



Inventory of Reptiles in Dinosaur National Monument



Greater Short-horned Lizard (*Phrynosoma hernandesi*) at Dinosaur National Monument.
UTAH STATE UNIVERSITY / STEPHANIE RUNS THROUGH

Inventory of Reptiles in Dinosaur National Monument

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Abstract

Reptile fauna in Eastern Utah has been historically understudied, yet it represents important components of desert ecosystems. The Northern Colorado Plateau Network (NCPN) developed an inventory needs list in 2007 identifying amphibians and reptiles as high priority; this need was reaffirmed as a high priority in 2017 as a component of Inventories 2.0 scoping. Because these parks are managed for multiple use (e.g., grazing as well as human visitation and recreation), lack of good data associated with herpetofauna could place local populations at risk. Key pieces of information such as species presence and distribution data are required for risk management decisions and to enhance management of these taxa. Dinosaur National Monument (DINO) was not included in earlier herpetofauna inventory efforts by the NCPN but was specifically identified as a priority for further reptile inventory assessment (Platenberg and Graham 2003). Absence of good herpetofauna species presence and distribution data were also specifically identified as potential data gaps that might hinder progress of future grazing allotment management planning in the 2016 DINO Grazing pre-NEPA analysis and lack of data have been identified as key needs at other localities. Work reported here was supported by the Inventory & Monitoring group and provides these critical data for DINO. We used a combination of standardized herpetological inventory tools as well as quasi randomized habitat-based sampling to assess reptile presence in a set of five active grazing allotments at DINO. As recommended in previous herpetofauna inventories we used the presence of water features and other unique habitat elements to maximize the effectiveness of surveys. We identified the presence of nine reptile species in target sites during a single field season in 2024. Species presence data from our study suggest that even common species of reptiles have a somewhat patchy distribution in upper elevation sites at DINO.

Acknowledgments

This project was made possible through the support from the National Park Service Inventory and Monitoring Division.

Introduction

Background

Reptiles and amphibians (herpetofauna) represent ecologically important fauna in terrestrial and aquatic habitats (Christoffel and Lepczyk 2012). However, these taxa are typically under-represented in wildlife studies, and their distribution and population status are poorly understood relative to groups such as large mammals or fish (Christoffel and Lepczyk 2012). However, land managers now recognize the importance of assessing herpetofauna species as components of integrated management plans and there is increasing interest in generating species inventories and assessment of herpetofauna to fill data gaps.

As with much of eastern Utah and western Colorado, herpetofauna associated with Dinosaur National Monument (DINO) have been historically understudied. Previous efforts, including work under a previous agreement with Utah State University, surveys by U.S. Geological Survey (1988) as well as National Park Service assessments and citizen science, provide an estimated species inventory for DINO but these assessments are incomplete and may be inadequate for management of resources such as grazing allotments or assessing other human impacts on herpetofaunal communities.

The Northern Colorado Plateau Network (NCPN) parks inventory needs list developed in 2007 identified amphibians and reptiles as high priority and this need was reaffirmed as a high priority in 2017 as a component of Inventories 2.0 scoping. Because these parks are managed for multiple use (e.g., grazing as well as human visitation and recreation), the lack of good data associated with herpetofauna could prevent appropriate management of herpetofauna at DINO. Key pieces of information such as species presence and distribution data are required for risk management decisions and to ensure that native herpetofauna species are appropriately managed. DINO was not included in the 2001–2002 NCPN Herpetofauna Inventory and was specifically identified in that report as a priority for further reptile inventory assessment (Platenberg and Graham 2003). Absence of good herpetofauna species presence and distribution data were specifically identified as potential data gaps that might hinder progress of future grazing allotment management planning in the 2016 DINO Grazing pre-NEPA analysis and lack of data have been identified as key needs at other localities. Current management concerns recognize potential conflicts between grazing and other human impacts with herpetofauna as well as the potential for negative impacts on native reptiles and amphibians in response to grazing and use. Work completed under this agreement expands efforts to close these data gaps and provide DINO and other NPS personnel with improved data and tools for herpetofauna assessment as well as meet specific management needs for individual management units.

Inventory and assessment work at DINO directly addressed management needs developed by park personnel. Specifically, results from this project were generated to assist in development of grazing management plans and water resource protection in five active grazing allotments at DINO. We included water sources/features to inform protective actions, such as rehabilitating existing livestock

water sources or designing water developments to promote reptile use of these limited sources in DINO's uplands.

Specific Project Goals

The goal of this project was to determine the presence and distribution of reptiles in select grazing allotments in DINO through multiple methods. In addition, rigorous sampling strategies generated data that can assist NPS personnel develop predictive models for presence/absence of some reptile taxa in the future. Initial data from this project provides updated species inventories for DINO and includes taxonomic revisions as well as assessments of the presence of state or federal reptile species of concern.

Methods

Work under this agreement incorporated three phases: (1) literature reviews of herpetofauna records from eastern/central Utah and Colorado and coordination with NPS personnel to finalize the sampling design and establish feasibility of access and timing to those sites; (2) field work and data collection in 2024; and (3) data organization and analysis and generation of final species lists and distribution maps, as well as completion of a report. Initial literature reviews were used to identify changes to species taxonomy and/or nomenclature for NPS records and to generate a list of species predicted to be present in study sites (Table 1).

Table 1. Predicted or possible reptile species present in surveyed areas based on multiple sources. Species with two names list the accepted current nomenclature first, followed by the older name.

Family	Scientific Name	Common Name
Boidae	<i>Charina bottae</i>	Rubber Boa
Colubridae	<i>Coluber constrictor</i>	Eastern Racer
	<i>Coluber taeniatus</i> (Older name: <i>Mastecophis taeniatus</i>)	Striped Whipsnake
	<i>Heterodon nasicus</i>	Plains Hog-nosed Snake
	<i>Hypsiglena chlorophaea</i> (Older name: <i>Hypsiglena torquata</i>)	Desert Night Snake
	<i>Lampropeltis gentilis</i> (Older name: <i>Lampropeltis triangulum</i>)	Utah Milk Snake
	<i>Opheodrys vernalis</i> (Older name: <i>Liochlorophis vernalis</i>)	Smooth Green Snake
	<i>Pantherophis emoryi</i> (Older name: <i>Elaphe gutatta</i>)	Great Plains Rat Snake
	<i>Pituophis catenifer</i>	Gopher Snake
	<i>Thamnophis elegans</i>	Terrestrial Garter Snake
	<i>Sceloporus graciosus</i>	Sagebrush Lizard
	<i>Sceloporus tristichus</i> (Older name: <i>Sceloporus undulatus</i>)	Plateau Fence Lizard
	<i>Urosaurus ornatus</i>	Ornate Tree Lizard
	<i>Uta stansburiana</i>	Common Side-blotched Lizard
Phrynosomatidae	<i>Phrynosoma hernandesi</i> (Older name: <i>Phrynosoma douglasii</i>)	Greater Short-horned Lizard
	<i>Phrynosoma platyrhinos</i>	Desert Horned Lizard
Teiidae	<i>Aspidoscelis tigris</i> (Older name: <i>Cnemidophorus tigris</i>)	Western Whiptail Lizard
Viperidae	<i>Crotalus oreganus concolor</i> (Older name: <i>Crotalus viridis concolor</i>)	Midget Faded Rattlesnake
	<i>Crotalus viridis</i>	Prairie Rattlesnake

Literature and Data Review

Efforts associated with this project focused on quantifying species presence and distributions. DINO was not formally surveyed as part of the 2001–2002 Herpetofauna Inventory. However, we generated a list of predicted herpetofauna species inventory using preexisting published resources (Table 1). Initial literature and data review included NPS materials (e.g., checklists), regional guidebooks, examination of naturalist records (GBIF.org, iNaturalist.org, IUCN databases), as well as published scientific literature and agency reports when appropriate (e.g., McGinnis and Stebbins 2018, GBIF 2024; IUCN 2024; NPS 2023). We also incorporated unpublished data from an earlier study (2020–2021) of herpetofauna at DINO by Hanifin and Pedersen. We followed accepted best practices and consulted authoritative taxonomic references to ensure current taxonomy and nomenclature when generating predicted species lists and final inventories (Table 1). Key sources included the Society for the Study of Amphibians and Reptiles: <https://ssarherps.org/> and the Center for North American Herpetology: <http://www.cnah.org/>.

From this list we developed appropriate surveys and tools to assess those species and worked with NPS personnel to identify appropriate sites for assessments. We prioritized inventory assessments and habitat sampling over developing estimates of population size or density. Similarly, we focused on surveying multiple habitat types rather than exhaustive surveys of a single habitat. The exception to this strategy focused on habitats and sampling strategies that maximized the likelihood of identifying rare or cryptic species.

Sample Design

Study Area

Dinosaur National Monument is an 85,325-ha park in northeastern Utah and northwestern Colorado, established to protect its dinosaur quarry. It was expanded in 1938 and includes hundreds of paleontological and archeological sites, as well as the confluence of the Green and Yampa rivers. DINO also includes ten active grazing allotments that require management and oversight. We limited the geographic scope of this project to a subset of six grazing allotments within the monument boundaries: Big Joe allotment, Docs Valley allotment, Green River allotment, Massey allotment, Round Top allotment, and Wild Mountain allotment (Figure 1).

