2.

STINKING LAKE RESEARCH NATURAL AREA

Supplement No. 12[1]

William N. Copeland and Sarah E. Greene[2]

The Research Natural Area described in this supplement is administered by the Fish and Wildlife Service of the U.S. Department of the Interior as part of the Malheur National Wildlife Refuge. Fish and Wildlife Service Research Natural Areas are administered through Area Offices; scientists wishing to use the Stinking Lake Research Natural Area should contact both the Area Manager (U.S. Fish and Wildlife Service, 4620 Overland Road, Boise, ID 83705), and the Refuge Manager (Malheur National Wildlife Refuge, P.O. Box 113, Burns, OR 97720). The Refuge Manager supervises management activities at the Refuge and coordinates scientific work on the Research Natural Area. For brief observational visits, permission may be obtained from the Refuge Manager.

Stinking Lake Research Natural Area is a part of the Federal system of such tracts established for research and educational purposes. Each constitutes a site where natural features are preserved for scientific and educational purposes, and natural processes are allowed to dominate. Their main purposes are to provide:

1. Baseline areas against which effects of human activities can be measured;
2. Sites for study of natural processes in undisturbed ecosystems; and
3. Gene pool preserves for all types of organisms, especially rare and endangered species.

The total Federal system is outlined in "A Directory of the Research Natural Areas on Federal Lands of the United States of America."[3] Of the 68 Federal Research Natural Areas that have been established in Oregon and Washington, 45 are described in "Federal Research Natural Areas in Oregon and Washington: A Guidebook for Scientists and Educators," (see footnote 1) along with details on management and use of such tracts; 11 have been described in supplements to the guidebook; this is the twelfth supplement to that guidebook.

The guiding principle in management of Research Natural Areas is to prevent unnatural encroachments, activities which directly or indirectly modify ecological processes on the tracts. Neither logging nor uncontrolled grazing is allowed, for example, nor is public use which threatens significant impairment of scientific or educational values. Management practices necessary for maintenance of the ecosystem may be allowed.

Federal Research Natural Areas provide a uniquely valuable system of publicly owned and protected examples of undisturbed ecosystems which are available to the scientific community. Research can be conducted with minimal interference and reasonable assurance that investments in long-term studies will not be lost to logging, land development, or similar activities. A scientist wishing to use a Research Natural Area assumes the responsibility to:

1. Obtain permission from the appropriate administering agency before using the areas;[4]

[1]Supplement No. 12 to "Federal Research Natural Areas in Oregon and Washington: a guidebook for scientists and educators," by Franklin, Jerry F.; Hall, Frederick C.; Dyrness, C. T.; Maser, Chris (Portland, OR: Pac. Northwest For. and Range Exp. Stn.; 1972). The guidebook is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, stock number 001-001-00225-9.

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[3]Federal Committee on Ecological Reserves. A directory of the Research Natural Areas on Federal Lands of the United States of America. Washington, DC: USDA For. Serv.; 1977.

[4]There are five agencies cooperating in this program in the Pacific Northwest (each agency differs slightly in its requirements): Forest Service in the U.S. Department of Agriculture; Bureau of Land Management, Fish and Wildlife Service, and National Park Service in the U.S. Department of the Interior; and the U.S. Department of Energy.

2. Abide by the administering agency's regulations governing the use of the natural area, including specific limitations on the type of research, sampling methods, etc.; and
3. Inform the administering agency on the progress of the research, published results, and disposition of collected materials.

The purposes of these limitations are simple-to insure that the scientific and educational values on the tract are not impaired, to accumulate a documented body of knowledge about the tract, and to avoid conflict between studies. Research on Research Natural Areas must be essentially nondestructive in character; destructive analysis of vegetation is generally not allowed nor are studies requiring extensive modification of the forest floor or extensive excavation of soil. Collection of plant and animal specimens should be restricted to the minimum necessary for provision of voucher specimens and other research needs; under no circumstances should collecting significantly reduce the population level of a species. Collecting must also be carried out in accordance with State and Federal agency regulations.

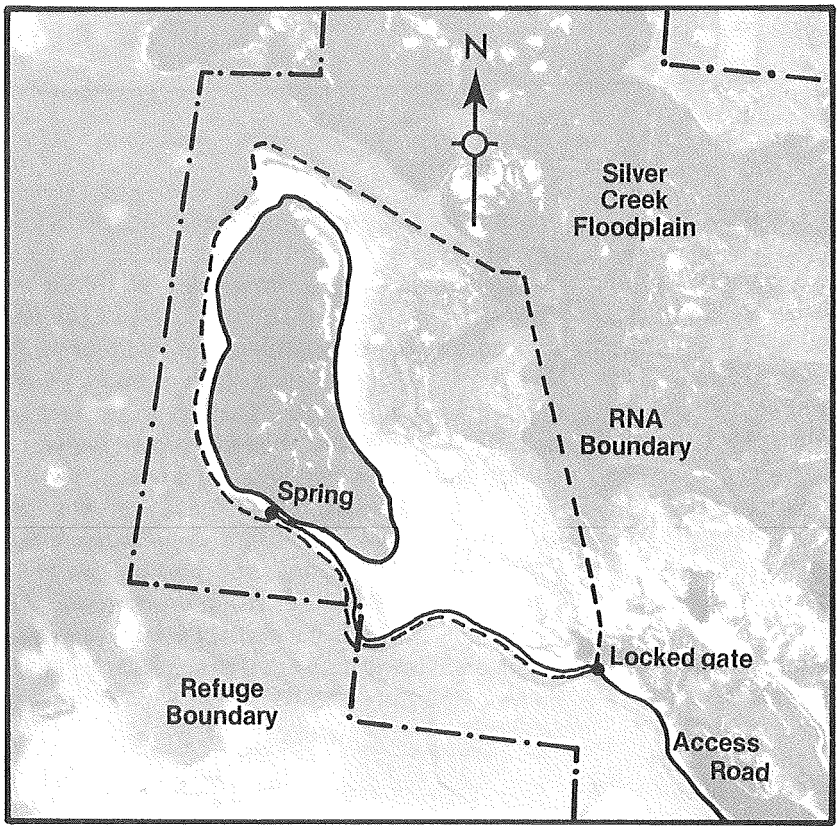
3.

A small, spring-fed, internally drained alkaline lake surrounded by sand dunes, ancient lake deposits and volcanic rimrocks, supporting typical examples of salt desert vegetation, and a large number of resident and migratory birds.

