LAKE WATER QUALITY ASSESSMENT REPORT

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER RESOURCES

LAKE ABSEGAMI

BASS RIVER TOWNSHIP, BURLINGTON COUNTY

Patrick Goan
Senior Environmental
Specialist

Robert Runyon
Chief, Bureau of Monitoring
Management

PREFACE

The 1986 revisions to the Clean Water Act requires states to provide the United States Environmental Protection Agency (USEPA) with water quality information on public lakes. This information is a prerequisite for eligibility in the USEPA Clean Lakes Program.

The New Jersey Department of Environmental Protection obtained a grant to assess the water quality of the State's lakes during 1989. The objectives of the FY 89 Project were to acquire limited limnological data for 21 lakes. The data was analyzed to determine the trophic status for each lake.

Lakes were selected based on several criteria which included; the amount of public access the lake provided, it's recreational usage (e.g. swimming, fishing, ...) and it's value as a local resource. The following lakes were surveyed during 1989:

COUNTY	LAKE
Burlington	Lake Absegami
	Crystal Lake
	Evans Pond
	Indian Mills Lake
	Jefferson Lake
	Smithville Lake
Camden	Cooper River Lake
Cape May	East Creek Pond
	Lake Nummy
Gloucester	Greenwich Lake
	Iona Lake
	Narriticon Lake
Mercer	Mercer County Park Lake
	Rosedale Lake
Middlesex	Brainerd Lake
	Farrington Lake
Monmouth	Mac's Pond
Morris	Lake Ames
	Mount Hope Pond
Ocean	Lake Carasaljo
Passaic	Shepherds Lake

CONTENTS

SCOPE OF SURVEY

The quality of a lake's water is determined by many factors. These factors may be found within the lake itself or they may come from the watershed surrounding it. The collection of data through sampling and measurements can help to determine what may be influencing the lake's water quality. Although the scope covered by this report is somewhat limited, the following data may be found:

1. Limited Historical Data
2. Geology
3. Morphology and Hydrology
4. Physical & Chemical Data Results
5. Biological Data

All lakes in the program were monitored three times during the year; once each during the spring, summer and fall. Samples were taken at the major inlets and at sites deemed representative of the entire lake. Samples were taken above the outlet when a boat was unavailable. The samples were analyzed for the following parameters:

In-situ analysis:

1. Temperature
2. Dissolved Oxygen
3. pH
4. Depth and Secchi readings
5. Visual check of Macrophytes

Laboratory Analysis (NJ Department of Health):

1. Bacterial Analysis
2. Alkalinity
3. Nutrients

Biological Analysis (Bio-Monitoring Unit of the NJDEP):

1. Chlorophyll a
2. Algal Scan (Microscopic)
3. Macrophyte Survey

EXPLANATION OF PARAMETERS SAMPLED

PHYSICAL AND CHEMICAL PARAMETERS

1. TEMPERATURE AND DISSOLVED OXYGEN (D.O.):
The temperature of a shallow lake generally follows climatic changes. As the temperature of the water increases the dissolved oxygen level of the water decreases. A deeper lake will usually stratify thermally, during the summer. A warmer, less dense layer of water (epilimnion) will float on a cooler, denser layer of water (hypolimnion). These two layers are separated by a zone of rapidly changing temperature and density called the metalimnion. The metalimnion, can form a barrier, which can keep the hypolimnion from being reoxygenated from the atmosphere. In a productive (eutrophic) lake this can cause anoxic conditions in the hypolimnion as oxygen is used up by animals and decomposers (bacteria).

2. ALKALINITY AND pH:
Alkalinity is a measurement that indicates the degree to which an aquatic system can buffer pH changes that can occur during photosynthesis and/or by the introduction of pollutants. The toxicity of certain pollutants can be reduced by this buffering action. A minimum of 20 mg/L CaCO3 has been recommended, except where natural conditions are lower (Quality Critera for Water, 1986, EPA 440/5-86-001). The Pine Barrens are an example of an area where natural conditions favor low alkalinity.
PH is a measurement of hydrogen ion activity or the acid-base equilibruim in natural waters. The pH can be raised by the photosynthetic processes of algae and/or macrophytes.

