

Organization and Initial Implementation
of an Alligator Monitoring Study
at Corkscrew Swamp Sanctuary

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ABSTRACT

A program was begun to monitor alligators at Corkscrew Swamp Sanctuary to determine population trends and provide data for management decisions. Transects with specific observation sites were established to provide a variety of pond and canal sizes, depths, and habitat types within reasonably easy access for observers. Night counts of alligator eye shine were used to determine numbers. Initial data was collected along four transects and permanent stakes were placed at sighting points for future counts. Instructions were compiled for four annual future counts.

INTRODUCTION

The function of an alligator monitoring program at Corkscrew Swamp Sanctuary is to provide information about increases or decreases in alligator populations on the sanctuary that can be used in sanctuary management decisions. The program may also be useful in indicating effects of different management procedures or changes in the environment outside the sanctuary boundaries upon alligator populations.

No work has been done on alligator numbers or distribution at Corkscrew Swamp Sanctuary in the past. In Louisiana and Florida population trends studies and censuses have previously been done utilizing such methods as call counts, nest counts, and night counts, and have usually been carried out in boats, planes or helicopters (Chabreck 1966, Hines et al. 1968,

McNease and Joanen 1978, Schemnitz 1972, Woodward and Marion 1978.) Call counts are only possible during breeding season when bellowing activity is greatest which is mainly mid-April through May (Toops 1979). Nest counts can only be done practically from the air in areas where there is no dense canopy and shortly after nests are constructed, about the end of June in this area (Toops 1979). Since seasonal naturalists will be observers in future years and they are only at Corkscrew Swamp Sanctuary from December 15th to April 15th, these two methods which can only be carried out in late spring could not be used.

Due to the lack of large bodies of open water, especially at the time of year the count is taken, boats or canoes were impractical. Aerial viewing was too expensive and could be used for only limited portions of the area due to the diversity of habitats, many having dense canopies over the water sites. Therefore a method of observation from land along fire lane transects seemed most versatile and practical for this sanctuary. Size estimates of alligators in all literature examined was done by rapidly approaching the animal by boat. Since no such vehicle was practical in this area, no size data could be gathered.

Corkscrew Swamp Sanctuary contains a wide variety of habitats such as pond and virgin bald cypress strands, logged cypress areas, cypress domes, burned areas, willow heads, marsh, wet prairie, pine flatlands, tropical and hardwood hammocks, an altered fish farm area, and manmade canals along fire lanes. Inclusion of many areas was impossible without developing a complex variety of counting methods and using large amounts of time. Willow heads, for example, would require walking cross country through possibly waist deep water into the central pool of the willow head, then climbing a tree or

standing in the water and waiting a sufficient amount of time for the alligator activity to return to normal after the excessive crashing and splashing which is required to reach the center of most willow heads. An important factor in designing this study is the likelihood of using new observers every year to collect the annual data. Because of this plans have been designed to be as easy to implement as possible, requiring a limited amount of time and energy, thus hopefully insuring a complete and accurate future accumulation of data by inexperienced persons. Unfortunately this has required sacrifices in habitat variety and the inclusion of less accessible and more distant areas.

At the time of this paper a monitoring program including the testing of procedures, collection of initial data, and completion of the first annual night count of alligators along four transects, has been completed. Annual counts will continue for four more years. Many variables affect this procedure, therefore a single year's data would not give a very accurate indication of population status. Trends indicated by a several year period would be much more reliable, so five years was considered a minimum time period for obtaining accurate population trend information. At the end of five years, data can be analyzed by sanctuary land management staff and monitoring could be continued or terminated after 1986 as desired.

MATERIALS AND METHODS

Site Selection. Observation sites were chosen to include the greatest possible diversity of habitat and pond or canal depth and size. Four transects

were chosen as shown in Figure 1. The South Dike Transect, a 4.7 kilometer transect, passes through 1) mainly swamp edge, logged cypress areas being replaced with a mixture of cypress and hardwoods and 2) marsh edge with grasses, willows, and myrtle. The North End Transect is the south 2.9 kilometers of the road to the north end of the sanctuary with 1) pine flatlands with slash pine and sabal palm as the dominant species and often bordered by pond cypress and 2) marsh with assorted grasses, pickerelweed and arrowhead. The Fish Farm Transect borders 3.5 kilometers of canals on an abandoned research fish farm, a series of dikes and canals with 1) some canals bordered by cattails, shrubs, and palms and 2) some canals with little tall vegetation. The Lettuce Lake Transect is a portion of boardwalk passing through virgin cypress swamp with viewing areas at two lakes that were formed by peat burnouts in the past and which are usually covered by a plant called water lettuce. The larger lake boardwalk is 62 meters long. The smaller lettuce lake boardwalk is 38 meters in length.

Observation sites were chosen along each transect where visibility was good since vegetation often obstructs a clear view of the water. Specific sites were chosen rather than continuous viewing along transects to standardize the counting technique; different observers will be counting each year and some may be more willing to climb and crawl through dense foliage to view areas. Hot rolled steel rods 122cm long and 0.95 cm in diameter were placed at each site as markers for future counts. Figures 2-6 show these observation sites.

Data Collection at Sites. The following data was collected for analysis of alligator distribution and preferred habitats.

Habitat type was determined by observation at each location. The seven general habitat divisions are presented in Figure 7. Habitat type is listed by site on Charts 1-3.

Water depth was measured in each canal or pond at the time of the official count. As reference points, official water depths were recorded from depth gauge 'B' at the large lettuce lake and the south dike water gauge at observation point No. 31.

The deepest point in each canal or pond was found by sampling depths in several locations within the observation area. Depths were measured to the nearest 15 cm. Water depths were divided into three categories-- Shallow Depth: 0-53cm., including 34 sites; Medium Depth: 53-127 cm., including 45 sites; and Deeper Depth: 127 cm. and deeper, including 26 sites. See Charts 1-3 for depths by site. Those ponds and canals in the Shallow Depth category were included because during Winter/Spring 1982 water levels were well below average and these areas might possibly support alligators in wetter future years.

Future relative depths at observation sites can be calculated by checking the water gauges along the South Dike and Lettuce Lake transects and comparing the water depth to the 1982 figures.

Pond size and canal width were determined by observation only to give a general idea of area for future reference. Ponds generally 9 meters or less in diameter were classified as Small; those appearing greater in diameter were classified as Large. Canals narrower than 9 meters were classified as Narrow; those that looked wider than 9 meters were classified as Wide. Determinations by site are also listed on Charts 1-3.

Material and Procedure Selection. A variety of materials and methods

were tested in several practice counts to determine effectiveness. A 12 Volt Eveready Commander Florescent Lantern was tested and used for night counts. The florescent light has the advantage of providing an extremely wide viewing range. This can be of value if many alligators are present to avoid duplication or omissions which might be caused by having to move a narrow beam regular flashlight over a wide area. The disadvantage of the florescent light is its short range. Because of this a regular 6 Volt Eveready Floating Lantern flashlight was also used to pick up alligators at far range at each site. Both lights were held on top of the observers head with head and light turned simultaneously to pan the viewing area. The observer can bend or move approximately 1½ meters in each direction from the point closest to the water at each stake. Observation sites are indicated on the site maps to show the appropriate location of the viewer in relation to the canal or pond.

