MAD Background Borehole Sample Sites (CAU 143)	None	1.06	0.10	None
00-06	5-01 Road Shoulder Maintenance	None	66.72	4.93	None
00-07	U12v Tunnel	Joshua trees, cacti	16.56	12.36	Avoid Joshua trees and cacti
00-08	Mercury Highway/5-01 Rd Intersection Grading	Joshua trees	1.04	0.22	Avoid Joshua trees
00-09	Area 9 U10c Landfill Expansion	None	8.15	8.15	None
00-10	Cloud Chamber II Project	None	0.91	0	None
00-11	Surface Radiological Surveys at 18 Sites (CAU 262 & 271)	None	13.19	0	None
00-12	Characterization at Desert Rock Airstrip Refueling Site (CAU 329)	None	0.96	0	None
00-13	JSEAD Demonstration Project II	None	0.40	0.14	None
00-15**	Pahute Mesa Road Repair	None	22.58	21.97	None
00-16	Burma Road Fill Pit	None	6.67	0.30	None
00-17	Decontamination Pad at Engine Test Stand I (CAU 252)	None	0.25	0	None
00-18	Reactivation of Area 3 Borrow Pit	None	29.16	0	None
00-19	Remediation at Camp Desert Rock Fuel Storage Site (CAU 321)	Tortoise burrow	1.61	1.50	Avoid burrow
00-20	Remediation at Area 25 Vehicle Wash Down Area (CAU 240)	None	0.54	0	None

Table 2. (Continued)

Project Number	Project	Important Species/ Resources Found	Area Surveyed (ac)	Proposed Project Area in Undisturbed Habitat (ac)	Mitigation Recommendations
00-21	Installation of Three Anemometer Stations	Pahute Mesa beardtongue, horse, Joshua trees, cacti	20.84	1.21	Avoid Pahute Mesa beardtongue plants, avoid Joshua trees
00-22	Plugging Test Hole #5	Three possible tortoise burrows	0.74	0.19	Avoid burrows
00-23	Remediation at Engine Maintenance Assembly and Disassembly (E-MAD), R-MAD, and Test Cell C (CAU 262)	None	5.33	0	None
00-24	Area 25 Borrow Pit	None	3.70	0.52	None
00-25	Orange Road and 4-04 Road Repairs	Two western burrowing owl burrows	26.90	0	Avoid burrows
			_____	_____	
	Total		291.30	77.85	

** A project assigned Project No. 00-14 was canceled and no survey was conducted.

designated as important habitat on the NTS (Table 3, Figure 2). A total 18.80, 10.27, and 10.0 ac may be disturbed in pristine, unique, and sensitive habitats, respectively, on the NTS (Table 3). These acreages are based on project descriptions and need to be verified with post-activity surveys.

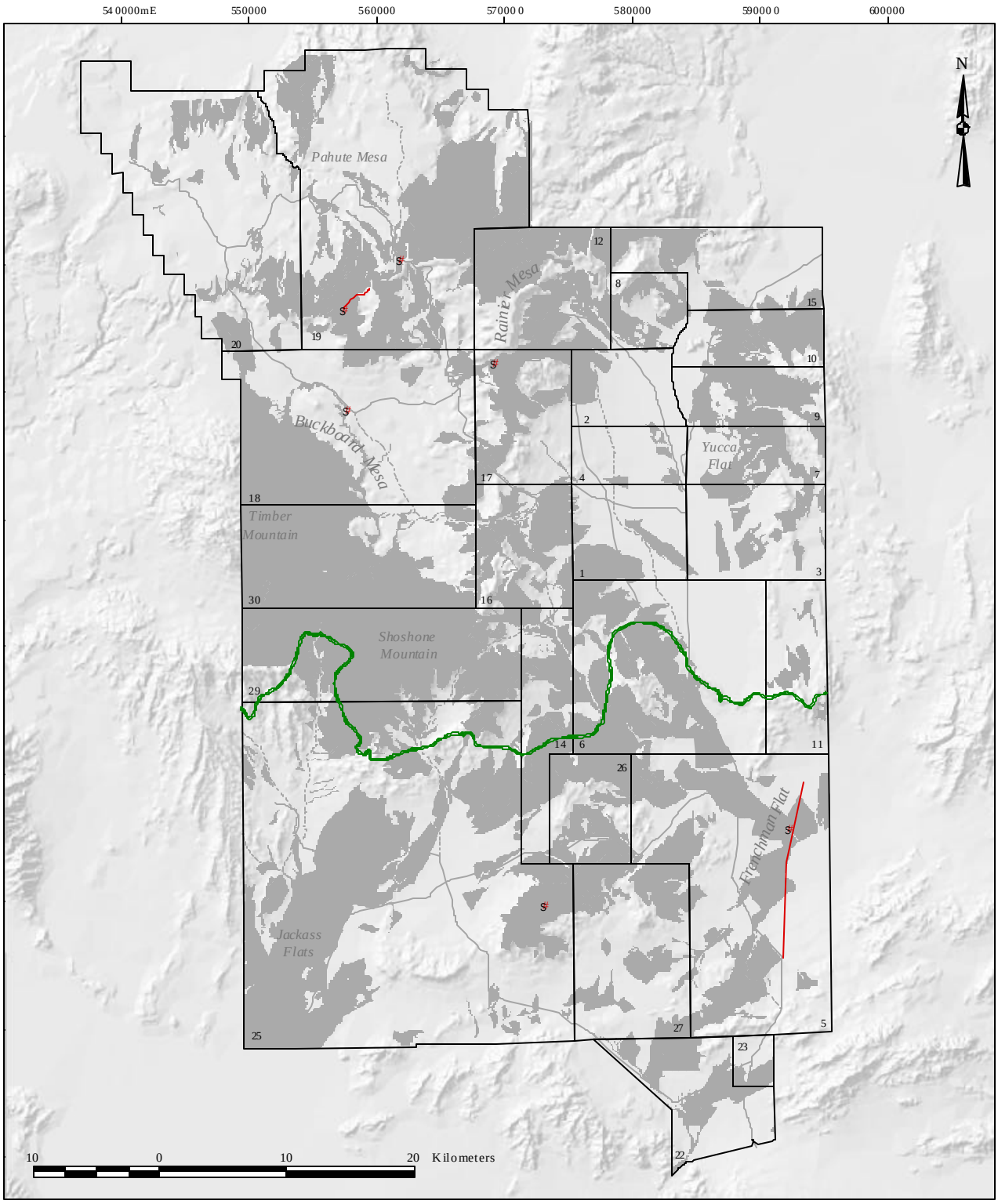

Figure 2. Biological surveys conducted in important habitats of the NTS in FY 2000

Table 3. Acreage proposed for disturbance within important habitats*

Project No.	Site Name	Pristine Habitat (ac)	Unique Habitat (ac)	Sensitive Habitat (ac)	Diverse Habitat (ac)
00-03	Well ER-5-4 (project to start next fiscal year)			10.0	
00-15	Buckboard Mesa Rd Borrow Area for Pahute Mesa Road Repair	18.28			
00-15	Stockade Wash Rd Borrow Pit for Pahute Mesa Road Repair		3.68		
00-21	Anemometer Site E	0.52			
00-21	Anemometer Site 5		0.17		
00-21	Anemometer Site 8		6.42		
		_____	_____	_____	_____
	Total	18.80	10.27	10.0	0

*Important Habitat Definitions:

Pristine: Habitat with few man-made disturbances
Unique: Habitat containing uncommon biological resources such as a natural wetland
Sensitive: Habitat containing vegetation associations which recover very slowly from direct disturbance
Diverse: Habitat with high plant species diversity

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3.0 DESERT TORTOISE COMPLIANCE

The desert tortoise occurs within the southern one-third of the NTS. This species is listed as threatened under the Endangered Species Act (ESA). In December 1995, DOE/NV completed consultation with the U.S. Fish and Wildlife Service (FWS) concerning the effects of DOE/NV activities, described in the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE/NV, 1996), on the desert tortoise. A final Biological Opinion (Opinion) (FWS, 1996) was received from the FWS in August 1996. The Opinion concluded that the proposed activities on the NTS were not likely to jeopardize the continued existence of the Mojave population of the species and that no critical habitat would be destroyed or adversely modified. All terms and conditions listed in the Opinion must be followed when activities are conducted within the range of the desert tortoise on the NTS.

The Desert Tortoise Compliance task of EMAC was developed to implement the terms and conditions of the Opinion, to document compliance actions taken by DOE/NV, and to assist DOE/NV in FWS consultations. The terms and conditions that were implemented for DOE/NV by BN staff biologists in FY 2000 included: (1) conducting clearance surveys at project sites within 24 hours from the start of project construction, (2) ensuring that environmental monitors are on-site during heavy equipment operation, (3) ensuring that required tortoise-proof fencing is maintained around open excavations and water impoundments, and (4) preparing an annual compliance report submitted to the FWS.

3.1 Project-specific Compliance Activities

Biologists conducted desert tortoise clearance surveys prior to ground-disturbing activities for 17 proposed NTS projects at a total of 47 different sites (Table 4, Figure 1). One tortoise burrow and three potential tortoise burrows were the only tortoise sign found (Table 2, Project Numbers 00-19 and 00-22). All four of these burrows appeared unoccupied and could be avoided during project activities. BN Ecological Services ensured that on-site construction monitoring was conducted by a designated environmental monitor at all sites where clearance surveys were performed.

Post-activity surveys were conducted at all sites where there was the potential to created long-term disturbance to viable tortoise habitat. A post-activity survey was not conducted if viable tortoise habitat was not found within the project area boundaries during the clearance survey, and if the environmental monitor documented that the project stayed within its proposed boundaries. Based on five post-activity surveys conducted this FY, 6.05 ac of desert tortoise habitat incurred long-term disturbance from NTS projects during FY 2000 (Table 4).

Table 4. Summary of tortoise compliance activities conducted by BN biologists during FY 2000

Project Number	Project	Compliance Activities	Tortoise Habitat Disturbed (ac)
00-01	Deactivation and Decommissioning at Test Cell A, C, & R-MAD	100 percent-coverage survey, post-activity survey	0
00-02	Pesticide Release Site & Mercury Fire Training Pit (CAU 340 & 342)	100 percent-coverage survey, post-activity survey	0.8
00-03	Wells ER-5-3 and ER-5-4	Voluntary 100 percent-coverage survey, site is in area exempt from terms and conditions of Biological Opinion	N/A[1]
00-05	R-MAD Background Borehole Sample Sites (CAU 143)	100 percent-coverage survey, post-activity survey	0.1
00-06	5-01 Road Shoulder Maintenance	100 percent-coverage survey, post-activity survey	4..93
00-08	Mercury Highway/5-01 Road Intersection Grading	100 percent-coverage survey, post-activity survey	0.22
00-11	Surface Radiological Surveys at 18 Sites (CAU 262 & 271)	100 percent-coverage survey	0
00-12	Characterization at Desert Rock Airstrip Refueling Site (CAU 329)	100 percent-coverage survey	0
00-13	JSEAD Demonstration Project II (2 Sites)	100 percent-coverage survey	TBD[2]
00-16	Burma Road Fill Pit	100 percent-coverage survey	0 (project canceled)
00-17	Decontamination Pad at Engine Test Stand I (CAU 252)	100 percent-coverage survey	0
00-19	Remediation at Camp Desert Rock Fuel Storage Site (CAU 321)	100 percent-coverage survey, flagged unoccupied tortoise burrow to avoid	TBD
00-20	Remediation at Area 25 Vehicle Wash Down Area (CAU 240)	100 percent-coverage survey	0
00-21	Installation of Anemometer Site E	100 percent-coverage survey	TBD
00-22	Plugging Test Hole #5	100 percent-coverage survey	TBD
00-23	Remediation at 9 Sites at E-MAD, R-MAD, and Test Cell C (CAU 262)	100 percent-coverage survey	0
00-24	Area 25 Borrow Pit	100 percent-coverage survey	TBD

	Total	6.05

[1]N/A - Not applicable
[2]TBD - To be determined

3.2 Other Compliance Activities

To ensure the maintenance of required tortoise-proof fences, monitoring was conducted at the dry sump at ER-5-2 Well in May and September and at sewage treatment ponds in Areas 6 and 23 in May. No breaches in the fences or sign of desert tortoises were found. The Desert Tortoise Protection brochure was distributed to 214 BN employees and DOE/NV contractors.