3. NUTRIENT ANALYSIS:
Phosphorus and nitrogen are the major nutrients required by algae for growth. In New Jersey's lakes, phosphorus is the nutrient most often responsible for limiting algal growth. Dissolved orthophosphorus is believed to approximate the solid reactive phosphorus used by all photosynthetic organisms (aquatic plants/ algae). However, all forms of total phosphorus can become reactive through biological decomposition and can be used as nutrients to enhance weed growth and/or algae blooms.

Nutrients can enter a lake or it's watershed via point (i.e. sewerage treatment plant) or nonpoint sources (i.e. fertilizer runoff from lawns). Nutrients may also be recycled from the sediments in the lake.

4. SECCHI DISC TRANSPARENCY:
A greater depth of light transmission generally indicates good water quality (low algal growth). However, heavy macrophyte growth can also keep the water clear. The macrophytes may outcompete the algae for nutrients and therefore, restrict most algal growth. Erosion from the watershed or upwelling of the lake's sediments, from adverse weather conditions, could also decrease the water's transparency. To determine the transparency of a lake's water a secchi disk is used. The secchi disk is an 8 inch black and white disk. Measurements are taken by lowering the disk until it is no longer visible.

EXPLANATION OF PARAMETERS SAMPLED

BIOLOGICAL DATA

1. BACTERIAL ANALYSIS:

Bacterial samples for Total coliform, Fecal coliform (FC) and Fecal streptococcus (FS) were taken at the inlets and in-lake. While sources are difficult to determine with 3 sampling runs, the ratio of FC/FS can imply whether the source is from human or animal waste.

FC/FS	Possible Bacterial source (Millipore Corp. 1972)
>4	-Human wastes
2-4	-Mainly human wastes and other sources
1-2	-Inconclusive
0.7-1	-Mainly animal wastes and other sources
<.7	-Animal wastes

A lake's water is considered unsafe for swimming when Fecal coliform levels exceed 200 mpn/100ml.

2. CHLOROPHYLL *a*/ALGAE

Chlorophyll *a* is a pigment that is present in all types of algae. The chlorophyll *a* content of the water can indicate the amount of planktonic algae present in the lake. Algae are an important part of a lake ecosystem because they are a vital part of the food chain. However, an excessive amount of algae can negatively impact a lake. Excessive algae growth can inhibit the growth of other plants, cause aesthetic problems and curtail recreational uses. Through the processes of photosynthesis, increased algal growth can raise the dissolved oxygen level in a lake during the daytime (sunlight) and decrease the dissolved oxygen level during the night (dark). Depressed dissolved oxygen levels, if extreme, could cause fishkills.

EXPLANATION OF PARAMETERS SAMPLED

3.ALGAL SURVEY:
As the growing season proceeds, a succession of algal communities typically occurs in a lake. During the spring and fall, diatoms are usually dominant. In the early summer, chlorophytes (green algae) become dominant. As available nutrients change during the summer, filamentous green or blue-green algae may become dominant. These may float to the surface forming mats that can cause aesthetic and recreational problems.

High chlorophyll a levels with little algal species diversity are indicative of nutrient rich water.

4.MACROPHYTE SURVEY:
Macrophytes are also a vital part of a lake. They provide cover for fish and food for wildlife. However, excessive macrophyte growth can limit the recreational uses of a lake including swimming, fishing and boating. A visual survey was done to identify and determine areal coverage of macrophytes.

LAKE TROPHIC STATES

Lake eutrophication (aging) is a natural process resulting from the gradual accumulation of nutrients, increased productivity, and filling in from sediments, silt and organic matter.

Lakes usually follow a progression through a series of trophic states, which are the following:

1. Oligotrophic
   - nutrient poor and low biological productivity.
2. Mesotrophic
   - intermediate levels of nutrients and biological productivity.
3. Eutrophic
   - nutrient rich and highly productive.