Alligator eyes shine red or yellow. Future observers should note that other animals such as frogs, spiders, racoons, and chuck-will's-widows, also have eye shines which may be seen reflecting in the vicinity of viewing sites.

In some portions of the transects the water is not visible while the observer is standing at ground level. These areas were observed by pulling the vehicle (Chevrolet Suburban or pickup truck) as close to the observation site stake as possible. Then observations are made by standing on top of the cab of the vehicle. These sites are numbers 13, 14, 15, 36, 37, and 38 on the South Dike Transect and numbers 9 and 10 on the Fish Farm Transect.

Color slides were taken at each observation site to show any vegetation that might be blocking visibility and how large an area was visible. These slides are available at the Ecosystems Research Unit Office at Corkscrew

Swamp Sanctuary. They may be used for comparison with future vegetation patterns that might obstruct viewing to a greater or lesser degree.

A daytime count was made without the aid of binoculars when water depths were taken to determine if day or night counts would yield higher numbers. Only 39 alligators were seen on the day count compared to the 73 alligators seen on the official night count.

PROCEDURE FOR FIRST AND FUTURE NIGHT COUNTS

In future years count procedure begins by an observer walking each transect except the lettuce lakes with the aid of site maps to locate the metal stakes; flagging in a color that can be easily seen in the dark with truck headlights (yellow worked well) should be attached to each stake so that it can be easily located at night.

Observers should practice eye shine counting at the lettuce lakes or in other areas where alligators may be easily seen until they feel familiar with the procedure.

On the night of the count, note was made of weather conditions for the time preceding and the night of the count. There was much less rain during the 1981 rainy season than average. The water level at the lettuce lake on March 9, 1982 was 22 cm. compared to a 22 year average of 67 cm. The March 9, 1982 water level was the lowest in the past 22 years. However, there was 4.5 cm. of rain in the week before water levels were measured on March 9th which definitely raised water levels above those of previous weeks. The water level at the gauge on Site No. 31 along the South Dike Transect was

13 lines below number one on the gauge stick. There was a full moon on March 9th which probably hindered visibility to some degree, though it was partly cloudy on all four evenings when the counts were taken.

The counts were taken as follows: South Dike transect on March 9th, Fish Farm transect on March 10th, North End transect on March 12th, and Lettuce Lake transect on March 13th. There was no count taken on March 11th due to a misty rain; previous observation indicated that alligators tend to be less visible on or right after rainy periods.

Counts were begun at 7 PM, approximately one half hour after sunset. Temperature was recorded at the thermometer behind the Visitors Center before the counts began. Two observers covered each transect and took turns counting eye shine at each observation site. One observer used the florescent light, then the second observer took a turn with the regular flashlight; numbers were compared and checked if necessary. It was often found that the longer one spent at a site, the more eye shines were spotted; therefore a full two minutes at each large site is recommended. Care was taken not to count eye shine seen at long distances again from the next site. Observers moved up to 1½ meters in either direction from the site to verify observations when practicable. At the Lettuce Lakes transect observations were taken from all points along the boardwalk bordering the lakes rather than one specific spot. Water levels should be noted at the Large Lettuce Lake site and Site No. 31 on the South Dike transect gauges on the night of those counts. Data obtained from the first annual count is provided on Charts 1-3.

OBSERVATIONS

Since only one year's data is available, no comparisons are possible. However, the following information may prove valuable for future evaluation.

Alligators were present in all the the "Marsh Perimeter" habitat sites as shown on Figure 7; 1.57 alligators per "Marsh Perimeter" site were seen. Only 0.04 alligators per "Swamp" habitat site were seen. No alligators were seen in "Open Marsh" habitats; this figure was possibly influenced by low water levels this year. "Pine Flatland" habitat canals and ponds had 1.0 alligators per site; these were all located in the three southernmost sites along the North End transect, leaving 25 other sites without any evidence of alligators. At the "Altered Open" habitat on the Fish Farm transect there were 0.85 alligators per site; visibility in this area is excellent which may allow a higher percentage of the alligators present in the canals to be seen and counted. The same is true to a lesser degree in the "Altered Tall Vegetation" habitats on the Fish Farm transect and South Dike transect where 0.31 alligators per site were observed. The "Lettuce Lakes" habitat showed 7.0 alligators per lake. From close daily observation of the two lakes three months previous to the official count, I observed a maximum of eight alligators at the large lettuce lake (6 less than 75 cm., and two 90-210 cm. adults); at the small lettuce lake the maximum number observed were 13 alligators (10 less than 45 cm., one approximately 90 cm., one approximately 120 cm., and one approximately 210 cm.).

Alligators were only observed at Shallow Depths at the two lettuce lake sites; the other 32 Shallow Depth sites were vacant. Medium Depth sites averaged 0.80 alligators per site. Deeper Depth sites averaged the greatest

0.80

0.92
number of alligators per site, 0.88 per site. In future years all ponds and canals may be deeper, but there will be more available water on the sanctuary so alligators may not be concentrated in the relatively deep manmade ponds and canals along the transects. It will be interesting to observe changes in distribution during an exceptionally wet year.

There were 0.89 alligators per Pond site and 0.54 alligators per Canal site. Broken down to relative widths of canals, 0.32 alligators were found per Narrow canal site and 0.79 alligators were found per Wide canal site. Eleven of the twelve alligators found in the Narrow canals were from one site and from daytime observation were probably mostly one or two year olds with their mother. There were only four ponds which contained alligators; during daytime observations these ponds also contained many small one or two year old alligators. There were 1.0 alligators per Small pond (all in one out of nine ponds), and 1.91 alligators per Large pond (in three out of nine ponds). At this point no trend is obvious based on pond area or canal width. Nor was there any obvious preference for ponds versus canals.

In future years I would suggest that water temperature be recorded on one or more nights during the counts at 7:00 PM at a control site such as near the "B" water gauge at the large lettuce lake. If counts are to be continued after 1986, consideration might be given to using water temperature to determine the date for beginning counts as suggested by Woodward and Marion (1978). If expansion of the study is being considered, Washout Road on the northern end of the sanctuary and more sites along the far western end of the south dike might be good areas for the additional transects. Even more valuable might be adding one or two counts per year.

March and September would provide interesting comparisons since young would have just hatched in late August and early September. If counts were three times a year, February (dry season), June (beginning of nesting and rainy seasons), and October (shortly after young are hatched and high water period) would provide a variety of information.

It has been my goal to make procedures as simple and understandable as possible for future observers, either other seasonal naturalists or staff of Corkscrew Swamp Sanctuary. This has required sacrifices in additions of natural habitats and areas less accessible because of distance or terrain. However, I hope that this study will provide valuable population trends information which will be a practical tool in land management.

