

Hanford Site Reptile Monitoring Report for Calendar Year 2015



Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-09RL14728



P.O. Box 650
Richland, Washington 99352

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Mission Support Alliance

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1.0 Introduction

The U.S. Department of Energy, Richland Operations Office (DOE-RL) conducts ecological monitoring on the Hanford Site to collect and track data needed to ensure compliance with environmental laws, regulations, and policies governing DOE activities. Ecological monitoring data provide baseline information about the plants, animals, and habitats under DOE-RL stewardship at Hanford required for decision-making under the *National Environmental Policy Act* ([NEPA](#)) and *Comprehensive Environmental Response, Compensation, and Liability Act* ([CERCLA](#)). The *Hanford Site Comprehensive Land Use Plan* (CLUP, [DOE 1999](#)), which is the Environmental Impact Statement for Hanford Site activities, helps ensure that DOE-RL, its contractors, and other entities conducting activities on the Hanford Site are in compliance with NEPA.

The *Hanford Site Biological Resources Management Plan* (BRMP, [DOE 2013](#)) is identified by the CLUP as the primary implementation control for managing and protecting natural resources on the Hanford Site.

The BRMP provides a mechanism for ensuring compliance with laws protecting biological resources; provides a framework for ensuring that appropriate biological resource goals, objectives, and tools are in place to make DOE an effective steward of the Hanford biological resources; and implements an ecosystem management approach for biological resources on the Site. The BRMP provides a comprehensive direction that specifies DOE biological resource policies, goals, and objectives.

DOE-RL prioritizes monitoring those plant and animal species or habitats with specific regulatory protections or requirements; that are rare and/or declining (federally or state listed endangered, threatened, or sensitive species); or are of significant interest to federal, state, or tribal governments or the public. The BRMP ranks wildlife species and habitats (Levels 0–5), providing a graded approach to monitoring biological resources based on the level of concern for each resource. Of the species documented or presumed to occur on the Hanford Site (Table 1), the Washington State Department of Fish and Wildlife (WDFW) currently lists both the sagebrush lizard (*Sceloporus graciosus*) and the striped whipsnake (*Masticophis taeniatus*) as ‘candidates’ for listing as threatened or endangered. The sagebrush lizard is also federally listed as a ‘species of concern’, and both of these reptiles are listed as a Level 3 resources in the BRMP. The management goal for Level 3 resources is conservation and requires a moderate level of status monitoring. Additionally, the night snake (*Hypsiglena torquata*), racer (*Coluber constrictor*), and short-horned lizard (*Phrynosoma douglasii*) are listed as ‘monitored’ species by WDFW.

1.1 Scope

This monitoring event focused on the three lizard species present on Hanford: the sagebrush (cover photo), short-horned (Figure 1), and side-blotched (*Uta stansburiana*) (Figure 2) lizards. Because of the diversity of life history strategies among the reptiles documented or presumed to occur on the Hanford

Site, lizards and snakes are monitored independently. A study focusing on the snakes of Hanford, specifically, their refugia and hibernacula locations and patterns of spring emergence is planned for 2016.



Figure 1. Short-horned lizard (*Phrynosoma douglasii*)



Figure 2. Side-blotched Lizard (*Uta stansburiana*)

2.0 Biology

Reptiles are ectothermic, meaning their bodies take on the temperature of their surroundings. As a result, they are unable to remain active during temperature conditions that are too hot or too cold. During the winter months, reptiles seek out underground refugia known as hibernacula. These locations have specialized temperature, humidity, and airflow conditions that allow reptiles to survive without becoming frozen during the winter months. The lizards of south-central Washington become active in March or April and are seen with less frequency as the temperature begins to drop in the autumn, although some lizards can be observed basking in the open on warm days in the fall and winter. Mating takes place soon after emergence in the spring. The sagebrush and side-blotched females lay 1-3 clutches of 1-8 eggs during their active period and the short-horned females give birth to live young (3-15 in the Pacific Northwest) between July and September (Stebbins 1985). Lizards generally feed on insects, spiders, ants, mites, ticks, and scorpions.

