



Status of Cobble Bar Communities 2018

Big South Fork NRR (BISO)
Obed Wild & Scenic River (OBRI)

Importance: A rare and imperiled plant community

Cobble bars, or "Cumberland river scour prairies" are unique plant communities endemic to the Cumberland Plateau of Tennessee and Kentucky. Ranked by NatureServe as Globally Imperiled (G2) and vulnerable to extinction throughout their range, they exist on open, flood-scoured exposures of bedrock, cobble or gravel along large rivers. Fewer than 500 acres of cobble bar habitat remain in existence, with the highest quality examples being inside Big South Fork National River and Recreation Area and Obed Wild and Scenic River. Typically thick with grasses and flowering herbs, these river prairies share many characteristics with the tallgrass prairies of the American Midwest. Whereas fire is the driving force sustaining Midwestern prairies, in the bottom of the deep river gorges of the Cumberland Plateau, water is the ecological driver. Raging floods wash over these habitats on multiple occasions each year, scouring out species that are not adapted to disturbance, including most trees and other woody species. Grasses, herbs, and some low shrubs thrive under these punishing conditions. Twenty-seven rare plant species, including some that grow nowhere else in the world, also flourish in these riparian prairies. Among these are two Federally-listed species - Cumberland rosemary (*Conradina verticillata*) and Virginia spiraea (*Spiraea virginiana*). No other habitat type within these two parks supports such a large assemblage of globally rare plant species.

Objectives

Track long-term trends in cobble bar community structure and integrity by measuring:

- Cover and density of woody species, grasses and herbs
- Substrate composition (sand, gravel, cobble, boulder, coal sediment)
- Presence and cover of invasive exotic species
- Abundance of selected rare plant species

OVERVIEW

The distribution of cobble bars in the parks was unknown prior to the beginning of this project in 2005. Over the course of several years, APHN crews and park staff mapped 120 river miles, by boat, during winter – the only time when water levels are high enough to make navigation possible. During the course of cobble bar mapping, 64 previously unknown populations of Cumberland rosemary were documented, proving OBRI to be the most significant remaining stronghold for this imperiled species, range-wide. BISO and OBRI protect 89% of all remaining populations.

Monitoring plots: 103 permanent transects have been established at 21 sites. Half the sites in each park are monitored each year, with the other half being monitored the following year, so that each site is monitored once every two years. Monitoring sites at OBRI were selected within stream reaches, using stratified random selection procedures. At BISO, where there are many fewer sites, all accessible sites are being monitored. Each site has been monitored at least three times, using point intercept and line intercept methods to assess vegetation structure and substrate composition (including coal deposition), as well as qualitative cover estimates for all non-native species. Counts and cover measurements for Cumberland rosemary are being collected separately, in winter, because the dense vegetation present through the growing season makes counts during cobble bar community monitoring unreliable.

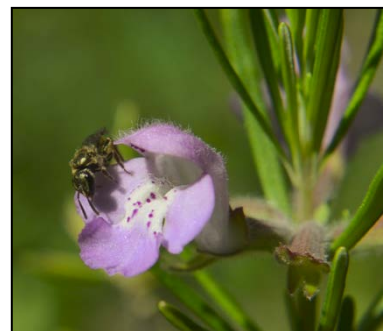


Figure 1. Cumberland rosemary is a Federally-listed Threatened plant endemic to Cumberland Plateau cobble bar and boulder bar habitat; BISO and OBRI protect 89% of all remaining populations.



Figure 2. Fewer than 500 acres of cobble bar habitat remain in existence, with the highest quality examples located inside Big South Fork National River and Recreation Area and Obed Wild and Scenic River.

