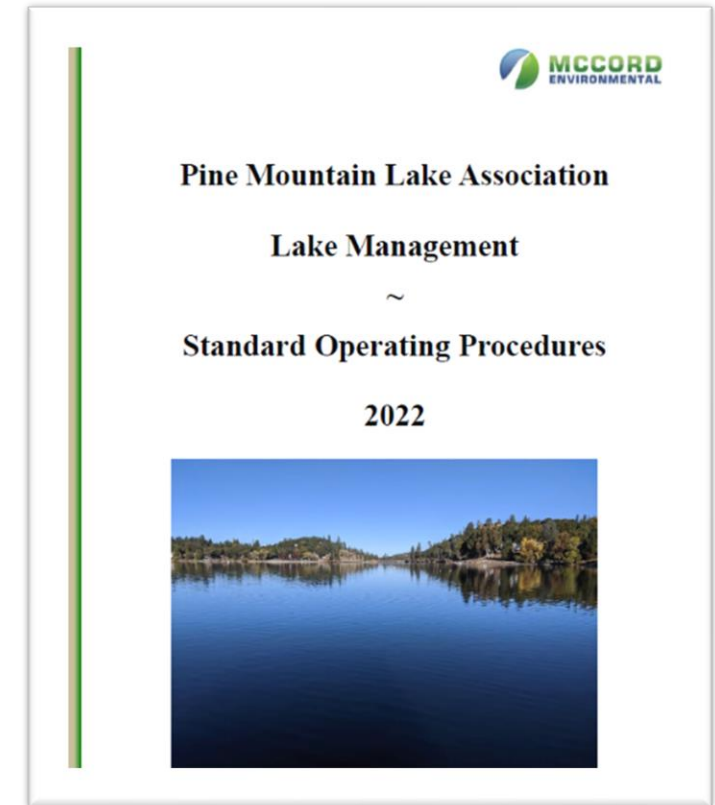


Pine Mountain Lake— Behind the Scenes & Beneath the Surface

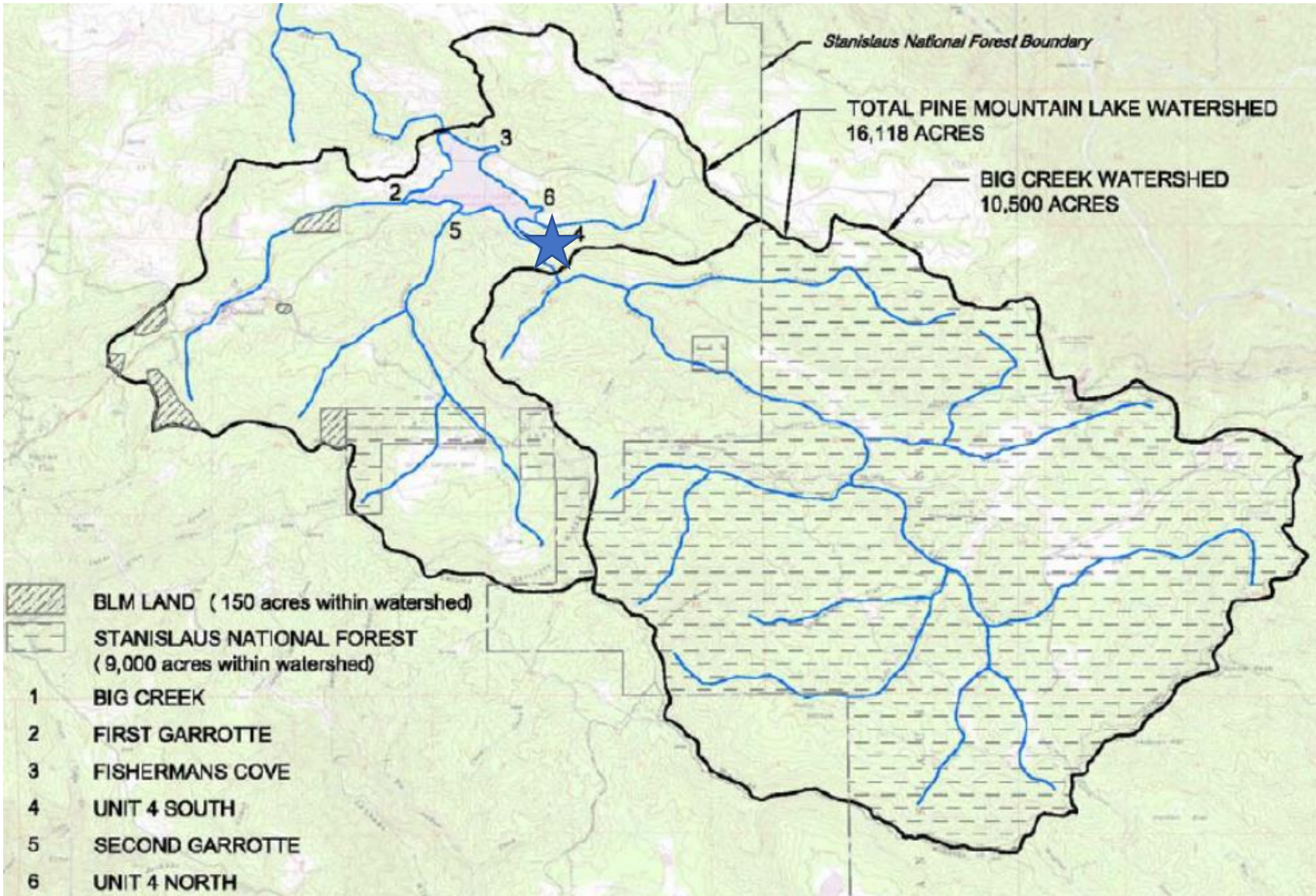
Water rights, dam safety, and lake limnology

Rick Laffranchi
Maintenance & Operations Mgr.

Stephen McCord, Ph.D., P.E.

