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FLORA AND FAUNA DISTRIBUTIONS
OF
THE GREAT RIFT LAVA FLOWS AND KIPUKAS
IN
SOUTHEASTERN IDAHO

A REPORT ON CONTRACT NUMBER ID-910-CT9-0006

SUBMITTED TO
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INTRODUCTION

The extensive lava flows of the Great Rift area of southeastern Idaho form a broad and unique range of habitats, with correspondingly interesting plant and animal distributions. Especially notable in a study of distributions are the numerous kipukas, isolated islands of undisturbed habitat surrounded by relatively barren lava. These lava flows and kipukas offer a unique opportunity to study plant and animal interrelationships in an environment undisturbed by man.

In the spring of 1979, funded by the Bureau of Land Management, Dr. Jay E. Anderson and research assistants Steven Lovejoy and Janice Carter of Idaho State University began an investigation of distributions of plants and animals on the lava flows. The major objectives of this study were

- 1) to complete a survey of the flora and fauna of the lava environment;
- 2) to determine the composition and distribution of major plant communities in relation to some soil and topographic parameters;
- 3) to assess the distribution of certain reptile and small mammal species in relation to plant communities and in relation to the presence, size, degree of isolation, and environmental heterogeneity of kipukas; and
- 4) to determine minimum habitat size and quality requirements for maintaining populations of certain animals.

Additional objectives included identifying threatened and endangered plant or animal species that might be discovered; identifying any water sources found within the study area; inventorying any evidence of prehistoric man that might be encountered; and developing a photographic record of the study and the area.

The methods we have used so far to achieve these objectives and the results of our field study are presented in this report.

STUDY AREA

The study took place on the Craters of the Moon lava flow and the Wapi lava flow, the two major flows that straddle the Idaho Great Rift System. (See map 1, Appendix A) These flows are geologically quite recent; consequently they are largely barren of vegetation relative to the surrounding landscape. The lion's share of the research occurred on the northeastern portion of the Craters of the Moon flow, south of Arco and east of the Craters of the Moon National Monument (map 2). Other study sites included kipuka 20 on the southern edge of the Craters of the Moon flow and Winter Kipuka (kipuka 25) and the section 36 kipuka (kipuka 24) on the Wapi flow (map 3). Further description of each of the kipukas studied is in Appendix B. Maps 4,5, and 6 in Appendix A show the locations of kipukas relative to the nearest "mainland"; maps 7-14 present enlargements of the kipukas in order to point out specific sampling areas.

METHODS

Plant and animal sampling took place primarily within the framework of 31 20meter by 50meter plots; these plots were scattered across 16 kipukas and 4 lava sites, with from 1 to 4 plots on each kipuka. The location and size of each kipuka are presented in Table 1; approximate locations of each plot within the kipukas can be seen in maps 7-14. We attempted to lay out each plot in an area subjectively judged to be vegetatively homogeneous.

Two soil samples were taken from each plot; they will be studied to determine soil texture, color, and organic content. The plots were also characterized topographically through determination of their average aspect and slope.

Vegetation cover estimates were made within a .2m by .5m Daubenmire

ments were used on a few plots that had lower plant density, such as for sampling sites on lava.

A standardized snap-trapping regime was established on 24 plots representing 13 kipukas and 1 lava location. This system consisted of 18 trapping stations located 10m apart on 3 lines of 6 stations. At each station 3 Museum Special break-back snap traps and 1 McGill rat trap were placed. These traps were baited with a mixture of rolled oats and peanut butter and left for 3 days; on the fourth day the traps were rebaited and set. For the next 3 or 4 days the traps were checked for animals every morning and rebaited and reset as necessary. Captured animals were identified, weighed, tagged, and transported to Idaho State University where they were put in freezer storage.

In addition to the standardized regimen other traps were used to assess small mammal populations. These included Museum Special and McGill traps located on k2; additional Museum Specials located on lava near k8 and on k10, k18 and k19; and 1 Longworth and 3 Sherman small mammal live traps placed on k8.

58 pitfall traps consisting of buried no. 10 tin cans were placed on 6 kipukas. Three pitfalls 28m apart were established diagonally across each plot on k1, k2, k6, k7, k8, and k9. Additional pitfalls were placed on k1, k3L, k8, and k9; the 12 additional pitfalls on k8 were conjoined with 3 feet long hardware cloth drift fences. The traps were unbaited and shaded with foil-covered paper plates. We checked the pitfall traps at irregular intervals not exceeding 10 days. Lizards captured were marked and released, but no lizard was ever recaptured.

Simple observation was also important in achieving our objectives. Our animal species list is augmented by a number of animals that we sighted

Daubenmire frame data were supplemented by other species identified during walking searches of the kipukas. A photographic record of all kipukas studied was maintained.