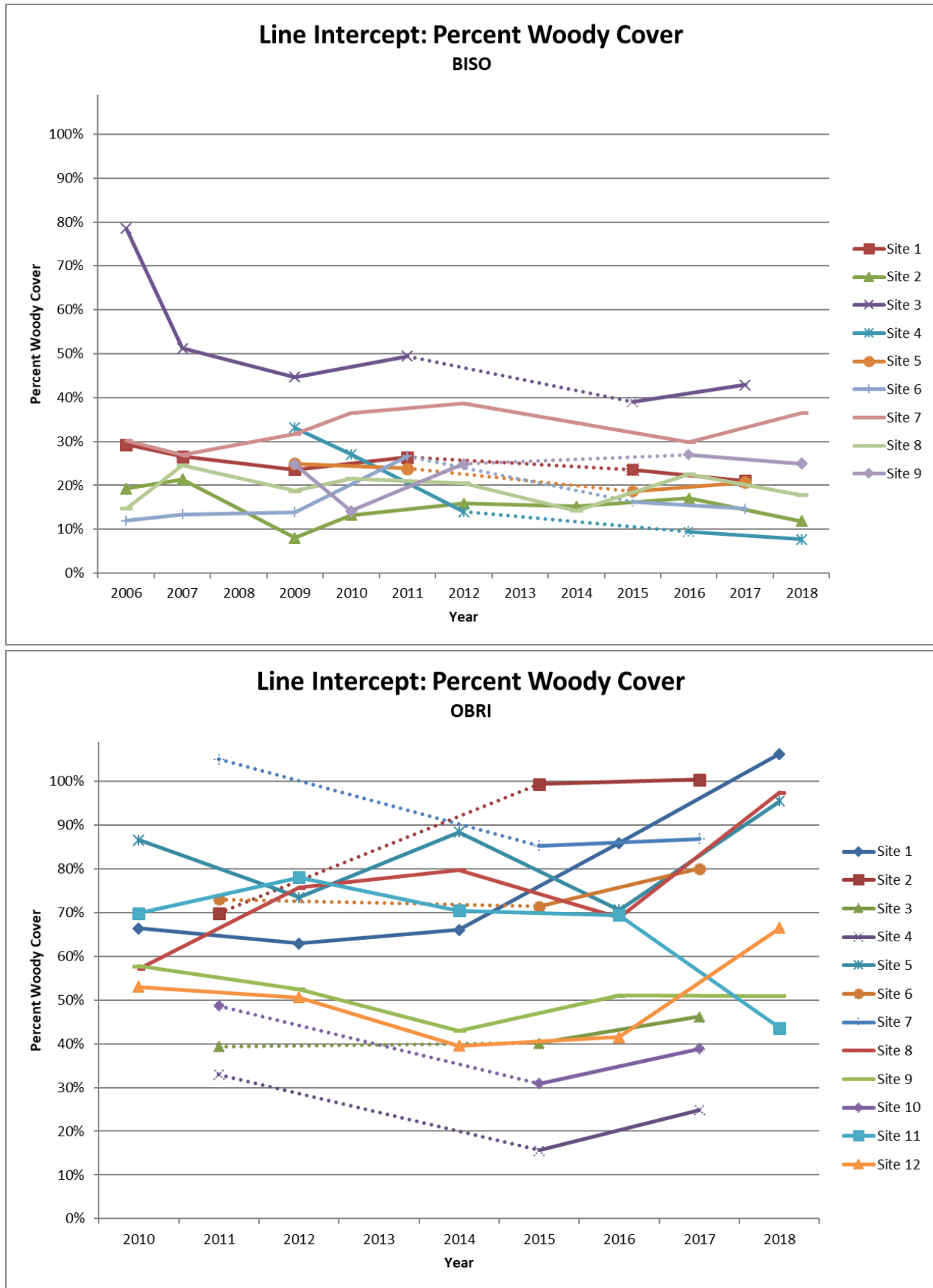


Figure 3. The graphs above illustrate the greater tall (> 1m) woody cover on OBRI cobble bars vs. BISO sites; OBRI sites also appear to be more variable, although only a few years of data are currently available. Tall woody cover is a measure of succession toward canopy closure, which would endanger these prairie-like habitats. Dotted lines indicate years in which scheduled monitoring did not occur.

