



Vocal Anuran Community Monitoring: 2022 Data Summary

Michael C. Parrish¹ and Lily H. Martin²

Southeast Coast Network, NPS, 135 Phoenix Road, Athens, Georgia 30605

¹ <https://orcid.org/0000-0001-8475-3699>

² <https://orcid.org/0009-0009-7895-3956>

Overview

Amphibian populations have declined in North America and many other areas around the world. A variety of factors have contributed to these population declines and localized extinctions, including: anthropogenic habitat conversion and degradation, introduced non-indigenous species, water and air pollution, disease, and altered surface water conditions (Collins and Storfer 2003; Muths et al. 2012). Partly due to their complex life cycles, which generally include an aquatic larval stage followed by an adult terrestrial phase, amphibians are often sensitive to perturbations of environmental conditions. Throughout their life cycle, amphibians rely heavily on availability of fresh, clean water to survive and successfully reproduce. Even minor disruptions of the aquatic or terrestrial environments on which amphibians depend may substantially impact the survival, reproduction, and persistence of a species. Many amphibian species in the United States, including those where there is little or no conservation concern, may be experiencing widespread declines (Adams et al. 2013).

The southern region of the United States hosts the highest amphibian diversity in North America. The South is home to at least 45 species of anurans (i.e., frogs, toads, and treefrogs), which comprise 41% of the anuran species diversity of North America, north of Mexico (Dorcas and Gibbons 2008; SSAR 2017). Thirty-two species of anurans have been documented (NPS 2024) as occurring within the 15 park units monitored by the National Park Service's (NPS) Southeast Coast Network (SECN).

Anuran communities respond fairly quickly to environmental stressors or changes. Because of the conspicuous vocalization behavior exhibited by most species during breeding periods, anurans are relatively easy to detect and identify, compared with other amphibians. Changes in anuran species composition, richness, and distribution on the landscape may reflect alterations to underlying ecological conditions of park resources. In conjunction with other environmental measures (e.g., water quality, vegetation, fish assemblages), anuran assemblages can serve as effective indicators of ecological integrity (Zampella et al. 2006).

National parks comprise valuable protected landscapes where long-term monitoring can detect and track anuran population trends that can inform assessments of ecosystem integrity and sustainability (Halstead et al. 2022). Given the noteworthy diversity of amphibians



A spring peeper (*Pseudacris crucifer*), one of two species detected at all locations in 2022. NPS photo / Briana Smrekar (NPGallery).

in the Southeast, their sensitivity to environmental stressors, and their evident declines in recent decades, anuran communities represent a priority for SECN monitoring efforts. Our monitoring data contribute to understanding how park resources and natural communities respond to changing environmental conditions, informing park management decision making.

Objectives

This report summarizes data collected at Moore's Creek National Battlefield under the SECN Vocal Anuran Community Monitoring Protocol (Byrne et al. 2013). The data address the following protocol objectives:

1. Evaluate status of vocal anuran community species richness during the spring breeding season.
2. Assess vocal anuran occupancy and spatial distribution at sampling locations during the breeding season.

We use the term "community" to refer to an assemblage of species populations occurring together in time and space (Begon et al. 1986) and consider the vocal anuran species assemblage within the park as a de facto community (Byrne et al. 2013).

Executive Summary

This brief summarizes data collected in 2022 at Moore's Creek National Battlefield during implementation of the Southeast Coast Network's Vocal Anuran Community Monitoring Protocol (Byrne et al. 2013).

- Automated recording devices (ARDs) captured anuran (i.e., frog, toad, and treefrog) vocalizations from March 14 to June 15 at 11 spatially-balanced random sampling locations.

