

Cooperative Lakes Monitoring Program



Cooperative Lakes Monitoring Program
training for

Chlorophyll *a*

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Water Bureau

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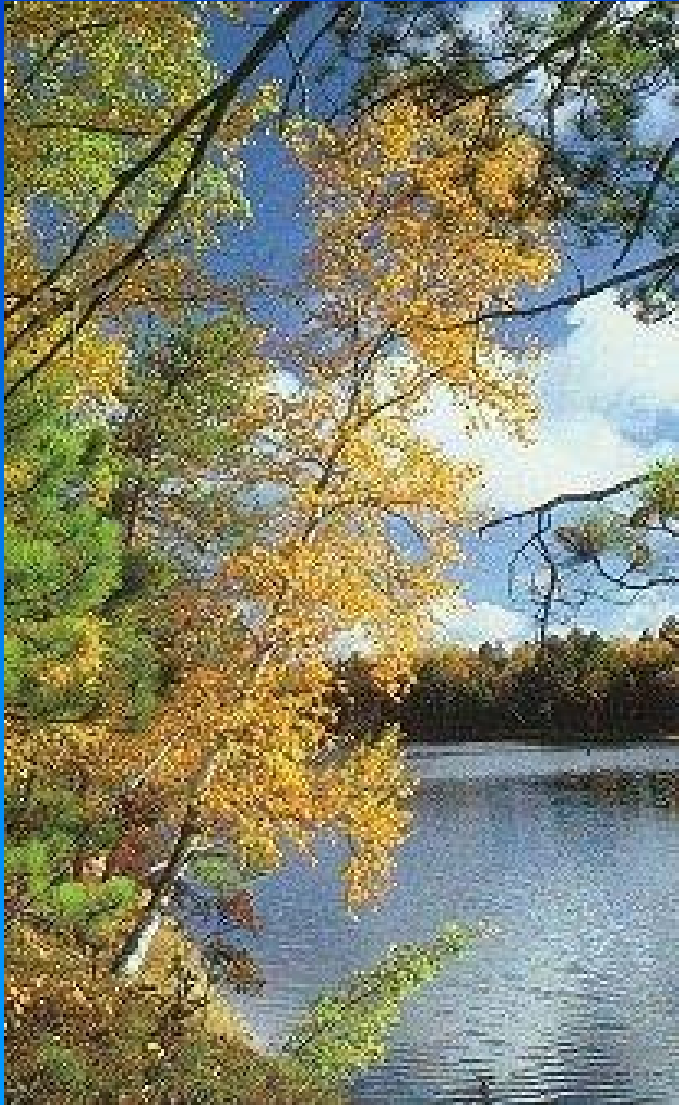
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CLMP Goals

- Provide baseline information and document trends in water quality for individual lakes
- Educate lake residents, users, and interested citizens in collection of water quality data, lake ecology, and lake management practices

CLMP Goals

- Build a constituency of citizens to practice sound lake management at the local level and build public support of lake quality protection
- Provide a cost-effective process for the DEQ to increase baseline data for lakes in Michigan

Trophic State Indicators

- Transparency
- Total Phosphorus
- Chlorophyll *a*
- Dissolved Oxygen and Temperature
- Aquatic Plants

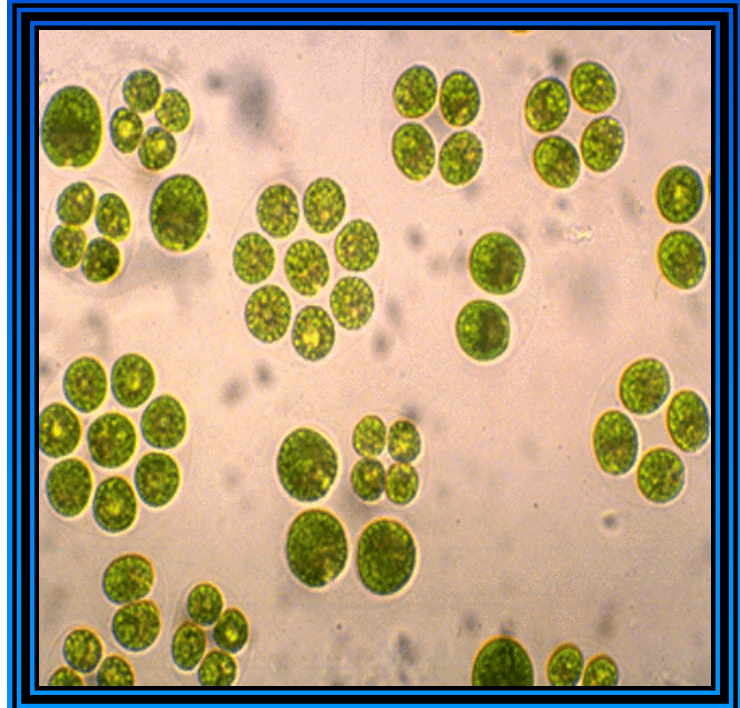


The Self-Help Legacy

- Program began in 1974 with Secchi disk and summer chlorophyll - second oldest program in country.
- Chlorophyll monitoring was part of the original Self-Help program, but it was dropped after a few years because of problems with the former monitoring methods.
- Chlorophyll monitoring was added back to the CLMP in 1998 with the new methods that we are providing today.

Chlorophyll *a*

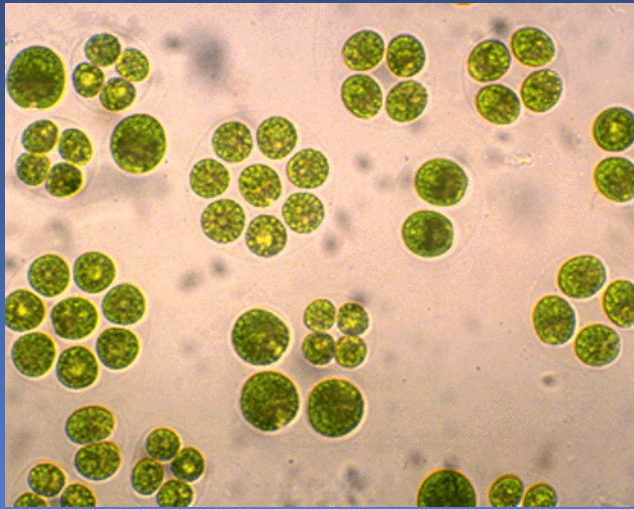
- five sampling events (May- Sept.)
- depth integrated sample
- sample handling
 - preservative (MgCO_3)
 - field filtering
 - freezer storage
- trophic state indicator
- variability and trends



