C. MacKinnon

CHIGNECTO NATIONAL WILDLIFE AREA:

AMHERST POINT SANCTUARY SECTION

1984 WETLAND STUDY

by

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Sackville, New Brunswick

March, 1985

Environment Canada
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Environnement Canada
Service canadien de la faune

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I. INTRODUCTION

Four wetland units totalling 226.5 ha were developed with the cooperation of Ducks Unlimited at the Amherst Point Sanctuary section of Chignecto National Wildlife Area during 1972 to 1983. The locations of those wetlands and their areas and years initially flooded are presented in Figure 1.

The Amherst Point Sanctuary wetlands and developed wetlands on four other National Wildlife Areas in the Atlantic Region are studied once every three years to evaluate their habitat conditions and use by wildlife. That program consists of a schedule of investigations including marshbird and waterfowl brood surveys, muskrat house counts, invertebrate, vegetation, water quality and substrate sampling and water depth measurements. The information from each assessment provides the basis for the formulation of operational management plans for the following three year period and the evaluation of previous management actions. The final scehduling and implementation of management practices will be done with the agreement and cooperation of Ducks Unlimited.

This is a report of the first full scale assessment of the Amherst Point Sanctuary wetlands which was conducted during June 5, 1984 and January 3, 1985.

II. METHODS

a) Water Quality

Water quality was monitored using a single measure, conductance obtained from samples collected at outlet structures and random sites within the wetlands. Normally two samples in addition to that at the control structure were taken from each wetland. Samples were collected in white opaque polyethylene bottles and analysed with a Hach model 2510 conductivity meter within six hours. Collections were made on June 6, 30, July 3, 16.

b) Vegetation

Vegetation sampling was conducted during July 30 to August 3. Quadrats (1 m^2), were located at 50 m points on transects that crossed the wetlands at either 50 m or 100 m intervals. Transects were spaced at 50 m intervals on wetlands less than 20 ha. Transect directions were chosen to provide the most suitable coverage of each wetland. On odd-numbered transects the first quadrat was located on the shoreline edge, whereas on even-numbered transects the first quadrat was located 50 m from the shoreline. The vegetation of each quadrat was described by estimating the percent cover of each species and classified according to the degree of emergent cover; dense (24%), sparse (0 25%) and open (0%).

The Amherst Point Sanctuary wetlands were photographed from a Cessna 172 chartered from the Moncton Flying Club on

July 20. The pictures were taken from an altitude of about 1000 m with two 35 mm cameras. The aircraft was banked as far as possible to reduce obliqueness in the pictures. Vegetative cover maps were prepared by projecting the pictures (slides) and tracing the outlines of the emergent covers and other features.

c) Water Depth and Substrate

A single water depth measurement was taken at each vegetation sampling point and the substrate classified as solid (mineral) or floating (mat of organic material in which vegetation was rooted). Water levels at control structures were monitored during the period of investigation (May to August).

d) Invertebrates

Two invertebrate collections were made (June 10, July 17) using a sweep net. The net consisted of a 25 cm diameter metal rim with a 30 cm deep nylon mesh bag attached to a 130 cm aluminum handle. A sample was collected by making 10 figure-of-eight strokes with the net while moving forward so that there was no overlap. The width of each stroke was approximately one meter and the net was moved constantly from the substrate to the surface as the strokes were made. The samples were placed in plastic bags and refrigerated.

Each collection consisted of three samples from the dense emergent cover (24%) and three from sparse emergent cover

(0 25%) of each wetland. An attempt was made to sample cover-types in proportion to their occurrence.

Samples were examined within 10 days of collection. Each sample was placed in a white tray and the invertebrates were by carefully picked out of the plant material (largely dead vegetation, filamentous algae and duck-weeds), identified (Pennak, 1978) and enumerated. Fish, primarily ninespine sticklebacks were sorted and enumerated.

e) Marshbirds

Marshbird surveys were conducted on June 5 and 6 and July 3 and 4. Each wetland was covered once during each of those periods. Surveys undertaken between 0600 and 1000 hrs by two observers,followed a meandering canoe route through each wetland. The locations of all marshbirds heard and observed were recorded by species and type of encounter (observed, heard, flight, simultaneous vocalization).

f) Waterfowl

Waterfowl brood surveys were conducted by helicopter on June 28 and August 7. A Bell Jet Ranger helicopter chartered from Trans-Maritime Helicopters, Fredericton, N.B. was used. Thorough coverage was provided by flying adjoining strips (approximately 100 m wide) across each wetland. The normal altitude was 30 m at a speed of 25 kmph. Lower altitudes and hovering were necessary for closer inspections of

broods. Each brood was recorded by species, number of young and age class.

g) Muskrats

Muskrat house counts were made on January 3, 1985. Two observers on foot systematically covered each wetland and thoroughly searched for houses.

III. RESULTS

a) Water Quality

The conductivities of samples collected from the wetlands were consistent with the corresponding control structure sample values presented in Table 1. Conductance remained relatively constant during the sampling period (June 6 - July 16) and with the exception of the Cove, values did not deviate more than 15 units from the seasonal means.

The conductivity of the Cove (seasonal mean, 615 mhos/cm) reflected the influence of the underlying gypsum deposits on the water quality of the wetland. Conductance values for the other wetlands (seasonal means, 145-235 mhos/cm), although much lower than that of the Cove, were considerably higher than those of similar wetlands at Tintamarre and Shepody NWA's (Barkhouse and Hicks, 1983, 1984). According to the relationship between wetland age (period of time continuously flooded) and conductance presented by Beauchamp and Kerekes (1980), the wetlands at Amherst Point Sanctuary (5+ years) were expected to have conductivity values less than 120 mhos/cm.

b) Vegetation

The distribution and classification of the vegetation sampling points of each wetland are shown in figures 2 to 5. The frequency of occurrence and total percent cover of species

recorded for each wetland are presented in Tables 2 to 5. The following is a brief account of each wetland's vegetative cover.

i) Impoundment 1

Emergent vegetation was recorded in 33 of the 76 quadrats (43.5%). The cover was sparse (25%) in 4 plots and dense (24%) in 29 plots. The other 43 plots (56.5%) had no emergent cover. The principal emergents were cattail (Typha spp.) and giant burreed (Sparganium eurycarpum) at 22.4% and 19.7% frequency of occurrence respectively. Small stands of arrowhead (Sagittaria latifolia), wildrice (Zizania aquatica), Common reed grass (Phragmites communis) and round-stem bulrush (Scirpus validus) were also present. The cover was unusual in that it comprised distinct single species stands.

Several non-emergents were prevalent including duckweeds (Lemna minor, L. trisulca, Spirodela polyrhiza), water-milfoil (Myriophyllum sp.), filamentous green algae, moss (Fissidens sp.), small pondweed (Potamogeton pusillus) and bladderwort (Utricularia spp.).

ii) Impoundment 2

Emergent vegetation was recorded in 35 of the 89 quadrats (39%). The cover was sparse in 5 plots and dense in 30 plots. The other 54 plots (61%) had no emergent cover. The principal species were cattail and giant

burreed at 19.1% and 15.7% frequency of occurrence respectively. Sixteen additional species were recorded, but each in 3 or fewer quadrats.

Non-emergents were prevalent including filamentous green algae, bushy pondweed (Najas flexilis), Fissidens sp., duckweeds (L. minor, L. trisulca, S. polyrhiza), pondweed (P. pusillus), liverwort (Ricciocarpus natans), bladderwort and curly-leaved pondweed (P. perfoliatus).

iii) Impoundment 3

Emergent vegetation was recorded in 14 of the 19 quadrats (73.7%) and in all of those the cover was dense. The other 5 quadrats (26.3%) had no emergent cover. Giant burreed was the dominant and only prominent emergent, occurring in 14 quadrats. Eleven minor species were recorded.

Duckweed (L. minor) was present in 13 quadrats (68.4%) and 6 other non-emergents, including flat-stemmed pondweed (P. zosteriformis) were recorded in smaller numbers of plots.

iv) The Cove

Emergent vegetation was recorded in 21 of the 38 quadrats (55.3%). The cover was sparse in 2 plots and dense in 19 plots. The other 17 plots (44.7%) had no emergent cover. Cattail was the only prominent emergent

and occurred in 19 (50%) of the quadrats. Seven other species were also recorded.

Water-milfoil and duckweed (L. minor) were prevalent, being recorded in 20 and 19 sample plots respectively. Ten other species were recorded including Sago pondweed (P. pectinatus) and horned pondweed (Zannichellia palustris), which indicate the alkaline nature of the wetland.

v) Vegetative Cover Maps

Vegetative cover maps of the Amherst Point Sanctuary wetlands prepared from aerial pictures (slides) are presented in Figures 6 to 9.

c) Water Depth and Substrate

Water depths and substrate types at the vegetation sample points of each wetland are given in Figures 2 to 5. In addition to the water depth measurement (cm) at each point, a mean depth is given for each transect (floating substrate points and dredged channels were excluded). The symbol (F) indicates a floating substrate and where no symbol appears the substrate was solid. The following is a brief account for each wetland.

i) Impoundment 1

Water depths at sample points ranged from 0 cm to 95 cm and mean transect depths from 47 cm to 71 cm. The impoundment mean was 58.3 cm. Water depths were

substantially more in the section of the impoundment covered by transects 6-9 with water levels in the other sections 15-20 cm less on the average. The corresponding level at the control structure was 18 cm below the top of the structure.

The substrate at all 76 sample points was solid.

ii) Impoundment 2

Water depths at sample points ranged from 10 cm to 150+ cm and mean transect depths from 74 cm to 85 cm. The impoundment mean was 79.1 cm. Water depths were relatively uniform from one section of the wetland to another. One site crossed by transects 6 and 7 was substantially deeper than others and probably was a former pond or sinkhole. The corresponding level at the control structure was 34 cm below the top of the structure.

The substrate was floating at 2 of the sample points (2.2%) and solid at the other 87.

iii) Impoundment 3

Water depths at sample points ranged from 2 cm to 66 cm and mean transect depths from 7 cm to 48 cm. Two sample points were located in the borrow pit and those measurements were not included in the calculation of mean values. The impoundment mean was 30.3 cm and with the exception of the southern most section, there was a gradual increase

in the water level from the south end to the north end of the wetland. The corresponding level at the control structure was 21 cm below the top of the structure.

