



Vocal Anuran Community Monitoring: 2015 Data Summary

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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-native 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 apparently minor disruptions of the aquatic or terrestrial environments upon which amphibians depend may substantially impact the survival, reproduction, and persistence of a species. Many amphibian species in the United States, including those for which there is currently 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 2023) 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



A green treefrog (*Dryophytes cinereus*), one of several species detected during monitoring in 2015. NPS photo / NPgallery.

can inform assessments of ecosystem integrity and sustainability (Halstead et al. 2022). Given the noteworthy diversity of amphibians 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 Cape Hatteras National Seashore 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).

Significant Results

This report summarizes data collected in 2015 at Cape Hatteras National Seashore during implementation of the SECN Vocal Anuran Community Monitoring Protocol (Byrne et al. 2013).

- Automated recording devices (ARDs) captured anuran (i.e., frog, toad, and treefrog) vocalizations from March 21 to June 18 at 27 spatially-balanced random sampling locations.
- We extracted 17,293 potential audio signals from 16,038 minutes of audio recordings. We manually reviewed a systematically selected subset of 2,039 (11.8%) of the extracted signals and classified to species any identifiable anuran vocalizations found within that subset.
- We identified six native species of anurans, which were previously documented at the park. No non-native anurans were detected.
- Anurans were observed at 23 out of 27 sampled locations.
- The most frequently detected species were green treefrog (*Dryophytes cinereus*) and squirrel treefrog (*Dryophytes squirellus*) which respectively occurred at approximately 70% and 67% of permanent sampling locations.
- Anuran communities were resampled at the park in 2020.

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

- [Data summary brief](https://irma.nps.gov/DataStore/Reference/Profile/2294561) (https://irma.nps.gov/DataStore/Reference/Profile/2294561)
- [Species distribution maps](https://irma.nps.gov/DataStore/Reference/Profile/2294562) (https://irma.nps.gov/DataStore/Reference/Profile/2294562)
- [Full dataset and metadata](https://irma.nps.gov/DataStore/Reference/Profile/2302261) (https://irma.nps.gov/DataStore/Reference/Profile/2302261)

Study Area

Cape Hatteras National Seashore is in the northern Outer Banks, a chain of barrier islands separating the Atlantic Ocean from mainland North Carolina. Pamlico Sound, north and west of the Outer Banks, lies between the islands and the mainland. The 9,903-hectare (24,470-acre) park extends approximately 125 kilometers (78 miles), including substantial areas of Bodie Island, Hatteras Island, and Ocracoke Island. Pea Island National Wildlife Refuge (NWR) is included within the administrative boundaries of Cape Hatteras NS; however, Pea Island NWR is managed by the US Fish and Wildlife Service. Sampling at Pea Island NWR was discontinued in 2020 and data from the NWR is not included in this report.

As a consequence of its exposed geographical location, Cape Hatteras National Seashore is subject to intense impacts from tides, storms, wind, and waves. Constantly shifting sand bars and severe weather create significant hazards to marine navigation, which have earned