On January 18, 2000, BN submitted to ESHD the annual report that summarized tortoise compliance activities conducted on the NTS from January 1 through December 31, 1999 (BN, 2000b). This report, required under the Opinion, 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.

Compliance with the Opinion will ensure that the two goals of the DOE/NV RMP are being met; namely, that the desert tortoise is protected on the NTS and that the cumulative impacts on this species are minimized. In the Opinion, the FWS has determined that the "incidental take"[1] of tortoises on the NTS and the cumulative acreage of tortoise habitat disturbed on the NTS are parameters to be measured and monitored annually. During this FY, the threshold levels established by the FWS for these parameters were not met (Table 5). No desert tortoises were accidentally injured or killed, nor were any captured or displaced from NTS project sites.

Table 5. Parameters and threshold values for desert tortoise monitoring on the NTS

Monitored Parameter	Threshold Value	Adaptive Management Action	Current Value of Monitored Parameter
Number of tortoises accidentally injured or killed as a result of NTS activities per year	3	Re-initiate consultation with FWS	0
Number of tortoises captured and displaced from NTS project sites per year	10	Re-initiate consultation with FWS	0
Number of total ac of desert tortoise habitat disturbed during NTS project construction since 1992	3,015	Re-initiate consultation with FWS	205

[1]To "take" a threatened or endangered species, as defined by the ESA, is to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct.

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4.0 ECOSYSTEM MAPPING

In FY 1996 through FY 1998, efforts were made to map wildlife and plant habitats of the NTS. Field data were collected, analyzed, and preliminary maps created to show basic habitat features. Databases were developed and linked to geographic information system (GIS) maps to facilitate creation of habitat-physical feature maps.

Emphasis during FY 2000 was on data summarization, data documentation, acquisition of digital elevation model (DEM) data, and completion of the report describing the classification of vegetation on the NTS. Coordination was made with other agencies and scientists to exchange information and facilitate continuing studies on the NTS.

4.1 NTS Vegetation Classification Report

A draft topical report describing the classification of habitat types on the NTS was updated and refined. Refinements included color GIS maps showing physical and biological features of vegetation types, representative photographs of vegetation types, and graphs and charts of biodiversity on the NTS. Databases (e.g., Microsoft™ Access) and GIS themes (ArcView™ 3.1) were described and documented through field, table, query, and report descriptions, and other GIS metadata needed to properly describe coverages and share data. Data were summarized and documented to support data distribution that may be requested upon publication of the topical report. The topical report was submitted to DOE/NV for review in September and will be published and distributed in FY 2001.

4.2 Updated DEM GIS Theme

During FY 2000, new DEM data covering the NTS were released through BN's Remote Sensing Laboratory and acquired by BN Ecological Services as a new GIS theme (Figure 3). This theme provides the mean elevation for nearly all NTS surface areas with a resolution scale of pixel size (area) equal to 10 square meters (m^2). This DEM coverage extends slightly beyond the western and northern boundary of the NTS into portions of the Nellis Air Force Range (NAFR) and into lands to the south of the NTS managed by the Bureau of Land Management (BLM) (Figure 3). Some areas northeast of the NTS were not flown because of restricted air space. Previous data were only available at a resolution of 30-m^2 and were of limited use. Projections [NAD83 (UTMS in meters) and NAD27 (UTMS in meters)] of the data will enable topographical characterization of vegetation types and ecological landform units (ELUs) that will be valuable in evaluating effects of slope and aspect on vegetation and wildlife. Prior to the acquisition of these projections, there was only a single elevation point in each ELU where data were taken (i.e., at the midpoint of the vegetation sampling transect). Now data points have been expanded dramatically. It is anticipated that application of the DEM data to data sets collected as part of the vegetation classification efforts will be made in FY 2001. This DEM coverage may be shared with the NAFR and BLM upon request to DOE/NV.

Figure 3. Area of coverage of NTS DEM data

4.3 Evaluating Environmental Monitoring Techniques

Evaluations of new environmental monitoring techniques continued in FY 2000 through cooperative research sponsored by a Strategic Environmental Research and Development Program (SERDP) funded jointly by the U.S. Department of Defense, U.S. Department of Energy, and the U.S. Environmental Protection Agency. Activities on the NTS included evaluation of analytical software to estimate shrub cover and density from aerial photographs taken at different altitudes in Frenchman Flat. Additionally, new IKONOS satellite images with 1-m^2 pixel size were evaluated for determining their usefulness to identifying shrub cover and density in the Mojave Desert. Other technologies applicable to the NTS from the SERDP program include cultural treatments, seed mixtures, irrigation, and other reclamation techniques needed to reduce erosion of impacted lands and to more successfully restore disturbed wildlife habitat.

Preliminary planning was conducted for application of the newly developed technology of rapidly assessing vegetative canopy cover, a measure highly correlated with soil stability, erosion control, and infiltration of precipitation. This technology will be applied using detailed hydrological recharge studies on the NTS by BN and the Desert Research Institute. Focus of the study will be to refine models using more accurate and detailed information about vegetative canopy cover and surficial geology, soils, and other hydrological and climatological parameters. It is anticipated that data collected as part of the NTS vegetation classification efforts and the SERDP project will be used during FY 2001.

4.4 Coordination With Ecosystem Management Agencies/Scientists

Collaboration with other federal government agencies included exchange of data and information with the U.S. Geological Survey Biological Services. Data will be used to evaluate changes in vegetation originally sampled by Janice Beatley in the 1970s. Photographs and field data taken during preliminary visits to selected research sites indicated significant changes to species and plant community composition. Studies will be useful to document changes due to climatic shifts (e.g., global warming) and direct and indirect effects of nuclear testing.

Data collected as part of the vegetation mapping efforts will also be used in support of studies to characterize potential biointrusion into buried waste at the NTS from ants and termites. Collaboration and data exchange will be made with Neptune and Company, Inc., of Los Alamos, New Mexico, and scientists at the University of Toronto in Ontario, Canada.

Data and GIS coverages were also provided to other government and state agencies including the FWS, Nevada Natural Heritage Program, State of Utah Department of Natural Resources, Utah State University, Pacific Northwest National Laboratory, University of Wyoming, and The Nature Conservancy.

BN scientists began preparation of a proceedings paper which describes their earlier oral presentation given in FY 2000 at the 11th Wildland Shrub Symposium on June 13-15, 2000, at Brigham Young

University in Provo, Utah. The paper describes biodiversity analysis of vegetation on the NTS. It emphasizes different measures of species diversity and their spatial patterning in the Mojave and Great Basin deserts and transition areas between these two deserts.

BN biologists also attended training on the National Vegetation Classification System and became familiar with data formats and procedures so vegetation classification at the NTS is consistent with national standards and can be provided to the National Classification Data Inventory.

5.0 SENSITIVE SPECIES AND HABITAT MONITORING

5.1 ESA-protected Species and Species of Concern

There are 26 species which occur on the NTS that are considered sensitive because they are either listed as threatened or endangered under the ESA, are current candidates for listing, or are species of concern (Table 1). The desert tortoise is the only threatened or endangered species which could be significantly impacted by DOE/NV activities. EMAC tasks related to the desert tortoise are addressed in Section 3.0 of this report. As with the desert tortoise, the goal of species and habitat monitoring is to ensure the continued presence of all sensitive species on the NTS by protecting them from significant impacts due to DOE/NV actions. A secondary goal is to gather sufficient information on these species' distribution and abundance on the NTS to determine if further protection under state or federal law is necessary. Sensitive species monitoring tasks include field surveys to identify species' distribution and abundance and monitoring of the known population locations, roost sites, and burrows of these species.

Some of the federally protected species and species of concern listed in Table 1 have been sighted on the NTS, however no site-wide surveys to determine their distribution or abundance have been conducted. They include the formerly endangered American peregrine falcon (*Falco peregrinus anatum*), the candidate mountain plover (*Charadrius montanus*), and three bird species of concern: the ferruginous hawk (*Buteo regalis*), western least bittern *(Ixobrychus exillis hesperis*), and white-faced ibis (*Plegadis chihi*). All of these birds are uncommon transients to the NTS and are not expected to be impacted by NTS activities. Records of all bird sightings that are made opportunistically by EMAC biologists and other NTS workers are maintained to provide some data on these species' occurrence on the NTS.

5.1.1 Candidate Plants and Plant Species of Concern

5.1.1.1 Long-term Monitoring Plan

The NTS supports 13 plant species considered sensitive because of their past or present status under the ESA and with the State of Nevada (Table 1). Over the last three decades, DOE/NV has taken an active role in collecting information on the status of these sensitive plants and produced numerous documents reporting their occurrence, distribution, and susceptibility to threats on the NTS. Data collected on the NTS have been invaluable to the FWS and state agencies in determining if these species should be protected.

This FY an adaptive monitoring plan was developed to ensure that the goals of the DOE/NV RMP (DOE/NV, 1998) are being met. The plan was submitted to DOE/NV for review in September (BN, 2000s) and will be implemented in FY 2001. This plan identifies the parameter(s) which will be measured for sensitive plant populations and the various adaptive management actions which may be taken if significant threats to the plants are detected.

The primary goal of the plan is to ensure that impacts caused directly by NTS projects can be detected, quantified, and managed so that the species' occurrence on the NTS is not threatened by such projects. These direct impacts are identifiable from project descriptions and are generally limited to loss of habitat during construction. A secondary goal of this plan is to detect non-DOE/NV threats and identify steps that may be taken to prevent a species' loss from the NTS due to such threats.

The number of sensitive plant populations included in the monitoring plan are shown in Table 6. It is important to note that two sensitive species which occur near the NTS southern border (*Penstemon albomarginatus* [White-margined beardtongue] and *Penstemon fruticiformis* var. *amargosae* [Death Valley beardtongue]), and for which extensive field surveys were conducted in the past (Blomquist et al., 1995), are not listed in Table 6 and not included in the monitoring plan. They would be monitored, however, if new populations were found on the NTS.

Table 6. Number of known locations of sensitive plants on the NTS

Plant Species	Number of Known Locations
Arctomecon merriamii	17
Astragalus beatleyae	33
Astragalus funereus	9
Astragalus oophorus var. *clokeyanus*	22
Camissonia megalantha	11
Cymopterus ripleyi var. *saniculoides*	18
Frasera pahutensis	9
Galium hilendiae ssp. *kingstonense*	5
Penstemon pahutensis	88
Phacelia beatleyae	41
Phacelia parishii	32

Baseline monitoring of sensitive plants will consist of two activities: preactivity surveys at new project sites and periodic field monitoring of sensitive plant locations on the NTS. Preactivity surveys are conducted to assess the direct impacts of land disturbance, and periodic monitoring of plant locations will be conducted to assess other indirect impacts.

Periodic field monitoring of plant locations will involve visiting each known location in a single season at least once every five years (for those species which have limited numbers [<10] of known locations on the NTS [Table 6]). For other species with larger numbers of known locations, a subsample of 5 - 10

locations will be monitored in a single season at least once every five years. For each species, the 5 - 10 locations chosen to sample may not be the same from sampling period to sampling period, and some locations (particularly for *Penstemon pahutensis*) may never be routinely sampled. The intent is to sample locations where direct effects of NTS activities and other factors such as drought or grazing/predation can best be detected.

If a single known plant population is found within a proposed project site, or is observed during periodic field monitoring to be significantly impacted by a disturbance, then site-specific management actions will take place. The suite of possible management actions in the monitoring plan are presented in Table 7.

5.1.1.2 Coordination With Natural Resource Agency Botanists

On April 6, 2000, the Northern Nevada Native Plant Society (NNNPS) Rare Plant Committee held its annual meeting. This meeting provides an opportunity for resource agencies to coordinate their efforts to protect rare plant species and make recommendations regarding species that may need protection under state or federal laws and regulations. BN botanists could not attend this year but did provide input (Ostler, 2000) on those species found on the NTS.

A new *Phacelia* species that occurs on the NTS was recommended for addition to the NNNPS sensitive species list last year. This new species had not been described at the time. This year, BN biologists contacted Dr. Duane Atwood, the taxonomist that is writing up the description of this new species. Dr. Atwood stated that species description is still in the review phase and has not yet been published. It is expected to be published in the winter of 2000. Once that is done, surveys to identify the occurrence and distribution of this new *Phacelia* on the NTS will be initiated.

