

Obed Wild and Scenic River and Big South Fork National River and Recreation Area

National Park Service
U.S. Department of the Interior

Inventory and Monitoring Division
Appalachian Highlands Network



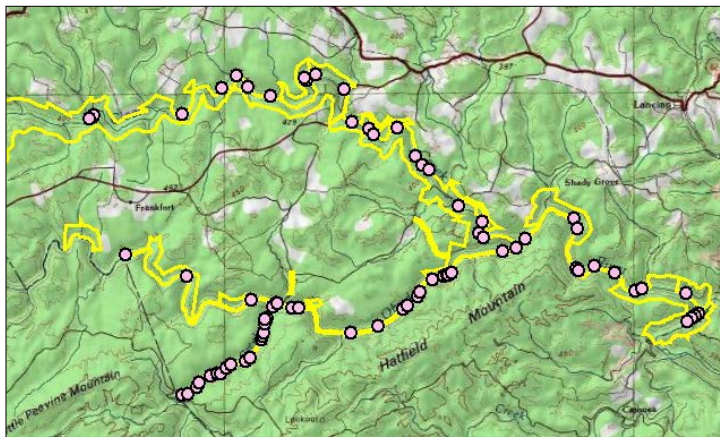
Cumberland Rosemary: 2021 Status Report

Importance: A Threatened Species

Cumberland rosemary (*Conradina verticillata*) is a federally-listed threatened species endemic to the upper Cumberland Plateau in Tennessee and Kentucky. Big South Fork National River and Recreation Area (BISO) and Obed Wild and Scenic River (OBRI) contain 89% of all the remaining populations of this imperiled species, and Obed contains almost 75% of the total, as well as the largest known population remaining in existence. The Obed Wild and Scenic River is by far the most significant remaining stronghold for this species. Cumberland rosemary, like other plant species found in the same open cobble bar/ riverscours prairie habitat, thrives in part due to the regular occurrence of massive, scouring floods. Regular floods eliminate competing woody species that would otherwise shade out and eliminate these unique plants, which rely on grassy openings. Populations of this rare species are threatened by water pollution, changes in river flow patterns, and non-native invasive plants.

Status and Trends

The Cumberland rosemary populations in the parks have been monitored since 2001, with National Park Service (NPS) and state (Tennessee and Kentucky) personnel conducting complete censuses at a limited number of accessible populations by counting and measuring all plants at those sites. Data are also collected on presence and cover of non-native invasive plant species at each site. Many previously unknown populations of rosemary were discovered during an effort by NPS crews to map cobble bars between 2005 and 2010. Prior to this project, the location and extent of most of these populations were unknown due to their inaccessibility at the bottom of deep river gorges lined by sheer cliffs, where many can only be reached by boat when flows are high.