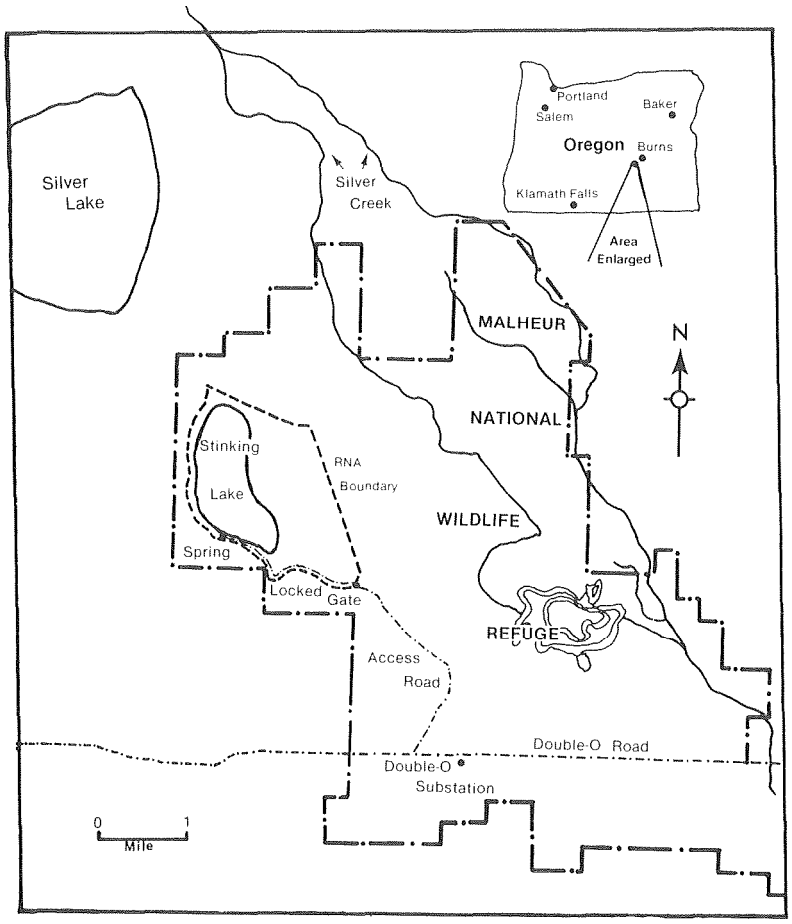
Stinking Lake Research Natural Area (RNA) was established on March 4, 1975, to preserve an example of a small, spring-fed alkaline lake in southeast Oregon and the associated high desert vegetation and wildlife (fig. SL-1). Important natural features receiving protection include a variety of salt desert plant communities, a permanent cold spring and associated wetlands, and a large number of birds and small mammals. Of the numerous species of migratory and resident birds, 20 are listed as rare, threatened, or endangered. These include Swainson's hawks[5], golden eagles, prairie falcons, long-billed curlews and greater sandhill cranes. The 630-ha (l,555-acre) tract is located in Harney County, southwest of Burns, in the Malheur National Wildlife Refuge of the Fish and Wildlife Service, U.S. Department of the Interior. The RNA lies principally in sec. 9, 15, and 16, T. 26 S., R. 28 E., Willamette meridian, but also includes parts of sec. 10, 21, 22, and 23 (lat. 43 °20 'N.; long. 119 °20 W.) (fig. SL-2). It is bounded on the north, west, and south by volcanic rimrocks and on the east by a fence.

SL-1.—Aerial view of Stinking Lake. The moist lakebed and Silver Creek wetlands are dark. The sand dune areas are light. (Photo from color infrared NASA U-2 original taken June 28, 1974; courtesy Fish and Wildlife Service, U.S. Department of the Interior.)

[5]Scientific names for plants, birds and animals appear in tables SL-3, 4, and 5.



SL-2.—Stinking Lake Research Natural Area, Harney County, Oregon.



Access and Accommodations

The Stinking Lake RNA is located 39 km (24 mil southwest of Burns, Oregon. The area is reached by traveling east from Burns on State Highway 78 for 3.2 km (2 mil, turning south on State Highway 205 and traveling 34 km (21 mil, and turning west on County Road Double-O and traveling 29 km (18 mil to the Double-O Refuge substation. A short distance beyond the substation an unimproved access road leads north for 6.5 km (4 mil to a locked gate at the southeast corner of the Stinking Lake Research Natural Area.

Access to the RNA is by written permit only. Overnight camping is prohibited. Camping, dormitories, and limited laboratory facilities are available at the Malheur Field Station 8 km (5 mil west of the Refuge headquarters. Information on the availability of these facilities may be obtained by writing: Director, Malheur Field Station, P.O. Box 989, Burns, OR 97720. Commercial accommodations are available in Burns.

Environment

Stinking Lake RNA is located at the boundary of the High Lava Plains, and Basin and Range Physiographic Provinces (Franklin and Dyrness 1973). It is a tiny remnant of the vast Pleistocene lake that filled the Malheur Basin (Baldwin 1976). Ancient beach and lakebed deposits dating from the Pleistocene era underlie most of the RN A; the remainder consists of the aeolian dune deposits along the east and southeast shore, alluvial deposits on the east side, and a small band of Pliocene sedimentary silicic to mafic volcanic rimrock on the north and west sides. Table SL-l gives the approximate area covered by each of the geomorphic surfaces. Elevation varies from 1 253 m (4,112 ft) to 1 257 m (4,125 ft).[6]

[6]Much of the background information is derived from a report by Jeffrey W. Fleischer in 1974; on file at Malheur National Wildlife Refuge Headquarters, Harney County, Oregon.

Table SL-1—Geomorphic surfaces and plant communities for Stinking Lake Research Natural Area

Geomorphic surface	Approximate area	Plant community
	Hectares	
Lakeshore	90	Alkali saltgrass-Nevada bulrush *(Distichlis stricta—Scirpus nevadensis)*
		Black greasewood *(Sarcobatus vermiculatus)*
		Black greasewood/sea blite *(Sarcobatus vermiculatus/Suaeda nigra)*
		Black greasewood/alkali saltgrass *(Sarcobatus vermiculatus/Distichlis stricta)*
Sand dunes and swales	110	Black greasewood/alkali saltgrass *(Sarcobatus vermiculatus/Distichlis stricta)*
		Black greasewood/sea blite *(Sarcobatus vermiculatus/Distichlis stricta)*
		Black greasewood-shadscale *(Sarcobatus vermiculatus—Atriplex confertifolia)*
Flood plain	60	Meadow Mosaic (a) Thick-spiked wheatgrass *(Agropyron dasystachym)* (b) *Carex* spp. (c) Foxtail barley, baltic rush, *(Hordeum jubatum, Juncus balticus)* alkali bluegrass *(Poa juncifolia)*
		Black greasewood/alkali saltgrass *(Sarcobatus vermiculatus/Distichlis stricta)*
Rimrock	40	Big sagebrush/shadscale *(Artemisia tridentata/Atriplex confertifolia)*
Spring and wetlands	20	Bulrush *(Scirpus* spp.)

