DEPARTMENT OF ECOLOGY
State of Washington

Freshwater Algae Grant Funding Guidelines

State Fiscal Years 2025 and 2026 (SFY2025-26)

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Publication and Contact Information

This report is available on the Department of Ecology's website at:
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Description of Funding Opportunity

In 2005, the Washington State Legislature established funding for the Freshwater Algae Program (FAP) through an annual one-dollar license fee assessed to the owners of boats. This program focuses on waterbodies with cyanobacteria, not algae. This program includes elements for public education, technical assistance, a toxicity testing program, and pass-through grants that address toxic fresh-water blooms.

The enabling statute states: The Freshwater Algae Control Account is created in the state treasury. Moneys directed to the account from RCW 88.02.050 must be deposited in the account. Expenditures from the account may only be used as provided in this section. Moneys in the account may be spent only after appropriation. Funds in the freshwater aquatic algae control account may be appropriated to the Washington State Department of Ecology (Ecology) to develop a freshwater aquatic algae control program. Funds must be expended as follows: (a) As pass-through grants to cities, counties, tribes, special purpose districts, and state agencies to manage excessive freshwater algae, with priority for the treatment of lakes in which harmful algal blooms have occurred within the past three years; and (b) To provide technical assistance to applicants and the public about aquatic algae control.

The FAP provides financial and technical assistance to local and state governments, tribes, and special purpose districts to prevent and control excessive freshwater algae growth (cyanobacteria).

Eligible activities include, but may not be limited to the following:

- Cyanobacteria control and management
- Lake Cyanobacteria Management Plans
- Cyanobacteria monitoring programs
- Cyanobacteria research
- Nutrient reduction activities
- Education and outreach

Definition of Blue-green Algae or Cyanobacteria

Cyanobacteria is sometimes referred to as blue-green algae and are typically unicellular, aquatic, and photosynthetic. Generally, the amount of phosphorus controls the amount of cyanobacteria found in a freshwater lake or water body. Cyanobacteria colonies grow rapidly when they have adequate nutrients, sunlight, pH, and temperature and can form extensive blooms. When cyanobacteria reproduce rapidly and reaches high concentrations, it is called an algae bloom or cyanobacteria bloom.

Algae are important to the productivity of a lake or water body, but excessive growth can cause economic, environmental, and public health problems. The FAP focuses on blue-green algae (cyanobacteria), because they can produce toxins that pose a threat to humans and animals. For more information about blue-green algae / cyanobacteria, see the Freshwater Algae Program website at: https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Freshwater-algae-program-grants

Ecology's financial assistance will target projects involving the treatment of lakes in which toxic cyanobacteria blooms have occurred within the past three years. Projects dealing with potentially toxic cyanobacteria species will generally receive funding priority over projects dealing with other algal species, such as filamentous green algae.

Eligibility and funding cycle

Eligible entities include cities, counties, state agencies, tribes, and special purpose districts.

The FAP Program has a yearly funding cycle for cyanobacteria projects. The annual application period begins October 24th and closes on December 14th this year. Each grant award will be a maximum of two years.

Ecology evaluates grant applications according to criteria established in these guidelines. Ecology publishes a list of projects proposed for funding roughly two months after the application deadline.

Once Ecology makes grant offers, it generally takes three to six months to negotiate a final grant agreement. Applicants have up to six months from the date of the offer letter to negotiate an agreement.

Types of Grant Opportunities

1) Lake Cyanobacteria Management Plan (LCMP)

Planning involves the identification of problems and evaluation of cost-effective alternatives for managing cyanobacteria blooms. To be eligible for Cyanobacteria Control grants, applicants must complete and submit to Ecology a *Lake Cyanobacteria Management Plan* for the targeted water body. An integrated plan provides historical information on the lake, watershed and data on water quality for all sources and considers all cyanobacteria management options and chooses one or a combination of options for implementation.

