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An Ecological Study of the Mud-Bottom Ponds of Mississippi

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AN ECOLOGICAL STUDY OF THE MUD-BOTTOM PONDS OF MISSISSIPPI

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AN ECOLOGICAL STUDY OF THE MUD-BOTTOM PONDS OF MISSISSIPPI

BY

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INTRODUCTION

My purpose in making an ecological study of the mud bottom ponds of Mississippi was to ascertain the nature of the fauna of this type of habitat; to learn under what conditions the pond varied in content, and the underlying causes of this variation.

To my knowledge, no previous work has been done in this particular field in Mississippi other than casual observation on the part of naturalists or experimentation given in connection with courses of study in the State Colleges.

Several mud bottom ponds were examined in Lafayette County the summer preceding the work done in Newton County. Later in the summer I did the same type of work in Montgomery County, and the results were practically identical for the three counties; a fact which indicates that the mud bottom pool is the prevalent type of pond in Mississippi.

Much valuable assistance was lent me by the students of East Central Junior College both in actual research and information which determined the choice of certain ponds.

The materials used were either made or borrowed for the occasion. A strong short handle dip net was used to work around edges and bottom, especially where vegetation and

debris offered much resistance. A silk net of average dimensions was attached to a long pole for plankton hauls. In the case of smaller ponds, the plankton net was handled from the bank, but after ponds grew larger, it was towed behind a boat.

In the handling of gathered materials, specimens easily identified, were pickled immediately by placing them in a large jar of alcohol. Later, they were transferred to individual vials where they were labeled and numbered. Specimens of doubtful character were placed in a quantity of the medium from which they were taken and carried to the laboratory for further examination. After being identified, these too, were placed in individual vials. In making microscopic examinations, I was unfortunate in not being able to carry a microscope on field trips. However, all specimens of this type were examined within thirty minutes after taken.

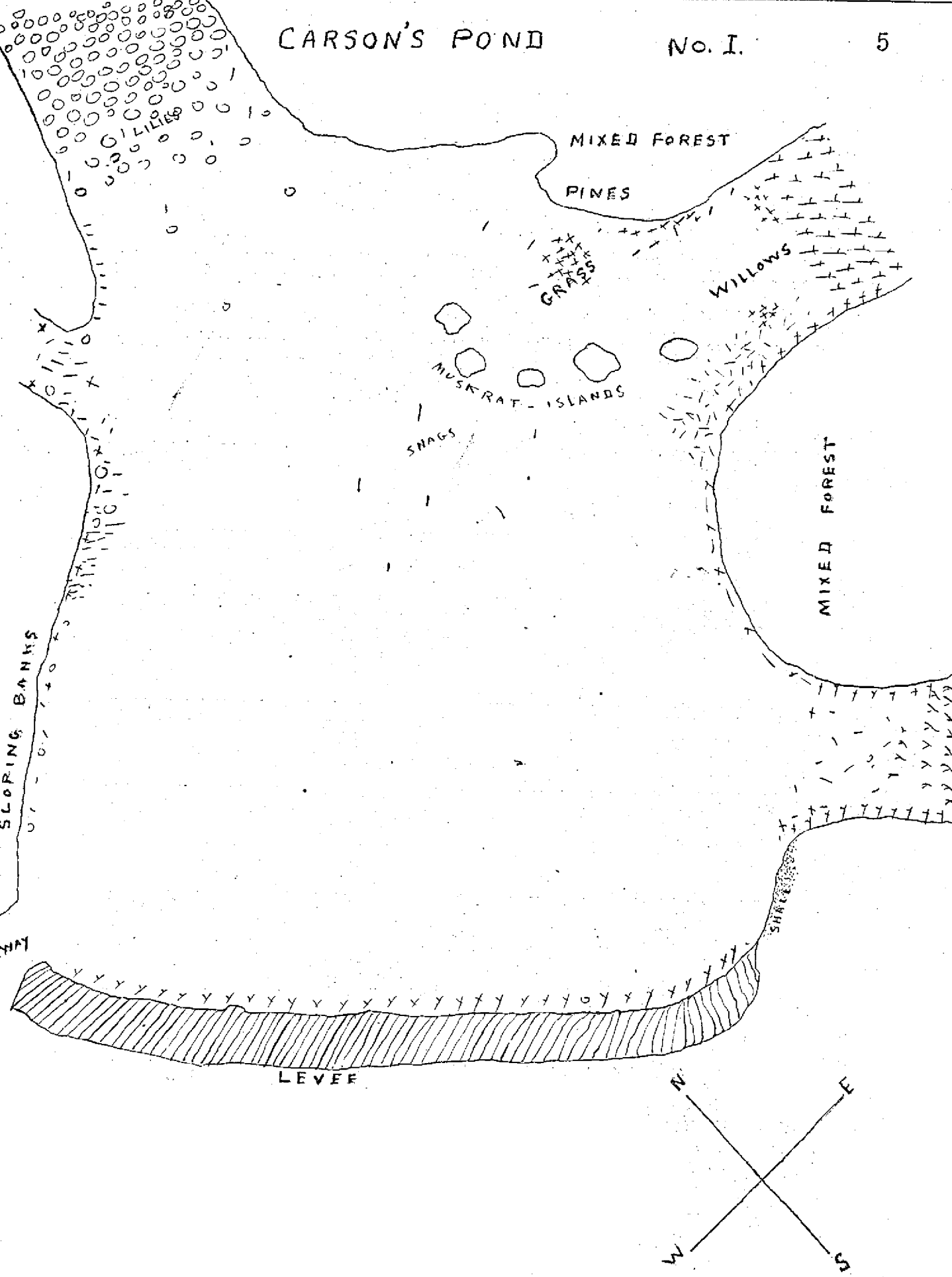
In the selection of ponds, I was careful to select as many different types as possible, making sure that they varied in size, age, and content. Within a radius of twelve miles, six ponds were examined. They included two stream-fed mill ponds, one still water pond of considerable dimensions, two swamp bar-pits, and one cow pond. In size, they ranged from twenty acres to small pools only a few feet in diameter. In clearness, they ranged from deep blue to extreme turbidity. Some were filled with vegetation, while

