12/16/77

NUBETH JOINT VENTURE

ENVIRONMENTAL REPORT
SUPPORTIVE INFORMATION
TO

APPLICATION FOR
SOURCE MATERIAL LICENSE

IN SITU SOLUTION MINING TEST SITE
SUNDANCE PROJECT
CROOK COUNTY
WYOMING

2.4 ECOLOGY

A study of vegetation and animal life at the test site area was conducted by Camp Dresser & McKee Inc., Environmental Sciences Division, 11455 West 48th Avenue, Wheatridge, Colorado 80033 (Enclosure 4).

2.4.1 Vegetation

The test site is in an area typical of rolling upland grasslands in the northern Great Plains. The elevation at the test site is approximately 4,240 feet and maximum relief in the area is approximately 300 feet. Soil types in the area are sand, sandy loam and clay.

Vegetation consists mostly of Junegrass, Blue Grama, Buffalo Grass, with Prairie Sandreed, Silvery Lupine on moister slopes and Needle-and-thread, Red Three-awn on some drier slopes and Wheatgrasses and Bluegrasses scattered throughout with or without Sagebrush. Approximately 70-85 per cent of the area is covered with this type of vegetation and the remainder with wet lowland or disturbed area vegetation. (Enclosure 4)

2.4.2 Wildlife

Animal species of the area are typical of the mixed grass prairie environment.

Birds observed include sparrows, larks, blackbirds, doves, swallows, nighthawk; various falcons and hawks (Enclosure 4). Also seen in the area are golden eagles, great horned owls and, rarely, bald eagles.

Mammals observed are typical of the environment and include jackrabbits, cottontails, ground squirrels, foxes, badgers and skunks (Enclosure 4). In addition pronghorn antelope, deer, Ref. 2) coyotes and various field mice, gophers, shrews and bats are known to occur in the general area. (Enclosure 5)

A small livestock watering dam known as Oshoto Reservoir which is located approximately 3000 feet north of the test site collects intermittent runoff and provides a habitat for waterfowl such as mallards, teals, grebes, pintails and herons as well as frogs (Enclosure 4) and other amphibians and reptiles. No fish are understood to be present.

ENCLOSURE 4

Report, Uranium Test Site Near Moorcroft, Wyoming -
Camp Dresser & McKee Inc., Environmental Engineers,
Scientists, Planners and Management Consultants

Refers to sections 2.4, 2.4.1, 2.4.2

environmental engineers, scientists, planners and management consultants

11455 West 48th Avenue
Wheat Ridge, CO 80033
(303) 422-0469

August 8, 1977

Al Stoick
Nuclear Dynamics
200 South Lowell
Casper, Wyoming 82601

Dear Mr. Stoick:

Enclosed is the report resulting from my recent field trip to your uranium test site near Moorcroft, Wyoming. Although no one-time species list can ever be considered complete, I feel confident that few species -- and certainly no major ones -- were overlooked.

Based on my previous conversations with the WDEQ, these data should be more than adequate to accompany your present permit application. If and when additional studies are required, such as vegetation maps, plant productivity, animal breeding densities, etc., please contact either David White or me.

Based on my previous conversations with the WDEQ, these data should be more than adequate to accompany your present permit application. If and when additional studies are required, such as vegetation maps, plant productivity, animal breeding densities, etc., please contact either David White or me.

We have enjoyed working with you and look forward to future involvement on this or other Nuclear Dynamics projects.

Sincerely,

Allen B. Crockett

Allen B. Crockett, Ph.D.

ABC/kt

Enclosure

The Nuclear Dynamics test site is located in the northeastern Powder River Basin, approximately 24 miles north of Moorcroft, Crook County, Wyoming (Section 18 and 19, T 53 N, R 67 W). In general, the site is in an area of gently rolling uplands underlain by Upper Cretaceous Lance strata. The uplands are dissected by small drainages which are tributaries to Oshoto Reservoir.

The vegetation of the site is typical of western high plains mixed-grass prairie of the region. Uplands, especially hilltops, were dominated by Prairie Junegrass (Koeleria cristata), Blue Grama (Bouteloua gracilis), and Buffalo Grass (Buchloe dactyloides) turf interspersed with a variety of common forbs, such as Yellow Owl-clover (Orthocarpus luteus), Purple Prairie-clover (Dalea purpurea), Blazing Star (Liatris punctata), Golden-aster (Heterotheca villosa), Ironplant Goldenrod (Haplopappus spinulosus), Purple-headed Coneflower (Echinacea angustifolia), Prairie Coneflower (Ratibida columnifera), Yarrow (Achillea lanulosa), Silver Scurfpea (Psoralea argophylla), Milkvetch (Astragalus cf. bisulcatus), Silver Loco (Oxytropis cf. sericea), Winter or Prairie Sage (Artemisia frigida), and a variety of less abundant species (see complete species list appended to this report).

Apparently slightly less severe sites, perhaps in areas of snow accumulation or greater shade, were similar to hilltops but varied by having increased abundance of Prairie Sandreed (Calamovilfa longifolia), Green Needlegrass (Stipa viridula), Bluegrass (Poa canbyi and Poa secunda), Slimflower Scurf-pea (Psoralea tenuiflora), Silvery Lupine (Lupinus argenteus), Goldenrod (Solidago spp.), and Pasture Sage (Artemisia ludoviciana).

Apparently slightly more severe sites, with southwesterly exposures, greater drainage, or sandier substrata, varied from hilltops in having Needle-and-thread (Stipa comata), Indian Ricegrass (Oryzopsis hymenoides), Red Three-awn (Aristida longiseta), Plains Muhly (Muhlenbergia cuspidata), Skeletonweed (Lygodesmia juncea), Globe Mallow (Sphaeralcea coccinea), and Cut-leaf Even-ing Primrose (Oenothera coronopifolia).