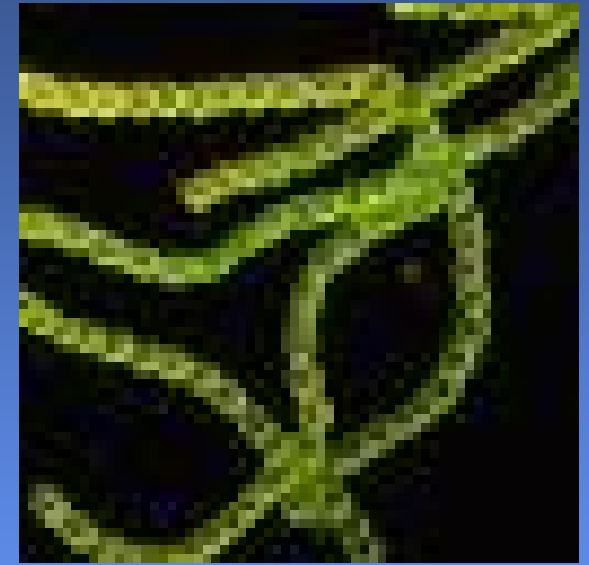
Algae Growth Forms



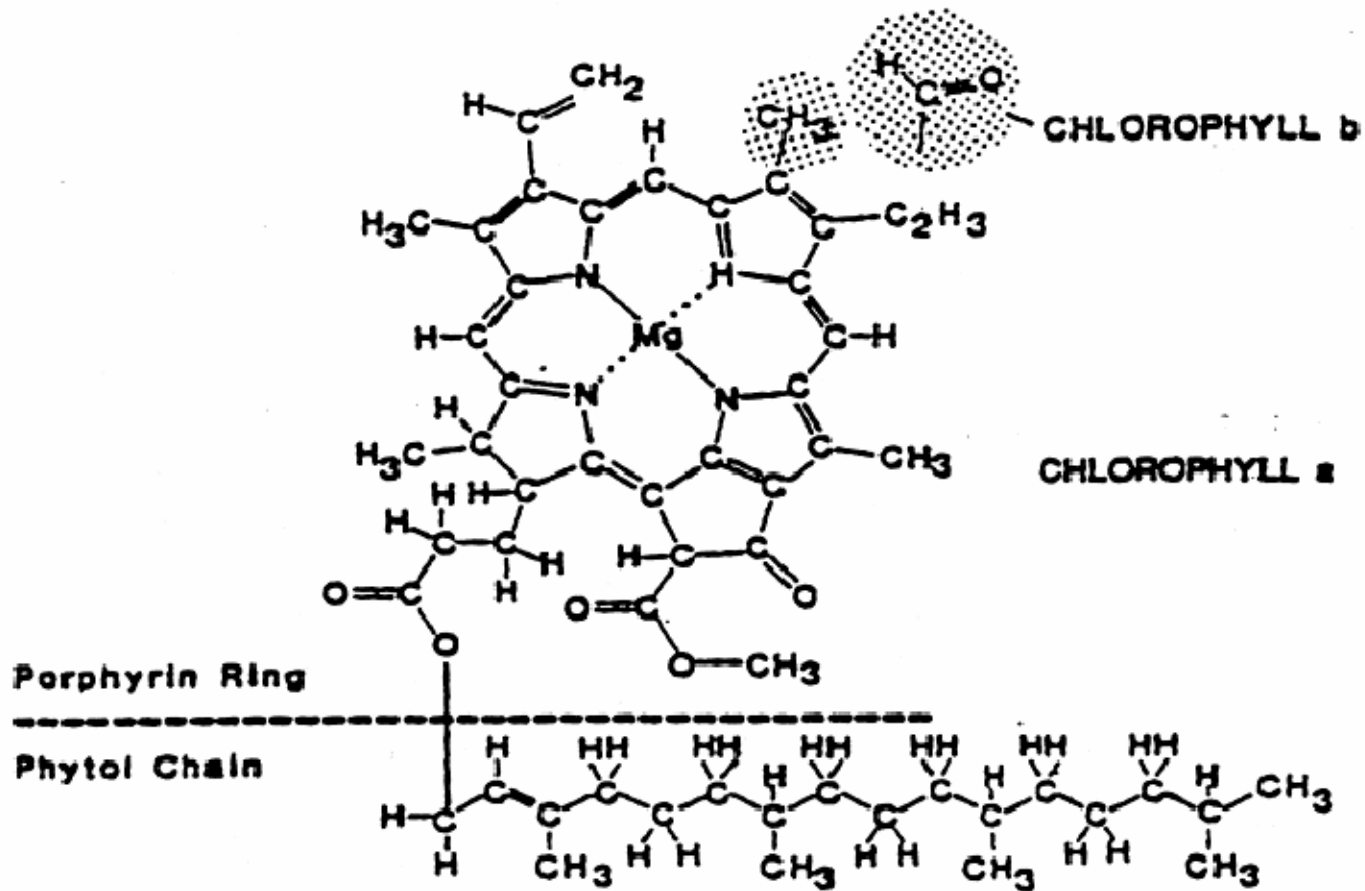
Single cell algae



Colonial algae

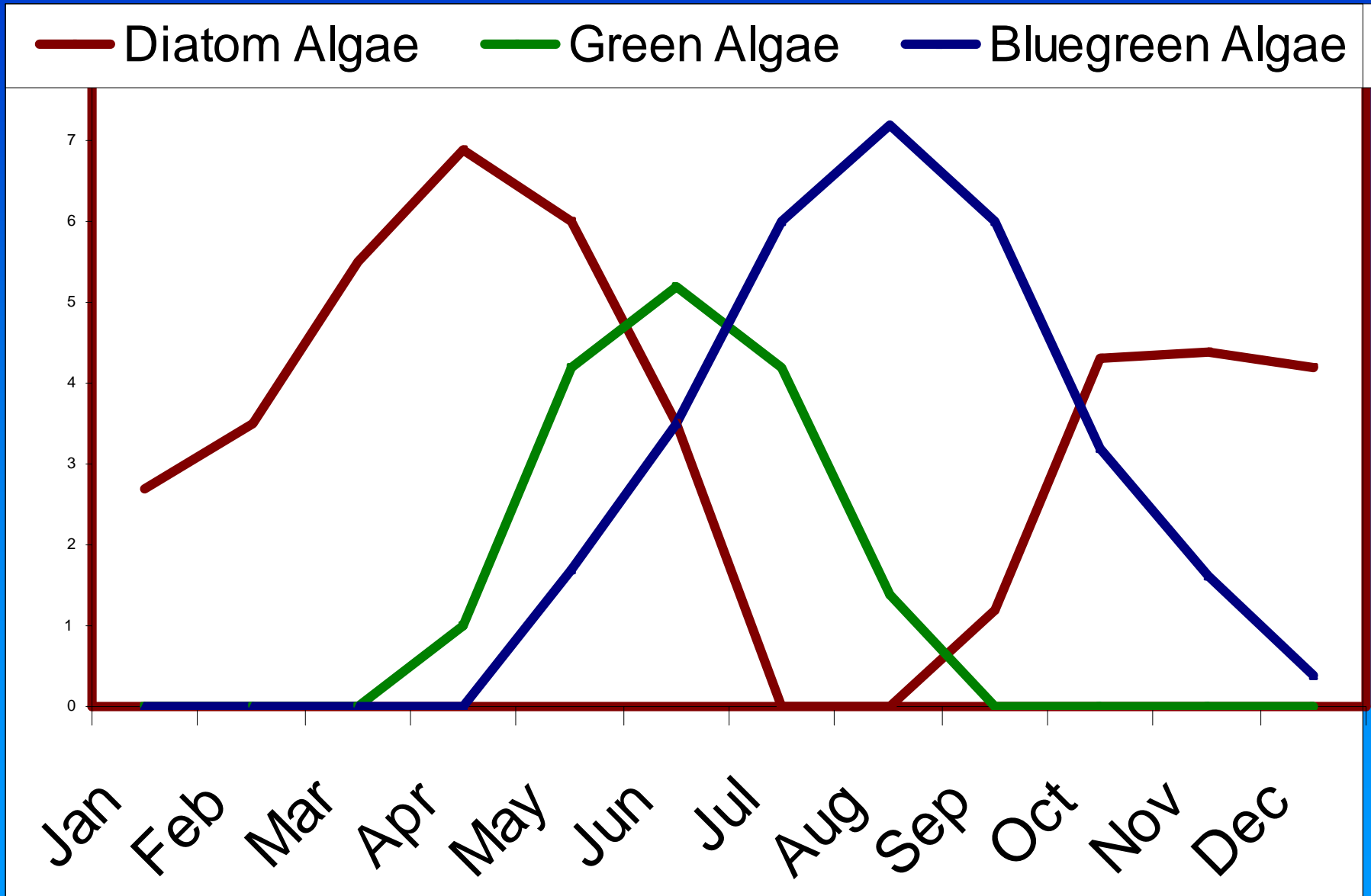


Filamentous algae



—The chlorophyll *a* molecule, consisting of a porphyrin ring, a chelated magnesium molecule in the ring, and a long hydrocarbon (phytol) "tail." Chlorophyll *b* is the same molecule with the shaded groups missing. (From Weber *et al.* 1986.)

Typical Seasonal Succession of Lake Algae



Chlorophyll Sampling Packet

- Welcome letter
- Chlorophyll monitoring procedures
- Chlorophyll data forms 1 and 2
- Sampling dates and sample turn-in dates and locations
- Good Sampling Sheet
- List of Lake Sampling Site Numbers

Complete Chlorophyll Sampling Equipment Kit

- Bag of equipment contains
 - 60 cc (ml) syringe
 - filter holder
 - filters (12-13) with warning label (in plastic box or envelope)
 - tygon tube
 - vials with caps (11)
 - tweezers
 - amber bottles (2)
 - dropper bottle with MgCO_3 (labeled)
 - coffee filters (3)
 - zip-lock bags (2)
 - labels (11)
 - clothes pin
 - business card (Ralph Bednarz)
- Weighted composite sampler

Chlorophyll Sampling Re-supply Kit

- filters (11- 12) with warning label (in envelope)
- vials with caps (11)
- dropper bottle with MgCO_3 (labeled)
- zip-lock bags (2)
- labels (11)

Chlorophyll Sampling Equipment

Provided by volunteer:

- boating safety equipment, anchor
- pencil or indelible ink pen
- measured line for sampler
- freezer ice pack