others were void of any visible signs within the pool proper; though all had shore vegetation. In temperature, they ranged from the warm sluggish water of the bar-pit to the cool spring-fed waters of the mill pond. The bottom of one pond was of sand, another fine black silt, another fine clay, two were of heavy swamp mud, while one was lined with typical pond ooze covered with algae. Each pond might be termed representative of its respective class.

The following tables show the groups and species of animal life present., and the stars indicate the concentration of each throughout the pond. In case certain species were present but in small quantities their concentration is indicated by one star. In case certain species were present in numbers not exceeding normal expectancy, this was indicated by two stars. In the event that species were present in large numbers three stars were used. Following each table are charts and notations that are self explanatory.

INDEX TO CHARTS

CARSON'S POND No. I.



CARSON'S POND

Group	Species	No.	Location
Protozoa	Vorticella	*	In Plankton
	Arcella	*	" "
	Euglena	*	" "
Nematoda	Thread Worm	**	Plankton Bottom Mud
Crustacea	Crayfish	*	In Shallows
	Cyclops	**	Plankton
Annelida	Bristle Worms	*	Bottom Mud
	Earth Worms	*	Shore Mud
	Blood Worms	***	Bottom Mud
Mollusca	Snails	*	Shallow Water
	Mussels	*	Pond Bottom
Larvae	Dragonfly	***	Mud Bottoms
	Mayfly	**	In Vegetation
	Midge	**	Bottom Mud
Insects	Water Spiders	***	Surface
	Water Striders	***	Surface
	Whirligig Beetle	***	Surface
	Backswimmer	**	Shallows
	Divingbeetle	*	Debris
Vertebrata	Fish	***	Throuout
	Snakes	*	Shallows
	Frogs	***	Shore Waters
	Turtle	*	Bottom
	Muskrats	*	In Beds

