VOLUME IV

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

LITTLE SOUTH

LITTLE WEST

LONG

LONG ISLAND (Little Island Pond)

MICAJAH

MOREY HOLD

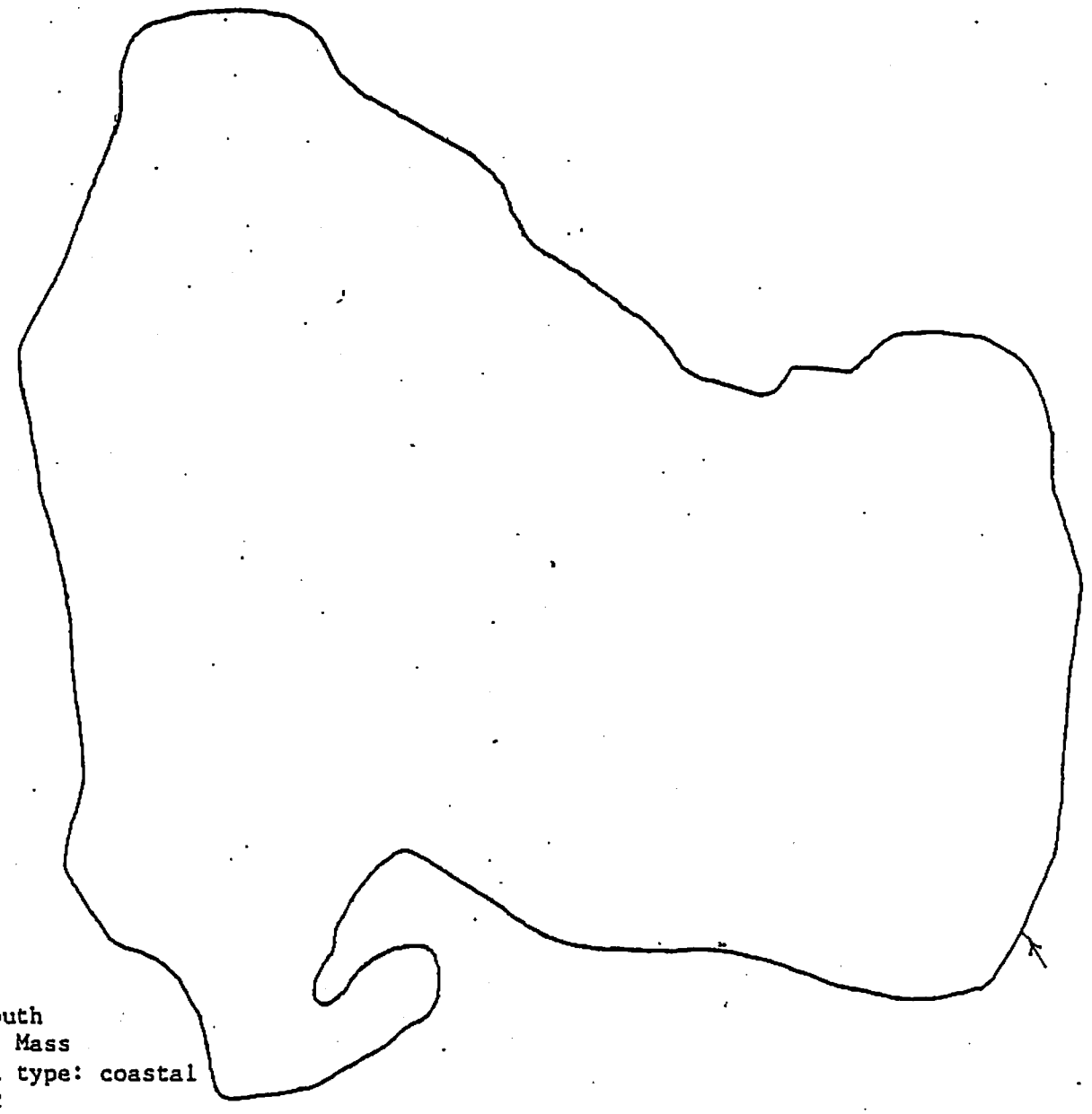
NORTH TRIANGLE

ROUND

By

Lyons - Skwarto Associates
147 Whitewood Road
Westwood, Massachusetts 02090

LITTLE SOUTH

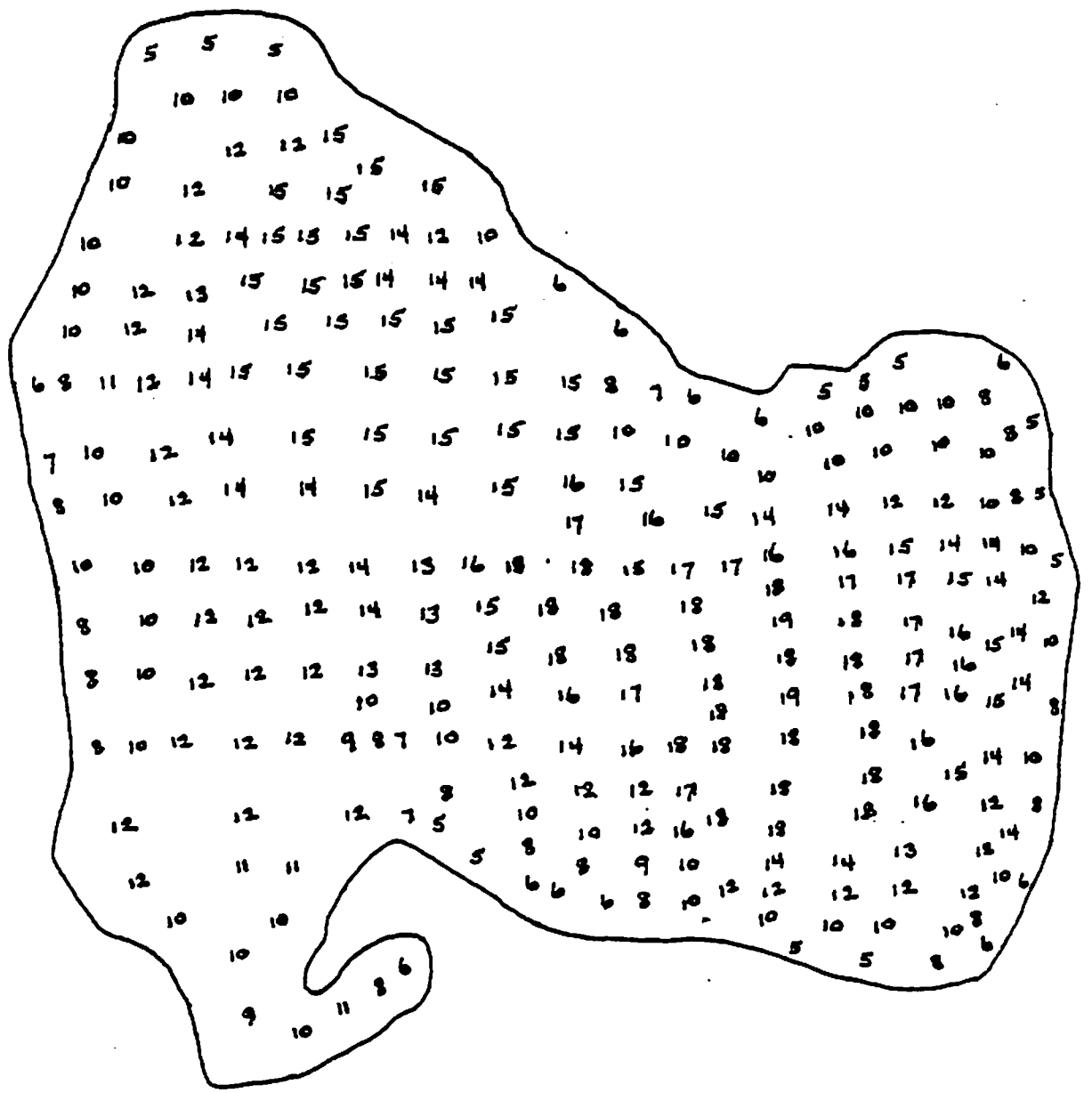


ittle South
lymouth, Mass
atershed type: coastal
cres: 62
ltitude: 099'
ater type: warm
ond type: natural
cratified: no
ond use: primary water supply
opo sheet: USGS 1:24000 Plymouth
osition Topo sheet: up 7.2 right 10.0
oreline distance 1.5 miles 7920'

Scale 1:320

LITTLE SOUTH

Bathymetric Map

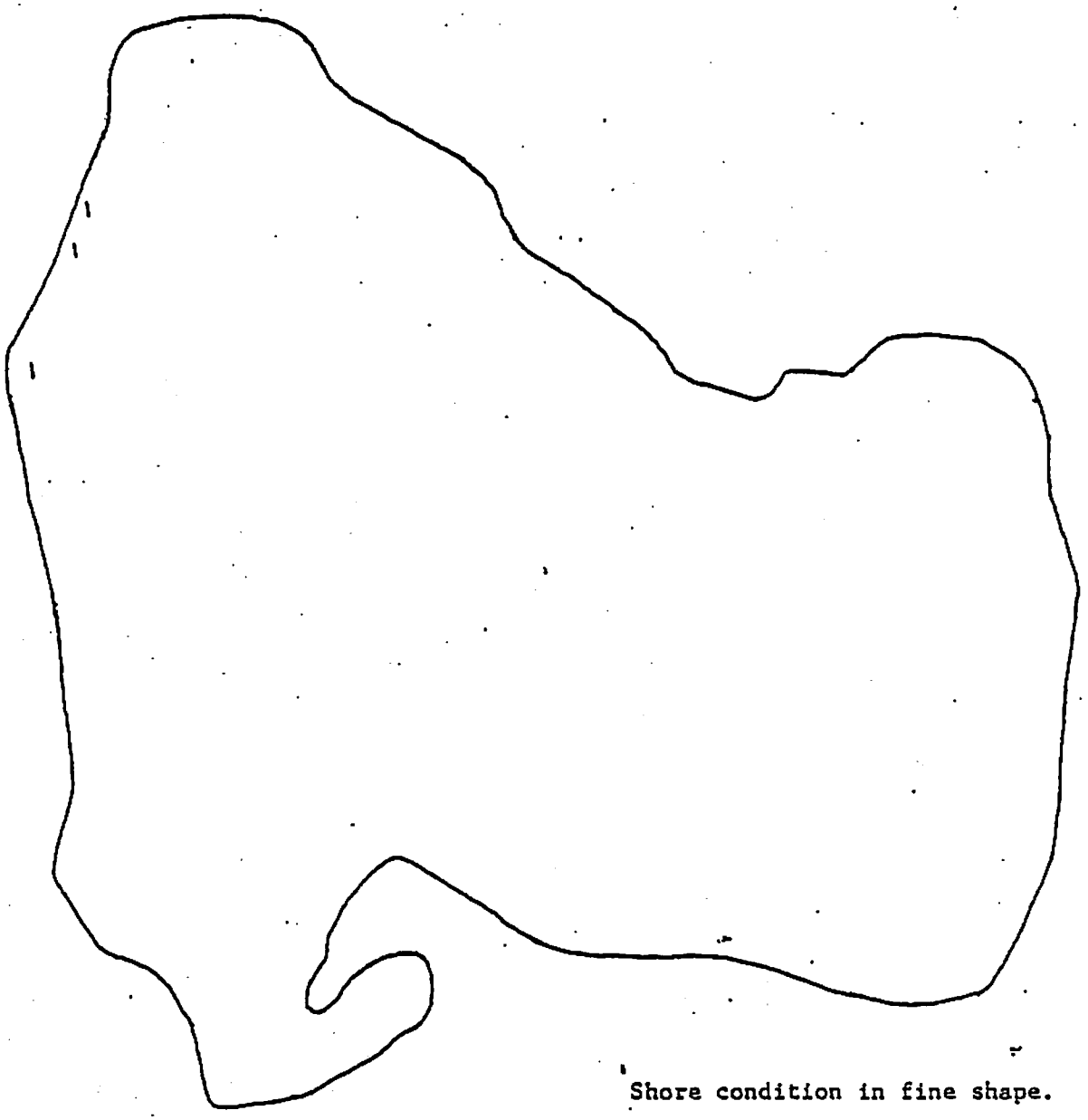


Maxmimum depth 19 ft. 5.79 M
Mean depth 14 ft. 4.27 M
Surface area 62 acres 25.1 H
Acre feet 869
Total gals. 282,838,668

Scale 1:320

LITTLE SOUTH

Emersed Aquatic Plant Map with Key



Shore condition in fine shape.

Scale 1:320

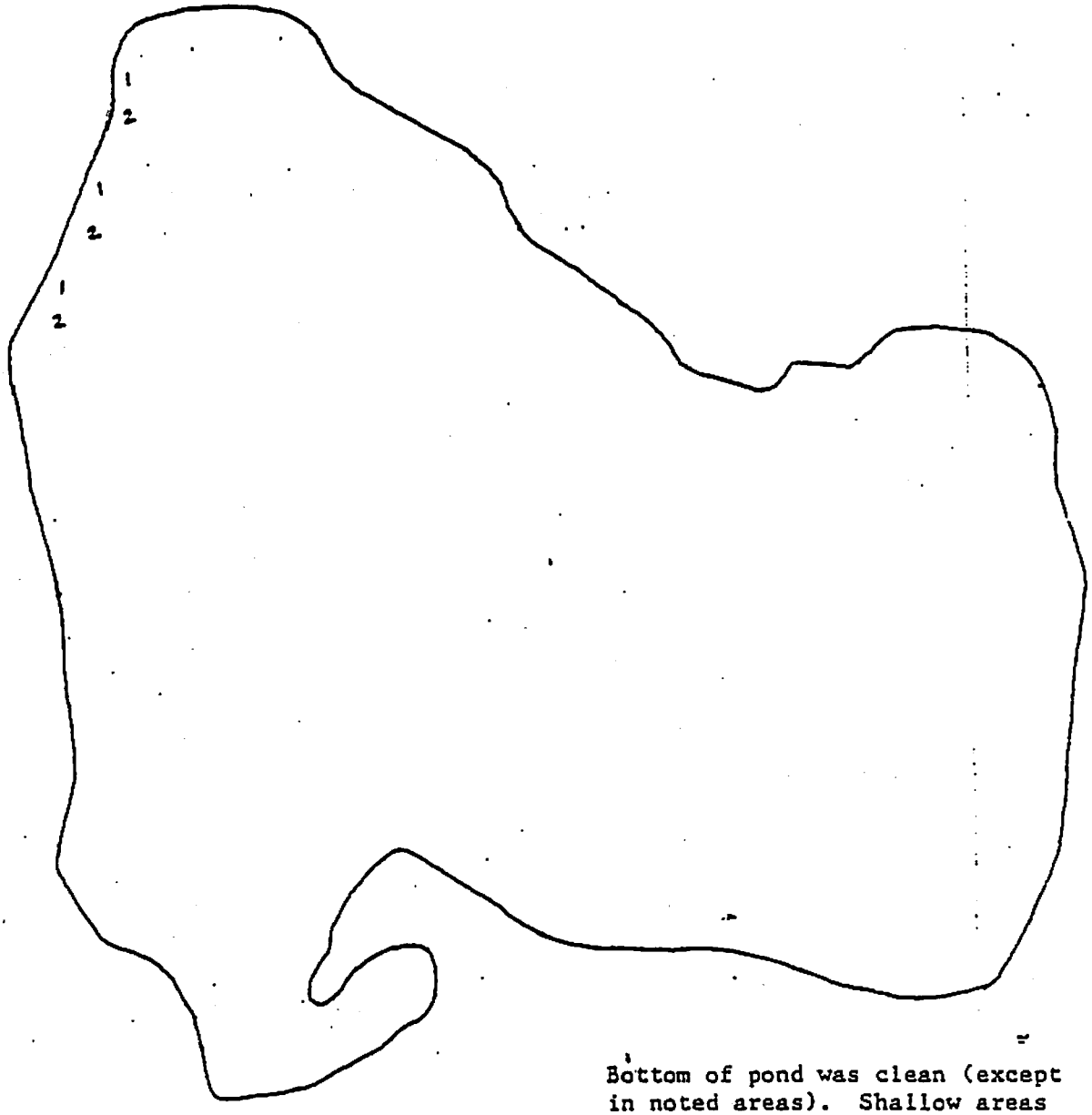
EMERSED AQUATIC PLANTS

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

Addenda

LITTLE SOUTH

Submersed Aquatic Plant Map with Key



Bottom of pond was clean (except in noted areas). Shallow areas were free of any growth. The whole system is in excellent condition.

Scale 1:320

SUBMERSED AQUATIC PLANTS

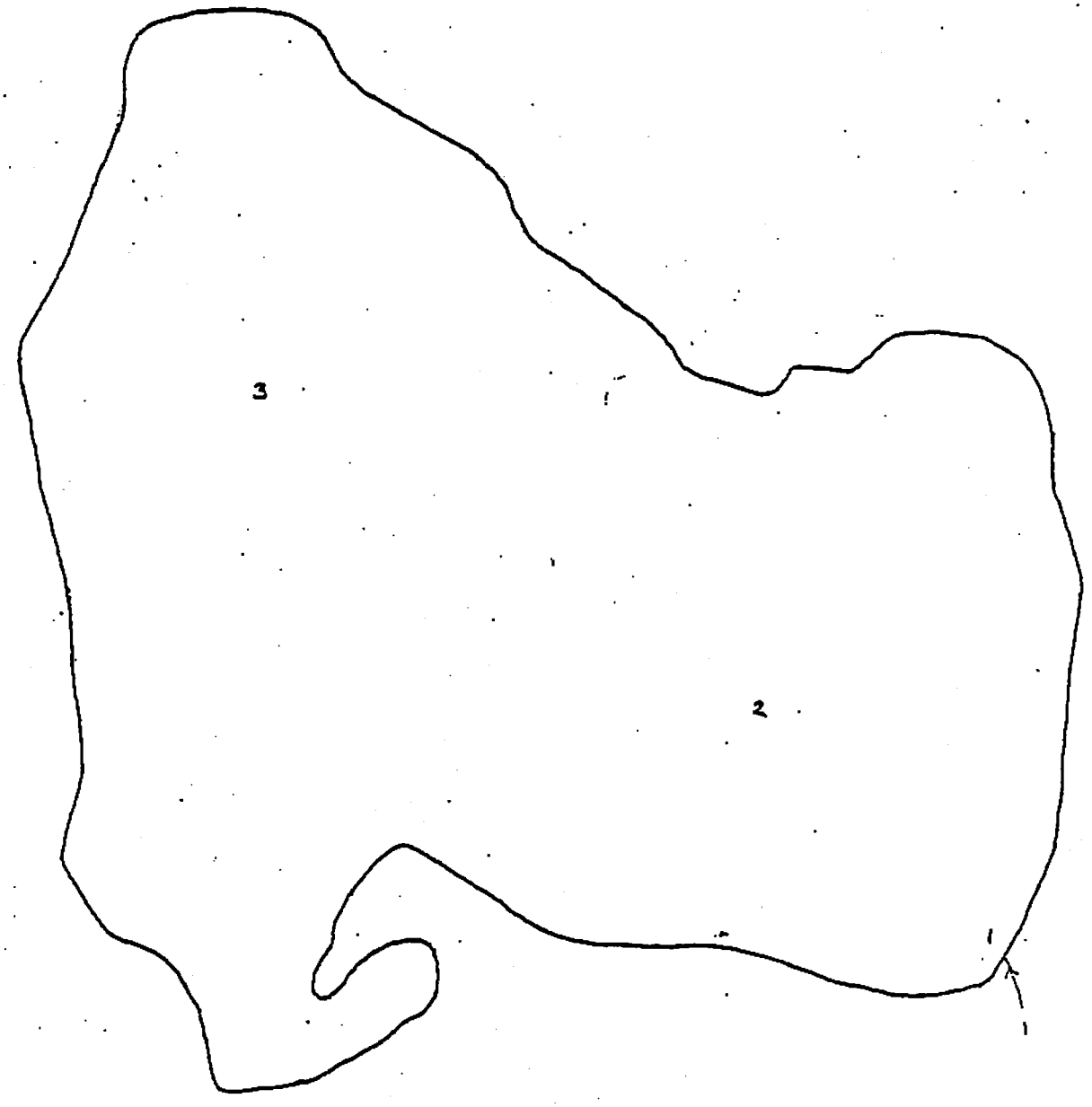
LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	
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	
Vallisneria	Wild Celery	

Addenda

Cyanophycear Filamentous	Blue-green	1
Sphagnum	Moss	2

LITTLE SOUTH

Chemical Sample Stations



Scale 1:320

	Little South IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.03	.02	.02						
Nitrate (N)	.10	.06	.05						
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	8								
Total Hardness	16								
CO_2	12								
Pn	7.1								
Temp (C+F) 1' Levels	14° C								
Secchi	12 ft.								

Heavy Metals

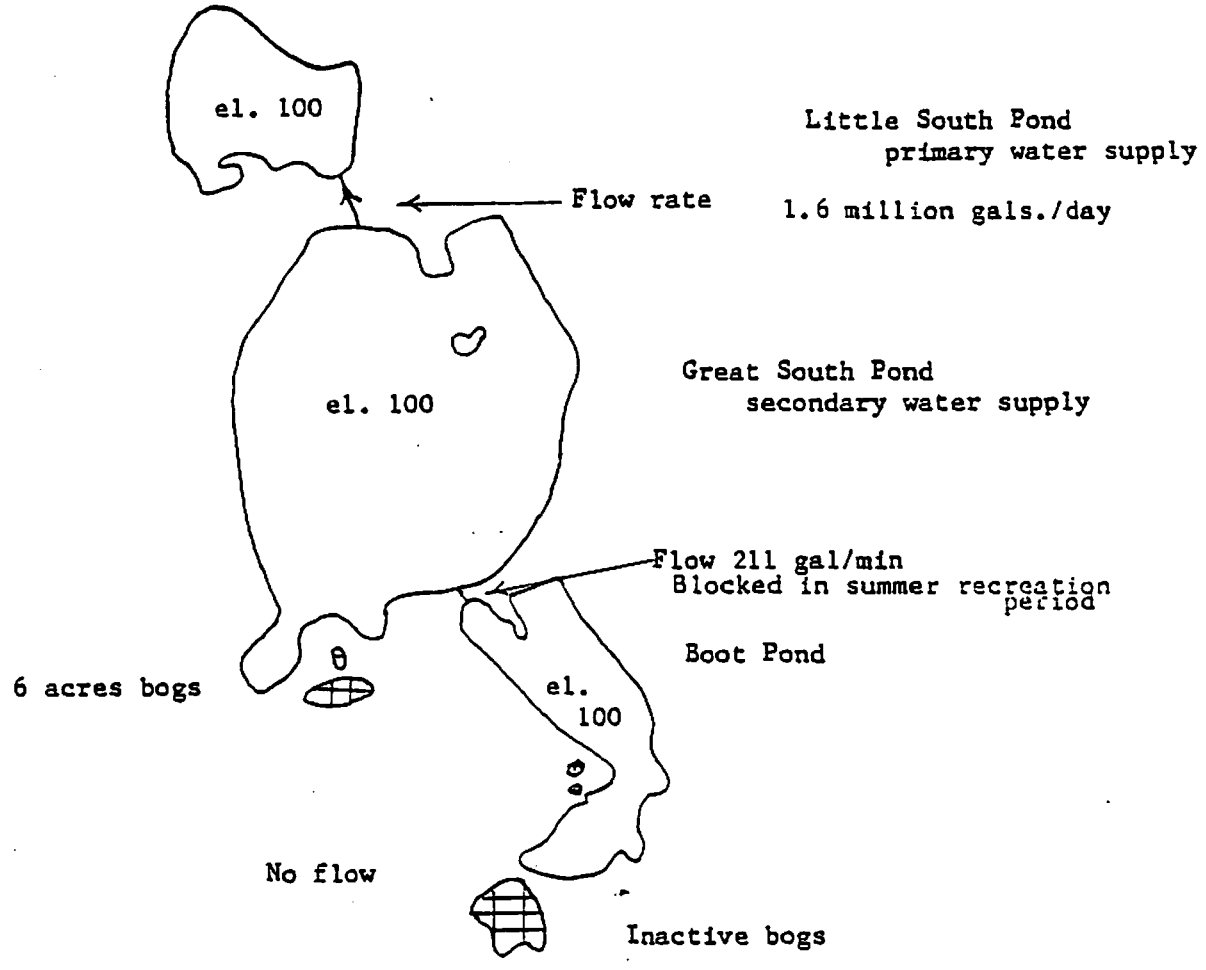
Zn	.003
CD	.001
Sn	.005
Au	.001
Fe	.037
P-	.019
AL	.006
Cu	.005
Ni	.006
AG	.001

Benthos

Total P	76.3
Total Nitrogen	14.8
Percent solids	4.8
Percent volatile solids	.03

LITTLE SOUTH POND

Impoundment Map

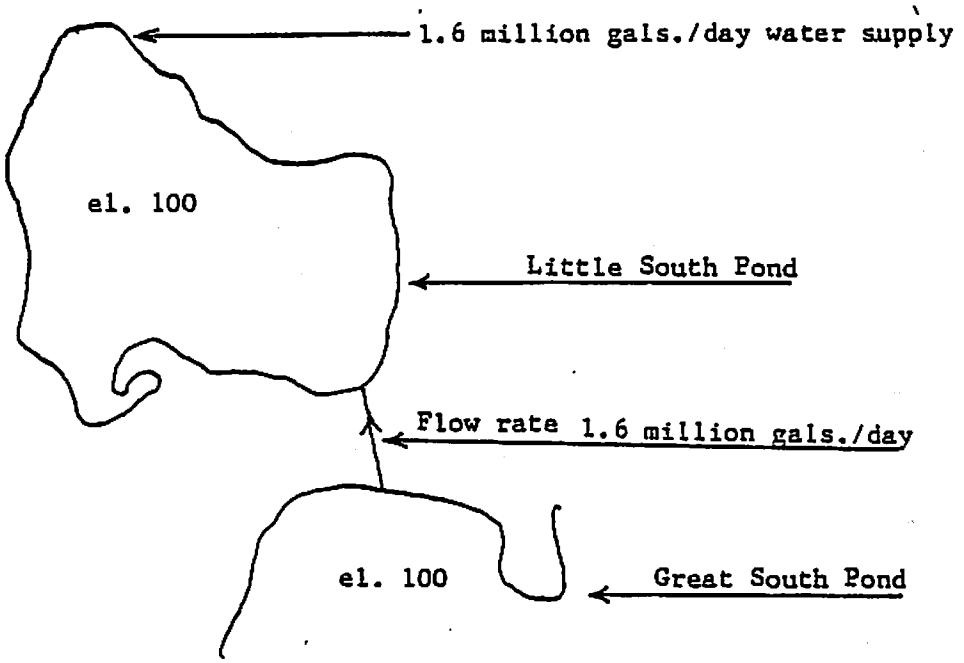


\# Cranberry bogs

Scale 1:2000'