The sagebrush lizard is associated with sandy areas that support shrubs, while the side-blotched lizard is more generally associated with shrub-steppe habitat but may prefer areas with bare ground interspersed (Washington Herp Atlas 2009). Recent observations of the short-horned lizard on the Hanford Site have found them exclusively in lithosols in the southwest portion of the site. The side-blotched lizard is the most frequently observed, sagebrush lizards are observed much less often and short-horned lizards are uncommon on Hanford.

2.1 Previous Studies of Reptiles on the Hanford Site

In 1995 and 1998, The Nature Conservancy (TNC) conducted a biodiversity inventory across the Hanford Site (which included the Fitzner/Eberhardt Arid Lands Ecology Reserve, the Saddle Mountain National Wildlife Refuge, and the Wahluke State Wildlife Recreation Area, all of which are currently managed by the United States Fish and Wildlife)(TNC a, TNC b). The work performed in 1995 focused primarily on creating a species list for the Hanford Site. A follow-up herpetofauna survey was performed in 1998, designed to search for rare species and to examine habitats that were not surveyed in 1995. The methods used included timed-visual encounter surveys, night and day road surveys, pitfall trapping, drift fences, and cover board surveys. Speculative relative abundance estimates for the three lizard species reported by the TNC are “abundant” for the side-blotched lizard, “common in sandy areas” for the sagebrush lizard, and “uncommon” for the short-horned lizard. Other reptile studies performed on Hanford have been small in scale and generally related to site-specific surveys relating to clean-up activities.

2.2 Objectives

The goal of this study is to examine the distribution and habitat associations of the lizard species present on the Hanford Site. The identification of key lizard habitat provides information necessary to address several of the DOE resource management objectives for Hanford:

- Protect species and habitats of state and federal concern
- Maintain and preserve native biological diversity
- Where and when feasible, improve degraded habitats in a strategic manner to increase landscape connectivity and native diversity
- Reduce and minimize fragmentation of habitats

Additionally, the identification of important habitats on the Hanford Site provide information necessary to assess the impacts of proposed Hanford Site activities during ecological compliance reviews as well as provide focus areas for more efficient biological resource monitoring in the future.

3.0 Methods

Visual encounter transect surveys were conducted to document the distribution and habitat associations of lizards across the Hanford Site. The linear transects were 8 kilometers (~5 mi) in length and divided into 16 separate 500 meter (1640 ft) segments (Figure 3). The endpoints of each transect were positioned on primary roadways so that a vehicle could be parked at each end to avoid “dead-heading” and minimize time surveyors spent walking while not surveying. The transects were designed to be completed by two surveyors, with each surveyor covering a 30 meter (98 ft) wide swath, for a total of 60 meters (197 ft) wide along the length of the transects. One surveyor carried the GPS and followed the transect path, while the second surveyor paralleled the first, staying 30 meters (98 ft) away. For each reptile observation, surveyors documented the species (if identified), and the vegetation type in the vicinity of the observation on field forms specific to each segment. Transects were located across the Hanford Site and included the majority of the habitat types found on the site.