The kidney shaped lake measures approximately 4.8 km (3 mil along its long northwest-southeast axis and 1 km (0.6 mil along the narrow axis (see fig. SL-2). A cold spring, arising from the base of an escarpment on the west side of the lake, and precipitation are the only sources of water; Stinking Lake has no outlet. The lakebed is 304 sq. ha (752 acres), but the actual lake surface area varies with rainfall and flow volume from the spring. Dry alkali flats occupy much of the bed during the summer when spring output is reduced and evaporation high.

The semiarid climate is typical of cooler portions of the intermountain west. Precipitation occurs mainly from November through January, with a smaller peak during May and June. Summers are hot, dry, and mostly cloudless, with drought periods of 1 to 3 months not uncommon. Climatic data from the Double-O Refuge substation (5 km or 3 mi southeast of the RNA) during 1966-73 are:

Mean annual temperature	8.7 °C (47.7 °F)
Mean January temperature	−1.1 °C (30.0 °F)
Mean July temperature	20.2 °C (68.4 °F)
Mean January minimum temperature	−6.5 °C (20.3 °F)
Mean July maximum temperature	31.2 °C (88.3 °F)
Mean annual precipitation	276 mm (10.9 in)
Mean annual snowfall	426 mm (16.8 in)

Soils

Soils in the Harney Basin have been mapped from field reconnaissance data (State Water Resources Board 1969). The Soil Conservation Service is presently conducting extensive mapping in southeast Oregon, and the results will be available in 1981 or 1982. The reconnaissance study and Fleisher's report (see footnote 6) have provided the following soils information.

Three general soil types are mapped for the Stinking Lake area. These are (1) playa, the lake surface itself; (2) stream bottom land soils of the Silver Creek flood plain; and (3) shallow stony soils of the escarpments on the north and east sides of the lake. The lake is mapped as playa, or alkaline lake sediments that are often salt encrusted. About half the RNA (304 ha or 752 acres) is lakebed; it is nearly devoid of vegetation.

Silver Creek flows by Stinking Lake on the east side (see figs. SL-1 and SL-2). About 60 ha of flood plain soils are included in the RN A. They are described as deep, silty, somewhat poorly drained, level stream bottom land soils. With the exception of highly alkaline swales, the soils in this part of the RNA are moderate in alkalinity. Silver Creek waters are extensively diverted for irrigation. It is now unlikely that its floods will impact the RNA.

The final mapping unit consists of loamy, shallow, very stony, well drained soils over basalt, rhyolite, or welded tuff. These soils are found on top of the escarpment bounding the RN A on the north and west; they support the only big sagebrush vegetation of the tract.

In addition to the above types, sand dunes are found on the east and south shores of the lake. These dunes are largely stabilized, and large, migrating dunes such as those at nearby Harney Lake (Copeland 1979) are not present. Swales in the dune system are poorly drained and strongly alkaline.

Much of the sand supply for the dunes has come from the north and northwest shore of the lake which is blown down to a flat, highly alkaline surface.

Wetland soils supporting a set of bulrush communities line the watercourse from its emergence at the base of the western escarpment.

Biota

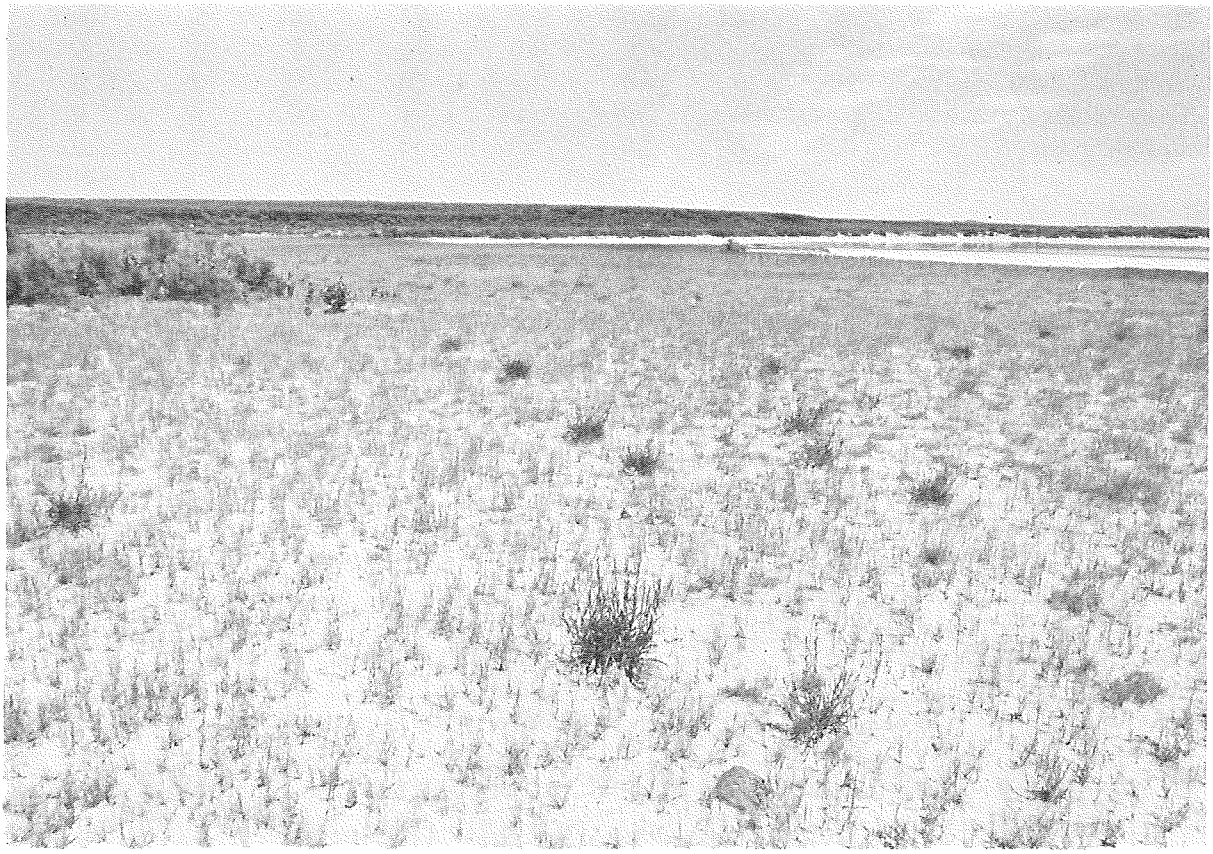
Vegetation

The vegetation consists of a variety of salt desert plant communities plus minor amounts of wetland vegetation adjacent to the spring and big sagebrush on the rimrock. Most of the vegetation can be classified under Kuchler's (1964) system as Type 40, Saltbush-Greasewood, with small amounts of Type 55, Sagebrush Steppe, and Type 49 Tule Marshes. The tract is located in the Desert Shrub vegetation zone (Franklin and Dyrness 1973).