Table 7. Proposed management actions to mitigate significant disturbances to sensitive NTS plant species

CONDITION	ACTION
A. No significant reduction in plant abundance or reproductive effort observed during periodic field monitoring or post-activity survey	Continue baseline field monitoring of sample locations every five years.
B. Plant population found within project area during a preactivity survey	1. Avoid population if possible. 2. Conduct post-activity survey to document impact of project.
C. Significant land disturbance or project-related disturbance observed during field monitoring or post-activity survey	1. Initiate annual sampling of disturbed location to document long-term impact of disturbance. Resume periodic sampling when population appears stable. 2. Eliminate location from sampling scheme if plants no longer present. 3. Sample additional plant locations annually for no more than five years to reassess susceptibility to threats at other known locations. 4. Protect other known locations if necessary from similar disturbance. Consider fencing and/or posting signs to identify other locations in the field to avoid. 5. Assess cause of significant disturbance (e.g., non-adherence to preactivity survey recommendations, conducting activity w/o prior preactivity survey) and alter preactivity survey procedures to prevent occurrence at other locations. 6. Reintroduce sensitive species to location if prudent and reasonable and sample annually for next five years to document status, then re-initiate periodic sampling.

Table 7. (Continued)

CONDITION	ACTION
D. Significant reduction in plant abundance or reproductive effort observed during field monitoring. Does not appear to be project-related.	1. Design and implement field study to determine causal factors. 2. Initiate annual monitoring of location and continue until causal factors are determined or viability of local population improves, then resume periodic baseline monitoring. 4. Implement appropriate measures to eradicate or alleviate causal factors.

5.1.2 Animal Species of Concern

Site-wide surveys for eight animal species of concern were initiated in 1996 (Steen et al., 1997). The species included chuckwallas (*Sauromalus obesus*), western burrowing owls (*Athene cunicularia hypugaea*), and six species of bats (Table 1). For chuckwallas, presence/absence data were gathered from all potential habitats in the southern portion of the NTS. These data were considered sufficient to identify chuckwalla habitat on the NTS. Proposed activities on the NTS are primarily within valleys, on northern mesas, or on level or gently sloping terrain, and do not include rocky slopes that are typical chuckwalla habitat. DOE/NV impacts on chuckwalla will be monitored over time by identifying all historic and new projects that have or will disturb chuckwalla habitat. This will be done through geospatial analysis using the GIS display and analysis software, ArcView. No new field surveys for chuckwalla were conducted this FY.

Collection of baseline data on western burrowing owls and bats continued this FY. Owl monitoring included searching for new burrows, visiting known burrows monthly to detect owl activity, and using still cameras at burrows to detect reproductive activity. Bat monitoring this year included mist-netting at selected NTS water sources, Anabat surveys (i.e., using an Anabat II recording system to document species-specific ultrasonic bat calls), and use of a night vision video camera. Anabat surveys were conducted seasonally along roads and at the entrances of mines and tunnels.

5.1.2.1 Western Burrowing Owl

New Burrow Surveys - Transect surveys were conducted primarily in areas away from man-made disturbances such as roads, drill pads, etc. to locate new (previously un-discovered) owl burrows. In previous years, surveys were conducted mainly along roads, and the distribution map of known burrows reflects this bias. Survey areas were chosen subjectively, and meandering transects were walked by one or two biologists through each survey area. At each new owl burrow, the following data were recorded: Universal Transverse Mercator coordinates; burrow type (e.g., predator-excavated burrow, culvert burrow); height, width, and aspect of burrow entrance; and the presence/absence and estimated age of owl sign. The burrow location was marked on a topographic map. All survey data were entered into an Access database.

Six transect surveys covering approximately 13 kilometers (km) were conducted throughout the NTS (Figure 4). One new owl burrow was located during the surveys. This burrow was found in undisturbed habitat and was excavated by a predator. An additional four owl burrows were found opportunistically while conducting other resource surveys. All four are in disturbed habitat (two are in roadcuts and two are in metal culverts). Figure 4 shows the distribution of the 69 known owl burrow sites on the NTS. Of the 69 known owl burrow sites, 44 are in disturbed habitat and 25 are in undisturbed habitat. It should be noted that there may be one or more burrows or burrow entrances at any given burrow site.

Monitoring of Known Burrows to Detect Owl Use - In order to identify the seasons of immigration, emigration, and breeding of owls within the three ecoregions of the NTS, known

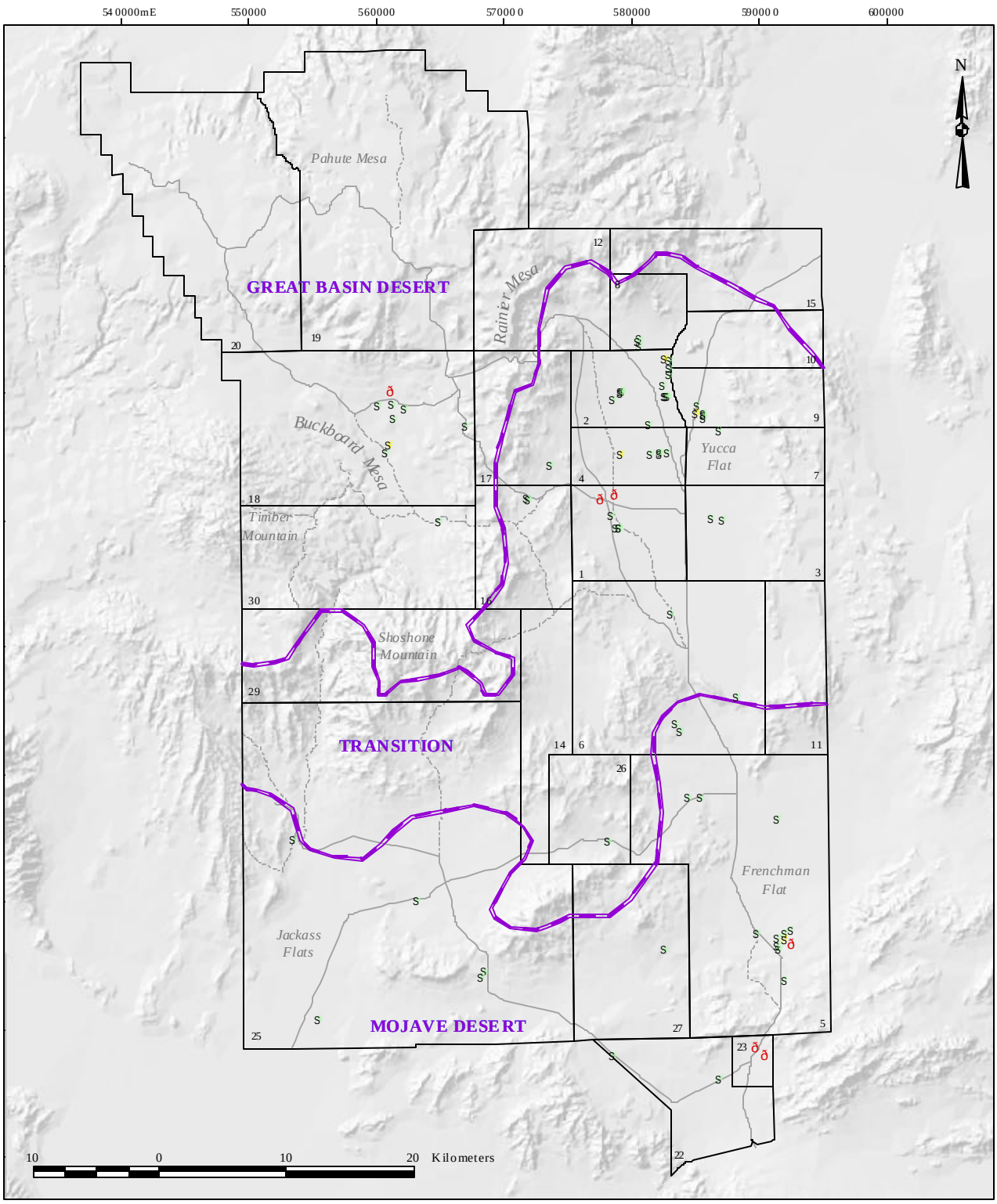

Figure 4. Location of known owl burrows on the NTS during FY 2000

burrows were monitored on a monthly basis from October 1999 to September 2000. Burrows at 59 of the 69 known burrow sites were monitored at least once during this time period. Burrow sites not sampled were either in very remote areas, in radiologically controlled areas, or had been filled in over time. Each time a burrow was visited, all owl sign (i.e., pellets, scat, prey remains, feathers, and tracks) on and around the burrow apron and under perching sites near the burrow were documented and then removed. This enabled BN biologists to document monthly owl activity at each burrow. If sign was detected at just one burrow at a site where multiple burrows occurred, then the burrow site was considered active. The number of burrow sites visited within each region varied across sampling periods because new burrow sites were found during the sampling period and some burrows became filled-in during the sampling period.

As in the past two years, burrowing owls were present during all months of the year (Table 8). Only in the Mojave Desert ecoregion was owl sign absent at known burrows between late January and mid-March. The number of active and inactive burrows is highest within the Transition ecoregion of the NTS. Changes in burrow use within this region may indicate periods of fall and spring migration through the region and dispersal of young from their nest burrows after fledging. The number of active burrows was highest in this region in October and in late March and lowest in late December through January. This pattern is fairly consistent with the few active burrows observed in the Mojave and Great Basin ecoregions (Figure 5). The following conclusions may be drawn from this year's burrow monitoring data (Table 8, Figure 5):

- An overall decrease in active burrows is observed within all three ecoregions from October through January. This decrease probably reflects the fall migration of some owls off of the NTS.

- Some owls reside year round in the Transition and Great Basin ecoregions.

- The increase in active burrows in the Mojave Desert and Transition ecoregions from mid-March to early April may be due to some owls moving through the NTS on their northward spring migration.

- The increase in active burrows in the Mojave Desert ecoregion in mid-August may be due to owls migrating through or to juveniles leaving their nest burrows and finding new unoccupied burrows.

Reproductive Activity - It is important to know when burrowing owls breed and when young fledglings leave the nest. This information will help ensure that burrows are avoided and owls are unharmed during construction activities for new projects on the NTS. It is also important to document trends in owl populations over time to determine if this species is being affected by DOE/NV activities. A good parameter to measure owl population trends is the annual number of breeding pairs. An active infrared beam and camera system was used as a passive data collection method to record the presence

of breeding owls and their young at selected burrows. Two Trailmaster TM1500s hooked to a still camera were used. The camera systems were set up at

Table 8. Summary of burrow use by burrowing owls on the NTS during FY 2000

Sampling Period	Burrow Use* By Ecoregion		
	Mojave Desert	Transition	Great Basin Desert
Oct 1 - Oct 27	2/13 (15)	11/33 (33)	4/6 (67)
Oct 28 - Nov 23	3/14 (21)	6/33 (18)	3/7 (43)
Nov 24 - Dec 21	2/14 (14)	7/33 (21)	2/7 (29)
Dec 22 - Jan 20	1/15 (7)	5/33 (15)	1/7 (14)
Jan 21 - Feb 16	0/15 (0)	6/33 (18)	2/6 (33)
Feb 17 - Mar 14	0/16 (0)	7/34 (21)	2/6 (33)
Mar 15 - Apr 6	4/15 (27)	10/35 (29)	2/6 (33)
Apr 7 - May 11	2/16 (13)	7/35 (20)	2/6 (33)
May 12 - Jun 5	3/15 (20)	8/35 (23)	1/6 (17)
Jun 6 - Jul 10	3/15 (20)	9/35 (26)	3/6 (50)
Jul 11 - Aug 15	2/14 (14)	8/35 (23)	4/7 (57)
Aug 16 - Sep 7	5/14 (36)	8/35 (23)	1/7 (14)
Average Percent Use	**16**	**23**	**35**
Average Number of Active Burrows	**2**	**8**	**2**
Total Burrow Sites Sampled	**16**	**35**	**8**

*Numerator - Number of burrow sites where sign was found.
Denominator - Number of burrow sites sampled.
( ) - Percent of sampled burrow sites where sign was found.

