Quality Assurance Project Plan
State of Maine Volunteer Lake Monitoring Program
funded through the State of Maine Department of Environmental Protection (DEP),
and United States Environmental Protection Agency (EPA)

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Project Description:

In 1971, the Maine State Legislature authorized a Volunteer Monitoring Program (VMP) to provide Maine citizens with continuously updated information regarding the quality of Maine's lakes and ponds. In 1976, the State of Maine Department of Environmental Protection (DEP) took over the VMP. Since 1974, approximately 600 lakes have been sampled by DEP-trained volunteers.

Data collections are performed bi-weekly over a minimum of 5 months during the open water seasons; however, many monitors collect data for six months. Transparency data give an indirect measure of water quality. By observing transparencies over a long period of time (years), a general trend develops. Many monitors also collect dissolved oxygen (D.O.) data from their perspective lakes. In addition, the DEP samples lakes for baseline data (dissolved oxygen and temperature profiles, color, alkalinity, pH, chlorophyll and total phosphorus) on a rotating basis.

In 1992, the State Legislature decided not to fund the Lake Restoration and Protection Fund (LRPF) for 1993 and beyond. The LRPF was the source of monies used to run the program. The DEP solicited monitors who would help create a revised program by becoming volunteer regional coordinators, data entry coordinators, and Board of Directors members. The Board of Directors voted to become a not-for-profit organization called the Maine Volunteer Lake Monitoring Program (VMP). The DEP has entered into a long term agreement with VMP. The VMP will be responsible for the administration of the program, while the DEP will manage the data and provide data quality assurance quality control (QA\QC) and technical expertise.

Future plans include increased sampling by monitors to include more detailed data collection, education for both monitors and the public, and expansion of the program -- both in number of lakes and breadth of sampling (possibly into exotic species monitoring and watershed non-point source surveys). Through the use of volunteers, these detailed data can be collected from a large number of lakes. In addition, lake residents and users will be educated regarding lake and watershed ecology. Any expansion of the program, however, will not take place until there are adequate funding mechanisms to support it. A complete list of lakes currently involved in the program is listed in Appendix (1).

Quality control checks have also increased in the recent past. Previously, volunteers were trained when first joining the program. After this training, only data discrepancies led to future quality control checks. Starting in 1992, and continuing into 1993, transparency quality controls checks were performed on 70 monitors. In 1994, quality control checks for transparency and dissolved oxygen measurements were performed on every monitor. Future quality control checks will be held bi-annually for monitors performing transparency sampling, and annually for monitors performing D.O. testing.

Data Usage:
The data collected by monitors, along with baseline data, are of great value to the DEP and the State of Maine. The data are integrated into a pre-existing long term monitoring data base. The data are used for determining trends, water quality assessment, and lake management. In addition, data from each lake are included in an annual report that is distributed to monitors, state and federal agencies, and others interested in the water quality of Maine's lakes. These data are also one basis for determining attainment of Maine's classification requirements and the assigned uses as reported in 305(b) reports.

Technical Design:
Sampling is designed to monitor lake transparency, which indirectly measure lake productivity. In Maine, Secchi disk transparency is affected by water color, suspended sediments, and algae. Algal populations are usually the most dominant factor. Secchi disk data are therefore used to provide an indirect measure of algal production. Periodic baseline monitoring, which includes dissolved oxygen and temperature profiles, and integrated total phosphorus, chlorophyll a, alkalinity, and color samples, supplement transparency readings.

Frequency of collection:
Transparency readings will be conducted bi-weekly for at least five months during the open water season. Sampling locations will be located at the deepest part of the sampled lake, with one exceptions. On larger lakes, or lakes with more than one distinct basin the DEP can add additional sampling stations.

Dissolved oxygen readings are performed at least once per month during the same five month open water season. At DEP discretion sampling could be increased or decreased. Sampling will occur at the same station as transparency monitoring. DEP occasionally devises custom monitoring programs for monitors with different objectives. Sampling procedures will follow those of Pearsall (1996).

Project Organization and Responsibilities (VMP, DEP and Boards)
The project is managed jointly by the non-profit organization (status pending) VMP and the DEP. VMP is responsible for the administration of the program, while the DEP is charged with the program's data management, technical assistance, training, and data quality assurance quality control. VMP also assists to the extent possible in training, QA\QC. Figure (1) depicts the organizational structure of the VMP.

A Board of Directors composed of representatives from the volunteer regional coordinators, data entry coordinators, monitors, and citizens at large will direct and oversee the program. The Board will draw guidance from a three year action plan developed by a Board appointed Strategic Planning Committee. The action plan will be updated every two years. Table (1) lists the contact persons for various aspects of the VMP.

