



Cumberland Rosemary Status 2019

Obed Wild and Scenic River (OBRI)
Big South Fork National River and Recreation Area (BISO)

Importance: A Threatened Species

Cumberland rosemary (*Conradina verticillata*) is a Federally-listed Threatened species endemic to the upper Cumberland Plateau in Tennessee and Kentucky. BISO and OBRI contain 89% of all the remaining populations of this imperiled species, and OBRI 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 (especially the reduction in floods associated with record drought conditions experienced in recent years), and non-native invasive plants.

Objectives

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



Figure 1. Cumberland rosemary (*Conradina verticillata*).

Status and Trends

Cumberland rosemary populations in the parks have been monitored since 2001, with NPS and State (TN and KY) 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 & 2010. Prior to this project, the location and extent of most of these populations were unknown due to their inaccessibility in the bottom of deep river gorges lined by sheer cliffs, where many can only be reached by boat when flows are high.

NPS staff conducted rosemary monitoring at seventeen sites in February & March of 2019, eight at BISO & nine at OBRI. Compiling all data collected since 2001 for eight rosemary populations at BISO and ten populations at OBRI, it appears that one of the BISO populations is steadily increasing in number of plants (clumps), three are stable to slightly increasing, three are stable to slightly decreasing, and one is decreasing dramatically and may soon be extirpated (one historical population has already been extirpated). Areal extent decreased from 2018 to 2019 for all populations, and all but one have steadily decreased since 2017. Longer-term trends in this measure are more variable. Count data from the last four years at OBRI suggest that one population is steadily increasing, two populations stable to slightly increasing, four populations more or less stable, one population stable to slightly decreasing, one population steadily 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 OBRI population numbers are generally stable or slightly increasing for all sites. Areal extent decreased from 2018 to 2019 for all populations; six have decreased steadily since 2017.

Longer-term trends (where available) are generally downward, although eight sites increased from 2016 to 2017.

Monitoring is planned for the same seventeen sites in February or March of 2020. In addition, APHN staff hope to repeat the rosemary mapping project over the next three years to look for population-level changes in the distribution of this rare plant.

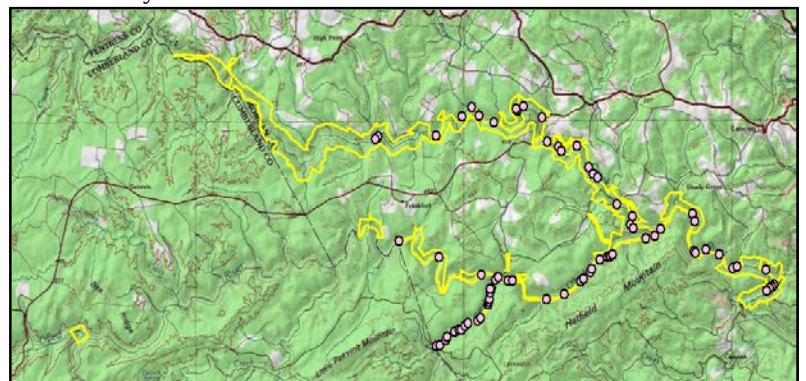
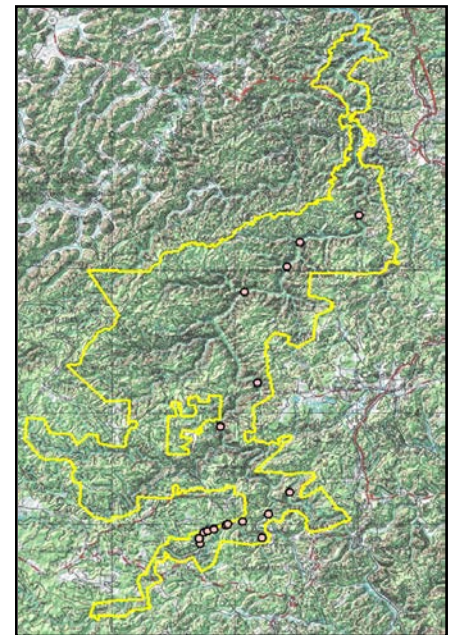


Figure 2. Distribution of Cumberland rosemary within BISO (top, 17 mapped populations) and OBRI (bottom, 79 mapped populations).

Agency Collaboration

Once again, park personnel provided valuable field assistance, with three BISO/OBRI Resource Management staff participating.

The NPS protocol for rosemary monitoring is the same as that being used by 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 (see Figure 3). NPS staff now conduct monitoring in winter, when other vegetation is less of a hindrance to accurate counts of the evergreen rosemary.

The US Fish & Wildlife Service (FWS) published a five-year status review of Cumberland rosemary in July of 2018. APHN contributed monitoring data for this project. Review recommendations include better coordination & data sharing between APHN & state resource agencies (TDEC & 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 work more closely with state resource agencies on rosemary monitoring in 2020 and beyond. Joint monitoring efforts should help ensure consistent data collection methods & thereby improve analyses using data from multiple agencies.



Figure 3. Rosemary monitoring site at BISO in September (top) & March (bottom).

**Cumberland rosemary monitoring data, compiled from all sources
OBRI – 2007-2019 and BISO – 2001-2019**

(Provisional data. Graphs are shown at different scales.)