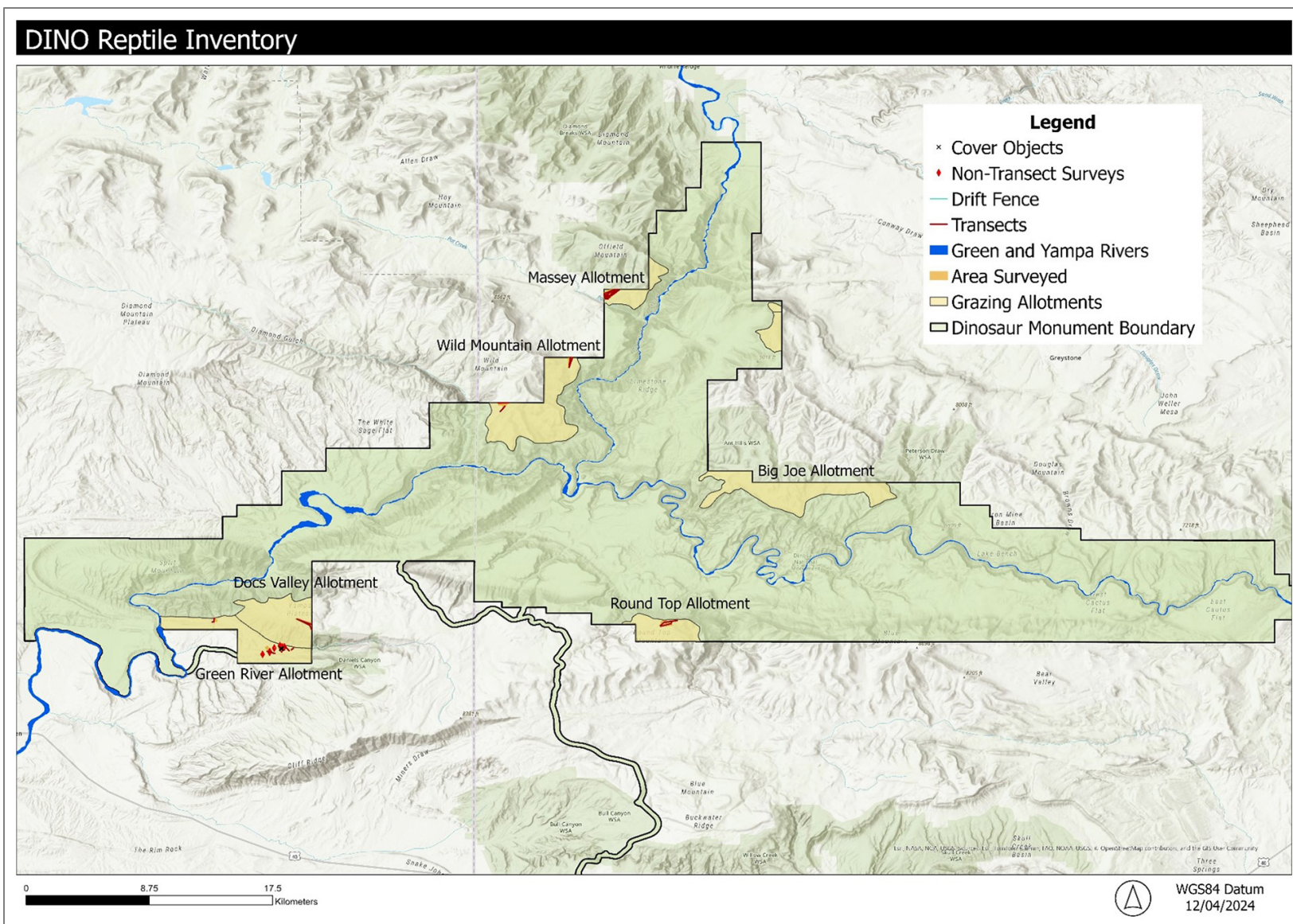


Figure 1. Dinosaur Monument survey locations with yellow polygons of the allotments sampled in 2024.
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Surveys and Sampling

Specific sampling approaches were created in consultation with monument staff based on need and management questions. Three sample design approaches were used in this study. They include (1) transect surveys selected using a balance acceptance sampling (BAS) design, (2) transect surveys that cover areas of interest identified by monument personnel, and (3) targeted habitat sampling to determine cover object and drift fence locations. We determined habitat type of surveyed locations using GIS veg data provided by DINO personnel.

Transect surveys allow coverage of a wide range of microhabitats in survey regions and provide rigorous sub-sampling of large areas, whereas targeted sampling maximizes the probability of finding rare or cryptic species. Broadly, planned efforts consisted of 75% effort associated with transects and 25% of survey effort dedicated to targeted sampling. Although outside the scope of this project, transect sampling provided data that can be used in future analyses to compare and contrast different areas of the park or to generate predictive models of reptile distribution within parks. Transect approaches are generally less effective at identifying rare or cryptic reptile species but provide a classic approach to sample microhabitats and reptile use of those habitats (Platenberg and Graham 2003). To maximize capture rate of rare or cryptic species, we supplemented efforts with a suite of tools (artificial cover objects and drift fences with funnel traps) placed in targeted habitats. These approaches maximized our chances of finding and identifying rare species that are also of potential management concern.

Transect Selection and Design

Transect surveys covered roughly 138 hectares of the areas of interest (Figure 1). Within the Green River allotment, we used BAS sampling to select transects, with complementary transects to cover specific areas of interest. BAS sampling uses quasi random numbers to design spatially balanced surveys (Robertson et al. 2017). Transects were selected using the MBHDesign R package (Foster 2021). MBHDesign can use legacy sites to reduce the likelihood of selecting previously surveyed locations. Because DINO was particularly interested in locations near water, we used this feature, while inverting the probabilities, to give a small increase to the chance that transects would be near water features. For all other allotments we used transect lines that were selected upon reaching the area of interest, to maximize coverage of said area. With all other allotments, monument personnel selected smaller regions of interest. This was due to a combination of access and time limitations as well as, in the case of the Massey allotment, limited use by cattle. Transect location and direction were selected upon arrival to these allotments.

Transects were up to 1000 meters in length. The directional component of the vector was chosen to allow us to follow the topology of the location and avoid barriers such as canyon walls. Transects typically had three to five (up to seven) surveyors present. For parallel survey lines (e.g., Massey) we had one person leading the transect, with the person on the far end of the survey line tracking their movement using GPS. Upon switching directions, the person tracking their line would become the transect leader, spacing themselves 30 to 50 meters from their previous line. For non-parallel surveys (e.g., Wild Mountain) we followed the topology covering the largest area possible. The remaining surveyors were spaced out from the lead, maintaining a distance between 15–30 meters between

surveyors. Surveyors weaved along their lines, particularly to check unique microhabitats along the survey line (e.g., rock outcrops, fallen logs, etc.). We surveyed the full length of each transect unless it was unsafe to do so due to terrain or weather.

Targeted Sampling

The USU team, in consultation with DINO personnel, determined that targeted sampling would focus on the Green River allotment. Other sites we deemed to remote to allow adequate sampling and/or placement of artificial cover objects (ACO) or drift fences. We used accepted best practices to determine placement of artificial cover objects (ACOs) and drift fences at the Green River site (Graeter et al. 2013; Lemm and Tobler 2021). Targeted sampling considered landscape features (e.g., rock formations or edge habitats) as well as habitat type. This kind of targeted placement can increase the chance of identifying rare or cryptic species with low discovery rates and/or identify species that are habitat limited.

In addition to transects we placed an array of 40 artificial cover objects in a location within the Green River allotment identified by the Utah State University team. These were placed along marshy edge habitat in a meadow near Josie's Cabin. We checked cover objects approximately every other week from March to July. Cover object checks typically occurred either in the morning a few hours after sunrise, or the evening beginning approximately two hours before dusk.

We placed three drift fences in the Green River allotment near Josies Cabin, with a combination of funnel traps and minnow traps (Figure 2). Drift fence one was placed in a meadow along marshy edge habitat, two was placed between the marshy habitat and Cub Creek, and fence three was placed partially enclosing an ephemeral puddle created by spring runoff. Drift fence traps were checked twice daily while deployed, except for the first and last days where they were checked once in the afternoon and once in the morning, respectively. We placed six plastic funnel traps through the drift fences, with eight metal minnow traps running along the fence (Figure 3). Cloth with grass or dirt was placed going up the slope of the funnels to create a more natural entrance into the traps.

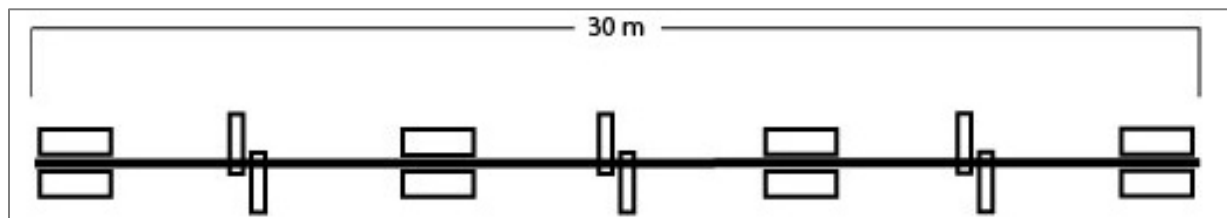


Figure 2. Drift fence layout. Tubes passing through fence are 4" PVC with plastic funnels in the ends. Tubes running parallel to drift fence are metal minnow traps.

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Figure 3. Photograph of drift fence deployed in Dinosaur National Monument.
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Data Collection

Each unique survey was collected as an event per National Park Service (NPS) guidelines. Events included start times, end times, and a GPS starting point. Transects also included a start and end location. Animals were recorded as an occurrence and each occurrence was linked to the event in which it occurred. Occurrences also included time of occurrence and GPS location.

We collected temperature, biometric data (i.e., mass, snout to vent length, sex), and photographic vouchers for each occurrence when possible. Photos were taken on a white board with a black and white measuring ruler. We also collected up to two tail clips per species, one male and one female. Tail clips were stored in 90% EtOH and placed into a -80°C freezer as soon as possible (usually within a few days). Tail clips and photographs were collected as a non-lethal alternative to full specimen collection. This allowed us to collect vouchers and DNA for future study without euthanizing and removing animals from the park. Photographs and tail clips are stored at the Monte L. Bean Life Science Museum at Brigham Young University along with relevant geospatial data.

Results

We conducted 28 walking transects between 3 April and 17 July 2024 for a total of 18.39 hours (86.47 person hours), covering a total of 137.68 hectares (Table 2). We also conducted nine artificial cover object (ACO) checks and four drift fence trap checks for a total of 52.9 person hours (Table 3). We observed 103 animals representing nine of the twenty reptile species identified as being possible within the park (Table 4). We found 48 animals during transect surveys, 12 animals under ACOs, five animals in drift fence traps, and 48 animals during ad hoc and road running surveys (Table 3). Overall, we collected data on 103 animals, 13 tail clips, and 25 photographic specimen vouchers for a total of 158.6 person hours of survey work (Table 3 and Table 4). Big Joe allotment was listed as an area of interest for surveying in 2024. We were unable to survey this location due to rockfall blocking access.

Table 2. Summary of Dinosaur National Monument reptile survey grouped by grazing allotment. Number of species in parenthesis indicates estimated total number of possible species within the park.

