

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: 2025 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 remaining populations of this imperiled species, and Obed Wild and Scenic River contains almost 75% of the total, as well as the largest known population remaining in existence (Emmott 2011). The Obed Wild and Scenic River is the most significant remaining stronghold for this species. Cumberland rosemary, like other plant species found in similar open cobble bar/river scour prairie habitat, thrives in part due to the regular occurrence of scouring floods. Regular floods eliminate competing woody species that would 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.

Emmott, R., 2011. Appalachian Highlands Network FY2011 Administrative Report (unpublished), Asheville, North Carolina.

Objective

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

Status and Trends

Cumberland rosemary populations in the parks have been monitored since 2001 (and annually since 2016), 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. 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.



Cumberland rosemary (*Conradina verticillata*). NPS / APHN.

Appalachian Highlands Inventory and Monitoring Network (APHN) staff conducted rosemary monitoring at 17 sites in February 2024, eight at Big South Fork National River and Recreation Area and nine at Obed Wild and Scenic River, assisted by three BISO employees, one agency partner (Tennessee Department of Environment and Conservation), and one volunteer.

At Big South Fork National River and Recreation Area (NRRA) over the last 10 years, the number of plants (clumps) rose then fell at six sites and generally decreased at the remaining two. Earlier data (going back to 2001 for some sites) are less reliable, but longer-term trends suggest counts are relatively stable or slightly increasing for two sites, falling after first rising for two sites, generally decreasing at three sites, and one has decreased dramatically and may soon be extirpated (one small historical population was extirpated before monitoring began). All 2025 counts were within the range of variation of prior counts at each site.



Left and above, APHN staff and interns monitor Cumberland Rosemary (*Conradina verticillata*) at Obed Wild and Scenic River and Big South Fork National River and Recreation Area. Park staff, a state partner and a volunteer also provided assistance with monitoring. NPS / APHN

Status and Trends (continued)

Areal extent increased for five sites between 2024 and 2025, but is still lower for all sites than in 2017. Longer-term trends for this measure are more difficult to interpret because year-to-year values are quite variable. All 2025 values were within the range of variation of prior values at each site.

The 2025 counts from three sites at Obed WSR were the lowest on record. One site was the highest on record, and the remaining five were within the range of variation of prior counts. Over the last 10 years, counts have been relatively stable for one site, stable to increasing for one site, rose then fell for two sites, and decreased for five sites (one to the point of being extirpated).

Areal extent increased from 2024 to 2025 for three of the sites monitored, but all populations except one show a drop in this measure over the last five years. Longer-term trends in areal extent (where available) are mostly downward, with 2025 areal extent being the lowest on record for six sites (including the site with highest-recorded clump count—see previous and below).

Note that a decrease in the number of clumps at a site could be the result of a general decline (clumps dying or being scoured out) or an improvement (previously discrete clumps expanding to become contiguous with neighboring clumps, resulting in fewer but larger clumps overall). Likewise, an increasing clump count may be the result of an expanding population with new individuals, or a declining population with larger clumps thinning out and losing continuity, resulting in more small, discrete clumps.

Future field work needs will be determined based on the results of an upcoming data analysis.

Agency Collaboration and Discussion

The APHN field methods for rosemary monitoring are the same as those used by the States of Tennessee and Kentucky, which should facilitate integration of data across the range of the species. In addition, joint monitoring efforts between NPS and state personnel over the past several years should promote consistent data collection and thereby improve the quality of any aggregate data analysis. One such analysis, the most current U. S. Fish and Wildlife Service five-year status review of Cumberland rosemary, was published in July 2023, and APHN monitoring data were used in their analysis.

Although Cumberland rosemary is adapted to grow in the scour zones along flashy streams, APHN staff suspect that unusually intense floods over the last decade may have had a negative impact on rosemary populations. To better quantify the frequency and duration of inundation events at each rosemary monitoring site, network staff have begun an effort to define and analyze high-flow events using remote cameras. These cameras are placed at rosemary sites for several months at a time (through at least one or two high-flow events) and are programmed to take photos at 15-minute intervals. When a camera is retrieved, network staff can review photos taken during high-flow events, visually determine when the site was inundated, and

correlate those dates and times with discharge data from the nearest USGS gage (see example photos below). Once inundation thresholds are known for each site, it will be possible to analyze inundation at each site for the entire period of record of the correlated gage, which may help to determine whether changes in rosemary populations are correlated with changes in flow regimes.