ACKNOWLEDGEMENTS

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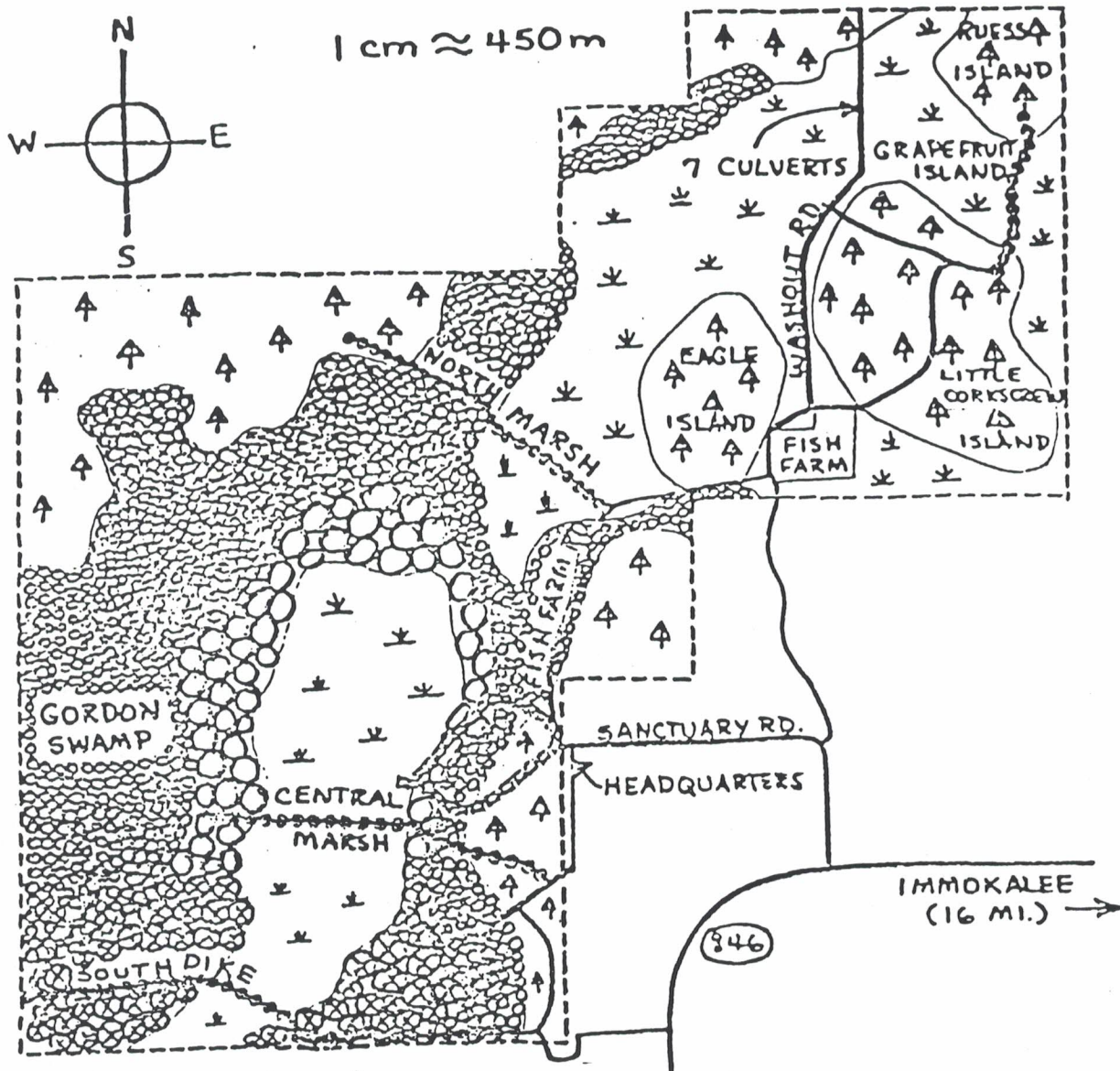
Financial support was provided as part of a grant from International Mining and Chemical Corporation to the National Audubon Society's Corkscrew Swamp Sanctuary, and Ecosystems Research Unit of the National Audubon Society.

The assistance provided by Jerry Cutlip, Mike Duever, Paige Patty, and Greg Seamon was also greatly appreciated.

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Transect Lines Corkscrew Swamp Sanctuary



- sanctuary boundary
- transects for research dept.
- access roads
- boardwalk
- △ pine flatwoods
- * marsh
- ⊙ "pond" cypress
- ⊙ "bald" cypress (virgin)
- ⊙ logged cypress

TRANSECTS:

- South Dike
- North End
- Fish Farm
- Lettuce Lakes

Figure 1.