* Small quantities
** Medium quantities
***Large numbers

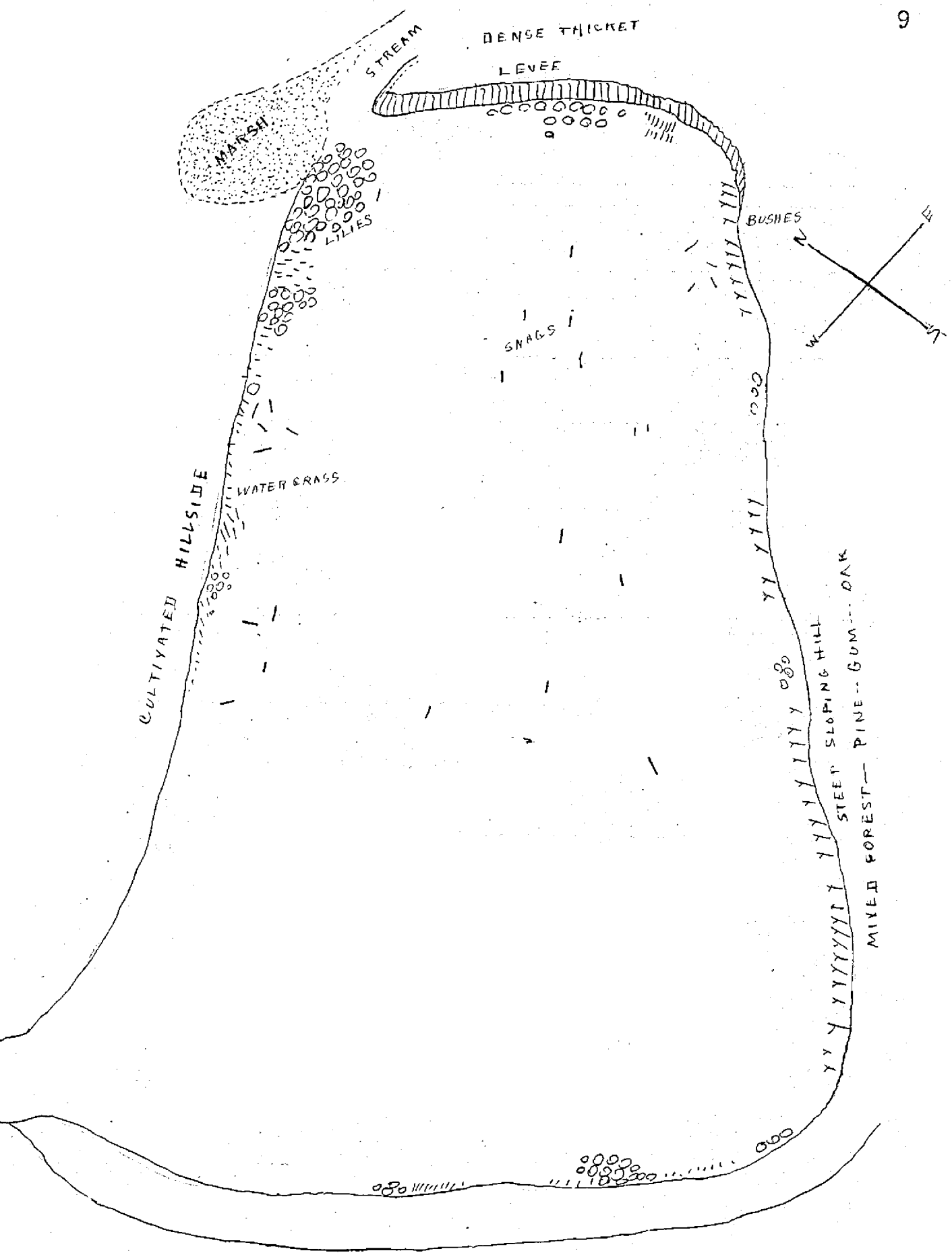
Carson's Pond was second in size and approximately the same age as Stamper's Pond, fifty years old. This pond like Stamper's was built following the Civil War for the purpose of furnishing water power.

The pond bed lies between several converging hills, and is fed by two main streams, one from the east, and one from the north, and by two smaller streams from the south-east and north-west. At the lower end, an eighteen foot dam holds the main body of water, being drained by a concrete spillway at the south-west corner. The body of water that passes out the spillway during the winter and spring months is over three feet wide and around three inches deep, but in the dead of summer, it dwindles to a tiny rimlet, and in extreme drouth ceases to run past the spillway.

This pond had an uninterrupted existence until an epidemic of fever struck the community some fifteen years after its origin. The people of the community believed that the mists that arose from the pond just before dawn caused the sickness. As a result, an unknown group of men cut the dam in the dead of night. For several years then the pond remained only a series of pools filled with flowing water. About twenty years ago, the pond was rebuilt as a fish pond, and stocked with fish taken from neighboring streams and sloughs. Eight years ago, the pond was purposely drained with the intent of moving the noxious fish and stocking with trout. Today, Carsons Pond is perhaps the best game fish lake of that section.

This pond is near eighteen acres in size, and reached a maximum depth of eighteen feet at the lower end. The water is clear but has a yellow tinge perhaps due to a background of sand susperd particles. The water had the lowest temperature of any pond examined.

This pond was especially well supplied with vegetation.

