

Lake Sampling Guidelines - REVISED 03/04/03 (Simonson)

updated 07/25/03

Fisheries Surveys

Tier I Lakes (100 acres or larger with public boat access)

Summer Fish Community Assessments: During the summer (July and August), sampling of littoral zone fish communities will be conducted with mini-fyke nets. The number of randomly selected stations will be scaled to lake size. At least six sets should be used on lakes <500 acres, and at least 8 sets on lakes > 500 acres. The number of sets suggested here should be considered the minimum. Nets must be set by mid-afternoon and fished overnight. The number of each species captured should be recorded, with separate counts kept for young-of-year (YOY). Each net-set should be recorded on a separate data sheet (do not combine catches from more than 1 net on a data sheet).

Recommended nets are the same as those recommended for comprehensive surveys, and have two 3'x2' frames (3'x3' frames are also acceptable), four 2'-diameter hoops spaced 2' apart, and a 30"x 2' lead. Nets used should be 3/16"-mesh, died green, with 1"-mesh exclusion netting.

Fall Gamefish Assessments: Fall sampling is intended to provide biologists with an indication of the health of the fishery through estimates of gamefish and forage/non-game fish relative abundance (catch per effort), gamefish population size-structure (length-frequencies), an index of growth, and gamefish recruitment (young-of-year catch per effort). The electrofishing is conducted at water temperatures from 50 to 68 F. Centrarchid lakes should be completed first and muskellunge lakes should be completed last (muskellunge young-of-year catch rates tend to increase as temperatures decline). The electrofishing should be conducted according to the following protocols:

- Boom electroshocking will be conducted at night. Whenever possible, two experienced people should be used to dip fish.
- The entire shoreline should be divided into 2-mile segments. Within each 2-mile segment, all gamefish will be collected in a 1-½-mile **Gamefish station** and ALL fish will be collected in a ½-mile **Index station**. The minimum coverage needed for a successful survey is as follows:

Total Lake Shoreline (miles)	Required Sampling (2-mile segments)
4 miles or less	Entire shoreline/2 index stations
4 to 16 miles	2 gamefish stations/2 index stations
16 to 24 miles	3 gamefish stations/3 index stations
24 to 32 miles	4 gamefish stations/4 index stations
> 32 miles	5 gamefish stations/5 index stations

- The first 2-mile segment should be chosen randomly and the other 2-mile segments should be equally spaced around the lake to achieve uniform coverage. As a general rule, at least 25% of the total shoreline (or 25% of the 2-mile segments) of each lake should be sampled.
- Within each 2-mile segment, all gamefish species (including young-of-year) will be collected within the 1-½ mile **Gamefish station** and a minimum of 250 individuals of each species will be randomly selected and measured to the nearest 0.1 of an inch or centimeter. If panfish are abundant, they may be defined as non-gamefish species and collected only during the ½-mile **Index stations**, as described below. Scales should be collected from the most abundant gamefish (5 per 1/2" or 0.3" length group) or, at a minimum, scales should be taken from 10 individuals within 0.3" of the "stock" length and from 10 individuals within 0.3" of the "quality" length. At a minimum, the average age of "stock" and "quality" size fish will be computed for comparison across lakes. Weights may be measured and recorded for fish that are aged (not required). All data should be recorded on form 3600-186 for gamefish and nongame fish and 3600-190 for panfish (See Appendix A). *The investigator should record the data from each 1-½ mile gamefish station and each ½-mile index stations separately as described below.*

Fish Species to collect in Gamefish Stations; at least 10 individuals of each size (+/- 0.3") should be aged; e.g., 10 bass from 7.7" to 8.3" and 10 from 11.7" to 12.3" should be aged.

Gamefish Species	Structure	Stock Size	Quality Size
Largemouth Bass	Scales	8"	12"
Smallmouth Bass	Scales	7"	11"
Muskellunge	Scales	20"	30"
Northern Pike	Scales	14"	21"
Walleye	Scales	10"	15"
Sauger	Scales	8"	12"
Catfish*	Spines	11"	16"
Sunfish*	Scales	3"	6"
Crappie*	Scales	5"	8"
Yellow Perch*	Scales	5"	8"

* Aging optional. If abundant, may be collected only in the Index Station.

