

Didymo Post-fire Helena BAER Monitoring

Amelia Fleitz – Fisheries Technician

Weaverville, CA

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Figure 1: Technicians, Johanna Ostling and Bryce Yoder, scrape algae and diatoms from rocks.

Abstract: Didymo (*Didymosphenia geminata*) was present in the Trinity River when sampled by the incident command team tested during the Helena-Fork Fire in 2017. There are two leading theories in reasoning for the distribution of Didymo. One group of scientists believes that Didymo is present everywhere but that it is expressed at differing concentrations due to environmental cues. The other opposing group believes that Didymo is non-native and invasive diatom which is easily transferred between watersheds most commonly through recreational equipment such as boats, waders, and fishing gear. Whether it is native or non-native, it has been known to lead to shifts in the macroinvertebrate community within impacted bodies of water. We sampled eighteen locations for the presence of Didymo where it may have been spread by emergency response equipment

during the Helena-Fork Fire. At this point in time it is not possible to confidently identify the diatom in-house. Five samples were selected and sent to an outside laboratory for identification.

Sampling Locations:

From the Didymo sampling locations selected by the Helena BAER team we evaluated the 11 sites and added 4 additional sites. Additionally, at the confluence locations between the Trinity River and the tributaries we sampled the mouth of the tributary separately from the mainstem. This was also applied where Big East Fork Creek flows into Canyon Creek. A total of 18 sites were selected to be sampled (Figure 2), but only 16 sites were accessible (Table 1). Based on the road access and the depth of the water at each location the use of each site during the Helena-Fork Fire was hypothesized. There were to sites selected by the BAER team that were inaccessible.

Table 1: Didymo sampling site locations and how the sites were likely used during the Helena Fire.

Site Name	GPS Coordinate	Sampled	Likely Use
Big East Fork Head	10T 0499273, 4522398	Yes – road access to the creek	Pump Site
Big East Fork Mouth	10T 0496366, 4522639	Yes – hike down Canyon Creek to access	Pump Site
Canyon Creek – Big East Fork Confluence	10T 0499273, 4522398	Yes – hike down Canyon Creek to access	Pump Site
Canyon Creek Upper		No – Inaccessible, on the BAER Map to location is on the road and the creek below is in a steep canyon.	Unknown
Canyon Creek Middle	10T 0495663, 4513706	Yes – road access down to the creek	Pump Site
Canyon Creek Bridge	10T 0495416, 4508962	Yes – parked at bridge and hiked down	Unknown
Conner Creek Head		No – Unable to access, terrain too steep to safely hike down to creek.	Unknown
Conner Creek Middle	10T 0491811, 4510468	Yes – Hiked up creek from Red Hill Rd	Pump Site
Conner Creek Mouth	10T 0494318, 4511195	Yes – Hiked to creek from Quail Rd	Unknown
Eagle Creek Middle	10T 0487211 4509432	Yes – Long drive to Eagle Ranch, 45 min hike.	Pump Site
Eagle Creek Mouth	10T 0486088, 4511157	Yes – Kayak to access	Dip Site
Miller Creek Mouth	10T 0488229, 4512492	Yes – Kayak to access	Dip Site
North Fork Trinity at East Fork Trinity	10T 0489047, 4514729	Yes – Road access to the confluence	Pump Site
Trinity River at Bagdad River Access	10T 0489487, 4513230	Yes – Road access to the river	Pump Site
Trinity River at Conner Creek Confluence	10T 0494330, 4511204	Yes – Hike to from Quail Rd.	Unknown
Trinity River at Eagle Creek Confluence	10T 0486092, 4511190	Yes – Kayak to access both sides of the river	Dip Site

Trinity River at Miller Creek Confluence	10T 0488239, 4512481	Yes – Kayak to access both sides of the river	Dip Site
Trinity River at Pigeon Point River Access	10T 0488783, 4512881	Yes – Road access to confluence	Pump Site

Sampling Methods:

Upon locating the sampling location GPS points and photos of the site were taken. To sample for the presence of Didymo we used a targeted sampling method. Samplers were introduced to Didymo prior to sampling and at each locations 6 rocks were selected that were most likely to have Didymo on them. On each rock a 9cm² area of algae was scrapped away using a tooth brush and rinsed into a sampling cup with a squirt bottle of tap water. The samples were then brought back to the office and stored in refrigeration. The toothbrushes and other materials were decontaminated with 10% bleach solution between each sampling location.

In the office we attempted to identify Didymo diatoms using compound microscopes by mounting one drop of mixed water algae solution onto a slide. We also attempted adding a drop of iodine. From the literature 200x-400x power should have been strong enough to locate the Didymo diatom, however we were unable to locate the diatom in the slides. Additionally, the Didymo diatom and stalks look similar to *Gomphonema* sp. which we believe are present in our samples. We attempted to use morphological key on diatoms.org (a key to North American diatoms), but were not confident enough in our conclusions to make correct identifications. Therefore five samples were sent away for identification. The five samples that were sent for identification were Trinity River at Miller Creek, Trinity River at Bagdad, North Fork Trinity River at East Fork North Fork Trinity Confluence, Canyon Creek Bridge, and Conner Creek Middle.

Budget:

Item	Amount
Tooth Brushes	\$15.00
Salary of Technicians	\$3,557.25
Identification (approx.)	\$800.00
Total	\$4,372.25

The one material that need to be purchased for this project was toothbrushes to scrape the diatoms off of the rocks. A total of 162.75 hours were spent by technicians to complete the planning, sampling, literature searches, and attempt at identification. In the future it could potentially require fewer hours to complete the sampling as the access routes for most of the sites is now established.