Plant communities found on the RN A are listed in table SL-1. Along portions of the lakeshore and in other highly alkaline, poorly drained locations a vegetation mosaic is found that is dominated alternately by alkali saltgrass and Nevada bulrush.

Scattered associates are alkali weed, a species of pigweed, and black greasewood. Along parts of the north shore and in some swales, alkali weed becomes co-dominant with alkali saltgrass (fig. SL-3).

Black greasewood is the dominant or co-dominant shrub in a number of associations (table SL-2). Considerable variability exists in the presence and abundance of associated species.



SL-3.—Alkali weed and alkali saltgrass on north shore of Stinking Lake.

Table SL-2—Vegetation associated with black greasewood plant community, by location, within Stinking Lake Research Natural Area

Species	Pebbly southeast shore	Swales, east side	North shore	Southeast shore	Mound, southeast shore	Swale, southeast side	Sand dunes	Sand dunes, southeast side, saline crust
	Percent cover							
Shrubs:								
Black greasewood	10	20	10	10	20	10-15	5-10	5-10
Shadscale	0	0	0	0	3	0	10-15	10-15
Spineless horsebrush	0	0	0	0	0	0	0	[1]
Spiny hopsage	0	0	0	0	0	0	5	0
Gray rabbitbrush	0	0	0	0	1	20	0	0
Rabbitbrush	0	0	0	0	0	0	[1]	[1]
Grasses:								
Needle and thread	0	0	0	0	0	0	[1]	0
Indian rice grass	0	0	0	0	2	0	1	1
Giant wild rye	0	0	0	0	0	15-20	0	0
Alkali saltgrass	0	10-15	0	10-15	0	2	0	[1]
Bottlebrush	0	0	0	0	0	0	0	[1]
Thick-spiked wheatgrass	0	1	0	0	7-10	0	[1]	[1]
Forbs:								
Sea blite	0	0	15-20	0	5	0	2	2
Hoary false yarrow	0	0	0	0	0	0	[1]	[1]
Pigweed	0	5-10	0	0	0	0	0	0
Alkali weed	0	0	10-15	0	0	4	0	0
Clasping pepperweed	0	0	0	0	0	0	0	[1]
Thickleweed thelypody	0	0	0	0	0	0	[1]	0

[1] Trace cover.

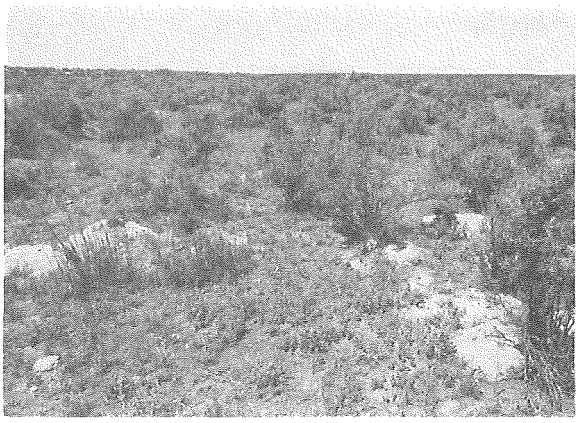
On the lakeshore and in some swales the following species are associates:

1. Gray rabbitbrush and giant wild rye (southeast shore).
2. Sea blite (southeast and east shores).
3. Alkali saltgrass, sometimes with alkali weed and Nevada bulrush (all shores, prominent on north shore) (fig. SL-4).

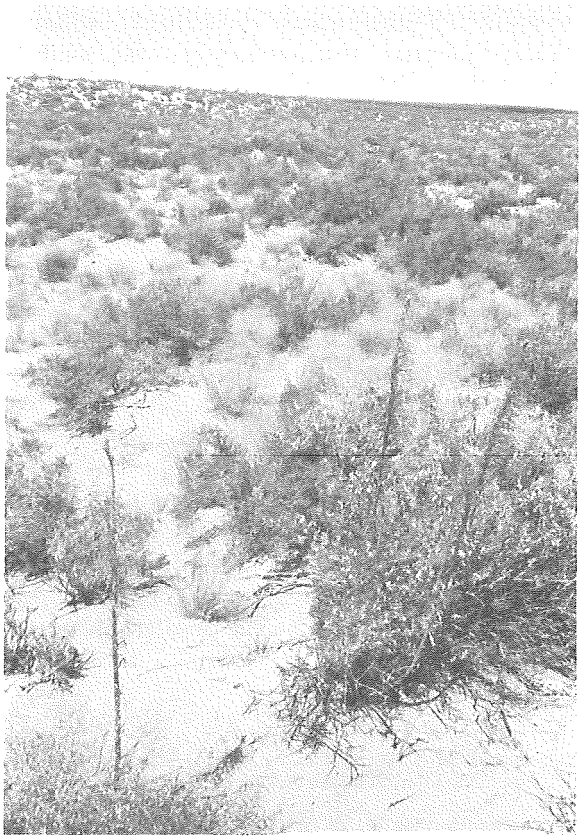
On dune surfaces the important species associated with black greasewood correlate most strongly with alkalinity:

1. Sea blite where most alkaline.
2. Shadscale sometimes with thick-spiked wheatgrass, needle and thread or Indian rice grass (fig. SL-5).

Black greasewood grows alone in one cobbly, highly alkaline area on the southeast shore. The black greasewood associations contain few species, and vegetative cover, although occasionally reaching 70 percent, is normally low (20-30 percent).



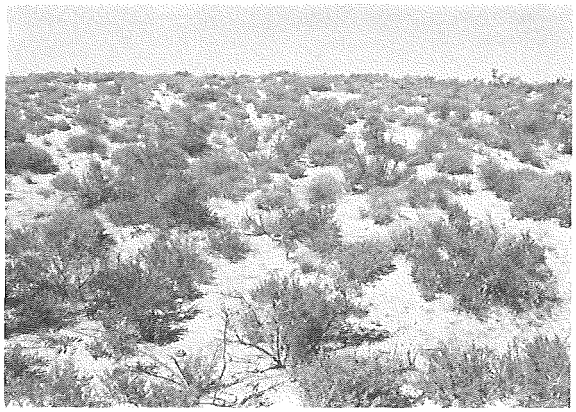
SL-4.—Black greasewood/alkali saltgrass community on east shore of Stinking Lake.



SL-5.—Black greasewood/shadscale community with thick-spiked wheatgrass, needle and thread grass and Indian rice grass.

