VOLUME I

A BASE LINE SURVEY AND MODIFIED EUTROPHICATION INDEX FOR FORTY-ONE PONDS IN PLYMOUTH, MASSACHUSETTS

BARTLETT

BLOODY

BOOT

CLEAR

EZEKIEL

FORGE

FRESH

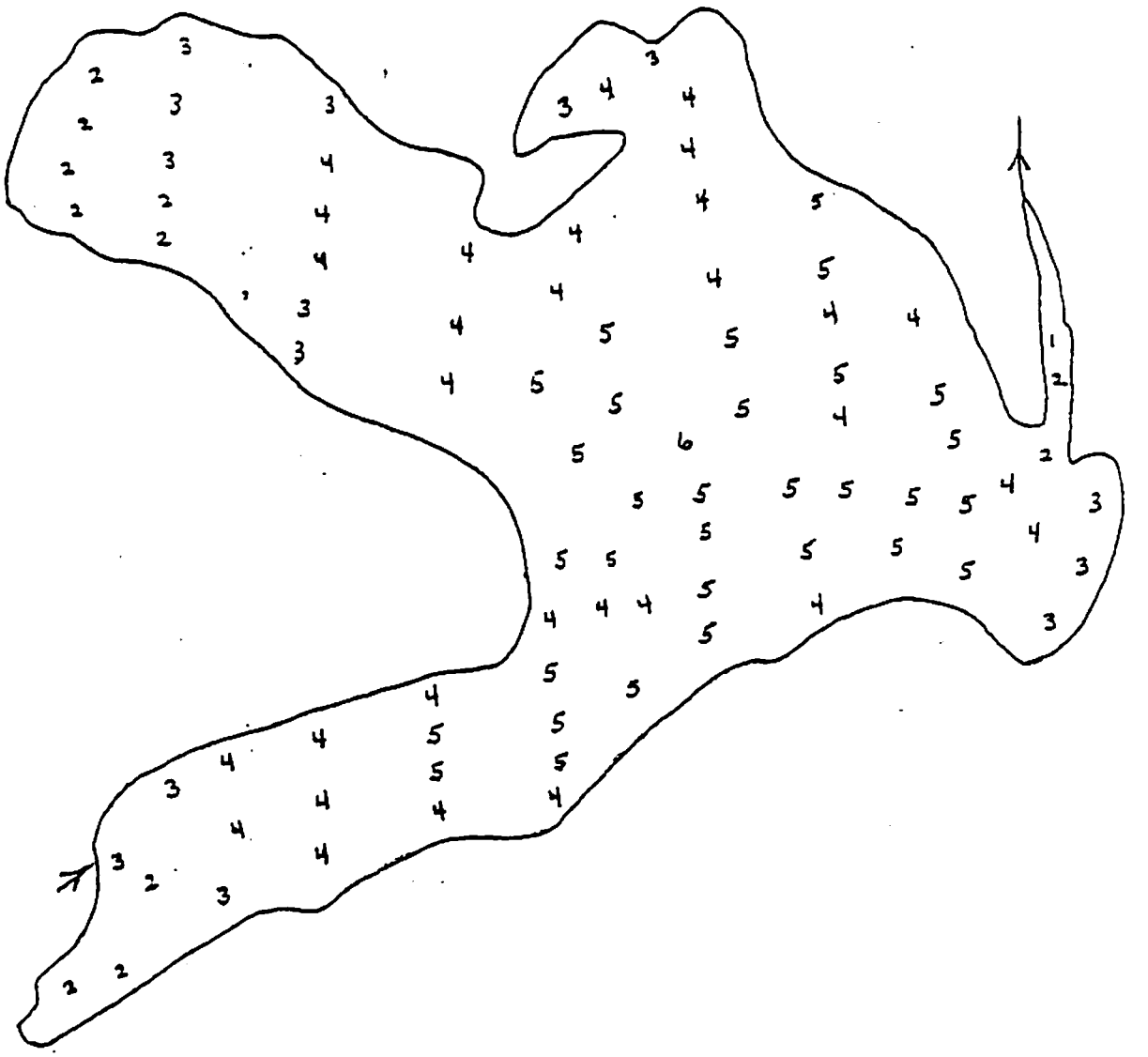
FRESH MEADOW

By

Lycns - Skwarek Associates
147 Whitewood Road
Westwood, Massachusetts 02090

BARTLETT POND

(Bathymetric Map)



Maximum depth 6' 1.83 M
Mean depth 4' 1.22 M
Surface area 32 acres 12.96 H
Acre feet 128
Total gals. 41,708,928

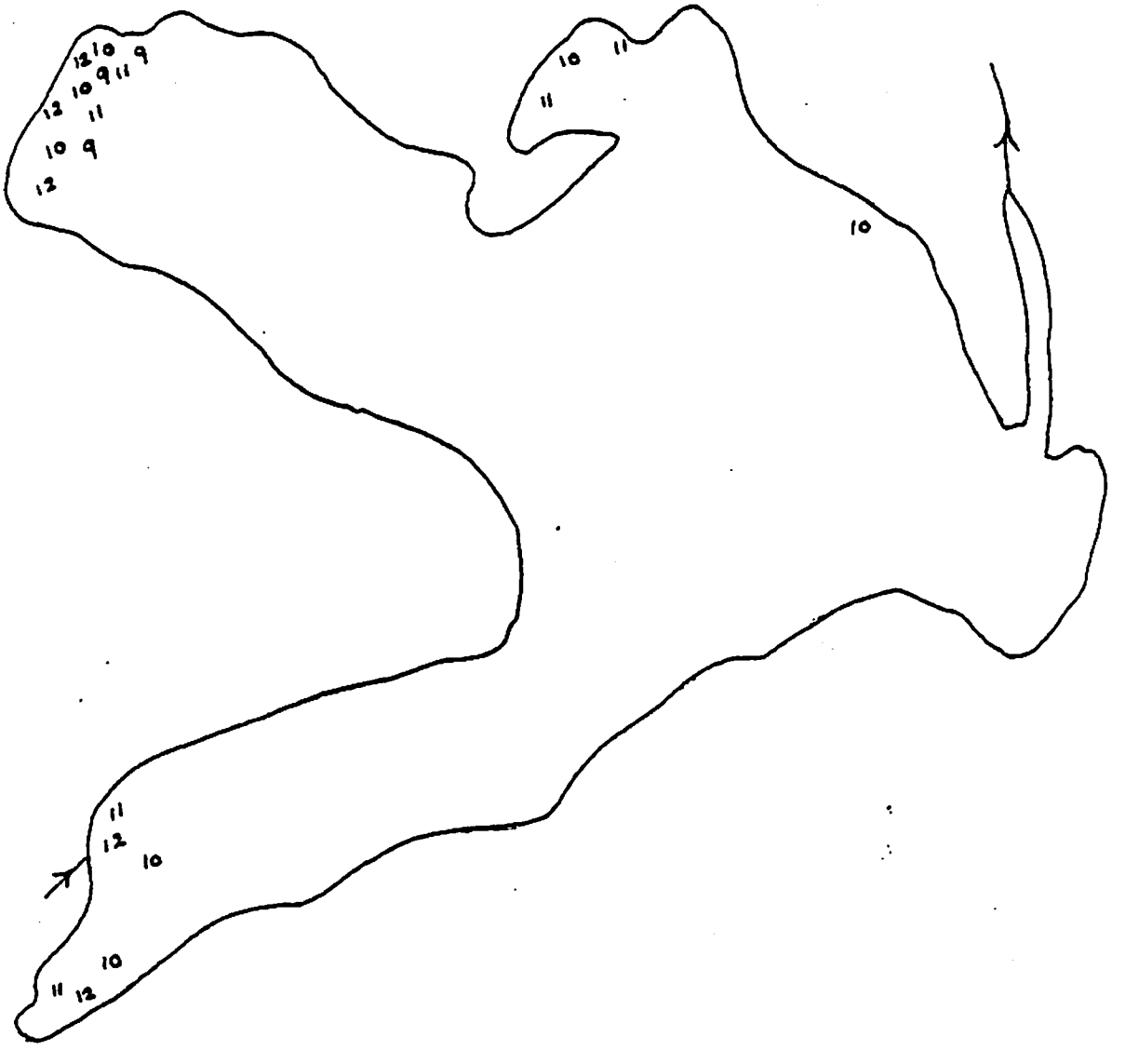
Scale 1:310'

MN

GN

BARTLETT POND

Floating Aquatic Plant Map with Key



Scale 1:310'

FLOATING AQUATIC PLANTS ATTACHED

LATIN	COMMON	MAP NUMBER
Nuphar	Cow Lily, Yellow Water Lily, Spatterdock	12
Nymphaea	Water Lily, White Water Lily	11
Brasenia	Watershield	9
	Addenda	

FLOATING AQUATIC PLANTS - UNATTACHED

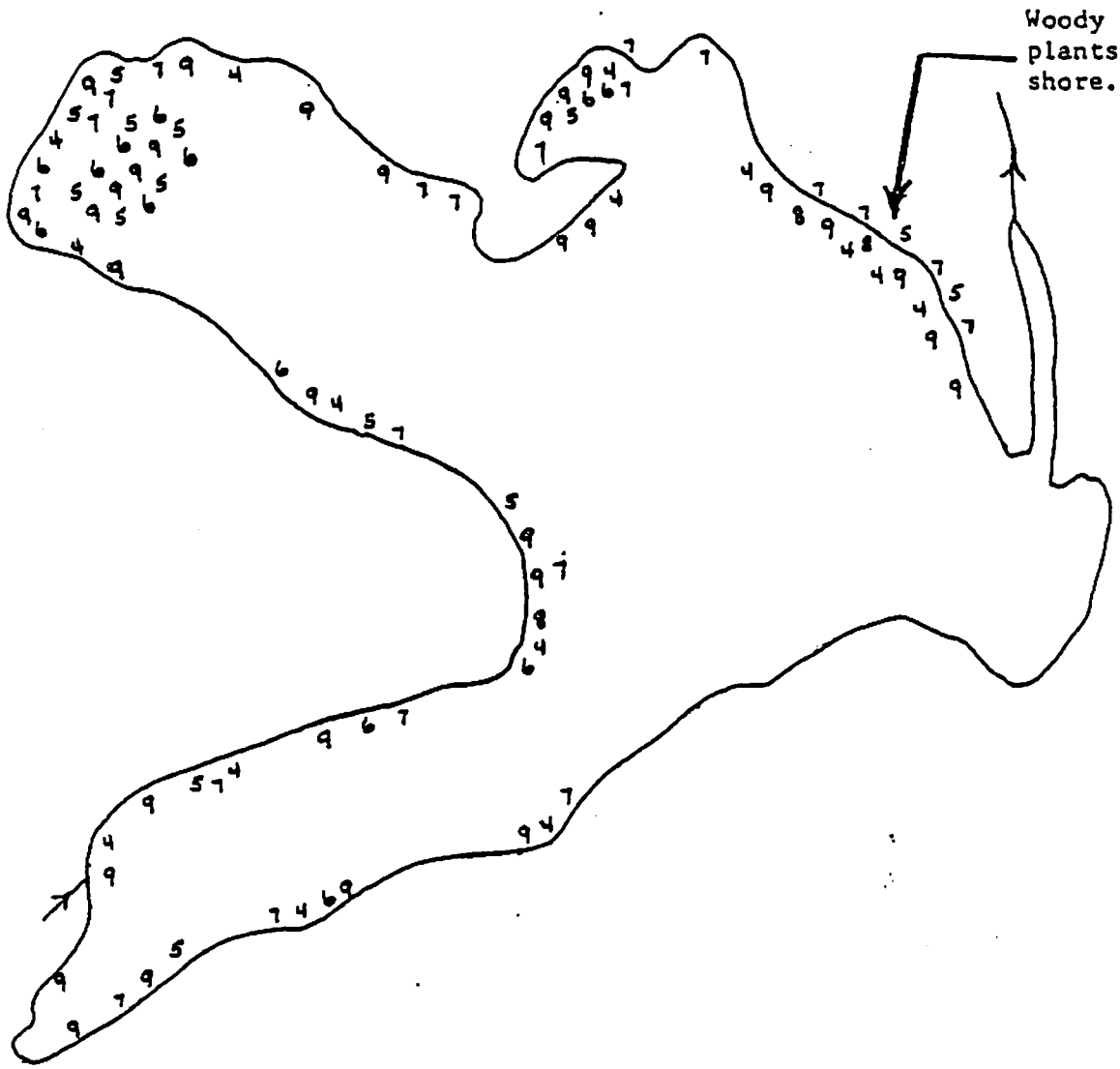
LATIN	COMMON	MAP NUMBER
Lemna	Duckweed	10
Spirodelia	Big Duckweed	
Wolffia	Watermeal	
	Addenda	

MN

GN

BARTLETT POND

Emersed Aquatic Plant Map with Key



Scale 1:310'

EMERSED AQUATIC PLANTS

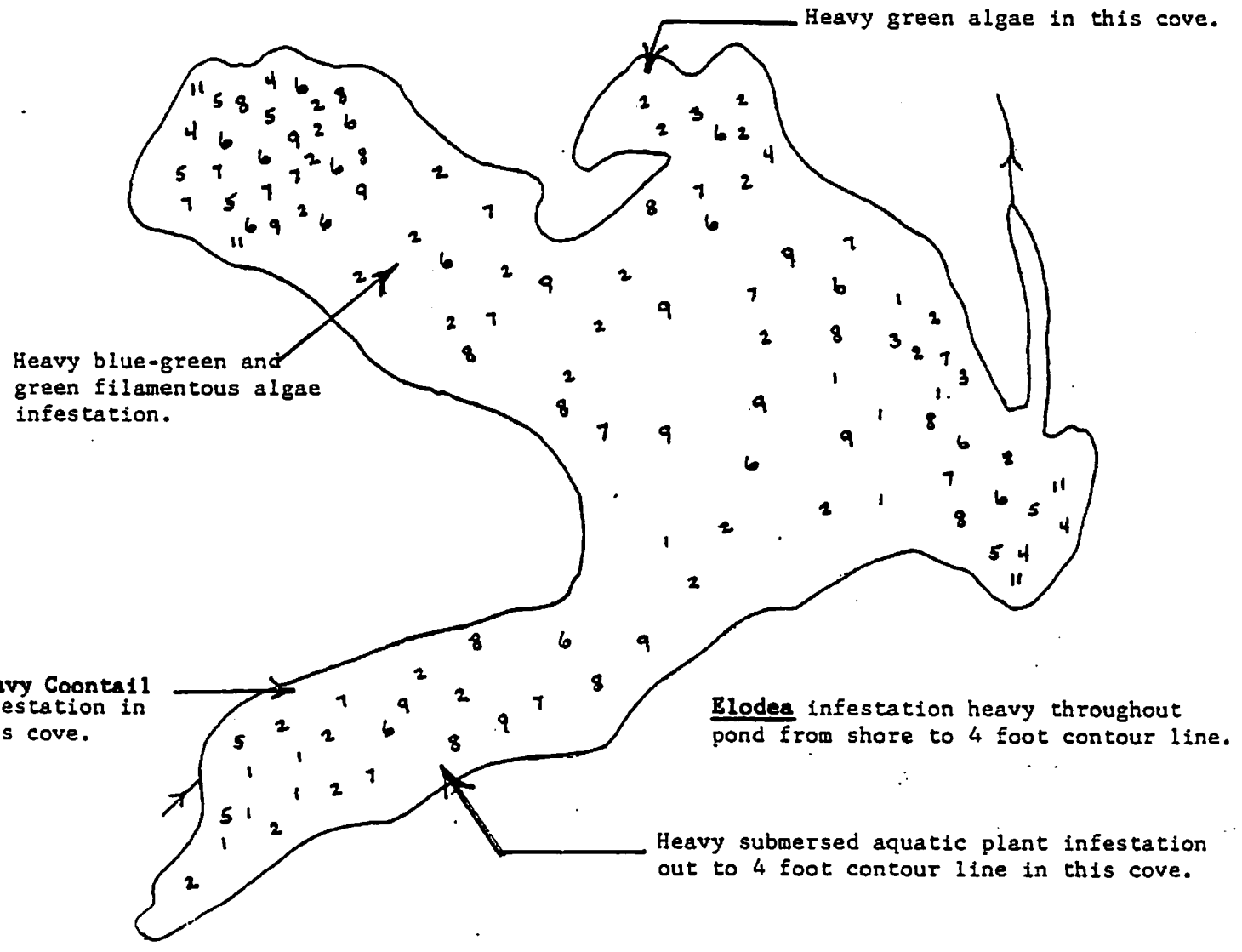
LATIN	COMMON	MAP NUMBER
Peltandra	Arrow Arum	
Pontederia	Pickerel Weed	4
Sagittaria	Arrowhead; Duck Potatoe	
Polygonum	Watersmart Weed	
Typha	Cattail	7
Eleocharis	Spike Rush Sedge	5
Scirpus	Bulrush Sedge	9
Juncaceae	Juncus Rush	6

Addenda

MN GN

BARTLETT POND

Submersed Aquatic Plant Map with Key



Scale 1:310'

SUBMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	
Potamogeton Natans	Floating Brown Leaf	5
Potamogeton Nodosus	American Pondweed	
Potamogeton Pectinatus	Sago Pondweed	4
Potamogeton Praelongus	White Stem Pondweed	
Potamogeton Richardsonii	Richardson Pondweed	
Potamogeton Robinsii		
Potamogeton Vaginatus	Giant Pondweed	
Najas	Bushy Pondweed	11
Zannichellia	Horned Pondweed	
Elodea	Waterweed	2
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	1
Myriophyllum	Water Milfoil	3
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	
Nasturtium	Water, Cress	
Utricularia	Bladderwort	10
Vallisneria	Wild Celery	

Addenda

Algae

Chlorophyceae — green

unicellular — 6

filamentous — 7

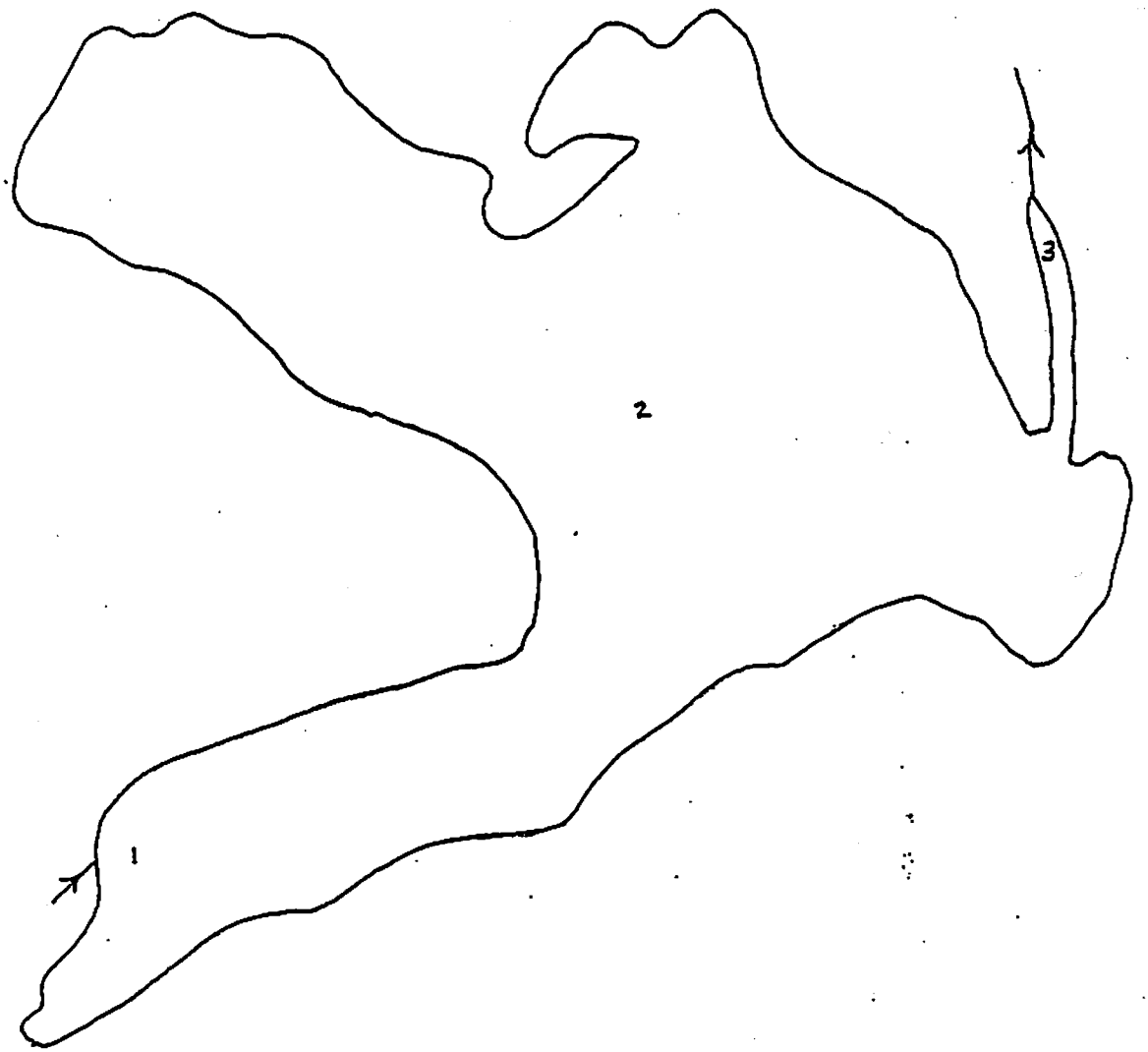
Cyanophyceae — blue-green

unicellular — 8

filamentous — 9

BARTLETT POND

Chemical Sample Stations



Scale 1:310'

Bartlett Pond

	IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.07			.07			.06		
Nitrate (N)	.05			.04			.03		
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	10								
Total Hardness	53								
CO_2	12								
Pn	6.6								
Temp (C+F) 1' Levels	11° C								
Secchi	5 ft.								

Heavy Metals

Zn	.005
CD	.001
Sn	.015
Au	.003
Fe	.435
PD	.01
AL	.047
Cu	.008
Ni	.028
AG	.009

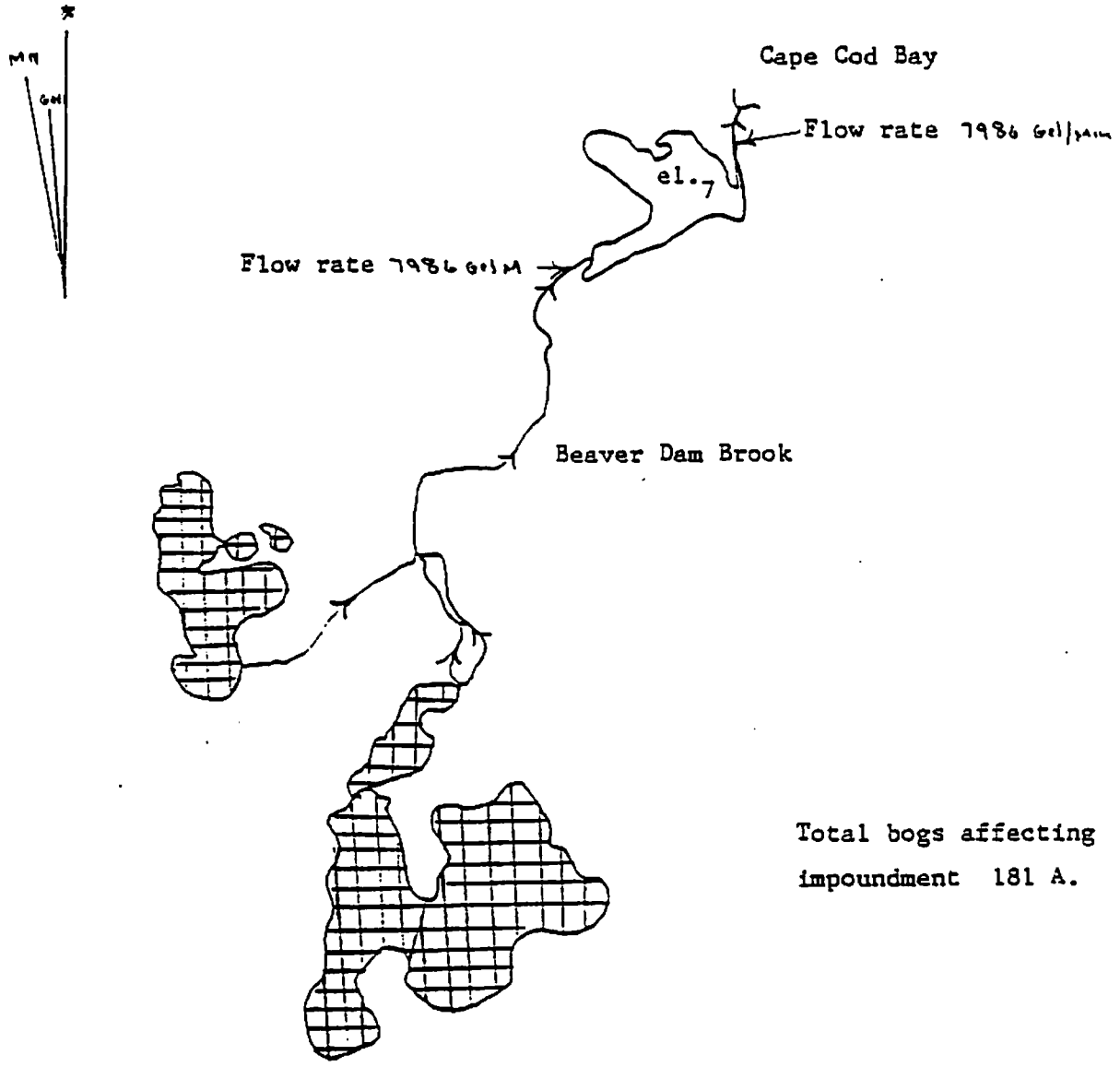
Benthos

Total P	21.7 mg/kg
Total Nitrogen	61.8 mg/kg
% Solids	1.9
Total volatile solds	.4%

All figures in mg/l unless otherwise noted.

BARTLETT POND

Impoundment Map



Total bogs affecting impoundment 181 A.

Scale 1:2000'

BARTLETT POND

Using a modified trophic level index Bartlett Pond ranks 34th.

