

I. Programmatic Documentation May 21, 2024

- 1 The HLWID has undertaken water quality monitoring in lieu of DEQ. They have utilized a strategy that wouldn't comply with DEQ's regulatory requirements. With HLWID's WQ study approaching completion, new strategies and new ownership will need to be defined to move lake monitoring forward.

Response: HLWID mission is to preserve and enhance the quality of the water and the environment within the watershed. So how does Idaho define water quality? Idaho defines water quality in IDAPA 58.01.02. It is recommended that HLWID adopt the Idaho State code definition and monitor the lake to those standards.



There is no clear record over the previous 20 + yrs of self-monitoring how the lake stands compared to Idaho and approved TMDL water quality standards. Recommend that water quality oversight of Hyden Lake be continued with technical leadership by the DEQ for future assessments and monitoring activities.

Idaho Code 36-3611(7) - The (DEQ) director shall review and reevaluate each TMDL, supporting subbasin assessment, implementation plan(s) and all available data periodically at intervals of **no greater than five (5) years**.

- Such reviews shall include the assessments required by section 39-3607, Idaho Code, and an evaluation of the water quality criteria, instream targets, pollutant allocations, assumptions, and analyses upon which the TMDL and subbasin assessment were based.
- If the members of the watershed advisory group, with the concurrence of the basin advisory group, advise the director that the water quality standards, the subbasin assessment, or the implementation plan(s) are not attainable or are inappropriate based upon supporting data, the director shall initiate the process or processes to determine whether to make recommended modifications.
- The director shall report to the legislature annually the results of such reviews.

Recent meetings and conversations with DEQ indicate that there is a willingness and commitment to perform the Hayden Lake TMDL 5 yr review against the 2001 EPA approved TMDL in the Upper Spokane Sub-basin Assessment 17010305. The scope of the review will include:

- Are the TMDL targets appropriate?
- Are the TMDL pollutant allocations appropriate?
- Are the TMDL assumptions and analysis appropriate?
- Do all available data confirm, and support data used in existing TMDL?
- Are the Water Quality Criteria identified in the Subbasin Assessment portion of the TMDL consistent with current Idaho Water Quality Standards?
- Is the TMDL Implementation Plan appropriate?

It is anticipated that the review would include inputs from all lake monitoring data, Hayden Creek monitoring data, sediment and macrophytes source data (if information is available) and commence after the 2025 monitoring season. It is anticipated to occur on subsequent 5 yr review cycles. Both HLWID and HLWA should be expected to participate in this review process and have a voice in the outcomes.

HLWID has applied for grant funding to hire U of I resources to provide key input data necessary for the TMDL 5 yr review through study of sediment and macrophytes. As indicated, the overall TMDL Implementation Plan will be part of the scope of the TMDL review process.

- 2 ISDA's "plan" goals for invasive weed management may be set too low for Curly Leaf Pondweed.

Response: Recommend that Hayden Lake put in place an Macrophyte/Aquatic Weed Management Plan for the North Arm and possibly include all shallow water bays similar to the model established by the CDA Lake Aquatic Weed Management Plan. This can either be implemented by the HLWID contract resources, supported by U of I expert consultation, or by hiring a third party consultant who would provide both labor and expertise. The Plan should address all aquatic plant life, i.e., invasive, noninvasive, and native plants and methods of control each. Funding and leadership for this effort is undetermined at this time.

Recommend, as an interim step, that we encourage ISDA to move to a "Harvest and Remove" approach of all Eurasian Watermilfoil, Hybrid Milfoil, and curly leaf pondweed throughout the lake until there is better information on the extent of conditions from sediment/macrophytes. This will help control the overabundance of vegetation, remove nutrients, and improve the water quality for the designated beneficial uses.

The Macrophyte Management Plan would be part of the overall TMDL Implementation Plan in #1 above.

- 3 A Hayden Lake management plan does not exist for overall macrophyte/SAV management. The overabundance and negative impacts on the ecosystem suggest a plan is warranted.