Executive Summary (continued)

- We extracted 9,135 potential audio signals from 6,723 minutes of audio recordings. We manually reviewed a systematically selected subset of 1,485 (16.3%) of the extracted signals and classified to species any identifiable anuran vocalizations found within that subset.
- Anurans were observed at all 11 sampled locations.
- We identified 13 native species of anurans, each previously documented at the park. No non-indigenous anurans were detected.
- The most frequently detected species were southern toad (*Anaxyrus terrestris*) and spring peeper (*Pseudacris crucifer*), which were detected at 100% of sampling locations (*n* = 11).
- The next scheduled sampling at this park is in 2025.

Visit the NPS data store at the Integrated Resource Management Application portal for:

- [Data summary brief](https://irma.nps.gov/DataStore/Reference/Profile/2306022) (https://irma.nps.gov/DataStore/Reference/Profile/2306022)
- [Species distribution maps](https://irma.nps.gov/DataStore/Reference/Profile/2306017) (https://irma.nps.gov/DataStore/Reference/Profile/2306017)
- [Full dataset and metadata](https://irma.nps.gov/DataStore/Reference/Profile/2302261) (https://irma.nps.gov/DataStore/Reference/Profile/2302261)

Table 1. Anurans known to occur at Moores Creek National Battlefield based upon records in NPSpecies (NPS 2024) and those detected during our (SECN’s) 2022 sampling. Documented species indicated with “X.”

Order	Family	Species	Authority	Common Name	NPSpecies (2024)	SECN Monitoring (2022)
Anura	Bufonidae	<i>Anaxyrus fowleri</i>	Hinckley 1882	Fowler's toad	X	–
		<i>Anaxyrus terrestris</i>	Bonnaterre 1789	Southern toad	X	X
	Hylidae	<i>Acris gryllus</i>	LeConte 1825	Southern cricket frog	X	X
		<i>Dryophytes chrysoscelis</i>	Cope 1880	Cope's gray treefrog	X	X
		<i>Dryophytes cinereus</i>	Schneider 1799	Green treefrog	X	X
		<i>Dryophytes femoralis</i>	Daudin 1800	Pine woods treefrog	X	X
		<i>Dryophytes gratiosus</i>	LeConte 1856	Barking treefrog	X	X
		<i>Dryophytes squirellus</i>	Daudin 1800	Squirrel treefrog	X	X
		<i>Pseudacris crucifer</i>	Wied-Neuwied 1838	Spring peeper	X	X
		<i>Pseudacris feriarum</i>	Baird 1854	Upland chorus frog	X	–
		<i>Pseudacris ocularis</i>	Bosc and Daudin 1801	Little grass frog	X	X
		<i>Pseudacris ornata</i>	Holbrook 1836	Ornate chorus frog	X	–
	Microhylidae	<i>Gastrophryne carolinensis</i>	Holbrook 1835	Eastern narrow-mouthed toad	X	X
	Ranidae	<i>Lithobates catesbeianus</i>	Shaw 1802	American bullfrog	X	X
		<i>Lithobates clamitans</i>	Latreille 1801	Green frog	X	X
		<i>Lithobates palustris</i>	LeConte 1825	Pickerel frog	X	–
		<i>Lithobates sphenoccephalus</i>	Cope 1886	Southern leopard frog	X	X
	Scaphiopodidae	<i>Scaphiopus holbrookii</i>	Harlan 1835	Eastern spadefoot	X	–

Study Area

Moores Creek National Battlefield is situated in the southeastern coastal plain of North Carolina, approximately 32 kilometers (20 miles) northwest of Wilmington, North Carolina. The primary purpose of the park is to interpret the pivotal Revolutionary War battle that occurred on the site; however, the park also hosts a variety of natural resources. The 36-hectare (88-acre) park contains a small portion of Moores Creek in the park’s western section, just north of the confluence of Moores Creek and Black River. Moores Creek is a tidally influenced blackwater stream with an approximate width of 8 meters (26 feet).

