Impacts of Off-Highway Motorized Vehicles on Sensitive Reptile Species in Owyhee County, Idaho

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INTRODUCTION

As the population of southwestern Idaho grows, there is a corresponding increase in the number of recreational users of off-highway motorized vehicles (OHMVs). An extensive trail system has evolved in the Owyhee Front, and several off-highway motorized vehicle races are proposed for any given year. Management decisions by the Bureau of Land Management (BLM) regarding the use of public lands for OHMV activity should take account of the impact of OHMV activity on wildlife habitat and populations. However, our knowledge of the impact of this increased activity on many species of native wildlife is minimal.

Of particular interest is the herpetofauna of the area: the Owyhee Front includes the greatest diversity of reptile species of any place in Idaho, and includes nine lizard species and ten snake species (Table 1). Three of these species are considered to be "sensitive" by BLM and Idaho Department of Fish and Game (IDFG): *Sonora semiannulata* (western ground snake), *Rhinocheilus lecontei* (long-nosed snake), and *Crotaphytus bicinctores* (Mojave black-collared lizard). One species, *Hypsiglena torquata* (night snake), was recently removed from the sensitive list, but will be regarded as "sensitive" for the purposes of this report.

Off-highway motorized vehicles could impact reptiles in several ways. First, they may run over and kill individuals. Second, they may collapse burrows, thereby reducing access to subterranean prey and to escape and thermoregulatory locations. Third, OHMV's may alter the habitat by changing the plant community, thereby affecting the availability of prey, of escape locations, and of shady locations.

The objectives of this study are:
1. To develop techniques for studying the impact of off-road vehicles. The typical method used to survey reptiles is the drift fence, which consists of a metal fence 2 feet high and 12 to 50 feet long, with funnel traps along the fence to capture reptiles. However, such fences are highly visible, and to be able to determine the presence of reptiles within feet of off road vehicle trails (where there would be a much higher rate of human visitation and therefore a higher rate of vandalism) required development of more subtle and less visible techniques.

2. To gather preliminary data on the actual impacts of off-road vehicles on the reptile fauna, in particular, to assess impacts on the three sensitive snake species mentioned above. One person working for one summer could not hope to answer all questions associated with the impact of off-road vehicles on reptiles.

METHODS

There are three OHMV trailheads in the Owyhee Front area: Hemingway Butte is the most heavily used, Rabbit Creek receives intermediate use, and Fossil Creek receives the least use. The present study was conducted in the vicinity of the Fossil Creek OHMV trailhead (Figure 1) because (1) it is an area of especially high reptile diversity, (2) it was easy to find unaffected control areas, and (3) we could try our "stealth" traps with less chance for vandalism.

Traditional drift fences are constructed of metal flashing and are very visible from quite a distance. We designed a trapping system that can be used in close proximity to motorcycle trails, but would attract relatively little attention from passers-by. A "fence" consisting of a 2.5 meter long piece of 1/8" mesh hardware cloth (1 ft. wide) buried so that the fence extends above ground level nine inches. Such a piece of hardware cloth is nearly invisible, but still provides a structure that will direct wandering reptiles towards either end of the fence. At each end of the hardware cloth fence we placed a funnel trap (Figure 2), constructed of a 9" diameter aluminum window screen, which had a funnel that narrowed to a 1" opening, and a 20 inch length. Each trap contained apiece of cardboard for shade. Each treatment plot consisted of two fences, one placed 2 m from the trail and one placed 25 m from the trail (Figure 3). For each treatment plot situated next to a trail, we also constructed a control plot located 200 m from the trail; the direction from the trail was determined randomly. In a very few cases, the control pair of fences fell in habitat very different from the next-to-trail treatment pair. For those cases we placed the control pair on the opposite side of the trail. We constructed a total of 26 pairs of plots located on trails varying from narrow (9 to 12 inches wide) motorcycle trails to a two track (Figure 4, Table 2).

We also censused reptiles in sandwashes, using six plots in rocky sandwashes and six plots in sandy washes. In these plots, one fence was placed at or near the center of the wash and the other placed 25 m up the bank (Figure 4). The washes chosen did not contain active OHMV trails, but should be representative of the habitat of impacted washes.

