



Reptile & Amphibian Monitoring at Vicksburg National Military Park

Data Summary, Monitoring Year 2012

Natural Resource Data Series NPS/GULN/NRDS—2013/533



ON THE COVER

Spotted Dusky Salamander, *Desmognathus conanti*, on Vicksburg NMP, 2013
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 three sites on Vicksburg National Military Park (VICK) 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 VICK 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.

VICK covers 1736 acres (circa 655 ha) of loess-based, hilly bluffs surrounding the inner, historic circa 1863, city of Vicksburg, MS. The majority of VICK is covered by a mixed hardwood regrowth forest. The remaining area consists of paved roads and maintained grassy lawns dedicated to visitor access and view-sheds. The land-surface is dissected by small springs and deep erosional cuts with ephemeral streams and drainages, and much of VICK is solidly covered by a thick, closed forest canopy, creating a deeply-shaded ground habitat. VICK environments provide habitats for a wide diversity of amphibian and reptile species, as evidenced by both recent faunal inventories and numerous anecdotal observations of fauna on roads and in the forest-edges of the park.

Amphibians were identified as a network higher-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 in parks 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.

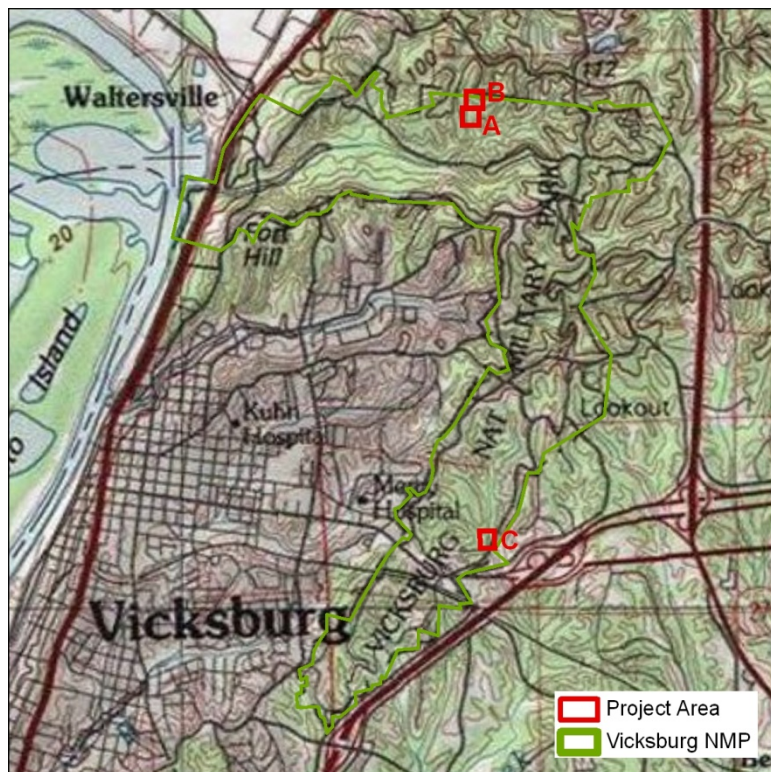


Figure 1. Overview topographic map image showing the 3 VICK sampling sites. The project area and sampling areas are marked by the red boxes. VICK appears as a green “crescent” surrounding the urban center of Vicksburg, MS.

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.

Methods

Sampling Design

Herp monitoring at VICK utilizes terrestrial cover-board (CB) and arboreal PVC-pipe (PVC) fixed-point sampling methods coupled with environmental conditional monitoring. CB and PVC sampling devices are permanently installed in fixed linear arrays (clusters) distributed in 3 accessible clearings in the heavily-forested area of the park (Figure 2). PVC arrays are co-located with CB arrays to simultaneously assess terrestrial and arboreal species within the selected sampling space.

