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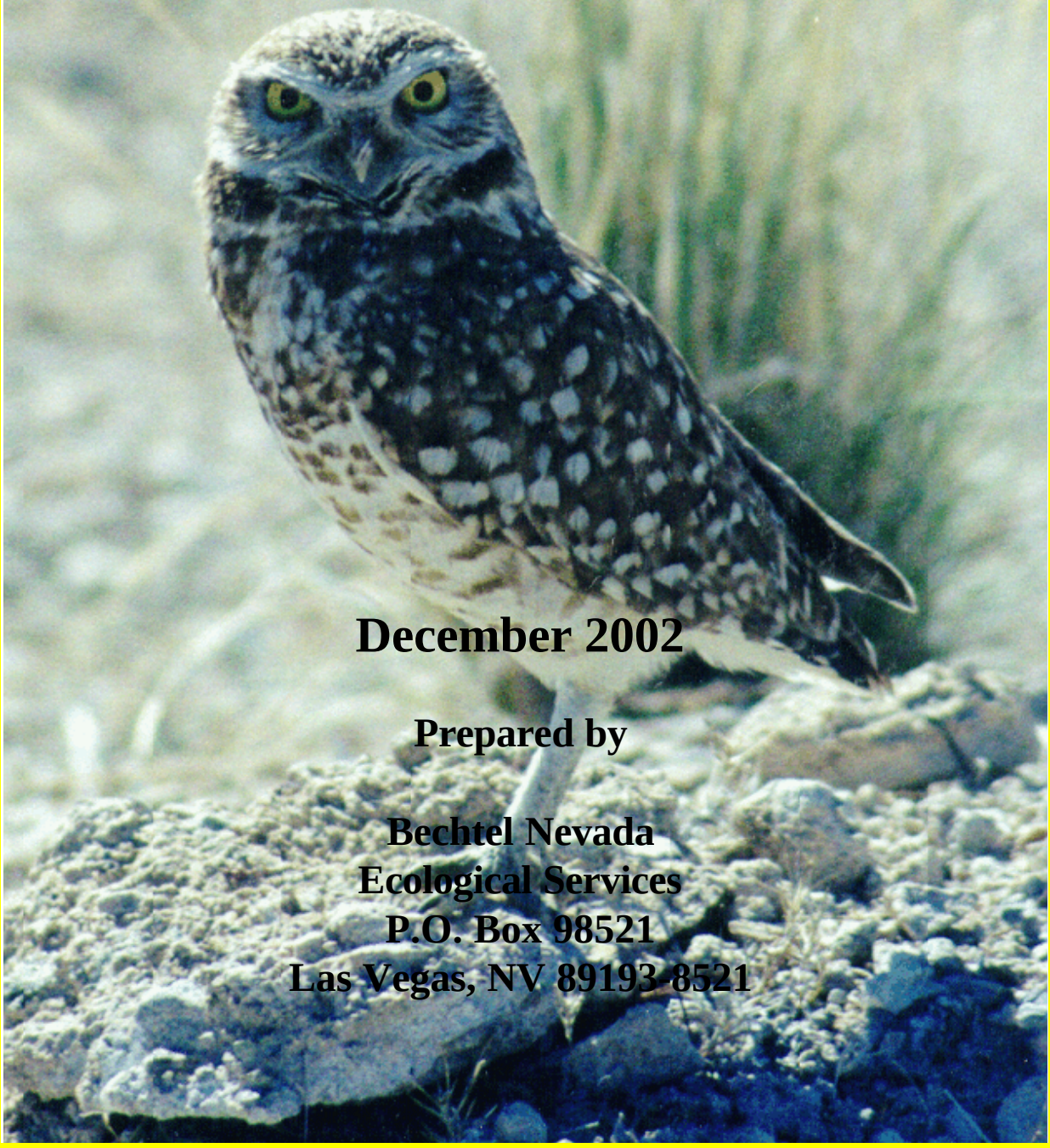
ECOLOGICAL MONITORING AND COMPLIANCE PROGRAM FISCAL YEAR 2002 REPORT



December 2002

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FISCAL YEAR 2002 REPORT

December 2002

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Prepared for the
U.S. Department of Energy
National Nuclear Security Administration
Nevada Operations Office
Environment, Safety, and Health Division
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ACRONYMS AND ABBREVIATIONS

BN	Bechtel Nevada
CAU	Corrective Action Unit
CAS	Corrective Action Site
CWA	Clean Water Act
DAF	Device Assembly Facility
DOE/NV	U.S. Department of Energy, Nevada Operations Office
EGIS	Ecological Geographic Information System
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
GPS	Global Positioning System
NNHP	Nevada Natural Heritage Program
NNPS	Nevada Native Plant Society
NNSA/NV	U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office
NTS	Nevada Test Site
RMP	Resource Management Plan
UGTA	Underground Test Area

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ABSTRACT

The Ecological Monitoring and Compliance program, funded through the U.S. Department of Energy, National Nuclear Security Administration 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 (BN) during fiscal year 2002. Program activities included: (1) biological surveys at proposed construction sites, (2) desert tortoise compliance, (3) ecosystem mapping and data management, (4) sensitive species and unique habitat monitoring, and (5) biological monitoring at the HAZMAT Spill Center. Biological surveys for the presence of sensitive species and important biological resources were conducted for 26 NTS projects. These projects have the potential to disturb a total of 374 acres. Thirteen of the projects were in desert tortoise habitat, and 13.38 acres of desert tortoise habitat were disturbed. No tortoises were found in or displaced from project areas, and no tortoises were accidentally injured or killed at project areas or along paved roads. Compilation of historical wildlife data continued this year in efforts to develop faunal distribution maps for the NTS. Photographs associated with the NTS ecological landform units sampled to create the NTS vegetation maps were cataloged for future retrieval and analysis. The list of sensitive plant species for which long-term population monitoring is scheduled was revised. Six vascular plants and five mosses were added to the list. Plant density estimates from ten populations of *Astragalus beatleyae* were collected, and eight known populations of *Eriogonum concinnum* were visited to assess plant and habitat status. Minimal field monitoring of western burrowing owl burrows occurred. A report relating to the ecology of the western burrowing owl on the Nevada Test Site was prepared which summarizes four years of data collected on this species' distribution, burrow use, reproduction, activity patterns, and food habits. Bat roost sites within seven buildings slated for demolition were identified, and a BN biologist was a contributing author of the *Nevada Bat Conservation Plan* published by the Nevada Bat Working Group. Thirty-three adult horses and five foals were counted this year. Six active raptor nests (two American kestrel, two Red-tailed hawk, and two Great-horned owl nests) were found and monitored this year. 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. The chemical release test plan for one experiment at the HAZMAT Spill Center on Frenchman Lake playa was reviewed. Seasonal sampling of downwind and upwind transects near the spill center was conducted to document baseline conditions of biota.

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1.0 INTRODUCTION

In accordance with DOE Order 450.1 "*Environmental Protection Program*", the Environment, Safety, and Health Division (ESHD) of the U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office (NNSA/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) 2002 (October 1, 2001, through September 30, 2002) included: (1) Biological Surveys, (2) Desert Tortoise Compliance, (3) Ecosystem Mapping/Data Management, (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.

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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 26 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 629.96 acres was surveyed for the projects (Table 2).

Thirteen 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 an active Great Horned Owl nest, active and inactive predator burrows, and mature yucca and cacti (Table 2). A pair of breeding Great Horned Owls was found in a building scheduled for demolition (Nest A3-B2, see Section 5.2.4). Demolition of this building was delayed until the owl chicks fledged. BN provided a written summary report of all survey findings and mitigation recommendations, where appropriate (Table 2).

2.2 Potential Habitat Disturbance

Six of the projects for which surveys were conducted were entirely on sites previously disturbed (e.g., industrial waste sites, building sites, existing borrow areas, existing well pads, road renovations) (Table 2). Surveys are conducted at old industrial or nuclear weapons testing sites whenever vegetation has reinvaded 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 that they are not in harms 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.

Twenty projects were located either partially or entirely in areas that had not been previously disturbed. These projects have the potential to disturb a total of 374.18 acres, where most (231 acres) are within the proposed Munitions Test Range in Dead Horse Flats in Area 18 (Project 02-23) (Table 2). Twelve of the 20 projects that will cause new disturbances occur in areas designated as important habitat on the NTS (Figure 2, Table 3). During vegetation mapping of the NTS, Ecological Landform Units (ELUs) were evaluated and some were identified as pristine, unique, sensitive, and diverse (see definitions, Table 3) (DOE, 1998). A single ELU could be classified as more than one type of important habitat. Figure 2 shows the distribution of these important habitats which were ranked so that pristine habitat overlays unique habitat,

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

Flowering Plant Species	Common Names	Status [a]
Arctomecon merriamii	White bearpoppy	SOC, W, IA
Astragalus beatleyae	Beatley's milkvetch	SOC , W, A
Astragalus funereus	black woollypod	SOC, W, A
Astragalus oopherus var. *clokeyanus*	Clokey's egg milkvetch	SOC, W, A
Camissonia megalantha	Cane Spring suncup	SOC, W, IA
Cymopterus ripleyi var. *saniculoides*	Ripley's springparsley	SOC, W, IA
Eriogonum concinnum	Darin's buckwheat	W, A
Eriogonum heermannii var. *clokeyi*	Clokey's buckwheat	W, A
Frasera pahutensis or *F. albicaulis* var. *modocensis*	Pahute green gentian or Modoc elkweed	SOC, W, IA
Galium hilendiae ssp. *kingstonense*	Kingston Mountain bedstraw	SOC, W, IA
Hulsea vestita ssp. *inyoensis*	Inyo hulsea	W, IA
Ivesia arizonica var. *saxosa*	Whitefeather ivesia	W, A
Lathyrus hitchcockianus	Hitchcock's peavine	W, A
Penstemon pahutensis	Pahute penstemon	SOC, W, IA
Phacelia beatleyae	Beatley's phacelia	SOC , W, A
Phacelia mustelina	Weasel phacelia	W, IA
Phacelia parishii	Parish's phacelia	SOC, W, IA
Moss Species		
Crossidiium seriatum	seriate crossidium	W, E
Didymodon nevadensis	Gold Butte moss	W, E
Entosthodon planoconvexus	planoconvex enthosthodon	W, E
Grimmia americana	American grimmia	W, E
Trichostomum sweetii	sweet tricohostomum	W, E
Reptile Species		
Gopherus agassizii	Desert tortoise	LT, NPT
Sauromalus obesus	Chuckwalla	SOC
Bird Species [b]		
Athene cunicularia hypugea	Western burrowing owl	SOC, P
Alectoris chukar	Chukar	G
Aquila chrysaetos	Golden eagle	EA, P

Table 1. (Continued)

Bird Species	Common Name	Status [a]
Buteo regalis	Ferruginous hawk	SOC, P
Callipepla gambelii	Gambel's quail	G
Charadrius montanus	Mountain plover	PT, P
Chlidonias niger	Black tern	SOC
Empidonax wrightii	Gray flycatcher	SOC
Falco peregrinus anatum	American peregrine falcon	<LE, P
Haliaeetus leucocephalus	Bald eagle	LT-PD, EA, P
Ixobrychus exillis hesperis	Western least bittern	SOC, P
Phainopepla nitens	Phainopepla	SOC
Phasianus colchicus	Ring-necked pheasant	G
Plegadis chihi	White-faced ibis	SOC, P
Mammal Species		
Antilocapra americana	Pronghorn antelope	G
Corynorhinus townsendii pallescens	Townsend's big-eared bat	SOC
Equus asinus	Burro	H&B
Equus caballus	Horse	H&B
Euderma maculatum	Spotted bat	SOC, NPT
Felis concolor	Mountain lion	G
Lynx rufus	Bobcat	F
Myotis ciliolabrum	Small-footed myotis	SOC
Myotis evotis	Long-eared myotis	SOC
Myotis thysanodes	Fringed myotis	SOC
Myotis volans	Long-legged myotis	SOC
Myotis yumanensis	Yuma myotis	SOC
Ovis canadensis nelsoni	Desert bighorn sheep	G
Odocoileus hemionus	Mule deer	G
Sylvilagus audubonii	Audubon's cottontail	G
Sylvilagus nuttallii	Nuttall's cottontail	G
Urocyon cinereoargenteus	Gray fox	F
Vulpes velox macrotis	Kit fox	F

Table 1. (Continued)

[a]Status Codes:

Endangered Species Act, U.S. Fish and Wildlife Service

LT - Listed Threatened
PT - Proposed for listing as Threatened
PD - Proposed for delisting
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
SOC - 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

NPT - Protected
G - Regulated as game
F - Regulated as fur-bearer
P - Protected bird

Long-term Plant Monitoring Status for Nevada Test Site (NTS) (see Section 5.1.1 of this report)

A - Active
IA - Inactive
E - Evaluate
W - On Nevada Natural Heritage Program's watch list

[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.