Connecting ring

Rubber stopper
with 2 glass
tubes

Retaining chain

Juice can

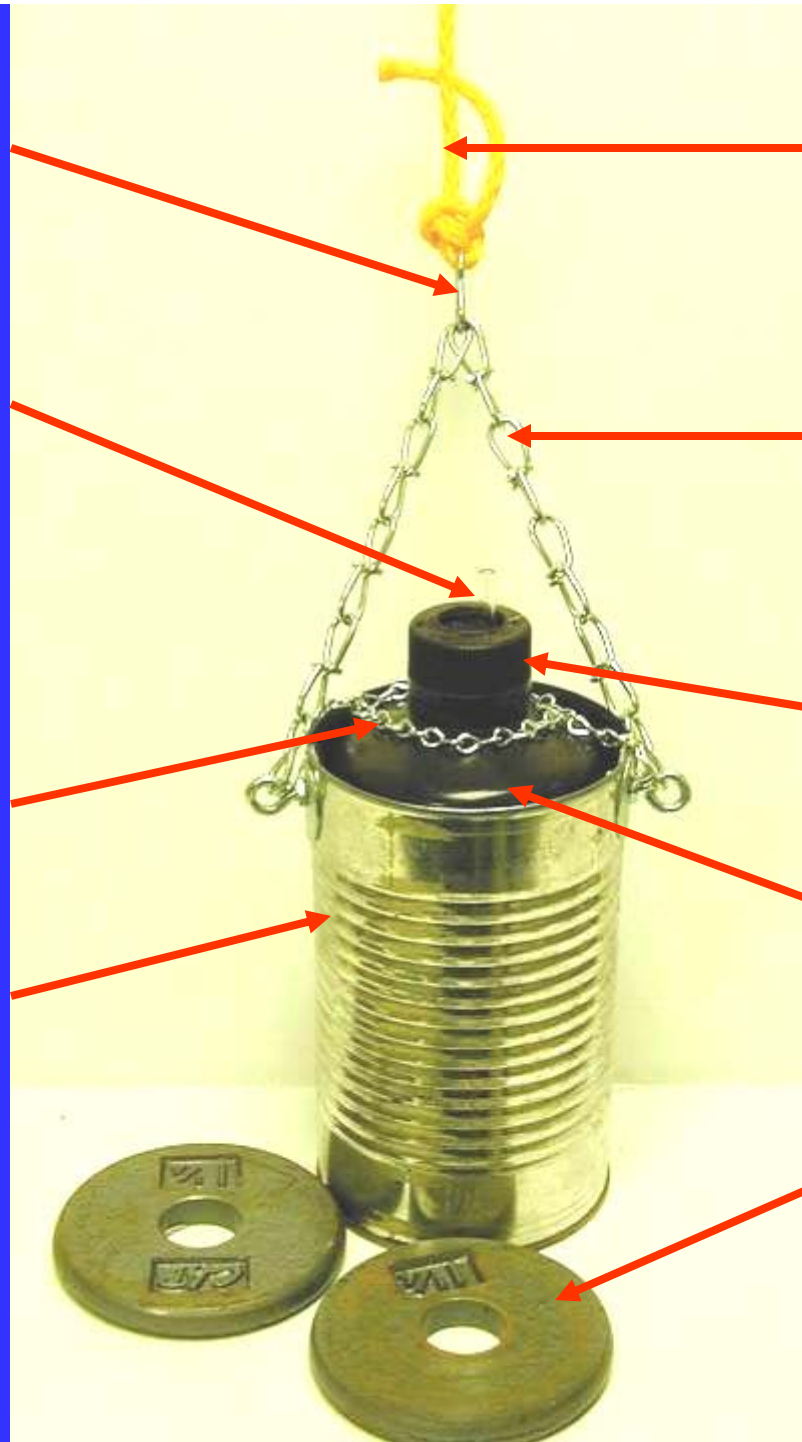
Measured line

Suspension
chain

Bottle cap

One liter
amber bottle

2 dumbbell
weights





Cooperative Lakes
Monitoring Program

CHLOROPHYLL

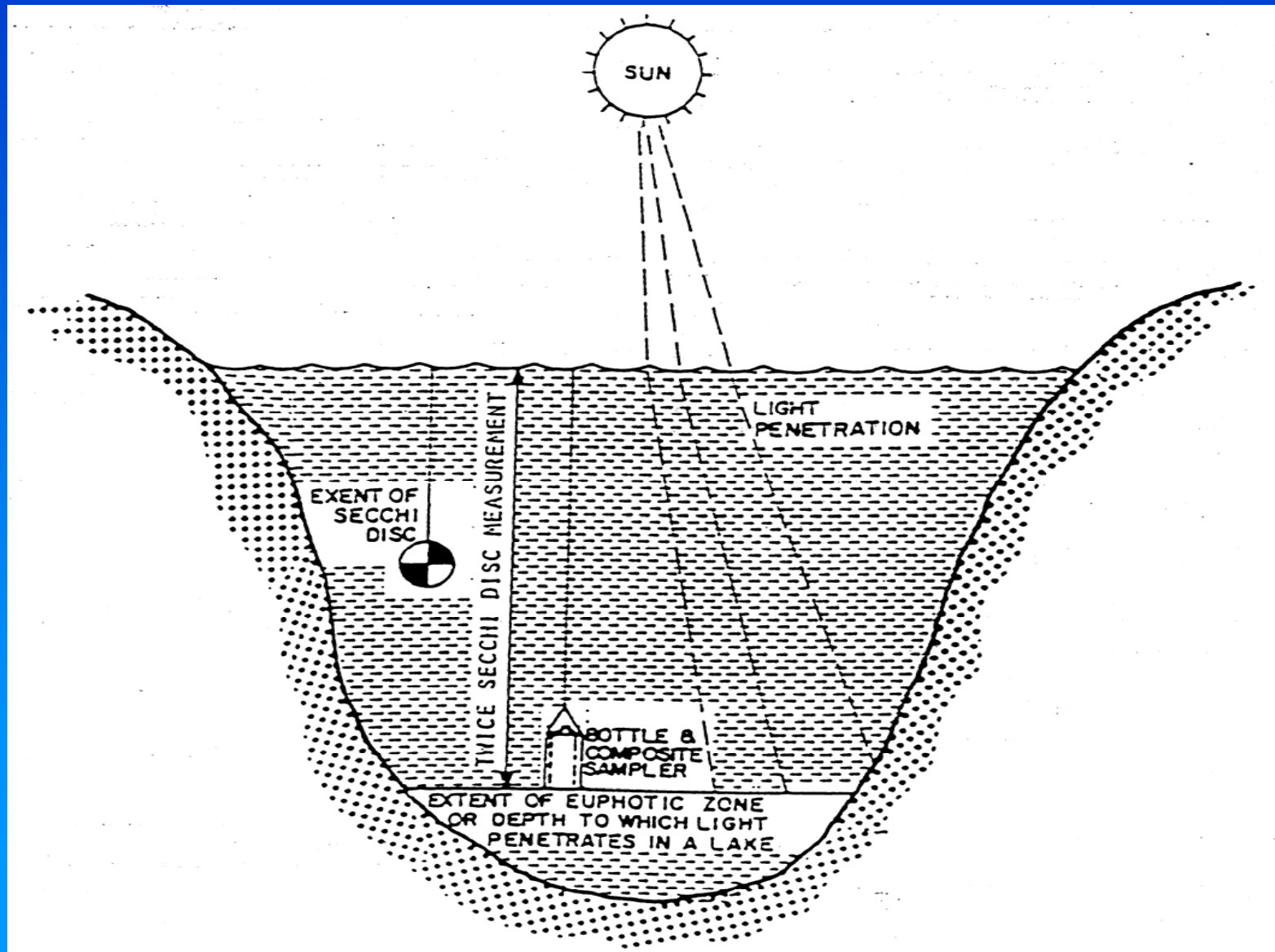
2007 summer sampling dates and
sample turn-in dates and locations