Table 1
VMP Organizational Contacts

Position	**Contact**
Project Coordinator (VMP)	Scott Williams (207) 225-3035 (207)225-3035 Fax
Data Management (DEP)	Linda Bacon (207) 287-7749 (207) 287-7826
QA Officer (DEP)	Webster Pearsall (207) 287-7649 (207) 287-7826 Fax
Chairperson Board of Directors	Jean Demetracopoulos (207) 384-5030

Project Organization and Responsibilities (Regional Coordinators)

An integral part of the program is the utilization of volunteer regional coordinators and data entry coordinators. The volunteer coordinators are the first contact with the monitors. All coordinators receive 3-4 hours of instruction along with a procedure manual. In addition, coordinators are required to attend an annual meeting, part of which consists of updating pertinent information and training. Table (2) list the responsibilities of the regional coordinators.

Table 2
Regional Coordinator's Responsibilities

1) Keep extra disks, tapes, scopes, field forms, log sheets, and envelopes

2) In order to remain current of program's goals and progress you must attend yearly Coordinators' meetings.

3) Response to inquires (know who to refer to)
   - Keep your opinions to yourself (Be objective; know VMP's positions on issues)
   - Know your limitations
   - Be responsive
   - Be courteous
   - Watch for hidden agendas

4) Be prepared for complaints of program procedures or policy refer to co-coordinators

5) Be informed on environmental laws (see training workshops) Coordinators are not expected to know the laws, only to provide background information and know what agency or bureau to refer to.

6) Keep log of questions
7) Keep log of time worked
8) Keep phone usage log
9) Keep log of problems, or suggestions to improve the program

10) Think about future training topics at annual meeting

11) Consider joining the Board of Directors (meets semi- annually)

12) Keep in contact with data entry personnel

13) Check with delinquent monitors

14) Repeat <u>know your limitations</u>! Saying I don't know is much better than guessing.
    - A: All questions from the media should go to program coordinator
    - B: All questions regarding permits should go to the appropriate DEP Bureau, Land Use Regulation Commission (LURC), Inland Fish and Wildlife, or Town.
    - C: All questions regarding policy should go to the VMP coordinator.

Project Organization and Responsibilities (Data Entry Coordinators)

Volunteer data entry coordinators' main function is to key punch data on time-share software package developed by the DEP. Data entry coordinators receive 3-4 hours of instruction, including hands-on use of the data entry program. After keypunching, the data are proof-read, and sent to DEP. All data will be proof-read by DEP staff. This system has produced the earliest annual VMP report. Table (3) lists the responsibilities of the data entry volunteers.

Table 3
Data Entry Coordinator's Responsibilities

1) Know procedures of data entry and management

2) Maintain contact with regional coordinators

3) Answer questions regarding data entry and management (but not interpretation of data) know your limitations and refer to DEP

4) All questions from media should go to Program Coordinator.

5) All questions regarding organizational or technical aspects of program should be referred to Regional Coordinators, or program's co-coordinators.

6) Keep log of time worked
7) Keep log of problems
8) Keep log of questions, or suggestions to improve the program

9 Make backup copy of data disk before mailing to DEP

10) Send DEP data disk and field forms in one envelope

11) Consider joining the Board of Directors (meets semi-annually)

Project Schedule:

1) March through November Monthly contact sheets and/or phone checks by Regional Coordinators

2) March Board of Directors meeting

3) April Field forms and annual reports sent to regional coordinators, and monitors.

4) April Annual report for all lakes in coordinator's area will be updated.

5) May QA\QC checks on dissolved oxygen meters and kits.

6) May through July; bi-annualQA\QC checks on Secchi Disk transparency.

7) July Board of Directors meeting

8) July 15 First half of data sent to Regional Coordinators.

9) July 20 Data forwarded to Data Entry Coordinators.

10) July 20 Regional Coordinators will contact delinquent monitors.

11) Last week in July Regional Coordinators annual meeting (Associated with COLA annual meeting, unless otherwise noted)

12) August 1 All data to DEP.

13) July Follow-up QA\QC for dissolved oxygen meters and kits.

14) September Fall letters sent by Regional Coordinators.

15) September Board of Directors meeting

16) November 10 All data to Regional Coordinators.

17) November 20 Data sent to Data Entry Coordinators.

18) November 20 Regional coordinators will contact delinquent monitors.

19) December 1 All data to DEP.

20) January Board of Directors meeting

21) February Strategic Planning Committee meeting (bi-yearly noted).

Field Sampling Table:

Parameter	Method	Frequency	Sample Vol. (ml)	Container	Preservative	Holding Time
Transparency	Secchi Disk	2/month	----	----	----	----
Dissolved oxygen	meter kit	monthly* monthly*	---- ----	---- glass	---- ----	---- 8 hr**
Total Phosphorus	digestion	1/Year	50 ml	plastic	cool (4^0C) dark, acid	8hr acid 28 days***
Chlorophyll a	digestion	1/Year	1 liter	plastic cube	cool (4^0C) dark	24 hrs. [a]
Alkalinity	kit	1/Year	low 23 ml high 6 ml	plastic cube	cool (4^0C)	24 hrs.
Color	kit	1/Year	low 15 ml high 5 ml	plastic cube	cool (4^0C)	24 hrs.