Traps were visited every other day during the first part of the season and every day as the weather grew so hot as to have a high probability of animals succumbing to the heat. Captured animals were identified, measured, then released near the point of capture. It was our experience that 128 fences (which is the size of our study) is at or near the maximum number of fences that can be checked during a day by a single worker. Trapping began on May 28 (see Table 2 for the days each array was active). Traps were disarmed for a week over the July 4 holiday, then rearmed until July 24, 1998.

Statistical Analysis

Our placement of traps at 2,25,200, and 225 m from trails allowed two different comparisons to be conducted. First, on a relatively small scale, we compared captures at the 2 m traps to those at the 25 m trap. Second, at a relatively larger scale, we compared the combined captures at the close pair offences (treatment plot: 2 m and 25 m) to the combined captures at the control pair offences (200 and 225 m). For both comparisons, we used paired t-tests.

RESULTS AND DISCUSSION

We captured a total of 12 reptiles species (5 lizard species and 7 snake species), nearly two-thirds of the species that occur in that geographic area and nearly all of the species that would be expected for such a low desert, arid habitat (Tables 1 and 3). Three of those species not captured (sagebrush lizards, short-horned lizards, rubber boas) tend to be at higher elevations

than our study site. Two other uncaptured species (both the garter snakes) tend to be found near water, which is non-existent on our site. Finally, the western skink is a secretive and relatively rare species, and the Mojave black-collared lizard was observed to fairly common in certain areas of our study site, but is quite territorial and sedentary and is limited to rock habitat.

It is clear that our "stealth" trap design can capture most of the species present in the area, including the sensitive snake species. However, our fences captured more easily those species that are widely ranging (such as western whiptail lizards and striped whip snakes) but do not do well at capturing highly territorial, relatively sedentary species (such as collared lizards). This is the same trend one would see from traditional drift fences. Because we did not erect traditional drift fences (long, high, and unclimbable), we are not able to make comparisons regarding the effectiveness of shorter, lower, and more climbable "stealth" fences and traditional drift fences.

Effect of Trails

Combined captures of all lizard species and of all snake species showed that proximity to OHMV trails had no detectable effect on numbers of reptiles (Figures 5 and 6). For both groups there was no substantial overall trend, and in some species (e.g., the side blotched lizard, the leopard lizard, and the whip snake) there was actually a trend towards more captures at the 2 m trap than at the 25 m trap (Table 2). This is likely the result of a combination of two factors. First, the trails in our study site are relatively lightly used, so impacts on the reptiles should be less severe. Second, the trails do have at least one positive. Much of the habitat in our study area contains cheat grass (*Bromus tectorum*), which can occur in quite dense stands, making movement by reptiles difficult. OHMV trails open up bare patches that can be traversed relatively rapidly by reptiles. We hesitate to make too much of this potentially positive effect because it would be operative only at low OHMV usage-at higher usage, many of the reptiles attracted to the bare areas would be killed by vehicular passage.

Sensitive Snake Species

Interestingly, for the two snake species deemed as "sensitive" and captured in our traps in OHMV trail treatment and control plots, we detected a negative effect of proximity of OHMV trails-more longnose snakes and night snakes were captured at the pair of fences 200 and 225 m from trails than at the pair of fences 2 and 25 m from trails ($P = .057$ for both species combined; Figures 7 and 8). This is an important result, indicating a potentially detrimental effect of OHMV activity. However, due to the short duration of this study and the relatively small number of animals captured, we urge that this result be confirmed before major management decisions are made.

Washes as habitat

Washes proved to be important habitat for two sensitive snake species (night snakes and ground snakes) and are important for collared lizards as well. Night snakes and ground snakes were more common in or near rock washes (washes with at least some rock substrate on the sides of

the wash) than in or near sandy washes (Figures 9 and 10), probably because the rock habitat provides more hiding places. The two sensitive snake species captured in or near washes differed in their affinities. Western ground snakes were captured only in or near rocky washes, and were more common on the banks of the washes 25 m from the center than in the center of the wash. Night snakes were more common in rock washes than in sandy washes, and were captured more commonly in the center of the wash than on the bank (Figures 7 and 8).