Remote camera photo of a BISO Cumberland rosemary monitoring site with the adjacent stream at base flow. NPS

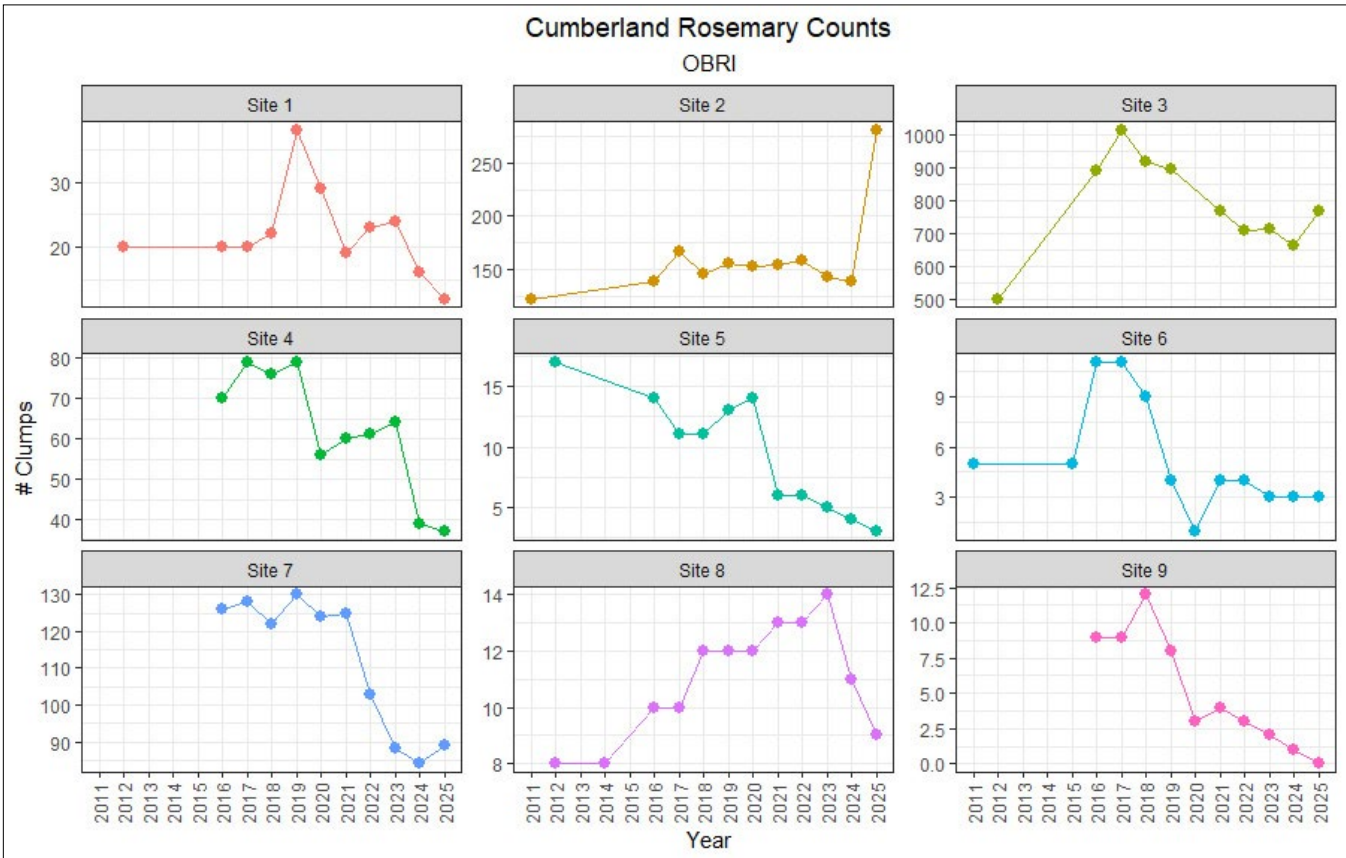


The same rosemary monitoring site completely inundated during a high-flow event. NPS