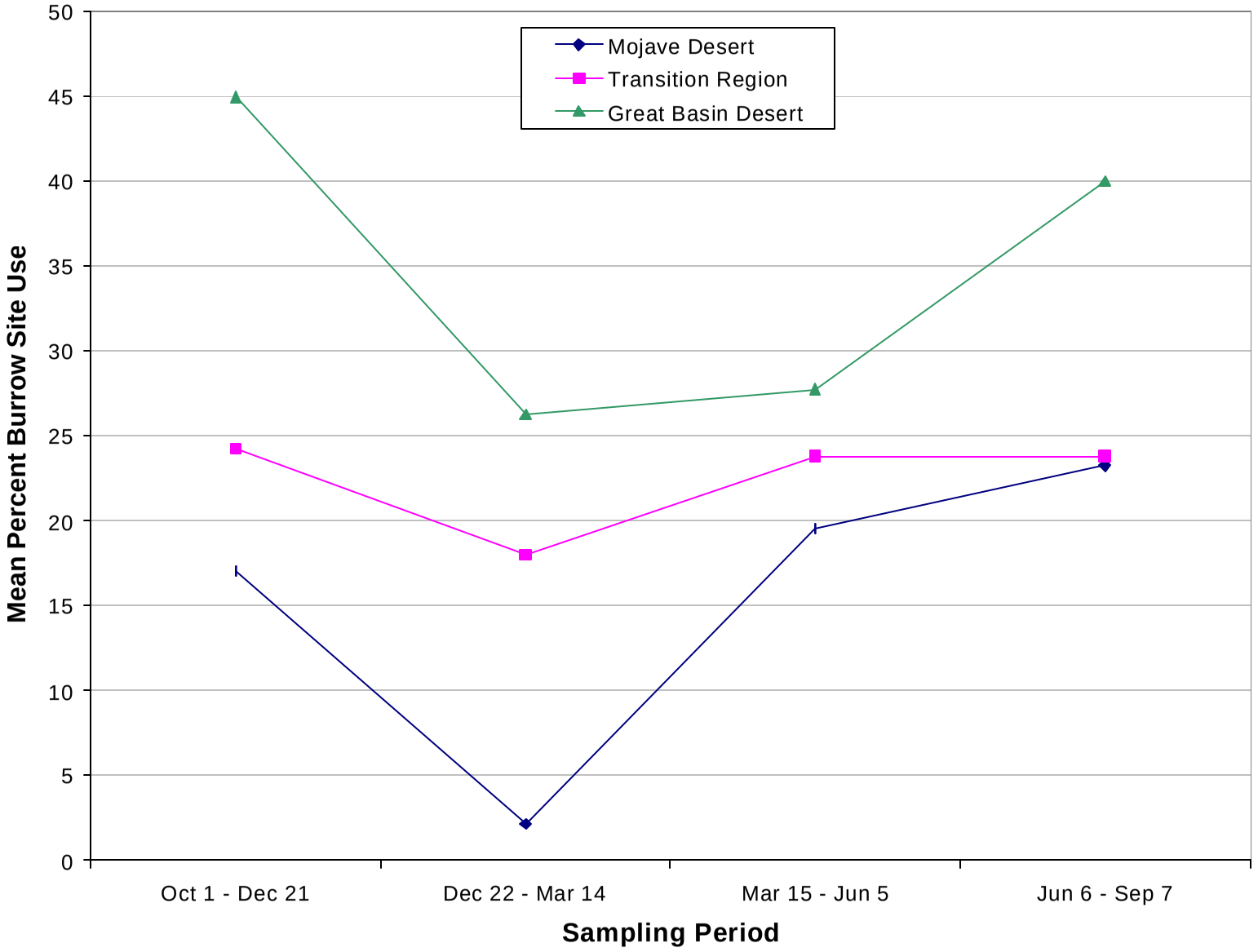

Figure 5. Seasonal use of burrows by burrowing owls within each ecoregion of the NTS during FY 2000

burrows where owls or abundant owl sign had been observed during burrow monitoring surveys. Camera setup and operation was the same as that described last year (BN, 1999a).

Twenty-four burrow sites were monitored using the TM1500 systems between February 22 and August 10 (Table 9). A total of 45 young owls was detected from eight breeding pairs. Thirty-four (75%) of the 45 young were from burrows in the Transition ecoregion of the NTS. The largest number of young owls observed at a single nest was eight (Table 9, Figure 6).

Based on observations during burrow monitoring and the photographic data from the Trailmaster TM1500 cameras, the breeding period this year was from early March through early September. This breeding period is defined as the time when adults began to form pairs until the time when adults and young were no longer observed together at a nest burrow.

The number of young detected on the NTS this year (45) was nearly double the number detected last year (24). An average of 5.6 young per breeding pair was observed this year. Last year an average of 3.4 young per breeding pair was observed (BN, 1999a).

Table 9. Summary of burrow use by pairs of owls on the NTS during FY 2000

Ecoregion	Sites Surveyed	Burrows With Non-breeding Pairs	Burrows With Breeding Pairs	Juvenile Owls
Mojave Desert	7	1	1	3
Transition	13	2	6	34 (4-7/burrow)
Great Basin Desert	4	0	1	8
Totals	**24**	**3**	**8**	**45**

Figure 6. Eight young and one adult owl photographed at a burrow (July, 2000)

Disturbance Monitoring - To develop reasonable mitigation recommendations for land-disturbing projects in burrowing owl habitat, it is important to know the level of disturbance owls tolerate without causing nest abandonment. Two methods were used to begin to determine this disturbance tolerance. One method involved setting traffic counters near active burrow nest sites and recording the number of vehicle passes and the distance from the nest burrow to the road. The second was measuring the distance at which owls flushed from observers as they approached the owl by foot and in a vehicle.

Between April 12 and May 17, traffic counters were set up near six burrow sites that were occupied by breeding pairs. The traffic counters remained operational until September 6. The total number of vehicle passes recorded was divided by the total number of days the traffic counter was operational. This yielded the average number of vehicles per day which passed near a burrow. These data show that owls can breed successfully with several vehicles per day passing within 14 to 165 meters (m) of a nest burrow (Table 10). No correlation is evident between the number of vehicles per day or distance to road and the number of young observed.

Table 10. Summary of traffic counter data collected at burrowing owl burrows

Burrow Site	Vehicles/Day	Distance to Nest Burrow (m)	Young Detected
Cane Spring Wash	40.2	165	6
2L18 Drill Pad	10.2	80	7
Airport Road #2 GB	5.7	14	8
8D Road Drill Pad (E)	0.4	97	7
8D Road Drill Pad (B)	0.4	161	4
9-01 Powerline Road	0.4	145	5
O-30 Wash	0.3	48	5

When owl sightings occurred, the distance from the observer to the owl when the owl flushed (i.e., flew away) or ducked into the burrow was recorded. The average flushing distance while an observer was approaching a burrow on foot was 34 m (range 3 m to 80 m; [n=32]). The average flushing distance while an observer was approaching a burrow in a vehicle was 48 m (range 5 m to 135 m; [n=9]). Based on these data, it may be a reasonable mitigation recommendation for new construction projects to avoid active owl nests during the breeding season (March through Septembert) by a minimum of 50 m.

Pellet Analysis - A contract was set up this FY with Oregon State University (Corvallis) to analyze several hundred burrowing owl pellets that have been collected over the past three years. The analysis was completed in late September and will be reported next FY. The data will be used to identify the prey base of owls in the different ecoregions during all seasons of the year.

Monitoring Parameters and Threshold Levels for Adaptive Management - Work continued on revising the burrowing owl monitoring plan. The final draft should be completed in FY 2001. Results from previous monitoring will be incorporated into the revised plan. The plan will identify the parameter(s) that will be monitored to ensure that the goals of the NTS RMP are being met, as they apply to this species. Threshold limits for these parameters will be identified as well as species-specific adaptive management actions.

5.1.2.2 Bat Species of Concern

Monitoring to identify the distribution of bat species of concern and their roost sites on the NTS continued this FY. Monitoring was conducted at selected water sources in each ecoregion and at several mine and tunnel sites where bat roosts might occur. Three techniques were used to document bat activity during monitoring. These included using mistnets to capture bats, recording ultrasonic vocalizations of bats with the Anabat II system (Titley Electronics, Ballina, Australia), and observing and recording bat activity with a special night vision camera equipped with NightSight™ technology.

A contract was made this FY with Dr. Michael O'Farrell of O'Farrell Biological Consulting to identify bat calls collected on the NTS. The calls are analyzed to determine which species emitted the call sequences based on known species-specific call parameters (O'Farrell, 1997; Corben et al., 1998).

Monitoring at NTS Water Sources - Four water sources were monitored during FY 2000. These included two sites in the Great Basin Desert ecoregion (Gold Meadows Spring [June 20], Camp 17 Pond [September 6]); one site in the Transition ecoregion (Well 3 Pond [June 19]); and one site in the Mojave Desert ecoregion (J11 Pond [September 5]) (Figure 7). Ninety-five bats representing 9 of the 14 species known to occur on the NTS were captured (Table 11). Of the 95 bats captured, 70 were bat species of concern (Table 11). Four different bat species of concern were captured, all within the Great Basin Desert ecoregion. No bat species of concern were caught in the other two ecoregions. One male Townsend's big-eared bat (*Corynorhinus townsendii*) was captured at Camp 17 Pond. This species has the highest likelihood of being listed under the ESA as threatened. Also, the Nevada Division of Wildlife has petitioned the Nevada legislature to protect this species and give it the status of "State Sensitive: Threatened."

Vocal signatures from hand-released bats of known species were recorded with the Anabat II system from eight of the nine species captured in mist nets. A vocal signature was recorded from a hand-released Townsend's big-eared bat. This is the first acoustic record of a Townsend's big-eared bat on the NTS. No California myotis (*Myotis californicus*) were captured this year, so comparisons with the small-footed myotis (*Myotis ciliolabrum*) could not be made.

Mine and Tunnel Exit Surveys - Mines and tunnels are important or even critical habitats for some bat species, including the Townsend's big-eared bat. These man-made excavations can be used as day and night roosts, maternity colonies, and hibernacula. Exit surveys continued this FY to determine which mines and tunnels were being used by bats and which bat species were using these resources. One mine system was sampled in the Transition ecoregion (Wahmonie Mine Shafts [July 20]), while five mines/tunnels were sampled in the Great Basin Desert ecoregion (T Tunnel [May 15], E Tunnel [May 16], IJK Tunnel Complex [May 17], A Tunnel [June 1], and B Tunnel [July 13]). The Anabat II system was set up at each mine/tunnel just after sunset and bat calls were recorded for two to three hours.

This year, bat calls were recorded at all of the mine/tunnel sites except E Tunnel. Species identification of the recorded calls should be completed by Dr. O'Farrell by October 2000. It is suspected that at least four bat species of concern occupy these tunnels. This is based on preliminary identification of this year's bat calls and on last year's verified call data. Last year, the A, B, and N tunnels were sampled and calls were identified by Dr. O'Farrell as those of the small-footed myotis (A Tunnel), the long-eared myotis (A Tunnel), the fringed myotis (B Tunnel), and the long-legged myotis (B and N tunnels).