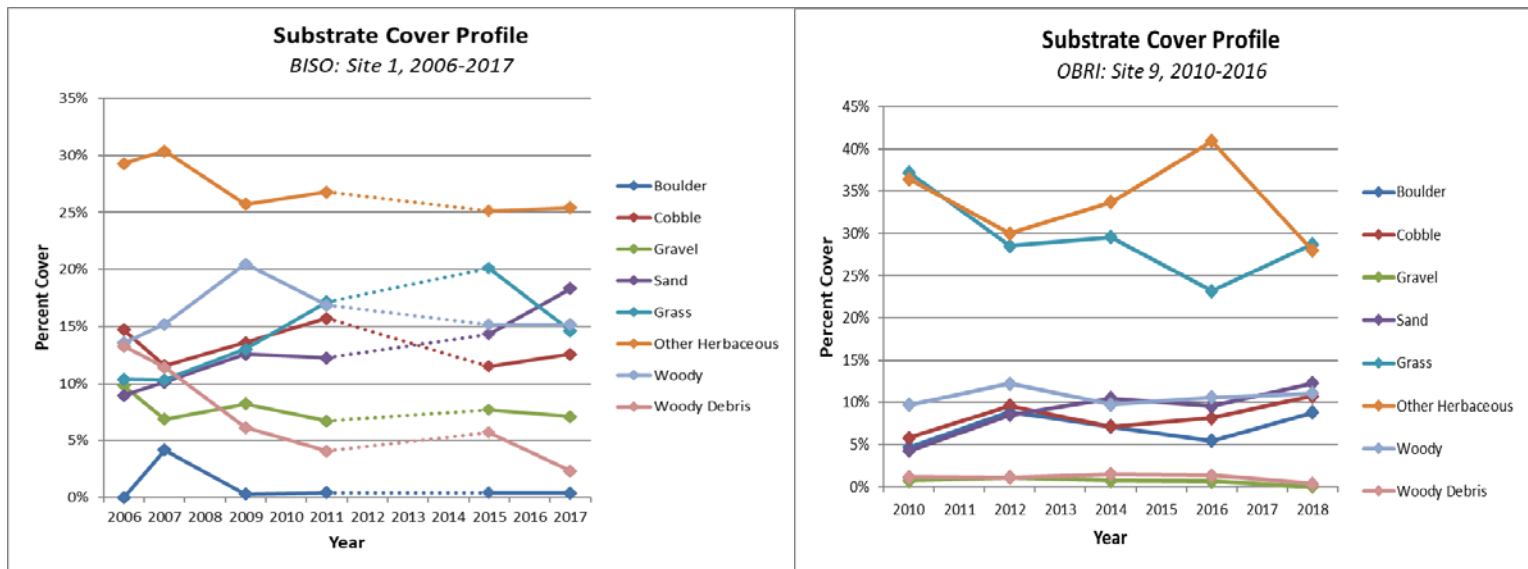


Figure 4. Trends in substrate composition and community structure at two sampling sites, showing changes in relative abundance of different substrate categories recorded by point-intercept sampling. The BISO Site 1 graph (left) illustrates the effect of the all-time record droughts of 2007-2008: an increase in woody species with a concurrent decrease in herbs, due to the decrease in frequency of large-volume scouring floods. Dotted lines indicate years in which scheduled monitoring did not occur. The OBRI Site 9 graph (right) shows an apparent trend of forbs (“Other Herbaceous”) gaining dominance over grasses until 2016, then reversing.

OVERALL ASSESSMENT OF CONDITION AND TRENDS: 2006/2010 – 2018

(provisional data)

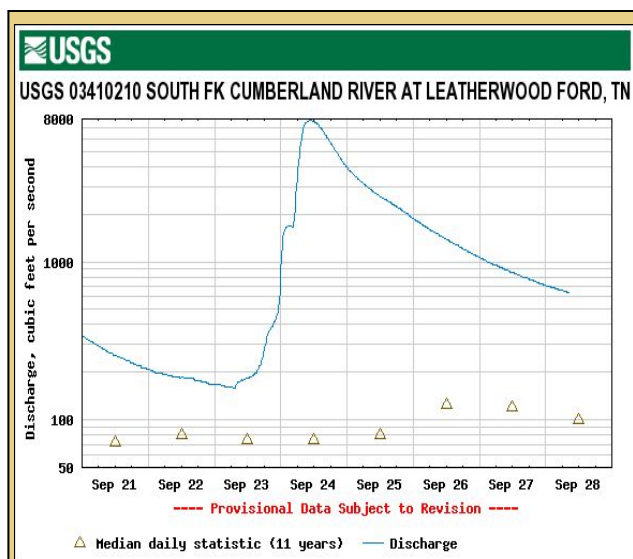
Park	Specific Measure	Condition Status/Trend	Resource Condition Comments and Interpretation
BISO (9 sites)	% cover of large shrubs and trees; % cover of grasses & herbs		- <u>Tall woody cover</u> is stable or decreasing at 6 sites. - <u>Grass cover</u> is increasing or stable at 8 sites. - <u>Herbaceous cover</u> is increasing or stable at 3 sites. (There are 6-8 years’ quantitative data available for these sites, spanning 3 years of severe drought and 2 years of heavy flooding.)
	Number of plants; overall cover of rosemary		- <u>Number of plants</u> : 3 populations stable to slightly increasing, 3 stable to slightly decreasing, 1 decreasing dramatically, 1 with counts highly variable, 1 historical population extirpated - <u>Rosemary cover</u> : 2 populations increasing, 3 relatively stable, 2 decreasing, 1 variable with no clear trend
	Percent cover of invasive exotics		Invasive exotic species represent less than $\leq 8\%$ total cover at 6 sites, and cover is relatively stable or decreasing at 5 sites. The 4 sites that have $>12\%$ total cover and/or increasing trends are a concern.
OBRI (12 sites)	% cover of large shrubs and trees; % cover of grasses & herbs		- <u>Tall woody cover</u> is stable or decreasing at 5 sites. This measure is higher at almost all OBRI sites (avg 70%) than BISO sites (avg 22%), with some OBRI sites now having only a small opening left in the canopy. - <u>Grass cover</u> is increasing or stable at only 4 sites. - <u>Herbaceous cover</u> is increasing or stable at 10 sites.
	Number of plants; overall cover of rosemary		- <u>Number of plants</u> : 6 populations relatively stable, 2 increased noticeably then apparently stable over the last 3 years, 1 decreased noticeably then apparently stable the last 3 years, 1 extirpated - <u>Rosemary cover</u> : 1 population increasing, 3 relatively stable, 3 decreasing, 1 decreased noticeably then apparently stable over the last 3 years, 1 variable with no clear trend
	Percent cover of invasive exotics		Invasive exotic species represent less than 5% total cover at 9 sites, and appear to be relatively stable or decreasing at 9 sites.