LITTLE SOUTH POND

Impoundment Map



Scale 1:950'

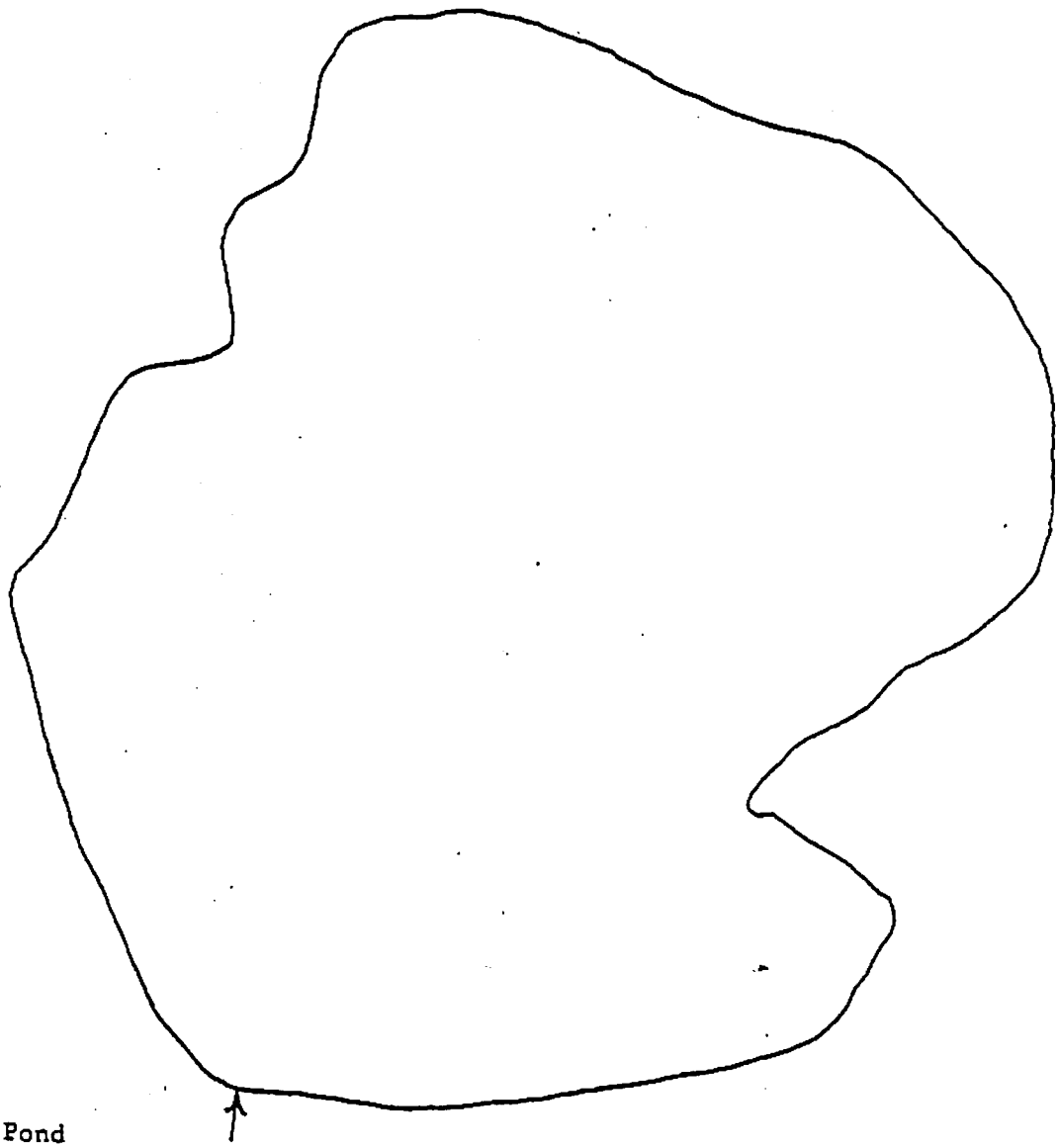
LITTLE SOUTH POND

Little South Pond ranks 4 using a modified trophic level index. It is a natural, non-stratified warm water pond, with maximum depth of 14 feet. Macrophyte pooulation is very sparce. On plant trophic index, it ranked 3rd. Microphytes: none. The secchi disc readingswas 12, and in this category it ranked 15th. The phosphate readings were permissible.The nitrate readings were permissible.

Number of houses affecting impoundment: none . Cranberry acreage affecting ecosystem: none.

Problems: None. Eliminating housing and agricultural practices has a decided effect on eutrophication indices. This pond is rated ologotrophic.

LITTLE WEST POND

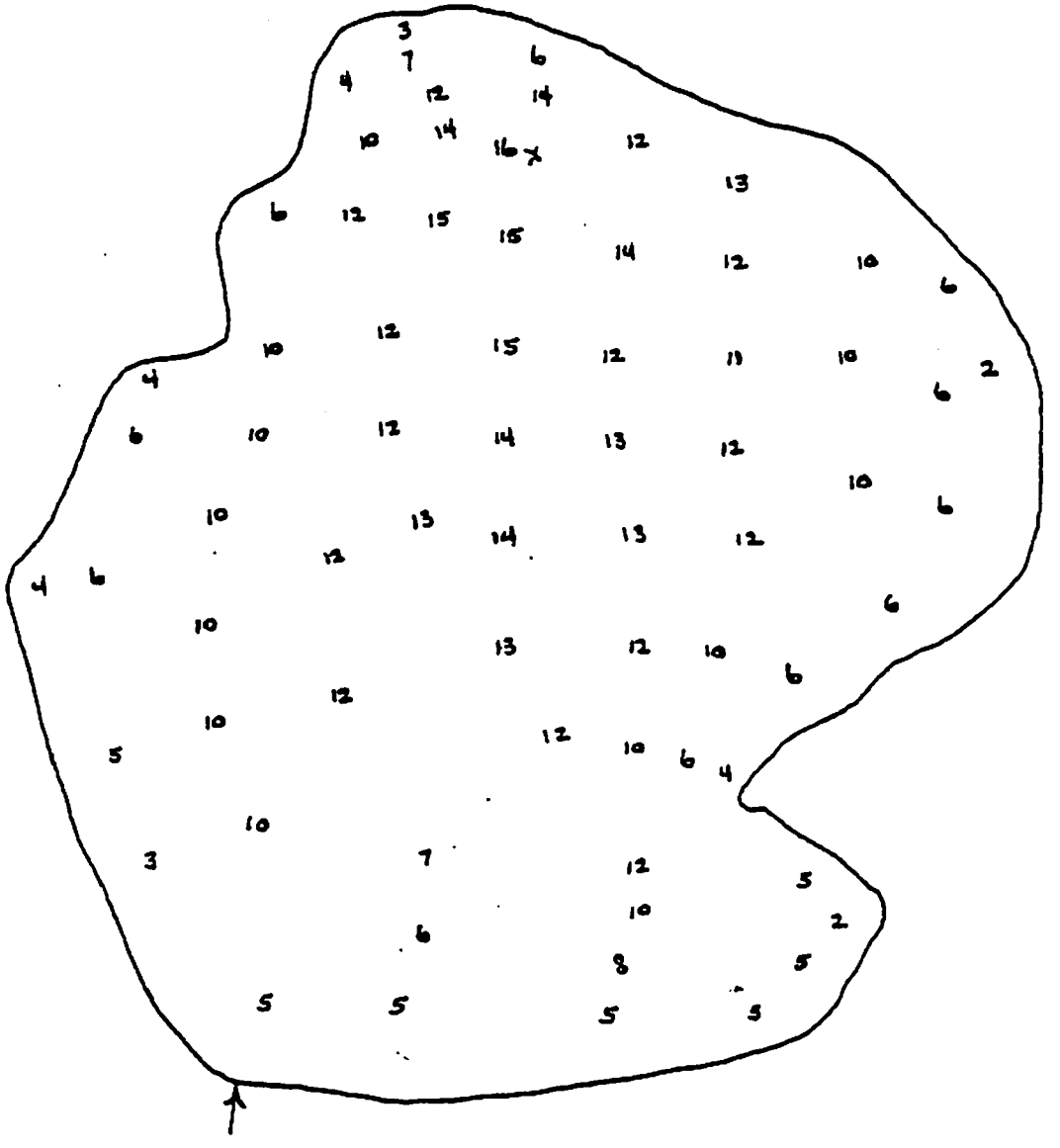


Little West Pond
Plymouth, Mass.
Watershed type: coastal
Acres: 25
Altitude: 0117'
Water type: warm
Pond type: natural
Stratified: no
Pond use: recreation, esthetic
Topo sheet: USGS 1:24000 Plymouth
Position Topo sheet: up 8.5 right 5.8
Shoreline distance: .8 miles 4224'

Scale 1:242

LITTLE WEST POND

(Bathymetric Map)

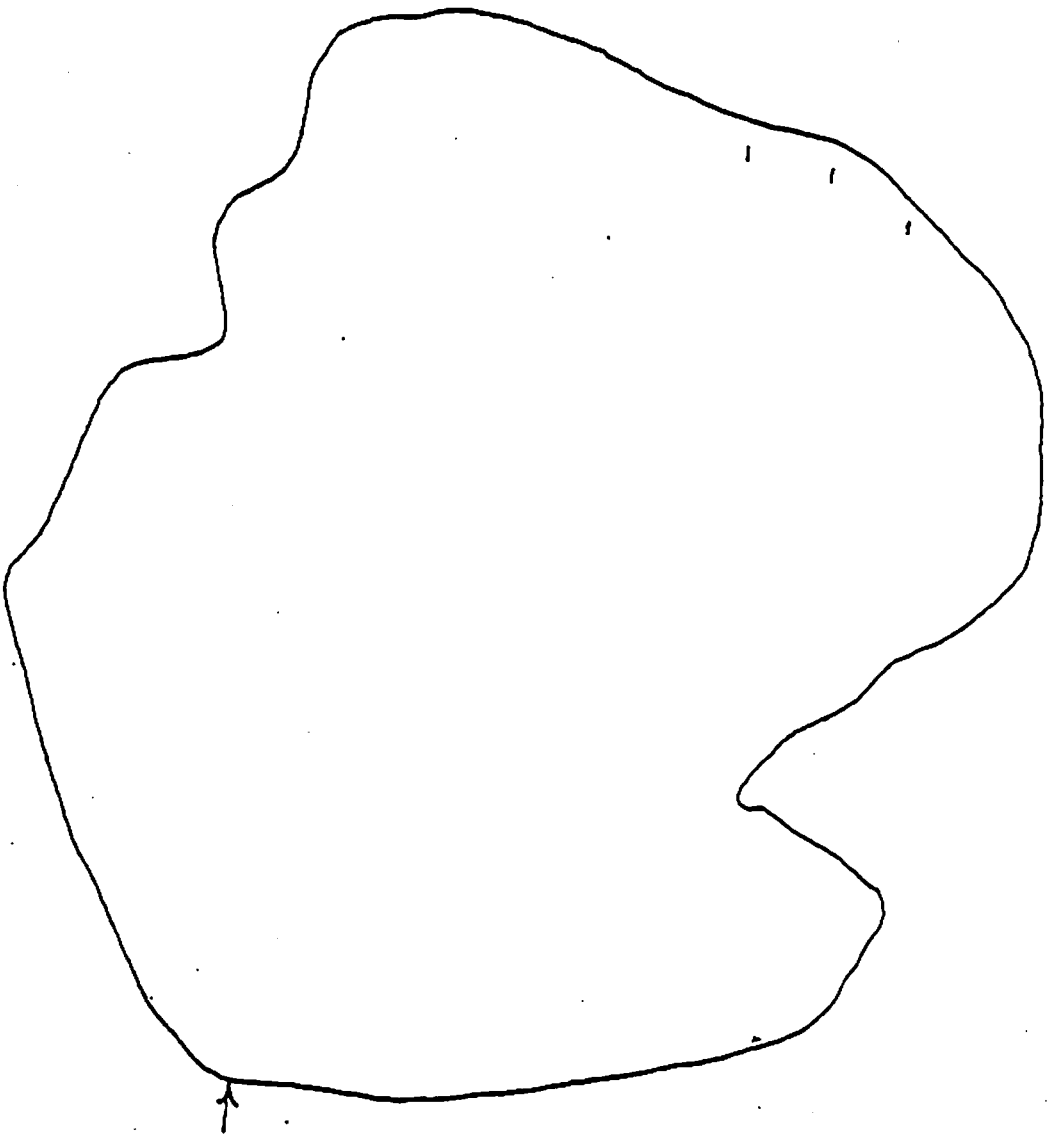


Maximum depth 16 ft. 4.9 M
Mean depth 9 ft. 2.7 M
Surface area 25 acres 10.1 H
Acre feet 225
Total Gals. 73,316,473

Scale 1:242

LITTLE WEST POND

Emersed Aquatic Plant Map with Key



Scale 1:242

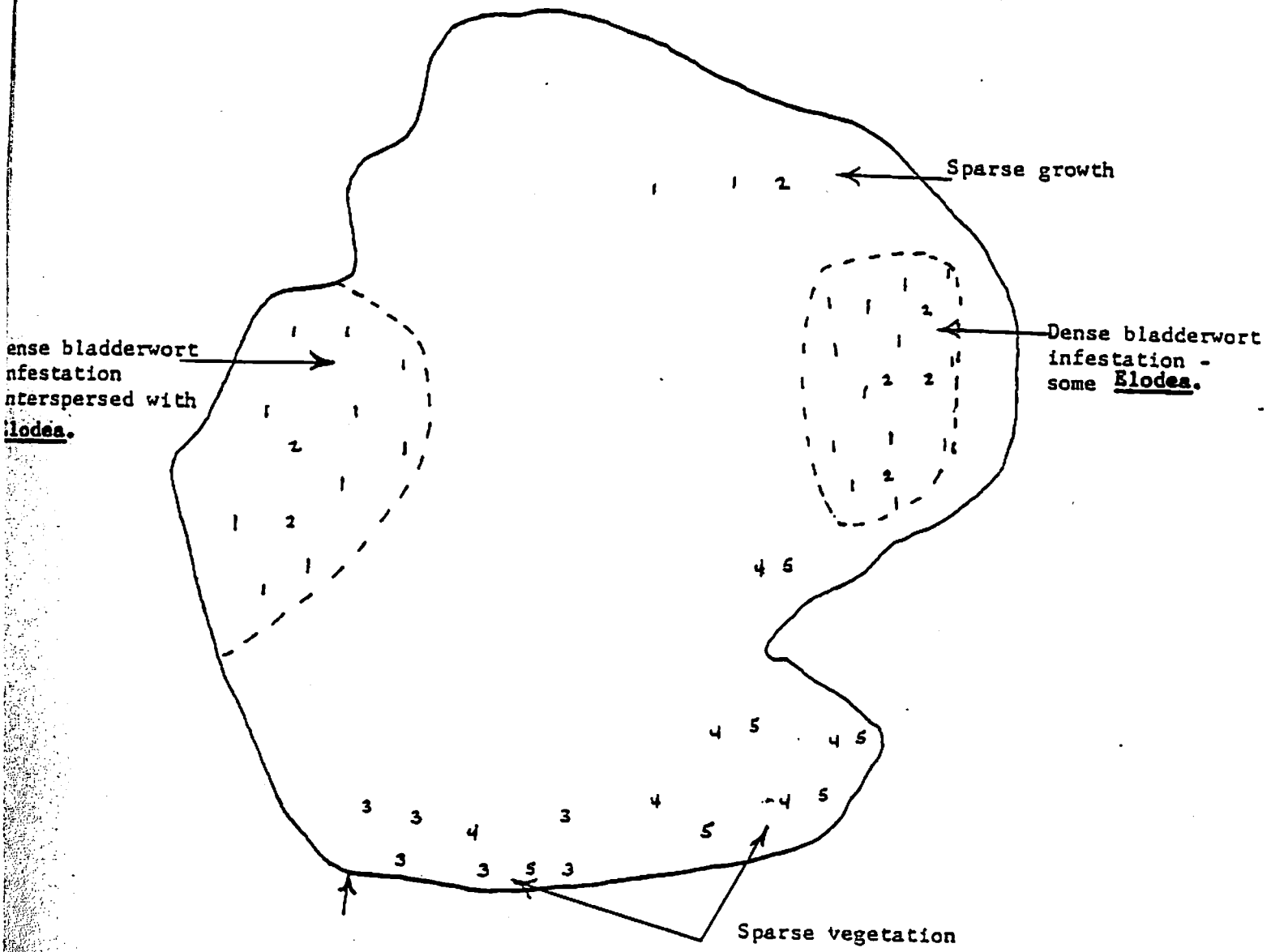
EMERSED AQUATIC PLANTS

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

Addenda

LITTLE WEST POND

Submersed Aquatic Plant Map with Key



Rest of pond in good condition. Water color clear.

Scale 1:242

SUBMERSED AQUATIC PLANTS

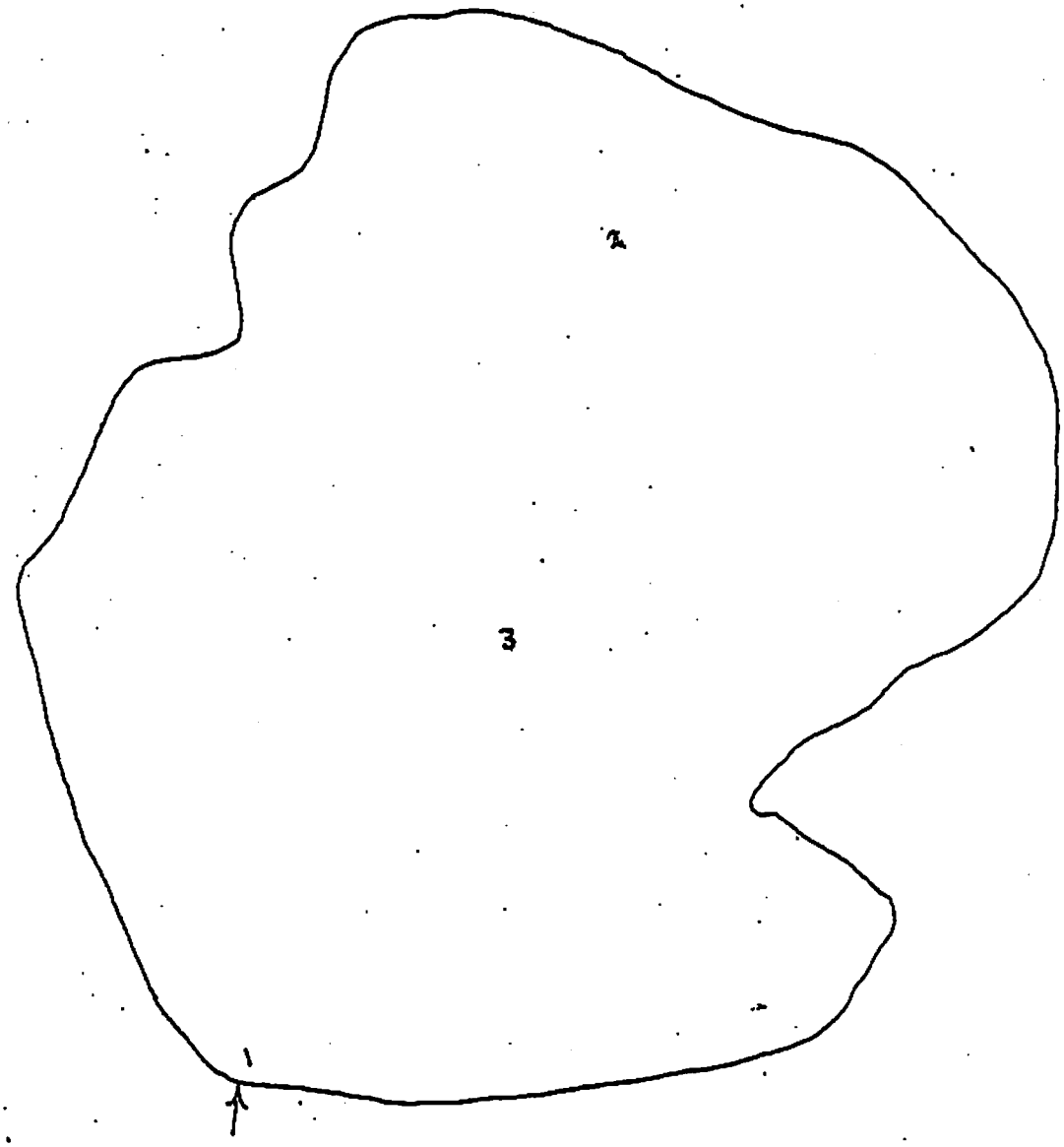
LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	
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	2
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	
Myriophyllum	Water Milfoil	3
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	
Nasturtium	Water, Cress	
Utricularia	Bladderwort	1
Vallisneria	Wild Celery	
	Addenda	
Cyanophyceae filamentous	Blue-green algae	4
		5
Chlorophyceae filamentous	Green algae	

MN

GN

LITTLE WEST POND

Chemical Sample Stations



Scale 1:242

	Little West IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.03	.03						.03	
Nitrate (N)	.09	.1							
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	8								
Total Hardness	16								
CO_2	14								
Pn	6.5								
Temp (C+F) 1' Levels	15° c								
Secchi	15 ft.								

Heavy Metals

Zn	.016
CD	.001
Sn	.004
Au	.001
Fe	.130
P_D	.004
AL	.049
Cu	.007
Ni	.022
AG	.001

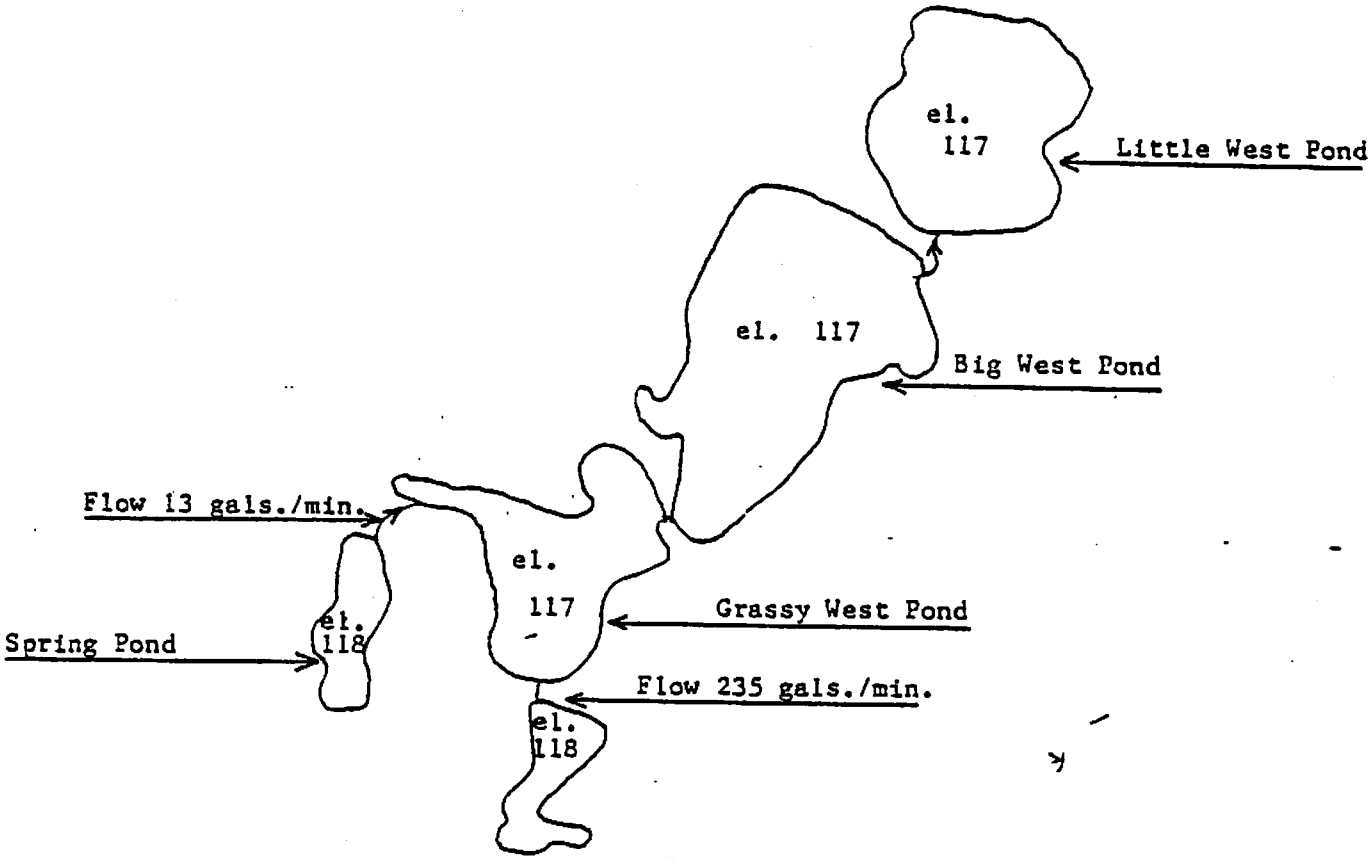
Benthos

Total P	4.7
Total Nitrogen	2.1
Percent solids	46.7
Total volitale solids	.29

All figures in mg/l unless otherwise noted.

LITTLE WEST POND

(Impoundment Map)



There are no commercial agriculture enterprises affecting the surface flow of this impoundment.

Scale 1:1030

LITTLE WEST POND

Using a modified trophic level index Little West ranks 13th.

Little West is a warm water, non-stratified pond, fairly deep at the northern end with a maximum depth of 16 feet. Macrophyte population is classified as medium out to the 8 foot contour line. Floating aquatic plants - none. Emersed aquatic plants - sparse. Submersed aquatic plants are medium with about 5 acres of subsurface classified as heavy. On the plant trophic list it ranks 20th. Secchi disc reading was 15 feet ranking it 8th for this parameter. Phosphate readings were above permissable levels, while nitrate readings were marginal.

