

An aerial photograph of Hayden Lake North Arm is shown, partially covered by a semi-transparent blue overlay. The overlay features several white gear icons representing water monitoring sampling sites. Labels for these sites are visible in a light blue font: "Sportsman Park" at the top, "Bob's Bay Water Monitoring Sampling Site" in the upper middle, "Ross Point Water Monitoring Sampling Site" in the middle left, "English Point" in the lower middle, and "Gonzaga Water Monitoring Sampling Site" at the bottom left. The main title is centered in large, bold, white capital letters. The date and author information are in a smaller white font at the bottom left. Several white diagonal lines cross the right side of the blue overlay.

HAYDEN LAKE NORTH ARM INVESTIGATION COMMITTEE SUMMARY

Date: January 9, 2023

TL Yount — Hayden Lake Watershed Improvement District

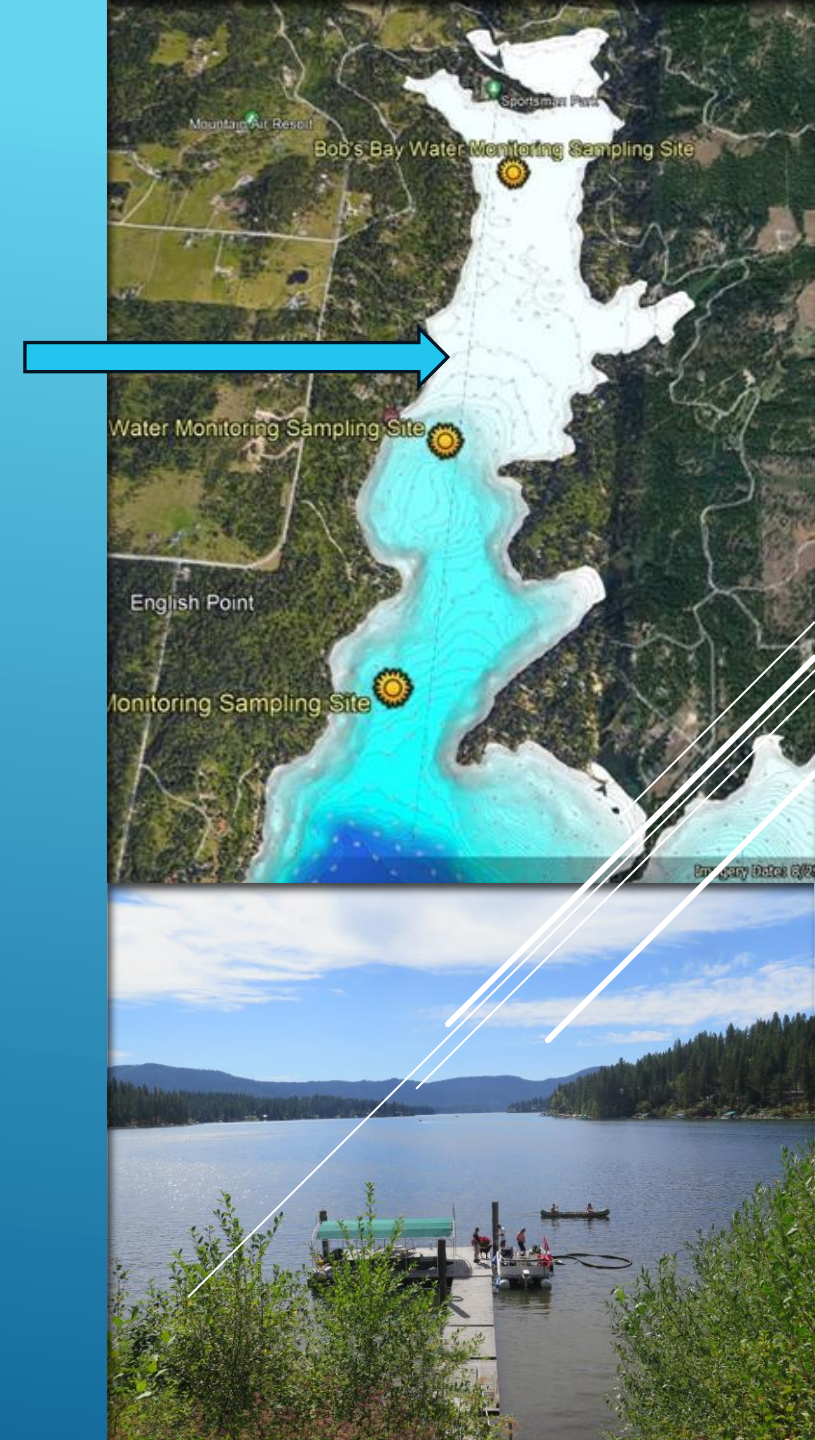
AGENDA

- Background and Introductions
- A Trophic State Perspective of the North Arm
- Nutrients & HABs
- North Arm Fishery
- Honey Badger Project
- Gaps and Data Needs



- ▶ Hayden Lake is 3800 Acres and has 40 miles of shoreline, reaching depths of 175', with a watershed population of ~1500
- ▶ The North Arm is 600 Acres with 8 miles of shoreline and has ~ 30% of the lake residents. Approximately half of the North Arm was created when a dike was constructed at the South end of the lake 100 years ago.
- ▶ Two public access points, Honeysuckle on the South end of the lake and Sportsman Park on the North end. Boat launches, public docks, and lake access points at both sites.
- ▶ Recent lake monitoring activities have identified serious area of concern at the North end of the North Arm.
- ▶ Hayden Lake Watershed Improvement District commissioned an investigative committee to review the state of conditions and make recommendations for improving the overall Ecosystem

