

TO: Caleb J. Osborne, Associate Director, OWQ 

THROUGH: Sarah Clem, Branch Manager, OWQ 

FROM: Nathan Wentz, Ecologist Coordinator, OWQ 

DATE: October 18, 2017

SUBJECT: 2017 Buffalo River Nuisance Algae Report

2017 Buffalo River Nuisance Algae Report

Notification of Bloom

The ADEQ Nuisance Algae Complaint tool received two notifications of nuisance algae blooms on the Buffalo River near Sand Hole which were observed on August 4, 2017 (Figure 1). Complaints were received by Ms. Jessie Green and Mrs. Carol Bitting on August 6, 2017 and August 7, 2017, respectively. ADEQ Office of Water Quality Planning Branch investigated the reported occurrence of the lower event approximately 1 mile below Tomahawk Creek confluence. Planning Branch representatives were Mandy Bates and Tate Wentz. National Park Service staff Shawn Hodges and Ashley Rodman assisted Planning in accessing and measuring extent of the events. Three separate locations were reported to ADEQ (Figure 1) and spanned approximately 4.5 miles, starting downstream of the confluence of Brush Creek and terminating 1 mile downstream of Tomahawk Creek confluence. Further discussion with complainants indicated that the lower event near Rocky Hollow was significantly larger than the other two.

Investigation

Investigation began approximately 2.5 miles downstream of the beginning of the lowest reported location near the Tomahawk Creek confluence. The river was accessed via Sanders Field Road at a large pool with minimal visible flow. One of three potential algal taxa (herein referred to as taxon A) appeared to be dominant in this pool, and total algal coverage was estimated to be >50% of the bottom substrate. Increasing areal coverage and density of taxa B and C were observed as the team progressed upstream to the coordinates provided by one of the complainants. However, habitats seemingly suitable for colonization were observed with no or minimal algal coverage.

Because of sporadic occurrence and coverage, it was determined in field that an individual bloom event would be based upon distance from upstream or downstream events/blooms and areal coverage. For the purpose of this investigation, an individual bloom would be considered distinct from others when a minimum of 100 linear meters separated a previous location and covered greater than 50% of wetted channel. *In-situ* dissolved oxygen, dissolved oxygen saturation, temperature, specific conductance, and pH were collected at the upper, middle, and lower portions of each bloom event. Parameters were collected from a YSI ProDSS Multi-Parameter handheld meter. Visual estimates of substrate type, depth, and measured wetted width were also recorded.

Bloom 1 began approximately 1 mile downstream of Tomahawk Creek confluence and extended unabated through a pool-glide complex for 555 meters. Average pool depth was 1.5 meters. Average in-situ parameters for bloom 1 were 9.16 mg/L dissolved oxygen, 114.3 % saturation, 230.5 $\mu\text{S}/\text{cm}$, 27.1°C, and 7.67 pH. Algae observed in the pool were loose, unattached, and gelatinous forms ranging in color from dark to neon green (Figure 2). Algae present in shallow, higher velocity habitat were more filamentous, developed long strands, and were attached to the substrate (Figures 3-4).

Bloom 2 length was the shortest measured at 380 meters. It began approximately 380 meters downstream of Bloom 1 terminus. Average in-situ readings were 10.25 mg/L dissolved oxygen, 130.3 % saturation, 226.8 $\mu\text{S}/\text{cm}$, 27.5 °C, and 8.03 pH.

Bloom 3 was the most extensive in terms of coverage, density, and habitats. Bloom length was approximately 930 meters and began almost 1 kilometer downstream from bloom 2. Average in-situ readings were 10.3 mg/L dissolved oxygen, 130.5 % saturation, 228 $\mu\text{S}/\text{cm}$, 27.5 °C, and 7.76 pH.

For all blooms, preferred substrate appeared to be small diameter gravel and was less dense in areas with bedrock, boulder, and cobble substrate. The team observed that greater current velocity appeared to reduce algal density; however, long filamentous strands were present amidst higher velocity riffles. Other variables are likely influencing algae presence in pools. Between blooms 2 and 3, multiple habitat types were observed to be free from any form of algae.

Following investigation of blooms between Tomahawk Creek confluence and Sanders Field, the team evaluated two downstream access points, North Maumee and Highway 14 (Dillard's Ferry). At both sites, visually estimated coverage of filamentous and loosely attached algae was $\geq 75\%$ of channel width. Communication with a National Park Service Ranger indicated that algae was extensive from Spring Creek to Dillard's Ferry on August 10, 2017. He was unaware of any indication of algal presence downstream to Rush.