MAP OF
NORTH END TRANSECT
PART I

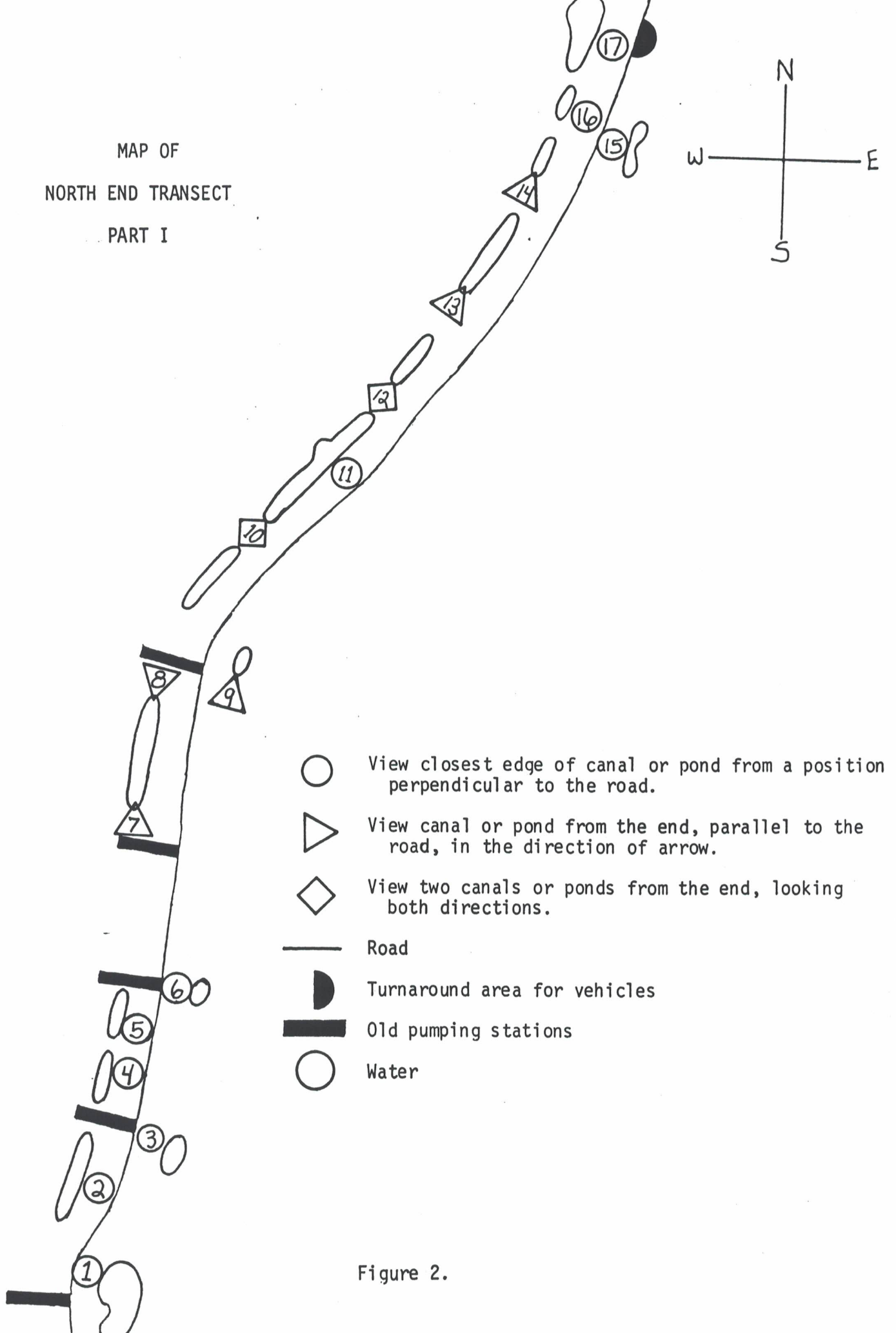
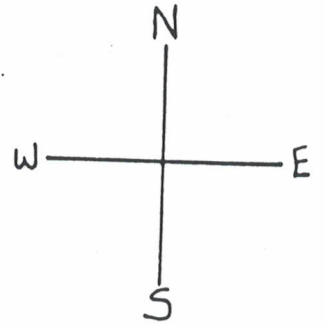
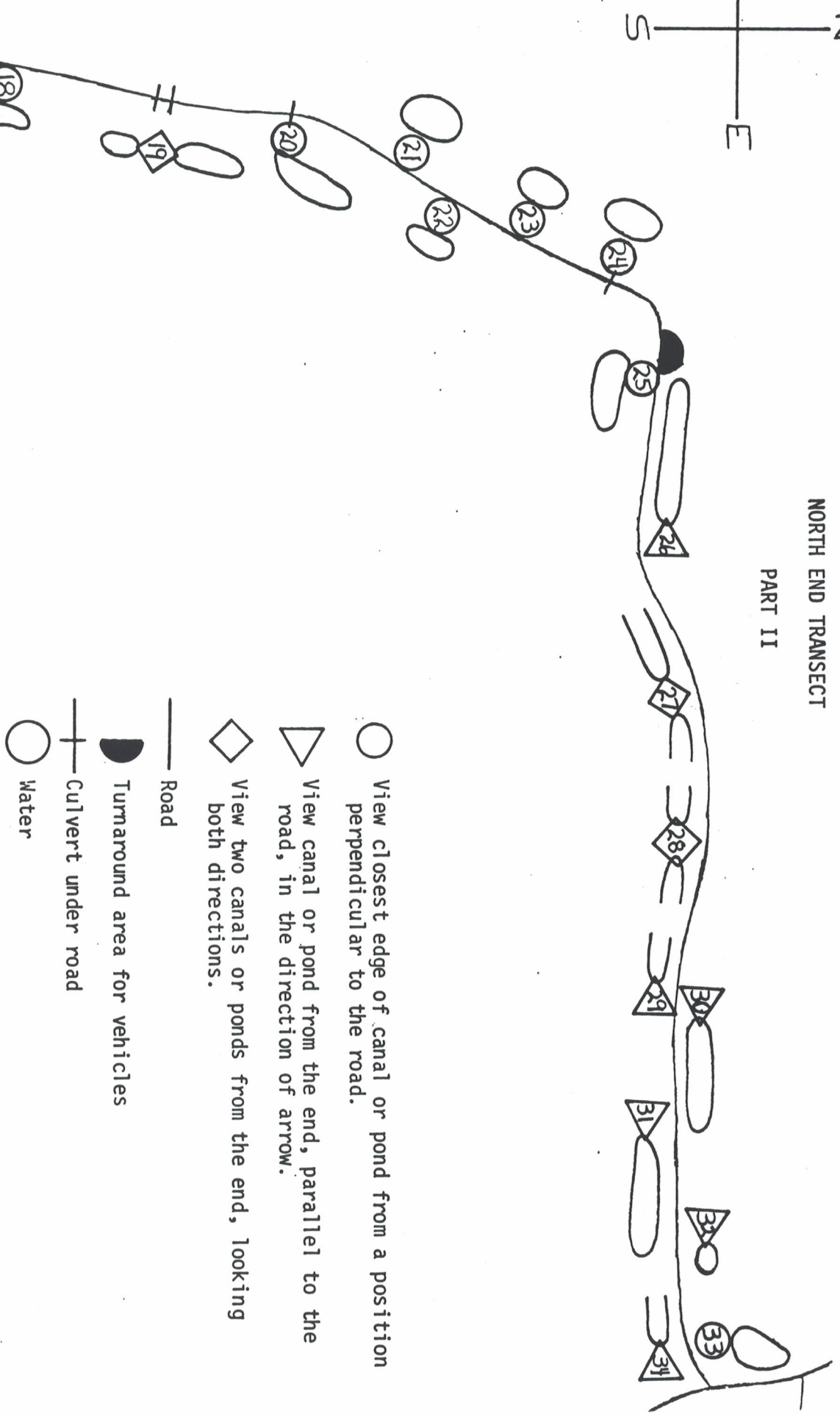
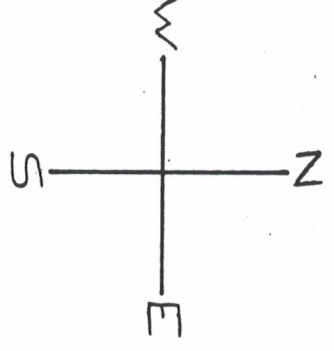


Figure 2.

MAP OF
NORTH END TRANSECT
PART II



- View closest edge of canal or pond from a position perpendicular to the road.
- ▷ View canal or pond from the end, parallel to the road, in the direction of arrow.
- ◇ View two canals or ponds from the end, looking both directions.
- Road
- Turnaround area for vehicles
- ├ Culvert under road
- Water

Figure 3.

MAP OF SOUTH DIKE TRANSECT



- View closest edge of canal or pond from a position perpendicular to the road.
- △ View canal or pond from the end, parallel to the road, in the direction of arrow.
- ◇ View two canals or ponds from the end, looking both directions.
- View from top of vehicle.