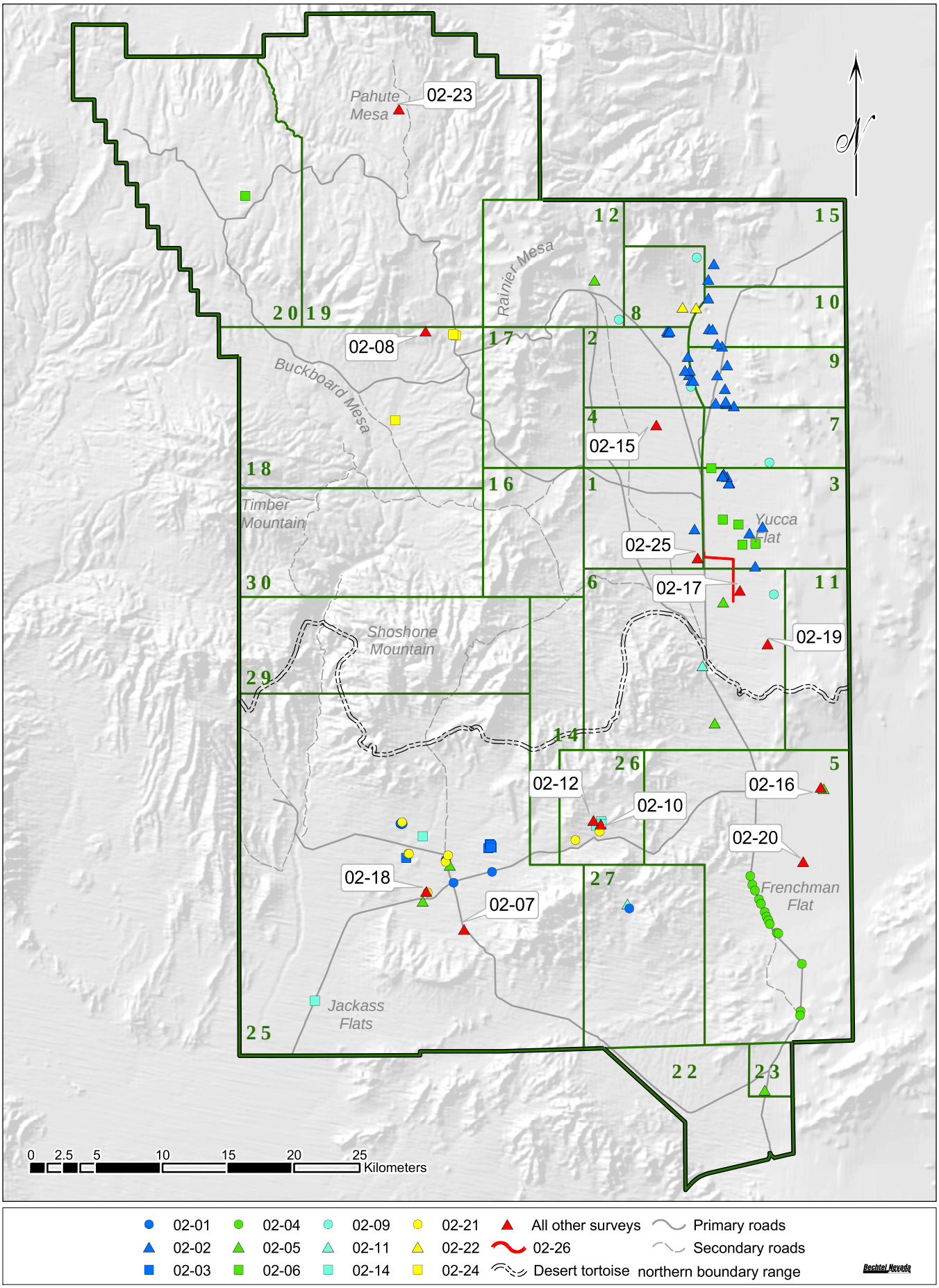

Figure 1. Biological surveys conducted on the NTS during FY 2002

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Table 2. Summary of biological surveys conducted on the NTS during FY 2002

Project No.	Project	Important Species/ Resources Found	Area Surveyed (acres)	Proposed Project Area in Undisturbed Habitat (acres)	Mitigation Recommendations
02-01	Corrective Action Unit (CAU) 271 (8 sites)	None	9.85	1.78	None
02-02	Borehole Plugging (35 sites)	Predator burrow	32.00	0	Avoid flagged burrow
02-03	Engine Maintenance, Assembly, and Disassembly (E-MAD) Remediation (CAU 143) (6 sites)	Inactive predator burrows	21.72	5.53	None
02-04	Mercury Highway Culvert Repairs (14 sites)	Inactive predator burrow	10.48	0.71	None
02-05	New Septic Tanks (7 sites)	Mature yucca, cacti	29.31	4.22	Avoid yucca, cacti if possible
02-06	Mud Pit Disposal Sites (CAU 356) (6 sites)	Inactive predator burrow, collapsed kit fox burrow, stick nest in building	6.13	0	Do not disturb nest
02-07	Surface Laid Cable	None	2.08	0.07	None
02-08	18-01 Road Renovation	Mature yucca, cacti	1.48	0.56	Avoid yucca, cacti if possible
02-09	Underground Test Area (UGTA) Drill Holes in Yucca Flat (5 sites)	Mature yucca, cacti, relic creosote shrub population	59.53	39.68	Avoid yucca, cacti, and relic creosote shrubs if possible
02-10	Phoenix Facility	None	0.10	0.07	None
02-11	Closure of Release Sites (CAU 326) (2 sites)	None	2.77	0.23	None
02-12	Explosive Magazine Move (CANCELLED)	None	0.20	0.10	None
02-13*	Fiscal Year 2002 Building Demolition (64 buildings)	Active Great Horned Owl nest, inactive Raven nest, 5 live bats	N/A	0	Delay demolition of building until owl chicks fledge, have biologist remove roosting bats prior to demolition
02-14	Areas 25 and 26 Contaminated Materials and Waste Dumps (CAU 168) (7 sites)	Collapsed tortoise burrow, mature yucca, cacti	24.47	1.07	Avoid yucca, cacti if possible
02-15	WATUSI Project	None	29.63	5.56	None
02-16	Radioactive Waste Maintenance Site (RWMS) Expansion	None	1.95	1.95	None
02-17	Fill Pipeline, A06 Construction Sump	None	1.04	0	None

*Building locations not shown on Figure 1.

Table 2. (Continued)

Project Number	Project	Important Species/ Resources Found	Area Surveyed (acres)	Proposed Project Area in Undisturbed Habitat (acres)	Mitigation Recommendations
02-18	Area 25 Spill Sites (CAU 398)	None	0.32	0	None
02-19	Yucca Lake Runway Repair and Extension	Inactive predator burrows	14.63	13.77	None
02-20	Hazmat Spill Center Sensors and Communications System	Collapsed burrows	11.44	11.44	None
02-21	CAU 165 (8 sites)	None	26.59	0.07	None
02-22	Radiological Demarcation (2 sites)	Predator burrows, mature cacti	57.08	44.20	Avoid burrows and cacti if possible
02-23	Munitions Test Range	Pronghorn antelope	241.42	231.6	None
02-24	CAU 394 (3 sites)	None	0.49	0.14	None
02-25	U1a 100 Pair Phone Cable Installation	Inactive predator burrows	1.81	1.81	None
02-26	Tweezer Road to U1g Powerline	Inactive predator burrows, mule deer, antelope	43.44	15.19	None
	Total		629.96	379.75	

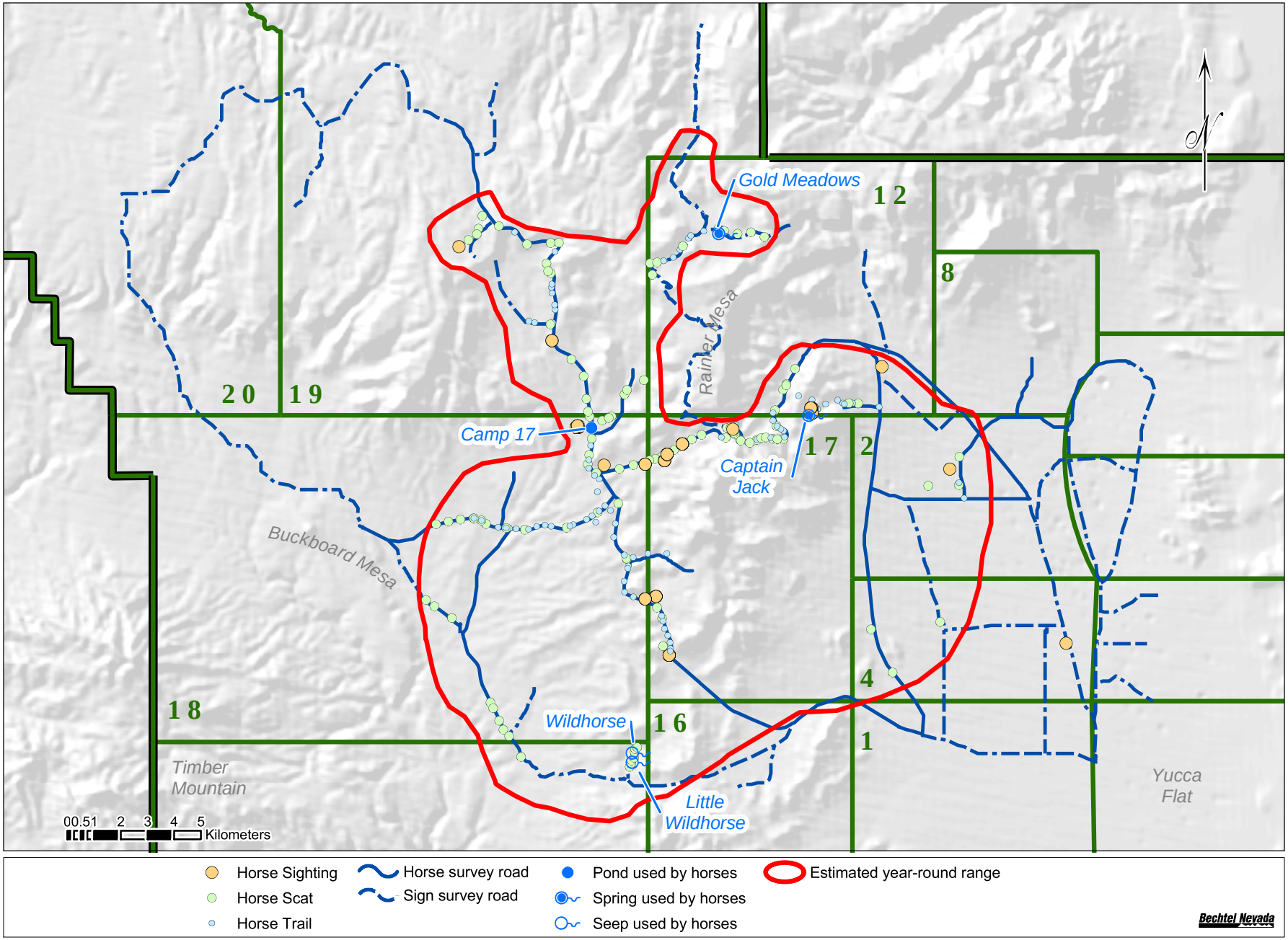

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Figure ## Feral horse sightings and horse sign observed on the NTS during FY 2002

Table 3. FY 2002 projects within important habitats* and acreage proposed for disturbance