The spatial distribution of CB and PVC constitute a fixed multiple-array sampling design where each cluster is discrete and statistically independent of and does not share possible specimens with any other cluster. Each CB cluster consists of 20 permanently-sited 3 x 4 US foot panels (10 roofing tin, 10 ¾ inch plywood) deployed in a loose line with 5m minimum spacing. Each co-located PVC cluster consists of five pairs of PVC pipes attached to trees located within the CB cluster area. Each PVC pair consists of one 1 inch x 2 foot pipe and one 2 inch x 2 foot pipe. Initial CB cluster start-points were selected by simple randomization among 5 potential start-points in each sampling site, followed by deployment of CB panels in a line extending along the local vegetation and ground features in the area. Individual device locations are determined by natural micro-habitat and site availability (spaces suitable for CB panels, trees large enough – 15+cm dbh - to host pipe pairs). All CB and PVC locations are mapped onto the project GIS layers using GPS location data. No baits, lures, added food or chemical attractants are used in any sampling at VICK sites.

Total sampling effort consists of 3 CB clusters (a total of 60 panels), and 3 PVC clusters (a total of 15 pipe-pairs). The spatial distribution and proximal locations of VICK sampling devices are depicted in Figure 2.



Figure 2. Map extracts showing the 3 VICK sampling areas and the associated CB and PVC arrays. The colored squares denote the alternating metal and wood panels in each array.

In addition to CB and PVC 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.

One data logger (HoBo Pro V2, by Onset, Inc.) is deployed within VICK PVC array A to provide long-term air-temperature and relative humidity monitoring at 10-minute intervals throughout the monitoring year.

Sampling and Data Collection

Sampling emphasizes consistent collection of detailed, high-quality data on all encountered individuals to provide a reliable database for assessing assemblage composition and structure. CB, PVC, and Casual Observations all 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 or site. 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

VICK 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 work-day: The sampling team sequentially samples CB and PVC clusters starting with a safety briefing at ca 0730 and typically completing CB and PVC sampling by 1130. 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 and PVC sampling are completed as early in a day as possible so as to reduce impacts on yield from increasing air and ground temperatures.

Data Handling

Data are recorded in the field on standard GULN paper field data sheets. Field crew submit completed data sheets 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 the Excel Data Table VICK-MY2012 attached 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 VICK Project dataset is provided in Appendix A of this report. This Project Data Table lists observation date, sampling location, 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 method. All summary data are presented in a per-sampling-event format with cumulative totals for the MY where appropriate.

Sampling at the 3 VICK sites yielded a total of 52 individuals (19 amphibians, 33 reptiles) representing 16 species (7 amphibians, 9 reptiles) from all methods in MY2012. Two salamanders, the Three-lined Salamander (*Eurycea guttolineata*, 9), and Dusky Salamander (*Desmognathus conanti*, 3) accounted for 63% of all amphibian detections. The two most abundant reptiles were the Common Ground Skink (*Scincella lateralis*, 14), and the Green Anole (*Anolis carolinensis*, 10), accounting for 73% of all reptiles observed.

Tables 1 and 2 present the summary counts of individual amphibians and reptiles, respectively, observed by sampling method (CB = cover-boards, PVC = PVC-pipes, Cas Obs = Casual Observations) by sampling month in MY2012. Note that the DEC 2011 sampling event was planned but cancelled due to adverse weather (NS = No Sample).

The total numbers of individual reptiles and amphibians observed across all methods vary among sampling events, with reptiles showing both somewhat greater apparent variation between events and substantially greater “peak-abundance” than do amphibians (Figure 3).

