

# **North Carolina Sandhills Conservation Partnership Biological Monitoring Plan**

## **Introduction**

The Biological Monitoring plan is a component of the North Carolina Sandhills Conservation Partnership's Strategic Conservation Plan. The purpose of the plan is to establish a monitoring program that will further the understanding of identified conservation targets in order for Partners to best conserve, restore, and manage the Sandhills ecosystem. This document prioritizes monitoring and research activities to achieve the greatest impact with available resources. The plan is a dynamic document to be reviewed and revised as needed to reflect increasing understanding of Sandhills ecosystem dynamics and responses to Partner conservation, restoration, and management efforts in the Sandhills.

## **Planning History**

The Partnership began the planning process in the spring of 2012 by using Open Standards for the Practice of Conservation (Open Standards) framework. Through this framework, the Partnership conducted a Target Viability Assessment, which involves the identification of key ecological attributes and indicators to assess the status of each conservation target. A key caveat to the Target Viability Assessment is that it uses best available knowledge but relies heavily on expert opinion and does not allow for the consideration of institutional capacity for monitoring. An ad hoc Monitoring committee was formed in the spring of 2013 to use the information created in the Target Viability Assessment (see NCSCP Strategic Conservation Plan) and identify the most critical and also practical monitoring efforts for the Partnership to implement given limited resources. This Monitoring Plan reflects this by focusing primarily on expansion of existing monitoring efforts and data sharing among Partners.

## **Current situation**

Currently, monitoring infrastructure in the Sandhills is held with individual Partners and an integrated ecological monitoring network does not exist beyond long term red-cockaded woodpecker (RCW) monitoring efforts. Most monitoring and reporting efforts conducted in the Sandhills are tied to objectives, programs or legal mandates of individual Partner organizations and their working areas. The Partnership does, however, have capacity for information sharing and some coordination of monitoring efforts among Partners. In addition, many datasets the Partnership is interested in monitoring are currently collected by individual Partners, and all that is necessary is consolidation and analysis.

## **Annual Monitoring Framework**

The Partnership does not have resources to monitor every Conservation Target on an annual basis. Therefore, biological monitoring for the Partnership will be conducted for one Target per year. This

allows for the Partnership and individual partners to focus energies and reduce pressures for reporting. Some Target indicators will require annual monitoring. Those that do require annual monitoring will only be reported on to the Partnership during that Target’s reporting year. Once monitoring is conducted for each target, a full report will be compiled by the Partnership Coordinator in the fifth year, creating a 5-year monitoring cycle. The 5-year monitoring cycle allows for advance preparation and finalization of Target monitoring by the Partnership as well as the flexibility for review and adaptation of future monitoring efforts. The below table describes the Target monitoring cycle.

Year 1 (FY 2013)	Finalize indicators and responsible parties for monitoring Longleaf Pine Mosaic Target; Report on longleaf at end of year
Year 2	Upland Depressional Wetlands
Year 3	Blackwater Streams
Year 4	Streamhead Pocosins/ Seeps
Year 5	Full State of Sandhills report

**Reporting Timeline**

Monitoring will be conducted based on a fiscal year beginning July 1 and ending June 31. Therefore, monitoring for the first Conservation Target, Longleaf Pine Mosaic, will begin July 1, 2013 and be completed by June 31, 2014. A report will be assembled by the Partnership Coordinator to be presented at the December 2014 Steering Committee meeting. Reports on the other three Targets will be presented at subsequent December Steering Committee meetings.

**Conservation Target Goals**

The monitoring plan is designed to be consistent with the following goals for conservation targets:

Longleaf Pine Mosaic

1. By 2025, natural longleaf pine communities containing healthy assemblages of longleaf pine associated species are restored within core areas as defined by the Reserve Design.
2. By 2025, adequate lands are protected and being managed to achieve demographic connectivity of the Sandhills East and West RCW populations with a minimum 500 breeding pairs.

Nested Community Targets: Xeric Sandhill Scrub, Sand Barren, Pine/Scrub Oak Sandhill, Mesic Transition, Mesic Pine Flatwoods, River Terraces, Wet Pine Flatwoods, Pine Savanna

Upland Depressional Wetlands

1. By 2025, vegetative structure and connectivity with associated habitats are restored for all known intact or restorable UDWs on protected lands.
2. By 2025, with landowner agreement, 50% of UDWs on private lands within reserve design are protected and managed to support vegetative structure and connectivity with associated habitats.