Project No.	Project Name / Site Name (s)	Pristine Habitat (acres)	Unique Habitat (acres)	Sensitive Habitat (acres)	Diverse Habitat (acres)
02-01	CAU 271 / Corrective Action Site (CAS) 25-04-08, CAS 25-04-09			0.15	0.15
02-04	Mercury Highway Culvert Repairs / Culverts 4, 5			0.06	0.06
	Mercury Highway Culvert Repairs / Culvert 10				0.10
02-05	New Septic Tanks / Area 6 DAF Septic Tank		0.92	0.92	0.92
	New Septic Tanks / Area 12 Septic Tank			2.77	2.77
02-06	Mud Pit Disposal Sites (CAU 356) / CAS 03-09-03, CAS 03-09-04			0.25	0.25
02-09	UGTA Drill Holes in Yucca Flat / Wells ER-7-1, ER-8-1			24.19	24.19
02-10	Phoenix Facility			0.07	0.07
02-12	Explosive Magazine Move (Cancelled this FY)	0.10		0.10	0.10
02-14	Areas 25 and 26 Contaminated Materials and Waste Dumps (CAU 168) / CAS 26-17-10, CAS 26-08-01			0.05	0.05
02-20	Hazmat Spill Center Sensors and Communications System / Fiberoptic Spur From Building 5-08			11.44	11.44
02-21	CAU 165 / CAS 25-51-02, CAS 26-07-01, CAS 26-59-01	0.05		0.05	0.05
02-26	Portion of U1g Primary Incoming Power Line			4.04	4.04
	Total	0.15	0.92	44.09	44.19

*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

which then overlays sensitive habitat, which then overlays diverse habitats. The expected acreage to be disturbed in pristine, unique, sensitive, and diverse habitats due to FY 2002 projects is 0.15, 0.92, 44.09, and 44.19 respectively (Table 3). Note that several projects fall within ELUs having multiple designations (e.g., Project Number 02-05 is located in an ELU classified as diverse, sensitive, and unique). Since FY 1999, when these important habitats were identified during mapping of vegetation associations on the NTS (DOE, 1998), a tally of all acreage proposed for disturbance within them has been kept (Table 4). The tally of acreage that may be disturbed within the four important habitat types defined in Tables 3 and 4 may be used in the future to estimate the area and rate of establishment of invasive species into these habitats. Land-disturbing activities are known to cause the spread of invasive species such as *Bromus rubens* into areas of the NTS where they have not previously occurred. Such non-native weeds can degrade important habitats by decreasing plant biodiversity and increasing the risk and spread of wildfires. The monitoring and control of invasive plants on federal lands is encouraged under an Executive Order.

Table 4. Total acreage proposed for disturbance within important habitats* over the past four fiscal years. The number of projects within each habitat type per year is shown in parentheses.

Fiscal Year	Pristine Habitat	Unique Habitat	Sensitive Habitat	Diverse Habitat
1999	0	0	78.51 (6)	79.97 (9)
2000	18.80 (2)	10.28 (2)	47.84 (6)	55.06 (8)
2001	0	8.65 (1)	14.63 (3)	14.63 (3)
2002	0.15 (2)	0.92 (1)	44.09 (11)	44.19 (11)
	_____	_____	_____	_____
Total	18.95	19.85	185.07	193.85

*Important Habitat Definitions: see Table 3

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 NNSA/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 NNSA/NV, and to assist NNSA/NV in FWS consultations. The terms and conditions that were implemented for NNSA/NV by BN staff biologists in FY 2002 included (a) conducting clearance surveys at project sites within 24 hours from the start of project construction, (b) ensuring that environmental monitors are on-site during heavy equipment operation, and (c) preparing an annual compliance report submitted to the FWS.

3.1 Project-specific Compliance Activities

In FY 2002, biologists conducted desert tortoise clearance surveys prior to ground-disturbing activities for 13 proposed NTS projects at 57 different sites (Table 5, Figure 1). All but one of the projects (Project Number 02-05) were in, or immediately adjacent to, existing facilities and disturbances. Only one collapsed tortoise burrow was found among all 57 sites surveyed (Table 2, Project Number 02-14). 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 to quantify the acreage of tortoise habitat actually disturbed were conducted for four FY 2001 projects and for nine FY 2002 projects (Table 5). Post-activity surveys were 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. This fiscal year, a total of 34.26 acres of disturbed tortoise habitat were documented, of which, 13.38 acres were for projects initiated in FY 2002 (Table 5).

3.2 Other Compliance Activities

In January, BN submitted to ESHD the annual report that summarized tortoise compliance activities conducted on the NTS from January 1 through December 31, 2001. This report, required under the Opinion, contains (a) the location and size of land disturbances that occurred within the range of the desert tortoise during the reporting period; (b) the number of desert

Table 5. Summary of tortoise compliance activities conducted by BN biologists during FY 2002

Project Number	Project	Compliance Activities	Tortoise Habitat Disturbed (acres)
01-09*	Remediation at Area 22 Sewage Lagoons and Desert Rock Airport Strainer Box (CAU 230/320)	Post-activity survey	0
01-13*	Erosion Control at Area 27 Landfill	Post-activity survey	0.09
01-17*	Renovation of Mercury Highway	Post-activity survey	0.39
01-21*	Frenchman Flat Geo-Seismic Study	Post-activity survey	20.40
02-01	CAU 271 (8 sites)	100 percent-coverage survey, post-activity survey	1.63
02-03	E-MAD Remediation (CAU 143) (6 sites)	100 percent-coverage survey, post-activity survey	5.53
02-04	Mercury Highway Culvert Repairs (14 sites)	100 percent-coverage survey, post-activity survey	0.71
02-05	New Septic Tanks (6 sites)	100 percent-coverage survey, post-activity survey	4.15
02-07	Surface Laid Cable (1 site)	100 percent-coverage survey, post-activity survey	0.07
02-10	Phoenix Facility (1 site)	100 percent-coverage survey, post-activity survey	0.07
02-11	Closure of Release Sites (CAU 326) (2 sites)	100 percent-coverage survey	0
02-12	Explosive Magazine Move (1 site)	100 percent-coverage survey	N/A[1] (Project cancelled)
02-14	Areas 25 and 26 Contaminated Materials and Waste Dumps (CAU 168) (7 sites)	100 percent-coverage survey, post-activity survey	1.15
02-16	RWMS Expansion (1 site)	Voluntary 100 percent-coverage survey, site is in area exempt from terms and conditions of Biological Opinion	N/A
02-18	Area 25 Spill Sites (CAU 398) (1 site)	100 percent-coverage survey	0
02-20	Hazmat Spill Center Sensors and Communications System (1 site)	Voluntary 100 percent-coverage survey, site is in area exempt from terms and conditions of Biological Opinion	N/A

Table 5. (Continued)

Project Number	Project	Compliance Activities	Tortoise Habitat Disturbed (acres)
02-21	CAU 165 (8 sites)	100 percent-coverage survey, post-activity survey	0.07
			_____
		Total	34.26
		Total - FY 2002 Projects Only	13.38

*Projects reported in FY 2001 for which the acres disturbed were not reported
[1]N/A - Not applicable

tortoises injured, killed, or removed from project sites; (c) a map showing the location of all tortoises sighted on or near roads on the NTS; and (d) a summary of construction mitigation and monitoring efforts.

Compliance with the Opinion will ensure that the two goals of the NNSA/NV Resource Management Plan are being met; namely, that the desert tortoise is protected on the NTS and that the cumulative impacts on this species are minimized (DOE/NV, 1998). 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 exceeded (Table 6). No desert tortoises were accidentally injured or killed, nor were any captured or displaced from NTS project sites.

Table 6. Parameters and threshold values for desert tortoise monitoring on the NTS

Monitored Parameter	Threshold Value	Adaptive Management Action	FY 2002 Value of Monitored Parameter
Number of tortoises accidentally injured or killed as a result of NTS activities per year	3	Reinitiate consultation with FWS	0
Number of tortoises captured and displaced from NTS project sites per year	10	Reinitiate consultation with FWS	0
Number of tortoises taken in form of injury or mortality on paved roads on the NTS by vehicles other than those in use during a project	Unlimited	Supplemental employee education and bulletins	1
Number of total acres of desert tortoise habitat disturbed during NTS project construction since 1992	3,015	Reinitiate consultation with FWS	212

[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.

4.0 ECOSYSTEM MAPPING/DATA MANAGEMENT

In FY 1996, efforts were begun 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 habitat-physical feature maps. The topical report *Classification of Vegetation on the Nevada Test Site* (Ostler et al., 2000) was published and distributed in FY 2001. Ten vegetation alliances and 20 associations were recognized as occurring on the NTS.

Emphasis during FY 2002 was on the identification and collection of published wildlife data to provide information about wildlife that can be correlated with vegetation alliances and associations. Information about historical species-specific wildlife collection and sighting data from the NTS has been entered into supporting databases that can be linked to the vegetation and site data. Additionally, metadata was prepared to help document the status of site field data and photographs, to identify future gaps of information, and to direct future field work for areas not surveyed previously.

4.1 Compilation of Historical Wildlife Data

This year, work started on entering location coordinates into the Ecological Geographic Information System (EGIS) fauna database for historical animal sighting and specimen collection sites on the NTS. The data will be used to link animal distribution data to the vegetation classification data gathered from ELUs. A review of all published vertebrate and invertebrate inventories and research performed on the NTS was conducted to identify geographical information. Other sources searched included field notes from past and present researchers on the NTS and collection records for vertebrate specimens maintained at the Brigham Young University museum in Provo, Utah. Wildlife observations made by BN biologists or reported to Ecological Services by NTS workers are also maintained in the EGIS animal database, and new wildlife observations were entered into the EGIS database as well. To date, thousands of data entries have been made. This work will continue next fiscal year and faunal distribution maps will begin to be produced.

4.2 NTS Vegetation Classification Metadata

Metadata associated with the topical report *Classification of Vegetation on the Nevada Test Site* (Ostler et.al., 2000) were prepared to help document the extent of field information collected for ELUs on the NTS. The location and extent of field photographs were reviewed for completeness and, where necessary, digitally scanned from old films and prints. Because of poor lighting conditions during field data collection, double exposures on some rolls of film, and infrequent camera failure, several photographs of ecological landform units were never taken and are currently lacking. It is anticipated that ELUs without photo documentation will be visited in the future to obtain photographs in order to provide a complete photo coverage of selected ELUs on the NTS. These photographs document site conditions and provide information needed to evaluate habitat for wildlife use. They also provide details of plant community structure, such as shrub height, foliar density, and vertical stratification of the site's vegetation.

Digital image files of individual ELUs were renamed and centralized into one subdirectory from several dozen compact disks to facilitate the future retrieval of site photos by ELU number and for electronic linkage with EGIS.

Rectified images of 1:24000 scale aerial digital images of the NTS were secured to provide basemaps for correction of vegetation unit polygons and registration with the georectified base-map images. It is anticipated that location of sampling transects as previously gathered by the old Global Positioning System (GPS) hardware (accurate to within 100 meters) will be corrected to more accurately reflect their proper location. This will also enable the more accurate location of sensitive plant populations.

4.3 Coordination With Ecosystem Management Agencies/Scientists

Collaboration with the U.S. Geological Survey Biological Services continued in FY 2002. Data that were being gathered will be used to evaluate changes in vegetation originally sampled by Janice Beatley in the 1970s. Data show that significant changes to species and plant community composition have occurred in some areas. Studies will be useful to document changes due to climatic shifts (e.g., global warming) and direct and indirect effects of nuclear testing. New findings will provide needed information to calculate fire risks to NTS vegetation (e.g., the conversion of blackbrush and mixed shrublands to annual grasslands).

Data collected as part of the vegetation mapping efforts was used in support of studies to characterize potential biointrusion into buried waste at the NTS from ants and termites. BN scientists spent several days assisting scientists from Neptune and Company, Inc., of Los Alamos, New Mexico, and scientists at the University of Toronto in Ontario, Canada, in conducting their research efforts. Additional habitat locations were identified in areas dominated by big sagebrush *(Artemisia tridentata*) with deep soils. Observations of plant root distribution and biomass were also made during the digging of new disposal pit at the Area 5 Radioactive Waste Management Site. Information about vegetation biomass will be summarized in a report during FY 2003.