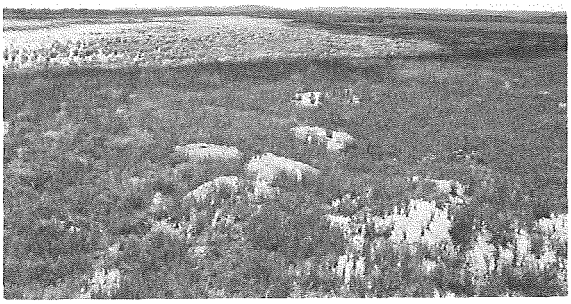
The high variability in species associated with black greasewood makes distinctions between communities difficult. Based on similarities to the nearby Harney Lake RN A (Copeland 1979), the following communities can be cited:

1. Black greasewood with no other species present.
2. Black greasewood/alkali saltgrass on moist, highly alkaline surfaces (see fig. SL-4).
3. Black greasewood/sea blite on drier, highly alkaline surfaces.
4. Black greasewood-shadscale on better drained, less alkaline surfaces (fig. SL-6).



SL-6.—Black greasewood/shadscale community.

On the northeast shore, a complex, graminoid dominated meadow mosaic occupies the Silver Creek alluvium. The drier portions of the meadow have thick-spiked wheatgrass as the dominant, with giant wild rye, alkali saltgrass, poverty weed, and black greasewood associated. Wetter portions of the meadow support a mosaic vegetation dominated principally by sedges in association with alkali saltgrass, black greasewood, poverty weed, and other forbs and grasses. Species dominating other parts of the meadow are foxtail barley, baltic rush, alkali bluegrass, or tule (fig. SL-7).



SL-7.—East-side meadow with foxtail barley, baltic rush, and alkali bluegrass.

The spring emerging at the boundary base of a rimrock area on the north side of the lake supports a wetland of about 20 ha (50 acres). The dominants are tule, American and Olney's bulrush, cattail, and baltic rush.

A small area of big sagebrush-black greasewood is found on the rimrock above the spring and on the slopes of the boundary rimrocks on the north and west sides of the RN A. This open community contains minor amounts of bottlebrush squirrel tail, Indian rice grass, cheatgrass, Sandberg's bluegrass, and spiny hopsage.

Plant species within the RNA are listed in table SL-3.

Fauna

Birds are well documented at Stinking Lake. Observations began in the area in the 1870's, and annual censuses have been taken by the Refuge since the 1940's. Data on species occurring in the RNA and their status are summarized in table SL-4.

Permanent residents include the great horned owl *(Bubo virginianus)* and horned lark *(Eremophila alpestris).* Golden eagles *(Aquila chrysaetos)* and prairie falcons *(Falco mexicanus)* nest nearby. One of the last sightings of a peregrine falcon *(Falco peregrinus)* in the Refuge took place at the lake.[7]

The lake is best known for its migratory shorebirds. Thousands of American avocets *(Recurvirostra americana),* Wilson's phalaropes *(Steganopus tricolor),* willets *(Catoptophorus semipalmatus),* and western sandpipers *(Calidris mauri)* rest on the moist saline flats and feed on the large populations of flies occupying the flats. The flies (Ephydridae: *Ephydra hians* (Say)[8] also support large shorebird populations at Mono Lake in California and at the Great Salt Lake in Utah.[9]

Certain birds, among them the black-bellied plover *(Squatarola squatarola),* pectoral sandpiper *{Calidris melanotos}* and dunlin *(Calidris alpina),* are rarely seen on the Refuge except at Stinking Lake, where the predictable supply of water shore and flies is ideal. Harney Lake provides the only other major shorebird habitat at the Refuge (see footnote 9). Its water supply fluctuates with the rainfall, and agricultural demand on the feeder streams and springs has been decreasing the annual input. Stinking Lake alone has a predictable water supply.

[7]Observed May 20, 1977, by C. D. Littlefield of the Malheur National Wildlife Refuge.

[8]Identification by W. W. Wirth, Systematic Entomology Laboratory, USDA Agricultural Research Center, Beltsville, Maryland. Letter on file Forestry Sciences Laboratory, Pacific Northwest Forest and Range Experiment Station, Corvallis, Oregon.

[9]Personal communication from C. D. Littlefield, Malheur National Wildlife Refuge.

Table SL-3 Tentative list of plants within Stinking Lake Research Natural Area[1]

Scientific name	Common name
Agropyron dasystachyum (Hook.) Scribn.	Thick-spiked wheatgrass
Atriplex confertifolia (Torr. & Frem.) Wats.	Shadscale
Atriplex spinosa (Hook.) Collotzi	Spiny hopsage
Bromus tectorum L.	Cheatgrass
Chaenactis douglasii (Hook.) H. & A.	Hoary false yarrow
Chenopodium leptophyllum (Moq.) Wats.	Pigweed
Chrysothamnus viscidiflorus (Hook.) Nutt.	Rabbitbrush
Chrysothamnus nauseosus (Pall.) Britt.	Gray rabbitbrush
Distichlis stricta (Torr.) Rydb.	Alkali saltgrass
Elymus cinereus Scribn. & Merr.	Giant wild rye
Hordeum jubatum L.	Foxtail barley
Iva axillaris Pursh	Poverty weed
Juncus balticus Willd.	Baltic rush
Lepidium perfoliatum L.	Clasping pepperweed
Nitrophila occidentalis (Moq.) Wats.	Alkali weed
Oryzopsis hymenoides (R. & S.) Ricker	Indian rice grass
Poa juncifolia Scribn.	Alkali bluegrass
Poa sandbergii Vasey	Sandberg's bluegrass
Sarcobatus vermiculatus (Hook.) Torr.	Black greasewood
Scirpus acutus Muhl.	Tule
Scirpus americanus Pers.	American bulrush
Scirpus nevadensis Wats.	Nevada bulrush
Scirpus olneyi Gray	Olney's bulrush
Sitanion hystrix (Nutt.) Smith	Bottlebrush
Stipa comata Trin. & Rupr.	Needle and thread grass
Suaeda nigra (Raf.) Macbr.	Sea blite
Tetradymia canescens DC.	Spineless horsebrush
Thelypodium laciniatum (Nutt.) Endl.	Thickleweed thelypody
Typha latifolia L.	Cattail

[1] Nomenclature follows Hitchcock and Cronquist (1976).

A large number of bird species of concern[10] inhabit Stinking Lake:

Redhead	Snowy egret
Ring-necked duck	Black-crowned night heron
Lesser scaup	Sandhill crane
Bufflehead	Snowy plover
Swainson's hawk	Long-billed curlew
Golden eagle	Franklin's gull
Bald eagle	Forster's tern
Prairie falcon	Caspian tern
Peregrine falcon	Poor-will
Common egret	

[10] Species of concern are considered rare, threatened, or endangered—either in Oregon or throughout their range—by the authorities cited in tables SL-4 and SL-5.