- Road
- Turnaround area for vehicles
- * Beehives
- Water

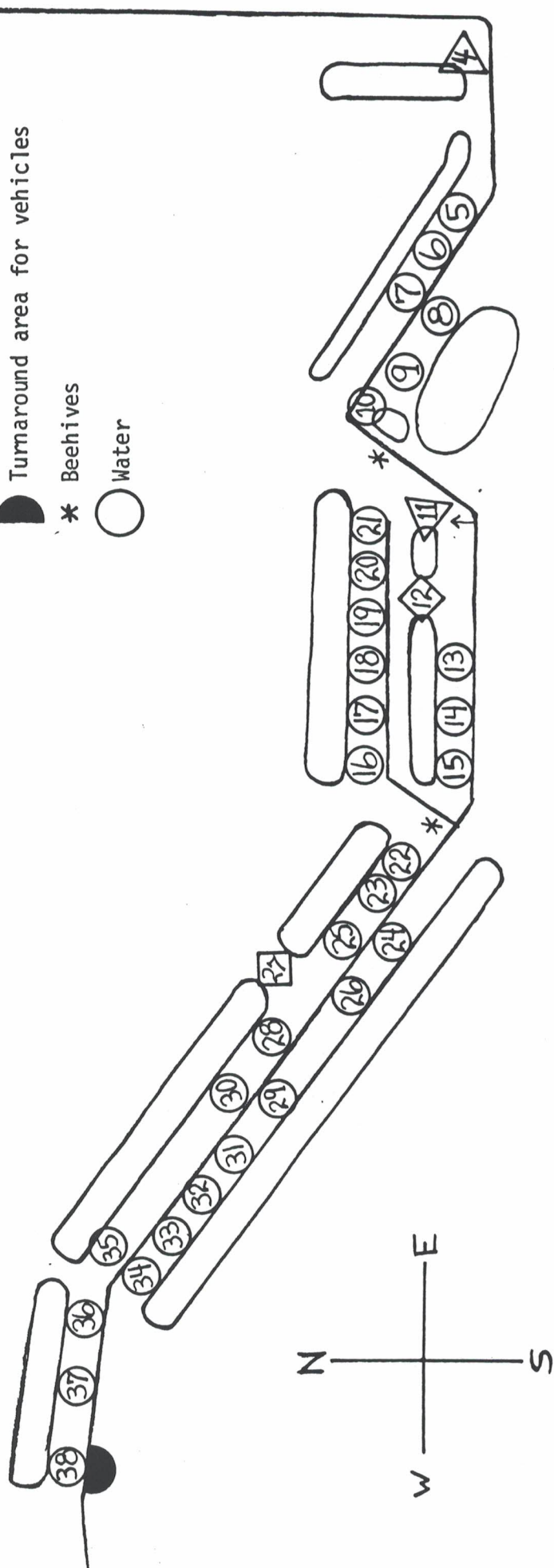


Figure 4.

MAP OF
LETTUCE LAKES
TRANSECT

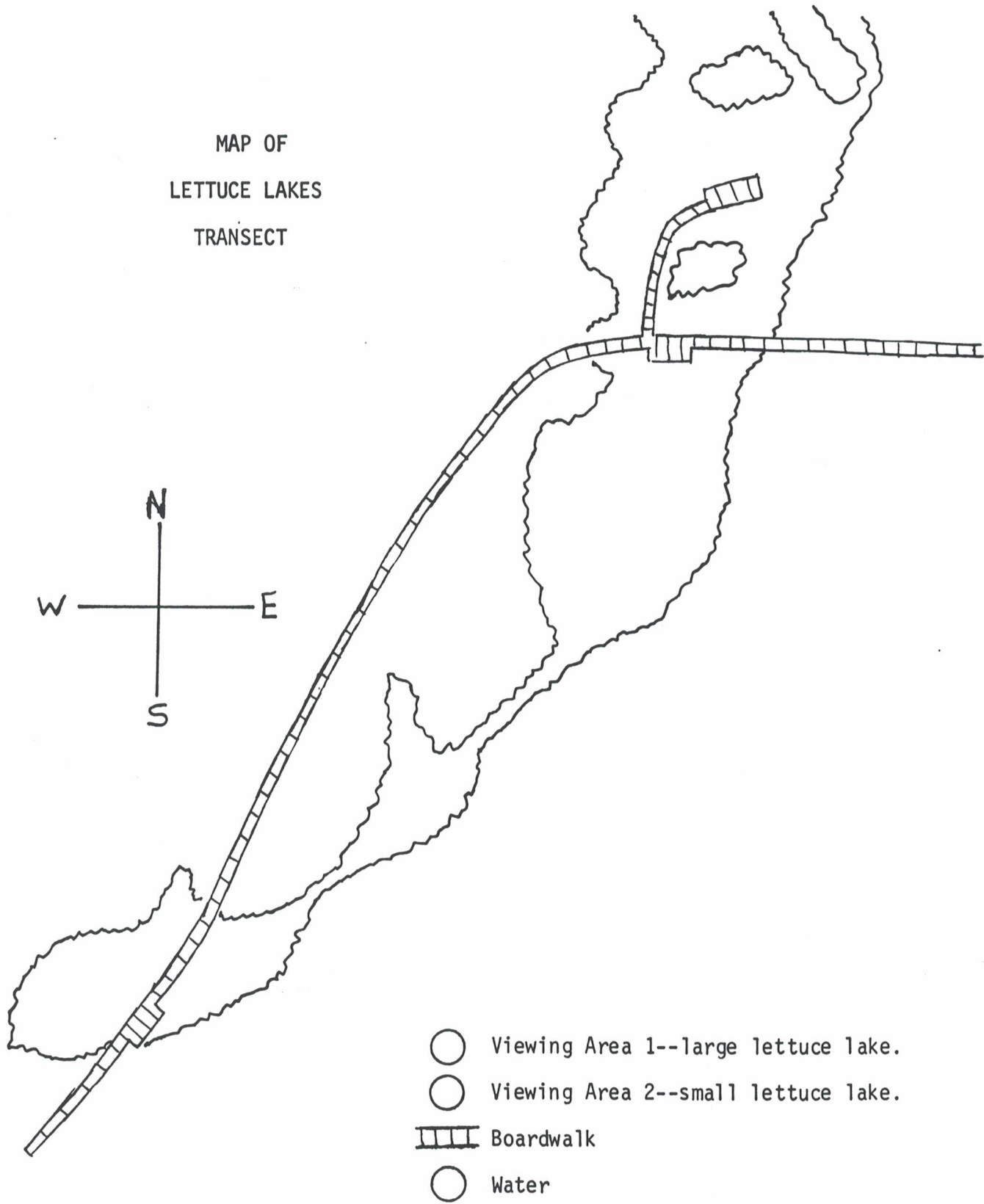
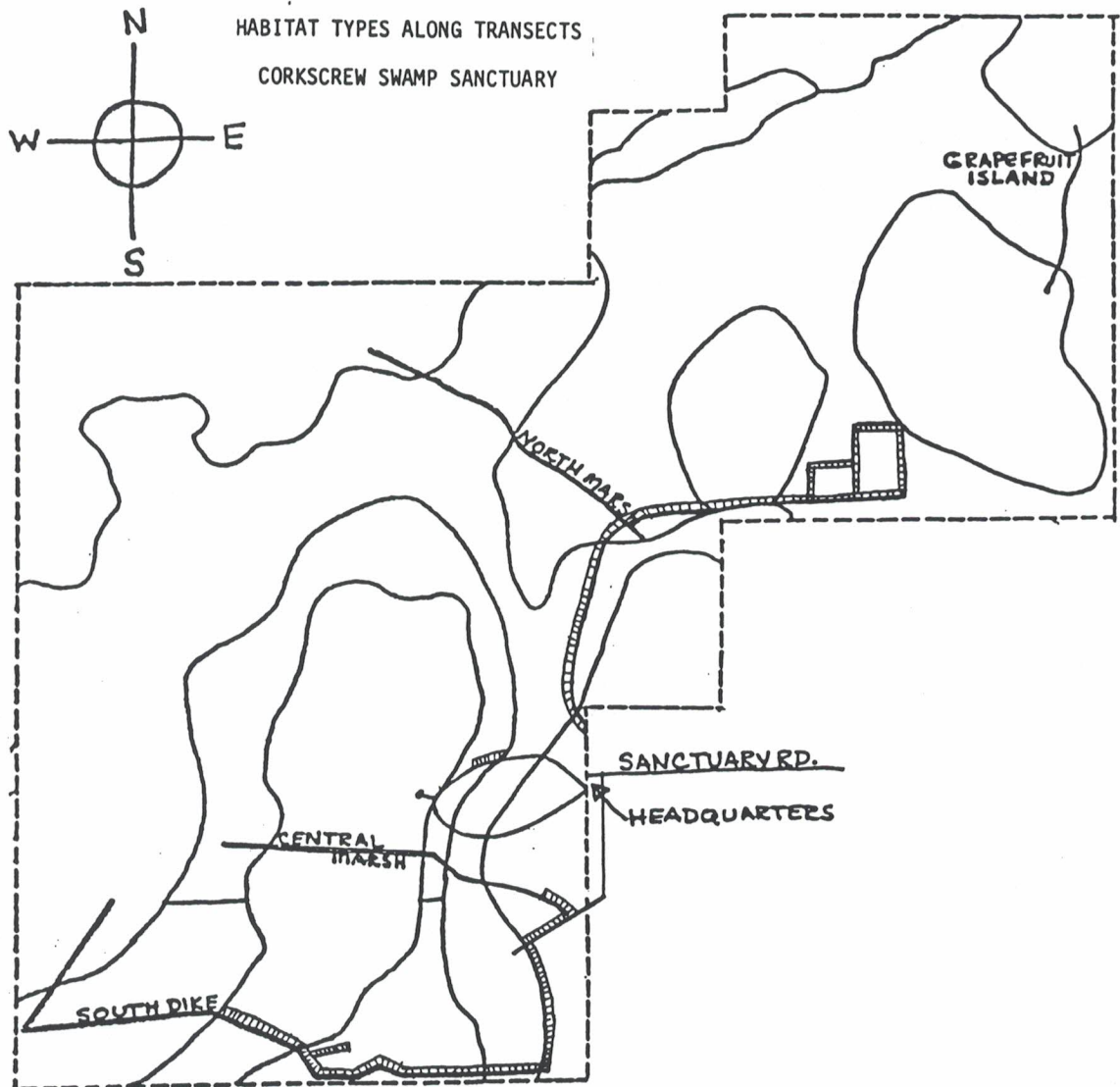


