



Ozone and Foliar Injury Summary, 2017

Overview

Ozone is a gas that occurs naturally in the lower levels of the earth's atmosphere. However, human-produced pollution can become an unnatural source of additional ozone that results in injury to humans and plants. The Cumberland Piedmont Network (CUPN) has been monitoring ozone and its injury to plants since 2008 to fulfill the National Park Service (NPS) mandate to protect its resources and preserve the enjoyment of these resources. Beginning in 2017, ozone concentration sampling was discontinued and foliar injury sampling continues uninterrupted.

The CUPN Ozone and Foliar Injury Program is designed to provide a network-wide assessment of status and trends in ozone foliar injury levels. All 14 CUPN park units are sampled on a rotational schedule outlined in CUPN's ozone concentration and foliar injury protocol. This brief summarizes data collected in August 2017 at Little River Canyon National Preserve (LIRI). Ozone and foliar injury reports are available upon request or at <http://go.nps.gov/cupn>. There were two ozone foliar injury sites at Little River Canyon NP in 2017: Feed Plot (site elevation 1,466 feet [ft] or 450 meters [m]) and Road 02 Feed Plot (site elevation 1,398 ft or 426 m). Site map and photographs are shown in Figures 1, 2, and 3 respectively.

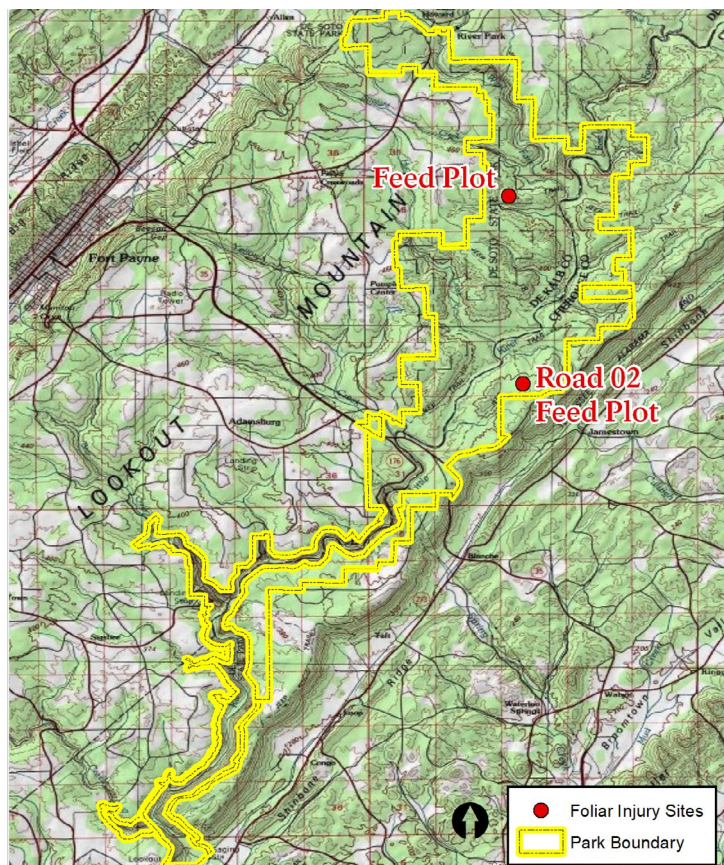


Figure 1. Map of ozone foliar injury sites. NPS map by Lillian Scoggins.



Figure 2. Left, ozone foliar injury sampling site at the Feed Plot. NPS photo by Johnathan Jernigan.



Figure 3. Right, ozone foliar injury sampling site at the Road 02 Feed Plot. NPS photo by Johnathan Jernigan.

Significant Findings

Foliar injury

In 2017, 427 plants at three CUPN parks were inspected for foliar injury. Of the 161 plants examined at Little River Canyon National Preserve, no plants were suspected to have foliar injury. The results of the survey are summarized in Table 1.

Table 1. Results of the 16 August 2017 ozone foliar injury surveys at Little River Canyon National Preserve.