Table SL-4—List of observed and tentative bird species for the Stinking Lake Research Natural Area[1]

Order	Scientific name[2]	Common name	Status
		OBSERVED SPECIES	
Podicipediformes	*Podiceps nigricollis*	Eared grebe	Migrant
Anseriformes	*Anas platyrhynchos*	Mallard	Migrant
	Anas acuta	Pintail	Migrant
	Anas strepera	Gadwall	Migrant
	Anas americana	American widgeon	Migrant
	Anas clypeata	Northern shoveler	Migrant
	Anas cyanoptera	Cinnamon teal	Migrant
	Anas carolinensis	Green-winged teal	Migrant
	Aythya americana	Redhead[3]	Migrant
	Aythya collaris	Ring-necked duck[4,5]	Migrant
	Aythya affinis	Lesser scaup[4,5]	Migrant
	Bucephale clangula	Common goldeneye	Migrant
	Bucephala albeola	Bufflehead[4,5]	Migrant
	Oxyura jamaicensis	Ruddy duck	Migrant
Falconiformes	*Cathartes aura*	Turkey vulture	Migrant
	Circus cyaneus	Marsh hawk	Migrant
	Buteo lagopus	Rough-legged hawk	Winter resident
	Buteo jamaicensis	Red-tailed hawk	Migrant
	Buteo swainsoni	Swainson's hawk[5]	Migrant
	Aquila chrysaetos	Golden eagle[3]	Resident
	Haliaeetus leucocephalus	Bald eagle[3,4,5,6,7]	Migrant
	Falco mexicanus	Prairie falcon[3,4,5,8,9]	Resident
	Falco peregrinus	Peregrine falcon[3,4,5,6,7,8]	Rare migrant
	Falco sparverius	American kestrel	Migrant
Galliformes	*Lophortyx californicus*	California quail	Resident
Cioconiiformes	*Casmerodius albus*	Common egret[4,5,]	Migrant and summer visitor
	Egretta thula	Snowy egret[4,5]	Migrant and summer visitor
	Ardea herodias	Great blue heron	Migrant and summer visitor
	Nycticorax nycticorax	Black-crowned night heron[8]	Migrant and summer visitor
	Botaurus lentiginosus	American bittern	Migrant and summer visitor
Gruiformes	*Grus canadensis*	Sandhill crane[3,4,5]	Summer visitor
	Rallus limicola	Virginia rail	Migrant and summer visitor
	Porzana carolina	Sora	Migrant and summer visitor
	Fulica americana	American coot	Migrant

Table SL-4—List of observed and tentative bird species for the Stinking Lake Research Natural Area[1] —Continued

Order	Scientific name[2]	Common name	Status
Charadriiformes	*Recurvirostra americana*	American avocet	Migrant and summer resident
	Himantopus mexicanus	Black-necked stilt	Migrant
	Squatarola squatarola	Black-bellied plover	Migrant
	Charadrius semipalmatus	Semipalmated plover	Migrant
	Charadrius alexandrinus	Snowy plover[3,4,5,7,9,10]	Summer resident
	Charadrius vociferus	Killdeer	Migrant and summer resident
	Numenius americanus	Long-billed curlew[3,10]	Migrant
	Limosa fedoa	Marbled godwit	Migrant
	Actitis macularia	Spotted sandpiper	Migrant
	Catoptrophorus semipalmatus	Willet	Migrant
	Tringa melanoleuca	Greater yellowlegs	Migrant
	Tringa flavipes	Lesser yellowlegs	Migrant
	Limnodromus scolopaceus	Long-billed dowitcher	Migrant
	Calidris melanotos	Pectoral sandpiper	Migrant
	Calidris canutus	Red knot	Rare migrant
	Calidris alpina	Dunlin	Migrant
	Calidris alba	Sanderling	Rare migrant
	Calidris bairdii	Baird's sandpiper	Migrant
	Calidris minutilla	Least sandpiper	Migrant
	Calidris mauri	Western sandpiper	Migrant
	Steganopus tricolor	Wilson's phalarope	Migrant
	Phalaropus fulicarius	Red phalarope	One record
	Lobipes lobatus	Northern phalarope	Migrant and summer visitor
	Capella gallinago	Common snipe	Migrant visitor
	Larus californicus	California gull	Migrant
	Larus delawarensis	Ring-billed gull	Migrant
	Larus pipixcan	Franklin's gull[4,5]	Summer visitor
	Larus philadelphia	Bonaparte's gull	Migrant and summer visitor
	Xemia sabini	Sabine's gull	One record
	Sterna forsteri	Forster's tern[3]	Migrant and summer visitor
	Sterna caspia	Caspian tern[3,4,5]	Migrant and summer visitor
	Chlidonias niger	Black tern	Migrant and summer visitor
Columbiformes	*Zenaida macroura*	Mourning dove	Migrant
Strigiformes	*Bubo virginianus*	Great horned owl	Resident
Caprimulgiformes	*Chordeiles minor*	Common nighthawk	Summer resident
	Phalaenoptilus nuttallii	Poor-will[3,4]	Summer resident
Piciformes[11]	*Colaptes auratus*	Common flicker	Migrant

Table SL-4—List of observed and tentative bird species for the Stinking Lake Research Natural Area[1] —Continued

Order	Scientific name[2]	Common name	Status
Passeriformes[11]	*Sayornis saya*	Say's phoebe	Migrant
	Eremophila alpestris	Horned lark	Resident
	Hirundo rustica	Barn swallow	Migrant
	Petrochelidon pyrrhonota	Cliff swallow	Migrant and summer visitor
	Iridoprocne bicolor	Tree swallow	Migrant
	Corvus corax	Common raven	Resident
	Pica pica	Black-billed magpie	Resident
	Salpinctes obsoletus	Rock wren	Migrant
	Telmatodytes palustris	Long-billed marsh wren	Summer resident
	Oreoscoptes montanus	Sage thrasher	Summer resident
	Turdus migratorius	American robin	Migrant
	Regulus calendula	Ruby-crowned kinglet	Migrant
	Anthus spinoletta	Water pipit	Migrant
	Lanius ludovicianus	Loggerhead shrike	Summer visitor
	Lanius excubitor	Northern shrike	Winter visitor
	Vermivora celata	Orange-crowned warbler	Migrant
	Dendroica petechia	Yellow warbler	Migrant
	Dendroica coronata	Yellow-rumped warbler	Migrant
	Geothlypis trichas	Common yellowthroat	Summer resident
	Wilsonia pusilla	Wilson's warbler	Migrant
	Sturnella neglecta	Western meadowlark	Summer resident
	Agelaius phoeniceus	Red-winged blackbird	Summer resident
	Euphagus cyanocephalus	Brewer's blackbird	Summer resident
	Molothrus ater	Brown-headed cowbird	Summer resident
	Icterus galbula	Northern oriole	Migrant
	Pheucticus ludovicianus	Rose-breasted grosbeak	One record
	Pipilo erythrophthalmus	Rufous-sided towhee	Migrant
	Passercules sandwichensis	Savannah sparrow	Summer resident
	Pooecetes gramineus	Vesper sparrow	Migrant
	Chondestes grammacus	Lark sparrow	Migrant
	Amphispiza belli	Sage sparrow	Summer resident
	Junco hyemalis	Dark-eyed junco	Migrant
	Spizella passerina	Chipping sparrow	Migrant
	Spizella breweri	Brewer's sparrow	Summer resident
	Zonotrichia leucophrys	White-crowned sparrow	Migrant
	Passerella iliaca	Fox sparrow	Migrant
	Melospiza lincolnii	Lincoln's sparrow	Migrant
	Melospiza melodia	Song sparrow	Resident