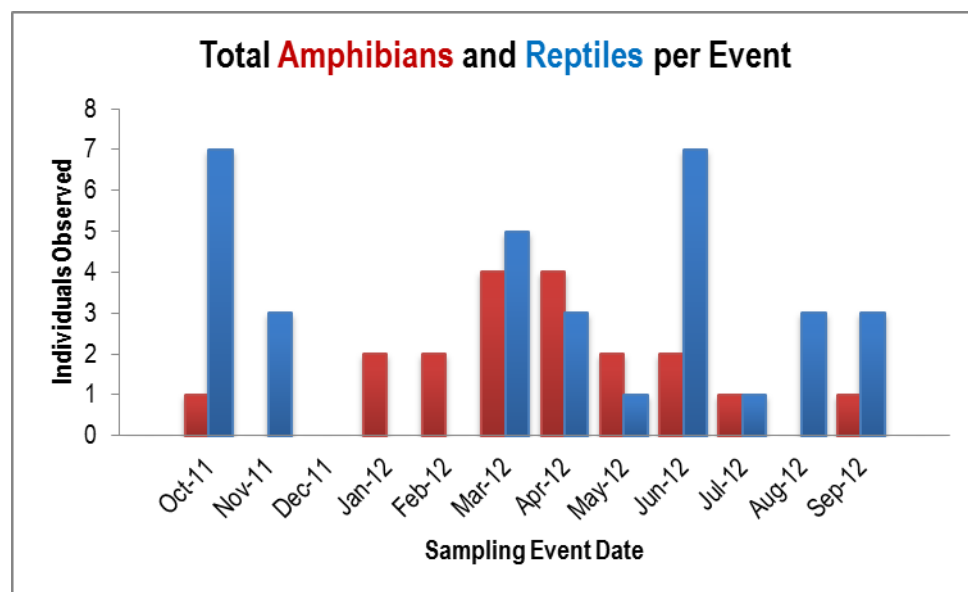


Figure 3. Total count of amphibians and reptiles observed at VICK over all methods by sampling month in MY2012.

Table 1. VICK Amphibians.

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	0	NS	2	2	3	4	2	2	1	0	1	18
PVC	0	0	NS	0	0	0	0	0	0	0	0	0	0
Cas Obs	0	0	NS	0	0	1	0	0	0	0	0	0	1
Total n by Event	1	0	NS	2	2	4	4	2	2	1	0	1	19

Table 2. VICK 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	3	1	NS	0	0	2	3	0	5	1	3	2	20
PVC	3	2	NS	0	0	3	0	0	0	0	0	1	9
Cas Obs	1	0	NS	0	0	0	0	1	2	0	0	0	4
Total n by Event	7	3	NS	0	0	5	3	1	7	1	3	3	33

Numbers of amphibian and reptile species observed at VICK sites in MY2012:

Tables 3 and 4 present the counts of amphibian and reptile species, respectively, observed by sampling method (CB = cover-boards, PVC = PVC-pipes, Cas Obs = Casual Observations) by sampling month in MY2012. Note that the DEC 2011 sampling event was planned but cancelled due to adverse weather (NS = No Sample). It should be noted that some species were observed in more than 1 sampling method in some events; individuals are seen in different sampling methods because they occur there (both CB and casual observation yield the same toad species). The total count column presents the counts of all species observed by method over the year. The yellow block denotes the total count of unique species observed by all methods during the MY.

Table 3. Number of amphibian species encountered MY2012.

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	0	NS	2	2	2	3	2	2	1	0	1	7
PVC	0	0	NS	0	0	0	0	0	0	0	0	0	0
Cas Obs	0	0	NS	0	0	1	0	0	0	0	0	0	1
Total species by Event	1	0	NS	2	2	2	3	2	2	1	0	1	7

Table 4. Number of reptile species encountered MY2012.

∞

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	1	NS	0	0	1	2	0	2	1	3	2	7
PVC	1	1	NS	0	0	1	0	0	0	0	0	1	1
Cas Obs	1	0	NS	0	0	0	0	1	2	0	0	0	3
Total species by Event	3	2	NS	0	0	2	2	1	3	1	3	3	9

Amphibian species-count exceeded that of reptiles in 7 of 12 sampling events (Figure 4). This outcome reflects, in part, the varied seasonality and possibly low overall abundance of some species, together with the limited efficiency of available sampling methods. Notably, many snake species and tree frogs known to be on the park did not appear in any sampling event in MY2012.