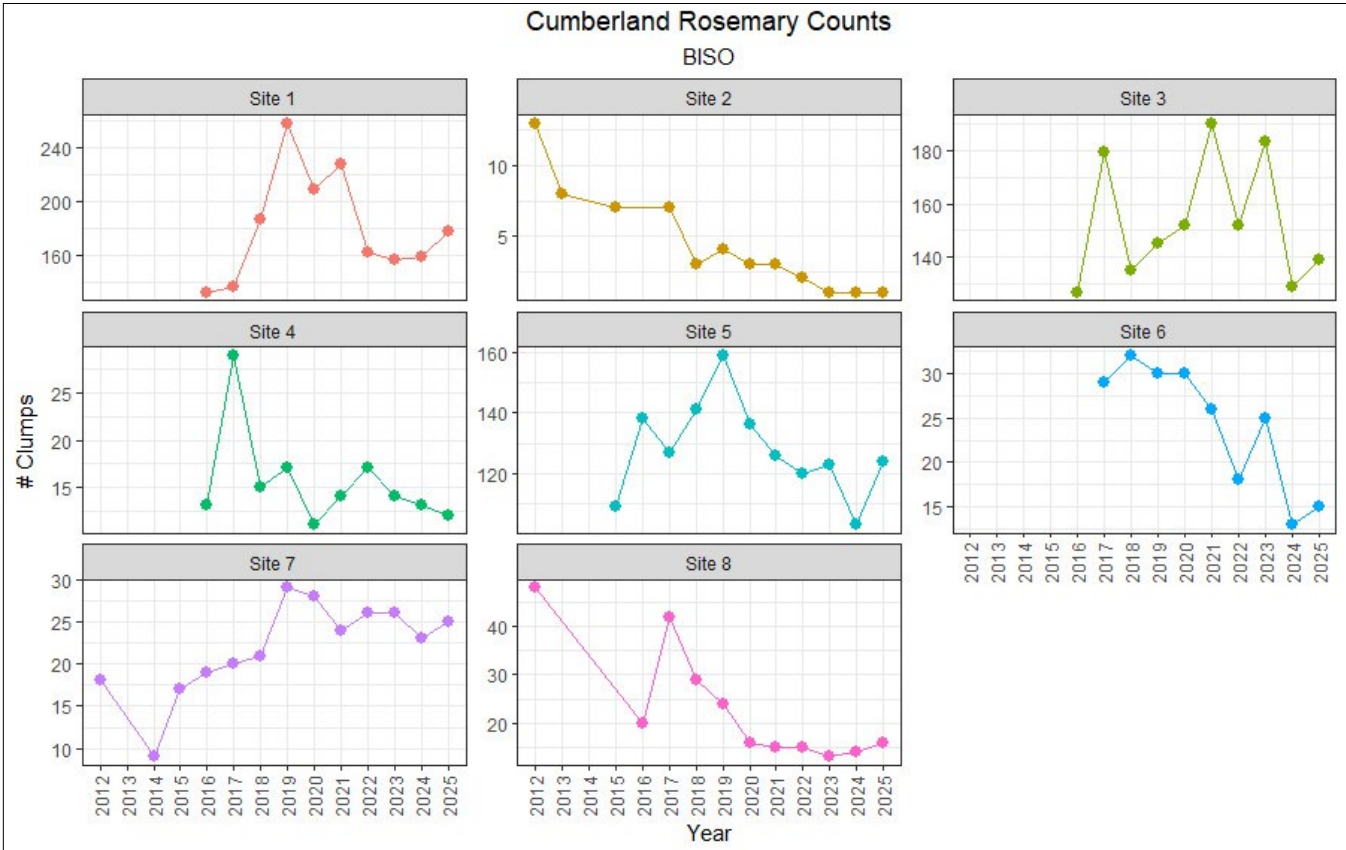
Management Applications

- 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.

