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Natural Resource Stewardship and Science

Reptile & Amphibian Monitoring at Palo Alto Battlefield National Historical Park

Data Summary, Monitoring Year 2012

Natural Resource Data Series NPS/GULN/NRDS—2013/557

ON THE COVER
The Texas Spiny Lizard, *Sceloporus olivaceous*, on PAAL, 2011
Photograph by: RL Woodman, Gulf Coast Inventory and Monitoring Network

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Introduction

The Gulf Coast Inventory and Monitoring Network (GULN) of the National Park Service started implementation of its reptile and amphibian monitoring protocol (GRAMP) at the Palo Alto Battlefield National Historical Park (PAAL) in April of 2011. The GRAMP is a protocol developed by GULN in collaboration with Kurt Buhlmann of the University of Georgia, Savannah River Ecological Laboratory to provide basic herpetological assemblage monitoring at selected sites on network parks based on peer-reviewed and widely used standard sampling methods supported by a unified data management and analysis system (Woodman, et al, 2013, in review). This annual report summarizes data collected at the PAAL sampling sites in Monitoring Year (MY) 2012, and includes a summary of the GRAMP, extracts of data collected, and a list of amphibians and reptiles, with count by species, detected in MY2012. The complete data table for MY2012 is provided in Appendix A.

The GULN is located in portions of six states, spanning from Brownsville, Texas, to Pensacola, Florida, and north to Nashville, Tennessee, with main offices located in Lafayette, Louisiana. The network includes eight National Park Service (NPS) units: Big Thicket National Preserve (BITH), Gulf Islands National Seashore (GUIS), Jean Lafitte National Historical Park and Preserve (JELA), Natchez Trace Parkway (NATR), Palo Alto Battlefield National Historical Park (PAAL), Padre Island National Seashore (PAIS), San Antonio Missions National Historical Park (SAAN), and Vicksburg National Military Park (VICK). The network is currently (2013) implementing the GRAMP on six parks (GUIS, JELA, NATR, PAAL, SAAN, and VICK), and is developing park projects on BITH and PAIS for anticipated start-up in FY2014. The PAAL monitoring project targets the terrestrial herp assemblage associated with selected habitat areas within the PAAL battlefield unit.

The PAAL battlefield area (Figure 1) encompasses approximately 520 hectares of post-agricultural coastal saltgrass prairie habitats typified by grassy lowland areas dominated by *Spartina* and *Borrichia sp*. and higher local elevations populated by mixed *Acacia*, *Prosopis* and *Opuntia* Tamaulipan Thornscrub vegetation. PAAL lies within a semi-arid region and environment which experiences periods of intense heat and sun, and no permanent standing water exists on the battlefield unit. The battlefield is surrounded by lands undergoing rapid urban development, and is closely bordered on two sides by high traffic highways. Notably, the battlefield supports relatively large numbers of Texas Tortoise (*Gopherus berlandieri*), Texas Horned Lizard (*Phrynosoma cornutum*), and Texas Indigo Snake (*Drymarchon corais*), all of which are listed by the State of Texas as threatened species and are of special interest to PAAL resource management for conservation and protection on the park. All of these species may be encountered during implementation of this monitoring program; *G. berlandieri* is specifically addressed on PAAL by implementation of the GULN Texas Tortoise Monitoring Protocol (Woodman, et al, 2013b, in review) and is not included in this data summary.

Amphibians were identified as a network high priority vital sign during initial vital signs selection performed in 2004. Amphibians were combined with reptiles when the GULN Monitoring Plan (Segura et al, 2007) was finalized, as it was broadly accepted that sampling for many amphibians is equally effective for coexisting reptiles. Amphibians and reptiles (herps) are ranked highly among potential vital signs for GULN because herps 1) are a diverse fauna associated with many habitats on all GULN parks, 2) specific species come under legal mandates related to state – level protected status, and 3), herps constitute a diverse set of potential indicators of local and regional changes in ecosystems, due to their widely demonstrated sensitivities to many anthropogenic system inputs and actions (pollutants and habitat disruption and fragmentation). In addition, herps have collectively become the subject of ever growing conservationist and resource management concern given the increasing recognition of their widespread decline at scales ranging from the local to global.