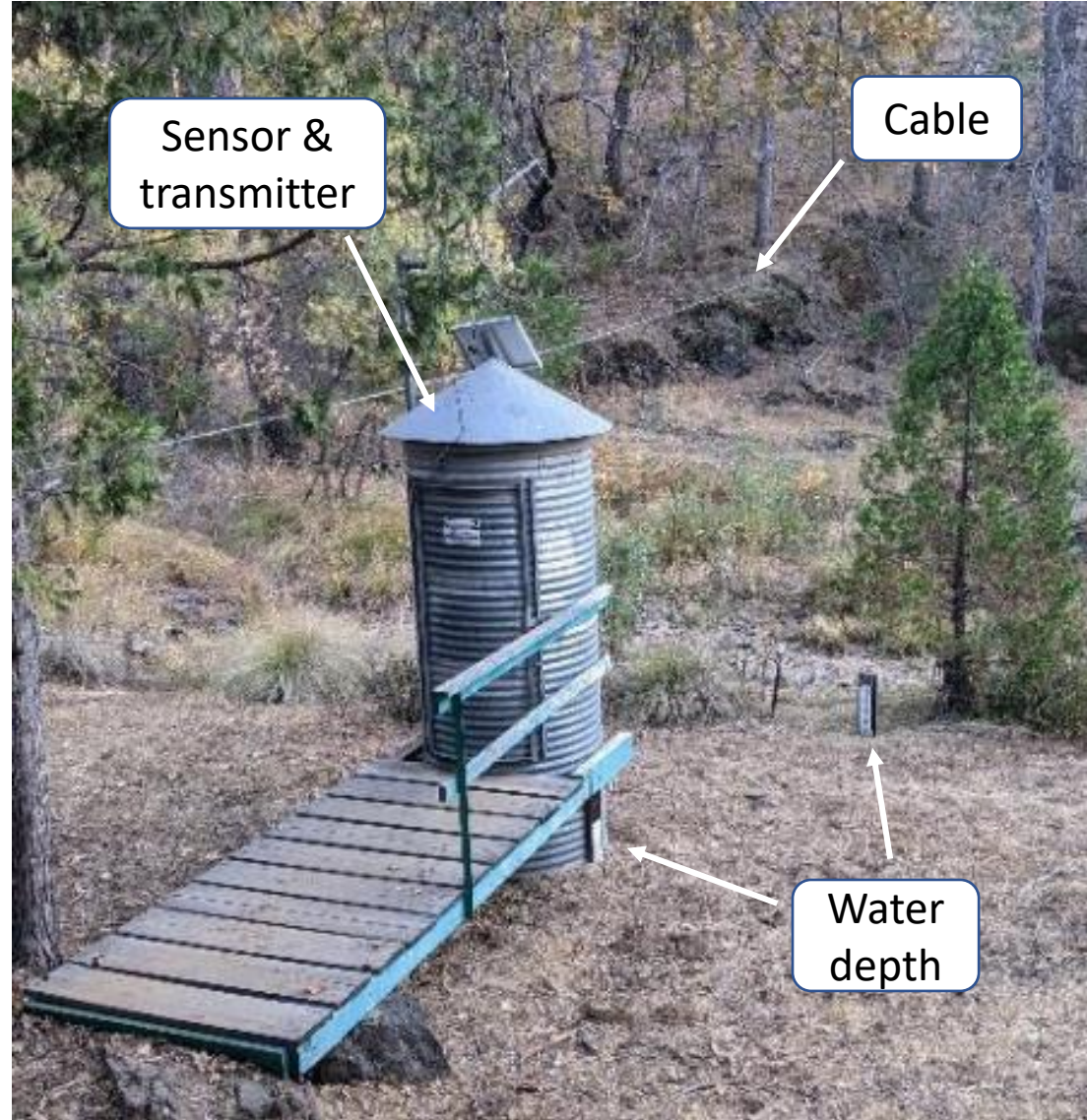


The Lake's Watershed



Lake area = 200 acres
PMLA area = 2,200 acres
Watershed = 18,000 acres

USGS Gage Upstream on Big Creek



Real-Time Weather Station on Dam

- Temperature
- Wind speed & direction
- Relative humidity
- Atmos. pressure
- Precipitation
- Solar radiation

- Lake water level



Oroville spillway, 2014



Dam Safety

It damn well better be safe!

So far, so good since 1969



Jan 9, 2023 1:12:08 PM
12855 Moon Light Court
Groveland
Tuolumne County
California

Dam Outlet Control

Gate control
motor & hydraulics

Air vent to bottom drain

Evaporation pan



Dam O&M Activities

- Low-level releases for major storms
- Vegetation mgt. (weeding, planting)
- Rodent control
- Inspections



Feature	Findings	Photo	Notes / Commentary*
Crest & Face			
Abutment– East			
Abutment– West			
Crest level & uniformity			
Face level & uniformity			
Slope protection (riprap)			
Instrumentation & Controls			
Water surface elevation			
Survey monuments			
Weather station w/ evap. Pan			
Valve motor & housing			
Downstream Slope			
Monitoring wells (2)			
Slope protection			
Rodent & other wildlife			
Vegetation			
Erosion			
Depressions or sinkholes			