Nested Community Targets: Small depressional ponds, vernal pools, small depressional pocosins and swamps

#### Black Water Streams

1. By 2020, the hydrologic regime of priority blackwater streams supports associated forest communities that meet the habitat requirements for healthy assemblages of common and nested target species.
2. By 2020, the water quality in all priority blackwater streams meets or exceeds the minimum criteria for a good rating as defined in the stream bioclassification metrics (criteria forthcoming from SERDP funded project)

Nested Community Targets: Beaver ponds, successional sedge meadows, and floodplain forests

#### Streamhead Pocosins/Seeps

1. By 2020, all known pocosins and seeps on protected lands support appropriate biological communities including vegetative structure and presence of a minimum number of indicator plant and animal species.
2. By 2020, with landowner agreement, 75% of known seeps and 25% of known streamhead pocosins on private lands within connectors and buffers are protected to support appropriate biological communities including vegetative structure and presence of a minimum number of indicator plant and animal species.

Nested Community Targets: Canebrakes, Sandhills seeps, Streamhead Atlantic white cedar, Streamhead pocosins

### **Monitoring Actions**

The following section represents the efforts to be undertaken by the Partnership to evaluate the status of each identified Conservation Target. Each colored box represents an action to evaluate a chosen indicator of ecosystem health. Each color represents a different Conservation Target. The final green box is an invasive species monitoring action that affects all Conservation Targets. Monitoring of invasive species will be conducted annually, but reported on with the full state of the Sandhills report.

## Longleaf Pine Mosaic

**KEA:** Representative Indicator Species

**Indicator:** Bachman's Sparrow

**Metric:** presence/absence

**Current Efforts:** NCWRC Monitoring Program

**Action:** Assess the status and population viability of Bachman's Sparrow. The Partnership will support and assist expansion of NCWRC's Bachman's Sparrow status assessment and monitoring efforts on Conservation and private lands in the Sandhills.

**Lead Partner Organization:** NCWRC

**Key Partner Organizations:** TNC, Ft. Bragg, SEI, USFWS

**Desired Outputs/Results:** Assessment of Bachman's Sparrow population status in the Sandhills, long term trend data

**Timeline:** Status assessment should be completed by summer 2014. Long term monitoring surveys on Sandhills Game Land conducted annually. Timeline for larger long-term monitoring across the Sandhills to be determined.

**Rationale for Action:** Bachman's Sparrow is highly dependent upon the herbaceous groundcover created by burning in longleaf woodlands, and thus is an indicator for many of the longleaf specialists that also rely upon native herbaceous groundcover. Surveying for Bachman's will provide a proxy for the extent of high quality open wiregrass habitat suitable for many species and could also help to indicate where additional management and conservation efforts are needed.

## Longleaf Pine Mosaic

**KEA:** Representative/ Indicator species

**Indicator:** Red Cockaded Woodpecker (RCW)

**Metric:** # potential breeding groups

**Current Efforts:** Sandhills Game Lands, private lands, Ft. Bragg monitoring programs

**Action:** Consolidate data and report on Sandhills RCW populations

**Lead Partner Organization:** USFWS

**Key Partner Organizations:** Ft. Bragg, SEI, NCWRC

**Desired Outputs/Results:** Report on Status of Sandhills East and West RCW Populations

**Timeline:** Annual

**Rationale for Action:** RCWs are currently a focus of management and monitoring efforts for many Partners within the Sandhills populations. RCWs are an indicator for old growth (~80+ years), open canopy longleaf woodlands with a reduced mid-story and tend to do better in fire-managed woodlands with lush herbaceous groundcover. They also play a key role in providing cavities for many secondary cavity nesters. Monitoring population demographics and trends will be essential in evaluating and supporting continued restoration and expansion of both RCW territories and healthy, intact Longleaf pine habitat.

## Longleaf Pine Mosaic

**KEA:** Extent of Longleaf Ecosystem

**Indicator:** Extent of longleaf habitat (listed in RCW recovery plan).

**Metric:** Acreage of longleaf habitat in core areas, connectors, and buffers

**Current Efforts:** none

**Action:** Develop methodology and conduct remote sensing assessment identifying extent of functional longleaf pine habitat in Sandhills

**Lead Partner Organization:** NC Forest Service

**Key Partner Organizations:** Ft. Bragg, TNC, SEI, JCA, State Parks, NCWRC

**Desired Outputs/Results:** Report on extent of longleaf pine habitat in Sandhills

**Timeline:** Every 5 years, beginning 2014

**Rationale for Action:** To determine habitat extent and connectivity for LL indicator species. Help assess whether we are making progress towards creating habitat for achieving demographic connectivity between Sandhills East and West RCW subpopulations. Tracking this metric over time will provide info on the trend in extent and connectivity of longleaf pine habitat and thus will provide one measure of success toward the goal of maintaining or increasing the extent of longleaf.