Applicants must have an Ecology-approved plan in place prior to the grant application period for Control grants. Ecology's *Lake Cyanobacteria Management Plan Template and Guidance* provides more detailed guidance for developing a plan. This manual is available on Ecology's website (https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Freshwater-algae-program-grants) and below in Appendix A.

2) Cyanobacteria Control and/or Education Project (LCMP Implementation)

Applicants must demonstrate that their projects will prevent, eradicate, contain, or control excessive growth of cyanobacteria in lakes. Ecology considers projects that demonstrate a recent toxic cyanobacteria bloom a funding priority.

Award Information

The total amount of grant funds available for pass-through varies each year but is expected at approximately $150,000 per funding year, and subject to legislative appropriation and available funds.

Ecology requires grant recipients to provide matching funds for FAP grants of 25 percent. For all projects, recipients can meet the match requirement using any combination of cash, interlocal costs, or in-kind contributions.

Ecology limits the size of grants to the following:

- The maximum grant for cyanobacteria control is $50,000.
- Planning grants are limited to $50,000 per year for a potential period of two or three years depending on the lake and other data available. Each project is considered to be unique and the complete costs of the LCMP will be determined after review by Ecology.

Ecology also limits the amount of funds available to each grant recipient during each funding cycle to $50,000.

In-kind contributions – In-kind match contributions must meet the requirements explained in the Administrative Requirements for Ecology Grants and Loans (Yellow book). In addition, in-kind contributions are subject to the following limits:

- In-kind contributions must relate directly to the activity being funded.
- In-kind contributions are limited to time, material, or real or personal property donated to the grant recipient to fulfill project requirements.
- Volunteer time may be donated at Ecology's accepted in-kind rate (check Yellow Book for current rate).
- Volunteer time from individuals receiving compensation through the grant does not count as in-kind contribution.
- The recipient must fully document in-kind contributions.

Ecology will offer funding to applicants for high-priority projects based on the availability of funds. Generally, the demand for funds exceeds the dollars available.

Funding List – Ecology develops and posts to the Water Quality funding page a final offer list after an internal team review of all eligible applications. Ecology sends a grant offer letter to the applicant soon after the date of the funding list. The letter identifies any special grant conditions and contact information for Ecology's project manager responsible for negotiating the grant agreement. Grant offers are effective for six months from the date of the offer letter. Ecology considers a recipient who is unable to negotiate a signed agreement during this time to have declined the grant offer.

Early authorization – Ecology recognizes that under certain circumstances, a grant recipient may need to commence work on a project in advance of a signed and executed grant agreement. Under circumstances and by written request of the applicant, Ecology may provide the applicant written authorization to incur expenses that could be grant eligible. Ecology will not release funds until a grant agreement is signed. Costs incurred prior to the effective date of the written notification of prior authorization from Ecology will be the sole responsibility of the public body. Until the recipient signs a grant agreement, it must assume responsibility for costs incurred as there is no guarantee by Ecology that a grant will be awarded. Any work performed by the public body that is not consistent with the conditions specified in Ecology's prior authorization letter, and all other applicable criteria, will not be eligible for grant funds.

Important dates – The grant agreement becomes effective on the date that Ecology's Water Quality Program Manager signs the agreement, unless otherwise state in the agreement. Any costs incurred before this effective date are not eligible for reimbursement. If the recipient does not begin work on the funded project within four months of the effective date (or other mutually acceptable start date), Ecology reserves the right to terminate the agreement.

Application Instructions

Applicants must complete and submit an application through the Ecology Administration of Grants and Loans (EAGL) web based grants system by the due date each year. For the **FY2025 grant cycle**, the application period is from **October 24th through December 14th.** If funded, the grant agreement information comes from the application. The description and task listed in the application are generally used in the agreement itself.

To access the application forms, applicants must - Register for a **Secure Access Washington (SAW) online services account.** While logged into your SAW account, register for an **EAGL user account.**

Once validated as a new user by Ecology's EAGL System Administrator, you will have access to the web-based EAGL system. Only EAGL users in the role of Authorized Official can view available funding opportunities, initiate and submit an application. If you have any questions with the application submittal process please contact Lizbeth Seebacher at lsee461@ecy.wa.gov.