HAYDEN LAKE AND THE NORTH ARM



NORTH ARM INVESTIGATION COMMITTEE



Vince Coleman
Resident, North Arm



Dan Lucas
Resident, North Arm



Kristin Lowell
Id Dept.
Environmental Quality



Frank Wilhelm
Limnologist, University of
Idaho



Rob Ryan
Fishery Biologist, Id Dept.
Fish and Game



Tom Yount
Board Member, HLWID



Jan Wilkins
President, HLWA

Residents

Agencies

HLW Orgs



Del Senner
Resident, North Arm



Gil Rossner
Resident, North Arm



Chris Robinson
USFS



Craig Cooper
Limnologist, ID Dept.
Environmental Quality



Jeremey Varley
Noxious Weeds, Id Dept.
Agriculture

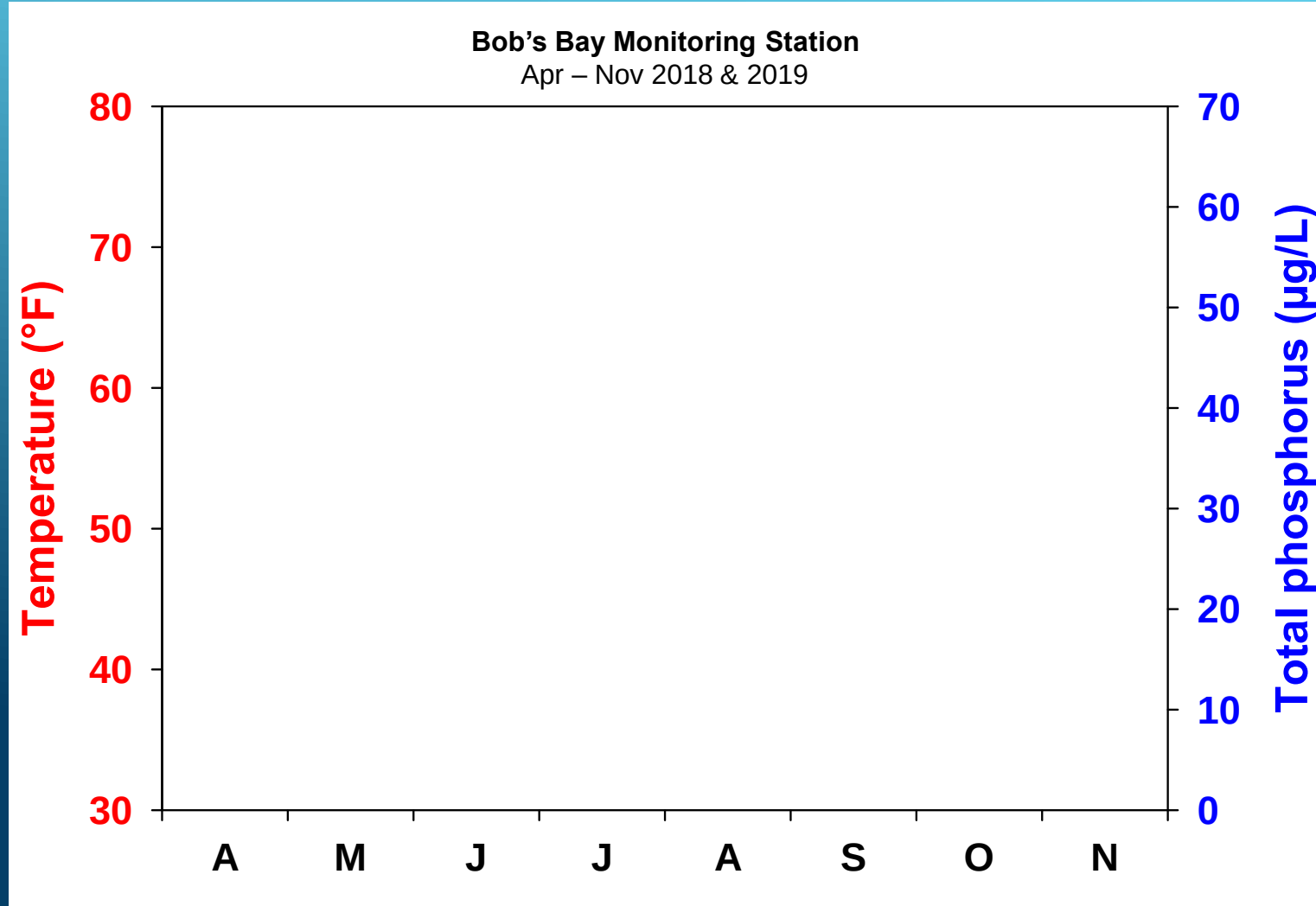


Mary Ann Stoll
Comm. & Outreach, HLWID



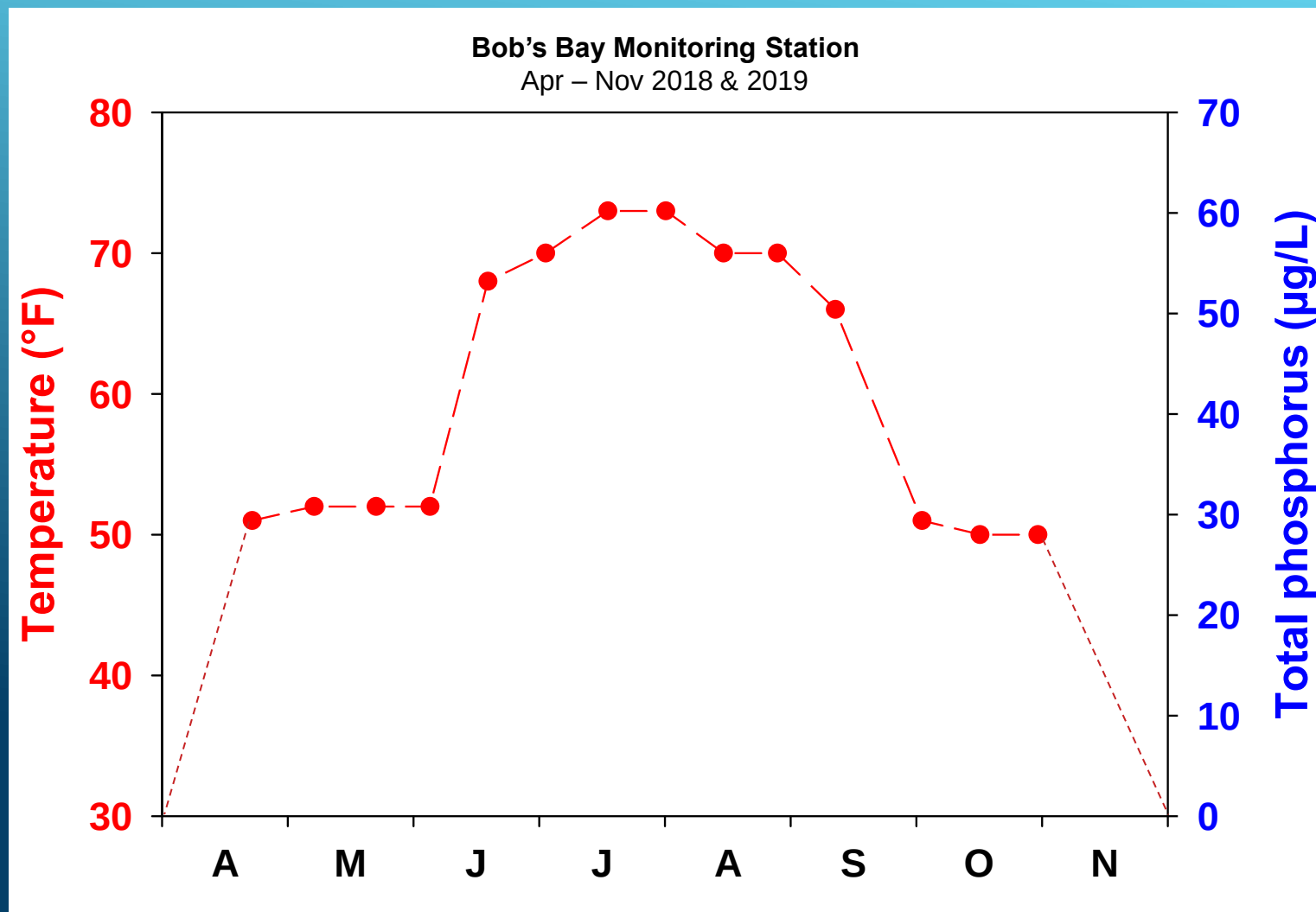
Todd Walker
Lake Manager, HLWID

► Typical North Arm nutrient cycle



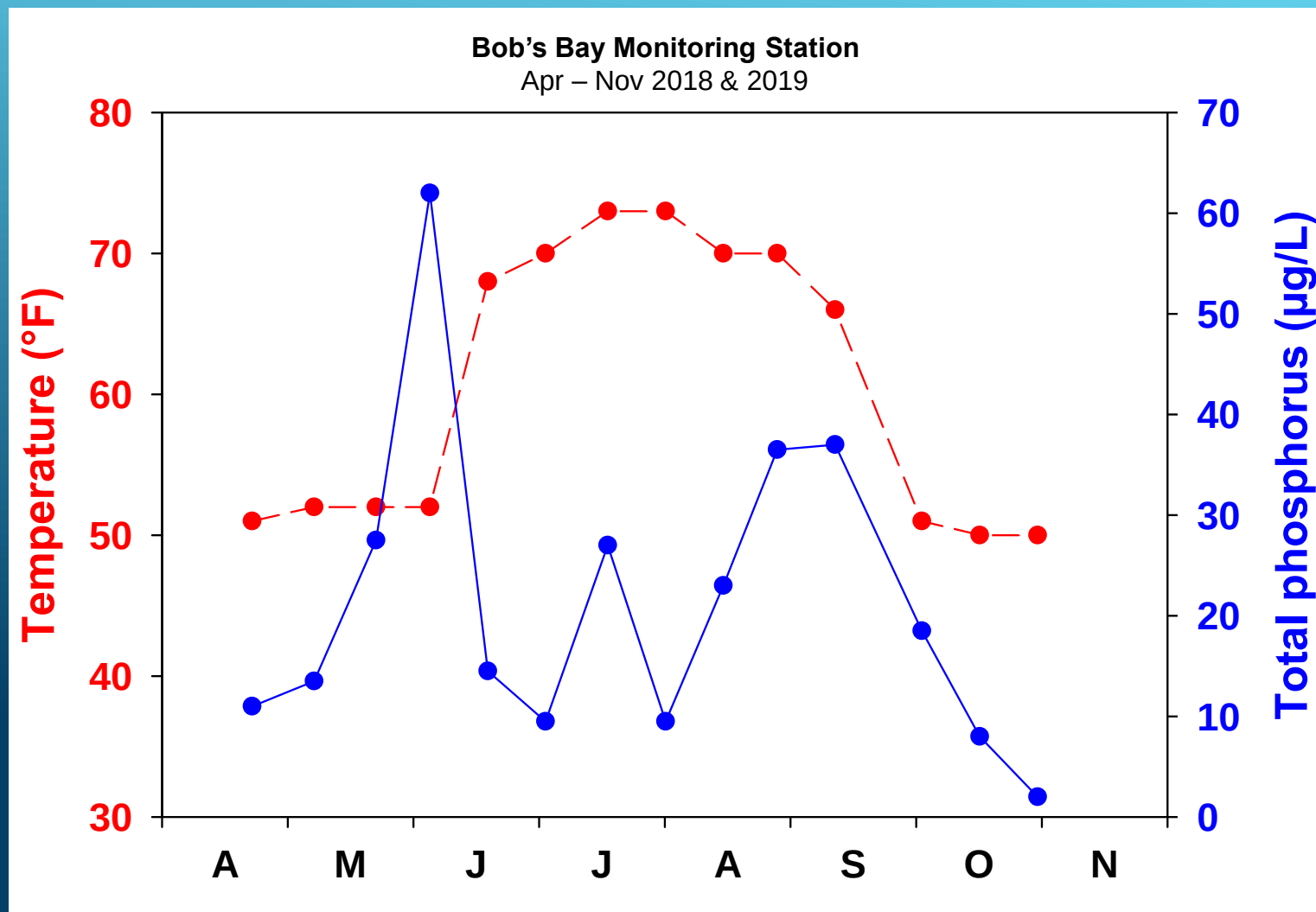
A TROPIC STATE PERSPECTIVE OF THE NORTH ARM

► Typical North Arm nutrient cycle – temp rise/fall



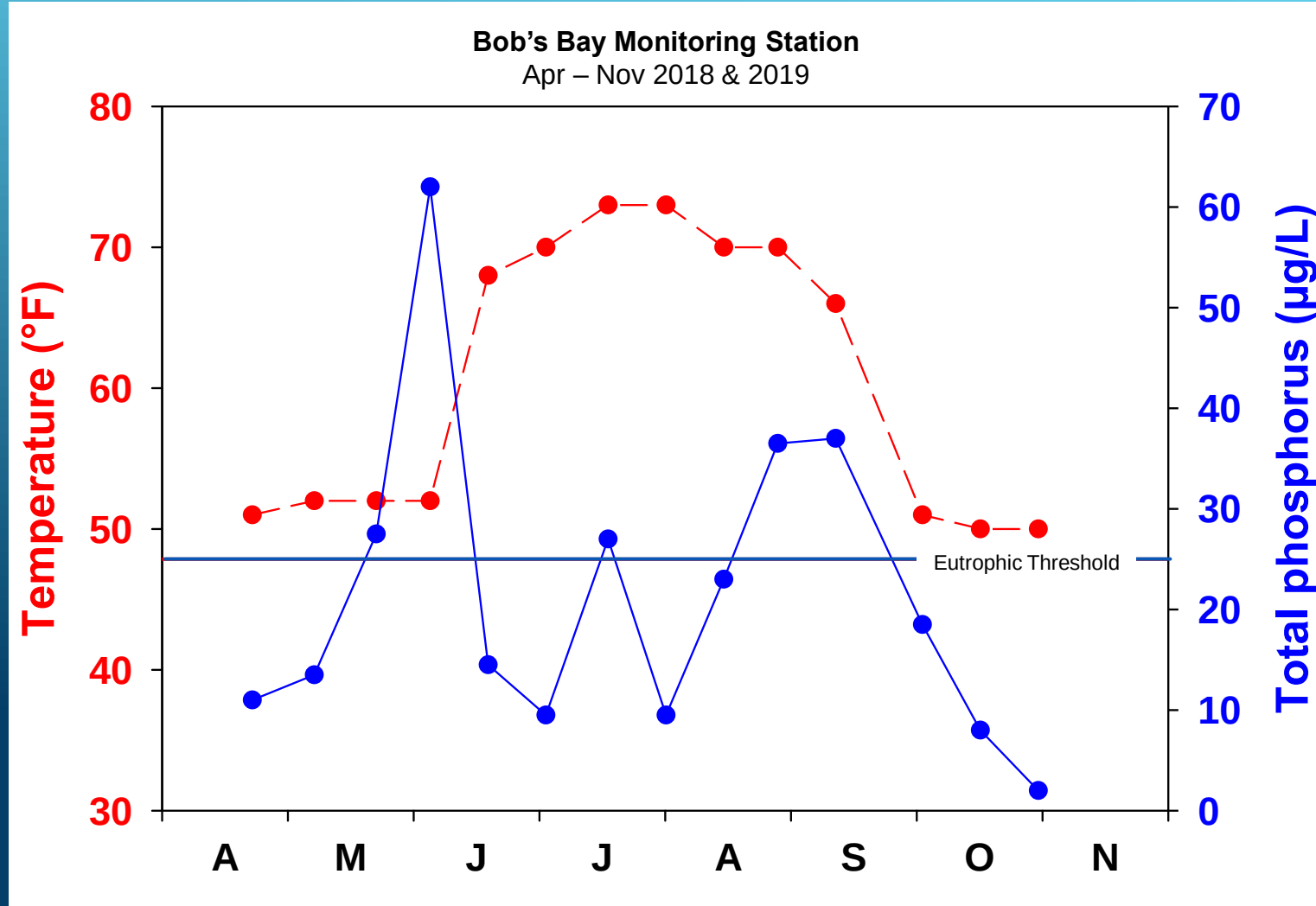
A TROPHIC STATE PERSPECTIVE OF THE NORTH ARM