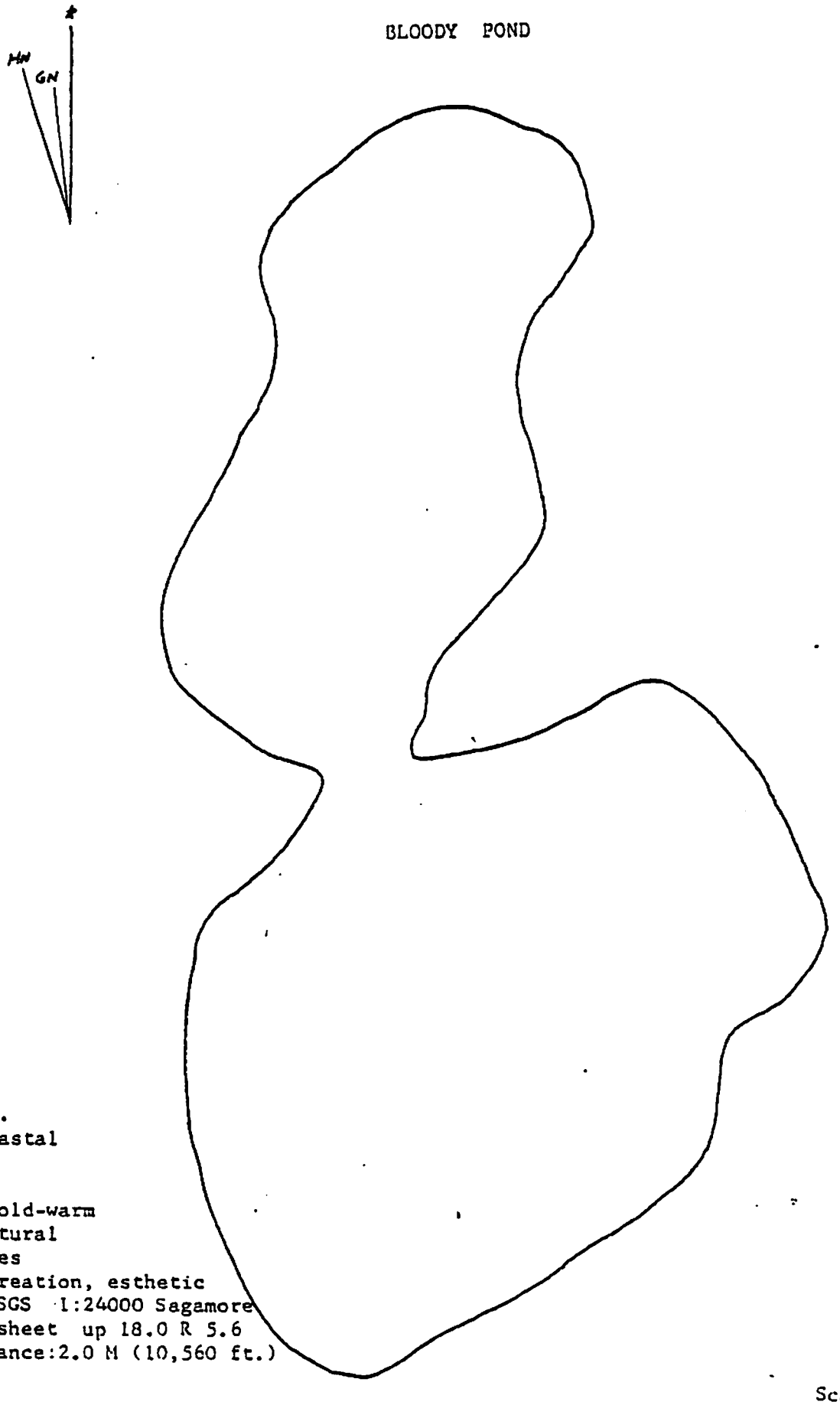
It is a shallow pond with a littoral zone throughout. Macrophyte population is high; floating aquatic plants cover 2 acres of the total area, spatterdock is the primary species. Emergent plant population is heavy along some parts of the shoreline. Submersed aquatic plants completely cover the bottom from dense to medium count, Elodea is the primary species. Green and blue-green filamentous algae are predominant throughout the pond. No unicellular algae are conspicuous at this time. The Secchi disc reading was low, Bartlett Pond ranked 37 in this parameter and 33rd in plant trophic index. Phosphate readings were critical, nitrate readings acceptable.

Number of houses affecting ecosystem: about 40

Cranberry bog acreage affecting impoundment: approximately 180 acres.

This pond is ultra-eutrophic.

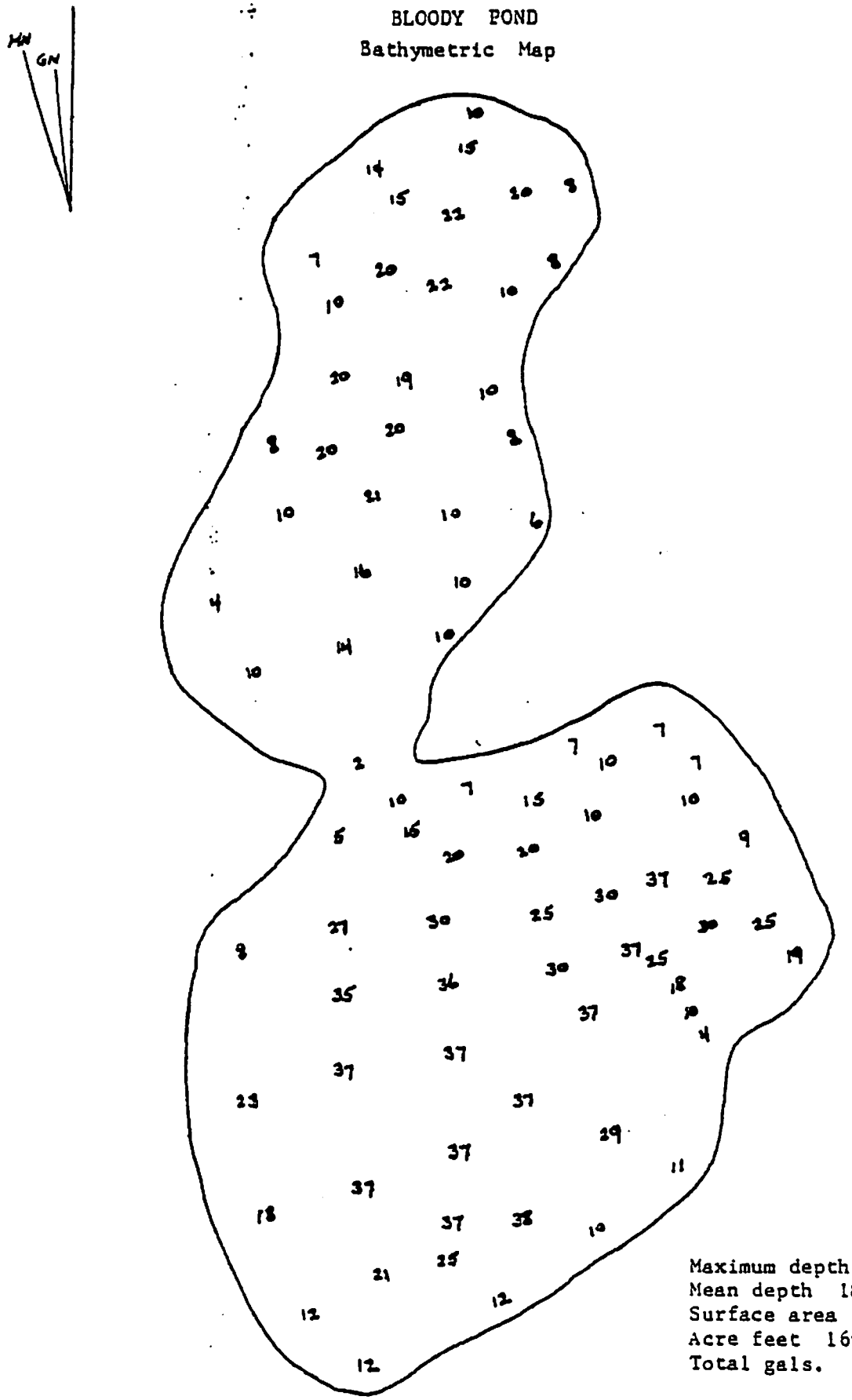
BLOODY POND



Bloody Pond
Plymouth, Mass.
Watershed: coastal
Acres: 94
Sltitude: 058
Water type: cold-warm
Pond type: natural
Stratified: yes
Pond use: recreation, esthetic
Topo sheet: USGS 1:24000 Sagamore
Position Topo sheet up 18.0 R 5.6
Shoreline distance:2.0 M (10,560 ft.)

Scale 1:430 '

BLOODY POND
Bathymetric Map

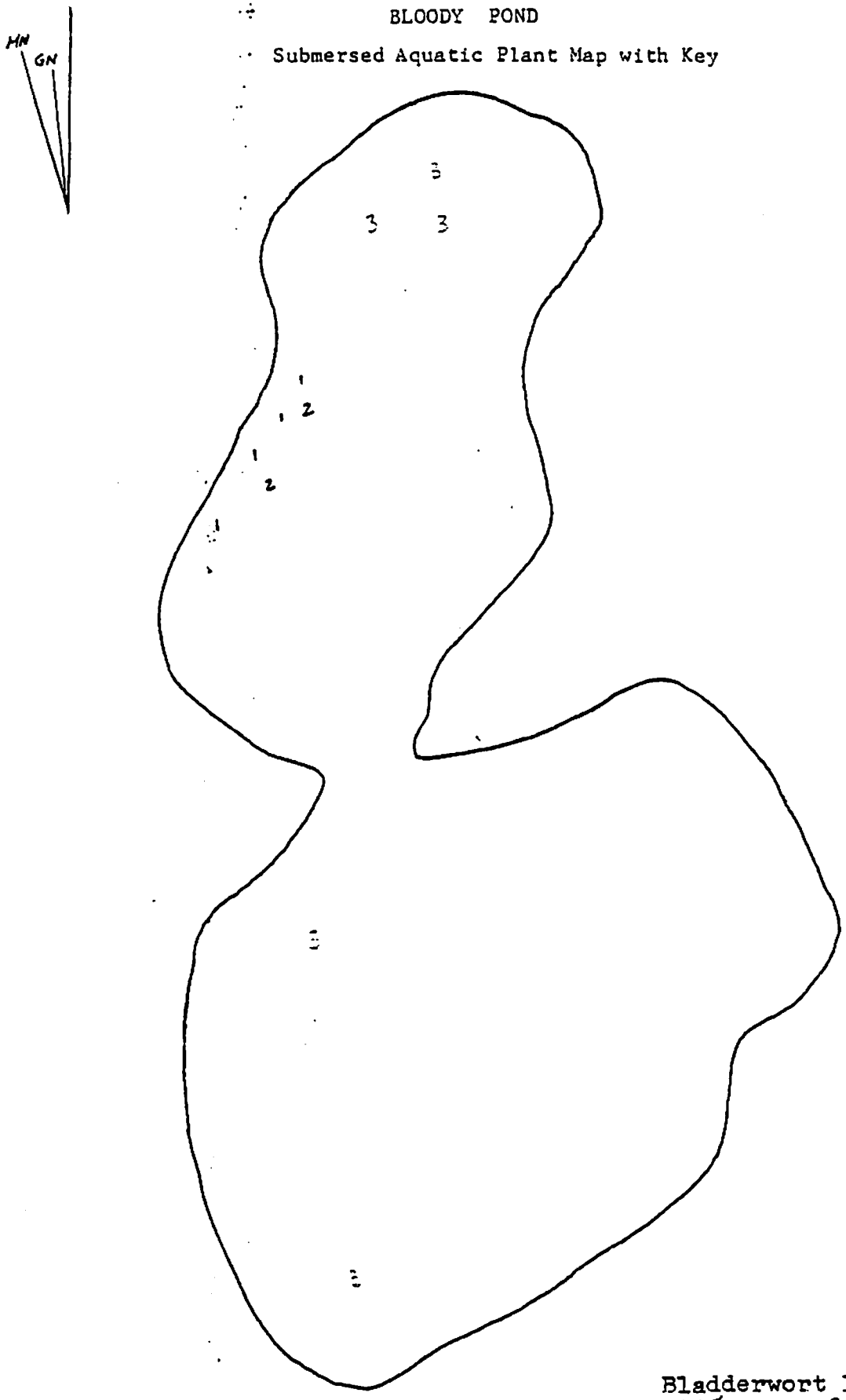


Maximum depth 38 ft. 11.58 M
Mean depth 18 ft. 5.49 M
Surface area 94 acres 38.1 H
Acre feet 1692
Total gals. 551,339,892

Scale 1:430 '

BLOODY POND

Submersed Aquatic Plant Map with Key



Bladderwort Infestation
.10% app. Scale 1:430 '

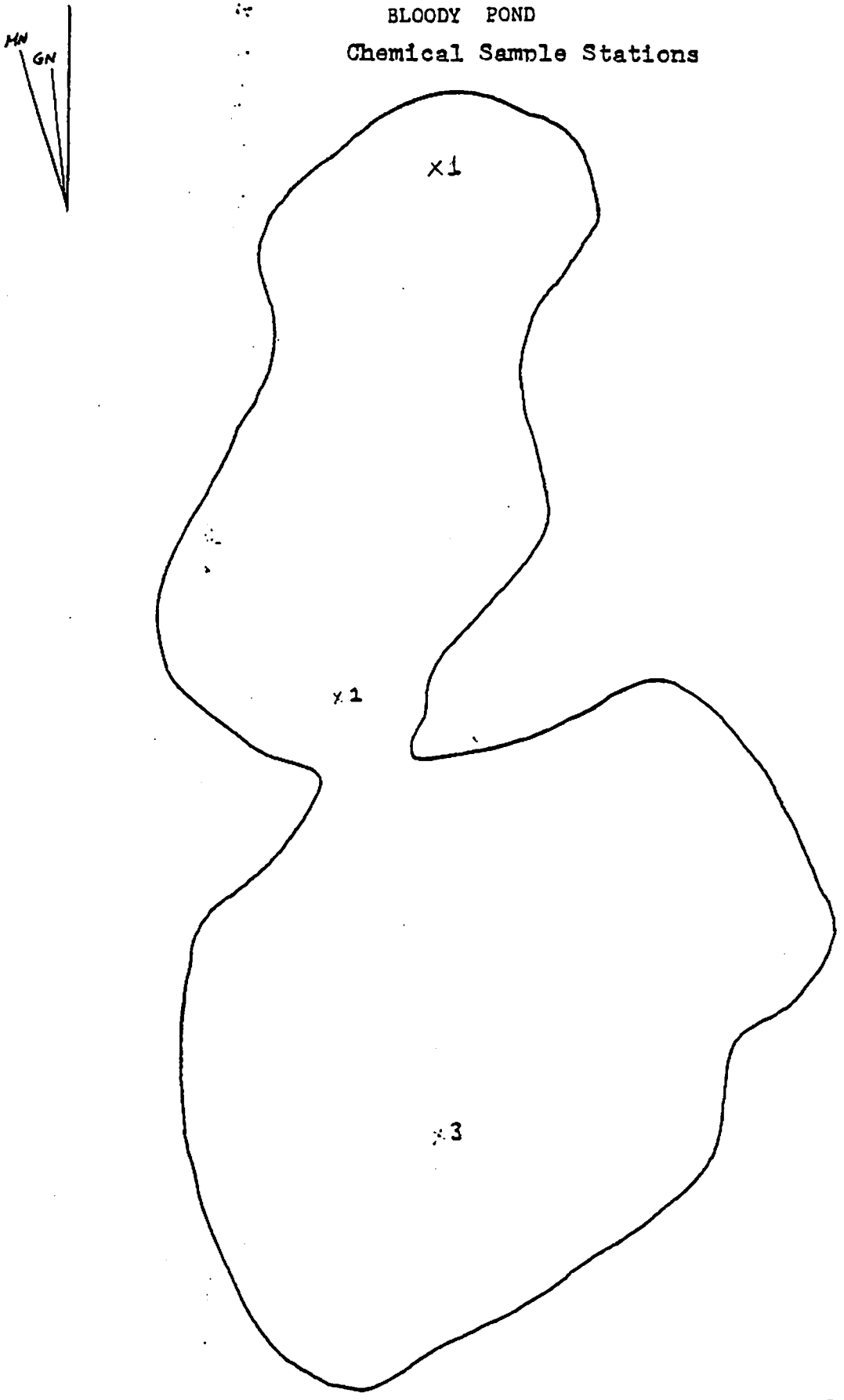
SUBMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	
Potamogeton Natans	Floating Brown Leaf	1
Potamogeton Nodosus	American Pondweed	
Potamogeton Pectinatus	Sago Pondweed	2
Potamogeton Praelongus	White Stem Pondweed	
Potamogeton Richardsonii	Richardson Pondweed	
Potamogeton Robinsii		
Potamogeton Vaginatus	Giant Pondweed	
Najas	Bushy Pondweed	
Zannichellia	Horned Pondweed	
Elodea	Waterweed	
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	
Myriophyllum	Water Milfoil	
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	
Nasturtium	Water, Cress	
Utricularia	Bladderwort	3
Vallisneria	Wild Celery	

Addenda

BLOODY POND

Chemical Sample Stations



Scale 1:430 '

	Bloody IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.02	.02		.02					
Nitrate (N)	.01	.02	.02						
Free Acid	.06	.03	.05						
Total Acidity	0								
Alkalinity	0								
DO	12								
Total Hardness	21								
CO_2	15								
Pn	6.4								
Temp (C+F) 1' Levels	21° C								
Secchi	19 ft.								

Heavy Metals

Zn	.006
CD	.001
Sn	.006
Au	.001
Fe	.018
PD	.006
AL	.007
Cu	.006
Ni	.006
AG	.001

Benthos

Total P	69.8
Total Nitrogen	.4

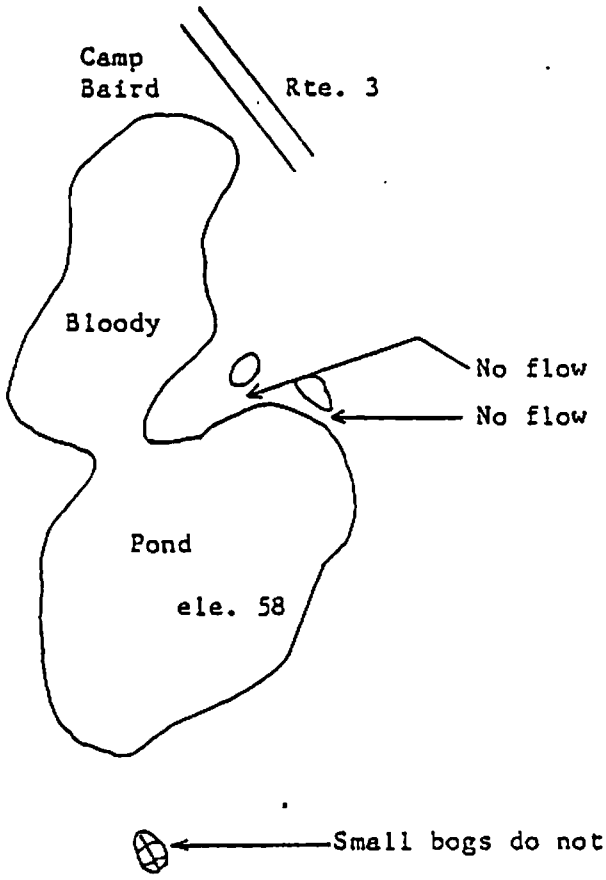
Percent solids

Total volatile solids	36%

All figures mg/l unlies otherwise noted.

BLOODY POND

Impoundment Map



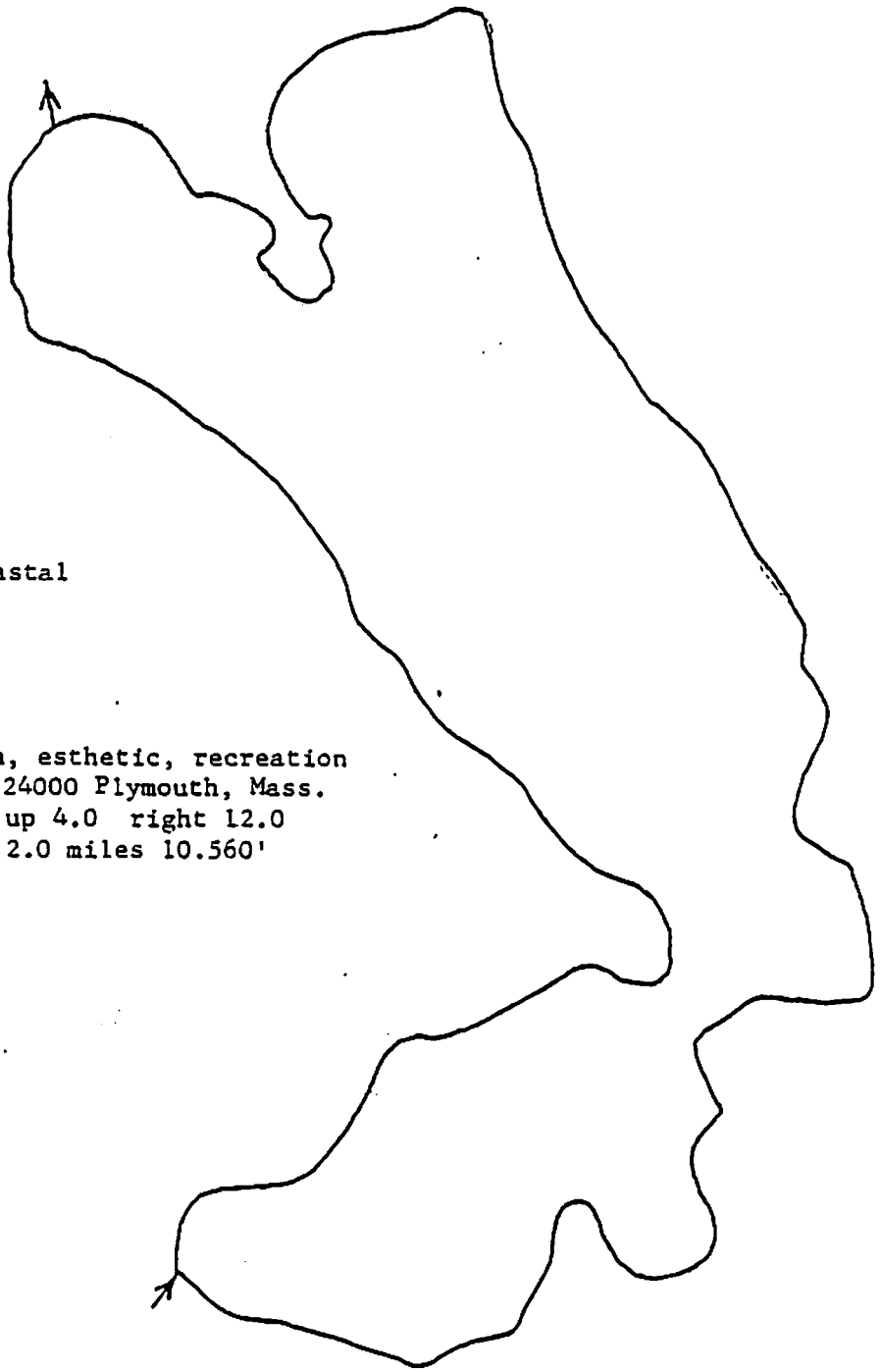
Pond type: Kettlehole
Tributary: none
Outfall: none
Overland flow: none
Groundwater and underground aquifers - primary source
Rainfall: secondary source
Surface runoff: secondary source
Agriculture practices directly affecting impoundment: none
Industrial practices directly affecting impoundment: none
Possible source of nutrient influx - Camp Baird
Possible source of nutrient influx - Route 3
Very few septic systems around pond

Scale 1:1150

BLOODY POND

Bloody Pond ranks 5 using a modified trophic level index. It is a natural, stratified, spring fed, steep sloping cold warm pond with maximum depth of 38 feet. Macrophyte population is low in all categories. On plant trophic index, it ranked 9th. The secchi disc reading was 19 feet and in this index, it ranked 4th. The phosphate readings were permissible. The nitrate readings were also permissible. Number of houses affecting impoundment: approx. 15. The cranberry acreage affecting pond: none. The pond is rates as mesotrophic. Problems possibłe: Camp Baird (long range)

BOOT POND

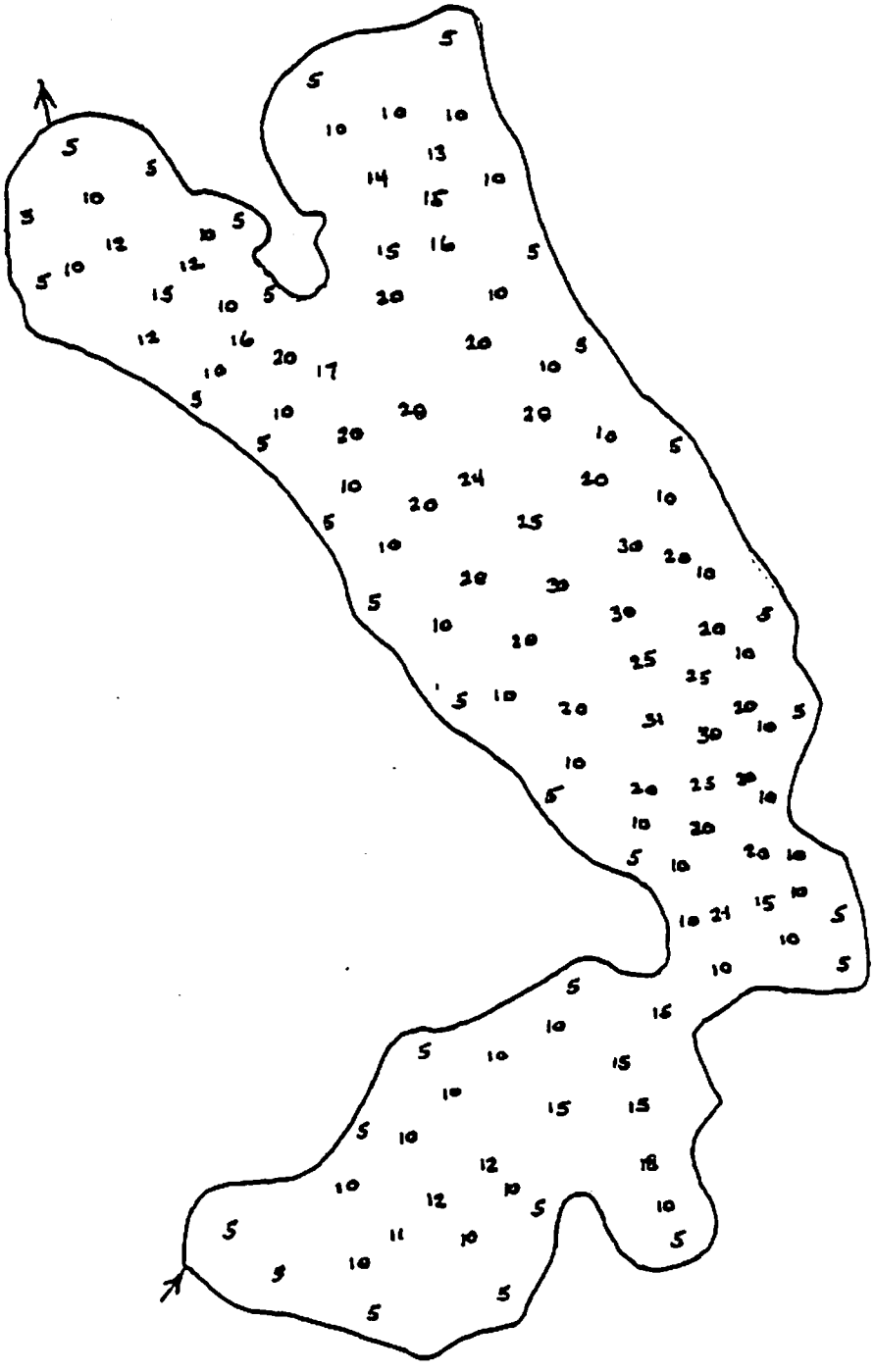


Boot Pond
Plymouth, Mass.
Watershed type: coastal
Acres: 76
Altitude 0100'
Water type: warm
Pond type: natural
Stratified: no
Pond use: irrigation, esthetic, recreation
Topo sheet: USGS 1:24000 Plymouth, Mass.
Postion Topo sheet: up 4.0 right 12.0
Shoreline distance: 2.0 miles 10.560'