Flow conditions were evaluated from the USGS 07056000 Buffalo River gage near St. Joe. On the day of the investigation, gage height (feet) was 3.6 ft (Figure 5).

Updates:

August 14, 2017

National Park Service staff indicated little to no change in bloom conditions near Sand Hole. This bloom was first observed on August 4, 2017, first reported on August 7, 2017 and evaluated by NPS staff on August 9, 2017. NPS staff also evaluated the river below Bear Creek and Brush Creek and observed some dislodged algae floating in the current, but minimal coverage.

August 17, 2017

Heavy rains fell for several day throughout the watershed. The Buffalo River near St. Joe rose approximately 2.5' (Figure 5).

August 25, 2017

Algae reported in isolated pools of Brush Creek by NPS staff (Figure 6). The river crested, but visibility is poor to evaluate whether a scour occurred.

August 31, 2017

NPS staff reported to ADEQ that no major algae coverage was observed at Highway 14 (Dillard's Ferry) as of August 29, 2017. Algal blooms were observed on August 28, 2017 within the Lower Wilderness Area and on August 30, 2017 above Highway 65 near Mt. Hersey (Figure 7-8). Bloom coverage was not included with the NPS observation.

September 20, 2017

Ms. Carol Bitting submitted a complaint and photos from the 11.5 mile portion of the Buffalo River from Gilbert to North Maumee and "algae was continuous through the trip" (Figure 9). Correspondence with NPS staff observed less algal coverage in the area of Sand Hole, which was a previously submitted bloom on August 14, 2017. Verbal correspondence with NPS and USGS staff did indicate increased coverage in pools above Highway 65 in the vicinity of Mt. Hersey.

ADEQ staff will continue to converse with the NPS on locations and size of blooms during the 2017 growing season.



Figure 1. Locations of complaintant observed events (August 4, 2017) and those observed by ADEQ and NPS on 11August2017.

Memorandum



Figure 2. Presence of gelatinous algae within pool margins.



Figure 3. Long filamentous algae present at bloom 3.



Figure 4. Long filamentous algae across wetted width at bloom 3.

Memorandum

Table 1. Average *in-situ* water quality.

	Water Quality Parameters				
	[DO]		Temperature	Specific Conductance	pH
Bloom 1	9.16 mg/L	114.3%	27.1°C	230.5 µS/cm	7.67
Bloom 2	10.25 mg/L	130.3%	27.5°C	226.8 µS/cm	8.03
Bloom 3	10.3 mg/L	130.5%	27.5°C	228 µS/cm	7.76