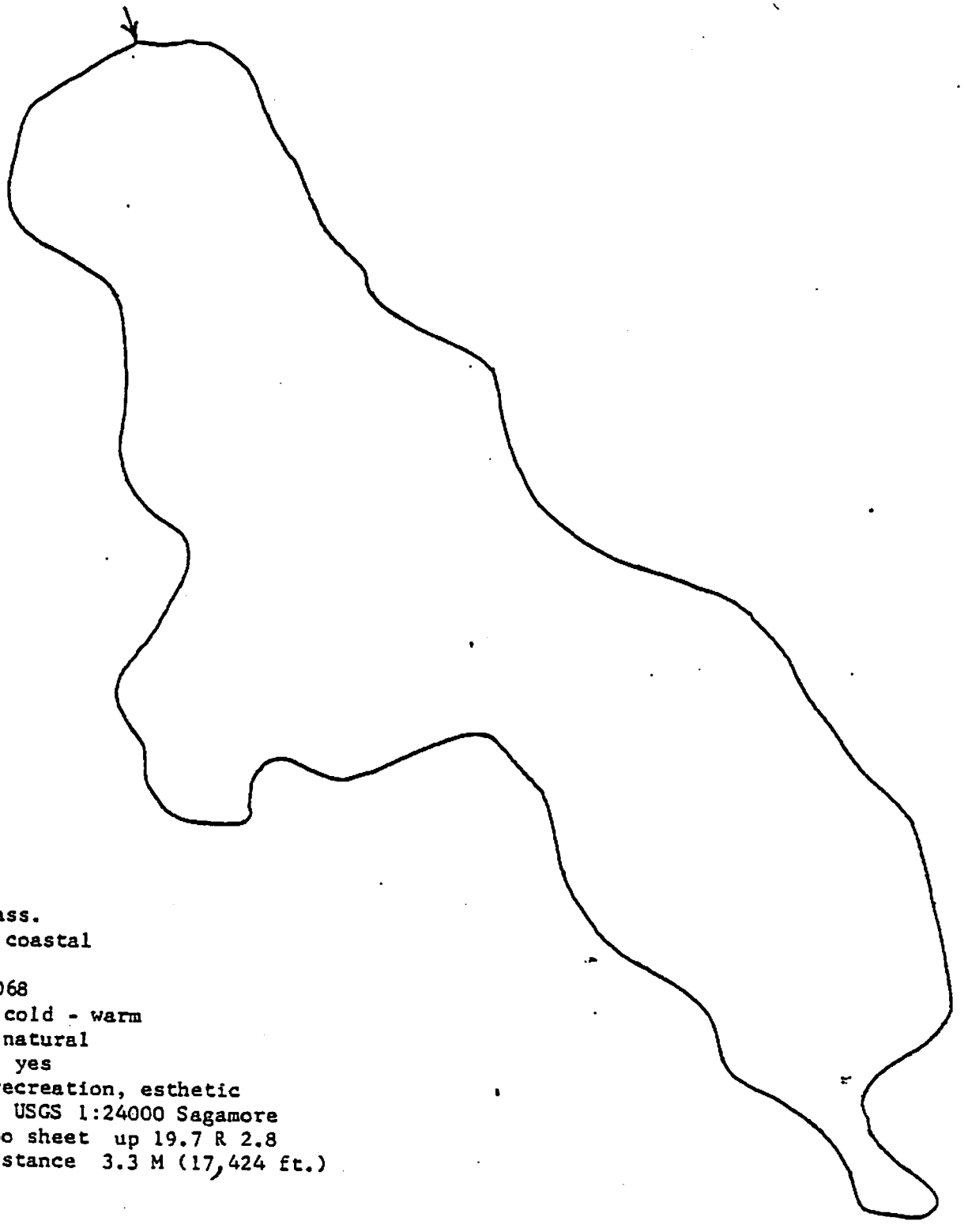
Number of houses affecting pond: approximately 13 plus social club at north end.

Cranberry bogs affecting pond: none

Problems: Flow from Spring Pond (ultra-eutrophic), Grassy West (ultra-eutrophic) to Big West (eutrophic) connected to Little West presents a nutrient influx problem which is serious (the houses and social club may also be contributing factors). The high phosphate levels almost reaching a critical level indicates trouble ahead for this pond.

This pond is rated eutrophic.

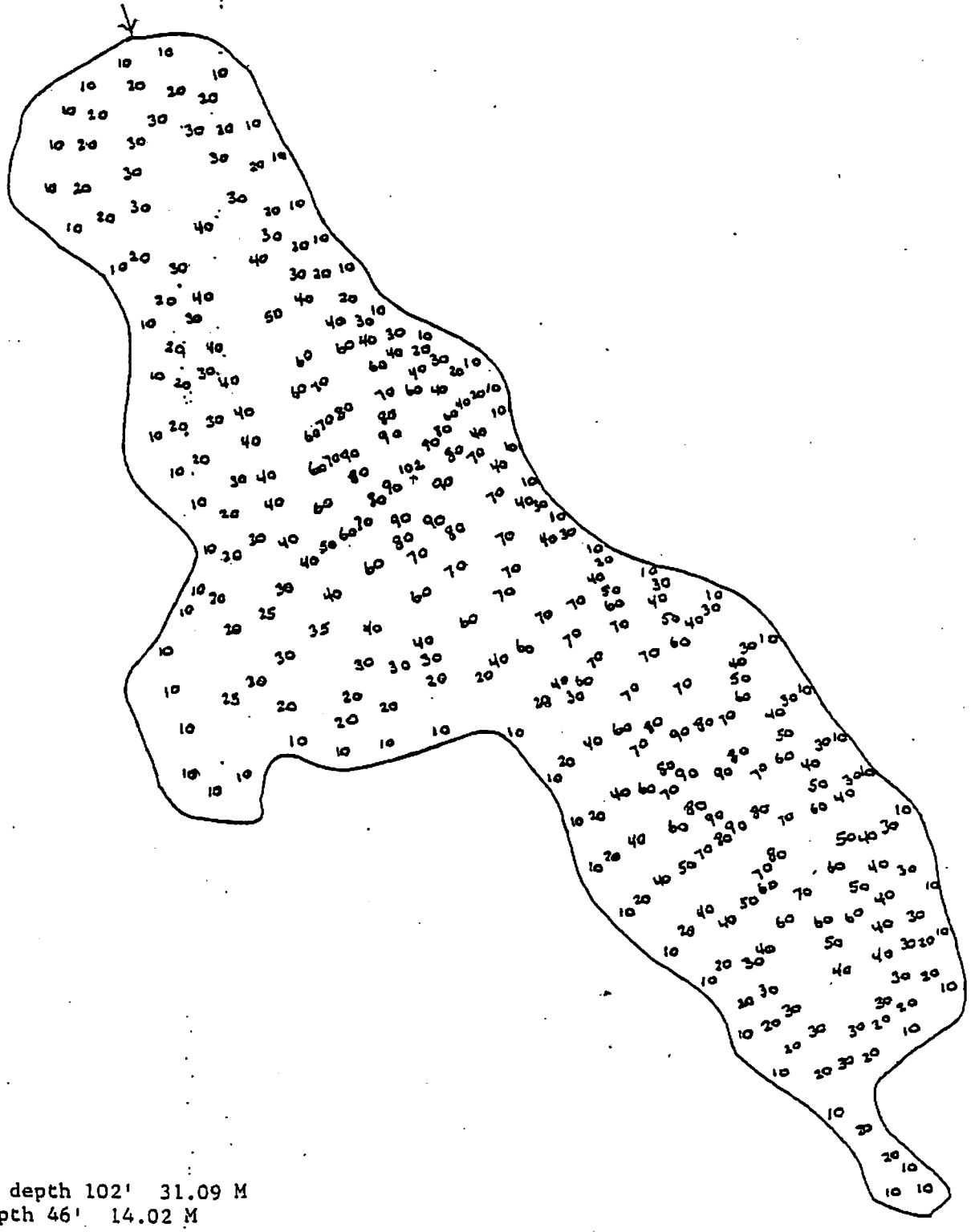
LONG POND



Long Pond
Plymouth, Mass.
Watershed: coastal
Acres: 211
Altitude: 068
Water type: cold - warm
Pond type: natural
Stratified: yes
Pond use: recreation, esthetic
Topo sheet: USGS 1:24000 Sagamore
Position Topo sheet up 19.7 R 2.8
Shoreline distance 3.3 M (17,424 ft.)

Scale 1:710'

LONG POND

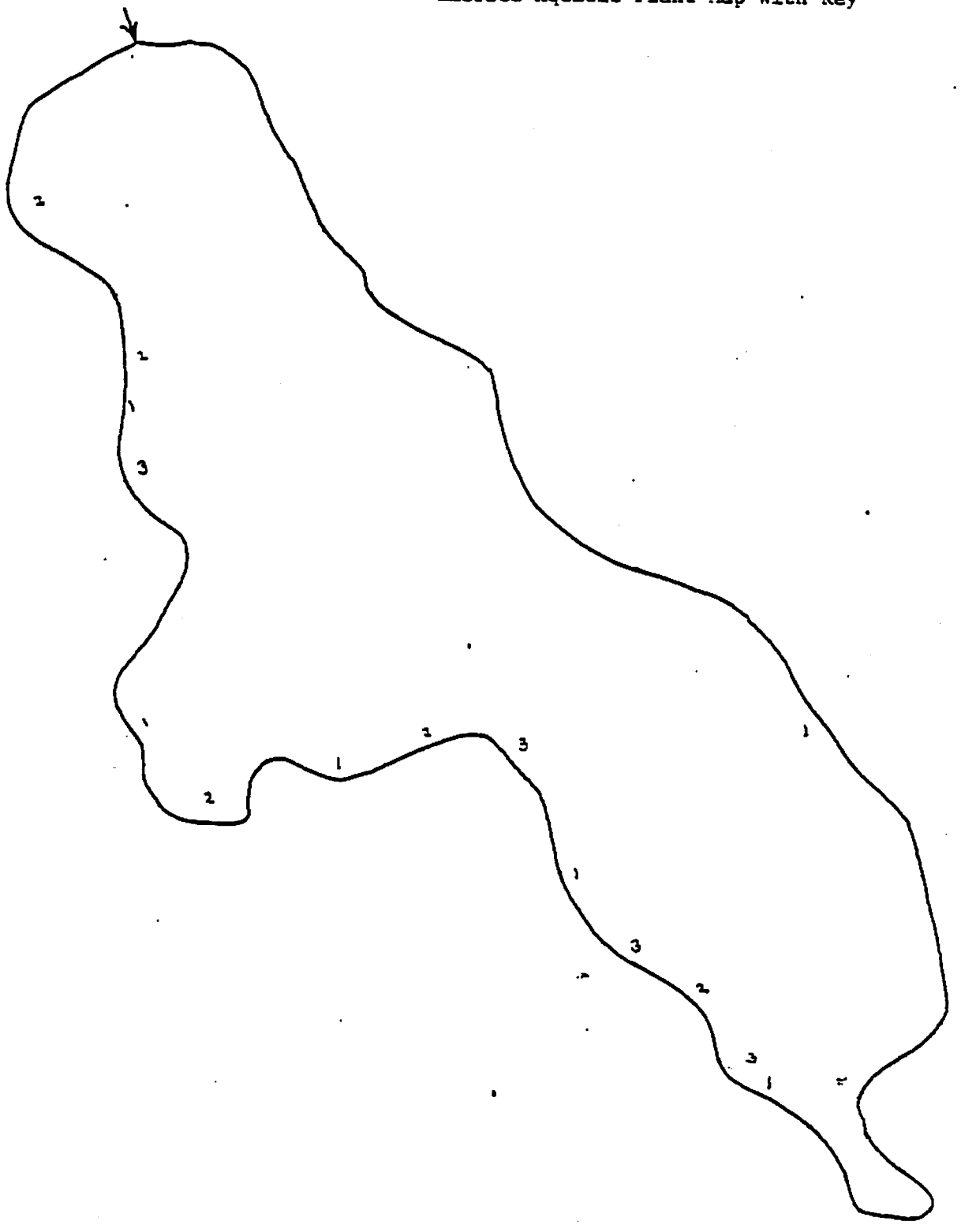


Maximum depth 102' 31.09 M
Mean depth 46' 14.02 M
Surface area 211 acres 85.46 H
Acre feet 9,706
Total gals. 3,162,109,506

Scale 1:710'

LONG POND

Emersed Aquatic Plant Map With Key



Scale 1:710'

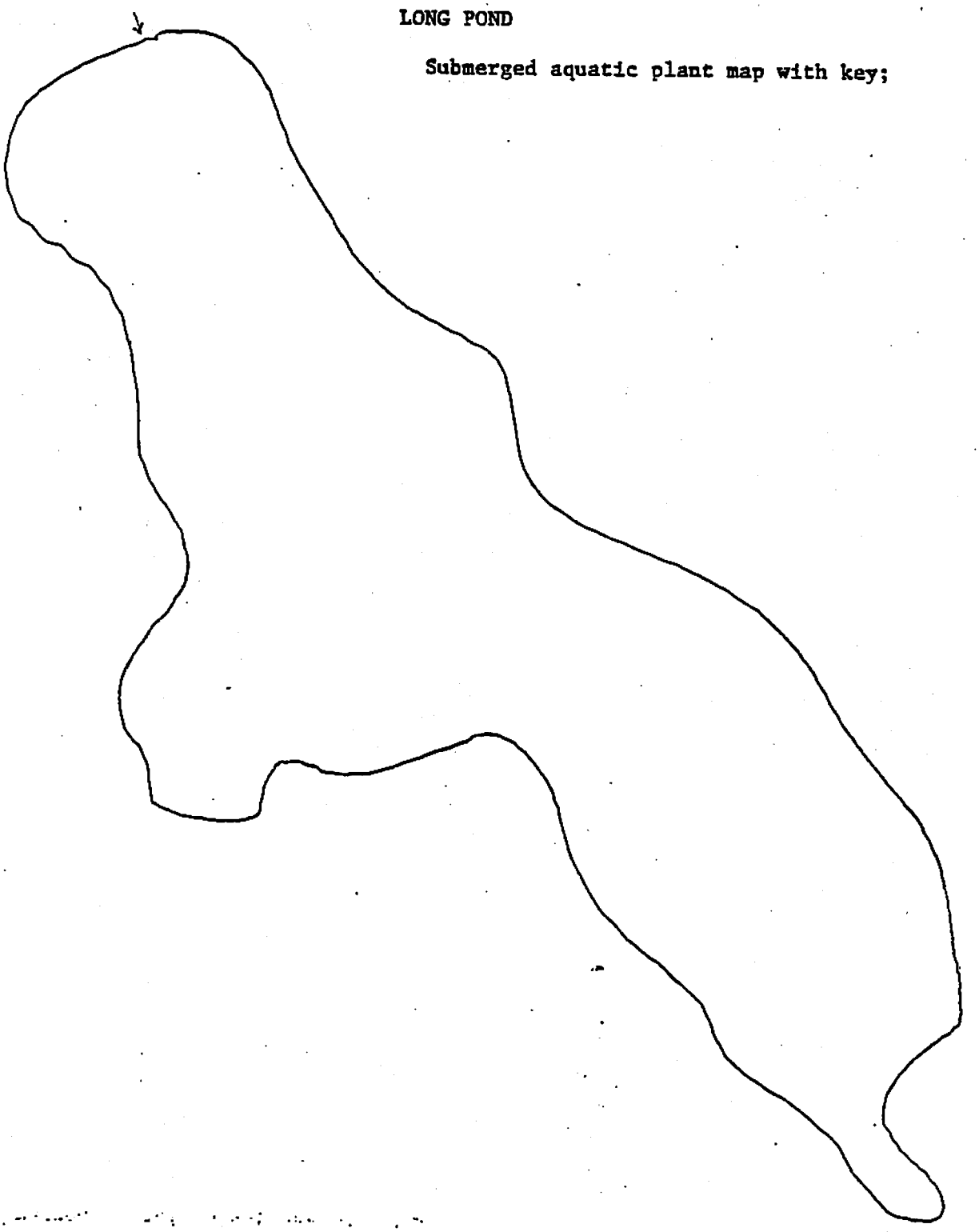
EMERSED AQUATIC PLANTS

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

Addenda

LONG POND

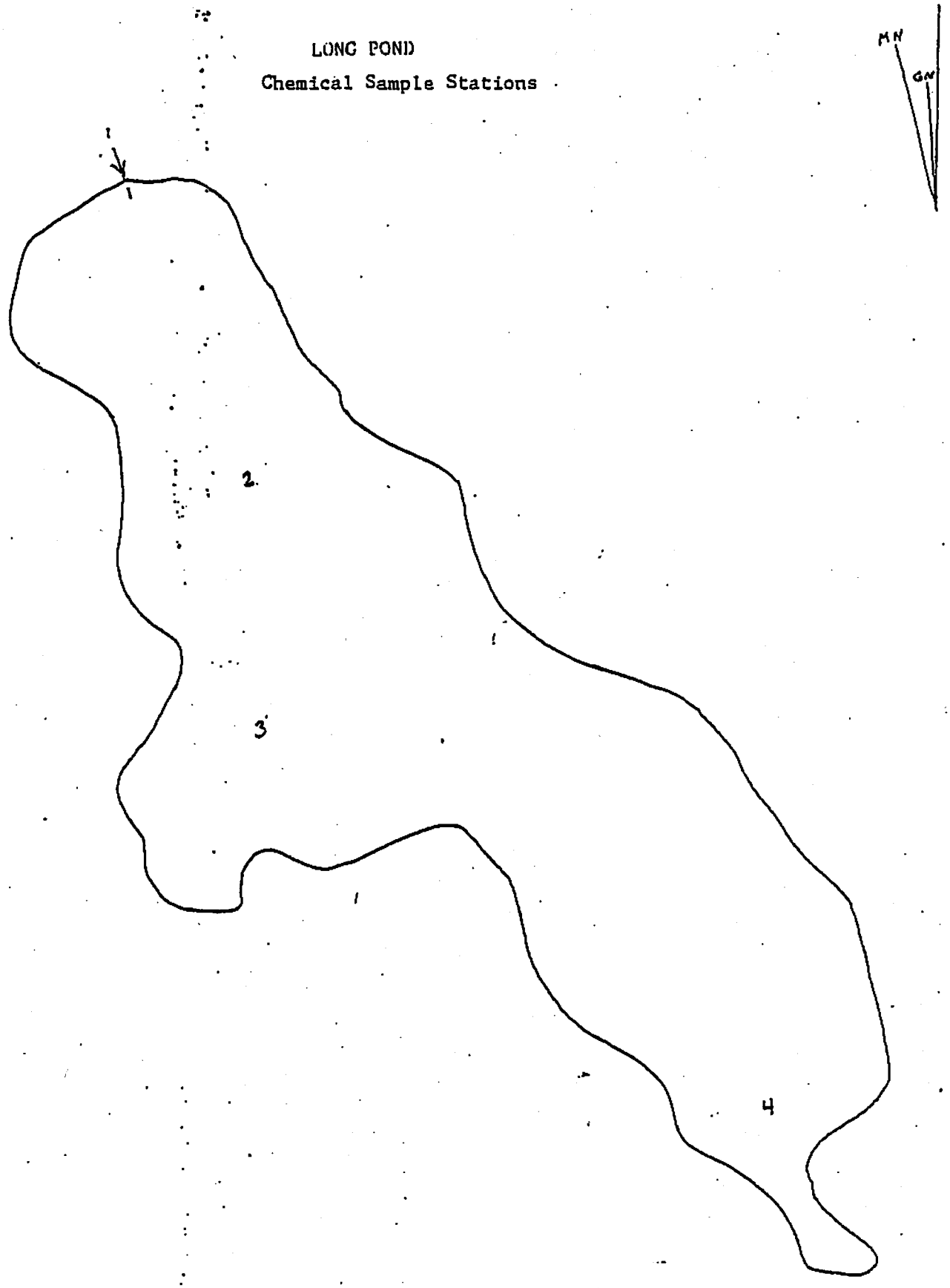
Submerged aquatic plant map with key;



Bottom - clean

LONG POND

Chemical Sample Stations



Scale 1:710'

	Long IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.01	.01					.02		
Nitrate (N)	.15	.1					.20		
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	10								
Total Hardness	16								
CO_2	5								
Pn	6.6								
Temp (C+F) 1' Levels	18° C								
Secchi	19 ft.								

Heavy Metals

Zn	.005
CD	.001
Sn	.006
Au	.001
Fe	.021
P D	.008
AL	.004
Cu	.006
Ni	.006
AG	.001

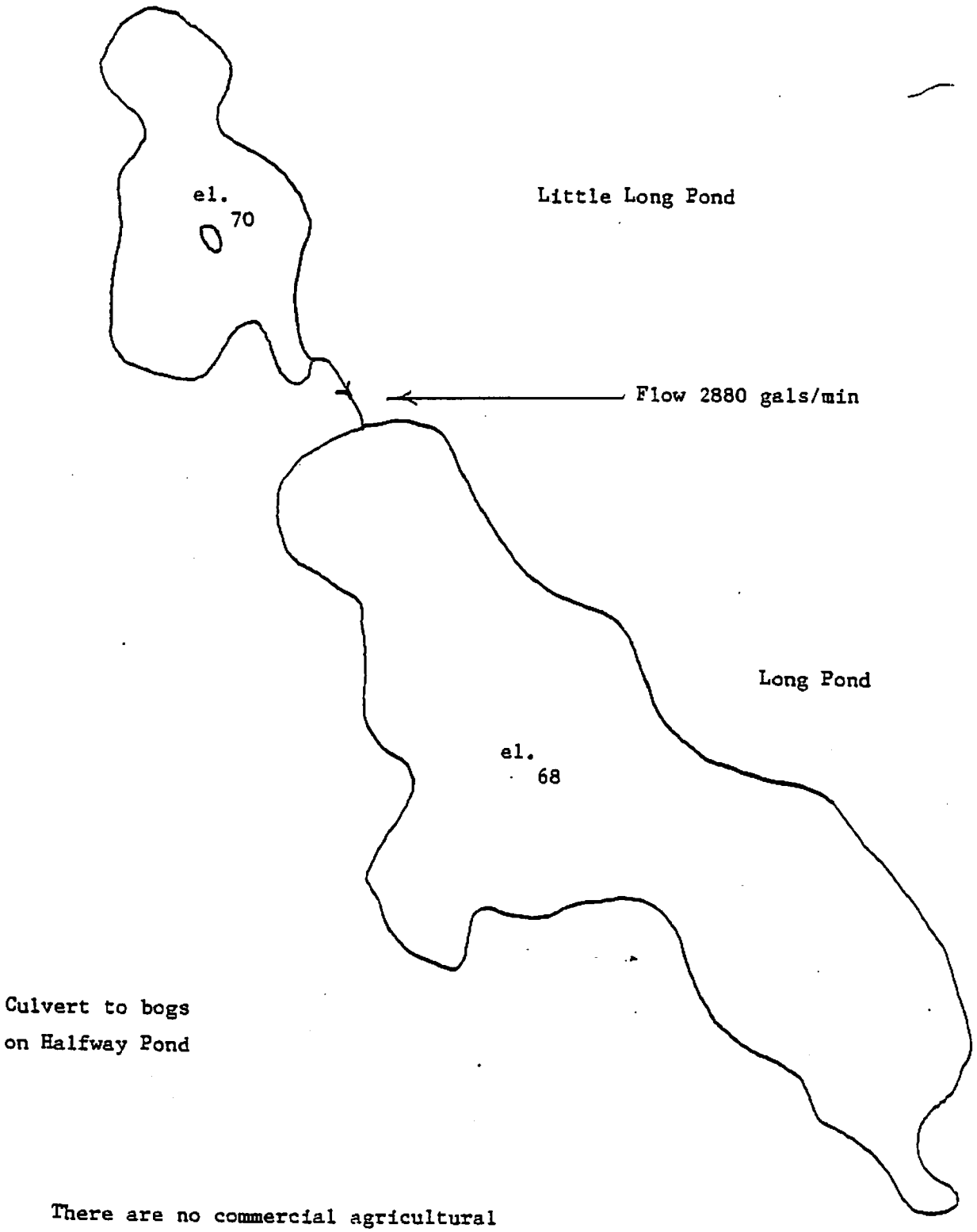
Benthos

Total P	11.1
Total Nitrogen	4.5
Total volatile solids	.02
Percent solids	1.90

All figures in mg/l unless otherwise noted.

LONG POND

Impoundment Map



There are no commercial agricultural enterprises affecting the surface flow of the impoundment.

Scale 1:1030'

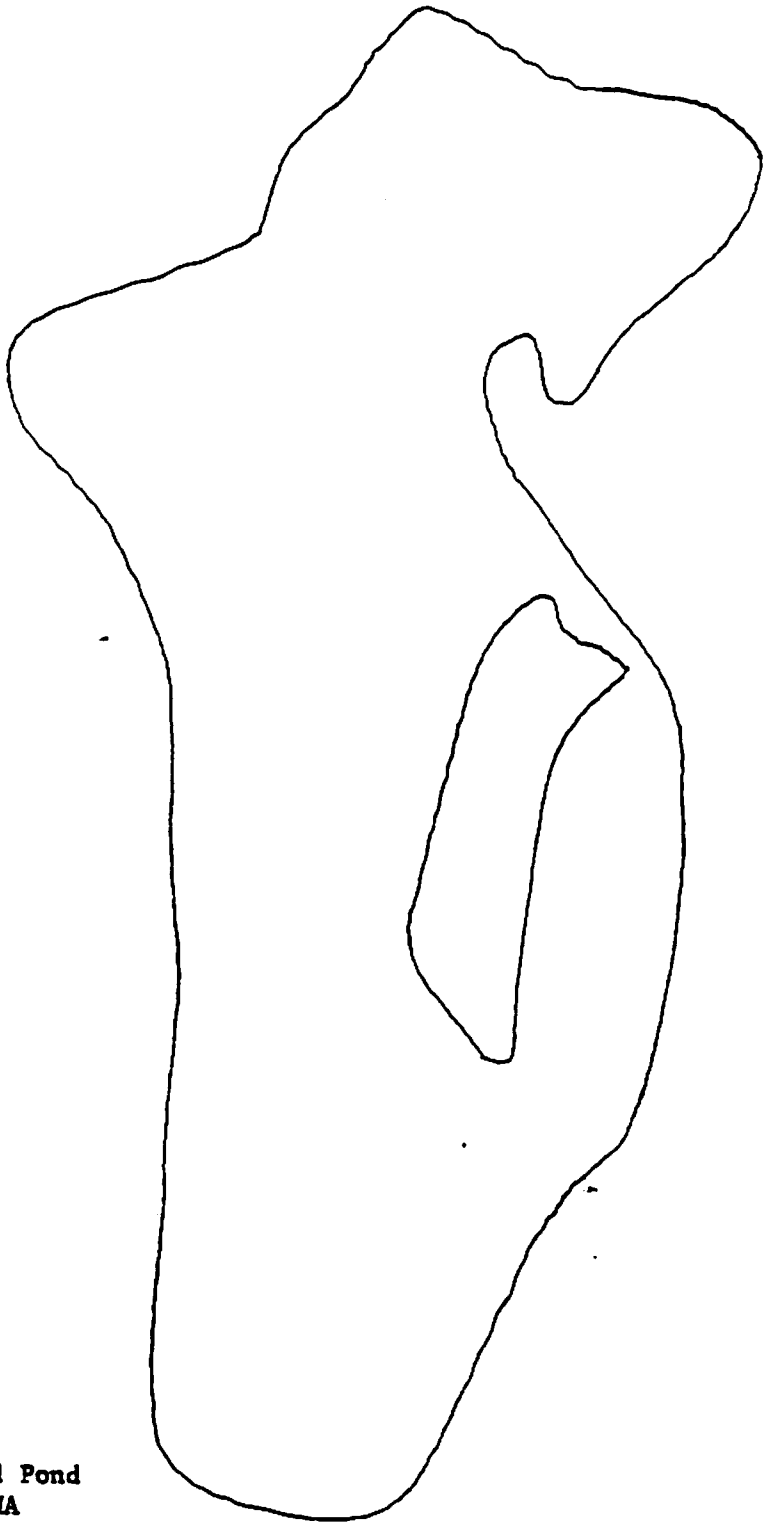
LONG POND

Long Pond ranks 1 using a modified trophic level index. It is a natural, stratified, steep sloping, cold water pond, with maximum depth of 102 feet. Macrophyte population: none. On plant trophic index, it ranked as number 1. Secchi reading: 19 ft. It randed number 1 in this category also. Phosphate readings were permissible. Nitrate readings were permissible.