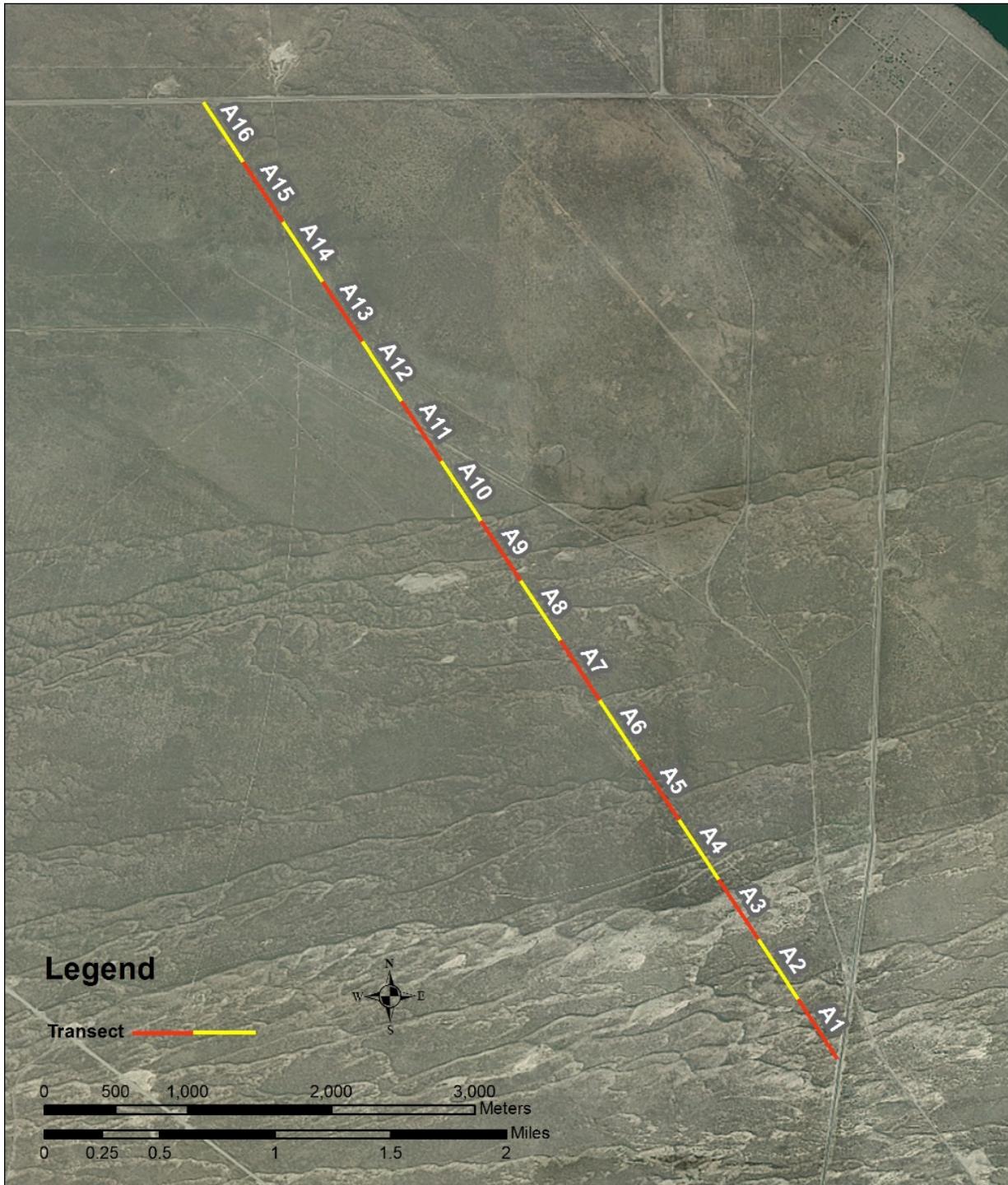


Figure 3. Example of a Visual Encounter Survey Transect

4.0 Results

Sixteen transects were surveyed between June and September of 2015, covering a total of 767 hectares (1895 acres) (Figure 2). Surveyors noted all reptile species encountered and the general habitat type where each observation occurred. A total of 518 reptile observations were documented during the visual encounter surveys (Table 1). 343 (66.2%) of the observations were side-blotched lizards, 160 (30.9%) were unidentified lizards, 13 (2.5%) were sagebrush lizards, and two observations were of snakes (one racer and one unidentified). No short-horned lizards were observed during the transect surveys, however, two individuals were observed on separate occasions in 2015 by biologists performing other natural resource surveys.