EAGL allows Ecology's grant recipients to electronically fill out and submit applications, manage agreements, request amendments, submit payment requests and progress reports and submit closeout reports.

Please refer to the *EAGL – External Users' Manual* (December 2017) Publication No. 17-01-015 at https://apps.ecology.wa.gov/publications/SummaryPages/1701015.html for detailed instructions on how EAGL works, EAGL terminology, and EAGL roles and permissions.

All grant applicants are responsible for reading and understanding these guidelines along with the *Administrative Requirements for Ecology Grants and Loans (Yellow Book).* (Publication No. 17-01-004) before entering into a grant agreement with Ecology. The *Administrative Requirements* document is available at: https://apps.ecology.wa.gov/publications/SummaryPages/1701004.html

Ecology rates and ranks project applications based on the criteria outlined in the table below. Applications are reviewed by a committee of three Ecology staff with cyanobacteria expertise.

Application Evaluation and Ranking

SCORE	EVALUATION CRITERIA
0-10	The scope of work represents a complete and concise description of the project tasks and outcomes, including deliverables and timelines
0-20	Project directly and measurably addresses a cyanobacteria / blue-green algae problem
0-10	The cost estimate process is reasonable
0-10	The project task costs represents a good value for the work and water body benefits achieved
0-10	Cyanobacteria severity, algal blooms within the last three years
0-10	Water body need
0-10	Risk of cyanobacteria spreading to a nearby water body
0-20	Improvements to water quality and habitat
0-10	Improvements to water body recreation
0-10	If the project is in a water body with endangered species and/or salmonids, these species are addressed
0-10	Improvements to public health
0-10	Nutrification issues for the water body addressed
0-10	Scientific integrity - quality of the project
0-10	Project success can be measured, and proposed methods to measure success are reasonable
0-10	The project will provide long-term water quality benefits. Systems are in place to sustain the benefits after funding support has ended
0-5	Team members' roles and responsibilities are well defined and adequate for the scope of work
0-5	Team members' past experience is relevant
0-5	Staffing commitment is well documented
0-5	Financial need of applicant
0-5	Plans for long-term project success and sustainability were considered during project development
0-5	A high level of local support and commitment for the project is documented
0-5	The applicant documents successful performance on other funded projects, including all Ecology funded projects
0-10	Project elements are in place for the project to proceed, permits obtained or researched and documentation is provided

Financial Management and Administration of Grants

Grant recipients must comply with all applicable federal, state and local statues, ordinances, orders, regulations, and permits including those related to discrimination, labor, job safety, and applicable provisions of the state or federal regulations for minority and women owned businesses. Recipients must also secure any necessary permits required by authorities having jurisdiction over the project and must provide documentation to Ecology upon request.

Ecology requires all grant recipients to maintain accounting records in accordance with generally accepted government accounting standards. These standards include those contained in the most recent editions of the United States General Accounting Office publication, *Standards for Audit of Government Organizations, Programs, Activities and Functions,* and *Ecology's Administrative Requirements for Ecology Grants and Loans*. In addition, Ecology requires grant recipients to maintain an accounting system which can track project expenditures separately from general local government expenses.

Ecology may conduct periodic administrative reviews of funded projects to evaluate a recipient's records and accounting systems. These reviews are intended to verify that eligible and ineligible costs have been documented for audit and that recipients are in compliance with applicable state statutes, regulations, and requirements (included special grant conditions).

Grant disbursements – Ecology disburses payments as costs are incurred. Recipients will submit Project Reports and Payment Requests at least quarterly, but not more than monthly, via the EAGL system per the *EAGL – External Users' Manual* (December 2017) Publication No. 17-01-015, noted above.

Payment request and progress reports – All payment request must follow the procedures described in Administrative Requirements for Ecology Grants and Loans and via the EAGL system.