Dam Inspections & Reports

Regular

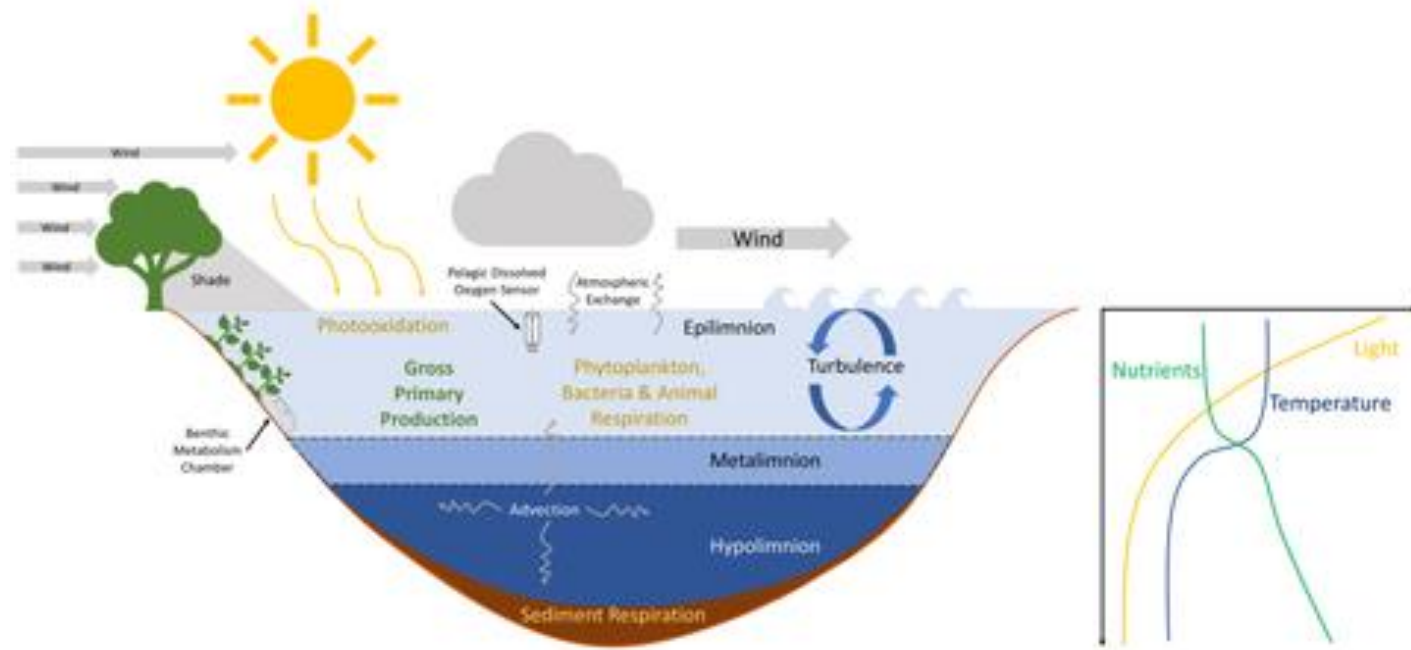
- Daily by security
- 2-3 x/week by Maint. Dept.
- 4-6x/year by Lake Mgr
- Annual inspection & outlet gate “exercise” by state

Periodic

- Online, controllable video camera
- Earthquake monitoring/alerts via USGS
- Extreme overflow monitoring via online stage gage

Dam Monuments, Observation Wells, and Seepage Ponds





Lake Limnology

And more words to impress your neighbors

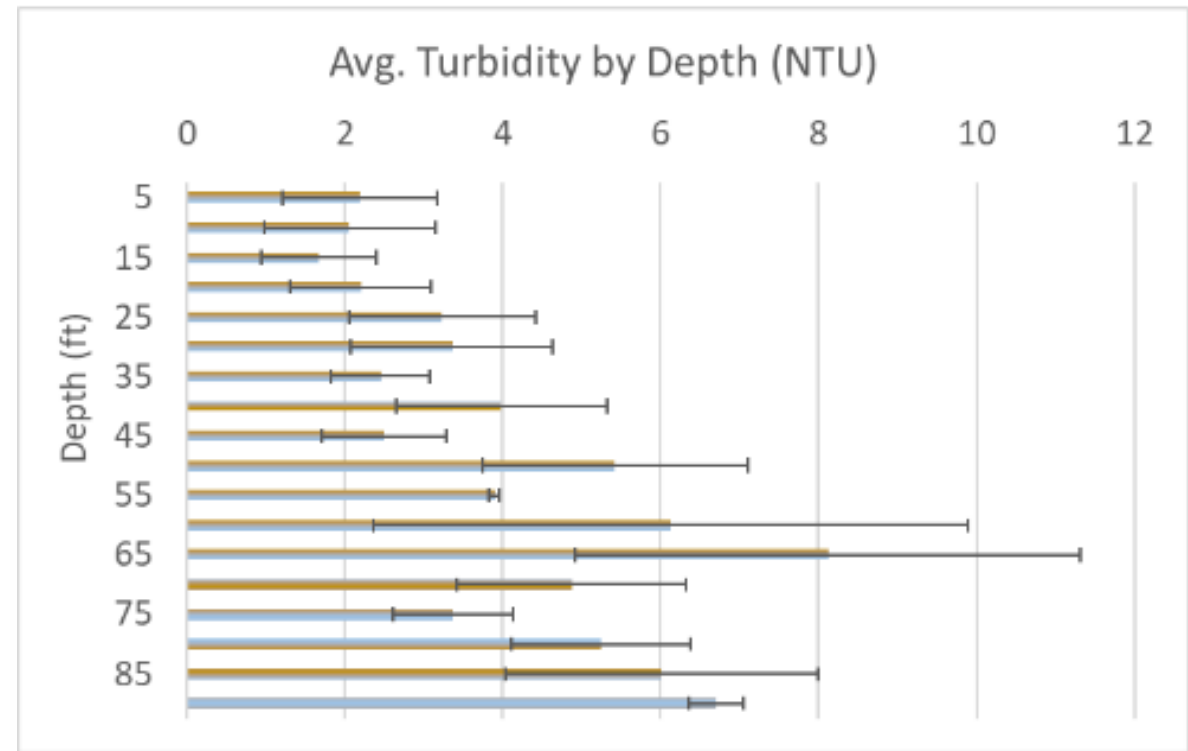
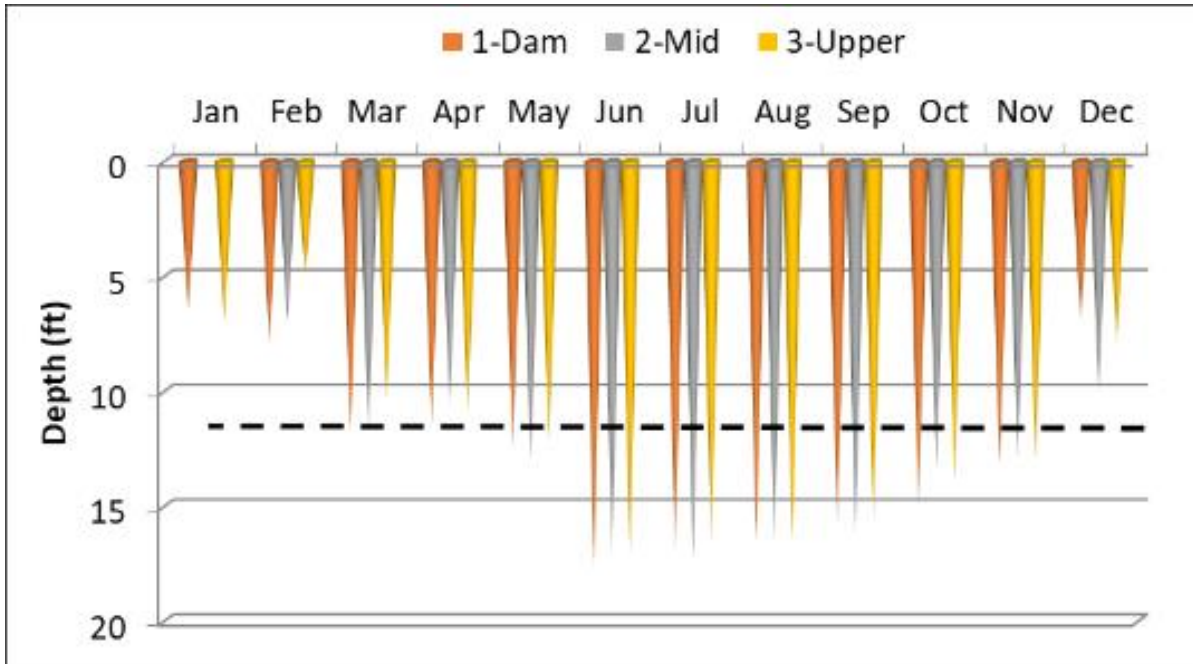
Monitoring Sites