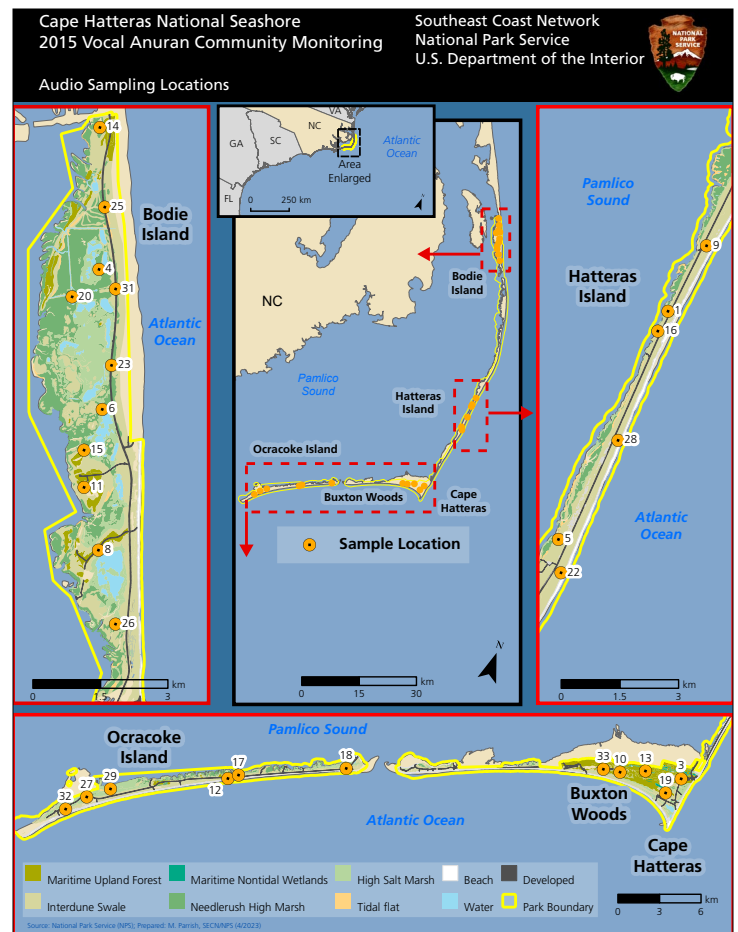


Figure 1. Permanent audio sampling locations ($n = 28$) at Cape Hatteras National Seashore. Sampling location ID numbers are indicated at each point.

the area the nickname, “Graveyard of the Atlantic.” Coastal erosion, accretion, and sea overwash represent an ongoing concern and dune construction has been undertaken to combat losses to the sea. North Carolina Highway 12 extends the length of the National Seashore and requires ongoing maintenance. Water management and drainage began early in the 1900s for mosquito control and to encourage waterfowl usage. Pressure from public recreational use and intensive development adjacent to NPS lands represent challenges to ongoing conservation efforts at the park.

The vegetative landcover of Cape Hatteras National Seashore can be broadly classified into four dominant communities: maritime tidal wetlands, maritime nontidal wetlands, maritime open uplands, and maritime upland forests and shrublands (Boyle and Rico 2022).

The NPSpecies park species list for Cape Hatteras National Seashore (NPS 2023) included 10 anurans as of 2015. Eight are documented with museum and field survey records (Tuberville et al., 2005; Parrish and Martin 2020). The distributional ranges of the two remaining species, American toad (*Anaxyrus americanus*) and gray treefrog (*Dryophytes versicolor*), do not extend into the park. We do not consider the NPSpecies records for these two species plausible and have excluded them from this report. We consider the valid species list for Cape Hatteras National Seashore to consist only of eight species (Table 1).

Table 1. Anurans known to occur at Cape Hatteras National Seashore based upon records in NPSpecies (NPS 2023) and those detected during our 2015 sampling. Documented species indicated with “X.”

Order	Family	Species	Authority	Common Name	NPSpecies (2023)	2015 Sampling
Anura	Bufonidae	<i>Anaxyrus fowleri</i>	Hinckley 1882	Fowler's toad	X	X
	Hylidae	<i>Dryophytes chrysoscelis</i>	Cope 1880	Cope's gray treefrog	X	–
		<i>Dryophytes cinereus</i>	Schneider 1799	Green treefrog	X	X
		<i>Dryophytes squirellus</i>	Daudin 1800	Squirrel treefrog	X	X
		<i>Pseudacris ocularis</i>	Boss and Daudin 1801	Little grass 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 sphenoccephalus</i>	Cope 1886	Southern leopard frog	X	X