Scale 1:456

BOOT POND

(Bathymetric Map)



Maximum depth 31 Ft. 9.5 M
Mean depth 16 ft. 4.9 M
Surface area 76 acres 30.8 H
Acre feet 1216
Tot. Gals. 396,234,816

Scale 1:456

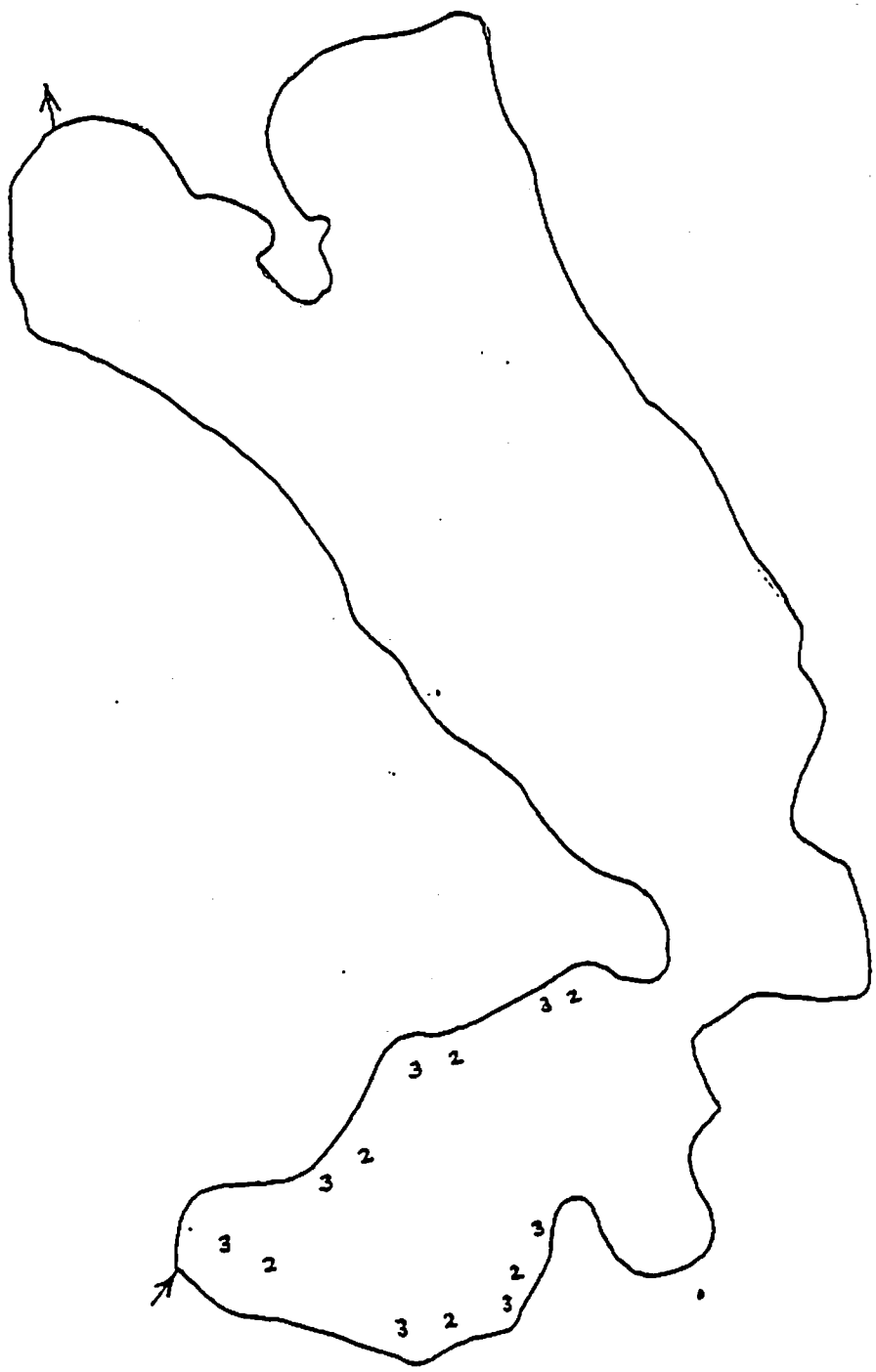
MH

GM

N

BOOT POND

Floating Aquatic Plant Map with Key



Scale 1:456

FLOATING AQUATIC PLANTS ATTACHED

LATIN	COMMON	MAP NUMBER
Nuphar	Cow Lily, Yellow Water Lily, Spatterdock	
Nymphaea	Water Lily, White Water Lily	2
Brasenia	Watershield	3
	Addenda	

FLOATING AQUATIC PLANTS - UNATTACHED

LATIN	COMMON	MAP NUMBER
Lemna	Duckweed	
Spirodelia	Big Duckweed	
Wolffia	Watermeal	
	Addenda	

BOOT POND

Emersed Aquatic Plant Map with Key

Scale 1:456

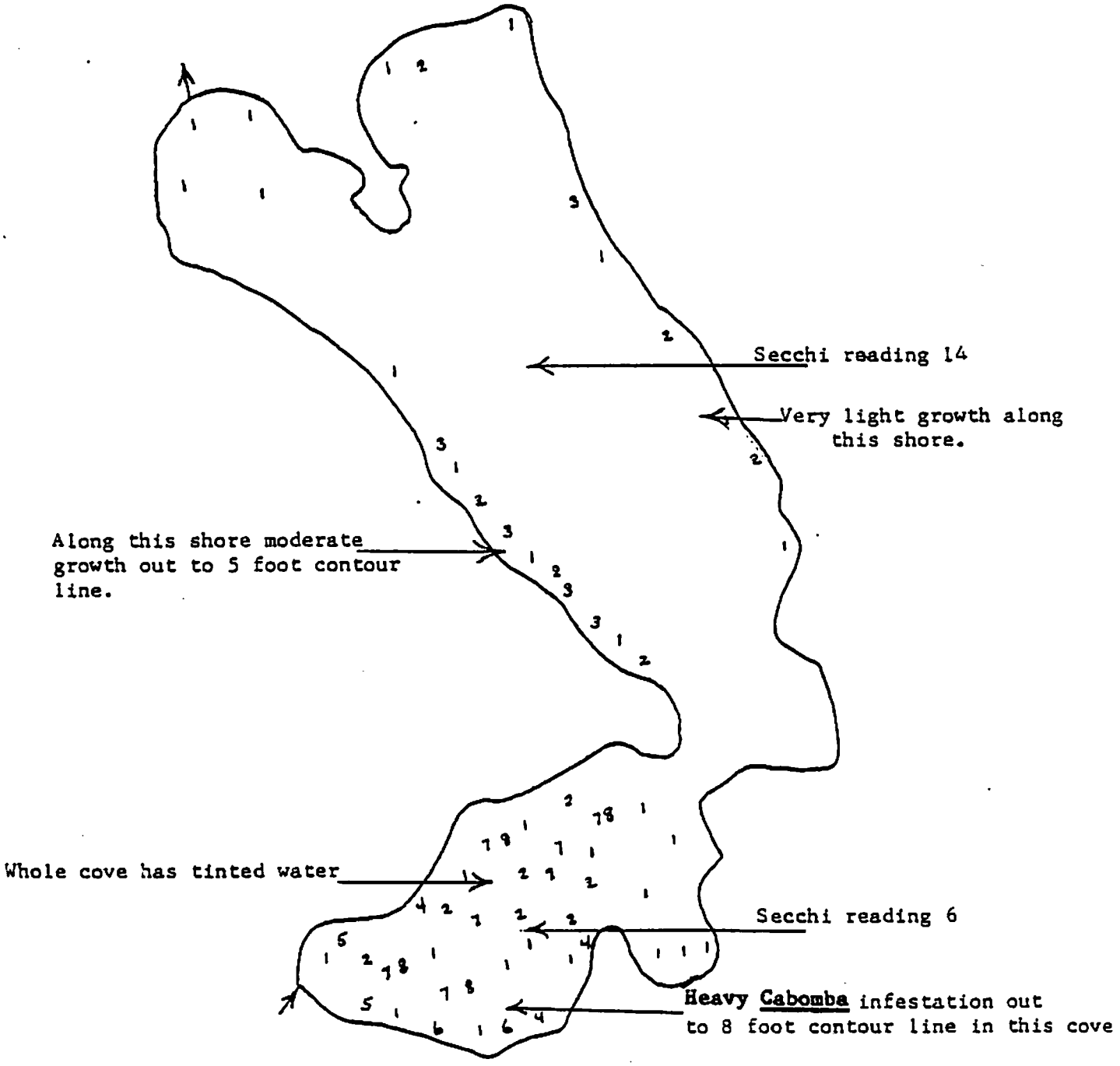
EMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Peltandra	Arrow Arum	
Pontederia	Pickerel Weed	3
Sagittaria	Arrowhead; Duck Potatoe	
Polygonum	Watersmart Weed	
Typha	Cattail	4
Eleocharis	Spike Rush Sedge	
Scirpus	Bulrush Sedge	1
Juncaceae	Juncus Rush	2

Addenda

BOOT POND

Submersed Aquatic Plant Map with Key



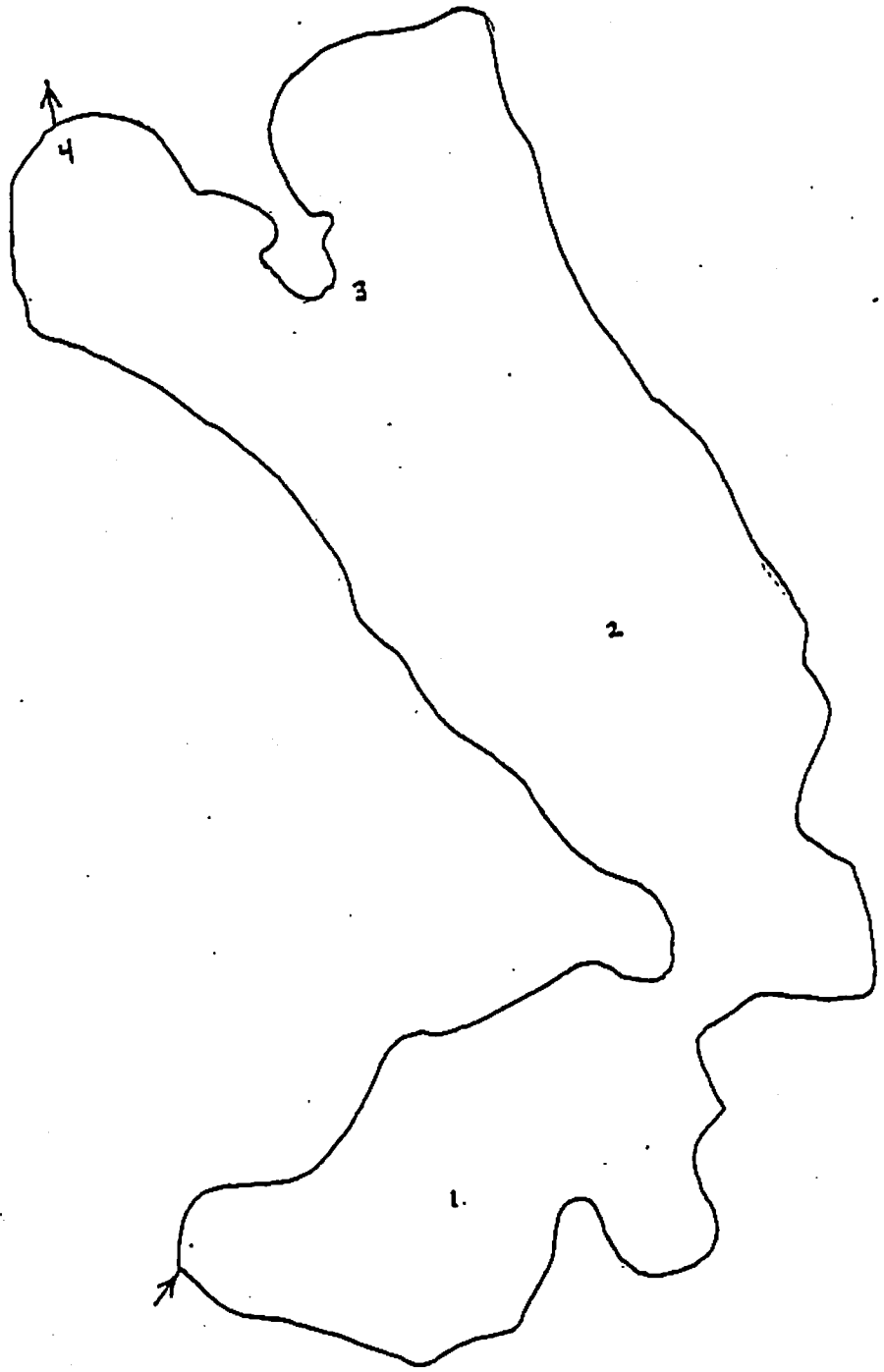
Scale 1:456

SUBMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	4
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	
Potamogeton Natans	Floating Brown Leaf	5
Potamogeton Nodosus	American Pondweed	
Potamogeton Pectinatus	Sago Pondweed	6
Potamogeton Praelongus	White Stem Pondweed	
Potamogeton Richardsonii	Richardson Pondweed	
Potamogeton Robinsii		
Potamogeton Vaginatus	Giant Pondweed	
Najas	Bushy Pondweed	
Zannichellia	Horned Pondweed	
Elodea	Waterweed	
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	
Myriophyllum	Water Milfoil	3
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	
Nasturtium	Water, Cress	
Utricularia	Bladderwort	2
Vallisneria	Wild Celery	
	Addenda	
Cabomba	Fanwort	1
Chlorophyceae	Green algae	
filamentous		8
unicellular		7

BOOT POND

Chemical Sample Stations



Scale 1:456

	Boot IN LAKE STATION			OUTFALL	SOURCES
	1	2	3	1 2 3	1 2 3
Total P	.03	.01	.01	.01	
Nitrate (N)	.08	.02	.02	.02	
Free Acid	0				
Total Acidity	0				
Alkalinity	0				
DO	10				
Total Hardness	17				
CO_2	20				
Pn	6.3				
Temp (C+F) 1' Levels	13o C				
Secchi	14 ft.				

Heavy Metals

Zn	.003
CD	.001
Sn	.005
Au	.001
Fe	.037
PD	.019
AL	.006
Cu	.005
Ni	.006
AG	.001

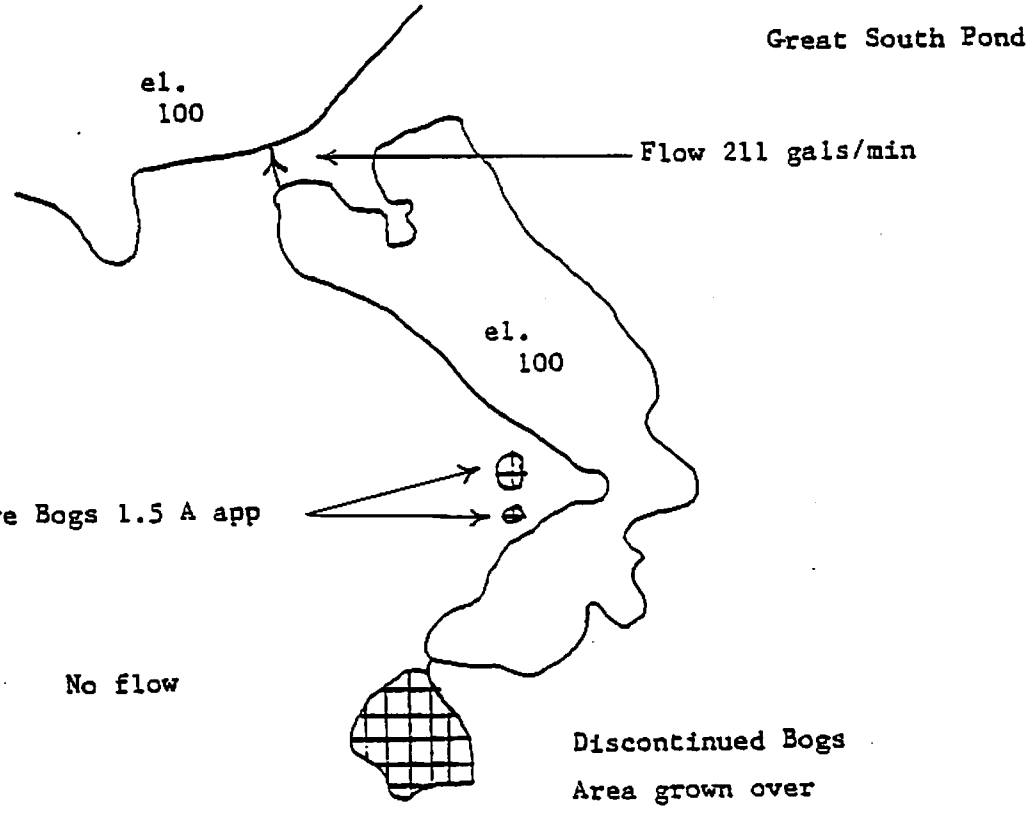
Benthos

Total P	306
Total Nitrogen	28.3
Total Volatile solids	.28
Percent solids	1.03

All figures in mg/l unless otherwise noted.

BOOT POND

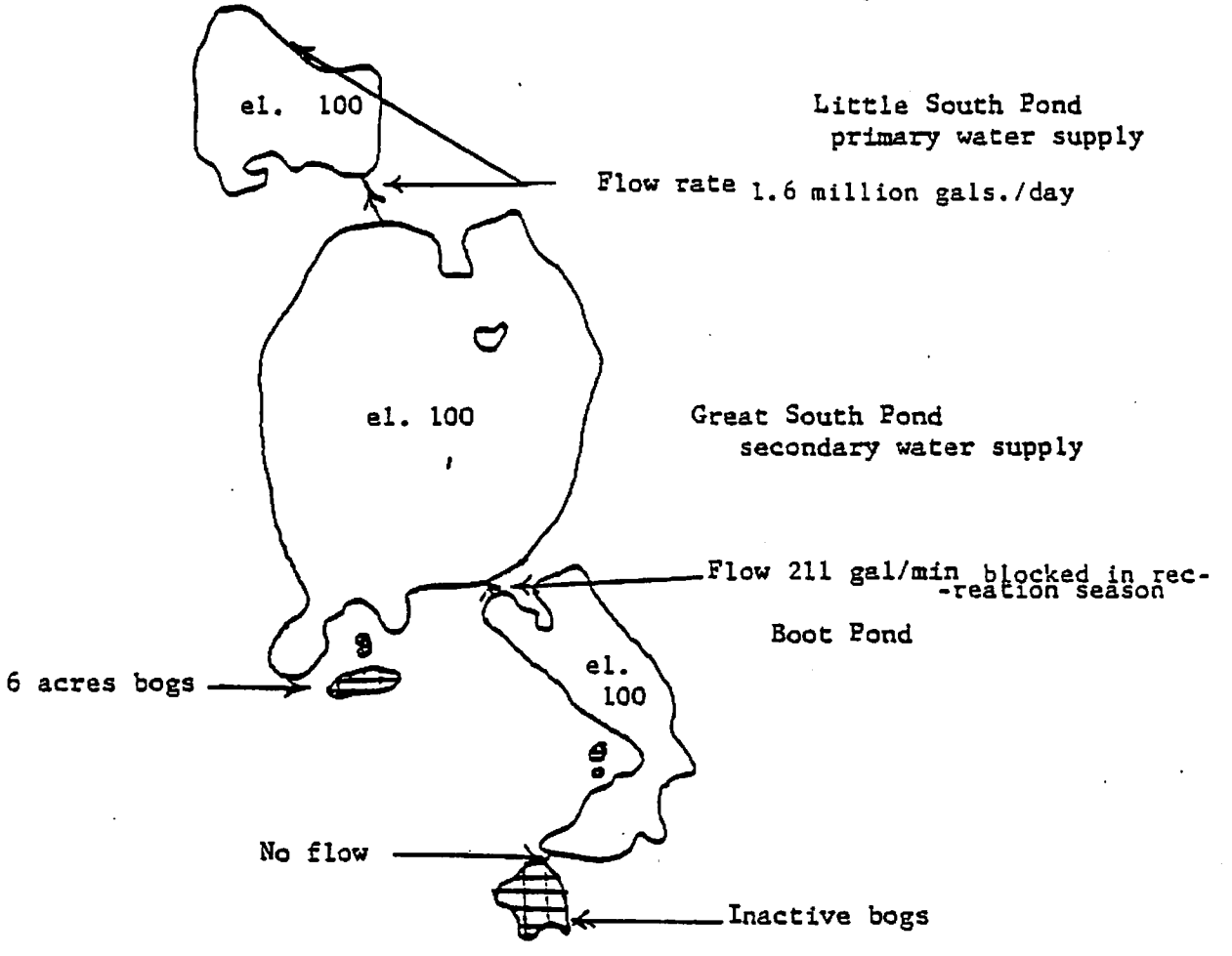
Impoundment Map



Scale 1:1140'

BOOT POND

Impoundment Map



Cranberry bogs

Scale 1:2000'

BOOT POND

Using a modified trophic level index Boot Pond ranks 10th.

It is a non-stratified pond, spring fed with steep slopes, maximum depth is 31 feet. Very few problems in main body of pond. Macrophyte population is low in all categories. The Secchi disc reading was 14 feet and ranked 9th in this parameter. Phosphate levels were permissable, nitrate readings were low.

Number of houses affecting pond: about 35

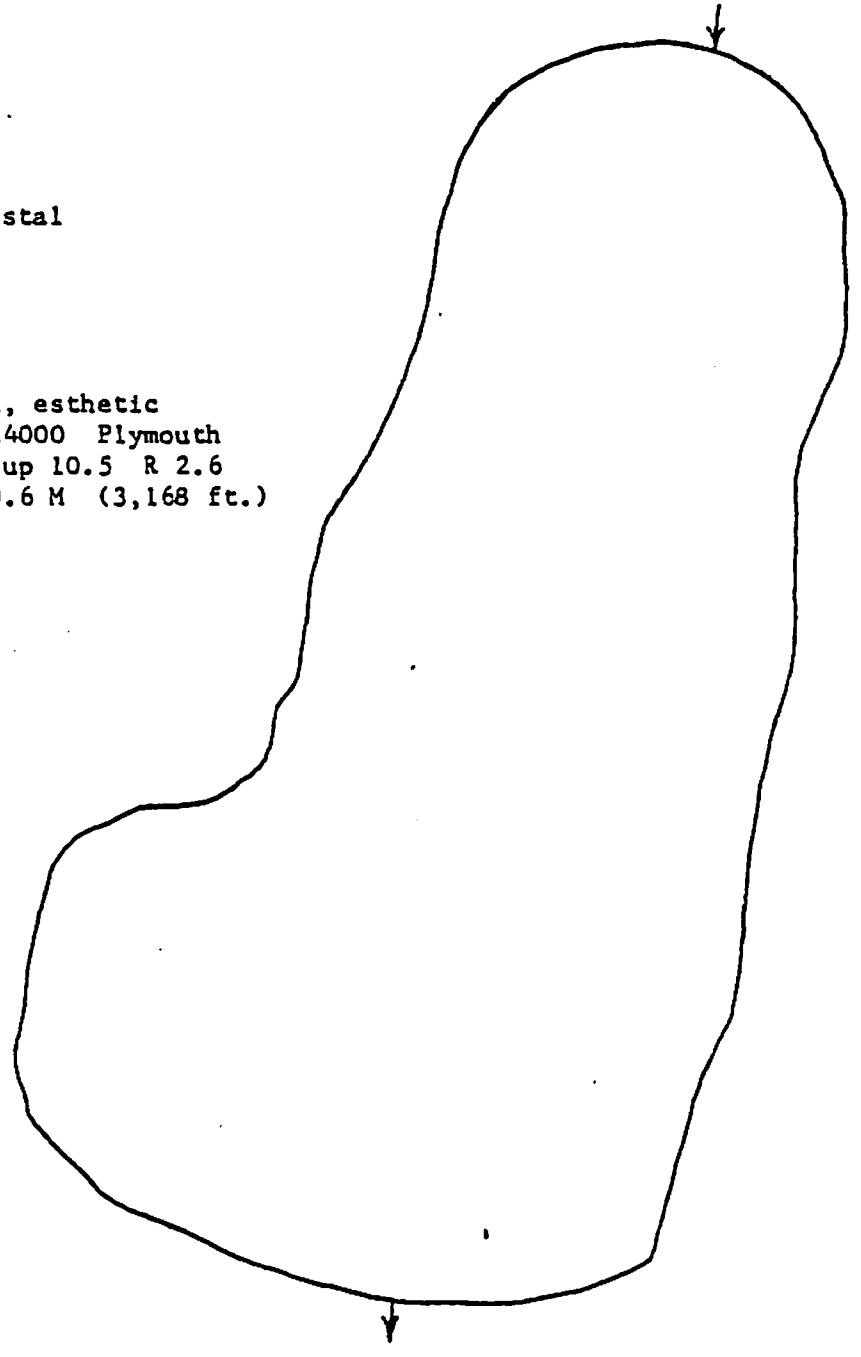
Cranberry bog acreage affecting impoundment: approximately 3 acres.

Problem area: Southwest cove has about 7 acres of obsolete bogs which border this cove with no apparent flow. Macrophyte population is dense; target species cabomba (an unusual problem) and potamogeton. Dense floating aquatic plants throughout the cove and water is deep green in color. Secchi disc reading is 6 feet. This is a danger spot in this pond.

This pond is classified as mesotrophic.