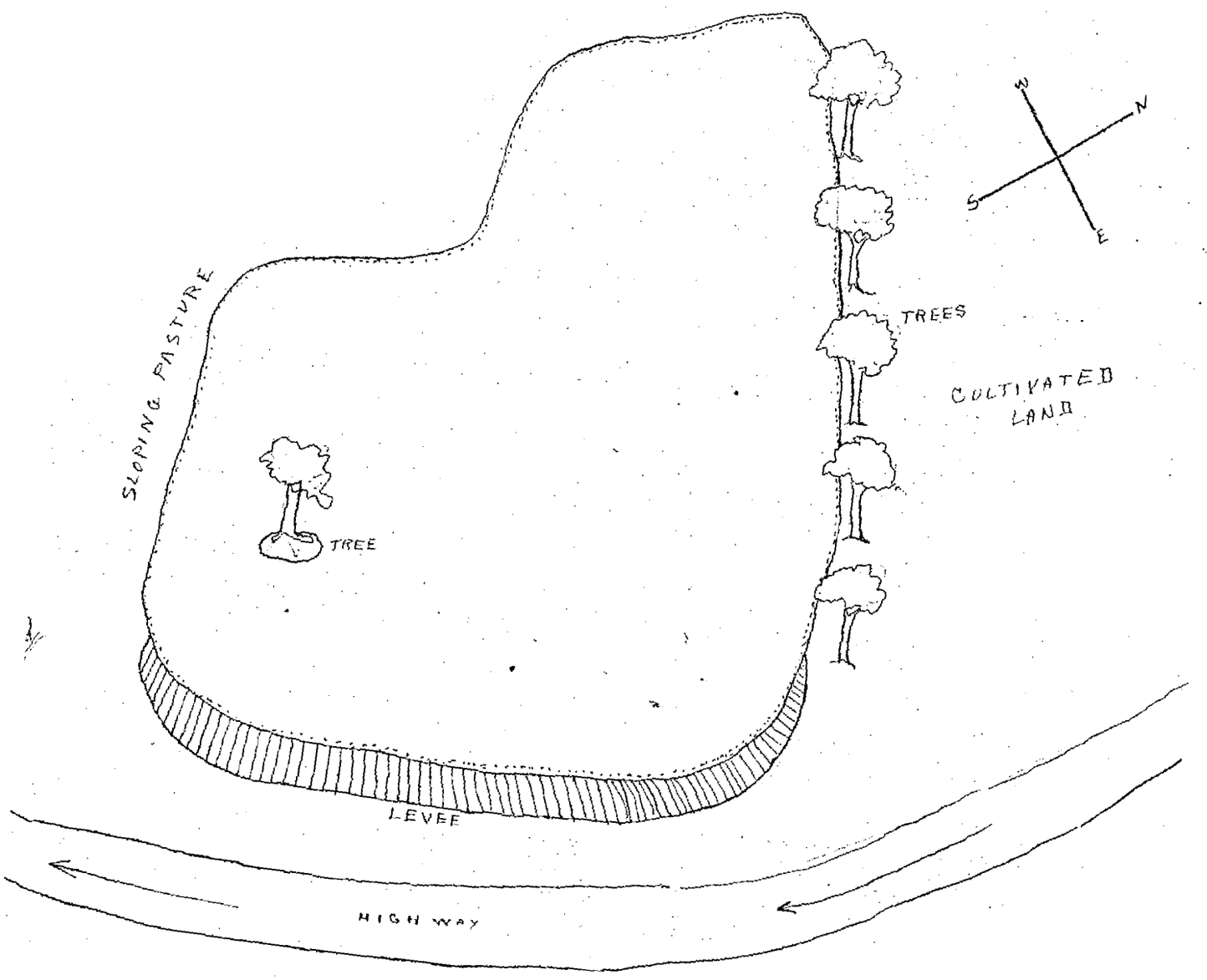


STAMPER'S POND
NO. II.

STAMPER'S POND

Group	Species	No.	Location
Protozoa	Vorticella	*	In Plankton
	Euglena	*	" "
Nematoda	Thread Worm	*	Plankton
Crustacea	Crayfish	*	In Shallows
	Cyclops	*	Plankton
Annelida	Blood Worms	**	Bottom Mud
Mollusca	Snails	**	Bottom and Shore
Larvae	Mayfly	***	In Submerged Vegetation
	Dragonfly	*	Trash and Mud
	Midge	*	Bottom Mud
Insects	Dragonfly	*	Above Water
	Damselfly	*	" "
	Water Spiders	***	On Vegetation
	Water Striders	**	On Surface
	Whirligig Beetle	**	Surface
	Water Boatman	*	In Shallows
	Giant Diving Beetle	*	In Trash
	Divingbeetle	*	In Trash
Vertebrata	Fish	**	Throughout
	Snakes	*	Shallows
	Frogs	***	Shore
	Turtles	*	Bottom

Stamper's Pond is situated eight miles north-west of Decatur, some ten miles from Carson's Pond. This pond like Carson's was originally a mill pond, now used as a public bathing resort. Its size is about twenty acres, and it is the largest of the group of ponds examined. It is spring-fed and runs continuously even through the summer months. The water had something like the same temperature as Carson's Pond, but was a clear blue in color. It contained less vegetation than Carson's Pond, and on examination produced slightly less life. This pond was spring-fed and bordered with forest vegetation only on one side, the east. The forest is mixed pine and oak. On the north lies a marsh; on the west a cultivated field; to the south a twenty foot levee. The spillway is a mill trough similar to the one used formerly to furnish power. Within the pond proper there are several types of vegetation, water lilies and marsh-grass predominating. In the lower part of the pond the depth exceeds twenty feet. The south end which comprises about one-third the total area of the pond is cleared of all debris for the convenience of bathers. All vegetation, even shore grass has been cleared away. There is no record of this pond having ever been drained. No particular emphasis has been made toward stocking the pond with fish, but through accident or occasional placing of fish, and due to uninterrupted growth the pond has become filled with fish of all varieties. No snakes were seen, but a few were reported by the owner.