In addition were scattered occurrences throughout the three above-mentioned upland mixed-grass areas of Big Sagebrush (Artemisia tridentata), Gardner Saltbrush (Atriplex gardneri), Rubber Rabbitbrush (Chrysothammus nauseosus), Broom Snakeweed (Gutierrezia sarothrae), Small Soapweed (Yucca glauca), Prickly Pear (Opuntia polycantha), Greasewood (Sarcobatus vermiculatus), and Silver Sagebrush (Artemisia cana). The latter two species were generally restricted to arroyos or other drainages.

Also present throughout the mixed-grass areas, but nowhere abundant, were Montana Wheatgrass (Agropyron albicans), Desert Wheatgrass (Agropyron desertorum), Western Wheatgrass (Agropyron smithii), Slender Wheatgrass (Agropyron trachycaulum and Agropyron trachycaulum ssp. majus), and Bearded Wheatgrass (Agropyron trichophorum).

Wetlands were of three basic types: grass/sedge, forb/shrub, and rooted aquatics. The grass/sedge wetlands were variously dominated by Big Bluestem (Andropogon gerardii), Timothy (Phleum pratense), Alkali Muhly (Muhlenbergia asperifolia), Nuttall Alkaligrass (Puccinellia nuttalliana), Redtop (Agrostis cf. gigantea), Northern Reedgrass (Calamagrostis cf. inexpansa), Smooth Brome (Bromus inermis), Threadleaf Sedge (Carex filifolia), Sedge (Carex xerantica), Rush (Juncus interior), American Bulrush (Scirpus americanus), and Longstem Spikerush (Eleocharis macrostachya). A variety of forbs were present but never dominant. These included Harebell (Campanula rotundifolia) and Clover (Trifolium sp.)

Forb/shrub wetlands generally were comprised of Western Snowberry (Symphoricarpos occidentalis), Wild Rose (Rosa sp.), Poison Ivy (Toxicodendron radicans), Curly-leaf Dock (Rumex crispus), Horsemint (Monarda fistulosa var. menthaefolia), Field Mint (Mentha arvensis), Milkweed (Asclepias speciosa and Asclepias pumila), Sunflower (Helianthus maximiliani and Helianthus rigidus var. subrhomboideus), Blue Lettuce (Lactuca tataria ssp. pulchella), Canada Thistle (Cirsium arvense), Bull Thistle (Cirsium vulgare), Yellow Thistle (Cirsium ochrocentrum), Wild Licorice (Glycyrrhiza lepidota), and Cocklebur (Xanthium strumarium), in addition to various wetland graminiforms. One lone Chokeberry (Prunus virginiana

var. melanocarpa) was present on the site.

Rooted aquatics included Cattail (Typha latifolia) and Arrow-head (Sagittaria cf. latifolia) along the reservoir itself, or in isolated puddles in adjacent tributaries.

Disturbed areas were dominated by weedy forbs and grasses, such as Ragweed (Ambrosia psilostachya and Ambrosia trifida), Pigweed (Amaranthus retroflexus), Lambsquarters/Goosefoot (Chenopodium album, Chenopodium incanum and Chenopodium leptophyllum), Russian-thistle (Salsola iberica), Fireweed Summer-cypress (Kochia scoparia), Knotweed (Polygonum aviculare and Polygonum ramossisimum), Black Medic (Medicago lupulina), Buttonweed Mallow (Malva neglecta), Prickly Lettuce (Lactuca serriola), Common Sunflower (Helianthus annus), Curlycup Gumweed (Grindelia squarrosa), Salsify (Tragopogon sp.), Dandelion (Taraxacum officinale), Plantain (Plantago patagonica), and a variety of mustards (Allyssum, Lepidium, Sisymbrium, and Thlaspi), as well as the thistles (Cirsium) listed above. Weedy grasses were Foxtail Barley (Hordeum jubatum), especially in moister sites, and Cheatgrass or Downy Brome (Bromus tectorum) and Japanese Brome (Bromus japonicus), especially on drier sites. Disturbed areas were primarily restricted to roads, buildings, or old drill sites and comprised a small percentage of the total area.

Domestic species whose presence probably is related, at least originally, to revegetation efforts included Yellow Sweetclover (Melilotus officinalis), Alfalfa (Medicago sativa), and Smooth Brome (Bromus inermis). These species were scattered throughout the site but were never dominant.

In summary, most of the site was covered by a well-developed turf of Junegrass, Blue Grama, and Buffalo Grass, with Prairie Sandreed and Silvery Lupine dominant on moister slopes, with Needle-and-thread and Red Three-awn dominant on some drier slopes, and with Wheatgrasses and Bluegrasses scattered throughout. This broad vegetation type, with or without Sagebrush, comprised 70 - 85 percent of the rolling landscape. The remaining 15 - 30 percent was divided between wet lowlands with grass/sedge, forb/shrub, or rooted aquatic dominants, and weedy disturbed areas.