Monitoring herps on PAAL will contribute to both park-level resource knowledge and improved management, and provide insight into habitat and ecosystem change. Monitoring is designed to provide data comparable to that obtained by other research and inventory efforts and will potentially contribute to regional and national datasets that further our understanding of population and community trends at many scales.

This annual report provides an overview of methodology and implementation of monthly sampling across the monitoring year. Results presented here are limited to descriptive summaries of the annual findings and data about observed species and abundance presented at a monthly sampling scale. Additional analyses and synthesis reports will be completed every 4 – 5 years beginning in 2015, to include assessment of potential trends in species count, changes in relative abundance, and changes in measurable assemblage composition and structure. Faunal trends will be evaluated in the context of recorded environmental data and with consideration of noted events, such as rainfall and significant anthropogenic and other impacts to local resources.

Figure 1. Aerial image showing PAAL – battlefield park area near Brownsville, Cameron County, TX. The three project areas are marked with red box outlines. The green outline represents the PAAL administrative boundary. The three smaller frames (A, B, and C) to the right show the CB distributions associated with each sampled area.

Methods

Sampling Design

Herp monitoring at PAAL utilizes terrestrial cover-board (CB) fixed-point sampling coupled with casual observation (Cas. Obs.) CB panels are permanently installed in 3 split linear arrays (2 clusters in each split array) distributed in grassy and scrub-thicket areas on the battlefield (Figure 1 above). The spatial distribution of CB constitutes a fixed multiple-array sampling design where each cluster is statistically independent of and does not share possible specimens with any other cluster. Each CB cluster consists of ten 3 x 4 foot panels (five galvanized steel roofing, five ¾ inch plywood) deployed in a linear arrangement with 5m minimum spacing between panels. Initial CB cluster starting points were selected by simple randomization among 4 potential points located within each of the selected general areas, followed by deploying the CB panels along the prevailing vegetation feature in the area. Individual panel locations are determined by natural microhabitat and spaces suitable for CB panels. All CB locations are mapped onto the project GIS layers using GPS location data. No baits, lures, added food or chemical attractants are used in sampling at PAAL sites. Total sampling effort consists of 60 CB panels.

In addition to CB device-based sampling, field crew record all individuals seen outside of sampling devices during sampling activities. These encounters are logged as "casual observations" (Cas. Obs.) and contribute to composite data on species-richness and species-specific population descriptive parameters, such as mean size and sex ratio estimation in the population, but are not considered in analyses utilizing device as a factor.

Sampling and Data Collection

Sampling emphasizes consistent collection of detailed, high quality data on all encountered specimens to provide a reliable dataset for assessing assemblage composition and structure. CB and Casual Observations both yield hand specimens and photographic records.

All field crew are led by experienced field biologists with detailed familiarity with the taxonomy of regional herp fauna. Performance of sampling events follows the methodology and procedures prescribed for each sampling method in GRAMP protocol SOP (Woodman, et al 2013, in review). All specimens are hand collected where possible for detailed assessment. Data include location, time, species ID (when possible), body length and sex (when possible), and count, when multiple individuals of a type are observed but not all are handled and assessed.

Specimen information is recorded on paper field data sheets during sampling. Photographs are taken of collected specimens to support post-sampling taxonomic ID review. Specimens are handled with appropriate prophylaxis and technique as adapted from the ASIH Guidelines (Beaupre 2004) and specified in the GRAMP. All collected specimens are immediately released following processing at the collection point. Non-collected individuals (venomous snakes are never handled, other individuals may escape or avoid capture) are photo-documented during sampling procedures, and images provide confirmation of "no-catch" encounters for data records.

Monitoring Schedule

PAAL sites are sampled every month over each Monitoring Year (MY, defined as being from October 01 to September 30), for a total of 12 monthly sampling visits per MY. Each visit consists of 1 workday: the sampling team samples CB clusters sequentially starting with a safety briefing at about 0730 and typically completing sampling by 1000. The array sampling order is held constant over all visits to avoid random variation in yield which could result from time of day effects. All CB sampling is completed as early in a day as possible to reduce impacts on yield from increasing air and ground temperatures.