Table 2 presents the total effort expended on each kipuka in the course of the study. This table includes the amount of vegetative sampling and trapping performed as well as the approximate time we spent in each area.

RESULTS

During the course of the summer no permanent water source was encountered, and no threatened or endangered species was identified. Evidence of prehistoric man was found in two areas. One obsidian flake was found on k6; an obsidian flake was found on k1, and several others were located on the mainland near the edge of the lava just to the north of k1. BLM Antiquities Site Inventory forms for each area are included with this report as Appendix G.

Thirteen species of mammals, five species of reptiles, and about eighty species of plants were identified. Table 3 shows the kind and number of animals trapped on each kipuka. An alternative presentation of the trapping data is found in Appendices D and E. These appendices are lists of the animals identified, annotated to include the kipukas on which they were found and other information on their distribution and abundance. The two animal lists include only those mammals or reptiles actually seen. Although we never saw a coyote (Canis latrans), scat was found on every kipuka and at many locations on open lava. They were also heard at various times in all portions of the study area. Pronghorn (Antilocapra americana) are commonly seen on the desert near the lava flows but the fact that we never saw pronghorn or pronghorn sign in the study area suggests that lava acts as a significant barrier for these ungulates.

An annotated plant list can be found in Appendix F. While this list is by no means exhaustive of all vascular plants in the study area, it represents almost all species that one is likely to encounter. Most plant species can be readily classed into one or more of three categories. Plants that grow only on the soil of kipukas will be called "kipuka" species; plants that have an affinity for rooting in cracks in the lava but remain closely associated with kipukas will be called "edge" species; plants with an affinity for lava whose distributions appear unrelated to the location of kipukas will be called "lava" species. A number of species show extensive overlap among categories, of course, but a noteworthy number of species are consistent in their distributional patterns.

Most effort directed toward developing species lists for plants went into searching the kipukas; little effort went into searching beyond the perimeters of the kipukas. This was because of the difficulty of determining how far a kipuka's vegetational sphere of influence should be extended, but it results in inconsistency in the distributions of many edge and lava species, especially those that are fairly inconspicuous. We observed that all but a very few lava and edge species were distributed widely over the study area.

So far little pattern to the animal and plant distributions has become apparent. Future stages of this research call for ordination of the vegetation-sampled plots in order to see what factors, of the many candidates, are responsible for the way the plants are distributed and in order to see how significant these factors are. The ordinations will be used as well to determine whether distributions of animals are patterned according to the vegetational patterns. Although our trapping data do not appear sufficient to draw conclusions regarding the minimum habitat size of any

conjoined with the vegetation community ordinations. An additional line of inquiry will explore the diversity of plant and animal communities in relation to the size and location of kipukas.

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TABLE 1
SIZE AND LOCATION OF KIPUKAS STUDIED

AREA	QUADRANGLE	KIPUKA	SIZE (ACRES)	LOCATION
1	Arco South	1	3.8	SW $\frac{1}{4}$ Sec. 27, T3N, R26
		2	1.7	SW $\frac{1}{4}$ Sec. 27, T3N, R26
2	Fingers Butte	4	.8	NE $\frac{1}{4}$ Sec. 7, T1N, R27E
		5	2.8	SE $\frac{1}{4}$ Sec. 6, T1N, R27E
		6	8.5	SE $\frac{1}{4}$ Sec. 6, T1N, R27E
		7	.4	SE $\frac{1}{4}$ Sec. 6, T1N, R27E
3	Fingers Butte/ The Watchman	8	27.7	SW $\frac{1}{4}$ Sec. 21, SE $\frac{1}{4}$ Sec. 20, T2N, R26E
		9	3.2	W $\frac{1}{2}$ Sec. 20, T2N, R26E
		10	3.5	NW $\frac{1}{4}$ Sec. 20, T2N, R26E
4	Arco South/ Fingers Butte	13	2.6	SE $\frac{1}{4}$ Sec. 16, T2N, R26E
		14	1.1	SE $\frac{1}{4}$ Sec. 16, T2N, R26E
		15	6.5	SE $\frac{1}{4}$ Sec. 16, T2N, R26E
		16	7.0	SE $\frac{1}{4}$ Sec. 16, T2N, R26E
5	Pratt Butte/ Fingers Butte	18	190.7	Sec. 36, T1N, R26E
6	Bear Park	20	40.7	NE $\frac{1}{4}$ Sec. 11, T5S, R25E
Wapi flow	Rattlesnake Butte	24	37.5	E $\frac{1}{2}$ Sec. 36, T6S, R28E
Wapi flow	Pillar Butte	25	17.8	SW $\frac{1}{4}$ Sec. 24, T6S, R28E

(K3L, K17L, K21L, K22L, and K23L are plots, not kipukas, and therefore have no meaningful area. K17L is in Area 2; the other plots are in Area 1.)