The substrate at all 19 sample points was solid.

iv) The Cove

Water depths at sample points ranged from 0 cm to 125+ cm and mean transect depths from 34 cm to 105 cm. The wetland mean was 63.0 cm. The corresponding level at the control structure was 33 cm below the top of the structure. The water level was generally greater in the northern section of the wetland, but deep sites were also located throughout.

The substrate at all 38 sample sites was solid.

d) Invertebrates

The results of the June 20 and July 17 invertebrate collections are presented in Tables 6 to 9. The number of each taxon (family) is given for each wetland by collection date and cover (dense, sparse). Ninespine stickleback numbers are also given. The following is an account for each wetland.

i) Impoundment 1

The numbers of 13 invertebrate taxa and ninespine sticklebacks are presented in Table 6. Small numbers of five additional taxa were collected. The total number of

invertebrates (13 major taxa) was 2008, of which 1196 were from June samples and 812 from July samples. The principal taxa were Physidae (514), Amphipoda (392), Corixidae (257), Chironomidae (233), Baetidae (225), Hirudinea (109) and Hydroptilidae (107). Baetidae, Corixidae and Chironomidae were substantially more abundant in the June collection which accounts for the larger June total. Only Physidae were noticeably more abundant in July. The numbers of Chironomidae and Physidae appeared to be related to cover, with the former more plentiful in dense cover and Physidae more abundant in sparse cover.

A total of 114 ninespine sticklebacks was collected of which 81 were from the June samples.

ii) Impoundment 2

The numbers of 13 invertebrate taxa and ninespine sticklebacks are presented in Table 7. Small numbers of 5 other families were collected. The total number of invertebrates (13 major taxa) was 1228 of which 662 were from June samples and 566 from July samples. The principal taxa were Corixidae (480), Chironomidae (224), Amphipoda (176), Physidae (136) and Hirudinea (65). Corixidae were much more abundant in the June samples and account for the somewhat higher June total. Chironomidae and Amphipoda were substantially more plentiful in the July collection. The numbers of Corixidae and Chironomidae appeared to be

related to cover, with the numbers of both species higher in dense cover.

A total of 55 ninespine sticklebacks was collected of which 44 were from the June samples.

iii) Impoundment 3

The numbers of 13 invertebrate taxa and ninespine sticklebacks are presented in Table 8. Small numbers of 6 other families were collected. The total number of invertebrates (13 major taxa) was 1281, of which 814 were from June samples and 467 from July samples. The principal taxa were Corixidae (301), Physidae (261), Amphipoda (217), Hirudinea (81), Haliplidae (67) and Dytiscidae (62). Corixidae, Haliplidae, Dytiscidae and Chironomidae were substantially more abundant in the June collection and account for the much higher June total. Amphipoda were much more abundant in the July samples. There was no obvious relationship between invertebrate numbers and cover.

Only 15 ninespine sticklebacks were collected in total and none in the July samples.

iv) The Cove

The numbers of 13 invertebrate taxa and ninespine sticklebacks are presented in Table 9. Small numbers of five other families were collected. The total number of invertebrates (13 major taxa) was 4123, of which 1325 were

from June samples and 2798 from July samples. The principal taxa were Physidae (2194), Chironomidae (642), Amphipoda (533), Corixidae (245) and Hirudinea (104). Physidae and Amphipoda were considerably more abundant in the July samples which accounts for the much higher July total. Corixidae were substantially more plentiful in the June samples. The numbers of Amphipoda appeared to be related to cover, with higher numbers present in dense emergents.

Only 15 ninespine sticklebacks were collected of which 12 were from June samples.

e) Marshbirds

The species and numbers of marshbirds recorded on June 5 and July 3 surveys and the two surveys combined are presented in Table 10. The following is a brief account for each wetland.

i) Impoundment 1

Five species, including Pied-billed Grebe, American Bittern, Virginia Rail, Sora and American Coot were recorded. The combined total of the two surveys was 78, a density of 2.19 birds/ha. Pied-billed Grebe accounted for 40 (51.3%) of the total. American Coot and Sora were also plentiful with 17 and 18 being recorded.

ii) Impoundment 2

Seven species, including Pied-billed Grebe, American Bittern, Least Bittern, Sora, American Coot, Common Snipe and Black Tern were recorded. The combined total of the two surveys was 79, a density of 1.07 birds/ha. Pied-billed Grebe and Sora were the most plentiful with 25 (31.6%) and 43 (54.4%) recorded respectively. One Least Bittern recorded on each survey was of special note.

iii) Impoundment 3

Three species including Virginia Rail, Sora and Marsh Wren were recorded. The combined total of the two surveys was 13, a density of 1.78 birds/ha. Sora accounted for 8 (61.5%) of the total. Virginia Rail (3) and Marsh Wren (2) were noteworthy.

iv) The Cove

Three species including Pied-billed Grebe, American Bittern and Sora were recorded. The combined total of the two surveys was 16, a density of 1.29 birds/ha. Sora accounted for 9 (56.3%) of the total.

f) Waterfowl

Species and numbers of waterfowl broods recorded on June 28 and August 7 surveys and combined survey results are presented in Table 11. Waterfowl broods that were possibly

encountered on both surveys were recorded only once in the combined results. The following is an account for each wetland.

i) Impoundment 1

A total of 16 broods were recorded, 4 on June 28 and 14 on August 7; there were two possible repeats. The brood density for the wetland was 0.45/ha. Four species including Black Duck, Blue-winged Teal, Ring-necked Duck and Ruddy Duck were encountered. Ring-necked Duck broods (8) accounted for 50% of the total. The single Ruddy Duck brood was of special interest.

ii) Impoundment 2

A total of 27 broods were recorded, 2 on June 28 and 25 on August 7; there were no possible repeats. The brood density for the wetland was 0.36/ha. Five species including Green-winged Teal, Black Duck, Northern Pintail, Blue-winged Teal and Ring-necked Duck were recorded. Ring-necked Duck broods (14) accounted for 51.9% of the total.

iii) Impoundment 3

There were no observations of waterfowl broods on either the June 28 or August 7 surveys.

iv) The Cove

A total of 10 waterfowl broods were recorded, 3 on June 28 and 8 on August 7; there was one possible repeat. The brood density for the wetland was 0.81/ha. Four species including Green-winged Teal, Northern Pintail, Blue-winged Teal and Ring-necked Duck were encountered. Ring-necked Duck broods (5) accounted for 50% of the total.

g) Muskrats

The numbers of muskrat houses counted on the January 3, 1985 survey and the resulting densities were: Impoundment 1 - 59 houses, 1.66 houses/ha; Impoundment 2 - 104 houses, 1.41 houses/ha; Impoundment 3 - 26, 3.56 houses/ha and The Cove - 38, 3.06 houses/ha.

IV. EVALUATIONS AND RECOMMENDATIONS

Habitat and wildlife values for the Amherst Point Sanctuary wetlands are presented in summary form in Tables 12 to 15 along with a set of corresponding standard values. A standard value was developed for each of the habitat and wildlife factors using results from previous studies conducted on developed wetlands in the Atlantic Region and the present monitoring program. They were chosen with a degree of subjectivity, but nevertheless provide criteria with which the assessed values can be compared and evaluated. The extent and manner by which the assessed values deviated from the standards are also presented. The following is an evaluation of each of the Amherst Point Sanctuary wetlands and recommendations for their management.

a) Impoundment 1

Waterfowl brood and muskrat values were substantially below standard values, 45 percent and 55 percent of standard values respectively. The wetland's marshbird value, however, was 219 percent of the standard value.

The water level and the degree of vegetative cover deviated significantly from the standards. The mean water depth of the wetland exceeded the standard mean (45 cm) by 13.3 cm and the amount of open vegetative cover (56.5%) exceeded the standard (40%) by 16.5 percent. Together those two conditions

significantly reduced the amount of suitable brood-rearing and muskrat habitat in the wetland.

The other habitat factors; conductivity, substrate and invertebrates were very suitable and much better than standard values. The total invertebrate number exceeded the standard value by 151 percent.

Previous studies (Cash et al., 1981; Forbes, 1983) have revealed and documented the unusual importance of Impoundment 1 to breeding marshbirds. Habitat conditions described in this investigation that appear responsible for that importance include the high percentage of open water, the excessive water level and the high abundance of invertebrates and ninespine sticklebacks.

i) Recommendations

There should not be any water level manipulation or other habitat alteration during the 1985-1987 period. The water level should be maintained at its present level of 18.0 cm below the top of the water control structure.

The unusual importance of the wetland for marshbirds is adequate justification for that recommendation. Lowering the water level would most likely result in better waterfowl brood rearing and muskrat habitat initially by permitting the spread of emergents and increasing the availability of feeding sites. However, it is expected that the wetland's importance to marshbirds would be

greatly reduced. Also, in the long term a lower water level would result in an over growth of dense emergents and without remedial action a reduction of habitat quality for waterfowl and muskrats as well as marshbirds.

b) Impoundment 2

Waterfowl brood and muskrat values were only 36 percent and 47 percent of the respective standard values. The wetland's marshbird value was barely above the standard. Ring-necked Duck broods accounted for about 52 percent of the total, whereas Black Duck broods accounted for only about 15 percent. Both species were expected to make up 30 percent of the total.

Both the water level and the degree of vegetative cover deviated substantially from the standard values. The mean water depth for the wetland exceeded the standard mean (45 cm) by 34 cm and the amount of open vegetative cover exceeded the standard (40%) by almost 21 percent. Other habitat factors including conductivity, substrate and invertebrates deviated from standard values in a positive manner.

i) Recommendations

The water level of this wetland should be lowered in May, 1985 by 15 cm and maintained at an operating level of 54 cm below the top of the structure. It may be desirable to reduce the level an additional 15 cm in 1986. Other measures should not be undertaken during the 1985 to 1987 period.

Lowering the water level should improve habitat conditions for waterfowl, muskrat and marshbirds. The 1984 level was certainly excessive and reduced waterfowl brood use over a large part of the wetland. The presence of a successfully nesting pair of Common Loons suggests that habitat conditions were not ideal for waterfowl broods. Black Duck and other dabblers are expected to account for increased use by waterfowl broods, whereas Ring-necked Duck use is not expected to change significantly.