Response: to be resolved same as #2 above. It should be noted that all macrophytes (not just invasive species) on the north arm result in impaired beneficial use and when left unattended **do not meet** IDAPA water quality standards during the summer months:

- Floating, Suspended or Submerged Matter. Surface waters of the state shall be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable

conditions or that may impair designated beneficial uses. This matter does not include suspended sediment produced as a result of nonpoint source activities.

- **Excess Nutrients.** Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses.
- **Oxygen-Demanding Materials.** Surface waters of the state shall be free from oxygen-demanding materials in concentrations that would result in an anaerobic water condition.
- **Deleterious Materials.** Surface waters of the state shall be free from deleterious materials in concentrations that impair designated beneficial uses. These materials do not include suspended sediment produced as a result of nonpoint source activities. **Deleterious Material:** Any nontoxic substance which may cause the tainting of edible species of fish, taste and odors in drinking water supplies, or the reduction of the usability of water without causing physical injury to water users or aquatic and terrestrial organisms.

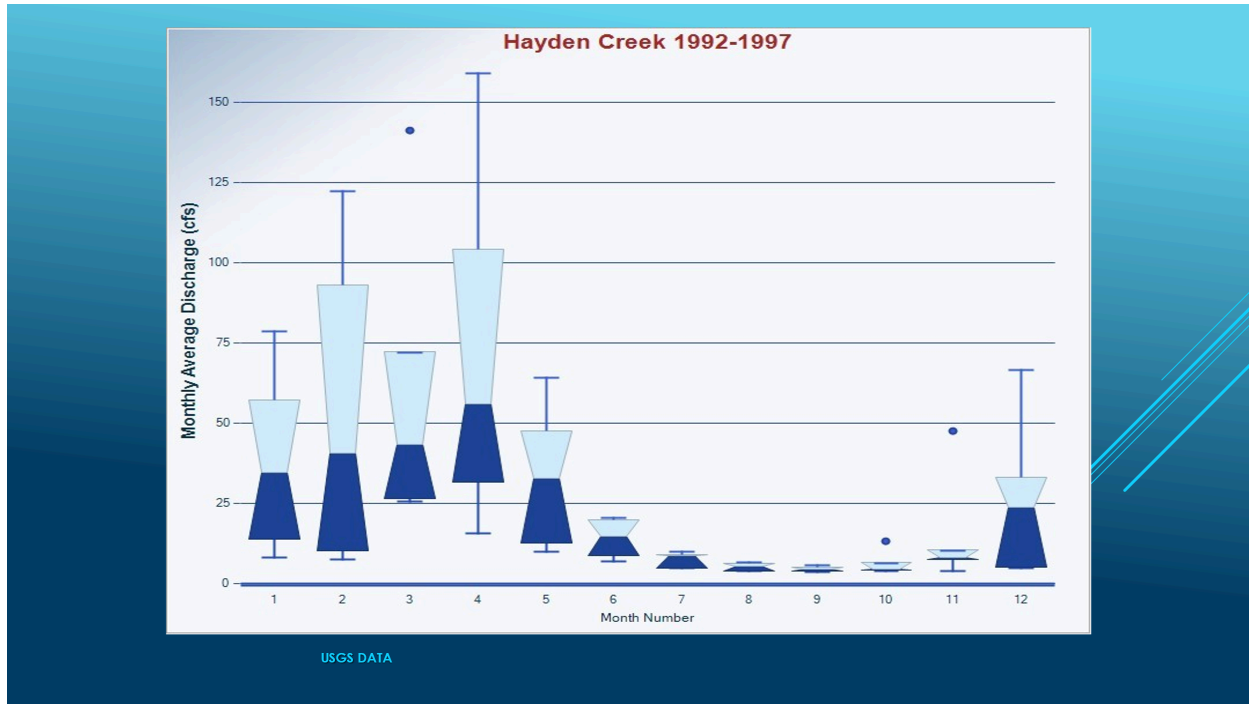
Carole A. Lembi, Professor of Botany, Purdue University: APM-3-W