TABLE 2
EFFORT EXPENDED ON EACH KIPUKA

KIPUKA	1	2	3L	4	5	6	7	8	9	10	13	14	15	16	17A	18	19	20	21L	22L	23L	24	25	TOTALS
# OF PLOTS VEGETATIVELY SAMPLED	2	1	1	1	2	4	1	4	1	1	1	1	1	3	0	1	0	2	1	1	1	0	1	31
# OF PLOTS ¹ SNAPTRAPPED	2	1	1	1	2	4	1	4	1	1	1	1	1	3	0	0	0	0	0	0	0	0	0	24
# OF TRAP NIGHTS	569	216	216	288	576	935	215	214	215	238	236	288	860	-	-	-	-	-	-	-	-	-	-	6314
							1148																	
ADDITIONAL TRAPS	0	15	0	0	0	0	0	59	0	212	0	0	0	0	25	104	104	0	0	0	0	0	0	
TOTAL TRAP NIGHTS	569	261	216	288	576	935	215	214	427	288	236	288	860	97	104	104	-	-	-	-	-	-	-	7037
							1309																	
# OF PITFALLS	10	3	2	0	0	12	3	24	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
PITFALL TRAP DAYS	270	81	54	-	-	312	78	672	108	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1575
LOCATION OF KIPUKA, AREA	1	2	3L	4	5	6	7	8	9	10	13	14	15	16	17A	18	19	20	21L	22L	23L	24	25	
		1			2			3					4			5		6		1		WAPI		
# OF FIELD DAYS IN AREA	12				15			18					12			4		1		-			4	
								+5 overnights				+3 overnights				+1 overnight							+1 overnight	

1. Each plot consists of about 54 snap traps per night.

APPENDIX B

KIPUKAS STUDIED DURING SUMMER 1979

K1 is a deep-soiled kipuka of low relief, dominated by green rabbitbrush and arrowleaf balsamroot. The soil is loose and largely bare.

K2 is small and high-walled, although there is a substantial edge community (in which the extra traps were placed). Plant diversity is low--vegetation away from the edge consists almost solely of big sage. The soil is hard-baked clay, mostly bare; the relief is flat.

K3L is not a kipuka at all, it is an area of relatively well-vegetated lava. From the high and fairly barren northern end the plot slopes down toward a "hole" at the south end. This "hole" is a pocket where soil and organic matter have collected and vegetation is lush--primarily big sage, rubber rabbitbrush, and fernbush. The diversity of this plot is high, primarily because the plot is not established in a homogeneous community.

K4 is also small and high-walled and dominated by big sage, but there is a substantial cover of grasses and forbs. The soil is clay and hard-baked except near the center where a rock outcrop rises up, covered primarily with bitterbrush. Threetip sage replaces big sage at the perimeter and then is replaced by big sage again at the lava's edge.

K5, a low-walled kipuka of moderate relief, offers three contrasting communities: a greenrabbitbrush-threetip sage-Great Basin wildrye community in the loose soil of the north and east side; a prickly phlox-threetip sage community in the stoney, rocky soil of the exposed southwestern slope; and a big sage community in the clay soil of the center and southeastern portion of k5. Plots were established in the first two of these communities.

K6 is a fairly ^{large} kipuka of low relief. On the east is a belt of clay soil, largely bare, dominated by big sage. Further west runs a belt of diverse low shrubs and grasses that swings along the north side toward the west. At the south-center of the kipuka stretching west is a stoney, rocky "spine" characterized by big sage, bitterbrush, and prickly phlox. Four plots were established on k6.

K7 is so small that the endpoints of the plot were on the lava edge. The kipuka is flat, with clay soil, and the vegetation is dominated by threetip sage with big sage scattered throughout.

K8 is a kipuka of strong relief, rising well up out of the surrounding lava and offering strong contrasts in aspect. Plots were established on four different aspects. The heavily vegetated north facing slope, dominated by threetip sage, bluebunch wheatgrass, and prickly phlox, has deep but stoney soil. The west facing slope has stoney shallow soil and is sparsely vegetated by prickly phlox and bluebunch wheatgrass. The south facing slope probably retains more moisture than the west facing slope because it acts as a draw between the two high points of k8; it is dominated by green rabbitbrush, big sage, and wheatgrass. The east facing slope is strongly dominated by tall big sage, with a diversity of undercover.

K9 and k10 are remnants of old crater walls so that except for "holes" where organic matter has collected there is much rock and little soil. Neither kipuka is very homogeneous vegetatively. There is strong influence by edge species such as rubber rabbitbrush and fernbush. Interestingly, our greatest success trapping came on these two kipukas.

(K11 and k12, tiny kipukas near k8, were named but not used.)

