

**Harmful Algal Bloom Report ID 2027 – Willow Lake (Plumas County) Lassen National Forest**

*The information in this bloom report is intended only for the agencies directly notified. Do not distribute to others without the authorization from the Water Board. Updated information appears at the top of the bloom report. All previous reported information, if any, appears under the “Archived Information” section.*

<b>BLOOM REPORT ID(s):</b>	2027
<b>REPORT DATE:</b>	07/29/2019; Initial observation made 07/15/2019
<b>WATER BODY:</b>	Willow Lake (Lassen National Forest)
<b>COUNTY:</b>	Plumas
<b>GPS COORDINATES:</b>	1 <sup>st</sup> sample (40.40474, -121.35839) 2 <sup>nd</sup> sample (40.40276, -121.35735) <input type="checkbox"/> Not provided by reporting party
<b>MOST RECENT OBSERVATION DATE:</b>	07/22/2019
<b>REPORTING PARTY:</b>	Craig Hemping (US Forest Service)
<b>CYANOBACTERIA IDENTIFIED:</b>	Aphanizomenon spp. and Dolichospermum spp.
<b>TOXIN GENES DETECTED (qPCR):</b>	<input type="checkbox"/> Microcystin gene <input type="checkbox"/> Anatoxin-a gene <input type="checkbox"/> Cylindrospermopsin gene <input checked="" type="checkbox"/> Saxitoxin gene <input type="checkbox"/> Non-Detect <input type="checkbox"/> Not Tested
<b>TOXIN(s) DETECTED:</b>	<input type="checkbox"/> Microcystin <input type="checkbox"/> Anatoxin-a <input type="checkbox"/> Cylindrospermopsin <input checked="" type="checkbox"/> Saxitoxin <input type="checkbox"/> Non-Detect <input type="checkbox"/> Not Tested <input type="checkbox"/> Other:
<b>TOXIN CONCENTRATION(s):</b>	Site 43930 (1 <sup>st</sup> sample) = 0.22 µg/L Site 43926 (2 <sup>nd</sup> sample) = 0.19 µg/L
<b>ADVISORY LEVEL RECOMMENDED:</b>	<input checked="" type="checkbox"/> Caution <input type="checkbox"/> Warning <input type="checkbox"/> Danger <input type="checkbox"/> No Advisory Recommended <input checked="" type="checkbox"/> Healthy Habits <input checked="" type="checkbox"/> Other: <b>Continue monitoring to update advisory level as bloom conditions change.</b>
<b>MAIN BENEFICIAL USES (if known):</b>	<input checked="" type="checkbox"/> Municipal and Domestic Supply – Drinking Water Supply <input checked="" type="checkbox"/> Water Contact Recreation (Rec-1) – Swimming, Wading, Fishing <input checked="" type="checkbox"/> Non-contact Water Recreation (Rec-2) – Hiking, Camping, Boating <input type="checkbox"/> Agricultural Supply <input type="checkbox"/> Cultural/Tribal Uses <input type="checkbox"/> Unsure
<b>AGENCIES/INDIVIDUALS NOTIFIED:</b>	US Forest Service, Plumas County, DDW District 02-Lassen, EPA, CDPH, State Water Board, Reg Bd
<b>WATER BOARD STAFF:</b> <i>For follow-up information</i>	<input checked="" type="checkbox"/> Christine Joab, <a href="mailto:Christine.Joab@waterboards.ca.gov">Christine.Joab@waterboards.ca.gov</a> (916) 464-4655 <input type="checkbox"/> Alice Lopes, <a href="mailto:Alice.Lopes@waterboards.ca.gov">Alice.Lopes@waterboards.ca.gov</a> , (916) 464-4649 <input type="checkbox"/> Matt Krause, <a href="mailto:Matthew.Krause@waterboards.ca.gov">Matthew.Krause@waterboards.ca.gov</a> (916) 464-4845 <input type="checkbox"/> Holly Grover, <a href="mailto:Holly.Grover@waterboards.ca.gov">Holly.Grover@waterboards.ca.gov</a> (916) 464-4747

**July 29, 2019 – Willow Lake (Plumas County) – Caution advisory recommended**

The U.S. Forest Service, Almanor Ranger District, received a call from a member of the public (week of July 8) concerned about the color of the water in Willow Lake (Lassen National Forest, Plumas County). US Forest Service staff visited the lake on July 15 and noticed the color of the water appeared like green pea soup. A sample was collected for jar testing (i.e., to see if cyanobacteria present and floating at the