5.0 SENSITIVE SPECIES AND HABITAT MONITORING

There are 22 plants and 34 animals which occur on the NTS that are considered sensitive because they are either: (a) listed as threatened or endangered under the ESA, (b) current candidates for listing, (c) species of concern to FWS or state agencies, (d) or state-managed species (Table 1). The desert tortoise is the only threatened or endangered species which could be significantly impacted by NNSA/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 plants and animals on the NTS by protecting them from significant impacts due to NNSA/NV actions. A secondary goal is to gather sufficient information on these species' distribution and abundance on the NTS to determine if further protection/management 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.

5.1 Sensitive Plants Species

In 1998, DOE/NV prepared a Resource Management Plan (RMP) with the objective to protect and conserve sensitive plant species found on the NTS and to minimize cumulative impacts to those species as a result of U.S. Department of Energy (DOE) activities (DOE/NV, 1998). Pursuant to that document, BN published and distributed an *Adaptive Management Plan for Sensitive Plant Species on the Nevada Test Site* (BN, 2001a). This document presents the procedures designed to ensure that the RMP goals are met by identifying parameters to be measured during long-term monitoring and outlining management actions that may be taken if significant threats to sensitive species are detected.

5.1.1 Revised List of Sensitive Plant Species for the NTS

One of the first tasks identified in the adaptive management plan is to identify those plant species found on the NTS that may require protection because of such factors as rarity, susceptibility to disturbance, or importance. Plants known to occur on the NTS and listed by the FWS as endangered, threatened or as a species of concern, are included on the list of sensitive plant species for the NTS. Other agencies are also consulted in determining which species should be protected. The Department of Conservation and Natural Resources of the Nevada Natural Heritage Program (NNHP) maintains a detailed list of rare plants and lichens. The list includes plants protected by all federal agencies, the Division of Forestry of the state of Nevada, and the Nevada Native Plant society. Any species included in their list and known or suspected to occur on the NTS are considered as sensitive plant species for the NTS.

The list of sensitive plant species being monitored on the NTS (BN, 2001b) was reviewed and revised in FY 2002. The revised list is shown in Table 1 (Section 1.0). Two species were removed from the list of sensitive plant species: *Penstemon albomarginatus* (whitemargin penstemon) and *Penstemon fruticiformis* var. *amargosae* (Amargosa penstemon). Both species were originally included on the list because they are known to occur on lands adjacent to the NTS. However, during surveys over the last several years, neither of these species has been

found. Habitat for these species is not known to occur on the NTS, therefore it is unlikely they

will be found in the future.

Six vascular plants and five nonvascular plants were added to the list. All vascular species are known to occur on the NTS and are listed as 'watch' species by the NNHP. None carry federal status. Five species of mosses were added to the NNHP watch list of sensitive species this last year. All are known from collections in southern Nevada and one has been collected on the NTS.

5.1.2 Long-term Monitoring

Long-term monitoring of sensitive plant species is part of the adaptive management plan. The goal of this program is to acquire an accurate delineation of populations of sensitive plant species on the NTS and to periodically assess their status for conservation and management purposes. All sensitive plant species (Table 1) were categorized as a species (a) to be monitored, (b) not to be monitored, or (c) to be evaluated. Species that will be monitored are classified as "active" (A) in Table 1 and include those known to occur on the NTS, are on the FWS or NNHP list of sensitive plant species, and have limited distribution either on the NTS or its entire range. Those species in Table 1 classified as "inactive" (IA) will not be monitored under the long-term monitoring plan for NTS plant species (although their presence at proposed project sites during biological surveys are still documented). They include species that are known to occur on the NTS, are has been gathered to suggest that they have widespread distribution on the NTS, in Nevada, or over the western United States. Species classified as "evaluate" (E) in Table 1 include those for which there is insufficient information to determine if they occur on the NTS and whether their distribution or abundance warrants their protection and monitoring. The revised list of sensitive plant species on the NTS includes ten species that will be monitored, five which will be evaluated, and seven which will not be monitored (Table 1). Six of the ten species that will be monitored are annual forbs, three are perennial forbs, and one is a perennial shrub. All five of the species to be evaluated are bryophytes (mosses).

Field monitoring to assess population status is to be conducted for each "active" species at least once every five years. A minimum of two species are selected each year and a representative number of populations are monitored. Population locations and habitat have been described during previous field studies (Blomquist et al. 1992, Blomquist et al. 1995) for many species, so the amount of field description data gathered during long-term monitoring will vary by species based on need. Other data will be collected during field monitoring to ascertain the current status of the species and may include density of plants, evidence of herbivory, disease, or disturbance.

Growing conditions this fiscal year were poor. Sporadic and light winter and spring rains did not provide adequate moisture for germination of annuals or growth of perennials. Only two species were selected to be monitored this year: *Astragalus beatleyae* (Beatley's milkvetch), a perennial forb, and *Eriogonum concinnum* (Darwin's buckwheat), an annual forb. No sensitive plant evaluations were scheduled for this fiscal year. Several mosses were collected during field surveys for *A. beatleyae* and *E. concinnum* but identifications have not been made.

5.1.2.1 Astragalus beatleyae

A. beatleyae flowers and sets seed in May and June. Ten of 18 known populations of *A. beatleyae* were monitored in mid to late June (Figure 3). Characterization of known populations was completed during previous studies. The goal this fiscal year was to collect density estimates of *A. beatleyae* and to note any conditions that may be impacting the plants (e.g., herbivory, disease, etc.). Although growing conditions were not good this year, individuals of *A. beatleyae* were observed during preliminary field surveys.

The number of individuals of *A. beatleyae* within each population was estimated by sampling two permanent transects previously established at each site (Blomquist et al., 1992). Transects were selected based on which transects had the highest number of individuals recorded in 1991 when sampling last occurred. Plant density was higher in 2002 than it was in 1989 at two of the populations (2b and 8) (Figure 4). However, at all other populations, *A. beatleyae* density was lowest in 2002. This was not unexpected given the poor growing conditions this year and considering there was no evidence of growth of other perennial forbs this year. Documentation of plant densities during these poor growing conditions will serve as a reference for future monitoring. There was no evidence of any of the populations being impacted by DOE activities.

5.1.2.2 Eriogonum concinnum

E. concinnum flowers and sets seed in late summer. Eight known *E. concinnum* populations were identified from herbarium records and from historic plant location maps of the NTS (Rhoads et al. 1977) (Figure 3). Characterization of *E. concinnum* populations had not been done. Only brief habitat descriptions are available from NTS herbarium collections made in the 1960s and 1970s. Preliminary surveys of five of the known sites were conducted in early August to determine if there were any living plants this year. Only old stalks from previous years were found. It was not possible to determine if the old stalks were *E. concinnum* or closely related species of *Eriogonum*. Based on these preliminary findings, an assessment of the current status of the species was not possible, therefore efforts were focused on relocating the eight historic locations and gathering information to characterize the habitat of *E. concinnum*.

All eight locations of *E. concinnum* (Figure 3) were visited in August of 2002. Habitat data were collected at each of the sites (Table 7) and added to the sensitive plant database maintained under the EMAC program. The habitat for *E. concinnum* is characterized by sandy soils associated with white volcanic tuff. Slopes vary from >35 percent to sandy flat bottoms and borrow areas along roads. The woodland and shrubland associations (Ostler et al., 2000) in which the populations are located are presented in Table 7.

Plotting population boundaries *of E. concinnum* in the field was not done this year due to the poor growing conditions and almost complete absence of *E. concinnum*. This phase of long-term monitoring will be completed in future years under more favorable growing conditions. Monitoring of population status will continue at a future time when conditions are more favorable for germination and growth. From the preliminary observations this year, it appears that only a fraction of the potential habitat for *E. concinnum* has been identified on the NTS. Future studies may show this species to be much more widespread than is currently indicated from herbarium records.

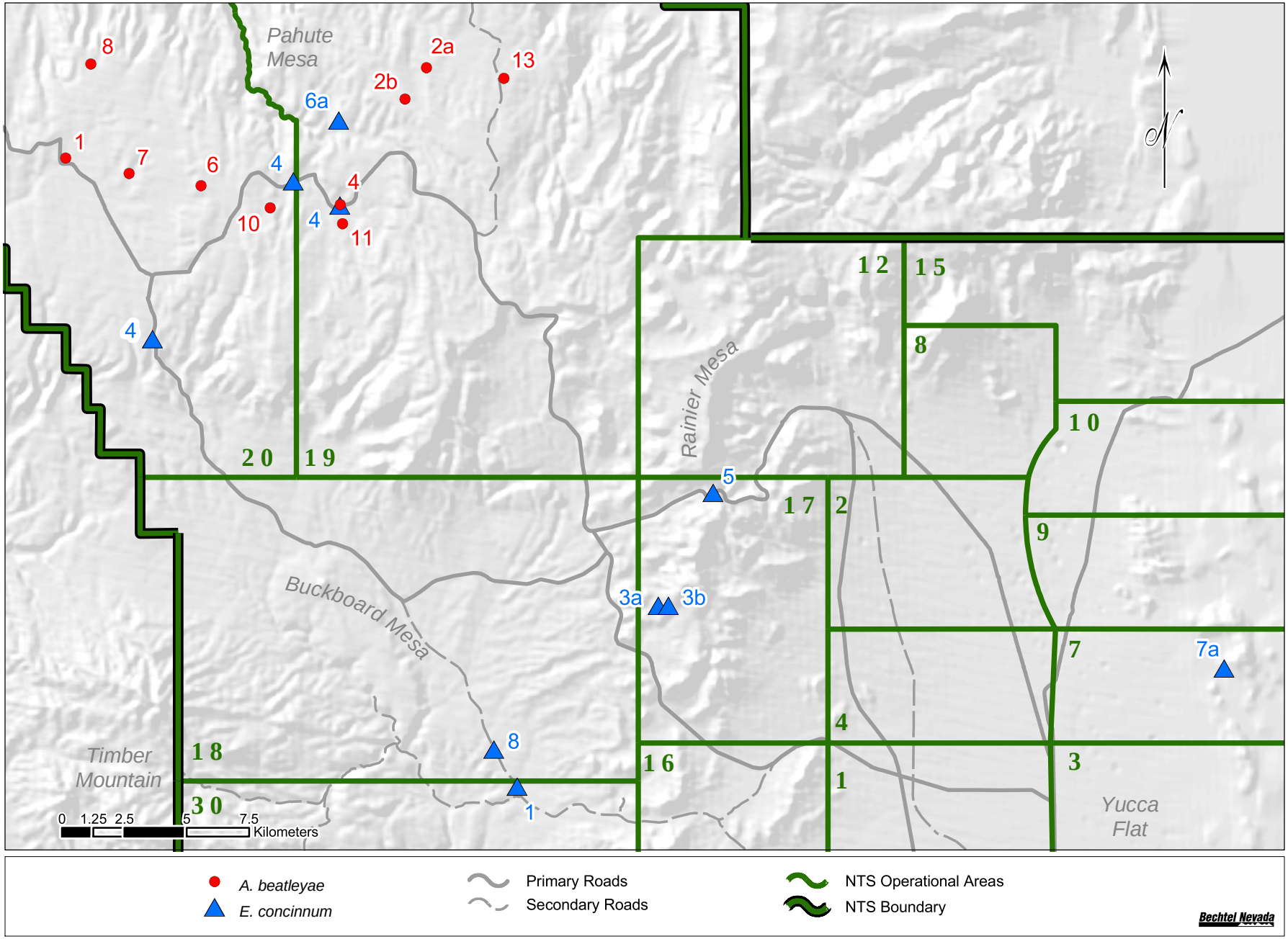
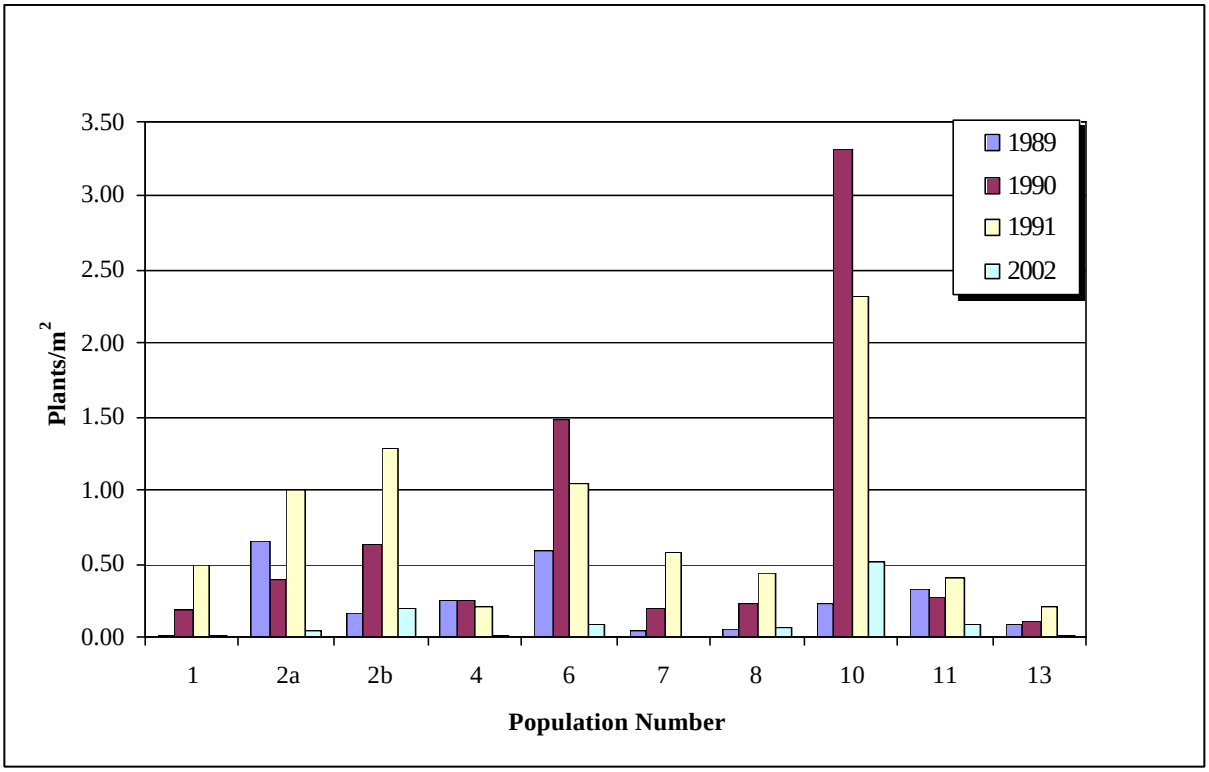