## Longleaf Pine Mosaic

**KEA:** Fire Regime

**Indicator:** Amount of longleaf pine habitat burned

**Metric:** % of protected longleaf habitat burned within 3 year period

**Current Efforts:** TNC, State Parks, NCWRC, and Ft. Bragg collect fire data

**Action:** Compile fire data on amount of prescribed fire conducted on protected lands in Sandhills

**Lead Partner Organization:** Partnership

**Key Partner Organizations:** TNC, State Parks, NCWRC, Ft. Bragg

**Desired Outputs/Results:** Report on total # of acres with potential for burning; running 3 year average of # of acres burned; calculated % of available acres burned in previous 3 years

**Timeline:** Annual

**Rationale for Action:** Extent of prescribed fire efforts is an indicator of whether our management and restoration goals for fire-dependent longleaf pine habitat are being met. Without fire the ecosystem loses its integrity and quality. One of the functions of the NCSCP is to enhance the capacity of partners to conduct controlled burns, and this metric provides a measure of effectiveness and will identify where more efforts are needed.

## Upland Depressional Wetlands

**KEA:** Presence of Natural Communities

**Indicator:** Representation of nested Upland Depressional Wetland (UDW) Community Targets

**Metric:** Number, location, and condition of different size classes of UDWs

**Current Efforts:** NCWRC currently have locations of known UDWs

**Action:** Combine all known data, inventory new sites, assess condition and restoration potential of known UDWs

**Lead Partner Organization:** NCWRC

**Key Partner Organizations:** Ft. Bragg, TNC, NCWRC, State Parks

**Desired Outputs/Results:** Inventory of location, condition and restoration potential of UDWs in Sandhills

**Timeline:** By 2015

**Rationale for Action:** Identifying locations and evaluating condition and restoration potential of remaining UDWs will focus our conservation, restoration, and management efforts. UDWs support several rare plants and are critical for the breeding of many rare amphibians and reptiles (e.g. gopher frog, tiger salamander, ornate chorus frog, chicken turtle), but many have been destroyed or degraded and no longer support these rare species. NCWRC has compiled information on many of the mid-size to large UDWs in the Sandhills, but there is an opportunity to standardize, expand upon, and share their data, particularly with regards to habitat condition.

## Upland Depressional Wetlands

**KEA:** Spatial Relationship

**Indicator:** Adequate connectivity and buffers for native herpetofauna

**Metric:** % of occurrences with adequate connectivity and buffers for native herpetofauna

**Current Efforts:** none

**Action:** Measure/analyze connectivity and buffers for UDWs and wetland complexes using inventory (GIS),

**Lead Partner Organization:** NCSCP

**Key Partner Organizations:** Ft. Bragg, TNC, NCWRC, State Parks

**Desired Outputs/Results:** Remotely sensed survey of UDWs assessing connectivity and buffers utilizing habitat requirements for each target species life cycle

**Timeline:** By 2015

**Rationale for Action:** To determine whether adequate connectivity and buffers exists for species dependent on UDWs requiring adjacent upland habitat for other stages of their life cycle. For gopher frog and tiger salamander, adequate uplands include sandy soils suitable for burrowing, herbaceous groundcover, coarse woody debris, and stump holes or other types of burrows. Some turtles forage in UDWs but lay their eggs in uplands. Incompatible land uses (e.g. roads, development) that occur between breeding and non-breeding sites can restrict seasonal movements and cause extirpation of species using the UDW.

## Upland Depressional Wetlands

**KEA:** Representative Species

**Indicator:** Gopher frog populations, and others

**Metric:** size and distribution of populations

**Current Efforts:** monitoring on Sandhills Game Land and Ft. Bragg

**Action:** Expand Monitoring of representative species (Gopher frogs, tiger salamanders, ornate chorus frogs)

**Lead Partner Organization:** NCWRC

**Key Partner Organizations:** Ft. Bragg, TNC, NCWRC, State Parks

**Desired Outputs/Results:** Distribution and population estimate for each of the 3 species

**Timeline:** Annual

**Rationale for Action:** Gopher frog, tiger salamander and ornate chorus frog are rare amphibians with documented population declines. They are almost exclusively dependent upon larger, ephemeral UDWs with a long but not permanent hydroperiod, emergent herbaceous vegetation, and an adequate amount of connected, suitable upland habitat. UDWs that support these species also tend to be able to support many of the more common and more habitat generalist species associated with UDWs.

## Blackwater Streams

**KEA:** Connectivity

**Indicator:** In-stream connectivity

**Metric:** presence/absence of impoundments in sub watersheds

**Current Efforts:** A few statewide and regional studies are available

**Action:** Include analyses by American Rivers to update Partnership's GIS database. Work to find partners to remove non-functioning impoundments.

**Lead Partner Organization:** TNC

**Key Partner Organizations:** American Rivers, DWQ, USACE, USFWS

**Desired Outputs/Results:** Report on location of impoundments in Sandhills

**Timeline:** By 2016

**Rationale for Action:** Impoundments signify flow interruptions and generally reservoirs and are an indicator for disruption of a natural hydrologic flow. Often this results in a changing of the downstream floodplain and a change in peak and low flows. This in turn can affect riparian forest communities and species that rely on particular aquatic habitats at particular times of year.