During the day, plants produce oxygen through photosynthesis. At night (as well as day), they consume oxygen through respiration. If plant growth is excessive during the summer, they can use up most of the oxygen in the water at night. In fact, oxygen-stressed fish often come to the surface gasping for air and die just before dawn when oxygen levels are lowest. **Decomposing algae and plants also contribute to oxygen depletion.** When plants die, bacteria and fungi break down the decaying plant material. This process uses up the oxygen in the water. Plant death and decomposition can occur in midsummer under natural conditions. Unfortunately, these conditions are not well understood. **We do know that herbicide treatments must be made carefully because if too much vegetation is killed at any one time, the decomposition could lead to oxygen depletion. Oxygen depletion can also occur when algae or free-floating plants such as duckweed or watermeal completely cover the water's surface.** These surface growths reduce the amount of light that can penetrate the water, inhibiting photosynthesis (and oxygen production) of plants in deeper waters. Anything that stirs or brings these deoxygenated waters to the surface (such as a strong wind) can lower oxygen levels throughout the water column and cause a fish kill. Even if it doesn't kill the fish, prolonged exposure to low oxygen concentrations can weaken fish, making them susceptible to diseases and toxicants. **Winter fish kills also occur, sometimes because decomposing plants that died in the fall deplete oxygen.** But more often, winter fish kills are caused by snow accumulating on the ice that blocks sunlight and prevents photosynthesis and oxygen production. People may not notice winter fish kills because dead fish can decompose and disappear under the ice. It may not be until spring or early summer that people notice that fishing is not what it used to be.

- 4 Harvey's 2016-2019 monitoring report does not appear to have been peer-reviewed. There are data discrepancies that may affect summary conclusions and/or recommendations.

Response: Recommend having the monitoring data from this unreviewed document be used as input to the upcoming DEQ TMDL 5 yr review along with any other monitoring data for the lake generated over the previous 20+ years. It is recommended that any HLWID lake monitoring reports undergo a peer review prior to issuance as final.

II. Hayden Creek Wetlands



1. The Plan/Addendum recommended a 257 kg/yr reduction in phosphorus from Hayden Creek. Current USFS modeling estimates the Honey Badger Project harvested units will contribute 84-211 kg/yr phosphorus from 233 tons of sediment. Variations in models used make it difficult to assess the success or failure of the agencies' efforts.

Response: The original TMDL goals for Hayden Creek were based on monitoring data over 25 yrs old and may not be accurate today. To better assess the real and current nutrient and sediment inputs from Hayden Creek a monitoring program commenced in 2023, coincidentally around the same time as the Ridge Creek Fire. The monitoring includes two locations, at the Lake/creek culvert and 2.5 miles upstream on USFS land where roads 437 and 206 come together. This work was authorized by HLWID and initiated 8/23 in cooperation with DEQ/USFS/HLWID. A Hayden Creek Monitoring plan is being generated and will be in place prior to the 2024 monitoring season. Obtaining nutrient and sediment information will establish a good assessment before the Honey Badger project commences in earnest and will also allow better assessment during the 5 yr review of the TMDL and Implementation Plan.

In the same timeframe as the publication of the NAIC's findings, the HLWID determined that the natural wetlands at the mouth of Hayden Creek, which are currently privately owned, have been modified by apparent creek diversion during high-flow periods around the land area. Such a diversion would channel the creek flow away from the natural filtration offered by wetlands and direct unfiltered water directly into Hayden Lake. With or without the Hayden Creek monitoring data, steps should be taken to improve the Hayden Creek wetland performance capability to filter out nutrients and sediment before entering the lake proper.

2. If lack of timber harvest reduces P inflow, then resuming timber harvest, i.e., the Honey Badger Project will increase P inflow.