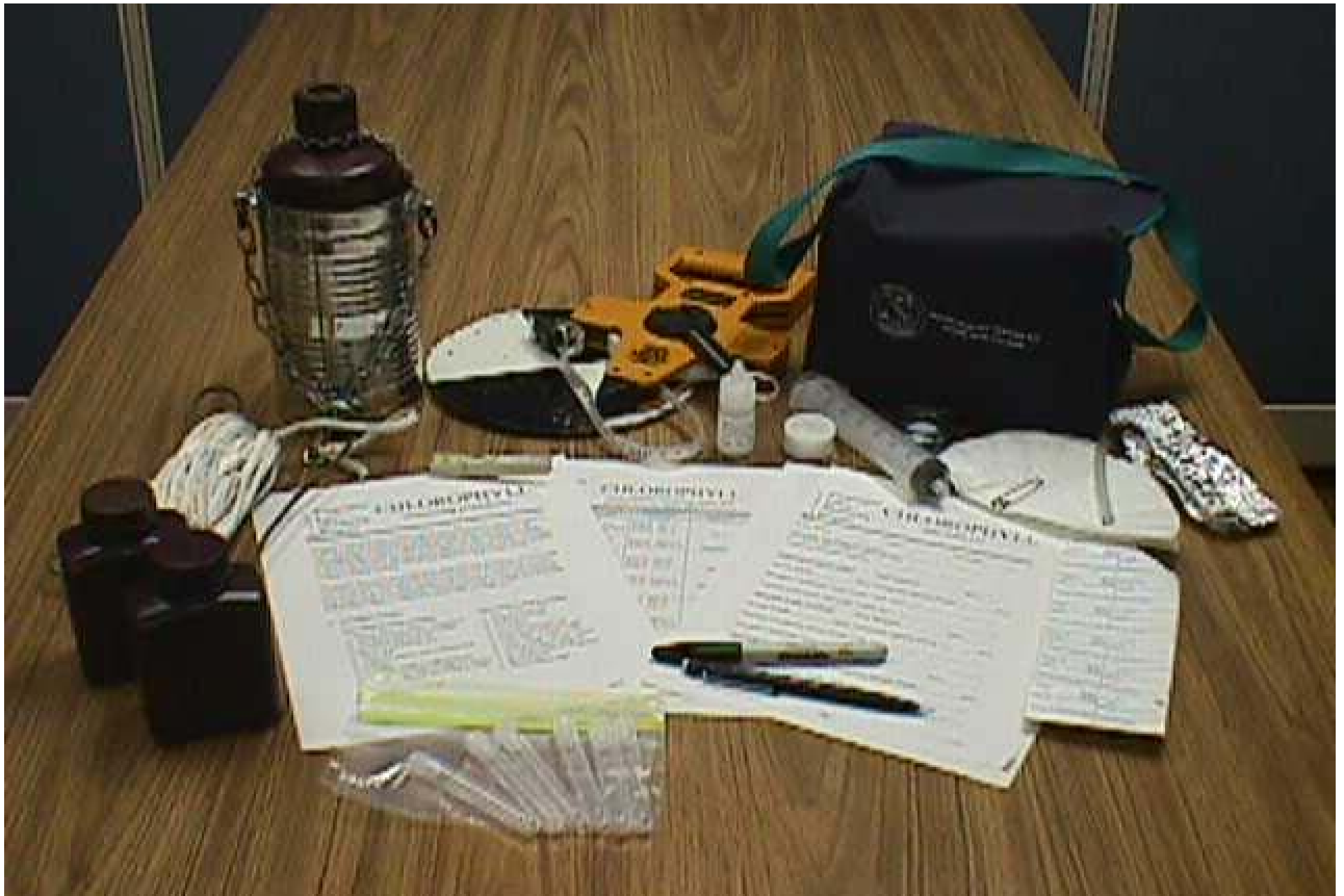
Michigan Clean
Water Corps

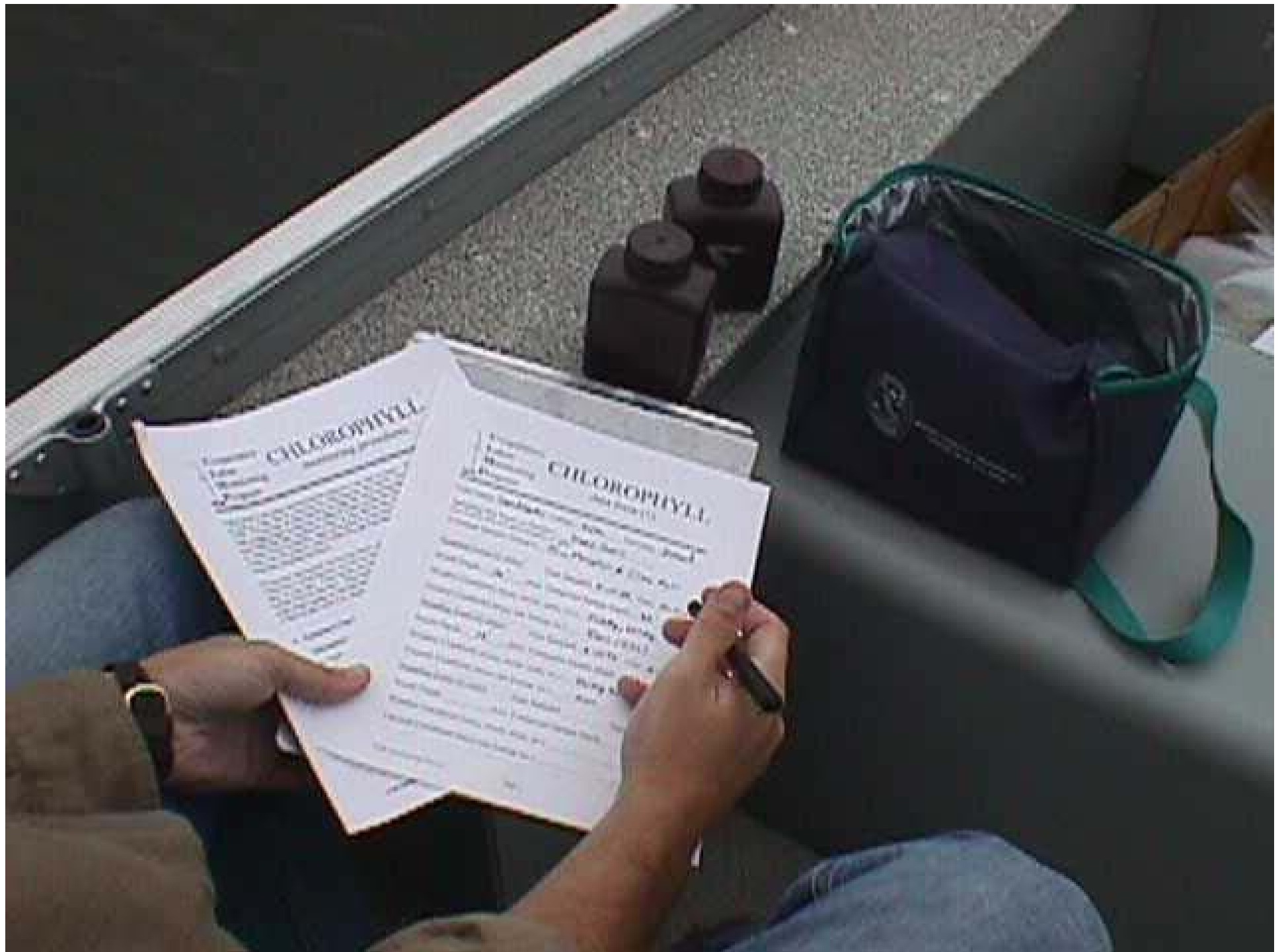
COUNTY	MDEQ OFFICE LOCATION	SAMPLING DATES	TURN-IN DATES
Allegan, Kalamazoo, Barry, Van Buren, Berrien, Cass, St. Joseph	7953 Adobe Road Kalamazoo, MI 49009 269-567-3500	Event #1 May 15 Event #2 June 15 Event #3 July 15	July 17
Calhoun, Jackson, Washtenaw, Branch, Hillsdale, Lenawee	301 E. Louis B. Glick Hwy Jackson, MI 49201 517-780-7690	Event #4 August 15 Event #5 Sept. 20-24	September 25
St. Clair, Macomb, Oakland, Wayne, Monroe	27700 Donald Court Warren, MI 48092-2793 586-753-3700	Event #1 May 15 Event #2 June 15 Event #3 July 15	July 17
Ottawa, Kent, Montcalm, Ionia, Muskegon, Oceana, Newaygo, Mecosta	GR Office Bldg, 6th Floor 350 Ottawa Street NW Grand Rapids, MI 49503 616-356-0500	Event #4 August 15 Event #5 Sept. 13-17	September 18
Eaton, Ingham, Livingston, Clinton, Gratiot, Genesee, Shiawassee	DEQ-Water Division Constitution Hall-2 nd South 525 W. Allegan Lansing, MI 48933 517-335-4211, 241-1300		
Isabella, Midland, Bay, Saginaw, Tuscola, Huron, Sanilac, Arenac, Lapeer	503 N. Euclid Ave. Suite 1 Bay City, MI 48706 989-686-8025		

Depth Integrated Composite Sample Collection



Transparency and Chlorophyll Equipment







CHLOROPHYLL

data form (1)



Lake Name: Dead Spider County: Lake Township: Inland

Lake Sampling Site (Field ID) Number: 380137 (see reverse and mark location on map)

Latitude: 44.67°N Longitude: 85.49°W GPS Map

Volunteer Monitor Name(s): Tami Phosphor + Barry Turbid

Sampling Event #1 (May)

Date Sampled: 5-15-07 Time: 12:10 pm

Secchi Depth: 19' (feet)

Composite Sample Depth: 38' (feet)

Weather Conditions (sunny, cloudy, windy, etc.): Clear, Cold

Unusual Conditions (heavy rain, boating, etc.): —

Filtering Sample (if 50 cc could not be filtered for this sample, indicate amount filtered): — (cc)

Sampling Event #2 (June)

Date Sampled: 6/15/07 Time: 12:15 pm

Secchi Depth: 15' (feet)

Composite Sample Depth: 30' (feet)

Weather Conditions (sunny, cloudy, windy, etc.): Hazy, calm

Unusual Conditions (heavy rain, boating, etc.): —

Filtering Sample (if 50 cc could not be filtered for this sample, indicate amount filtered): — (cc)