Accelerated or cultural eutrophication occurs to a lake when nutrients, silt and organic matter inputs are increased by activity in the watershed. Several examples of increased inputs include; a sewage treatment plant discharging into a lake, runoff of fertilizers from farms or lawns, and erosion from new construction sites. Because of New Jersey's large population, all lakes in the State are considered to be threatened by accelerated eutrophication.

INTRODUCTION

Lake Absegami, which is part of the Bass River State Park, is a 92 acre body of water with a maximum depth of 4 feet. The lake has a beach with a guarded swimming area, a boat launching area and many areas along the shoreline from which to fish. There are also several log cabins and 178 campsites situated near the lake.

LAKE NUM. AND NAME: #792 LAKE ABSEGAMI

STUDY PERIOD: SPRING, SUMMER, FALL 1989

LOCATION: BASS RIVER TWP., BURLINGTON CO.

U.S.G.S. QUAD: #34 OSWEGO

LAKE AREA: 92 ACRES

LAKE MAXIMUM DEPTH: 4 ft.

GEOLOGIC DESIGNATION: TCH COHANSEY, QCM CAPE MAY SURFACE

TRIBUTARIES: INLET #1 TOMMY'S BRANCH
INLET #2 TRIBUTARY OFF EAST BRANCH BASS RIVER
WHEN INLET #'S 1 & 2 ARE DRY WATER PUMPED FROM BASS RIVER VIA INLET #2

POINT SOURCES: NONE

LAKE USE AND HISTORICAL NOTES: SWIMMING, CAMPING, BOATING AND FISHING. SAMPLED BY NJDEP IN 1975, 1976, 1977, 1978 AND 1981.

COMMENTS: BLADDERWORT AND GRASSES GROWING IN 100% OF LAKE AND CHOKING AREAS NEAR INLETS. POTENTIAL RUNOFF FROM WOODLANDS AND PARK (INCLUDING CAMPGROUND AND CABINS).

RESULTS

PHYSICAL/CHEMICAL PARAMETERS

Temperature and Dissolved Oxygen

Due to the shallowness of the lake, the temperature and dissolved oxygen were uniform throughout the water column for each sampling. Dissolved oxygen levels ranged from 6.8 mg/l to 10.5 mg/l for monitoring period.

Secchi Disk

Secchi disk readings ranged from 4.0 feet to 4.5 feet.

Alkalinity and pH

The alkalinity was low (<1 mg/l) and therefore, the lake had a poor buffering capacity. The pH in the lake was around 4.20 to 4.30 for each sampling.

Nutrients

Total phosphorus levels in the water column ranged from less than 0.02 mg/l to 0.03 mg/l.

RESULTS

BIOLOGICAL DATA

Chlorophyll a/Algae

Algal growth in the lake was minimal. Chlorophyll a levels never exceeded 3.23 mg/m^3. No algal cells were observed by the Bio-monitoring unit, in the spring sample.

Macrophytes

Areal coverage of the lake by macrophytes was nearly 100%. The two dominant species present were bladderwort (Utricularia spp.) and tapegrass (Vallisneria spp.). Although they were present throughout the lake, the heaviest concentrations were found in the two fingers of the lake, where the inlets enter. These were also the shallowest parts of the lake.

Bacteria

Fecal coliform counts were less than 20 mpn/100ml for each sampling, indicating safe swimming conditions on these days.

CONCLUSION

Because of the proliferation of aquatic macrophytes throughout the lake, Absegami is considered to be in an eutrophic state. The heavy growth of macrophytes is having a negative impact on some of the recreational uses afforded by the lake. Fishing and boating are mainly restricted to the center-most (deepest) part of the lake. The swimming area appeared to be unaffected. However, in time the weeds may also spread to the swimming area and become a nuisance to swimmers.

The heavy aquatic macrophyte growth may also be impacting the ecology of the lake. As the plants die they sink and accumulate on the lake bottom and therefore, increase and enrich the lake's sediments. This leads to a decrease in the lake's depth and a likely increase of aquatic macrophyte growth. Where the two inlets enter, the lake has taken on the appearance of wetlands because of shallow depth and heavy plant growth.