Number of houses affecting impoundment: approx. 145. Cranberry acreage affecting geosystem: none.

Problems: Number of homes on steep shores, and Storrow Camp. Inlet from Little Long: phosphate readings in lake less than .01, while inlet stream was .02 phosphate. Nitrate on inlet was .20 which is critical. The pond's huge volume can compensate for this, but for how long a time? Heavy traffic on public launch could also be a problem. Pond is rated as oligotrophic.

LONG ISLAND POND
(LITTLE ISLAND POND)

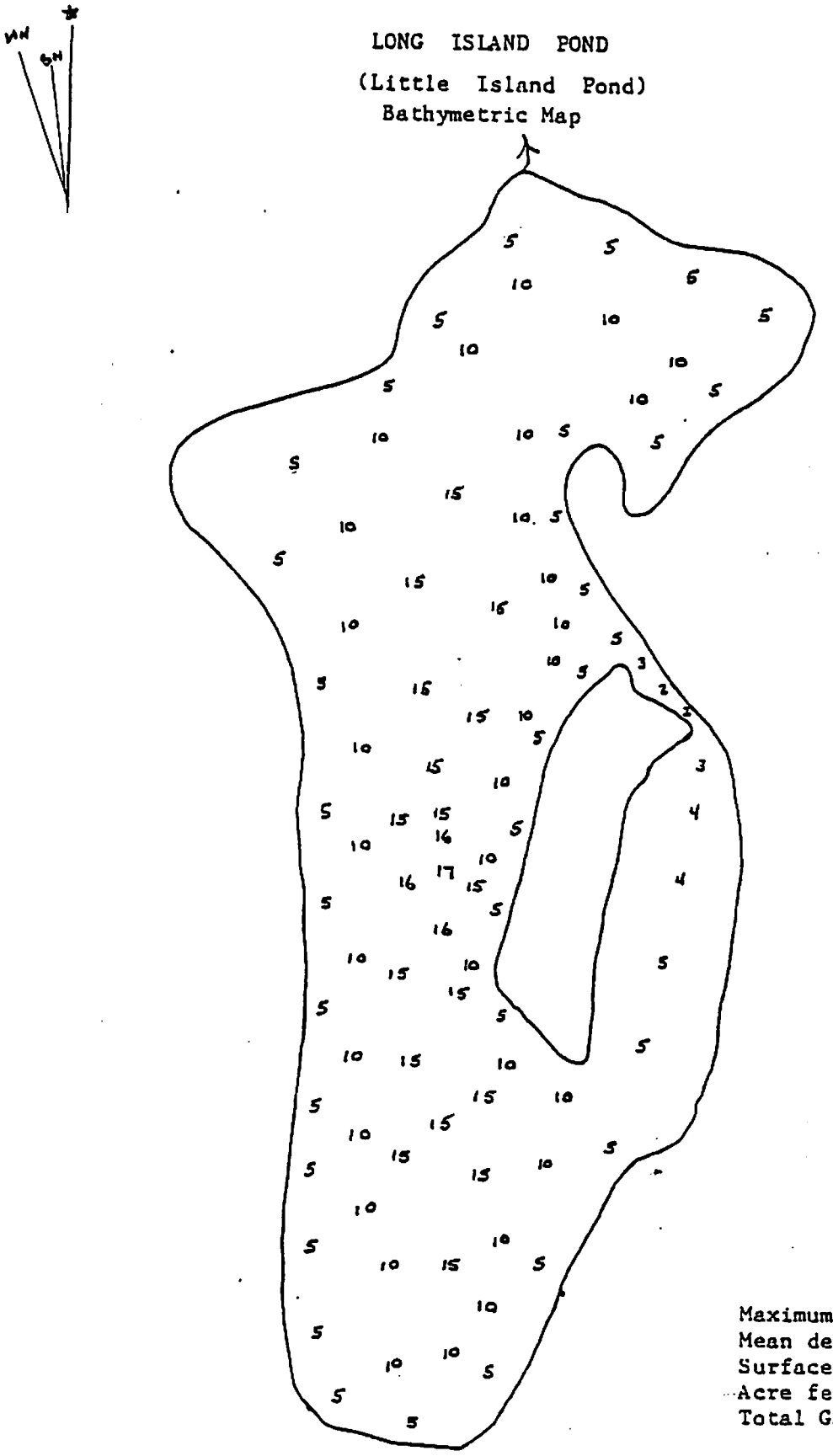


Long Island Pond
Plymouth, MA
USGS Map Manomet 1:24000
Pond use: Irrigation, recreation, aesthetic
Pond type: natural
Area: 30 acres - 12.15 hectares
Elevation: o4o
Shoreline distance: 17 miles
Stratified: no
Water type: Warm Watershed: Coastal

LONG ISLAND POND

(Little Island Pond)

Bathymetric Map



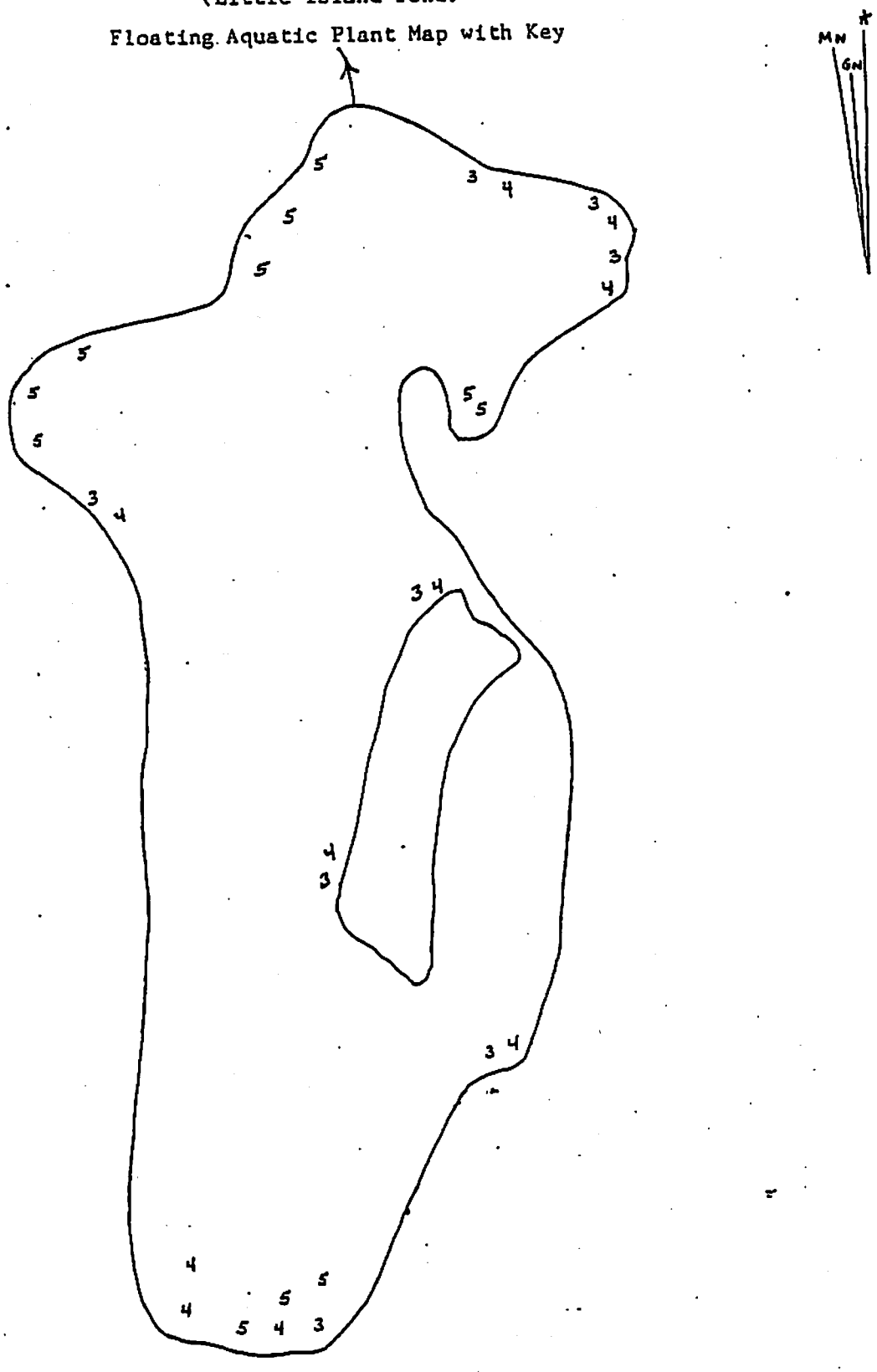
Maximum depth 17 5.18
Mean depth 10 3.48
Surface area 30 12.15 H.
Acre feet 300
Total Gals. 97,748,700

Scale 1:310

LONG ISLAND POND

(Little Island 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	3
Nymphaea	Water Lily, White Water Lily	5
Brasenia	Watershield	4
	Addenda	

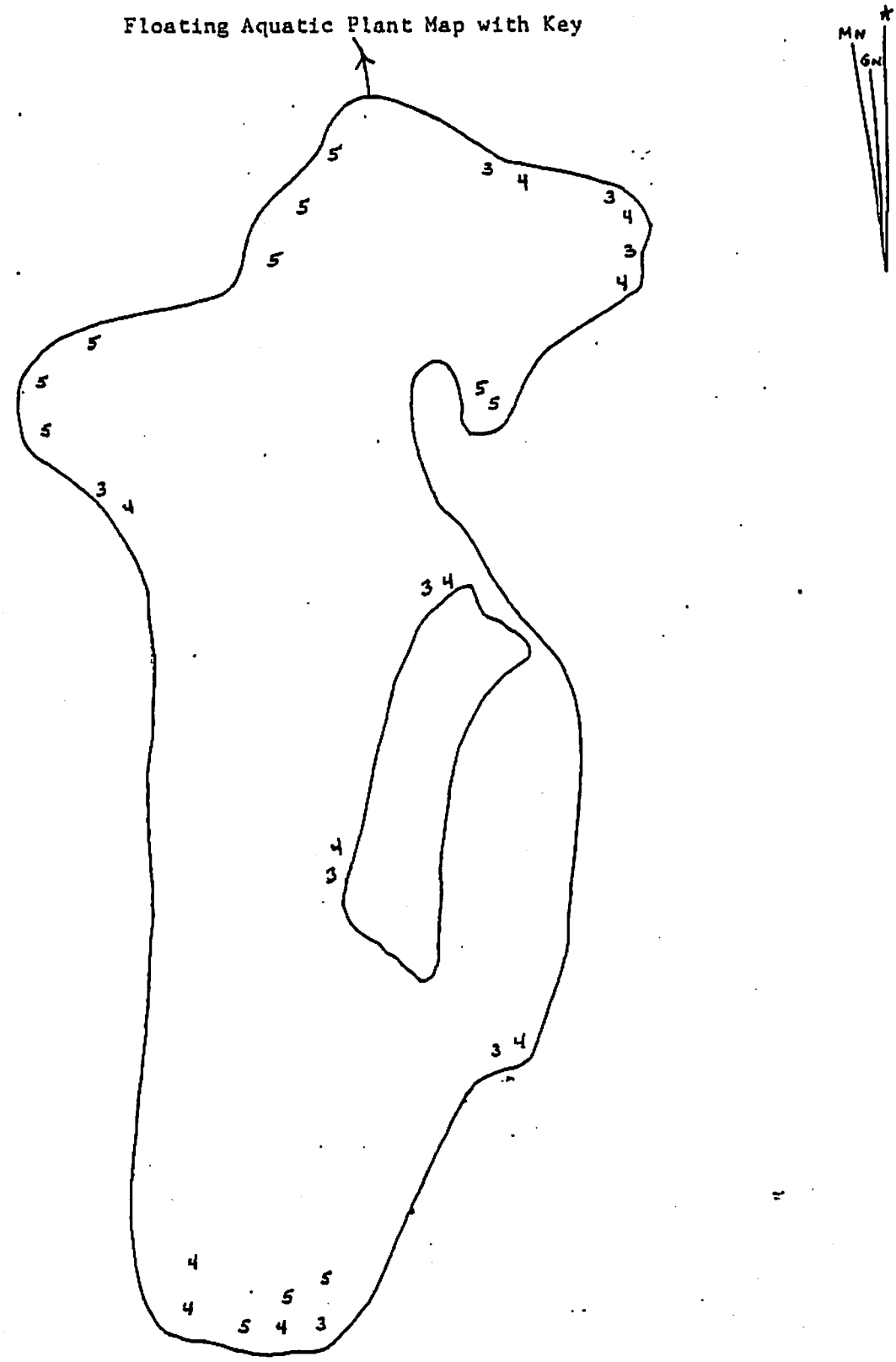
FLOATING AQUATIC PLANTS - UNATTACHED

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

LONG ISLAND POND

(Little Island Pond)

Floating Aquatic Plant Map with Key



Scale 1:310

EMERSED AQUATIC PLANTS

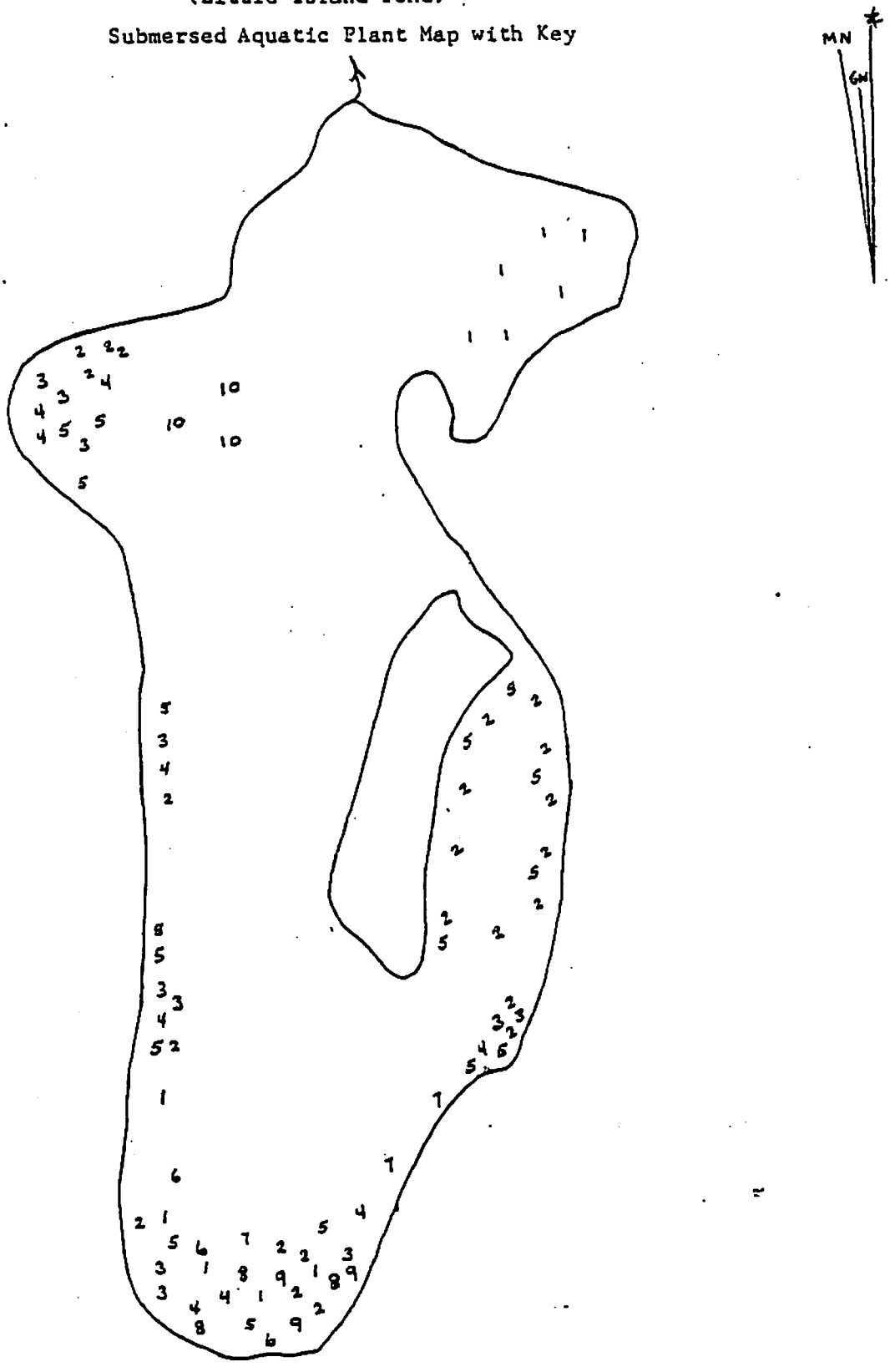
LATIN	COMMON	MAP NUMBER
Peltandra	Arrow Arum	
Pontederia	Pickerel Weed	2
Sagittaria	Arrowhead; Duck Potatoe	
Polygonum	Watersmart Weed	
Typha	Cattail	4
Eleocharis	Spike Rush Sedge	
Scirpus	Bulrush Sedge	3
Juncaceae	Juncus Rush	5

Addenda

LONG ISLAND POND

(Little Island Pond)

Submersed Aquatic Plant Map with Key



Vegetation heavy out to 5 foot contour line. Rest classified as light.

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	2
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	3
Potamogeton Natans	Floating Brown Leaf	4
Potamogeton Nodosus	American Pondweed	
Potamogeton Pectinatus	Sago Pondweed	5
Potamogeton Praelongus	White Stem Pondweed	
Potamogeton Richardsonii	Richardson Pondweed	
Potamogeton Robinsii		
Potamogeton Vaginatus	Giant Pondweed	
Najas	Bushy Pondweed	
Zannichellia	Horned Pondweed	
Elodea	Waterweed	7
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	
Myriophyllum	Water Milfoil	1
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	
Nasturtium	Water, Cress	
Utricularia	Bladderwort	
Vallisneria	Wild Celery	6

Addenda

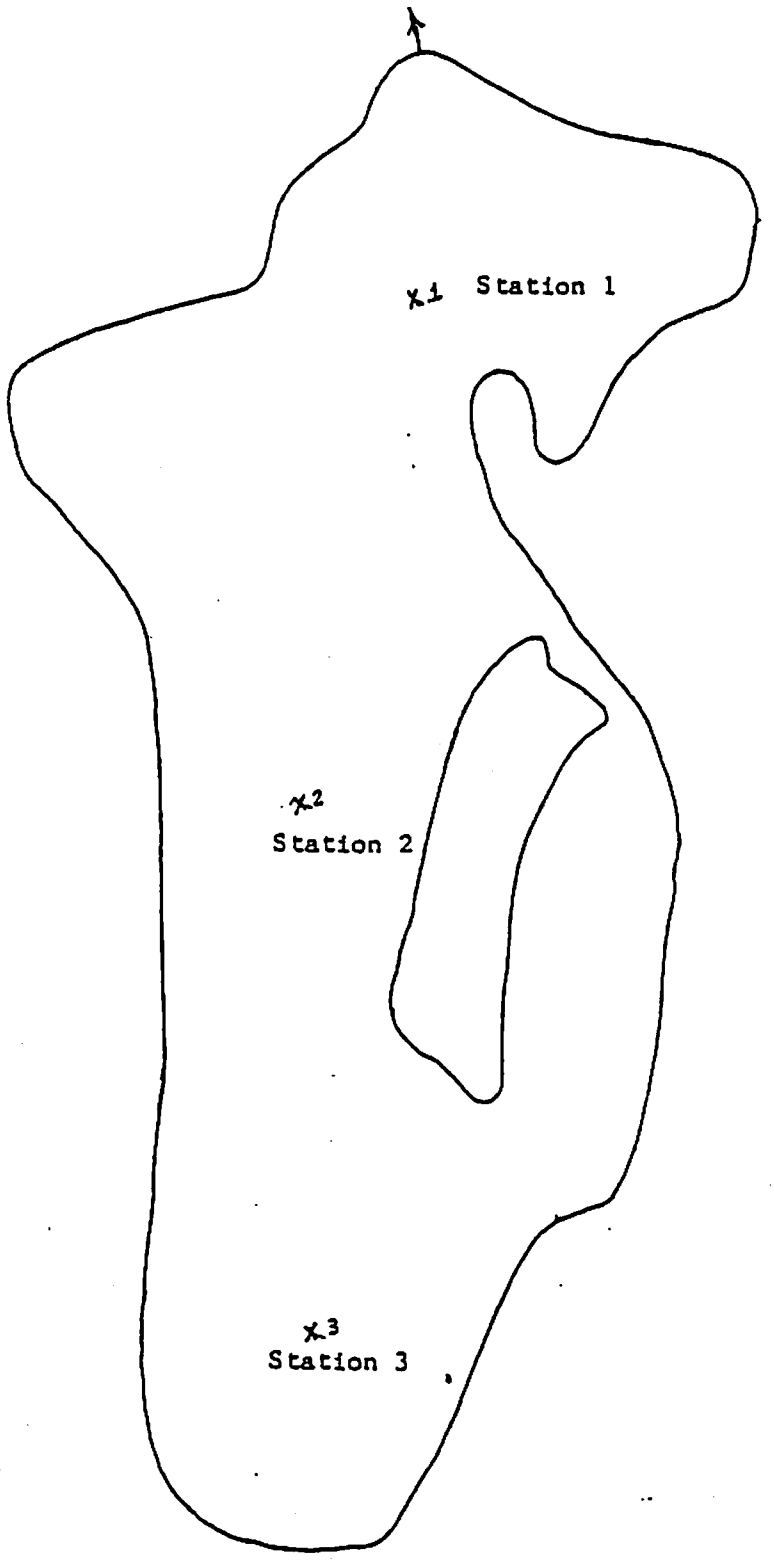
Algae

Chlorophyceae	green	
unicellular filamentous		8
Cyanophyceae	blue-green	
unicellular filamentous		9
Nitella	stonewort	10

LONG ISLAND POND

(Little Island Pond)

Chemical Sample Stations



Scale 1:310

Long Island

	IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.02	.02	.02						
Nitrate (N)	.03	.06	.05						
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	7								
Total Hardness	30								
CO_2	14								
Pn	7.2								
Temp (C+F) 1' Levels	21° C								
Secchi	10.5 ft.								

Heavy Metals

Zn	.003
CD	.001
Sn	.015
Au	.002
Fe	.040
PD	.002
AL	.045
Cu	.009
Ni	.017
AG	.006

Benthos

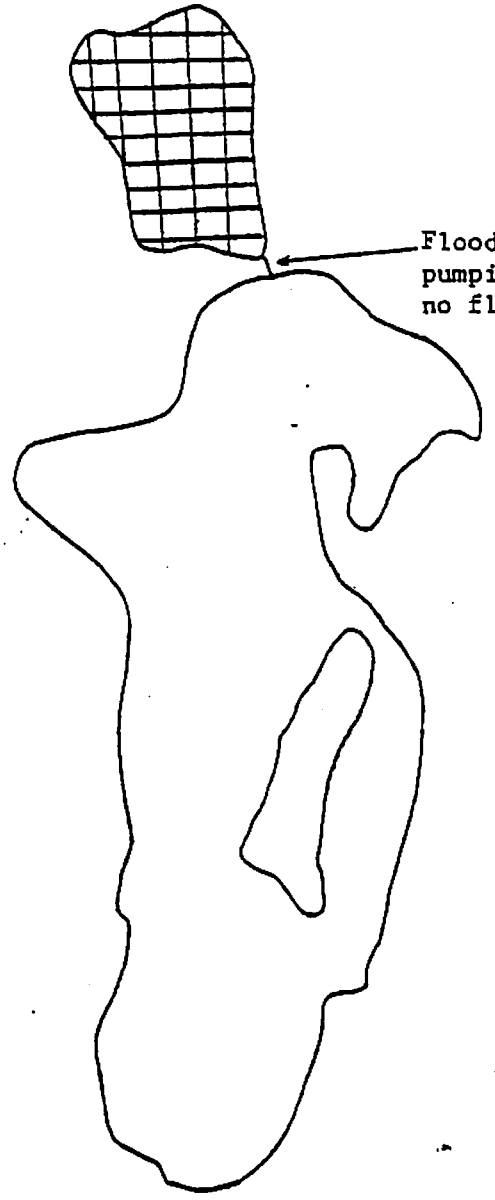
Total P	39.3
Total Nitrogen	7.2
Total volatile solids	.92 %
Percent solids	2.33

All figures in mg/l unless otherwise noted.

LONG ISLAND POND

Little Island Pond

Impoundment Map



Total agriculture acreage

Affecting system 6 acres

Cranberry Bogs

Scale 1:500'

LONG ISLAND POND

Using a modified trophic level index Long Island Pond ranks 19th.

Long Island Pond is a natural warm water, spring fed, non-stratified pond with a maximum depth of 17 feet. Macrophyte population is very dense to medium. Floating aquatic plants cover four acres with white lilies dominant. Emersed aquatic plants are medium along the shore. Submersed aquatic plants are very dense out to the five foot contour, from 5 to 17 feet classified as light with the dominant species being milfoil. Blue-green filamentous algae covers about two acres of bottom. On the plant trophic list it ranks 28th. Secchi disc readings of 10.5 feet ranked it 19th in this parameter. Phosphate and nitrate readings were acceptable.