Sampling Event #3 (July)

Date Sampled: 7-14-07 Time: 12:20 pm

Secchi Depth: 8' (feet)


Composite Sample Depth: 16' (feet)

Weather Conditions (sunny, cloudy, windy, etc.): Cloudy


Unusual Conditions (heavy rain, boating, etc.): Heavy boating past weekend

Filtering Sample (if 50 cc could not be filtered for this sample, indicate amount filtered): 40 (cc)

NEW Lake Sampling Site (Field ID) Number



CHLOROPHYLL
data form (1)



Lake Name: Dead Spider Lake County: Lake Township: Inland
 Lake Sampling Site (Field ID) Number: 380137 (see reverse and mark location on map)
 Latitude: 44.67°N Longitude: 85.49°W GPS Circle Map
 Volunteer Monitor Name(s): Tami Phospor + Barry Turbid



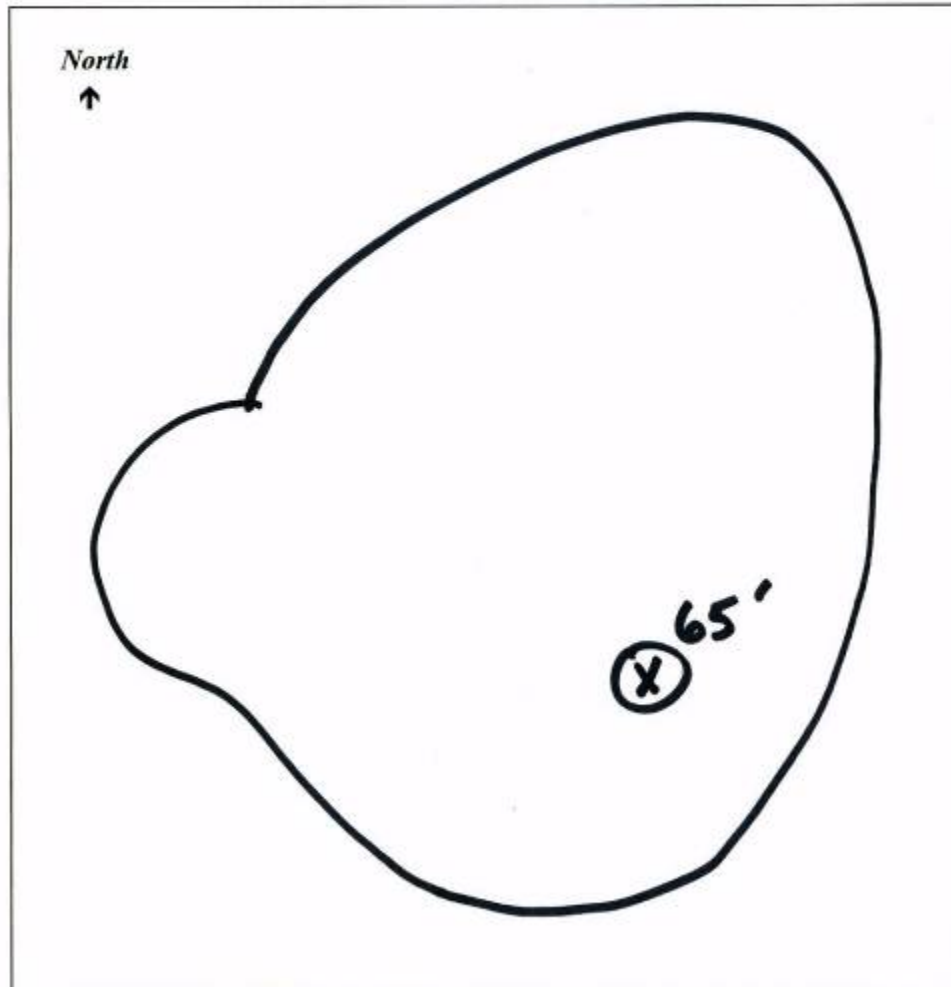
2007 CLMP
Lake Sampling Site (Field ID) Numbers



LAKE NAME	COUNTY	LAKE SAMPLING SITE (FIELD ID) NUMBER
Angela	Oakland	631121
Ann	Benzie	100082
Arbutus	Grand Traverse	280109
Arnold	Clare	180107
Baldwin	Cass	140105
Baldwin	Montcalm	590171
Bankson	Van Buren	800159
Barlow	Barry	080176
Base Line	Livingston	470149

- ❖ In the box below draw an outline of your lake (i.e lake map)
- ❖ On the lake map outline, mark your chlorophyll sampling location (this should be at the deepest basin in the lake) and write in the total LAKE DEPTH at this location.

❖ Surface Area of Lake: 321 (acres)



- ❖ Turn in completed data form with frozen chlorophyll samples. Make a copy of the completed data form for your records.



CHLOROPHYLL

data form (2)



Lake Name: Dead Spider County: Lake Township: Inland

Lake Sampling Site (Field ID) Number: 380137 (see reverse and mark location on map)

Latitude: 44.67° N Longitude: 85.49° W GPS Map ^{Circle}

Volunteer Monitor Name(s): Tami Phosphor + Barry Turbid

Sampling Event #4 (August) Date Sampled: 8.15.07 Time: 12:35 pm

Secchi Depth: 12.5' (feet) Composite Sample Depth: 25' (feet)

Weather Conditions (sunny, cloudy, windy, etc.): Clear, windy

Unusual Conditions (heavy rain, boating, etc.): -

Filtering Sample (if 50 cc could not be filtered for this sample, indicate amount filtered): - (cc)

Sampling Event #5 (September) Date Sampled: 9.9.07 Time: 12:00 noon

Secchi Depth: 9' (feet) Composite Sample Depth: 18' (feet)

Weather Conditions (sunny, cloudy, windy, etc.): Cloudy

Unusual Conditions (heavy rain, boating, etc.): Heavy rain (9/8)

Filtering Sample (if 50 cc could not be filtered for this sample, indicate amount filtered): 40 (cc)

Comments: 9/9 Sample was very green.

MiCorps Data Exchange Network

- Online data entry and data search of volunteer monitoring data collected by MiCorps member programs
- All MiCorps members encouraged to use the online data entry system
 - Advantages include immediate access to search your lake's monitoring data on the MiCorps website
 - <http://www.micorps.net/data/enter/login>
- Data search website open to the public
 - <http://www.micorps.net/data/view/search/>
- Contact MiCorps staff to sign up for a username and password to enter your data!
 - Anne Sturm, asturm@glc.org, 734-971-9135

Secchi Disk Measurement



Secchi depth is midway

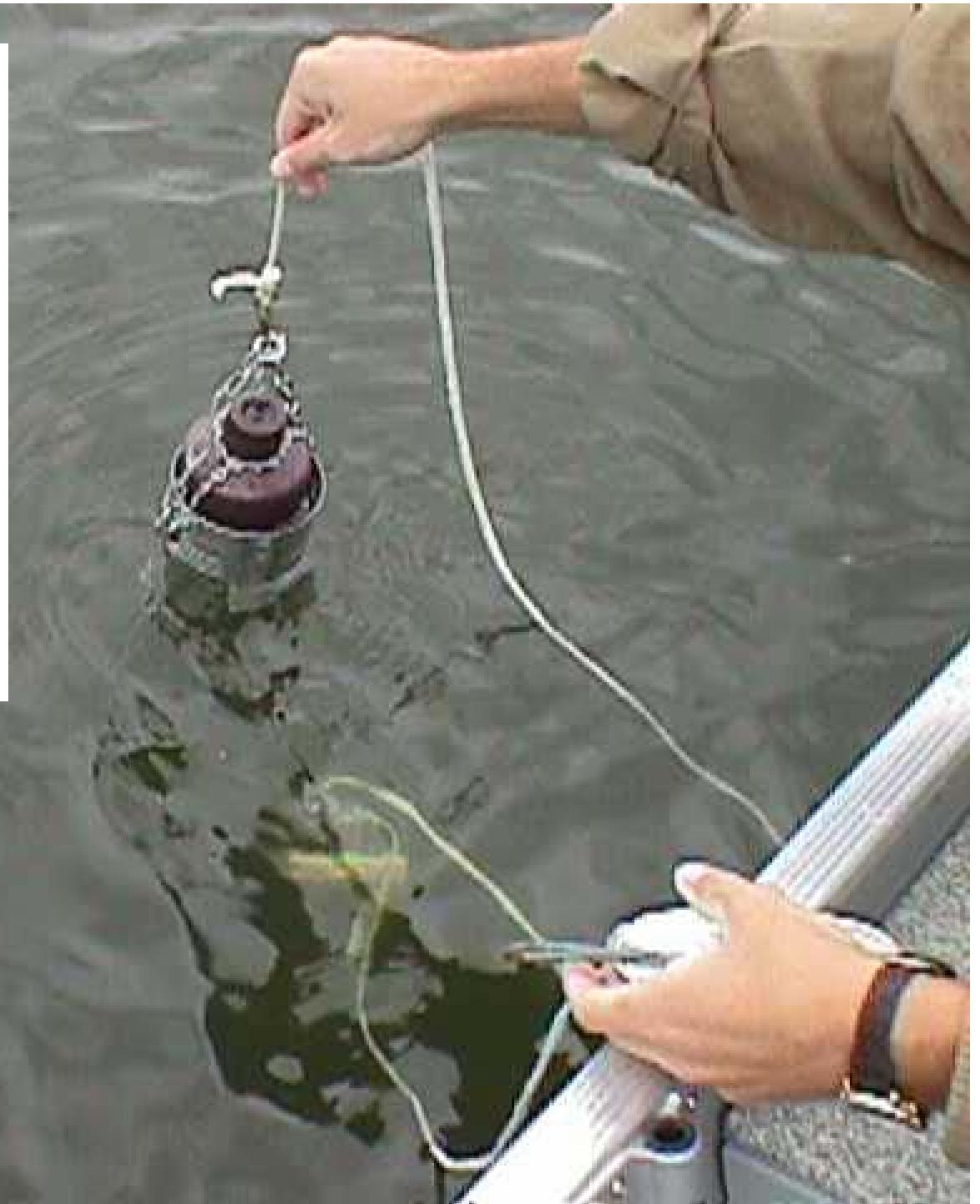
Disk raised slowly to point where it reappears