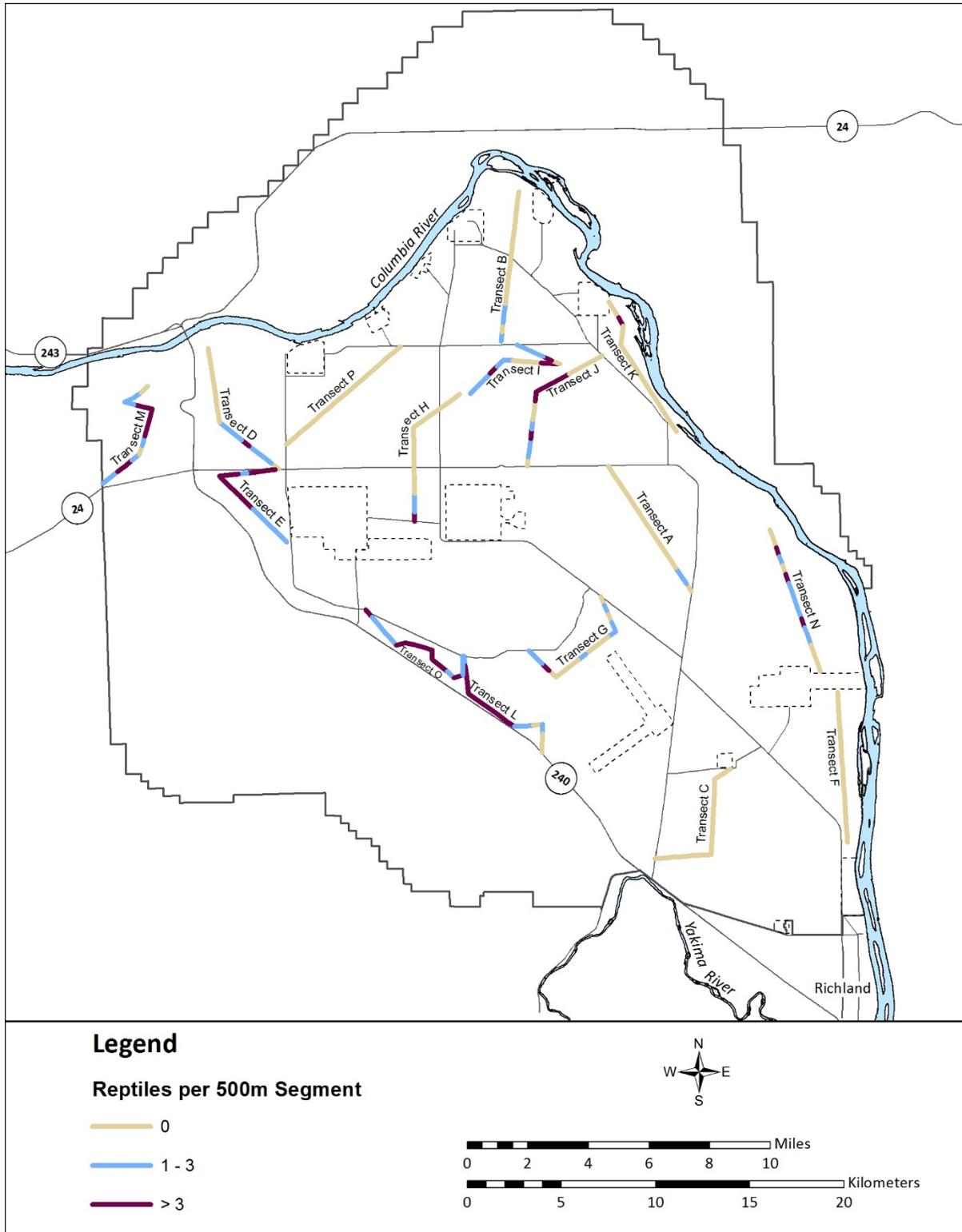


Figure 4. Reptile Visual Encounter Transects Results Summary

Table 1. Reptile Monitoring Data for 2015

Transect	Date Surveyed	Side-Blotched Lizards	Sagebrush Lizards	Unidentified Lizards	Other Reptiles*	Transect Total
A	6/11/2015	1	0	3	0	4
B	6/16/2015	1	0	4	0	5
C	6/24/2015	0	0	0	0	0
D	7/7/2015	2	0	11	0	13
E	7/14/2015	53	1	53	0	107
F	7/21/2015	0	0	0	0	0
G	7/28/2015	10	0	6	0	16
H	7/30/2015	4	0	4	0	8
I	8/5/2015	33	3	6	0	42
J	8/14/2015	26	1	27	1	55
K	8/19/2015	1	3	1	0	5
L	8/27/2015	43	1	26	0	70
M	9/3/2015	53	0	14	1	68
N	9/9/2015	20	4	5	0	29
O	9/23/2015	96	0	0	0	96
P	9/30/2015	0	0	0	0	0
Totals		343	13	160	2	518

*A racer was observed on 8/14/2015 and an unidentified snake was observed entering a hole in the ground on 9/3/2015.