Washes are apparently often used as trails by OHMVs, with the potential to heavily impact reptiles that might use them as habitat. Our findings indicate that (a) western ground snakes were only captured in or near washes, and (b) night snakes were captured at higher densities in washes than at our treatment and control plots. However, both species are nocturnal, and are unlikely to spend the day in the highly unstable substrate of wash bottoms. Therefore, OHMVs that remain in the wash proper should have little impact on ground snakes and night snakes. OHMVs that use bank areas could have substantial impacts on both snake species.

CONCLUSIONS

1. We were unable to detect negative impacts to the reptile fauna when taken as a whole. Possible explanations are: (a) There may have been no actual overall effect of OMHVs on reptiles. (b) We were dealing with trails that receive relatively little traffic; more traffic might have a greater effect. (c) Our trapping was conducted over a two-month period by one individual; we therefore have a relatively small data set which may be too small to detect effects. (d) Positive effects on some species (opening of habitat may favor western whiptails) may obscure negative effects on other species.

2. We have some indication that sensitive snake species, especially long-nosed snakes, are negatively affected by OHMV activity. However, due to our relatively low sample sizes and the short duration of this study, we hesitate to label this finding as definitive.

3. Washes are important habitat, but day use by OHMV s that remain in the unstable portion of the wash are unlikely to have much impact on reptiles, as the reptiles spend the day in burrows or under rocks on the sides of the washes.

4. Our "stealth" design traps are able to capture the reptile species present at the site. They are, however, short and easily climbable, so probably capture fewer reptiles than traditional trapping arrays.

5. A total of 128 fences is at or near the upper limit of what one person can visit in a day.

Table 1. Reptiles that may potentially be found in the Owyhee Front area. Species marked with a "*" were captured during the present study.	
Lizards	**Snakes**
*Western Whiptail (*Cnemidophorus tigris*)	*Western Rattlesnake (*Crotalus viridis*)
*Longnose Leopard Lizard (*Gambelia wislizenii*)	*Striped Whipsnake (*Masticophis taeniatus*)
Mojave Black-collared Lizard (*Crotaphytus bicinctores*)	*Gopher Snake (*Pituophis catenifer*)
Short Horned Lizard (*Phrynosoma douglassi*)	*Night Snake (*Hypsiglena torquata*)
*Desert Horned Lizard (*Phrynosoma platyrhinos*)	W. Terrestrial Garter Snake (*Thamnophis elegans*)
Sagebrush Lizard (*Sceloporus graciosus*)	*Racer (*Coluber constrictor*)
*Western Fence Lizard (*Sceloporus occidentalis*)	Common Garter Snake (*Thamnophis sirtalis*)
*Side-blotched Lizard (*Uta stansburiana*)	*Longnose Snake (*Rhinocheilus lecontei*)
Western Skink (*Eumeces skiltonianus*)	*W. Ground Snake (*Sonora semiannulata*)
	Rubber Boa (*Charina bottae*)

Table 2. Summary of captures by trap type.

Trap Code:	A	B	C	D	E	F	Total
Traps oriented to:	trail	trail	trail	trail	wash	wash	
Distance of trap from trail or wash	2m	25m	175m	200m	2m	25m	
Species:							
Western Whiptail (*Cnemidophorus tigris*)	85	111	81	92	22	28	419
Longnose Leopard Lizard (*Gambelia wislizenii*)	3	0	5	5	0	0	13
Side-blotched Lizard (*Uta stansburiana*)	10	5	5	10	5	2	37
Desert Horned Lizard (*Phrynosoma platyrhinos*)	5	0	3	2	0	1	11
Western Fence Lizard (*Sceloporus occidentalis*)	0	0	0	0	1	0	1
Mojave Black-collared Lizard (*Crotaphytus bicinctores*)	0	0	0	0	0	0	0
Western Rattlesnake (*Crotalus viridis*)	1	1	0	0	0	0	2
Western Striped Whipsnake (*Masticophis taeniatus*)	20	11	15	8	2	3	59
Great Basin Gopher Snake (*Pituophis catenifer*)	9	10	10	7	3	2	41
Night Snake (*Hypsiglena torquata*)	0	0	0	2	4	1	7
Western Longnose Snake (*Rhinocheilus lecontei*)	1	2	4	2	0	0	9
Western Ground Snake (*Sonora semiannulata*)	0	0	0	0	2	3	5
Totals:	134	140	123	128	39	40	604