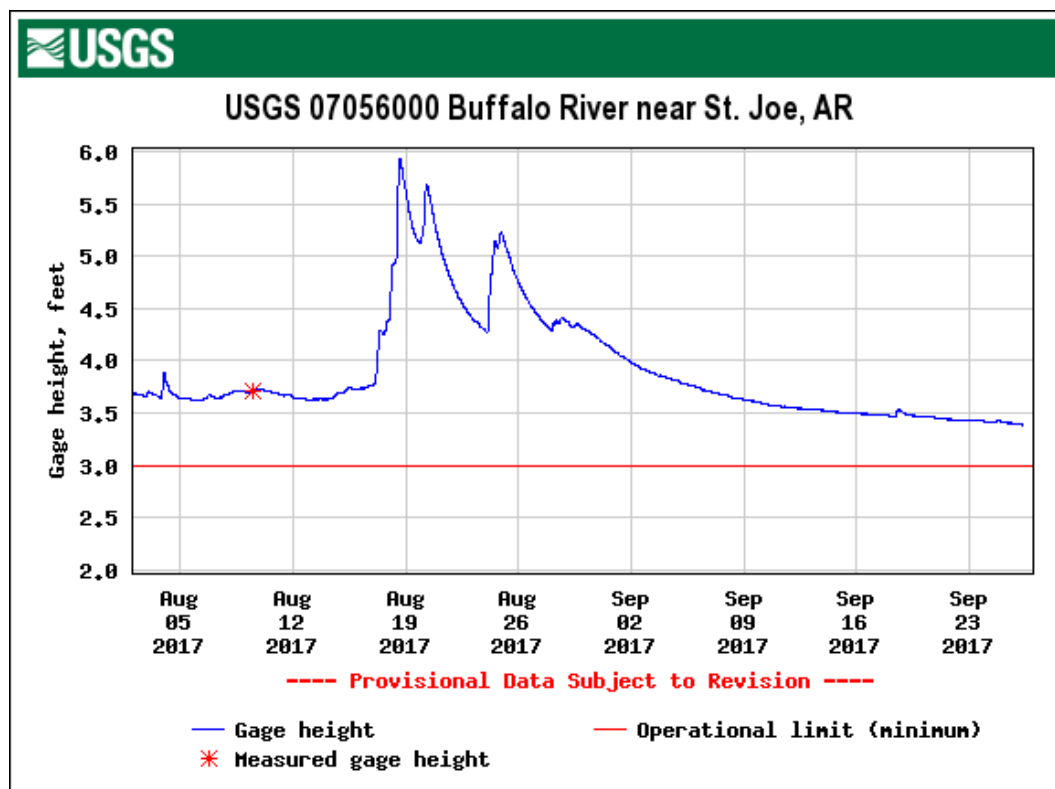


Figure 5. Measured gage height for the Buffalo River near St. Joe, Arkansas.



Figure 6. Brush Creek on August 24, 2017 upstream of Searcy County Road 416.



Figure 7. Long filamentous algae coverage observed in the Lower Wilderness Area by NPS staff on August 29, 2017.

Memorandum

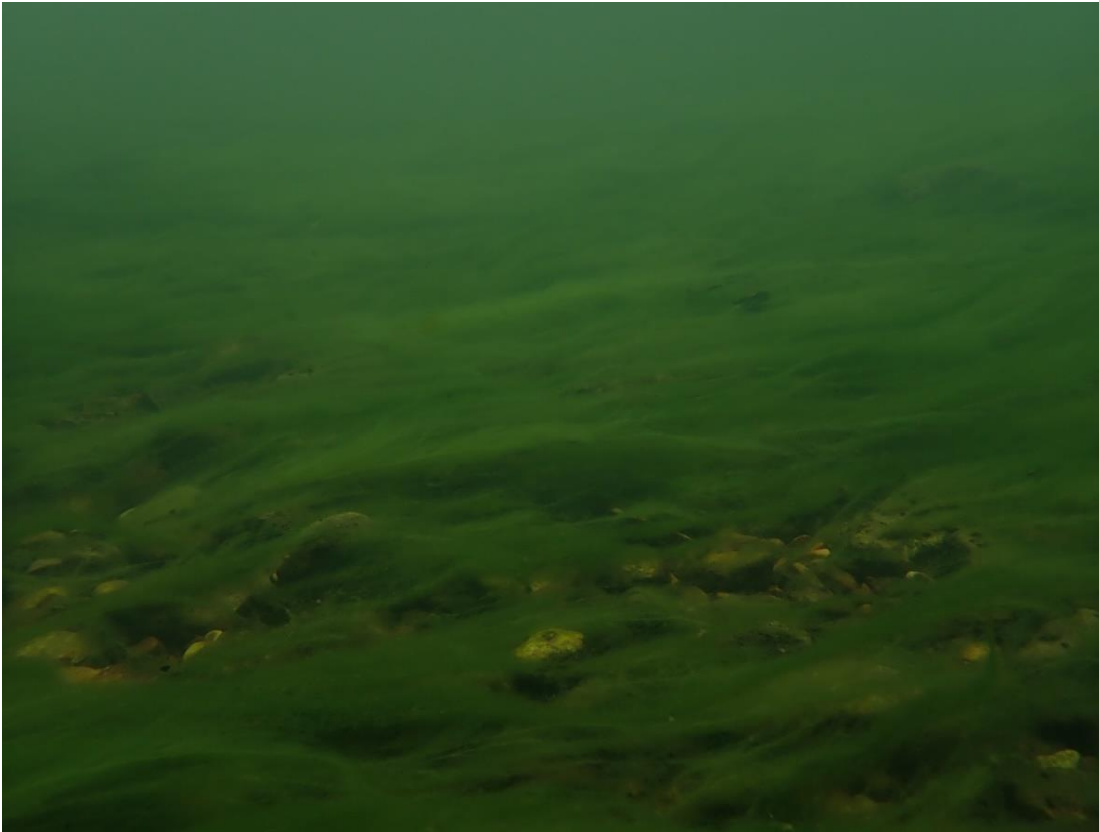


Figure 8. Underwater photo of attached algae at NPS reported bloom at Mt. Hersey on August 30, 2017.

Memorandum



Figure 9. Photo taken on September 19, 2017 just downstream of the Gilbert access and submitted by complainant on September 20, 2017.