Response: Nutrients in spring runoff feed the phytoplankton & cyanobacteria or Harmful Algal Blooms (HABs) that occur in early summer when conditions are ripe. Reducing P inflow via runoff to the North Arm is a critical mitigation strategy to eliminate HAB's. Prioritizing nutrient inflow from Hayden Creek should be a priority. Experts have conjectured that any measures to manage in-lake nutrient sources would be short lived because Hayden Creek runoff will recharge anything that has been removed from the in-lake system every year. Left as is, Hayden Creek will build upon the internal sources (macrophytes and sediment) on a continual basis. Every Lake restoration planning document reviewed suggests attacking point sources should be the first step.

See the response to #1 above. Recommend measures to increase the performance capacity of the Hayden Creek wetlands to better contain sediment and nutrients during spring high-flow events.

Experts from Ducks Unlimited and Kootenai Shoshone Water and Soil Conservation District were consulted (Bill Lillibridge and Chris Bonsignour). Both believe either natural or man-made improvements to the Hayden Creek wetlands can establish a better system than currently exists to retain both sediment and nutrients during peak flow events. This is the most critical strategy to protect the beneficial uses of the North Arm. This would need to be verified when and if site access is granted for soils characterization in the privately-owned meadow north of the lake. Approaching the landowner is a very important next step to seek "level of cooperation." If proven uncooperative, then more hardened system solutions inside state land boundaries will be required, such as retention berms or walls. Also, the sooner this improvement can be made for the system, the better protected from Honey Badger impacts and any other human/USFS interactions that will occur in the watershed.

The logic here is that a strategy of "Catch It All" is and will be more effective long term than trying to find and correct every threat that arises in the USFS-managed Hayden Creek watershed.

3. Monitoring and Protections before, during, and after project execution, outside of USFS BMPs, are not in place to mitigate the increased nutrients and sediment that will enter the North Arm Hayden Lake via the affected tributaries. (Note: Monitoring on Hayden Creek was initiated in August 2023.)

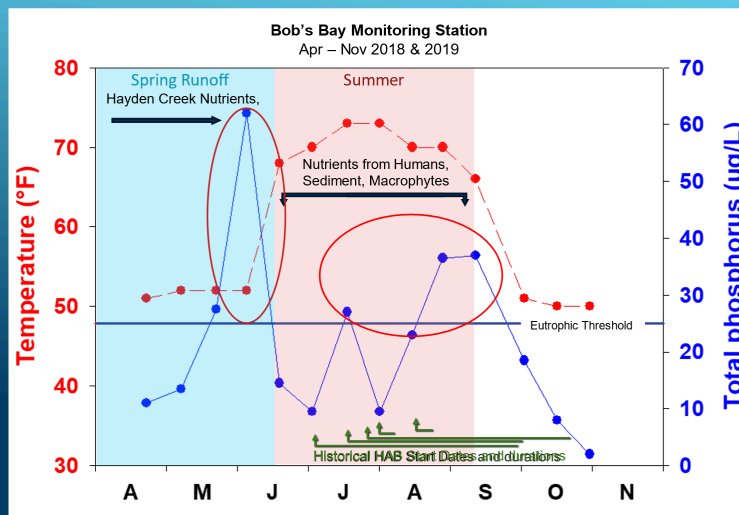
Response: see #2 above, the sooner an improved wetland solution is implemented, the sooner protections can be in place to mitigate all USFS impacts to Hayden Lake through what is currently, unabated Hayden creek. Preliminary estimates for both land acquisition and wetland restoration is in the \$1M-\$2M range.



Hayden Creek Wetland on private property

III. North Arm Sediment and Macrophytes

► Typical North Arm nutrient cycle – nutrient sources



A TROPIC STATE PERSPECTIVE OF THE NORTH ARM

1. Neither the current TMDL Implementation Plan nor its Addendum addresses phosphorus loading from macrophytes adequately. The Addendum marginally acknowledges Eurasian Watermilfoil. Today, we

also have issues with curly-leaf pondweed and an overabundance of native plant growth. The North Arm is literally blanketed by aquatic plants from late winter through the fall. All plants contribute to nutrient cycling and should be addressed.