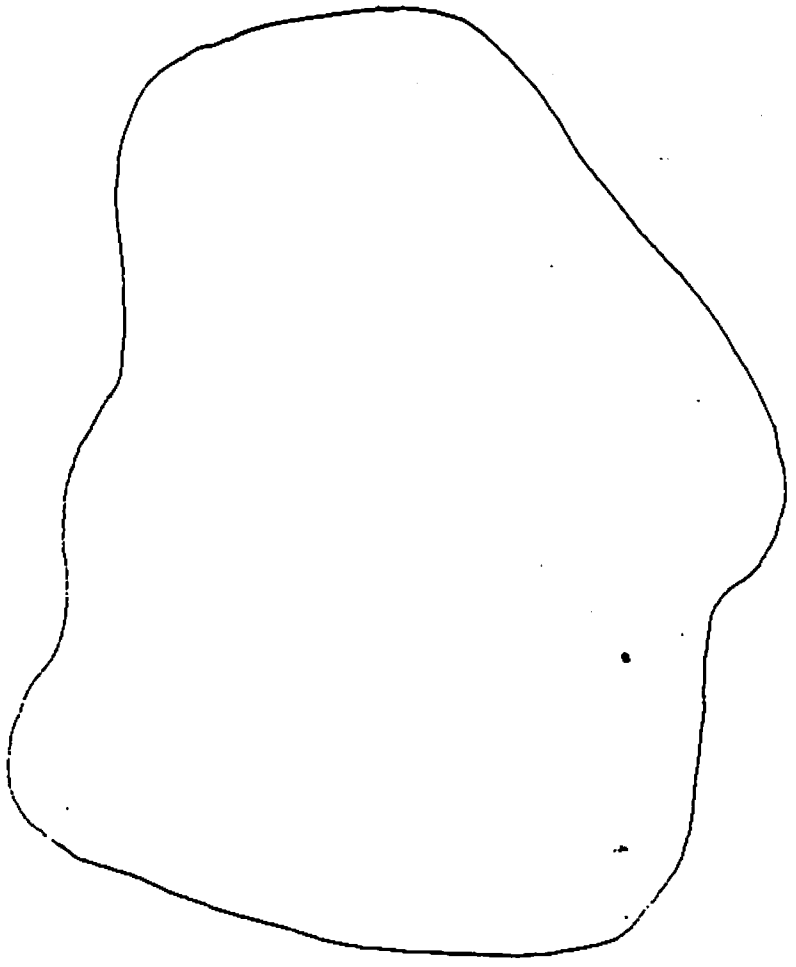
Number of houses affecting pond: 2

Cranberry bogs affecting pond: 6 acres

This pond is classified eutrophic

Low phosphate and nitrate readings may be misleading due to plant utilization.

MICAJAH

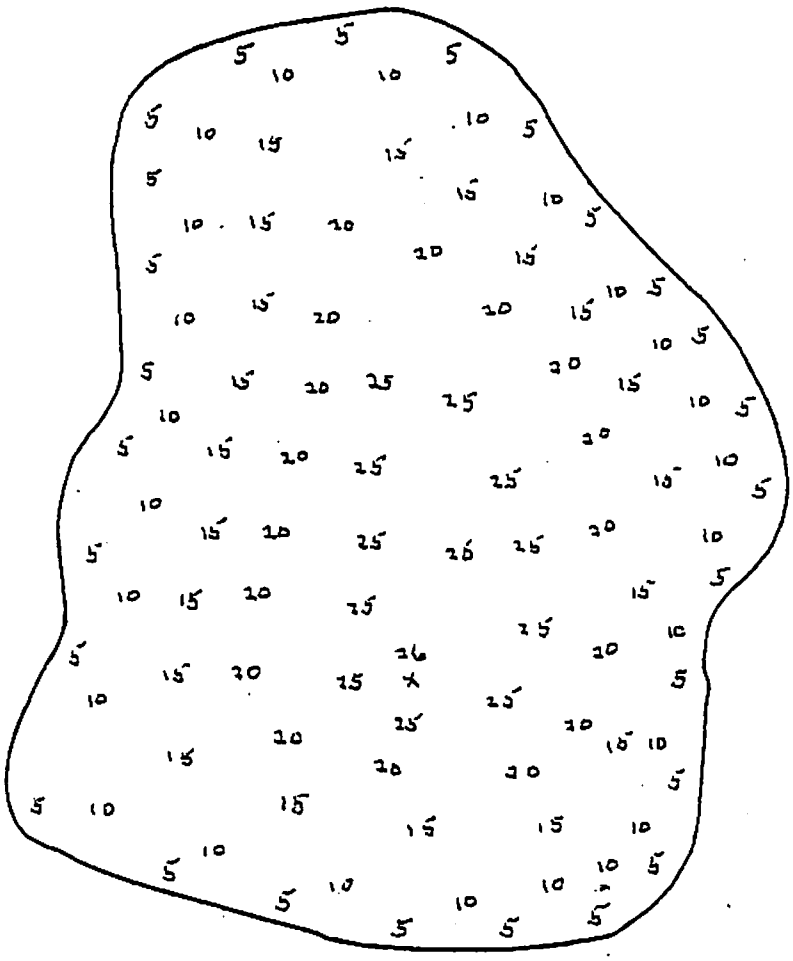


Micajah Pond
Plymouth, Mass.
Watershed: coastal
Acres: 20
Altitude: 0107
Water type: warm
Pond type: kettlehole
Stratified: no
Pond use: recreation, asthetic
Topo sheet USGS 1:24000 Plymouth
Position Topo up 8.3 R 7.0
Shoreline distance .9 M (4752 ft.)

Scale 1:245'

MICAJAH

Bathymetric Map

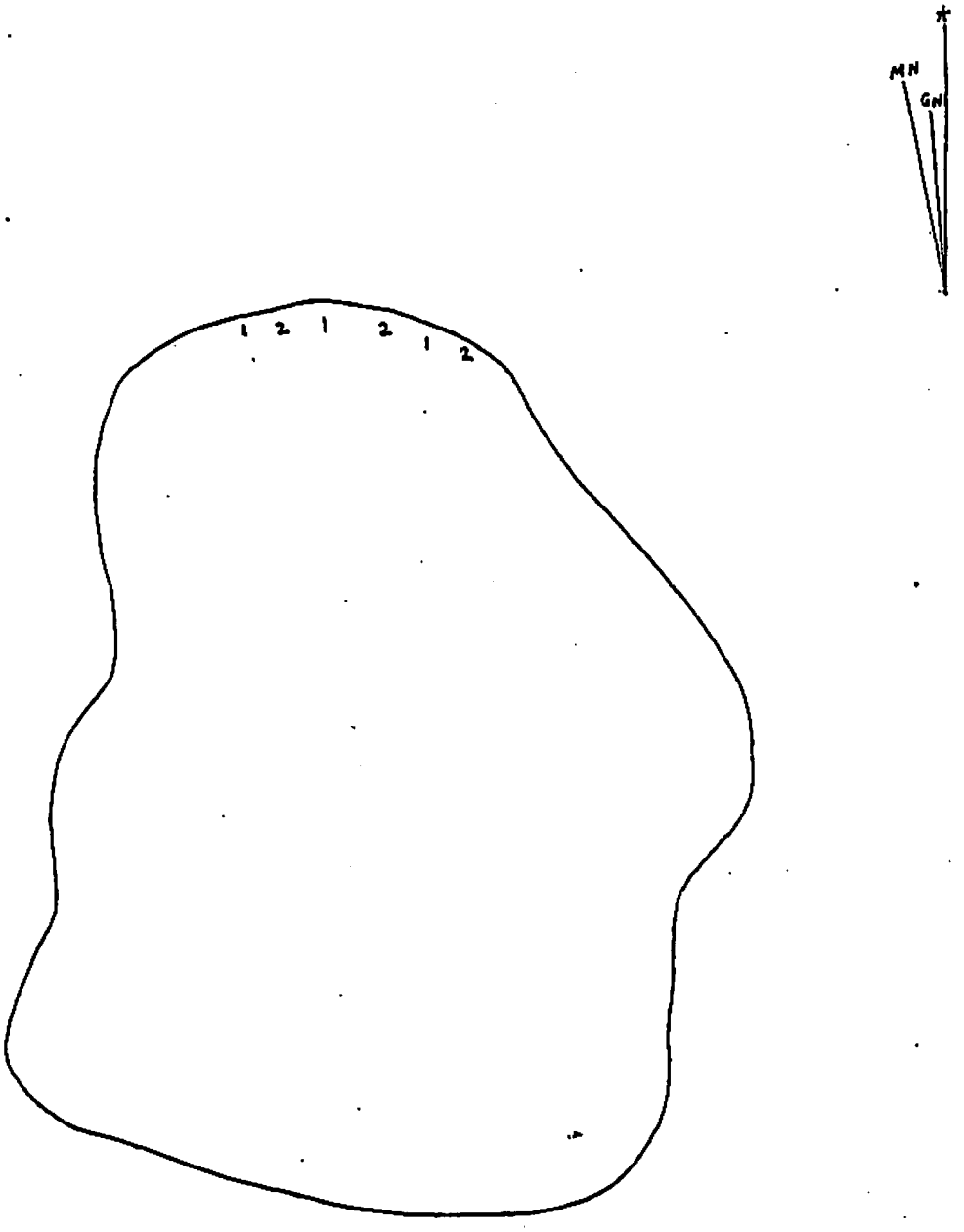


Maximum depth 26'
Mean 14'
Area 20 A
Acre feet 280
Volume 91,232,000 gals.

Scale 1:245

MICAJAH POND

Floating Aquatic Plant Map with Key



Scale 1:245

FLOATING AQUATIC PLANTS ATTACHED

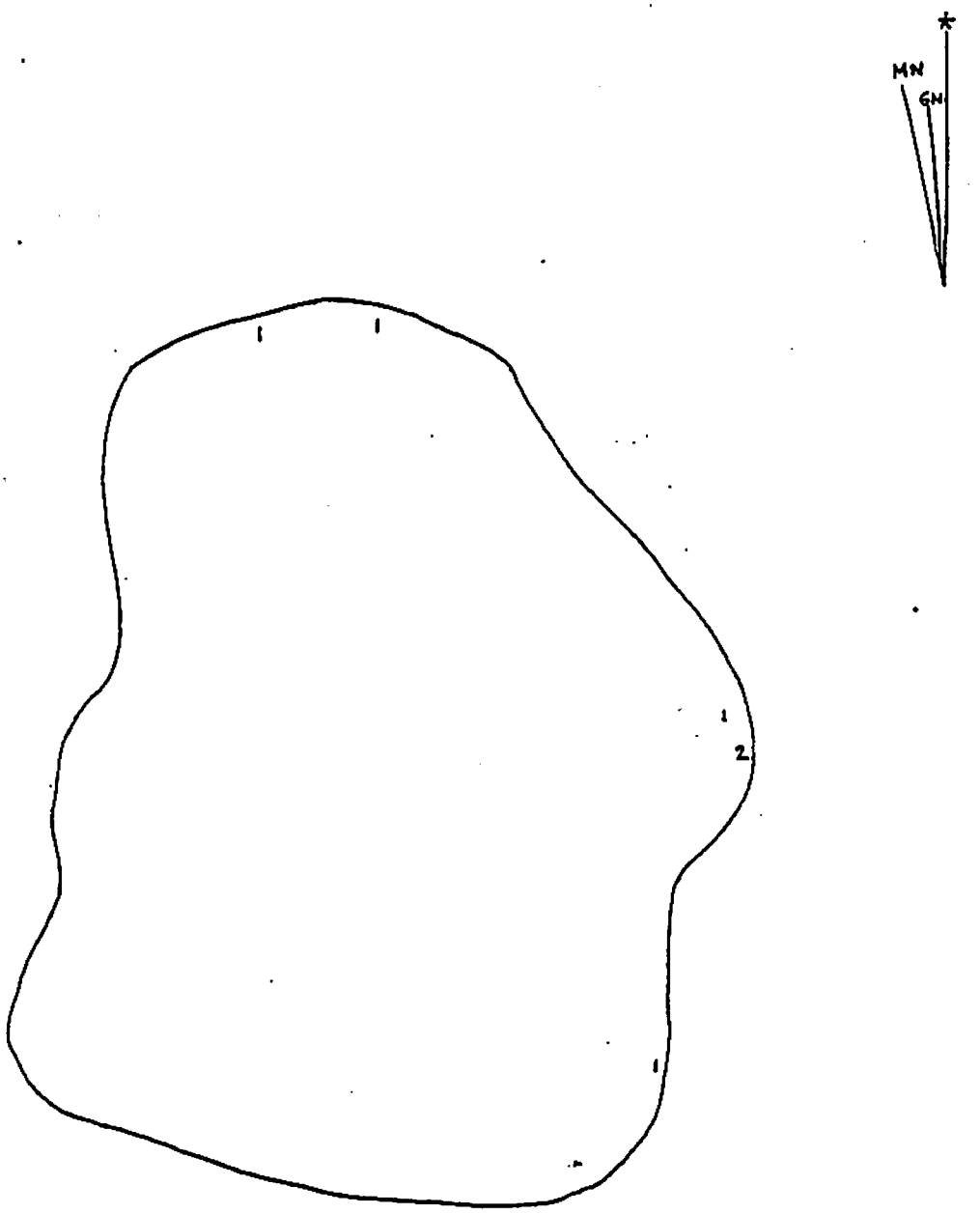
LATIN	COMMON	MAP NUMBER
Nuphar	Cow Lily, Yellow Water Lily, Spatterdock	
Nymphaea	Water Lily, White Water Lily	1
Brasenia	Watershield	2
	Addenda	

FLOATING AQUATIC PLANTS - UNATTACHED

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

MICAJAH POND

Emersed Aquatic Plant Map with Key



Scale 1:245

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	2
Scirpus	Bulrush Sedge	1
Juncaceae	Juncus Rush	

Addenda

MICAJAH

Submersed Aquatic Plant Map with Key

From dotted line to shore area is heavily infested with **Utricularia** (Bladderwort)

Scale 1:245

SUBMERSED AQUATIC PLANTS

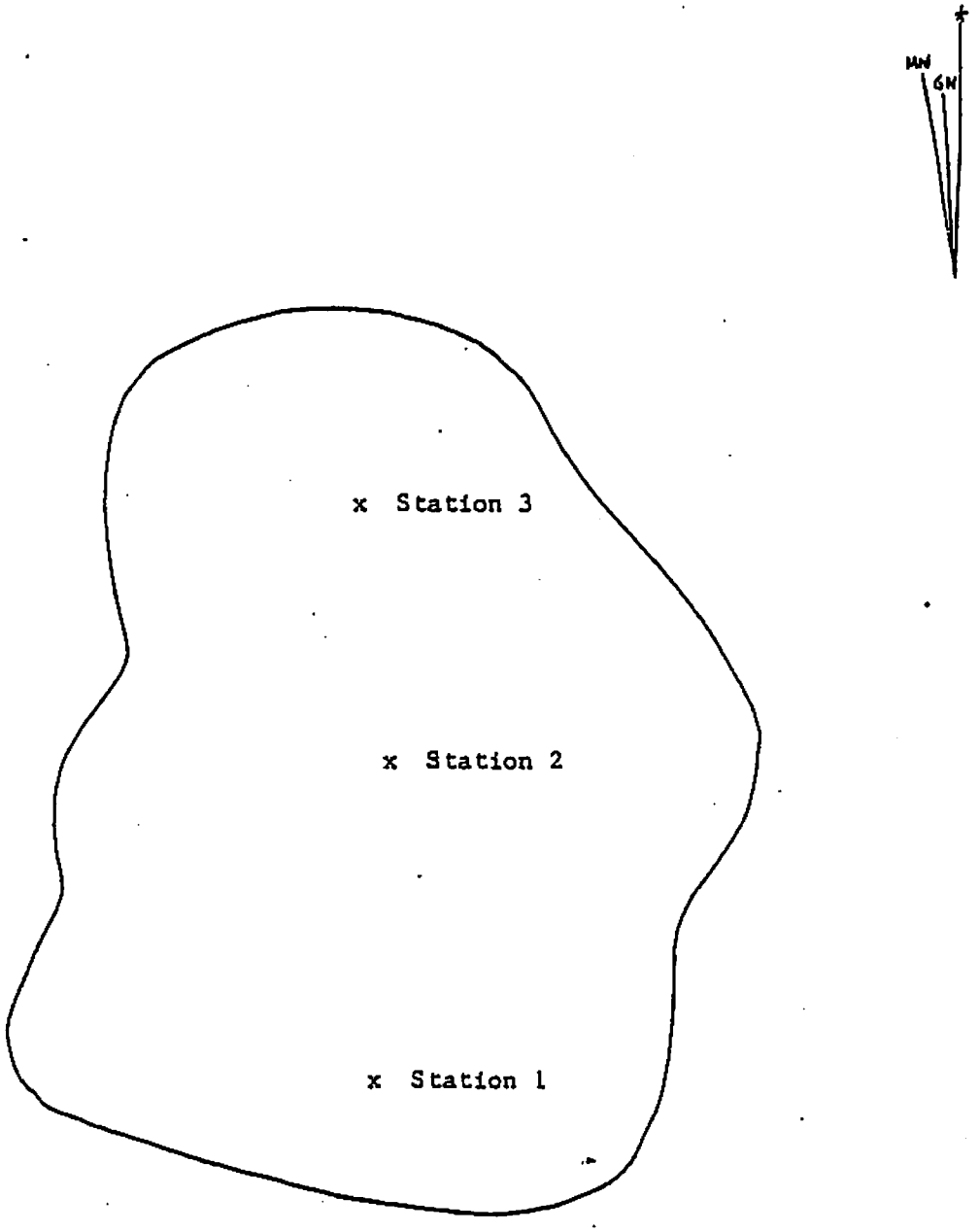
LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	
Potamogeton Natans	Floating Brown Leaf	2
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	
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

	Algae	
Chlorophyceae	green	
unicellular		
filamentous		4
Cyanophyceae		
unicallular		
filamentous		5

MICAJAH POND

Sample Station Location Map



Scale 1:245

Micajah

	IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.02	.02	.02						
Nitrate (N)	.05	.06	.05						
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	8								
Total Hardness	18								
CO_2	18								
Pn	6.5								
Temp (C+F) 1' Levels	22° C								
Secchi	18 ft.								

Heavy Metals

Zn	.011
CD	.001
Sn	.004
Au	.001
Fe	.153
P D	.004
AL	.038
Cu	.007
Ni	.016
AG	.001

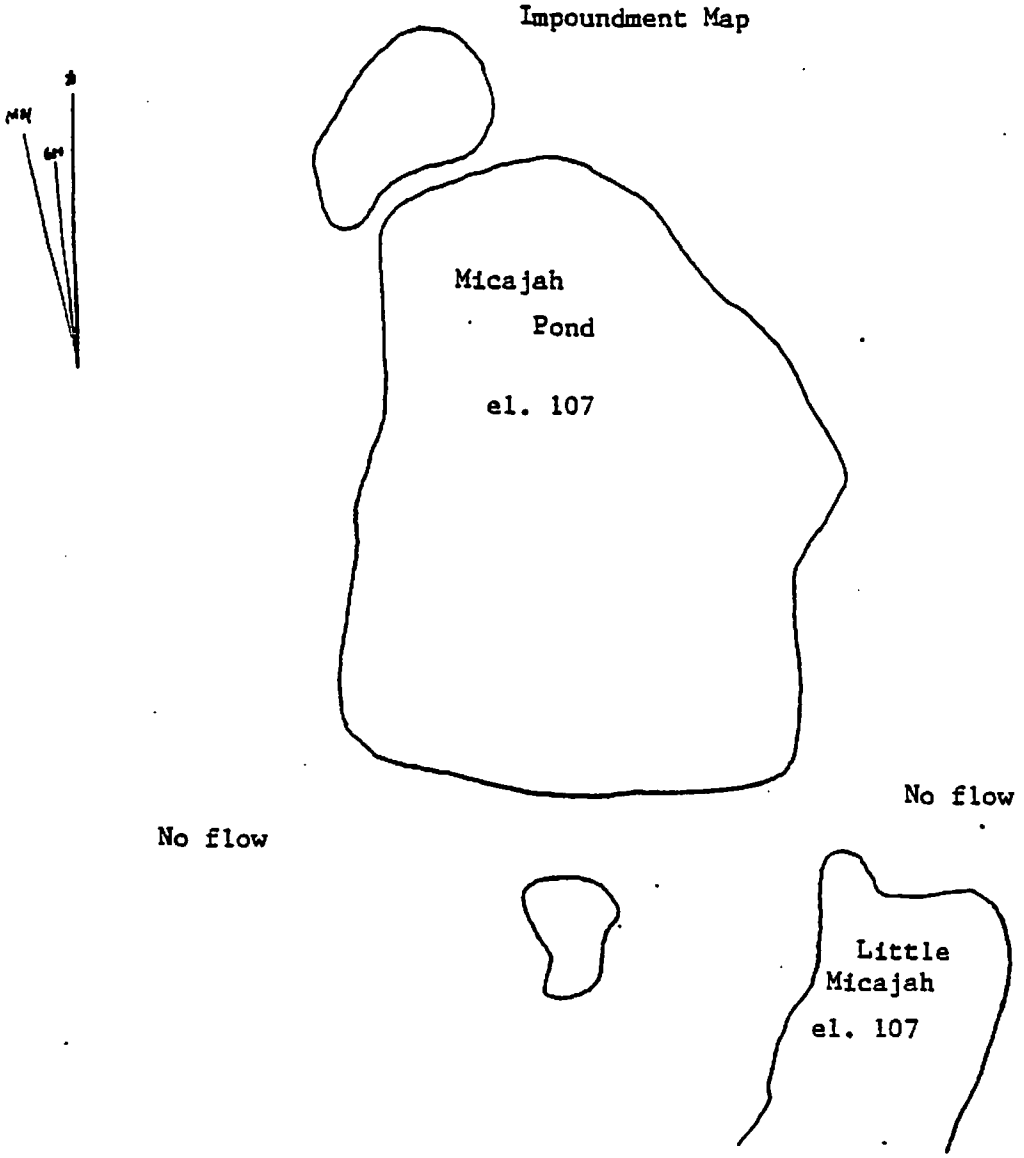
Benthos

Total P	5.27
Total Nitrogen	6.1
Total volatile solids	.25%
Percent solids	1.37

All figures in mg/l unless otherwise noted.

MICAJAH 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 the impoundment none
Industrial practices directly affecting the impoundment none
Possible sources of nutrient influx. Houses
permanent and seasonal around perimeter of pond
also small park on S.E. corner of pond.

Scale 1:356

MICAJAH

Using a modified trophic level index Micajah ranks 8th.

Micajah is a warm water, spring fed, non-stratified kettle hole with a maximum depth of 26 feet. Macrophyte population is generally light except for 3 acres along the southwest shore. Floating aquatic plants on the northshore are light, emergent aquatic plants are sparse, and submersed aquatic plants covering 4 acres of which 3 acres are densely populated along the southwest corner are predominantly bladderwort (the southwest corner also contains the most houses.) Blue-green filamentous algae is sparse in the northern end of the pond. Except for 3 acres the macrophyte problem is rated good, it ranked 12th on the plant trophic list. Secchi disc reading was 18 feet, ranking it 7th in this parameter. Phosphate and nitrate readings were acceptable.

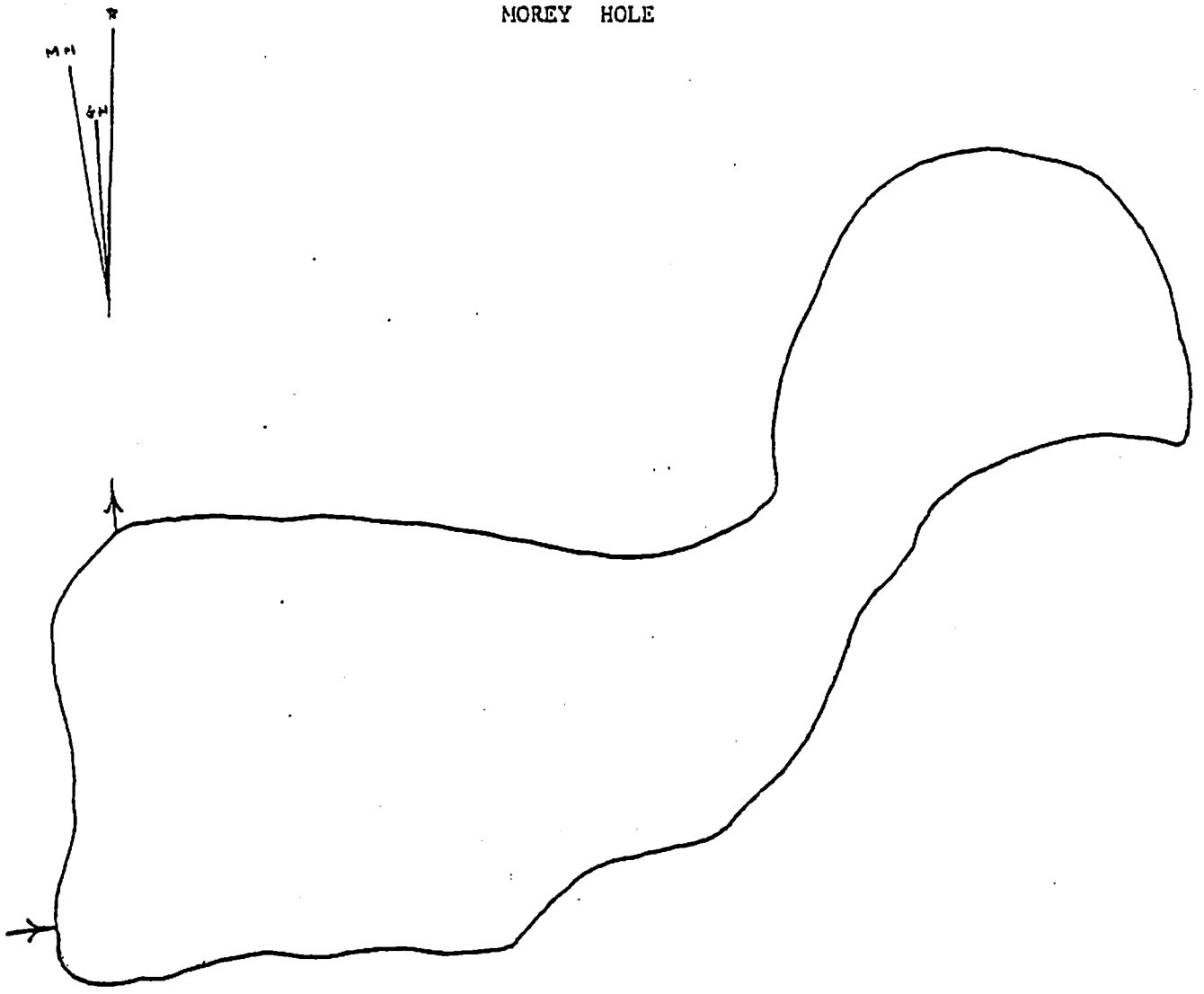
Number of homes affecting pond: approximately 25

Cranberry bogs affecting pond: none

Pond is rated as mesotrophic

Problems: Congested development of southwest shore; any further development of small recreation area should proceed cautiously.