5.0 Discussion

The 2015 reptile monitoring results generally reflect the outcome of the biological inventory work performed by TNC in 1995 and 1998 (TNC a, TNC b). TNC's relative abundance estimates of the three lizard species were "abundant" for side-blotched lizards, "common in sandy areas" for sagebrush lizards, and "uncommon" for short-horned lizards. These speculative descriptions were based on ease of detection under appropriate conditions and habitat for each species (Hallock 1998).

5.1 Side-Blotched Lizards

In this study, side-blotched lizards were abundant and observed during 13 of the 16 transect surveys. Surveyors noted that areas with dense cheatgrass (*Bromus tectorum*) and/or lacking areas of bare ground were typically devoid of side-blotched lizards. It is assumed that the majority of observations marked as 'unidentified lizards' were most likely side-blotched lizards. Many of these observations were glimpses of lizards darting from cover such as a shrub or a small burrow to another form of cover. Identification of these lizards improved as the monitoring event progressed. Surveyors developed a "search image" for the lizards, their habitats, and the structures that were typically used for cover.

5.2 Sagebrush Lizards

Sagebrush lizards were observed much less frequently than expected. The relative abundance estimate of sagebrush lizards by TNC proposed that they are common in the sandy areas of the Hanford Site. The results from 2015 suggest that they are not common in all sandy areas of the site but are instead found specifically in the transition zones between sand dune complexes and areas with mature shrubs. Presumably, the lizards use the shrubs for cover to protect them from predators and extreme heat, and then dart out into the open sand in pursuit of prey. Analysis of the available sagebrush lizard geospatial data revealed an apparent preference for the transitional zones on the south and west edges of active dune on the Hanford Site. This is presumably due to the prevailing winds of the area that come out of the southwest. Shrubs along the south and west edges of these active dunes are less likely to be inundated by the adjacent open sand and most likely provide optimal shelter for the lizards.

The disparity in results between TNC's 1995/98 surveys and the 2015 survey is likely due to the difference in survey methods. TNC employed a time-based visual encounter survey method that was performed during optimal times-of-day and weather conditions. The survey areas were chosen based on the likelihood of encountering the target species (Hallock 1998). The survey method used by Mission Support Alliance (MSA) during 2015 used distance-based linear transects that typically traversed several different habitat types. Thus, a transect that passed through an area that was inhabited by sagebrush lizards would most likely intersect the suitable microhabitats in the transition zones much less frequently (Figure 5).