Figure 3. Sensitive plant populations monitored on the NTS during FY 2002

Figure 4. Density of ten populations of *A. beatleyae* from 1989 to 2002. Site names are same as those used in



Blomquist et al. 1992.

Table 7. Characteristics of *E. concinnum* habitat on the NTS

Habitat Feature	Plant Population Name and Number							
	Buckboard Mesa (No. 1)	**W Sugar Loaves (No. 3a)**	**WSW Pinyon Butte (No. 3b)**	**Pahute Mesa Roadcuts [1] (No. 4)**	**Stockade Wash/ Holmes Road Jnct (No. 5)**	**E Silent Canyon (No. 6a)**	**NE Reitmann Seep (No. 7a)**	**Buckboard Mesa - Disturbed - (No. 8)**
Elevation (ft)	4,850	5,800	5,965	6,160	6,400	6,620	4,660	4,925
Vegetation Association [2]	Green Rabbitbrush-Nevada Jointfir	Basin Boig Sagebrush-Green Rabbitbrush	Singleleaf Pinyon-Black Sagebrush	Singleleaf Pinyon-Basin Big Sagebrush, Basin Big Sagebrush-Green Rabbitbrush, Nevada Jointfir-Spiny Hopsage	Miscellaneous	Singleleaf Pinyon-Black Sagebrush	Blackbrush -Nevada Jointfir	Green Rabbitbrush-Nevada Jointfir
Soils [3]	Loose sand at base of tan volcanic cliffs	Volcanic tuff	Volcanic tuff hills and cliffs	Reddish brown / white rock slopes	Disturbed - soil derived from light colored tuff	Volcanic tuff/ sands	Light colored volcanics	Disturbed
Aspect [4]	Northeast	West	South	Various	Southwest	South	West	West
Slope (%) [4]	10 - 35	1 - 10	0 - 10	35 +	0 - 10	35 +	35 +	0 - 10
Topographic Position [4]	Mid slope to bottom	Bottom	Bottom	Lower slope to bottom	Bottom	Crest to upper slope	Mid slope to upper slope	Bottom
Light [4]	Open	Open	Open	Open	Open	Open	Open	Open
Plant Abundance [3]	Common (1968), Abundant (1969), Rare (1977)	Abundant (1969), Scattered (1978)	Common (1968)	Scattered to common (1977)	Small population (1969)	Common (1968), Abundant (1977)	Common (1983)	Abundant (1969)

[1]Three historic locations along a six mile segment of Pahute Mesa Road.
[2]Classified as per Ostler et al., 2000.
[3]Taken from herbarium notes.
[4]Collected during site visits in FY 2002.

5.1.3 Coordination With Natural Resource Agency Botanists

On April 3, 2002, the NNHP held its annual meeting in Reno, Nevada. Participants included state and federal agencies, academia, land resource managers, and private concerns. 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 or no longer need protection under state or federal laws and regulations. A representative from BN attended this year's meeting and reported on the design and implementation of long-term monitoring as described in the published *Adaptive Management Plan for Sensitive Plant Species on the Nevada Test Site* (BN, 2001a).

A report on *Astragalus oophorus* var. *clokeyanus* (Clokey's egg milkvetch), funded and prepared by NNHP, was submitted to BN for review and comment prior to final publication. The report is a comprehensive report on the species and incorporates into one document much of the data provided to NNHP over the years by BN (Anderson, 1998) and other entities working with this particular species. This concerted effort has resulted in the determination by the FWS that listing of this species is not necessary for its protection.

The National Park Service was present at the meetings and reported on an effort in Nevada to complete a flora of the mosses of Nevada. The emphasis on mosses in Nevada has resulted in the listing of five mosses and two liverworts as sensitive plant species during the past year. One of the moss species is known to occur in Rock Valley on the NTS.

5.2 Sensitive Animal Species

Some of the federally protected animals and animal 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 threatened bald eagle (*Haliaeetus leucocephalus*), 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.

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 (Steen et al., 1997). NNSA/NV impacts on chuckwalla will be monitored over time by identifying all historic and new projects that have, or will, disturb chuckwalla habitat. Collection of baseline data on western burrowing owls and bats was limited this fiscal year. Owl burrow monitoring was performed, and buildings scheduled for demolition were surveyed to identify bat roost sites. A major effort this year was summarizing ecological field data collected on western burrowing owls over the past four years. Other sensitive animal species monitored this year included wild horses (*Equus caballus*) and raptors (birds of prey) (see Table 1). These species are visible and their welfare on the NTS is

important to NNSA/NV stakeholders and NTS personnel. Some NTS activities could impact these species. For example, man-made water sources used by horses 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. Although performed periodically on the NTS, census surveys of mule deer, a state game species, were not conducted this year

5.2.1 Western Burrowing Owl

5.2.1.1 Burrow Distribution

Three new burrowing owl burrow sites were found opportunistically while conducting other resource surveys. All three burrows were found in man-enhanced habitat with one located in a culvert, one in a roadcut, and one in a man-made earthen mound near a disturbed pad. 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. All survey data were entered into an Access database. Figure 5 illustrates the known distribution of the 117 documented burrowing owl locations (30 locations of owl sightings and 87 burrow sites) on the NTS.

5.2.1.2 Burrow Use

Monthly monitoring of burrows was completed in December, yielding three full years of continuous burrow use data. This information is important in order to identify the seasons of immigration, emigration, and breeding of owls on the NTS. 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.

5.2.1.3 Topical Report

The most notable accomplishment regarding burrowing owl monitoring on the NTS this year was the completion of the draft document relating to the ecology of the western burrowing owl on the Nevada Test Site. This report summarizes the results of more than four years of data collected while monitoring burrowing owls on the NTS. Major sections of the report include: distribution, burrow use, reproduction and activity patterns, food habits, disturbance effects, winter burrow temperatures, and management implications. This report is important because it represents the first comprehensive study of burrowing owls in Nevada. The final document will be published and distributed next fiscal year as an NNSA/NV topical report.

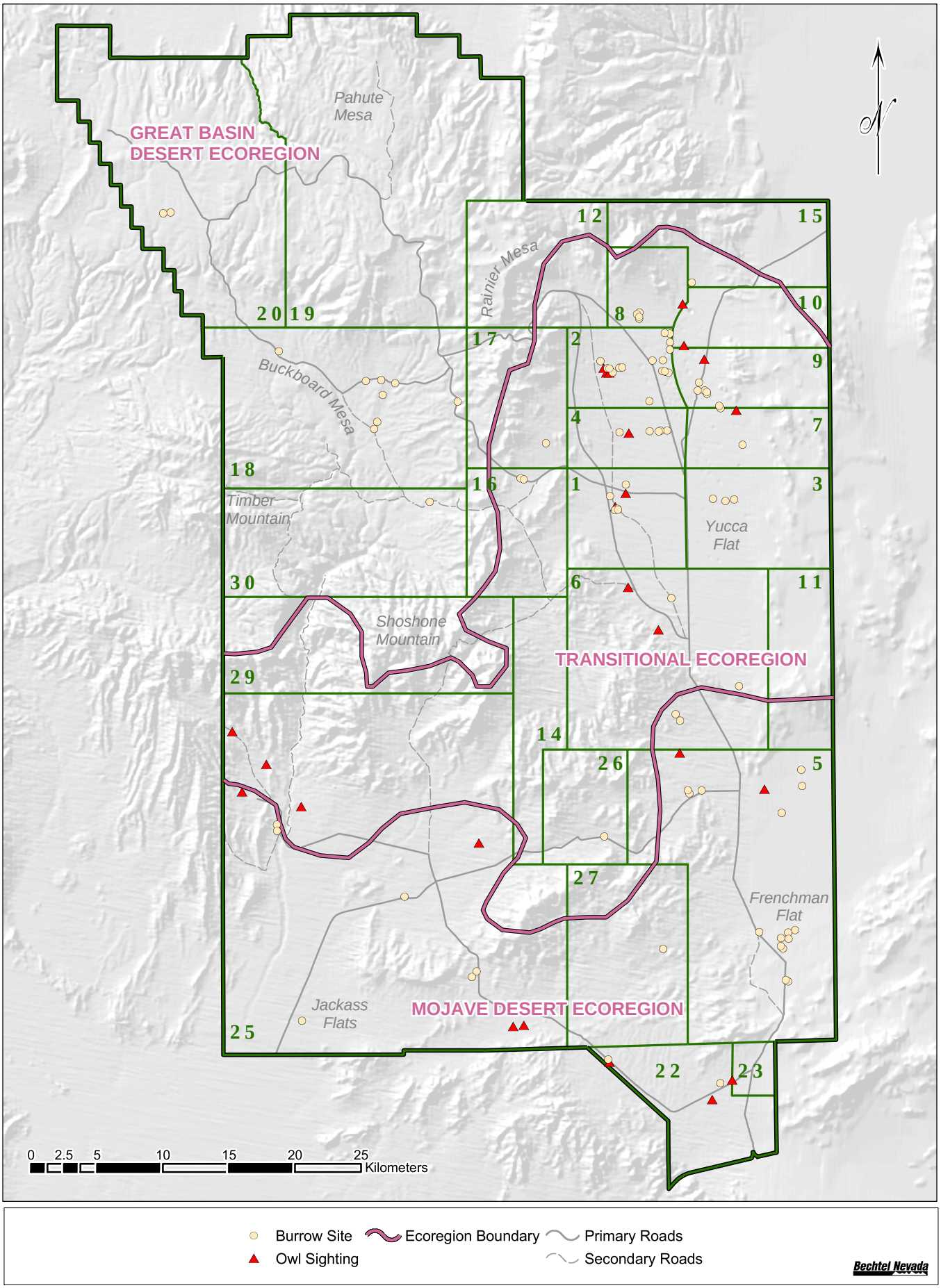


Figure ## Known western burrowing owl distribution on the NTS

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5.2.1.4 Coordination With Other Wildlife Agencies/Biologists

The FWS asked BN biologists to review a draft of the document they prepared titled *Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States* (Anderson *et al.*, 2001). This plan includes a state-by-state summary. BN biologists submitted substantial comments to the plan, particularly for the Nevada state summary, including valuable information from burrowing owl monitoring on the NTS.