Animals of the site were typical of mixed grass prairie and included Brewer's Sparrow (Spizella breweri), Vesper Sparrow (Pooecetes gramineus), Lark Sparrow (Chondestes grammacus), Savannah Sparrow (Passerculus sandwichensis), Le Conte's Sparrow (Passerherbulus caudacutus), Lark Bunting (Calamospiza melanocorys), Horned Lark (Eremophila alpestris), Western Meadowlark (Sturnella neglecta), Sage Thrasher (Oreoscoptes montanus), Mourning Dove (Zenaidra macroura), and Brewer's Blackbird (Euphagus cyanocephalus) in grasslands; Red-winged Blackbird (Agclaius phoeniceus), Song Sparrow (Melospiza melodia), and common Yellowthroat (Geothlypis trichas) in wetlands; Great Blue Heron (Ardea herodias), Mallard (Anas platyrhynchos), Pintail (Anas acuta), Gadwall (Anas strepera), American Widgeon (Anas americana), Blue-winged Teal (Anas discors), Green-winged Teal (Anas carolinensis), and Horned Grebe (Podiceps auritus) in standing water; and Cliff Swallow (Petrochelidon pyrrhonota), Barn Swallow (Hirundo rustica), Common Nighthawk (Chordeiles minor), Eastern Kingbird (Tyrannus tyrannus), Say's Phoebe (Sayornis saya), Loggerhead Shrike (Lanius ludovicianus), American Kestrel (Falco spaverius), Prairie Falcon (Falco mexicanus), Rough-legged Hawk (Buteo lagopus), Red-tailed Hawk (Buteo jamaicensis), and Marsh Hawk (Circus cyaneus) across the site. In addition, numerous shorebirds, primarily Tringa and Calidris species were present in migratory flocks.

Mammals observed were White-tailed Jackrabbit (Lepus townsendii), Cottontail (Sylvilagus sp.), Thirteen-lined Ground Squirrel (Spermophilus tridecemlineatus), Red Fox (Vulpes vulpes), Badger (Taxidea taxus), and Striped Skunk (Mephitis mephitis). Shrews, bats, gophers, mice, voles, coyotes, deer, and pronghorn antelope are presumed to occur as well but were not seen.

The only amphibian seen was the Leopard Frog (Rana pipiens); numerous reptiles and other amphibians undoubtedly are present also. The ichthyofauna of water bodies was not surveyed.

Table 1 - Vegetation by Life-form of the Nuclear Dynamics Test Site, July 1977

ANNUAL FORBS

Scientific Name	Common Name
Alyssum desertorum	Desert Alyssum
Amaranthus retroflexus	Redroot Pigweed
Ambrosia psilostachya	Ragweed
Ambrosia trifida	Giant Ragweed
Chenopodium album	Lambsquarters
Chenopodium incanum	Goosefoot
Chenopodium leptophyllum	Narrowleaf Goosefoot
Cleome serrulata	Rocky Mountain Beeplant
Helianthus annus	Common Sunflower
Kochia scoparia	Fireweed Summer-cypress
Lactuca serriola	Prickly Lettuce
Lepidium densiflorum	Prairie peppergrass
Malva neglecta	Buttonweed
Medicago lupulina	Black Medic
Orthocarpus luteus	Yellow Owl-clover
Plantago patagonica	Wooly Plantain
Polygonum aviculare	Prostrate Knotweed
Polygonum ramossisimum	Upright Knotweed
Salsola iberica	Russian-thistle
Sisymbrium altissimum	Tumbling Hedgemustard
Thlaspi arvense	Pennycress
Xanthium strumarium	Cocklebur

ANNUAL GRAMINIFORMS

Bromus japonicus	Japanese Brome
Bromus tectorum	Downy Brome, Cheatgrass

Table 1 - Vegetation by Life-form of the Nuclear Dynamics Test Site, July 1977, Continued

BIENNIAL FORBS

Scientific Name	Common Name
Cirsium arvense	Canada Thistle
Cirsium ochrocentrum	Yellow Thistle
Cirsium vulgare	Bull Thistle
Erigeron strigosus	Daisy Fleabane
Grindelia squarrosa	Curlycup Gumweed
Melilotus officinalis	Yellow Sweetclover
Tragopogon sp.	Salsify

PERENNIAL FORBS

Achillea lanulosa	Yarrow
Antennaria	Pussytoes
Arnica fulgens	Arnica
Artemisia frigida	Winter or Prairie Sage
Artemisia ludoviciana	Pasture Sage
Asclepias pumila	Low Milkweed
Asclepias speciosa	Showy Milkweed
Aster commutatus	Aster
Aster ericoides	Aster
Astragalus sp.	Milkvetch
Astragalus cf. *bisulcatus*	Milkvetch
Campanula rotundifolia	Harebell or Bluebell
Dalea purpurea	Purple Prairie-clover
Echinacea angustifolia	Purple-headed Coneflower
Erigeron pumilus	Low Daisy
Eriogonum alatum	Buckwheat
Glycyrrhiza lepidota	Wild Licorice
Gutierrezia sarothrae	Broom Snakeweed
Haplopappus spinulosus var. *spinulosus*	Ironplant Goldenrod
Helianthus maximiliani	Sunflower
Helianthus rigidus var. *subrhomboideus*	Sunflower

Table 1 - Vegetation by Life-form of the Nuclear Dynamics Test Site, July 1977, Continued

PERENNIAL FORBS (cont.)

