EDITOR'S
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JORDAN CRATER RESEARCH NATURAL AREA

Supplement No. 7[1]

Robert R. Kindschy and Chris Maser[2]

The Research Natural Area described in this supplement is administered by the Bureau of Land Management. Bureau of Land Management Research Natural Areas are administered by District Offices which are organizational subdivisions of their State Offices. Scientists wishing to use these Research Natural Areas should contact the Bureau's State Director. Since this agency's tract is located in Oregon, the responsible individual is the Oregon State Director (Bureau of Land Management, P.O. Box 2965, Portland, Oregon 97208). The manager of the district in which the Research Natural Area is located will be informed of mutually agreed upon activities by the State Director. Nevertheless, a scientist should visit the administering District Office when beginning his studies and explain the nature, purpose, and duration of his activities if at all possible. Permission for brief observational visits to Research Natural Areas can be obtained from District Managers.

The Jordan Crater Research Natural Area is a part of a Federal system of such tracts established for research and educational purposes. Each of these constitutes a site where some natural features are preserved for scientific purposes and natural processes are allowed to dominate. Their main purposes are to provide:

1. Baseline areas against which effects of human activities or ecologically equivalent areas can be compared;
2. Sites for study of natural processes in undisturbed ecosystems; and
3. Gene pool preserves of the biota, especially rare and endangered types.

The total Federal system is outlined in "A Directory of the Research Natural Areas on Federal Lands of the United States of America."l In Oregon and Washington, 62 Federal Research Natural Areas have been established; 51 are described in "Federal Research Natural Areas in Oregon and Washington: A Guidebook for Scientists and Educators,"1 ineluding supplements 1 through 6, along with details on management and use of such tracts; this is supplement 7 to that guidebook.

The guiding principle in management of Research Natural Areas is to prevent unnatural encroachments, such as activities which directly or indirectly modify ecological processes on the tracts. Logging and uncontrolled grazing are not 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 scientist.

ISupplement No.7 to "Federal Research Areas in Oregon and Washington: A Guidebook for Scientists and Educators," by Jerry F. Franklin, Frederick C. Hall, C. T. Dyrness, and Chris Maser (USDA Forest Service, 498 p., ilIus., 1972), The guidebook is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. *20402,* for *$3.50;* stock number 0101.0225.

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:Wederal Committee on Research Natural Areas. A directory of Research Natural Areas on Federal lands of tbe United States of America. Washington, D.C., Superintendent of Documents, *280* p. 1977.

.j See footnote 1.

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He can conduct his research with minimal interference and reasonable assurance that investments in long-term studies will not be lost to logging, land development, or similar activities. In return, the scientist wishing to use a Research Natural Area has some obligations. He must:

2. Obtain permission from the appropriate administering agency before using the area;
3. 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. allowed; and
4. Inform the administering agency on the progress of the research, published results, and disposition of collected materials.

The purposes of these obligations are easily understood to ensure 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 repetition between new and old studies. Investigations on Research Natural Areas must be essentially nondestructive in character; destructive analysis of vegetation is generally not allowed nor are studies requiring extensive forest floor modification or extensive soil excavation. Collection of plant and animal specimens should be restricted to the minimum necessary for provision of voucher specimens and other research needs but 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.

A scientist wishing to use a particular Research Natural Area within these broad guidelines must contact the administering agency regarding the proposed use" and obtain the necessary permission. Each agency differs slightly in its requirements.

5There are five agencies cooperating in this program in the Pacific Northwest: Forest Service in the U.S. Department of Agriculture; Bureau of Land Management. Bureau of Sport Fisheries and Wildlife, and the National Park Service in the U.S. Department of Interior; and the Energy Research and Development Administration.

JORDAN CRATER RESEARCH NATURAL AREA

Large area of recent basaltic lava, generally of pahoehoe type, fresh-water ponds, and two isolated kipukas with pristine examples of the sagebrush steppe communities characteristic of southeastern Oregon.

Jordan Crater Research Natural Area (henceforth referred to as the Research Natural Area) was established in June 1975 to exemplify one of the most recent extrusions of basaltic lava in the United States (figs. JC-l, 2, and 3). The surface ofthe lava is principally the smooth pahoehoe type (fig. JC-4), but a few areas of rough aa lava do occur. In addition to the youthful geological features, the primary scientific values of Jordan Crater Research Natural Area include: (1) a series of natural, fresh-water ponds within the lava (figs. JC-5 and 6); (2) plant succession on the lava surfaces and within the ponds; and (3) a concentrated, rich fauna. There also are two pristine kipukas, about 5 ha (12.4 acres) each, which are ideally protected as benchmarks for range vegetation (figs. JC-7, 8, 9, and 10). The tract comprises 12 703 ha (31,390 acres), of which 6 878 ha (16,995 acres) are lava, and is located at 43° 10' N latitude and 117° 20' W. longitude in portions of T. 27 S., R. 43 E.; T. 28 S., R 43 E.; T. 28 S., R 44 E.; T. 29 S., R 43 E.; and T. 29 S., R. 44 E., Willamette meridian (fig. JC-11). Jordan Crater Research Natural Area is administered by the Vale District (Vale, Malheur County, Oregon) Bureau of Land Management (ELM).

Figure JC-1.—Coffee Pot crater, principal source of basaltic extrusion which formed the Jordan Crater flows.

Figure JC-2.—Spatter cones immediately above the principal crater have been altered but little by erosion in the 4 to 10 thousand years since eruption.

Access and Accommodations

The Jordan Crater Research Natural Area is located in southeastern Oregon approximately 161 km (100 mil by road from the population centers of the Snake River valley: Boise, Caldwell, and Nampa, Idaho; and Ontario, Nyssa, and Vale, Oregon. The small ranching community of Jordan Valley, Oregon, is approximately 48.3 km (30 mil by road southeast of the Research Natural Area. Two motels, a trailer court, and several restaurants are available at Jordan Valley.

Access to the main crater is provided by the Cow Creek county road from U.S. Highway 95 near Sheaville, Oregon. The first 15 km (9 mil are good quality soil and gravel surface; the remaining 24 km (15 mil are soil with a high clay content which restricts access to dry weather.

A<;cess to the fresh-water ponds is difficult and has been left undeveloped purposefully to protect the highly sensitive environment of the area.