Vegetation communities at the battlefield are characteristic of a coastal pine-flatwoods mosaic and include riparian areas, dry pine forests, and wet pine savannas. The riparian areas are generally dominated by bald cypress (*Taxodium distichum*), while the uplands are a mix of loblolly and longleaf pine (*Pinus taeda* and *P. palustris*) and sweetgum (*Liquidambar styraciflua*). Beginning in the 2000s, the park began successful active management program to improve the condition of the park’s natural communities by restoring natural hydrologic processes, reintroducing several native plant species, and reinstating periodic fires.

Moores Creek National Battlefield had 18 previously documented anuran species when sampling occurred in 2022 (Table 1; NPS 2024).

Methods

Sampling Design

The Southeast Coast Network established a randomly-selected, spatially-balanced set of sample locations ($n = 11$) during an initial field season in 2014 (Figure 1). Our sample size was chosen based on considerations that included park size, hypothesized variability in wildlife populations, and logistics. Sample locations are permanent and are revisited on a three-year rotation. This report pertains to 2022 sampling only. More comprehensive details regarding study design, data collection, and data analyses can be found in the SECN Vocal Anuran Community Monitoring Protocol (Byrne et al. 2013).

Data Collection

In 2022, we deployed automated recording devices (ARDs) at 11 permanent sampling locations (Figure 1) from March 14 to June 15. One unit, at site 10 (Figure 1), experienced equipment failure on April 16; but, we were able to analyze recordings from that unit made prior to its failure. We programmed each ARD to record audio on every fourth night, in 60-second intervals every 20 minutes from 20:00 to 04:40, for 24 nights of sampling. Each ARD captured 648 one-minute recordings during the recording period (the ARD at site 10 captured 243 recordings). The ARDs were collected from the field after recording was completed and audio files were downloaded to a computer for classification and analyses.



Figure 1. Permanent audio sampling locations ($n = 11$) at Moore's Creek National Battlefield. Sampling location ID numbers are indicated at each point.

Methods (continued)

Manual Classification of Recordings

It is not possible, given personnel constraints, to manually review all recordings for a park. Additionally, a full manual review of all audio recordings would not be an efficient use of resources, considering a large proportion of the recordings do not contain signals of interest. We therefore began classification work by using computer program Kaleidoscope Pro (Wildlife Acoustics, Inc 2024) to automatically review all recordings at a sample location in the park and to extract as many signal detections as possible. Signal detections usually comprise natural or artificial acoustic departures from the background soundscape and may include biological signals of interest (i.e., frog calls), biological signals not of interest (e.g., bird calls, insect noises, or human noises), natural environmental sounds not of interest (e.g., rain, wind, surf, or thunder), or anthropogenic noises not of interest (e.g., planes, trains, and automobiles). After extracting signals from the raw recordings, Kaleidoscope Pro grouped the isolated signals into clusters, according to mathematical similarity. The result was a set of clusters of unclassified, but potentially interesting signals and the simultaneous elimination of much of the inconsequential noise recorded in the field.

Ideally, this process would result in “pure” clusters each containing a single class of signal (e.g., a cluster consisting only of calls belonging to a single species). However, given the complex, overlapping, natural jumble of sounds present in the background soundscape, Kaleidoscope Pro tends to produce clusters more heterogeneous than optimally desired. This necessitates manual classification work performed by expert listeners familiar with the calls of anurans of the southeastern states.

An expert listener in identification of anuran calls then manually reviewed the first five signals in each cluster (i.e., those closest to the mathematical center of the cluster), which represented the five signals most representative of that cluster. When a signal consisted of anuran vocalizations that could be classified to the species level, the signal was labeled accordingly. Once all manual signal reviews were completed, the listener reviewed all of the anuran classifications and selected one signal that was a representative example of each species. Each selected signal became the definitive record for a given species’ occurrence at a given sample location. Later, the SECN Wildlife Biologist reviewed each definitive record individually to confirm species identification and to perform data quality assurance steps. The electronic records of each species occurrence were later validated, and the records were elevated to accepted status by the SECN Wildlife Biologist.