Figure 6.



- A--MARSH PERIMETER with heavy cattails, willow, and myrtle.
- B--SWAMP with shrubs, vines, and small trees.
- C--OPEN MARSH with little buildup of dense vegetation along the perimeter.
- D--PINE FLATLANDS with slash pine, palms, small trees.
- E--ALTERED OPEN HABITAT with little buildup of dense vegetation along banks.
- F--ALTERED TALL VEGETATION HABITAT with tall vegetation partially obstructing view.
- G--VIRGIN BALD CYPRESS SWAMP LAKE.

Figure 7.

NORTH END TRANSECT

DATA SHEET

Date: March 12, 1982

Air Temperature: 22° C

Time: 7:00 PM

Moon Phase: 2 days after full

General Weather Conditions: Hazy and still

SITE #	# ALLIGATORS SEEN	HABITAT TYPE*	POND OR CANAL	RELATIVE SIZE**		WATER DEPTH***	
				SIZE	CATEGORY	ACTUAL	CATEGORY
1	7	D	P	>9 m	L	150 cm	L
2	12	D	C	<9 m	N	75 cm	M
3	9	D	P	<9 m	S	120 cm	M
4	0	D	C	<9 m	N	60 cm	M
5	0	D	C	<9 m	N	75 cm	M
6	0	D	P	<9 m	S	150 cm	L
7	0	D	C	<9 m	N	45 cm	S
8	0	D	C	<9 m	N	30 cm	S
9	0	D	C	<9 m	N	45 cm	S
10	0	D	C	<9 m	N	30/45cm	S
11	0	D	C	<9 m	N	30 cm	S
12	0	D	C	<9 m	N	30/30cm	S
13	0	D	C	<9 m	N	30 cm	S
14	0	D	C	<9 m	N	75 cm	M
15	0	D	C	<9 m	N	60 cm	M
16	0	D	C	<9 m	N	75 cm	M
17	0	D	P	>9 m	L	90 cm	M
18	0	D	C	>9 m	W	120 cm	M
19	0	C	C	<9 m	N	60/90cm	M
20	0	C	P	<9 m	S	45 cm	S
21	0	C	P	<9 m	S	30 cm	S
22	0	C	P	<9 m	S	30 cm	S
23	0	C	P	<9 m	S	30 cm	S
24	0	C	P	<9 m	S	30 cm	S
25	0	D	C	<9 m	N	90 cm	M
26	0	D	C	<9 m	N	30 cm	S
27	0	D	C	<9 m	N	60/60cm	M
28	0	D	C	<9 m	N	45/60cm	S/M
29	0	D	C	<9 m	N	75 cm	M
30	0	D	C	<9 m	N	75 cm	M
31	0	D	C	<9 m	N	90 cm	M
32	0	D	C	<9 m	N	60 cm	M
33	0	D	C	<9 m	N	30 cm	S
34	0	D	C	<9 m	N	60 cm	M

* See Figure 7.

** Canals >9 m. are classified as Wide (W); those <9 m. are classified as Narrow (N). Ponds >9 m. across the center are classified as Large (L); those <9 m. are classified as Small (S).

*** Shallow (S) depths are 0-53 cm.; Medium (M) depths are 53-127 cm.; Deeper (L) depths are 127 cm. or more.

Chart 1.