Methods

Sampling Design

The Southeast Coast Network established a randomly selected, spatially-balanced set of sample locations ($n = 28$, Figure 1) in 2015. Our sample size was chosen based on considerations including park size, hypothesized variability in wildlife populations, and logistics. Sample locations are permanent and are revisited on a three-year rotation. This brief pertains to 2015 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 2015, we deployed automated recording devices (ARDs) at 28 permanent sampling locations (Figure 1) from March 21 to June 18. One unit subsequently experienced equipment failure reducing our final sample size to $n = 27$. We programmed each ARD to record audio on every fourth night, in 30-second intervals every 10 minutes from 20:00 to 04:50, for 21 nights of sampling. Each ARD captured 1,188 recordings (594 minutes of audio) during the recording period with one exception. The ARD at site 22 failed prematurely after collecting 432 minutes of recording but we opted to include the data for site 22 in our analyses for completeness. The ARDs were collected from the field after recording was completed and audio files were downloaded to a computer for classification and analyses.

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.,



A southern leopard frog (*Lithobates sphenoccephalus*), one of several species detected during monitoring in 2015. NPS photo (NPgallery).

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 then 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 Chuck-will’s-widow [*Antrostomus carolinensis*] calls). However, given the complex, overlapping, natural jumble of sounds present in the background soundscape, Kaleidoscope Pro tends to produce clusters that are more heterogeneous than would be optimally desired. This necessitates manual classification work performed by expert listeners who are familiar with the calls of anurans of the southeastern states.

A expert 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 2023). The National Park Service maintains the online database NPSpecies (NPS 2023), 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 vocalizing anuran community. Our results were derived from a semi-automated evaluation of 16,038 minutes of audio from 32,076 recordings captured across 27 sample locations. We extracted 17,293 potential signals from the audio recordings, of which we manually classified 2,039 (11.8% of signals). We included in analyses only detections of anurans identified to the species level. We calculated metrics separately for native vs. non-native 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 calculated 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-native anuran species when non-native 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,



An eastern narrow-mouthed toad (*Gastrophryne carolinensis*), one of several species detected during monitoring in 2015. Photo by Brad Glorioso, USGS (NPgallery).

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). Therefore, we 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 in order 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 Cape Hatteras National Seashore in 2015 was six (Table 1). Five species were detected on Ocracoke Island as well as in Buxton Woods near Cape Hatteras; four species were detected on Bodie Island, and two species were detected on Hatteras Island, north of the Cape (Table 2). We did not detect any non-native anuran species. Mean $\pm$ SD observed species richness of native anurans per sample location (across all islands) was 2.19 ± 1.44 (range: 0–5; Table 2, Figure 2). We did not detect any anurans at four sample locations (locations 09, 14, 22, and 25).

Occupancy and Spatial Distribution

Overall (across all islands) naïve occupancy was greatest for green treefrog (*Dryophytes cinereus*) and squirrel treefrog (*Dryophytes squirellus*), which respectively occurred at approximately 70% and 67% of permanent sampling locations (Table 3). The two treefrogs represented the only species detected across all of the sampled islands. Least frequently encountered were eastern narrow-mouthed toad (*Gastrophryne carolinensis*), detected at approximately 15% of permanent sampling locations, and American bullfrog (*Lithobates catesbeianus*), which was detected at only one sample location (Table 3). American bullfrog was only observed in the Buxton Woods area of Hatteras Island (see distribution maps supplement).

Each of the six anuran species we detected in 2015 were previously documented at Cape Hatteras National Seashore (NPS 2023; Table 1).

We did not observe Cope's gray treefrog (*Dryophytes chrysoscelis*) or little grass frog (*Pseudacris ocularis*), which were previously documented at Cape Hatteras National Seashore (Tuberville et al. 2005; NPS 2023). Typically, Cope's gray treefrog is vocally conspicuous, and we would expect to detect the species if it vocalized near an active ARD. Little grass frog has a very inconspicuous call and ARDs typically have difficulty detecting it, especially in areas such as Cape Hatteras National Seashore, where background wind and traffic noise is relatively high.