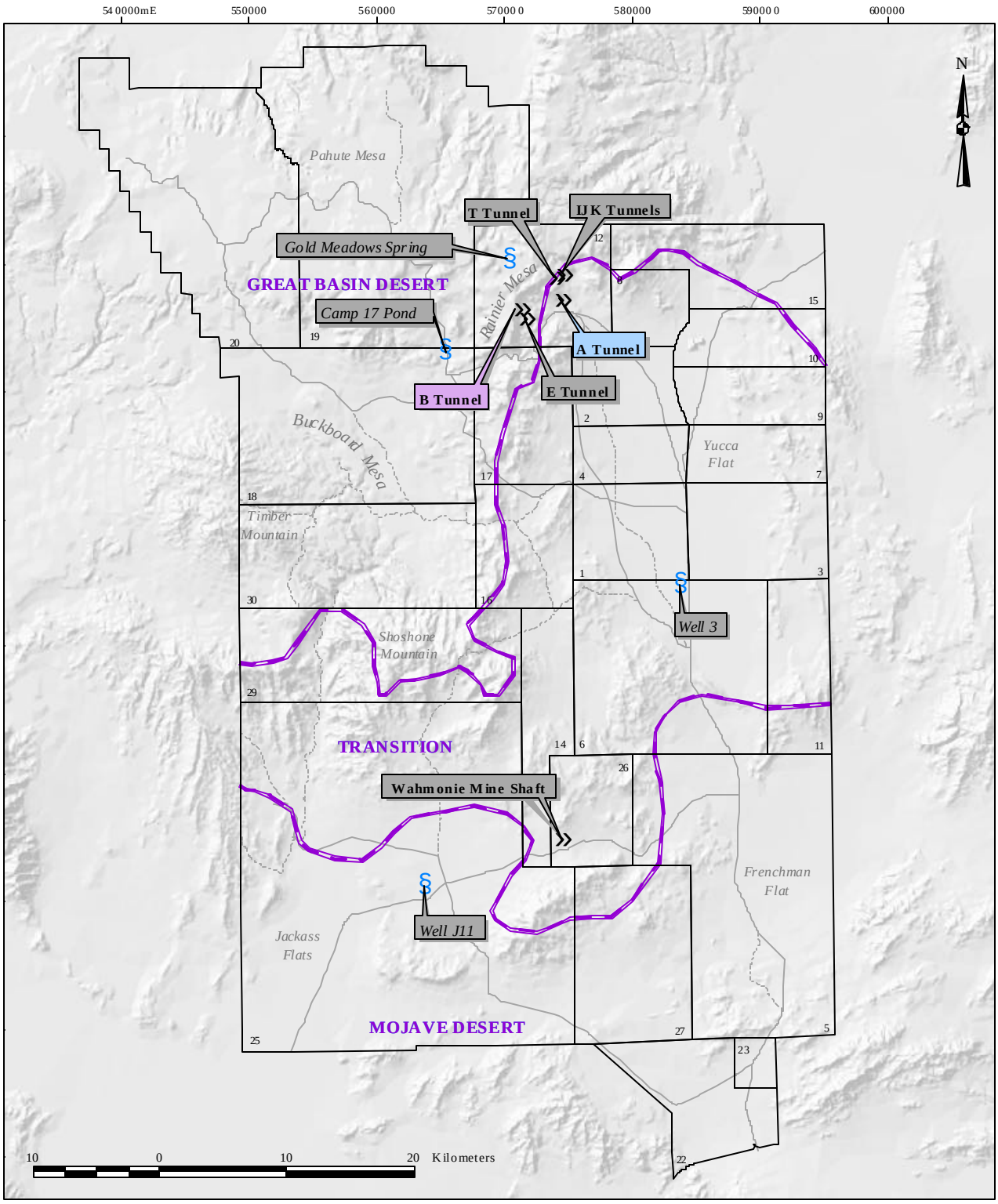

Figure 7. Bat monitoring locations on the NTS during FY 2000

Table 11. Number of bats by species, gender, and location captured during FY 2000 in three ecoregions of the NTS

	Great Basin Desert Ecoregion		Transition Ecoregion	Mojave Desert Ecoregion	
Species Captured	**Camp 17 Pond**	**Gold Meadows Spring**	**Well 3 Pond**	**J-11 Pond**	**Total**
Species of Concern					
Corynorhinus townsendii Townsend's big-eared bat	0	1 (1M)	0	0	1 (1M)
Myotis ciliolabrum Small-footed myotis	2 (1F, 1M)	35 (8F, 27M)	0	0	37 (9F, 28M)
Myotis evotis	0	11	0	0	11
Myotis volans Long-legged myotis	1 (1F)	20 (10F, 9M, 1U)	0	0	21 (11F, 9M, 1U)
Other Species					
Antrozous pallidus Pallid bat	0	0	1 (1F)	0	1 (1F)
Eptesicus fuscus	0	6	0	0	6
Lasionycteris noctivagans Silver-haired bat	0	1 (1M)	0	0	1 (1M)
Pipistrellus hesperus Western pipistrelle	0	0	0	11 (7F, 4M)	11 (7F,4M)
Tadarida brasiliensis	0	1	0	0	1
Unknown species	1	4	0	0	5
Total	**4**	**79**	**1**	**11**	**95**

F=Female; M=Male; U=Unknown sex

Use of the Night Vision Camera - The night vision camera worked well during both mist-netting and exit surveys. Bats were easily seen flying over the water or into and out of mines and tunnels. This allowed biologists to count the relative number of bats flying from a tunnel or over a water source. Much of the bat activity was also recorded onto videotape using a handheld video camera. However,

it is difficult to recognize individual bats and therefore the total number of individual bats is impossible to determine. Thus, a sampling protocol to measure an index of abundance is being developed.
Coordination With Other Biologists - A BN biologist presented a paper, by invitation, on the results of bat monitoring on the NTS at a bat symposium held at the annual meeting of The Western Section of The Wildlife Society. A manuscript based on the presentation was also prepared and accepted for inclusion in the peer-reviewed Transactions of The Western Section of The Wildlife Society which should be published this winter. Results of all bat monitoring through 1999 on the NTS are included in this manuscript.

5.2 Other Federally Protected/State-managed Species

There are several other species monitored routinely on the NTS. These include wild horses (*Equus caballus*), raptors (birds of prey), and mule deer (*Odocoileus hemionus*) (see Table 1). These species are visible and their welfare on the NTS is important to DOE/NV stakeholders and NTS personnel. Some NTS activities could impact these species. For example, man-made water sources used by horses and deer can be created or removed, affecting herd size and distribution, and potential raptor nest sites (e.g., Joshua trees, power poles) can be disturbed or removed. Because of their federal and state status, their importance to stakeholders, and their potential susceptibility to DOE/NV impacts, horses, raptors, and mule deer are monitored annually on the NTS.

5.2.1 Wild Horses

Cattle and other livestock were removed from the Nevada Test Site prior to testing of nuclear weapons in 1951, but a small herd of horses was not removed (Greger and Romney, 1994a). There were no efforts to monitor the size of that herd from 1951 through the 1970's, although O'Farrell and Emory (1976) reported that "A band of about 20 mustangs is located in the vicinity of Rainier Mesa…. Their numbers have not increased markedly over the last few years."
In 1989, a program was initiated to estimate the abundance of horses annually by identifying and photographing all horses seen during systematic surveys. That monitoring has continued through 2000 and has provided excellent information on the abundance, recruitment (i.e., survival of horses to reproductive age), and distribution of the horse population on the NTS. Information on abundance and recruitment during 1990-1998 is summarized in Greger and Romney (1999). In FY 2000, BN biologists performed several sub-tasks related to horse monitoring:

- Annual horse abundance was estimated to monitor population stability.
- Horse sign were recorded along selected roads 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 influence on horse distribution and movements and to determine the impact horses are having on NTS wetlands.
- A monitoring plan for wild horses on the NTS was completed.

5.2.1.1 Abundance Survey

A count of individual horses was taken to estimate abundance on the NTS. The count was conducted during 18 nonconsecutive days between April and August. A standard road course on the NTS was driven to locate and identify horses (Figure 8). Individuals were identified by their unique physical features. The direct population count in FY 2000 was 37 individuals (Table 12), and does not include foals. Eleven foals were observed with their mares, of which five were missing by the end of the summer. Four yearlings were observed this year from foals born in 1999. Six more horses (excluding foals) were observed this year than were observed in 1999 (Table 12). They included two adult (> 3 years old) bachelor males of known identity, one new adult female, and two male two-year olds which were found dead (indicated as a count of "(2)" in Table 12). The cause of the two deaths are unknown but are suspected to be related to dehydration (see section 5.2.1.3). Only one adult horse (a male) which was observed on the NTS during FY 1999 was not observed this year. Four of the five foals observed last year have survived to yearlings.

Since 1995, the feral horse population has declined 31 percent, from 54 to 37 individuals (Table 12). Of the 23 horses which have been classified as missing since 1995, 12 were adult males, 9 were adult females, and 2 were yearlings of unknown sex. No foals observed in 1995 through 1998 survived to yearlings. The cause of the population decline appears to be (1) low recruitment due to very poor foal survival and (2) moderate adult mortality.

Table 12. Number of horse individuals observed on the NTS by age class, gender, and year since 1995

Age Class	Number of Individuals Observed											
	1995		1996		1997		1998		1999		2000	
Foals	1		1		3		8		5		11	
Yearlings	3		0		0		0		0		4	
Adults	**M***	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
2 Year Olds	0	0	0	1	0	0	0	0	0	0	(2)	0
3 Year Olds	0	0	0	0	0	1	0	0	0	0	0	0
> 3 Years Old	22	29	21	24	19	20	16	21	11	20	12	21
Total (exluding foals)	**54**		**46**		**40**		**37**		**31**		**37**	

*M=male; F=female

Greger and Romney (1999) suggest that low foal survival is due in part to mountain lion predation. One foal and one adult were found killed by a lion and two others were observed with bite marks or

wounds. Some horses on the NTS live in rugged terrain, much of it in pinyon-juniper woodlands, which may make foals more vulnerable to predation by mountain lions or other carnivores than horses living in more open, lower-elevation habitat. Low foaling rates (26-50%) also may contribute to poor recruitment, although foaling rates may be underestimated if foals die very soon after birth.

Two to six adults seen in prior years have died or have not been found in subsequent years annually since 1993. Known causes of mortality among adults include predation, collisions with vehicles, and drowning. Because there is no evidence of emigration from or immigration to this population, it is likely that these horses died.

Other factors may also be responsible for or have contributed to the decline in abundance of horses. A decrease in the availability of water sources, or the unwillingness of females to drink from the remaining sources because of fear of predation (resulting in dehydration), may be resulting in poor milk production and malnourished foals. A lack of alternate water sources may make the movements of horses more predictable and therefore make them more vulnerable to predation. It is also possible that some horses in this population are past their prime reproductive age, resulting in lower foal production and more adults dying of causes related to old age.

5.2.1.2 Annual Range Survey

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 does not totally describe their annual range (winter and summer). During FY 2000, selected roads were driven within and along the boundaries of the suspected annual horse range and all fresh sign (estimated to be < 1 year old) located on and adjacent to the roads were recorded. Five days of effort were expended for the road surveys.

Horse sign data collected during the road surveys and horse use at natural and man-made water sources indicate that the FY 2000 NTS horse range includes Kawich Canyon, Gold Meadows, Yucca Flat, southwest foothills of the Eleana Range, and southeast Pahute Mesa (Figure 8). Overall, the annual horse range appears not to have changed greatly from last year. However, a small group of about 12-13 horses on Northern Yucca Flat appear to be using a smaller forage area than in previous years. Horses or sign were not observed north of Rainier Mesa Road in Area 2 during FY 2000 (Figure 8), but in previous years horses were commonly seen as far northeast as Sedan Crater. Therefore, horses present on the northern end of Yucca Flat may not be extending their range as far north and east as in previous years. This is possibly due to reduced water resources on northern Yucca Flat. Two water sources in Area 2 (Well 2 Pond, Mud Plant Pond) were removed during 1995-96. Horses here are dependent on the only nearby available water source during summer, Captain Jack Spring, which is located in the nearby Eleana Range. Because of the removal of water sources on

Yucca Flat, the increased distances they must travel back and forth to Captain Jack Spring may limit how far they can extend their grazing range to the north.

At present, the NTS horse herd appears to consist of two components, one larger group of horses (about 24 individuals) that spends summers west of the Eleana Range and one smaller group (12-13 individuals) that summer east of the Eleana Range on Yucca Flat. These groups of horses probably intermix during the winter but the exact mixing areas are unknown. More information on winter range of horses needs to be developed in the future.