Data Management

Data are recorded in the field on standard GULN field data sheets. The cooperators (Drs. Eric Linder and Alejandro Fierro, University of Texas - Brownsville) scan and electronically submit completed data sheets and photo image files to the GULN Data Manager and the GULN GRAMP Project Leader for review and verification of taxonomic information. All data are entered into the GRAMP database following procedures specified in SOP 5 Data Entry of the GRAMP protocol (Woodman, et al, 2013, in review). Project data are managed following procedures and standards specified in the GULN Data Management Plan (Granger, 2007). Data are extracted from this database for analysis and reporting. The complete Monitoring Year 2012 faunal data are provided in Appendix A of this report. Data are also made available by going to the GULN Amphibian & Reptile Monitoring Project in the NPS Integrated Resource Management Applications (IRMA) portal at: https://irma.nps.gov/App/Reference/Profile/2192506.

Results

The complete PAAL Project dataset is provided in Appendix A of this report. The Project Data Table lists observation date, sampling array ID, sampling method, common and scientific name, and body length and sex (if determined) for each individual recorded. Key aspects of this dataset are summarized in the following tables and graphs by sampling site. All summary data are presented in a per-sampling-event format with cumulative totals for the MY where appropriate.

Sampling at PAAL sites yielded a total of 39 individuals representing 8 reptile species from CB and Cas. Obs. in MY2012. No amphibians were collected at PAAL in MY2012. The two most abundant species were Texas Rose-bellied Lizard (*Sceloporus variabilis*, 24) and Four-lined Skink (*Eumeces tetragrammus*, 6), accounting for 77% of all individuals observed.

Table 1 presents the summary count of individual reptiles observed by sampling method (CB = cover-boards, Cas. Obs. = Casual Observations) by sampling month in MY2012.

Table 1: PAAL Reptiles.

Sampling Method	OCT 2011	NOV 2011	DEC 2011	JAN 2012	FEB 2012	MAR 2012	APR 2012	MAY 2012	JUN 2012	JUL 2012	AUG 2012	SEP 2012	Total By Method
CB	1	3	5	4	6	4	1	2	4	1	0	3	**34**
Cas Obs	0	0	0	0	0	0	1	0	0	0	3	1	**5**
Total n by Event	**1**	**3**	**5**	**4**	**6**	**4**	**2**	**2**	**4**	**1**	**3**	**4**	**39**

The total number of individual reptiles observed varied among sampling events, with no one event yielding more than 6 individuals across all sites (Figure 2).