Table 3. Summary of captures at the various trapping arrays.																			
Trap#	traptype	trailtype	days up	elevation (m)	utm	utm	Ct	Gw	Us	Pp	So	Cb	Cv	Mt	Pc	Ht	Rl	Ss	total
00A	***C***	backtrail	34	950	546106	4773396	6	0	0	0	0	0	0	0	0	0	0	0	6
00B	***D***	backtrail	34	949	546087	4773398	3	0	0	0	0	0	0	0	1	0	0	0	4
00C	***A***	frontoffossil	43	965	544642	4772533	5	0	0	0	0	0	0	1	2	0	0	0	8
00D	***B***	frontoffossil	43	966	544661	4772542	5	0	0	0	0	0	0	1	1	0	0	0	7
00E	***C***	frontoffossil	43	958	544783	4772608	8	0	0	1	0	0	0	1	0	0	0	0	10
00F	***D***	frontoffossil	43	956	544803	4772616	12	0	0	0	0	0	0	0	1	0	0	0	13
00G	***A***	frontoffossil	43	963	544580	4772689	8	0	1	1	0	0	0	0	0	0	0	0	10
00H	***B***	frontoffossil	43	964	544558	4772682	14	0	1	0	0	0	0	1	0	0	0	0	16
01A	***C***	frontoffossil	43	967	544428	4772683	4	1	1	0	0	0	0	0	0	0	0	0	6
01B	***D***	frontoffossil	43	967	544404	4772681	5	1	1	1	0	0	0	0	1	0	0	0	9
01C	***A***	frontoffossil	43	967	544543	4772856	5	0	0	0	0	0	0	1	0	0	0	0	6
01D	***B***	frontoffossil	43	966	544563	4772862	7	0	0	0	0	0	0	0	0	0	0	0	7
01E	***C***	frontoffossil	43	972	544687	4772902	5	0	0	0	0	0	0	0	1	0	0	0	6
01F	***D***	frontoffossil	43	973	544710	4772907	6	0	1	0	0	0	0	1	0	0	0	0	8
02A	***A***	connectingtrail	42	964	544696	4772195	2	0	0	2	0	0	0	1	0	0	0	0	5
02B	***B***	connectingtrail	42	968	544673	4772193	4	0	0	0	0	0	0	1	1	0	0	0	6
02C	***C***	connectingtrail	42	971	544551	4772185	7	1	0	0	0	0	0	1	2	0	0	0	11
02D	***D***	connectingtrail	42	971	544532	4772174	3	0	0	0	0	0	0	0	0	0	0	0	3
02E	***A***	connectingtrail	42	961	544727	4771991	0	0	0	0	0	0	0	0	2	0	0	0	2
02F	***B***	connectingtrail	42	961	544705	4771988	9	0	0	0	0	0	0	2	2	0	0	0	13
02G	***C***	connectingtrail	42	955	544857	4771973	6	0	1	0	0	0	0	2	0	0	1	0	10
02H	***D***	connectingtrail	42	958	544874	4771958	4	2	0	0	0	0	0	1	0	0	0	0	7
03A	***A***	connectingtrail	42	962	544750	4771869	0	0	0	0	0	0	0	0	0	0	0	0	0
03B	***B***	connectingtrail	42	961	544729	4771864	0	0	0	0	0	0	0	0	0	0	0	0	0
03C	***C***	connectingtrail	42	961	544642	4771849	3	1	0	0	0	0	0	1	1	0	0	0	6
03D	***D***	connectingtrail	42	966	544618	4771848	6	0	0	0	0	0	0	0	1	0	0	0	7
03F	***A***	connectingtrail	42	964	544788	4771704	1	0	0	0	0	0	0	1	2	0	0	0	4