K13, k14, k15, k16, and k17 are all located along what is apparently a relict ridge almost entirely inundated by lava. The lava forms a high wall to the southwest of Area 4 but is almost flat to the kipukas on the northeast side, so that all of the kipukas are more or less north facing. K13, k14, ~~k15~~, and k17 are within 50m of each other.

K13 is flat and dominated by low vegetation: threetip sage, green rabbitbrush, and some prickly phlox.

K14 is divided topographically into two parts: a shallowly sloping southern section dominated by prickly phlox, threetip sage, bluebunch wheatgrass, and needle-and-thread grass, and a strongly sloping northern part more diverse vegetatively due to the rock cropping out at the break in the slope.

K15 too has many rock outcrops and is consequently a diverse mix of threetip sage and bluebunch wheatgrass interspersed with big sage and bitterbrush. All three of these kipukas have fairly stoney soil.

The larger k16 is located at the western end of Area 4. We placed plots in each of three distinct vegetational communities. On the east side, separated from the rest of the kipuka by a rocky ridge, is a fairly heterogeneous community consisting of threetip sage, bluebunch wheatgrass, and scattered rubber rabbitbrush, Great Basin Wild Rye, and big sage. To the west of the ridge on the higher, flatter southern portion of the kipuka is a low shrub community broken up by scattered clumps of big sage corresponding to rock outcrops. On the lower northern portion the soil is fairly loose and the vegetation is dominated by Great Basin wildrye.

K17L is in the lava high above and to the south of k17. It is a formation difficult to interpret: there is a great deal of soil development, but the area does not look like a relict and there is no evidence that the lava flowed around any sort of former obstacle. Shrub development

is quite good and there is a great deal of grass as well, including Indian ricegrass, needle-and-thread grass, and bluebunch wheatgrass.

K18 is a very large kipuka with strong relief and a huge variety of communities, including serviceberry/snowberry thickets. One plot was sampled, in a rocky big sage community, and some traps were laid out. We did not have an opportunity to prebait the traps and apparently deermice were the only animals bold enough to come to the traps in one night.

K19 is a unique type of kipuka, consisting primarily of lava and edge shrubs and limber pines rooted in a jumble of talus-like lava rock. No vegetative sampling was made in this area. It was trapped in the same way as k18, with equally disappointing results.

K20 is a large kipuka with fairly low relief. The higher east end has loose sandy soil; it is dominated by rubber rabbitbrush and cheatgrass. The lower west end has about the same aspect, but the soil is hard-baked clay, and the vegetation differs correspondingly: big sage dominates, and rubber rabbitbrush and cheatgrass are by and large restricted to pockets of sand within the clay.

K21L, k22L, and k23L are all in Area 1. All three samplings were made more intensively in order to gather a meaningful quantity of data.

K21L is located just north of K3L, in an area of vegetation similar to that of 3L, although the "hole" is less extensive and the lava above the hole is less vegetated. Edge species dominate.

K22L is adjacent to the north side of k1; it is part of the "edge" of k1, not much higher than k1 and one to three meters lower than the surrounding lava. Big sage dominates but there is much bare lava.

K23L is the only truly "barren" lava we sampled. It is located south and well above k1; the surface is fairly smooth, with no major irregularities. Only four species were sampled in 50 daubenmire frame placements.

*alt
juniper*

K24 is a huge relict crater system. Due to the tremendous size and steepness of the kipuka's slopes the actual surface area of the kipuka is almost double the size calculated from a map. Considering the contrasting aspects the vegetation is remarkably uniform over the kipuka. The outside of the main crater is low big sage and bluebunch wheatgrass dominated, with much arrowleaf balsamroot, shrubby buckwheat, and bluegrass. The inside walls of the crater are similar except that threetip sage replaces big sage. At the bottom of the crater is a small community of tall big sage, rubber rabbitbrush, and Great Basin wildrye, similar to the vegetation of the kipuka at its perimeter. The southern portion of the kipuka complex is flat but vegetatively similar to the outside walls, with a great deal of arrowleaf balsamroot. The northern edge of the southern portion is the site of an impressive old stand of Utah junipers.

Winder

K25 is also a crater remnant, but of much scaled down proportions compared to k24. The dominant vegetation on this kipuka is grass, bluebunch wheatgrass and bluegrass and needle-and-thread grass; big sage and threetip sage also occur, together, along with an occasional bitterbrush. The soil surface is stoney but the soil beneath the surface is deep and not stoney. The central crater appears to have been burned in the past; there is little shrub, mostly cheat grass and annual mustards.

APPENDIX D

MAMMALS IDENTIFIED DURING KIPUKA STUDY, SUMMER 1979

(numbers following the common name of an animal refer to the kipukas on which that animal was trapped.)