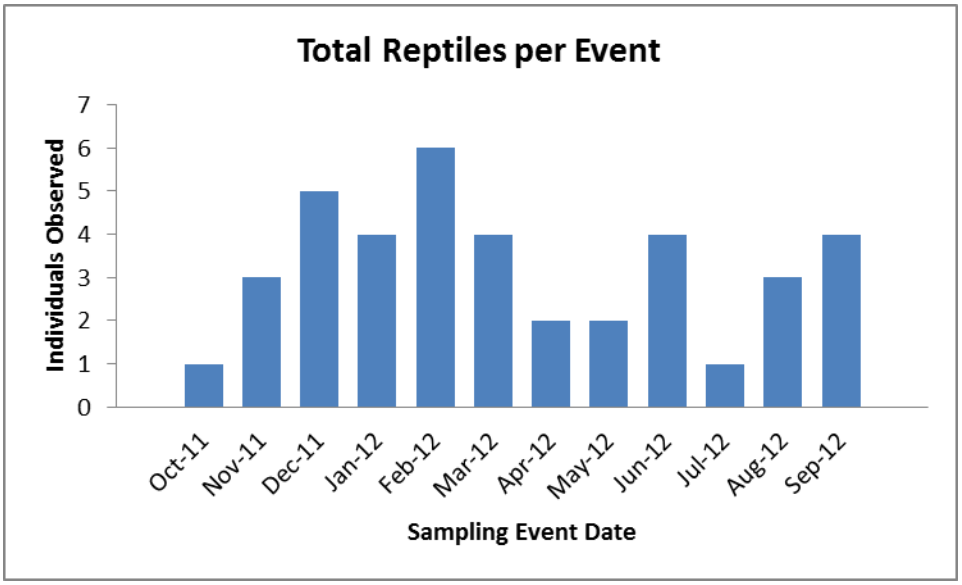

Figure 2. Total counts of reptiles observed in each sampling month in MY2012.

Table 2 presents the counts of reptile species observed by sampling method (CB = cover-boards, Cas. Obs. = Casual Observations) in each sampling month in MY2012. The total count column presents the count of all species observed by method over the year.

Table 2: Number of reptile species seen at PAAL by sampling method by sampling month in MY2012. Note that most observed species occur in multiple events.

Sampling Method	OCT 2011	NOV 2011	DEC 2011	JAN 2012	FEB 2012	MAR 2012	APR 2012	MAY 2012	JUN 2012	JUL 2012	AUG 2012	SEP 2012	Total Spp.
CB	1	1	1	2	3	2	1	1	1	1	0	3	**5**
Cas Obs	0	0	0		0	0	1	0	0	0	3	1	**4**
Total species by Event	**1**	**1**	**1**	**2**	**3**	**2**	**2**	**1**	**1**	**1**	**3**	**4**	**8**

Very few total species were observed in any one sampling month in MY2012. The number of species observed ranged from 1 to 4 per month, and did not appear to exhibit any strong distribution pattern over the MY (Figure 3).

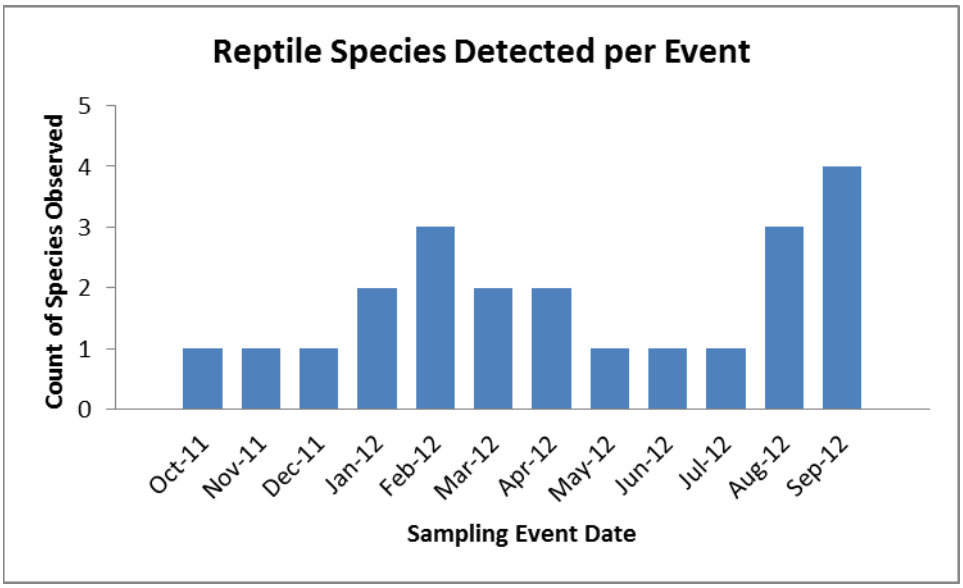

Figure 3: Numbers of reptile species observed in each sampling month in MY2012.

The accumulation of species detections over time:

Reptile species detections continued to accumulate over the monitoring year (Table 3, and visualized in Figure 4), as is typically expected in repeat-sampling studies performed within a site; species vary widely in local abundance and seasonality and thus exhibit different probabilities of detection at any given sampling effort in any given area.

Table 3: Cumulative reptile species count over MY2012. The highlighted count in the SEP 2012 event is the cumulative total for the MY.