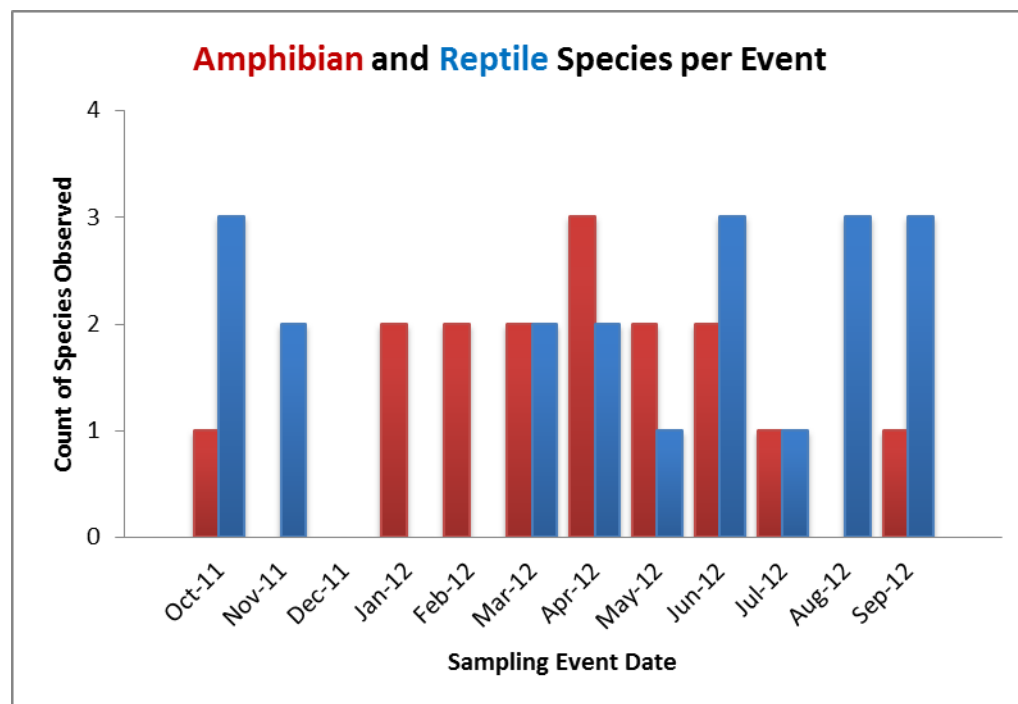


Figure 4. Numbers of amphibian and reptile species observed in 3 VICK sites in each sampling month in MY2012. Most species occurred in only one or 2 events in the year.

The accumulation of species-detections over time:

Amphibian and reptile species-accumulation plateaued late in the MY (Table 5, and visualized in Figure 5), suggesting that the hypothetical maximum numbers of species likely to be detected by the sampling methods being used in the effort available may have been reached.

Table 5. Cumulative species-counts for amphibians, reptiles, and all herp species over MY2012. The high-lighted counts in the SEP 2012 event are the cumulative totals for MY2012.

Taxon Group	OCT 2011	NOV 2011	DEC 2011	JAN 2012	FEB 2012	MAR 2012	APR 2012	MAY 2012	JUN 2012	JUL 2012	AUG 2012	SEP 2012
Amphibians	1	1	NS	3	4	5	6	6	7	7	7	7
Reptiles	2	3	NS	3	3	3	4	5	7	8	9	9
Cum of all Herp Species	3	4	4	6	7	8	10	11	14	15	16	16