REFERENCES

Aquatic Vegetation of New Jersey. 1965. Rutgers Extension Service Bulletin # 382.

Lake and Reservoir Restoration Guidance Manual. 1988. North American Lake Management Society. First Edition.

NJDEP. 1987. Water Resources Field Procedures Manual.

Trudeau, Philip N. 1982. Nuisance Aquatic Plants and Aquatic Plant Management Programs in The United States.

USEPA 1980. Clean Lakes Program Guidance Manual. EPA 440/5-81-003.

Wetzel, Robert G. 1983. Limnology. Saunders College Publishing, New York.

APPENDIX

STATION	DATE	TEMP C	DO	pH	ACIDITY	TOT P	ORTHO P	F COLI	F STREP	TOT COLI	FC/FS	SECCHI (feet)
INLET #1	04/18/89	11.5	5.6	4.10	128	<.02	.01	<20	4	50	NA	
	07/12/89	18.0	2.6	4.22	42	<.02	<.01	50	33	50	1.52	
	10/03/89	16.6	4.5	3.94	24	.02	<.01	50	49	130	NA	
INLET #2	04/18/89	11.6	6.3	4.24	58	<.02	.01	<20	2	20	NA	
	07/12/89	23.0	1.6	4.14	58	<.02	<.01	80	110	80	.73	
	10/03/89	16.5	5.0	4.02	14	<20	<.01	17	<20		NA	
UPPER LAKE	04/18/89	14.5	9.9	4.35	68	<.02	.01					2.5
	07/12/89	30.2	6.8	4.20	28	.03	<.01					2.5
LOWER LAKE	04/18/89	14.1	10.5	4.27	112	.03	.01	<20	<2	<20	NA	4.0
	07/12/89	30.8	7.9	4.21	20	<.02	<.01					4.5
	10/03/89	19.9	9.4	4.26		.02	<.01	<20	<2	<20	NA	4.5

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
GEOLOGICAL SURVEY
LABORATORY OPERATIONS SECTION

89/04/18
Sample No. None
DWR/Lakes Management
Absegami Lake

<u>Plankton Identification</u>

Nothing in sample.

Analyst/Unit ____________________

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
GEOLOGICAL SURVEY
LABORATORY OPERATIONS SECTION

89/07/12
Sample No. 76825
Lakes Management
Absegami Lake, NJ

Plankton Identification

CHLOROPHYCEAE (green)
Chlamydomonas sp.
Pyramimonas sp.

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Macrophyte Identification

Potamogeton confervoides

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Chlorophyll Analysis

Chlorophyll "a" (mg/m^3) = 2.36*

* There may have been something in the sample that interfered with the reading. On the basis of plankton content, one would have expected a much lower chlorophyll value.