Emergent cover is expected to expand with lower water levels and in the longer term (5+ years), measures may be required to reduce that cover. The expansion of emergent cover should improve conditions for muskrats and marshbirds.

c) Impoundment 3

Marshbird and muskrat values for the wetland exceeded standard values by 78 percent and 19 percent respectively; however there was no recorded waterfowl brood use. Soras and Virginia Rails accounted for about 85 percent of the wetland's marshbirds compared to an expected value of 45 percent. Pied-billed Grebes were not present.

The mean water level of the impoundment was 30.3 cm, only 60 percent of the standard mean water level. Dense vegetative cover, largely comprising giant burreed, made up almost 74 percent of the wetland's cover compared to the standard value of 40 percent. Other habitat conditions

including conductivity, substrate and invertebrates were more favorable than the corresponding standards. A small number of ninespine sticklebacks were collected in the June samples and none in July which probably accounted for the total absence of Pied-billed Grebes. The complete lack of waterfowl brood use was unusual and there is no apparent explanation. The low water level and high percentage of dense emergent cover substantially reduced the amount of suitable habitat, but not to the total exclusion of broods.

i) Recommendations

The following measures should be taken to reduce the extent of the present vegetative cover as much as possible and to replace it with wild rice. The wetland should be drawn-down in May 1985 and remain dry until the giant burreed cover has been substantially reduced. It is expected that that will require only one season and that the impoundment can be reflooded and seeded with wild rice in September 1985. If a sufficient amount (75%) of the burreed has not died by August 1985, the impoundment should remain dry for another year.

The wetland should be flooded to the maximum operating level (15 cm above 1984 level) for the first year after seeding with wild rice and then lowered to the 1984 level (15 cm below Top of structure). The screw lift water control (Figure 1) should be opened to provide a flow through the impoundment.

Establishment of a wild rice stand will very likely reduce the value of the wetland to marshbirds and muskrats, but its importance to waterfowl should be substantially improved. It is expected that its value for waterfowl broods will be less than standard, however, its principal value will be as feeding habitat during the breeding and nesting period and late summer and autumn staging period.

d) The Cove

Assessed wildlife values did not differ substantially from standard values with the wetland's waterfowl brood, marshbird and muskrat values being 81, 129 and 102 percent of the respective standards. Ring-necked Duck broods accounted for 50 percent of the total, whereas there were no Black Duck broods recorded.

The wetland's water level (mean, 63.0 cm) was the only habitat condition that compared unfavorably with standard values. Cattail accounted for about 90 percent of the emergent cover; however, the degree of vegetative cover compared closely with standard values. The wetland's conductivity and invertebrate values far surpassed the standards. The conductivity was 615 mhos/cm, 512 percent of the standard and the total number of invertebrates was 4123, 515 percent of the standard. Snails, particularly Physa spp. accounted for about 54 percent of the total.

i) Recommendations

There should not be any water level or other habitat manipulation during 1985 to 1987. It is expected that conditions will remain stable during that period as they appear to have for the past several years. Small ponds created in the dense cattail cover in 1983 with the cookie cutter should continue to improve in quality over the next few years.

V. SUMMARY OF RECOMMENDATIONS FOR 1985 TO 1987

a) Impoundment 1

No water level or other habitat alteration. Water level maintained at 18.0 cm below top of structure.

b) Impoundment 2

Lower water level by 15 cm in May 1985 and operate at 54 cm below top of structure. Monitor that level in 1985 and if required reduce the level an additional 15 cm in 1986.

c) Impoundment 3

Implement the following measures to replace giant burreed cover with wild rice. Draw-down impoundment in May 1985. Assess burreed condition in August 1985, and if 75 percent is dead, reflood impoundment and seed with wild rice in September 1985. Delay that action until 1986 if sufficient burreed has not died. Maintain water level at maximum (0 cm below top of structure) for the first year after seeding and then lower by 15 cm for normal operation.

d) The Cove

No water level or other habitat alteration. Water level maintained at 33 cm below top of structure.

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Figure 1. Location of Amherst Point Sanctuary wetlands (Impoundments 1-3 and The Cove) studied in 1984.

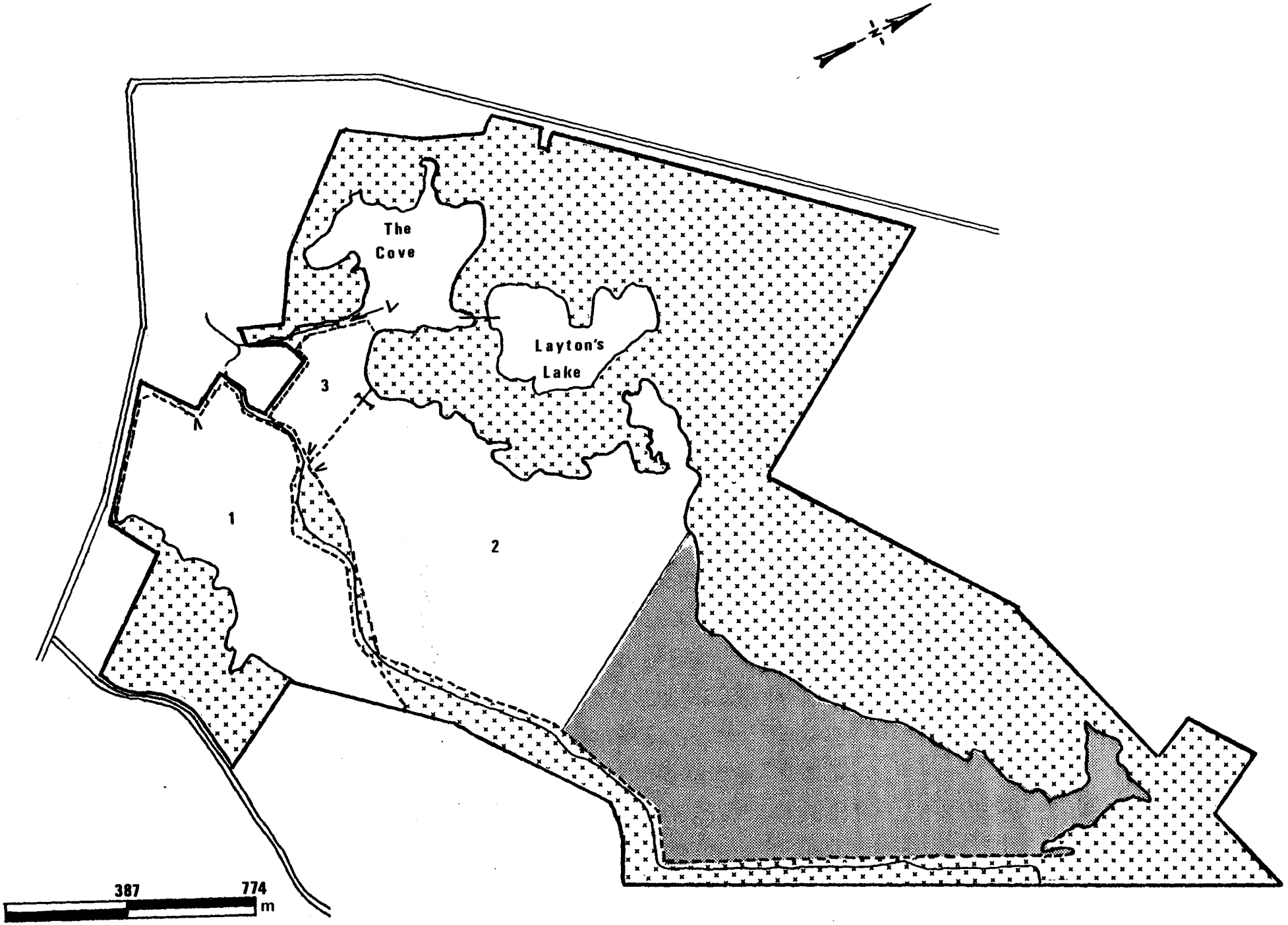
Legend:

Dike	- - -
Water control structure	>
Screw lift pipe	⊢
Floating mat wetland	
Non-wetland habitat	

Wetland Information:

Wetland	Area (ha.)	Year Flooded
Impoundment 1	35.6	1973
Impoundment 2	73.8 *	1973
Impoundment 3	7.3	1977
The Cove	12.4	1983

* Only this part of impoundment was studied, remainder is largely floating mat.


The
Cove
Layton's
Lake
1
2
3
387
774
m

Figures 2 to 5. Location, water depth, substrate type and emergent cover classification of vegetation sample points, Impoundments 1-3 and The Cove, Amherst Point Sanctuary, 1984.

Legend:

Cover Classification

>24% emergent cover - ●

>0<25% emergent cover - ◐

0% emergent cover - ○

Substrate Type

Floating - (F)