Cumberland Rosemary Monitoring Data, Compiled from All Sources, OBRI 2011–2025 and BISO 2012–2025 (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 2011–2025 and BISO 2012–2025 (Continued)

Table 1. Cumberland Rosemary Overall Assessment of Trends and Data Quality 2001–2025 (Provisional Data).

Park	Measure	Condition Status/Trend*	Resource Condition Comments and Interpretation
Big South Fork NRRRA (Eight Monitored Sites)	Number of plants		Over the last 10 years: six sites increasing then decreasing, one generally decreasing, one decreasing dramatically. In 2025, all sites within the range of variation of prior counts.
	Overall cover of rosemary		Five populations increased from 2024 to 2025; all but one showed a net decrease from 2016 to 2025, although seven increased from 2016 to 2017. Longer-term trends more variable. In 2025, all sites within the range of variation of prior counts.
Obed WSR (Nine Monitored Sites)	Number of plants		Over the last 10 years: one site more or less stable, one stable to increasing, two increasing then decreasing, five populations generally decreasing (including one now extirpated). Three sites had the lowest count on record in 2025.
	Overall cover of rosemary		Three sites increased from 2024 to 2025, but all decreased from 2016 to 2025. Longer-term trends (where available) are mostly downward, although eight sites increased from 2016 to 2017. Six sites had the smallest total extent on record in 2025.

*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.

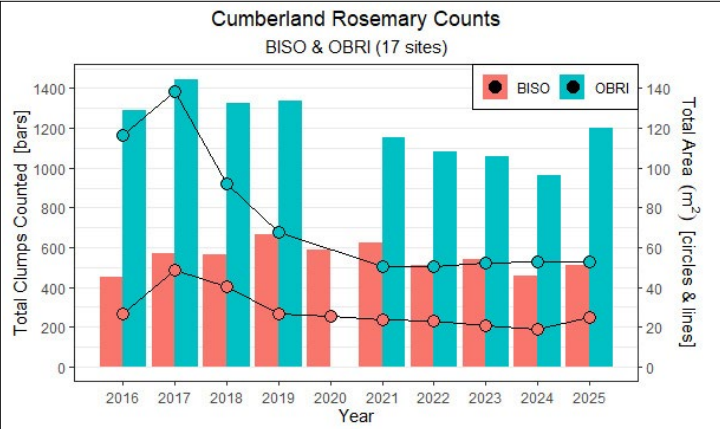
Table 2. Symbol Key.

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 2025

- 2025 was the 10th consecutive year the Appalachian Highlands Network has 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. A more-detailed data analysis is planned for this year.
- Several populations are declining, and smaller ones are beginning to disappear. No rosemary could be found at OBRI Site 9 in 2025 (down from 12 clumps in 2018). Counts at BISO Site 1 have declined from more than 100 to only one clump, while OBRI Sites 5 and 6 each have five or fewer clumps remaining.
- Intense scouring from record-setting high flows in recent years may be contributing to the decline in rosemary cover since 2017. While flood adapted, Cumberland rosemary may be scoured out by repeated intense floods.
- Flood stage at BISO’s Leatherwood Ford gage and OBRI’s Lilly Bridge gage were the highest on record during a high flow event in March 2021, the former exceeding the record set in 2020 by nearly 3 feet (0.9 meters).

- Since more-consistent monitoring began in 2016, data across sites for each park indicate somewhat variable counts with no clear trend at Big South Fork NRRRA and an overall downward trend in counts at Obed WSR (with 2025 an outlier, primarily due to one aberrant site count). Overall cover has almost uniformly fallen at both parks after a high in 2017, with a slight uptick this year at Big South Fork NRRRA. The drop in cover between 2017 and 2021 was especially sharp at Obed WSR, but seems to have been relatively stable since 2021. See graph below.



Cumberland rosemary counts since monitoring began in 2016. NPS / APHN

For More Information

[Appalachian Highlands I&M Network website](https://www.nps.gov/im/APHN/index.htm)
(<https://www.nps.gov/im/APHN/index.htm>)

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