Eutamias minimus, least chipmunk 1,5,6,7,8,11,12,13,14,15,16,17A

The second most common animal trapped, and frequently observed on kipukas and in the lava due to its abundance and its diurnal habits.

Marmota flaviventris, yellow-bellied marmot

Observed on k3, k9, and on a kipuka just north of Huddle's Hole. Based on scat found and on their habitat preferences it is probable that they are more widely distributed.

Microtus montanus, montane vole 1,7,8,16

Only six specimens taken, at north facing locations. These animals are more commonly found in moister habitats. One was spotted on the lava north of k1 one night.

Neotoma cinerea, bushy-tailed woodrat 2,3L,9,17A

Caught only by traps set on or near the edge of the lava. Although they apparently do not venture far from lava, we saw woodrat sign--their highly visible urine markings--near every kipuka we visited. They stole several of our traps.

Ochotona princeps, pika

Spotted or heard in talus-like lava rock in or near Areas 1,3, and 4 as well as far removed from any kipukas between Area 1 and Area 4. Generally inhabitants of higher elevations, a distinct race has apparently adapted well to the rigors of the lava environment. Unlike woodrats, which associate generally with kipuka edges, pikas seem truly to be animals of the open lava.

Odocoileus hemionus, mule deer

Observed on k18 and in Area 4; these ungulates seem comfortable moving over lava.

Perognathus parvus, Great Basin pocket mouse 6,8

Only one was trapped on k6, but they are as common as chipmunks on k8 where they were found in a variety of habitats.

Peromyscus maniculatus, deer mouse all kipukas

By far the most abundant animal everywhere we trapped; it is obviously widely distributed over both kipukas and lava.

Reithrodontomys megalotis, western harvest mouse 6

Only one specimen captured, although it is a fairly common animal on the nearby desert.

Sorex vagrans, vagrant shrew 1

One specimen captured in a pitfall trap on k1. This was a surprising find, because shrew distribution is thought to be closely tied to water availability. Their distribution is hard to assess because, being carnivores, they are not attracted to peanut butter-baited snap traps.

Spermophilus townsendii, Townsend's ground squirrel 6,10,16

Only six captured in all, and four of the six were captured on k16. k16 was the only kipuka where ground squirrel digging activity was noted. Another ground squirrel was seen on k8.

Sylvilagus nuttallii, Nuttall's cottontail 1,2,6,7,8,9

Very common; observed on every kipuka and quite frequently seen on lava, occasionally far from any kipuka. Their distribution is poorly revealed by the trapping data, because they are too large to be captured reliably by the snap traps we used. They are the only species of rabbit noted in the study area with the exception of one black-tailed jackrabbit (Lepus californicus) observed on Huddle's Hole.

APPENDIX E

REPTILES IDENTIFIED DURING KIPUKA STUDY, SUMMER 1979

(numbers following the common name of an animal refer to the kipukas on which that animal was captured.)

Coluber constrictor, racer

Two sightings were made, on consecutive days, one on each side of the narrow band of well-vegetated lava separating k14 from k15; probably we saw the same individual. A third sighting was made near the center of k8.

Crotalus viridis, Great Basin rattlesnake

Captured on k19, associated with the talus-type lava rock and strong shrubbiness distinctive with this kipuka. Popular lore to the contrary, this was the only rattlesnake encountered on the lava flows.

Eumeces skiltonianus, western skink 1,6,9

Trapped on only 3 strongly dissimilar kipukas, but apparently quite abundant on k9. We did not sight any skinks except those in the pitfalls.

Pituophis melanoleucus, Great Basin gopher snake

Captured near the center of k8 by hand.

Sceloporus graciosus, sagebrush lizard 1,2,3,8,9

Common and visible animals, frequently observed during the course of our work. Often they were seen on lava near kipukas, and occasionally seen on lava at some distance from any kipuka. They were sighted on all kipukas in the northern Craters of the Moon area except for k18 and for the kipukas in Area 4; this latter absence is somewhat surprising in light of their ubiquity elsewhere.

APPENDIX F

VASCULAR PLANTS IDENTIFIED DURING KIPUKA STUDY, SUMMER 1979

(numbers following the common name of a plant refer to the kipukas on or near which that plant was identified.)

Agropyron dasystachyum, thickspike wheatgrass 20

Encountered on only one kipuka.

Agropyron spicatum, bluebunch wheatgrass all but 3L,21L,22L,23L

Probably the most common grass; found on every true kipuka.

Alium geyeri, Geyer's onion 4

This generally inconspicuous lily may have been overlooked on other kipukas.

Amelanchier alnifolia, western serviceberry 18,24,25

Found only on the three kipukas with the greatest relief, reflecting its greater moisture requirement. It also occurs in several locations along the lava's edge, rooted in deep moisture-retaining cracks.