Symbol Key:

Condition Status		Trend in Condition		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



In the steep-walled sandstone gorges of the Cumberland Plateau, heavy rainfall can drastically raise water levels within hours of a storm. Violent floods are crucial to the long-term survival of the rare, prairie-like cobble bar communities along the rivers' edges.



Hydrograph from Leatherwood Ford gage at Big South Fork, illustrating one of the river's characteristic sudden rises – in this case from 170 to 8,000 cfs (cubic feet per second) in less than 24 hours.

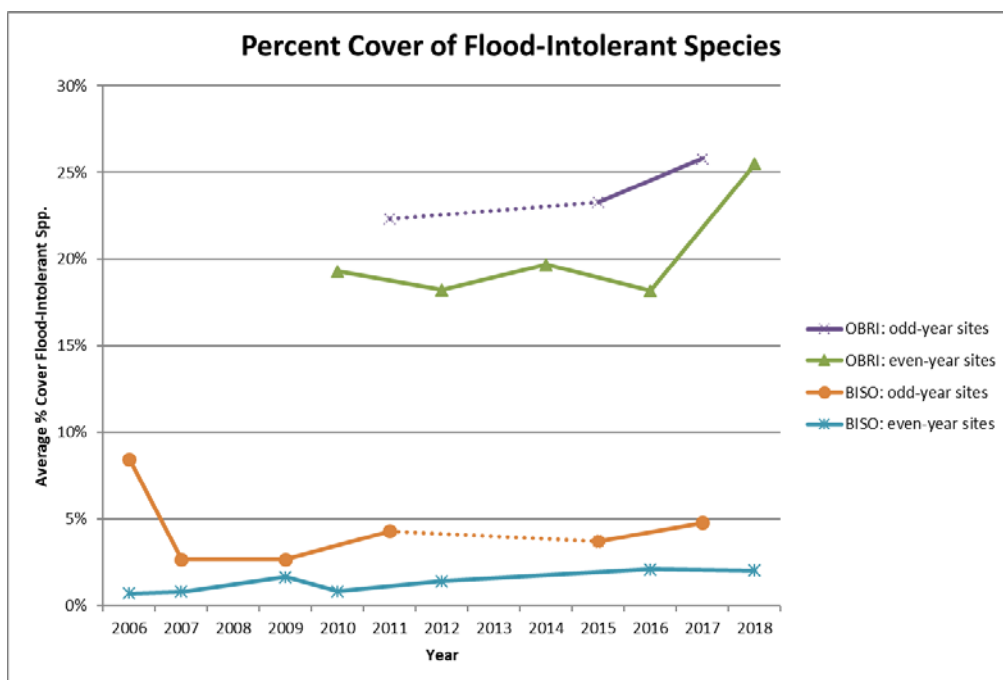


Figure 5. Cover of all flood-intolerant shrubs and trees, averaged across sites by park, suggests responses of flood-intolerant woody species to years of drought and high-rainfall/flood years, as well as the higher woody cover of OBRI sites compared to BISO sites. Encroachment by flood-intolerant species is of greater concern than increasing cover by flood-tolerant trees and shrubs that normally occur at low density in these riparian prairies, because it may signal a change in fundamental community dynamics. Dotted lines indicate years in which scheduled monitoring did not occur.

Information gathered from this monitoring, in concert with water quality monitoring, will provide park managers with a baseline against which to assess future changes in this imperiled community and its rare inhabitants, detrimental resource changes associated with water quality degradation and disruptions of natural hydrological cycles, as well as early detection of invasive exotic species.

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