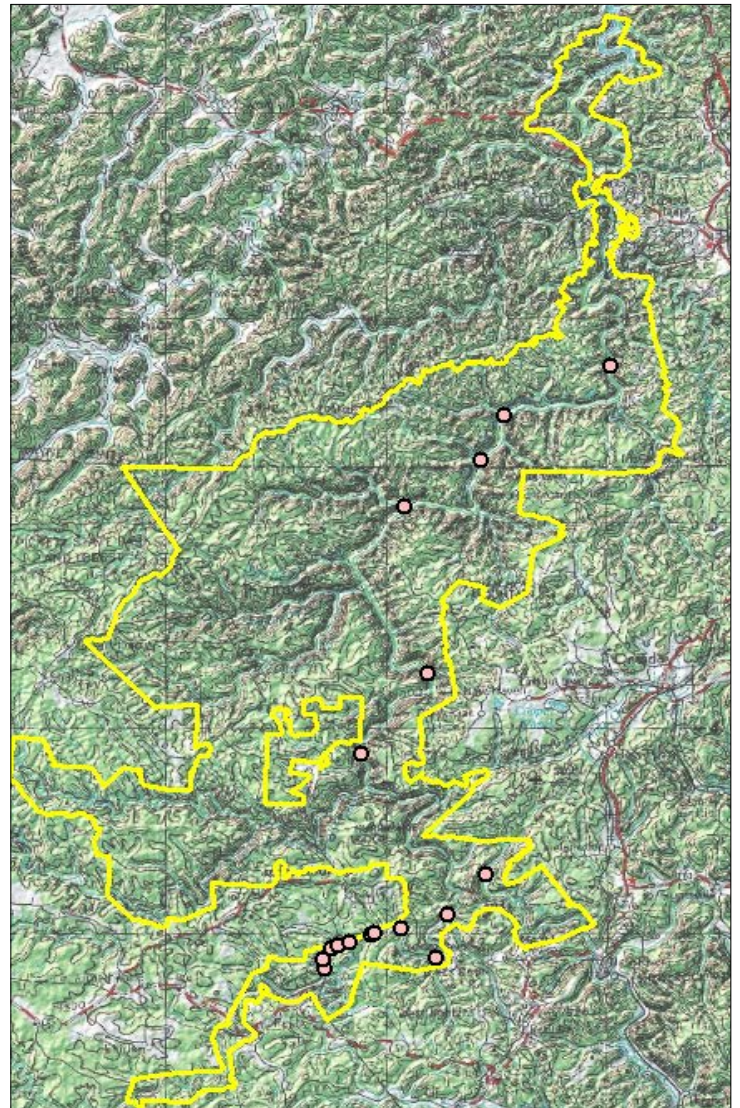
Distribution of Cumberland rosemary. Above, 79 mapped populations at Obed Wild and Scenic River. Right, 17 mapped populations in Big South Fork National River and Recreation Area.



Cumberland rosemary (*Conradina verticillata*). NPS photo.

Objective

Determine current status and track long-term trends in abundance, cover, and size class distribution within selected park populations.



Status and Trends (continued)

National Park Service staff conducted rosemary monitoring at 17 sites in February and March of 2021, eight at Big South Fork National River and Recreation Area and nine at Obed Wild and Scenic River. Compiling data collected since 2001 for eight rosemary populations at Big South Fork and since 2007, 10 populations at Obed, it appears two of the BISO populations are generally increasing in number of plants (clumps). Two are stable to slightly increasing, one is stable to slightly decreasing, two are generally decreasing, and one is decreasing dramatically and may soon be extirpated (one historical population is extirpated). Areal extent increased from 2020 to 2021 for all but one population, but is still lower than the 2017 maximum. Longer-term trends in this measure are more difficult to interpret because year-to-year values are quite variable.

Count data from the last five years at Obed suggest that one population is stable to slightly increasing, two populations are more or less stable, three populations are stable to slightly decreasing, three populations are decreasing, and one has been extirpated (although it only comprised a single plant). Data from before 2016 are less reliable, but longer-term trends suggest Obed population numbers are generally stable or slightly increasing for three sites, rising and then falling for four sites, and generally decreasing for the remaining two.

Areal extent decreased from 2020 to 2021 for all but two of the populations monitored; all populations show a drop in this measure over the last five years. Longer-term trends in areal extent (where available) are mostly downward.

Monitoring was planned for the same 17 sites in February of 2022. In addition, Appalachian Highlands Network (APHN) staff hope to repeat the rosemary mapping project at some point in the next five years to look for population-level changes in the distribution of this rare plant.

Discussion and Agency Collaboration

Rosemary counts were conducted by five APHN personnel, with assistance from one BISO employee. After several years of attempting to coordinate monitoring with state personnel from Tennessee and Kentucky, it came together this year, with two staff from the Tennessee Department of Environment and Conservation (TDEC) Division of Natural Areas and one from the Kentucky State Nature Preserves Commission (KSNPC) Plant Conservation Section joining us. Winter weather again presented scheduling challenges.