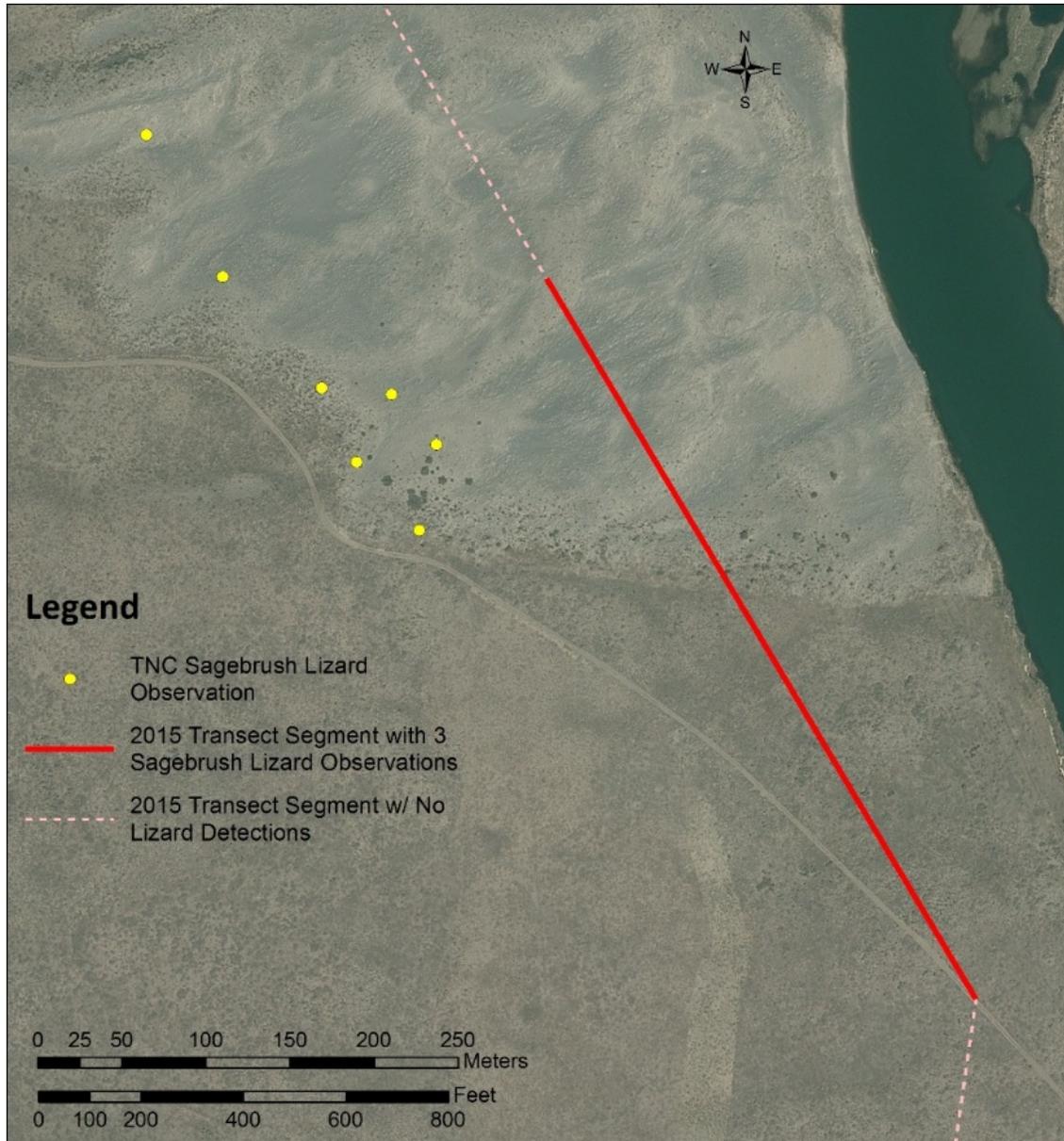


Figure 5. An example of resulting observations from both time-based (TNC) and distance-based (2015) transects in an area inhabited by the sagebrush lizard.

5.3 Short-Horned Lizards

No short-horned lizards were found during the transect surveys, however, two were observed separately by biologists performing other work in 2015. Both short-horned lizards were seen in lithosols near highway 240 directly south of the 200 Area which are characterized by weathered rock at the surface. A study of short-horned lizards in Kittitas County, Washington also found that short-horned lizards in the shrub-steppe preferred lithosol microhabitats (Lahti et al. 2010). Because short-horned lizards rely on mimicry of habitat features (Figure 6) and employ a sit-and-wait tactic for foraging, the methods used in this study were most likely not suited for short-horned lizard detections. Because lithosols are not prevalent on the Hanford Site, the linear survey transects seldom intersected these microhabitats. A more thorough survey of these microhabitats in the future could provide further insight into the distribution and abundance of the short-horned lizard on the Hanford Site.