Table SL-4—List of observed and tentative bird species for the Stinking Lake Research Natural Area[1] —Continued

Order	Scientific name[2]	Common name	Status
		TENTATIVE SPECIES	
Podicipediformes	*Aechmophorus occidentalis*	Western grebe	Migrant
	Podiceps auritus	Horned grebe[4,5]	Migrant
	Podilymbus podiceps	Pied-billed grebe	Migrant
Pelicaniformes	*Pelecanus erythrorhynchos*	White pelican[3,4,5,9]	Migrant and summer visitor
	Phalacrocorax auritus	Double-crested cormorant	Migrant and summer visitor
Anseriformes	*Olor columbianus*	Whistling swan	Migrant
	Branta canadensis	Canada goose	Migrant and summer visitor
	Anser albiforns	White-fronted goose	Migrant
	Chen caerulescens	Snow goose	Migrant
	Chen rossii	Ross' goose	Migrant
	Anas discors	Blue-winged teal	Migrant
	Aix sponsa	Wood duck	Migrant
	Aythya valisineria	Canvasback	Migrant
	Mergus merganser	Common merganser	Migrant
	Lophodytes cucullatus	Hooded merganser	Migrant
Falconiformes	*Accipiter cooperii*	Cooper's hawk[3,9]	Migrant
	Accipiter striatus	Sharp-shinned hawk	Migrant
	Buteo regalis	Ferruginous hawk	Migrant
	Pandion haliaetus	Osprey[4,5,9,10]	Migrant
	Falco columbarius	Merlin[3,4,5,9]	Migrant
Galliformes	*Centrocercus urophasianus*	Sage grouse	Summer visitor
	Alectoris graeca	Chukar	Resident
	Phasianus colchicus	Ring-necked pheasant	Resident
Cioconiiformes	*Ixobrychus exilis*	Least bittern[3,4,5]	Migrant
	Plegadis chihi	White-faced ibis[3,4,5,9,10]	Migrant and summer visitor
Charadriiformes	*Pluvialis dominica*	Golden plover	Migrant
	Tringa solitaria	Solitary sandpiper	Migrant
	Stercorarius parasiticus	Parasitic jaeger	Migrant
	Larus argentatus	Herring gull	Migrant
Strigiformes	*Asio otus*	Long-eared owl	Migrant
	Asio flammeus	Short-eared owl	Resident
	Tyto alba	Barn owl	Migrant
	Nyctea scandiaca	Snowy owl	Winter visitor
	Athene cunicularia	Burrowing owl[3,4,9,10]	Migrant and summer visitor

Table SL-4—List of observed and tentative bird species for the Stinking Lake Research Natural Area[1] —Continued

Order	Scientific name[2]	Common name	Status
Apodiformes	*Selasphorus rufus*	Rufous hummingbird	Migrant
Coraciiformes	*Megaceryle alcyon*	Belted kingfisher	Migrant and visitor
Piciformes[11]	*Asyndesmus lewisi*	Lewis' woodpecker[3,9]	Migrant
	Sphyrapicus varius	Yellow-bellied sapsucker	Migrant
	Dendrocopos villosus	Hairy woodpecker	Migrant
	Dendrocopos pubescens	Downy woodpecker	Migrant
Passeriformes[11]	*Tyrannus tyrannus*	Eastern kingbird	Migrant
	Tyrannus verticalis	Western kingbird	Migrant
	Myiarchus cinerascens	Ash-throated flycatcher	Migrant
	Empidonax traillii	Willow flycatcher	Migrant
	Empidonax hammondii	Hammond's flycatcher	Migrant
	Empidonax oberholseri	Dusky flycatcher	Migrant
	Empidonax dificilis	Western flycatcher	Migrant
	Empidonax wrightii	Gray flycatcher	Migrant
	Contopus sordidulus	Western wood peewee	Migrant
	Nuttallornis borealis	Olive-sided flycatcher	Migrant
	Tachycineta thalassina	Violet-green swallow	Migrant
	Stelgidopteryx ruficollis	Rough-winged swallow	Migrant
	Corvus brachyrhynchos	Common crow	Migrant
	Parus atricapillus	Black-capped chickadee	Migrant
	Parus gambeli	Mountain chickadee	Migrant
	Troglodytes aedon	House wren	Migrant
	Catherpes mexicanus	Canyon wren	Migrant
	Ixoreus naevius	Varied thrush	Migrant
	Myadestes townsendi	Townsend's solitaire	Migrant
	Hylocichla guttata	Hermit thrush	Migrant
	Hylocichla ustulata	Swainson's thrush	Migrant
	Sialia mexicana	Western bluebird[3,9]	Migrant
	Sialia currucoides	Mountain bluebird	Migrant
	Sturnus vulgaris	Starling	Migrant
	Vireo gilvus	Warbling vireo	Migrant
	Vermivora ruficapilla	Nashville warbler	Migrant
	Dendroica townsendi	Townsend's warbler	Migrant
	Oporornis tolmiei	MacGillivray's warbler	Migrant
	Xanthocephalus xanthocephalus	Yellow-headed blackbird	Migrant and summer visitor

Table SL-4—List of observed and tentative bird species for the Stinking Lake Research Natural Area[1] —Continued

Order	Scientific name[2]	Common name	Status
	Piranga ludoviciana	Western tanager	Migrant
	Pheucticus melanocephalus	Black-headed grosbeak	Migrant
	Passerina amoena	Lazuli bunting	Migrant
	Carpodacus mexicanus	House finch	Migrant
	Amphispiza bilineata	Black-throated sparrow	Migrant
	Spizella arborea	Tree sparrow	Winter visitor
	Zonotrichia atricapilla	Golden-crowned sparrow	Migrant
	Chlorura chlorura	Green-tailed towhee	Migrant

[1]List courtesy of C. D. Littlefield, Malheur National Wildlife Refuge. Species considered rare, threatened, or endangered are footnoted.
[2]Nomenclature follows American Ornithologist's Union (1957).
[3]White-Swift (1978).
[4]Dyrness and others (1975).
[5]Marshall (1969).
[6]U.S. Department of the Interior, Fish and Wildlife Service (1977).
[7]Oregon Department of Fish and Wildlife (1977).
[8]U.S. Department of the Interior, Fish and Wildlife Service (1973b).
[9]Arbib (1976).
[10]U.S. Department of Agriculture, Fish and Wildlife Service (1973a).
[11]Most Piciformes and Passeriformes occur in the willows in the northwest portion and in brush areas at the spring. Sparrows, warblers, and other songbirds also occur in sage and greasewood throughout the RNA.