5.2.2 Bat Species of Concern

No bat monitoring using mist nets or the ultrasonic call recording system (Anabat II) occurred this year. Two water sources on the NTS that have never been monitored for bats were scheduled to be monitored during the spring. However, when the water sources were checked, they were found to be dry so they were not monitored.

5.2.2.1 Building Roost Site Surveys

Bats or bat sign were documented at seven buildings this year during biological surveys of 84 buildings scheduled for demolition (see Section 1.0). Five live bats (two California myotis [*Myotis californicus*], one Brazilian free-tailed bat [*Tadarida brasiliensis*], and two unknown myotis species [*Myotis* spp.]) and eight dead bats (four Brazilian free-tailed, one California myotis, one pallid bat [*Antrozous pallidus*], and 2 unknown species) were observed during these surveys. At one of the buildings, bat droppings from an unknown species were found. None of the identified species are species of concern.

Bats in buildings were found on three other occasions by NTS workers who then contacted Ecological Services biologists. One female western pipistrelle (*Pispistrellus hesperus*) and one male California myotis were found day roosting in Building 550 in Mercury. Two California myotis females were found in a building in Area 25. None of these were bat species of concern. All bats were taken out of the buildings and released a substantial distance away.

Results from biological surveys of buildings and reports by others of bats in buildings enables BN biologists to increase their knowledge about bat roosting sites on the NTS. These data are valuable because little information on specific bat roost sites exists for the NTS. Figure 6 shows the 28 known bat roost locations on the NTS to date. Roost site locations will continue to be documented in the future and stored in the EGIS bat database.

5.2.2.2 Coordination With Other Wildlife Agencies/Biologists

A BN biologist attended a meeting of the Nevada Bat Working Group in March 2002. The Nevada Bat Working Group discussed the final format and content of the Nevada Bat Conservation Plan that was written to address the status and conservation strategies for all bat species occurring in Nevada. The BN biologist provided input as one of the contributing authors to the *Nevada Bat Conservation Plan*, which was published and distributed in July 2002 (Altenbach et al., 2002). Information from bat monitoring on the NTS was included in the plan.

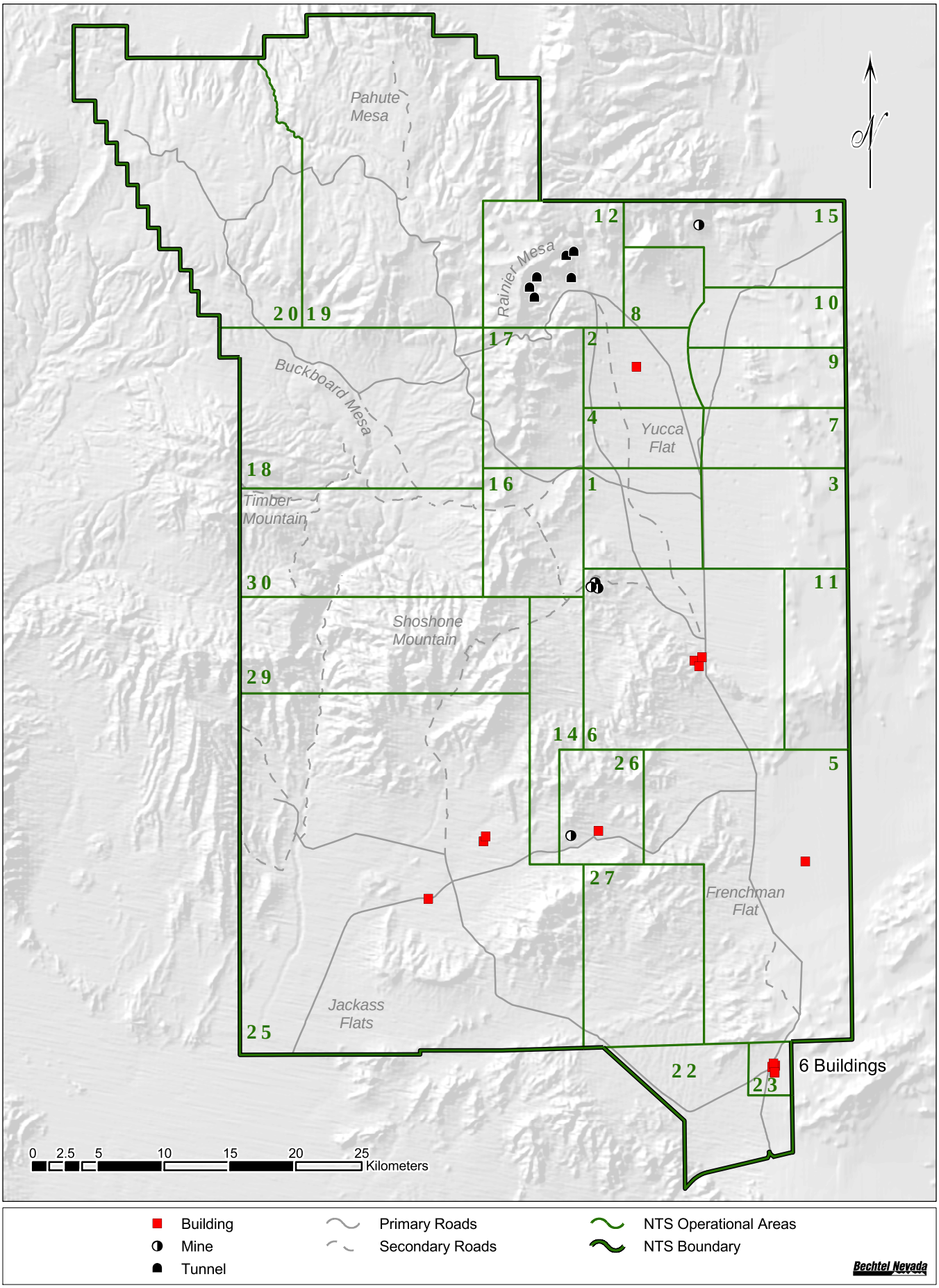

Figure 6. Known bat roost sites on the NTS

5.2.3 Wild Horses

Cattle and other livestock were removed from the NTS 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 1970s, although O'Farrell and Emery (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 2002 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 2002, BN biologists determined horse abundance and recorded horse sign along roads. Also, 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.

5.2.3.1 Abundance Survey

A count of individual horses was taken to estimate abundance on the NTS. The count was conducted during 20 nonconsecutive days between April and September. A standard road course on the NTS was driven to locate and identify horses (Figure 7). Individuals were identified by their unique physical features. The direct population count in FY 2002 was 33 individuals (Table 8) and does not include foals. None of the 11 foals observed last year survived to yearlings. Only five foals were observed with their mares in 2002, of which all were missing by the end of the summer. Three adult males and 1 adult female (> 3 years old) that were observed on the NTS last year were not observed this year.

From 1995 to 1998, the feral horse population declined 31 percent, from 54 to 37 adult individuals (Table 8). Over the past five years, the population appears to be stable. Six of the 16 foals observed in 1999 and 2000 survived to yearlings during the past two years. This resulted in stabilizing the horse population decline from the previous five years (1995-99). The addition of younger horses increases the herd's viability. The overall population declines from 1995 appear to be the result of low recruitment due to low foaling rates, poor foal survival, none to very low immigration of new adults, and moderate adult mortality. Also, older male horses have tended to disappear from the population over time, with only 8 males presently known in the NTS population (Table 8). It is not known how much of this decline is due to mortality versus emigration.

The horse population has been significantly impacted by drought this year. Poor physical condition was noted in numerous older adult horses during late summer. A decline in available forage or forage quality during a drought year could contribute to poor nutrition of adults and low foaling rates. Poor recruitment of younger horses (if it continues) will lead to an aging horse population, and older horses are more susceptible to death from drought-related stress than young horses. Old horses that are past their prime reproductive age also have lower foal production. Over the past ten years, observed causes of mortality among adults have included predation

figure 7

Table 8. 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		2001		2002	
Foals	1		1		3		8		5		11		11		5	
Yearlings	3		0		0		0		0		4		2		0	
Adults	M*	F	M	F	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	0	4	0	2
3 Year Olds	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4
> 3 Year Olds	22	29	21	24	19	20	16	21	11	20	13	21	11	20	8	19
Total (excluding foals)	54		46		40		37		31		38		37		33	

*M = male; F = female ** ( ) = dead

(four), collisions with vehicles (two), and drowning (one). An additional four adult horses have been found dead from unknown causes. Many horses have disappeared and are presumed dead.

5.2.3.2 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 2002, 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. Seven 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 2002 NTS horse range includes Kawich Canyon, Gold Meadows, Yucca Flat, southwest foothills of the Eleana Range, and southeast Pahute Mesa (Figure 7). Overall, the annual horse range appears not to have changed greatly from previous years. During the summer, horses are dependent on Captain Jack Spring, the only known water source in the Eleana Range (Figure 7). Man-made water sources on Yucca Flat have been removed in past years, and the increased distances horses must travel back and forth to Captain Jack Spring probably limits the herds grazing range to the north and east.

As in previous years, the NTS horse herd appears to consist of two components, one larger group of horses (about 20-25 individuals) that spends summers west of the Eleana Range and one smaller group (7-10 individuals) that summers east of the Eleana Range on Yucca Flat. These groups of horses probably intermix during the winter in the Eleana Range. As in 2001, some horses were observed during FY 2002 during the winter season (December-February) in the Eleana Range in Areas 17 and 18. These observations suggest that horses do not move off the NTS during the winter.

5.2.3.3 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 7) during different seasons. Man-made water source availability has not changed greatly on the NTS over the last six years. 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 and Camp 17 Pond were the most important summer-fall water sources for horses based on the presence and quantity of horse sign and trampled and grazed vegetation. Horses often use ephemeral water sources in winter such as rock tanks and natural pools that collect water from rain and snowmelt. They appear to be much less dependent on man-made sources in winter.

Wildhorse and Little Wildhorse seeps were used by several bands of horses (numbering about 20-23 individuals) during the spring of 2002 (as in previous years) when water was available. Horse usage declined during early summer as these springs dried up. The paucity of fresh sign in this region indicates that horses moved to higher elevations earlier than normal in FY 2002, and

were dependent on Camp 17 Pond for the remainder of the summer. Gold Meadows Spring was dry during July - September 2002 due to low summer rainfall in the area. The drying of water sources during 2002 probably restricted horse movements to higher elevations more than during a normal rainfall year.

There are presently six other man-made water sources within or on the edge of the annual horse range, however none of them were used by horses in FY 2002 (see section 5.3.2, Figure 10). Only two of these six water sources are permanent year-round: the E-Tunnel Containment Ponds and Area 12 Sewage Ponds. The other water sources are semipermanent, plastic-lined sumps, that occur at ER 19-1, ER 12-1, U10j, and U2gg (see Figure 10); they contain water only in the winter and spring. No horse sign have ever been found at these ponds, suggesting that horses do not drink from them.

5.2.4 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 5.1.2.1), there are nine raptors (Table 9) which are known to breed on the NTS (Greger and Romney, 1994b). During FY 2002, surveys to locate new raptor nests were discontinued. Work this year was focused on monitoring nests found during previous years and those found this year by BN biologists or other NTS workers in buildings or at sites close to ongoing disturbances.

Table 9. Raptor species that are known to breed on the NTS

Raptor Species	Common Name
Aquila chrysaetos	Golden eagle
Asio otus	Long-eared owl
Bubo virginianus	Great-horned 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

5.2.4.1 Nest Sites

Fourteen previously located nests and four new nests were visited from April through July to check for reproduction (Table 10). One known nest (A27-PP1) was not visited, but NTS workers reported active breeding. A total of six nests were active this year (Table 10, Figure 8). Two active Great-horned owl nests, one in Area 6 (A6-B1) and one in Area 3 (A3-B2) were found in buildings in Yucca Flat and represent the second consecutive year of documented breeding of this species on the NTS. The building in Area 3 was demolished this year after two young fledged from the nest.

Breeding pairs of American kestrels were documented from two locations on Yucca Flat during FY 2002. At the U1a facility in Area 1 (A1-CR1), an active nest containing three chicks and one egg was found by NTS workers in an elevated metal crane boom. A BN biologist was notified. Upon consultation with the Las Vegas FWS office, the biologist relocated the chicks and the egg to a nest box that was placed on top of a building near the crane. These birds did not survive due to subsequent abandonment of the nest after relocation. A second American kestrel nest site (A6-B2) was somewhere inside a new building being constructed at the Atlas facility in Area 6. NTS workers reported to BN biologists that young birds appeared to be trapped in the building. An NTS worker found one young kestrel dead in the building and captured one young inside the building and released it outside. A third juvenile escaped from the building on its own. The cavity nest could not be found inside the building.