Disk lowered slowly until it disappears from view

Rinse
with lake
water



Lower to
twice the
Secchi
depth



Slowly
bring to
surface







5 drops of MgCO_3
preservative added



Cold storage until returning to shore



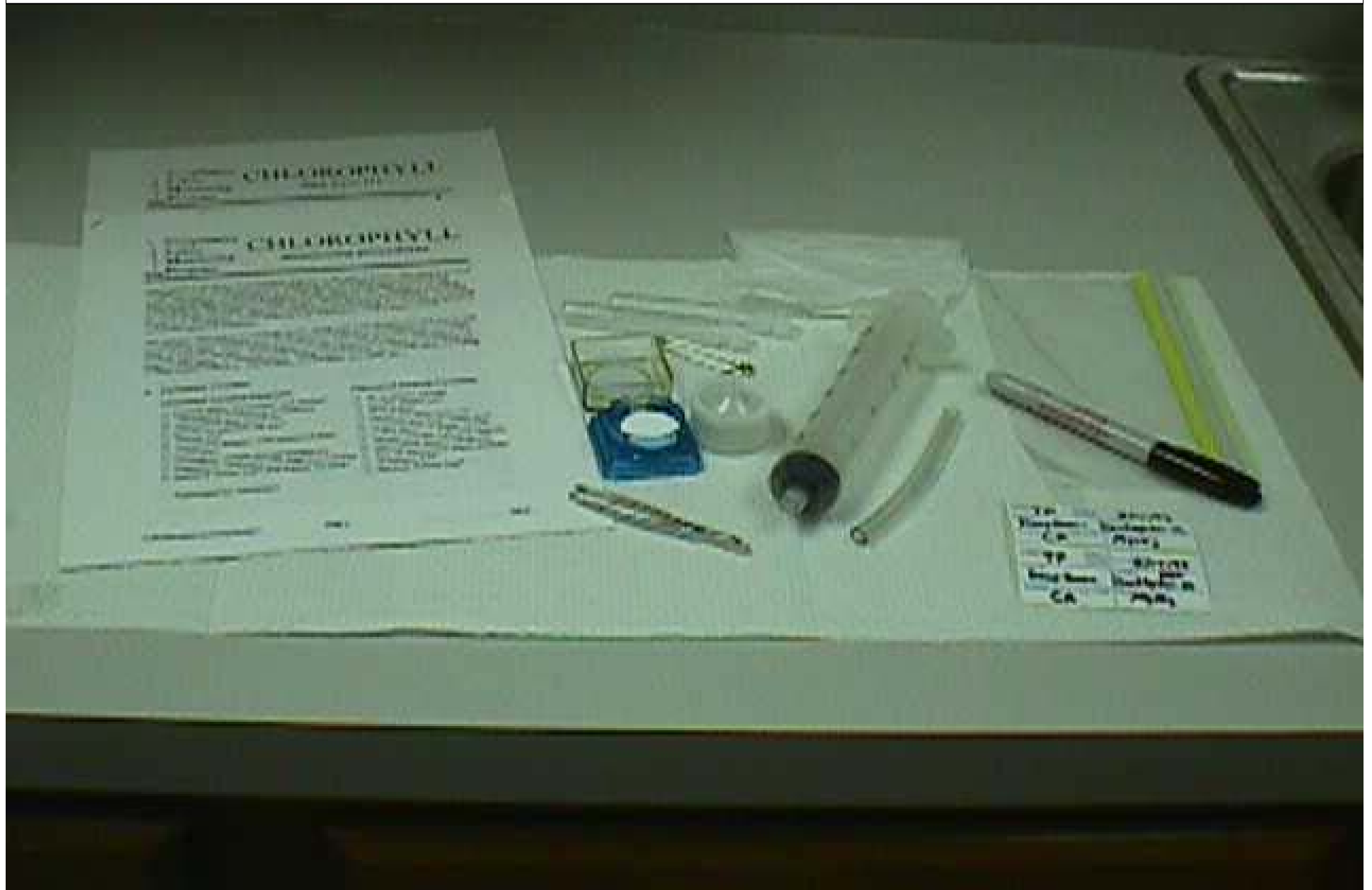
Chlorophyll Filtering Equipment

- 60 cc plastic syringe
- flexible plastic tube
- filter holder
- membrane filter disks
- tweezers
- sample storage vials and caps (2)
- chlorophyll sample labels (2)

Chlorophyll Filtering Equipment Provided by volunteer

- fine-tip permanent black marker
- aluminum foil
- zip-lock freezer bag
- large safety pin
- coffee filter or paper towel

Chlorophyll filtering equipment



Collector's
Initials

TP

Dept. of
Environmental
Quality

Date

6-15-03

Field ID

380137

Location

Dead Spider Lake

Analysis or Parameter Code

CA

Chemicals Added

MgCO₃

Collector's
Initials

TP

Dept. of
Environmental
Quality

Date

6-15-03

Field ID

380137

Location

-REP

Dead Spider Lake

Analysis or Parameter Code

CA

Chemicals Added

MgCO₃

Remove blue separator sheets



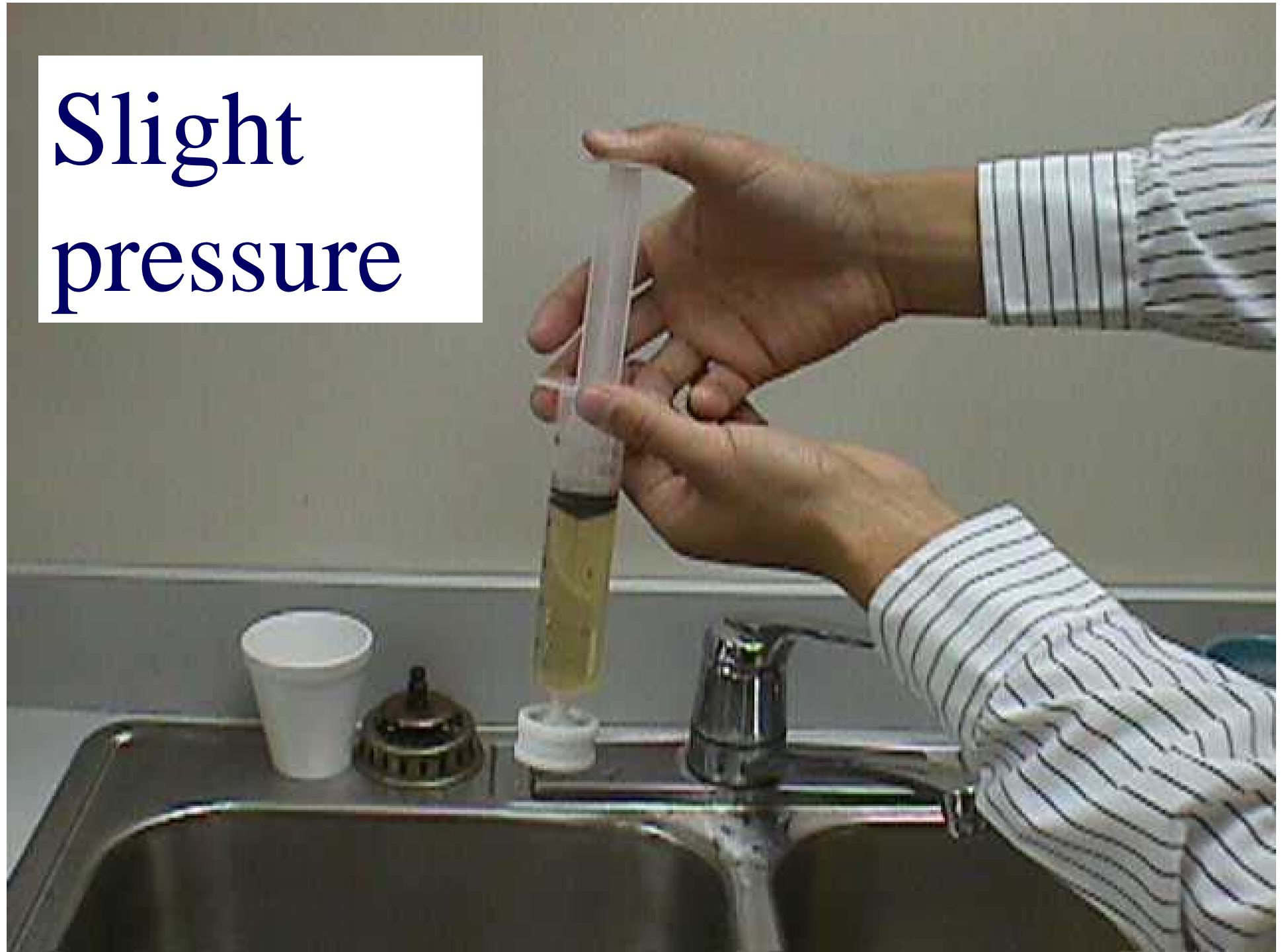
Rinse with sample water
then fill to 60cc line