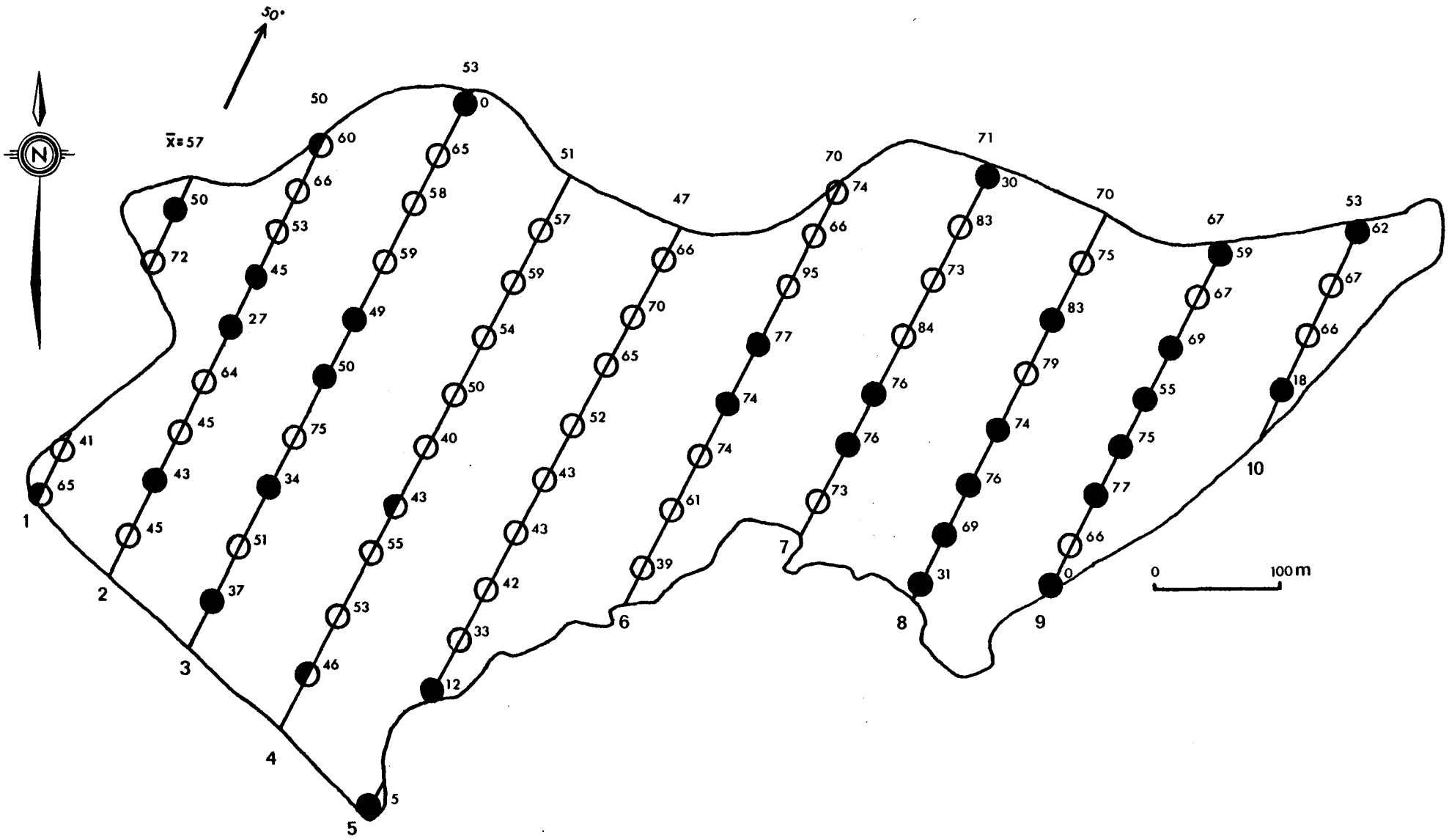
Solid - No designation

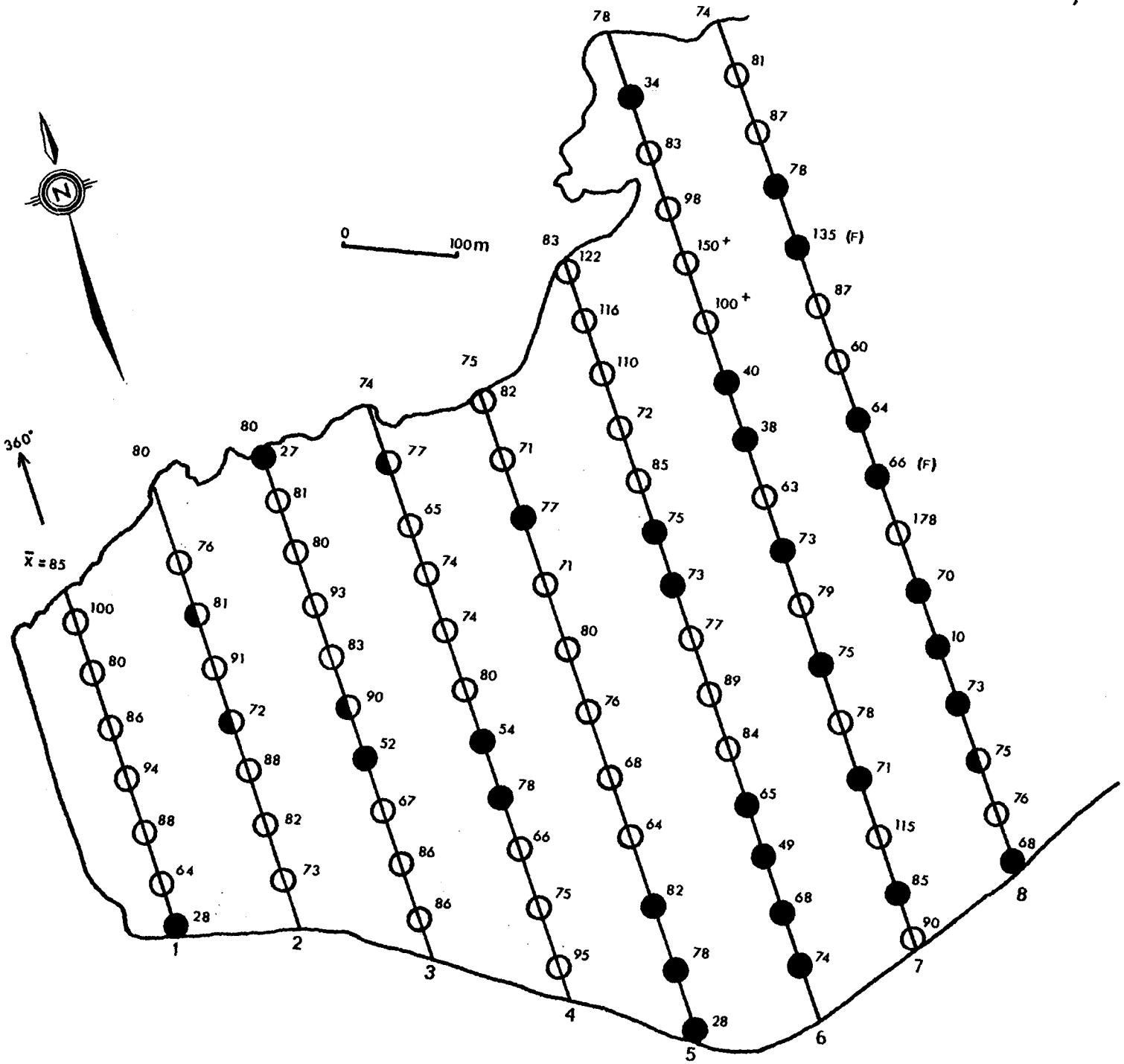
Water Depth (cm.)