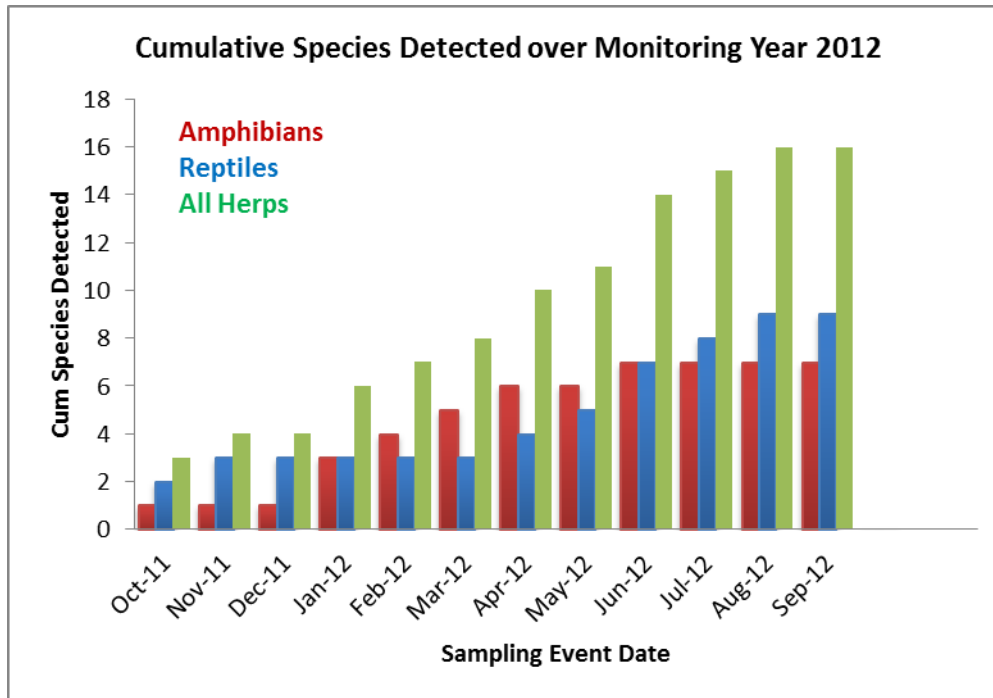


Figure 5. Cumulative count of amphibian, reptile, and “all herps” species observed at 3 VICK sites over MY2012. Notably, “new species” detection plateaued before the end of the MY.

The 17 amphibian and reptile species detected in VICK sampling in MY2012 are listed in Table 6 below. The numbers are the total count observed for each species over all sampling methods in the MY.

Table 6. Amphibian and Reptile species observed MY2012.

Amphibians			Reptiles		
Scientific Name:	Common Name:		Scientific Name:	Common Name:	
<i>Acris crepitans</i>	Northern Cricket-frog	1	<i>Agkistrodon contortrix</i>	Copperhead	1
<i>Ambystoma maculatum</i>	Spotted Salamander	1	<i>Anolis carolinensis</i>	Green Anole	10
<i>Anaxyrus fowleri</i>	Fowler's Toad	1	<i>Coluber constrictor</i>	Eastern Racer	1
<i>Anaxyrus terrestris</i>	Southern Toad	2	<i>Crotalus horridus</i>	Timber Rattlesnake	1
<i>Desmognathus conanti</i>	Spotted Dusky Salamander	3	<i>Diadophis punctatus</i>	Ring-neck Snake	2
<i>Eurycea guttolineata</i>	Three-lined Salamander	9	<i>Eumeces fasciatus</i>	Five-lined Skink	2
<i>Plethodon mississippi</i>	Mississippi Slimy Salamander	2	<i>Lampropeltis getula</i>	Speckled King Snake	1
			<i>Scincella lateralis</i>	Ground Skink	14
			<i>Thamnophis sirtalis</i>	Common Garter Snake	1

Air temperature and percent-relative humidity recorded at VICK during MY2012:

Air temperature and %-RH were recorded at 10-minute intervals using HoBo data-loggers throughout MY2012 to provide an environmental condition covariate to faunal data. Air-T and %-RH are presented as data-value traces over the MY2012 period in Figure 6 below. Note that these

data traces include data for approximately 30 days prior to start of MY2012 sampling (Oct 06, 2011), in recognition that potential impacts from changing air-T and %-RH may take several weeks to affect faunal behavior and manifest in detection rates. Formal assessment of possible relationships between environmental conditions and faunal parameters is an anticipated element in long-term trend analysis to be performed from 2015 on.