It was reported to BN biologists that a Red-tailed hawk was nesting in Area 27 on a powerline pole nest. This nest (A27-PP1; Table 10) has been used for four consecutive years.

5.2.4.2 Mortality Records

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 12 years, from 1990 to 2002, 31 incidents of dead raptors have been recorded on the NTS (Table 11). The known causes of death include seven roadkills, three electrocutions, two suspected drownings, three predator kills, and two entrapments in buildings. Also, a total of seven chicks have been found dead and seven adult birds found dead of unknown causes.

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 were started in FY 1997 as components of the EMAC program. Periodic wetland monitoring may help identify annual fluctuations in measured parameters that are natural and unrelated to NNSA/NV activities. Also, if a spring classified as a jurisdictional wetland were to be unavoidably impacted by an NNSA/NV project, mitigation for the

Table 10. Status of known raptor nests on the NTS

			Number of Young Observed				
Nest ID	**Species**	**Nest Type**	**FY 1998**	**FY 1999**	**FY 2000**	**FY 2001**	**FY 2002**
A12-C1	Golden eagle	Cliff stick nest	1		~~*	~~	~~
A16-C1	Golden eagle	Cliff stick nest	--**	1	~~	~~	~~
A4-Y1	Red-tailed hawk	Joshua tree nest	3	~~	~~	~~	~~
A6-Y1	Red-tailed hawk	Joshua tree nest	2	~~	~~	~~	~~
A6-Y2	Red-tailed hawk	Joshua tree nest	1	~~	~~	~~, collapsed	~~, collapsed
A6-C1	Red-tailed hawk	Cliff stick nest	1	~~	~~	~~	~~
A3-Y1	Red-tailed hawk	Joshua tree nest	--	3	~~	~~	~~
A3-PP1	Red-tailed hawk	Powerline pole nest	--	--	1	~~, collapsed	~~, collapsed
A5-W1	Red-tailed hawk	Willow tree nest	--	--	1	~~	~~
A6-Y3	Red-tailed hawk	Joshua tree nest	--	--	3	3	~~
A27-PP1	Red-tailed hawk	Powerline pole nest	--	??***	2	3	??
A4-Y2	Swainson's hawk	Joshua tree nest	2	~~	~~	~~	~~
A25-B1	Barn owl	Cavity nest in building	--	--	??	8	building demolished
A23-B1	Barn owl	Cavity nest in building	--	--	--	4	building demolished
A6-B1	Great-horned owl	Building stick nest	--	--	--	3	3
A3-B1	Great-horned owl	Building stick nest	--	--	--	1	~~
A25-B2	Red-tailed hawk	Building stick nest	--	--	--	1	~~
A3-B2	Great-horned owl	Building stick nest	--	--	--	--	2
A3-Y2	Red-tailed hawk	Joshua tree	--	--	--	--	??
A6-B2	American kestrel	Cavity nest in building	--	--	--	--	3
A1-CR1	American kestrel	Cavity nest in crane	--	--	--	--	3
	Known Total		**10**	**4**	**7**	**23**	**11**

*~~= Inactive **-- = Unknown, nest found in subsequent years ***?? = nest active but number of young not determined

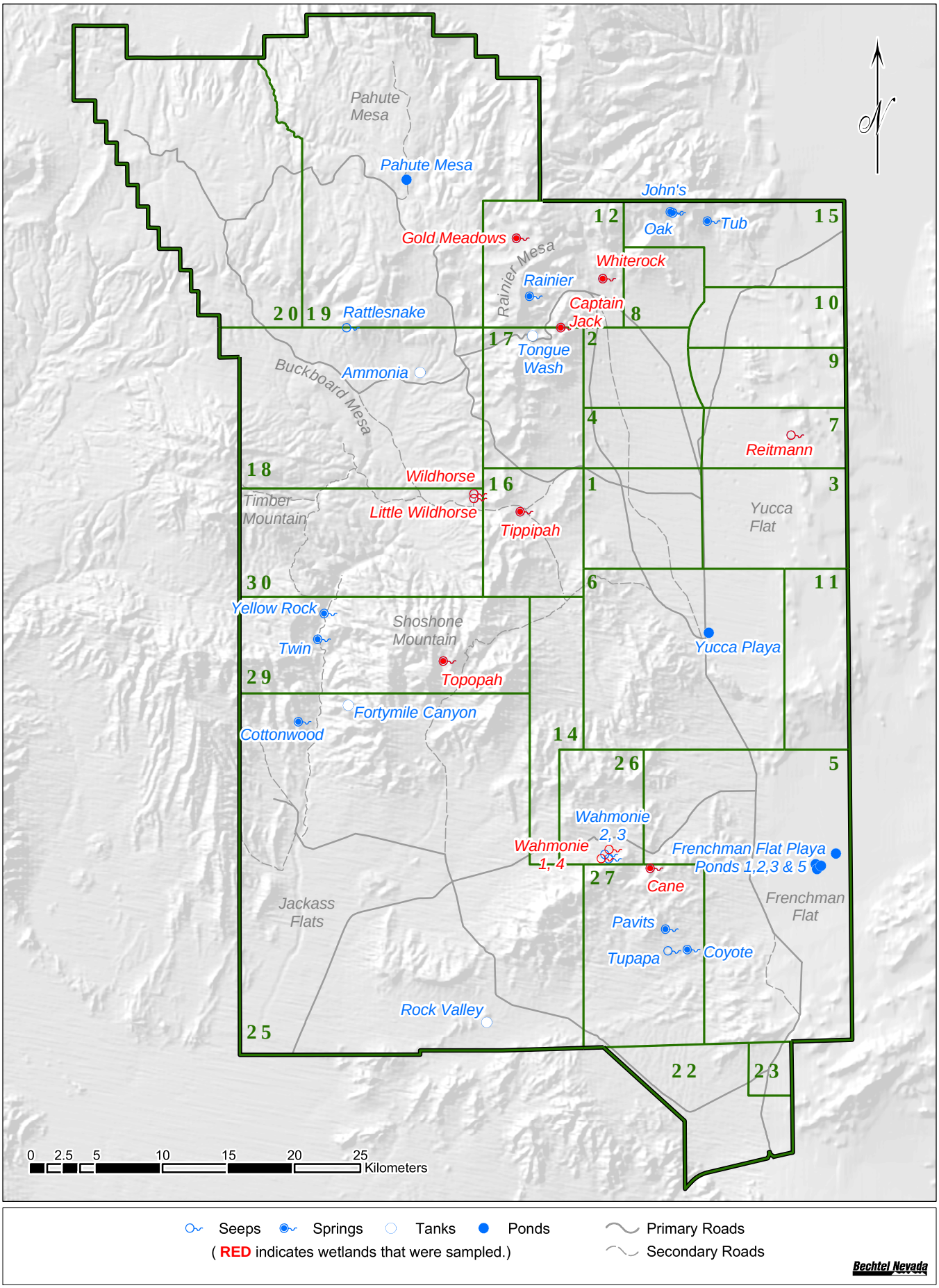

Figure ## Natural water sources on the NTS sampled during FY 2002

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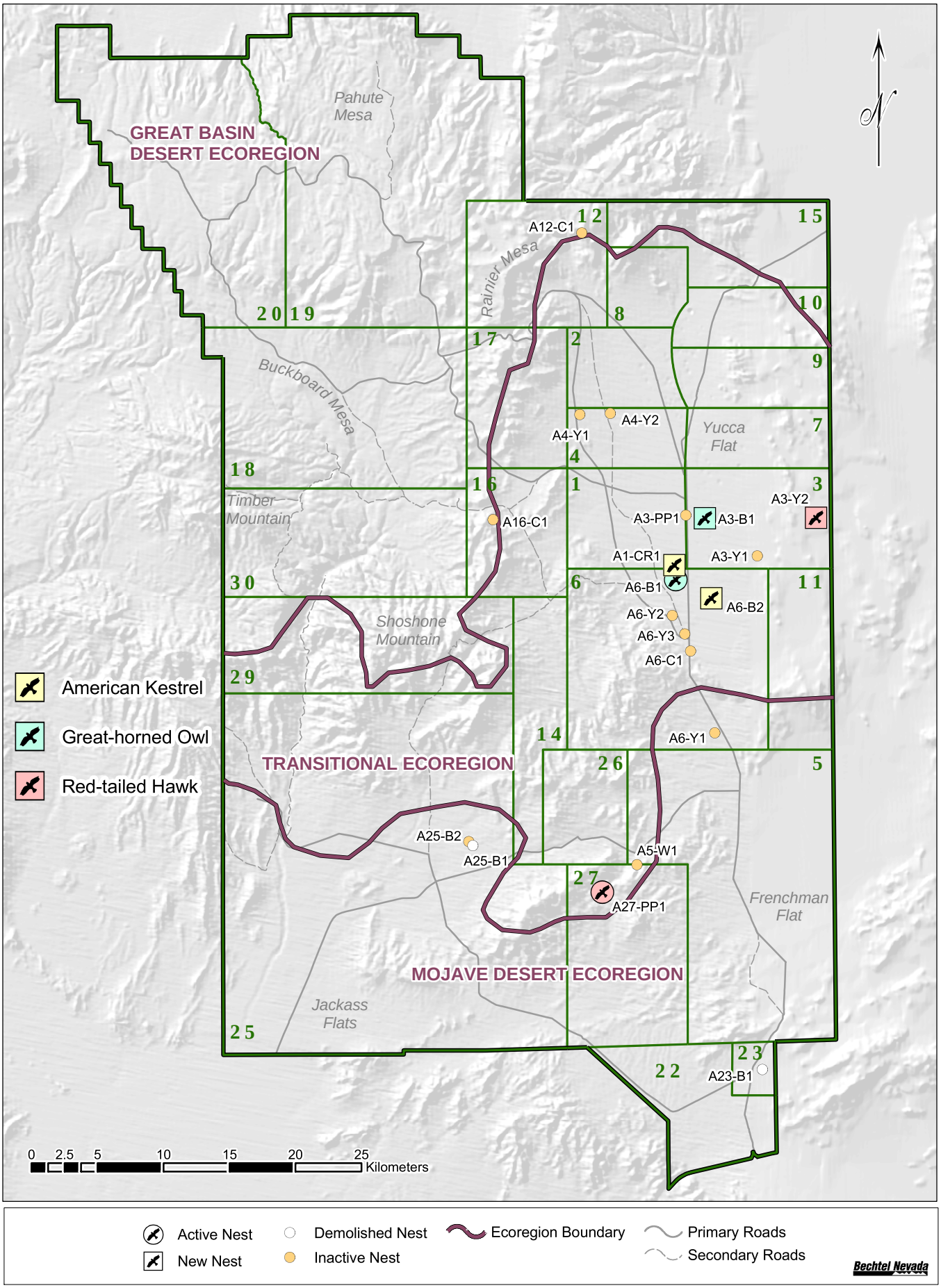

Figure ## Monitored raptor nests on the NTS during FY 2002

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Table 11. Summary of NTS raptor mortality records from 1990-2002

Species	Roadkill	Electrocutio	Drowning	Predation	Entrapment	Chick Mortality	Unknown	Totals
American kestrel				1	1	3	2	**7**
Barn owl	1			1	1	3	1	**7**
Golden eagle	1	1					1	**3**
Great-horned owl	3	1				1		**5**
Prairie falcon				1				**1**
Red-tailed hawk	2	1	1				1	**5**
Sharp-shinned hawk							1	**1**
Turkey vulture							1	**1**
Western burrowing owl			1					**1**
Totals	**7**	**3**	**2**	**3**	**2**	**7**	**7**	**31**

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 2002 to document wildlife use and mortality.

5.3.1 Wetlands Monitoring

Monitoring of selected NTS wetlands continued this fiscal year to characterize seasonal baselines and trends in physical and biological parameters. Eleven wetlands (Figure 9) 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 12). Wildlife use data collected at these water sources are shown in Table 13. Due to a low rainfall year, declines in wetland surface area, flow rates, and wildlife use were noted at most wetlands on the NTS during FY 2002 compared to FY 2001.