Taxonomic Standards

Our use of taxonomic nomenclature followed the Integrated Taxonomic Information System (ITIS 2024). The National Park Service maintains the online database NPSpecies (NPS 2024), which documents the occurrence and status of species found in parks.

Data Analysis

We analyzed species richness and related characteristics, occupancy and spatial distribution, and frequency of detection of the park’s



A southern toad (*Anaxyrus terrestris*), one of two species detected at all locations in 2022. NPS photo / Kristen Maxfield (NPGallery).

vocalizing anuran community. Our results were derived from a semi-automated evaluation of 6,723 minutes of audio from recordings captured across 11 sample locations. We extracted 9,135 potential signals from the audio recordings, out of which we manually classified 1,485 (16.3% of signals). We included in analyses only detections of anurans that were identified to the species level. We calculated metrics separately for native versus non-indigenous species if applicable.

Species Richness and Composition

We defined species richness as the number of unique species detected at least once at the scale of interest. We began by calculating anuran species richness for the park as a whole, as the total number of unique species across all sample locations. We also calculated species richness at each sample location. We determined species richness separately for native versus non-indigenous anuran species when non-indigenous species were present.

Field methods for sampling species richness (e.g., point-counts or audio sampling) inherently produce incomplete counts, due to imperfect detection of cryptic species that may be present but are difficult to record during surveys. Observed species richness, therefore, is expected to be an underestimate of true species richness, though it offers utility as an index of the true diversity of a sample unit. Various methods exist to adjust incidence data to provide an estimated species richness that includes species present, but unobserved (e.g., multispecies occupancy models or non-parametric richness estimators, such as *iChao2*); but, these approaches may show strong bias in study areas where average occupancy is low (Tingley et al. 2020). We therefore report only unadjusted species richness, with the caveat that it should be interpreted as described above.

Occupancy

We calculated naïve occupancy (i.e., frequency of occurrence) as the percent of sampling locations where a species was detected in one or more reviewed recordings. We did not adjust occupancy estimates for probability of detection (i.e., detectability). Species with greater naïve occupancy were detected at more locations than those with low values.

Spatial Distribution

We mapped species incidence records in the park to provide a means of visually assessing spatial distributions of detected anurans across the park. An understanding of anuran distribution is beneficial for informed management of species and their requisite habitats. Following future park visits, trend analysis of data is planned to assess changes in species distribution and community makeup. This has potential to provide insights into influences on park diversity (e.g., land use change and habitat condition, climate issues, and hydrological processes).

Results

Species Richness

Observed species richness for native anurans at Moores Creek National Battlefield in 2022 was 13 (Table 1). We did not detect any non-indigenous anuran species. Mean $\pm$ SD observed species richness of native anurans per sample location was 7.09 ± 2.17 (range: 4–11; Figure 2; Table 2). Anurans were detected at all sampled locations.