Red = Lake
Blue = Beach

Water Clarity

- Minor site differences
- Clearest in summer; most turbidity from winter runoff
- Surface clearer; deeper more variable from stirring



*Secchi Depth
> 12 ft is good*



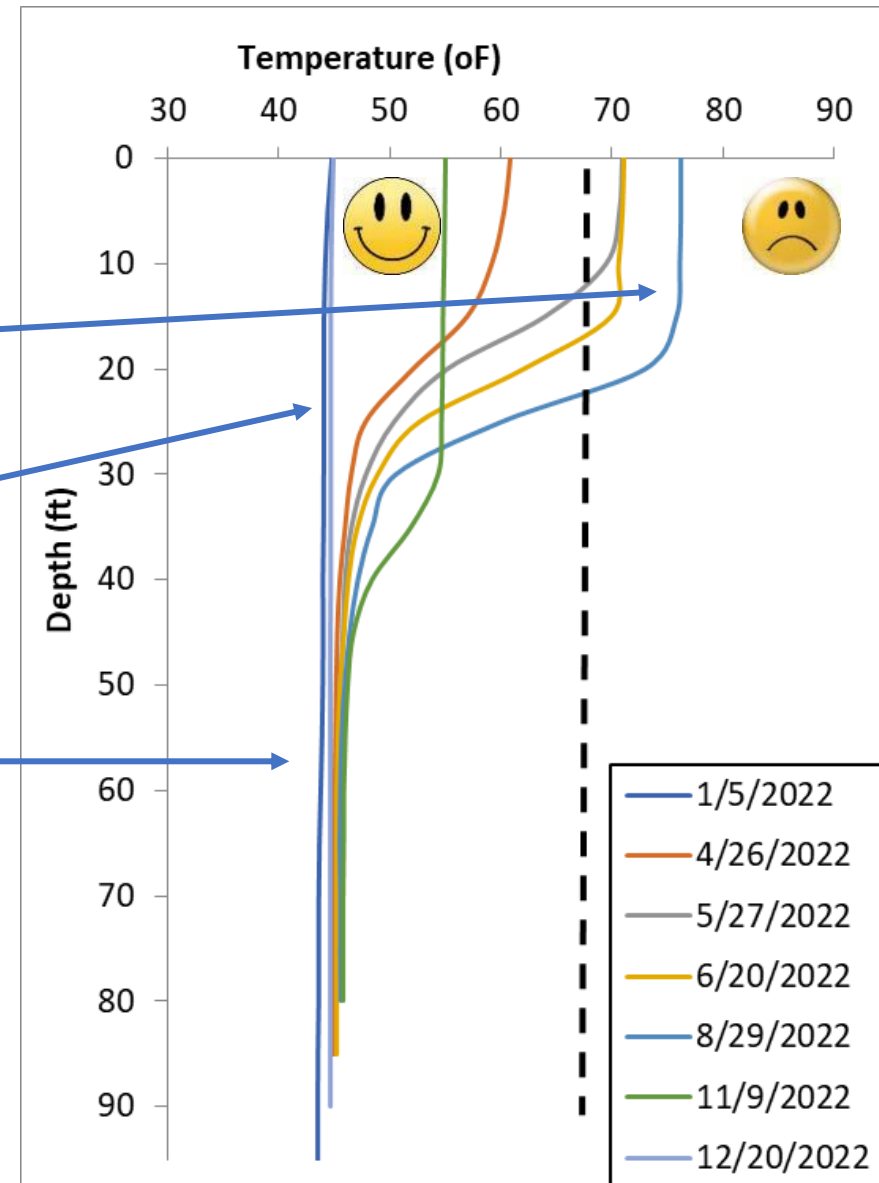
Temperature

Surface temperature peaks mid-summer

Region of greatest temperature change =
"thermocline"