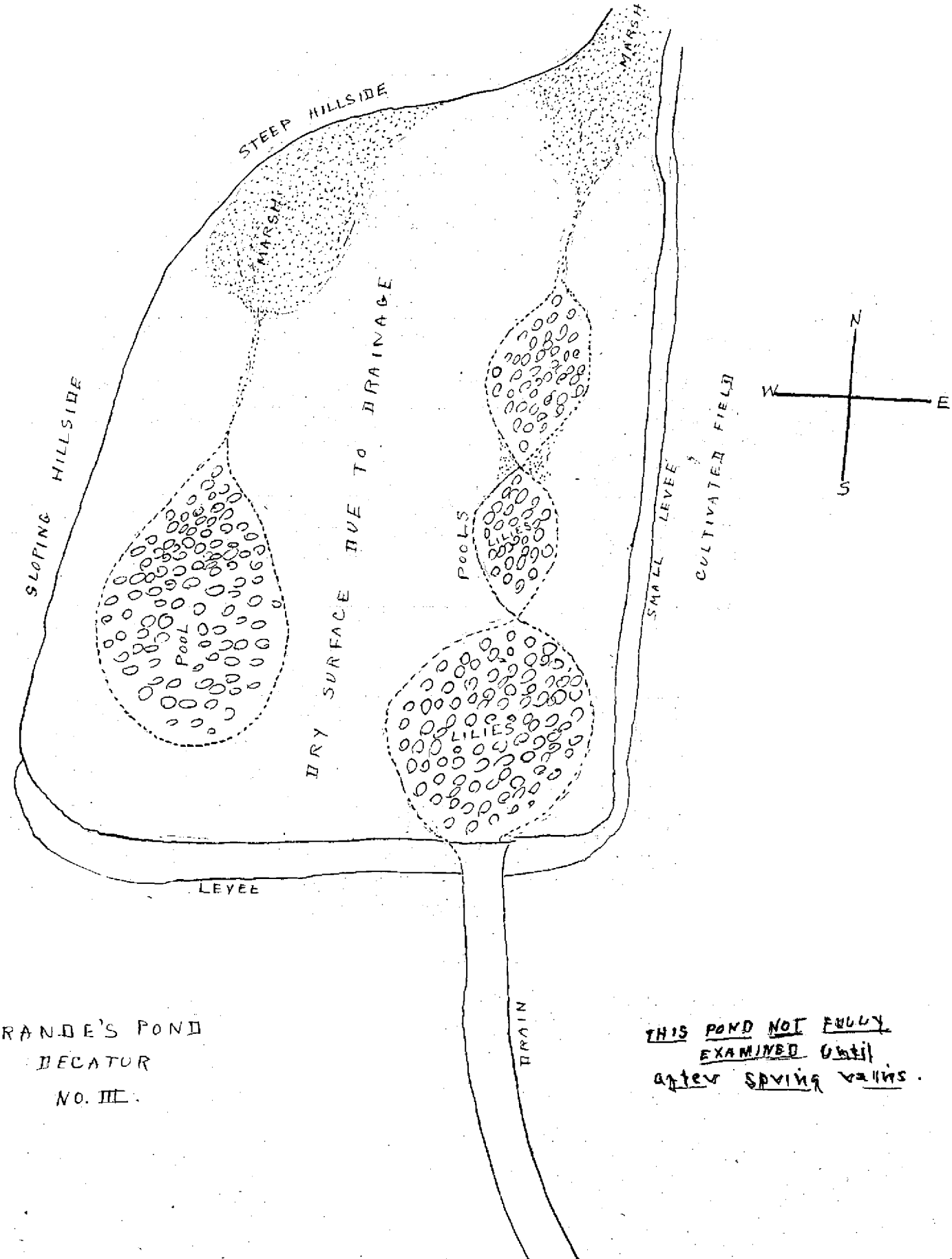


DOOLITTLE POND
(3 MI. NORTH of NEWTON)
NO. VI.

DOOLITTLE POND

Group	Species	No.	Location
Protozoa	Euglena	*	In Plankton
Nematoda	Thread Worm	*	Plankton
Crustacea	Crayfish	*	On Bottom
Annelida	Blood Worm	*	Bottom Mud
Mollusca	Snails	**	Shallow Water
Larvae	Dragonfly	*	Mud Bottoms
	Midge	**	Mud Bottoms
Insects	Water Spider	*	Surface
	Water Strider	*	Surface
	Small Waterbug	*	Trash
	Diving Beetle	*	Debris
Vertebrata	Fish	***	Throughout
	Snakes	**	Shallows
	Frogs	***	Shore Waters

Doolittle's Pond lies between Decatur and Newton. This pond is only a few years old. It was built for a dual purpose; as a watering place for a dairy herd, and to serve as a fish pond. The building of this pond consisted mainly of throwing a levee across the lower end and side of a depression in the pasture. This pond covers a space of about two acres, but does not exceed five feet in depth. There is no evidence of a fresh water supply. The water is blue, quite transparent, and warm due to a full exposure to the afternoon sun. Shore vegetation consists of pasture grass on all sides with a bordering of large trees around the east and north-east side, with one large tree growing on a small island in the pond proper. During several visits to this pond there was little evidence of life to the casual observer. On examination, this pond showed less life other than fish, of any pond examined.