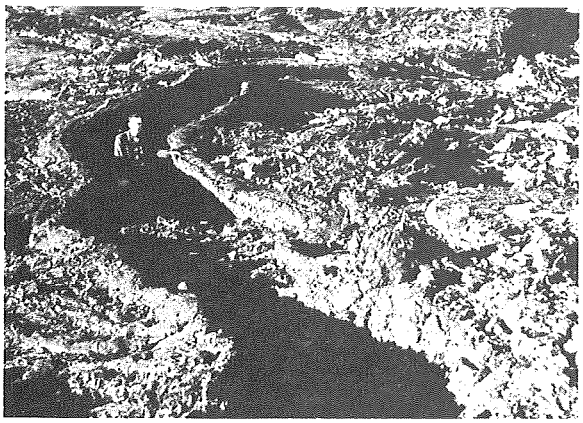

Figure JC-3.—One of several lava shoots or gutters which transported molten lava along the slopes of Coffee Pot crater.

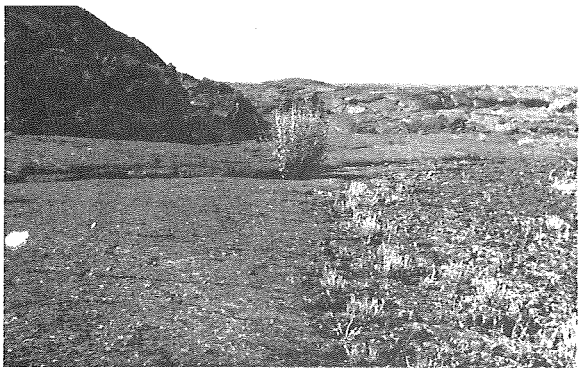

Figure JC-4.—Pahoehoe basalt dominates the Jordan Crater flow. Variations in surface texture determine the habitat for plants. The rougher surface on the right supports a limited stand of *Scutellaria antirrhinoides*; *Brickellia californica* occupies a deep crack, mid-photo. A pressure dome rises in the background.

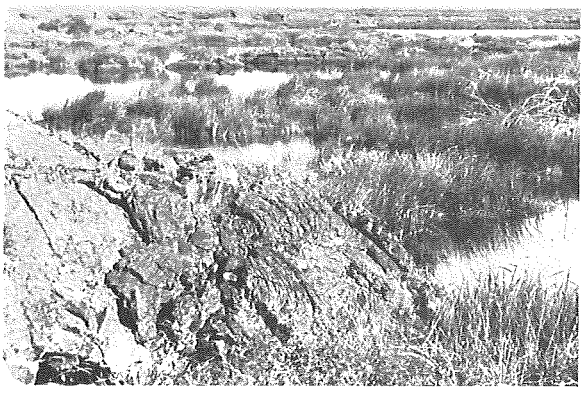

Figure JC-5.—Aquatic and riparian vegetation associated with the numerous permanent ponds in the eastern portion of the Jordan Crater flow. This unique association is rich in birds and mammals.

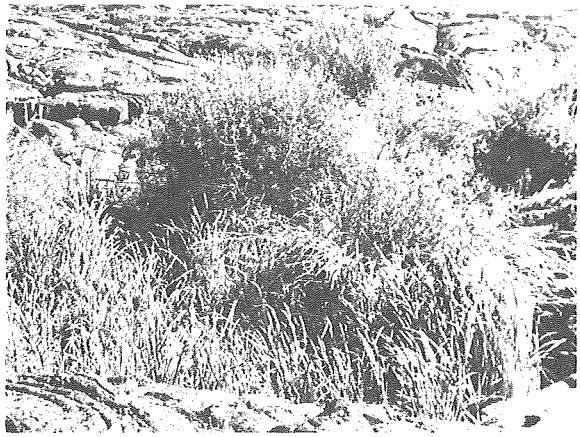

Figure JC-6.—Lava sink holes come in contact with the water table, providing habitat for willow, bullrush, and cattails.

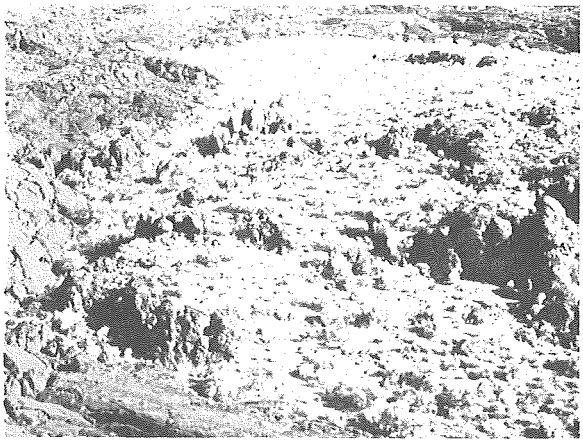

Figure JC-7.—The west kipuka, one of the two hill-top protrusions above the lavas, has been isolated from livestock. The site is rather xeric with frequent rim-rock outcrops.

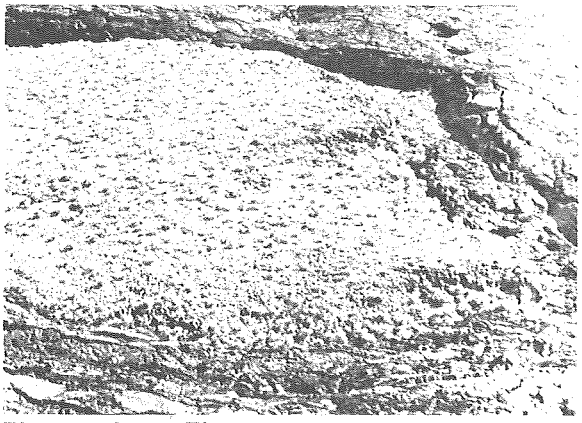

Figure JC-8.—The east kipuka is more mesic with pristine stands of *Agropyron spicatum* and *Artemisia tridentata*. Both kipukas are less than 5 ha in size and difficult to reach except by helicopter.

Figure JC-9.—Giant wild rye, *Elymus cinereus*, is common on mesic sites on the east kipuka.

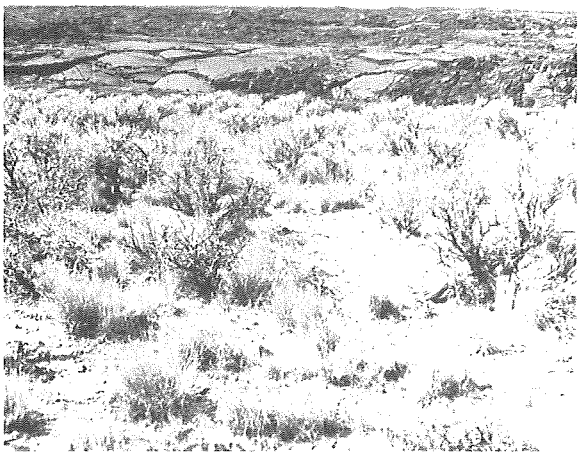

Figure JC-10.—Pristine stands of bluebunch wheatgrass, *Agropyron spicatum*, and associated grasses, forbs, and shrubs occur on the east kipuka. The site is especially well suited for "benchmark" data on original range potential.