Appendix A

Lake Cyanobacteria Management Plan Template – Table of Contents

Freshwater Algae Control Program

Lake Cyanobacteria Management Plan Template Guidance

Fiscal Year 2025 and Fiscal Year 2026 Guidance

Please review the Lake Cyanobacteria Management Plan template before applying to the Freshwater Algae Control Program (FACP). *This template lists numerous elements that might be included in a detailed Cyanobacteria Plan. Not all elements may be appropriate for your project. In the application, explain what elements are or are not applicable to your project and why.*

A. Title Page with Approvals
   a. *[Lake name* Cyanobacteria Management Plan]
   b. *[Lake, County]*
   c. *[Your organization name]*
   d. *[Date]*
   e. *[Page with all key individuals listed and signatures]*

B. Table of Contents

C. Table of Figures and Tables

D. Executive Summary – [*briefly describe the problem, the results of the monitoring and analyses, and the recommended lake restoration plan.]*

E. Background
   a. Study area
      i. Lake and watershed. [*Describe the lake (acres, min and max depth, bathymetry, trophic status), shoreline (topography/slopes) and watershed (size in acres) with any tributary streams and significant wetlands; provide lake and watershed maps.]*
      ii. Beneficial uses of the lake – *[describe (quantify if possible) the use of the lake for swimming, fishing, boating, wildlife habitat and other uses.]*
      iii. Current and historical land uses – [*describe current and historical land uses or activities, such as homes, businesses, septic systems, livestock, etc. within the watershed or along tributary streams that may be impacting or have impacted the lake; also describe the level of development or alteration of the immediate shoreline of the lake (bulkheads, fills, etc.).]*
      iv. Number and location of houses on septic – [*provide a map if possible* (https://www.doh.wa.gov/CommunityandEnvironment/WastewaterManagement/OnsiteSewageSystemsOSS). *Also try searching for OSS at your county health dept.* https://www.doh.wa.gov/AboutUs/PublicHealthSystem/LocalHealthJurisdictions]
      v. Water use – [*explain whether any residents use the lake water as a drinking or domestic water source.]*
      vi. Water withdrawals – *[describe any surface water rights owned or used by residents* (https://fortress.wa.gov/ecy/waterresources/map/WaterResourcesExplorer.aspx)]
      vii. Fisheries – [*describe the frequency of current and past fish stocking and how many fish have been stocked (in kg/ha); also estimate the numbers and types of fish caught. Describe the presence and general abundance of fish or other species that may disturb the lake sediments (bioturbation) such as carp.]*
      viii. Aquatic plants – [*describe the relative density of aquatic plants in the lake (both submersed and emergent) and both historical and recent actions to control aquatic plants in the lake.]*

ix. Endangered/rare species present [(https://wdfw.wa.gov/conservation/endangered/All/#)]

b. Water quality history
   i. Past water quality conditions – [*describe what is known about past water quality (problems or absence of problems, caused by algal blooms, toxic algae, fecal bacteria, invasive or nuisance aquatic plants, etc.). Provide summary data of past water quality conditions, such as water clarity, nutrient levels, toxic algae concentrations, nutrient loading, etc.]*
   ii. Efforts to improve water quality – [*describe past and ongoing actions taken to reduce nutrients, control algae, reduce human health risks, etc., including BMPs, in-lake measures, capital projects and community involvement.]*

c. Current conditions
   i. Water quality – [*describe in detail the current problems with toxic or nuisance algae and the impact on beneficial uses of the lake; provide a summary of any recent monitoring data or other information that explains the water quality conditions, the impacts to beneficial uses and known or suspected drivers of toxic algae production.]*
   ii. Contaminants of concern
      1. Cyanotoxins – [*describe cyanotoxins that have been a problem in the lake.]*
      2. 303d list status – *[describe any state listing of pollutants (phosphorus, nitrogen, fecal bacteria, low DO, temperature, etc.) for the lake and tributary streams.]*
      3. TMDLs – *[list any TMDL reports approved by Ecology and the EPA. List any TMDL plans that have been implemented.]*
      4. Regulatory criteria of contaminants and cyanotoxins –[*list the regulatory criteria for the cyanotoxins and pollutants in the lake. Both federal and state standards.*
      Criteria Development Guidance for Lakes and Reservoirs Fact Sheet | US EPA]
   iii. Public participation – [*list the various stakeholders for this project and describe their participation in developing the proposed management plan, including monitoring, committees, public meetings, publicity, etc.]*
   iv. Public support – [*describe public support for the proposed management plan as evidenced by political support, financial support, the level of public participation, the willingness of residents to implement BMPs, etc.*]