Response: The DEQ 5 yr TMDL Review can and should consider nutrients in the system from macrophytes, if we can obtain sufficient characterization of the existing macrophyte biomass. Nutrients from aquatic plants can be included as nutrient sources, and reduction targets can be set as other lakes in the sub-basin have done (Hauser Lake). Macrophyte characterization of the North Arm is also needed for input to an overall Macrophyte Management Plan, similar to the CDA Lake ??? Management Program. Such a plan will need to be coordinated with ISDA and Fish and Game at a minimum.

ISDA, Jeremy Varley, has offered to generate the initial macrophyte map when he performs his June 2024 Lake survey.

As of 3/1/2024, the HLWID is pursuing grants to obtain funding to hire U of I technical expertise to better quantify and characterize the sediment, oxygen, and macrophyte relationships over two monitoring seasons. Anticipated 2 year costs, including monitoring, at \$350k.

- **EPA Emerging Contaminant Grant – Letter of intent submitted end of February. No match required.**

2. The TMDL Update contends that, based on modeling, macrophyte harvesting would have no effect on phosphorus load to the lake. This conclusion is contradicted by the 1987 research at Twin Lakes that indicates macrophyte harvesting in that location would generate modestly up to 20% phosphorus and chlorophyll reduction, as well as overall water quality improvements (CM Falter 1987). Additionally, Lake Minnetonka (John M Barten 2004) claims to have removed 2.6 pounds of phosphorus per truckload in the course of their investigation. This evidence points to a need to reevaluate the conclusion.

Response: See #1 above. Also of note, the CDA Tribes have been harvesting for 6 years to control milfoil and ensure beneficial uses are not impaired for access to boat launches and public beaches. CDA Tribes have shared their Aquatic Weed Management Plan for our use. They also reported actual 2023 harvest costs of \$550/Acre. The estimated annual cost for harvest would be approximately \$200k for 400 acres of the North Arm. The HLWID should consider implementing similar strategies to control the vegetation, remove nutrients, and improve the water quality for the designated beneficial uses. Priority should be given to public access points such as Sportsman Park boat launch, public fishing sites, and weed-impacted recreational boating channels.

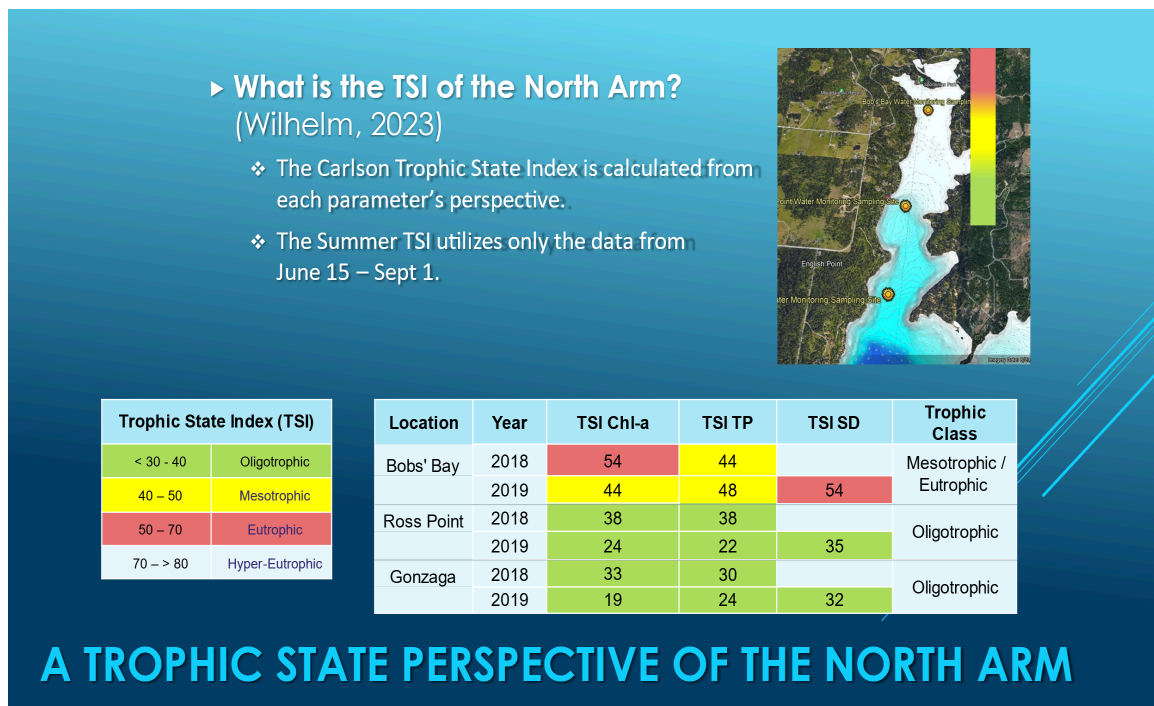
3. The TMDL Update report asserts victory, and yet (1) only 33% of the 709 kg/yr phosphorus reduction target in Hayden Lake is claimed; (2) the North Arm Total Phosphorus concentration, well above the 7 ug/L phosphorus target, is noted but not addressed; and (3) some major sources, internal and external, of nutrient contributions in the North Arm are not recognized or analyzed.