MOREY HOLE

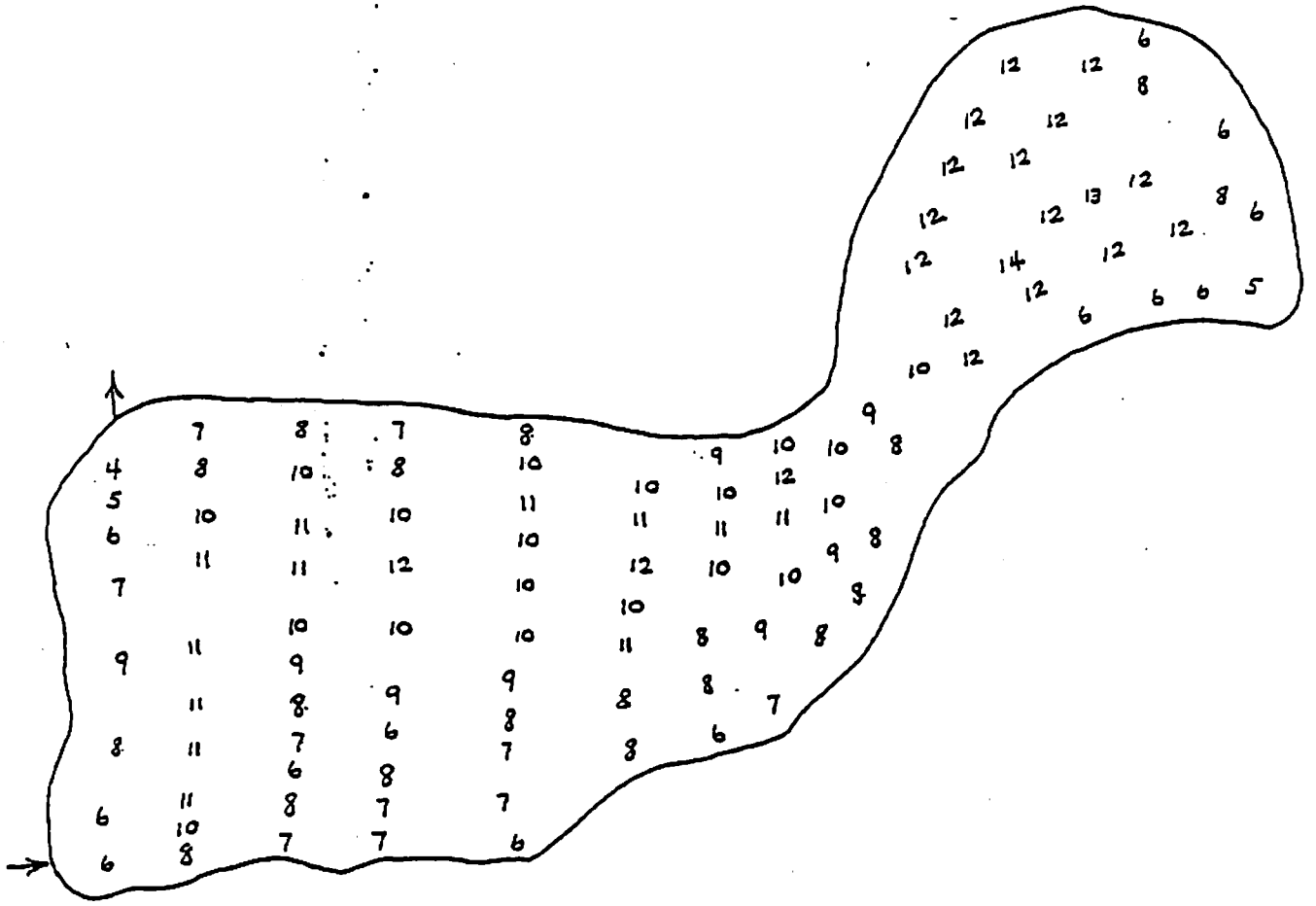


rey Hole Pond
ymouth, Mass.
tershed type: coastal
res: 20
titude: 047'
ter type: warm
nd type: enhanced
ratified: no
nd use: recreation
po sheet: USGS 1:24000 Sagamore
sition Topo sheet: up 21.5 right 9.1
oreline distance: 1 mile 5280'

Scale 1:262'

MOREY HOLE

(Bathymetric Map)

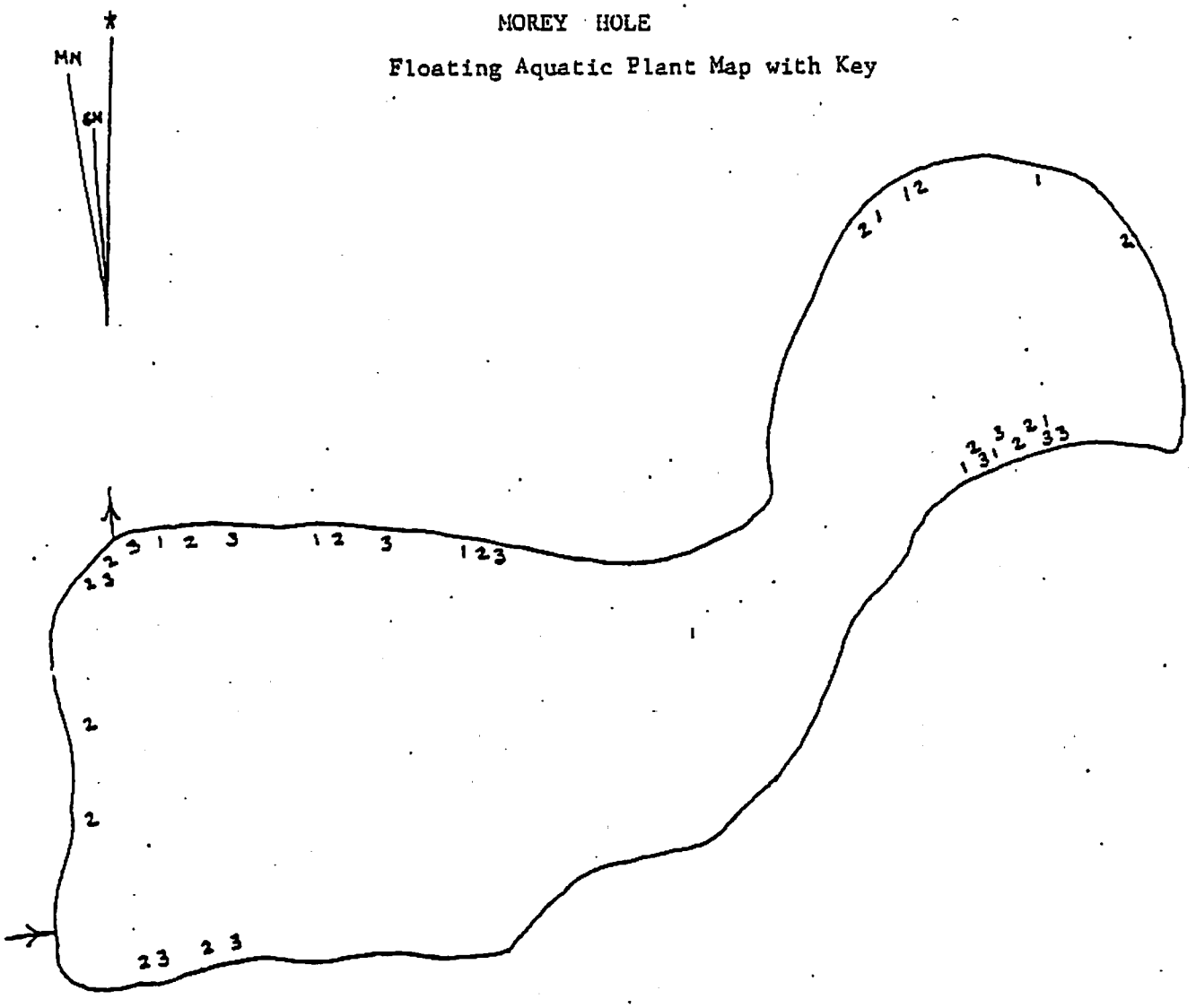


Maximum depth 13' 3.96 M
Mean depth 8' 2.44 M
Surface area 20 acres 8.1 H
Acre fee 160
Total gals. 52,136,160

Scale 1:262'

MOREY HOLE

Floating Aquatic Plant Map with Key



Scale 1:262'

FLOATING AQUATIC PLANTS ATTACHED

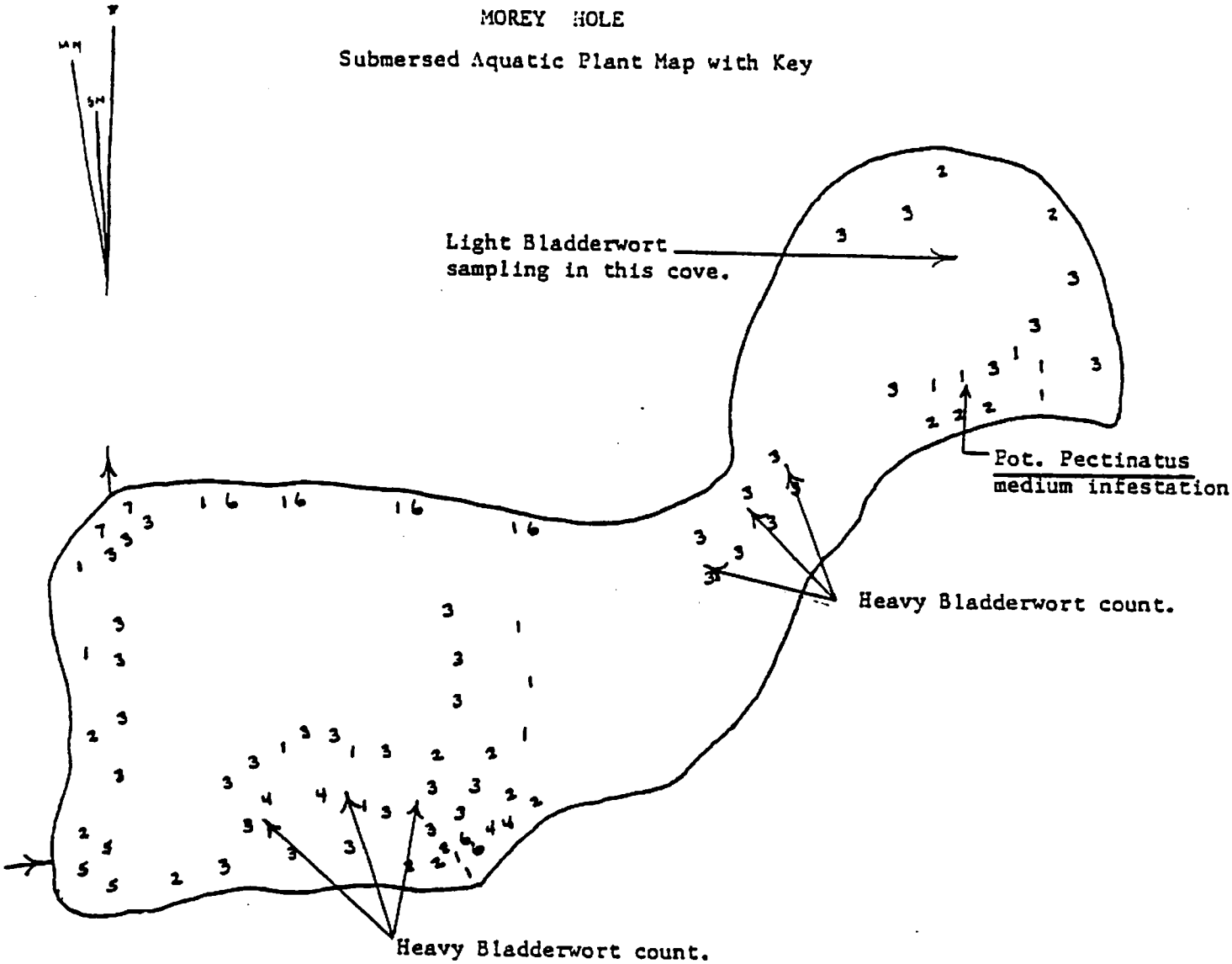
LATIN	COMMON	MAP NUMBER
Nuphar	Cow Lily, Yellow Water Lily, Spatterdock	——— 1
Nymphaea	Water Lily, White Water Lily	—·—·— 2
Brasenia	Watershield	——— 3
	Addenda	

FLOATING AQUATIC PLANTS - UNATTACHED

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

MOREY HOLE

Submersed Aquatic Plant Map with Key



Scale 1:2[illegible]

SUBMERSED AQUATIC PLANTS

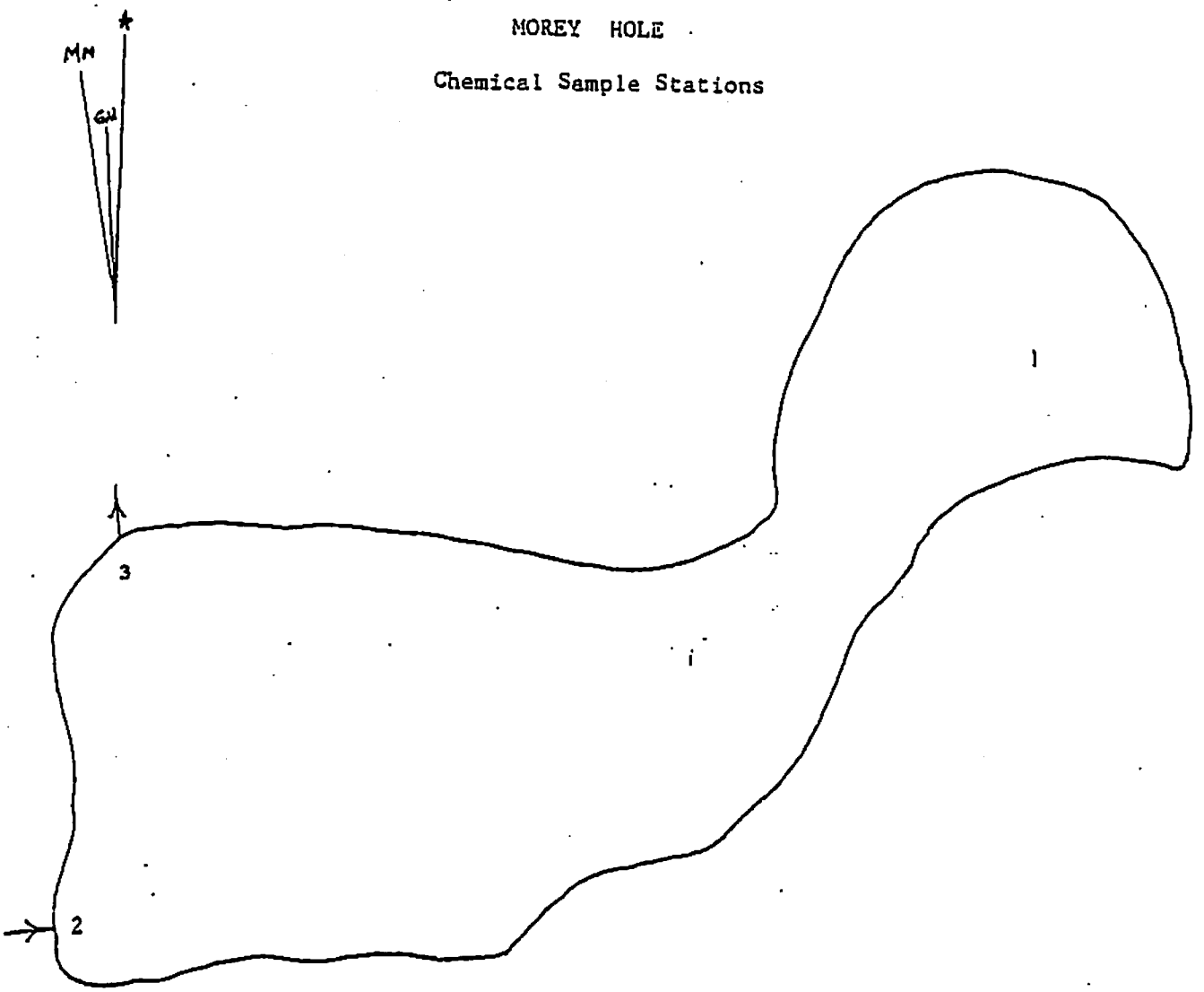
LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed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

Addenda

Cyanophyceae filamentous	Blue-green algae	5

MOREY HOLE

Chemical Sample Stations



Scale 1:262'

Morey Hole

	IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.04	.04		.03					
Nitrate (N)	.10	.10		.10					
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	8								
Total Hardness	16								
CO_2	12								
Pn	6.5								
Temp (C+F) 1' Levels	20° C								
Secchi	7 ft.								

Heavy Metals

Zn	.004
CD	.001
Sn	.009
Au	.003
Fe	.237
P D	.007
AL	.032
Cu	.008
Ni	.020
AG	.009

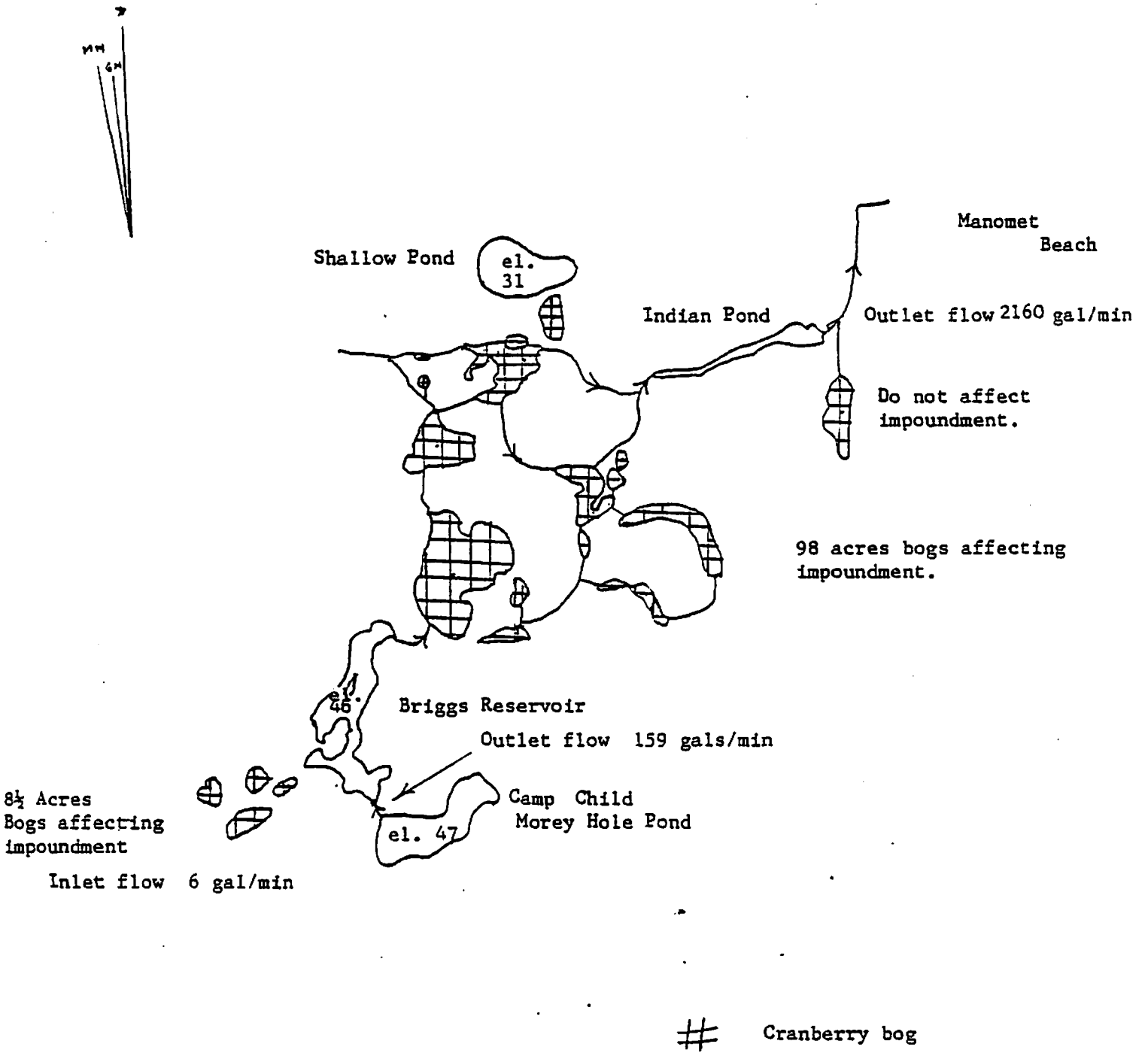
Benthos

Total P	14.3
Total Nitrogen	3.1
Percent solids	9.4
Total volatile solies	.24%

All figures in mg/l unless otherwise noted.

MOREY HOLE - INDIAN

Impoundment Map



Scale 1:2000'

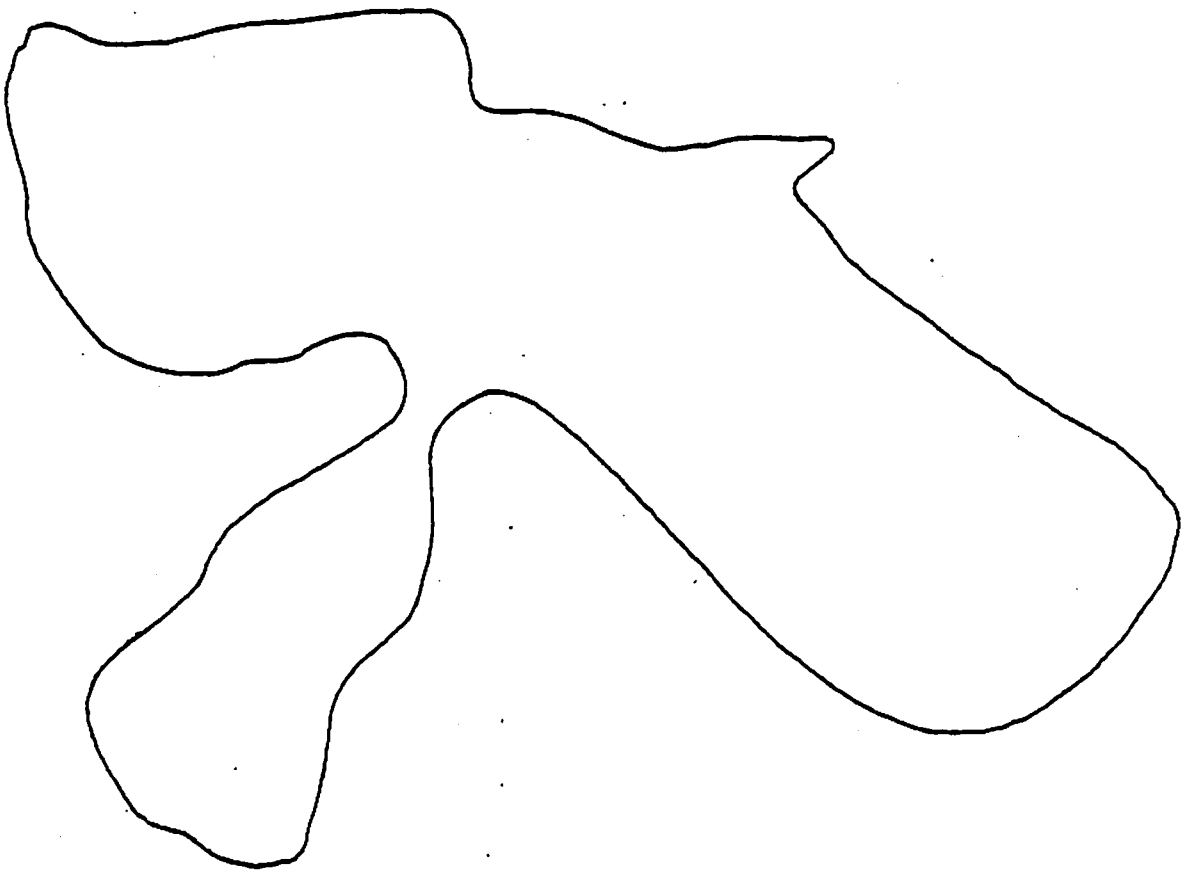
MOREY HOLE

Morey Hole ranks 20 using a modified trophic level index. It is an enhanced, non-stratified, partially spring-fed, warm water pond, with maximum depth of 14 feet. Floating aquatic plants cover 5%of surface. Dominant species is white lillies. Submerged aquatic plants cover 30% of bottom, with population classified as medium. Algae problem in southwest corner of pond. Blue-green and green filamentous algae cover about 1 acre. On plant trophic index, it ranked 22nd. The secchi disc reading was 12 feet and in this category, it ranked 16th. The phosphate readings were critical. . The nitrate readings were satisfactory. .

Number of homes affecting impoundment: none. Cranberry acreage: none.

Problems: Camp Child, a Boy Scout camp, surrounds most of the lake, and this could be a source of nutrient influx. This pond is rated as eutrophic.