03G	***B***	connectingtrail	42	963	544810	4771704	2	0	0	0	0	0	0	1	0	0	0	0	3
03H	***A***	connectingtrail	42	966	544822	4771585	3	0	2	0	0	0	0	2	0	0	0	0	7
03I	***B***	connectingtrail	42	966	544844	4771586	6	0	1	0	0	0	0	0	0	0	0	0	7
10A	***A***	rockywash	27	925	545670	4772060	5	0	0	0	0	0	0	0	0	0	0	0	5
10B	***B***	rockywash	27	939	545671	4772081	2	0	0	0	0	0	0	0	0	0	0	1	3
11A	***A***	rockywash	27	922	545738	4772099	4	0	0	0	0	0	0	0	0	3	0	1	8
11B	***B***	rockywash	27	930	545721	4772112	6	0	0	0	0	0	0	0	0	1	0	0	7
12A	***A***	rockywash	27	930	545743	4772189	1	0	4	0	0	0	0	1	1	0	0	1	8
12B	***B***	rockywash	27	919	545761	4772176	3	0	1	0	0	0	0	1	0	0	0	1	6
13A	***C***	connectingtrail	42	965	544941	4771652	2	0	0	0	0	0	0	1	0	0	1	0	4
13B	***D***	connectingtrail	42	964	544962	4771642	2	0	0	0	0	0	0	0	1	0	0	0	3
13C	***C***	connectingtrail	42	968	544968	4771563	5	1	0	0	0	0	0	0	0	0	0	0	6
13D	***D***	connectingtrail	42	967	544990	4771556	1	0	2	0	0	0	0	0	0	0	0	0	3
14A	***A***	trailhead	16	944	544950	4770897	1	0	0	1	0	0	0	1	0	0	0	0	3
14B	***B***	trailhead	16	944	544931	4770882	1	0	0	0	0	0	0	0	0	0	0	0	1
14C	***C***	trailhead	16	949	544795	4770866	0	0	0	2	0	0	0	0	0	0	0	0	2
14D	***D***	trailhead	16	950	544774	4770863	0	0	0	0	0	0	0	0	0	0	0	0	0
14E	***A***	trailhead	16	938	545042	4770759	0	0	0	0	0	0	0	0	1	0	0	0	1
14F	***B***	trailhead	16	940	545025	4770746	1	0	0	0	0	0	0	0	0	0	0	0	1
14G	***C***	trailhead	16	941	544964	4770630	0	0	0	0	0	0	0	0	0	0	0	0	0
14H	***D***	trailhead	16	942	544953	4770609	0	0	0	0	0	0	0	0	1	0	0	0	1
14I	***A***	trailhead	16	953	545125	4770616	0	0	1	0	0	0	0	0	1	0	0	0	2
14J	***B***	trailhead	16	952	545105	4770606	0	0	2	0	0	0	1	0	0	0	0	0	3
15A	***C***	trailhead	16	954	545011	4770532	2	0	1	0	0	0	0	0	1	0	0	0	4
15B	***D***	trailhead	16	953	545009	4770507	4	0	0	0	0	0	0	0	0	1	0	0	5
15C	***A***	trailhead	16	959	545199	4770462	0	0	2	0	0	0	0	0	0	0	0	0	2
15D	***B***	trailhead	16	962	545180	4770451	2	0	0	0	0	0	0	0	0	0	0	0	2
15E	***C***	trailhead	16	963	545132	4770326	3	0	0	0	0	0	0	0	0	0	0	0	3
15F	***D***	trailhead	16	963	545120	4770309	2	0	0	0	0	0	0	0	0	0	0	0	2
15G	***A***	trailhead	16	962	545277	4770311	1	0	1	0	0	0	0	1	0	0	0	0	3
15H	***B***	trailhead	16	960	545259	4770297	0	0	1	0	0	0	0	0	0	0	0	0	1