Location	Hectares Sampled	Total Hectares	Number of Animals	Animals per Hectare	Number of Species
Docs Valley	20.5	1118	6	0.29	1
Green River	21.78	1078	62	2.84	9
Massey	37.5	392	29	0.77	4
Round Top	27.5	568	2	0.07	1
Wild Mountain	30.4	1674	4	0.13	1
Total	137.68	4830	103	0.75	9 (20)

Table 3. Survey type, effort, and results for Dinosaur National Monument reptile survey.

Type	Number of Surveys	Time Spent	Percent of Effort	Number of Animals	Animals per Hours Surveyed
Transect	28	86.47	54.5	48	0.55
Artificial Cover Object	9	25.6	16.1	12	0.47
Drift Fence	4	27.3	17.2	5	0.18
Ad Hoc	9	19.2	12.1	38	1.98
Total	50	158.6	99.9	103	0.65

Table 4. Dinosaur National Monument reptile survey with total number of individual animals by species. Collection of tail clips and/or photo vouchers are in relevant columns. For tail clips, M = male, F = female, and M/F indicates both.

Scientific Name	Number of Animals	Tail Clip	Photographs
<i>Aspidoscelis tigris</i>	23	–	Y
<i>Charina bottae</i>	0	–	N
<i>Coluber constrictor</i>	21	M/F	Y
<i>Coluber taeniatus</i>	1	F	Y
<i>Crotalus oreganus</i>	1	–	N
<i>Crotalus viridis</i>	0	–	N
<i>Heterodon nasicus</i>	0	–	N
<i>Hypsiglena chlorophaea</i>	0	–	N
<i>Lampropeltis gentilis</i>	0	–	N
<i>Opheodrys vernalis</i>	0	–	N
<i>Pantherophis emoryi</i>	0	–	N
<i>Phrynosoma hernandesi</i>	6	M	Y
<i>Phrynosoma platyrhinos</i>	0	–	N
<i>Pituophis catenifer</i>	3	–	Y
<i>Rhinocheilus lecontei</i>	0	–	N
<i>Sceloporus graciosus</i>	32	–	Y
<i>Sceloporus tristichus</i>	0	–	N
<i>Thamnophis elegans</i>	0	–	N
<i>Urosaurus ornatus</i>	1	–	Y
<i>Uta stansburiana</i>	14	M/F	Y
Total	103	–	–

Docs Valley

Docs Valley followed an access road to a stock pond. The habitat consisted of pinyon-juniper/sparse understory woodland, pinyon-juniper woodland, pinyon-juniper sagebrush woodland ponderosa pine woodland, sagebrush/rabbitbrush shrubland, pinyon-juniper/littleleaf mountain mahogany shrubland and woodland, native grassland, and pinyon-juniper/true mahogany woodland. Docs Valley has an elevation between 1,657 and 2,360 meters with surveys occurring between 2,257 and 2,308 meters. We conducted the survey on 10 June 2024. We conducted a total of three transects, covering approximately 20.5 hectares (Figure 4, 5 and Table 2). We observed six total animals representing one species of reptile: Sagebrush Lizard (*Sceloporus graciosus*, Table 5). We also collected location data on tadpoles, as well as collecting a single specimen, identified under a microscope as Great Basin Spadefoot Toad (*Spea intermontane*, not listed in tables). While not a target of this study, amphibians were considered targets of opportunity to assist with an amphibian eDNA study also occurring within the monument.

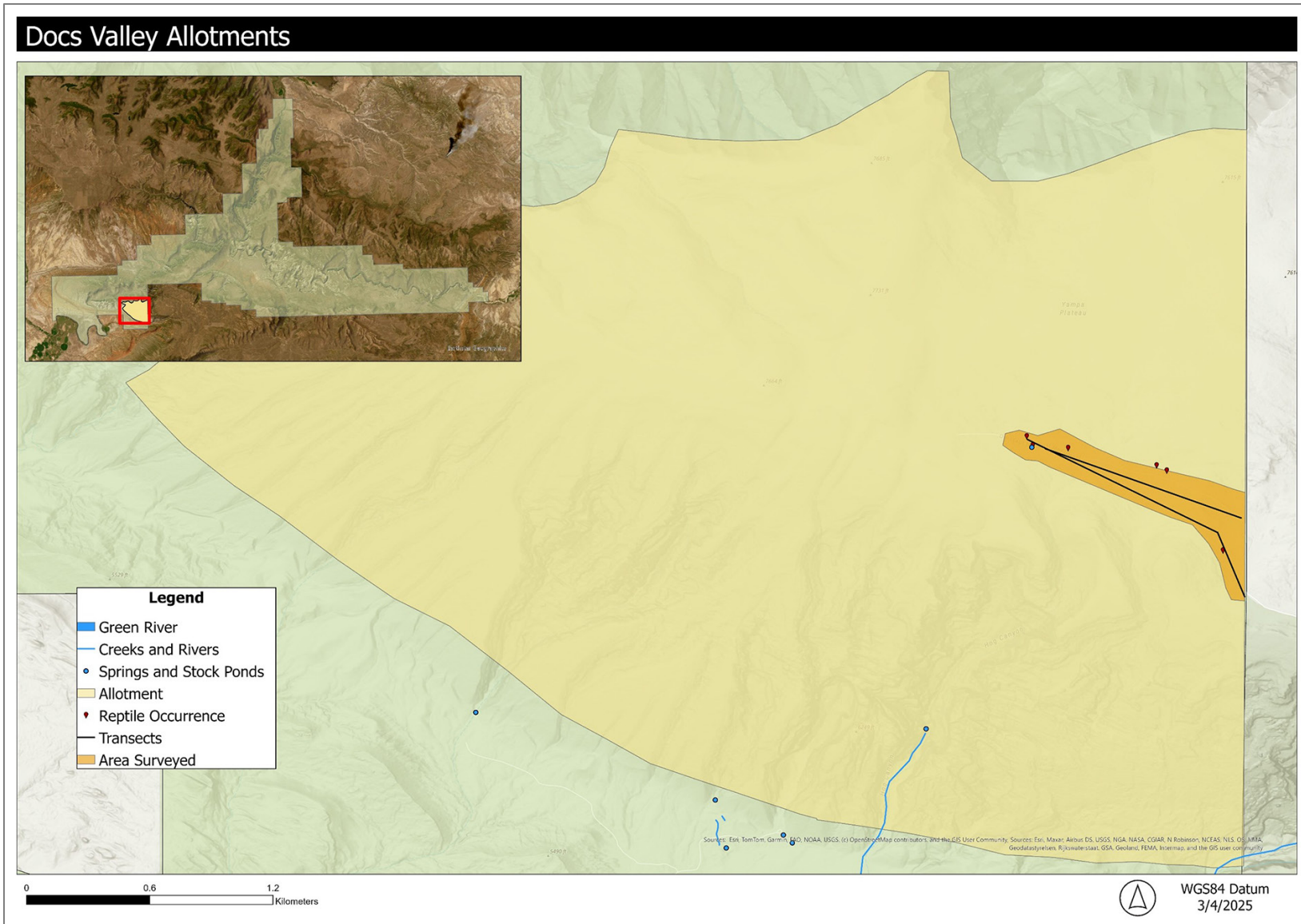


Figure 4. Docs Valley allotment map, including transect lines created from start and end points, as well as area covered.
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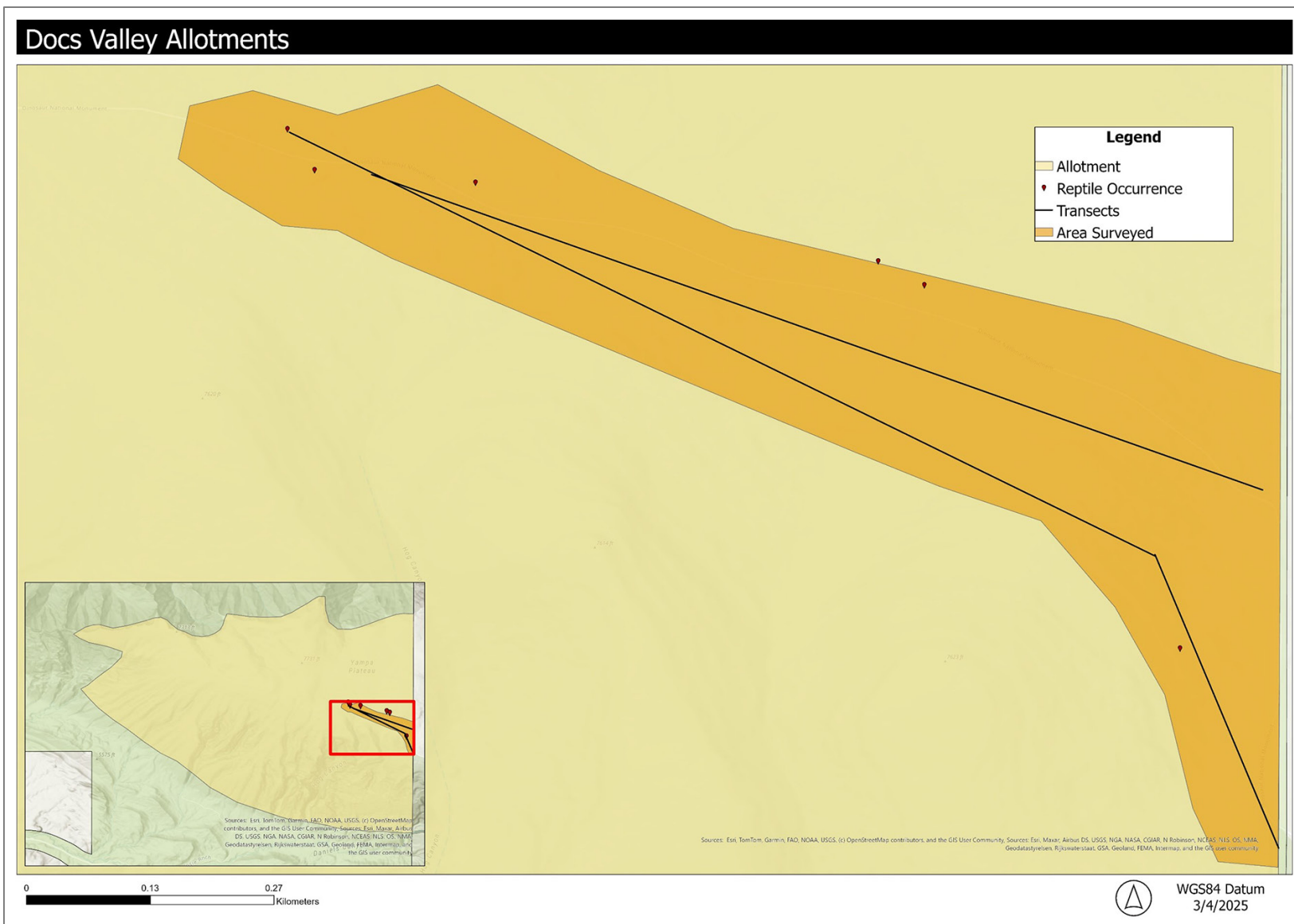


Figure 5. Docs Valley allotment survey area showing transects and reptile occurrences.
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Table 5. Species and numbers of animals found by allotment.