- Within each 2-mile segment, a ½-mile **Index station** will be delineated where ALL species (including gamefish species) will be collected, identified, and counted. If panfish were defined as non-gamefish species, then a minimum of 250 individuals of each species will be randomly selected and measured. All data should be recorded on form 3600-186 for gamefish and nongame fish and 3600-190 for panfish (See Appendix

A). *Data from each ½ - mile index station (including any gamefish species collected) should be recorded separately and should not be combined with data from the larger 1-1/2 mile gamefish station.*

Tier II Lakes (< 100 acres with public boat access)

Fall Gamefish Assessments: Only fall gamefish assessments will be conducted on Tier II lakes using the same procedures described for Tier I lakes (see above). No summer mini-fyke netting will be conducted on Tier II lakes.

Spring Gamefish Population Estimates

In order to calibrate and “ground truth” recent changes in the protocol (a move from spring to fall electrofishing), each fisheries biologist with a Baseline Lakes workload is asked to conduct a more comprehensive survey on one of the baseline lakes sampled in each year of the biennium. The choice of the lake and species will be left up to the biologist, but generally, if baseline data indicate a fishery-related problem, a more detailed analysis can be completed within the same fiscal year (the following spring).

Population abundance and population size- and age-structure of the predominant gamefish species should be estimated based on the Comprehensive Survey guidelines. Generally, northern pike and walleye are marked, measured, and scales are taken from ice-out to peak spawning (40-50 F) using fyke nets; recaptures are made using electrofishing within the spawning period (45-50 F). For bass, fish are marked, measured, and scales are taken during pre-spawn using electrofishing (55-60 F) – walleyes are also collected at this time, if they were marked earlier, to complete a total population estimate. Recaptures are also made with electrofishing during and after the spawning period, within 2 weeks of the marking run (60-69 F). Either a single-census estimate can be made, or multiple-recapture periods can be used to calculate a Schnabel-type estimate if the initial number of recaptures is low. Muskellunge population estimates should be conducted using fyke nets during the spawning period in two consecutive years, with first year for marking and the second year for recapture.

Fish Contaminants

Each spring a collection schedule for fish contaminants is developed. This schedule should be examined before conducting planned field work to see if fish are needed for contaminant analysis. See the following folder for the collection schedule and for collection procedures:

FHCOMMON:>MONITORING\Fish Contaminants

Training and Quality Assurance

Training of field staff for consistency in data collection and recording is critical to the success of the baseline-monitoring program. Training in taxonomy, deployment of field gear, and general program implementation will be made available to all staff annually. A layer of quality assurance to maximize data integrity will be initiated through a data screening process built into the statewide database. All monitoring protocols employed will, at a minimum, meet the Department's data standards as developed by the Aquatic and Terrestrial Resources Inventory (ATRI) Team.

Water Quality Monitoring

Tier I and Tier II Status Lakes

Water quality monitoring of Status lakes will include a one-time collection of total phosphorus in the spring and a one-time collection of the components of the TSI (total phosphorus, Secchi disk, and chlorophyll *a*) in the summer (15 July - 15 September). In addition to the components of the TSI, other water quality parameters, also measured once during the summer, include conductivity, pH, and alkalinity, color, nitrate+nitrite, total Kjeldahl-N and field profiles for dissolved oxygen, temperature, and conductance. Every attempt should be made to coordinate with ongoing "Self-Help" monitoring so that we are not repeating their efforts. For example, if "Self-Help" volunteers are collecting TSI data in the summer, don't do that portion of the protocol.

Additional limnological parameters will be sampled in order to refine the lake classification. These include calcium and magnesium, which will be collected once during the first summer sampling visit to each lake.

Procedures for Spring TP Sample Collection

One total phosphorus (TP) sample should be collected in the spring. Bottles, forms, and instructions for shipping samples are available from the local lake coordinator.