► Typical North Arm nutrient cycle – Total Phosphorus rise/fall



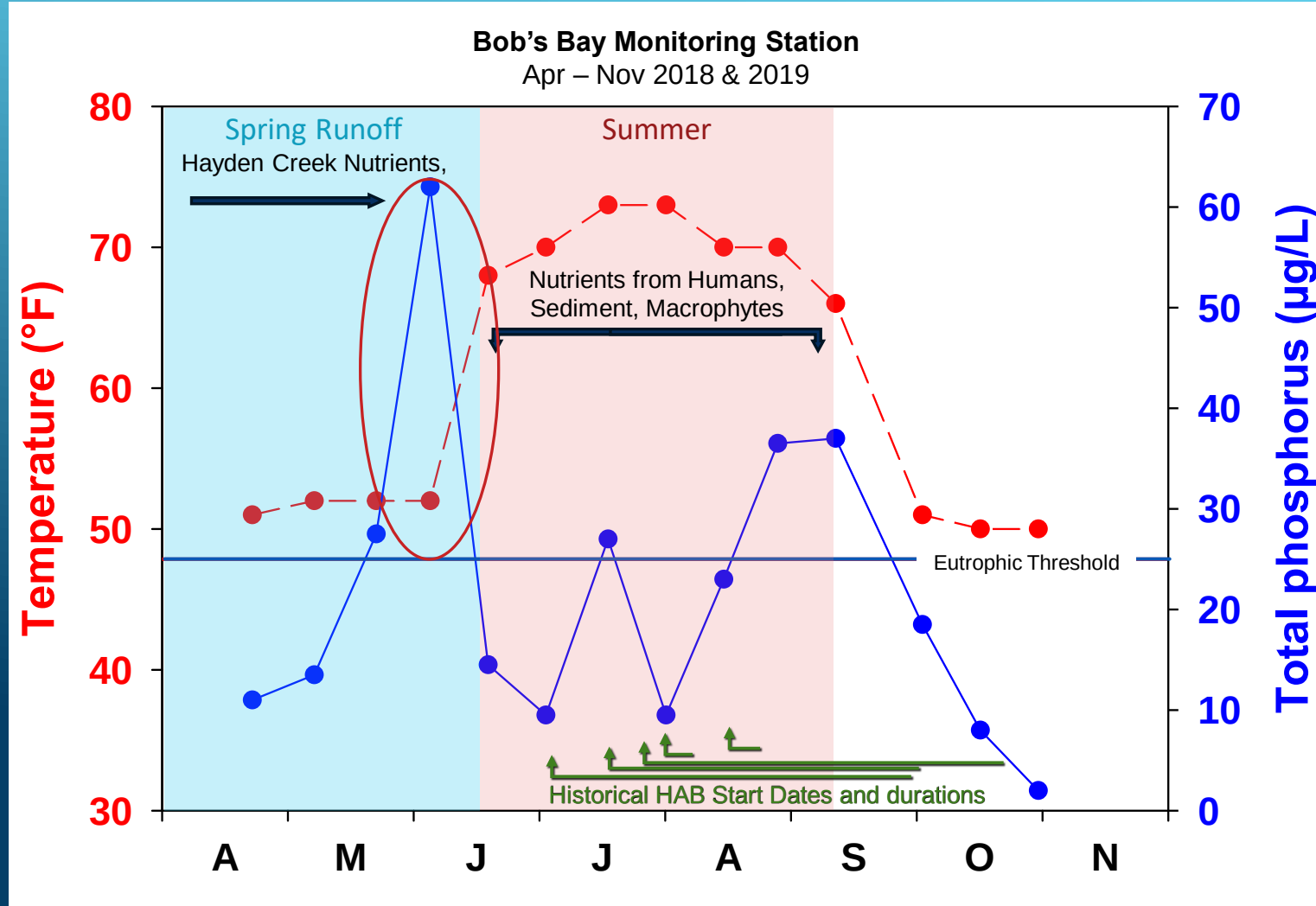
A TROPHIC STATE PERSPECTIVE OF THE NORTH ARM

► Typical North Arm nutrient cycle – Eutrophic Threshold ~ 24 µg/L

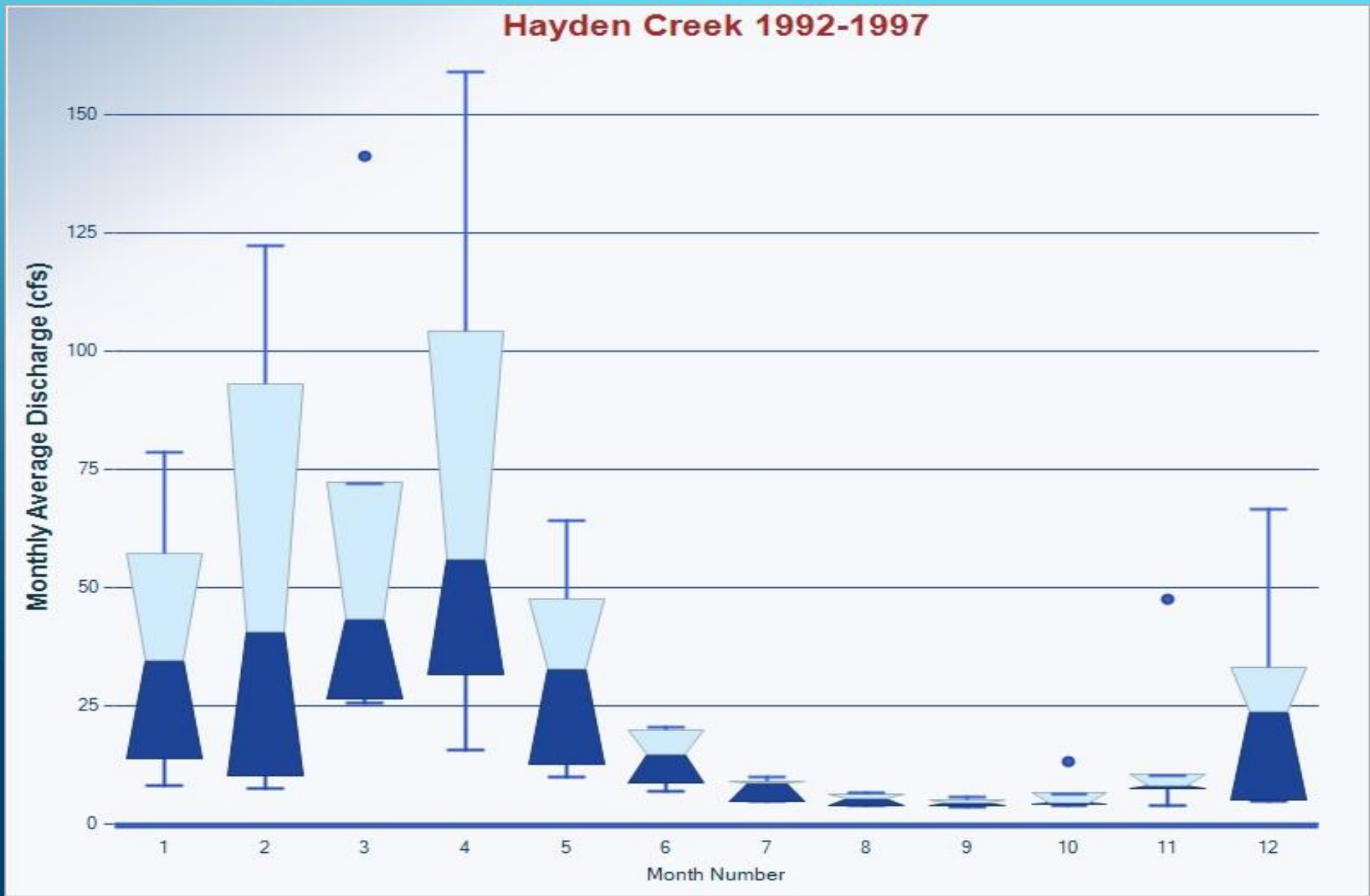


A TROPIC STATE PERSPECTIVE OF THE NORTH ARM

► Typical North Arm nutrient cycle – nutrient sources



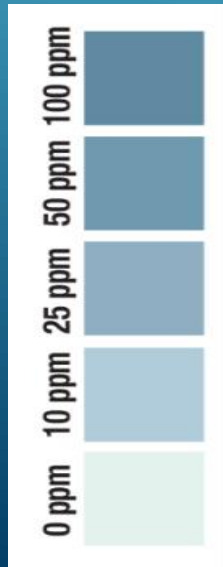
A TROPHIC STATE PERSPECTIVE OF THE NORTH ARM