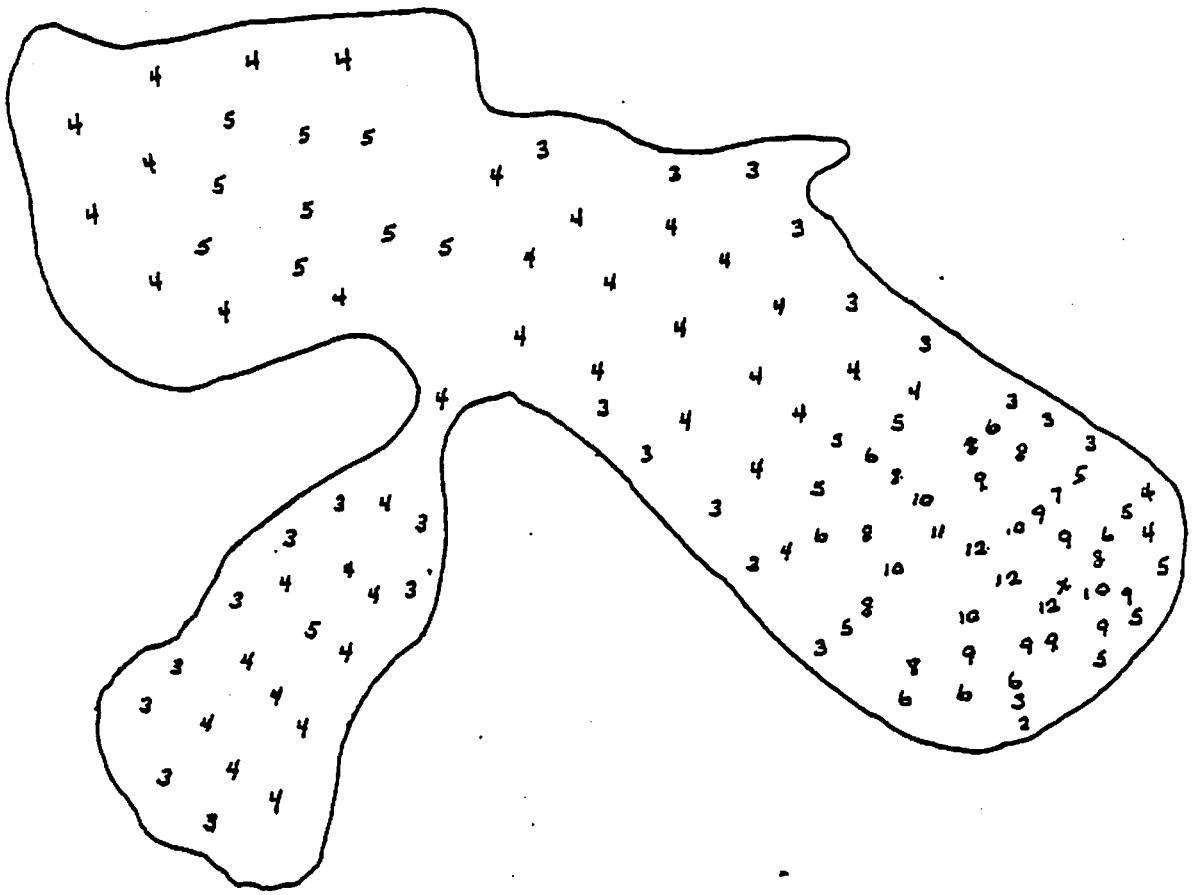
NORTH TRIANGLE



th Triangle Pond
mouth, Mass.
ershed type: coastal
es: 23
itude: 0105'
er type: warm
d type: kettlehole
atified: no
d use: recreation, esthetic
o sheet: USGS 1:24000 Plymouth
ition Topo sheet up 13.7 right 6.3
reline distance 1.9 miles 10032'

Scale 1:260

NORTH TRIANGLE

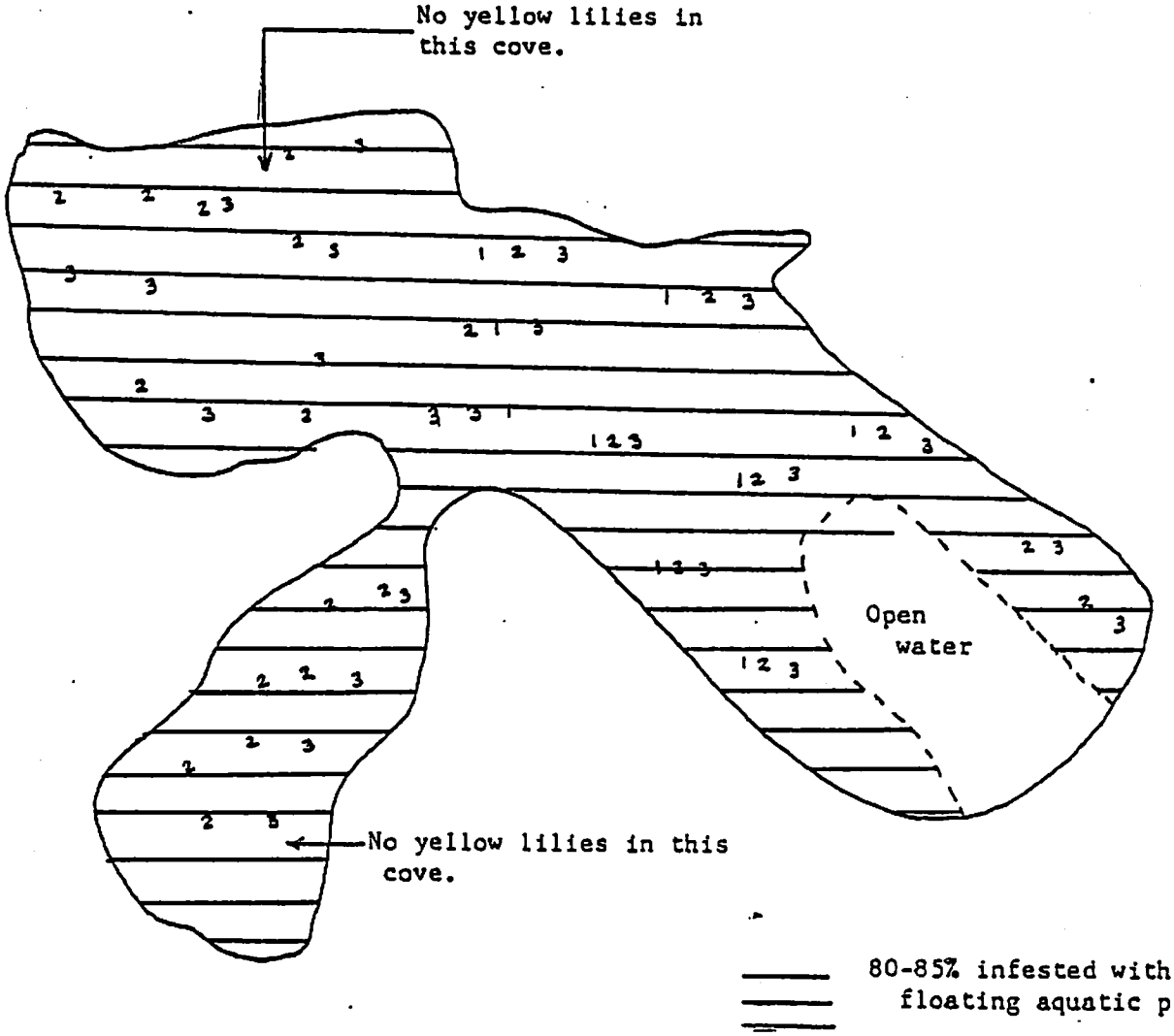


Maximum Depth 12 feet 3.66 meters
Mean depth 5 feet 1.52 meters
Surface area 23 acres 9.32 hectares
Acre feet 115
Total Gals. 37,472,865

Scale 1:260

NORTH TRIANGLE

Floating Aquatic Plant Map with Key



80-85% infested with floating aquatic plants.

Heavy Brasenia and Nymphyaea throughout pond.

Scale 1:260

FLOATING AQUATIC PLANTS ATTACHED

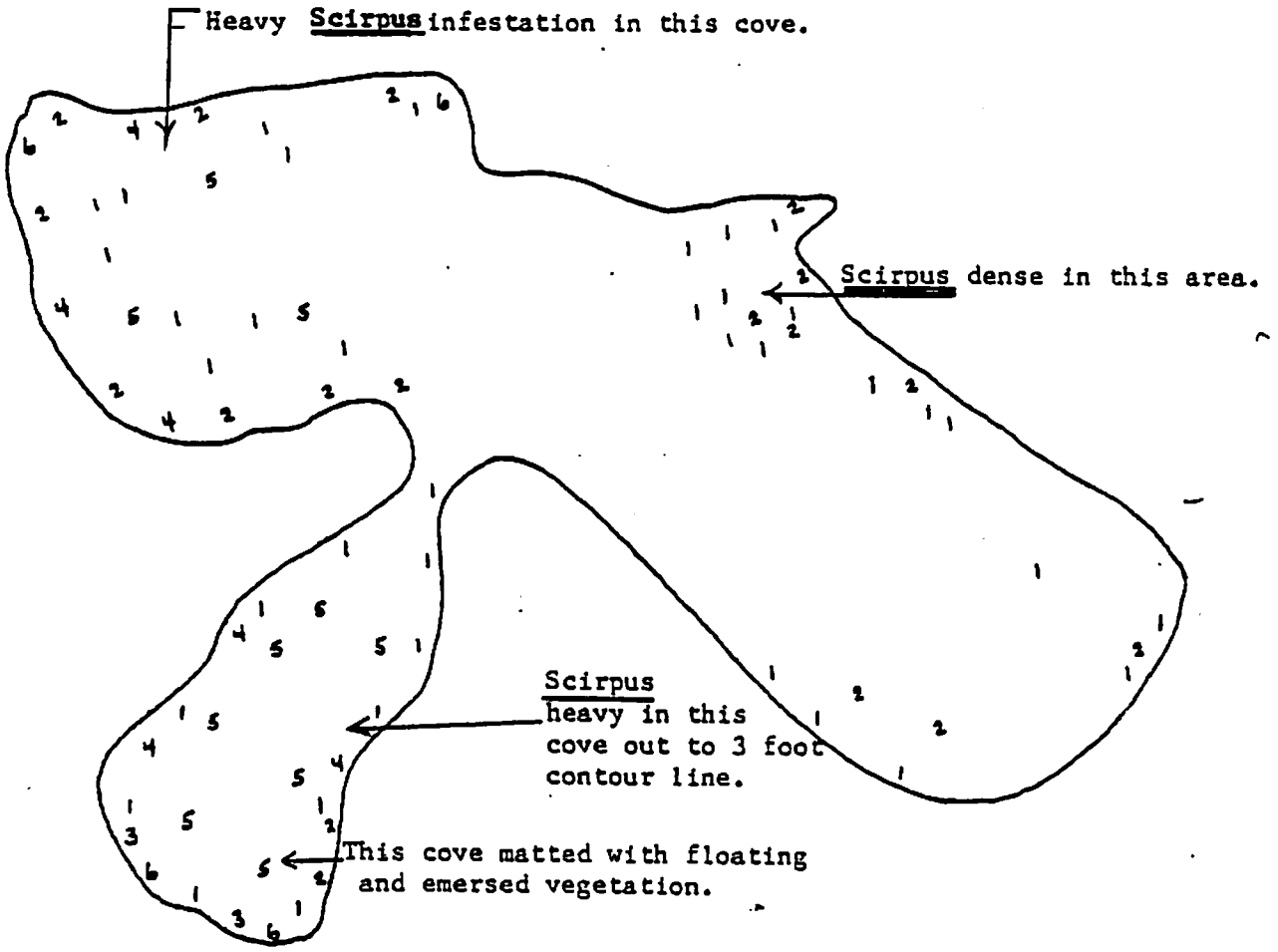
LATIN	COMMON	MAP NUMBER
Nuphar	Cow Lily, Yellow Water Lily, Spatterdock	1
Nymphaea	Water Lily, White Water Lily	2
Brasenia	Watershield	3
	Addenda	

FLOATING AQUATIC PLANTS - UNATTACHED

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

NORTH TRIANGLE

Emersed Aquatic Plant Map with Key



Scale 1:260

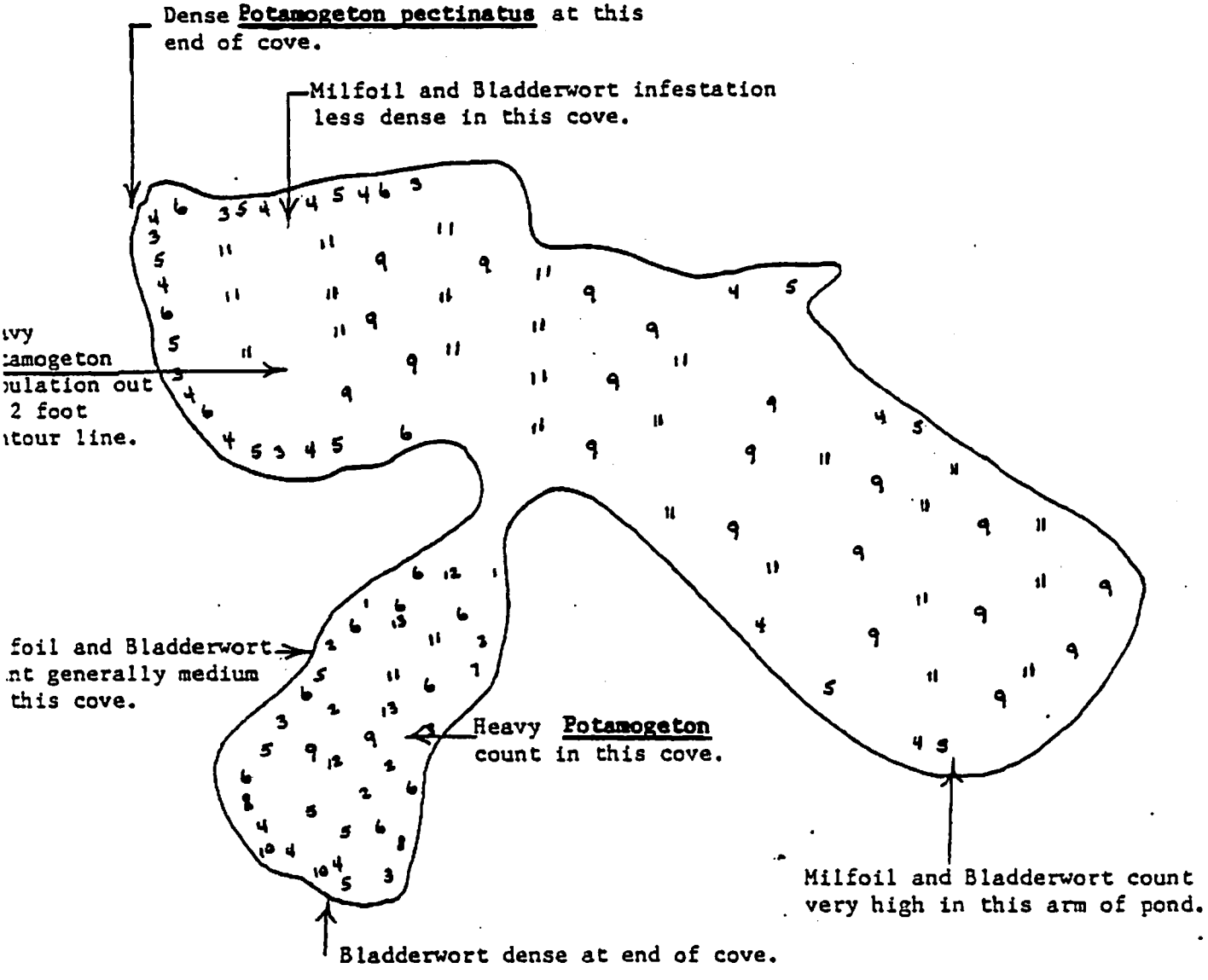
EMERSED AQUATIC PLANTS

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

Addenda

NORTH TRIANGLE

Submersed Aquatic Plant Map with Key

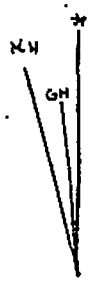


reen and blue-green filamentous algae covers bottom
f entire pond. Pond bottom 90% covered with submersed
egetation.

Scale 1:260

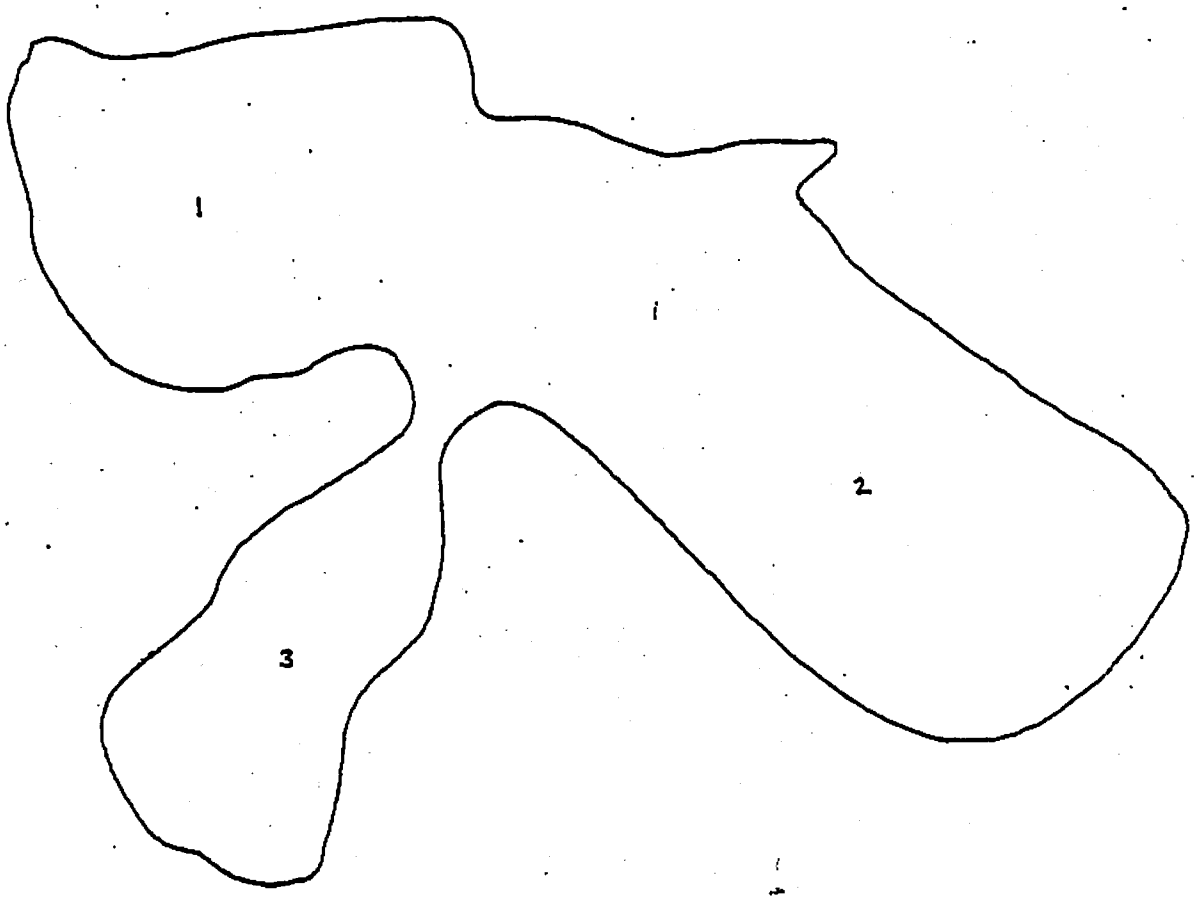
SUBMERSED AQUATIC PLANTS

LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	1
Potamogeton Diversifolius	Waterthread Pondweed	2
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	3
Potamogeton Gramineus	Variable Pondweed	4
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	7
Zannichellia	Horned Pondweed	
Elodea	Waterweed	
Ranunculus	Water Buttercup	
Ceratophyllum D.	Coontail	8
Myriophyllum	Water Milfoil	9
Alisma	Waterplantain	
Heteranthera D.	Water Star Grass; Mud Plantain	10
Nasturtium	Water, Cress	
Utricularia	Bladderwort	11
Vallisneria	Wild Celery	
	Addenda	
	Algae	
Chlorophyceae filamentous	green	12
Cyanophyceae filamentous	blue-green	13



NORTH TRIANGLE

Chemical Sample Stations



Scale 1:260

N. Triangle

	IN LAKE STATION			OUTFALL			SOURCES		
	1	2	3	1	2	3	1	2	3
Total P	.02	.03	.01						
Nitrate (N)	.02	.02	.02						
Free Acid	0								
Total Acidity	0								
Alkalinity	0								
DO	7								
Total Hardness	17								
CO_2	15								
Pn	64								
Temp (C+F) 1' Levels	17° C								
Secchi	9 ft.								

Heavy Metals

Zn	.008
CD	.001
Sn	.004
Au	.001
Fe	.097
PD	.008
AL	.040
Cu	.007
Ni	.030
AG	.006

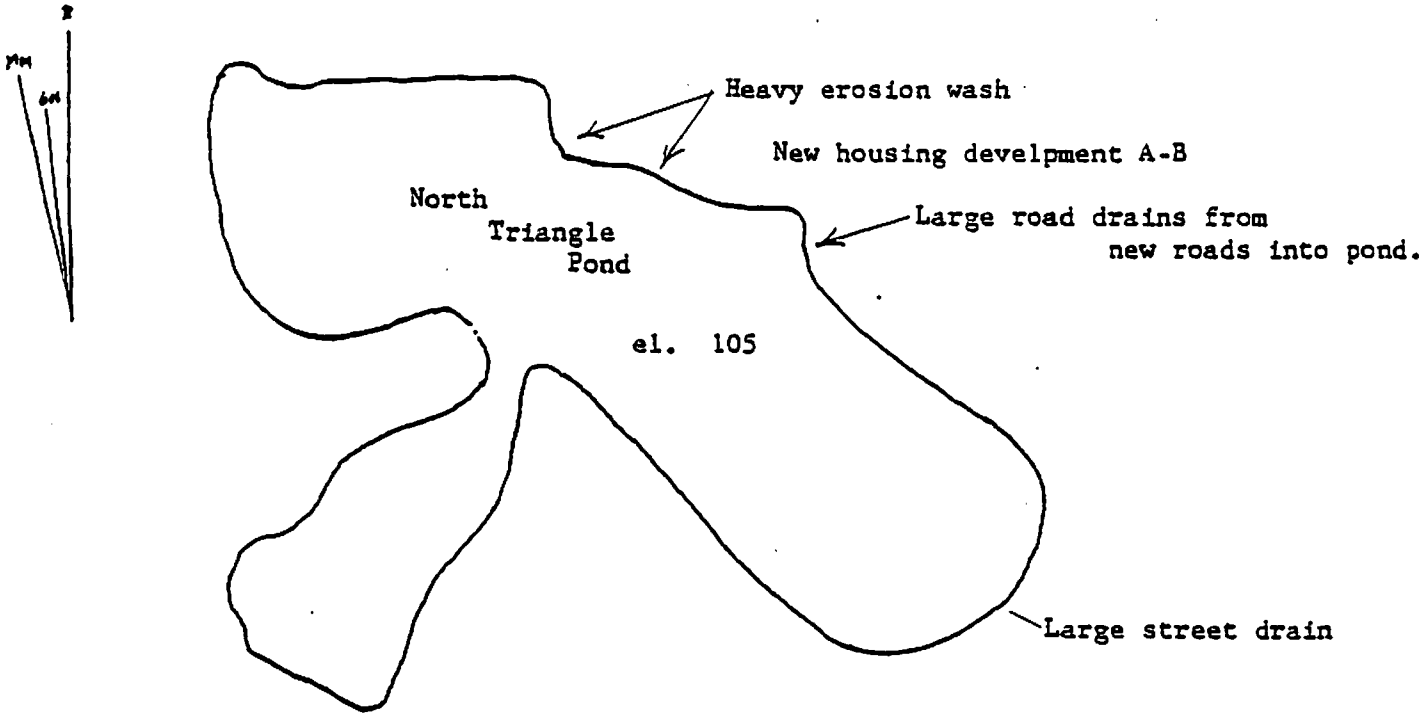
Benthos

Total P	27.7
Total Nitrogen	14.5
Percent solids	22.1
Total volatile solids	.41%

All figures in mg/l unless otherwise noted.

NORTH TRIANGLE POND

Impoundment Map



Pond type: Kettlehole
Tributary: None
Outfall: None
Overland Flow: None

Groundwater & 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 sources of nutrient influx
- New housing development
- Road drains directly into pond
- Erosion wash

NORTH TRIANGLE

Using a modified trophic level index North Triangle ranks 40th.

North Triangle is a warm water, spring fed, non-stratified kettle hole with a maximum depth of 12 feet. The macrophyte population is very dense. Floating aquatic plants cover 20 acres of the 23 available acres with numerous species. Emersed aquatic plants cover southwest cove. Submersed aquatic plants cover the entire bottom; bladderwort, milfoil, and potamogetons predominate. Green and blue-green filamentous algae are also abundant. On the plant trophic list it ranked 39th. Secchi disc reading was 9 feet which ranked 21st in this parameter. Phosphate and nitrate readings were permissable (this is misleading due to utilization of nutrients by abundant macrophyte mass).

Number of houses affecting pond: very many

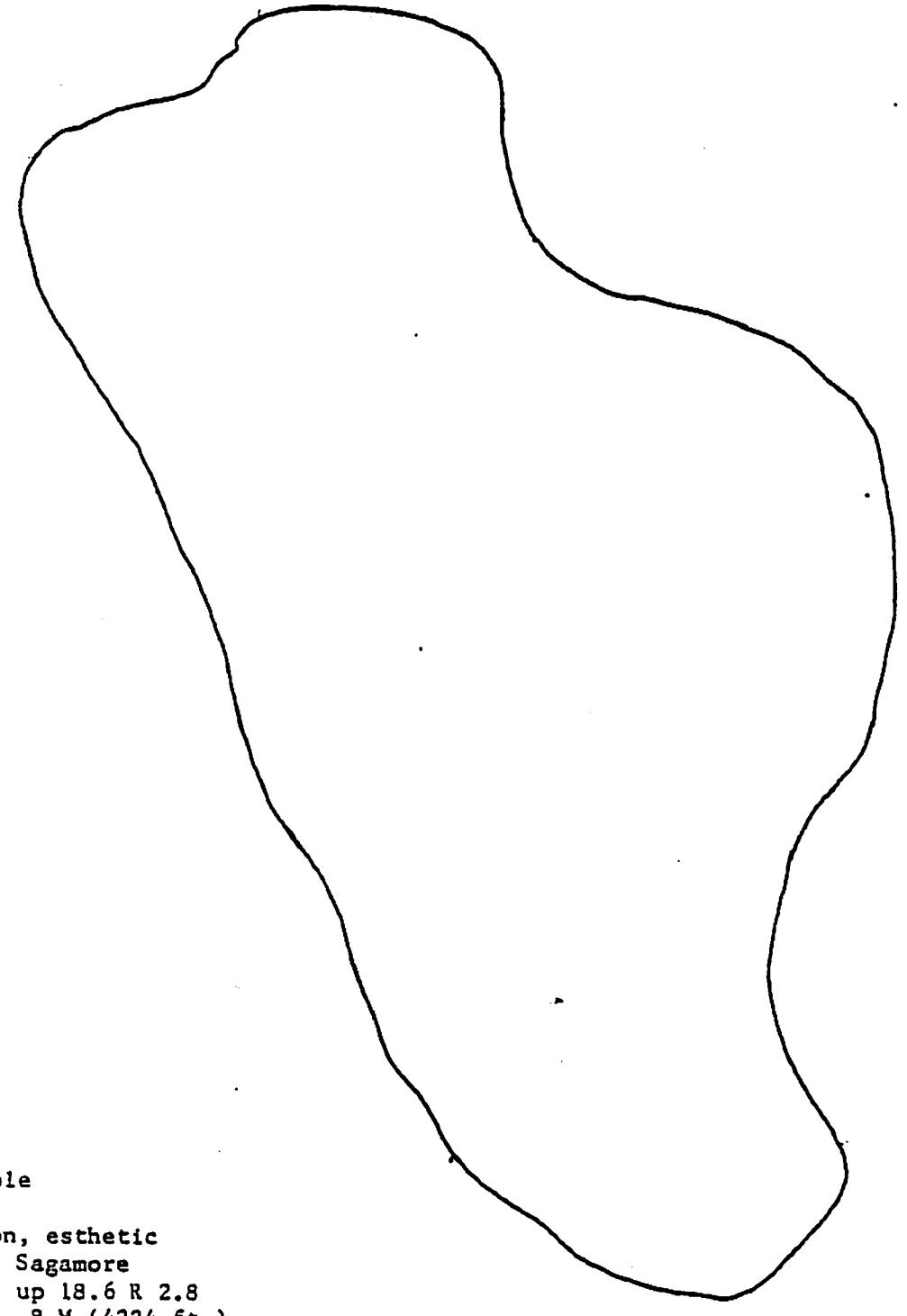
Cranberry bogs affecting pond: none

This pond is rated ultra-eutrophic.

Problems: New housing and new roads along with corresponding cultural development creates a serious problem for this ecosystem. Large road drain leads directly into basin on south shore, two street drains lead directly into system on east shore. Serious soil erosion on northeast shore presents a road undermining problem as well as introducing pollutants into the ecosystem.