Allotment	Scientific Name	Number of Animals
Docs Valley	<i>Sceloporus graciosus</i>	6
Green River	<i>Aspidoscelis tigris</i>	23
	<i>Coluber constrictor</i>	21
	<i>Coluber taeniatus</i>	1
	<i>Crotalus oreganus</i>	1
	<i>Pituophis catenifer</i>	2
	<i>Sceloporus graciosus</i>	1
	<i>Uta stansburiana</i>	13
Massey	<i>Coluber constrictor</i>	1
	<i>Pituophis catenifer</i>	1
	<i>Sceloporus graciosus</i>	25
	<i>Urosaurus ornatus</i>	1
	<i>Uta stansburiana</i>	1
Round Top	<i>Phrynosoma hernandesi</i>	2
Wild Mountain	<i>Phrynosoma hernandesi</i>	4

Green River

Green River consisted of the Cub Creek Road, the area around Josies Cabin, and a location east of Beach Draw. The habitat consisted of sagebrush/rabbitbrush shrubland, pinyon-juniper sagebrush woodland, pinyon-juniper/sparse understory woodland, box elder woodland, narrow canyon mesic woodland, mixed wetland/riparian, weedy herbaceous vegetation, bottomland shrubland, pinyon-juniper/true mountain mahogany woodland, black sagebrush shrubland, and broadleaf cottonwood woodland. Green River has an elevation between 1,463 and 1,881 meters with surveys occurring between 1,550 and 1,656 meters. We conducted surveys between 3 April and 17 July 2024. We conducted a total of five transects, covering approximately 21.78 hectares (Figure 6, 7, 8, 9 and Table 2). We placed 40 cover objects and three drift fences in this location (Figure 4). We observed 62 animals representing seven species of reptiles (Table 2). Species were: Western Whiptail (*Aspidoscelis tigris*), Eastern Racer (*Coluber constrictor*), Striped Whipsnake (*Coluber taeniatus*), Midget Faded Rattlesnake (*Crotalus oreganus concolor*), Gopher Snake (*Pituophis catenifer*), Sagebrush Lizard (*Sceloporus graciosus*), and Side-blotched Lizard (*Uta stansburiana*) (Table 5).

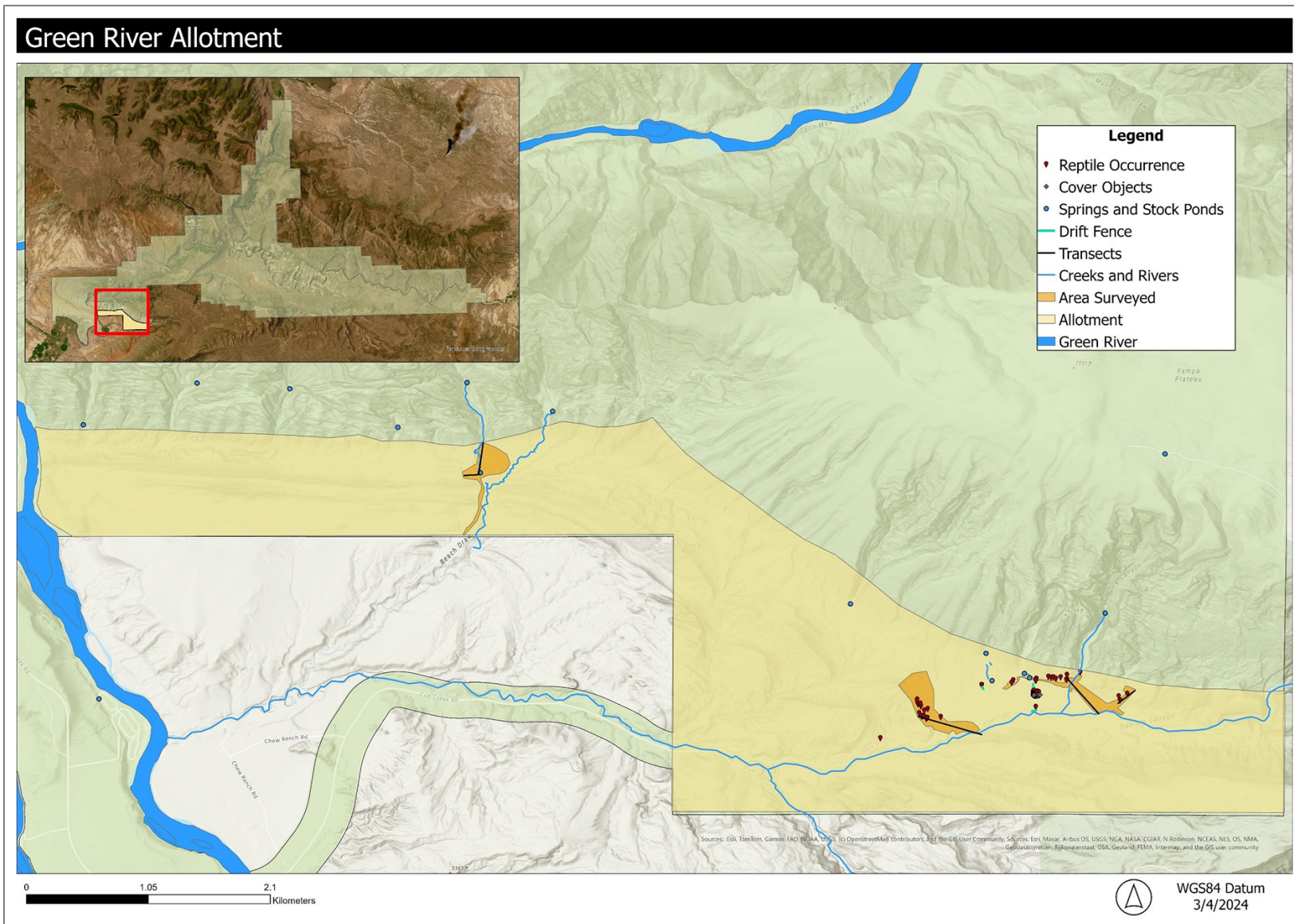


Figure 6. Green River allotment map, including transect lines created from start and end points, as well as area covered.
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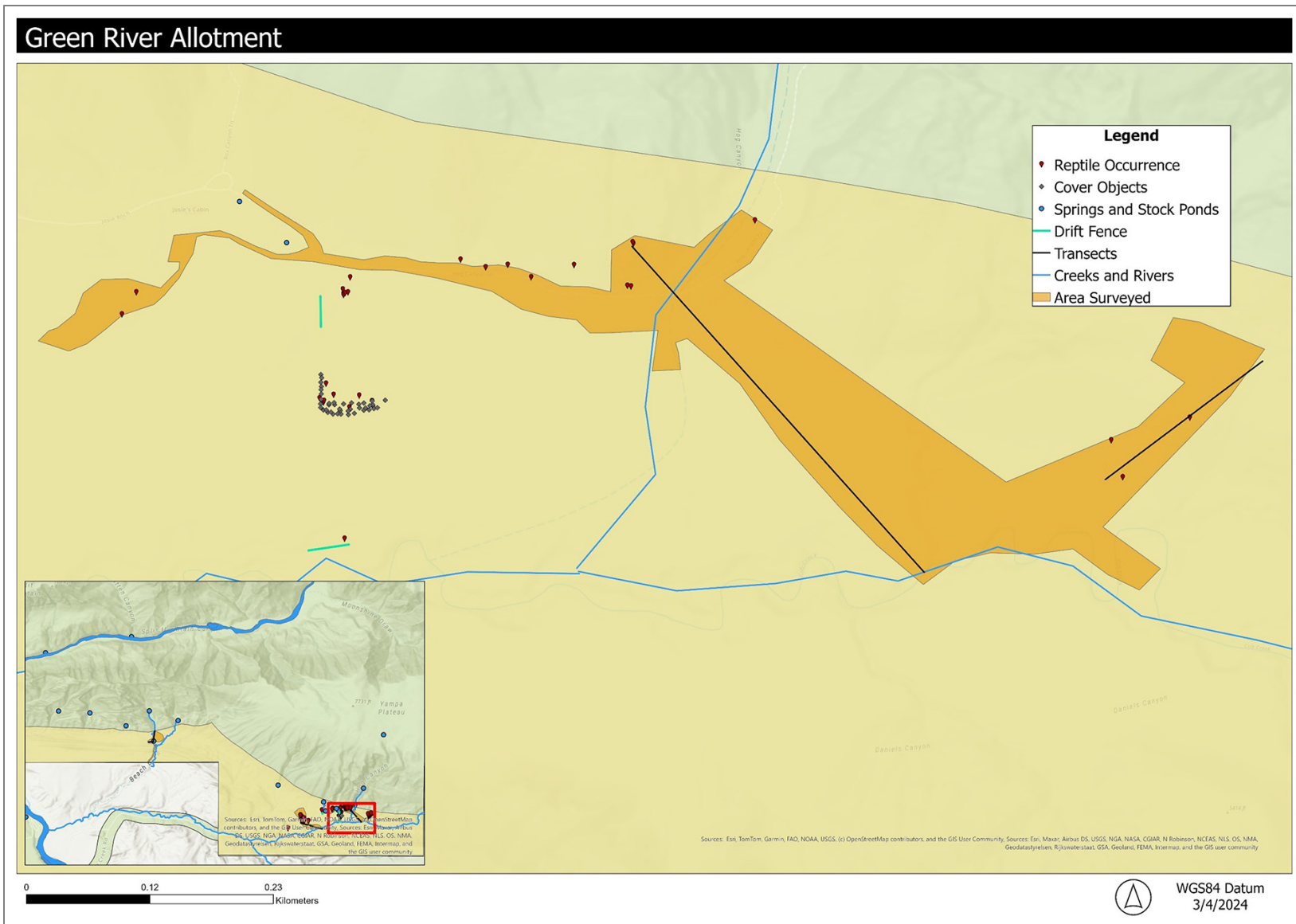