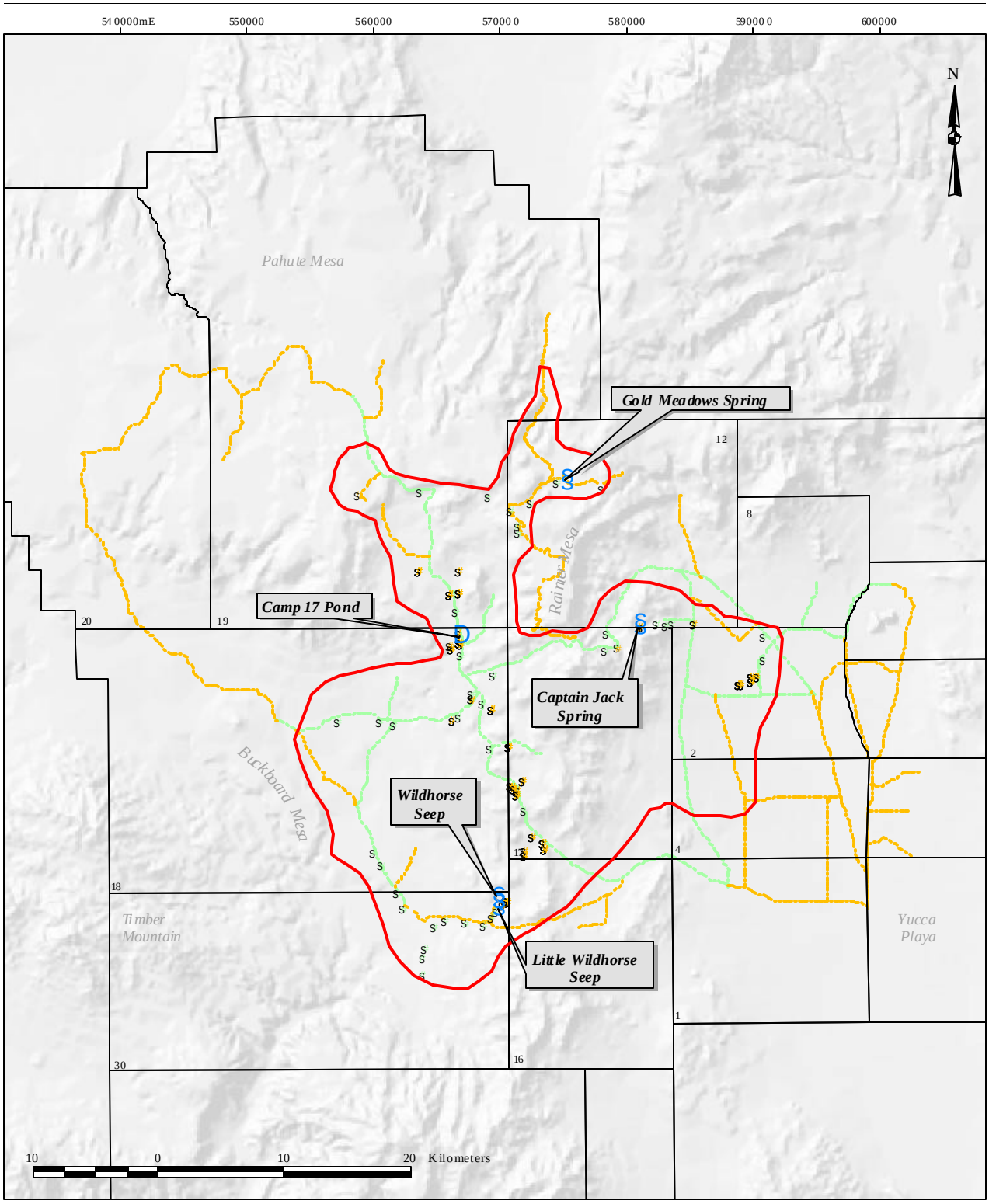

Figure 8. Feral horse sightings and horse sign observed on the NTS during FY 2000

5.2.1.3 Horse Use of NTS Water Sources

The NTS horse population is dependent on several natural and man-made water sources in Areas 18, 12, and 30 (Figure 8) during different seasons (see Table 18). Wildhorse and Little Wildhorse seeps, both located in Area 30, are important winter-spring water sources. Two other natural water sources (Captain Jack Spring in Area 12, Gold Meadows Spring in Area 12) and one man-made pond (Camp 17 Pond in Area 18) were used by horses this summer, as in past years. Overall, Captain Jack Spring, Gold Meadows Spring, and Camp 17 Pond were the most important water sources for horses based on the presence and quantity of horse sign and trampled and grazed vegetation. Captain Jack Spring was not used by horses during the winter-spring months of FY 2000 until after the May 3rd visit (see Table 18). Horses living there probably vacate this area of the Eleana Range in winter and move to lower elevations until returning to the area around May-June.

Wildhorse and Little Wildhorse seeps were used heavily by several bands of horses (numbering about 20-26 individuals) during the spring of 2000 when their water flow was greater, but horse usage declined during early June as the springs dried up (see Table 18). In June, horses moved to higher elevations and were dependent on Camp 17 Pond for the remainder of the summer. In dry summers, Camp 17 pond becomes an important resource for horse survival when Gold Meadows Spring normally dries up. Gold Meadows Spring became dry in early August, 2000. On August 15, a young male horse (1-2 years old) was found dead at the dry spring. Although the actual cause of death is unknown, it is likely that it was related to lack of water at the spring. This individual was a young male which may have separated from his natal band and stayed in the area too long while other horses left the area as water dried up. Another young male horse (1-2 years old) was found dead on Rainier Mesa Road in Area 12 about 1 km west of Captain Jack Spring. The cause of death of this horse is also unknown (it did not appear to be a roadkill) but may also have been due to drought affects.

An infrared motion-sensing video camera was set up at Captain Jack Spring for three days and two nights between July 27 and July 29 to examine its usefulness in identifying the pattern of water use by horses. One band of horses (seven individuals) was videotaped drinking at Captain Jack Spring on July 27 at 3 p.m. and then again on July 29 at 7 a.m. This is an interim period of 40 hours between visits at this one spring. There are no other known water sources in this area, suggesting that horses need to water every other day in the summer at the NTS. It is anticipated that the video camera can be used in the future at other NTS water sources to help identify water use patterns at other sources and during different seasons.

There are presently six man-made water sources within or on the edge of the annual horse range and all were not used by horses in FY 2000. However, only two pond locations are permanent. These are E-Tunnel Containment Ponds, and Area 12 Sewage Ponds. Other semi-permanent water sources are plastic-lined sumps that occur at ER 19-1, ER 12-1, U10j, and U2gg (see Figure 11). These ponds have only seasonal water availability (winter-spring). No horse sign have ever been found at the E-Tunnel Containment Ponds or the Area 12 Sewage Ponds.

5.2.1.4 Adaptive Monitoring Plan

The horse monitoring task was evaluated this FY for its ability to determine if the RMP (DOE/NV, 1998) goals for horse protection are being met. As a result, a monitoring plan was developed and submitted to DOE/NV for review in September (BN, 2000s). The plan identifies desired minimum and maximum sizes of the NTS horse population and identifies possible adaptive management actions which may be taken if these sizes are reached. If the horse population continues to decline, the plan calls for studies to be developed and implemented to determine the cause(s). Because horses are not native to the NTS, there are currently no proposed management actions to increase the herd size.

5.2.2 Raptors

Several raptors occur and breed on the NTS which are not protected under the ESA and are not species of concern. They are, however, protected by the federal government under the Migratory Bird Treaty Act and by the state of Nevada. Raptors include all vultures, hawks, kites, eagles, ospreys, falcons, and owls. Because these birds occupy high trophic levels of the food chain, they are regarded as sensitive indicators of ecosystem stability and health. Including the burrowing owl (see Section 5.1.2.5), there are eight raptors (Table 13) which are known to breed on the NTS (Greger and Romney, 1994b). Few records exist, however, of breeding raptors on the NTS or of their reproductive success, egg incubation periods, and fledging times (time when young leave the nest) (Hayward et al., 1963). Surveys to locate raptor nests and the number of breeding pairs of raptors began on the NTS in FY 1998 and were continued this FY.

Table 13. Raptor species that occur and breed on the NTS

Raptor Species	Common Name
Aquila chrysaetos	Golden eagle
Asio otus	Long-eared owl
Buteo jamaicensis	Red-tailed hawk
Buteo swainsoni	Swainson's hawk
Falco mexicanus	Prairie falcon
Falco sparverius	American kestrel
Speotyto cuniculaia	Western burrowing owl
Tyto alba	Barn owl

5.2.2.1 Ground Surveys for Nest Sites

Nineteen known nests were revisited from April through July to check for reproduction. During these surveys, searches for new nests were conducted. Areas around springs were also searched for raptor

nests during monitoring of water sources (see section 5.3.2). Soaring raptors, eliciting territorial defense calls, were noted to determine if they were guarding or flying to and from a nest site. Binoculars and spotting scopes were used to search cliff faces and Joshua trees for reproductive activity (nestlings or eggs). Whenever a known Joshua tree nest was visited and found to be inactive, an area of 1-2 km radius around the inactive nest was searched for new nests. When active nests were found, efforts were made to determine the number of young in the nest without disturbing the birds. All nest locations and reproductive data were recorded and mapped. Nests containing young were periodically revisited to determine the status of nestlings. The regions of the NTS which were surveyed on foot or by vehicle this year included: Yucca Flat, Horse Wash, Oak Spring Butte, Buckboard Mesa, Rainier Mesa, lower Stockade Wash, North Shoshone Mountain, and the Tippipah Spring area.

Similar to FY 1999, six active raptor nests were detected this year. However, all six nests were those of red-tailed hawks, and no golden eagles or other raptor species were observed breeding this year (Table 14). Two of the three known red-tailed hawk nests active last year were active again this year (Table 15). These were the Area 12 microwave tower nest (A12-T1) and the Area 27 powerline pole nest (A27-PP1). Four new red-tailed hawk nests were detected: a powerline pole nest in Area 3 (A3-PP1); a willow tree nest at Cane Spring (A5-W1); a Joshua tree nest in southeast Yucca Flat (A6-Y3); and a cliff nest on the western edge of Buckboard Mesa (A18-C4) (Table 15, Figure 9).

The number of red-tailed hawk active nests and nestlings observed this year was more than last year. The total number of nestlings and number of active nests (Table 14) was lower in both FY 1999 and FY 2000 (dry years) compared to 1998 (a wet year).

Although monitoring has only occurred for three years, it appears that the reuse of existing nests is not common on the NTS. Only 1 (10 %) of 10 raptor nests known in FY 1998 were reused in FY 1999, and only 2 (13 %) of 15 raptor nests known in FY 1999 were reused in FY 2000 (Table 15).

Table 14. Summary of raptor reproduction observed on the NTS

	Number of Active Nests			Number of Young Observed		
Species	**FY 1998**	**FY 1999**	**FY 2000**	**FY 1998**	**FY 1999**	**FY 2000**
Golden eagle	1	2	0	1	2	0
Prairie falcon	1	0	0	5	0	0
Red-tailed hawk	7	4	6	10	2	10
Swainson's	1	0	0	2	0	0
Totals	**10**	**6**	**6**	**18**	**4**	**10**

Table 15. Status of known raptor nests found on the NTS

Nest ID	Species	Nest Type	Nest Use Status			Number of Young Observed		
			FY 1998	FY 1999	FY 2000	FY 1998	FY 1999	FY 2000
A12-C1	Golden eagle	Cliff stick nest	Active	Active	Inactive	1	2 on 5/5 1 on 5/25	0
A16-C1	Golden eagle	Cliff stick nest	UNK[1]	Active	Inactive	UN	1 on	0
A18-C1	Prairie falcon	Cliff eyrie	Activ	Inactive	Inactive	5	0	0
A4-Y1	Red-tailed hawk	Joshua tree nest	Activ	Inactive	Inactive	3	0	0
A6-Y1	Red-tailed hawk	Joshua tree nest	Activ	Inactive	Inactive	2	0	0
A6-Y2	Red-tailed hawk	Joshua tree nest	Activ	Inactive	Inactive	1	0	0
A6-C1	Red-tailed hawk	Cliff stick nest	Activ	Inactive	Inactive	1	0	0
A18-C2	Red-tailed hawk	Cliff stick nest	Activ	Inactive	Inactive	ND[2]	0	0
A29-C1[3]	Red-tailed hawk	Cliff stick nest	Activ	Inactive	Inactive	2	0	0
A15-C1	Red-tailed hawk	Cliff stick nest	Activ	Inactive	Inactive	1	0	0
A3-Y1	Red-tailed hawk	Joshua tree nest	UNK	Active	Inactive	UNK	2 on 5/19 1 dead on 6/30	0
A18-C3	Red-tailed hawk	Cliff stick nest	UNK	Active	Inactive	UN	ND	0
A12-T1	Red-tailed hawk	Microwave tower	UNK	Active	Active	UN	ND	2
A3-PP1	Red-tailed hawk	Powerline pole nest	UNK	UNK	Active	UN	UNK	1
A5-W1	Red-tailed hawk	Willow tree nest	UNK	UNK	Active	UN	UNK	1
A6-Y3	Red-tailed hawk	Joshua tree nest	UNK	UNK	Active	UN	UNK	3
A18-C4	Red-tailed hawk	Cliff stick nest	UNK	UNK	Active	UN	UNK	1
A27-	Red-tailed hawk	Powerline pole nest	UNK	Active	Active	UN	NV[4]	2
A4-Y2	Swainson's	Joshua tree nest	Activ	Inactive	Inactive	2	0	0