Bottom stays cold

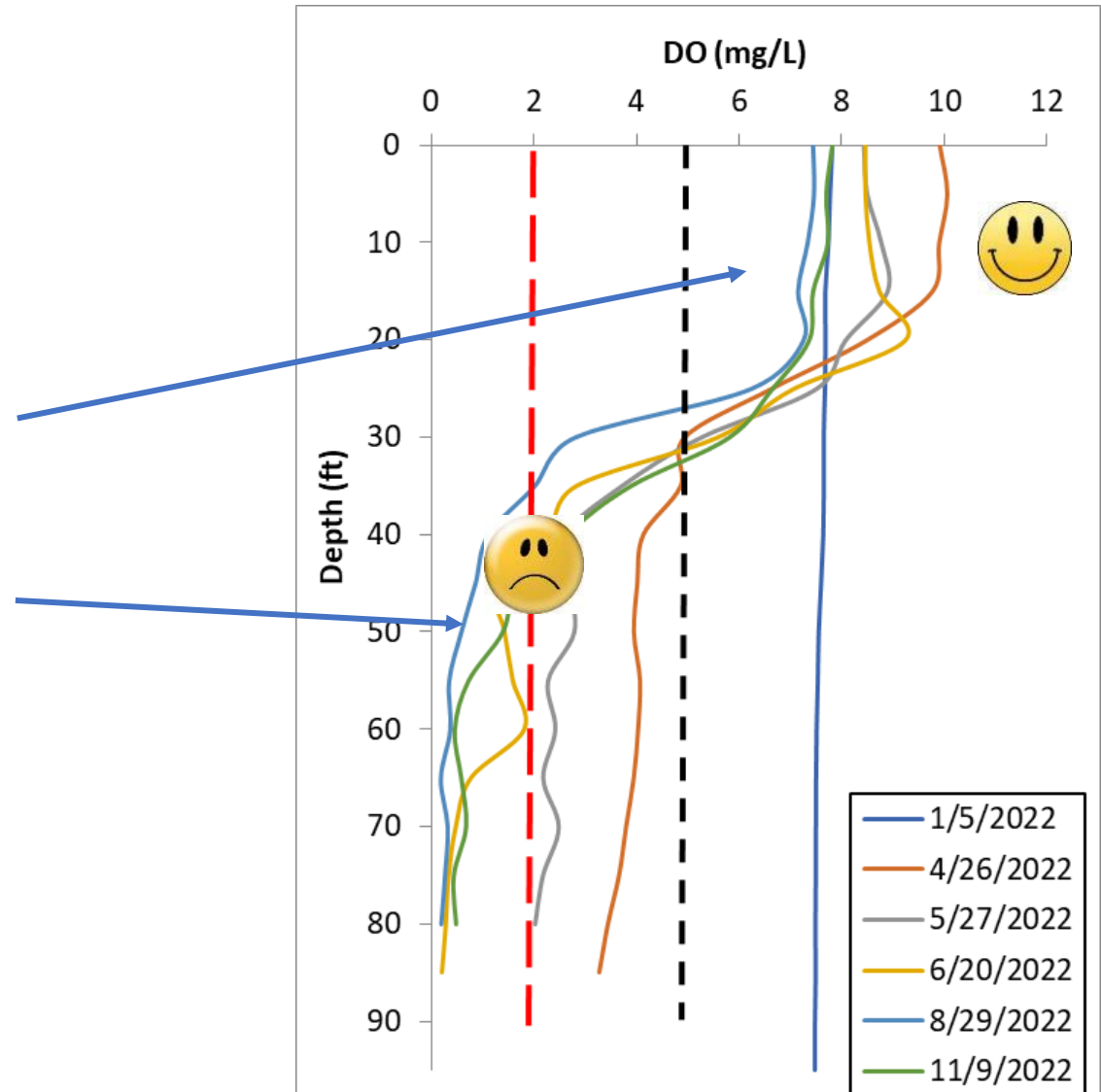
- Stratified spring-fall
- Hottest mid-summer
- Inflows sink in winter;
float in spring



Trout prefer temp. <68 oF

Dissolved Oxygen

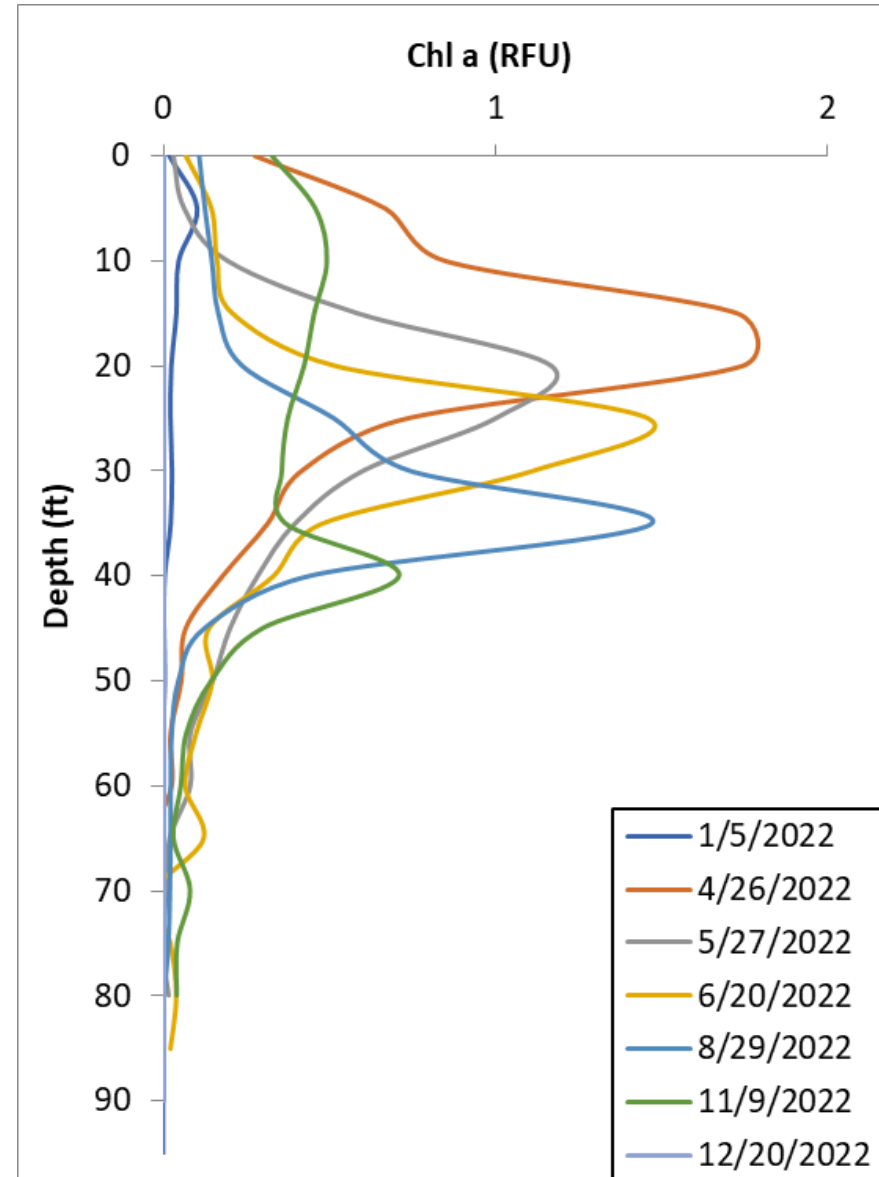
- DO near surface from air diffusion & photosynthesis
- DO lost quickly below thermocline by respiration
- Similar pattern every year