F. Project Description
   a. Project goals and objectives
   b. Project schedule

G. Monitoring Methods and Results

Notes:

- *[Residents and other trained volunteer citizen scientists can perform most of the following monitoring tasks in order to keep the costs down and help with the education of residents and lake users.*
- *Some of the following monitoring elements may not be appropriate for your specific lake, but you should provide reasonable justification for excluding those elements.*
- *Monitoring elements a through d must be performed within the same one-year period in order to develop valid water and nutrient budgets for the lake. Monitoring elements e through g, although not required for the water and nutrient budgets, should also be performed within the same one-year period if at all possible because they reflect or may impact the nutrient levels in the lake for that one-year period. Monitoring elements h through j can be performed in a subsequent year, or under a separate grant if they cannot be funded under the original grant.]*

a. Lake level, stream inflows/outflows, groundwater, and precipitation/evaporation
   i. Monitoring methods – [*describe the methods used to measure or estimate lake levels, steam inflows, outlet flows, groundwater inflows/outflows and precipitation/evaporation. These components of the water budget must be monitored for at least one year to develop a lake water budget that corresponds with the period of water quality monitoring.*]
   ii. Monitoring results – [*describe the results and significance of lake level, steam inflows/outflows, groundwater, and precipitation/evaporation monitoring; provide data tables and graphs where appropriate. If the monitoring year is unusual (extremely wet or dry) describe how this may have affected the water quality conditions of the lake*.]

b. Lake water quality profile monitoring – Field measurements
   i. Monitoring methods – [*describe the methods used to collect field monitoring data within the lake.]*

   Timing – [*lake profile data should be collected for at least one full year, with biweekly measurements during the growing season (approx. March – early November for many lakes) and monthly measurements during the remainder of the year (approximately late November – March).*]

   Location – [*for most lakes, profile measurements can be taken at one location at the deepest point in the lake. For larger, or more complex lake systems, two or more profile monitoring locations may be appropriate*.]

   Depths – *[profile measurements should be collected at each meter down through the entire water column unless the lake depth is greater than 20 meters, in which case measurements in the hypolimnion may be taken every two to five meters down to one meter above the lake bottom, depending on the depth of the lake. (Note: profile measurements should be taken at the same depths during both the mixed and stratified periods).*]

   Parameters – profile monitoring should include the following parameters:
   - Temperature
   - Dissolved oxygen
   - pH
   - Conductivity
   - Secchi depth [*should also be measured at every sampling event.]*

ii. Monitoring results – [*describe the results and significance of water quality profile monitoring; provide data tables and graphs where appropriate. In particular, describe the timing and strength of lake stratification and associated anoxia in the hypolimnion.]*

c. Lake water quality sampling – Lab samples
   i. Monitoring methods – *[describe the methods used to collect and analyze water samples from the lake.]*
   Timing – [*lake samples should be collected every month for at least one full year.*
   Location – *sampling should be performed at one location in the deepest point of the lake, unless the lake is large or complex.]*
   Depths – [*at a minimum, discrete samples of the epilimnion and hypolimnion should be collected from one meter deep and from one meter above the lake bottom. In addition, during the stratified period, a sample should be taken from the metalimnion. For lakes greater than 20 meters deep, at least one additional epilimnion sample and one or more additional hypolimnion samples should be taken at depths that will help characterize the conditions throughout the lake water column.*
   In some cases, (funding or comparability with past data) the discrete epilimnion samples may be composited into a single sample and the hypolimnion samples may be composited into a second sample, provided that the samples from discrete depths that will be composited are spaced so as to be representative of the entire epilimnion and the entire hypolimnion, respectively. During the stratified period, a separate discrete or composited metalimnion sample should also be collected.]
   Parameters – Lake monitoring should include the following parameters:
      - Phosphorus (TP and SRP)
      - Nitrogen (ammonium (NH4) and nitrate-nitrite (NO3 – NO2 or total persulfate N)
      - Chlorophyll a/Phaeophytin *(discrete samples should be collected from 1 meter deep and from the metalimnion, no hypolimnion samples necessary)*
   ii. Monitoring results – [*describe the results and significance of lake water quality monitoring; provide data tables and graphs where appropriate. Part of the description of water quality sampling results should address phosphorus versus nitrogen limitation (or other environmental limiters) throughout the year in the production of algae in the lake.]*