Antennaria microphylla, rosy pussy-toes

Found on the eastern side of Huddle's Hole near the lava's edge.

Arenaria franklinii, Franklin's sandwort 2

Possibly confused occasionally with Leptodactylon pungens when not in flower.

Arabis spp., rockcress 1,2,4,5,6,8,10,15,16,18,20,22L,24,25

The most common species are A. holboellii and A. sparsiflora, but at least two other species were found. Especially common in stonier soils.

Arnica sororia, twin arnica 6

Found also on Huddle's Hole.

Artemisia tridentata, big sage 1,2,3L,4,5,6,7,8,9,16,18,20,21L,22L,24,25

Artemisia tripartita, threetip sage 4,5,6,7,8,9,10,13,14,15,16,17,18,20,24,25

One of these two Artemisia species is a dominant shrub in almost every kipuka community. A. tripartita prevails more often in deeper soils, steeper slopes, and moister aspects; A. tridentata often is present within a stand of A. tripartita, associated with rock outcrops and patches of shallower soil. In addition it is valuable to point out that there are several subspecies of big sage, each with different ecological requirements. Frequently we encountered more than one big sage subspecies coexisting on one kipuka.

<u>Astragalus filipes</u> , basalt milkvetch	1,4,5,6,7,13,16,18
<u>Astragalus purshii</u> , wooly-pod milkvetch	4,5,6

One other Astragalus species was found on k15. A. filipes is quite abundant in some communities.

<u>Atriplex spinosa</u> , spiny hopsage	8
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The dominant shrub on the cindery soil atop k8.

<u>Balsamorhiza sagittata</u> , arrowleaf balsamroot	1,2,5,6,18,20,24,25
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Where it is found it is generally quite abundant.

<u>Bromus tectorum</u> , cheat grass	6,8,20,24,25
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Also found on Huddle's Hole. Cheat grass is not common on the northern kipukas of the Craters of the Moon flow except on Huddle's Hole, which is grazed.

<u>Calochortus macrocarpus</u> , sagebrush mariposa	4,5,6,8,9,13,14,15,18,20,25
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A widely-occurring lily.

<u>Carex filifolia</u> , threadleaf sedge	4,5,6,16
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Growing in deep-soiled low areas of these kipukas, generally near the kipuka edge. One other species of Carex was found growing in a deep crack on the lava north of k1.

Castilleja angustifolia, northwest paintbrush 6,8

Castilleja chromosa, desert paintbrush

Castilleja inverta, dwarf pale Indian-paintbrush

lance
C. chromosa is a widely occurring species on lava. C. angustifolia and C. inverta were also found on Huddle's Hole.

edge
Chaenactis douglasii, hoary false-yarrow 1,2,4,5,6,8,9,10,14,15,16,18,20,21L,22L,24

A common and widespread edge species, growing in stoney or cindery soils on kipukas and occasionally rooted in the shallow soil of a crack or crevice on lava.

Chamaebatiaria millefolium, fernbush all but 23L

A very common shrub of edge and lava.

edge
Chrysothamnus nauseosus, rubber rabbitbrush all but 23L

Common on kipukas, especially associated with rocky soil. Also common --even dominant--on the lava edge surrounding kipukas, but rarely found very far away from a kipuka.

K
Chrysothamnus viscidiflorus, green rabbitbrush all but 21L,22L,23L

Requires deeper soils than its congener, although it is equally common. Almost never is it found growing on lava.

C
Cirsium utahense, Utah thistle all but 2,14,22L,23L

A common edge species, sometimes found on lava far from the nearest kipuka.

E
Clematis ligusticifolia, western virgin's-bower 20

Growing in the edge.

Crepis acuminata, longleaved hawksbeard 1,2,4,5,6,8,10,18,20,24,25

Usually abundant where present.

Cryptantha interrupta, bristly cryptantha 1,3,10

An inconspicuous but not uncommon edge and lava species.

Cymopterus terebinthinus, turpentine cymopterus

1,2,3,5,7,9,10,13,14,15,16,17,18,21,22

A very common, very widespread edge and lava species. It can also be found near the center of kipukas associated with rock outcrops.

Cystopteris fragilis, brittle bladderfern

Found exclusively in deep lava cracks.

Delphinium andersonii, desert larkspur

4,6

Associated with rock outcrops and bitterbrush. An early bloomer, quite likely overlooked on some other kipukas.

Descurainia sp., tansey mustard

20,24,25

Disturbance annuals like this and Bromus tectorum are significant components of the plant communities on the Wapi flow and on the south portion of the Craters of the Moon flow; Descurainia is also found on Huddle's Hole, the most disturbed of the northern kipukas.