Figure 7. Green River allotment survey area south of Josies Cabin showing transects and reptile occurrences.
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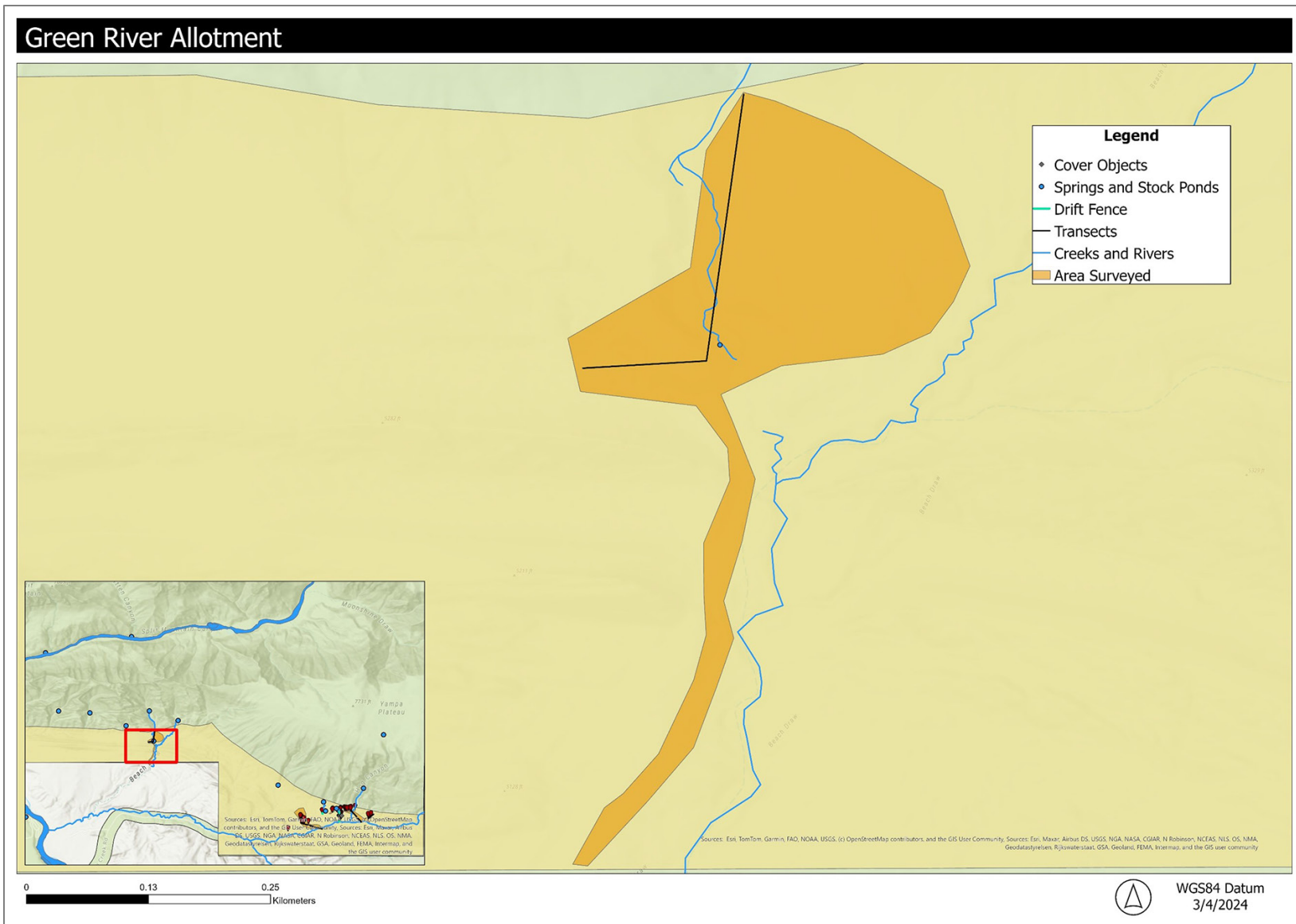


Figure 8. Green River allotment survey west of Josies Cabin area showing transects and reptile occurrences.
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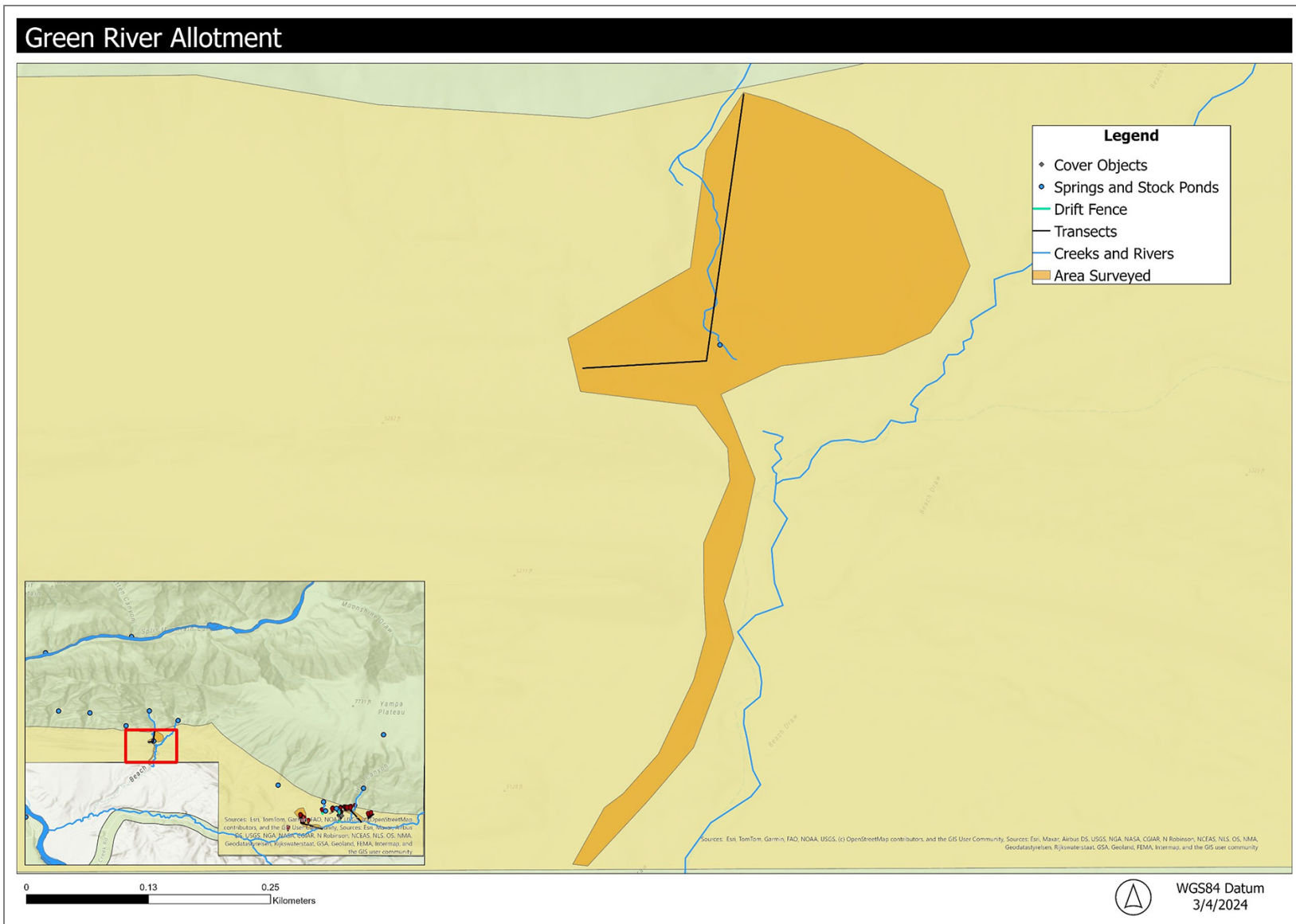


Figure 9. Green River allotment survey area at Beach Draw showing transects and reptile occurrences.
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Massey

Massey followed a road on which cattle are driven between grazing locations. The habitat consisted of ponderosa pine woodland, pinyon-juniper/sagebrush woodland, sagebrush/rabbitbrush shrubland, native grassland, and pinyon-juniper/sparse understory. We conducted surveys on 5 and 6 June 2024. Massey has an elevation between 1,936 and 2,370 meters with surveys occurring between 2,035 and 2,100 meters. We conducted a total of 11 transects, covering approximately 37.5 hectares (Figure 10, 11 and Table 2). We observed 29 animals, representing five species of reptile including: Eastern Racer (*C. constrictor*), Gopher Snake (*P. catenifer*), Sagebrush Lizard (*S. graciosus*), Ornate Tree Lizard (*Urosaurus ornatus*), and Side-blotched Lizard (*U. stansburiana*) (Table 5).