What you need:

- 250 mL bottle from SLH (sample bottle with field number and lake name)
- Sulfuric acid ampoule for preserving sample (from SLH)
- pH indicator paper to check pH of sample
- SLH form 4800-015 with highlighted areas to be filled out in the field.
- Ziploc bags
- Sharpie pen
- Cooler
- Plastic gloves
- A 250-mL bottle containing water marked 'ICE' and pre-frozen with water.

How to collect sample:

- Lakes should be sampled in spring prior to thermal stratification.
- The sampling station should be preferably away from shore near mid-lake.
- Rinse 250-mL bottle three times with lake water by dipping below the surface as far as you can reach.
- Fill bottle to neck (not to top) with lake water, dipping bottle as far as you can reach below the surface to avoid collecting material on the surface.
- Put capped bottle in a ziploc bag and store in a small cooler. It's important to keep samples cool and away from contamination.

- On shore, add amount of sulfuric acid to acidify to $\text{pH} < 2$. This can be an ampoule of acid from the SLH, or a certain number of drops of acid (i.e., 8 as in NOR). Check with lake coordinator for proper amount for your region's lakes.
- Mark sample bottle with yellow sticker as being acidified with sulfuric acid. Pour a bit of acidified water sample onto tip of pH indicator paper to ensure you've acidified sample to $\text{pH} < 2$. Be cautious as sulfuric acid eats holes in clothes, etc. Firmly cap bottle.
- Place all acidified bottles in a single ziploc bag in cooler with ice bottle. Keep samples cool not frozen. Refrigerate them if not shipping the same day.

Send samples to SLH:

- Fill out SLH form 4800-015 (see slhform.ppt for examples and instructions on how to fill out this form for spring phosphorus grab samples).
- Store sample cooled (not frozen) until shipment
- Ship sample on ice with completed lab sheet to the SLH in a mailer or cooler.
- Contact your lake management coordinator for specific information.

Procedures for Summer Water Quality Sampling:

This protocol covers methods for baseline water quality monitoring during the summer index period (i.e. 15 July to 15 September). Go metric where possible; otherwise consider 3 feet as the interval unit for measurement in profiles and water sampling depth. Be sure to note on field sheets (see accompanying pdf file) whether you use feet or metric units.

Field procedures:

- Anchor boat over deepest point in the lake basin.
- Note weather conditions, including whether it is sunny/cloudy, raining, wind speed and direction, etc.
- Measure dissolved oxygen, temperature and conductance at 1 meter (or 3 feet) intervals from surface (0) to the nearest whole meter off the bottom. If you have the capability, also measure pH at 1 meter. Record measured depth at sample site. Note that conductance values will have to be corrected to 25°C. It is best to record uncorrected conductance then use corresponding temperature data to apply a correction factor. Note also that if you start measurements from the bottom you *must* end up with comparable values for 0, 1, 2... meter depths or 0, 3, 6, 9... foot depths.
- Measure Secchi disk transparency to nearest tenth of a meter or ½ foot.
- All water samples, where practical, will be collected with an integrating column sampler to 2 meters depth. In shallower lakes, a Van Dorn may be

used. Use the integrating water column sampler (see additional notes below) to collect a composite water sample as follows:

- Rinse the integrating sampler and compositing jug three times with lake water before sample collection.
- After rinsing, lower the integrating sampler vertically at a relatively slow speed to 2 meters depth. After reaching 2 m pull sampler up vertically.
- Empty the contents of the integrating sampler into the compositing jug by pushing ball valve end against the bar installed across the jug's mouth. This pops the ball valve up releasing water in the pipe.
- When emptying water from the integrating tube sampler into the composite jug, do not allow water to run over your hands or get contaminated.
- The 2 m integrating sample collects ~1 liter of water. Combine as many separate sample pulls as needed to have enough water to fill water sample bottles (i.e. 2 – 250 mL bottles and 1 – quart bottle) and 250 mL to filter for chlorophyll. If a single epilimnetic sample doesn't provide enough volume for samples and chlorophyll filtration (see guidelines in Appendix D), collect additional samples and add to the composite.
- After gently mixing the water in the composite container, fill three sample bottles to the neck and preserve as follows. Make sure to mark the labels of these bottles appropriately.
 - 250 mL polyethylene bottle to the neck for TP, TKN and nitrate+nitrite-N; acidify with sulfuric acid.
 - 250-mL polyethylene bottle for calcium and magnesium; acidify with nitric acid.
 - 1-quart plastic bottle for color and alkalinity (keep these samples in the dark as much as possible).
- Store the remaining composite water in a plastic amber bottle pre-rinsed three times with lake water. Keep this bottle in a cooler on ice for later chlorophyll filtration described later in Appendix D. Filtration should be done back at your closest laboratory site. Whole samples may be sent to the State Lab of Hygiene for filtration if they are sent the same day they are collected and processed within about 24 hours. NOTE: we do not encouraging filtration on site in the boat.