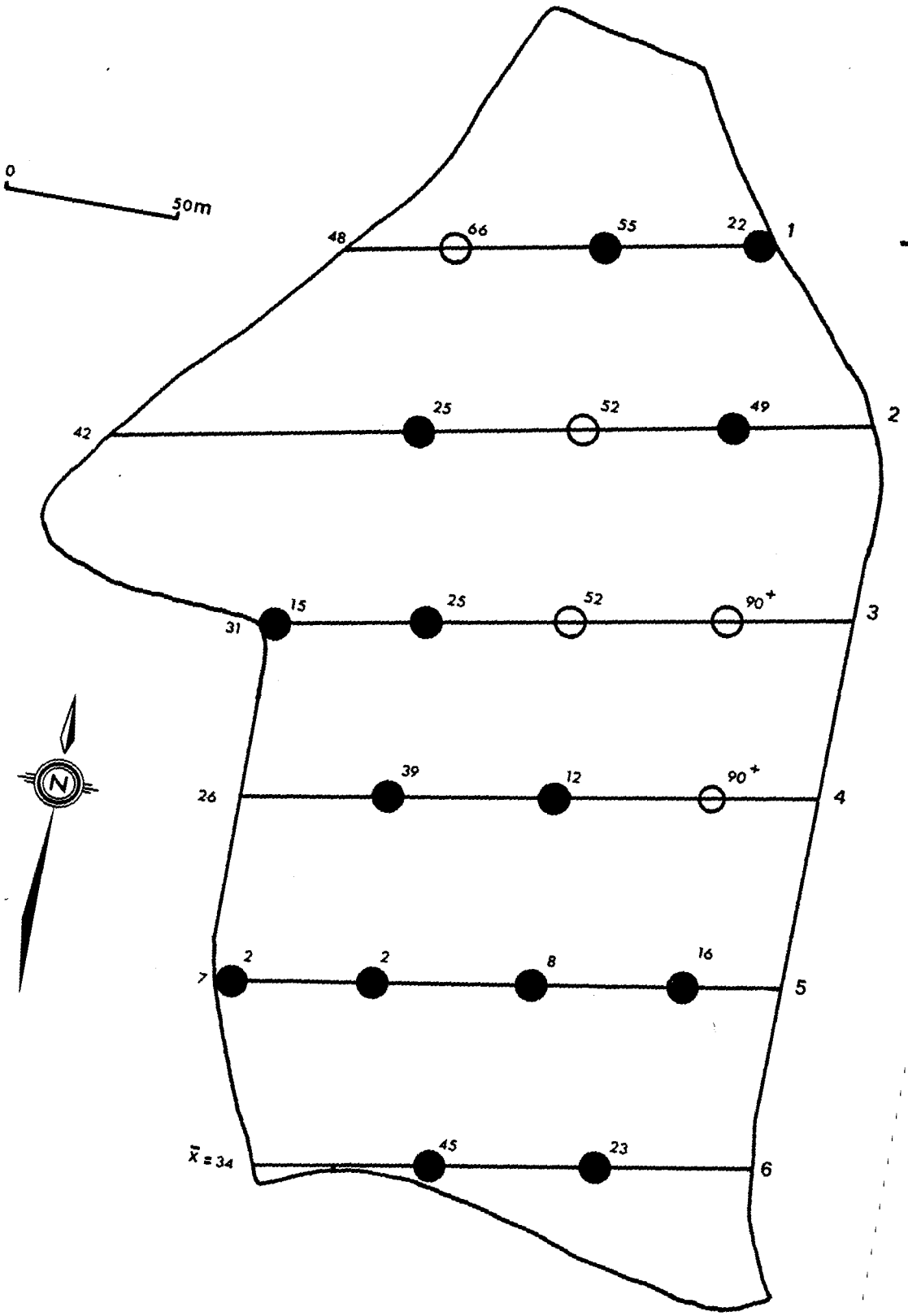
Sample point depth - eg. ●50

Mean transect depth - $\bar{x}$ = 57

Transect Direction - eg. → 50°


50°
N
$\bar{X}$ = 57
0 100 m
1
2
3
4
5
6
7
8
9
10


N
0
100m
360°
$\bar{x}$ = 85
1
2
3
4
5
6
7
8


0
50m
48
66
55
22
1
42
25
52
49
2
31
15
25
52
90+
3
26
39
12
90+
4
7
2
2
8
16
5
$\bar{x}$ = 34
45
23
6
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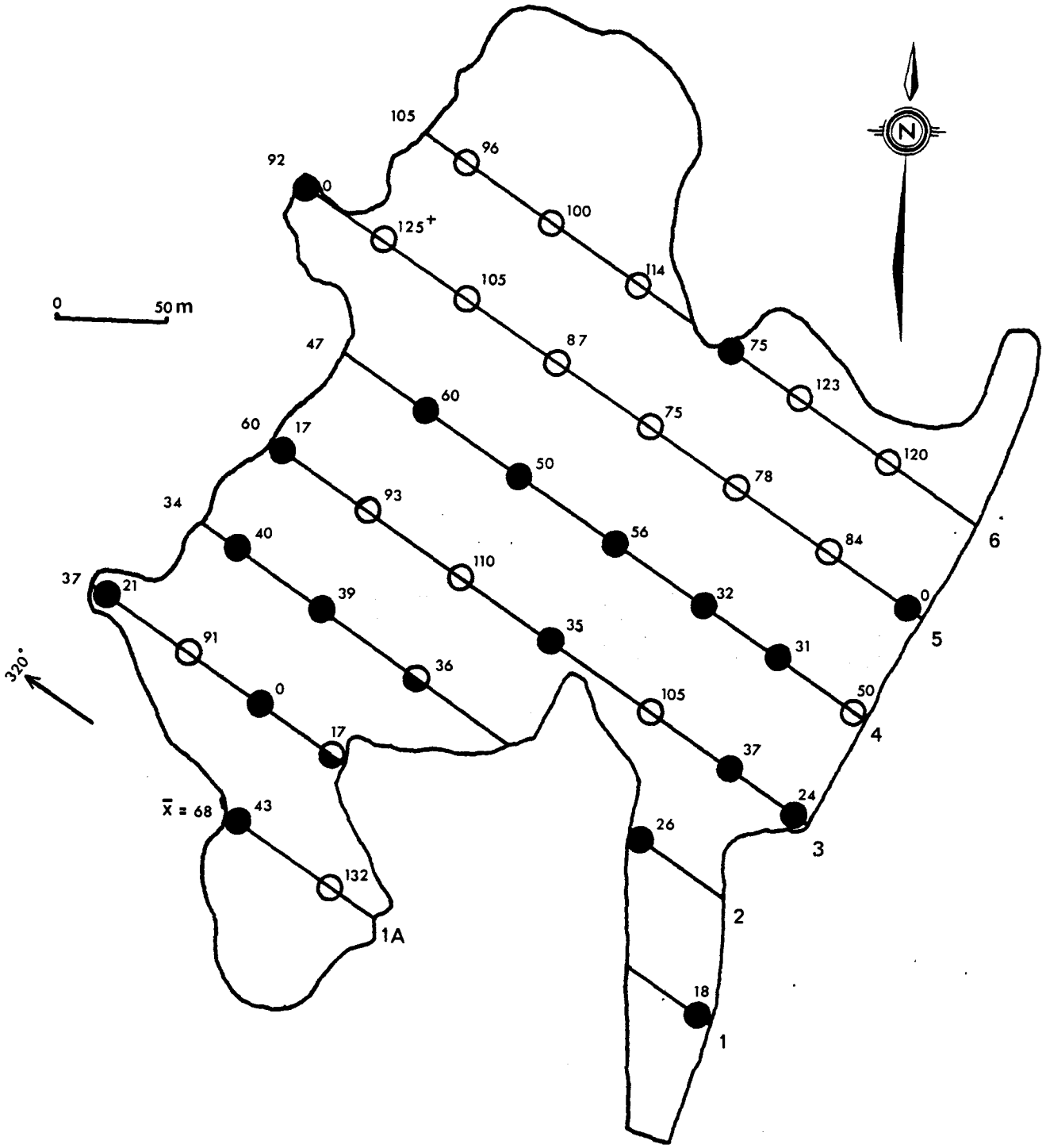
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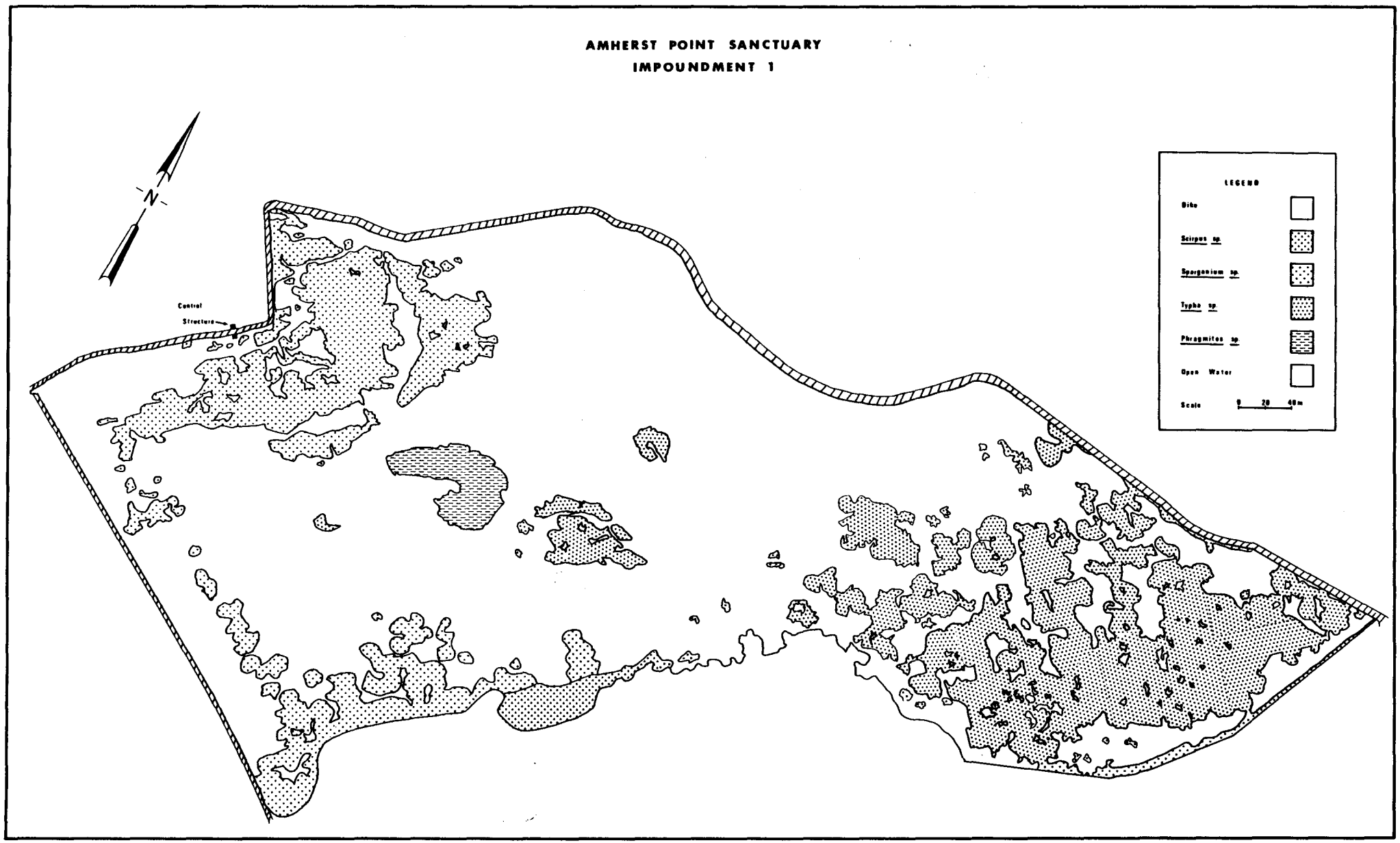