- *DO < 5 mg/L stresses fish*
- *DO < 2 mg/L changes chemistry*

Algae

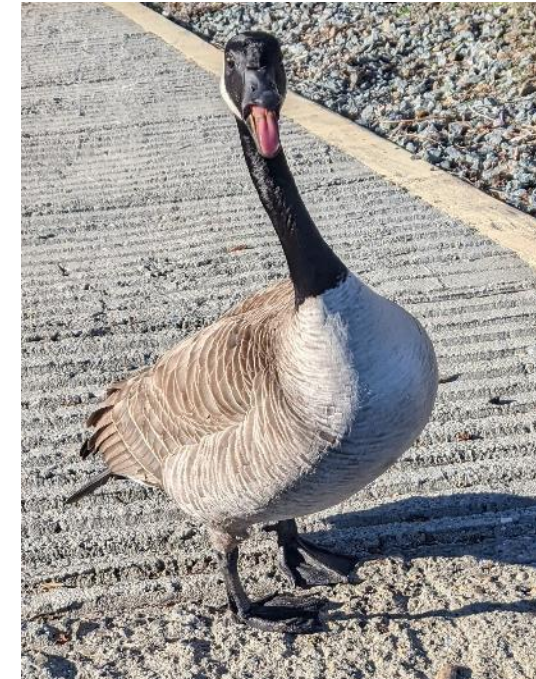
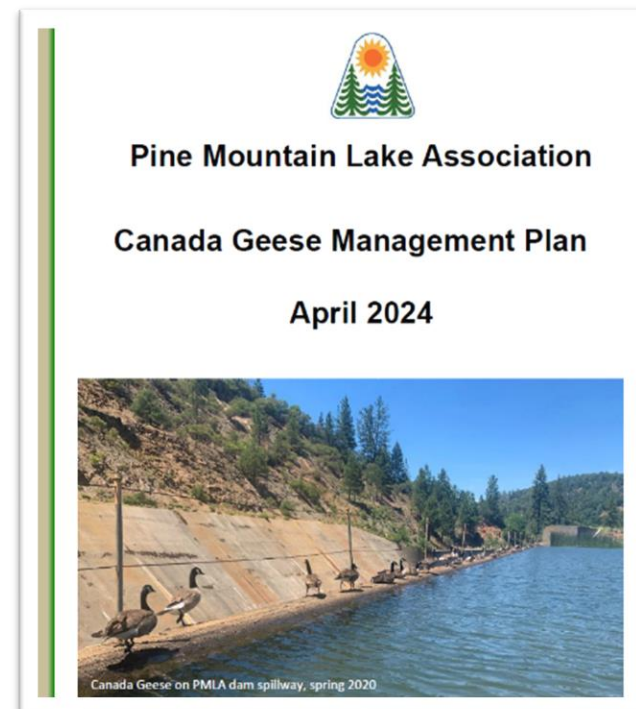
- Max spring-summer
- Max around thermocline
 - UV from above
 - Nutrients below
 - Site predation low
- Oligotrophic (low productivity)
- Mix of plankton species (good)
- Algae toxins not detected



>25 RFU is oligotrophic

Canada Geese Management – Progress Response

- Monitor
 - Outreach
 - Clean use areas
 - Oil eggs
 - Harass
 - Hunt
-
- Staff out-competed on large area
 - Prevent & deter costs > benefits



Canada Geese Update

- First hunt Dec. 2022, then wet winter dispersed
- Oiled 52 eggs in March 2023 → >200 geese again by late summer 2023
- Most recent hunt Oct. 2023 → 1 nest March 2024
- Sampled feces: toxic bacteria NOT detected
- Depredation permit NOT granted → need stronger support from Tuol. Co. EHS