Elymus cinereus, Great Basin wildrye

all but 3L,22L,23L

Widely but patchily distributed; occasionally it can dominate a plant community, as on k5 and k16.

Erigeron compositus, cut-leaved daisy

6,21L,22L,23L

Erigeron pumilis, shaggy fleabane

6

E. compositus is a very common lava species; E. pumilis was not found on the lava.

Eriogonum microthecum, shrubby buckwheat

1,6,8,14,15,16,18,20,24,25

Eriogonum ovalifolium, cushion buckwheat

4,5,6,8,9,10,13,14,15,16,18,20,24

Eriogonum umbellatum, sulfurflower buckwheat

1,3L,4,5,8,9,10,13,14,15,16,17,18,21L

E. microthecum is a common subshrub on stoney soils of kipukas; E. ovalifolium is a widespread kipuka plant; E. umbellatum is a widespread edge plant.

Eurotia lanata, winterfat

6

Festuca idahoensis, Idaho fescue

Growing in Huddle's Hole.

Fritillaria atropurpea, checkerlily

8

An early bloomer; possibly we missed it elsewhere.

Haplopappus resinosus, columbia goldenweed

2,3L,6,9,10,13,14,15,17L,18,21L,22L

A dominant lava plant.

Holodiscus dumosus, oceanspray

2,3L,4,5,6,9,10,13,14,17L,18,21L,22L

A widespread inhabitant of deep lava cracks.

Juniperus osteosperma, Utah juniper

24,25

Juniperus scopulorum, Rocky Mountain juniper

J. osteosperma is very common rooted in deep lava cracks on the Wapi flow and in Area 6. Further north it is apparently replaced ecologically by Pinus flexilis, limber pine. The only junipers I found in the northern part of the Craters of the Moon flow are J. scopulorum located at the very northern edge of the lava to the north of Area 1.

Koeleria cristata, Junegrass

4,5,6,13,24

Found in deep soil.

Lactuca serriola, prickly lettuce

Found on lava in Area 6.

Leptodactylon pungens, prickly phlox

all but 3L,21L,22L,23L

A common and occasionally dominant shrub on kipukas; it is often found growing on lava as well.

Lithospermum ruderales, western gromwell

4,6,7,14,15,16,18,24

A fairly widespread plant on deep-soiled areas of kipukas.

Lomatium dissectum, fern-leaved desert parsley

1,4,5,6,7,18

A locally significant forb.

Lupinus argenteus, silvery lupine 1,2,3L,4,5,6,7,8,13,14,15,16,17L,18,2

A widespread kipuka and edge plant.

Machaeranthera canescens, hoary aster 20

Frequently found in Area 6 and on the Wapi flow.

Mertensia oblongifolia, leafy bluebells 1,5,6,7,18,20,22L

When not in flower this was frequently confused with Penstemon cyaneus.

Oenothera caespitosum, desert evening primrose 20

Also found on old lava west of Area 2.

Opuntia polyacantha, prickly pear 1,2,4,5,6,7,8,13,14,15,16,18,20,24,25

A widespread kipuka plant.

Oryzopsis hymenoides, Indian ricegrass 1,2,3L,4,5,6,7,8,10,13,15,16,17L,18,2

A widespread but not major grass.

Penstemon cyaneus, dark blue penstemon 1,2,4,5,6,7,8,9,10,13,14,15,16,18,20

A widespread kipuka plant occasionally confused with Mertensia oblongifolia

Penstemon deustus, hot-rock penstemon all but 23L

A ubiquitous lava and edge species.

Phacelia hastata, silverleaf phacelia 1,2,4,5,6,7,8,13,14,15,16,18,22,24

This plant grows near the edge, not usually in the edge; another ubiquitous species.

Philadelphus lewisii, Lewis' mockorange 1,3L,5,6,7,8,9,10,13,14,18,22L,25

A widely occurring inhabitant of deep lava cracks.

Phlox hoodii, Hood's phlox 1,2,4,5,6,7,8,9,13,14,15,16,18,20,24,25

A kipuka plant associated with stoney and rock soils.

Phlox longifolia, long-leaved phlox 1,2,4,5,6,7,16

This inconspicuous plant may occur elsewhere as well.

Pinus flexilis, limber pine 1,3L

Found rooted in deep lava cracks, especially near and north of Area 5; some grow in Area 1.

Poa spp., Sandberg's or Nevada bluegrass all but 2, 21L, 23L

P. sandbergii, most common on shallow rocky soil, is difficult to distinguish often from P. nevadensis, which is found on better soils but also inhabits lava cracks and crevices; often they coexist. Poa is rarely a dominant grass but is almost always present.

Polystichum scopulinum, Christmas fern

Found exclusively within deep lava cracks.

Potentilla glandulosa, gland cinquefoil all but 2

The most common plant on the lava flows.