Response: the upcoming 5 yr TMDL review will address targets to meet current objectives of Hayden's designated beneficial uses. Consideration for two separate TMDL targets should be assessed, one for deep water and potentially one for the shallow waters of the lake. Twin Lakes, as

an example, has two separate TMDL standards. DEQ's recommendation for the best approach will be sought.

4. Hayden Lake's "informal" sampling plan does not satisfy regulatory interests for monitoring the greatest water quality impact areas for location or frequency.

Response: The HLWID should consider increased monitoring on the north arm for the 2024 and 2025 monitoring season. This is a necessary check on the system 5 years after the last monitoring performed (in 2019) and would assist with data input for TMDL 5 yr review. The HLWID should partner with DEQ to better define the monitoring parameters to ensure we are meeting the Idaho code and TMDL targets for the designated beneficial uses. All objectives should be defined in a monitoring plan.



5. Hayden Lake TMDL documentation (2009 Plan Addendum and 2022 Update Report) does not address nutrient pollution leading to HABs in the North Arm nor does it set nutrient targets for the highest risk area of the lake. Elevated nutrient loading and/or manipulation of natural circulation are common root causes of bloom problems that can be corrected through well-designed mitigation strategies. An N:P target/goal should be set and managed to control HABs.

Response: HAB's are a high priority to mitigate and protect Hayden's designated beneficial uses. Because the phytoplankton growth in the North Arm is nitrogen-limited, a strategy to manage the system towards reducing Phosphorus is the preferred mitigation strategy. Some have suggested that a strategy to add Nitrogen to the system may be better to mitigate HAB. This was considered, discussed, and determined to be an inferior approach at this time. Primarily because adding more nitrogen to the system will lead to an increase in the overall biomass in the system, not less. To best protect the beneficial uses of the lake, improve the Eutrophic condition, and better control HAB's, a reduction in overall biomass is preferred. Therefore, a target reduction in total phosphorus is the better strategy.

The North Arm is already heading to Eutrophic conditions due to an overabundance of Algae as shown in the 2018 and 2019 monitoring data. The goal should be to reduce algae biomass of the North Arm through reduction in nutrients and protect the designated beneficial uses mandated by state code.