ROUND POND

(Elevation 064)



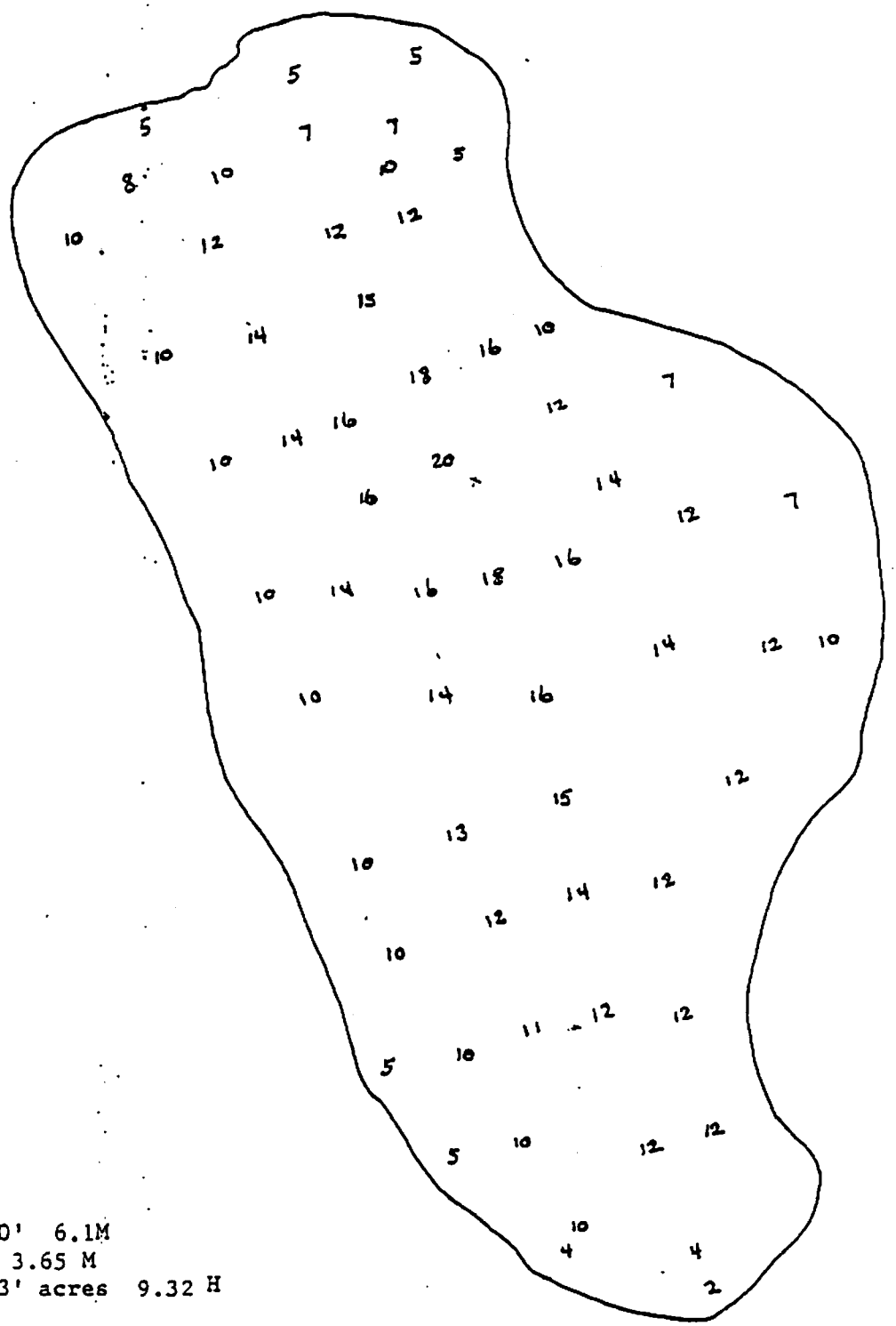
und Pond
ymouth, Mass.
tershed: coastal
res: 23
titude: 064
ter type: warm
id type: kettlehole
ratified: no
id use: recreation, esthetic
o sheet 1:24000 Sagamore
ition Topo sheet up 18.6 R 2.8
reline distance: .8 M (4224 ft.)

Scale 1:200'

MN
GN

ROUND POND

(Bathymetric Map)



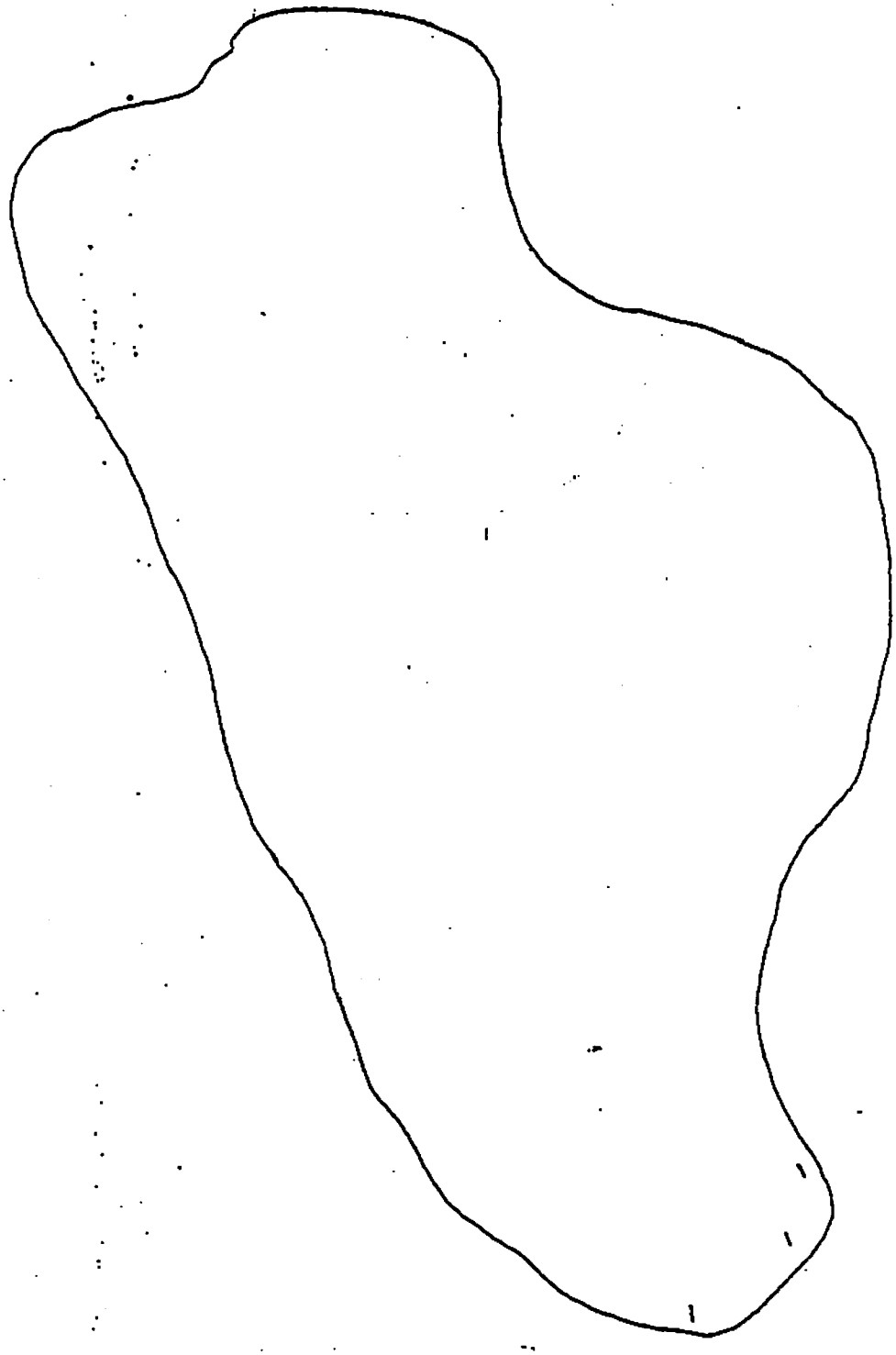
Maximum depth 20' 6.1M
Mean depth 12' 3.65 M
Surface Area 23' acres 9.32 H
Acre feet 276
Total gals. 89,934,876

Scale 1:200'

ROUND POND

(Elevation 064)

Floating Aquatic Plant Map with Key



Scale 1:200'

FLOATING AQUATIC PLANTS ATTACHED

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

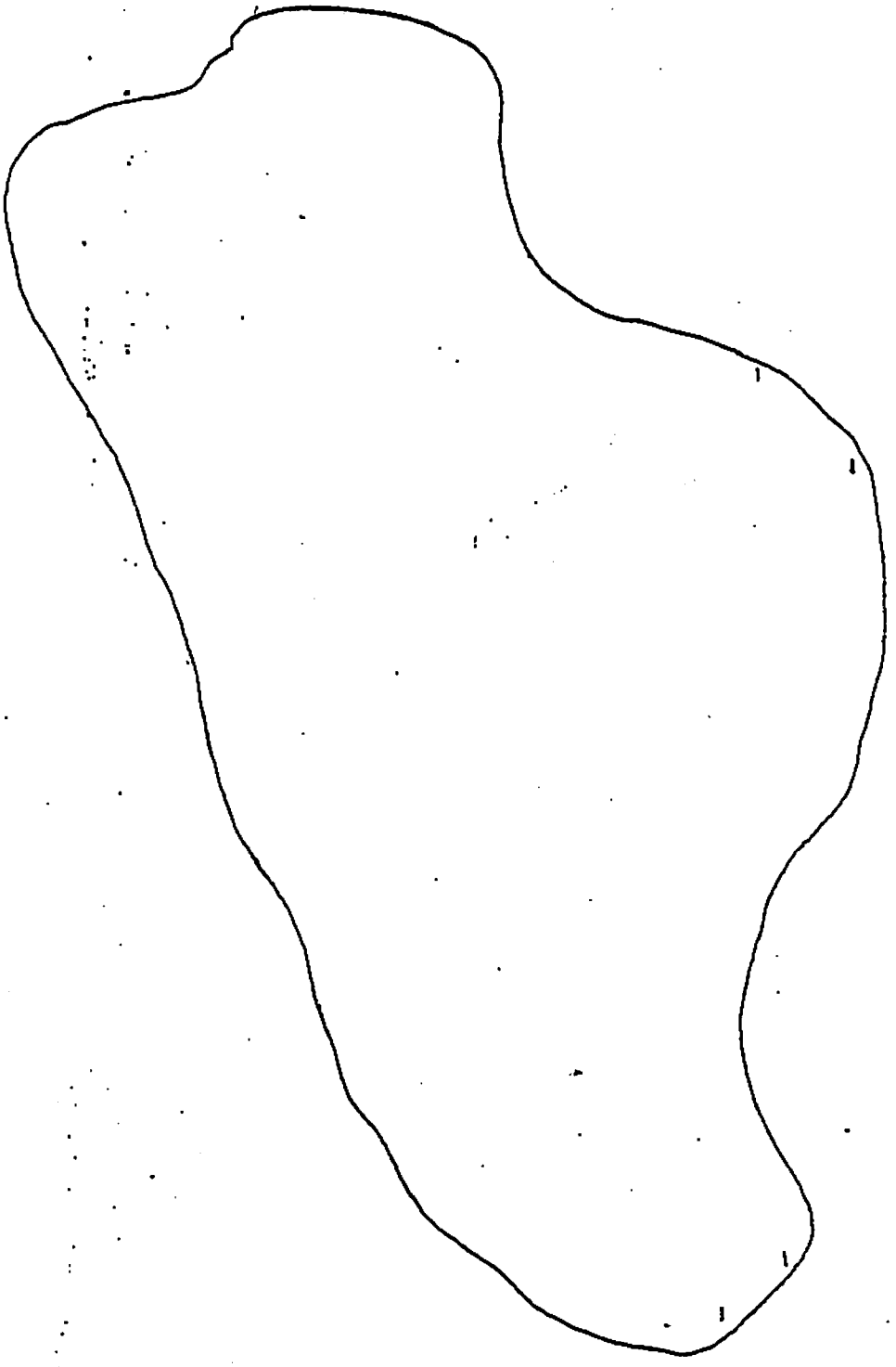
FLOATING AQUATIC PLANTS - UNATTACHED

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

ROUND POND

(Elevation 064)

Emersed Aquatic Plant Map with Key



Scale 1:200'

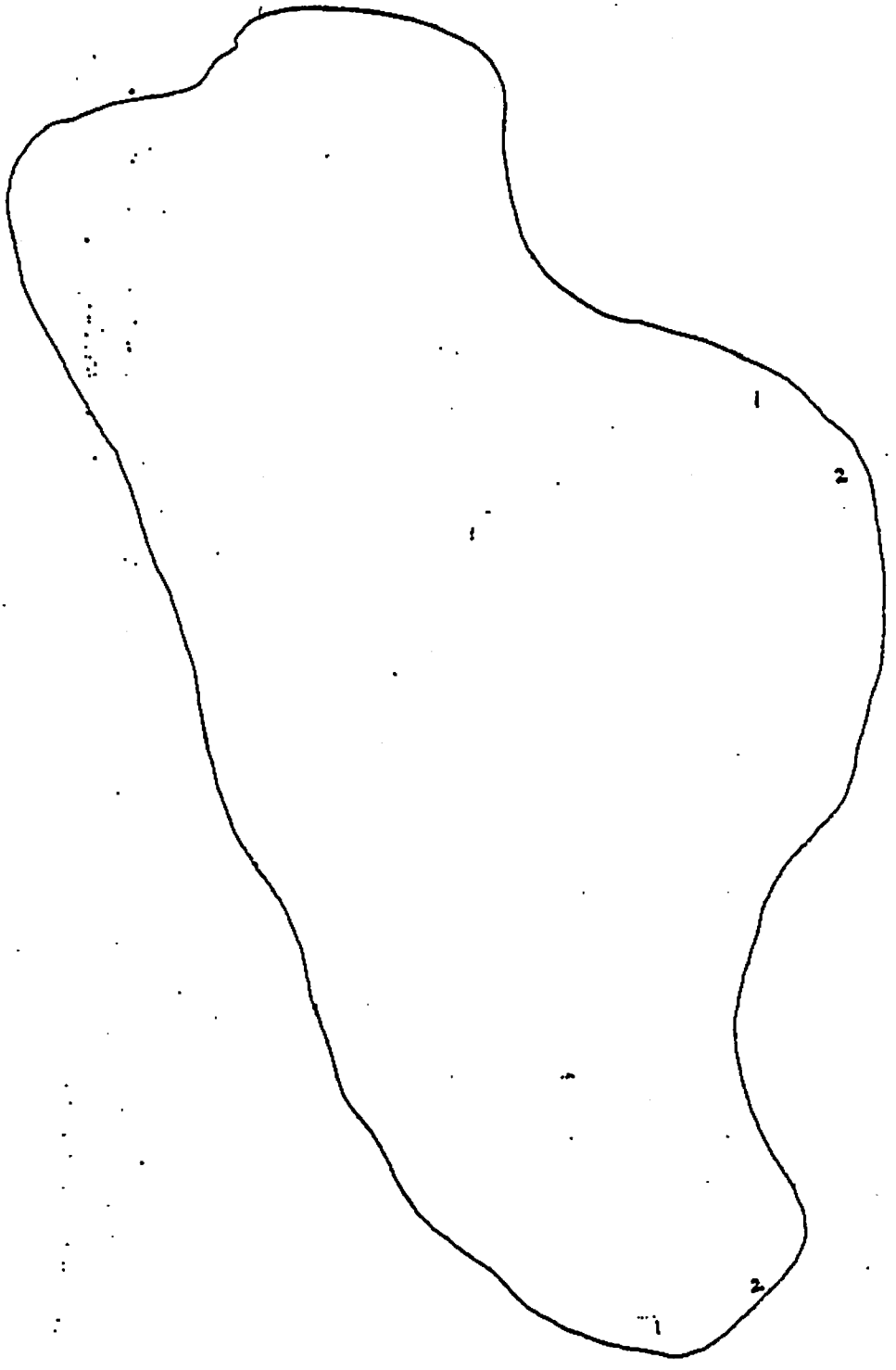
EMERSED AQUATIC PLANTS

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

ROUND POND

(Elevation 064)

Submersed Aquatic Plant Map with Key



Scale 1:200'

SUBMERSED AQUATIC PLANTS

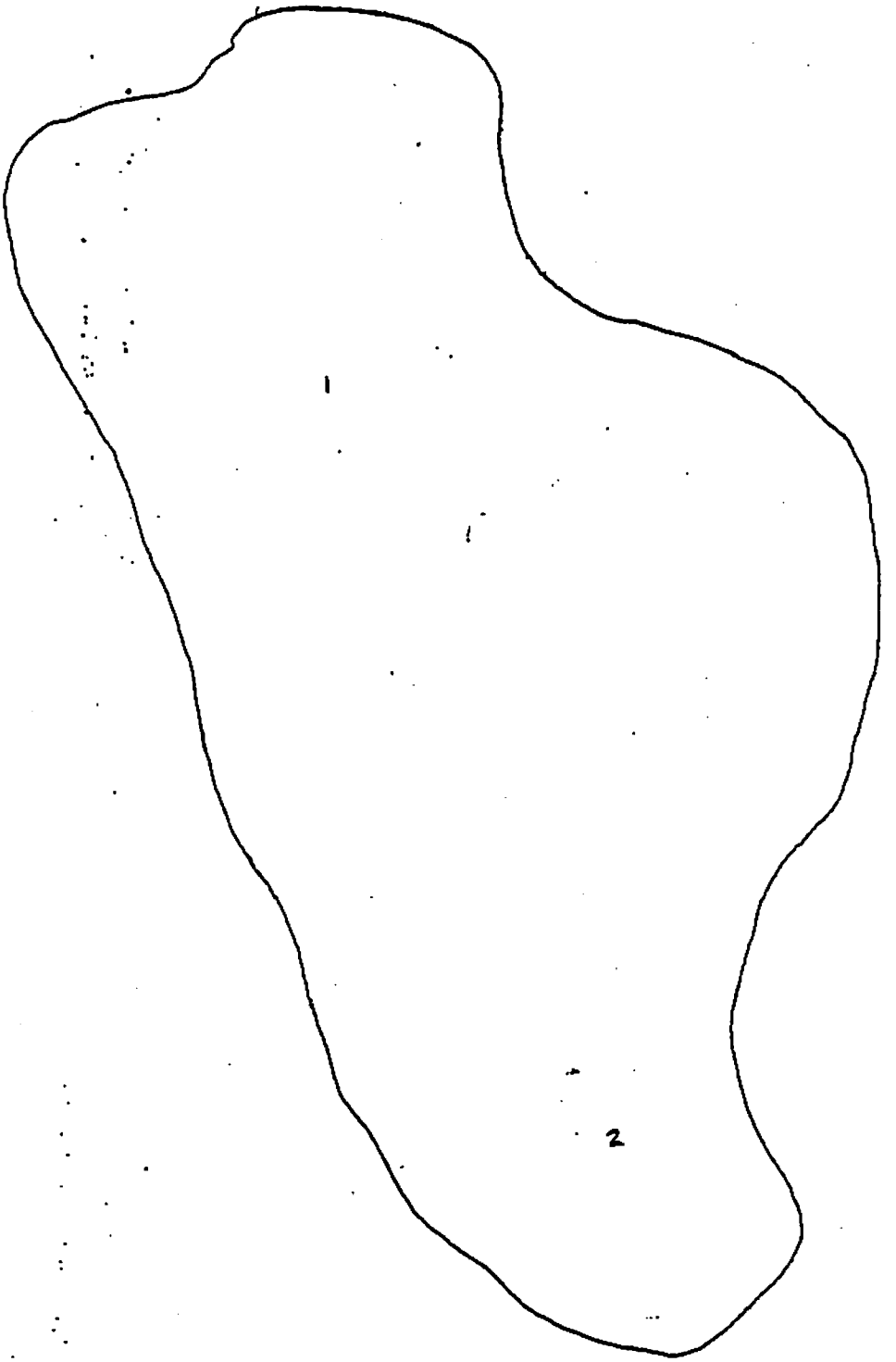
LATIN	COMMON	MAP NUMBER
Potamogeton	Pondweed	
Potamogeton Americanus		
Potamogeton Ampl. Folius	Large Leaf Pondweed	
Potamogeton Crispus	Curly Leaf Pondweed	
Potamogeton Diversifolius	Waterthread Pondweed	
Potamogeton Filiformus		
Potamogeton Filiosus	Leafy Pondweed	
Potamogeton Gramineus	Variable Pondweed	
Potamogeton Natans	Floating Brown Leaf	
Potamogeton Nodosus	American Pondweed	
Potamogeton Pectinatus	Sago Pondweed	1
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	2
Vallisneria	Wild Celery	

Addenda

ROUND POND

(Elevation 064)

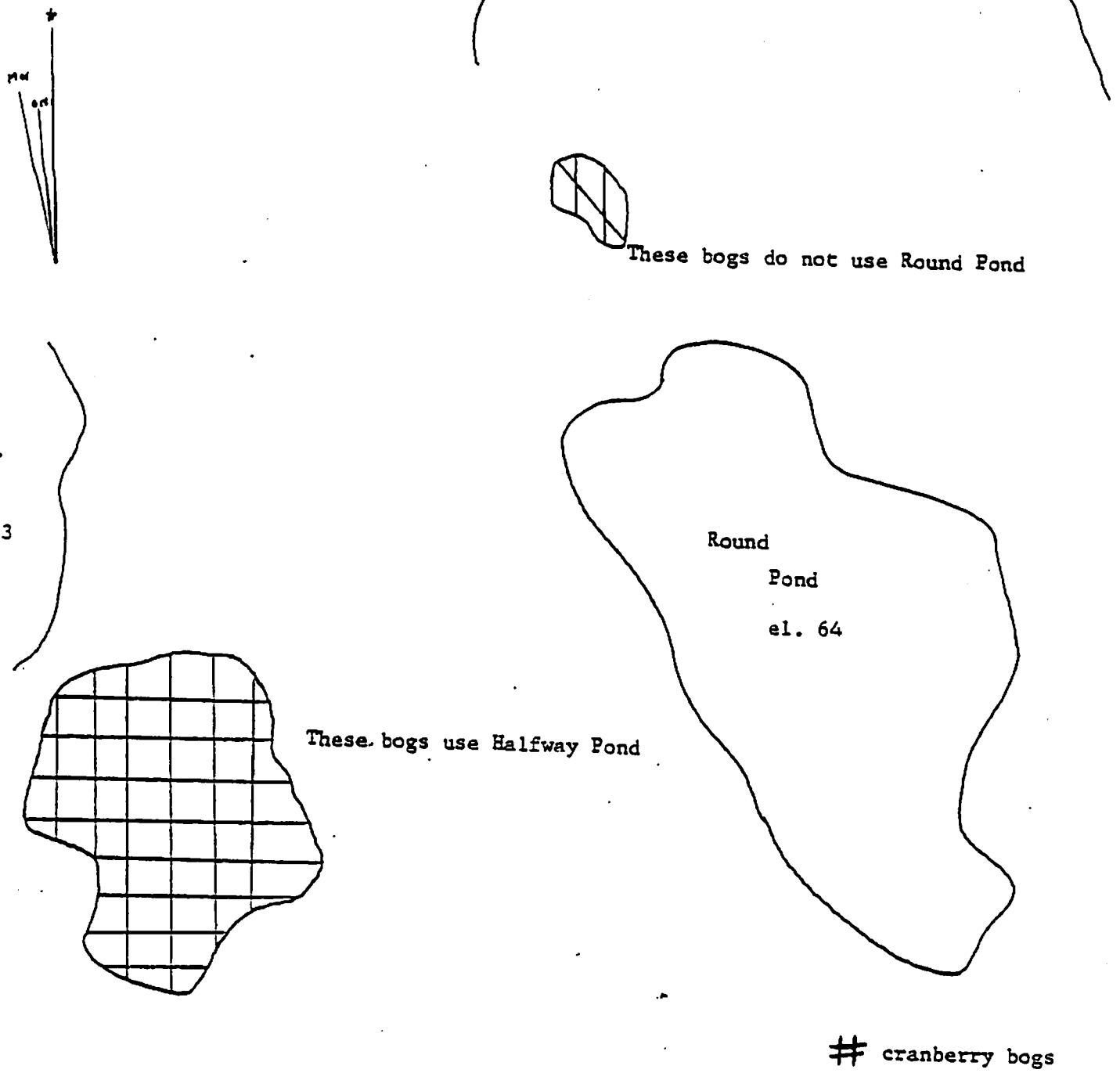
Chemical Sample Stations



Scale 1:200'

	Round IN LAKE STATION 1 2 3	OUTFALL 1 2 3	SOURCES 1 2 3
Total P	.01 .01		
Nitrate (N)	.04 .03		
Free Acid	0		
Total Acidity	0		
Alkalinity	0		
DO	11		
Total Hardness	16		
CO_2	17		
Pn	6.5		
Temp (C+F) 1' Levels	17° C		
Secchi	11 ft.		
Heavy Metals			
Zn .005			
CD .001			
Sn .008			
Au .001			
Fe .015			
PD .005			
AL .007			
Cu .009			
Ni .006			
AG .001			
Benthos			
Total P	233		
Total Nitrogen	83		
Percent solids	.15		
Total volatile solids	.29%		

All figures in mg/l unless otherwise noted.



Pond Type Kettlehole Tributary none Outfall none Overland Flow none

Ground water 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 sources of nutrient influx.

Houses permanent & seasonal around perimeter of pond

Scale 1:350'

ROUND POND

Using a modified trophic index Round Pond ranks 11th.

Round Pond is a warm water, spring fed, non-stratified kettle hole with a maximum depth of 20 feet. Macrophyte population is sparse with little or no infestation except in two small areas with sparse population (less than .33 acres). On plant trophic index it ranked 5th. Secchi disc reading was 11 feet which ranked it 18th in this parameter. Phosphate and nitrate readings are well within the permissable range.

Number of houses affecting pond: approximately 10

Cranberry bogs affecting pond: none

This pond is rated mesotrophic but could be oligotrophic, discrimination is difficult with limited data.

EUTROPHICATION LIST

oligo. 1. Long
2. Little
3. Great South
oligo 4. Little South
meso. 5. Bloody
6. Fresh
7. Gallows
8. Micajah
9. Sandy
10. Boot
11. Round
Meso. 12. White Island
eu. 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
eu. 33. Ship
34. Bartlett ultra-eu.
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 overall 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.

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	4.5 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

EUTROPHICATION INDEX USED TO RATE 41 PONDS IN PLYMOUTH

Parameters

Secchi Disc Readings Rank 1 - 41 — Rank

1. Phytoplankton coloration

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

2. Macrophytes

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

3. Algae Filamentous

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

Total of 1 + 2 + 3 = Points = Rank

Secchi Rank + Macro and Microphyte Rank = x

x times 4 = Ranking Points

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