15I	***C***	trailhead	16	964	545153	4770208	1	0	1	0	0	0	0	0	1	0	0	0	3
15J	***D***	trailhead	16	966	545131	4770195	1	0	0	0	0	0	0	0	0	0	0	0	1
15K	***A***	trailhead	16	959	545360	4770161	2	0	0	0	0	0	0	0	0	0	0	0	2
15L	***B***	trailhead	16	960	545341	4770150	4	0	0	0	0	0	0	1	0	0	0	0	5
15M	***C***	trailhead	16	963	545252	4770063	1	0	0	0	0	0	0	0	0	0	0	0	1
15N	***D***	trailhead	16	963	545235	4770049	0	0	0	0	0	0	0	0	0	0	0	0	0
1A	***A***	twotrack	32	981	544367	4772209	2	0	0	0	0	0	0	0	0	0	1	0	3
1B	***B***	twotrack	32	979	544374	4772187	1	0	0	0	0	0	0	0	0	0	0	0	1
1C	***C***	twotrack	32	972	544440	4772025	0	0	0	0	0	0	0	0	0	0	0	0	0
1D	***D***	twotrack	32	972	544447	4772004	0	1	0	0	0	0	0	0	0	0	1	0	2
21A	***A***	backtrail	42	884	546529	4773998	8	2	0	0	0	0	0	2	0	0	0	0	12
21B	***B***	backtrail	42	879	546548	4773984	2	0	0	0	0	0	0	1	2	0	0	0	5
22A	***C***	backtrail	42	876	546705	4773881	8	1	0	0	0	0	0	1	2	0	0	0	12
22B	***D***	backtrail	42	875	546712	4773862	5	0	1	0	0	0	0	3	1	0	1	0	11
22C	***A***	backtrail	42	895	546478	4773852	5	1	0	0	0	0	0	2	0	0	0	0	8
22D	***B***	backtrail	42	894	546458	4773858	2	0	0	0	0	0	0	0	0	0	0	0	2
22E	***C***	backtrail	42	901	546377	4773932	3	0	0	0	0	0	0	0	0	0	0	0	3
22F	***D***	backtrail	42	898	546356	4773930	4	0	0	0	0	0	0	0	0	0	0	0	4
22G	***A***	backtrail	34	916	546433	4773721	4	0	0	0	0	0	0	0	0	0	0	0	4
22H	***B***	backtrail	34	915	546451	4773709	5	0	0	0	0	0	0	0	2	0	1	0	8
22J	***C***	backtrail	34	916	546312	4773796	2	0	0	0	0	0	0	0	0	0	1	0	3
22I	***D***	backtrail	34	916	546295	4773804	8	0	0	0	0	0	0	1	0	0	0	0	9
22K	***A***	backtrail	34	921	546394	4773577	3	0	0	0	0	0	0	1	1	0	0	0	5
23A	***B***	backtrail	34	920	546372	4773581	9	0	0	0	0	0	0	1	0	0	0	0	10
23B	***C***	backtrail	34	926	546278	4773635	5	0	0	0	0	0	0	1	1	0	0	0	7
23C	***D***	backtrail	34	926	546256	4773639	2	0	0	0	0	0	0	1	0	0	0	0	3
23D	***A***	backtrail	34	925	546316	4773450	3	0	0	0	0	0	0	0	0	0	1	0	4
23E	***B***	backtrail	34	926	546336	4773442	2	0	0	0	0	0	0	0	0	0	0	0	2
23F	***C***	backtrail	34	929	546473	4773386	0	0	0	0	0	0	0	3	0	0	0	0	3
23G	***D***	backtrail	34	928	546484	4773369	2	0	0	0	0	0	0	0	0	0	0	0	2
23H	***A***	backtrail	34	947	546236	4773330	2	0	1	0	0	0	1	1	0	0	0	0	5
23I	***B***	backtrail	34	944	546217	4773340	3	0	0	0	0	0	0	1	0	0	0	0	4
25A	***A***	sandywash	16	906	545649	4774316	3	0	0	0	0	0	0	1	1	0	0	0	5
25B	***B***	sandywash	16	909	545638	4774331	0	0	0	0	0	0	0	0	0	0	0	0	0
26A	***A***	sandywash	16	906	545605	4774252	0	0	0	0	0	0	0	0	0	0	0	0	0
26B	***B***	sandywash	16	913	545592	4774265	1	0	0	1	0	0	0	1	0	0	0	0	3
27A	***C***	sandywash	16	910	545561	4774279	2	0	0	0	0	0	0	0	0	1	0	0	3
27B	***D***	sandywash	16	916	545569	4774293	0	0	0	0	0	0	0	0	0	0	0	0	0
28A	***A***	sandywash	16	909	545507	4774255	2	0	0	0	0	0	0	0	0	0	0	0	2
28B	***B***	sandywash	16	913	545485	4774265	0	0	0	0	0	0	0	0	0	0	0	0	0
29A	***A***	sandywash	16	911	545491	4774204	2	0	0	0	0	0	0	0	0	0	0	0	2
29B	***B***	sandywash	16	916	545475	4774212	1	0	0	0	0	0	0	1	0	0	0	0	2
2A	***A***	twotrack	32	981	544441	4772251	3	0	0	1	0	0	0	2	0	0	0	0	6
2B	***B***	twotrack	32	980	544434	4772273	2	0	0	0	0	0	0	0	1	0	0	0	3
2C	***C***	twotrack	32	977	544377	4772387	0	0	0	0	0	0	0	0	1	0	0	0	1
2D	***D***	twotrack	32	976	544378	4772406	6	0	1	1	0	0	0	0	0	0	0	0	8
30A	***A***	sandywash	16	913	545465	4774146	1	0	0	0	0	0	0	0	0	0	0	0	1
30B	***B***	sandywash	16	920	545454	4774158	1	0	0	0	0	0	0	0	2	0	0	0	3
3A	***A***	twotrack	32	975	544526	4772260	6	0	0	0	0	0	0	0	0	0	0	0	6
3B	***B***	twotrack	32	977	544518	4772282	12	0	0	0	0	0	0	0	0	0	0	0	12
3C	***C***	twotrack	32	971	544618	4772148	3	0	0	0	0	0	0	0	0	0	0	0	3
3D	***D***	twotrack	32	969	544628	4772126	6	0	0	0	0	0	0	0	0	0	0	0	6
4A	***A***	twotrack	32	955	544801	4772451	4	0	0	0	0	0	0	2	0	0	0	0	6
4B	***B***	twotrack	32	955	544789	4772468	10	0	0	0	0	0	0	0	0	0	0	0	10
4C	***C***	twotrack	32	959	544737	4772589	2	0	1	0	0	0	0	3	0	0	0	0	6
4D	***D***	twotrack	32	958	544727	4772608	2	1	1	0	0	0	0	0	0	1	0	0	5
5A	***A***	twotrack	32	955	544883	4772482	10	0	0	0	0	0	0	0	0	0	0	0	10
5B	***B***	twotrack	32	953	544893	4772462	4	0	0	0	0	0	0	0	0	0	0	0	4
5C	***C***	twotrack	32	952	544978	4772370	2	0	0	0	0	0	0	0	0	0	0	0	2
5D	***D***	twotrack	32	954	544992	4772353	3	0	2	0	0	0	0	1	0	0	0	0	6
6A	***A***	twotrack	32	955	544954	4772532	7	0	2	0	0	0	0	2	0	0	0	0	11