BRANDE'S POND
DECATUR
NO. III.

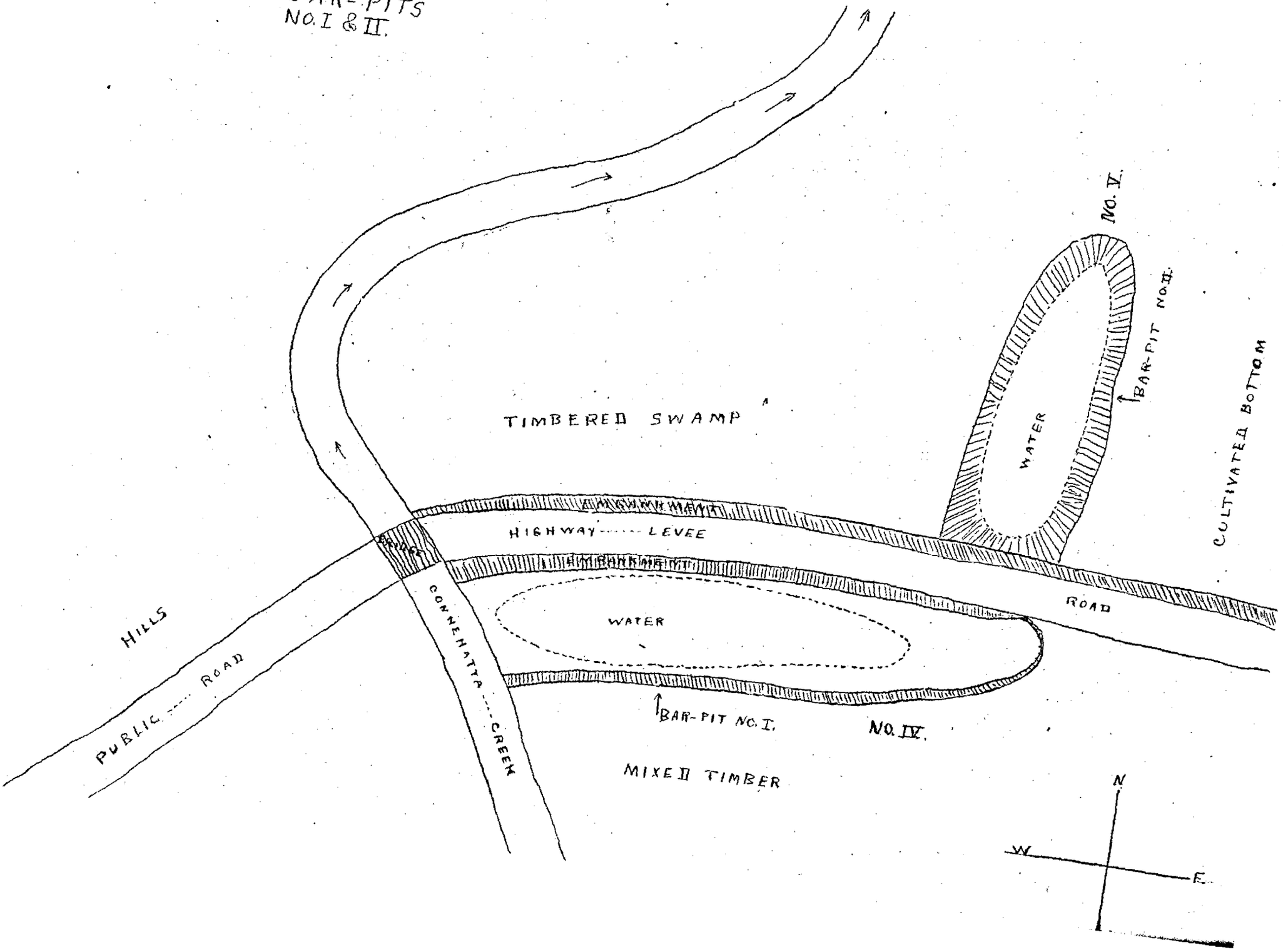
THIS POND NOT FULLY EXAMINED Until after spring rains.