CLEAR POND

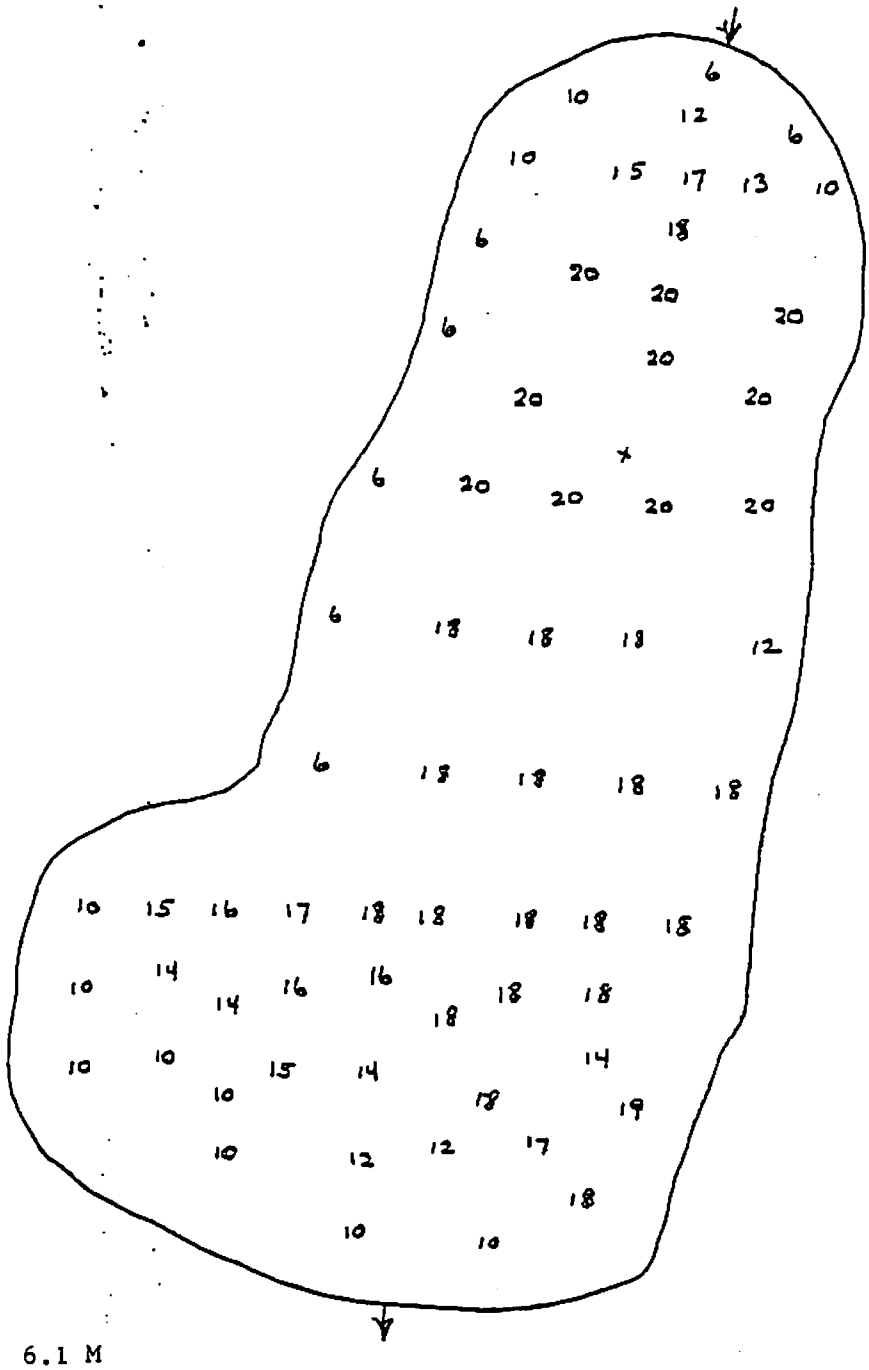
Clear Pond
Plymouth, Mass.
Watershed: south coastal
Acres: 12
Altitude: 0124
Water type: warm
Pond type: natural
Stratified: no
Pond use: recreation, esthetic
Topo sheet: USGS 1:24000 Plymouth
Position Topo sheet up 10.5 R 2.6
Shoreline distance 0.6 M (3,168 ft.)



Scale 1:174 '

CLEAR POND

(Bathymetric Map)

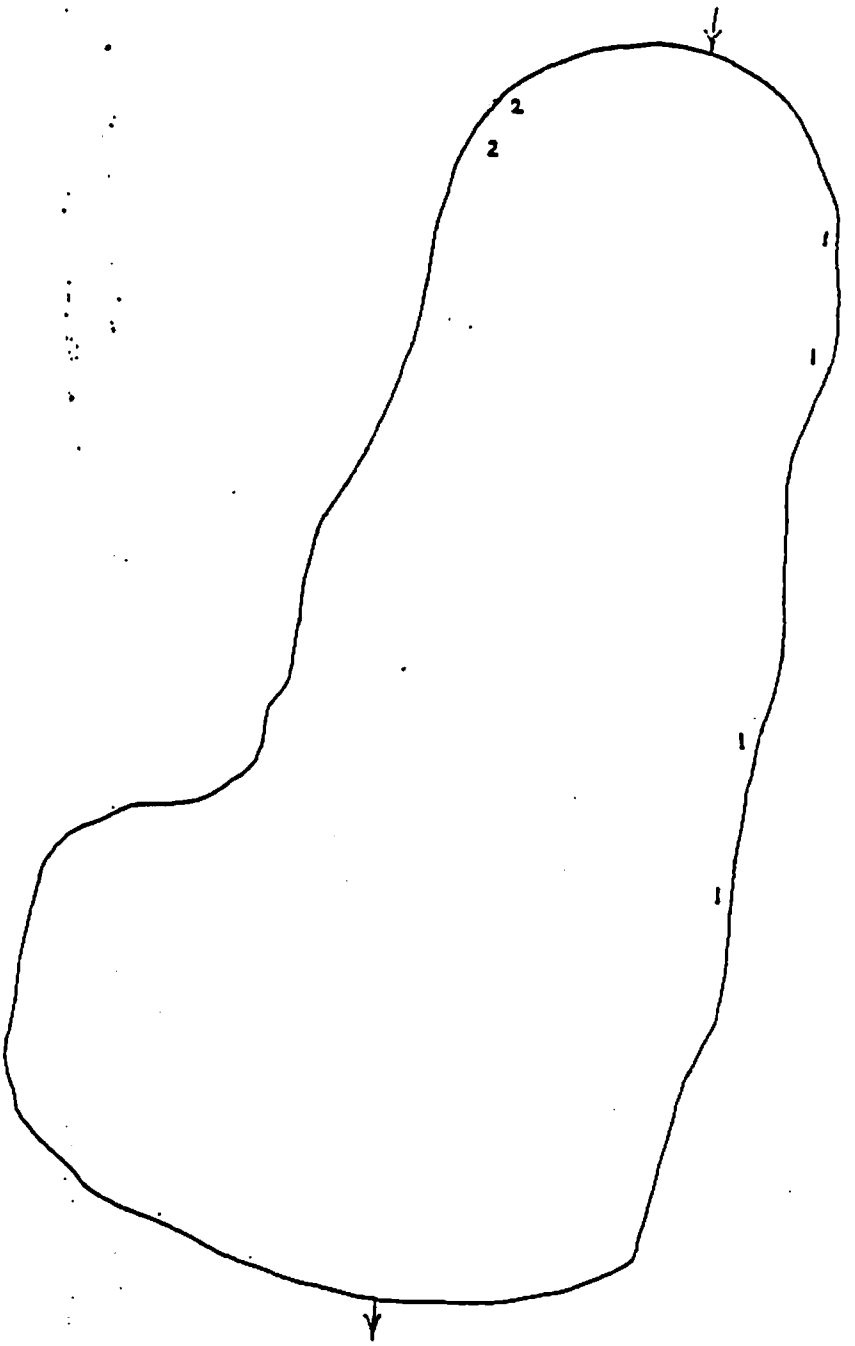


Maximum depth 20' 6.1 M
Mean depth 14' 4.27 M
Surface area 12 acres 4.86 H
Acre feet 168
Total gals. 54,742,968

Scale 1:174'

CLEAR POND

Emersed Aquatic Plant Map with Key



Scale 1:174 '

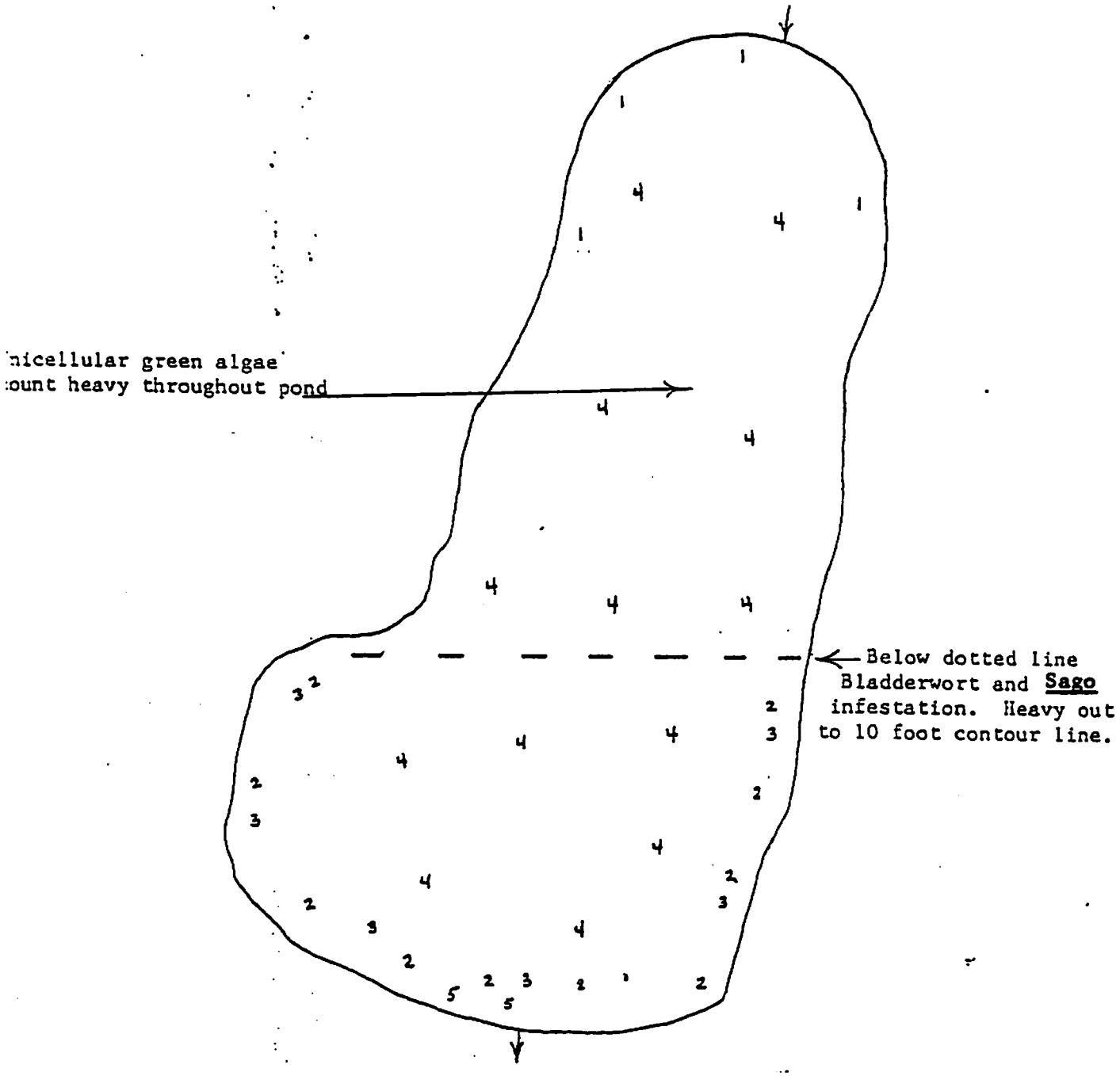
EMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Peltandra	Arrow Arum	
Pontederia	Pickerel Weed	
Sagittaria	Arrowhead; Duck Potatoe	
Polygonum	Watersmart Weed	
Typha	Cattail	2
Eleocharis	Spike Rush Sedge	1
Scirpus	Bulrush Sedge	
Juncaceae	Juncus Rush	

Addenda

CLEAR POND

Submersed Aquatic Plant Map with Key



Scale 1:174

SUBMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	
Potamogeton Natans	Floating Brown Leaf	
Potamogeton Nodosus	American Pondweed	
Potamogeton Pectinatus	Sago Pondweed	3
Potamogeton Praelongus	White Stem Pondweed	
Potamogeton Richardsonii	Richardson Pondweed	
Potamogeton Robinsii		
Potamogeton Vaginatus	Giant Pondweed	
Najas	Bushy Pondweed	
Zannichellia	Horned Pondweed	
Elodea	Waterweed	1
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	
Myriophyllum	Water Milfoil	
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	
Nasturtium	Water, Cress	
Utricularia	Bladderwort	2
Vallisneria	Wild Celery	

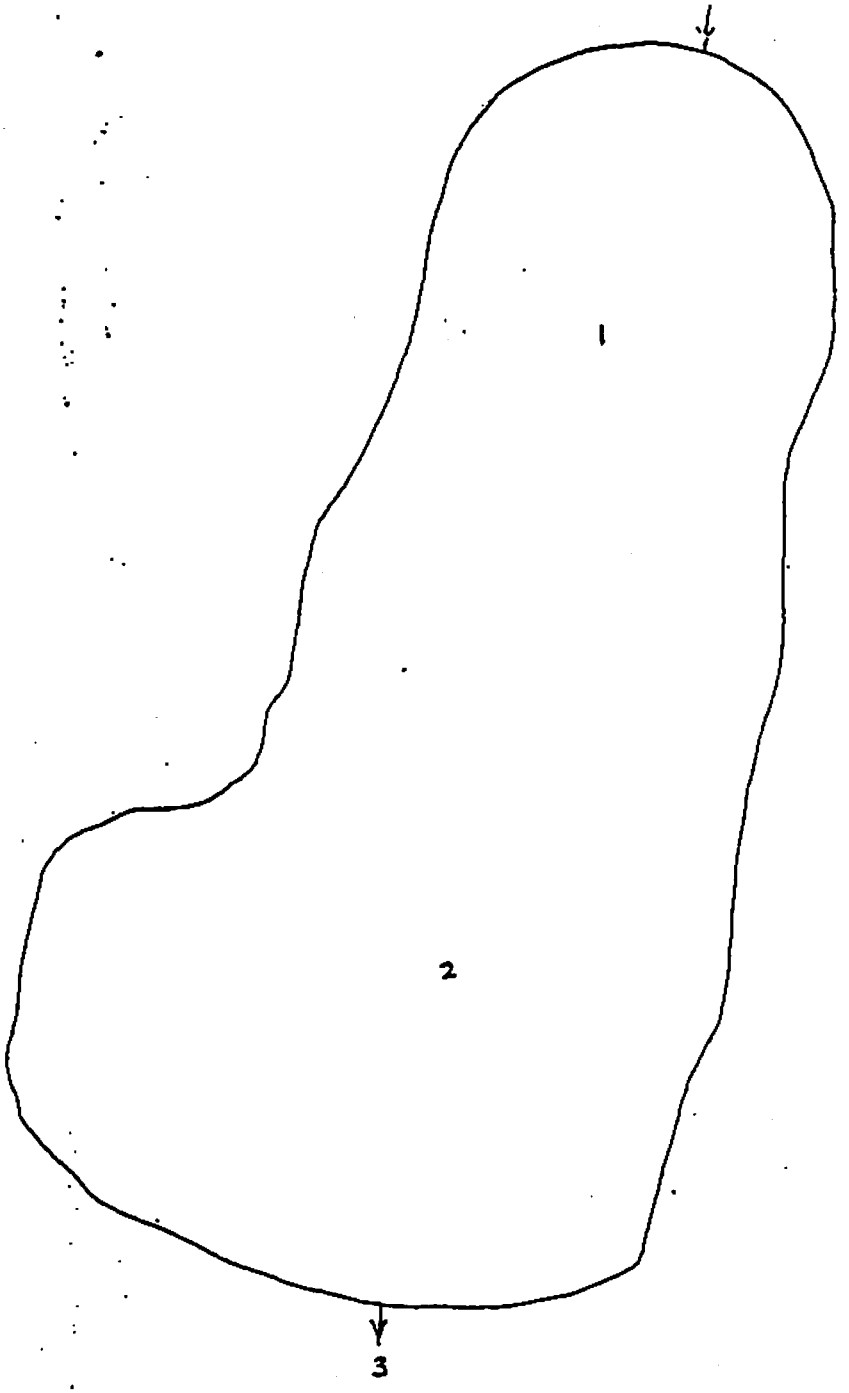
Addenda

Algae

Chorophyceae	green	
unicellular		4
filamentous		5

CLEAR POND

Chemical Sample Stations



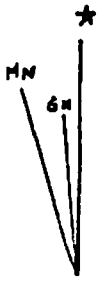
Scale 1:174 '

CLEAR POND

Clear Pond ranks 25 using a modified trophic level index. It is a natural, non-stratified spring-fed, warm water pond, with maximum depth of 20 ft. Floating aquatic plants were sparse. Emergent plant population was sparse. Submerged aquatic population ranged from light on north end to heavy on south end. Elodea and sago pond weed were dominant species. Water had a green tint. On the trophic index it ranked 16th. The secchi reading was 5 feet, which ranked it 33rd in this category. The phosphate readings were high . . The nitrate readings were critical.

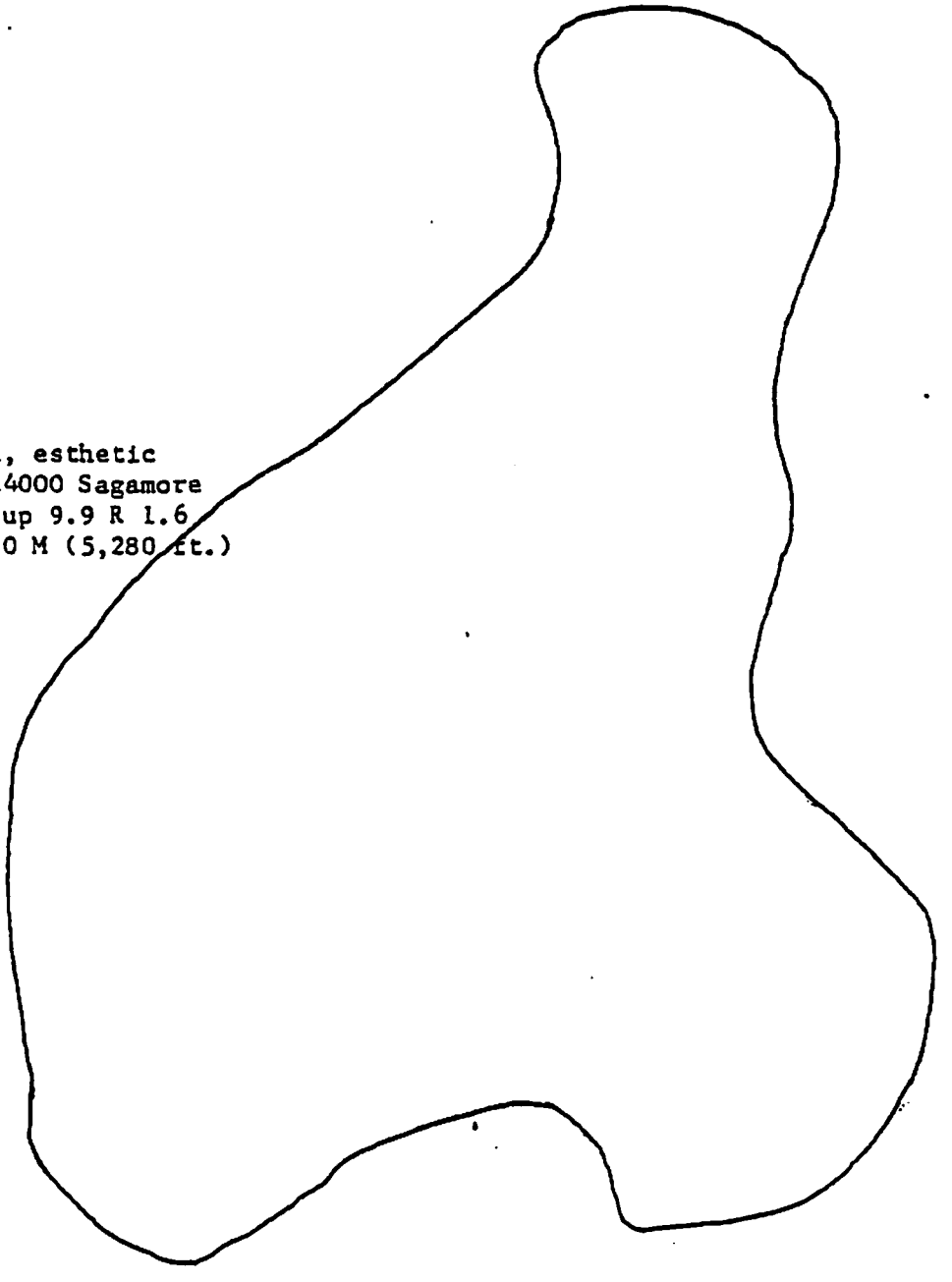
Number of houses affecting impoundment: approx. 35. Cranberry acreage affecting system: none.

Problems: cottage rentals at south end of pond are an obvious problem. Weed count here was highest. At north end are discarded bogs, but flooding ditch was full of rubish, had an oil scum, and generally showed signs of advanced disintergration. This pond was rated eutrophic with a good chance of accelerated eutrophication.

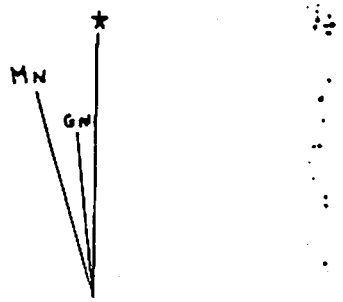


EZEKIEL POND

Ezekiel Pond
Plymouth, Mass.
Watershed: coastal
Acres: 36
Altitude: 047
Water type: warm
Pond type: natural
Stratified: no
Pond use: recreation, esthetic
Topo sheet: USGS 1:24000 Sagamore
Position Topo sheet up 9.9 R 1.6
Shoreline distance 1.0 M (5,280 ft.)

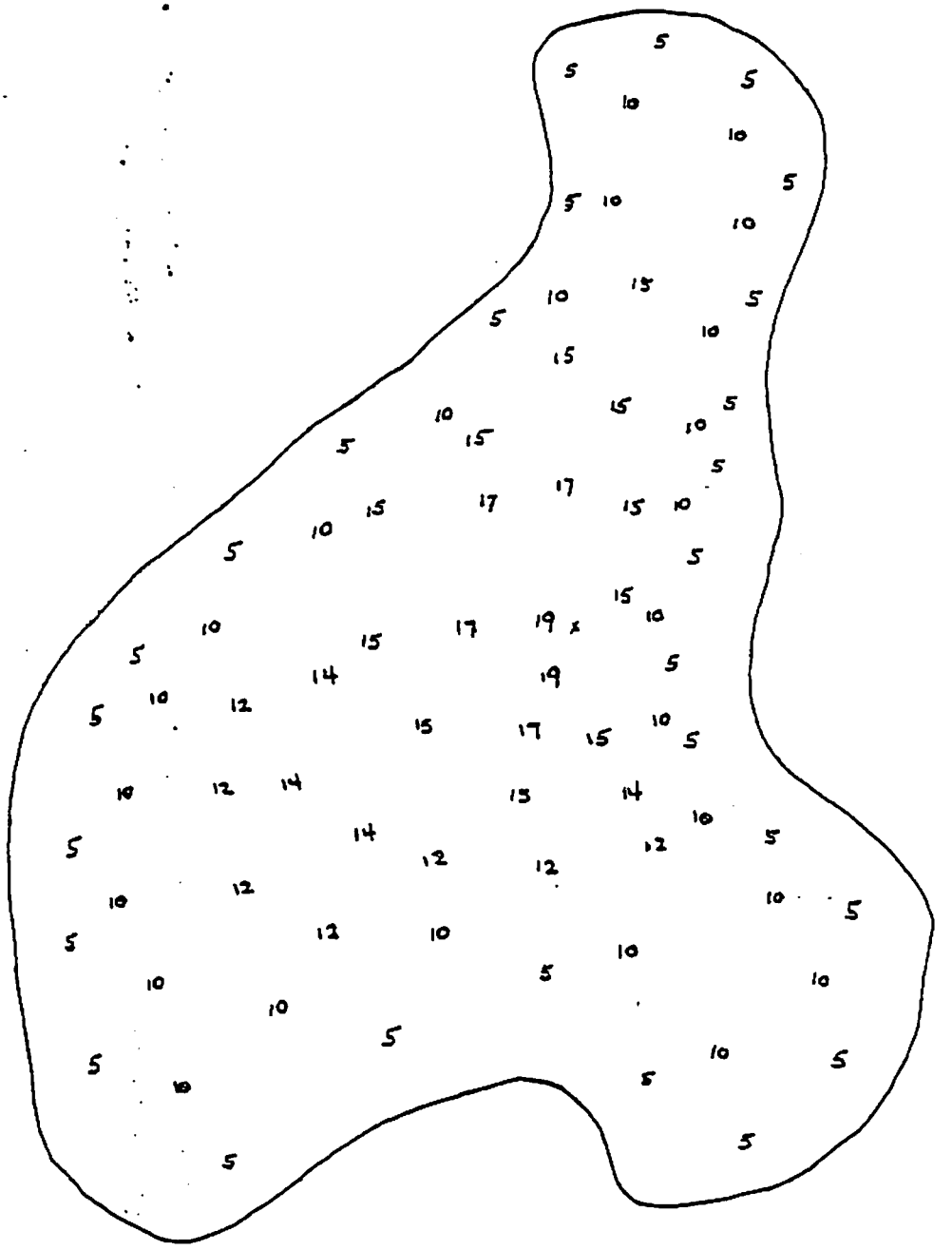


Scale 1:200'



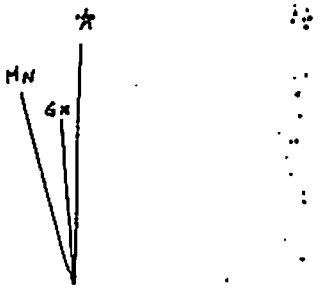
EZEKIEL POND

(Bathymetric Map)



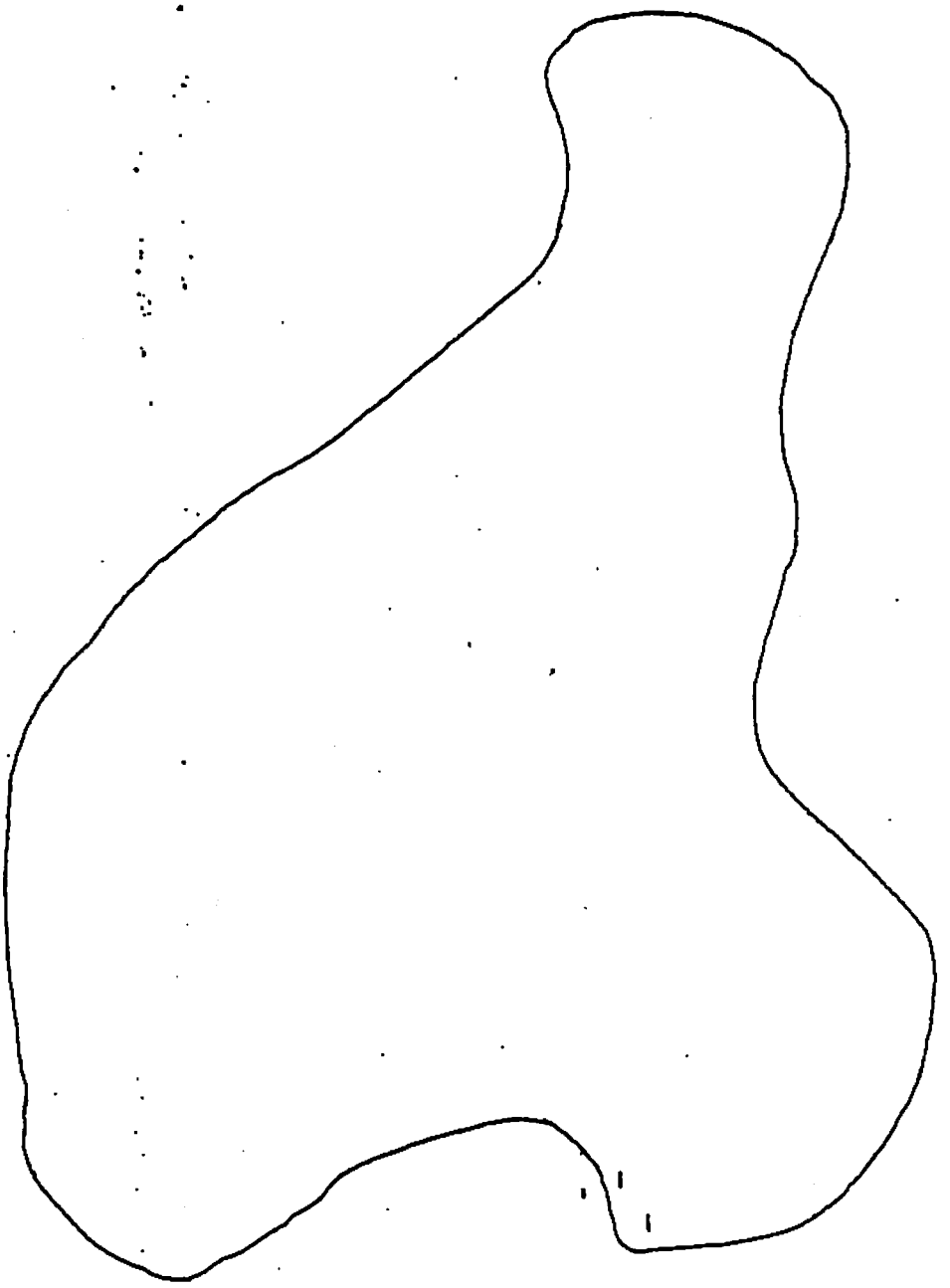
Maximum depth 19' 5.79 M
Mean depth 10' 3.05 M
Surface Area 36 acres 14.55 H .
Acre feet 360
Total gals. 117,306,360