Figure 6. Location and extent of major vegetation covers of Impoundment 1

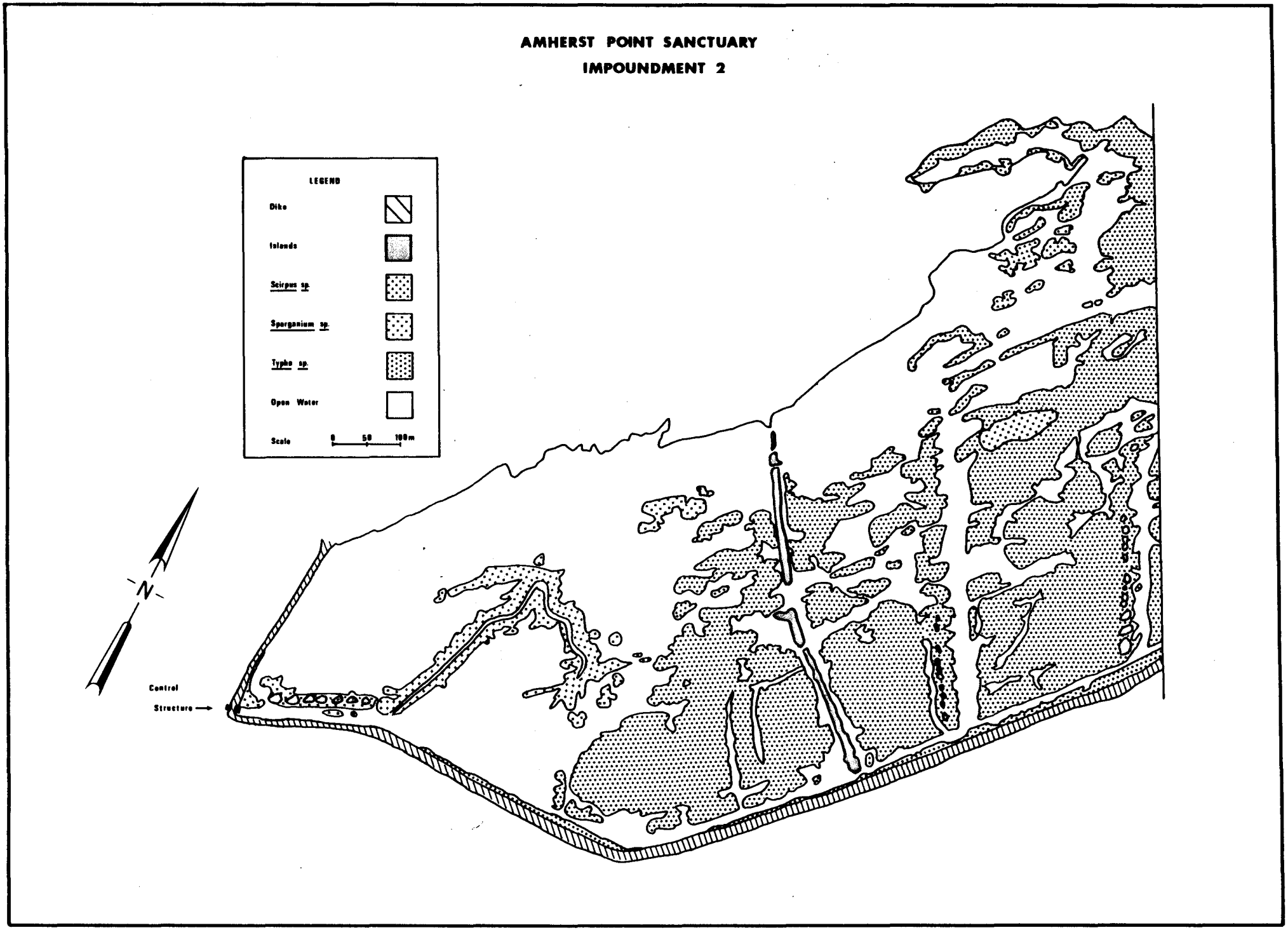

Figure 7. Location and extent of major vegetation covers of impondment 2

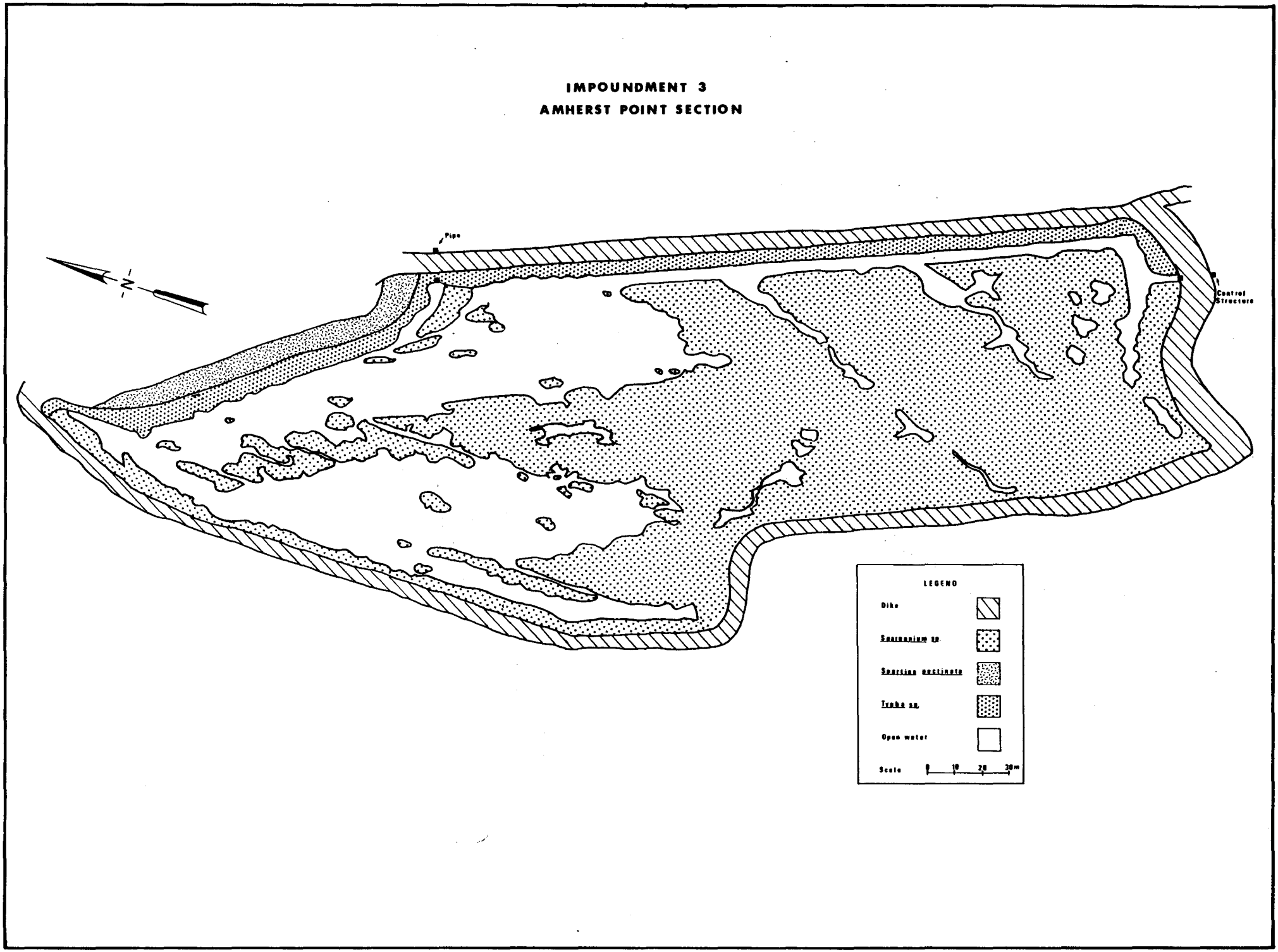

Figure 8. Location and extent of major vegetation covers of Impoundment 3

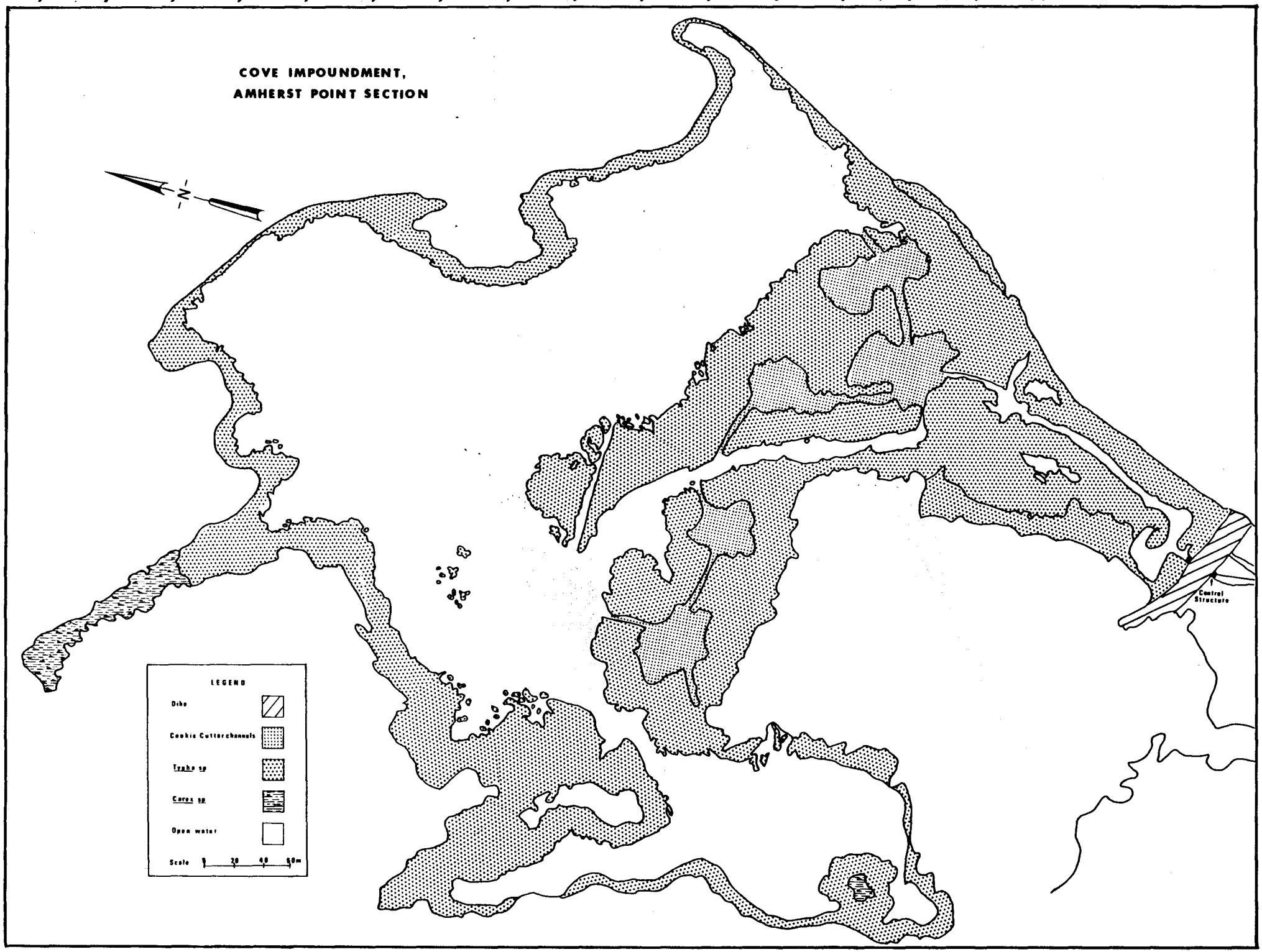

Figure 6. Location and extent of major vegetation

Table 1. Conductivity (mhos/cm) of samples collected at the outlets of the Amherst Point Sanctuary Wetlands in 1984.

Collection Date	Wetland 1	2	3	The Cove
June 6	240	135	165	700
June 20	220	140	155	555
July 3	225	155	155	600
July 16	250	155	135	600
Mean	235	145	155	615

Table 2. Frequency of occurrence and total percent cover of species recorded in sample quadrats in Impoundment 1, Amherst Point Sanctuary, 1984.