USGS DATA

► Carlson Trophic State Index (TSI)

A calculation of the degree of eutrophication derived from commonly measured lake parameters:



Phosphorus
Concentration

Secchi Depth



Chlorophyll a
concentration

A TROPHIC STATE PERSPECTIVE OF THE NORTH ARM

► **Trophic State = the amount of plant biomass**

- ❖ The total weight of living biological material (biomass) in a waterbody at a specific location and time
- ❖ Located along a continuum:



A TROPHIC STATE PERSPECTIVE OF THE NORTH ARM

► Carlson Trophic State Index (TSI)

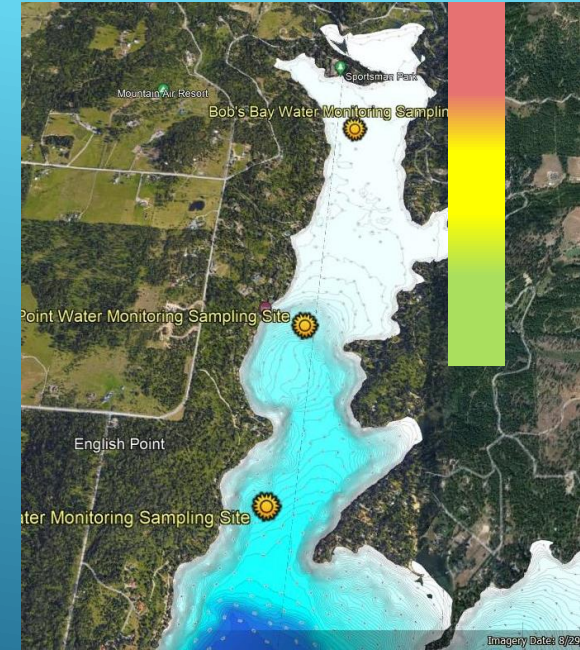
Trophic State Index (TSI)	Chlorophyll a (µg/L)	Secchi Disk (m)	Total Phosphorus (µg/L)	Attributes	Water Supply	Fisheries & Recreation
< 30	< 0.95	> 8	< 6 ↓	Oligotrophic: Clear water, oxygen year-round in the hypolimnion.	May be suitable for unfiltered water supply.	Salmonid fisheries dominate.
30 – 40	0.95 – 2.6	8 – 4	6 – 12	Hypolimnion of shallower lakes may become anoxic.		Salmonid fisheries in deep lakes only.
40 – 50	2.6 – 7.3	4 – 2	12 – 24	Mesotrophic: Moderately clear water; increased probability of summer hypolimnetic anoxia.	Fe, Mg, taste, + odor problems worsen. Raw water requires filtration.	Anoxia results in salmonid loss. Walleye may dominate.
50 – 60	7.3 – 20	2 – 1	24 – 48	Eutrophic: Anoxic hypolimnia, macrophyte problems possible.		Warm-water fisheries only Bass may dominate.
60 – 70	20 – 56	0.5 – 1	48 – 96	Blue-green algae dominate, algal scums and macrophyte problems.	Episodes of severe taste and odor possible.	Macrophytes, low transparency, algal scums, may discourage sports.
70 – 80	56 – 155	0.25 – 0.5	96 – 192	Hypereutrophic: (light limited productivity). Dense algae and macrophytes.		
> 80	> 155	< 0.25	192 – 384	Algal scums, few macrophytes		Rough fish dominate; summer fish kills possible.

Adapted from: <https://www.nalms.org/secchidipin/monitoring-methods/trophic-state-equations/>

A TROPHIC STATE PERSPECTIVE OF THE NORTH ARM

► What is the TSI of the North Arm? (Wilhelm, 2023)

- ❖ The Carlson Trophic State Index is calculated from each parameter's perspective.
- ❖ The Summer TSI utilizes only the data from June 15 – Sept 1.



Trophic State Index (TSI)	
< 30 - 40	Oligotrophic
40 – 50	Mesotrophic
50 – 70	Eutrophic
70 – > 80	Hyper-Eutrophic

Location	Year	TSI Chl-a	TSI TP	TSI SD	Trophic Class
Bobs' Bay	2018	54	44		Mesotrophic / Eutrophic
	2019	44	48	54	
Ross Point	2018	38	38		Oligotrophic
	2019	24	22	35	
Gonzaga	2018	33	30		Oligotrophic
	2019	19	24	32	

A TROPHIC STATE PERSPECTIVE OF THE NORTH ARM

- Harmful Algal Blooms (HABs) have occurred in Hayden Lake 5 times over the last 10 years

Hayden Lake HAB History

(Note: 2012 is the year DEQ began recording HABs on Hayden Lake.)

Year	Health Advisory Start Date	Health Advisory End Date	Days Under Health Advisory	Dominant Cyanobacteria sp.
2012	8/16/2012	8/22/2012	7	Anabena circinalis
2014	8/1/2014	8/6/2014	6	Anabena sp.
2015	7/5/2015	Past recreation season	71+	Anabena sp. Microcystis sp.
2016	7/15/2016	Past recreation season	61+	Anabena sp.
2017-2020	No Advisory			
2021	7/22/2021	10/14/2021	71	Dolichospermum
2022	No Advisory			



HARMFUL ALGAL BLOOMS

HARMFUL ALGAL BLOOMS

- ▶ Rapid growth in cyanobacteria due to excess nutrients, coinciding with lots of sunlight, warm temperatures and shallow, slow-flowing water.
- ▶ Can produce toxins that are harmful to humans, animals and aquatic life.
- ▶ Why is this important?
~50% of Hayden Lake residents draw drinking water from the lake.