- To store water for later filtration for chlorophyll, we're suggesting you use 1 or 2 L wide-mouth amber bottles made of polyethylene that can be ordered relatively cheaply from Fisher or VWR Scientific. These amber bottles have the benefit of preventing light exposure to the sample, which can break-down chlorophyll. If you reuse these bottles from day to day, rinse with deionized or milli-Q water after filtration is complete, and rinse 3 times with lake water before filling with water from the composite jug.

Clean-up

At the end of the day, rinse all composite containers and tube samplers with deionized water and allow to dry. Hang tube samplers with ball end at top to allow water to drain out.

- **Note:** It is **very** important to rinse out all composite containers at the end of the day. We need to prevent any contamination of the water chemistry samples, particularly since we're measuring constituents like calcium and magnesium that may be in very low concentrations.

Quality Assurance

It is important to get an idea of the field precision of our chemical measures. To get this useful data we suggest the following:

- Field replicates for all chemical samples and chlorophyll should be collected at a rate of 10%. The easiest way to do this, and to keep it relatively random, is to keep track of samples and every tenth lake collect a duplicate set. Note that this second set of samples needs to have a unique field number
- If there are two observers in the boat, have both people make observations of Secchi disk and Custer color strip value on replicate lakes.
- Notes on meter calibration, etc. should be kept in a project notebook.
- Once a week during the field season (or about 10% of samples), send a set of blanks to the State Lab for all variables except chlorophyll. To do this, get milli-Q water from SLOH, rinse the integrating sampler three times, fill it, empty it into a pre-rinsed composite jug, then pour water into the three sample bottles. Essentially, you're following the same procedure as you would for a lake sample. Remember to give this set of samples a unique field number.

Temperature/DO/Conductance Profiles: Profile data should be entered into the DNR Lake Water Quality database. Data should be entered on the Web or by telephone. Both data entry systems should be available by summer 2003. Data can possibly be submitted in other formats as well. Contact Jennifer Filbert for more information.

SLH Inorganic Test Request Form:

Use the SLH Inorganic Test Request form 4800-015 (R 12/00) available on the intranet at the address given below. You can use form filler to customize and save your form except for the field parameters added at the end of the day.

<http://intranet.dnr.state.wi.us/int/es/science/ls/fpm/download/>

The SLH Inorganic Test Request form needs to have the following information included in addition to the usual stuff (like your name, date, time, lake name, county, WBIC (water body number), STORET number etc.).

- On page two make sure you indicate the top of sampling interval as 0.0 meters and the bottom of the sampling interval as 2.0 meters.
- Check boxes for the following chemical tests:
 - Under plastic quart bottle check:
 - Color
 - Chlorophyll *a*, uncorrected. Write in the volume of water filtered, unless sending the whole sample for SLOH to filter.
 - Alkalinity, pH and Conductivity
 - Under 250 mL Bottle for Nutrients or Metals (Acidify with nitric acid) check:
 - Calcium
 - Magnesium
 - Nutrients Bottle 250 mL (Acidify with sulfuric acid) check:
 - Tot.-Phosphorus
 - Total Kjeldahl-N
 - NO₂+NO₃ as Nitrogen
- If you collect a replicate set of samples you will need to fill out a separate Inorganic Test Request, giving the second set of samples a unique field number, which you write on both the sample bottles and the Request Form.