Sampling Date	OCT 2011	NOV 2011	DEC 2011	JAN 2012	FEB 2012	MAR 2012	APR 2012	MAY 2012	JUN 2012	JUL 2012	AUG 2012	SEP 2012
Cum Species	1	1	1	2	3	4	6	6	6	6	8	**8**

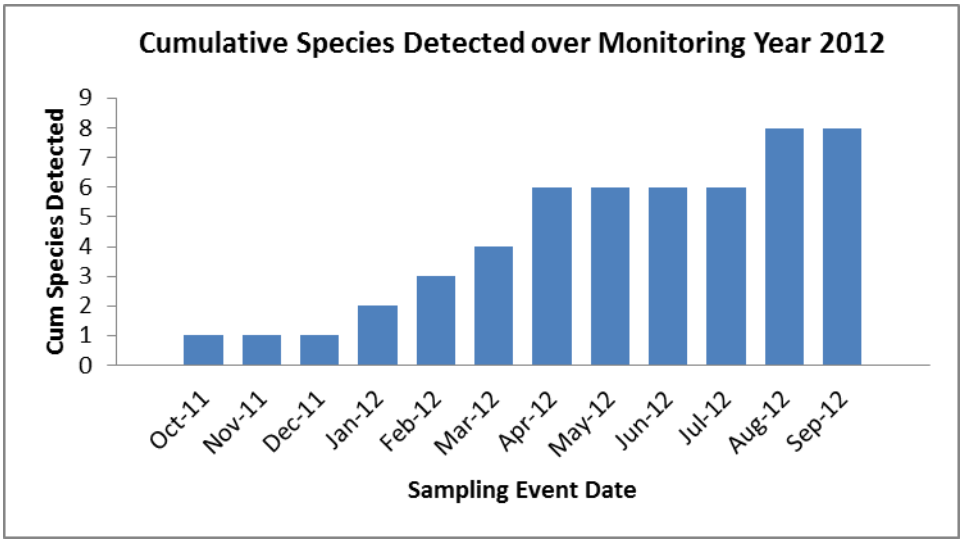

Figure 4: Cumulative count of reptile species observed at PAAL by sampling month over MY2012. Species continued to be added to the project detection list throughout the year. This likely reflects some combination of species being rare in the sampling site, species exhibit seasonality of possible detection, and sampling methods are limited and biased as to which species may be detected.

The 8 reptile species detected in PAAL sampling in MY2012 are listed in Table 4 below. The numbers are the total count observed for each species over all sampling methods in the MY.

Table 4: Reptile species observed at PAAL in MY2012.

Scientific Name:	Common Name:	
Coluber constrictor	Mexican Racer	2
Crotalus atrox	Western Diamond-backed Rattlesnake	1
Eumeces tetragrammus	Four-lined Skink	6
Gopherus berlandieri	Texas Tortoise	2
Micrurus fulvius	Texas Coral Snake	1
Salvadora grahamiae	Texas Patch-nosed Snake	1
Sceloporus olivaceus	Texas Spiny Lizard	2
Sceloporus variabilis	Rose-bellied Lizard	24

Discussion

The 8 reptile species detected during MY 2012 represent 20 percent of the 40 species (11 amphibians, 29 reptiles) reported as being possible on PAAL in the most recent herp inventory (Duran 2004). The 8 detected reptiles represent 31% of the 26 reported terrestrial reptile species (the 3 species of aquatic turtles reported by Duran (2004) would be unlikely to be detected in terrestrial CB sampling). Notably, MY2012 sampling did not detect any of the park's possible 11 amphibian species. It is broadly recognized in herp monitoring and research (e.g., Graeter, et al 2010, Heyer, et al 1995) that many herp species are notably habitat-specific and no sampling method is uniformly effective for all species even within its habitat-range (i.e., CB panels sample terrestrial fauna, but are very unlikely to detect Texas Tortoise nor equally detect all snake and lizard species in the area.). The PAAL project does not sample or address the ephemeral and seasonal wet habitats on the battlefield, and thus will not detect any of the taxa closely associated with those habitats and conditions. In addition, sampling effort is limited in scope and range, and larger snake species may be relatively rare and thus unlikely to be encountered in smaller sampling efforts; from these factors, we accept that some species may be present and active in the sampling area but unlikely to be seen in our effort.