Site Name	Common Name	Scientific Name	Number Inspected	Number w/ Injury	Ozone-Caused?
Feed Plot	Yellow Poplar	<i>Liriodendron tulipifera</i>	2	0	N/A
Feed Plot	Winged Sumac	<i>Rhus copallinum</i>	30	0	N/A
Feed Plot	Blackberry	<i>Rubus</i> sp.	30	0	N/A
Road 02 Feed Plot	Sweetgum	<i>Liquidambar styraciflua</i>	30	0	N/A
Road 02 Feed Plot	Sourwood	<i>Oxydendrum arboreum</i>	4	0	N/A
Road 02 Feed Plot	Wild Black Cherry	<i>Prunus serotina</i>	3	0	N/A
Road 02 Feed Plot	Winged Sumac	<i>Rhus copallinum</i>	30	0	N/A
Road 02 Feed Plot	Blackberry	<i>Rubus</i> sp.	30	0	N/A
Road 02 Feed Plot	Sassafras	<i>Sassafras albidum</i>	2	0	N/A

Significant Findings

The NPS Air Resources Division periodically evaluates status and trends of air pollutants in parks using monitors in and near those parks. The most recent evaluation for ozone concentration and ozone foliar injury was in 2015. The results for Little River Canyon National Preserve are shown in Figure 4.

2015 Ozone Summary

Air Quality Indicator	Specific Measure	Condition Status/Trend*	Rationale
Ozone	Human Health: Annual 4th-highest 8hr concentration		Condition: Human health risk from ground-level ozone warrants moderate concern at Little River Canyon N PRES. This status is based on NPS Air Resources Division benchmarks and the 2011–2015 estimated ozone of 65.2 parts per billion (ppb). Trend: No trend information is available because there are not sufficient on-site or nearby ozone monitoring data. Confidence: The degree of confidence at Little River Canyon N PRES is medium because estimates are based on interpolated data from more distant ozone monitors.
	Vegetation Health: 3-month maximum 12hr W126		Condition: Vegetation health risk from ground-level ozone is in good condition at Little River Canyon N PRES. This status is based on NPS Air Resources Division benchmarks and the 2011–2015 estimated W126 metric of 6.6 parts per million-hours (ppm-hrs). The W126 metric relates plant response to ozone exposure. A risk assessment concluded that plants in at Little River Canyon N PRES were at high risk for ozone damage (Kohut 2007; Kohut 2004). See list of ozone-sensitive plant species. Trend: No trend information is available because there are not sufficient on-site or nearby ozone monitoring data. Confidence: The degree of confidence at Little River Canyon N PRES is medium because estimates are based on interpolated data from more distant ozone monitors.
* Condition assessments for contiguous U.S. parks use the Inverse Distance Weighted (IDW) interpolation method is used to estimate 5-year average (2011–2015) values. Trend analyses use 10 years (2006–2015) of data from on-site or nearby monitors.			

Symbol Legend

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

Figure 4. Stats and trends in ozone concentration and ozone foliar injury for Little River Canyon NP. Image obtained from <https://www.nature.nps.gov/air/data/products/parks/index.cfm>.

Future Monitoring

Ozone-induced foliar injury will be monitored by the Cumberland Piedmont Network per its one-year-on/five-year-off panel design.

About the Cumberland Piedmont Network

In 1999, the National Park Service initiated a long-term ecological monitoring program, known as “Vital Signs Monitoring,” to provide the minimum infrastructure to allow more than 270 national park system units to identify and implement long-term monitoring of their highest-priority measurements of resource condition. The overarching purpose of natural resource monitoring in parks is to develop scientifically sound information on the current status and long-term trends in the composition, structure, and function of park ecosystems, and to determine how well current management practices are sustaining those ecosystems.

The NPS Vital Signs Monitoring Program addresses five goals for all parks with significant natural resources:

- Determine the status and trends in selected indicators of the condition of park ecosystem,
- Provide early warning of abnormal conditions,
- Provide data to better understand the dynamic nature and condition of park ecosystems,
- Provide data to meet certain legal and Congressional mandates, and
- Provide a means of measuring progress towards performance goals.

Effective long-term management and stewardship of natural resources in the Cumberland Piedmont Network begins with baseline knowledge of these resources. To acquire this knowledge, an inventory program was established by the National Park Service with the goals of acquiring baseline information for a variety of resources, from bibliographic information to species occurrence and distribution.

For More Information

CUPN Home Page:

<http://science.nature.nps.gov/im/units/cupn/index.cfm>

CUPN Reports & Publications:

<http://science.nature.nps.gov/im/units/CUPN/publications.cfm>

About the NPS Inventory & Monitoring Division:

<http://science.nature.nps.gov/im/index.cfm>

Data Downloads via the Natural Resource Information Portal:

<http://irma.nps.gov>