HARMFUL ALGAL BLOOMS

- ❖ Harmful Algae Blooms have become more frequent in the North Arm due to nutrient pollution and shallow water, with abundant sunlight and higher water temperatures. Nitrogen/phosphorus (N:P) ratios in North Arm periodically are below 5 (Harvey 2022).
- ❖ “The key to managing the eutrophic northern end of Hayden Lake is managing the amount of available phosphorus and nitrogen.” (Harvey 2022)
- ❖ Annual precipitation appears to correlate with densities of B/G Algae populations. Retaining spring run off volume can reduce spike in nutrients and reduce unwanted algae presence

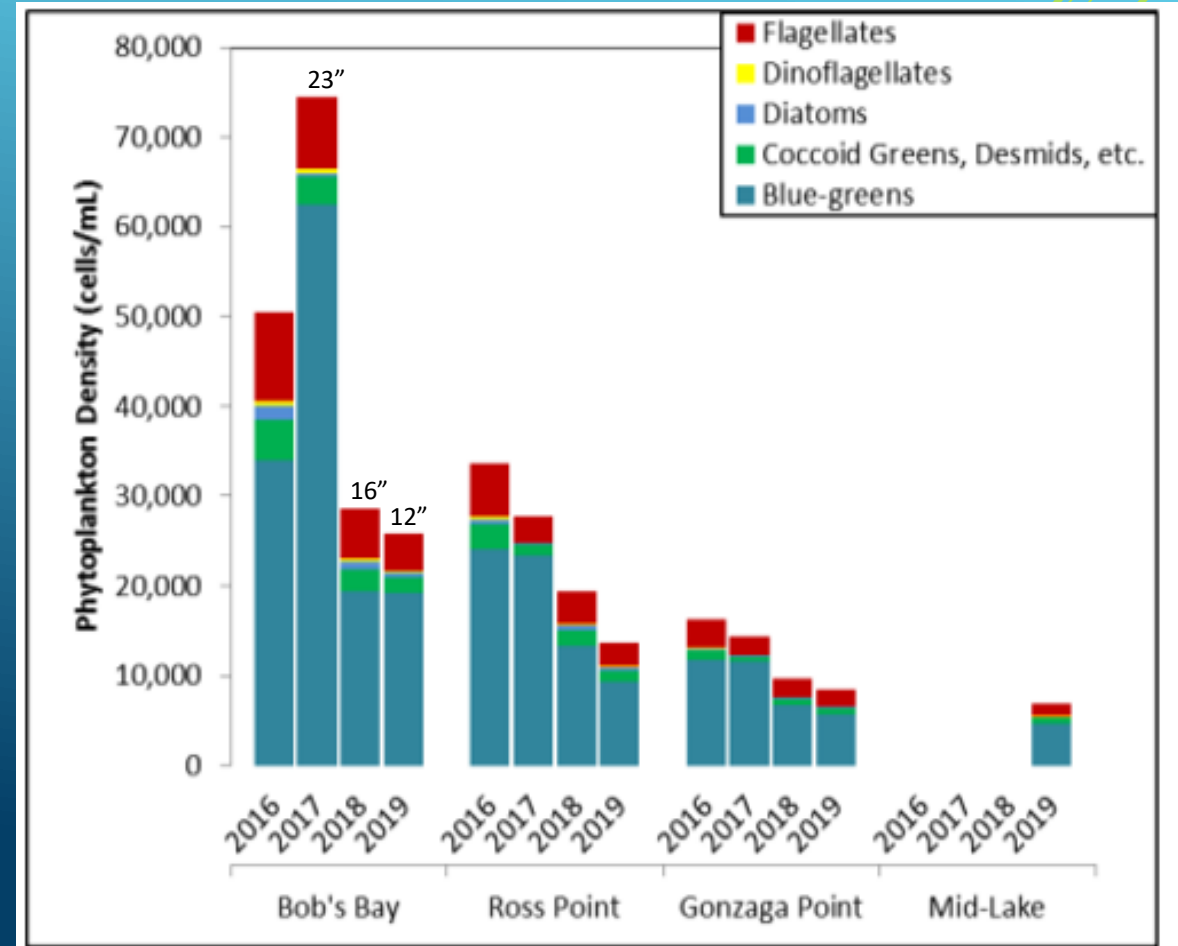


Figure 11. Phytoplankton Density by class, year and station.



THE NORTH ARM FISHERY

Fisheries Management Plan

2019-2024

A Comprehensive Guide to
Managing Idaho's Fisheries Resources



This document was adopted by the
IDAHO DEPARTMENT OF FISH AND GAME COMMISSION
June 2019



Idaho Fish Management Plan For Hayden Lake

- ❖ Rainbow Trout
- ❖ Cutthroat trout

General

Maintain trout fishery with wild production.
Provide harvest opportunity for trout species

- ❖ Kokanee

Quality

Provide Kokanee fishery through stocking and maintain quality size structure by maintaining low density. Evaluate contribution of wild production by periodic monitoring.

- ❖ Largemouth Bass
- ❖ Black Crappie

Quality

Provide high catch rates for quality size fish with regulations that limit harvest. Evaluate largemouth bass and black crappie population structure and fishery to determine if the regulations are meeting management goals.

- ❖ Smallmouth bass
- ❖ Northern Pike
- ❖ Yellow perch
- ❖ Pumpkinseed
- ❖ Bullhead
- ❖ bluegill

General

Provide liberal opportunity and encourage harvest of smallmouth bass and northern pike to reduce impacts to other fish populations.

NORTH ARM FISHERY

Trout

- ▶ ~50,000 plants a year not making it to spring
- ▶ Pike appear to be controlling the trout population.



Largemouth Bass

- ▶ Pike and North Arm ecosystem conditions challenge to smaller bass and pan fish
- ▶ 2023 Bass tournament, 2 LMB caught, 45 boats w/ 90 anglers, 26 boats skunked
- ▶ North Arm Macrophyte above target (<40%) for vibrant bass fishery

Kokanee

- ▶ 80-100,000 fish stocked/yr
- ▶ *Meeting objective*

Northern Pike

- ▶ Thrive in North Arm condition: shallow, warm, dense macrophytes.
- ▶ Managed primarily by fishing year-round, 45-50% harvest rate.
- ▶ North Arm Macrophyte abundance is breeding mecca for pike



NORTH ARM FISHERY

HONEY BADGER PROJECT



► HBP – Is a Potential Threat to North Arm Ecosystem

- ❖ ~63% of the Hayden Lake watershed is in USFS land that will see significant logging activities 2024-2040.
- ❖ Current & forecast sediment contributions to Hayden Lake from impacted tributaries have been modeled for the EA.
- ❖ Hayden Creek expected to see 44% of the impact; Yellowbanks, 18%.
- ❖ Project will reduce sediment contribution to Hayden Creek from 233 tons/year to 136 tons/year when complete through closure, storage and decommissioning of ~150 miles of roads. However, modeling of impacts during project execution not performed.
- ❖ ***Does the Forest Service have responsibilities to address nutrient and sediment impacts to the waters and biological resources under the Clean Water Act (CWA)? Sediment contains from 400-1000mg phosphorus per kilogram (Strawn 2006). Per the 2009 Hayden Lake Management Plan Addendum***

HONEY BADGER PROJECT

HONEY BADGER EA STATEMENTS

Honey Badger Environmental Assessment:

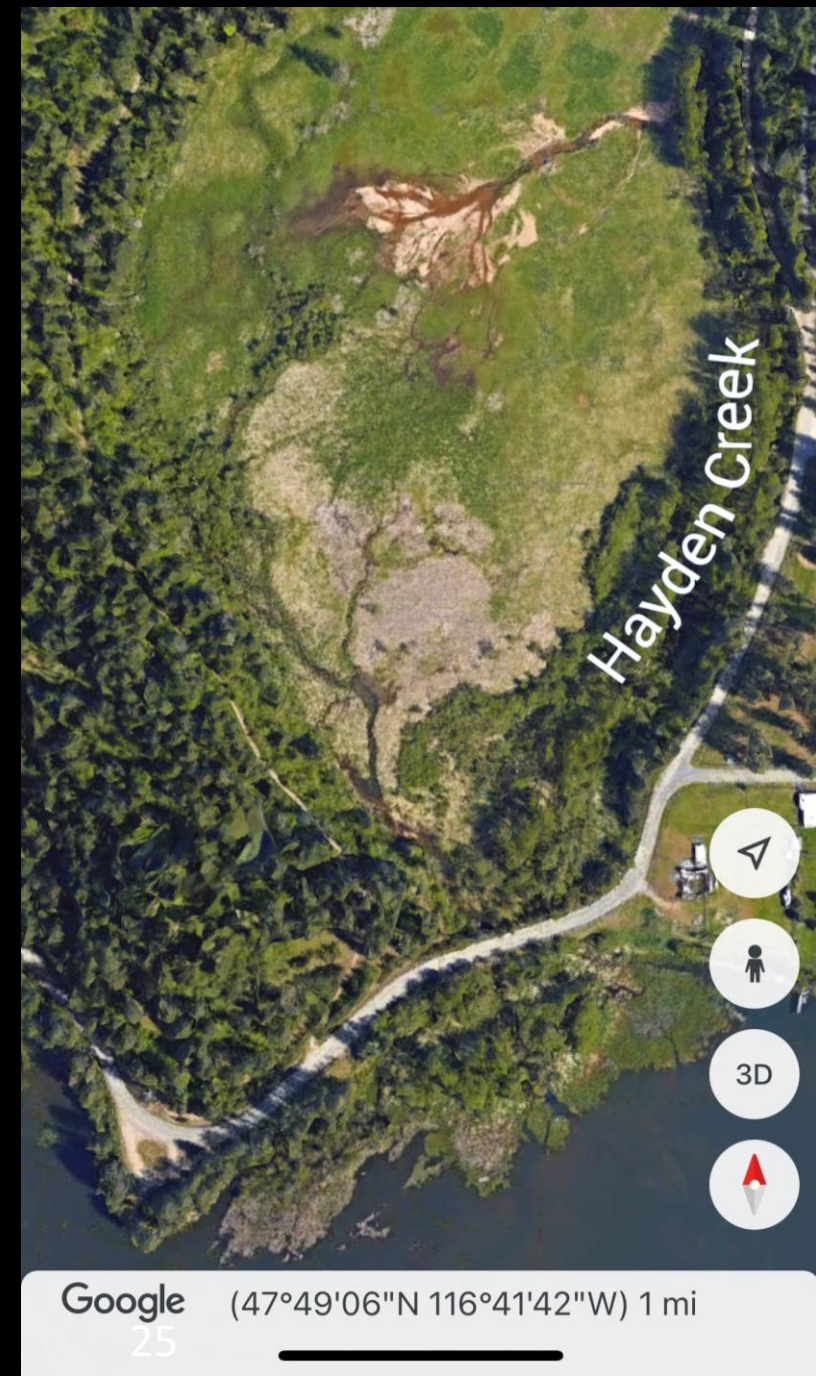
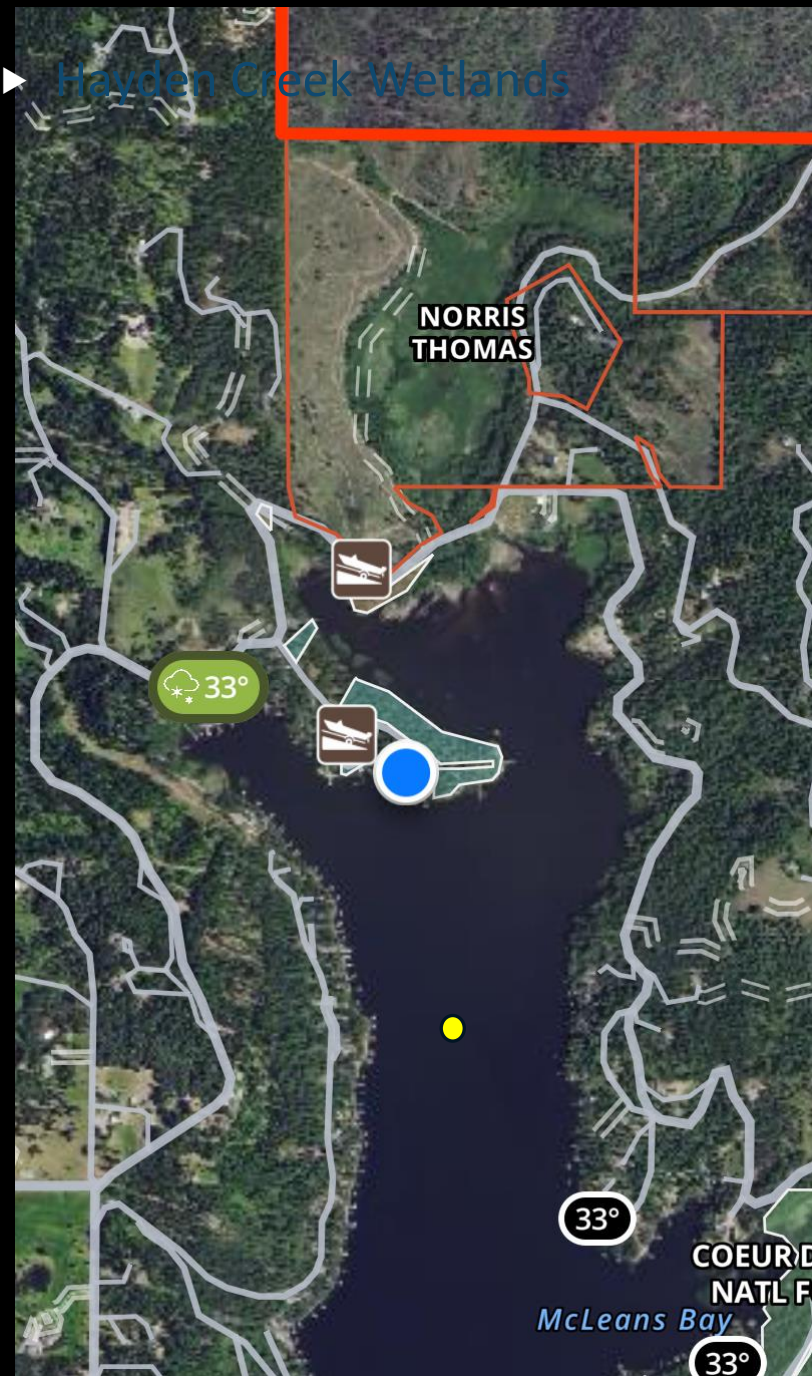
- ▶ “In addition to jobs and income, timber sales would generate receipts to fund restoration work.”
- ▶ “Additional funding is available through stewardship contracts, grants, partnerships, and other programs, such as the Great American Outdoors Act, Land and Water Conservation Fund, and challenge cost-share programs.”
- ▶ “Contracts associated with other proposed activities (to reduce wildfire risk, improve water quality, make trails more sustainable, and improve roads) could also benefit the local economy.”
- ▶ “Timber products would be available for use both nationally and locally.”
- ▶ “Based on anticipated timber volume, market trends, and anticipated funding sources, there is a reasonable degree of certainty that this project would be economically feasible and have a positive effect on communities.”