Purshia tridentata, antelope bitterbrush 4, 5, 6, 7, 8, 9, 10, 13, 14, 15, 17L, 18, 20, 24, 25

A common shrub, especially associated with rock outcrops.

Ribes aureum, golden currant 5, 8, 14, 15, 18, 25

Ribes cereum, squaw currant 8, 14, 15, 18, 24

Edge species, also occasionally associated with rock outcrops.

Senecio canus, wooly groundsel 3L, 6, 21L, 22L

Senecio integerrimus, western groundsel 1, 2, 4, 6, 8, 10, 14, 17L

S. canus is a lava plant; S. integerrimus is a kipuka plant.

Sitanion hystrix, bottlebrush squirreltail 1, 2, 3L, 5, 6, 8, 9, 10, 14, 17L, 18, 20, 22L, 23L

Usually present but usually rare on kipukas, this grass is the most common grass on lava.

Stephanomeria tenuifolia, narrow-leaved skeletonweed 1, 3L, 4, 5, 8, 9, 17L, 18, 21L, 23L

A lava plant, widespread but not abundant.

Stipa commata, needle-and-thread grass all but 3L, 21L, 22L, 23L

Frequently the dominant grass in well-soiled areas. S. occidentalis and S. thurberiana were lumped with S. commata.

Symphoricarpos oreophilus, mountain snowberry 18

An inhabitant of relatively moist areas, this plant was found only at the high elevations of k18, although at both south and north facing aspects.

Tetradymia canescens, hairy horsebrush 1,4,5,6,8,9,10,13,14,15,16,18,20,24,25

A widespread, common, and occasionally dominant kipuka shrub. Interestingly, this shrub is found on lava on the Wapi flow but not on the northern Craters of the Moon flow.

Tragopogon dubius, yellow salsify

Found on lava in Area 6.

Viola nuttallii, Nuttall's violet 1,6

This early bloomer may have been overlooked on other kipukas.

Zigadenus sp., death-camas 8,25

Also found on Huddle's Hole. This lily was very common on the mainland north of Area 1, yet none were seen on the kipukas of Area 1.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ANTIQUITIES SITE INVENTORY☒ Archeological ☐ Paleontological ☐ Historical

1. Site number

2. Type of site

FLAKE FIND

3. State
IDAHOCounty
BUTTEDistrict
IDAHO FALLS4. Map reference
ARCO SOUTH QUADRANGLE

5. Location

3½ miles south-southwest of the Arco Municipal Airport, within an area of rangeland jutting south into recent lava.

Section
NW¼ of SW¼, Sec. 27Township
T3NRange
R26E

Meridian

6. Land ownership status
BLM

7. Other site designations

8. Cultural affiliation; Geologic Age and/or formation; dates of use

9. Site description, position, surrounding terrain, and importance

The site is grazed rangeland dominated by sagebrush, rubber rabbitbrush, and needle-and-thread grass; a few juniper trees are found in the nearby lava. The area is flat; lava surrounds it on three sides.

Only a few obsidian flakes were encountered, mostly in the eastern portion of the area. One other flake was found at the north end of the 3.76 acre kipuka 300m southwest of the main location.

10. Area of occupation
250m by 75m (excluding outlying find)11. Present condition
poor--disturbance by cattle grazing

12. Photo numbers

13. Informants and references

4. Recorded by
Steven LovejoyDept. of Biology ISU
Pocatello, ID 83209Date
31 August, 1979

(continued on reverse)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT☒ Archeological ☐ Paleontological ☐ Historical

ANTIQUITIES SITE INVENTORY

1. Site number

2. Type of site
FLAKE FIND3. State
IDAHOCounty
BUTTEDistrict
IDAHO FALLS4. Map reference
FINGERS BUTTE QUADRANGLE

5. Location

About 13 miles (by air) south of Arco; located on a kipuka in the lava to the east of Huddle's Hole and due west of Cruther's Butte (kipuka 6 of Kipuka Study, Anderson 1979)

Section

SW of center, Sec. 6

Township

T1N

Range

R27E

Meridian

6. Land ownership status
BLM

7. Other site designations

8. Cultural affiliation; Geologic Age and/or formation; dates of use

9. Site description, position, surrounding terrain, and importance

Only one flake, obsidian, was found, on the western end of this 8.5 acre kipuka. The site is ungrazed by domestic livestock. It is an area of stoney, rocky soil; vegetation is dominated by big sage, prickly phlox, and antelope bitterbrush.

10. Area of occupation

11. Present condition

poor--considerable search failed
to reveal more than the one
flake found

12. Photo numbers

13. Informants and references

4. Recorded by

Steven Lovejoy

Dept. of Biology, ISU
Pocatello, ID 83209

Date

31 August, 1979

(continued on reverse)