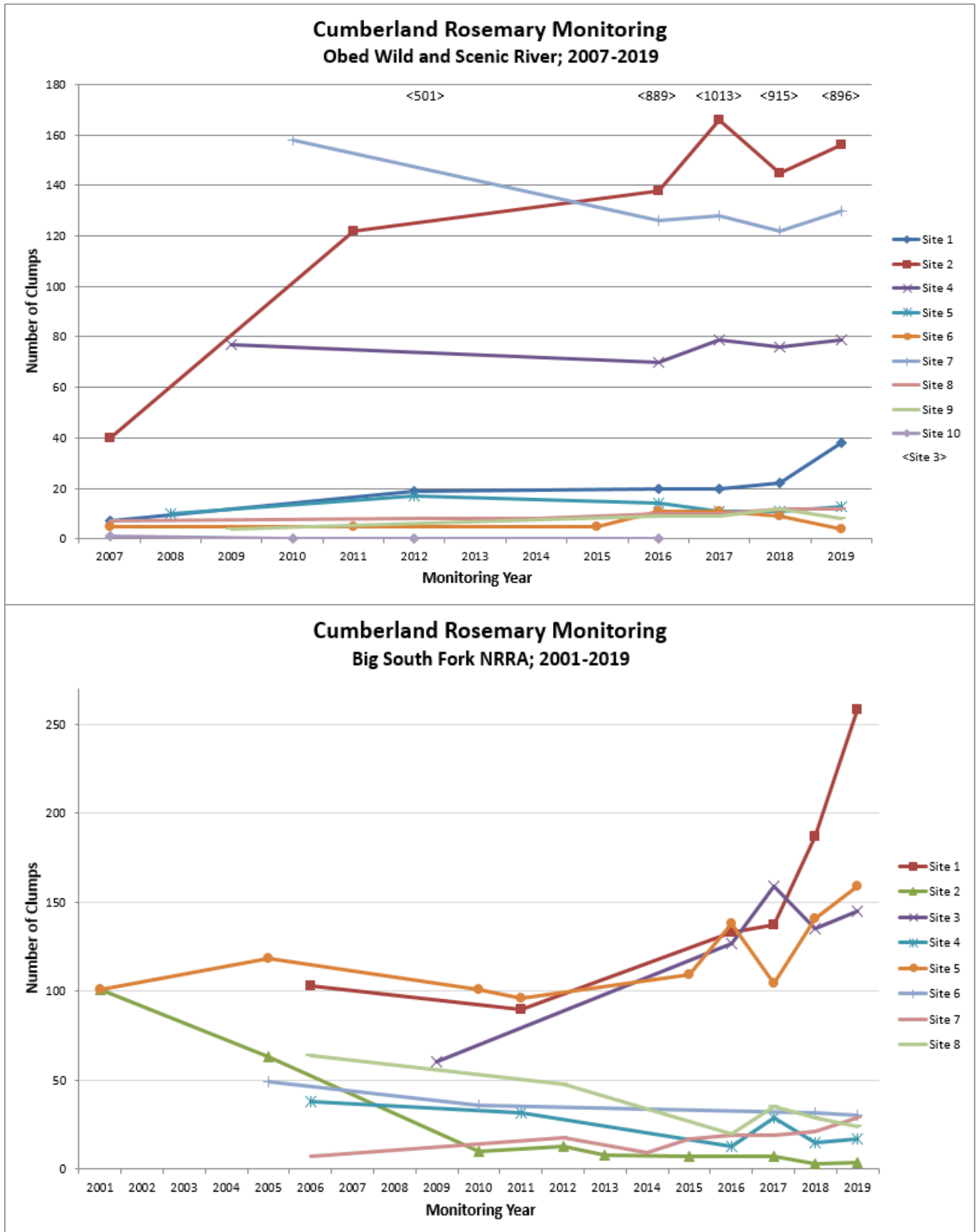
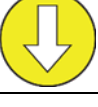


Figure 4. Rosemary count data from OBRI (top) & BISO (bottom). Counts for Site 3 at OBRI are shown enclosed in angle brackets; inclusion of these outlier data in the graph itself expands the scale of the y-axis to the point that the data for all other sites are nearly impossible to interpret.

Cumberland Rosemary - Overall Assessment of Trends and Data Quality 2001-2019

(Provisional data)

Park	Measure	Condition Status/Trend*	Resource Condition Comments & Interpretation
BISO 8 monitored sites	Number of plants		1 population steadily increasing, 3 populations stable to slightly increasing, 3 stable to slightly decreasing, 1 decreasing dramatically
	Overall cover of rosemary		All populations decreased from 2018 to 2019; all but one have steadily decreased since 2017. Longer-term trends more variable.
OBRI 9 monitored sites	Number of plants		Over the last 4 years, 1 population steadily increasing, 2 populations stable to slightly increasing, 4 populations more or less stable, 1 population stable to slightly decreasing, 1 population steadily decreasing.
	Overall cover of rosemary		All populations decreased from 2018 to 2019; 6 have decreased steadily since 2017. Longer-term trends (where available) are generally 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.

Key Points for 2019

- 2019 was the fourth consecutive year in which APHN completed winter counts & cover measurements at a majority of monitoring sites. This more consistent monitoring should provide a better understanding of population conditions & trends.
- Winter floods were more intense than usual, with some notable high-water events in February 2019. This scouring likely contributed to the decline in rosemary cover since 2018, and follows notable high-flow events in April 2017. High water also complicated field scheduling & logistics.
- Several populations appear to be declining, one of which may soon be extirpated if the trend continues.
- Counts for one BISO population nearly doubled from 2016 to 2019. It will be interesting to see if this trend continues.

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

Contact Information

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Figure 5. Winter rosemary monitoring at OBRI in March, 2018.