SOUTH DIKE TRANSECT

DATA SHEET

Date: March 9, 1982

Air Temperature: 20° C.

Time: 7:00 PM

Moon Phase: full

General Weather Conditions: Cloudy with very little wind

SITE #	# ALLIGATORS SEEN	HABITAT TYPE*	POND OR CANAL	RELATIVE SIZE**		WATER DEPTH***	
				SIZE	CATEGORY	ACTUAL	CATEGORY
1	0	F	P	>9 m	L	120 cm	M
2	0	F	P	>9 m	L	120 cm	M
3	0	F	P	>9 m	L	120 cm	M
4	0	F	P	>9 m	L	195 cm	L
5	0	B	C	<9 m	N	30 cm	S
6	0	B	C	<9 m	N	45 cm	S
7	0	B	C	<9 m	N	30 cm	S
8	0	B	P	>9 m	L	150 cm	L
9	0	B	P	>9 m	L	150 cm	L
10	0	B	C	<9 m	N	30 cm	S
11	0	B	C	>9 m	W	120 cm	M
12	2	A	C	>9 m	W	105 cm	M
13	1	A	C	>9 m	W	120 cm	M
14	2	A	C	>9 m	W	150 cm	L
15	3	A	C	>9 m	W	150 cm	L
16	0	B	C	>9 m	W	150 cm	L
17	0	B	C	>9 m	W	150 cm	L
18	0	B	C	>9 m	W	150 cm	L
19	0	B	C	>9 m	W	135 cm	L
20	1	B	C	>9 m	W	120 cm	M
21	0	B	C	>9 m	W	180 cm	L
22	0	B	C	<9 m	W	180 cm	L
23	0	B	C	<9 m	N	30 cm	S
24	0	B	C	<9 m	N	30 cm	S
25	0	B	C	<9 m	N	45 cm	S
26	0	B	C	<9 m	N	30 cm	S
27	0	B	C	<9 m	N	45 cm	S
28	0	B	C	>9 m	W	90 cm	M
29	0	B	C	>9 m	W	90 cm	M
30	0	B	C	<9 m	N	45 cm	S
31	0	B	C	<9 m	N	60 cm	M
32	0	B	C	<9 m	N	30 cm	S
33	0	B	C	<9 m	N	15 cm	S
34	0	B	C	<9 m	N	60 cm	M
35	0	B	C	<9 m	N	30 cm	S
36	1	A	C	<9 m	N	45 cm	S
37	1	A	C	>9 m	W	90 cm	M
38	1	A	C	<9 m	N	120 cm	M
				>9 m	W	150 cm	L

* * * * * See bottom of Chart 1.

Chart 2.

FISH FARM TRANSECT

DATA SHEET

Date: March 10, 1982 Air Temperature: 20° C.
 Time: 7:00 PM Moon Phase: one day after full
 General Weather Conditions: Hazy clouds which did not totally block the moon; damp from light rain during the day; very light breeze.

SITE #	# ALLIGATORS SEEN	HABITAT TYPE*	POND OR CANAL	RELATIVE SIZE**		WATER DEPTH***	
				SIZE	CATEGORY	ACTUAL	CATEGORY
1	0	F	P	>9 m	L	195 cm	L
2	0	E	P	<9 m	S	30 cm	S
3	1	E	C	>9 m	W	120 cm	M
4	2	E	C	>9 m	W	150 cm	L
5	1	E	C	>9 m	W	150 cm	L
6	1	E	C	>9 m	W	135 cm	L
7	0	F	C	>9 m	W	120 cm	M
8	0	F	C	>9 m	W	105 cm	M
9	0	F	C	>9 m	W	120 cm	M
10	0	F	C	>9 m	W	120 cm	M
11	1	E	C	>9 m	W	120 cm	M
12	0	E	C	>9 m	W	150 cm	L
13	3	F	C	>9 m	W	150 cm	L
14	1	E	C	>9 m	W	210 cm	L
15	0	F	C	>9 m	W	150 cm	L
16	2	F	C	>9 m	W	120 cm	M
17	0	F	P	<9 m	S	75 cm	M
18	3	F	C	>9 m	W	120 cm	M
19	0	F	C	>9 m	W	135 cm	L
20	0	E	C	>9 m	W	135 cm	L
21	0	E	C	>9 m	W	120 cm	M
22	1	E	C	>9 m	W	120 cm	M
23	2	E	C	>9 m	W	120 cm	M
24	1	E	C	>9 m	W	135 cm	L
25	0	F	C	>9 m	W	150 cm	L