Scale 1:200'



EZEKIEL POND

Floating Aquatic Plant Map with Key



Scale 1:200'

FLOATING AQUATIC PLANTS ATTACHED

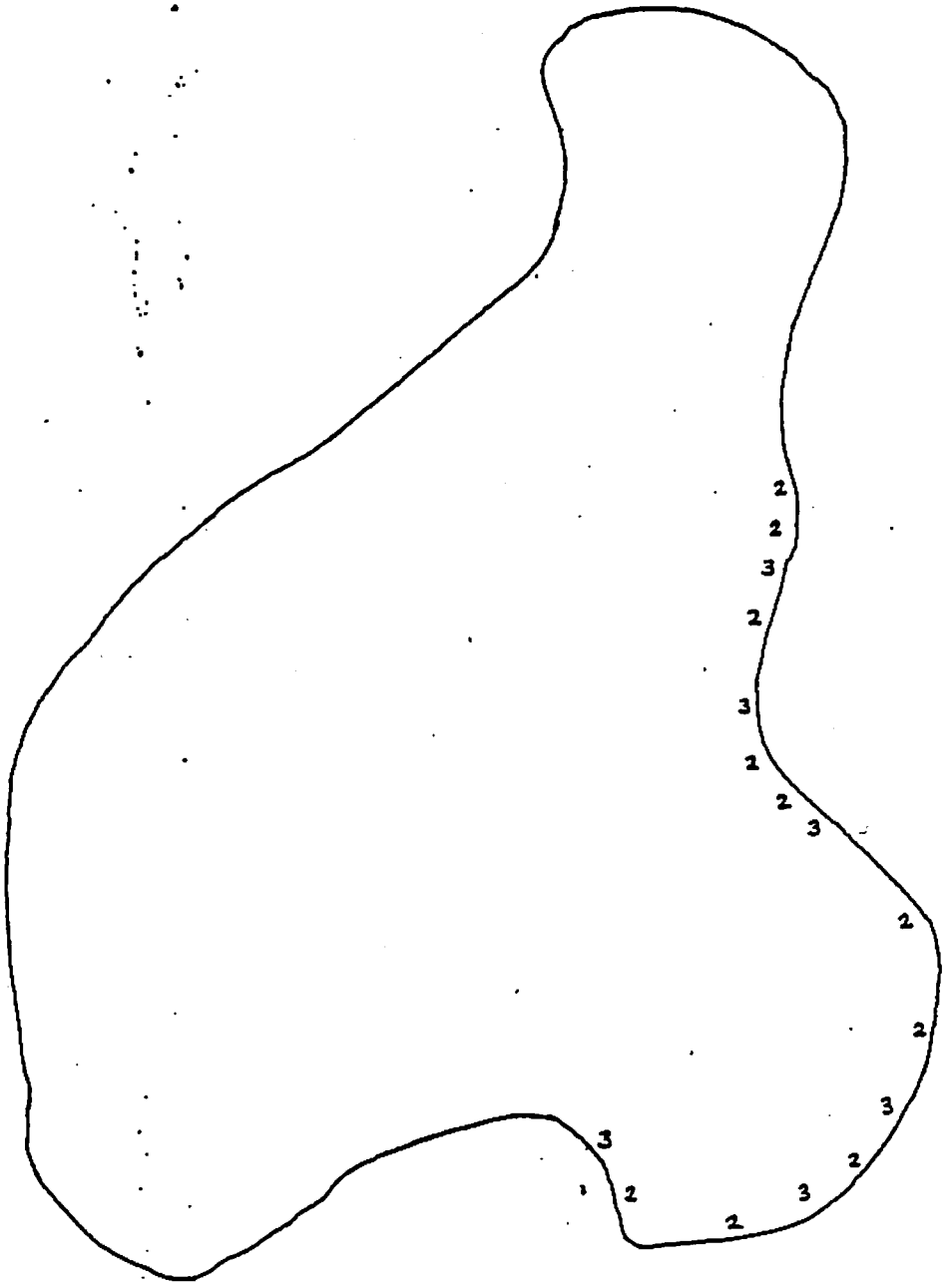
LATIN	COMMON	MAP NUMBER
Nuphar	Cow Lily, Yellow Water Lily, Spatterdock	
Nymphaea	Water Lily, White Water Lily	1
Brasenia	Watershield	
	Addenda	

FLOATING AQUATIC PLANTS - UNATTACHED

LATIN	COMMON	MAP NUMBER
Lemna	Duckweed	
Spirodelia	Big Duckweed	
Wolffia	Watermeal	
	Addenda	

EZEKIEL POND

Emersed Aquatic Plant Map with Key



Scale 1:200'

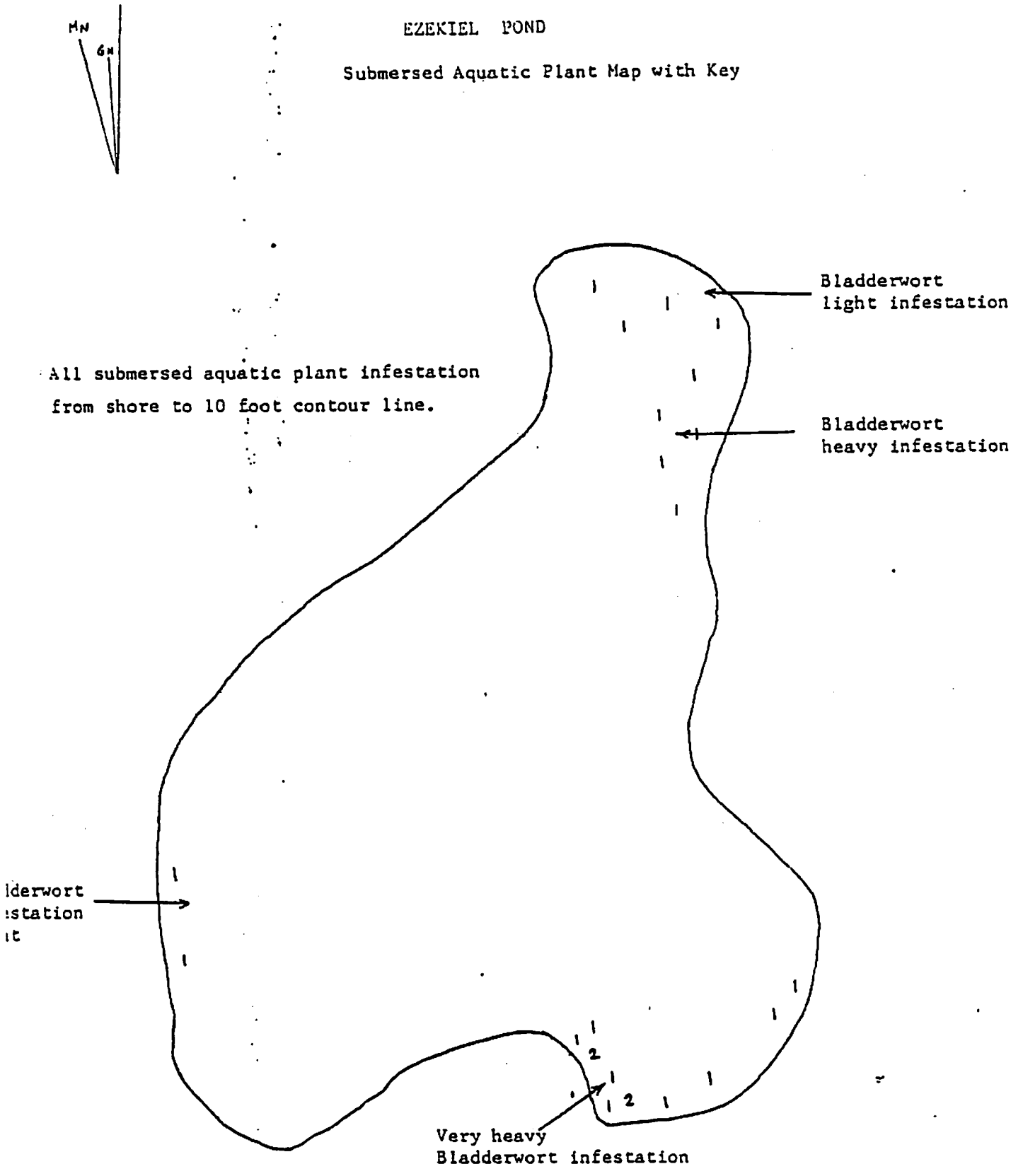
EMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Peltandra	Arrow Arum	
Pontederia	Pickerel Weed	
Sagittaria	Arrowhead; Duck Potatoe	
Polygonum	Watersmart Weed	
Typha	Cattail	
Eleocharis	Spike Rush Sedge	3
Scirpus	Bulrush Sedge	
Juncaceae	Juncus Rush	2

Addenda

EZEKIEL POND

Submersed Aquatic Plant Map with Key



Scale 1:200'

SUBMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	
Potamogeton Natans	Floating Brown Leaf	
Potamogeton Nodosus	American Pondweed	
Potamogeton Pectinatus	Sago Pondweed	
Potamogeton Praelongus	White Stem Pondweed	
Potamogeton Richardsonii	Richardson Pondweed	
Potamogeton Robinsii		
Potamogeton Vaginatus	Giant Pondweed	
Najas	Bushy Pondweed	
Zannichellia	Horned Pondweed	
Elodea	Waterweed	
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	
Myriophyllum	Water Milfoil	
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	
Nasturtium	Water, Cress	
Utricularia	Bladderwort	1
Vallisneria	Wild Celery	

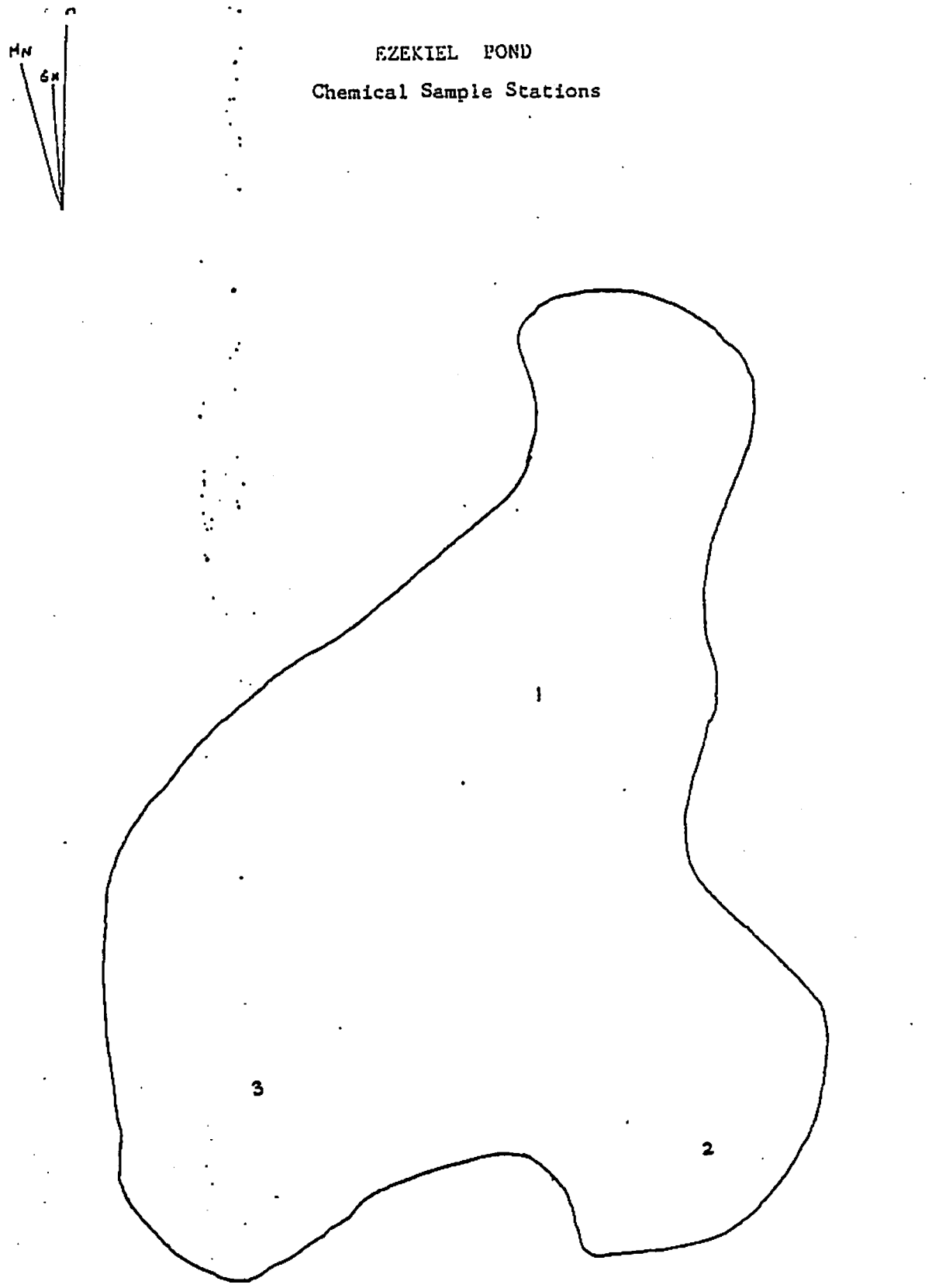
Addenda

Chlorophyceae Green algae

unicellular
filamentous — 2

EZEKIEL POND

Chemical Sample Stations



Scale 1:200'

Ezekiel

	IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.03	.03	.03						
Nitrate (N)	.10	.10	.10						
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	9								
Total Hardness	17								
CO_2	15								
Pn	7								
Temp (C+F) 1' Levels	17° C								
Secchi	7 ft.								

Heavy Metals

Zn	.007
CD	.001
Sn	.004
Au	.001
Fe	.044
P D	.004
AL	.061
Cu	.008
Ni	.010
AG	.014

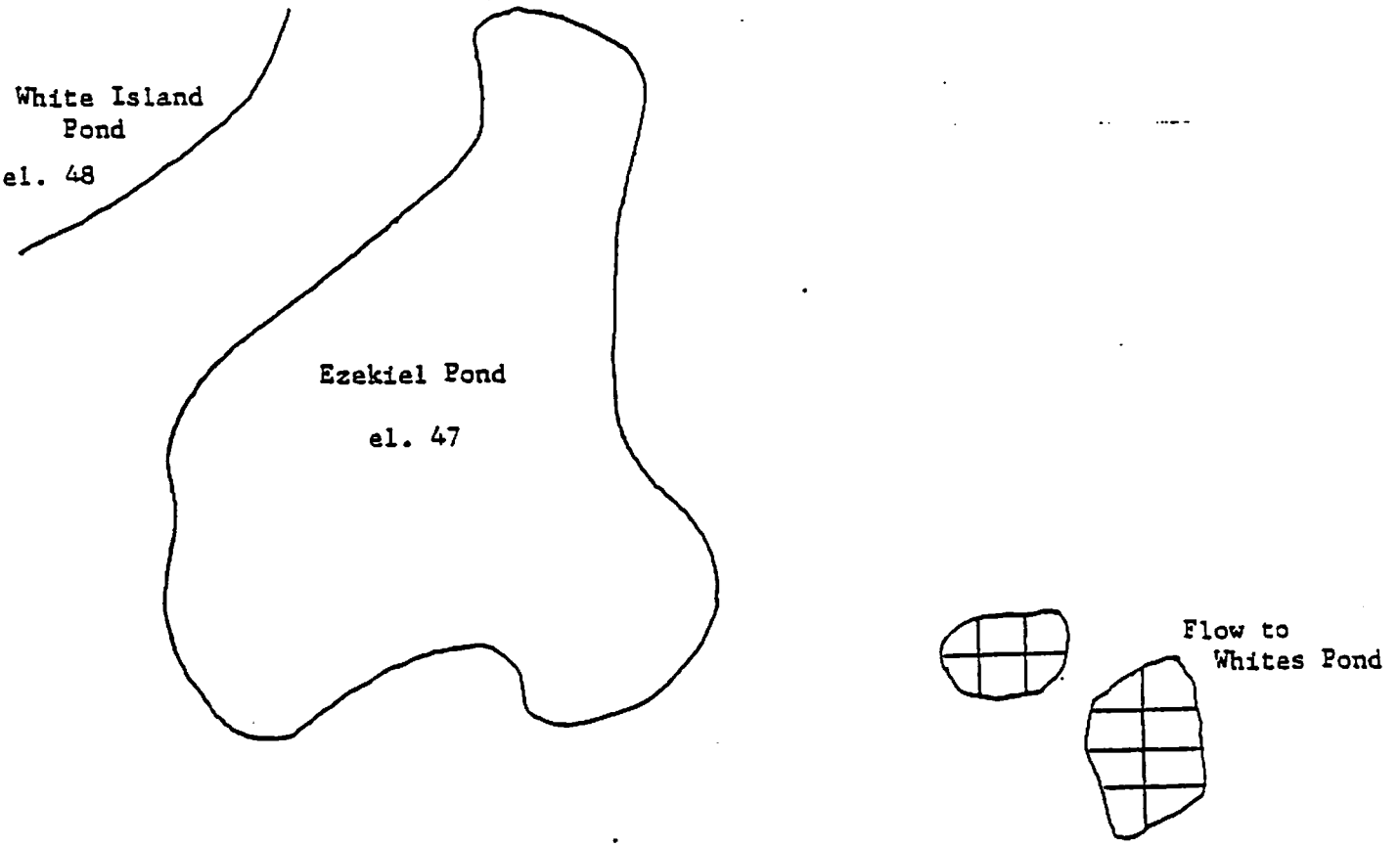
Benthos

Total P	162
Total Nitrogen	2.4
Percent solids	12.8
Total volatile solids	.47

All figures in mg/l unless otherwise noted.

EZEKIEL POND

Impoundment Map



Pond type: kettlehole
Tributary: none
Outfall: none
Overland flow: none

Groundwater and underground aquifers	primary source
Rainfall	secondary source
Surface run-off	secondary source

Agriculture practices directly affecting impoundment none
Industrial practices directly affecting impoundment none
Possible source of nutrient influx. Many homes permanent and seasonal around pond perimeter.

Cranberry bogs

Scale 1:47

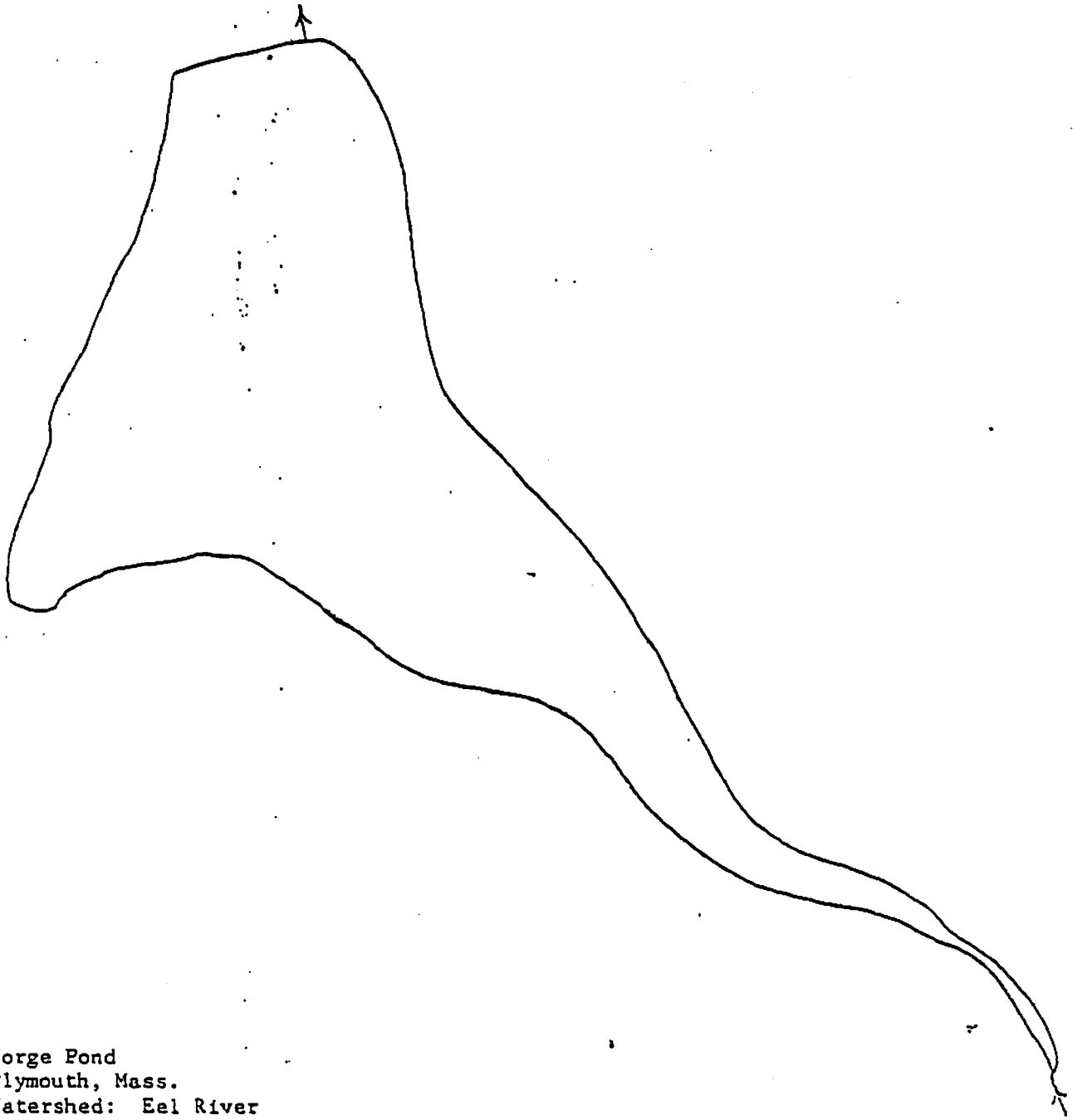
EZEKIEL

Using a modified trophic level index Ezekiel ranks 14th.

It is a fairly deep pond with a maximum depth of 19 feet. It is spring fed with fairly deep slopes. Macrophyte population is low, with very few floating aquatic - very little emergent growth, and a small submersed population. No unicellular algae are apparent. Secchi disc reading was low at 7 feet and Ezekiel ranked 26th in this parameter. Phosphate readings were above permissable levels, and nitrate readings were above permissable levels.

Number of houses affecting pond: about 65 on shoreline.
Cranberry bogs affecting impoundment: none
Problem: Dense population, even though this pond is rated eutrophic it appears to be worsening. An algae bloom situation is very possible.