American bullfrog (*Lithobates catesbeianus*), one of several species detected during monitoring in 2015. NPS photo (NPgallery).

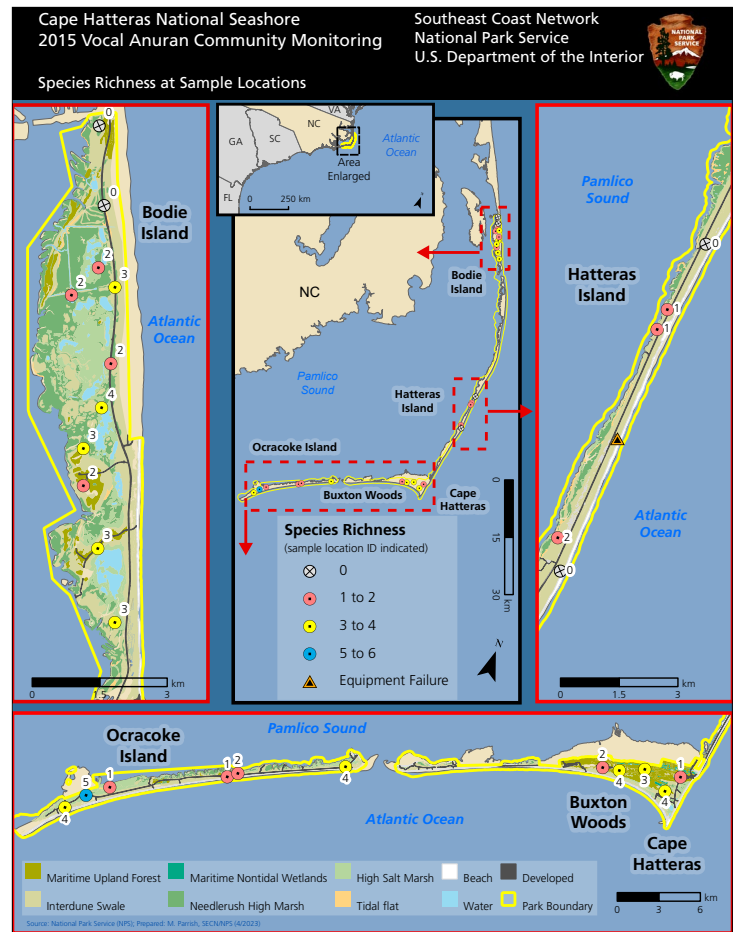


Figure 2. Vocal anuran species richness at sampling locations ($n = 27$) at Cape Hatteras National Seashore based on audio recording detections in 2015.

Distribution maps indicating the sampling location(s) where species detections occurred are available on the NPS Integrated Resource Management Application portal at [Species Distribution Maps](https://irma.nps.gov/DataStore/Reference/Profile/2294562) (<https://irma.nps.gov/DataStore/Reference/Profile/2294562>).



A squirrel treefrog (*Dryophytes squirellus*), one of several species detected during monitoring in 2015. NPS photo (NPgallery).

Table 2. Species detections (indicated with “X”) and species richness (native-only and inclusive of non-native species) at each sampling location at Cape Hatteras National Seashore in 2015. Refer to Figure 1 for labeled sampling locations [BI = Bodie Island; HI = Hatteras Island; BW = Buxton Woods; OI = Ocracoke Island]. Ø = No data collected at this sample location due to equipment failure.