Environment

The Jordan Crater Research Natural Area is within the Owyhee Upland Province (Franklin and Dyrness 1973). Elevation varies from 1 402 m (4,600 ft) to 1 311 m (4,300 ft). Relief is gentle, the slope falling 91.4 m (300 ft) toward the east in a distance of 16 km (10 mi). The surface of the lava flow, however, is irregular with innumerable domes, cracks, and sinks.

Basaltic extrusions have occurred throughout this portion of the Owyhee Uplands since the Miocene. Several older flows occur near the Research Natural Area. The Jordan Crater flow, tentatively dated through vegetational succession as between 4,000 years and 10,000 years B.P. (Kindschy)6, seems to be contemporary with Craters of the Moon in Idaho and Mt. Mazama in central Oregon.

Soils are lacking on the flow proper, and accumulation of organic materials forms a shallow muck within the pond area. Shallow, stony soils, characteristic of the cold desert biome, occur along the lava perimeter within the Research Natural Area.

The present climate at the Jordan Crater flow is probably similar to that reported for Danner, 17.7 km (11 mil to the southeast. The 30-year average precipitation at Danner (1930-1960) was 28.1 cm (11.05 in). Between 1951 and 1960, the maximum annual precipitation was 34.7 cm (13.65 in) and the minimum was 16.9 cm (6.66 in). Snowfall over a 20-year period averaged 68 cm (26.8 in), 96 percent of which fell from November through March. Danner temperature data over the 30-year period showed a mean annual temperature of *8.2°C* (46.8°F), a January mean of *-3.5°C* (25.7°F) and a July mean of 20.6°C (69.1°F). There is an average of 43 days annually with temperatures in excess of *32.2°C* (90°F), and an average of 197 days annually with temperatures below O°C (32°F). The maximum temperature recorded during the period was *42.8°C* (109°F) in July; the minimum recorded was *-43°C* (-46°F) in January.

6Unpublished data on file at Bureau of Land Management, Vale District Office, Vale, Oregon.

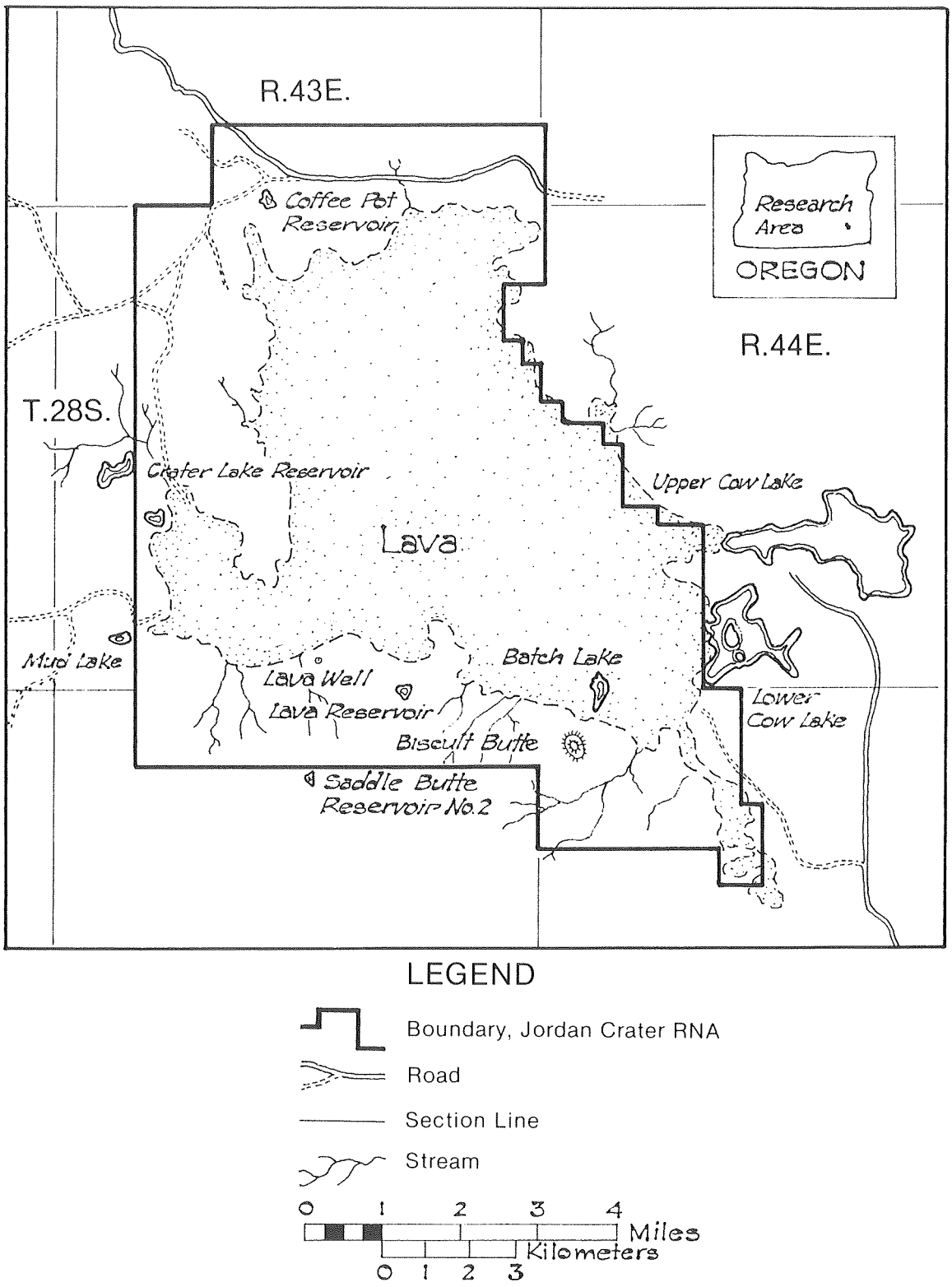

Figure JC-11.—Jordan Crater Research Natural Area is located in Malheur County, Oregon, and includes 178 ha (441 acres) of private land, and 12 703 ha (31,390 acres) of public land administered by the Bureau of Land Management.