The NPS protocol for rosemary monitoring is the same as the states of Tennessee and Kentucky, which should permit integration of data across the range of the species. However, some past monitoring has been conducted during the growing season when tall grasses and other dense vegetation can obscure the low-growing rosemary, making detection difficult and calling into question the accuracy of growing-season results. NPS staff now conduct monitoring in winter, when other vegetation is less of a hindrance to accurate counts of the evergreen rosemary.

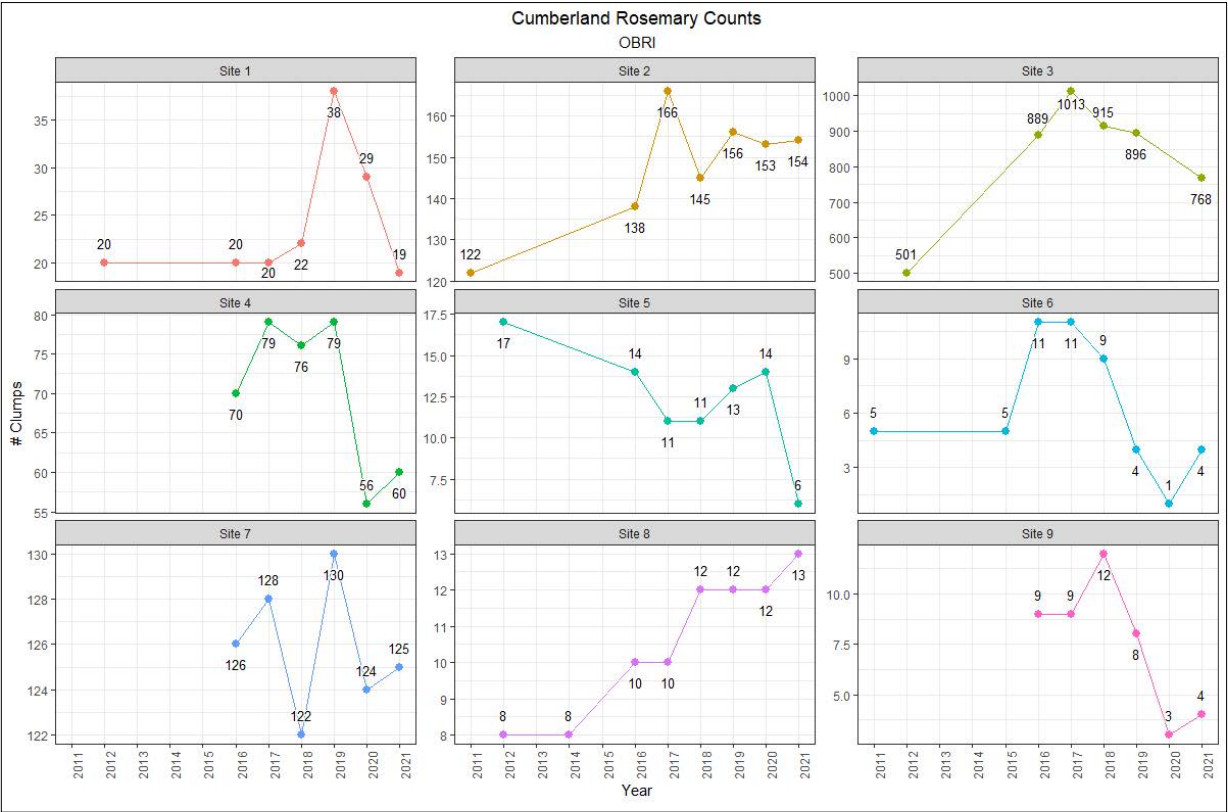


Above, Rosemary monitoring site at Big South Fork National River and Recreation Area in September. Below, the same site in March. NPS photos / APHN staff.