Figure 10. Massey allotment map, including transect lines created from start and end points, as well as area covered.
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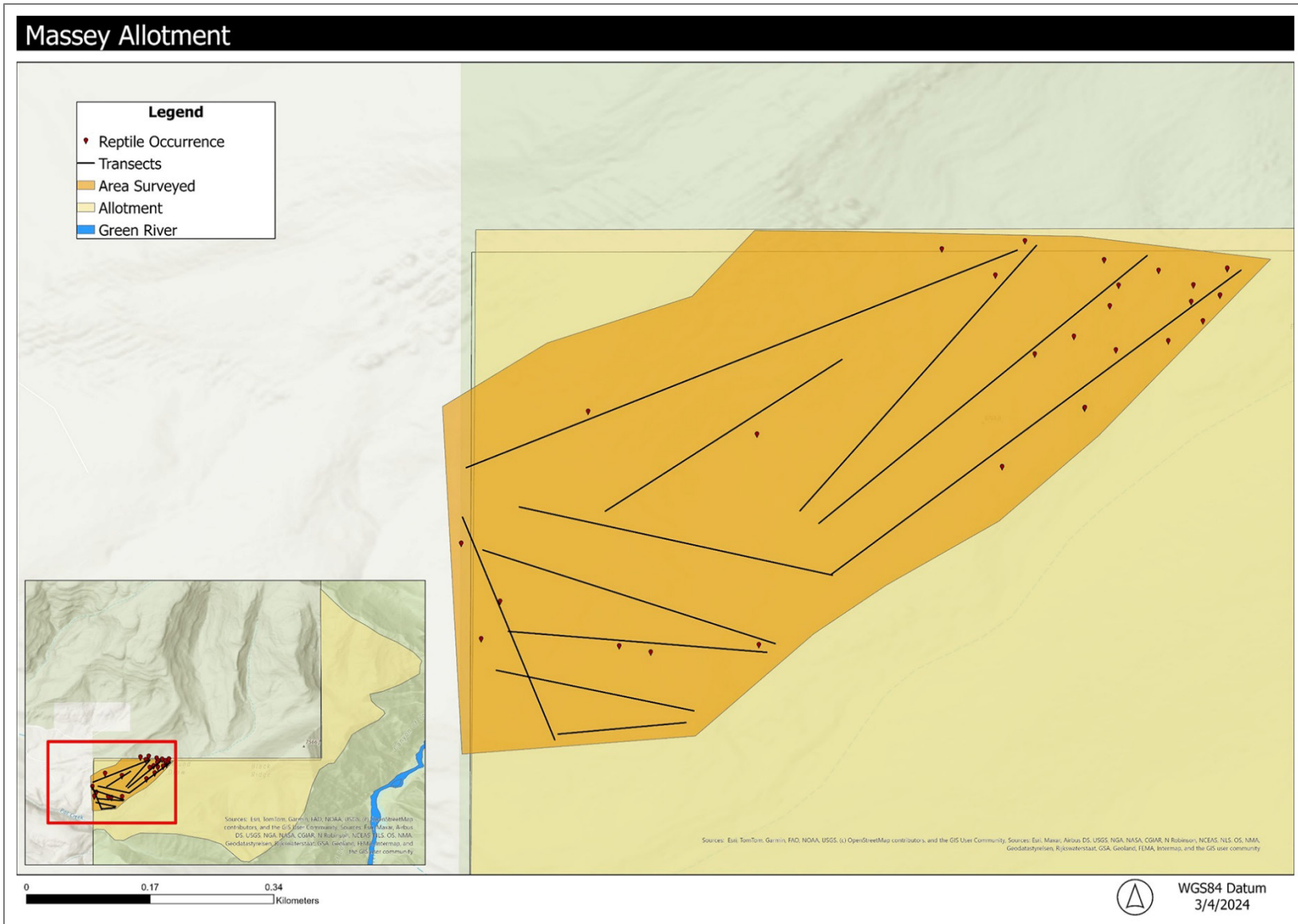


Figure 11. Massey allotment showing transects and species occurrences.
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Round Top

Round Top was on the north-central part of the allotment, along the fire tower access road. The habitat consisted of black sagebrush shrubland, sagebrush/rabbitbrush shrubland, mixed mountain shrubland, and aspen forest. Round Top has an elevation between 2,321 and 2,608 meters with surveys occurring between 2,352 and 2,607 meters. We conducted surveys on 16 July 2024. We conducted a total of three transects, covering approximately 27.5 hectares (Figure 12, 13 and Table 2). We observed two animals, representing one species of reptile: Greater Short-horned Lizard (*Phrynosoma hernandesi*, Table 5).

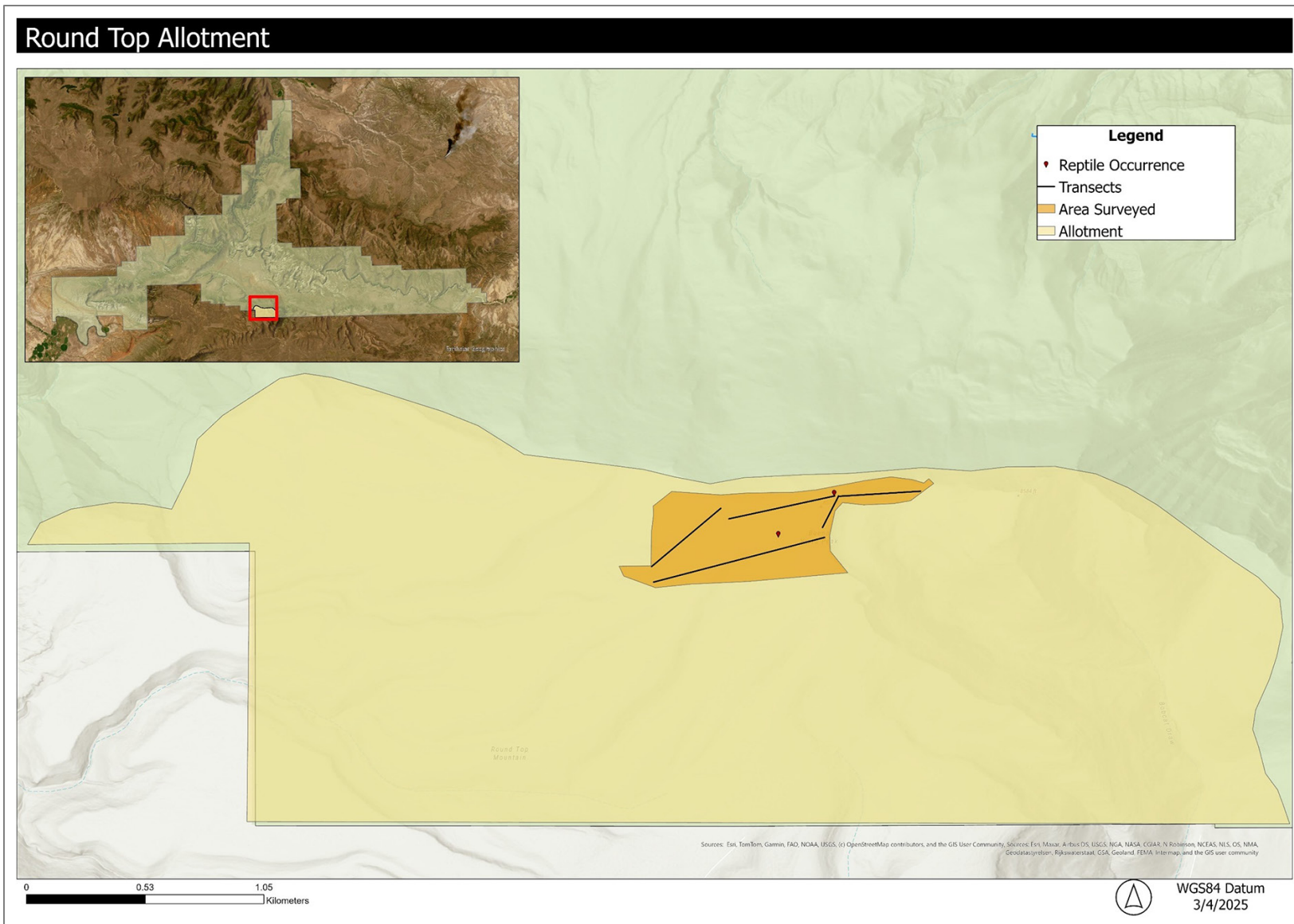


Figure 12. Round Top allotment map, including transect lines created from start and end points, as well as area covered.
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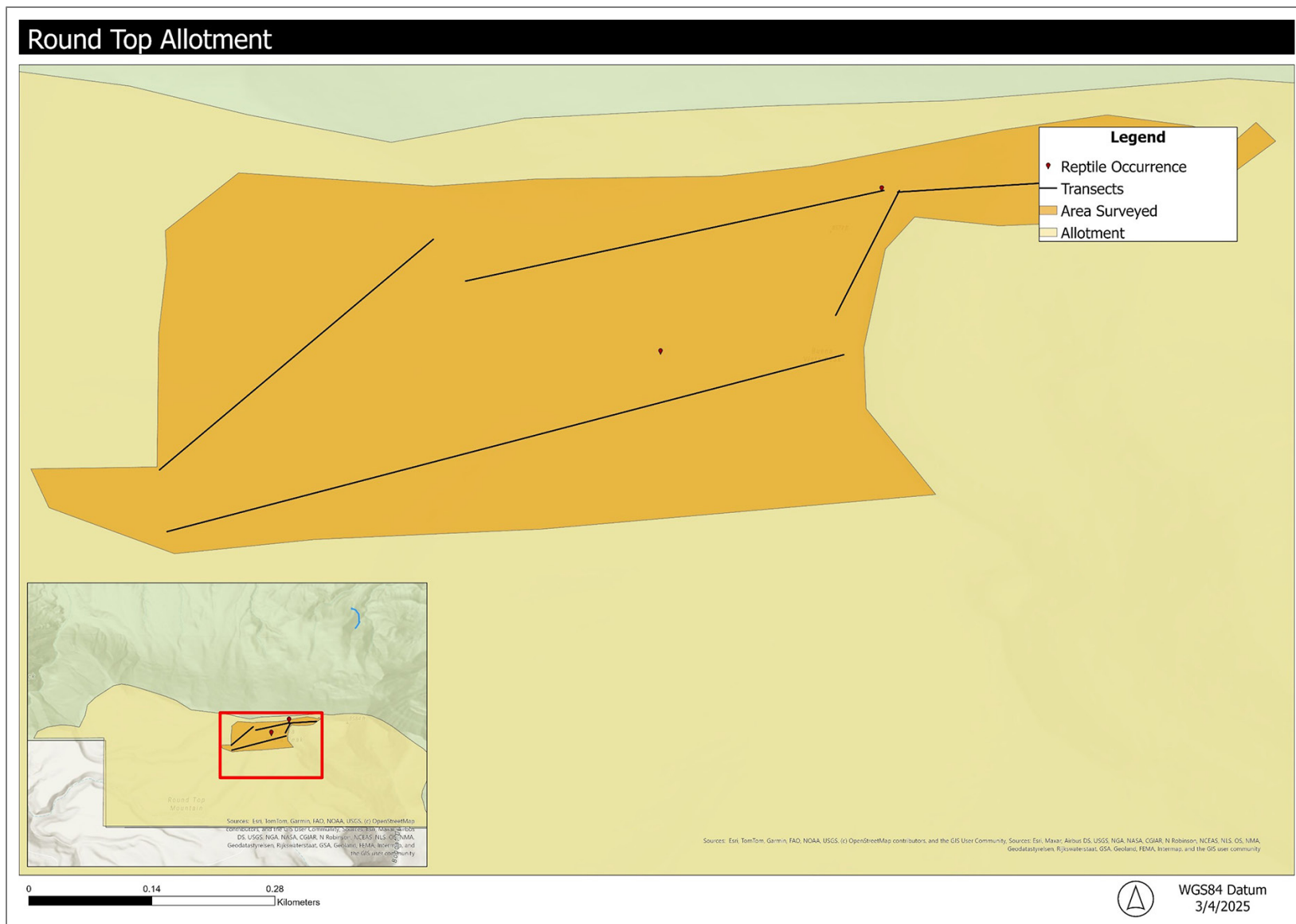