Biota

Vegetation on the lavas is composed principally of lichens and mosses. The plant list for Jordan Crater Research Natural Area includes 125 native species (t:lble JC-ll, mostly from the lava surface and the associated ponds, but is not complete. Collectors included Kindschy (1960-1976)7; Maser (1974-1976)8; Glad (1974)9; and Packard (1976)10. The data indicate an unusually high number of species for a harsh habitat. Packard (1976) reported:

1. There are seven species belonging to the fern alliance.
2. There is a relative absence - both in species and individuals - of introduced plants compared to the surrounding range.
3. There is a high frequency of plants that are diminutive in form.
4. Two fern species occur in the Jordan Crater Research Natural Area that are thought to be rare within the State of Oregon: *Polystichum. scopulinwn* and *D,-yopter'iB filirc-mas.*

Kindschy (1960)11 developed the following physiographic classification of the lava surface for use in describing and predicting the occurrence of the various plant communities:

I. Irregular surface flow
  J. North and east exposures
    1.Smooth textured lava 2. Rough textured lava
  B. South and west exposures
    1.Smooth textured lava 2. Rough textured lava
II. Flat surfaced flow
  A. Smooth textured lava
  B. Rough textured lava
  C. Cinders and volcanic debris
III. Deep cracks, caves, and collapse holes
  A. North and east exposed walls
  B. South and west exposed walls
    1. Sunshine zone
    2. Perpetual shade zone
  C. Bottoms
    1. Rubble filled
    2.Soil filled
    3. Bare rock
IV. Water flooded lavas
  A. Open water
  B. Water margin fluctuation zone
    1. Rock shore
    2. Muck shore

The usefulness of the classification can be exemplified by studies of the distribution of the fern *Polystichum scopulr:num* .. This fern occurs in the deep cracks, especially east/west oriented cracks, which are protected from solar radiation and excessively high temperatures. Temperature studies confirm that the summer maximums at 1.8- to 2.4-m (6- to 8-ft) depths in the cracks were consistently between 15.6° and 21.1°C (60° to 70°F) in spite of surface maximums of 47.2°C (117°F) (Kindschy 1960).

7Field notes on Jordan Crater's recent lavas. On file at Bureau of Land Management, Vale District Office, Vale, Oregon.

8Field notes on file at Bureau of Land Management, Vale District Office, Vale, Oregon.

9Field notes on file at Bureau of Land Management, Vale District Office, Vale, Oregon.

IOUnpublished report on file at Bureau of Land Management, Vale District Office, Vale, Oregon.

11 Unpublished report on file at Bureau of Land Management, Vale District Office, Vale, Oregon.

Table JC-1.—Flora identified within the Jordan Crater Research Natural Area[1]

Family	Scientific name	Common name
Polypodiaceae	*Asplenium trichomanes*	maidenhair spleenwort
	Cystopteris fragilis	brittle bladder fern
	Polystichum scopulinum	Eaton hollyfern
	Woodsia oregana	Oregon woodsia
	Dryopteris filix-mas	male fern
Marsileaceae	*Marsilea vestita*	pepperwort

Table JC-1.—Flora identified within the Jordan Crater Research Natural Area—Continued[1]

Family	Scientific name	Common name
Salviniaceae	*Azolla mexicana*	Mexican water-fern
Typhaceae	*Typha latifolia*	broad-leaved cattail
Sparganiaceae	*Sparganium eurycarpum*	broadfruited burreed
Potamogetonaceae	*Potamogeton richardsonii*	Richardson's pond weed
Alismataceae	*Alisma plantago-aquatica*	American waterplantain
Gramineae	*Poa sandbergii*	Sandberg's bluegrass
	Bromus tectorum	cheatgrass brome
	Festuca idahoensis	Idaho fesque
	Agropryon spicatum	bluebunch wheatgrass
	Elymus cinereus	giant wildrye
	Hordeum jubatum	foxtail barley
	Sitanion hystrix	bottlebrush squirreltail
	Agrostis scabra	winter bentgrass
	Alopecurus aequalis	shortawn foxtail
	Alopecurus geniculatus	marsh foxtail
	Muhlenbergia filiformis	pullup muhly
	Muhlenbergia minutissima	little seed muhly
	Phalaris arundinacea	Reed canary-grass
Cyperaceae	*Carex atherodes*	awned sedge
	Carex athrostachya	slenderbeak sedge
	Carex rostrata	beaked sedge
	Cyperus aristatus	awned flatsedge
	Eleocharis ovata	spike rush
	Eleocharis palustris	creeping spikesedge
	Scirpus acutus	viscid bulrush
Lemnaceae	*Lemna minor*	duckweed
	Spirodela polyrhiza	greater duckweed
Juncaceae	*Juncus balticus*	Baltic rush
	Juncus bufonius	toad rush
Liliaceae	*Allium acuminatum*	tapertip onion
	Calochortus macrocarpus	green-banded mariposa lily
	Zigadenus paniculatus	foothill death camas
Salicaceae	*Populus trichocarpa*	black cottonwood
	Salix exigua	coyote willow
	Salix lasiandra	red willow
Urticaceae	*Parietaria pennsylvanica*	pellitory
Polygonaceae	*Eriogonum vimineum* var. *nidularium*	broom buckwheat
	Eriogonum caespitosum	mat eriogonum
	Eriogonum strictum ssp. *proliferum*	strict buckwheat
	Polygonum amphibium	water ladysthumb
	Polygonum coccineum	water smartweed
	Rumex maritimus	golden dock
Chenopodiaceae	*Chenopodium rubrum*	red goosefoot
Ceratophyllaceae	*Ceratophyllum demersum*	hornwort
Ranunculaceae	*Myosurus minimus*	tine mousetail
	Ranunculus aquatilis	watercrowfoot buttercup
	Ranunculus cymbalaria	shore crowfoot

Table JC-1.—Flora identified within the Jordan Crater Research Natural Area—Continued[1]