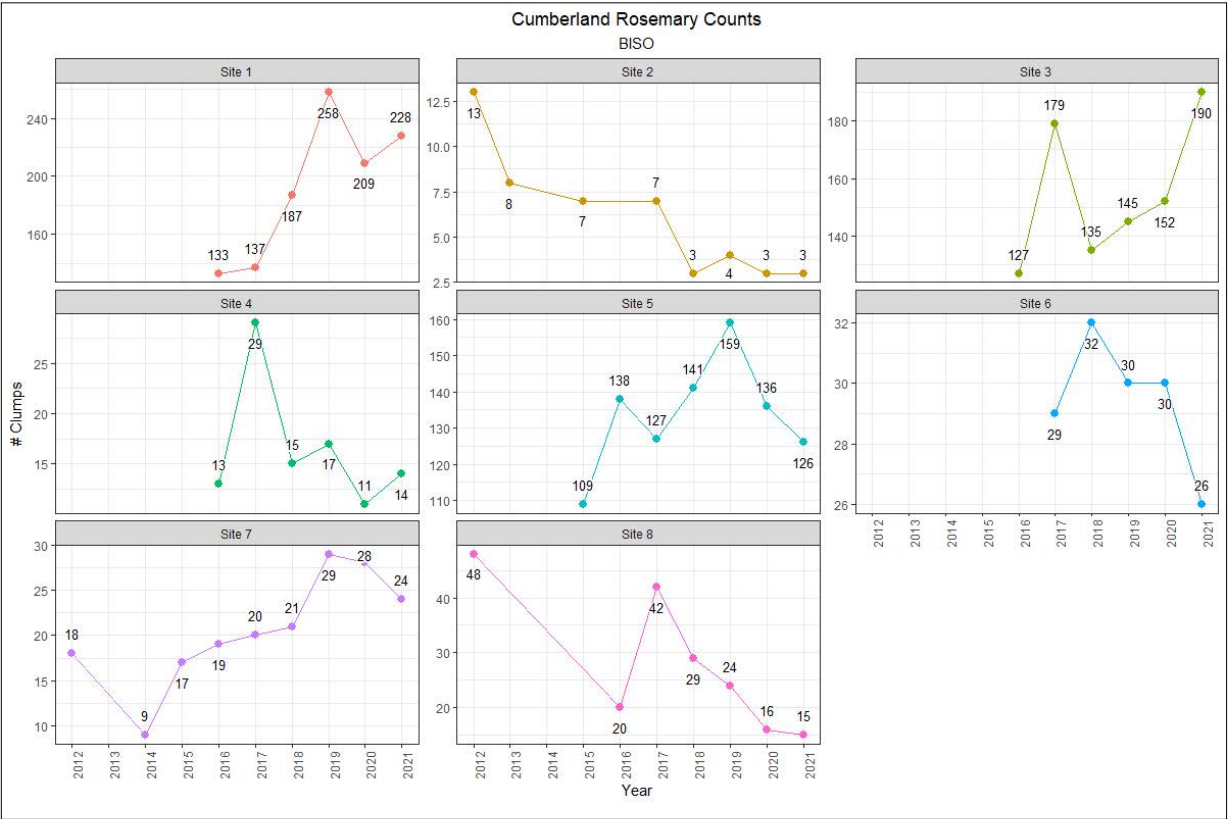


The US Fish and Wildlife Service (FWS) published a five-year status review of Cumberland rosemary in July of 2018. The Appalachian Highlands Network contributed monitoring data for this project. Review recommendations included better coordination and data sharing between the network and state resource agencies (TDEC and KSNPC), assessing impacts of recreation on rosemary populations, using APHN cobble bar monitoring data to inform analysis of rosemary data, and targeted monitoring efforts for locations where data are lacking, among others. We hope to continue working closely with state resource agencies on rosemary monitoring. Joint monitoring efforts help ensure consistent data collection methods and thereby improve analyses using data from multiple agencies.