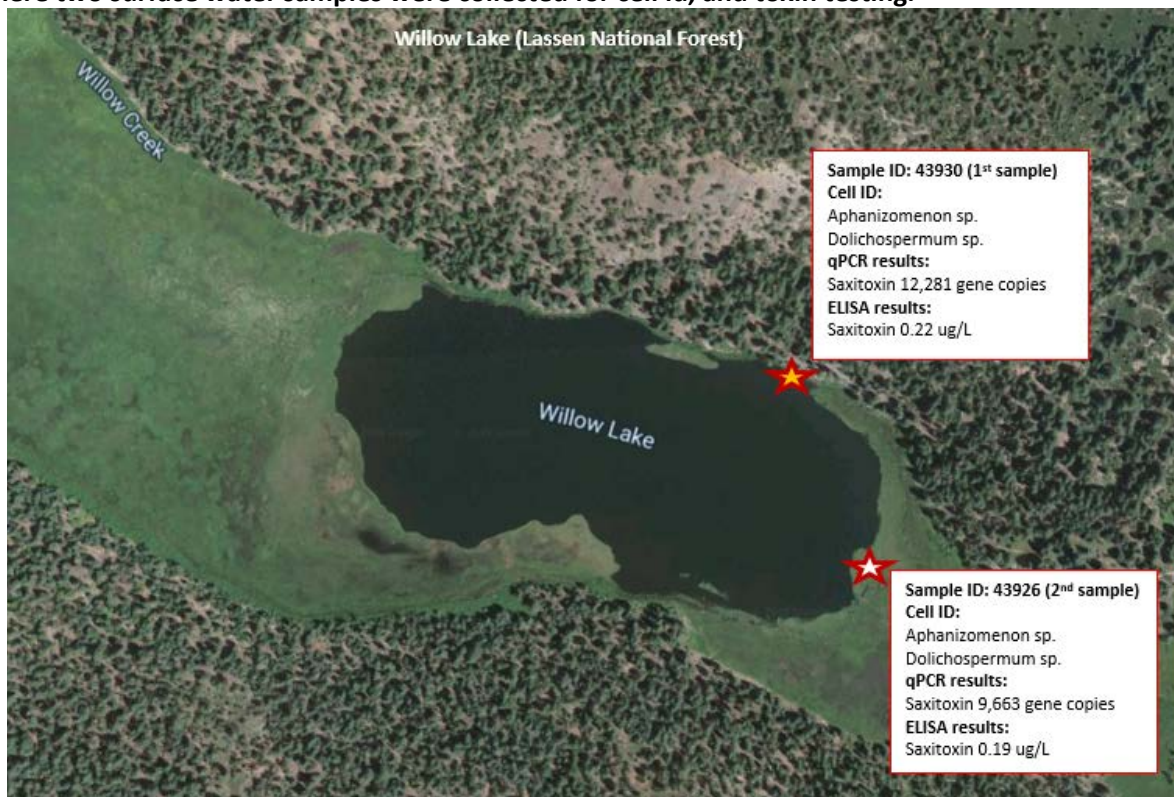
surface). The jar test was positive, so the staff reached out to the Water Boards for assistance in analysis.

Forest Service staff revisited the lake on July 22 and collected two surface water grab samples. Lab results identified two different genera of cyanobacteria - *Aphanizomenon* sp. and *Dolichospermum* sp. Lab results indicated the detection of the saxitoxin gene in both samples, and toxin testing detected low concentrations of saxitoxin in each sample.

The [2008 and 2016 update of the California Blue-Green Algae Draft Voluntary Guidance Document](#) do not contain any guidance on posting advisory signs when saxitoxin is detected. The World Health Organization along with other U.S. states have developed trigger values for this toxin. The Water Board is recommending a Caution advisory be placed at Willow Lake until the bloom fully subsides. This recommendation is based on several considerations (1) this waterbody is heavily recreated per email communication with Forest Service, which may be visited by people with dogs; (2) saxitoxin is a known potent neurotoxin, small children and pets tend to be more sensitive due to their water play and behavior (3) very little information on blooms in this water body is known (i.e., duration and extent of bloom and types of toxins and concentrations observed, and (4) toxin concentrations can potentially increase once the cells begin to die, thereby increasing the currently known toxin concentrations.

Ultimately, the advisory signs, if any, posted at the water body will need to be decided by the US Forest Service in consultation with the Plumas County Environmental and Public Health offices. At a minimum, all recreational users should be encouraged to practice [healthy habits](#) when recreating in waters known to experience HABs.

**Figure 1. Map of Willow Lake in the Lassen National Forest (Plumas County) showing the location where two surface water samples were collected for cell id, and toxin testing.**