Gear List:

Meters, field measuring devices.

- Meter(s) for measuring dissolved oxygen, temperature and conductance profiles and, if available, pH (at 1 meter only). If lines for DO/temperature meter are in feet, mark sampler in 1-ft intervals, or redo lines in metric!!!
- Black/white Secchi disk with line calibrated in meters (to 0.2 m units) or feet.
- Custer color strip
- Depth finder

Water sampling gear:

- Integrating water sampler to sample top 2 meters of water.
- Composite bottle (and spare) fitted with emptying device that dislodges the ball check valve in the tube sampler. A half gallon jug works well.

Chlorophyll filtration (see Appendix D for complete list of gear):

Sample bottles and preservatives:

- 250 mL polyethylene bottle and nitric acid ampoules for Ca and Mg
- 250 mL polyethylene bottle and sulfuric acid ampoules for TP, TKN, and nitrate+nitrite-N
- 1-quart plastic bottle for total alkalinity/conductance/pH and color.
- 250 mL plastic amber bottle for storing water for chlorophyll filtration

Miscellaneous:

- SLH shipping coolers, inorganic test requests, ice bottles
- Coolers and ice to store samples on in the field and during transport
- Marking pens, pens, label tape, etc.
- Field data forms (see 'water quality baseline form.pdf' file for example).

Notes on the Integrated Sampler:

Jim Klosiewski, NOR-Rhineland (715-365-8992) is the expert who put in long hours developing the integrated sampler (or "Chloropolski"). He put together some useful files on how to construct the integrated sampler and how to use them in the field. A file describing sampler construction and use is available on the FH common drive under \fhmonitoring\baseline lakes\Protocol&Strategy as 'Integrating_water_sampler_ver3_04_2001.doc'.

Water Sample Handling and Shipping:

The DNR intranet website has a link to the WDNR field procedures manual (see address below), which provides details on sample handling, shipping, labeling, etc. Appropriate sections on preservation are included in Appendix C of this document. See the website at: <http://intranet.dnr.state.wi.us/int/es/science/ls/fpm/>

Tier I and Tier II Trend Lakes

Background - About 56 lakes will be identified statewide to monitor long-term trends in lake condition and provide regional reference conditions for each defined lake class. These lakes will be used to characterize within-lake and among-year variability in Baseline WQ monitoring.

Lake Selection - Trend lakes should be distributed throughout the state, with 18 lakes in NOR, 12 in both NER and SER, and seven each in SCR and WCR. Lakes should be selected by the both lakes and fisheries staff in each region, with at least one lake in each of the defined lake classes. At least one lake should be selected to represent the “typical” condition of the lakes within a region and lake class, if possible. In NOR, NER, and SER, a lake from each class should also be selected that represents the “best” condition in that lake class. Care must be taken when selecting trend lakes to ensure that lakes selected represent the class and will, over the long-term, represent trends for the region. Lakes that have immediate problems or issues associated with them should be avoided. If data are required for problem lakes, they should be proposed as “special projects” and not used as trend lakes under Baseline.

Sampling Protocol - Once the trend lakes have been identified, GIS or aerial photography will be used to assess watershed and riparian land-use. This should be repeated every seven to ten years.

Trend lakes are sampled annually for water quality with an "expanded" baseline monitoring protocol. Trend lakes should be sampled every 3 years for fisheries parameters, when possible.

Water quality monitoring on Trend lakes includes collection of total phosphorus in spring (as described above for Status Lakes) and components of the TSI (total phosphorus, Secchi disk, and chlorophyll *a*) along with field profiles for dissolved oxygen, temperature, and conductance, 3 times during the summer (15 July - 15 September). This should be done once every 2 to 3 weeks. In addition, other water quality parameters collected once each summer, include conductivity, pH, and alkalinity, color, and, on specified lakes, nitrate+nitrite and total Kjeldahl-N. Again, every attempt should be made to coordinate with ongoing "Self-Help" monitoring so that we are not repeating their efforts. For example, if "Self-Help" volunteers are collecting TSI data in the summer, don't do that portion of the protocol.