Family	Scientific name	Common name
Cruciferae	*Arabis holboellii*	Holboell rockcress
	Descurainia pinnata	pinnate tansymustard
	Draba verna	vernal draba
	Phoenicaulis cheiranthoides	wallflower phoenicaulis
	Polyctenium fremontii	combleaf
	Rorippa curvisiliqua	western yellowcress
	Rorippa islandica	marsh yellowcress
Saxifragaceae	*Lithophragma parviflora*	small-flowered fringecup
	Saxifraga integrifolia	northwestern saxifrage
Grossulariaceae	*Ribes aureum*	golden currant
	Ribes cereum	wax currant
	Ribes viscosissimum	sticky currant
Rosaceae	*Holodiscus dumosus*	bush rockspirea
	Potentilla biennis	biennial cinquefoil
	Rosa woodsii	woods rose
Leguminosae	*Astragalus filipes*	threadstalk milkvetch
	Astragalus purshii	Purch's milkvetch
	Lupinus laxiflorus	spurred lupine
	Trifolium eriocephalum	woollyhead
Geraniaceae	*Geranium carolinianum*	Carolina geranium
Euphorbiaceae	*Euphorbia serpyllifolia*	thymeleaf euphorbia
Malvaceae	*Sphaeralcea munroana*	Munro globemallow
Onagraceae	*Boisduvalia glabella*	smooth spikeprimrose
	Boisduvalia densiflora	dense spikeprimrose
	Epilobium glandulosum	common willowweed
	Epilobium paniculatum	autumn willowweed
	Epilobium watsonii	Watson's willowweed
	Oenothera tanacetifolia	tansyleaf eveningprimrose
Umbelliferae	*Berula erecta*	stalky berula
	Cicuta douglasii	western water-hemlock
	Lomatium triternatum	nineleaf lomatium
	Rhysopterus siumsuave	
Apocynaceae	*Apocynum cannabinum*	hemp dogbane
Asclepiadaceae	*Asclepias speciosa*	showy milkweed
Polemoniaceae	*Leptodactylon pungens*	granite gilia
	Navarretia intertexta	needle-leaf navarretia
	Phlox pulvinata	cushion phlox
Hydrophyllaceae	*Phacelia hastata*	whiteleaf phacelia
Boraginaceae	*Cryptantha* sp.	cryptantha
	Plagiobothrys scouleri	Scouler popcornflower
Verbenaceae	*Verbena bracteata*	bracted verbena
Labiatae	*Mentha arvensis*	field mint
	Scutellaria antirrhinoides	snapdragon skullcap
Solanaceae	*Nicotiana attenuata*	coyote tobacco
Scrophulariaceae	*Collinsia parviflora*	littleflower collinsia
	Mimulus floribundus	purplestem monkeyflower
	Mimulus guttatus	common monkeyflower
	var. *guttatus*	
	var. *depauperatus*	

Table JC-1.—Flora identified within the Jordan Crater Research Natural Area—Continued[1]

Family	Scientific name	Common name
	Mimetanthe pilosa	Douglas monkey flower
	Penstemon deustus	hot-rock penstemon
	Penstemon speciosus	royal penstemon
	Veronica peregrina xalapensis	purslane speedwell
Lentibulariaceae	*Utricularia vulgaris*	common bladderwort
Rubiaceae	*Galium trifidum*	small bedstraw
Caprifoliaceae	*Sambucus cerulea*	blue elderberry
Campanulaceae	*Downingia yina*	
	Downingia elegans	
Compositae	*Achillea millefolium*	western yarrow
	Agoseris heterophylla	annual agoseris
	Antennaria dimorpha	low pussytoes
	Artemisia arbuscula	low sagebrush
	Artemisia cana	silver sagebrush
	Artemisia tridentata	big sagebrush
	Balsamorhiza sagittata	arrowleaf balsamroot
	Bidens cernua	nodding beggars-ticks
	Brickellia californica	California brickellia
	Chaenactis douglasii	falseyarrow
	Chrysothamnus nauseosus	tall gray rabbitbrush
	Chrysothamnus viscidiflorus	tall green rabbitbrush
	Cirsium utahense	Utah thistle
	Conyza canadensis	horseweed
	Crepis acuminata	long-leaved hawks beard
	Erigeron aphanactis	basin rayless daisy
	Erigeron compositus	dwarf mountain fleabane
	Erigeron pumilus	shaggy fleabane
	Gnaphalium palustre	
	Haplopappus nanus	dwarf goldenweed
	Lagophylla ramosissima	slender rabbitleaf
	Machaeranthera canescens	hoary aster
	Madia exigua	little tarweed
	Solidago occidentalis	western goldenrod
	Stephanomeria tenuifolia	narrow-leafed skeletonweed
	Stylocline filaginea	northern stylocline
	Tetradymia canescens	gray horse brush
	Xanthium strumarium	common cocklebur

[1]Plant nomenclature follows Hitchcock and Cronquist (1974).

Within the Research Natural Area, 5 312 ha (13,120 acres) of native range vegetation surround the basaltic flows. The condition of existing communities varies with the level of past grazing by domestic livestock. Nearly pristine big sagebrush/bluebunch wheatgrass *(Artemisu), tridentata/Agropyron spicatum)* communities occur in a large 414 ha (1,024 acre) peninsular intrusion into the flow that has been isolated from grazing. Conversely, the southern margin of the lavas has traditionally been a heavy-use area; it is presently populated by big sagebrush/Sandberg's bluegrass *(A. tridentatojPoa sandberg?:i)* communities. Intensive grazing during the past decade has allowed successional advance toward climax conditions on much of the remaining range within the Research Natural Area.

Animal distribution may be divided into three major regions within the Jordan Crater Research Natural Area: the lava surface; the surrounding rangelands, especially near the lava margin; and the aquatic and associated habitats of the ponds (tables JC-2, JC-3, and JC-4).

The lava surface is the least populated, both in abundance and diversity of species; the deer mouse *(Perolllyscusmaniculalus)* is the most common mammal while the rock wren *(Salpineles obsolelus)* and the canyon wren *(Calherpes me:rica/ws)* represent most of the avifauna. No amphibians or reptiles have been observed within the interior of the flow, although inventories of this region have been limited.

The lava margins are especially rich in habitat diversity, and vegetation is often tall along the lava-rangeland ecotone. Mammals most evident include the deer mouse, bushy-tailed woodrat *(Neolmna cinerea),* cottontail rabbit *(S!Jlvilagu,~ mdlalli),* and least chipmunk *(Enlalnias minimu,~).* The avifauna is varied, including the chukar *(Alect(m;~ chukar)* near wa ter, logger head s hrike *(Lanill,~ ludulJici(ulli,~),* rock wren, and canyon wren. Reptiles are plentiful, especially the western yellow-bellied racer *(Culllber cUl/,';lrictur),* western rattlesnake *(Crolalu,~ lJiri(h~),* and gopher snake *(Pilnup!u:~ melruwlelicllS).* Lizards include the western fence lizard *(Scelupurlls uccidenlah~)* and sideblotched lizard *(Ula slal/,~bnri(Uw).*

The aquatic habitats associated with the flooded lavas are the richest in diversity and abundance of animals. Principal mammals are the muskrat *(Ondalra zibelhiclls)* and beaver *(Caslur canadel/,~I;~).* Birds are typified by the red-winged blackbird *(Agelaius p!wenicens),* cinnamon teal *(A 1U1S c!f(uwplera),* and American coot *(Fllhf:a allWrlf:alw).* Reptiles include the western fence lizard and common garter snake *(Th(Unlwp!u;~ 81:l'lah;~).* Amphibians are apparently represented only by the Pacific treefrog *(Hyla regilla).* Two species of introduced fish, the black bullhead *(JctalW1(S melfLs)* and yellow perch *(Perea .flavescen,~),* occur in many of the ponds. No inventory of invertebrates has been made.