Scientific Name	Common Name
Heterotheca villosa	Golden-aster
Lactuca tataria ssp. *pulchella*	Large-flowered Blue Lettuce
Linum lewisii	Wild Blue Flax
Lupinus argenteus	Silvery Lupine
Lygodesmia juncea	Skeletonweed
Medicago sativa	Alfalfa
Melandrium drummondii	Drummond Campion
Mentha arvensis	Field Mint
Monarda fistulosa var. *menthaefolia*	Pink Bergamot or Horsemint
Oenothera coronopifolia	Cut-leaf Evening Primrose
Oxytropis sericea	Silver Loco
Oxytropis cf. lagopus	Haresfoot Loco
Phlox hoodii	Hood's Phlox
Potentilla arguta ssp. *arguta*	White Cinquefoil
Psoralea argophylla	Silver Scurfpea
Psoralea tenuiflora	Slimflower Scurfpea
Ratibida columnifera	Prairie Coneflower
Rumex crispus	Curly-leaf Dock
Rumex triangulivalvis	Dock
Sagittaria cf. latifolia	Arrow-head
Solidago missouriensis	Missouri Geldenrod
Solidago mollis	Goldenrod
Solidago nana	Goldenrod
Sphaeralcea coccinea	Globe Mallow
Taraxacum officinale	Dandelion
Trifolium sp.	Clover
Yucca glauca	Small Soapweed Yucca

Table 1 - Vegetation by Life-form of the Nuclear Dynamics Test Site, July 1977, Continued

PERENNIAL GRAMINIFORMS

Scientific Name	Common Name
Agropyron albicans	Montana Wheatgrass
Agropyron desertorum	Desert Wheatgrass
Agropyron smithii	Western Wheatgrass
Agropyron trachycaulum	Slender Wheatgrass
Agropyron trachycaulum ssp. *majus*	Compact Slender Wheatgrass
Agropyron trichophorum	Bearded Wheatgrass
Agrostis cf. *gigantea*	Redtop
Andropogon gerardii	Big Bluestem
Aristida longiseta	Red Three-awn
Bouteloua gracilis	Blue Grama
Bromus inermis	Smooth Brome
Buchloe dactyloides	Buffalo Grass
Calamagrostis cf. *inexpansa*	Northern Reedgrass
Calamovilfa longifolia	Prairie Sandreed
Carex filifolia	Threadleaf Sedge
Carex xerantica	Sedge
Eleocharis macrostachya	Longstem Spikerush
Hordeum jubatum	Foxtail Barley
Juncus interior	Rush
Koeleria cristata	Prairie Junegrass
Muhlenbergia asperifolia	Alkali Muhly
Muhlenbergia cuspidata	Plains Muhly
Oryzopsis hymenoides	Indian Ricegrass
Phleum pratense	Timothy
Poa canbyi	Canby Bluegrass
Poa secunda	Sandberg Bluegrass
Puccinellia nuttalliana	Nuttall Alkaligrass
Scirpus americanus	American Bulrush
Stipa comata	Needle-and-thread Grass
Stipa viridula	Green Needlegrass
Typha latifolia	Cattail

Table 1 - Vegetation by Life-form of the Nuclear Dynamics Test Site, July 1977, Continued

Scientific Name	Common Name
SHRUBS	
Artemisia cana	Silver Sagebrush
Artemisia tridentata	Big Sagebrush
Atriplex gardneri	Gardner Saltbrush
Chrysothamnus nauseosus	Rubber Rabbitbrush
Prunus virginiana var. *melanocarpa*	Chokecherry
Rosa sp.	Wild Rose
Sarcobatus vermiculatus	Greasewood
Symphoricarpos occidentalis	Western Snowberry
Toxicodendron radicans	Poison Ivy
CACTI	
Opuntia polycantha	Prickley Pear
LICHENS	
Parmelia chlorochroa	Lichen

ENCLOSURE 5

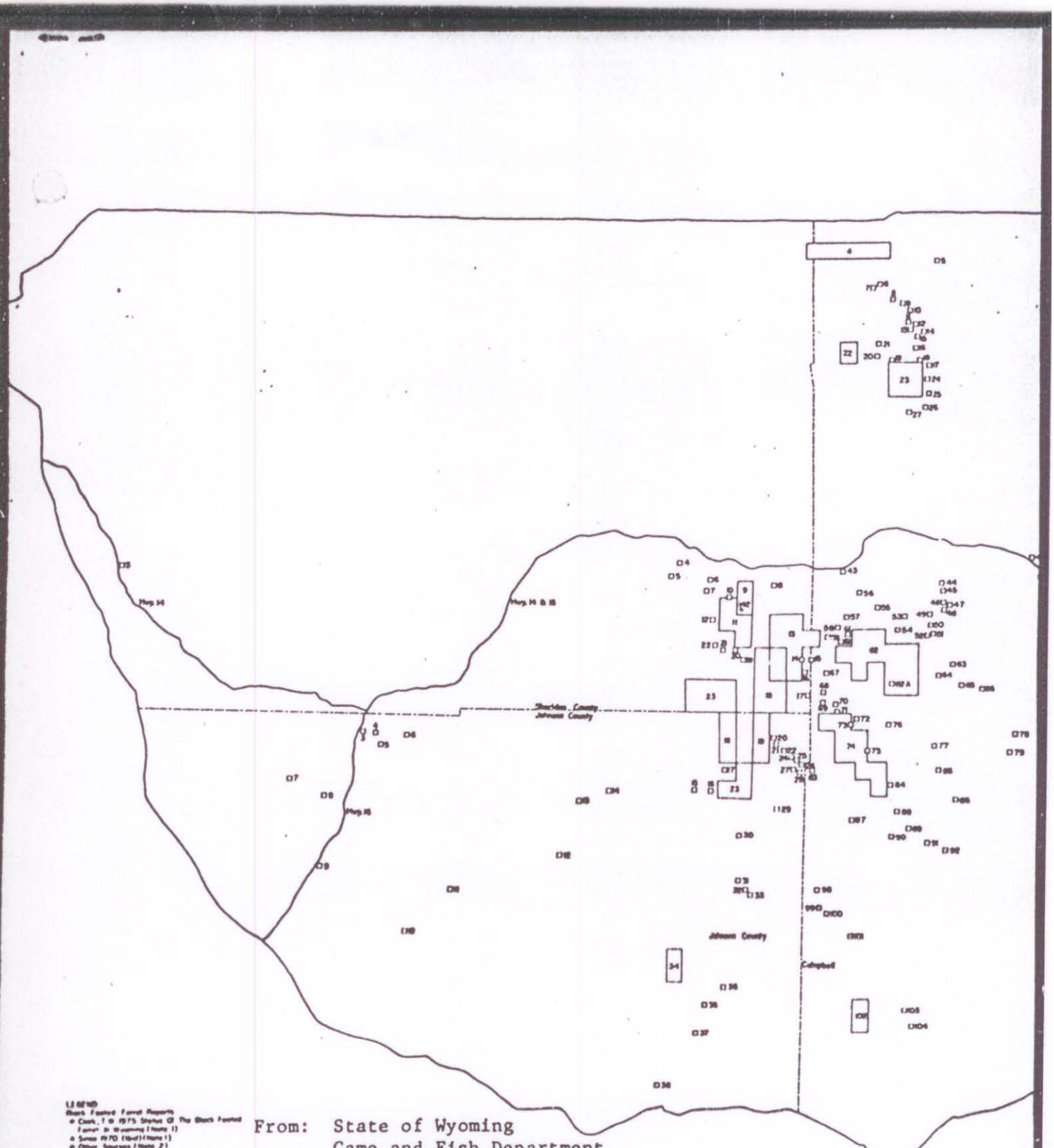
Wildlife Distribution Maps, State of Wyoming Game & Fish Dept. 5400 Bishop Boulevard, Cheyenne, Wyoming: White Tailed Deer, Mule Deer, Prairie Dog and Black Footed Ferred