Figure 13. Round Top allotment survey area showing transects and reptile occurrences.
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Wild Mountain

Wild Mountain consisted of two locations on the north edge of the allotment (Figure 1). Habitat consisted of sagebrush-antelope bitterbrush shrubland, pinyon-juniper/sagebrush woodland, mixed mountain shrubland, native grassland, and sagebrush/rabbitbrush shrubland. We conducted surveys on 25 June and 11 July 2024. Wild Mountain has an elevation between 1,973 and 2,516 meters with surveys occurring between 2,101 and 2,315 meters. We conducted a total of four transects, covering approximately 30.4 hectares (Figure 14, 15, 16 and Table 2). We observed four animals, representing one species of reptile: Greater Short-horned Lizard (*Phrynosoma hernandesi*, Table 5). No reptiles were observed in the western transect location.

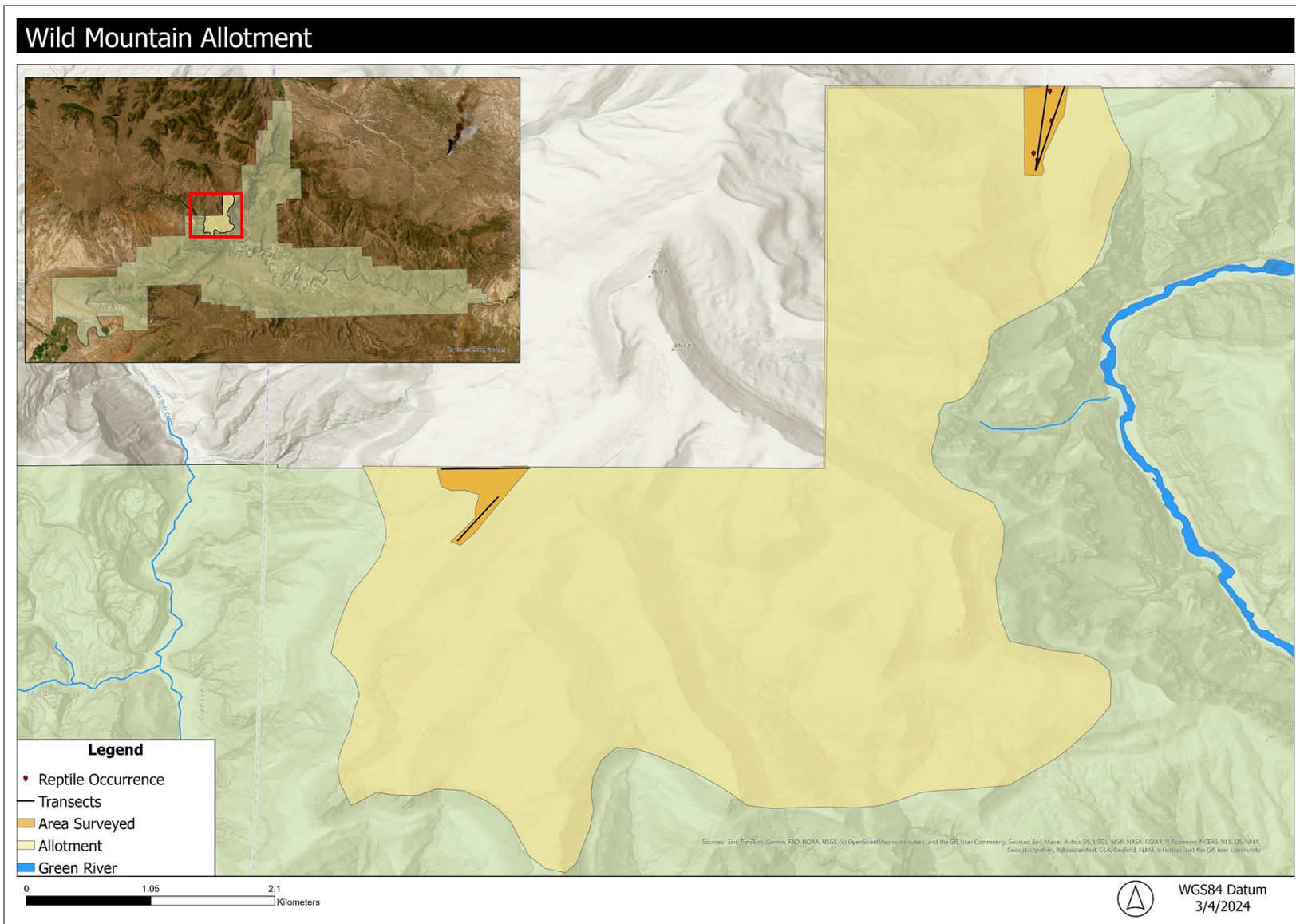


Figure 14. Wild Mountain allotment map, including transect lines created from start and end points, as well as area covered.
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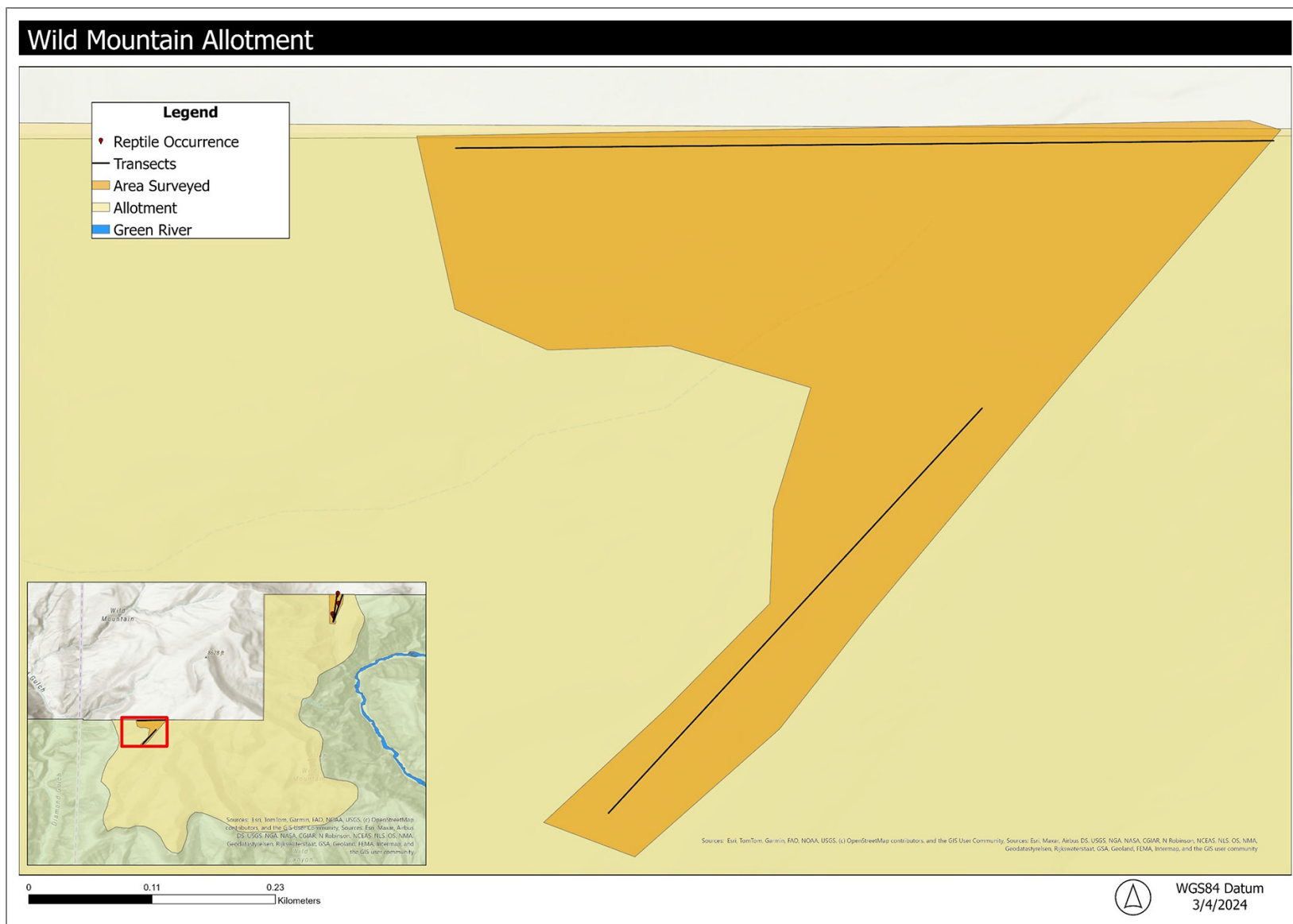


