

Alberta Biodiversity
Monitoring Institute

www.abmi.ca

Processing Water Samples

Version 2010-11-18

November 2010



Acknowledgements

This document was developed by Robert Hinchliffe. Jim Schieck provided input on earlier drafts. Document revised in 2010 by Jolene Swain with contributions from Rob Hinchliffe and Mingsheng Ma.

Disclaimer

These standards and protocols were developed and released by the ABMI. The material in this publication does not imply the expression of any opinion whatsoever on the part of any individual or organization other than the ABMI. Moreover, the methods described in this publication do not necessarily reflect the views or opinions of the individual scientists participating in methodological development or review. Errors, omissions, or inconsistencies in this publication are the sole responsibility of ABMI.

The ABMI assumes no liability in connection with the information products or services made available by the Institute. While every effort is made to ensure the information contained in these products and services is correct, the ABMI disclaims any liability in negligence or otherwise for any loss or damage which may occur as a result of reliance on any of this material. All information products and services are subject to change by the ABMI without notice.

Suggested Citation: Alberta Biodiversity Monitoring Institute. 2010. Processing Water Samples (10020), Version 2010-11-18. Alberta Biodiversity Monitoring Institute, Alberta, Canada. Report available at: abmi.ca [Date Cited].

Use of this Material: This publication may be reproduced in whole or in part and in any form for educational, data collection or non-profit purposes without special permission from the ABMI, provided acknowledgement of the source is made. No use of this publication may be made for resale without prior permission in writing from the ABMI.

Contact Information

If you have questions or concerns about this publication, you can contact:

ABMI Information Centre
CW-405 Biological Sciences Centre
University of Alberta
Edmonton, Alberta, Canada, T6G 2E9
Phone: (780) 492-5766
E-mail: abmiinfo@ualberta.ca

Table of Contents

Summary	4
Sample Transfer from Field Crews to Temporary Storage	5
Water Sample Analyses	5
Moving Samples to The Water Laboratory	5
Analyses Of The Water Samples	5
<i>Total Phosphorus</i>	5
<i>Total Nitrogen</i>	5
<i>Dissolved Organic Carbon</i>	6
Quality Control During Analyses	6
Data Return to the ABMI.....	6
Literature	7
Appendix 1. Data Log for ABMI Water Samples	8
Appendix 2. Data Sheets for Water Physiochemistry Analyses	9

Summary

This report describes the protocols (methodology) presently being used by the Alberta Biodiversity Monitoring Institute (ABMI) to process water samples. Water samples are collected from wetlands, lakes, and rivers and sent to accredited water labs for analyses of phosphorous, nitrogen, and dissolved organic carbon.

Sample Transfer from Field Crews to Temporary Storage

- Nalgene bottles containing water samples are placed inside a cooler (packed with ice) to maintain a temperature of 4° C by field crews, recorded on a shipping manifest, and shipped via courier to the ABMI Sample Processing Center (see Wetland, River, and Lake Protocols).
- Samples are logged in when they arrive at the processing center. Each shipment is assigned a “lot number”, and the contents of each lot are tracked by that number.
- A detailed description of the data log is provided in Appendix 1.
- The data log includes information about the date the lot arrived, the location where the samples are stored, the ABMI sites where the samples were collected, the number of water samples in the lot, and a detailed listing about each sample.
- Water samples are removed from the cooler and placed in a fridge (~4° C) for storage. To the degree possible, samples are transported and stored in a dark environment.
- The lab coordinator ensures that all water sample bottles, from each ABMI site, are present in the storage facility and recorded in the log book.
- If water samples are moved to a different location for temporary storage, the new location and the date of movement are recorded in the log book.

Water Sample Analyses

Water samples must be analyzed within 28 days of being collected.

Moving Samples to the Water Laboratory

- To transport the water samples, the ABMI lab coordinator places the samples inside a cooler (packed with ice) to maintain a temperature of ~4° C). To the degree possible, samples are transported and stored in a dark environment.
- The cooler is transported via courier, or delivered by the lab coordinator if the distance is short, to a qualified Water Lab.
- To be classified as a qualified lab, the lab must be endorsed by the Canadian Association for Environmental Analytical Laboratory's (CAEAL).
- Water samples are logged out of the storage location and into the Water Lab. Record the new location, and the date of transfer in the log book (Appendix 1).
- Receiving personnel at the Water Lab ensure that all water samples from each ABMI site have been received.

Analyses of the Water Samples

Water samples are analyzed for total phosphorus, total nitrogen, and dissolved organic carbon.

Total Phosphorus

- Sample analyses follows Menzel and Corwin, 1965; Prepas and Rigler, 1982; and Method 4500 – P Phosphorous.
- In general, a sub-sample is obtained from each ABMI site, and the sub-sample is digested by persulfate oxidation to produce orthophosphate. Orthophosphate then reacts with the ammonium molybdate, potassium antimonyl tartrate, and ascorbic acid in the reagent to form a molybdenum blue complex that absorbs light at 885 nm. The relationship between concentration of phosphorus and absorbance is linear and can be determined by regression analysis from known standards.