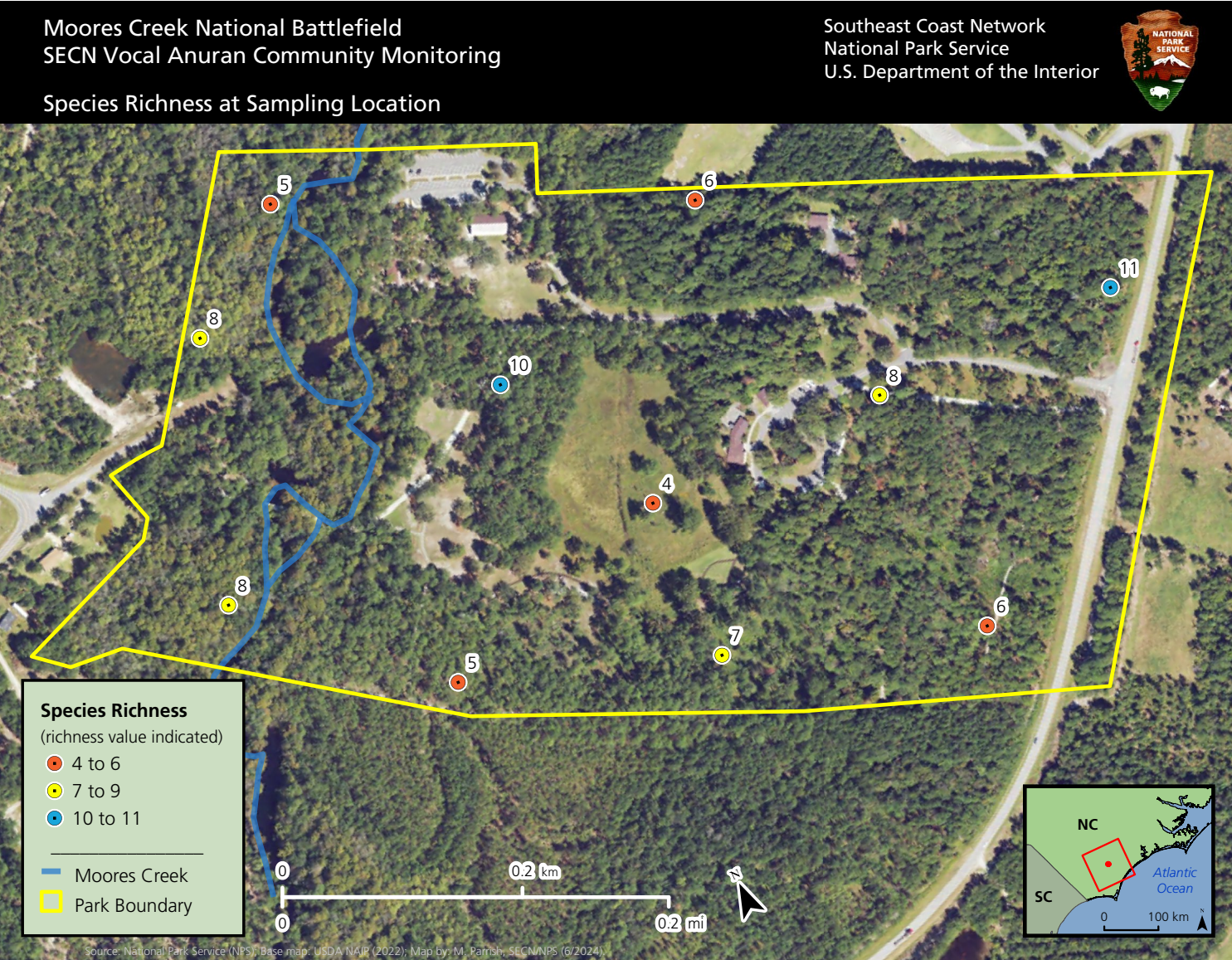


Figure 2. Vocal anuran species richness at sampling locations ($n = 11$) within Moores Creek National Battlefield, based on audio recording detections in 2022. Species richness values are indicated at each point.

Results (continued)

Table 2. Species detections (indicated with “X”) and observed species richness at each sampling location within Moores Creek National Battlefield in 2022. Refer to Figure 1 for labeled sampling locations.

Common Name	01	02	03	04	05	06	07	08	09	10	11
Southern toad	X	X	X	X	X	X	X	X	X	X	X
S. cricket frog	–	X	X	X	X	X	X	–	–	–	X
Cope's gray treefrog	X	X	–	X	X	–	X	X	–	X	–
Green treefrog	–	X	X	X	X	–	X	–	X	–	X
Pine woods treefrog	X	X	–	–	–	X	X	–	–	–	–
Barking treefrog	–	–	–	–	–	–	–	X	–	–	–
Squirrel treefrog	X	X	–	X	X	X	X	X	X	–	X
Spring peeper	X	X	X	X	X	X	X	X	X	X	X
Little grass frog	–	X	–	X	–	–	–	X	–	–	–
E. narrow-mouthed toad	–	–	–	–	–	–	X	–	–	–	–
American bullfrog	–	X	–	X	–	X	X	–	–	–	X
Green frog	–	–	–	–	X	–	X	–	–	–	X
S. leopard frog	X	X	X	–	X	–	X	X	X	X	X
Observed Species Richness	6	10	5	8	8	6	11	7	5	4	8

