



Anuran Community Monitoring Program Summary

Overview

Amphibian populations have experienced documented declines in North America and many other areas around the world. Several factors have contributed to these population declines and in some cases localized extinctions. Among these factors are disease and anthropogenic stressors, such as habitat loss and degradation, non-native predators, acid precipitation, altered hydrology and hydroperiod, ultraviolet radiation, and chemical contaminants. Although diseases and parasites naturally occur in amphibian populations, their effects can be exacerbated when combined with other anthropogenic stressors.

Amphibians have complex life cycles in which the immature phase often consists of an aquatic larval stage, followed by a post-metamorphic adult terrestrial stage. Slight alterations in the aquatic or terrestrial communities upon which amphibians depend can substantially impact the survival, reproduction, and persistence of a species. Given their habitat requirements, anatomy, and physiology, amphibians are considered good indicators of ecological condition.

The southern United States hosts one of the most diverse amphibian communities in the world and supports the highest density of amphibian species in North America (Echternacht and Harris 1993). Units in the National Park Service's (NPS) Southeast Coast Network (SECN) have 35 known anuran species (frogs and toads). Given their known population declines, sensitivity to anthropogenic stressors, and the diversity in the southeastern United States, anuran communities are a priority for SECN monitoring efforts.

Approach and Objectives

Automated recording devices (ARDs) are used to monitor vocal anurans in SECN parks (Figure 2). Because of the high number of vocal anurans in SECN park units, their wide distribution and nocturnal calling behavior, the subtle triggers for many anuran vocalizations (e.g., temperature, relative humidity), and safety concerns associated with personnel working through the night, acoustical monitoring with ARDs are the most effective technique to monitor these populations.

Because of the wide range of anuran vocalization behaviors, factors that influence vocalizations, and times at which different species are most active, we collect recordings when the majority of species are most active and collect a 30-second recording every ten minutes. Anuran monitoring is conducted in the spring and early summer to facilitate the detection of both cool- and warm-season breeding species.

Species occurrences are derived from the recordings by applying various algorithms combined with a manual-evaluation process to confirm detections.

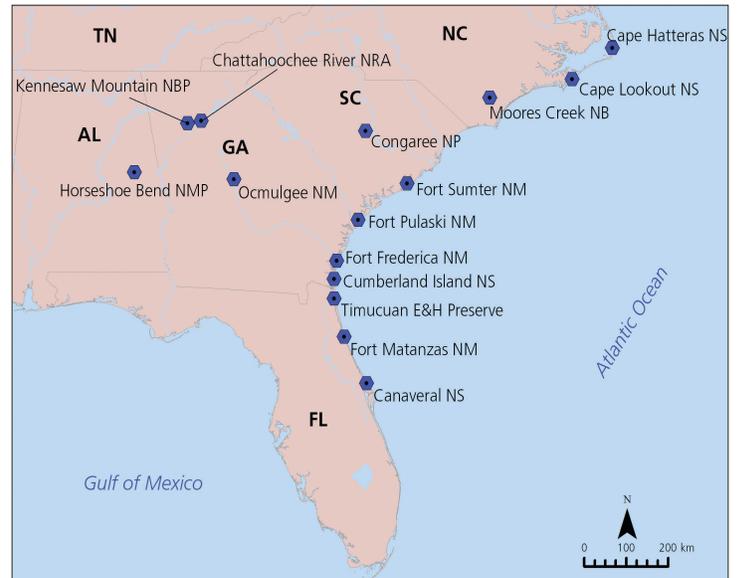


Figure 1. Overview map showing locations of National Park Service units in the Southeast Coast Network's anuran community monitoring program.

Objectives for the anuran community monitoring program include:

- Determine changes in the species richness of the anuran community from March to June,
- Determine changes in the occupancy of anuran species and groups of anurans from March to June, and
- Determine changes in the distribution of anuran species and groups of anurans from March to June.

Data Analysis

Composition

Measures of community composition are often good indicators of abiotic variability, disturbance, or other stressors. Summaries related to composition include the total number of species detected (i.e., species richness), relative detection frequency, and naïve occupancy. Naïve occupancy is a measure of frequency of species' occurrence using the percentage of the sampling locations where a species was detected at least once, without adjusting for probability of detection.

Distribution

Understanding changes in the distribution of amphibian species is integral to informed management of species and their habitats. Changes in species distributions over time provide useful information regarding how species respond to large-scale influences such as changing land use, climate, hydrology, or habitat availability and condition. Shifting species distributions alter species interactions and the food-web structure, thereby producing cascading effects on ecosystem processes.

Phenology

Phenology, the periodic life-cycle events of plants and animals as they are influenced by changes in the seasons, is an increasingly useful tool in monitoring climate change and its potential effects on amphibian populations. The timing of anuran territorial and mating vocalizations can provide insight into the initiation of the breeding season for these animals. Tracking these dates may prove to be a robust method for monitoring climate change in the southeastern United States.



A pinewoods treefrog (*Hyla femoralis*) at Canaveral National Seashore.



Figure 2. Deploying an automated recording device (ARD) in the field to collect frog call data (inset shows close-up of ARD).

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. The overarching purpose of natural resource monitoring in parks is to develop scientifically sound information on the status and long-term trends in the composition, structure, and function of park ecosystems and to determine 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:

1. Determine the status and trends in selected indicators of the condition of park ecosystems,
2. Provide early warning of abnormal conditions,
3. Provide data to better understand the dynamic nature and condition of park ecosystems,
4. Provide data to meet certain legal and congressional mandates, and
5. Provide a means of measuring progress toward performance goals.

The Southeast Coast Network includes 20 parks, 17 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 span a wide diversity of cultural missions, as they include four national seashores, two national historic sites, two national memorials, seven national monuments, and two national military parks, as well as a national recreation area, a national battlefield, and an ecological and historic preserve. The park units range in size from slightly more than 20 to nearly 60,000 acres, and, when considered with non-federal lands jointly managed with NPS, the Southeast Coast Network encompasses more than 253,000 acres.

For More Information

SECN Home Page:

<http://science.nature.nps.gov/im/units/secn/index.cfm>

About the NPS Inventory & Monitoring Division:

<http://science.nature.nps.gov/im/index.cfm>

Data Downloads via the Natural Resource Information Portal:

<http://irma.nps.gov>

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