Cumberland Rosemary Monitoring Data, Compiled from All Sources, OBRI 2011–2021 and BISO 2012–2021 (Provisional Data)

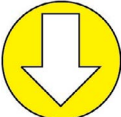
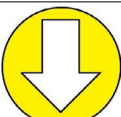
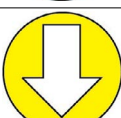


Rosemary count data from Obed Wild and Scenic River (above) and Big South Fork National River and Recreation Area (below). Intermittent counts dating back to 2001 (Big South Fork) and 2007 (Obed) are not shown to save space. Note y-axis scales vary between sites to accommodate the wide range of clump counts.



Cumberland Rosemary Monitoring Data, Compiled from All Sources, OBRI 2011–2021 and BISO 2012–2021 (Continued)

Table 1. Cumberland Rosemary Overall Assessment of Trends and Data Quality 2001–2021 (Provisional Data)

Park	Measure	Condition Status/Trend*	Resource Condition Comments and Interpretation
Big South Fork National River and Recreation Area 8 Monitored Sites	Number of plants		2 populations mostly increasing, 2 populations stable to slightly increasing, 1 stable to slightly decreasing, 2 generally decreasing, 1 decreasing dramatically
	Overall cover of rosemary		All but 1 population increased from 2010 to 2021, but all show an overall decrease from 2017 to 2021. Longer-term trends more variable.
Obed Wild and Scenic River 9 Monitored Sites	Number of plants		Over the last 5 years: 1 population stable to slightly increasing, 2 populations more or less stable, 3 populations stable to slightly decreasing, 3 populations generally decreasing.
	Overall cover of rosemary		All but 2 populations decreased from 2020 to 2021 and all decreased from 2017 to 2021. Longer-term trends (where available) are mostly downward, although 8 sites increased from 2016 to 2017.

* General trends, not necessarily statistically significant. Some data prior to 2016 were collected during the growing season, when detectability is lower and counts may therefore be less accurate.

Table 2. Symbol Key

Symbol	Condition Status	Symbol	Trend in Condition	Symbol	Confidence in Assessment
	Warrants Significant Concern		Condition is Improving		High
	Warrants Moderate Concern		Condition is Unchanging		Medium
	Resource is in Good Condition		Condition is Deteriorating		Low

Key Points for 2021

- 2021 was the sixth consecutive year in which Appalachian Highlands Network completed winter counts and cover measurements at a majority of monitoring sites. This more-consistent monitoring should provide a better understanding of population conditions and trends. We hope to build a 10-year dataset for more-detailed trend analysis
- Winter floods were again more intense than usual, although peak flows this year arrived in late March, after monitoring was completed. The intense scouring from these floods may be contributing to the general decline in rosemary cover since 2018. Flood stage at BISO's Leatherwood Ford gage and OBRI's Lilly Bridge gage were the highest on record, the former exceeding the record set in 2020 by nearly 3 feet (0.9 meters). While it is flood adapted, Cumberland rosemary may be scoured out by repeated record floods.
- Several populations appear to be declining, and smaller ones could soon disappear if trends continue. For example, BISO Site 2 has declined from more than 100 to only three clumps, while OBRI Sites 6 and 9 each have fewer than five clumps.

- Counts from BISO Site 1 nearly doubled from 2016 to 2019. The 2020 count at this site was down somewhat, but then ticked back up in 2021, with more than double the 2006 and 2011 counts (although those were growing-season counts).

Management Applications

- Provide critical status information on this protected species to park management
- Identify sites in need of control efforts for invasive exotic plants
- Provide feedback on the timing and success of park management and restoration activities
- Support park resource protection planning and land health reporting efforts

For More Information

APHN website:

<https://www.nps.gov/im/aphn/index.htm>

Evan Raskin, Assistant Data Manager/Biologist:

evan_raskin@nps.gov