Occupancy and Spatial Distribution

Naïve occupancy was greatest for southern toad (*Anaxyrus terrestris*) and spring peeper (*Pseudacris crucifer*), detected at 100% of sampling locations (Table 3). Squirrel treefrog (*Dryophytes squirellus*) and southern leopard frog (*Lithobates sphenoccephalus*) were also frequently detected, occurring at approximately 82% of sampling locations (Table 3). Barking treefrog (*D. gratiosus*) and eastern narrow-mouthed toad (*Gastrophryne carolinensis*) were the least frequently detected species and each was observed at only one sampling location (Table 3).

All 13 anuran species we detected in 2022 were previously documented at Moores Creek National Battlefield (NPS 2024, Table 1).



A squirrel treefrog (*Dryophytes squirellus*), one of several species detected during monitoring in 2022. NPS photo / Briana Smrekar (NPgallery).

Table 3. Naïve occupancy estimates (i.e., proportion of permanent sampling locations where a species was detected) for vocal anurans at Moores Creek National Battlefield in 2022, ranked by descending proportion of locations occupied.

Common Name	Scientific Name	Naïve Occupancy ¹
Southern toad	<i>Anaxyrus terrestris</i>	100.0%
Spring peeper	<i>Pseudacris crucifer</i>	100.0%
Squirrel treefrog	<i>Dryophytes squirellus</i>	81.8%
Southern leopard frog	<i>Lithobates sphenoccephalus</i>	81.8%
Southern cricket frog	<i>Acris gryllus</i>	63.6%
Cope's gray treefrog	<i>Dryophytes chrysoscelis</i>	63.6%
Green treefrog	<i>Dryophytes cinereus</i>	63.6%
American bullfrog	<i>Lithobates catesbeianus</i>	45.5%
Pine woods treefrog	<i>Dryophytes femoralis</i>	36.4%
Little grass frog	<i>Pseudacris ocularis</i>	27.3%
Green frog	<i>Lithobates clamitans</i>	27.3%
Barking treefrog	<i>Dryophytes gratiosus</i>	9.1%
E. narrow-mouthed toad	<i>Gastrophryne carolinensis</i>	9.1%

¹ Percent of sampling location where species was observed.

We did not detect five species previously reported in 2001–2003 by the Savannah River Ecology Laboratory (SREL) park inventories (Tuberville et al. 2004; Tuberville et al. 2005) during our 2022 sampling: Fowler’s toad (*A. fowleri*), upland chorus frog (*P. feriarum*), ornate chorus frog (*P. ornata*), pickerel frog (*L. palustris*), and eastern spadefoot (*Scaphiopus holbrookii*).

Several records of Fowler’s toad were reported (Tuberville et al. 2004), but the species would appear to be extremely uncommon at the park, if not out of range. Fowler’s toad is a vocally conspicuous species we would expect to detect if it were calling during monitoring. Upland chorus frog and ornate chorus frog were reported in small numbers during the SREL inventory surveys (Tuberville et al. 2004). Neither chorus frog species would be expected to range into the park. Upland chorus frog, if present, probably concluded most calling activity before our ARDs began recording in mid-March. Ornate chorus frog (listed as North Carolina Endangered) was reported as a lone individual calling but not seen (Tuberville et al. 2004). We remain cautious about accepting the presence of these chorus frog species at the park.