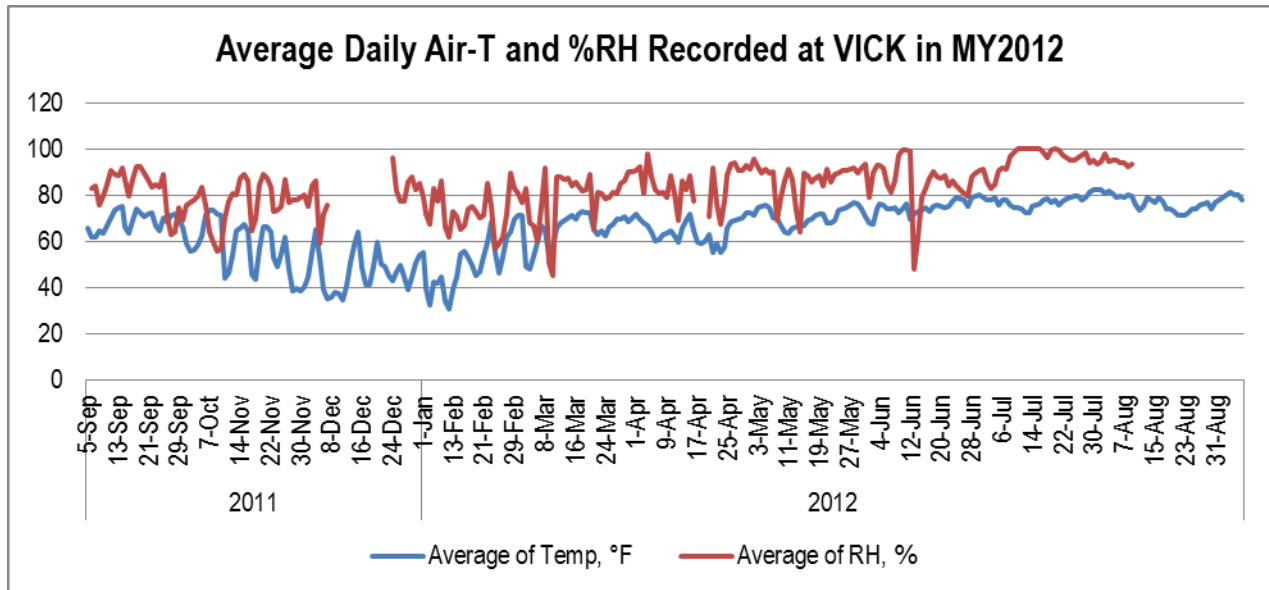


Figure 6. Daily mean air temperature and percent-relative humidity recorded at VICK from SEP 05 2011 through SEP 07 2012. The missing line-segments for %RH denote that the HoBo RH sensor had failed during these periods.

Discussion

The 16 herp species (7 amphibians, 9 reptiles) detected during MY 2012 represent 36 percent of the 45 species (18 amphibians, 27 reptiles) reported as being present or likely-present on VICK according to the most recent herp inventory (Keiser, 2002). It should be noted that many species reported in the inventory, including alligators, aquatic turtles, and snakes primarily associated with aquatic habitats (accounting for 16 species noted by Keiser in 2002), are unlikely to be detected in this specific monitoring effort. In addition, it is broadly recognized in herp monitoring and research (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 box-turtles nor equally detect all snakes, lizards, and salamanders in the area.) 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.

Notably, this effort did not formally detect any tree frogs, yet several species are both known from park inventories and clearly present and abundant as evidenced by calls and chorusing. The cause for this detection failure at VICK is not known. The same sampling method (PVC) is successfully used in other parks (GUIS, JELA, NATR) to sample many of the same species expected on (and frequently heard on) VICK, yet no frogs are seen in VICK pipes. All detected species are considered expected and typical of the region and habitats. No obvious pathologies or abnormalities were noted in any species.

Species accumulation at VICK plateaued late in MY2012. Detected species-richness 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 both amphibian and reptile species – detections plateaued as of AUG 2012, it is possible that this hypothetical maximum detected species count was attained, and it may be reasonable to anticipate that few “new” species will be added to the VICK monitoring detection list in the near future.

The recorded air-T and %RH indicated no extreme variation or apparent departures from anticipated pattern and ranges in MY2012; the lack of large and abrupt changes likely indicates that no substantial weather changes occurred in the sampling period. This would suggest that faunal detections recorded in MY2012 did not reflect any strong impacts from unusual weather shifts or events.