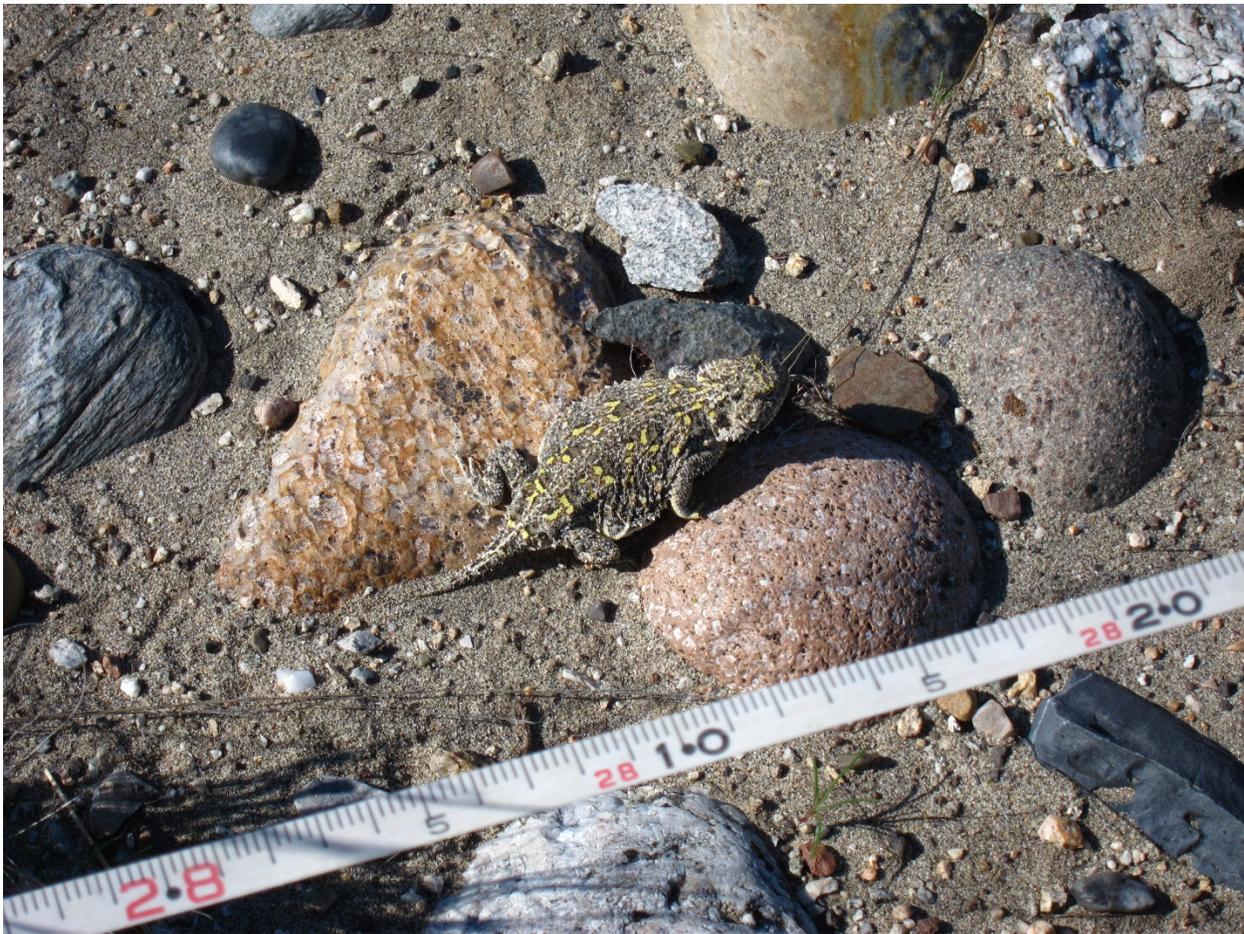


Figure 6. A Short-Horned Lizard Blending in with its Surroundings on the Hanford Site (Encountered during a Separate Monitoring Event in 2015).

5.4 Habitat Availability and Utilization

Each reptile observation was assigned a vegetation type at the time of the observation. Vegetation types were categorized by the dominant plants in the overstory (shrubs) and understory (grasses) present. To test whether the lizards were utilizing the habitats available in proportion to their availability on the Hanford Site, a chi-square test was used (Byers and Steinhorst 1984). Only side-blotched lizard observations ($n = 343$) were used during this test as sample size for the sagebrush ($n = 13$) and short-horned lizards ($n = 0$) were too small or non-existent. Unidentified lizard observations ($n = 160$) were not used in the test. Results of the test showed that the expected number of side-blotched lizards utilizing the surveyed habitats differed significantly ($P < 0.0001$, $\chi^2=170.45$) from the observed number of side-blotched lizards using these habitats. Bonferroni Confidence intervals were calculated using the actual observations, providing a 95% confidence interval to which the expected values (proportion of habitat surveyed) could be compared (Table 2). If the expected values (proportion surveyed) fell outside and higher than the confidence intervals the habitat was used less than would be expected by chance. If the expected (proportion surveyed) values fell outside and lower than the intervals that habitat was used more than would be expected by chance.