In contrast to the extensive records available on birds, information on other animals is fragmentary. The only list available for mammals (table SL-5) is for the entire Refuge and is based on historical records maintained at the Refuge. A number of the mammals listed probably do not occur in the RNA, but the list is useful until a survey can be taken for the RNA alone.

Three animals worthy of mention are the kit fox *(Vulpes macrotis)* and two inhabitants of the spring waters, the speckled dace *(Rhinichthys osculus* ssp.) and a small crayfish *(Pacifastus gambeli connectens).* No kit foxes have been spotted, but small canine tracks are visible in early spring on the moist dune surfaces. Small dens have been found nearby (see footnote 9). The dace appears to differ from other speckled dace in the area. I t is described as having "extremely small fins, incomplete lateral lines, and lacking scales on parts of the body;" there may be a possible relationship to other isolated dace subspecies of the Harney Basin." The crayfish is a rare subspecies encountered occasionally in the Harney Basin and some parts of the Snake River drainage in Idaho and Wyoming. Bond (see footnote 11) suggests it merits protection because of its rarity.

The sand dunes beside the lake may harbor an interesting set of small mammals known from the nearby Harney Lake dunes (Copeland 1979). These include the Ord kangaroo rat *(Dipodomys ordi),* the chisel-toothed kangaroo rat *(Dipodomys microps),* the Townsend ground squirrel *(Spermophilus townsendi),* and the Belding ground squirrel *(Spermophilus beldingi).*

[11]Personal communication from Dr. Carl Bond, Oregon State University. On file at Forestry Sciences Laboratory, Pacific Northwest Forest and Range Experiment Station, Corvallis, Oregon.

Table SL-5—List of observed and tentative mammals for the Stinking Lake Research Natural Area[1]

Order	Scientific name[2]	Common name
Insectivora	*Sorex preblei*[3,4]	Malheur shrew
	Sorex vagrans	Vagrant shrew
	Sorex merriami[3,4]	Merriam shrew
Chiroptera	*Myotis lucifugus*	Little brown myotis
	Myotis yumanensis	Yuma myotis
	Myotis evotis[3]	Long-earned myotis
	Myotis thysanodes[3,4]	Fringed myotis
	Myotis volans[3]	Long-legged myotis
	Myotis californicus	California myotis
	Myotis leibi[3]	Small-footed myotis
	Lasionycteris noctivagans[3]	Silver-haired bat
	Pipistrellus hesperus[3,4]	Western pipistrelle
	Eptesicus fuscus	Big brown bat
	Lasiurus cinereus[3,4]	Hoary bat
	Plecotus townsendi	Western big-eared bat
	Antrozous pallidus[3]	Pallid bat
Lagomorpha	*Sylvilagus idahoensis*[3,4]	Pygmy rabbit
	Sylvilagus nuttalli	Mountain cottontail rabbit
	Lepus californicus	Black-tailed jackrabbit

Table SL-5—List of observed and tentative mammals for the Stinking Lake Research Natural Area[1]—Continued

Order	Scientific name[2]	Common name
Rodentia	*Eutamias minimus*	Least chipmunk
	Marmota flaviventris	Yellow-bellied marmot
	Ammospermophilus leucurus	White-tailed antelope ground squirrel
	Spermophilus townsendi	Townsend ground squirrel
	Spermophilus beldingi	Belding ground squirrel
	Spermophilus lateralis	Golden-mantled ground squirrel
	Thomomys townsendi	Townsend pocket gopher
	Thomomys talpoides	Northern pocket gopher
	Perognathus longimembris	Little pocket mouse
	Perognathus parvus	Great Basin pocket mouse
	Microdipodops megacephalus	Dark kangaroo mouse
	Dipodomys ordi	Ord kangaroo rat
	Dipodomys microps	Chisel-toothed kangaroo rat
	Castor canadensis	Beaver
	Reithrodontomys megalotis	Western harvest mouse
	Peromyscus maniculatus	Deer mouse
	Peromyscus crinitus	Canyon mouse
	Onychomys leucogaster[3]	Northern grasshopper mouse
	Neotoma lepida	Desert woodrat
	Neotoma cinerea	Bush-tailed woodrat
	Microtus montanus	Montane vole
	Microtus longicaudus	Long-tailed vole
	Lagurus curtatus[3,4]	Sage vole
	Ondatra zibethicus	Muskrat
	Mus musculus	House mouse
	Erethizon dorsatum	Porcupine

Table SL-5—List of observed and tentative mammals for the Stinking Lake Research Natural Area[1]—Continued

Order	Scientific name[2]	Common name
Carnivora	*Canis latrans*	Coyote
	Procyon lotor	Raccoon
	Mustela erminea	Short-tailed weasel
	Mustela frenata	Long-tailed weasel
	Mustela vison	Mink
	Taxidea taxus	Badger
	Spilogale putorius	Spotted skunk
	Mephitis mephitis	Striped skunk
	Vulpes macrotis	Kit fox
	Felis concolor[4]	Mountain lion
	Lynx rufus	Bobcat
Artiodactyla	*Cervus elaphus*	Elk
	Odocoileus hemionus	Mule deer
	Antilocapra americana	Pronghorn

[1]This is a listing of the mammals known to be in the Malheur National Wildlife Refuge. Not all species are to be expected in Stinking Lake Research Natural Area. For information on specific locations, consult Feldhamer (1977) and data from the Malheur Wildlife Refuge and Malheur Field Station. Species considered rare, threatened, or endangered are footnoted.
[2]Nomenclature follows Jones and others (1975).
[3]Dyrness and others (1975).
[4]Olterman and Verts (1972).

History of Disturbance

Grazing by sheep and more recently by cattle has been the major disturbance in the RNA. Completion of a fence around the RNA in 1976 now prevents access by cattle, but decaying manure was abundant in 1977, particularly in the meadow at the Silver Creek outwash.

The access road from the Double-O substation goes into the RNA and over the rim above the spring. Increasing use by university and school groups is affecting the area around the spring and probably some species. Access is controlled by the Refuge, and careful monitoring of the spring area is necessary.

Research

Annual bird censuses and generalized soil surveys have provided background information, though no formal research has taken place at the RNA. A number of research opportunities are available for studies on:

1. secondary succession in salt desert vegetation released from grazing;
2. birds and mammals in the alkaline lake and salt desert ecosystem;
3. comparison of animal populations of the dunes with those at the dunes of nearby Harney Lake, where a diverse and interesting set of small rodent species is found;
4. interaction of shorebirds and the large lake-shore fly population;
5. biology of the animals that inhabit the spring waters; and
6. alkaline vegetation patterns using both Stinking Lake and Harney Lake RNA's.

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