[1]UNK = Unknown, nest found in subsequent years
[2]ND = Could not be determined during visit
[3]This nest was erroneously labeled as A30-C1 in FY 1999 annual progress report (BN, 1999a)
[4]NV = Not visited, nest location and observation of breeding noted by NTS worker in FY 1999 but reported to BN biologists
in FY 2000

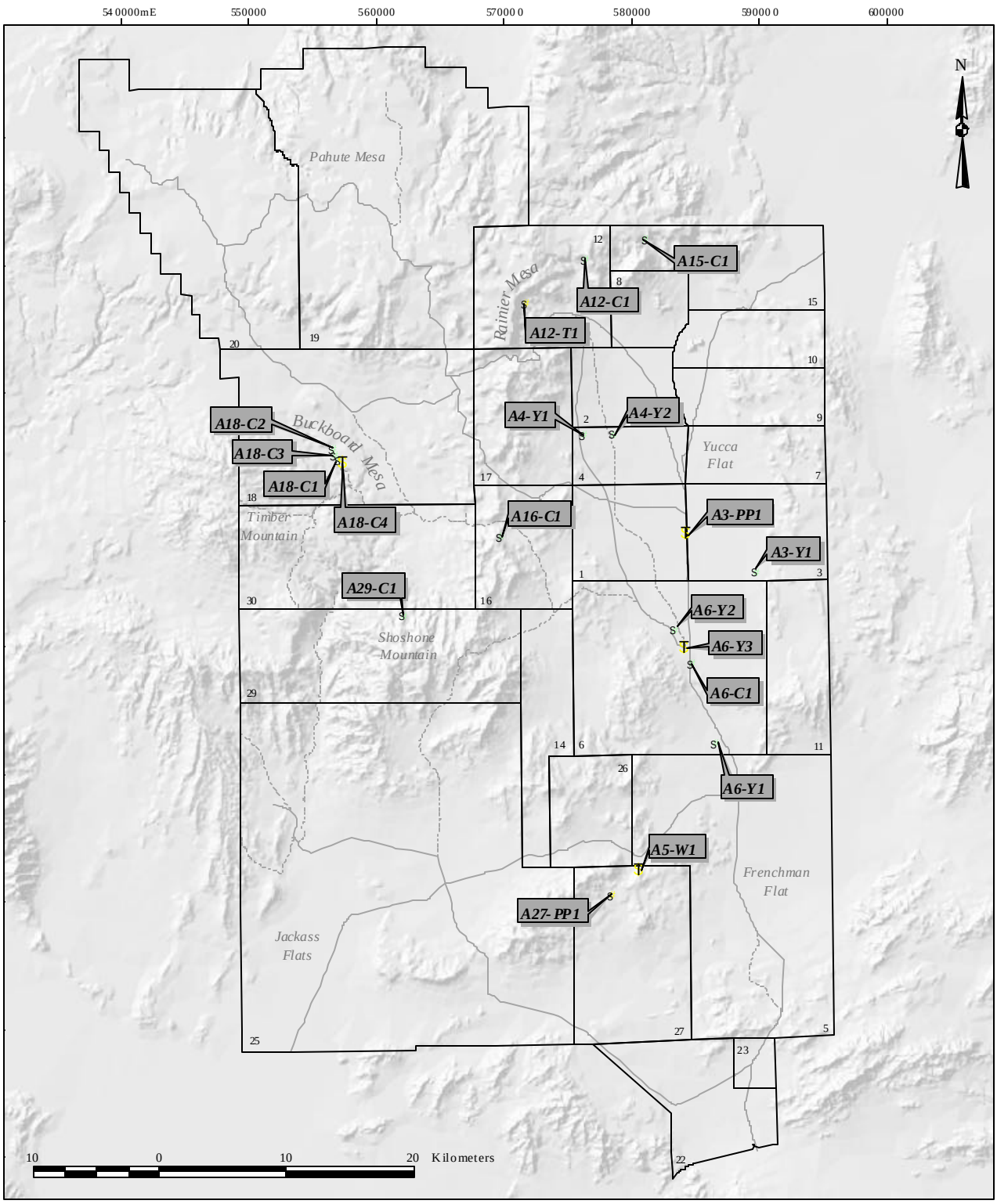

Figure 9. Locations of known raptor nests on the NTS during FY 2000

5.2.2.2 Raptor Mortality

Few raptor mortalities have been recorded at the NTS. Wildlife observations, made opportunistically by BN biologists and other NTS workers, are maintained by BN biologists in a computerized database. Accounts of injured and dead animals are also usually reported to BN biologists and are stored in the same database. Over the last 10 years, from 1990-2000,
16 incidents of dead raptors have been recorded on the NTS. The known causes of death include seven roadkills, two electrocutions, two predator kills, and two drownings (Table 16).

Table 16. Summary of NTS raptor mortality records from 1990-2000

Species	Roadkill	Electrocution	Suspected Drowning	Predation	Unknown	Totals
American kestrel				1	1	**2**
Barn owl	1				1	**2**
Golden eagle	1	1				**2**
Great-horned owl	3					**3**
Prairie falcon				1		**1**
Red-tailed hawk	2	1	1			**4**
Turkey vulture					1	**1**
Western burrowing owl			1			**1**
Totals	**7**	**2**	**2**	**2**	**3**	**16**

5.2.3 Mule Deer

Mule deer (*Odocoileus hemionus*) are state-managed game which occur throughout the NTS. Mule deer appear to be less abundant on the NTS during the last few years compared to approximately 10 years ago. This is based on qualitative observations of animals and their sign at springs and ponds and from deer spotlighting counts. This decline could be due to numerous factors including drought and/or a general reduction over the last decade in the numbers of permanent earthen water sources in deer habitat (there are six to seven fewer pond locations in or adjacent to *Pinus monophylla* / *Artemisia* ssp. Woodland habitat). Low numbers of deer as available prey for mountain lions could also cause mountain lions to prey more on horses, resulting in the decline of horse numbers measured from 1994 - 1998. Spotlighting surveys were initiated in FY 1999 and continued this year to examine trends in their relative abundance on the NTS.

Spotlighting surveys were conducted during two separate sampling sessions and over three consecutive nights during each session. The spotlighting sessions were October 18-20, 1999, and August 21-23, 2000. Two BN biologists drove a standard road course while shining spotlights

and counting all mule deer observed along a 100-m viewing region on each side of the road. Roads driven totaled 75 km in length and were located in the northern regions of the NTS on and adjacent to Pahute Mesa and Rainier Mesa. These methods were identical to those used during past deer spotlighting surveys.

During the October session, 11, 9, and 7 deer were observed each night, resulting in a mean count of 1.2 deer/10 km. This is the same mean sighting rate which was observed last FY in August, 1999 (BN, 1999a). In August 2000, 13, 9, and 14 deer were observed during the 3 consecutive nights, resulting in a sighting rate of 1.6 deer/10 km, a slight increase over last year. Five mountain lion and one bobcat sightings were also made over four of the six spotlighting nights.

Overall, the deer sighting rates from FY 1999 and FY 2000 are much lower than that observed from deer counts conducted during 1989-1994 (range = 2.1 deer/10 km to 5.5 deer/10 km). In FY 2001, a mule deer monitoring plan will be finalized which will identify sampling frequencies, threshold values for mean sighting rates, and adaptive management actions to be taken related to monitoring this species on the NTS.

5.3 Wetlands and Wildlife Water Sources

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 as components of the EMAC program which were started 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 conducted in FY 2000 to document wildlife use and mortality.

5.3.1 Wetlands Monitoring

Monitoring of selected NTS wetlands continued this FY to characterize seasonal baselines and trends in physical and biological parameters. Fourteen wetlands (Figure 10) were visited at least once during

the year to record the presence/absence of land disturbance, water flow rates, and surface area of standing water (Table 17). Wildlife use data collected at these water sources are shown in Table 18.

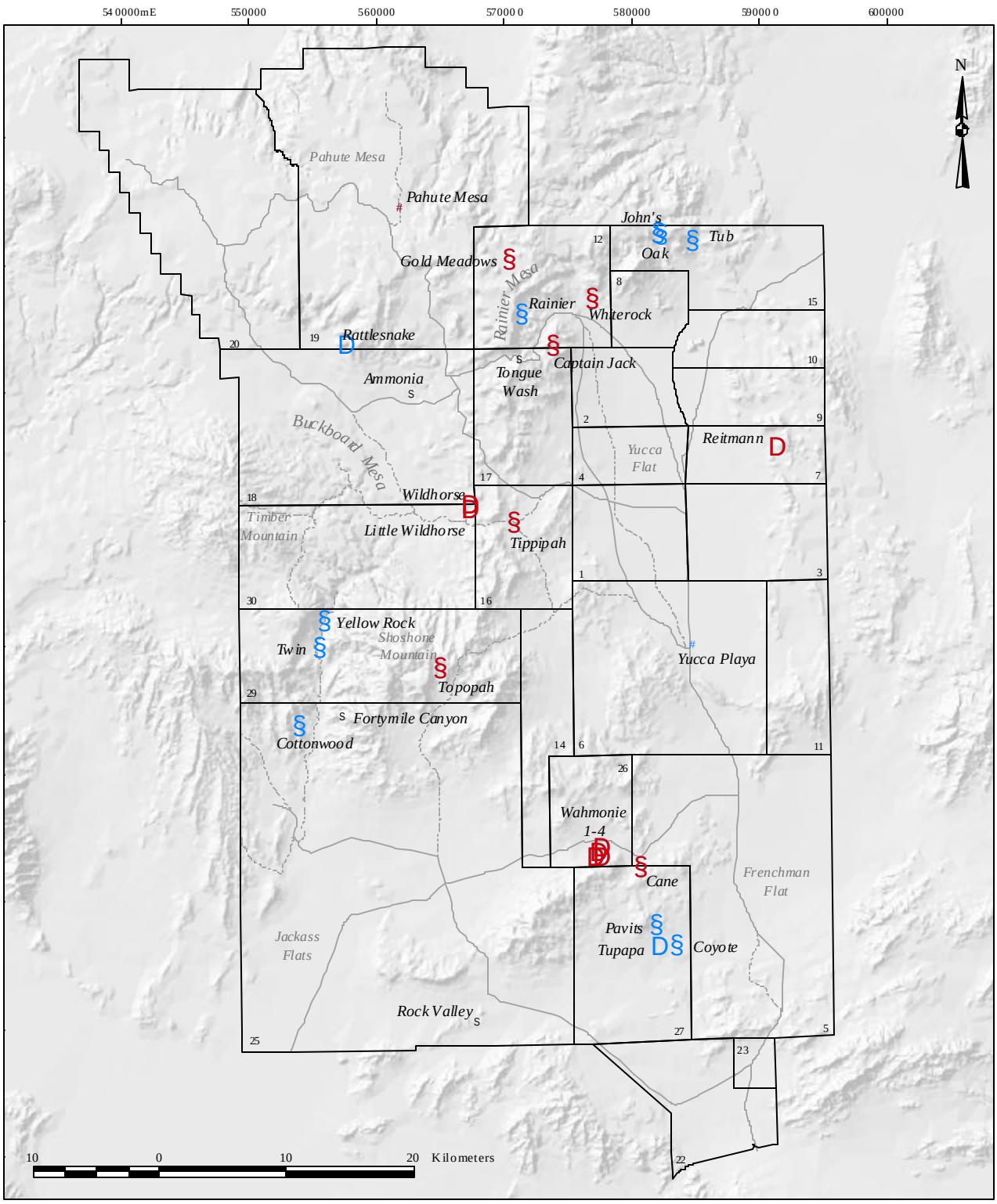

Figure 10. Natural water sources on the NTS

Table 17. Seasonal data from selected natural water sources on the NTS collected during FY 2000

Water Source	Date	Surface Area of Water (m^2)[a]	Surface Flow Rate (L/Min)[b]	Disturbance at Spring
Cane Spring	5/10	15	2.4	None
Cane Spring	8/31	9	2.4	None
Captain Jack Spring	5/3	40	2	None
Captain Jack Spring	7/27	40	1.1	Horse grazing and trampling
Gold Meadows Spring	5/2	600	0	Horse grazing and trampling
Gold Meadows Spring	8/15	0	0	Horse grazing and trampling
Little Wildhorse Seep	4/27	18	NM	Horse grazing and trampling
Little Wildhorse Seep	7/20	0	0	None
Pahute Mesa Pond	6/13	0	0	None
Reitmann Seep	5/24	0.04	0	None
Reitmann Seep	9/14	0.03	0	None
Tippipah Spring	5/4	440	3.6	None
Tippipah Spring	8/31	290	1.2	None
Topopah Spring	8/10	1.5	0.5	None
Wahmonie Seep No. 1	6/26	0	0	None
Wahmonie Seep No. 2	6/26	0	0	None
Wahmonie Seep No. 3	6/26	0	0	None
Wahmonie Seep No. 4	6/26	2	NM	None
Whiterock Spring	5/17	70	2.7	None
Whiterock Spring	9/13	60	3	None
Wildhorse Seep	4/27	45	NM	Horse grazing and trampling
Wildhorse Seep	7/20	0	0	None

[a] m^2 - Square meters
[b] L/min - Liters per minute
[c] NM - Not measureable due to diffused flow.