LETTUCE LAKES TRANSECT

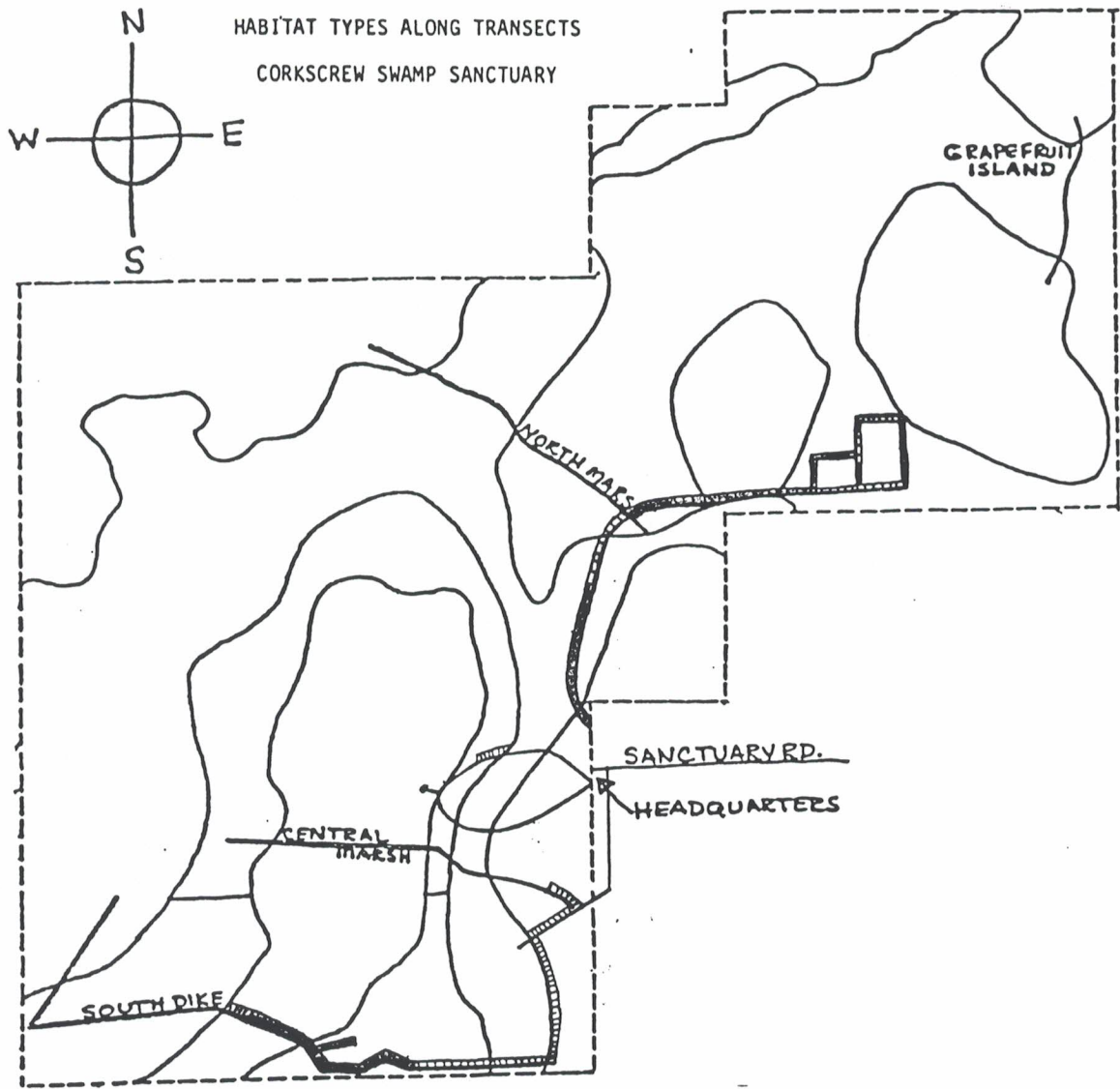
DATA SHEET

Date: March 13, 1982 Air Temperature: 24° C.
 Time: 7:00 PM Moon Phase: 4 days after full
 General Weather Conditions: Clear with very little wind

SITE #	# ALLIGATORS SEEN	HABITAT TYPE*	POND OR CANAL	RELATIVE SIZE**		WATER DEPTH***	
				SIZE	CATEGORY	ACTUAL	CATEGORY
1	9	G	P	>9 m	L	30 cm	S
2	5	G	P	>9 m	L	30 cm	S

* * * * * See bottom of Chart 1.

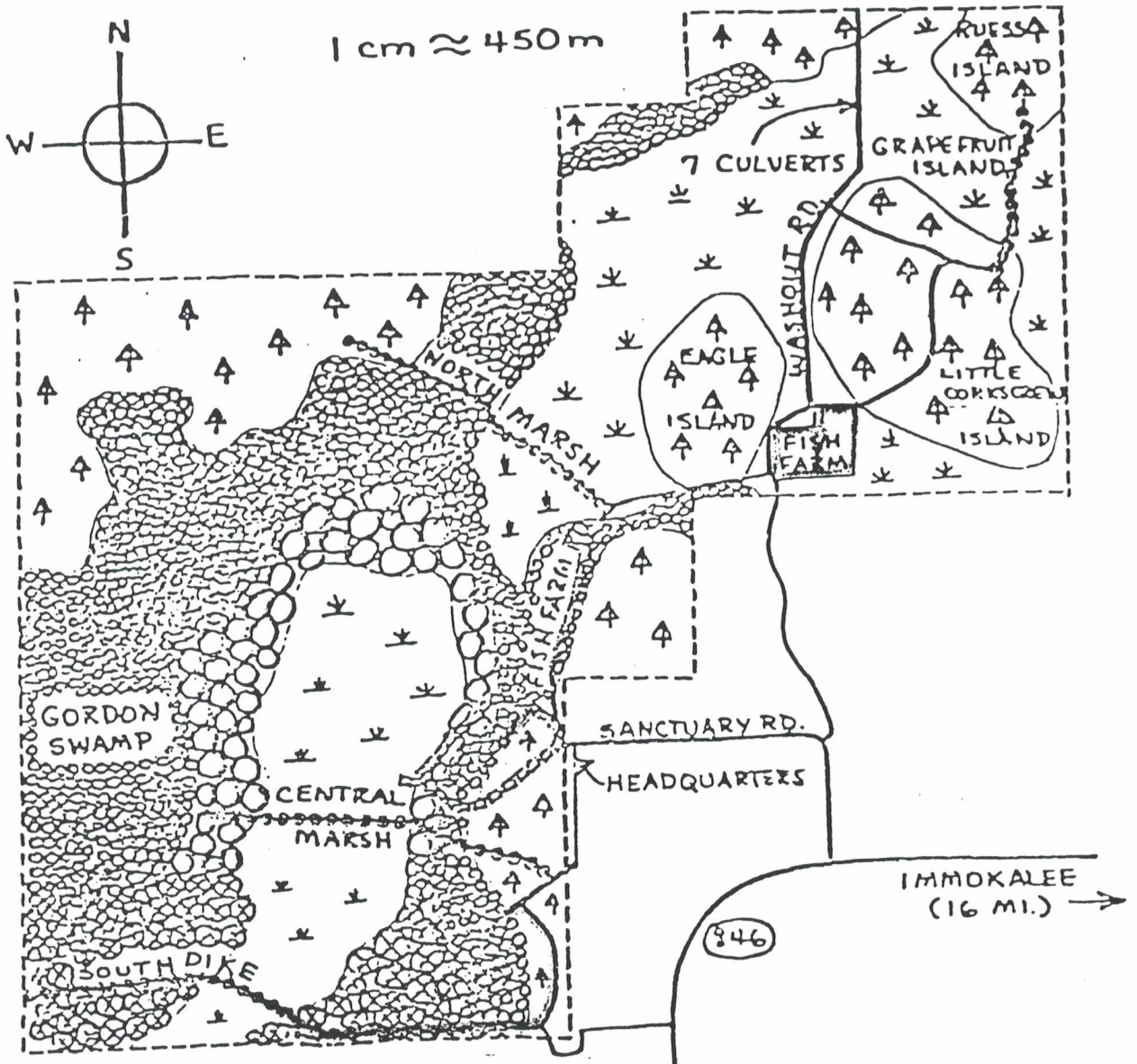
Chart 3.



- A--MARSH PERIMETER with heavy cattails, willow, and myrtle.
- B--SWAMP with shrubs, vines, and small trees.
- C--OPEN MARSH with little buildup of dense vegetation along the perimeter.
- D--PINE FLATLANDS with slash pine, palms, small trees.
- E--ALTERED OPEN HABITAT with little buildup of dense vegetation along banks.
- F--ALTERED TALL VEGETATION HABITAT with tall vegetation partially obstructing view.
- G--VIRGIN BALD CYPRESS SWAMP LAKE.

Figure 7.

Transect Lines Corkscrew Swamp Sanctuary



- sanctuary boundary
- transects for research dept.
- access roads
- ▣▣▣ boardwalk
- ♣ pine flatwoods
- ✱ marsh
- ⊗ "pond" cypress
- ⊗ "bald" cypress (virgin)
- ⊗ logged cypress

TRANSECTS:

- ⊗ South DiKe
- North End
- ⊗ Fish Farm
- Lettuce Lakes

Figure 1.