As with the Status Lakes, additional limnological parameters will be sampled on a one-time basis on Trend Lakes in order to refine the initial lake classification. These include calcium and magnesium. These measures should be collected once during the first summer sampling visit to each lake. Once these parameters have been estimated for a lake, they should not be determined on subsequent visits.

APPENDICES

Appendix A- DNR Field Forms: 3600-186 (generic), 3600-187 (gamefish), and 3600-190 (panfish) on the FHmonitoring common drive under \fhmonitoring\baseline lakes\Protocol&Strategy\Field Data Forms.

You may use any form you prefer, but make sure you collect all mandatory variables required in the FH database. On the FHmonitoring drive, the “.pdf” file is the form and the “.doc” file with the same number is the instructions on the reverse side. The baseline lakes sub-team will consider including additional forms on the F drive. There are some nice ones around the state.

Appendix B – DNR field form for water quality on the FHmonitoring common drive under \fhmonitoring\baseline lakes\Protocol&Strategy\Field Data Forms\‘water quality baseline form.pdf’

Appendix C: Description of Water Samples for SLH

Aliquots from Integrated Water Column Sample:

One 250 mL bottle for TKN, TP, and Nitrite+Nitrate-N, acidified with sulfuric acid

Preservation Notes For Total Kjeldahl-Nitrogen

Sample Size: 38 ml

Bottle Type: 250-ml polyethylene with white polypropylene cap

Preservative: H₂SO₄ to pH<2, Cool to 4 °C

Volume of Preservative: 1 mL 25% (9N) H₂SO₄/250 mL

Compatible With: COD (15 ml), Ammonia-Nitrogen (38 ml), Nitrate + Nitrite-Nitrogen (38 ml), Total Phosphorus (38 ml), Total 175 ml for all parameters

Special Notes: None

Preservation Notes For Total Phosphorus

Sample Size: 38 ml

Bottle Type: 250-ml polyethylene with white polypropylene cap

Preservative: H₂SO₄ to pH<2, Cool to 4 °C

Volume of Preservative: 1 mL 25% (9N) H₂SO₄/250 mL

Compatible With: COD (15 ml), Ammonia-Nitrogen (38 ml), Nitrate + Nitrite-Nitrogen (38 ml), Total Kjeldahl Nitrogen (38 ml), Total 175 ml for all parameters
Special Notes: None

Preservation Notes For Nitrate plus Nitrite-Nitrogen

Sample Size: 38 ml

Bottle Type: 250-ml polyethylene with white polypropylene cap

Preservative: H₂SO₄ to pH<2, Cool to 4 °C

Volume of Preservative: 1 mL 25% (9N) H₂SO₄/250 mL

Compatible With: COD (15 ml), Ammonia-Nitrogen (38 ml), Total Kjeldahl Nitrogen (38 ml), Total Phosphorus (38 ml), Total 175 ml for all parameters

Special Notes: None

1 Quart bottle with for color and alkalinity

Preservation Notes For Color and Alkalinity

Sample Size: 150 ml

Bottle Type: Can use 1 quart bottle for color and alkalinity, remember to mark clearly. Preservative: Cool to 4°C.

Compatible With: Alkalinity & Conductivity (75 ml), BOD (150 ml, low level 900 ml), Nitrite-Nitrogen (38 ml), pH (38 ml), Dissolved Silica (38 ml), Total & Volatile Solids (75ml), Dissolved Solids (75m), Suspended Solids (250 ml or 1500 ml low level), Sulfate (38 ml), Surfactants (MBAS) (375 ml or 75 ml for non-compliance), Turbidity (38 ml), Total for all parameters 1,400 ml to 3,300 ml

Special Notes: None

One 250 mL polyethylene bottle with white cap – acidified with nitric acid for Ca and Mg

Preservation Notes For Metals – Ca and Mg

Sample Size: 250 ml

Bottle Type: 250-ml polyethylene with white polypropylene cap

Preservative:HNO₃ to pH<2

Volume of Preservative: 1 mL 70% (16N) HNO₃ to pH<2

Compatible With: Need Whole Volume

Special Notes: None

Appendix D: 1004 CHLOROPHYLL SAMPLE FILTRATION (from DNR Field Procedures Manual)

A. Scope:

This procedure is for the *filtering* of surface waters to determine the chlorophyll content.