d. Stream water quality sampling – Lab samples and field measurements
   i. Monitoring methods – [*describe the methods used to collect (typically grab samples) and analyze water samples from inflowing streams. The lake outflow does not need to be sampled because the results are normally very similar to the near-surface lake samples.]*
   Timing – *[inflow stream grab samples should be collected at regular intervals (at least monthly) during the portion of the year when the streams are flowing. In addition, grab samples during periods of storm flows are recommended to help characterize the impacts of peak flows on the lake.]*
   Location – *[stream sampling should be conducted in each significant inflowing stream at one location that corresponds with the location used to measure the velocity and cross section for stream flows. Samples should be taken from the center of each stream at wrist depth.]*
   Parameters – *stream monitoring should include the following parameters:*

- Phosphorus *(TP and SRP)*
- Temperature
- Dissolved oxygen
- pH
- Conductivity *(all measured with a field probe in the same location as water samples were collected)*

ii. Monitoring results – [*describe the results and significance of stream water quality monitoring; provide data tables and graphs where appropriate.]*

e. Phytoplankton sampling

i. Monitoring methods – [*describe the methods used to collect and analyze phytoplankton in the lake.]*

Timing –*[phytoplankton samples should be collected monthly during the growing season from March through October (or over a longer period if the lake is known to produce algal blooms outside of this period). During algal blooms, shoreline grab samples may also be taken to augment monthly sampling.]*

Location – *[sampling should be performed at one location in the deepest point of the lake, provided that additional shoreline grab samples may be collected during algal blooms.]*

Sample depths – *[discrete samples should be collected from one meter deep and from the metalimnion (no samples from the hypolimnion); alternatively, discrete samples may be collected from multiple depths within the photic zone and composited into one sample.]*

Parameters –

- Species present – [*identification to species (where possible), genus or division of the phytoplankton found in the sample.]*
- Concentration – [*counts of numbers of individual cells or colonies per liter of each algal specie/genus/division identified in the sample.]*

ii. Monitoring results –[*describe the results and significance of phytoplankton sampling; provide data tables and graphs where appropriate.]*

f. Zooplankton sampling

i. Monitoring methods – [*describe the methods used to collect and analyze zooplankton in the lake.]*

Timing – *[zooplankton samples should be collected monthly during the growing season from March through October.]*

Location – *[sampling should be performed at one location in the deepest point of the lake.]*

Sample depth – *[a single zooplankton sample should be collected by a continuous net tow (80 µ net) from one meter above the lake bottom to the lake surface.]*

Parameters

- Species present – [*identification to specie, genus or division (whichever is appropriate) of the zooplankton found in the sample.]*
- Concentration – [*counts of numbers of individuals per liter of each zooplankton specie/genus/division identified in the sample.]*

ii. Monitoring results –[*describe the results and significance of zooplankton sampling; provide data tables and graphs where appropriate.]*

g. Waterfowl survey – [*record the types and number of waterfowl observed on the lake; weekly early morning and/or early evening observations should be conducted; provide average monthly waterfowl usage.]*