BRANDE'S POND

Group	Species	No.	Location
Protozoa	Paramoecium	*	Surface
	Epistylis	*	Plankton
	Vorticella	**	In Plankton
	Stentor	*	In Algae
	Euglena	*	In Plankton
Nematoda	Thread Worm	***	Plankton
Crustacea	Crayfish	***	In Shallows
	Cyclops	**	Plankton
Annelida	Bristleworms	***	Bottom Mud
	Earth Worms	**	Shore Mud
	Blood Worms	***	Bottom Mud
Mollusca	Snails	*	Shallow Water
Larvae	Dragonfly	*	Mud Bottoms
Insects	Water Spiders	***	Vegetation
	Water Striders	**	Surface
	Small Waterbug	*	Debris
	Leaf Beetle	***	Vegetation
	Water Scorpian	**	Shore Trash
Vertebrata	Minnows	***	Throughout
	Small Snakes	*	Shallows
	Small Frogs	***	On Shores
	Small Turtles	*	On Bottom
	Salamanders	**	Bottom Mud

Brande's Pond was the smallest examined. It consisted of a series of small pools a few feet in diameter and a few inches deep all lying in the old pond bed. The levee of the original pond had given way several years before. Vegetation in this pond consisted almost altogether of lily pads and algae. Each pool was literally teeming with small fish, crayfish and tad-poles. The water being extremely shallow and clear, these could be observed with care and driven from one end of the pool to the other with a stick. The bottom of this pond was covered with several inches of typical pond ooze, and lined with green algae. A small spring from the upper end of the pond kept a tiny stream of water flowing the length of the pools, and according to people who lived nearby, the pools never completely dried up.

BAR-PITS
NO. I & II.



Bar-Pit No. I

Group	Species	No.	Location
Protozoa	Stentor	*	In Plankton
	Vorticella	**	" "
	Euglena	*	Plankton
Nematoda	Thread Worm	***	Plankton
Crustacea	Crayfish	***	On Bottom
	Cyclops	*	Plankton
Annelida	Blood Worm	***	Bottom Mud
Mollusca	Snails	*	On Bottom
Larvae	Dragonfly	**	In Trash
	Midge	**	In Mud
	Mayfly	*	In Vegetation
	Divingbeetle	**	On Bottom
Insects	Dragonfly	**	Above Water
	Water Spiders	***	Shore Vegetation
	Water Measurer	*	On Surface
	Divingbeetle	**	In Trash
	Water Scorpian	*	" "
	Waterbug	**	Debris
Vertebrata	Fish	***	Throughout
	Snakes	***	Shallows
	Frogs	***	Near Shore
	Turtles	***	On Bottom

Bar-Pit No. II

Group	Species	No.	Location
Protozoa	Vorticella	***	In Plankton
	Arcella	*	" "
Nematoda	Thread Worm	**	Plankton
Crustacea	Crayfish	***	On Bottom
Annelida	EarthWorm	***	Shore Mud
	Blood Worm	***	Bottom Mud
Mollusca	Snails	*	On Bottom
Larvae	Dragonfly	***	In Trash
	Midge	***	In Mud
	Diving Beetle	***	On Bottom
Insects	Dragonfly	**	Above Water
	Water Spiders	***	Near Shore
	Water Striders	***	On Surface
	Diving Beetle	***	In Trash
	Water Scorpian	**	In Vegetation
	Waterbugs	***	In Debris
	Giant Waterbug	**	In Trash
	Tiger Beetle	*	In Vegetation
Vertebrata	Small Minnows	*	On Surface
	Snakes	***	In Shallows
	Frogs	***	Near Shore
	Turtles	**	On Bottom

Both Bar-pit No. I and No. II were the accidental results of excavation in the construction of the Decatur Connehatta Highway. They lie on opposite sides of the highway in the creek swamp. Both are rectangular; having nearly perpendicular banks. They have no vegetation other than marsh grass. However, they are filled with broken limbs and rotting leaves. In both there is a layer of swamp mud several inches thick which cracks open in the dead of summer when the pits dry up. In the case of both pits, the water is a milky color covered in part by a brown scum. The temperature changes with the weather. At no time of the year does the water exceed a depth of three feet, and varies according to the amount of rainfall. During periods of excessive rainfall, overflow water from the creeks fill Pit No. I, but does not effect No. II. In all other physical effects, the pits are similar. A detailed examination of No. II showed only forms of life that could migrate to neighboring water or adjust themselves to the extreme dryness; as for fish, only a few of the smallest top minnows were present. These died in dry weather. Crayfish could either go into the ground or migrate to other bodies of water. Reptiles and amphibians, of course, were independent of this particular pond, using it more or less as a breeding ground and resting place. Many of the water bugs and other aquatic insects were capable of locomotion either crawling or flying. Practically all of the life in the pond was adapted to its changes.

In the case of Bar-pit No. I, many fish were left stranded and died as the water evaporated. The fish, of course, were left stranded from high water and were unable to return to their proper environment. This pit lacked much of the aquatic life present in Bar-pit No. II due, of course, to the fish that preyed on them. All in all, the concentration of life in this pond was decidedly less than that of No. II even though they were relatively the same size.

