

Purpose of study recap:

The primary goal of this project is to intensively collect free-living and plant-parasitic nematodes in a statistically valid way for the purpose of defining their diversity in BITH and providing an authoritative list of the species present. Numerous new records and new species can be expected, along with an expanded understanding of the impact of biotic and abiotic disturbance in soils. The data derived from this project will be suitable for comparisons with ongoing ecoregion surveys of natural areas (Ricketts et al., 1999) conducted by the first PI in prairies and with a survey of nematodes in Great Smoky Mountains National Park ATBI sites conducted by both PIs. A comprehensive species list will be prepared with complete collection and taxonomic data. The diversity estimates will contribute to a continent-wide survey of North American ecosystems.

We are conducting an in depth analysis of Criconematina, a suborder of plant parasitic, soil-dwelling nematodes. Criconematina, commonly referred to as ring-nematodes, are distributed globally and associated with a wide range of hosts and habitats. In native grasslands and forests, they may constitute as much as 30% of the below-ground nematode community. Their abundance often approaches 500 individuals per 100cc of soil with as many as a dozen species recorded from a single habitat. Host associations may be broad, covering entire plant families, or they may specialize in feeding on a few closely related plant species. Several are known agronomic pest species, but the vast majority is known only from native habitats and responds negatively to soil disturbance. Due to their sensitivity to disturbance and associations with a range of plant species, some ecologists have suggested that ring nematodes could serve as a below-ground biological indicator of habitat quality. Before this application is possible taxonomic boundaries need to be evaluated and a reference database needs to be established.

The nematode inventory has been conducted in each of the terrestrial units of the BITH, Beaumont, Beech Creek, Big Sandy Creek, Canyonlands, Hickory Creek Savannah, Houseman tract, Lance Rosier Unit, Neches Bottom and Jack Gore Baygall, Loblolly and Turkey Creek Unit. Within each of the terrestrial BITH units, 40x40m² sampling sites were selected after consultation with BITH biologists and land managers to reflect areas of high plant diversity, endemism, or varying levels of disturbance. We have sampled each of the major plant communities found in BITH: longleaf pine uplands, Beech-magnolia-loblolly pine, arid sandyland, upper floodplain/lower floodplain, cypress-tupelo swamps, palmetto hardwood flats, acid bog/baygall, and pine savannah wetlands.

Findings and Status for 2012:

The initial pilot survey took place December 26-27, 2012. Soil samples were collected from sites within three BITH Units and one prairie: the Lance Rosier Unit-a cypress grove and a hardwood forest site, Marysee Prairie-one grassland site, the Loblolly Unit- one pine forest site, and the Turkey Creek Unit-a cypress grove and a pine uplands site. At each sampling site, a single 40x40m² plot was established with the corners marked by GPS (UTM) coordinates. Each plot was entered and traversed by the collector with a hand-held Oakfield tube soil corer of 2cm diameter. Every 6 meters a core was extracted to a depth of approximately 20 cm, until 500-1000cc of soil was accumulated. The soil was then placed into a plastic collection bag and stored in a cooler until transportation to the laboratory for analysis. Images of each study site and notes on the plant community were recorded. All samples were returned to the University of Nebraska-Lincoln for extraction, identification, and preservation.

The pilot survey was preparation for a more expansive survey of the 10 terrestrial units of the BITH to be conducted in March 2013 by nematologists and students from the Universities of Nebraska-Lincoln and Tennessee-Knoxville.

Findings and Status for 2013:

Nematologists and students from the Universities of Nebraska-Lincoln (Dr. Thomas O. Powers, Dr. Peter Mullin, undergraduates Matt Lodema, Maggie Olsen, and staff Kris Powers) and Tennessee-Knoxville (Dr. Ernest Bernard and graduate student Kim Whitlock) conducted an extensive survey and collected samples from 8 BITH terrestrial units and The Nature Conservancy's Roy E. Larsen Sandyland Sanctuary between March 15-20, 2013. BITH National Preserve's Deanna Boensch and Stephanie Burgess provided critical guidance in selecting suitable collection sites and *The Thicket of Diversity* Director Mona Halvorsen led the group to the collection sites, helped with sampling and provided transportation.

On June 20, 2013, University of Nebraska-Lincoln undergraduate Matt Lodema returned to BITH to collect the first soil samples from the Canyonlands north and south units. Mona Halvorsen with *The Thicket of Diversity* GIS summer intern accompanied Matt Lodema to the sites, helped with sampling and provided transportation.

Total samples collected from BITH and neighboring areas are listed in Table 1.

BITH samples processed and nematodes identified at the University of Nebraska as of Nov. 26, 2013 are listed in Table 2.

Table 1. Total soil samples collected (28) within approximately 40m² plots in 2012 and 2013.

1. 2012 collections
 - a. Lance Rosier Unit (2 samples)
 - i. cypress slough
 - ii. Teel cemetery woods
 - b. Marysee Prairie Preserve (1 sample)
 - i. restored prairie
 - c. Loblolly Unit (1 samples)
 - i. loblolly forest
 - d. Turkey Creek Unit, Kirby Nature Trail (2 samples)
 - i. piney woods
 - ii. cypress slough
2. 2013 collections
 - a. Hickory Creek Savannah Unit (2 samples)
 - i. sundews dry bog
 - ii. longleaf pines
 - b. Roy E. Lawrence Sandyland Sanctuary (3 samples)
 - i. baygall
 - ii. relic longleaf pines
 - iii. sandhills
 - c. Big Sandy Creek Unit (4 samples)
 - i. wetland pine savannah
 - ii. beech/magnolia forest
 - iii. pine savannah
 - iv. hardwood forest
 - d. Beech Creek Unit (1 sample)
 - i. beech/magnolia hardwood forest
 - e. Jack Gore Baygall and Neches Bottoms Unit (4 samples)
 - i. river birch forest
 - ii. cypress swamp
 - iii. cypress slough on the eastern edge of Johns Lake
 - iv. sandbar plot on the eastern side of the Neches River
 - f. Turkey Creek Unit (1 sample)
 - i. pitcher plant dry bog
 - g. Lance Rosier Unit (4 samples)
 - i. dwarf palmetto swamp plot 1
 - ii. dwarf palmetto swamp plot 2
 - iii. Lance Rosier homestead championship oak
 - iv. pitcher plant dry bog
 - h. Houseman's Tract from the Beaumont Unit (1 sample)
 - i. former cattle grazing land
 - i. Canyonlands Unit (2 samples)
 - i. upland stream area (south unit)
 - ii. lowland swampy area (north unit)