The three main sources of nutrients in the North Arm are Hayden Creek (reported at 1200kg/yr of P), in-lake macrophytes (tbd), and lake-bottom sediment (tbd). A strategy to control the inflow of nutrients from Hayden Creek is an imperative step in the overall long term restoration strategy. Achieving this objective may take several years to implement. However, a parallel first step to remove nutrients in the lake through a harvest and remove macrophyte management strategy should be investigated, and if demonstrated to be effective, funding can be sought. In addition to removing in-lake nutrients, it would start the “nutrient drain” from the sediment, improve beneficial uses of the lake, and may bring about compliance with IDAPA code. The committee has identified one local harvest vendor and one local rancher that is willing to receive the harvested materials as fertilizer. Work will continue developing this approach further and identify potential funding sources.

The overall long-term strategy is to harness the Hayden Creek nutrients prior to entering the lake as well as Harvest and Remove macrophytes to draw down the nutrients in the sediments. Over time, to be determined, the system would have removed and drained nutrients sufficiently to require less human intervention. If not, then decisions can be made at that time on steps to reduce additional nutrients from the sediments, if required.

6. Northern Pike are thriving, likely impacting the Trout and other priority fish in the lake. Additionally, Kokanee are meeting the F&G objective.

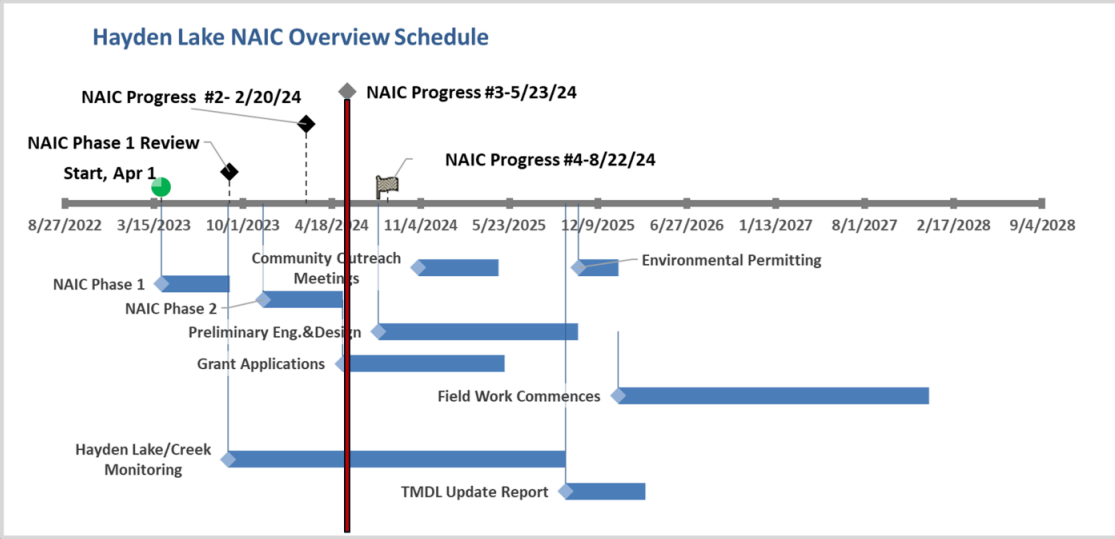
Response – All lake restoration steps should be done with an aim to improve an already struggling fishery in the North Arm. The overall quantity and coverage of macrophytes in the shallow waters of the north arm are benefiting the pike at the expense of other priority fish. Consider harvesting significant quantities of macrophytes to challenge the pike habitat and benefit the other target fish breeds. Consider eliminating chemical applications for plant management that cause Ammonia spikes and O2 reduction during plant decay. Improve fishing opportunities for pike (only check on overpopulation) with better public access and less deleterious materials during summer fishing months. Consider teaming with F&G on wildlife grant opportunities for Swan Habitat restoration and Sportsman Park fishing improvements.

7. Trout are not meeting F&G's objective.

Response – same as 6 above

8. Largemouth Bass are not meeting F&G's objectives.

Response – same as 6 above



NORTH ARM COMMITTEE WORKING SCHEDULE