Analyst(s)/Unit ____________________

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
GEOLOGICAL SURVEY
LABORATORY OPERATIONS SECTION

89/10/02
Sample No. 53436
Lakes Management
Absegami Lake (lower lake), NJ

Plankton Identification

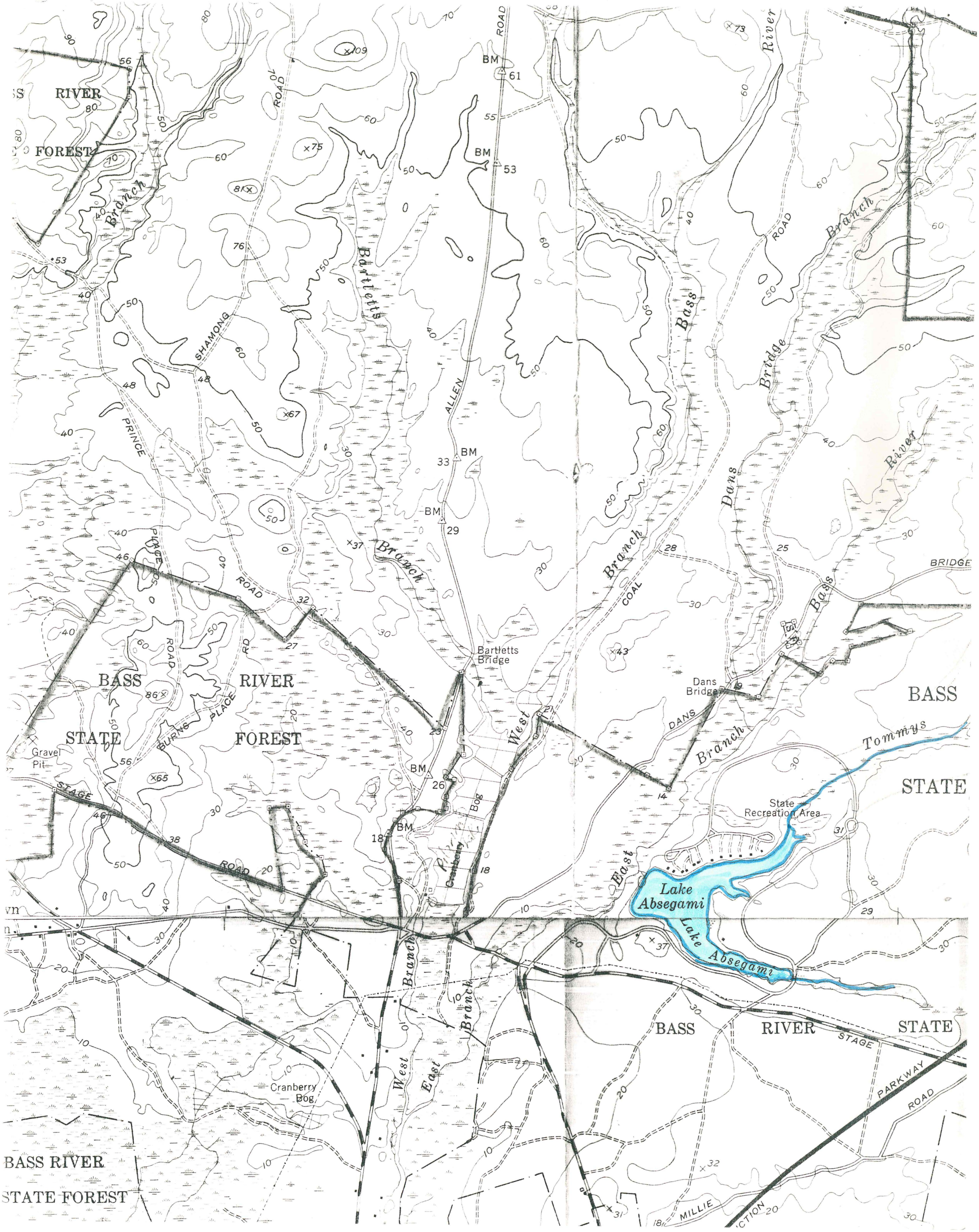
CHLOROPHYCEAE (green)
Chlamydomonas sp.
Nannochloris sp.