Species	No. of Plots	Frequency of Occurrence (%)	Total % Cover
Typha spp.	17	22.4	1038
Sparganium eurycarpum	15	19.7	965
Impatiens capensis	4	5.3	64
Sagittaria latifolia	2	2.6	12
Cicuta bulbifera	2	2.6	12
Bidens cernua	2	2.6	4
Phragmites communis	1	1.3	75
Carex spp.	1	1.3	5
Galium trifidum	1	1.3	1
Onoclea sensiblis	1	1.3	5
Scirpus cyperinus	1	1.3	10
Sium suave	1	1.3	5
Zizania aquatica	1	1.3	2
Calamagrostis canadensis	1	1.3	5
Lemna minor	41	53.9	1036
Myriophyllum sp.	40	52.6	2196
Lemna trisulca	31	40.8	308
Spirodela polyrhiza	30	39.5	394
Filamentous green algae	28	36.8	700
Fissidens sp.	21	27.6	303
Potamogeton pusillus	14	18.4	404
Utricularia spp.	12	15.8	227
Ricciocarpus natans	4	5.3	50
Potamogeton natans	2	2.6	25
Potamogeton perfoliatus	2	2.6	10

Table 3. Frequency of occurrence and total percent cover of species recorded in sample quadrats in Impoundment 2, Amherst Point Sanctuary, 1984.

Species	No. of Plots	Frequency of Occurrence (%)	Total % Cover
Typha spp	17	19.1	805
Sparganium eurycarpum	14	15.7	735
Sium sauve	3	3.4	13
Gramineae spp.	2	2.2	110
Potentilla palustris	2	2.2	30
Rumex orbiculatus	2	2.2	30
Lysimachia terrestris	2	2.2	10
Sagittaria latifolia	2	2.2	17
Agrostis spp.	1	1.1	110
Scirpus validus	1	1.1	60
Sparganium americanum	1	1.1	50
Epilobium palustris	1	1.1	10
Zizania aquatica	1	1.1	10
Bidens cernua	1	1.1	7
Hippuris vulgaris	1	1.1	5
Cicuta bulbifera	1	1.1	3
Glyceria grandis	1	1.1	2
Galium trifidum	1	1.1	2
Blue-green algae and Filamentous green-algae	74	83.2	2105
Najas flexilis	39	43.8	1515
Fissidens sp.	30	33.7	1195
Lemna minor	26	29.2	511
Spirodela polyrhiza	24	26.9	221
Potamogeton pusillus	15	16.8	103
Ricciocarpus natans	13	14.6	147
Utricularia spp.	10	11.2	664
Potamogeton perfoliatus	7	7.9	140
Lemna trisulca	7	7.9	35
Myriophyllum spp.	2	2.2	10
Potamogeton epihydrus	2	2.2	10

Table 4. Frequency of occurrence and total percent cover of species recorded in sample quadrats in Impoundment 3, Amherst Point Sanctuary, 1984.

Species	No. of Plots	Frequency of Occurrence (%)	Total % Cover
Sparganium eurycarpum	14	73.7	1000
Galium trifidum	6	31.6	27
Sagittaria latifolia	3	15.8	12
Cicuta bulbifera	3	15.8	7
Typha spp.	2	10.5	20
Scirpus cyperinus	2	10.5	8
Bidens cernua	2	10.5	8
Impatiens capensis	1	5.3	25
Eleocharis sp.	1	5.3	15
Agrostis spp.	1	5.3	5
Calamagrostis canadensis	1	5.3	5
Sparganium americanum	1	5.3	5
Lemna minor	13	68.4	188
Myriophyllum spp.	6	31.6	135
Spirodela polyrhiza	5	26.3	178
Ricciocarpus natans	5	26.3	160
Filamentous green Algae	4	21.1	200
Potamogeton zosteriformis	3	15.8	280
Potamogeton pusillus	1	5.3	5

Table 5. Frequency of occurrence and total percent cover of species recorded in sample quadrats in The Cove, Amherst Point Sanctuary, 1984.

Species	No. of Plots	Frequency of Occurrence (%)	Total % Cover
Typha spp.	19	50.0	1100
Galium trifidum	3	7.9	7
Zizania aquatica	2	5.3	60
Scirpus cyperinus	2	5.3	30
Sium sauve	2	5.3	3
Spartina pectinata	1	2.6	5
Carex sp.	1	2.6	5
Gramiceae sp.	1	2.6	2
Myriophyllum spp.	20	52.6	1040
Lemna minor	19	50.0	575
Filamentous green algae	10	26.3	325
Potamogeton pectinatus	10	26.3	158
Ricciocarpus natans	8	21.0	220
Utricularia spp.	5	13.2	100
Potamogeton pusillus	5	13.2	55
Lemna trisulca	4	10.5	40
Spirodela polyrhiza	3	7.9	65
Potamogeton sp.	3	7.9	55
Fissidens sp.	1	2.6	75
Zannichellia palustris	1	2.6	5

Table 6. Numbers of major invertebrate taxa and ninespine sticklebacks from Impoundment 1, Amherst Point Sanctuary samples, 1984.

	June 20			July 17			
Taxa	Dense cover	Sparse cover	Total	Dense cover	Sparse cover	Total	Grand Total
Hirudinea	27	33	60	20	29	49	109
Amphipoda	90	75	165	93	134	227	392
Baetidae	37	178	215	7	3	10	225
Aeschnidae	5	-	5	8	2	10	15
Agrionidae	11	20	31	5	6	11	42
Corixidae	125	114	239	10	8	18	257
Hydroptilidae	14	22	36	31	40	71	107
Haliplidae	6	15	21	-	2	2	23
Dytiscidae	13	2	15	2	2	4	19
Heleidae	22	9	31	2	1	3	34
Chironomidae	119	48	167	52	14	66	233
Physidae	26	179	205	112	197	309	514
Planorbidae	4	2	6	28	4	32	38
Total	499	697	1196	370	442	812	2008
Pungitius pungitius	47	34	91	17	16	33	114

Table 7. Numbers of major invertebrate taxa and ninespine sticklebacks from Impoundment 2, Amherst Point Sanctuary samples, 1984.

	June 20			July 17			
Taxa	Dense cover	Sparse cover	Total	Dense cover	Sparse cover	Total	Grand Total
Hirudinea	17	21	38	9	18	27	65
Amphipoda	31	27	58	39	79	118	176
Baetidae	-	36	36	-	-	-	36
Aeschnidae	2	1	3	6	5	11	14
Agrionidae	4	7	11	1	5	6	17
Corixidae	141	223	364	32	84	116	480
Hydroptilidae	3	1	4	1	3	4	8
Haliplidae	7	5	12	-	17	17	29
Dytiscidae	3	14	17	2	3	5	22
Heleidae	2	2	4	1	-	1	5
Chironomidae	19	40	59	43	122	165	224
Physidae	20	34	54	61	21	82	136
Planorbidae	2	-	2	3	11	14	16
Total	251	411	662	198	368	566	1228
Pungitius pungitius	13	31	44	2	9	11	55

Table 8. Numbers of major invertebrate taxa and ninespine sticklebacks from Impoundment 3, Amherst Point Sanctuary samples, 1984.

	June 20			July 17			
Taxa	Dense cover	Sparse cover	Total	Dense cover	Sparse cover	Total	Grand Total
Hirudinea	17	33	50	8	23	31	81
Amphipoda	48	28	76	30	111	141	217
Baetidae	13	23	36	-	2	2	38
Aeschnidae	7	16	23	1	9	10	33
Agrionidae	14	6	20	4	5	9	29
Corixidae	101	158	259	8	34	42	301
Hydroptilidae	5	7	12	2	13	15	27
Haliplidae	16	42	58	7	2	9	67
Dytiscidae	29	28	57	2	3	5	62
Heleidae	11	5	16	1	-	1	17
Chironomidae	21	68	89	5	21	26	115
Physidae	51	62	113	23	125	148	261
Planorbidae	1	4	5	22	6	28	33
Total	334	480	814	113	354	467	1281
Pungitius pungitius	4	11	15	-	-	-	15

Table 9. Numbers of major invertebrate taxa and ninespine sticklebacks from The Cove, Amherst Point Sanctuary samples, 1984.

	June 20			July 17			
Taxa	Dense cover	Sparse cover	Total	Dense cover	Sparse cover	Total	Grand Total
Hirudinea	19	6	25	31	48	79	104
Amphipoda	30	84	114	135	284	419	533
Baetidae	29	48	77	-	7	7	84
Aeschnidae	3	2	5	8	25	33	38
Agrionidae	16	14	30	8	23	31	61
Corixidae	82	99	181	46	18	64	245
Hydroptilidae	8	7	15	15	6	21	36
Haliplidae	21	14	35	7	46	53	88
Dytiscidae	37	1	38	9	5	14	52
Heleidae	2	12	14	-	7	7	21
Chironomidae	140	179	319	131	192	323	642
Physidae	254	208	462	693	1039	1732	2194
Planorbidae	9	1	10	9	6	15	25
Total	650	675	1325	1092	1706	2798	4123
Pungitius pungitius	2	10	12	1	2	3	15

Table 10. Numbers of marshbirds recorded at Amherst Point Sanctuary wetlands on June 5 and July 3, 1984 surveys

June 5

Species	Impoundment 1	2	3	Cove	Total
Pied-billed Grebe	14	11	-	3	28
American Bittern	-	1	-	1	2
Least Bittern	-	1	-	-	1
Virginia Rail	-	-	-	-	-
Sora	10	18	4	6	38
American Coot	11	2	-	-	13
Common Snipe	-	1	-	-	1
Black Tern	-	-	-	-	-
Marsh Wren	-	-	-	-	-
Total	35	34	4	10	83

July 3

Species	Impoundment 1	2	3	Cove	Total
Pied-billed Grebe	26	14	-	2	42
American Bittern	2	1	-	1	4
Least Bittern	-	1	-	-	1
Virginia Rail	1	-	3	-	4
Sora	8	25	4	3	40
American Coot	6	1	-	-	7
Common Snipe	-	1	-	-	1
Black Tern	-	2	-	-	2
Marsh Wren	-	-	2	-	2
Total	43	45	9	6	103

Table 10. (cont'd.) Numbers of marshbirds recorded at Amherst Point Sanctuary wetlands on June 5 and July 3, 1984 surveys

	June 5 & July 3 Combined				
	Impoundment				
Species	1	2	3	Cove	Total
Pied-billed Grebe	40	25	-	5	70
American Bittern	2	2	-	2	6
Least Bittern	-	2	-	-	2
Virginia Rail	1	-	3	-	4
Sora	18	43	8	9	78
American Coot	17	3	-	-	20
Common Snipe	-	2	-	-	2
Black Tern	-	2	-	-	2
Marsh Wren	-	-	2	-	2
Total	78	79	13	16	186

Table 11. Numbers of waterfowl broods observed at Amherst Point Sanctuary wetlands on June 28 and August 7, 1984 helicopter surveys.