The following tasks may be performed in a subsequent year and/or a subsequent grant:

h. Vegetation surveys – [*provide maps where appropriate.]*
   i. Submersed plants – [*explain the sampling/observation methods used and describe the plant species present and percent cover or relative density of plant species or groups of species that grow primarily underwater within the lake; indicate native versus invasive species.]*
   ii. Emergent plants – [*explain the sampling/observation methods used and describe the plant species present and percent cover or relative density of plant species or groups of species that grow primarily above the water of the lake; indicate native versus invasive species.]*
   iii. Shoreline plants – *[explain the sampling/observation methods used and describe the plant types (tree/shrub/herb/lawn) present and the percent cover or relative density of plant types around the lake shore; indicate native versus invasive species.]*

i. Shoreline modification survey – [*conduct a survey of the lake shore to determine the length or percent of the shoreline that has been modified with bulkheads, fill, or other changes to the natural shoreline.]*

j. Lake sediment sampling
   i. Monitoring methods – [*describe the methods used to collect and analyze sediment cores from the lake bottom.]*

   Location – *[one sediment core should be taken from the deepest portion of the lake; in addition, at least one sediment core should be collected from a site closer to the shore, representing the mid-depth littoral area; depending on the size and complexity of the lake, additional cores may be warranted.]*
   Depths –[*sediment cores should be at least 30 cm in length and should be segmented by the lab into 5 cm thick sections for analysis.]*
   Parameters – *[sediment core sections should be analyzed for the following parameters:]*
      - TP, Loosely sorbed P, Fe-P, Al-P, Ca-P, Org P, Biogenic P, Total Calcium, Total Fe, Total Al, % water, % solid

   ii. Monitoring results – [*describe the results and significance of the sediment core analyses, including the changes in phosphorus concentrations with depth (back in time); provide data tables and graphs where appropriate.]*

The following elements of the plan may be completed under a subsequent grant if necessary or may be completed by limnology graduate students as part of their graduate work:

H. Hydrologic Budget
   a. Description of water budget components – [*describe how each of the components of the lake water budget were derived for the monitoring year (either through direct measurement, estimations, or calculations of unmonitored components). If the*

monitoring year was unusually wet or dry, explain how that may have affected water quality conditions in the lake.]

b. Inflows – [*describe the inflow side of the water budget and the significance of the components to conditions in the lake; provide graphs, charts, and data tables as appropriate. Inflows should include the following components:*
    - stream/inlet flows
    - surface runoff and shallow groundwater inflows *(This is water that runs off directly into the lake from surrounding properties, either over the surface or just underground, without flowing through monitored streams. This is typically estimated from land use runoff tables.)*
    - precipitation
    - groundwater inputs]

c. Outflows – [*describe the outflow side of the water budget and the significance of the components to conditions in the lake; describe the residence time of water entering and leaving the lake; provide graphs, charts, and data tables as appropriate. Outflows should include the following components:*
    - lake outlet flows
    - evaporation
    - groundwater losses *(these outflows are normally calculated as the remaining unknown portion of the water budget)]*

I. Nutrient Budget and Phosphorus Model

[Notes: In almost all cases, the lake nutrient budget will focus on phosphorus because phosphorus is the nutrient that drives production of toxic cyanobacteria. Even if algal production is limited by nitrogen or other factors during much of the year, reduction of phosphorus will be the primary mechanism for controlling toxic blooms.]

a. External phosphorus loading – [*describe and quantify the sources of phosphorus entering the lake; provide data tables and graphs as appropriate. For a phosphorus budget, external loading from individual sources should be summarized for the entire year. External loading should include the following components:*
    - inlet streams *(calculated from measured stream flows and water sample results; results should be provided for individual streams or reaches of streams if data are available)*
    - direct precipitation on the lake surface
    - surface runoff and shallow groundwater *(normally estimated)*
    - groundwater *(unless groundwater flows and nutrient concentrations were actually measured, this component is normally calculated as the remaining unknown portion of phosphorus loading)*
    - other sources – *characterize and quantify other specific sources of phosphorus that contribute to the external loading components described above, including estimates of loading from septic systems based on the density and age of systems and topography surrounding the lake, waterfowl around the lake, pet waste in the watershed, fish stocked in the lake, and unique land uses (such as livestock or other farm, commercial or industrial land uses) that may be particular sources of nutrients.]*

b. Internal phosphorus loading – [*describe and quantify the amount of phosphorus entering the lake from the lake sediments; provide data tables and graphs as*

appropriate. The release of phosphorus from lake sediments should be calculated from the results of the sediment cores and the variations in hypolimnetic phosphorus concentrations throughout the year. For a phosphorus budget, internal loading from the sediments should be summarized for the entire year.]

