

First Case Study Test of the Preliminary Lake Evaluation (PLE) Concept

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Text in red added post interview

Preliminary Lake Evaluation - Harmful Algal Blooms		
Lake Name/Dam Name:	Willow Lake/no dam	
Managing Entity / Contact Name / Phone / Email:	US Forest Service, Lassen National forest, Almanor Ranger District	
Contact Name / Phone / Email:	Craig Heping, Supervisory Fisheries Biologist, (530-258-5169), craig.heping@usda.gov (Craig's first experience with HABs, he took sampling training)	
County / Coordinates (Latitude, Longitude):	Plumas County (40°24'14.27" N 121°21'40.03" W)	
Interview Date:	2/26/2020	
Evaluation Category	Description or comment (attach copies of supporting docs if available)	Source (footnotes)
PART 1 - LAKE EVALUATION		
Algae problem description: (frequency, magnitude, duration, areal extent)	Locals claim problems are new in last couple of years. Woman returning annually for 25 years to celebrate wedding recalls no algae bloom events. A fisherman saw nothing over 10 year period.	
Cyanobacteria blooms/scums (by species if known)	7/16/2019 Cyano bloom reported. Entire lake surface involved in pea soup bloom. <i>Aphanizomenon</i> and <i>Dolichospermum</i> . Saxitoxin (data available for 2 samples).	
Other nuisance algae blooms (by species if known)	NA	
Nuisance aquatic plants (by species if known)	Patchy, some macrophytes	
Cyanotoxins monitored	saxitoxin (see report from analysis of two algae and toxin samples)	
Taste and Odors	NA	
Lake Type:		
Natural lake	Relatively isolated natural fen lake surrounded by extensive areas of floating sphagnum ≥ 2' deep, and carnivorous flora. pH of lake water may normally be < 7.0. Because of the unusual assemblage of plants that occur here, Willow Lake was designated a Botanical Special Interest Area. A small primitive campground is located in the forest adjacent to the lake, for visitors wishing to linger in the area, and a hiking trail leads northwest about a mile from Willow Lake to Terminal Geyser, a geothermal feature within Lassen Volcanic National Park.	
Enhanced natural lake (with dam)	No	
Reservoir	No	
Lake Morphology:		
Spillway elevation (m) (above mean sea level)	No	
Surface Area (m ²)	No	
Max depth (m)	No	

Lake volume (m ³)	No	
Max length (m)	No	
Max width (m)	No	
Shoreline length (m)	No	
Attach a depth contour map if available	No	
Characteristic Shape		
Circular or elongated	Appears as a simple elongated oval from photos. Actual shoreline may be more complex, but hidden by the sphagnum.	
single or multiple basin	single	
other		
Water management objectives:		
Recreation		
	Lake is quite isolated and mainly used by locals. Estimated 500-1000 visitors/year, mostly local.	
Body contact (wading, swimming, skiing, camping)	Some body contact occurs. It is difficult to get to the water due to the extensive sphagnum beds.	
Non-body contact (fishing, boating, picnicing)	A small primitive campground is located in the forest adjacent to the lake, for visitors wishing to linger in the area, and a hiking trail leads northwest about a mile from Willow Lake to Terminal Geyser, a geothermal feature within Lassen Volcanic National Park. Fishing, picnicing and infrequent boating (kayaks, canoeing), No launch ramp. No motorized boats. Few reports of launching boats of any type. Fish have not been stocked in this lake for decades. Current stocks rely on natural reproduction.	
Wildlife		
Birds - herbivores	?	
Birds - piscivores	?	
Mammals	?	
Endangered species	carnivorous plants	
Other		
Water Quality Management Activities:		
Chemicals: (herbicides, pesticides, fish toxins, algaecides, settling agents)	No	
Aeration	No	
Oxygenation	No	
Destratification	No	
Dilution	natural stream with uncontrolled flows in or out	
Integrated aquatic weed/algae management plan	No	
Watershed sediment and nutrient management	No	
Fish stocking	Stocked many years ago, no current program. Fish populations are low	
Multi-level withdrawals	No	

Sediment cover or excavation other	No	
Down stream uses: Indicate if any uses directly affect lake operations		
Drinking water supply (municipal)	Willow Creek is water supply for small cluster of homes downstream. No controls at lake to modify natural flows.	
Hydropower	No	
Flood control	No	
Industrial	No	
Agriculture	Possibly for small scale gardening by home owners. Not confirmed.	
Fish and wildlife habitat	Yes, for creatures living in the creek and the national forest	
Other	No grazing in watershed	
PART 2 - HYDROLOGY		
Average annual surface level operating range (m)	?	
Provide labeled diagram with inlets and outlet(s) (sketch will do)	See attached map	
Water Sources: (provide annual volumes in m³)		
Stream(s)	Flow rate unknown. Willow Creek has year round flows in and out. Water supply for small numbers of homes down stream	
Direct runoff	?	
Direct precipitation (annual rainfall)	?	
Ground water seepage in	Most likely through bogs and soil, no data	
Weather	2017 and 2019 were very large water years: 2017 had 250" of snow equal to 124" (?) of water and 2019 had ? inches of snow equal to 103.5 inches of water late in winter (Jan-Feb 2019???). Note: There may have been enough water, especially if the snow melted rapidly, to carry nutrients into the lake at these time. In 2019, Craig Hempting looked for signs of erosion and found none. It is possible that nutrients could have been washed from the peat bogs into the lake under high flows, a speculation that requires confirmation.	
Imported water supply		
Aqueduct	No	
Pipeline	No	
Water losses: (provide annual volume m³)		
Evaporation	no data	
Irrigation	no	
Uncontrolled outflow	yes	
Outflow via control structure	No	
Tiered valves (selective withdrawal)	No	
Seepage (ground water/dam)	Probably, but no data and no dam	

PART 3 - Watershed		
Area (m ²)		
General description of dominant terrain surrounding the lake		
Attach contour map of terrain if available		
Potentially significant nutrient sources:		
Landfills or dumps	no	
Wastewater treatment plants	no	
Septic systems	One vault toilet in camp ground located in nearby forest	
Confined animal feeding operations	no	
Lakeside home development (% shoreline)	no	
Golf courses	no	
Erosion (e.g., slumping hill sides)	Lake is in active hydrothermal region with snow and rain. Needs clarification.	
Land uses (estimate): (attach landuse map if available)		
Agriculture (m ²)	no	
Industrial (m ²)	no	
Pasture (m ²)	no	
Urban (m ²)	no	
Forest (m ²)	Forested on slopes above the lake and away from the bogs	
Wetlands (m ²)	floating peat bogs extend out over the water of the lake	
Restricted (m ²) - near shore land with no public access	Restrictions related to difficulty of moving through the bog areas. Other wise fishing where access is reasonable.	
PART 4 - WATER QUALITY		
Monitoring:		
Is there a regular monitoring program in place? If so, see next:	No	
Attach water quality monitoring plan/design, if available	No	
Attach annual water quality reports for last 2-4 years, if available	No	
Special studies, e.g., internal Inutrient loading	No	
Surface mixed layer conditions:		
Secchi depth (m)	No data	
Turbidity (NTU)	No data	
Chlorophyll a (ug/L)		
Water column conditions: by season		
Vertical profiles - Oxygen, temperature, pH, conductivity	No profiles, current or historical	
Nutrients: (attach reports or summaries if available)		
Min, Max and mean concentration of Phosphorus (TP & ortho-P)	No	
Min, Max and mean concentration of Nitrogen (NO ₃ +NO ₂ , ammonia)	No	
Has a nutrient budget been developed?	No	