For one hour of analysis by a trained phycologist it will cost \$100 per sample and \$150 if the sample needs to be acid treated to remove the plant material to locate the diatoms more easily. The shipping cost \$24. If the Didymo diatom is found in any of the samples we sent they will mount it on a slide and return it to us to use as a reference in the future.

Future Improvements:

In the future, I believe it would be beneficial to invest in training someone in-house in diatom identification. We may want to look into preserving the diatoms in Lugol's solutions to add a dying agent to add contrast for identification and preserve the sample for longer.

There are some sites that could be removed from future sampling. Those that were inaccessible should be removed and I feel that the Eagle Creek Middle site was very remote and likely to not have cross contamination from different pumps at this location. There for I recommend Eagle Creek Middle as a site that could be removed from future sampling efforts. Eagle Creek Middle site, as well as the Big East Fork Mouth, and Big East Fork Head did not show any signs of Didymo or significant algae growth and could be removed from future surveys.

During spawning surveys it seemed as if Didymo could be located higher up in the mainstem of the Trinity River. There appeared to be small, dark, circular balls of diatoms or algae attached to rocks in the middle of the Trinity River above the Dutch Creek Bridge. If any locations are added in the future, I would recommend floating from Evans Bar to Junction City and sampling where it looks like Didymo is present. Making sure specifically to sample within ½ mile above the Dutch Creek Bridge.

Finally, we sampled in the fall for this survey, it was recommended by a phycologist to sample in the late spring or early summer. Sampling in this earlier time frame has a higher likelihood to have the diatoms are still attached to the stocks and in a greater abundance.

2018 Didymo Sampling Sites

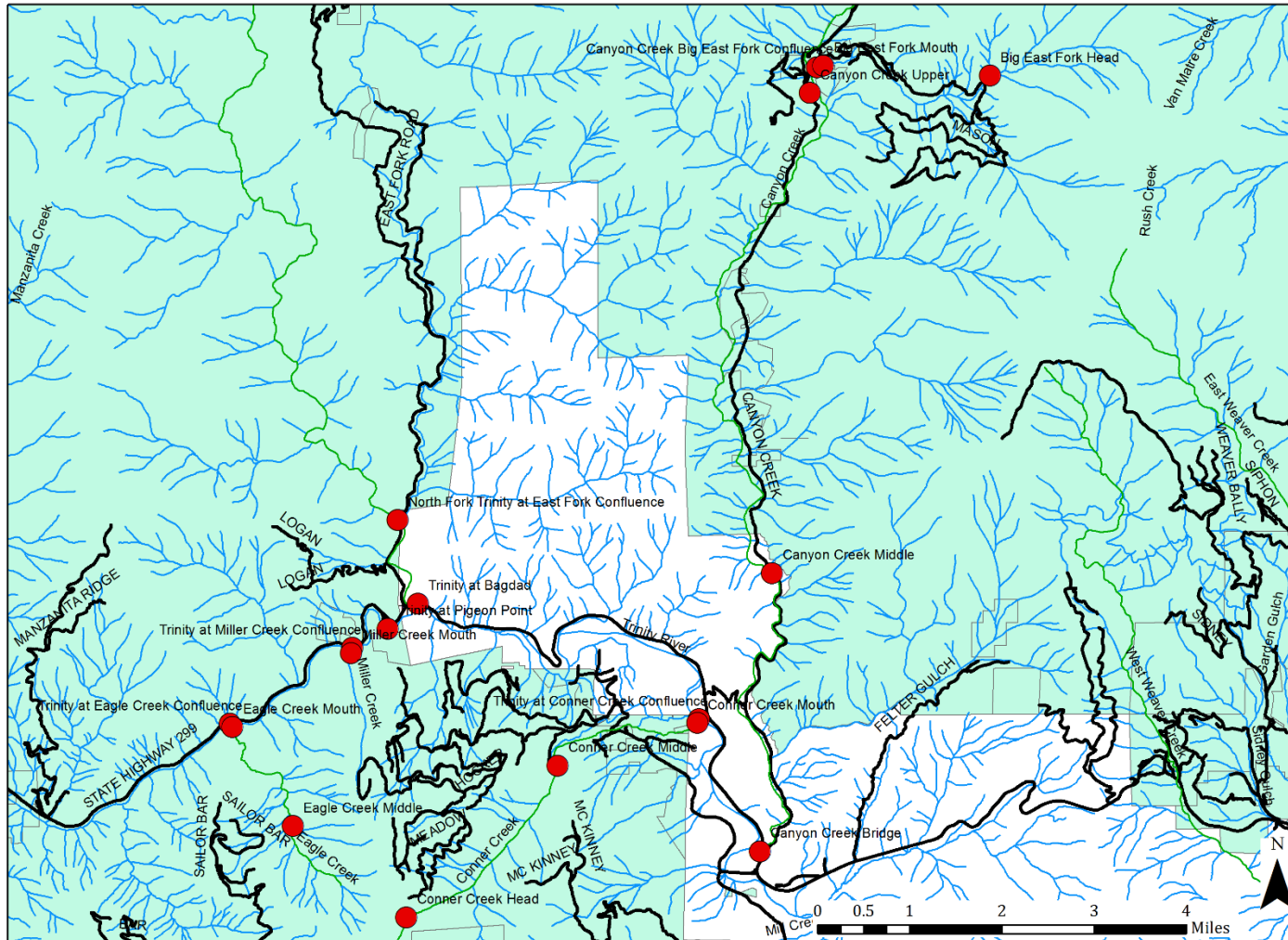


Figure 2: A map with forest roads of the Didymo sampling sites used in Avenza to access sampling locations.