Table 24 Estimated Economic return - life of project		
	No action	Action
Estimated Volume (million board feet-mmmbf)	0	204
Estimated Forest Products Industry Jobs	0	4,080
Estimated revenue to Communities through wages and salaries	0	\$ 136,068,000
Estimated Revenue to Communities through sale of goods and services	0	\$ 785,400,000

- ▶ Hayden Creek sediment and nutrient contribution data is not current (monitoring of Hayden Creek initiated by HLWID/USFS/DEQ 2023).
- ▶ Lake conditions north of Bob's Bay sample point are likely “eutrophic to hyper-eutrophic”, but not monitored to date.
- ▶ Lake bottom sediment and macrophyte contributions to yearly nutrient cycle have not been sufficiently quantified to date.
- ▶ Hayden Creek Wetland is suspected of under performing key nutrient/sediment functions during springtime high flow events.
- ▶ Technical assistance in the review and assessment of the Hayden Creek Wetland performance capabilities is needed to better inform management decisions on restoration plans for the North Arm of Hayden Lake.

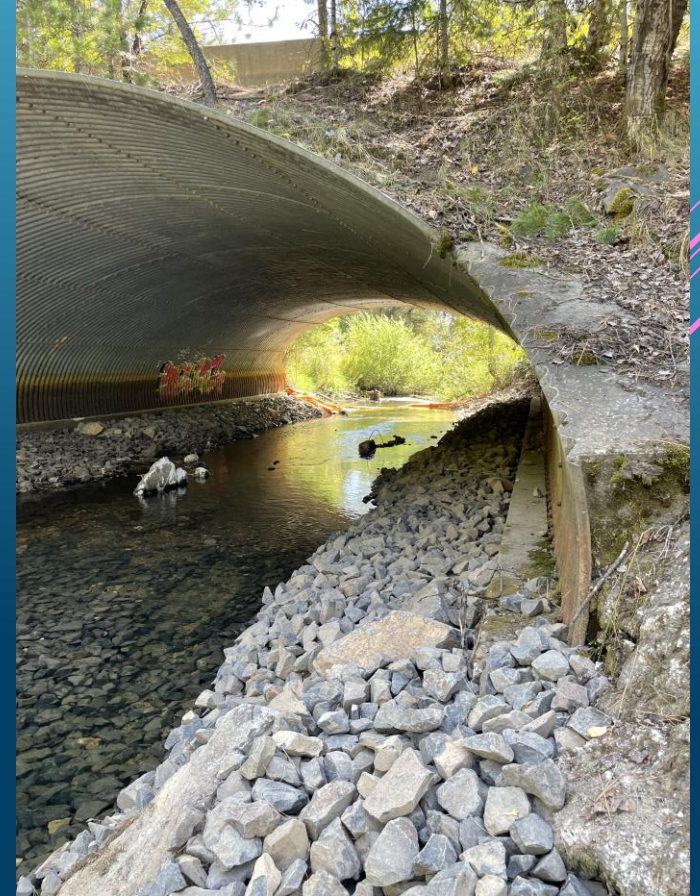
GAPS AND DATA NEEDS





HAYDEN CREEK – WETLANDS EAST FORK

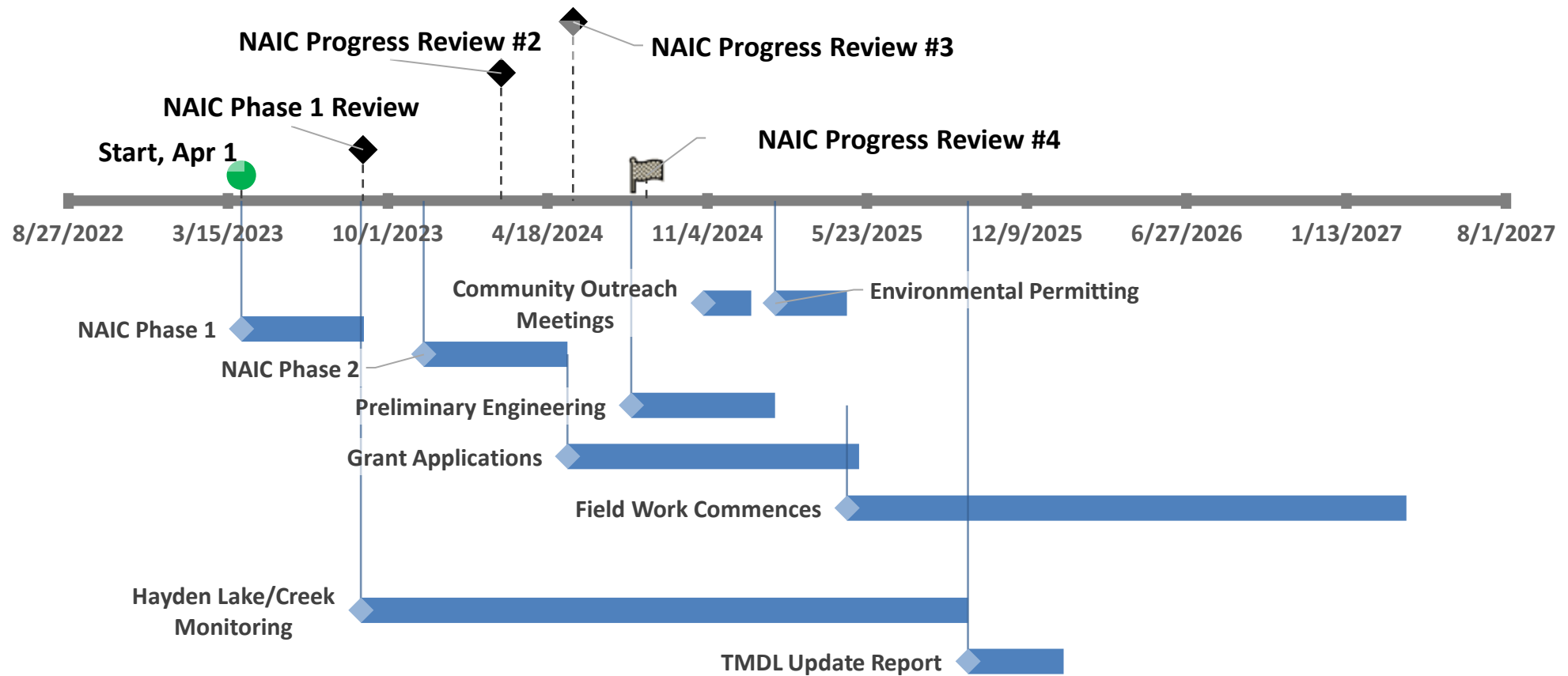
- Hayden Creek stream bank on private land may have been created without regard to a functioning wetland during high flow events.
- Landowner installed culvert for access to pasture for livestock.
- Culvert is undersized for spring flow (peak >100cfs) and consistently washes out.



SUMMARY



- ▶ Left unattended, the North Arm will most likely decline further and eventually affect the overall balance of the lake. Managing nutrients, plants and the fish to a more positive balance for human interaction would be the favored outcome. Public outreach and communication will be key to managing change effectively.
- ▶ Working thesis is to contain/retain the nutrients & sediment entering the system from Hayden Creek, harvest & remove macrophytes during summers to reduce in-lake nutrients, study to determine if system can accommodate the nutrients from the existing sediments as is, or not.
- ▶ Stopping the inflow of nutrients from Hayden Creek and removing or reducing the internal macrophyte grow/decay cycle may reduce sufficient nutrients from the existing sediment to become somewhat self sustaining over time.
- ▶ Overall, our goal is to reduce HAB health risks, improve target fish habitat, and reduce risks and nuisance to animals, pets, and humans.



NORTH ARM COMMITTEE WORKING SCHEDULE

THANK YOU

Hayden Lake Watershed Improvement District and
the North Arm Investigative Committee