Common Name	04 BI	06 BI	08 BI	11 BI	14 BI	15 BI	20 BI	23 BI	25 BI	26 BI	31 BI	01 HI	05 HI	09 HI	16 HI	22 HI	28 HI	03 BW	10 BW	13 BW	19 BW	33 BW	12 OI	17 OI	18 OI	27 OI	29 OI	32 OI	
Fowler's toad	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	X	–	X	–	–	–	–	X	X	X	
Green treefrog	X	X	X	X	–	X	X	X	–	X	X	–	X	–	X	–	Ø	–	X	X	X	X	X	–	X	X	X	–	X
Squirrel treefrog	–	X	X	X	–	X	–	–	–	–	X	X	X	–	–	–	Ø	X	X	X	X	X	X	X	X	X	–	X	
Eastern narrow-mouthed toad	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	–	–	–	–	–	X	X	–	X	
American bullfrog	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Ø	–	–	X	–	–	–	–	–	–	–	–	
Southern leopard frog	X	X	X	–	–	X	X	X	–	X	X	–	–	–	–	–	Ø	–	X	–	X	–	–	–	X	X	–	–	
Observed Species Richness	2	4	3	2	0	3	2	2	0	3	3	1	2	0	1	0	Ø	1	4	3	4	2	1	2	4	5	1	4	

Table 3. Naïve occupancy estimates (i.e., proportion of permanent sampling locations where a species was detected) for vocal anurans at Cape Hatteras National Seashore in 2015, ranked by descending proportion of locations occupied [N.O. = Naïve occupancy or percent of sampling locations where species was observed; “–” = Not detected on island].

Common Name	Scientific Name	Park N.O.	Bodie Island N.O.	Hatteras Island N.O.	Buxton Woods N.O.	Ocracoke Island N.O.
Green treefrog	<i>Dryophytes cinereus</i>	70.4%	81.8%	33.3%	80.0%	66.7%
Squirrel treefrog	<i>Dryophytes squirellus</i>	66.7%	54.5%	33.3%	100.0%	83.3%
Southern leopard frog	<i>Lithobates sphenoccephalus</i>	44.4%	72.7%	–	40.0%	33.3%
Fowler's toad	<i>Anaxyrus fowleri</i>	18.5%	–	–	40.0%	50.0%
Eastern narrow-mouthed toad	<i>Gastrophryne carolinensis</i>	14.8%	9.1%	–	–	50.0%
American bullfrog	<i>Lithobates catesbeianus</i>	3.7%	–	–	20.0%	–

Acknowledgements

We wish to thank Meaghan Johnson (Chief of Resource Management and Science, Cape Hatteras National Seashore), Tracy Ziegler (former Chief of Resource Management and Science, National Parks of Eastern N.C.), William Thompson (Hatteras Island Supervisory Biological Science Technician), and the staff of Cape Hatteras National Seashore for their kind assistance with sampling logistics and ARD retrievals during the COVID-19 pandemic.

Literature Cited

Adams M. J., D. A. W. Miller, E. Muths, P. S. Corn, E. H. C. Grant. 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.

Boyle, M. F. and E. Rico. 2022. Terrestrial vegetation monitoring at Cape Hatteras National Seashore: 2019 data summary. Natural Resource Data Series NPS/SECN/NRDS—2022/1341. National Park Service, Fort Collins, Colorado. Available at: <https://doi.org/10.36967/nrr-2290019> (last accessed September 2024).

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). 2023. Integrated Taxonomic Information System Online Database. Available at: <https://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). 2023. NPSpecies: Information on species in national parks. Available at: <https://irma.nps.gov/NPSpecies/> (last accessed September 2024).

Parrish, M. C. and L. H. Martin. 2022. Cape Hatteras National Seashore: Vocal Anuran Community Monitoring: 2020 Data Summary. National Park Service / Southeast Coast Network: Athens, Georgia. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2291582> (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).

Literature Cited

- 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. 2005. Herpetofaunal Species Richness of Southeastern National Parks. *Southeastern Naturalist* 4(3): 537–569. Available 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).
- Wildlife Acoustics, Inc. 2023. Kaleidoscope Pro Analysis Software, version 5.5.0 for Windows OS. Wildlife Acoustics, Inc.: Maynard, Massachusetts, USA. 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 Fowler's toad (*Anaxyrus fowleri*), one of several species detected during monitoring in 2015. 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/>)