Pickerel frog was photographically documented during the SREL inventory (Tuberville et al. 2004; Tuberville et al. 2005). Pickerel frog is challenging to detect on ARDs due to its subdued call characteristics, particularly if a population is small or infrequently vocally active. Similarly, eastern spadefoot is often challenging to detect on ARDs; spadefoots typically vocalize only during short, explosive breeding periods associated with warm-weather rain events and their calls are low-frequency and low-volume.

Results (continued)

Distribution Maps

Distribution maps indicating the sampling location(s) where species detections occurred are available at [Species Distribution Maps](https://irma.nps.gov/DataStore/Reference/Profile/2306017) (<https://irma.nps.gov/DataStore/Reference/Profile/2306017>).

Acknowledgements

We wish to thank Amorita Bracket (Biological Science Technician, NPS/ Invasive Plant Management Team) for performing ARD deployment and retrievals. We also thank Nick Raynor, Maintenance Worker, Moores Creek National Battlefield for assistance with sampling logistics. Wayne Ryan (Intern, Cooperative Ecosystem Studies Unit/ University of Georgia) assisted with data entry. Audio classification and analyses were performed by the authors.

Literature Cited

- Adams M. J., D. A. W. Miller, E. Muths, P. S. Corn, E. H. C. Grant, et al. 2013. Trends in Amphibian Occupancy in the United States. PLOS ONE 8(5): e64347. Available at: <https://doi.org/10.1371/journal.pone.0064347> (last accessed September 2024).
- Begon, M., J. L. Harper, and C. R. Townsend. 1986. Ecology: Individuals, populations and communities. Blackwell Scientific Publications. ISBN: 0-632-01337-0.
- Byrne, M. W., B. D. Smrekar, L. M. Elston, J. C. DeVivo, C. J. Wright, and E. Thompson. 2013. Protocol for monitoring vocal anuran communities in Southeast Coast Network Parks. Natural Resource Report NPS/SECN/NRR-2013/720. National Park Service, Fort Collins, Colorado. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2203687> (last accessed September 2024).
- Collins, J. P. and A. Storfer. 2003. Global amphibian declines: Sorting the hypotheses. Diversity and Distributions 9:89-98. Available at: <https://doi.org/10.1046/j.1472-4642.2003.00012.x> (last accessed September 2024).
- Dorcas, M. E. and J. W. Gibbons. 2008. Frogs and Toads of the Southeast. University of Georgia Press. ISBN: 978-0-8203-2922-2.
- Halstead, B. J., A. M. Ray, E. Muths, E. H. C. Grant, R. Grasso, M. J. Adams, K. S. Delaney, J. Carlson, and B. R. Hossack. 2022. Looking ahead, guided by the past: The role of US national parks in amphibian research and conservation. Ecological Indicators 136: 108631. Available at: <https://doi.org/10.1016/j.ecolind.2022.108631> (last accessed September 2024).
- Integrated Taxonomic Information System (ITIS). 2024. Integrated Taxonomic Information System Online Database. Available at: <http://www.itis.gov> (last accessed September 2024).
- Muths, E., M. J. Adams, E. H. C. Grant, D. Miller, P. S. Corn and L. C. Ball. 2012. Amphibian Research and Monitoring Initiative Fact Sheet 2012-3092. United States Geological Survey. Available at: <https://pubs.usgs.gov/fs/2012/3092/pdf/fs20123092.pdf> (last accessed September 2024).
- National Park Service (NPS). 2024. NPSpecies: Information on species in national parks. Available at: <https://irma.nps.gov/NPSpecies> (last accessed September 2024).
- Society for the Study of Amphibians and Reptiles (SSAR). 2017. Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, with Comments Regarding Confidence in Our Understanding. 8th ed. pp. 1-102. Crother, B. I. (ed.). SSAR Herpetological Circular 43. Available at: <https://ssarherps.org/publications/north-american-checklist/> (last accessed September 2024).
- Tingley, M. W., C. P. Nadeau, and M. E. Sandor. 2020. Multi-species occupancy models as robust estimators of community richness. Methods in Ecology and Evolution 11: 633-642. Available at: <https://doi.org/10.1111/2041-210x.13378> (last accessed September 2024).
- Tuberville, T. D., J. D. Willson, M. E. Dorcas, and J. W. Gibbons. 2004. Herpetofaunal Inventory Final Report - Moores Creek National Battlefield. Unpublished dataset and voucher photos provided to NPS.
- Tuberville, T. D., J. D. Willson, M. E. Dorcas, and J. W. Gibbons. 2005. Herpetofaunal Species Richness of Southeastern National Parks. Southeastern Naturalist 4(3): 537-569. Available online at: [https://doi.org/10.1656/1528-7092\(2005\)004\[0537:HSROSN\]2.0.CO;2](https://doi.org/10.1656/1528-7092(2005)004[0537:HSROSN]2.0.CO;2) (last accessed September 2024).