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Appendix A

VICK Project Data. The following table presents all faunal observation data recorded at the 3 VICK sampling areas in Monitoring Year 2012.

Start Date	Category	Species	Common Name	Number Observed	Avg. SVL (mm)	Trap Type
10/6/2011	Reptile	Scincella lateralis	Ground Skink	1		COBS
10/6/2011	Reptile	Anolis carolinensis	Green Anole	3	59.66666667	PVC
10/6/2011	Amphibian	Anaxyrus fowleri	Fowler's Toad	1	52	CB
10/6/2011	Reptile	Scincella lateralis	Ground Skink	3	32.5	CB
11/10/2011	Reptile	Anolis carolinensis	Green Anole	2	43	PVC
11/10/2011	Reptile	Crotalus horridus	Timber Rattlesnake	1		CB
1/5/2012	Amphibian	Desmognathus conanti	Spotted Dusky Salamander	1	40	CB
1/5/2012	Amphibian	Eurycea guttolineata	Three-lined Salamander	1	52	CB
2/9/2012	Amphibian	Ambystoma maculatum	Spotted Salamander	1	65	CB
2/9/2012	Amphibian	Eurycea guttolineata	Three-lined Salamander	1	47	CB
3/8/2012	Amphibian	Eurycea guttolineata	Three-lined Salamander	1		COBS
3/8/2012	Reptile	Anolis carolinensis	Green Anole	3	35	PVC
3/8/2012	Amphibian	Desmognathus conanti	Spotted Dusky Salamander	1	54	CB
3/8/2012	Amphibian	Eurycea guttolineata	Three-lined Salamander	1	47	CB
3/8/2012	Amphibian	Plethodon mississippi	Mississippi Slimy Salamander	1	62	CB
3/8/2012	Reptile	Scincella lateralis	Ground Skink	2	47	CB
4/4/2012	Amphibian	Anaxyrus terrestris	Southern Toad	1	56	CB
4/4/2012	Amphibian	Desmognathus conanti	Spotted Dusky Salamander	1	58	CB
4/4/2012	Reptile	Diadophis punctatus	Ring-necked Snake	2	401.5	CB
4/4/2012	Amphibian	Eurycea guttolineata	Three-lined Salamander	2	50	CB
4/4/2012	Reptile	Scincella lateralis	Ground Skink	1	44	CB
5/3/2012	Reptile	Anolis carolinensis	Green Anole	1		COBS
5/3/2012	Amphibian	Eurycea guttolineata	Three-lined Salamander	1		CB
5/3/2012	Amphibian	Plethodon mississippi	Mississippi Slimy Salamander	1		CB
6/7/2012	Reptile	Lampropeltis getula	Speckled Kingsnake	1		COBS

Start Date	Category	Species	Common Name	Number Observed	Avg. SVL (mm)	Trap Type
6/7/2012	Reptile	Scincella lateralis	Ground Skink	1		COBS
6/7/2012	Amphibian	Acris crepitans	Northern Cricket Frog	1		CB
6/7/2012	Reptile	Agkistrodon contortrix	Copperhead	1	950	CB
6/7/2012	Amphibian	Eurycea guttolineata	Three-lined Salamander	1		CB
6/7/2012	Reptile	Scincella lateralis	Ground Skink	4	55	CB
7/5/2012	Reptile	Eumeces fasciatus	Five-lined Skink	1		CB
7/5/2012	Amphibian	Eurycea guttolineata	Three-lined Salamander	1	55	CB
8/10/2012	Reptile	Coluber constrictor	eastern racer	1	980	CB
8/10/2012	Reptile	Scincella lateralis	Ground Skink	1		CB
8/10/2012	Reptile	Thamnophis sirtalis	Common Garter Snake	1	204	CB
9/7/2012	Reptile	Anolis carolinensis	Green Anole	1	64	PVC
9/7/2012	Amphibian	Anaxyrus terrestris	Southern Toad	1	64	CB
9/7/2012	Reptile	Eumeces sp.		1		CB
9/7/2012	Reptile	Scincella lateralis	Ground Skink	1		CB