Refers to section 2.4.2

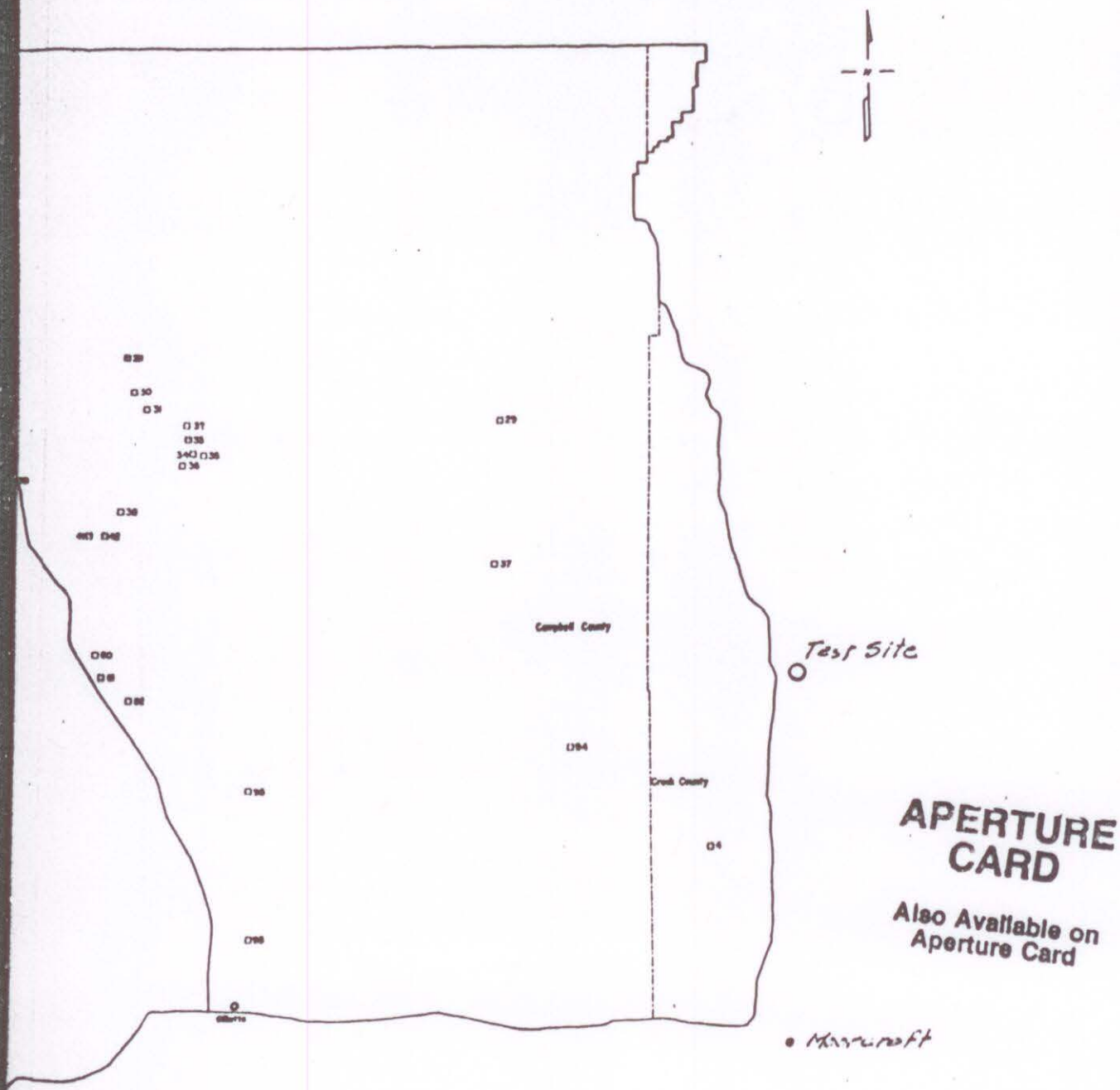
GUIDELINES FOR MAPPING WILDLIFE DISTRIBUTION