A most interesting feature of my observation is the fact that so many of the same species were found in all the ponds. However, many of the lower forms showed a sharp decline as the ponds increased in size. This might have been due to the size of the pond, freshness of the water, lack of turbidity; but I am inclined to believe it was due to the presence of higher forms which preyed on the lower forms of life.

The species found in all the ponds are characteristic of all mud bottom ponds. Fish, aquatic insects, and nematode worms occurred in all of the ponds; insects being by far the most numerous in number of species. Many species occurred in all the ponds. Both structural and environmental reasons were responsible for this fact. Wings and flying as a means of locomotion enables insects to reach an isolated body of water before other forms which might inhabit it but are unable to reach it on account of intervening obstacles. Further, once having reached it, adult insects can be semi-independent of a pond as a source of food. They can frequent it, even lay their eggs and thus start an entirely aquatic fauna and yet go elsewhere for their food. In the smaller ponds, the absence of predaceous enemies helped the percent of insects. As there was an increase of fish especially surface feeders, there was a sharp decline in the insect life.

Another striking feature of this study was the increase of life, especially insect life, with the increase of vegetation. However, this might be easily explained by the

fact that vegetation furnished them both food and protection, and too, might have furnished their enemies with food thereby saving themselves from being taken as food. Waterstriders, leaf-beetles, all forms of spiders, were especially numerous about the vegetation. Waterbugs and water-beetles of all kinds were especially numerous in piles of decayed leaves and debris. However, this fact is not strange. They were simply following the law of nature, just as other animals that leave the barren plain and seek the denser forest. It was quite evident that in ponds lacking in vegetation there was a decided scarcity of insect life. Doolittle's Pond was a striking example of this fact. Too, the clearness of the water might have influenced the lack of life in this pond, especially if it be borne in mind that Carson's Pond and the Bar-pits were turbid.

Where the higher forms were concerned it seemed the freshness of water made no difference, and in the case of a few species such as fish, proved beneficial. The stream-fed ponds like Carson's Pond and Stamper's Pond contained more game-fish than other ponds. Even though Carson's Pond was stocked, the fact that they have multiplied so rapidly indicates the probability of that statement. Even though Carson's Pond contained more surface feeding fish, it yet contained more species than any other pond. However, their concentration was less, due, of course, to the size of the pond. The presence of the insect forms in great numbers even in the face of predaceous enemies in great numbers may be explained, as I have mentioned before, by the presence of

suitable environment: namely, food, protection, and room for escape from enemies.

As the ponds increased in size, it became a noticeable fact that the actual number of species increased, yet the concentration grew less. This fact can best be explained by a comparison of Carson's Pond and Brande's Pond. Only a few species were found in Brande's Pond, mainly small fish, crayfish, tadpoles, and a few waterbugs, yet the small pools were overcrowded. These several forms of life could be found almost touching one another. This was due to the lack of room for expansion. Daily, as the amount of life increased, the size of the pool grew smaller; many of the forms being confined to that environment only, and unable to migrate. One feature of this pond was the fact that the three predominant species were not dependent upon each other for food whereby each was allowed to multiply at a rapid rate. The absence of larger predaceous enemies made this possible. In the case of the larger ponds, possibly more individuals even of the same species, existed, but naturally the concentration became less as the area of the habitat increased. The ever present danger of attack from larger and fiercer animals, the clash for food not only with the members of their own species, but of countless others, allowed only the survival of the fittest.

Possibly the most distinctive feature of the entire work was the huge difference in content of the two bar-pits. Their only real difference consisted of their source of

water supply. Bar-pit No. II, being isolated, was wholly dependent on rain and seepage, while Bar-pit No. I, having a high water connection with Connehatta Creek, was subject to a fresh water supply following every freshet above its location. Both of these ponds dry up in the dead of summer, yet, Bar-pit No. II always dries up a few weeks before Bar-pit No. I.

In examining the plankton, the principle findings were rotifers, nematodes, and protozoa, with innumerable diatoms and desmids, and a few crustacea. In concentration, protozoa and rotifers were much greater in smaller ponds, and grew decidedly less as they increased in size, due, possibly, as I have stated, to higher predaceous forms which preyed on them, and certain physical factors already mentioned.

Conclusions:

I. The amount of animal life increases with the increase of pond vegetation.

II. The amount of insect life decreases as the number of their predators increase.

III. As the ponds increase in size, the total number of species increase, but the concentration of life grows less.

IV. The amount of life seemed to increase with the turbidity of the water.

V. Mud and ooze bottom ponds contained more life than ponds with sand and silt bottoms.

VI. Ponds that dried up and were not supplied by overflow from neighboring streams contained no permanent habitants; only those that could seek another environment or adjust themselves to an extreme change in environment.

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