December 2023 at marina

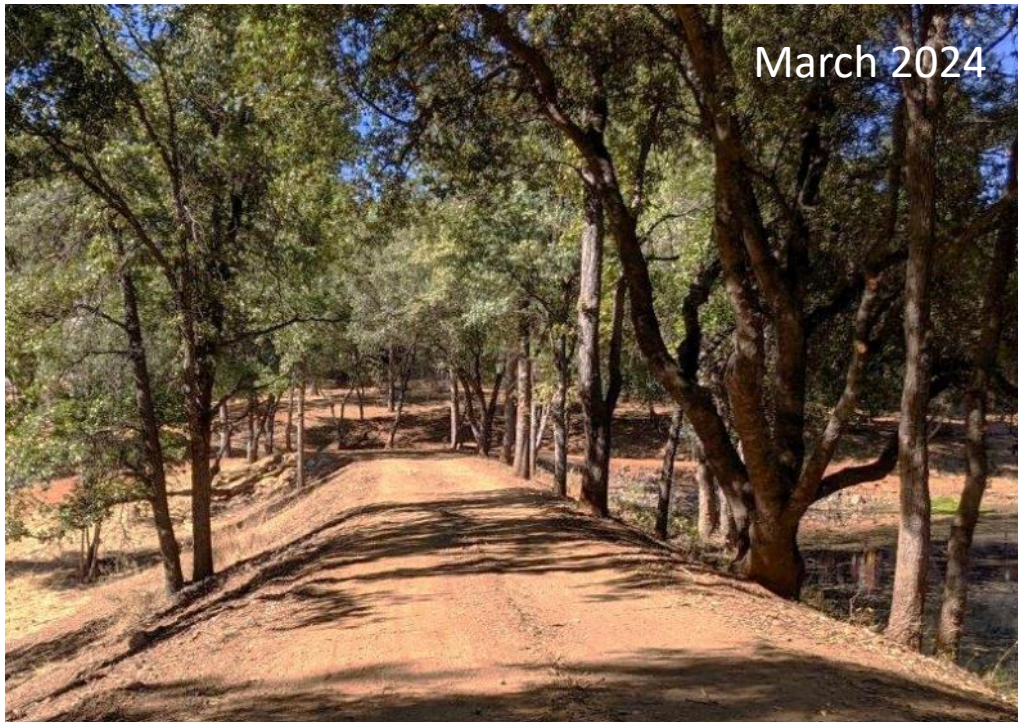


October 2023 at golf course



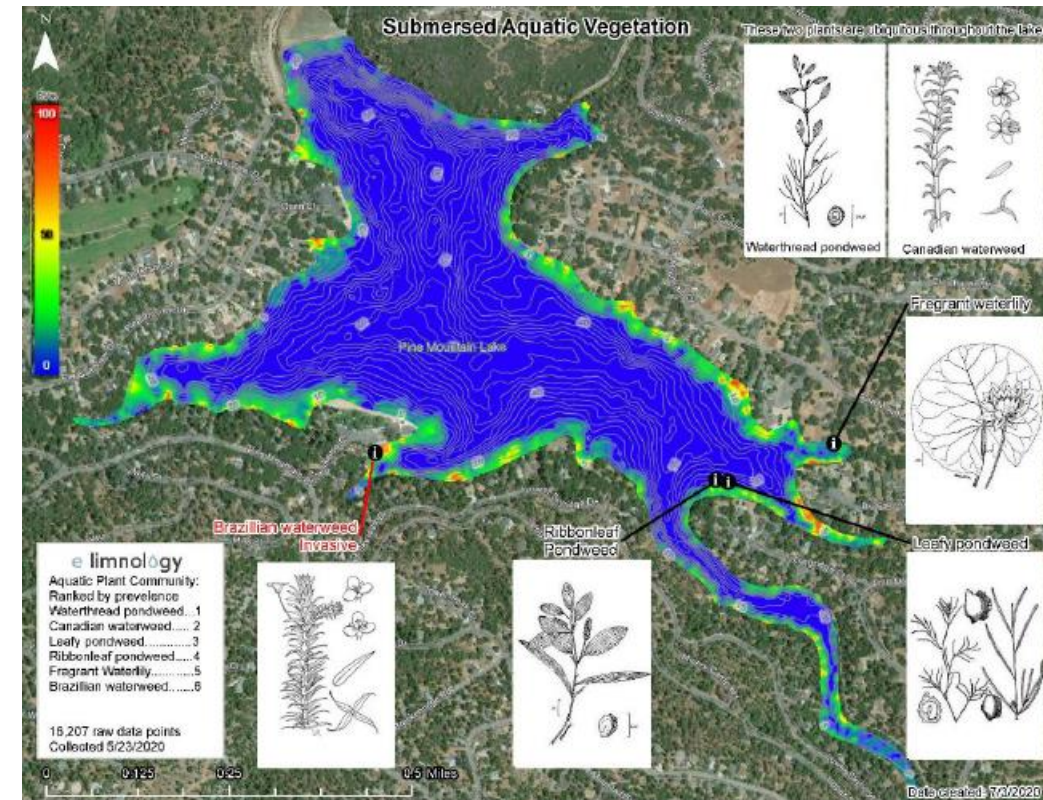
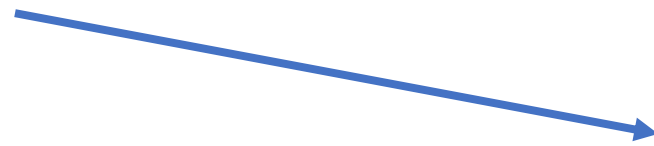
Bass Pond Challenges (& Responses)

- Trees on dam (trim, monitor)
- Weeds (harvest)
- Mosquitos (fish; larvae inhibitor)
- Spillway (lower, repair)



But Wait...There's (Always) More!