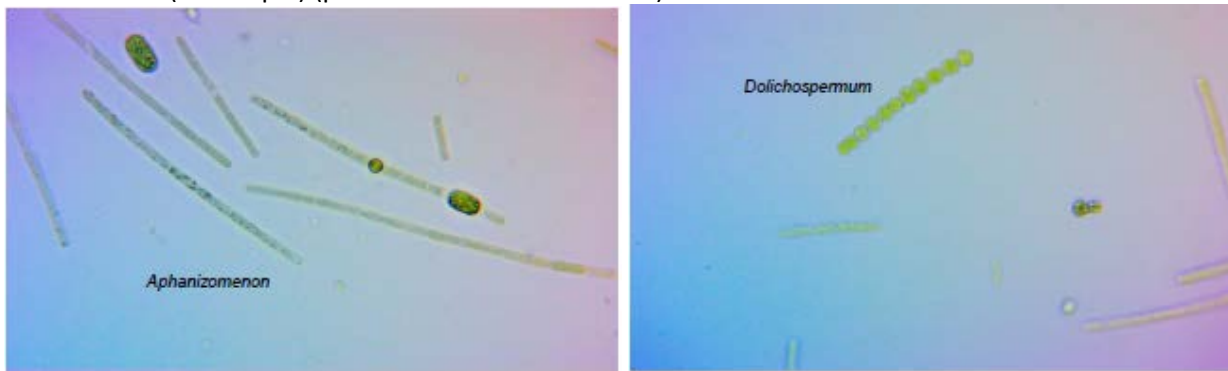
## Lab Results

Two surface water grab samples were sent to Bend Genetics for analysis of cell identification, qPCR analysis for all four toxin genes, and testing for microcystin and anatoxin-a (at a minimum) and any of the other two toxins as determined by qPCR. Saxitoxin was the only toxin gene detected at very low gene copies/mL, and saxitoxin was detected at low concentrations (see tables below).

## Microscopy results

Sample name	Cyanobacteria Identified
43930 (1 <sup>st</sup> sample) (40.40474, -121.35839)	High amount of Aphanizomenon spp. and a low amount of Dolichospermum spp.
43926 (2 <sup>nd</sup> sample) (40.40276, -121.35735)	High amount of Aphanizomenon spp. and a low amount of Dolichospermum spp.

Site ID 43930 (1<sup>st</sup> sample) (photo credit: Bend Genetics)



Site ID 43926 (2<sup>nd</sup> sample) (photo credit: Bend Genetics)



**qPCR Results**

Sample name	Microcystin (gene copies/mL)	Anatoxin (gene copies/mL)	Saxitoxin (gene copies/mL)	Cylindrospermopsin (gene copies/mL)
43930 (1 <sup>st</sup> sample) (40.40474, -121.35839)	Non-Detect	Non-Detect	12,281	Non-Detect
43926 (2 <sup>nd</sup> sample) (40.40276, -121.35735)	Non-Detect	Non-Detect	9,663	Non-Detect

**Toxin concentrations (ELISA)**

Sample name	Microcystin (µg/mL)	Anatoxin (µg/mL)	Saxitoxin (µg/mL)	Cylindrospermopsin (µg/mL)	Advisory recommended
43930 (1 <sup>st</sup> sample) (40.40474, -121.35839)	Non-Detect	Non-Detect	0.22	Non-Detect	Healthy habits Caution*
43926 (2 <sup>nd</sup> sample) (40.40276, -121.35735)	Non-Detect	Non-Detect	0.19	Non-Detect	Healthy habits Caution*

\* The state’s guidelines for recreational advisory levels does not contain any guidance for the detection and associated concentrations of saxitoxin.

**Cyanotoxin advisory levels for finished drinking water and recreational waters (these are not regulatory):**

[https://mywaterquality.ca.gov/habs/resources/habs\\_response.html#trigger\\_levels](https://mywaterquality.ca.gov/habs/resources/habs_response.html#trigger_levels)

Trigger Level Type	US EPA finished drinking water 10-day health advisory levels		California Recreational Action Levels (for posting and public notification)		
	Children < 6 years old	Children > 6 years old & adults	Caution	Warning	Danger
Microcystins (µg/L)	0.3	1.6	0.8	6	20
Anatoxin-a (µg/L)	None developed	None developed	Detection	20	90
Cylindrospermopsin (µg/L)	0.7	3.0	1	4	17
Cell density (toxin producers)	NA	NA	4,000 cells/mL	-	-
Site specific indicators of cyanoHAB			Visible bloom/discoloration, scum, algal mats	-	-

## Site Conditions

On July 15, 2019 US Forest Service staff visited Willow Lake based on a public complaint concerning water conditions. During the staff visit, staff noted that the water appearance looked like pea soup. Water samples were collected for performing the jar test. The jar test was positive, so site photos and results of the jar test were sent to the Water Boards for assessment along with a request for assistance in analysis.

**Figure 2. Site photos of Willow Lake taken on July 15, 2019 (Photo Credit: Craig Hemping, USFS)**



On July 22, 2019, US Forest Service staff revisited Willow Lake to check on site conditions and, if needed, collect additional water samples for lab analysis. According to forest service staff, the watercolor appeared to be a slightly different color as compared to the previous week. Color appeared more brown than green. However, site conditions still looked to be impaired.

Two surface water grab samples were collected at the lake from on top of a floating algal mat. See the map (Figure 1) for sampling locations. The samples were collected around 9:30 AM in 250-mL amber glass bottles. The air temperature was around 20°C and the water temperature was around 22°C.

**Figure 3. Site photo of Willow Lake taken on July 22, 2019 (Photo Credit: Craig Hemping, USFS)**



***Archived Information Section***

No previous information on cyanobacteria blooms has been reported for Willow Lake.