Plunge to
50 cc (ml)
line



Slight
pressure



Tweezers and safety pin





Carefully
fold filter
paper

A close-up photograph showing a person's hands performing a laboratory procedure. The person is using a metal tool to carefully place a folded white filter disk into a small glass vial. The vial has a white label with handwritten text that reads "Duis-Davis" and "Duis-Spiller-LK". The background is a white surface with various laboratory items, including a blue container, a black ring, and a piece of paper with handwritten notes. A safety pin is also visible on the right side of the frame.

Put folded
filter disk
into vial

Tin foil to keep out light



Freezer storage until turn-in date

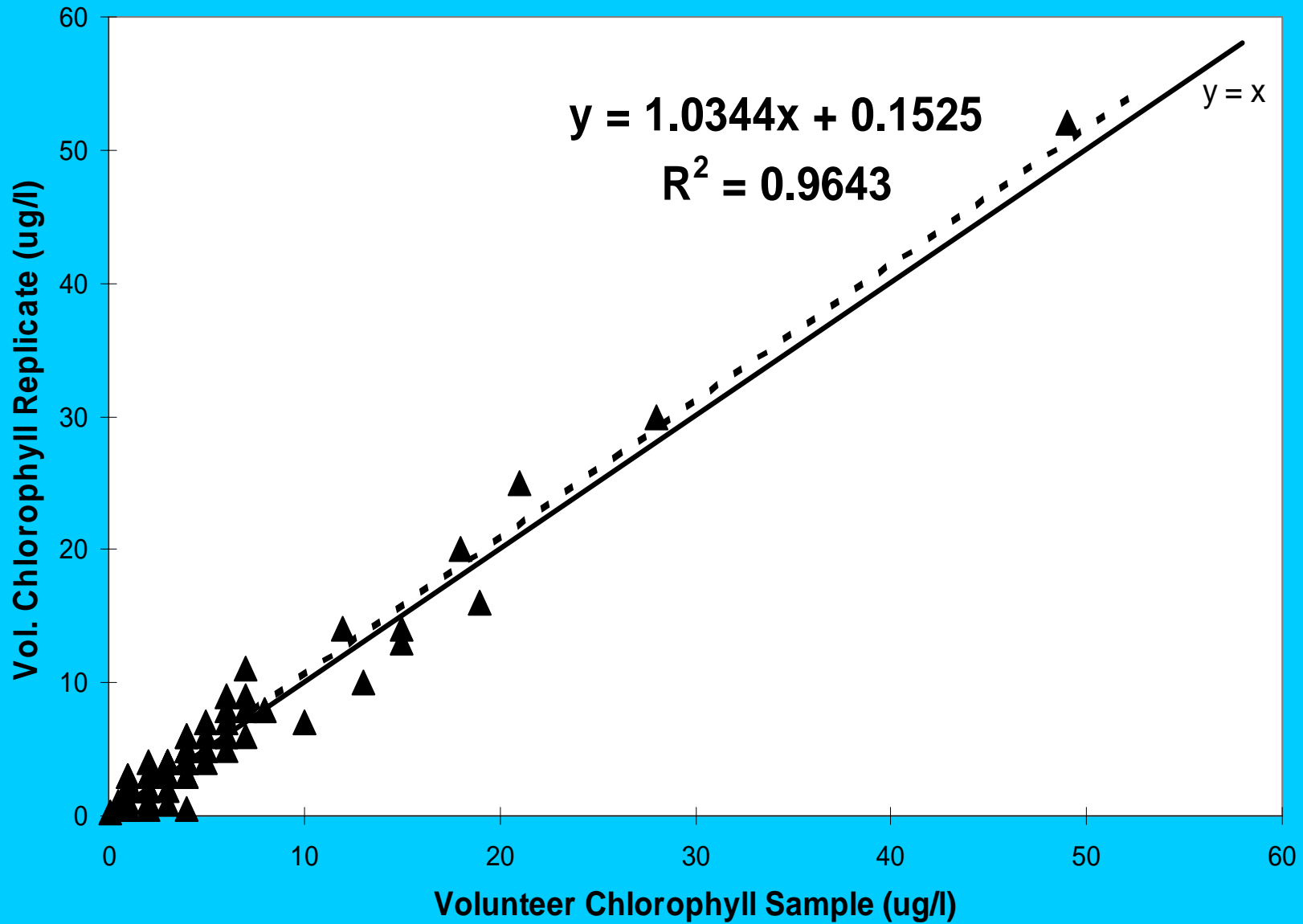




Lake	County	Sampling Event					Mean	Median	Standard Deviation	Carlson TSI _{CHL}
		May	June	July	Aug	Sept				
ADA DAM	KENT	6 a	22 a	28	29 ac	31	23.2	28	10.2	63
ANN	BENZIE	2	2	3	2	3	2.4	2	0.5	37
ARBUTUS	GRAND TR	1 <	1 <	2	2	2	1.4	2	0.8	37
ARNOLD	CLARE	1	*	2	2	2	1.8	2	0.5	37
B. PINE ISLAND	KENT	*	*	*	*	8				
BALDWIN	MONTCALM	2	6	4	5	8	5.0	5	2.2	46
BARLOW	BARRY	1	2	2	2	3	2.0	2	0.7	37
BASS	KENT	1	1	1	*	*				
BASS	LIVINGSTON	1	2	2	3	1	1.8	2	0.8	37
Vol/Rep				2						
MDEQ				2						
MDEQ/Rep.				2						
BIG	OSCEOLA	*	2	5	8	5	5.0	5	2.4	46
BIG CROOKED	KENT	2 a	1 <a	4 a	5 c	2 c	2.7	2	1.8	37
BIRCH	CASS	2	1 <	2	2	1	1.5	2	0.7	37