June 28

Species	Impoundment 1	2	3	Cove	Total
Green-winged Teal	-	-	-	1	1
Black Duck	2	2	-		4
Northern Pintail	-	-	-	1	1
Ring-necked Duck	2	-	-	1	3
Total	4	2	-	3	9

August 7

Species	Impoundment 1	2	3	Cove	Total
Green-winged Teal	-	2	-	1	3
Black Duck	3	2	-	-	5
Northern Pintail	1	1	-	-	2
Blue-winged Teal	2	6	-	2	10
Ring-necked Duck	7	14	-	5	26
Ruddy Duck	1	-	-	-	1
Total	14	25	-	8	47

June 28 and August 7 combined

Species	Impoundment 1	2	3	Cove	Total
Green-winged Teal	-	2	-	2	4
Black Duck	5	4	-	-	9
Northern Pintail	-	1	-	1	2
Blue-winged Teal	2	6	-	2	10
Ring-necked Duck	8	14	-	5	27
Ruddy Duck	1	-	-	-	1
Total	16	27	-	10	53

Table 12. Comparison of standard values for habitat factors with corresponding Impoundment one values obtained in 1984.

Factor		Standard Value	Impoundment Value	Deviation
1. Conductivity (mhos/cm)		120 (min)	235	+115
2. Water Depth (cm)		20-90 (range)	0-95	Low -20, High +5
		45 (mean)	58.3	+13.3
3. Substrate (% floating mat)		20 (max)	0	-20
4. Vegetative Cover (%)				
	Dense	40	38.2	- 1.8
	Sparse	20	5.3	-14.7
	Open	40	56.5	+16.5
5. Vegetative Composition (%)				
Emergents	Cattail	30	47.0	+17.0
	Burreed	30	43.7	+13.7
	Sedge, Wildrice bulrush, others	40	9.3	-30.7
	Duckweed	40	34.2	- 5.8
Submergents	Pondweed	30	7.4	-22.6
	Milfoil	20	36.9	+16.9
	Others	10	21.5	+11.5
6. Invertebrates (% composition)				
Leech		5	5.4	+ 0.4
Scuds		10	19.5	+ 9.5
Water Boatman		30	12.8	-17.2
Midges		35	11.6	-23.4
Snails		10	27.5	+17.5
Others		10	23.2	+13.2
Total Organisms		800	2008	+1196

(see next page)

Table 12. Comparison of standard values for wildlife factors with corresponding Impoundment one values (cont'd.) obtained in 1984.

Factor	Standard Value	Impoundment Value	Deviation
1. Waterfowl			
Brood Density (per ha)	1	0.45	- 0.55
Species composition (%)			
Black Duck	30	31.2	+ 1.2
G.-w. Teal	10	-	-10.0
B.-w. Teal	20	12.5	- 7.5
R.-n. Duck	30	50.0	+20.0
Others	10	6.3	- 3.7
2. Marshbirds			
Adult Bird Density (per ha)	1	2.19	+ 1.19
Species Composition (%)			
P.-b. Grebe	40	51.3	+11.3
American Bittern	10	2.6	- 7.4
Sora	40	23.0	-17.0
Virginia Rail	5	1.3	- 3.7
Others	5	21.8	+16.8
3. Muskrats			
House Density (per ha)	3	1.66	- 1.34

Table 13. Comparison of standard values for habitat factors with corresponding Impoundment two values obtained in 1984.

Factor		Standard Value	Impoundment Value	Deviation
1. Conductivity (mhos/cm)		120 (min)	145	+25
2. Water Depth (cm)		20-90 (range)	10-150+	Low -10, High +60
		45 (mean)	79.1	+34.1
3. Substrate (% floating mat)		20 (max)	2.2	-17.8
4. Vegetative Cover (%)				
Dense		40	33.7	- 6.3
Sparse		20	5.6	-14.4
Open		40	60.7	+20.7
5. Vegetative Composition (%)				
Emergents	Cattail	30	38.3	+ 8.3
	Burreed	30	35.0	+ 5.0
	Sedge, Wildrice bulrush, others	40	26.7	-13.3
Submergents	Duckweed	40	11.5	-28.5
	Pondweed	30	26.6	- 3.4
	Milfoil	20	0.2	-19.8
	Others	10	61.7	+51.7
6. Invertebrates (% composition)				
Leech		5	5.3	+ 0.3
Scuds		10	14.3	+ 4.3
Water Boatman		30	39.1	+ 9.1
Midges		35	18.2	-16.8
Snails		10	12.4	+ 2.4
Others		10	10.7	+ 0.7
Total Organisms		800	1228	+ 428

(see next page)

Table 13. Comparison of standard values for wildlife factors with corresponding Impoundment two values (cont'd.) obtained in 1984.

Factor	Standard Value	Impoundment Value	Deviation
1. Waterfowl			
Brood Density (per ha)	1	0.36	- 0.64
Species composition (%)			
Black Duck	30	14.8	-15.2
G.-w. Teal	10	7.4	- 2.6
B.-w. Teal	20	22.2	+ 2.2
R.-n. Duck	30	51.9	+21.9
Others	10	3.7	- 6.3
2. Marshbirds			
Adult Bird Density (per ha)	1	1.07	+ 0.07
Species Composition (%)			
P.-b. Grebe	40	31.6	- 8.4
American Bittern	10	2.5	- 7.5
Sora	40	54.4	+14.4
Virginia Rail	5	0.0	- 5.0
Others	5	11.5	+ 6.5
3. Muskrats			
House Density (per ha)	3	1.41	- 1.59

Table 14. Comparison of standard values for habitat factors with corresponding Impoundment three values obtained in 1984.

Factor		Standard Value	Impoundment Value	Deviation
1. Conductivity (mhos/cm)		120 (min)	155	+35
2. Water Depth (cm)		20-90 (range)	2-66	Low -18, High -24
		45 (mean)	30.3	-14.7
3. Substrate (% floating mat)		20 (max)	0	-20
4. Vegetative Cover (%)				
	Dense	40	73.7	+33.7
	Sparse	20	0	-20.0
	Open	40	26.3	-13.7
5. Vegetative Composition (%)				
Emergents	Cattail	30	1.8	-28.2
	Burreed	30	88.0	+58.0
	Sedge, Wildrice bulrush, others	40	10.2	-13.7
Submergents	Duckweed	40	31.9	- 8.1
	Pondweed	30	24.9	- 5.1
	Milfoil	20	11.8	- 8.2
	Others	10	31.4	+21.4
6. Invertebrates (% composition)				
Leech		5	6.3	+ 1.3
Scuds		10	16.9	+ 6.9
Water Boatman		30	23.5	- 6.5
Midges		35	9.0	-26.0
Snails		10	22.9	+12.9
Others		10	22.4	+12.4
Total Organisms		800	1281	+ 481

(see next page)

Table 14. (cont'd.) Comparison of standard values for wildlife factors with corresponding Impoundment three values obtained in 1984.

Factor	Standard Value	Impoundment Value	Deviation
1. Waterfowl			
Brood Density (per ha)	1	0	- 1
Species composition (%)			
Black Duck	30		
G.-w. Teal	10		
B.-w. Teal	20		
R.-n. Duck	30		
Others	10		
2. Marshbirds			
Adult Bird Density (per ha)	1	1.78	+ 0.78
Species Composition (%)			
P.-b. Grebe	40	0	-40
American Bittern	10	0	-10
Sora	40	61.5	+21.5
Virginia Rail	5	23.1	+18.1
Others	5	15.4	+10.4
3. Muskrats			
House Density (per ha)	3	3.56	+ 0.56

Table 15. Comparison of standard values for habitat factors with corresponding Cove values obtained in 1984.

Factor		Standard Value	Impoundment Value	Deviation
1. Conductivity (mhos/cm)		120 (min)	615	+495
2. Water Depth (cm)		20-90 (range)	0-125+	Low -20, High +35
		45 (mean)	63.0	+18.0
3. Substrate (% floating mat)		20 (max)	0	-20
4. Vegetative Cover (%)				
	Dense	40	50.0	+10.0
	Sparse	20	5.3	-14.7
	Open	40	44.7	+ 4.7
5. Vegetative Composition (%)				
Emergents	Cattail	30	90.1	+60.1
	Burreed	30	0	-30.0
	Sedge, Wildrice bulrush, others	40	9.9	-30.1
	Duckweed	40	25.1	-14.9
Submergents	Pondweed	30	10.1	-19.9
	Milfoil	20	38.3	+18.3
	Others	10	26.5	+16.5
6. Invertebrates (% composition)				
Leech		5	2.5	- 2.5
Scuds		10	12.9	+ 2.9
Water Boatman		30	5.9	+24.1
Midges		35	15.6	-19.4
Snails		10	53.8	+43.8
Others		10	9.3	+ 0.7
Total Organisms		800	4123	+3323

(see next page)

Table 15. Comparison of standard values for wildlife factors with corresponding Cove values obtained (cont'd.) in 1984.

Factor	Standard Value	Impoundment Value	Deviation
1. Waterfowl			
Brood Density (per ha)	1	0.81	- 0.19
Species composition (%)			
Black Duck	30	0	-30.0
G.-w. Teal	10	20.0	-10.0
B.-w. Teal	20	20.0	-
R.-n. Duck	30	50.0	+20.0
Others	10	10.0	-
2. Marshbirds			
Adult Bird Density (per ha)	1	1.29	+ 0.29
Species Composition (%)			
P.-b. Grebe	40	31.2	- 8.8
American Bittern	10	12.5	+ 2.5
Sora	40	56.3	+16.3
Virginia Rail	5	0	- 5.0
Others	5	0	- 5.0
3. Muskrats			
House Density (per ha)	3	3.06	+ 0.06