6B	***B***	twotrack	32	956	544938	4772547	4	0	0	0	0	0	0	1	1	0	0	0	6
6C	***C***	twotrack	32	959	544825	4772653	3	0	0	0	0	0	0	1	0	0	1	0	5
6D	***D***	twotrack	32	957	544811	4772670	5	0	1	0	0	0	0	0	0	0	0	0	6
7A	***A***	rockywash	27	936	545486	4772098	1	0	1	0	0	0	0	0	1	0	0	0	3
7B	***B***	rockywash	27	947	545492	4772118	12	0	0	0	0	0	0	0	0	0	0	0	12
8A	***A***	rockywash	27	935	545555	4772127	0	0	0	0	0	0	0	0	0	0	0	0	0
8B	***B***	rockywash	27	942	545536	4772140	1	0	0	0	0	0	0	0	0	0	0	1	2
9A	***A***	rockywash	27	931	545603	4772097	1	0	0	0	1	0	0	0	0	0	0	0	2
9B	***B***	rockywash	27	941	545620	4772108	1	0	1	0	0	0	0	0	0	0	0	0	2
total							419	13	37	11	1	0	2	59	41	7	9	5	604
Notes:																			
	1. Species	Ct= Western Whiptail (Cnemidophorus tigris)																	
		Gw= Longnose Leopard Lizard (Gambelia wislizenii)																	
		Us = Side-blotched Lizard (Uta stansburiana)																	
		Pp = Desert Horned Lizard (Phrynosoma platyrhinos)																	
		So = Western Fence Lizard (Sceloporus occidentalis)																	
		Cb = Mojave Black-collared Lizard (Crotaphytus bicinctores)																	
		Cv = Western Rattlesnake (Crotalus viridis)																	
		Mt = Western Striped Whipsnake (Masticophis taeniatus)																	
		Pc = Great Basin Gopher Snake (Pituophis catenifer)																	
		Ht = Night Snake (Hypsiglena torquata)																	
		Rl = Western Longnose Snake (Rhinocheilus lecontei)																	
		Ss = Western Ground Snake (Sonora semiannulata)																	