A southern leopard frog (*Lithobates sphenoccephalus*), one of several species detected during monitoring in 2022. NPS Photo / Andrew Bennett (NPgallery).

Literature Cited (continued)

Wildlife Acoustics, Inc. 2024. Kaleidoscope Pro 5 User Guide.
Available at: <https://www.wildlifeacoustics.com/> (last accessed September 2024).

Zampella, R. A., J. F., Bunnell, K. J. Laidig, and N. A Procopio. 2006.
Using multiple indicators to evaluate the ecological integrity of a coastal plain stream system. *Ecological Indicators* 6(4): 644–663. Available at: <https://doi.org/10.1016/j.ecolind.2005.08.027> (last accessed September 2024).

About the Southeast Coast Network

In 1999, the National Park Service initiated a long-term ecological monitoring program, known as “Vital Signs Monitoring,” to provide the minimum infrastructure to allow more than 270 national park system units to identify and implement long-term monitoring of their highest-priority measurements of resource condition. Monitoring resources in parks develops scientifically sound information on the current status and long-term trends in the composition, structure, and function of park ecosystems, and determines how well current management practices are sustaining those ecosystems.

The NPS Vital Signs Monitoring Program addresses five goals for all parks with significant natural resources:

- Determine the status and trends in selected indicators of the condition of park ecosystem,
- Provide early warning of abnormal conditions,
- Provide data to better understand the dynamic nature and condition of park ecosystems,
- Provide data to meet certain legal and Congressional mandates, and
- Provide a means of measuring progress towards performance goals.



A barking treefrog (*Dryophytes gratiosus*), one of several species detected during monitoring in 2022. NPS Photo / Briana Smrekar (NPGallery).



An American bullfrog (*Lithobates catesbeianus*), one of several species detected during monitoring in 2022. NPS photo (NPGallery).

The Southeast Coast Network (SECN) includes eighteen administrative areas containing twenty park units, fifteen of which contain significant and diverse natural resources. In total, SECN parks encompass more than 184,000 acres of federally-managed land across North Carolina, South Carolina, Georgia, Alabama, and Florida. The parks serve a wide diversity of cultural and natural resource missions and include: five national monuments, four national seashores, three national battlefield parks, two national historic parks, a national memorial, a national recreation area, an ecological and historic preserve, and a single national park. The parks range in size from slightly more than 20 acres to nearly 60,000 acres, and when considered with non-federal lands jointly managed with NPS, the network encompasses more than 253,000 acres.

For More Information

[SECN Home Page](https://www.nps.gov/im/secn/index.htm)

(<https://www.nps.gov/im/secn/index.htm>)

[SECN Reports and Publications](https://www.nps.gov/im/secn/reports-publications.htm)

(<https://www.nps.gov/im/secn/reports-publications.htm>)

[NPS Inventory and Monitoring Program](https://www.nps.gov/im/index.htm)

(<https://www.nps.gov/im/index.htm>)

Data Downloads via the [Natural Resource Information Portal](https://irma.nps.gov/portal/)

(<https://irma.nps.gov/portal/>)