



National Park Service
U.S. Department of the Interior

Old-Growth Bottomland Forest Research and Education Center
Congaree National Park

Hopkins, SC

Carolina Bogmint Research at Congaree National Park

Research Summary

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Above: Carolina bogmint in bloom at Congaree National Park. © DR. KATHERINE MANRY, CLEMSON UNIVERSITY

Pink Flowers, Square Stem

Carolina bogmint (*Macbridea caroliniana*; MACA), also known as Carolina birds-in-a-nest, is a rare mint found at a few dozen forested wetland sites across the coastal plain of the Carolinas and Georgia. Congaree National Park is home to the largest known MACA population. The paired, purplish-pink blooms of this square-stemmed herb provide a welcome splash of color under the muggy forest canopy from late June to August. On closer inspection, to many people the flowers do indeed look like hungry baby birds reaching up from a nest.

Both the U.S. Fish and Wildlife Service and the State of South Carolina list MACA as a Species of Concern. The Nature Conservancy lists it as vulnerable (S3) at the state level and imperiled (G2-3) at the global level. White birds-in-a-nest (*M. alba*), the only other species in the genus, is a federally-endangered mint found in Florida. MACA's conservation status is attributed to both a lack of data about the species and to the fact that its fragile wetland habitat is vulnerable to changes in land use, nutrients, altered hydrology, invasive species, and other threats. Beginning in 2002, Congaree National Park partnered with Clemson University and the U.S Forest Service to learn more about MACA. The goal of this research was to inform long-term management and conservation of this species at Congaree National Park and throughout its range.

Background

Carolina bogmint, also known as Carolina birds-in-a-nest (*Macbridea caroliniana*; MACA), is a perennial, obligate wetland herb with a stem up to 1.18 feet (30 cm) tall. The opposite, elliptical leaves have a slightly toothed to smooth margin and measure up to 5.0 inches (13 cm) long and 1.6 inches (4 cm) wide. The flowers bloom from late June to August. Stems die back in the fall, but rhizomes and basal leaf rosettes survive the winter. The plant reproduces vegetatively via rhizomes in addition to seeds. MACA is typically found in blackwater swamps that are infrequently flooded. At Congaree National Park, such habitat is found in muck swamp, which is a seepage forest near the northern floodplain margin.

Research Overview and Approach

Beginning in 2002, Congaree National Park partnered with Clemson University and the U.S Forest Service to study two large MACA populations in muck swamp. These sites were termed "Site A" and "Site B." The goals of the study were to collect and analyze several different types of data.

To assess MACA population size and distribution, researchers established eleven, 500 meter-long transects at each site. Transects were divided into 1x2 meter plots that were each systematically surveyed for stems of MACA, stems of the invasive swamp dayflower (*Murdannia keisak*), and feral hog (*Sus scrofa*)

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disturbance. Some MACA patches were also surveyed for flowers, fruit, and pollinators. Researchers also surveyed for MACA outside of muck swamp.

To assess MACA habitat characteristics, researchers collected data at randomly-selected sites with more than ten MACA stems. Data included light, soil chemistry, and a vegetation survey. Reference habitat surveys were completed at random, nearby, MACA-free sites.

Researchers also studied the amount of genetic variation among MACA populations. To look at detailed differences within Congaree National Park, individuals were randomly selected from both shady and bright patches at Sites A and B. Samples from the park were also compared more broadly to samples from ten non-park MACA sites in the southeastern United States.

Results: Population Size and Variability

Researchers documented 6,995 MACA stems in 232 patches at Congaree National Park from 2003 to 2005. Patches ranged from one to 1,116 stems. Site A had more patches, larger patches, and more variable patch size than Site B. A total of 128 MACA stems were found in three areas of the park not previously known to have MACA. One of these areas, a cypress-tupelo forest, was previously undocumented as a MACA habitat.

Patch size and distribution varied from year to year. Minimum population estimates at Site B, for example, fluctuated between 469 in 2005 and 11,250 in 2004. Estimates of the MACA population in Congaree National Park ranged from 27,900 in 2003 to 225,200 in 2004. Even the lower estimate was the largest known MACA population across its range.

Results: Habitat Preferences

MACA patches, stems, and flowers were more abundant in forest light gaps with diverse herbaceous cover. Some associated herbs included netted chainfern (*Woodwardia areolata*), whorled pennywort (*Hydrocotyle verticillata*), lizard's tail (*Saururus cernuus*), swamp dayflower, Carolina violet (*Viola villosa*), and St. John's wort (*Triadenum walteri*). Some associated trees included swamp tupelo (*Nyssa biflora*), sweetgum (*Liquidambar styraciflua*), Carolina ash (*Fraxinus caroliniana*), green ash (*F. pennsylvanica*), American holly (*Ilex opaca*), laurel oak (*Quercus laurifolia*), and red maple (*Acer rubrum*).

MACA stems grew in soils with higher phosphorus and less potassium relative to non-MACA habitats. The generally larger populations at Site A were also

associated with less organic matter and higher pH relative to Site B.

Only 1.1 percent of surveyed MACA stems were fruiting in 2003, but flowers were more abundant in light gap patches. This suggested frequent vegetative reproduction via rhizomes overall, but with more opportunity for cross-pollination in light gaps. Bumblebees (*Bombus impatiens*) were the most frequent pollinators noted during timed observations, but other visitors included Zabulon skippers (*Poanes zabulon*), sweatbees, flies, yellow jackets, and hoverflies.

Research results also documented relationships with two invasive species. While feral hogs did not directly graze on MACA, they did cause significant habitat damage as they rooted for food. Associations with the swamp dayflower were more complicated. The swamp dayflower was almost always found with MACA at site A, but MACA was not always found with Swamp dayflower nearby. The Swamp dayflower was not recorded at Site B. More work is needed to understand MACA interactions with both of these species.

Results: Genetics

Within Congaree National Park, genetic analysis suggested that MACA populations at sites A and B were broadly similar. At a finer scale, however, light gap patches at Site A showed less genetic variation than shady patches. This finding was consistent with observations of patch size and flowering patterns. Large, vigorous light gap patches may attract more pollinators, which could lead to more gene flow within and between light gaps. Less frequent pollinator visits and vegetative propagation within shady patches may result in lineages that remain more isolated and distinct over time.

At a broader scale, Genetic analysis indicated that MACA populations are distinct between the large river basins. The populations at Congaree National Park were ranked highest in conservation priority based on their high levels of internal genetic variation compared to other non-park sites across the Southeast.

Research and Management in Action

Researchers used the results to develop a detailed MACA monitoring plan. This plan focuses on long-term status and trends of MACA populations. As of 2014, Congaree National Park is working with Clemson University on an NPS-funded project to implement this monitoring.

For More Information

1. *The MACA page at the USDA PLANTS database:*
<http://plants.usda.gov/core/profile?symbol=MACA>

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