Table JC-2.—Tentative list of the amphibians and reptiles which utilize the Jordan Crater Research Natural Area[1]

Order	Scientific name	Common name
Anura	*Hyla regilla*[2]	Pacific treefrog
	Scaphiopus intermontanus	Great Basin spadefoot toad
Squamata	*Charina bottae*	rubber boa
	Cnemidophorus tigris	western whiptail lizard
	Coluber constrictor[2]	yellow-bellied racer
	Crotalus viridis[2]	western rattlesnake
	Crotaphytus collaris	collared lizard
	Crotaphytus wislizenii	leopard lizard
	Hypsiglena torquata	night snake
	Masticophis taeniatus	striped whipsnake
	Phrynosoma douglassi	short-horned lizard
	Phrynosoma platyrhinos	desert horned lizard
	Pituophis melanoleucus[2]	gopher snake
	Sceloporus graciosus	sagebrush lizard
	Sceloporus occidentalis[2]	western fence lizard
	Thamnophis elegans[2]	western terrestrial garter snake
	Thamnophis sirtalis[2]	common garter snake
	Uta stansburiana[2]	side-blotched lizard

[1]Amphibian and reptile nomenclature follows Stebbins (1966).

[2]Presence of animal has been verified by sighting or capture.

Table JC-3.—Tentative list of the birds which utilize the Jordan Crater Research Natural Area[1]

Order	Scientific name	Common name
Gaviiformes	*Gavia immer*	common loon
Podicipediformes	*Aechmorphorus occidentalis*[2]	western grebe
	Podiceps auritus	horned grebe
	Podiceps dominicus[2]	least grebe
	Podiceps grisegena	red-necked grebe
	Podiceps nigricollis[2]	eared grebe
	Podilymbus podiceps[2]	pied-billed grebe
Pelecaniformes	*Pelecanus erythrorhynchos*[2]	white pelican
	Phalacrocorax auritus	double-crested cormorant
Ciconiiformes	*Ardea herodias*[2]	great blue heron
	Botaurus lentiginosus[2]	American bittern
	Casmerodius albus[2]	common egret
	Egretta thula[2]	snowy egret
	Ixobrychus exilis	least bittern
	Nycticorax nycticorax[2]	black-crowned night heron
	Plegadis chihi	white-faced ibis
Anseriformes	*Anas acuta*[2]	pintail
	Anas americana[2]	American wigeon
	Anas clypeata[2]	northern shoveler
	Anas crecca[2]	green-winged teal
	Anas cyanoptera[2]	cinnamon teal
	Anas discors[2]	blue-winged teal
	Anas platyrhynchos[2]	mallard
	Anas strepera[2]	gadwall
	Anser albifrons	white-fronted goose
	Aythya affinis[2]	lesser scaup
	Aythya americana[2]	redhead
	Aythya collaris[2]	ring-necked duck
	Aythya marila	greater scaup
	Aythya valisineria[2]	canvasback
	Branta canadensis[2]	Canada goose
	Bucephala albeola[2]	bufflehead
	Bucephala clangula[2]	common goldeneye
	Bucephala islandica[2]	Barrow's goldeneye
	Chen caerulescens[2]	snow goose
	Chen rossii	Ross' goose
	Lophodytes cucullatus[2]	hooded merganser
	Mergus merganser[2]	common merganser
	Mergus serrator[2]	red-breasted merganser
	Olor columbianus[2]	whistling swan
	Oxyura jamaicensis[2]	ruddy duck
Falconiformes	*Aquila chrysaetos*[2]	golden eagle
	Buteo jamaicensis	red-tailed hawk
	Buteo lagopus[2]	rough-legged hawk
	Buteo regalis[2]	ferruginous hawk
	Buteo swainsoni	Swainson's hawk
	Cathartes aura[2]	turkey vulture
	Circus cyaneus[2]	marsh hawk

Table JC-3.—Tentative list of the birds which utilize the Jordan Crater Research Natural Area—Continued[1]

Order	Scientific name	Common name
	Falco columbarius	merlin
	Falco mexicanus[2]	prairie falcon
	Falco peregrinus	peregrine
	Falco sparverius[2]	American kestrel
	Haliaeetus leucocephalus[2]	bald eagle
Galliformes	*Alectoris chukar*[2]	chukar
	Centrocerus urophasianus[2]	sage grouse
	Lophortyx californicus[2]	California quail
	Perdix perdix	gray partridge
	Phasianus colchicus[2]	ring-necked pheasant
Gruiformes	*Fulica americana*[2]	American coot
	Grus canadensis[2]	sandhill crane
	Porzana carolina[2]	sora
	Rallus limicola	Virginia rail
Charadriiformes	*Actitis macularia*	spotted sandpiper
	Calidris bairdii	Baird's sandpiper
	Calidris mauri	western sandpiper
	Calidris melanotos	pectoral sandpiper
	Calidris minutilla[2]	least sandpiper
	Capella gallinago[2]	common snipe
	Catoptrophorus semipalmatus[2]	willet
	Charadrius alexandrinus[2]	snowy plover
	Charadrius montanus	mountain plover
	Charadrius vociferus[2]	killdeer
	Chlidonias niger[2]	black tern
	Himantopus mexicanus[2]	black-necked stilt
	Hydroprogne caspia[2]	Caspian tern
	Larus californicus[2]	California gull
	Larus delawarensis[2]	ring-billed gull
	Larus philadelphia	Bonaparte's gull
	Larus pipixcan	Franklin's gull
	Limnodromus scolopaceus[2]	long-billed dowitcher
	Lobipes lobatus	northern phalarope
	Numenius americanus[2]	long-billed curlew
	Recurvirostra americana[2]	American avocet
	Steganopus tricolor[2]	Wilson's phalarope
	Sterna forsteri[2]	Forster's tern
	Tringa flavipes	lesser yellowlegs
	Tringa melanoleuca	greater yellowlegs
	Tringa solitaria	solitary sandpiper
Columbiformes	*Columba livia*[2]	rock dove
	Zenaida macroura[2]	mourning dove
Cuculiformes	*Coccyzus americanus*	yellow-billed cuckoo
Strigiformes	*Aegolius acadicus*	saw-whet owl
	Asio flammeus[2]	short-eared owl
	Asio otus	long-eared owl
	Athene cunicularia[2]	burrowing owl
	Bubo virginianus[2]	great horned owl