## Blackwater Streams

**KEA:** Habitat Connectivity

**Indicator:** Connectivity of Riparian Communities

**Metric:** % Intact Forested riparian habitat in 100 year floodplain within a defined reach or basin

**Current Efforts:** none

**Action:** Conduct GIS analysis using most recent aerial imagery available, ground truth as needed.

**Lead Partner Organization:** Partnership

**Key Partner Organizations:** TNC, SALT, WRC, State Parks, Ft. Bragg, Natural Heritage

**Desired Outputs/Results:** GIS analysis of extent of intact forested riparian habitat in 100 year floodplain

**Timeline:** By 2016

**Rationale for Action:** Connectivity of riparian communities will be used as a proxy for supporting appropriate biological communities as forested riparian habitat serves as important dispersal and travel corridors for many terrestrial and semi-aquatic species. As floodplain forests are degraded or lost, their ability to serve these functions is also degraded. Floodplain forests also help to filter nutrient and sediments running off from uplands and provide habitat for many species.

## Blackwater Streams

**KEA:** Water quality

**Indicator:** biological communities (benthics)

**Metric:** benthic community scoring from sample sites - DWQ Bioclassification metrics

**Current Efforts:** Ft. Bragg aquatics SERDP study

**Action:** Work with USFWS, Natural Heritage, and Ft. Bragg to identify existing monitoring programs for indicator species and expand efforts if feasible

**Lead Partner Organization:** DWQ

**Key Partner Organizations:** USFWS, Ft. Bragg, TNC, NC State Parks

**Desired Outputs/Results:** Report on water quality of priority blackwater streams in Sandhills

**Timeline:** 2016

**Rationale for Action:** To determine the health of aquatic ecosystems in the Sandhills. Aquatic invertebrates are important components of aquatic ecosystems and can be good indicators of water quality. Benthic invertebrate sampling is already a part of DWQ's stream monitoring efforts.



### Streamhead Pocosins and Seeps

**KEA:** Presence of Natural Communities

**Indicator:** Representation of nested community targets

**Metric:** Number, location and condition of community targets

**Current Efforts:** none

**Action:** Combine all known data. Develop protocols and assess condition and restoration potential of known Streamhead Pocosins and Seeps. Inventory new sites.

**Lead Partner Organization:** Ft. Bragg

**Key Partner Organizations:** TNC, NCWRC, State Parks

**Desired Outputs/Results:** Inventory of location, condition and restoration potential of Streamhead Pocosins and Seeps in Sandhills

**Timeline:** Every 5 years, beginning 2017

**Rationale for Action:** Identifying locations and evaluating condition and restoration potential of Streamhead Pocosins and Seeps will focus our conservation, restoration, and management efforts.

### Streamhead Pocosins and Seeps

**KEA:** Habitat Connectivity

**Indicator:** Adequate habitat connectivity and/or buffers of downstream riparian corridors

**Metric:** % of occurrences with adequate connectivity and buffers of downstream riparian corridors

**Current Efforts:** none

**Action:** Measure/analyze connectivity and buffers for Streamhead Pocosins and Seeps using inventory (GIS)

**Lead Partner Organization:** Partnership

**Key Partner Organizations:** Ft. Bragg, TNC, NCWRC, State Parks

**Desired Outputs/Results:** Remotely sensed survey assessing connectivity and buffers of downstream riparian corridors

**Timeline:** Every 5 years, beginning 2017

**Rationale for Action:** To determine whether adequate connectivity and buffers exists for species dependent on Streamhead Pocosins and Seeps requiring downstream riparian corridors.

## All Conservation Targets

**KEA:** Condition of natural communities

**Indicator:** # of EDRR invasive plant occurrences

**Metric:** % of EDRR invasive plant occurrences being monitored and/or treated

**Current Efforts:** SEI (NCSWMA) is currently mapping invasive plants on all conservation lands and treating selected EDRR species; Fort Bragg surveyed for invasive plants in 2003-2004.

**Action:** Continue mapping and treating invasive plant occurrences on public and private lands in the Sandhills focusing on EDRR species

**Lead Partner Organization:** SEI (NCSWMA)

**Key Partner Organizations:** Ft. Bragg, NCWRC, TNC, State Parks

**Desired Outputs/Results:** Report on location and abundance of invasive plants on conservation lands in the Sandhills

**Timeline:** Annual

**Rationale for Action:** Invasive plants have the potential to impact all conservation targets by displacing native species, altering natural community structure, impacting threatened and endangered species (i.e. RCW foraging habitat), altering fire regimes, effecting stream bank stability