- Outreach articles
- Invasive species & boat inspections
- Fecal indicators at beaches
- Aquatic weeds
- Stocking sportfish
- Barn swallows
- Wildfire impacts
- *What's next?!*



Lake Management Requires Balancing Competing Interests

Of Course!	<i>But Wait!</i>
Geese are cute	Geese feathers & feces
Weeds are fish habitat	Weeds suck for boaters and swimmers
Tahoe-blue water	Productive ecosystem; turbidity inhibits plants and algae
Shoreline standards	Landowner rights
Recreation fun	Tranquility
Flood control	Dry season storage
Be transparent	Everything you say can and will be used against you, on Facebook

Acting SMART*

Annual schedule

Tasks	Responsible	Annual Cycle												Frequency	Notes	Description		
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Dam safety and performance																		
Dam/spillway inspections	PW																Monthly	complete field log; attach to DSOD annual rpt.
Full hypolimnetic release	PW																Annually	after Oct. 31 lake winterizing
Annual dam instrumentation report	Lake Mgr																Annually	for prior calendar year; submit to DSOD
Annual DSOD dam inspection	PW staff																Annually	best in Nov after winterizing & before fall turnover
Dam monuments survey	??																every 3 yrs unless triggered by storm or earthquake	
Diver survey	Big Valley Divers																Every 5 yrs unless triggered by outlet concerns	
Update Emergency Action Plan	??																Every 10 yrs	
Water rights management																		
Obtain monthly golf course water use data	Lake Mgr																Annually, after water year	should be on SCADA; compile use of lake & GCSD recycled water
Obtain USGS discharge estimates for Upper Big Creek	Lake Mgr																Annually; due Feb. 1 for prior water year (Oct-Sept)	
Prepare annual use reports	Lake Mgr																Annually; due Feb. 1 for prior water year (Oct-Sept)	for water year; submit online via eWRIMS
Lake water quality management																		
Complete lake monitoring checklist & measure profiles	PW																	

Tasks tracking table

Tasks	Responsibility	Start	Due	Done	Notes
3 Site visit #5	MEI	9/15/23	9/28/23		Complete inspection forms (pond, lake & dam), discuss improvements for 2024; sample/analyze: (1) macronutrients & Chl a pigment at Caltest, (2) algae & zooplankton at Linnopro, (3) e coli at IEH-JL Analytical (4) cyanotoxins [pick downwind site when sampling], (5) remove Solinst levellogger from Bass Pond stage gage (battery probably needs replacement; use data to estimate monthly storage volumes for water rights report; estimate dry season water balance as net GW in vs ET out); (6) sample for redox compounds per SOP; EBI clean/calib sensor chain, replace sensor chain anchor, add WSE sensor, connect existing weather station
1 Replace low-level outlet gate motor/pump unit	RL	6/1/23	9/30/23		to address hydraulic fluid leak; ordered in early 2022
3 Organize geese hunt #1	MEI	9/1/23	10/1/23		Mike Hernandez guide; per usual hunting season conditions; Sep. 30 -Oct. 2; Oct. 21-Jan. 28; Feb. 17-18
3 Complete short wildlife incident report to track geese eggs coated	MEI	10/1/23	10/30/23		data in "GooseTracker2023.xlsx" avail from Cathy; see "Canada Goose Nest and Egg Reporting Procedure.pdf"; at https://apps.wildlife.ca.gov/wir/incident/create ; (1) fill out wildlife incident report: https://apps.wildlife.ca.gov/wir/incident/create ; (2) report # eggs/month at https://epermits.fws.gov/eRCGR
2 Download Solinst water level sensor from Bass Pond	MEI	9/1/23	10/31/23		remove after dry season, if deep will need 1-2 hooks to pull up cable
1 Add bait to rodent traps in upper section; seed bare soil on E end of back face	RL	8/17/23	11/15/23		
1 Remove accumulated aquatic plants in channel below seepage pond A weir	RL	8/17/23	11/15/23		to prevent backwater effect
2 Transfer weather station to LakeTech; add water level sensor to buoy & LakeTech	MEI	8/17/23	11/15/23		
3 Site visit #6	MEI	11/1/23	11/15/23		Complete inspection forms for (pond, lakes, dam, stream gages); following lake winterizing; exercise gate to release hypolimnetic water
2 Get SCADA readings from Dunn for golf course inrig meter	MEI	10/1/23	11/30/23		

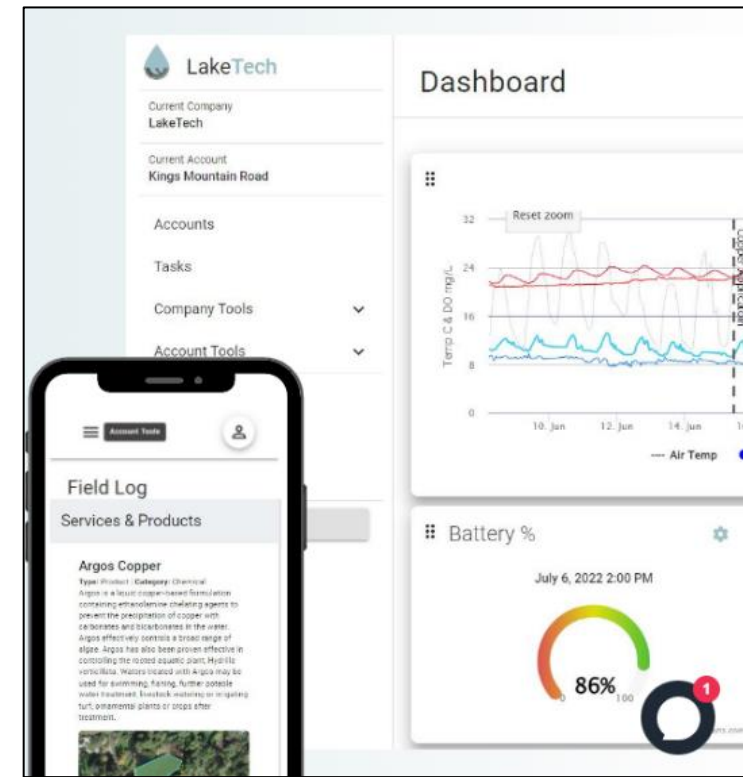
* Specific, Measurable, Achievable, Relevant, and Time-Bound

Plans for 2024 & Wish List

- LakeTech sensors & online tool
- Geese depredation permit
- Sister HOAs discussions
- NALMS article & international conference at Tahoe

Wish List:

- On-line, live, public: water temp. & level, weather
- Fall hypolimnetic (deep-water) release
- Dam surface map





Keep Pine Mountain Lake Blue!