Table 18. Seasonal wildlife use at selected springs on the NTS during FY 2000. P = species present, inferred from sign.

Wildlife Observed	Cane Spring		Captain Jack Spring		Gold Meadows Spring		Little Wildhorse Seep		Pahute Mesa Pond	Reitmann Seep	
Mammals	5/10	8/31	5/3	7/27	5/2	8/15	4/27	7/20	6/13	5/24	9/14
Coyote (*Canus latrans*)	**P**	**P**		**P**			**P**		**P**	**P**	**P**
Feral horse (*Equus caballus*)				**1**	**P**	**1 dead**	**P**	**P**			
Mule deer (*Odocoileus hemionus*)	**P**	**P**	**P**	**P**	**P**		**P**	**1**	**P**		**P**
Mountain lion (*Felis concolor*)											
Birds											
Broad-tailed hummingbird (*Selasphorus platycercus*)		**1**									
Black-throated sparrow (*Amphispiza bilineata*)	**5**										
Brewer's sparrow (*Spizella breweri*)											
Brown-headed cowbird (*Molothrus ater*)					**10**						
Chukar (*Alectoris chukar*)				**20**							
Common raven (*Corvus corax*)					**>50**						
Double-crested cormorant (*Phalacrocorax auritus*)					**1**						
Gambel's quail (*Calipepla gambelii*)											
Horned lark (*Eremophila alpestris*)											
House finch (*Carpodacus mexicanus*)	**5**				**1**						
Long-eared owl (*Asio otus*)		**1**									
Mourning dove (*Zenaida macroura*)	**>100**		**>10**	**10**						**6**	
Northern harrier (*Circus cyaneus*)											
Red-tailed hawk (*Buteo jamaicensis*)	**3**										
Rufose-sided towhee (*Pipilo erythrophthalmus*)					**1**						
Say's phoebe (*Saya saya*)				**1**							
White-crowned sparrow (*Zonotrichia leucophyrs*)					**1**	**l**					

Table 18. (Continued)

Wildlife Observed	Tippipah Spring		Topopah Spring	Wahmonie Seep #1	Wahmonie Seep #2	Wahmonie Seep #3	Wahmonie Seep #4	Wildhorse Seep		Whiterock Spring	
Mammals	5/4	8/31	8/10	6/26	6/26	6/26	6/26	4/27	7/20	7/17	9/13
Coyote (*Canus latrans*)	**P**	**P**	**P**	**P**		**P**	**P**	**P**		**P**	
Feral horse (*Equus caballus*)								**22**	**P**		
Mule deer (*Odocoileus hemionus*)	**P**	**P**	**P**		**P**			**P**	**P**	**P**	**P**
Mountain lion (*Felis concolor*)			**P**								
Birds											
Broad-tailed hummingbird (*Selasphorus platycercus*)											
Black-throated sparrow (*Amphispiza bilineata*)	**5**						**5**				
Brewer's sparrow (*Spizella breweri*)	**1**										
Brown-headed cowbird (*Molothrus ater*)											
Chukar (*Alectoris chukar*)	**50**		**>500**						**1**		
Common raven (*Corvus corax*)											
Double-crested cormorant (*Phalacrocorax auritus*)											
Gambel's quail (*Calipepla gambelii*)			**5**	**80**			**60**			**5**	
Horned lark (*Eremophila alpestris*)											
House finch (*Carpodacus mexicanus*)	**5**		**>10**				**15**				
Long-eared owl (*Asio otus*)											**1**
Mourning dove (*Zenaida macroura*)			**>10**	**2**			**20**			**>150**	
Northern harrier (*Circus cyaneus*)											**1**
Red-tailed hawk (*Buteo jamaicensis*)			**1**								
Rufose-sided towhee (*Pipilo erythrophthalmus*)											
Say's phoebe (*Saya saya*)	**1**										
White-crowned sparrow (*Zonotrichia leucophyrs*)											

Additional observations at Pahute Mesa Pond in the spring confirmed that field indicators were present for vegetation, hydrology, and soils and it was concluded that the lower one-half of the pond was considered to have jurisdictional status as a wetland.

Several meetings were held during FY 2000 between BN ecologists and geohydrologists and hydrologists at Desert Research Institute (DRI). The meetings were held to discuss coordination of water sampling activities at NTS wetlands and development of a routine wetland monitoring plan. Information published for the wetlands was distributed to geohydrologists and the merits of data collection of ecological and hydrological data during the same visit to the wetlands was discussed. The value of the past wetland monitoring data was recognized and recommendations were made by hydrologists on how to improve sampling procedures and timing of visits to the water sources. DRI is seeking funding to pay for water analyses such as specific oxygen isotope ratios that would be useful in characterizing historical flows of the springs and seeps. BN ecologists will collect their routine data and additionally may collect water samples at selected sites for analyses by DRI. Issues such as data analyses, interpretation, and reporting will be finalized in FY 2001 if funding can be secured. The routine wetland monitoring plan will be finalized in FY 2001 as soon as the specific springs and seeps have been identified by DRI for their water sampling parameters.

No jurisdictional or nonjurisdictional wetlands on the NTS were disturbed during FY 2000 and no U.S. Army Corps of Engineers 404 Permit was required.

5.3.2 Monitoring of Man-made Water Sources

BN biologists conducted quarterly monitoring of man-made water sources. These sources, located throughout the NTS (Figure 11), include 35 plastic-lined sumps, 39 sewage treatment ponds, 13 unlined well ponds, and 4 radioactive containment ponds. Several ponds or sumps are located next to each other at the same project site. 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/NV, 1996), include placing flag lines, fencing, or coverings over contaminated water sources to repel birds. Ponds are monitored to assess their use by wildlife and to develop and implement mitigation measures to prevent them from causing significant harm to wildlife.

Man-made water sources were visited during four quarterly sampling periods: November, February, May, and September. 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. All survey observations were summarized in quarterly reports (BN, 2000a; h; o).

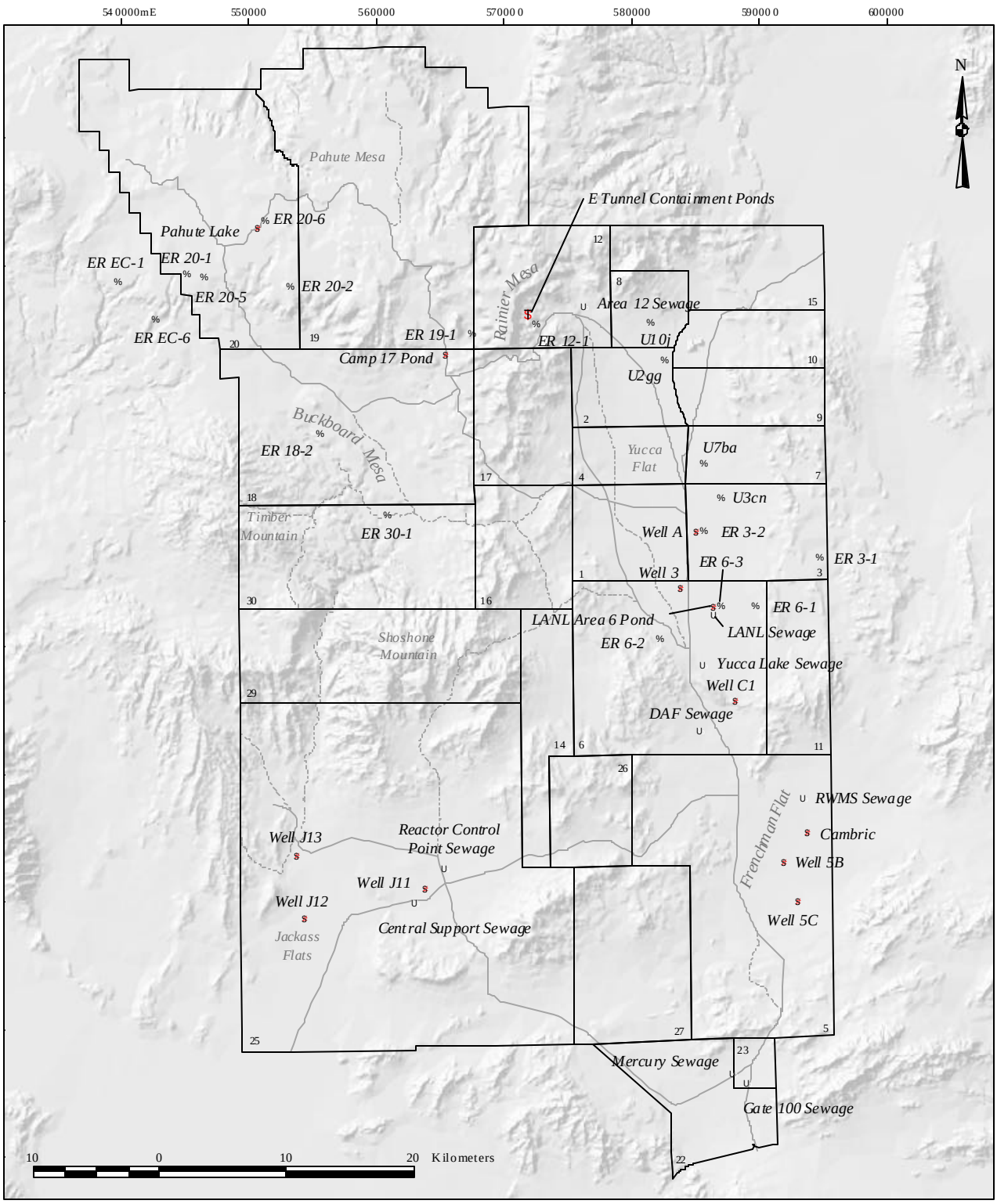

Figure 11. Man-made water sources monitored for wildlife use and mortality on the NTS during FY 2000

During FY 2000, use of unlined sumps and ponds by waterfowl (ducks, shorebirds), passerine birds (ravens, horned larks, house finches), and mammals, such as coyotes and deer, was common. Only one man-made pond (Camp 17 Pond in Area 18) was used this year 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.

No dead animals were recorded in any plastic sumps during FY 2000. A sediment mound was constructed in Sump # 3 at ER-20-6 this year to prevent deer drownings. This sediment ramp appears to be working well as deer sign have been recorded at this site, yet no additional deer drownings have occurred. No functional flaglines have been present at any plastic-lined ponds on NTS for the last three years. No mortality of birds have occurred, however, in these sumps since the flaglines have been absent. This indicates that flaglines presently are not necessary to prevent bird mortality. Flagline conditions will not be monitored in the future unless conditions require their reinstallation.

6.0 MONITORING OF THE HAZMAT SPILL CENTER

6.1 Task Description

Biological monitoring at the 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, 1996). It describes how field surveys will be conducted to determine test impacts on plants and animals and to 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. 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

BN reviewed chemical spill test plans for one experiment: REOP-CHLOREP Special Equipment and Techniques Mercury Workshop. The letter documenting that review was submitted to ESHD on September 7, 2000 (BN, 2000r).

Biota monitoring was not conducted for any of the chemical tests at the HAZMAT Spill Center during FY 2000. No baseline monitoring was conducted at established control-treatment transects near the HAZMAT Spill Center due to insufficient funding.

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