CRYPTOPHYCEAE (colorless or brownish)
Cryptomonas erosa
==

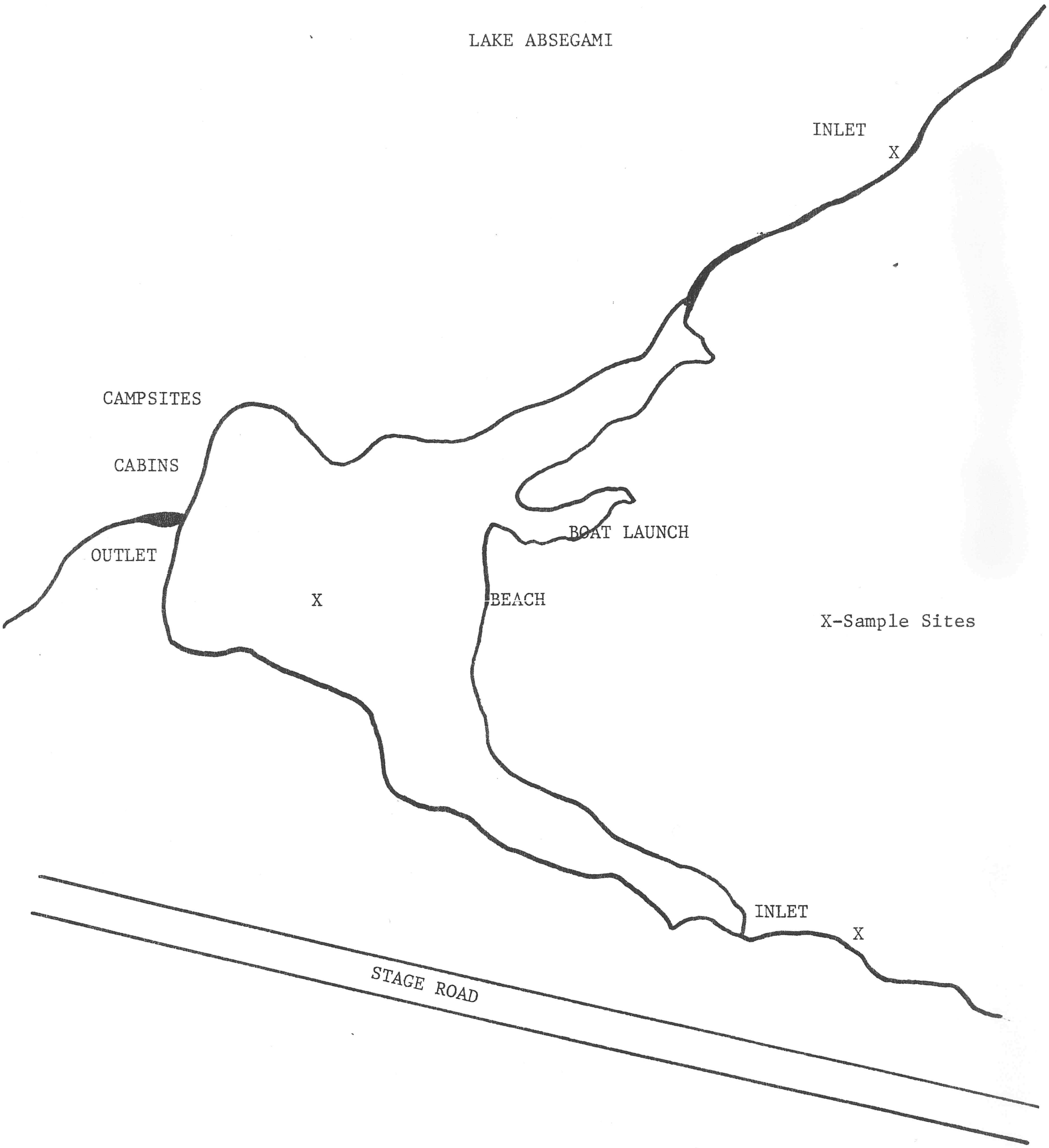
Chlorophyll Analysis

Chlorophyll "a" (mg/m^3) = 3.23

Analyst/Unit ____________________



BASS RIVER FOREST
Branch
Bartletts Branch
ALLEN ROAD
SHAMONG ROAD
PRINCE PLACE ROAD
BURNS PLACE RD
BASS RIVER STATE FOREST
Gravel Pit
STAGE ROAD
Bartletts Bridge
Cranberry Bog
West Branch
East Branch
Bass River
Dans Bridge Branch
Dans Bridge
DANS BRIDGE
BRIDGE
COAL ROAD
Bass
Tommys
BASS STATE
State Recreation Area
Lake Absegami
BASS RIVER STATE
STAGE
PARKWAY
ROAD
Cranberry Bog
BASS RIVER
STATE FOREST
MILLIE


LAKE ABSEGAMI
INLET
X
CAMPSITES
CABINS
OUTLET
X
BOAT LAUNCH
BEACH
X-Sample Sites
INLET
X
STAGE ROAD