c. Phosphorus model – [*the purpose of a phosphorus model is to quantify the changes in phosphorus mass and concentration within the lake (or ideally within the epilimnion and hypolimnion) throughout the year and to evaluate the effects of various algae control methods on phosphorus concentrations in the lake. The phosphorus model may be a simple spreadsheet or a more sophisticated construct.]*

   i. Model description – [*describe the phosphorus model developed for this lake; the model should produce calculations of phosphorus concentrations and the changes in phosphorus mass in the lake for each month (or at more frequent time steps if data are available) and should be summarized for the stratified period and the mixed period of the year. Where possible, the model should look at phosphorus concentrations in both the epilimnion and hypolimnion layers. In addition to external and internal phosphorus loading, the model should take into consideration the movements (flux) of phosphorus through sediment release, sedimentation, and lake outlet outflow. Diffusion and entrainment are two other movements of phosphorus that may be estimated if the model is set up to calculate the flux between the epilimnion and hypolimnion.]*

   ii. Model results – [*describe the results of the phosphorus model in replicating the actual changes in phosphorus concentrations measured throughout the year and any calibrations that were needed to improve the model. Also, describe the impacts of various algae control methods on future phosphorus concentrations in the lake as predicted by the model. The model should look at the impacts in the first year after implementation as well as at the potential impacts several years later.]*

J. Management Methods for Cyanobacteria Control and Lake Restoration

   a. Direct Algae Control Methods – *[describe common methods of direct algae control, including algaecides and physical inhibitors.]*

   b. Internal Loading Control Methods – *[describe common methods of internal loading control, including dredging, artificial circulation (aeration), hypolimnetic aeration, hypolimnetic withdrawal, iron application, alum treatment, lanthanum treatment, etc.]*

   c. External Loading Control Methods – *[describe common methods of external loading control, including: landowner and public agency BMPs, aeration, mechanical mixing, alum injection, wetland treatment, floating treatment wetlands, biomanipulation of foodweb, etc. You may consider reviewing this document - http://www.globalhab.info/files/Cyano_mitigation_GlobalHAB2019.pdf]*

K. Management/Restoration Methods Rejected – [*list cyanobacteria control/lake restoration methods rejected and explain why these methods are inappropriate for your lake.]*

L. Recommended Management/Lake Restoration Plan – [*describe the individual elements of the recommended lake restoration plan; for each element address:*

- *how this element will be implemented in your lake;*

- *the timing of implementation;*
- *the costs of implementation and maintenance;*
- *the estimated effectiveness and longevity;*
- *the potential adverse effects on zooplankton, fish and wildlife; and*
- *the potential impacts on residents, lake users, and the downstream watershed.]*

M. Future Monitoring and Adaptive Management
    a. Evaluation – [describe what methods will be used to evaluate the success of the Recommended Management/Lake Restoration Plan, including:
        - *water quality monitoring;*
        - *progress in implementing each element of the plan;*
        - *costs of implementation and maintenance; and*
        - *adverse impacts of the implemented methods.]*
    b. Adaptive changes – [*describe the process for considering changes to the Management/Lake Restoration Plan in light of new monitoring results or plan progress.]*

N. Funding Strategy – [*describe the sources of funding to be used to implement the Management/Lake Restoration Plan and to track changes in water quality conditions.]*

O. Roles and Responsibilities – [*describe what agencies and/or groups or individuals that will be responsible for implementing the plan and monitoring progress.]*

P. References