Table JC-3.—Tentative list of the birds which utilize the Jordan Crater Research Natural Area—Continued[1]

Order	Scientific name	Common name
	Glaucidium gnoma[2]	pygmy owl
	Nyctea scandiaca	snowy owl
	Otus asio[2]	screech owl
	Otus flammeolus	flammulated owl
	Tyto alba	barn owl
Caprimulgiformes	*Chordeiles minor*[2]	common nighthawk
	Phalaenoptilus nuttallii	poorwill
Apodiformes	*Aeronautes saxatalis*	white-throated swift
	Archilochus alexandri	black-chinned hummingbird
	Chaetura vauxi	Vaux's swift
	Cypseloides niger	black swift
	Selasphorus platycercus	broad-tailed hummingbird
	Selasphorus rufus	rufous hummingbird
	Stallula calliope	calliope hummingbird
Coraciiformes	*Megaceryle alcyon*	belted kingfisher
Piciformes	*Asyndesmus lewis*	Lewis' woodpecker
	Colaptes auratus[2]	common flicker
	Sphyrapicus thyroideus[2]	Williamson's sapsucker
	Sphyrapicus varius	yellow-bellied sapsucker
Passeriformes	*Agelaius phoeniceus*[2]	red-winged blackbird
	Ammodramus savannarum	grasshopper sparrow
	Amphispiza belli[2]	sage sparrow
	Anthus spinoletta	water pipit
	Bambycilla garrulus	Bohemian waxwing
	Bombycilla cedrorum	cedar waxwing
	Carduelis psaltria	lesser goldfinch
	Catharus fuscescens[2]	veery
	Catherpes mexicanus[2]	canyon wren
	Chondestes grammacus	lark sparrow
	Cistothorus palustris[2]	long-billed marsh wren
	Corvus brachyrhynchos[2]	common crow
	Corvus corax[2]	common raven
	Dendroica coronata[2]	yellow-rumped warbler
	Dendroica petechia[2]	yellow warbler
	Dendroica townsendi	Townsend's warbler
	Dumetella carolinensis	gray catbird
	Empidonax difficilis[2]	western flycatcher
	Empidonax hammondii	Hammond's flycatcher
	Empidonax oberholseri	dusky flycatcher
	Empidonax traillii	willow flycatcher
	Eremophila alpestris[2]	horned lark
	Euphagus cyanocephalus[2]	Brewer's blackbird
	Geothlypis trichas	common yellowthroat
	Gymnorhinus cyanocephalus	pinyon jay
	Hirundo rustica[2]	barn swallow
	Iridoprocne bicolor	tree swallow
	Junco hyemalis[2]	dark-eyed junco
	Lanius excubitor[2]	northern shrike

Table JC-3.—Tentative list of the birds which utilize the Jordan Crater Research Natural Area—Continued[1]

Order	Scientific name	Common name
	Lanius ludovicianus[2]	loggerhead shrike
	Leucosticte tephrocotis	gray-crowned rosy finch
	Leucosticte atrata	black rosy finch
	Melospiza lincolnii	Lincoln's sparrow
	Melospiza melodia[2]	song sparrow
	Molothrus ater[2]	brown-headed cowbird
	Myadestes townsendi	Townsend's solitaire
	Myiarchus cinerascens	ash-throated flycatcher
	Oreoscoptes montanus[2]	sage thrasher
	Parus atricapillus	black-capped chickadee
	Passerculus sandwichensis	savannah sparrow
	Passerella iliaca	fox sparrow
	Passerina amoena	lazuli bunting
	Petrochelidon pyrrhonota[2]	cliff swallow
	Pheucticus melanocephalus	black-headed grosbeak
	Pica pica[2]	black-billed magpie
	Piranga ludoviciana	western tanager
	Pooecetes gramineus	vesper sparrow
	Psaltriparus minimus	bushtit
	Regulus satrapa[2]	golden-crowned kinglet
	Riparia riparia	bank swallow
	Salpinctes obsoletus[2]	rock wren
	Sayornis saya	Say's phoebe
	Sialia currucoides[2]	mountain bluebird
	Sialia mexicana[2]	western bluebird
	Spinus tristis	American goldfinch
	Spizella breweri[2]	Brewer's sparrow
	Stelgidopteryx ruficollis[2]	rough-winged swallow
	Sturnella neglecta[2]	western meadowlark
	Sturnus vulgaris[2]	starling
	Tachycineta thalassina	violet-green swallow
	Troglodytes aedon	house wren
	Turdus migratorius[2]	American robin
	Tyrannus tyrannus	eastern kingbird
	Tyrannus verticalis[2]	western kingbird
	Vermivora celata	orange-crowned warbler
	Vireo gilvus	warbling vireo
	Vireo olivaceus	red-eyed vireo
	Xanthocephalus xanthocephalus[2]	yellow-headed blackbird
	Zonotrichia leucophrys[2]	white-crowned sparrow

[1]Bird nomenclature follows Robbins et. al. (1966) except where they are superseded by the American Ornithologists' Union (1973).

[2]Presence of bird has been verified by sighting.