FORGE POND

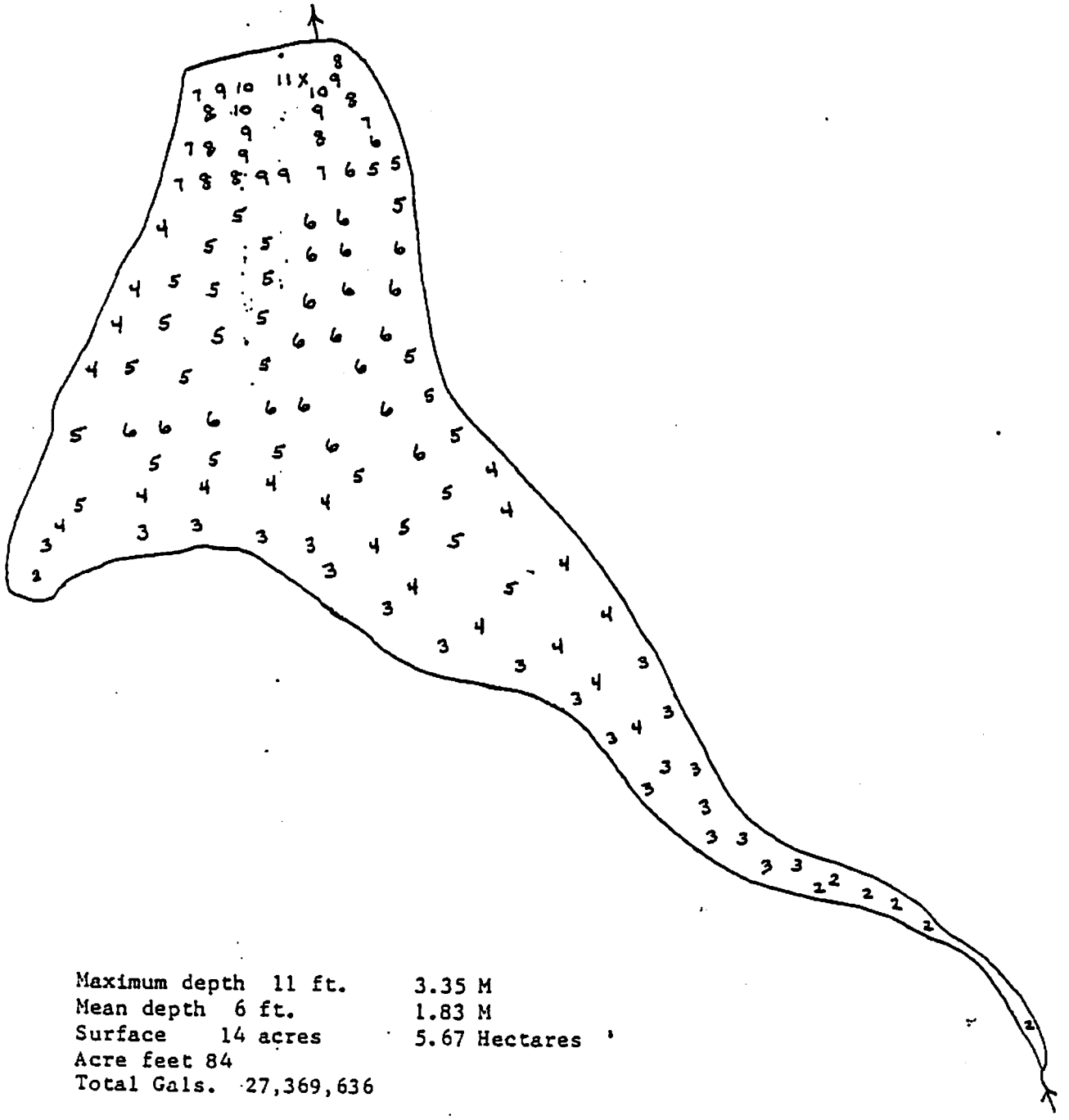


Forge Pond
Plymouth, Mass.
Watershed: Eel River
Acres: 14
Altitude: 29
Water type: warm
Pond type: artificial
Stratified: no
Pond use: irrigation, aesthetic, recreation
Topo sheet USGS 1:24000 Manomet, Mass.
Position Topo sheet up 7.7 A 1.9
Shoreline distance .9 miles

Scale 1:245

FORGE POND

Bathymetric Map

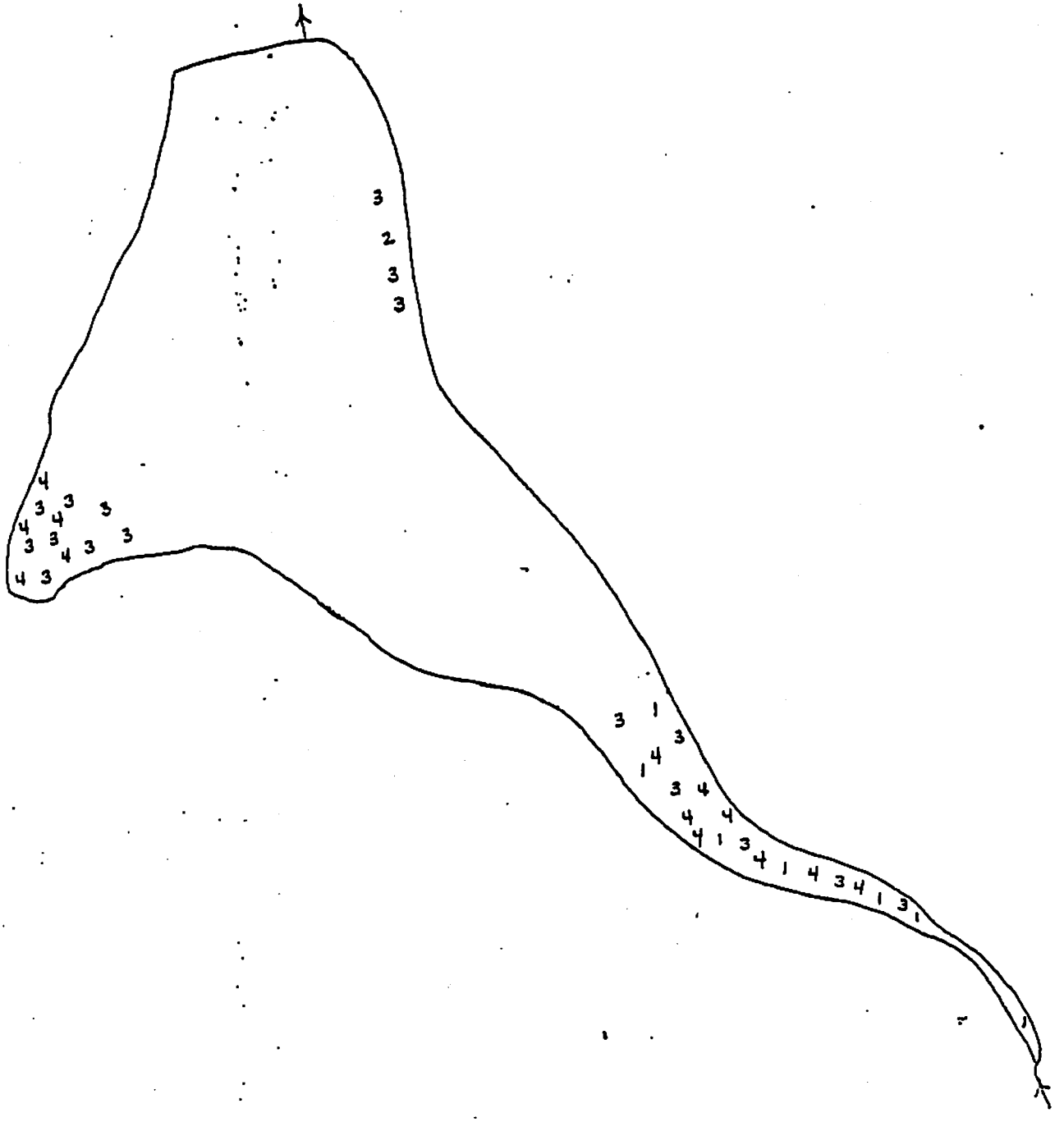


Maximum depth 11 ft. 3.35 M
Mean depth 6 ft. 1.83 M
Surface 14 acres 5.67 Hectares
Acre feet 84
Total Gals. 27,369,636

Scale 1:245

FORGE POND

Floating Aquatic Plants with Key



Scale 1:245

FLOATING AQUATIC PLANTS ATTACHED

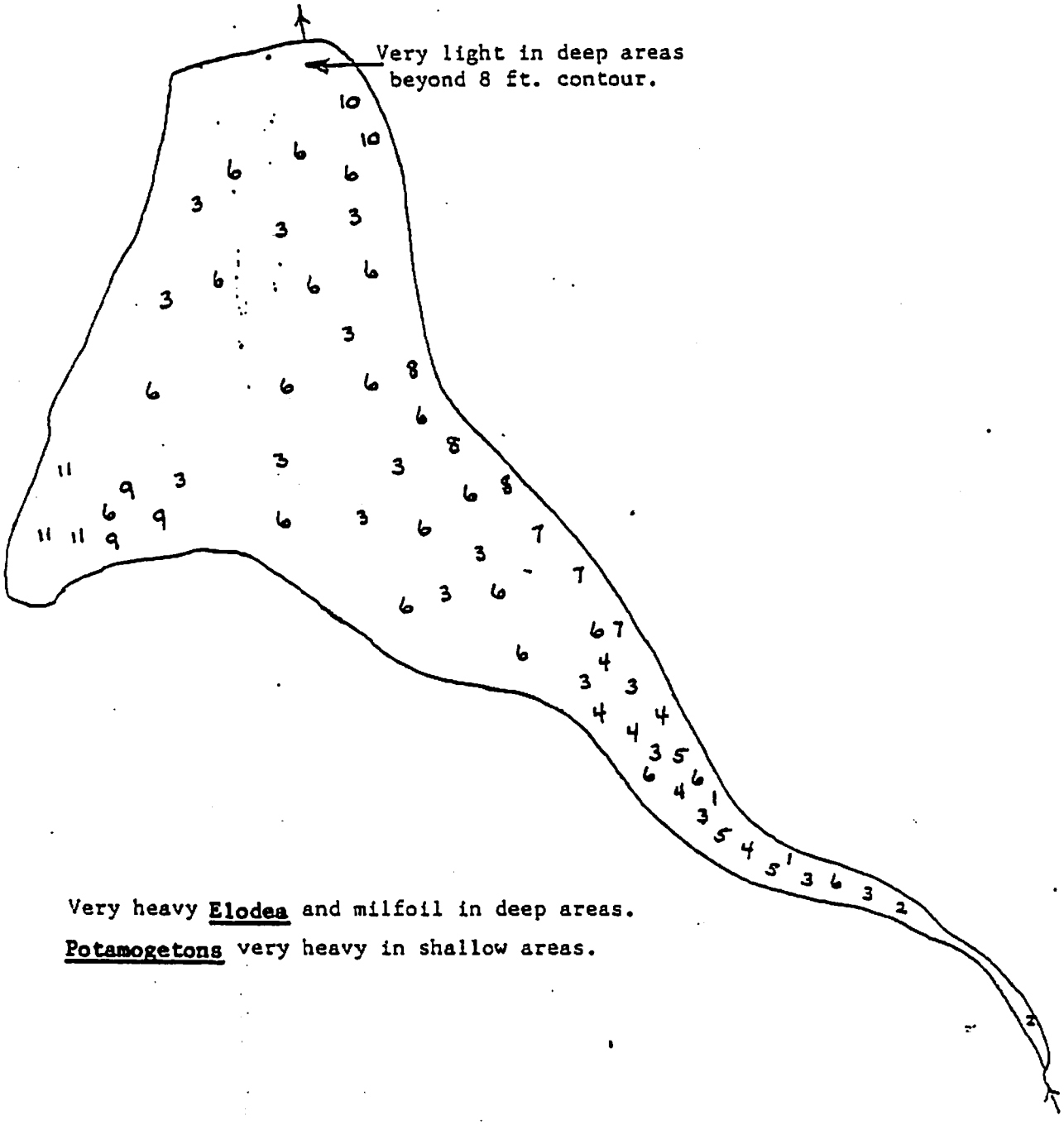
LATIN	COMMON	MAP NUMBER
Nuphar	Cow Lily, Yellow Water Lily, Spatterdock	2
Nymphaea	Water Lily, White Water Lily	4
Brasenia	Watershield	3
	Addenda	

FLOATING AQUATIC PLANTS - UNATTACHED

LATIN	COMMON	MAP NUMBER
Lemna	Duckweed	1
Spirodelia	Big Duckweed	
Wolffia	Watermeal	
	Addenda	

FORGE POND

Submersed Aquatic Plant Map with Key



Very heavy **Elodea** and milfoil in deep areas.

Potamogetons very heavy in shallow areas.

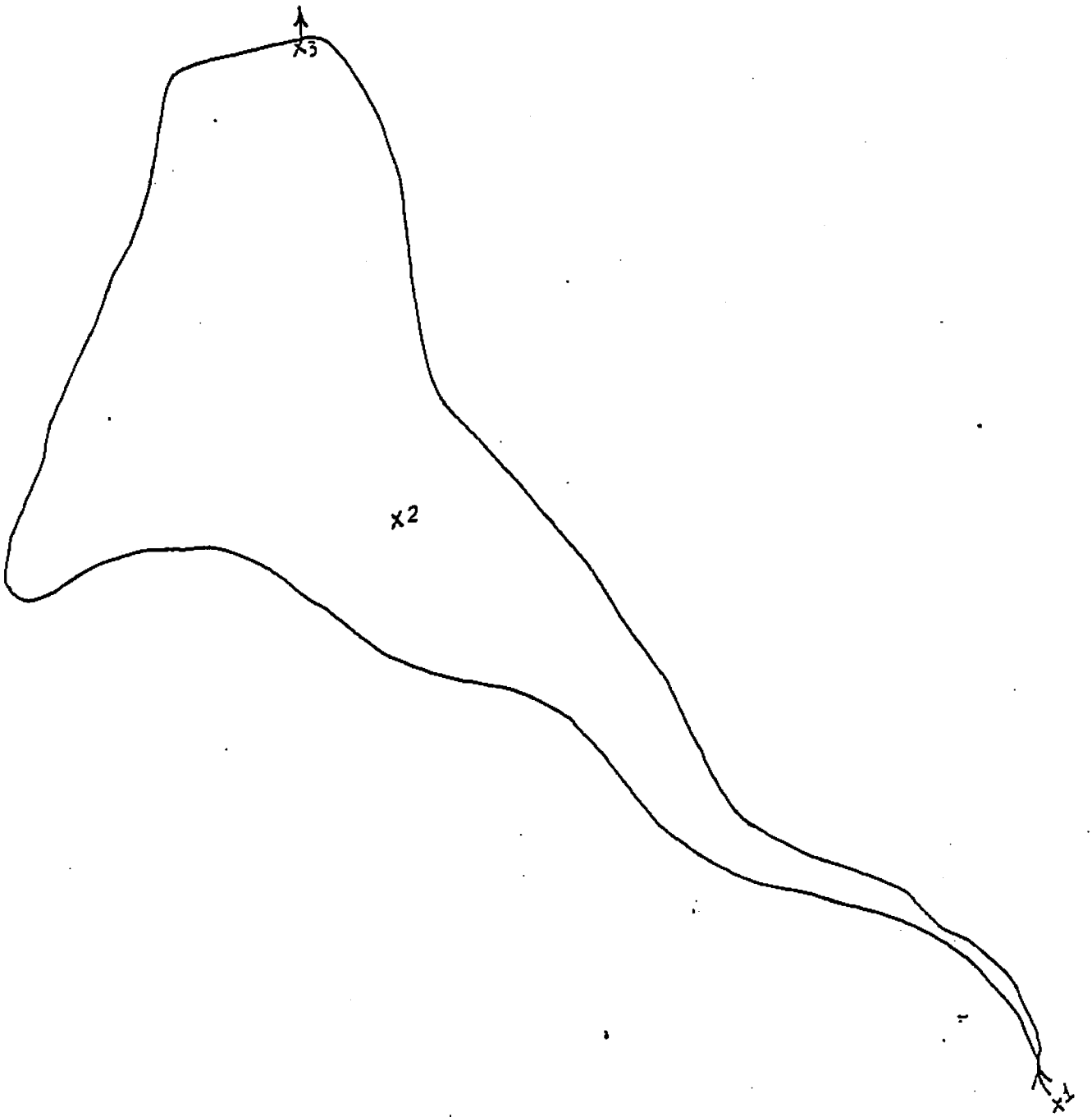
Scale 1:245

SUBMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	1
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	
Potamogeton Natans	Floating Brown Leaf	11
Potamogeton Nodosus	American Pondweed	
Potamogeton Pectinatus	Sago Pondweed	9
Potamogeton Praelongus	White Stem Pondweed	
Potamogeton Richardsonii	Richardson Pondweed	
Potamogeton Robinsii		
Potamogeton Vaginatus	Giant Pondweed	
Najas	Bushy Pondweed	7
Zannichellia	Horned Pondweed	
Elodea	Waterweed	6
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	5
Myriophyllum	Water Milfoil	3
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	
Nasturtium	Water, Cress	
Utricularia	Bladderwort	8
Vallisneria	Wild Celery	10
	Addenda	
	Algae	
Chlorophyceae	green	
unicellular		
filamentous		4
Cyanophyceae	blue-green	
unicellular		
filamentous		2

FORGE POND

Sample Station Location Map



Scale 1:245

	Forge IN LAKE STATION 1 2 3	OUTFALL 1 2 3	SOURCES 1 2 3
Total P	.08	.07	.07
Nitrate (N)	.10	.10	.10
Free Acid	0		
Total Acidity	0		
Alkalinity	0		
DO	8		
Total Hardness	12		
CO_2	14		
Pn	65		
Temp (C+F) 1' Levels	15° C		
Secchi	6 ft.		

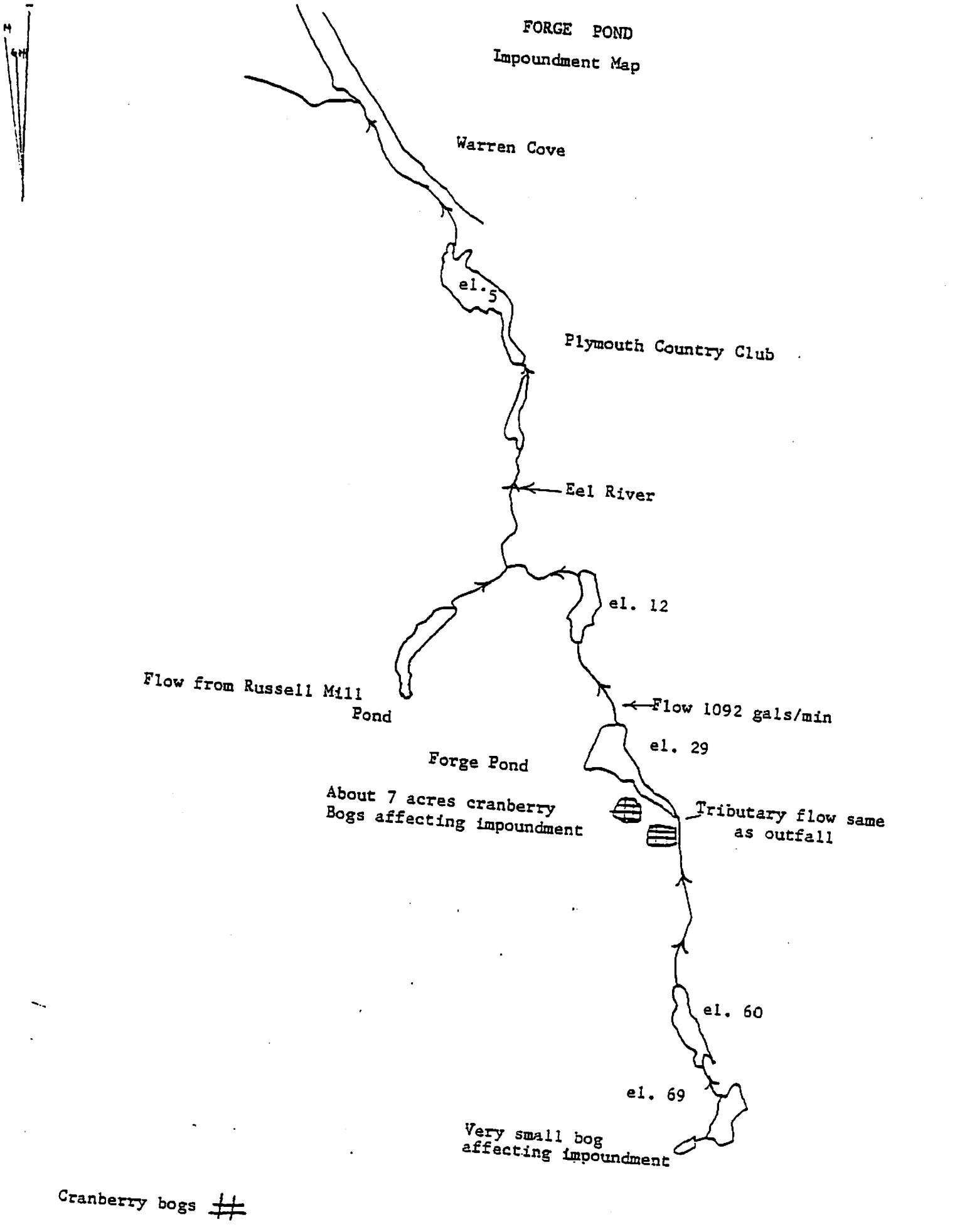
Heavy Metals

Zn	.004
CD	.001
Sn	.010
Au	.003
Fe	.400
P D	.010
AL	.035
Cu	.006
Ni	.025
AG	.005

Benthos

Total P	721
Total Nitrogen	9.7
Percent solids	5.6
Total volatile solids	.42

All figures in mg/l unless otherwise noted.


FORGE POND
Impoundment Map
Warren Cove
el. 5
Plymouth Country Club
Eel River
el. 12
Flow from Russell Mill Pond
Flow 1092 gals/min
el. 29
Forge Pond
About 7 acres cranberry Bogs affecting impoundment
Tributary flow same as outfall
el. 60
el. 69
Very small bog affecting impoundment
Cranberry bogs

FORGE POND

Forge Pond ranks 29 using a modified trophic level index. It is an artificial, non-stratified, warm water pond with a maximum depth of 11 feet. Floating aquatic plants covered 14% of the pond, with white water lilies the dominant species. Immersed aquatic plants were dense at tributary end of pond. Submerged aquatic covered bottom with 65% classified as dense, the rest medium. Dominant species were milfoil, elodea, and potamogetons. Green and blue-green filamentous algae, covered the bottom. On plant trophic index it ranked 34th. The secchi reading was 8 feet, which ranked it 29th. The phosphate readings were critical. The nitrate readings were permissible.

Number of houses affecting impoundment: approx. 4. Cranberry acreage affecting system:approx. 7 acres

Problem: Some run-off from farmland a high probability. The tributary flow through cranberry growing areas would be a source of nutrient flux. This was rated ultraeutrophic.

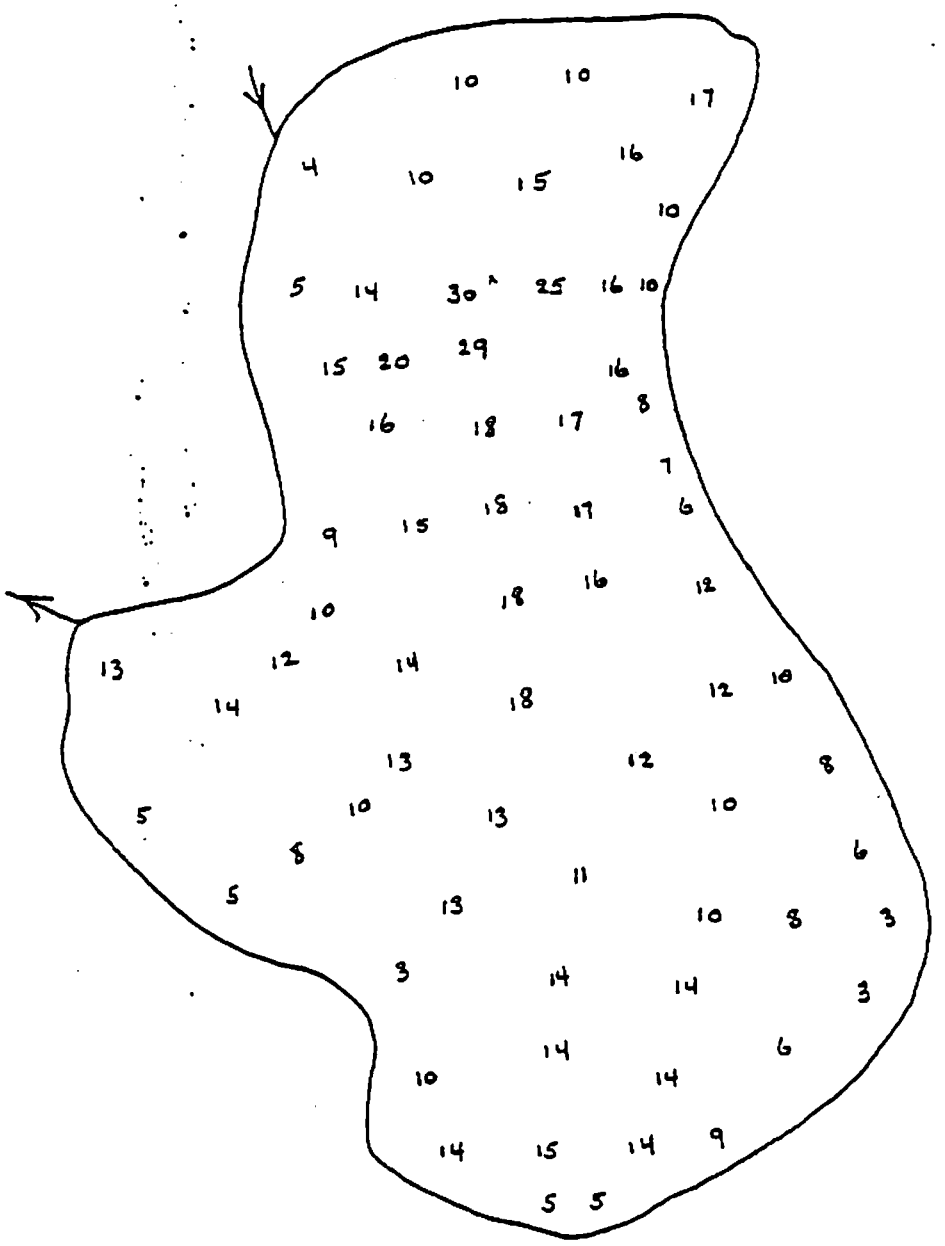
FRESH POND

sh Pond
mouth, Mass.
ershed type: coastal
es: 62
itude: 014'
er type: cold
d type: natural
atified: yes
d use: recreation, esthetic, irrigation
o sheet: USGS 1:2400 Manomet, Mass.
ition Topo sheet: up 5.3 right 9.3
reline distance 1.3 miles 6864'

Scale 1:375'

FRESH POND

(Bathymetric Map)

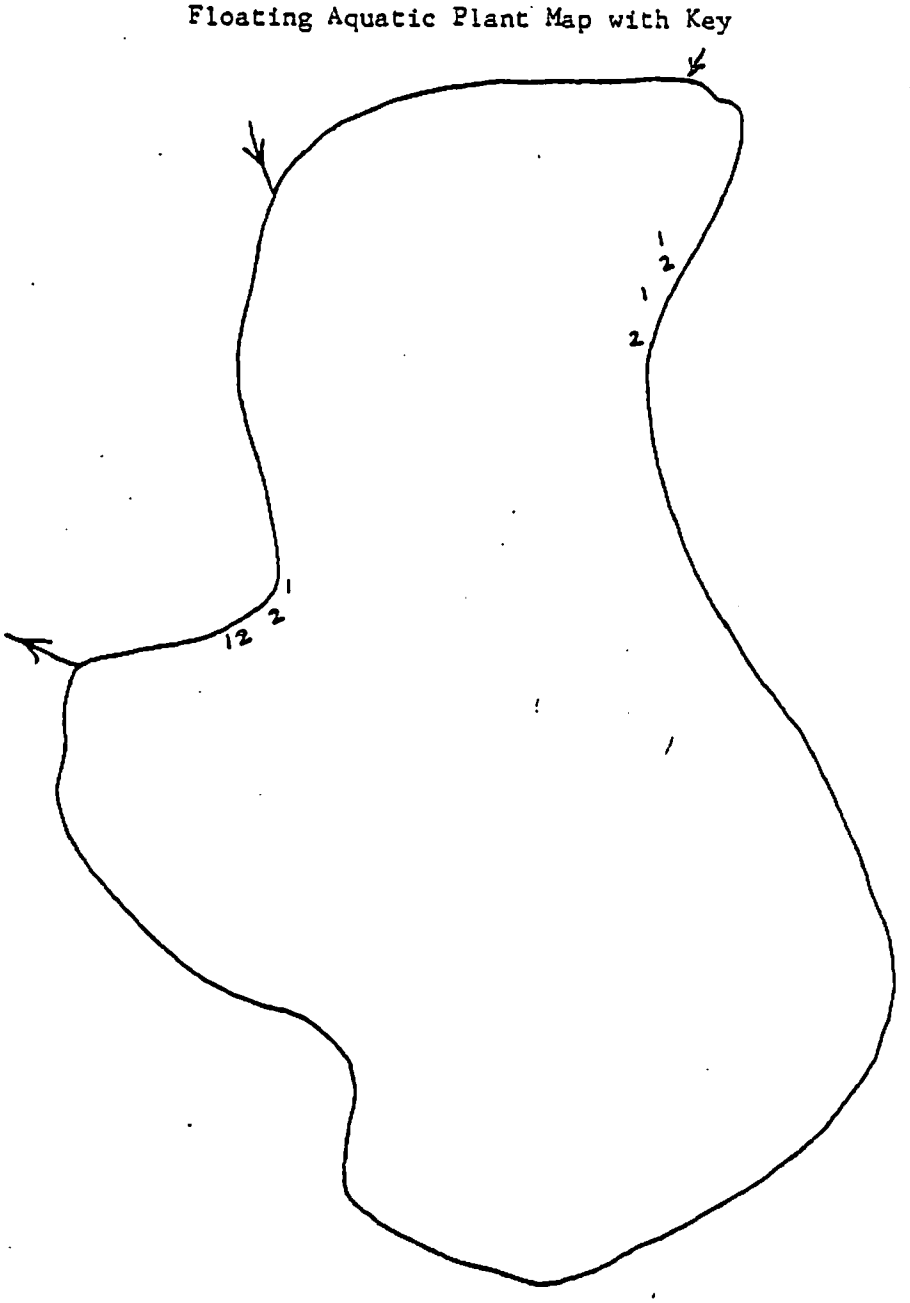


Maximum depth 30' 9.144 M
Mean depth 15' 4.572 M
Surface area 62 acres 25.1 H
Acre feet 930
Total gals. 303,041,430