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 10), include 35 plastic-lined sumps, 9 sewage treatment ponds, 8 unlined well ponds, and 2 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. 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 2002, February, May, and September 2002. Sewage ponds and well reservoirs were visited once annually. 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. The presence 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 are recorded.

During FY 2002, 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, although numbers observed were low. Only one man-made pond (Camp 17 Pond in Area 18) was used this year by wild horses. Birds were observed much less at the plastic-lined sumps compared to the unlined ponds.

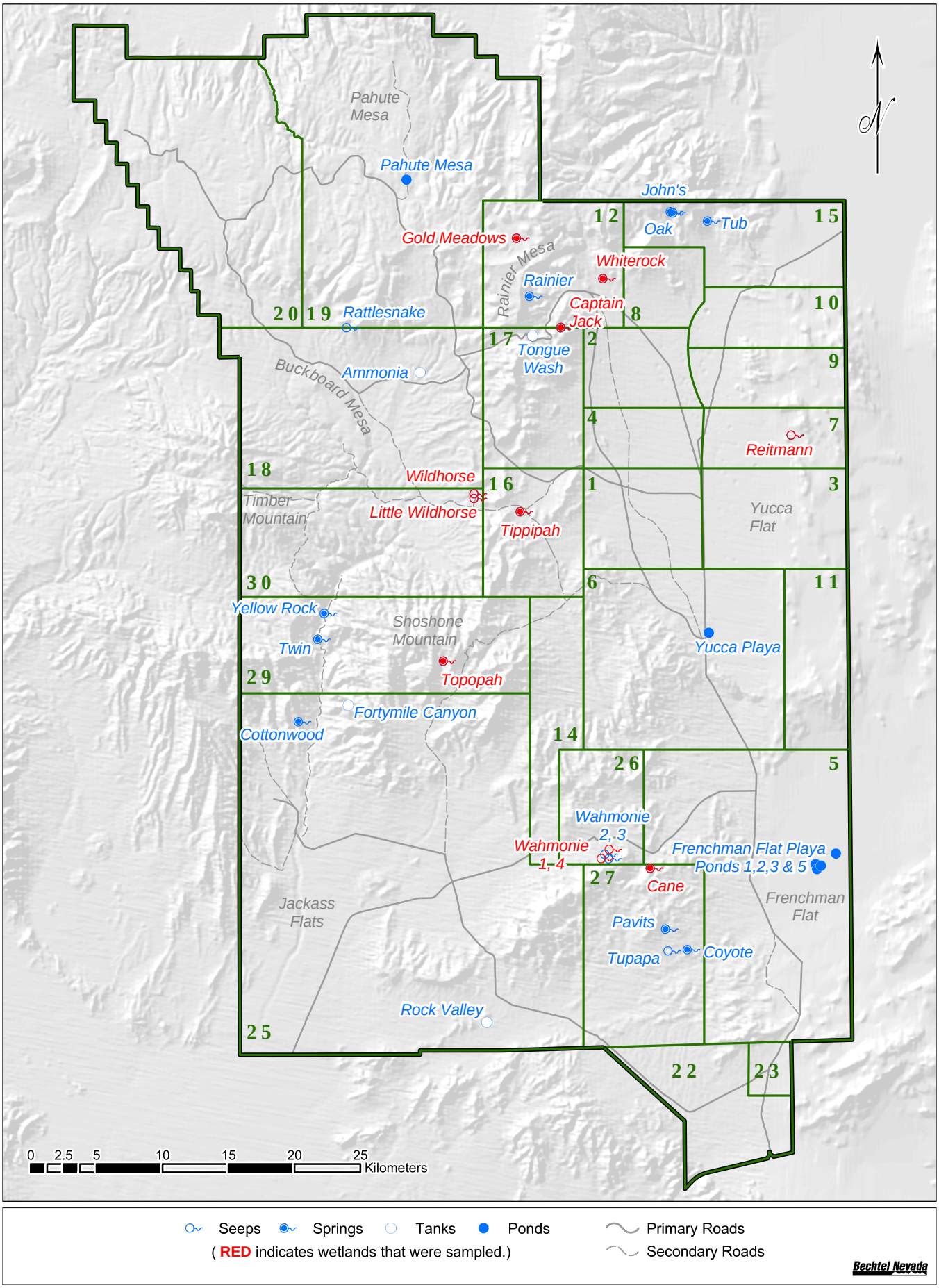

Figure ## Natural water sources on the NTS sampled during FY 2002

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Table 12. Seasonal data from selected natural water sources on the NTS collected during FY 2002

Water Source	Date	Surface Area of Water (m^2)[a]	Surface Flow Rate (L/Min)[b]	Disturbance at Spring
Cane Spring	08/07	6	0.3	None
Captain Jack Spring	08/20	23	1	Horse grazing and trampling
Gold Meadows Spring	07/03	0	0	Horse grazing and trampling
Little Wildhorse Seep	09/05	0	0	Horse grazing and trampling
Reitmann Seep	09/04	0.4	0	None
Tippipah Spring	08/01	130	NM[c]	None
Topopah Spring	09/05	1.5	0.015	None
Wahmonie Seep No. 1	08/07	0	0	None
Wahmonie Seep No. 4	08/07	0	0	None
Whiterock Spring	08/27	2	1.7	None
Wildhorse Seep	09/05	0	0	Horse grazing and trampling

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

No dead animals were recorded in any plastic-lined sumps during FY 2002. A sediment mound was constructed in Sump No. 3 at ER-20-6 during FY 2001 and has been monitored since that time to assess its effectiveness in preventing animal entrapment or drowning. This sediment ramp appears to be working well as deer sign have been recorded at this site, yet no deer or other wildlife entrapment or mortality has occurred.

Table 13. Seasonal wildlife use at selected natural water sources on the NTS during FY 2002. P = species present, inferred from sign.

Wildlife Observed	Cane Spring	Captain Jack Spring				Gold Meadows Spring	Little Wildhorse Seep	Reitmann Seep	Tippipah Spring	Topopah Spring	Wahmonie Seep No. 1	Wahmonie Seep No. 4	Whiterock Spring	Wildhorse Seep
Mammals	**08/07**	**08/20**	**08/27**	**08/28**	**09/04**	**07/03**	**09/04**	**09/14**	**08/01**	**09/05**	**08/07**	**08/07**	**08/27**	**9/4**
Coyote (*Canus latrans*)	1	P	P	P	P	P	P	P	P	P	P	P	P	P
Cottontail rabbit (*Sylviligus audubonii*)	1													
Feral horse (*Equus caballus*)		P	P	P	6	P	P							P
Mule deer (*Odocoileus hemionus*)	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Birds														
Black-throated sparrow (*Amphispiza bilineata*)	>4											>4		
Chukar (*Alectoris chukar*)		5								>3				
Common raven (*Corvus corax*)										1				
Cooper's hawk (*Accipiter cooperi*)		1												
Gambel's quail (*Calipepla gambelii*)	20								6				4	
Mourning dove (*Zenaida macroura*)								1	1					
Pinion jay (*Gymnorhinus cyanocephalus*)		1	25	7	5									
Roadrunner (*Geococcyx californianus*)							1							
Scrub jay (*Aphelocoma coerulescens*)		1												1
Western kingbird (*Tyrannus verticalus*)									1					

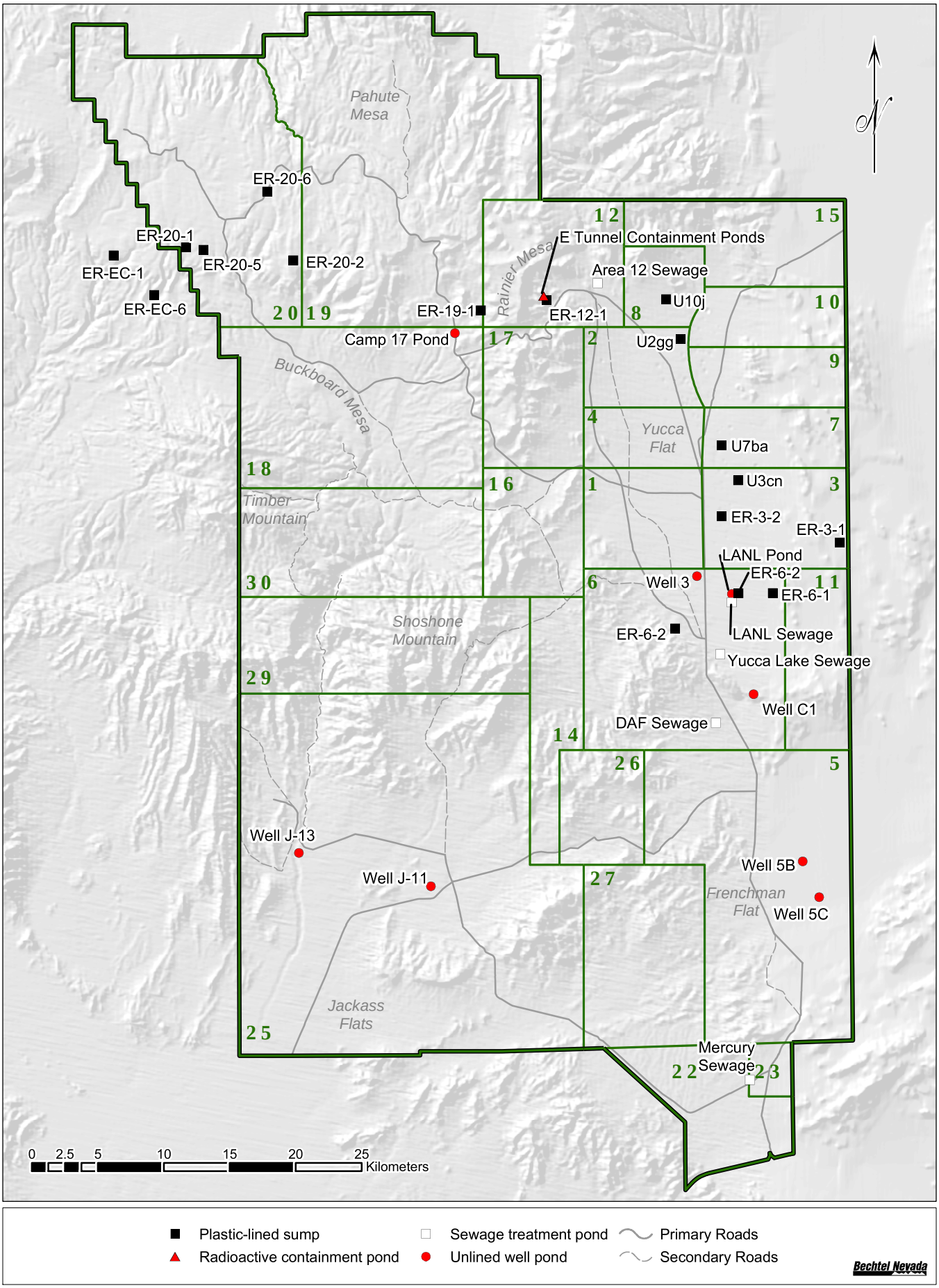

Figure ## Man-made water sources monitored for wildlife use and mortality on the NTS during FY 2002

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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 will be performed, if necessary, for certain types of chemical releases as per the center's programmatic Environmental Assessment. In addition, ESHD has requested that BN monitor any test which may impact plants or animals downwind which are off the playa. A document titled *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 center's 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. The control and treatment transects have similar environmental and vegetational characteristics.

BN biologists are tasked to review chemical release 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. Since 1996, the majority of chemical releases being studied at the center use such small quantities that downwind test-specific monitoring has not been necessary.

6.2 Task Progress Summary

BN reviewed chemical spill test plans for one experiment this year called Roadrunner. Five chemicals were released at such low volumes that there was no need to monitor downwind transects for biological impacts. Baseline monitoring was conducted at established control-treatment transects near the HAZMAT Spill Center in August. This sampling noted the condition of plants and the presence of wildlife sign during the period of vegetative dormancy. No differences in biota were noted along downwind (treatment) versus upwind (control) transects. Baseline monitoring data are collected to document any cumulative impacts over time of test center activities on biota downwind of the facility. These data are made available to neighboring land managers upon request. Noticeable cumulative impacts on biota are not expected.

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