TYPE	DESCRIPTION	SYMBOL
Summer	The general geographic area occupied by a migratory herd during summer months. (Approximately June 1 - October 31)	——— S
Winter	The general geographic area occupied by a migratory herd during winter months. (Approximately November 1 - May 31)	——— W
Migration Routes	Definable route followed during seasonal movements year after year. a. General area of movement b. Specific movement corridors	Mr →→→ → → →
Parturition Areas	Geographic area consistently used for birth of young.	------ P
Breeding Areas	Geographic area consistently used for breeding by the majority of a population.	-·--·- B
Display Areas	Sites consistently used by the male segment of game bird populations during courtship (e.g., strutting grounds, dancing grounds, drumming sites, etc.) a. censused b. uncounted c. abandoned	
Year-long	Geographic area occupied by all or a portion of the population for the entire year.	——— Y
Combination	Range where animals occur during more than one season.	——— S/Y ——— W/Y
Critical	That range that is present in minimum amounts and is the determining factor in the potential for population maintenance and/or growth. This will usually be represented by a winter concentration where most members of a population are forced during periods of maximum snow cover each year or where most members of a population are concentrated during periodic severe winters. The critical range may also be represented by late fall water source or other resources in short supply (e.g., cover for breeding, nesting, fawning, etc.). The degree of criticalness is related to a specific herd and is not related to the density of animals relative to any other herd.	

From: State of Wyoming
Game and Fish Department
5400 Bishop Boulevard
Cheyenne, Wyoming 82002



From: State of Wyoming
Game and Fish Department
5400 Bishop Boulevard
Cheyenne, Wyoming 82002



PRAIRIE DOG AND BLACK FOOTED FERRET

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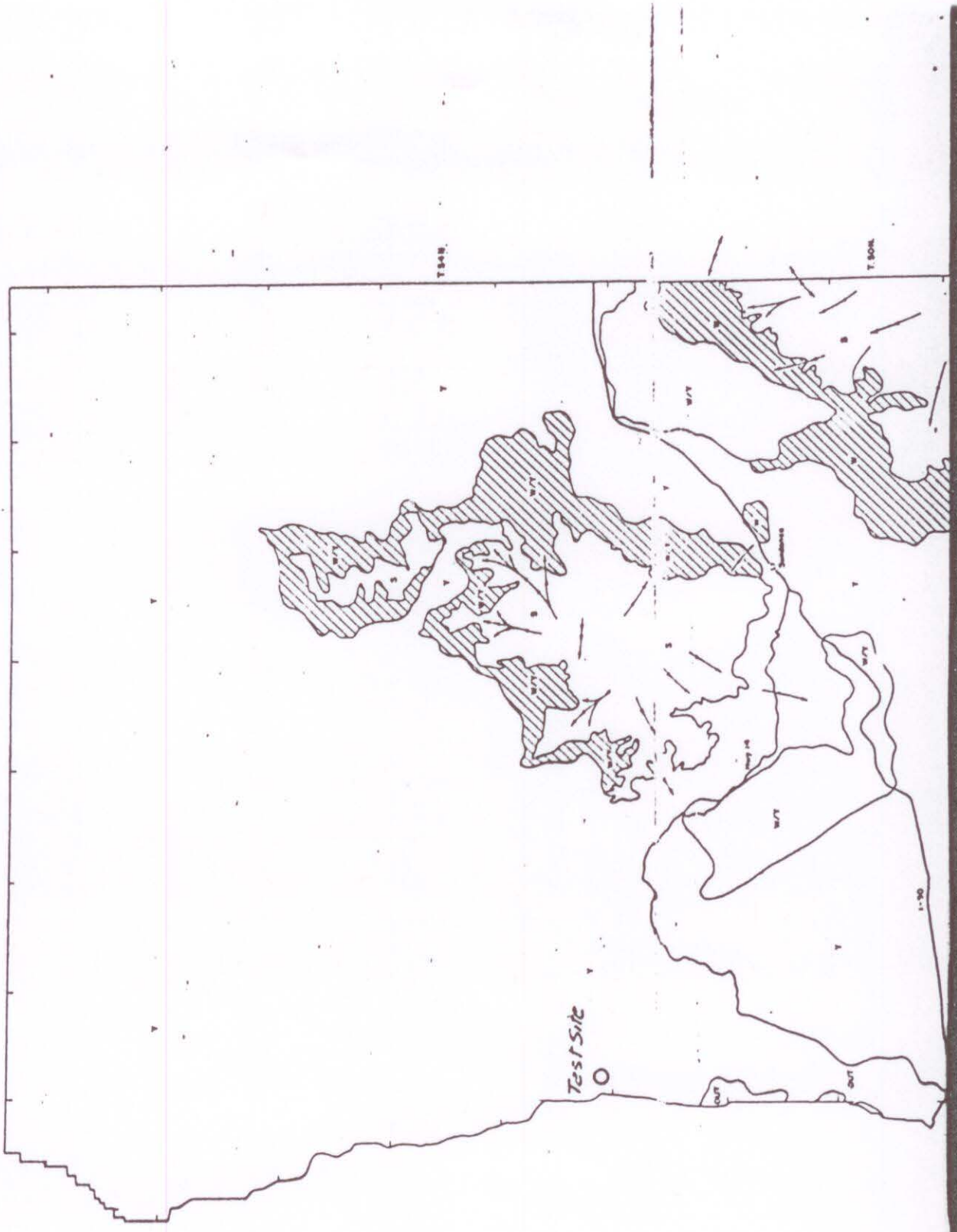