Table JC-4.—Tentative list of the mammals which utilize the Jordan Crater Research Natural Area.[1]

Order	Scientific name	Common name
Insectivora	*Sorex merriami*	Merriam shrew
	Sorex preblei	Malheur shrew
	Sorex vagrans	wandering shrew
Chiroptera	*Antrozous pallidus*[2]	pallid bat
	Eptesicus fuscus	big brown bat
	Lasionycteris noctivagans	silver-haired bat
	Lasiurus cinereus	hoary bat
	Myotis californicus	California myotis
	Myotis lucifugus[2]	little brown myotis
	Pipistrellus hesperus[2]	western pipistrel
	Plecotus townsendi[2]	western big-eared bat
Lagomorpha	*Lepus californicus*[2]	black-tailed jackrabbit
	Lepus townsendi	white-tailed jackrabbit
	Sylvilagus idahoensis	pygmy rabbit
	Sylvilagus nuttalli[2]	mountain cottontail
Rodentia	*Castor canadensis*[2]	beaver
	Dipodomys ordi[2]	Ord kangaroo rat
	Erethizon dorsatum[2]	porcupine
	Eutamias minimus[2]	least chipmunk
	Lagurus curtatus[2]	sage vole
	Marmota flaviventris[2]	yellow-bellied marmot
	Microtus longicaudus	long-tailed vole
	Microtus montanus[2]	montane vole
	Neotoma cinerea[2]	bushy-tailed woodrat
	Neotoma lepida	desert woodrat
	Ondatra zibethicus[2]	muskrat
	Onychomys leucogaster	northern grasshopper mouse
	Perognathus parvus[2]	Great Basin pocket mouse
	Peromyscus maniculatus[2]	deer mouse
	Reithrodontomys megalotis	western harvest mouse
	Spermophilus beldingi[2]	Belding ground squirrel
	Spermophilus lateralis	mantled ground squirrel
	Spermophilus townsendi[2]	Townsend ground squirrel
	Thomomys talpoides[2]	northern pocket gopher
	Zapus princeps	western jumping mouse
Carnivora	*Canis latrans*[2]	coyote
	Felis concolor[2]	cougar
	Lutra canadensis[2]	river otter
	Lynx rufus[2]	bobcat
	Mephitis mephitis	striped skunk
	Mustela frenata[2]	long-tailed weasel
	Procyon lotor[2]	raccoon
	Spilogale putorius	spotted skunk
	Taxidea taxus[2]	badger

Table JC-4.—Tentative list of the mammals which utilize the Jordan Crater Research Natural Area—Continued[1]

Order	Scientific name	Common name
Artiodactyla	*Antilocapra americana*[2]	pronghorn
	Odocoileus hemionus[2]	mule deer
	Ovis canadensis	bighorn sheep

[1]Mammal nomenclature follows Hall and Kelson (1959) except where they are superseded by Johnson and Ostenson (1959) and Burt and Grossenheider (1964).

[2]Presence of mammals has been verified by sign, sighting, or capture.

History of Disturbance

Domestic livestock have grazed the rangeland perimeter of the Jordan Crater Research Natural Area since the 1860's; sheep largely replaced cattle after 1915. By the mid-1960's, cattle were again grazed on the area to the exclusion of sheep. Because of the "Vale Project" in the 1960's, portions of the rangeland area were treated with 2,4-D herbicide and seeded with crested wheatgrass *(AY/'()]J!ll'li/l cri.statuli/* or *A. desert()l'/(lii)* (Heady and Bartolome 1977). Intensive livestock management, employing rotational grazing systems, has been practiced for the past decade.

No grazing by domestic livestock has occurred on the lavas proper. An illegal irrigation division attempt occurred during the early 1960's in the largest pond (Batch Lake), resulting in some lava removal and an earth fill in a small area. Cinder removal at the main crater occurred during the same period, but was stopped before significant damage occurred. The remote and inaccessible nature of the J ordan Crater lavas has minimized damaging human disturbance. Future management goals of the BLM are to preserve this degree of inaccessability.

Research

Little formal research has occurred on the Jordan Crater lavas. Millholen (1965) studied the petrography of the basalts. Some technical (e.g., Newcomb 1962, Russell 1903) and popular (e.g., Otto and Hutchison 1977) articles have been written concerning geological aspects of the lavas. Kindschy (1960-1977), Maser (1974-1976), Glad (1974), and Packard (1976) have conducted plant and animal inventories for the Bureau of Land Management.

Maps and Aerial Photographs

The Bureau of Land Management, Vale District Office, can supply information on most recent maps and aerial photo coverage of the area.

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LITERATURE CITED

American Ornithologists' Union. 1973. Checklist of North American Birds, Fifth Edition, as Amended by Supplement 32. Auk 90(2):411-419.

Burt, William H., and Richard p, Grossenheider. 1964. A Field Guide to the Mammals. Houghton Mifflin Co., Boston. 248 p.

Glad, Judith. 1974. Field notes on file at Vale District Office, BLM, Vale, Oregon.

Franklin, Jerry F., and C. T. Dyrness.
1973. Natural vegetation of Oregon and Washington. USDA For. Servo Gen. Tech. Rep. PNW-8, 417 p. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.
Hall, E. Raymond, and Keith R. Kelson.
1959. The mammals of North America. 2 vols. Ronald Press Co., New York. 1083 p.
Heady, Harold F., and James Bartolome.
1977. The Vale rangeland rehabilitation program: the desert repaired in southeastern Oregon. USDA For. Servo Resour. Bull. PNW-70, 139 p., illus. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.
Hitchcock, C. Leo, and Arthur Cronquist.
1974. Flora of the Pacific Northwest, Univ. of Wash. Press, Seattle. 730 p.
Johnson, Murray L., and Burton T. Ostenson. 1959.
Comments on the nomenclature of some mammals of the Pacific Northwest. J. Mammal. 40(4):571-577.
Kindschy, Robert R.
1960-1977. Field notes on Jordan Crater's recent lavas. On file at Vale District Office, BLM, Vale, Oregon.
Kindschy, Robert R.
1960. Unpublished report on file at Vale District Office, BLM, Vale, Oregon.
Maser, Chris.
1974-1976. Field notes on file at Vale District Office, BLM, Vale, Oregon.
Millhollen, Gary L.
1965. The petrography of the basalts of the Cow Creek Lakes area, Malheur County, Oregon. M.S. Thesis, on file University of Oregon, Eugene.
Newcomb, R. C.
1962. Hydrology of the public domain.
Ground Water in the western part of the Cow Creek and Soldier Creek grazing units, Malheur County, Oregon. U.S. Geol. Surv. Water-supply Publ. No. 1475E:159-172.
Otto, Bruce R., and Dana A. Hutchison.
1977. The geology of Jordan Craters, Malheur County, Oregon. The Ore Bin 39(8):125-140.
Packard, Patricia.
1976. Unpublished report on file at Vale District Office, BLM, Vale, Oregon.
Robbins, Chandler S., Bertel Bruun, and Herbert S. Zim.
1966. Birds of North America. Golden Press, New York. 340 p.
Russell, Israel C.
1903. Geology of southwestern Idaho and southeastern Oregon. U.S. Department of the Interior Geol. Surv. Bull. 217, Series B, Descriptive Geol. 32, 83 p.

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