Table 2. Occurrence of Side-Blotched Lizards within Various Habitat Types on the Hanford Site.

Habitat Type	Proportion Surveyed (Expected usage)	Number of Observations Expected	Number of Observations Observed	Bonferroni Confidence Interval ($P < 0.05$)
Big Sagebrush / Bluebunch Wheatgrass-Sandberg's Bluegrass	0.006	2.11	2	$-0.006 \leq p_1 \leq 0.018$
Big Sagebrush / Bunchgrass Mosaic	0.090	30.82	36	$0.056 \leq p_2 \leq 0.154$
Big Sagebrush / Sandberg's Bluegrass-Cheatgrass	0.162	55.48	62	$0.119 \leq p_3 \leq 0.242$
Big Sagebrush-Bitterbrush / Bunchgrass Mosaic	0.057	19.67	2	$-0.006 \leq p_4 \leq 0.018$
Bitterbrush / Bunchgrass Mosaic	0.071	24.31	28	$0.038 \leq p_5 \leq 0.125$
Big Sagebrush-Spiny Hopsage / Sandberg's Bluegrass-Cheatgrass	0.007	2.50	0	$0.000 \leq p_6 \leq 0.000^*$
Big Sagebrush-Rigid Sagebrush / Bunchgrass Mosaic	0.006	2.17	0	$0.000 \leq p_7 \leq 0.000^*$
Rabbitbrush / Bunchgrass Mosaic	0.033	11.38	1	$-0.006 \leq p_8 \leq 0.012^*$
Rabbitbrush / Sandberg's Bluegrass-Cheatgrass	0.005	1.86	0	$0.000 \leq p_9 \leq 0.000^*$
Snow Buckwheat / Bunchgrass Mosaic	0.044	14.95	0	$0.000 \leq p_{10} \leq 0.000^*$
Snow Buckwheat / Sandberg's Bluegrass-Cheatgrass	0.018	6.19	0	$0.000 \leq p_{11} \leq 0.000^*$
Bluebunch Wheatgrass-Sandberg's Bluegrass	0.004	1.48	0	$0.000 \leq p_{12} \leq 0.000^*$
Bunchgrass Mosaic	0.174	59.55	137	$0.321 \leq p_{13} \leq 0.478^{**}$
Sandberg's Bluegrass-Cheatgrass	0.313	107.19	75	$0.153 \leq p_{14} \leq 0.285^*$
Riparian / Wetlands / Aquatic Habitats	0.002	0.60	0	$0.000 \leq p_{15} \leq 0.000^*$
Highly Disturbed	0.008	2.75	0	$0.000 \leq p_{16} \leq 0.000^*$

*Denotes less use than expected by chance

**Denotes greater use than expected by chance

Side-blotched lizards appear to select for native bunchgrass habitats (17% of the surveyed areas) disproportionately to habitat availability (Table 2). They utilized areas with big sagebrush (*Artemisia tridentata*) or antelope bitterbrush (*Purshia tridentata*) shrubs with a native understory as expected based on their availability (22% of the surveyed areas). They also utilized areas with a big sagebrush overstory and Sandberg's bluegrass (*Poa sandbergii*)/cheatgrass (*Bromus tectorum*) understory as expected (16% of the surveyed areas) based on availability. They appear to disproportionately avoid cheatgrass dominant habitats (31% of the surveyed areas) that have little to no shrubs. This is most likely due to the lack of cover and open areas in these habitats. The other habitat types that were utilized less than expected represent a small portion of the total area that was surveyed (avg. of 1% of the surveyed areas).

The 2015 reptile monitoring efforts identified the distribution, relative abundance, and key habitats of the lizards on Hanford. This information will be used to assess the impacts of ongoing Hanford Site activities during future ecological compliance reviews. Future monitoring of the lizards of Hanford could benefit by focusing on the habitats identified for the sagebrush lizard and short-horned lizard. The methods used during this monitoring event were best suited for studying the site-wide distribution and relative abundance of lizards on Hanford. Surveys for sagebrush and short-horned lizards would most likely be more successful with time-based surveys in the key habitats identified for each of these species.

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