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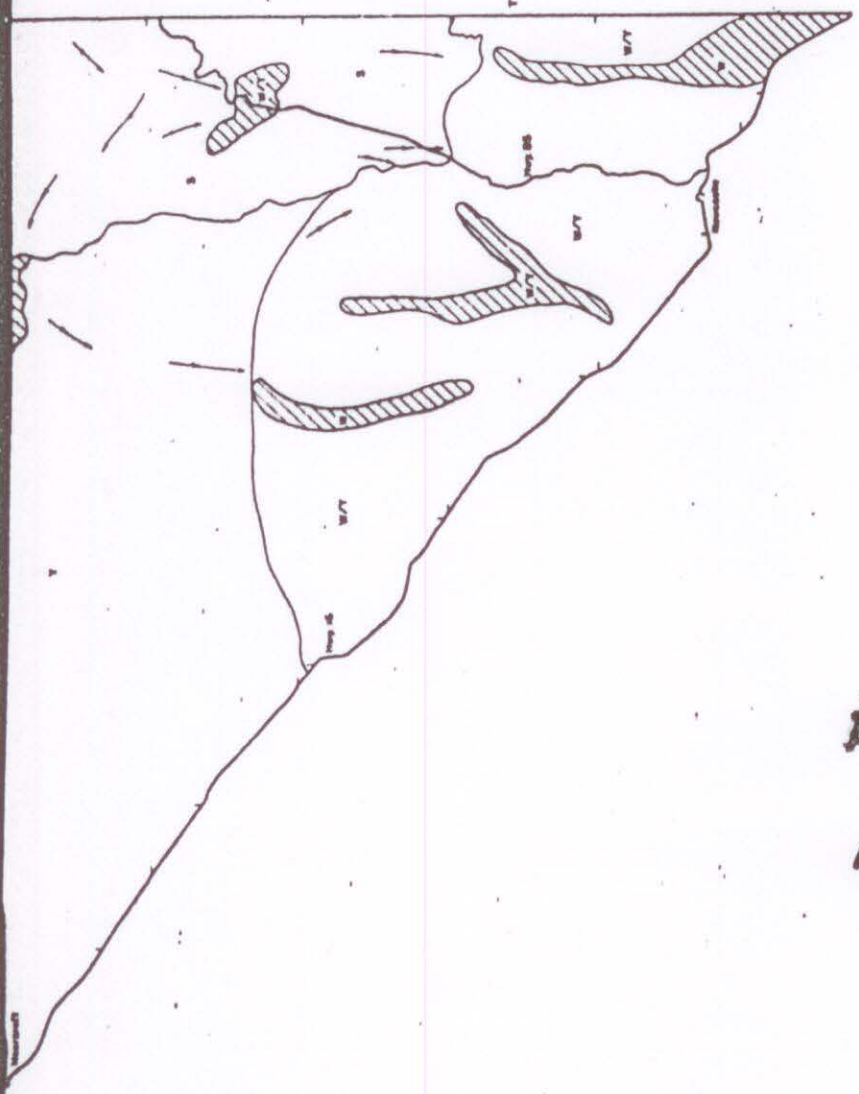
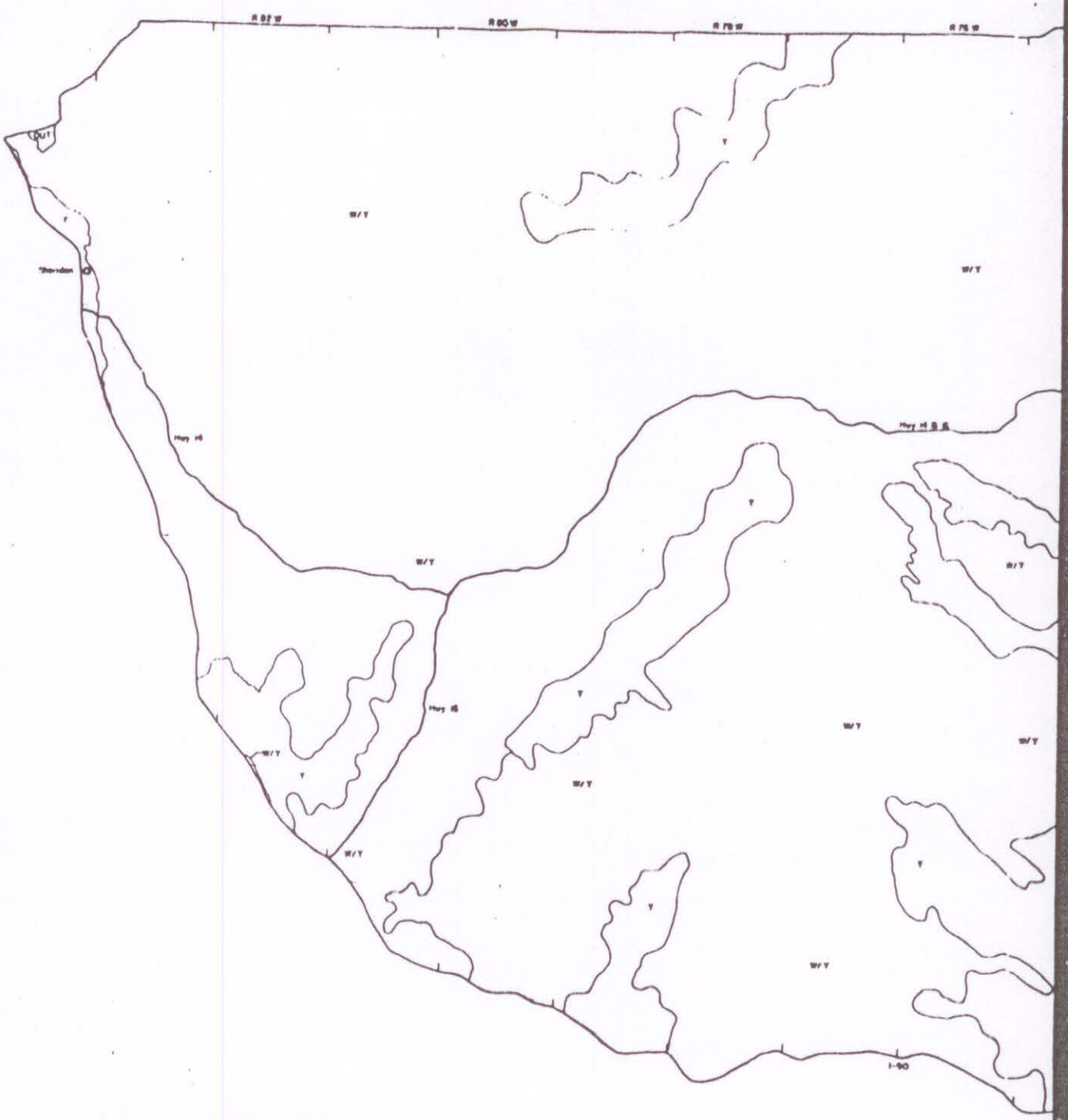
Cheyenne, Wyoming 82002