Scale 1:375'

FRESH POND

Floating Aquatic Plant Map with Key



Scale 1:375'

FLOATING AQUATIC PLANTS ATTACHED

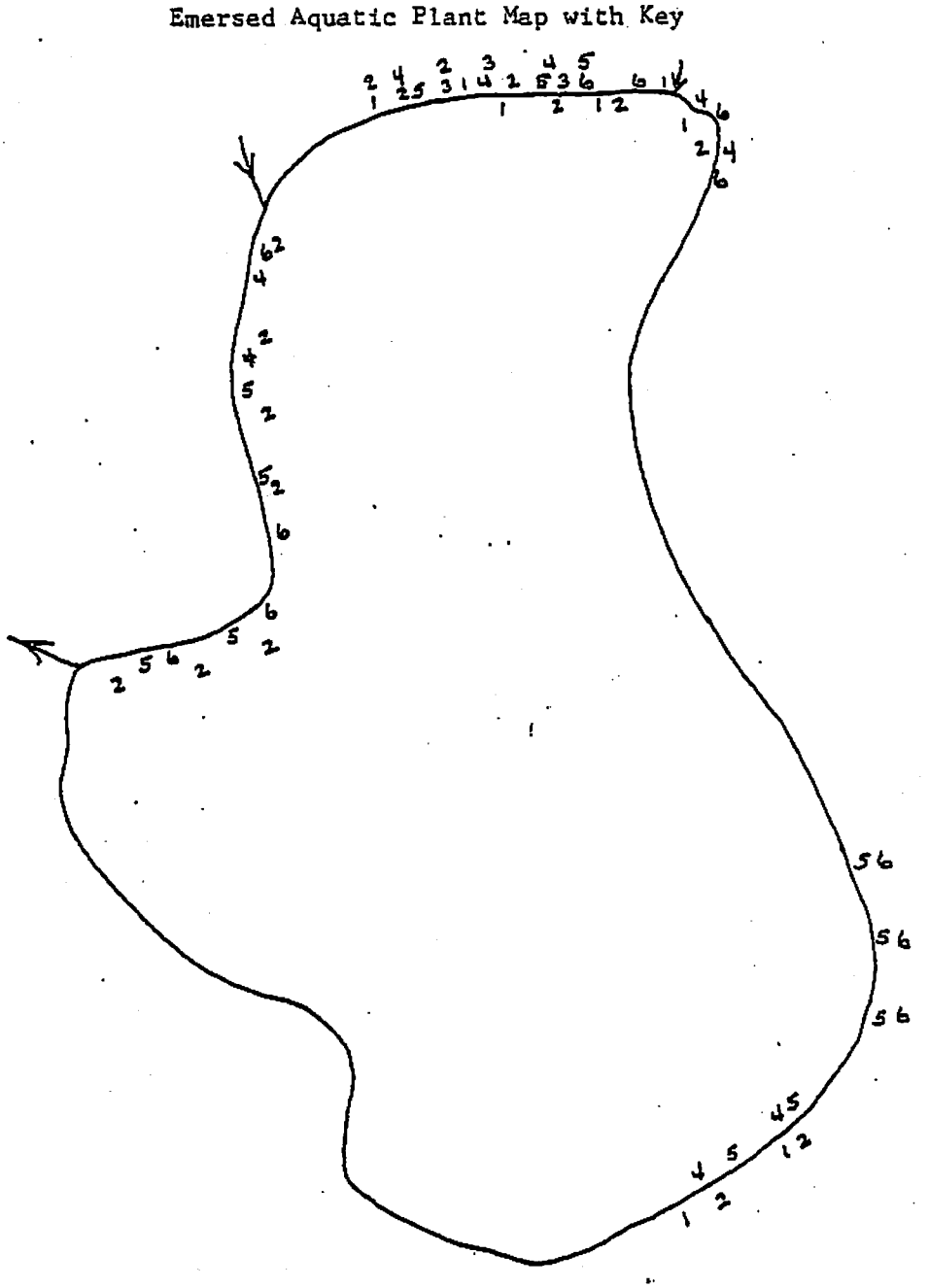
LATIN	COMMON	MAP NUMBER
Nuphar	Cow Lily, Yellow Water Lily, Spatterdock	
Nymphaea	Water Lily, White Water Lily	1
Brasenia	Watershield	2
	Addenda	

FLOATING AQUATIC PLANTS - UNATTACHED

LATIN	COMMON	MAP NUMBER
Lemna	Duckweed	
Spirodelia	Big Duckweed	
Wolffia	Watermeal	
	Addenda	

FRESH POND

Emersed Aquatic Plant Map with Key



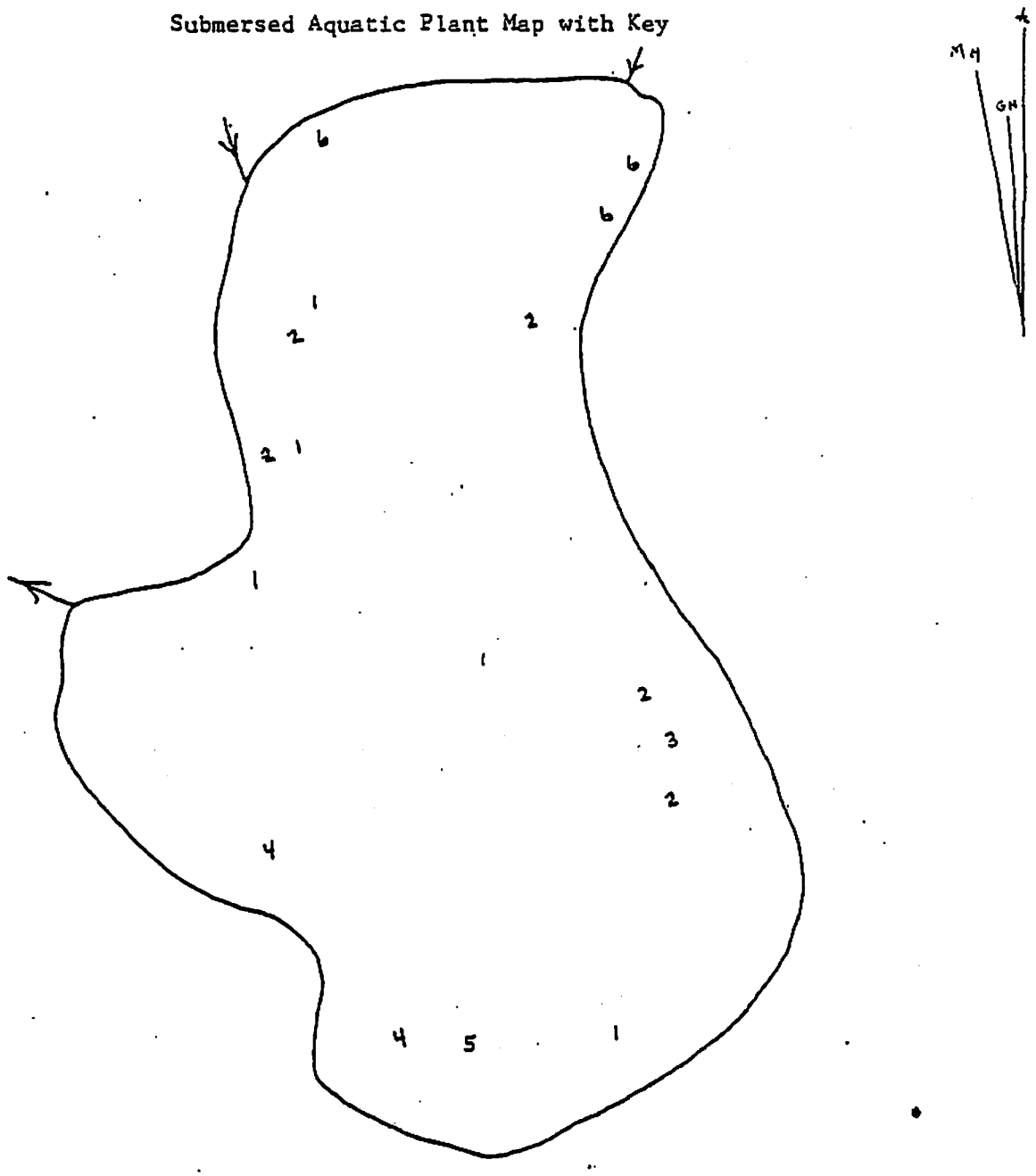
Scale 1:375'

EMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Peltandra	Arrow Arum	1
Pontederia	Pickerel Weed	2
Sagittaria	Arrowhead; Duck Potatoe	
Polygonum	Watersmart Weed	
Typha	Cattail	3
Eleocharis	Spike Rush Sedge	4
Scirpus	Bulrush Sedge	5
Juncaceae	Juncus Rush	6
	Addenda	

FRESH POND

Submersed Aquatic Plant Map with Key



All counts classified as very low.

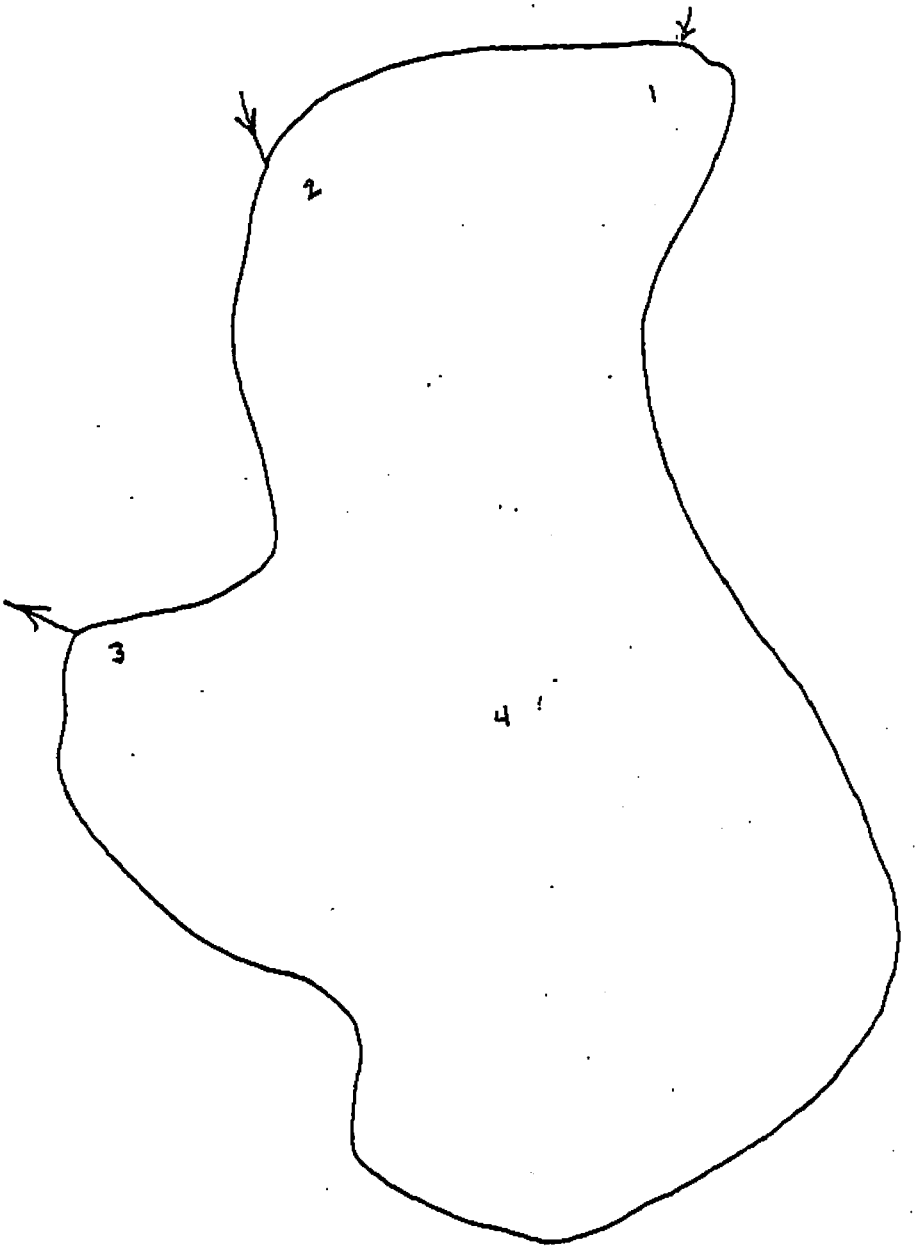
Scale 1:375'

SUBMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus	Large Leaf Pondweed	
Potamogeton Ampl. Folius	Curly Leaf Pondweed	
Potamogeton Crispus	Waterthread Pondweed	1
Potamogeton Diversifolius	Leafy Pondweed	
Potamogeton Filiformus	Variable Pondweed	
Potamogeton Filiosus	Floating Brown Leaf	
Potamogeton Gramineus	American Pondweed	
Potamogeton Natans	Sago Pondweed	2
Potamogeton Nodosus	White Stem Pondweed	
Potamogeton Pectinatus	Richardson Pondweed	
Potamogeton Praelongus		
Potamogeton Richardsonii		
Potamogeton Robinsii		
Potamogeton Vaginatus	Giant Pondweed	
Najas	Bushy Pondweed	
Zannichellia	Horned Pondweed	
Elodea	Waterweed	3
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	
Myriophyllum	Water Milfoil	
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	6
Nasturtium	Water, Cress	
Utricularia	Bladderwort	4
Vallisneria	Wild Celery	
	Addenda	
NITELLA	ALGAE	5

FRESH POND

Chemical Sample Stations



Scale 1:375'

	Fresh IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.04	.03	.04						
Nitrate (N)	.20	.20	.20						
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	10								
Total Hardness	14								
CO_2	12								
Pn	63								
Temp (C+F) 1' Levels	18° C								
Secchi	19								

Heavy Metals

Zn	.004
CD	.001
Sn	.014
Au	.002
Fe	.393
PΦ	.01
AL	.05
Cu	.008
Ni	.020
AG	.007

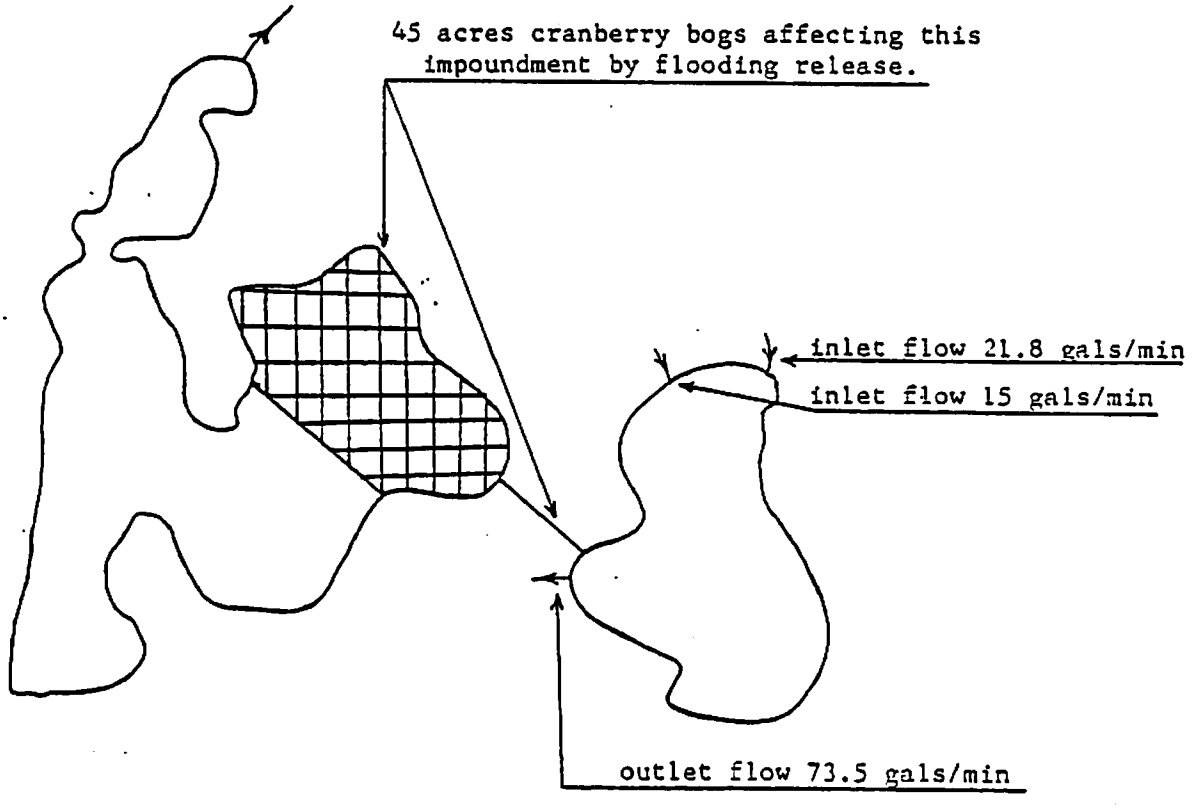
Benthos

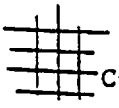
Total P	293
Total Nitrogen	10.9
Percent solids	2.3
Total volatile solids	.58

All figures in mg/l unless otherwise noted.

FRESH POND

Impoundment Map




Cranberry Bogs

Scale 1:1260'

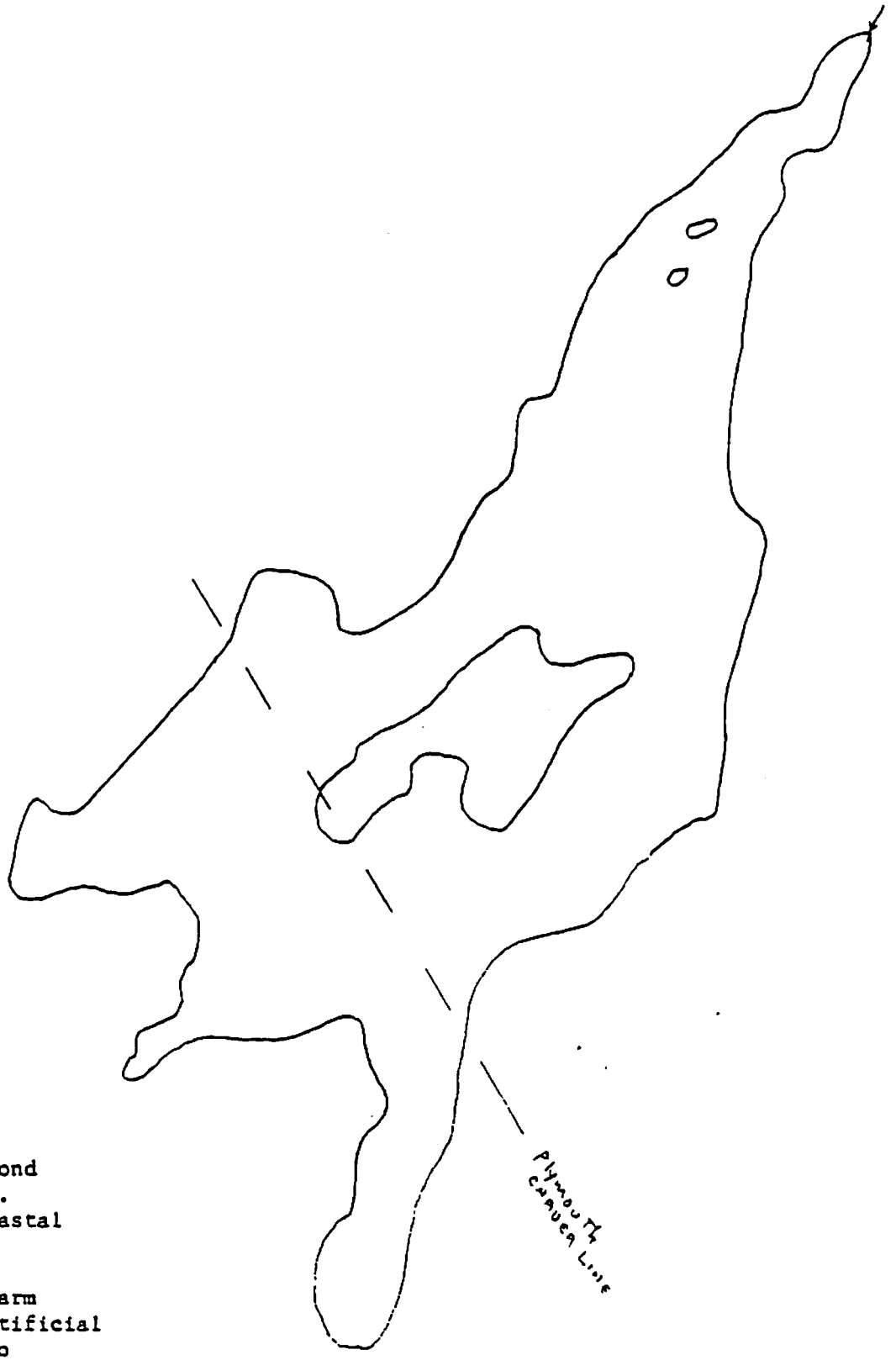
FRESH POND

Fresh Pond ranks 6 using a modified trophic level index. It is a natural, stratified, spring-fed, steep sloping, cold water pond, with maximum depth of 30 feet. Macrophyte population was low in all categories. On plant trophic index, it ranked 7th. The secchi disc reading was 19 feet, and in this index it ranked 7th. The phosphate readings were critical. The nitrate readings were high.

Number of houses affecting impoundment: approx. 65. The cranberry acreage affecting system: approx 45 acres.

Problems: Southwest shore showed medium infestation of elodea and bladderwort. This would indicate nutrient influx from this area. A potentially heavy contribution could be the park area if policing should fall down. Bog contribution must be appreciable. This pond was rated mesotrophic.

FRESH MEADOW

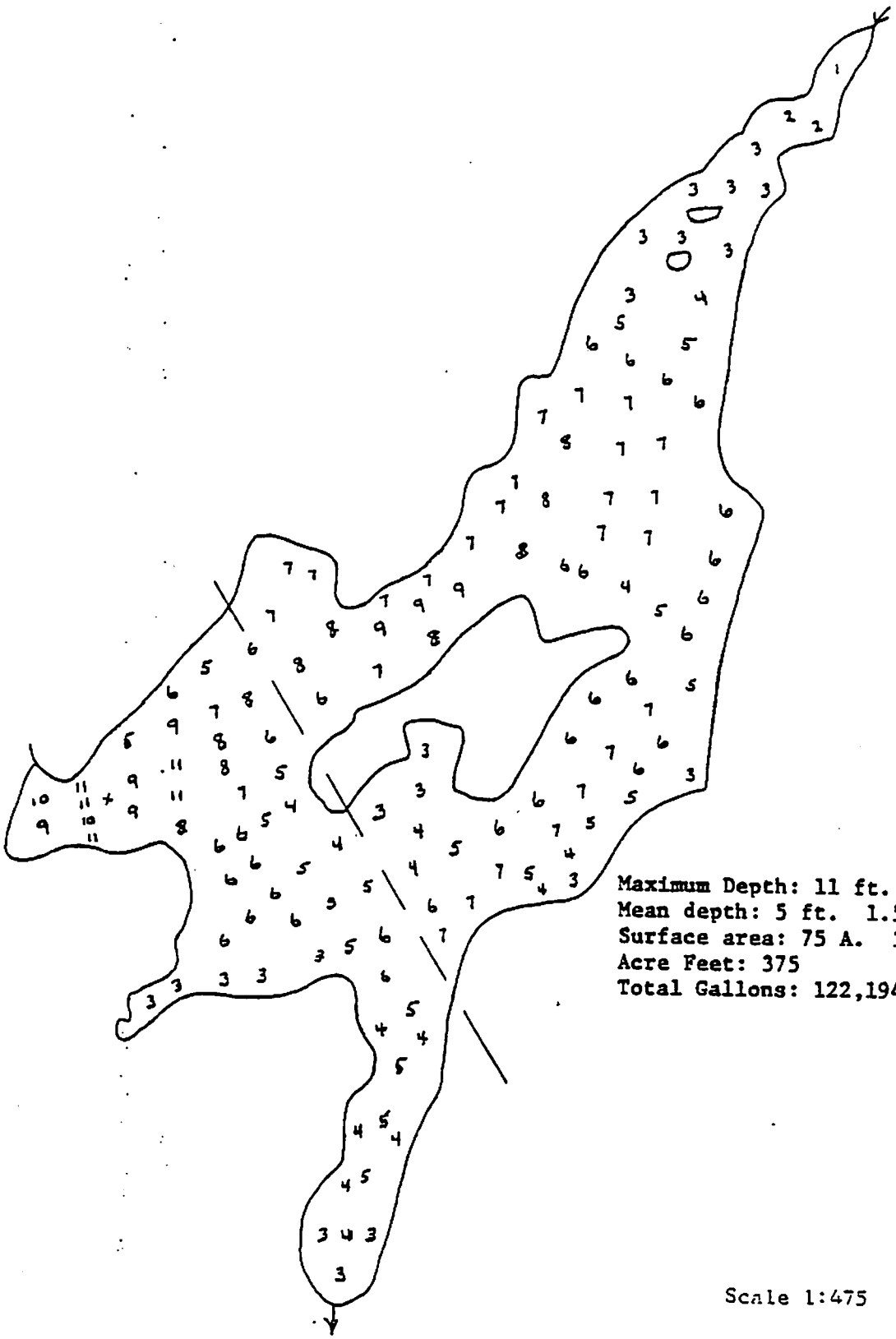


esh Meadow Pond
ymouth, Mass.
tershed: coastal
res: 75
titude: 109
ter type: warm
nd type: artificial
ratified: no
nd use: recreation, irrigation, fishing
po sheet USGS Plymouth
sition Topo sheet up 8 R 1
oreline distance 2.2 M

Scale 1:475'