All detected reptiles are considered expected and typical of the region and habitats. No obvious pathologies or abnormalities were noted in any species.

Species accumulation continued throughout monitoring year 2012. Detected species count is expected to level off with time, as the methods in use and available effort attain their maximum likely detection of species in the sampled area. As reptile species continued to accumulate throughout MY2012, this hypothetical maximum detected species count was not apparently attained, and it may be reasonable to anticipate that some additional species will be added to the monitoring detection list into the future.

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Appendix A

PAAL Project Data. The following table presents all faunal observation data recorded at the PAAL battlefield sampling sites in Monitoring Year 2012.

Start Date	Category	Species	Common Name	Number Observed	Avg. SVL (mm)	Trap Type
9/14/2011	Reptile	Sceloporus variabilis	Rose-bellied Lizard	1	38	CB
9/14/2011	Reptile	Sceloporus variabilis	Rose-bellied Lizard	2	25	CB
9/14/2011		unknown lizard		1		CB
10/14/2011	Reptile	Sceloporus variabilis	Rose-bellied Lizard	1	25	CB
11/15/2011	Reptile	Sceloporus variabilis	Rose-bellied Lizard	1		CB
11/15/2011	Reptile	Sceloporus variabilis	Rose-bellied Lizard	2		CB
12/14/2011	Reptile	Sceloporus variabilis	Rose-bellied Lizard	2		CB
12/14/2011	Reptile	Sceloporus variabilis	Rose-bellied Lizard	3		CB
1/18/2012	Reptile	Sceloporus olivaceus	Texas Spiny Lizard	1	75	CB
1/18/2012	Reptile	Sceloporus variabilis	Rose-bellied Lizard	1		CB
1/18/2012	Reptile	Sceloporus variabilis	Rose-bellied Lizard	2		CB
2/20/2012	Reptile	Eumeces tetragrammus	Four-lined Skink	2	67	CB
2/20/2012	Reptile	Sceloporus olivaceus	Texas Spiny Lizard	1	105	CB
2/20/2012	Reptile	Sceloporus variabilis	Rose-bellied Lizard	2	50	CB
2/20/2012	Reptile	Sceloporus variabilis	Rose-bellied Lizard	1		CB
3/16/2012	Reptile	Eumeces tetragrammus	Four-lined Skink	3		CB
3/16/2012	Reptile	Salvadora grahamiae	Texas Patch-nosed Snake	1		CB
4/16/2012	Reptile	Coluber constrictor	Mexican Racer	1		CB
4/16/2012	Reptile	Micrurus fulvius	eastern coral snake	1		COBS
5/11/2012	Reptile	Sceloporus variabilis	Rose-bellied Lizard	2	41	CB
6/19/2012	Reptile	Sceloporus variabilis	Rose-bellied Lizard	1		CB
6/19/2012	Reptile	Sceloporus variabilis	Rose-bellied Lizard	3		CB
7/13/2012	Reptile	Sceloporus variabilis	Rose-bellied Lizard	1		CB

Start Date	Category	Species	Common Name	Number Observed	Avg. SVL (mm)	Trap Type
8/21/2012	Reptile	Crotalus atrox	Western Diamond-backed Rattlesnake	1		COBS
8/21/2012	Reptile	Gopherus berlandieri	Texas Tortoise	1		COBS
8/21/2012	Reptile	Sceloporus variabilis	Rose-bellied Lizard	4		COBS
9/18/2012	Reptile	Coluber constrictor	Mexican racer	1	584	CB
9/18/2012	Reptile	Eumeces tetragrammus	Four-lined Skink	1		CB
9/18/2012	Reptile	Sceloporus variabilis	Rose-bellied Lizard	1		CB
9/18/2012	Reptile	Gopherus berlandieri	Texas Tortoise	1		COBS