WHITE-TAILED DEER - BLACK HILLS WHITETAILS

WHITETAIL DEER

From: State of Wyoming
Game and Fish Department
5400 Bishop Boulevard
Cheyenne, Wyoming 82002



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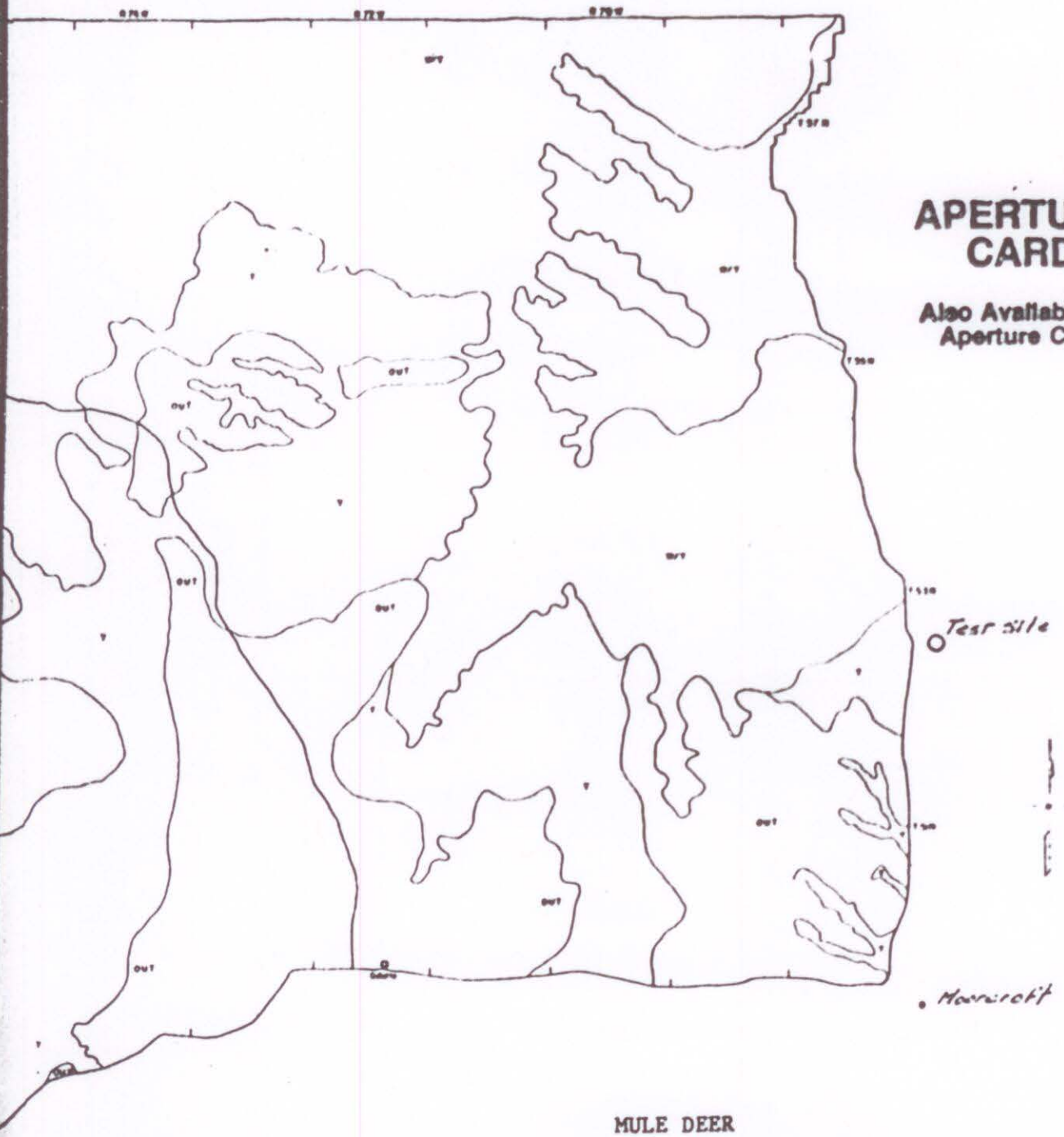

MULE DEER