Total Nitrogen

- Sample analyses follow Motter and Jones, 2006; and Method 4500 – N Nitrogen.

- In general, a sub-sample is obtained from each ABMI site, and in the sub-sample organic nitrogen is converted to nitrate after being digested using potassium persulfate. Then, nitrate is quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide followed by coupling with N-(1-naphthyl) ethylenediamine dihydrochloride. The resulting water-soluble dye has a magenta color, which is read at 520 nm.

Dissolved Organic Carbon

- Sample analyses follows EPA Method 415.3, 2005.
- In general, a sub-sample is obtained from each ABMI site, and in the sub-sample all inorganic carbon is removed from the samples by acidifying with 2 M/L HCl and sparging with hydrocarbon free air before analyzing DOC. In DOC determinations, organic carbon in the water sample is converted to carbon dioxide (CO₂) by catalytic combustion at 680 °C. Then, the formed CO₂ is detected by a non-dispersive infrared detector (NDIR). External calibration method is used to calibrate the DOC concentrations in water samples.

Quality Control during Analyses

Standards analyzed for quality control (Unpublished SOP's from the Biogeochemical Analytical Laboratory, Department of Biological Sciences, Z808 Biological Science Centre, University of Alberta, Edmonton, Alberta, Canada, T6G 2E9):

Total Phosphorus

- Laboratory blank samples analyzed regularly to demonstrate freedom from contamination. Two quality control samples at different concentrations are analyzed after every 20 samples to monitor the drift of instrument sensitivity. If the any QC is over $\pm 10\%$ of prepared value, the instrument is re-calibrated and previous samples re-analyzed.

Total Nitrogen

- Total Nitrogen: two quality control samples at different concentrations are analyzed after every 20 samples to monitor the drift of instrument sensitivity. If the any QC is over $\pm 10\%$ of prepared value, the instrument is re-calibrated and previous samples re-analyzed.

Dissolved Organic Carbon

- Two certified standard solutions are analyzed at the same time as each sample group.
- The values obtained from the standards must be within $\pm 10\%$ of prepared values.
- If the values are not within $\pm 10\%$ of prepared values, the instruments must be re-calibrated and the samples re-analyzed.
- A sample containing 20 mg/L inorganic carbon is analyzed with every batch of samples to check the purge efficiency (the concentration of this sample should be at the level of lab water blank). Also, in every 15-20 sample analyses, the column is washed using deionized water to remove the salts from the column and a 20 mg/L standard sample is measured to monitor the instrument sensitivity drift.

Data Return to the ABMI

- Results of the analyses are recorded on spread sheets by the Water Lab (see Appendix 2 for a copy of the data sheets).
- Results from the Water Lab analyses are emailed to the ABMI lab coordinator.
- The lab coordinator ensures all the required information has been returned for all samples, and enters the information into the ABMI database.

- The lab coordinator sends an email to the Water Lab indicating the information from all samples has been received and is in good order. The Water Lab then discards the water samples.
- For each sample, the lab coordinator records in the log book that water chemistry information has been obtained and the water sample has been destroyed (Appendix 1).

Literature

- EPA Method 415.3 (2005). Determination of Total Organic Carbon and Specific UV Absorbance at 254 nm in Source Water and Drinking Water. EPA Document #: EPA\600\R - 05\055
www.epa.gov/nerlcwww/m_415_3Rev1_1.pdf
- Method 4500 – N Nitrogen, In: Standard Methods for the Examination of Water and Wastewater 20th Edition on CD (1999). American Public Health Association, American Water Works Association and Water Environment Federation.
- Method 4500 – P Phosphorus, In: Standard Methods for the Examination of Water and Wastewater 20th Edition on CD (1999). American Public Health Association, American Water Works Association and Water Environment Federation.
- Menzel, D. W., and N. Corwin. 1965. The measurement of total phosphorus in seawater based on the liberation of organically bound fractions by persulfate oxidation. *Limnol. Oceanogr.* 10: 280-282.
- Motter, K. and Jones, C. 2006. Standard Operating Procedure for the Digestion and Analysis of Fresh Water Samples for Total Nitrogen and Total Dissolved Nitrogen. CCAL 33A.0. Cooperative Chemical Analytical Laboratory, Forestry Sciences Laboratory, Oregon State University 3200 SW Jefferson Way Corvallis, Oregon
- Prepas, E. E., and F. H. Rigler. 1982. Improvements in quantifying the phosphorus concentration in lake water. *Can. J. Fish. Aquat. Sci.* 39: 822-829.
- Unpublished SOP's from the Biogeochemical Analytical Laboratory, Department of Biological Sciences, Z808 Biological Science Centre, University of Alberta, Edmonton, Alberta, Canada, T6G 2E9