Figure 1a. Overview of Study area, showing arrangement of plots near trails and washes. See 1b and 1c for close-ups of the northeast and southwest portions.

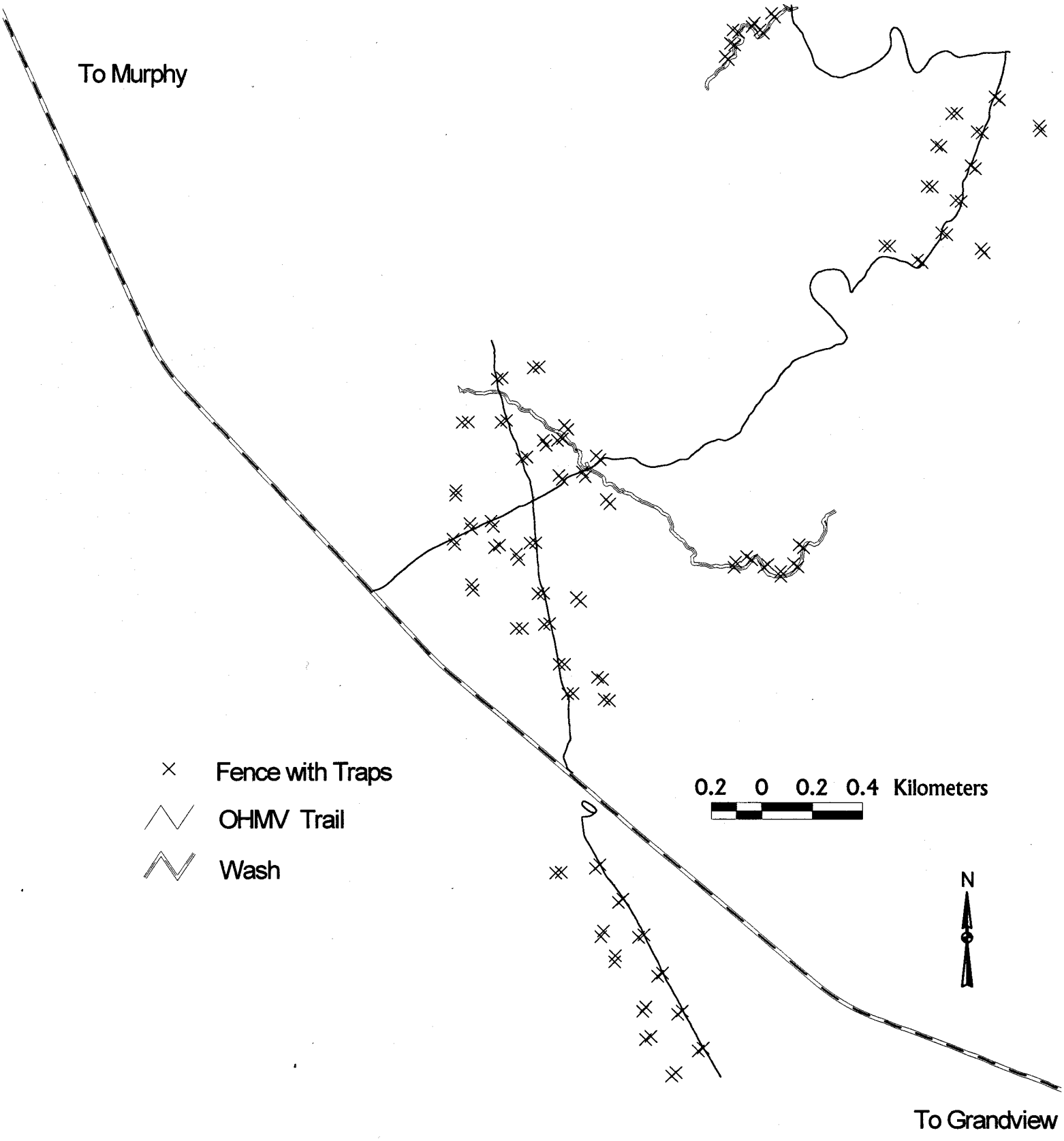

Figure 1b. Close up of northwestern portion of study site showing arrangement of plots near trail and near wash.