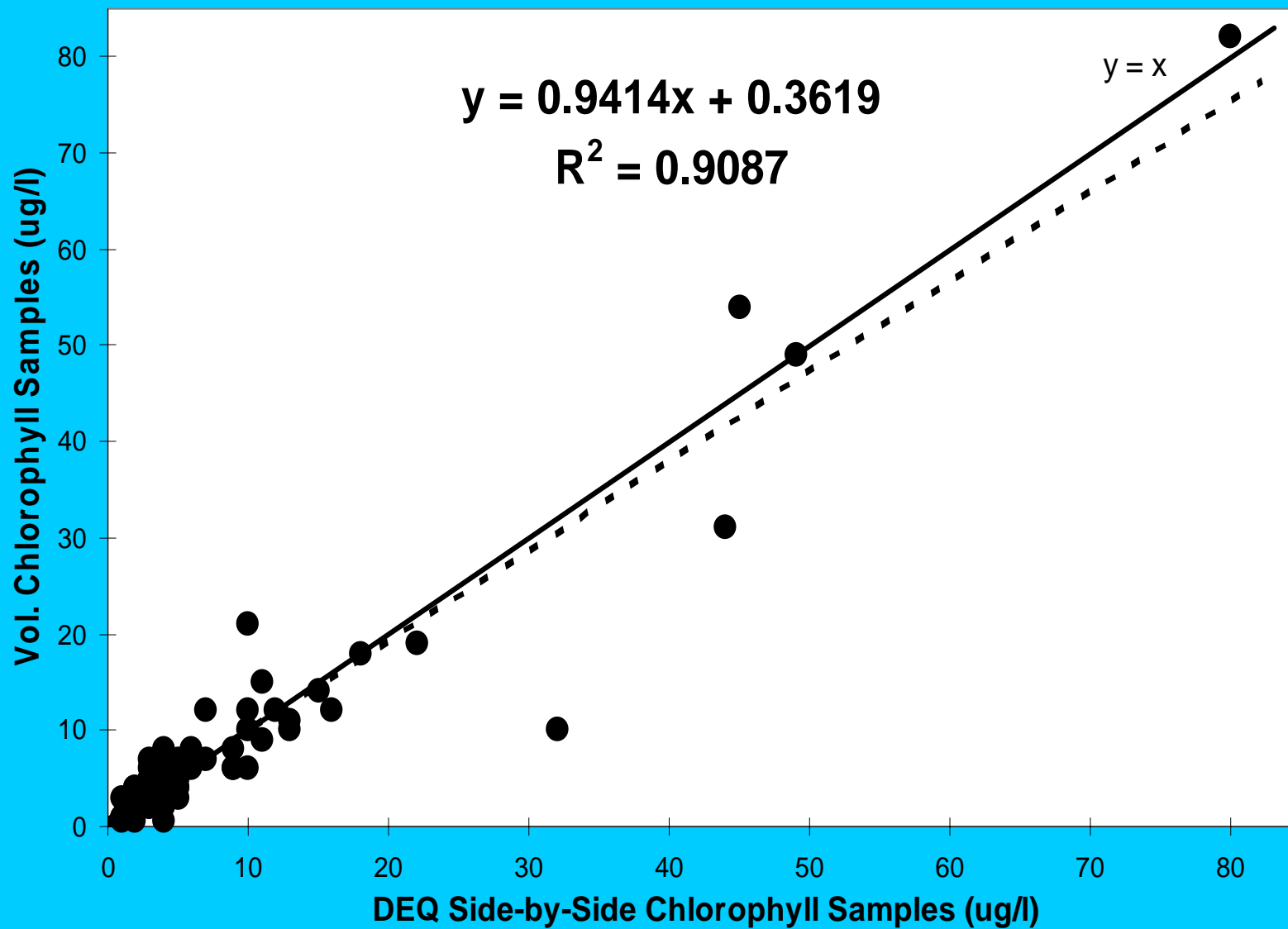
Chlorophyll a 1998 - 2002

(Volunteer S1 vs. Volunteer S2 Samples)



Chlorophyll a 1998 - 2002

(Volunteer vs. DEQ Side-by-Side Samples ug/l)



Lake Trophic Status

Carlson's TSI Equations

$$\text{TSI}_{\text{SD}} = 60 - 33.2 \log_{10} \text{SD}$$

$$\text{TSI}_{\text{TP}} = 4.2 + 33.2 \log_{10} \text{TP}$$

$$\text{TSI}_{\text{CHL}} = 30.6 + 22.6 \log_{10} \text{CHL}$$

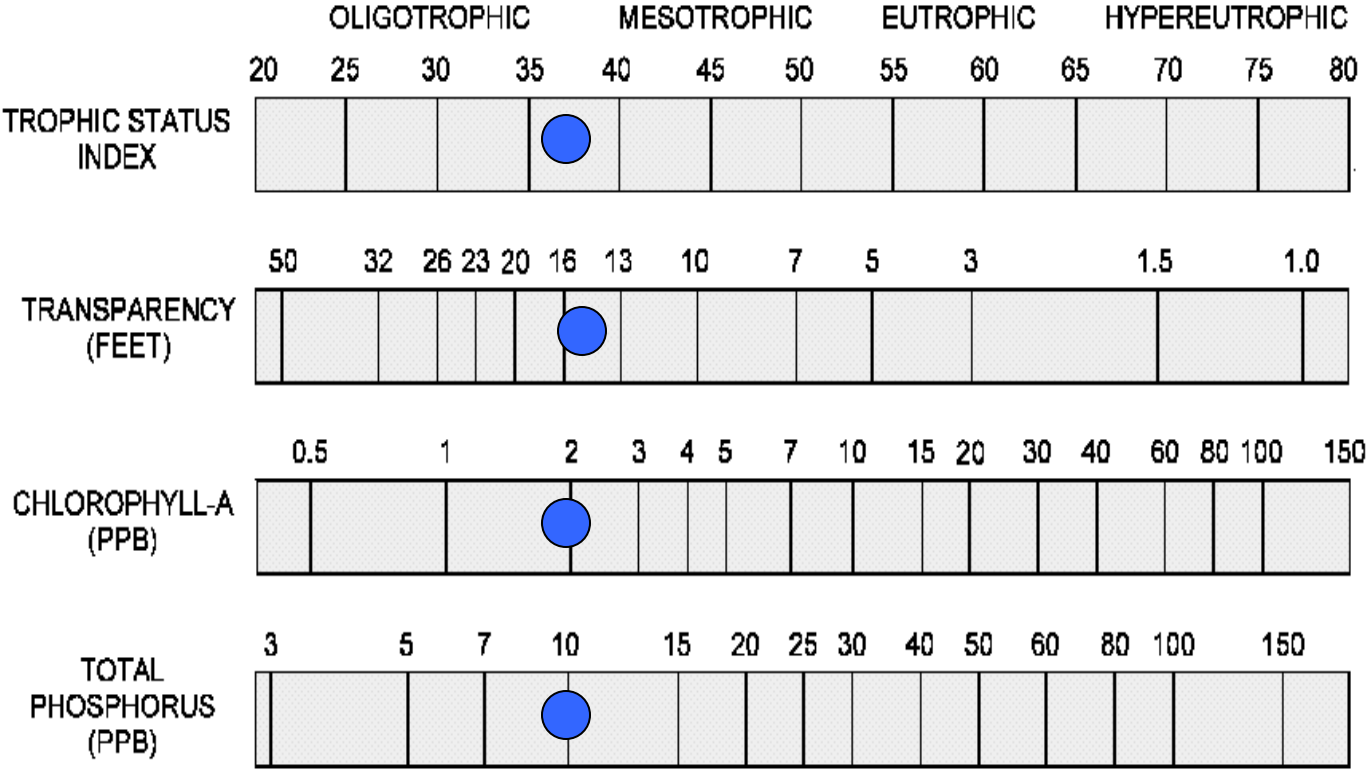
where,

SD = Secchi depth transparency (m)

TP = total phosphorus concentration (ug/l)

CHL = chlorophyll *a* concentration (ug/l)

CARLSON'S TROPHIC STATE INDEX

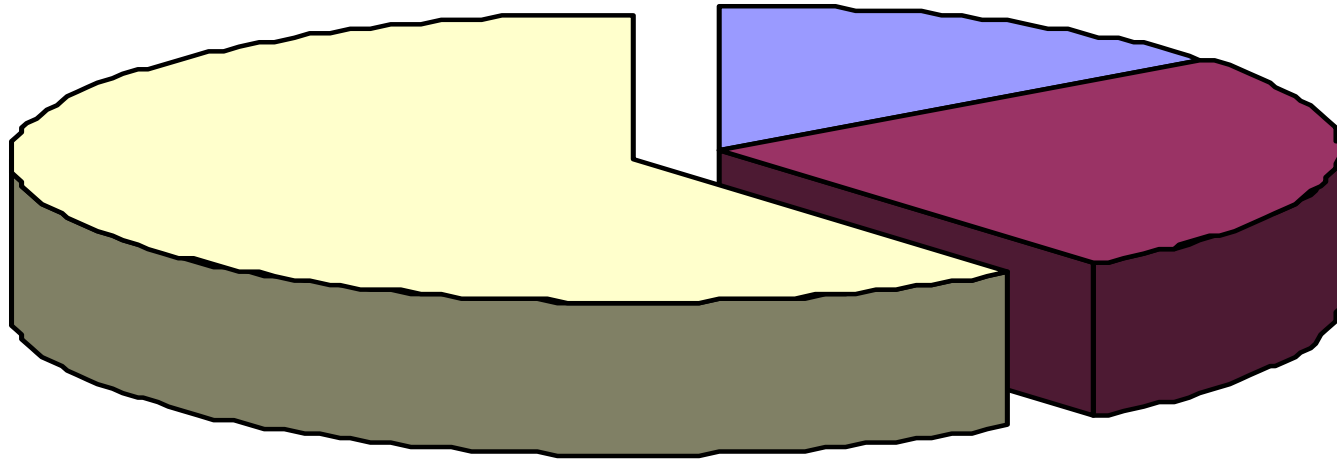


Blue Lake (Mecosta Co.)

Summary of Results

Lake Trophic State Classification

63 Lakes



■ eutrophic

■ oligotrophic

■ mesotrophic

“working together to protect lakes”



Questions?

Evaluation Form

- Please take a few minutes to fill out the evaluation form for this session.
- You can leave them in the box when you are done.