B. Safety:

NA

C. Equipment:

1. Membrane filtration apparatus.
2. Millipore SM 5.0 mm membrane filters (SMWP 0 470 47 mm diameter, 100/pack). Millipore, Bedford, MA 01730, 800-646-5476.
3. Vacuum source (hand or electric pump).
4. 1000 ml filtration flask.
5. 500 ml graduated cylinder.
6. Tubing.
7. Wash bottle.
8. Distilled water.
9. Tweezers.
10. Aluminum foil (4.25" by 3.5").
11. Zip lock bag (3" by 5").

D. Collection Procedures:

Collect the samples with the procedures given in the surface water sampling section. Be sure to store collected sample on ice and out of direct sunlight.

E. Sample Handling and Filtration:

This procedure should be conducted in the shade, out of direct sunlight. We actually recommend that filtering of samples kept on ice and in coolers is better done at the laboratory at the end of the day, not on site.

1. Place all the equipment on your work area.
2. Insert the bottom part of the filtering cup (membrane filtration apparatus) into the 1000-ml filtration flask. You may wish to wet the stopper first to get a good seal.
3. Attach the plastic tubing of the vacuum pump to the spout of the filtration flask.
4. Pick up one small membrane filter with the tweezers and place it on the center of the filter base (the black screen). Note that filters are white, divider sheets are blue -- be careful to use a filter! Squirt a small amount of distilled water on the filter to keep it in place. Do not touch the filter with your fingers while removing it from the bag or when placing it on the screen.
5. Carefully place the cup on top of the filter base. It is magnetic. Be sure that the filter does not move!
6. Determine the approximate volume of water to filter for the chlorophyll analysis, refer to table 1004-1. Match the Secchi depth you got today against the volume of water that should be filtered. *Gently* mix the sample by turning the bottle upside down several times (be sure to use a sealed amber container to store samples for filtration). Keep track of the total volume of water filtered.

7. To begin filtering, pour some of the measured water from the graduated cylinder into the filter apparatus.
8. Squeeze the hand pump or turn on the vacuum pump to move the water through the filter.
9. When you are finished filtering, separate the top cup from the filter base.
10. Using the tweezers, fold the filter paper in half so that the algae are on the inside. **Do not touch the algae with your fingers!**
11. Fold the filter paper in half again and wrap it in a piece of aluminum foil. Fold edges around sample to form a closed packet.
12. Place foil packet in zip lock bag.
13. Using a pencil, complete the information on a chlorophyll sticker. Attach the sticker directly to the zip lock bag. **BE SURE TO INCLUDE THE VOLUME FILTERED!**

Table 1004-1

Note: These are approximate guidelines -- you should filter as much water as you can.

Secchi Depth (meters)	Secchi Depth (feet)	Approximate Volume to Filter (mLs)
<0.3 m	< 1 ft	50 mLs
0.3 – 0.5 m	1-1.5 ft	100 mLs
>0.5 – 0.7 m	>1.5 - 2.25 ft	200 mLs
>0.7 – 1.0 m	>2.25 - 3.25 ft	300 mLs
>1.0 – 1.8 m	>3.25 - 6 ft	500 mLs
>1.8 – 3.0 m	>6 - 9.75 ft	800 mLs
>3.0 – 5.0 m	>9.75 - 16.5 ft	1000 mLs
> 5.0 m	>16.5 ft	1500 mLs

F. Documentation

Complete the Inorganic Test Request Form with the information on the sampling site, depth of integrated sample, and volume of sample filtered. Also see # 14 above.

G. References:

1. Wisconsin Department of Natural Resources, "Self Help Lake Volunteer Training Manual, Chemistry Monitoring Procedures", page 35, January 1995.