* minimum sampling, 2/month is recommended
** After Fixation
*** After acid has been added.
[a] Filter within 24 hours. Hold filter in freezer, wrapped in foil (no light) for up to 21 days. If can not filter within 24 hours whole water sample can be held up to 14 days at 4oC in the dark. Do not freeze whole water sample.

Sampling Procedures and Chain of Custody:

All sampling will be performed at the deep hole of the lake, unless otherwise directed by DEP. Water craft will be anchored before sampling occurs. Sampling procedures will follow those described by Pearsall (1996) Data will be recorded on fields form DEP-142B for transparency, and form DEP-142 for dissolved oxygen.

Analytical Procedures:

The objective precision and accuracy of data are listed in Table (4). The data will be reviewed for completeness, accuracy, and possible errors at the half way point and end of the field season. If any data problems are encounter, they will be identified and corrected. At least 80 percent of the data must be accepted for the project to be considered complete. EPA may conduct field or lab audits to assess the project. All analytical procedures will follow DEP (Pearsall 1996), and State of Maine Department of Human Services Health and Environmental Testing Laboratory (HETL 1994) guidelines.

Quality Control Samples:

Quality control checks for transparency data will be performed with each monitor on a bi-yearly schedule. DEP staff, or DEP-trained Mentors will conduct training workshops. The workshops will be composed of two parts, theoretical, and hands on. Detailed instructions on proper Secchi disk procedures will be reviewed. Monitors will then be observed performing the task on an individual basis. At this time the trainer will note any flaws in the monitor procedure and correct it. In addition, the trainer will obtain a reading at the same time for direct comparison of transparency readings. Acceptable accuracy for water transparency will be ±0.3 meter from the State standard, the VMP's QA\QC officer. The QA\QC officer will be calibrated against two other DEP staff members to determine a valid state standard. The trainer will work with the individual monitor until the monitor's reading is within the acceptable range, or is consistent. It must be noted that if a monitor is consistently outside the acceptable limits their data will be flagged but used. The reasoning for this; data collected are used in long term trend analysis. As long as the same monitor is consistent in procedures and ability to see the disk, long term comparison can be made even if the data is outside the acceptable range in terms of absolute readings.

Dissolved oxygen quality control checks will be performed by DEP staff or DEP trained mentors. Monitors will be checked once a year, unless it is deemed necessary by DEP that additional visits are warranted.

Procedures for checking quality control of monitor-owned dissolved oxygen meters will consist of an observation of general meter and probe condition, calibration steps and field procedures. Dissolved oxygen and temperature readings will be compared to a Winkler calibrated Yellow Springs Instrument dissolved oxygen meter.

Acceptable accuracy for LaMotte field kits will be a combination of ±10% for the field kits and the accepted accuracy of the individual calibrated meter (Table 5). The LaMotte Company states that accuracy of their kits can be improved to ±5%. This is achieved by the use of a higher quality graduated cylinder for measuring samples, and extra care by the monitors. Acceptable accuracy for meters will be within the combined accuracy of both meters (Table 5).

Table 5
Acceptable Accuracy of Yellow Spring Instruments Dissolved Oxygen meters
and
LaMotte Chemical Kits

Model	**Temperature**	**Dissolved Oxygen**
YSI 54	±0.7°	±1% of full scale calibration
YSI 51B	±0.7°	±0.2ppm when calibrated within 5 degrees of sample temperature
YSI 50B	±0.1°	±1% of saturation
LaMotte 7414	NA	±10%* ±5% with use of graduated cylinder and extra care
LaMotte 5856	NA	±10%* ±5% with use of graduated cylinder and extra care

Acceptable accuracy for other brands of meters and kits will be obtained directly from the manufactures.

Project Fiscal Information

The VMP will be funded by various sources. These include, but are not limited to, DEP (in-kind services, and general fund revenue), VMP (in-kind services), USEPA 604B and 319 funds, and private foundations. Future sources could include corporations.

References Cited

Mitnik, P. 1995. Salmon Falls / Piscataqua River Watershed TMDL Project. Work plan / Quality Assurance Project Plan. State of Maine DEP. Augusta, ME.

Pearsall, W. 1996 Instruction Manual for Baseline Water Quality Sampling. Publication DEPLW96-19. State of Maine Department of Environmental Protection. Augusta, Maine.

State of Maine Department of Human Services. 1994. Maine Department of Human Services Health and Environmental Testing Laboratory User Manual. State of Maine Department of Human Services. Augusta, ME.