FRESH MEADOW POND

Bathymetric Map

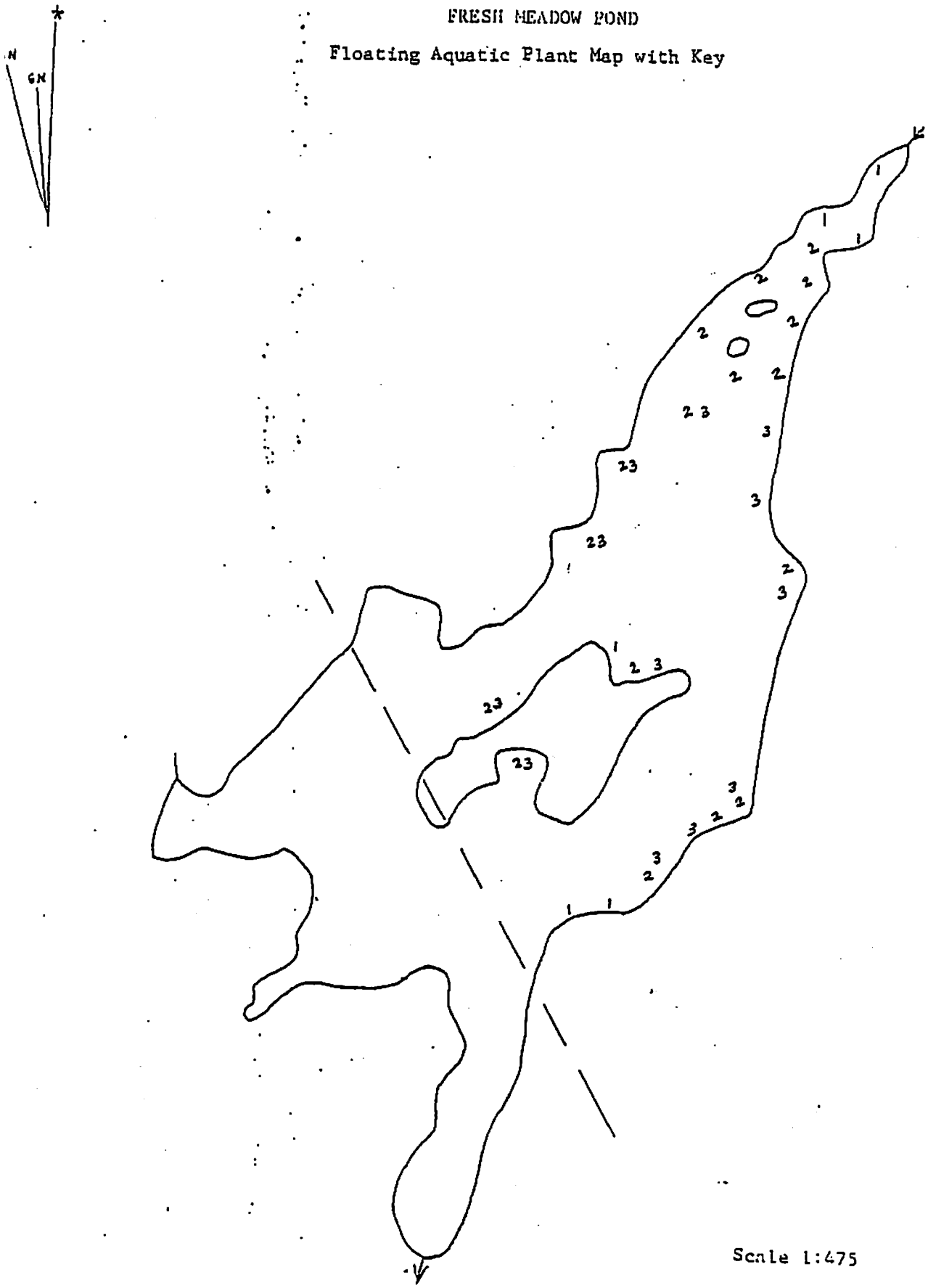


Maximum Depth: 11 ft. 3.4 M
Mean depth: 5 ft. 1.52 M
Surface area: 75 A. 30.4 H.
Acre Feet: 375
Total Gallons: 122,194,125

Scale 1:475

FRESH MEADOW POND

Floating Aquatic Plant Map with Key



Scale 1:475

FLOATING AQUATIC PLANTS ATTACHED

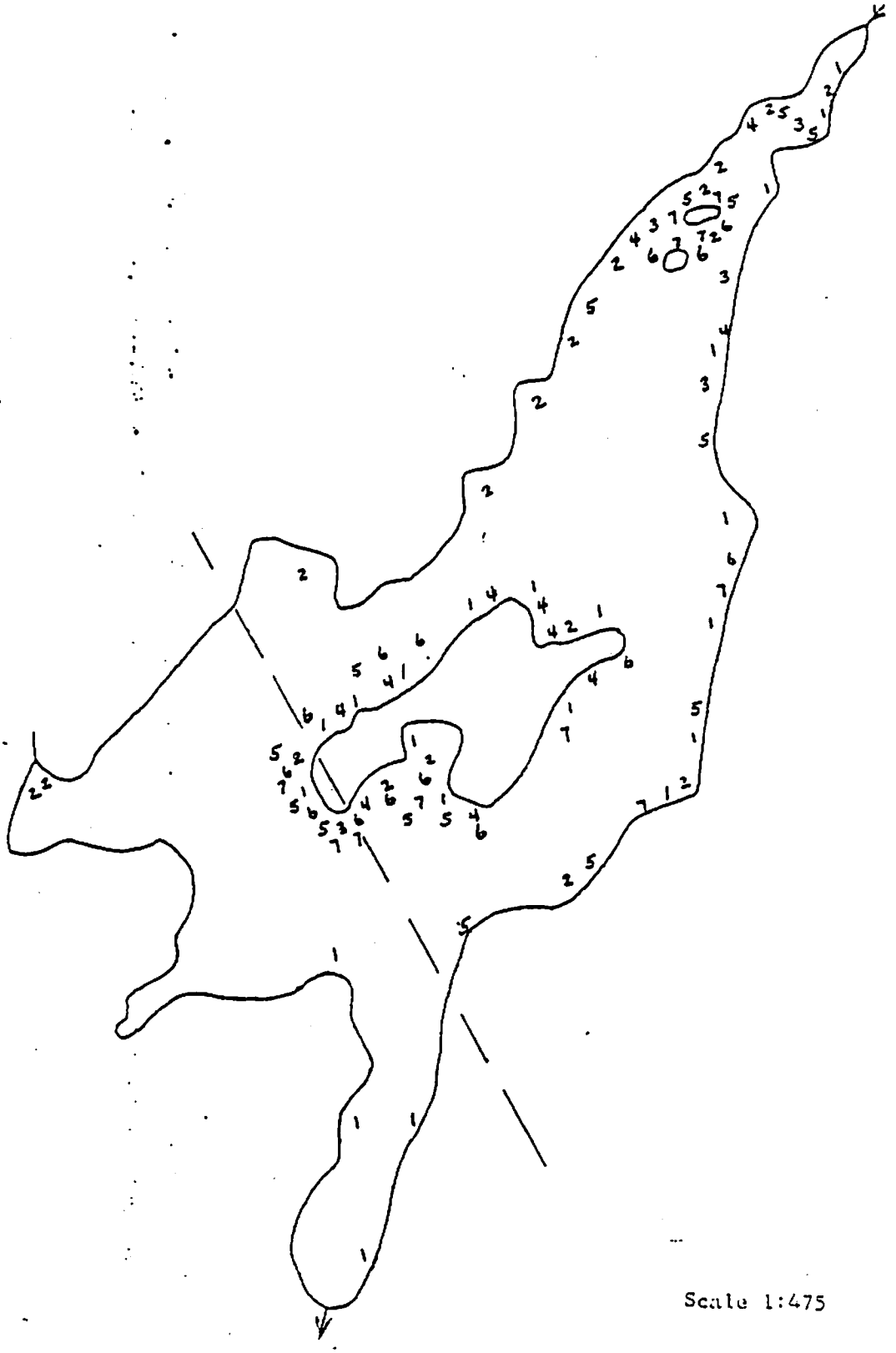
LATIN	COMMON	MAP NUMBER
Nuphar	Cow Lily, Yellow Water Lily, Spatterdock	1
Nymphaea	Water Lily, White Water Lily	2
Brasenia	Watershield	3
	Addenda	

FLOATING AQUATIC PLANTS - UNATTACHED

LATIN	COMMON	MAP NUMBER
Lemna	Duckweed	
Spirodelia	Big Duckweed	
Wolffia	Watermeal	
	Addenda	

FRESH MEADOW POND

Emersed Aquatic Plant Map with Key



Scale 1:475

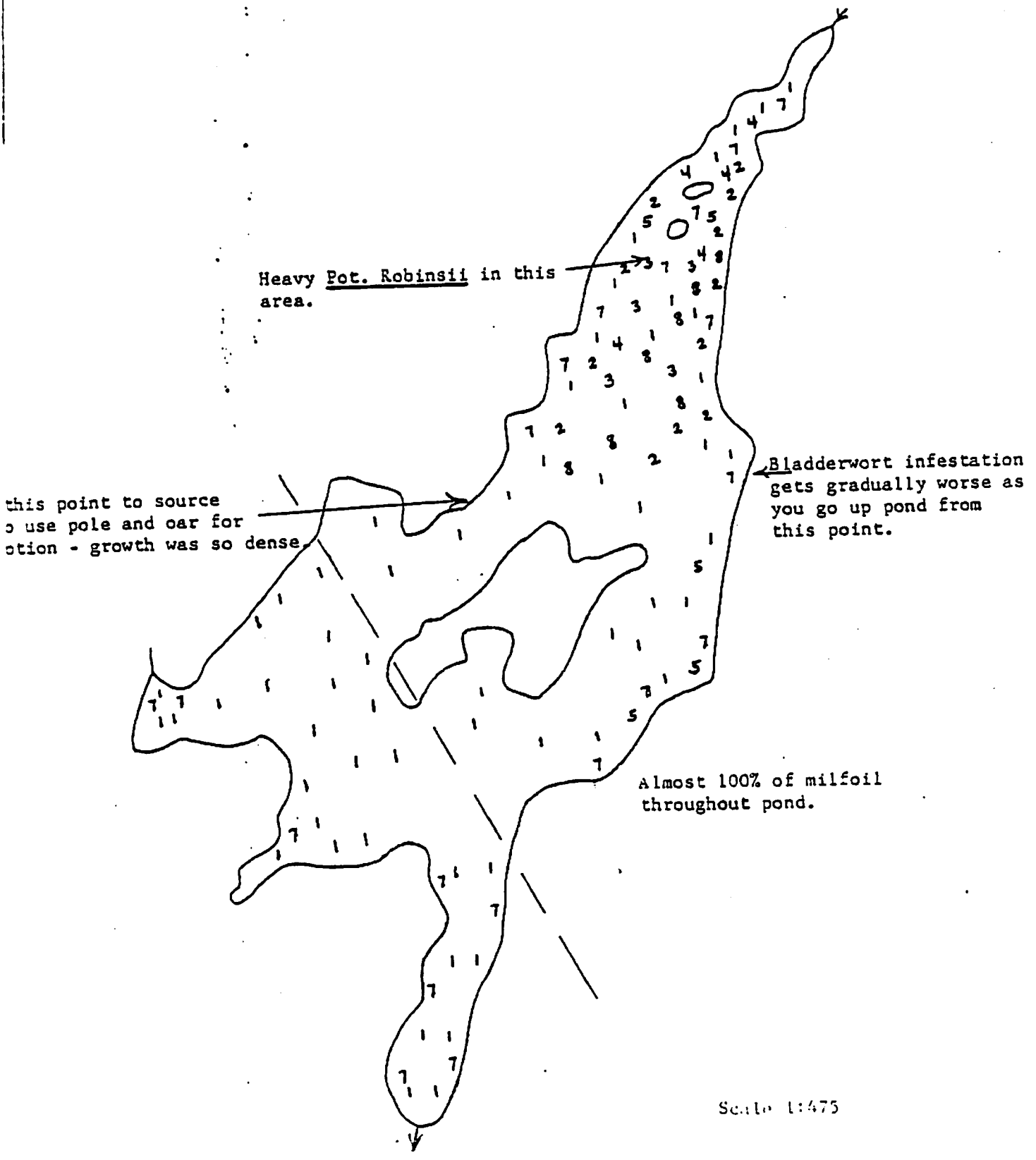
EMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Peltandra	Arrow Arum	1
Pontederia	Pickerel Weed	2
Sagittaria	Arrowhead; Duck Potatoe	
Polygonum	Watersmart Weed	3
Typha	Cattail	4
Eleocharis	Spike Rush Sedge	5
Scirpus	Bulrush Sedge	6
Juncaceae	Juncus Rush	7

Addenda

FRESH MEADOW POND

Submersed Aquatic Plant Map with Key



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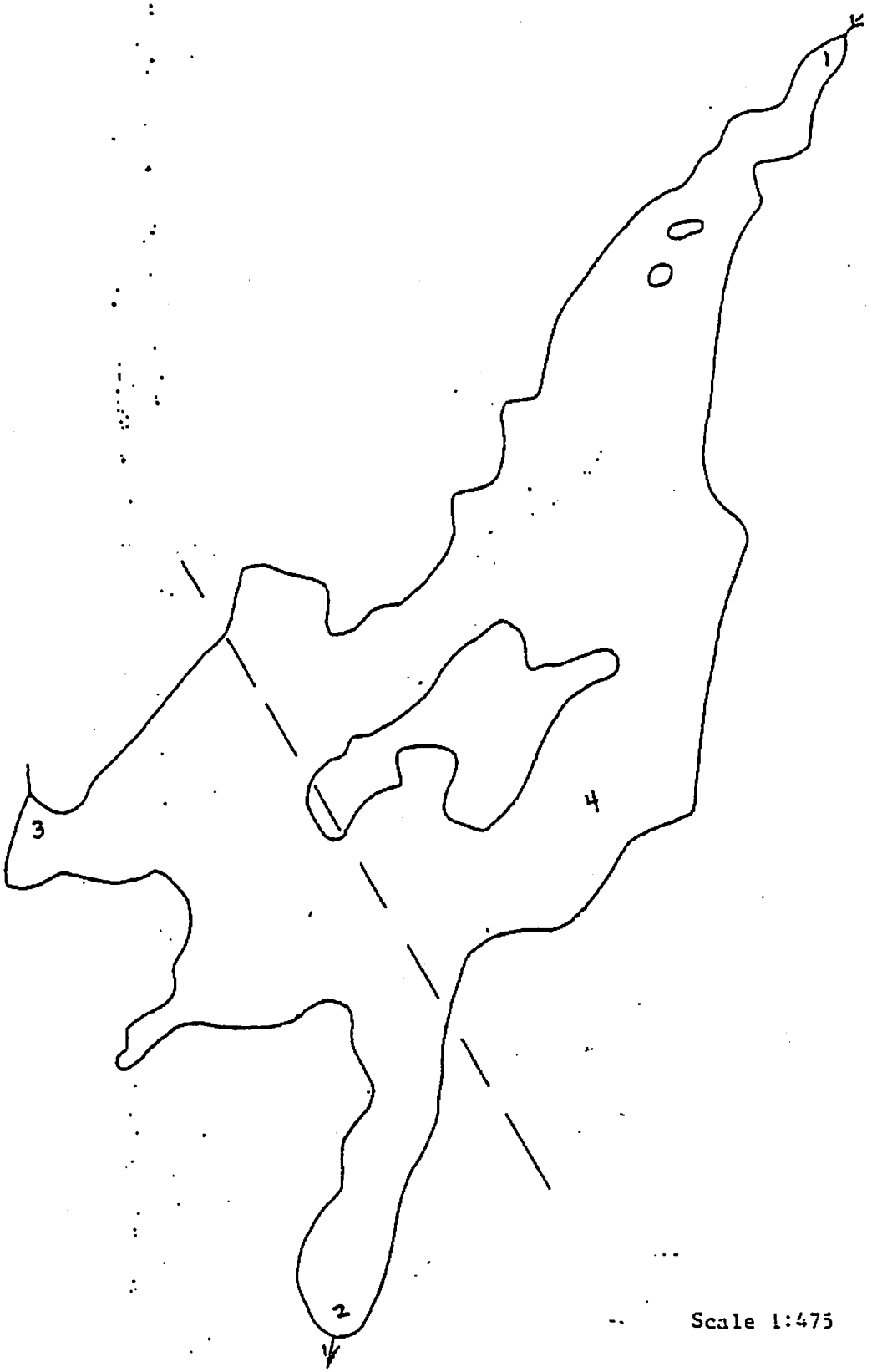
SUBMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Follus	Large Leaf Pondweed	5
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	8
Potamogeton Gramineus	Variable Pondweed	
Potamogeton Natans	Floating Brown Leaf	7
Potamogeton Nodosus	American Pondweed	
Potamogeton Pectinatus	Sago Pondweed	
Potamogeton Praelongus	White Stem Pondweed	
Potamogeton Richardsonii	Richardson Pondweed	
Potamogeton Robinsii		3
Potamogeton Vaginatus	Giant Pondweed	
Najas	Bushy Pondweed	
Zannichellia	Horned Pondweed	
Elodea	Waterweed	4
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	
Myriophyllum	Water Milfoil	1
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	
Nasturtium	Water, Cress	
Utricularia	Bladderwort	2
Vallisneria	Wild Celery	

Addenda

FRESH MEADOW POND

Chemical Sample Stations



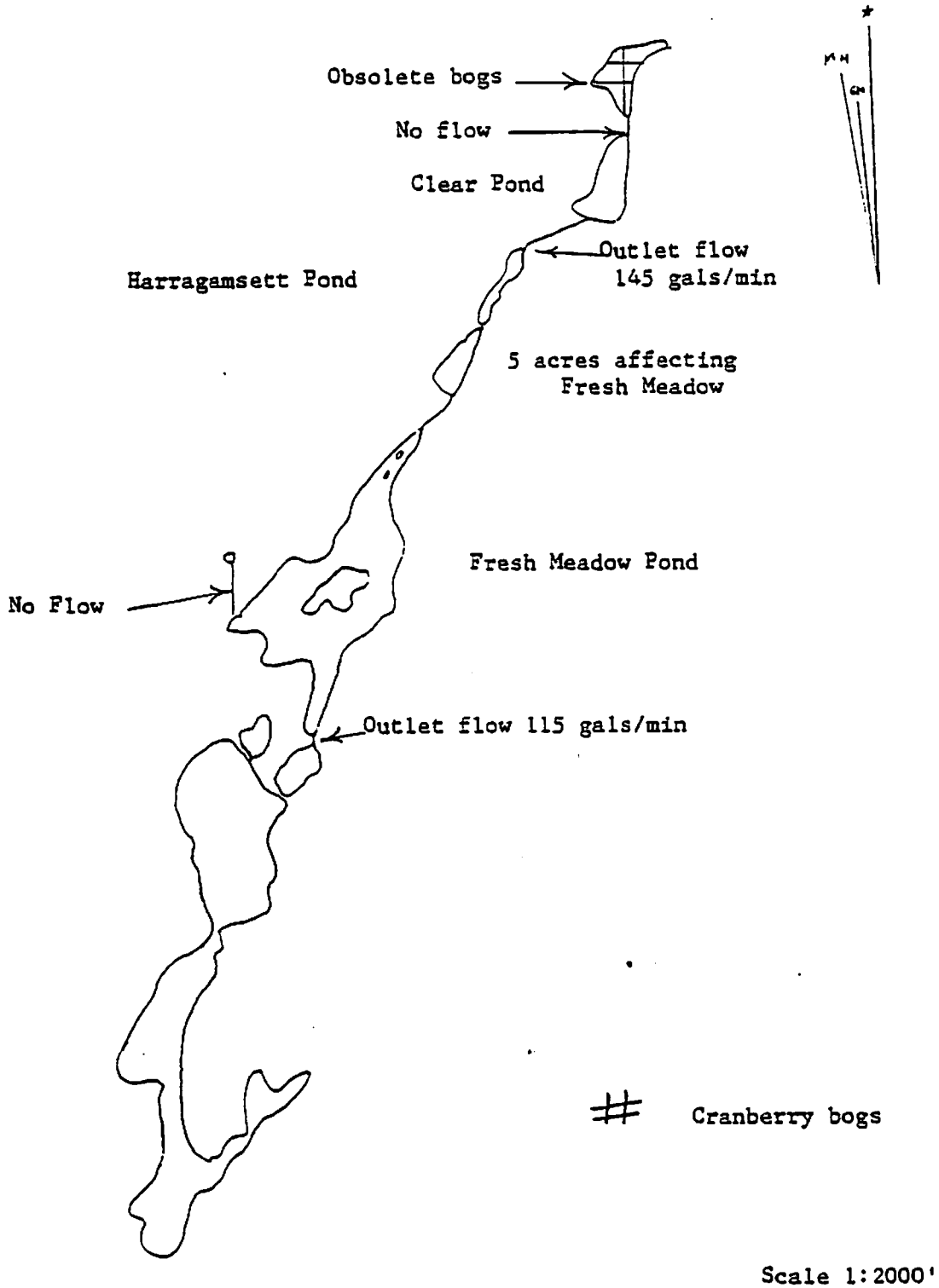
Scale 1:475

	Fresh Meadow IN LAKE STATION 1	2	3	OUTFALL 1	2	3	SOURCES 1	2	3
Total P	.05			.04			.04		
Nitrate (N)	.2			.20			.20		
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	7								
Total Hardness	15								
CO_2	16								
Pn	7.0								
Temp (C+F) 1' Levels	15°C								
Secchi	5 ft.								
Heavy Metals									
In .010									
D .001									
n .004									
u .001									
e .010									
) .003									
. .039									
i .007									
. .019									
; .001									
nthos									
tal P	255								
tal Nitrogen	164								
rcent solids	3.3								
tal volatile solids	.92								

All figures in mg/l unless otherwise noted.

FRESH MEADOW AND CLEAR POND

Impoundment Map



Scale 1:2000'

FRESH MEADOW POND

Fresh Meadow Pond ranks 37 using a modified trophic level index. It is an artificial, non-stratified warm water pond with maximum depth of 11 feet. Floating aquatic plants covered 40% of surface. Immersed vegetation was present throughout.most of tributary area. Submerged aquatic plants covered bottom, a very dense stand. The two dominant species were milfoil and bladderwort. Green and blue-green filamentous algae covered bottom. On the plant trophic index, it ranked 38th. The secchi disc reading was 5 feet, which ranked it 34th in this category. The The phosphate readings were critical. The nitrate readings were high. Number of houses affecting impoundment: approx. 60. Granberry acreage affecting system: approx. 5 acres.

Problems: New developement around pond. The pond in some areas has reached such a high eutrophication level, it could be classified as swamp-like. It was ultra-eutrophic.

EUTROPHICATION LIST

1. Long
2. Little
3. Great South
4. Little South
5. Bloody
6. Fresh
7. Gallows
8. Micajah
9. Sandy
10. Boot
11. Round
12. White Island
13. Little West
14. Ezekial
15. Wall
16. Little Sandy
17. Island 39
18. Gunners Exchange
19. Long Island
20. Morey Hole
21. Russell Mill
22. Island 52
23. Great Herring
24. Little Herring
25. Clear
26. Big West
27. Kings
28. Hoyts
29. Forge
30. Scokes
31. Little Long
32. Savery
33. Ship
34. Bartlett
35. Hedges
36. Indian
37. Fresh Meadow
38. Halfway
39. Spring
40. N. Triangle
41. Grassy West

* Billington Sea would rank 31

CLASSIFICATION DEFINITION

OLIGOTROPHIC: Aquatic plant production is low; aquatic animal production is low; aquatic plant nutrient flux is low. Oxygen is present in the hypolimnion. Depth; tends to be deeper. Water quality for most domestic and industrial use is good, total salts or conductance is usually lower. Number of plant and animal species is varied and diverse. Oligotrophic waters have only a small supply of available nutrients, hence, they support little organic production.

EUTROPHIC: Aquatic plant production is high; aquatic animal production is high; aquatic plant nutrient flux is high. Oxygen in hypolimnion is absent. Depth; tends to be more shallow. Water quality for most domestic and industrial uses is generally poor. Total salts or conductance is mostly higher. Number of plant and animal species is fewer. Eutrophic waters are waters with a good supply of nutrients, they may support rich organic production such as algal blooms.

MESOTROPHIC: lakes exhibit conditions between eutrophic and oligotrophic, their water is less transparent than oligotrophic waters, but more transparent than eutrophic waters. Supplies of dissolved oxygen decrease during the summer months in deep water, but do not disappear entirely as in eutrophic waters. Less all-round production than eutrophic waters.

The above is a brief description of classification, and the trophic index was developed along these qualifications. The following parameters were considered in rating the lakes:

1.) hypolimnetic dissolved oxygen
2.) transparency
3.) phytoplankton
4.) nitrates
5.) total phosphorous
6.) aquatic vegetation

ADDENDA

Macrophyte Populations and Nutrient Utilzation

When it is obvious that intense macrophyte growth has consumed large quantities of nutrients, adjustments were made in the overall rating. For example, a reading of .01 mg/l of phosphate on North Triangle Pond would indicate that it falls in the acceptable level, however, a 90% weed cover on the pond keeps the nutrient level low because of heavy plant utilizations and should not raise North Triangle Pond in the over-all rating. Dense plant growth and a high algae count would affect nutrient readings in such a manner.

A good example of this anomaly is chemical weed control, plants disingegrate after treatment and in some cases 40-60 days after the kill an algae bloom occurs due to the release of nutrients through decomposition. Another impoundment showing this anomaly is Indian brook - again, index evaluation was kept in its true perspective.

EUTROPHICATION INDEX USED TO RATE 41 PONDS IN PLYMOUTH

Parameters

Secchi Disc Readings Rank 1 - 41 — Rank

1. Phytoplankton coloration

clear	0	x	100% volume	= Points
green tint	1			
moderate green	2			
deep green	3			

2. Macrophytes

emergent	none 0	x % covered		= Points
floating	sparse 1			
submersed	medium 2			
	dense 3			

3. Algae Filamentous

none 0	x % area covered		= Points
sparse 1			
medium 2			
dense 3			

Total of 1 + 2 + 3 = Points = Rank

Secchi Rank + Macro and Microphyte Rank = x = Ranking Points

x times 4

Nutrient Points

1. Phosphates

0 ppm.	- .025 ppm.	= 0
.025	- .03	= 1
.03	- .04	= 2
.04	- .06	= 3
.06	-	= 4

Points _____

2. Nitrate

0	- .05	= 0
.05	- .1	= 1
.1	-.25	= 2
.25	- .4	= 3
.4	-	= 4

Points _____

Y = 1 + 2 x 2 = Ranking Points

x + Y = Total Ranking Points Ponds Rank 1 to 41

EXAMPLE
BIG WEST

Parameter

Secchi Disc Reading 1 - 41 8 1/2 ft. = 22nd

1. Phytoplankton

Clear + 0 x 100% volume 0

2. Macrophytes - Emergent and Floating

Dense	1.5 acres	3.75%	x 3	11.25 points
Medium	5.72	14.0 %	x 2	28.00
Submersed				
Dense	8.7	21.75%	x 3	65.25
Medium	31.3	78.25	x 2	153.56

3. Algae Filamentous

None 0 x area 0 = 0

Total 1 + 2 + 3 = 261.00

Rank 1 - 41 Plant Index = 28

Secchi Rank 22

Plant Rank 28

50 Ranked 26th combined

Combined rank = 26 x 4 = 104

Nutrient

a. Phosphate .03 ppm. = 1 point

b. Nitrates .1 ppm. = 1/2

Y = a + b = 2 x 2 = 4

X = 104

Y = 4

108 Total This ranked it 26th overall