Figure 15. Wild Mountain allotment western survey area showing transects and reptile occurrences.
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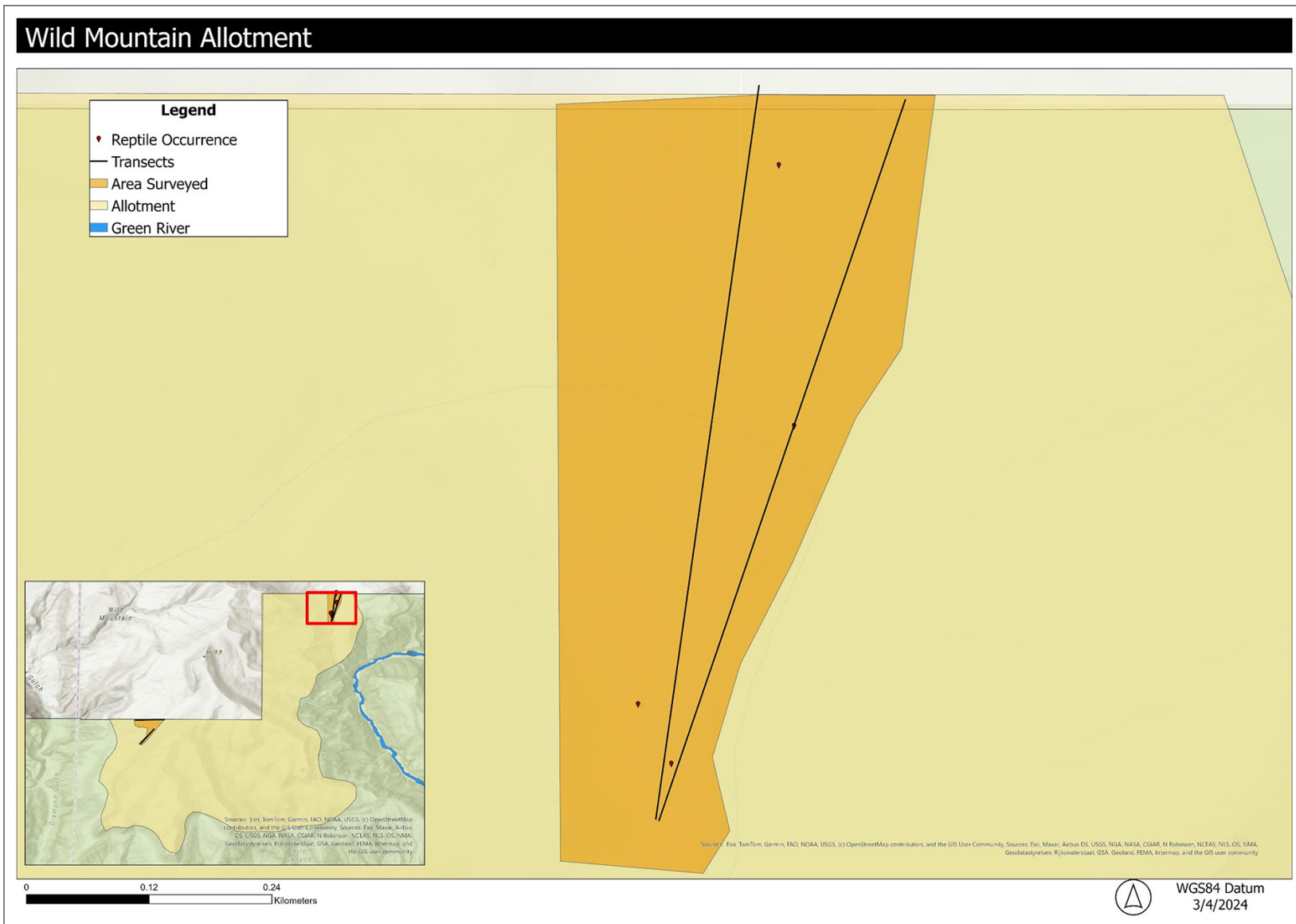


Figure 16. Wild Mountain allotment northeastern survey area showing transects and reptile occurrences.
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Summary and Conclusions

Our results documented the presence of nine reptile species in target grazing allotments at DINO (see Table 4). Although our master list likely overestimates the total number of potential species (e.g., *Phrynosoma platyrhinos*; see below), our results suggest that around 45% of the total species present in DINO were present in our study sites. Of the species present, four—Side-blotched Lizard, Western Whiptail, Sagebrush Lizard, and Ornate Tree Lizard—are common diurnal lizards with wide distributions and are expected in habitats associated with DINO grazing allotments. These common species were not ubiquitous across DINO sites. For example, none of these relatively common species were present at either the Round Top or Wild Mountain high elevation sites but a subset were present at two other high elevation sites (Massey and Docs Valley) and our low elevation site (Green River; Table 5). We also identified the presence of three common snake species: Striped Whipsnakes, the Eastern Racer, and Gopher Snake in DINO survey sites. As with common diurnal lizards, these snakes were only identified in a subset of DINO sites (Table 5). Differences across sites were also observed in the distribution of Greater Short-horned Lizard which was present at two high elevation sites: Round Top and Wild Mountain (Table 5) but absent at all other sites (see below for discussion). Finally, we identified a single encounter with Midget Faded Rattlesnake at the Green River site.

The patchy and somewhat limited diversity of reptiles identified in DINO grazing allotments is generally unsurprising (but see below). Many of the common species present in DINO are near the geographic edges of their ranges and their populations may be limited by habitat quality or climate (e.g., Side-blotched Lizard). Furthermore, the high elevation (e.g., Round Top elevation 2,615 meters) and generally cool climate of grazing sites at DINO also likely limits reptile habitability. Although our data does not allow us to assess population densities in our study sites, we would expect that populations of even common lizard and snake species are limited in comparison to more southern locations. Hanifin and Pedersen have seen similar patterns in previous herpetofauna studies at DINO and other public lands (e.g., Pariette Wetlands) in the Uintah Basin (unpublished data).

The limited sampling of a single year of study coupled with the extreme remoteness and difficult access to most of our DINO study sites limits our ability to draw extensive conclusions about reptile populations in our study sites and broad management recommendations. Our results suggest that population densities of even common species are likely limited at high elevation sites and possibly throughout DINO. This could, in turn, suggest that these populations might be more sensitive or at risk because of human activity. However, the impact of grazing on reptile populations is unclear. Some studies suggest that grazing can increase abundance for some species and have negative impacts for others (Travers et al 2019). Two lines of evidence suggest that grazing at DINO may not be problematic for the reptiles that are present at DINO sites. First, two studies (Germano et al. 2012; Read and Cunningham 2010) show that the effect of grazing on lizards is either neutral or positive. Because lizards appear to be the dominant herpetofauna at DINO sites we expect grazing to be less significant. Second, there is some evidence that grazing associated with DINO sites may increase abundance of some species at the expense of species richness. Because we expect the general species richness in DINO sites to be low because of inherent biotic and abiotic conditions we would expect

herpetofauna grazing impacts to be minimal. In conclusion, managed grazing does not appear to be a major concern for most reptile species at DINO. One potential concern at DINO is that the invasive Cheatgrass appears to generate negative impacts for some reptiles (Hall et al. 2009; Newbold 2005). Cheatgrass invasion is driven by several biotic and abiotic factors, including cattle grazing, which can reduce ecosystem resistance to Cheatgrass invasion (Reisner et al. 2013). This species is currently a management problem at DINO and poorly managed grazing can increase spread of Cheatgrass and potentially have negative impacts on reptile populations at DINO.

Species- and Site-Specific Comments

The only potential species of concern we identified in DINO sites was the Greater Short-horned Lizard (*Phrynosoma hernandesi*). Although the current status of this species at both the state (Utah and Colorado) and federal level is low concern, it has been historically listed as a species of concern in Utah and Colorado. Our surveys suggest that this species is present in at least two grazing allotments at DINO: Round Top and Wild Mountain. The Greater Short-horned Lizard occupies a wide elevational range (170–3,440 meters) and wide range of arid habitats such as grasslands, sagebrush, and pine (McGinnis and Stebbins 2018). Our survey found animals in both sagebrush habitat and loose, rocky habitat, both above 2,000 meters.

We also identified Desert Horned Lizard (*Phrynosoma platyrhinos*) as a species on our master list that is not included on the DINO reptile list. Desert Horned Lizard range maps show this species as possibly being present in areas near the park (IUCN 2024; McGinnis and Stebbins 2018). The locations near the park are listed as needing more data to either verify or remove these locations as part of the species range. Our study did not identify Desert Horned Lizard within the park. Further, both iNaturalist and GBIF.org (2023) lack observations for this species within the area in question. We do not recommend adding this species to the DINO reptile list but want to make DINO personnel aware of the possible presence of this species.

Green River Allotment

The Green River site was the only site included in both this study and a 2020 survey of DINO grazing allotments. We chose to repeat surveys in Green River because we identified this site as the best potential site to expand the master species list at DINO and because the 2020 survey indicated that this site had high levels of reptile diversity relative to other sites at DINO, a finding repeated in this study.

In the current study a total of seven of the twenty species on the DINO master list were found at the Green River site (Table 5). These included all the common diurnal lizards present at DINO as well as three common snakes (Table 5). As with previous work in 2020, the reptile diversity of the Green River site was greater than any other site from either 2020 or 2024. Data from 2020 (Table 6) document similar species diversity across years with some exceptions. In 2024, we found Midget Faded Rattlesnakes and Striped Whipsnakes, which were not observed in 2020. Also of interest are two common species: the Plateau Fence Lizard and the Terrestrial Garter Snake. These species are common and should have relatively high densities at the Green River site. In 2020, we found 13 Plateau Fence Lizard and had two sightings of Terrestrial Garter Snake. However, neither of these

species were observed during the 2024 survey. While the lack of observations in 2024 are of interest, the limited timeframe of our study does not allow us to assess whether this is cause for concern or normal year-to-year variation in population size or local habitat usage. Another important caveat is that total person hours, area, and length of survey time in our 2020 Green River study were greater than in 2024.

Table 6. List of species found in the Green River Allotment in DINO 2020 reptile and amphibian survey.

Taxa	Common Name	Scientific Name	Number Detected
Lizards	Western Whiptail Lizard	<i>Aspidoscelis tigris</i>	20
	Sagebrush Lizard	<i>Sceloporus graciosus</i>	5
	Plateau Fence Lizard	<i>Sceloporus tristichus</i>	13
	Side-blotched Lizard	<i>Uta stansburiana</i>	17
Snakes	Eastern Racer	<i>Coluber constrictor</i>	3
	Gopher Snake	<i>Pituophis catenifer</i>	2
	Terrestrial Garter Snake	<i>Thamnophis elegans</i>	2

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Appendix

Figures 17–24 show examples of species sampled during this study.



Figure 17. *Aspidoscelis tigris*.
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Figure 18. *Coluber constrictor*.
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Figure 19. *Coluber taeniatus*.
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Figure 20. *Phrynosoma hernandesi*.
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Figure 21. *Pituophis catenifer*.
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Figure 22. *Sceloporus graciosus*.
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Figure 23. *Urosaurus ornatus*.
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Figure 24. *Uta stansburiana*.
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