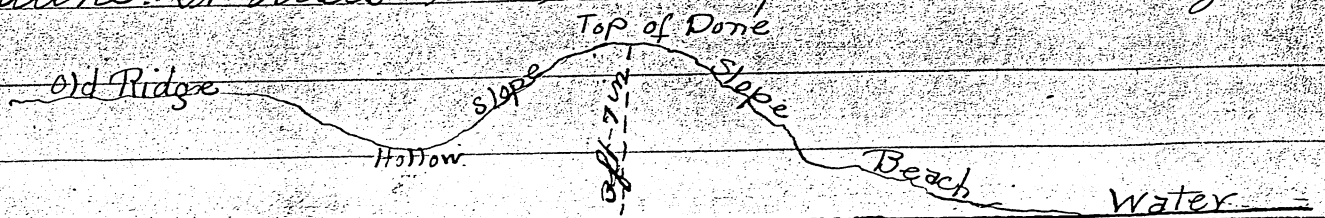


## Vegetation on the East Shore of Douglas Lake

There are several distinct beach formations on the east shore of Douglas Lake. Two of these are included in a half mile stretch. The first, a sand dune formation, is located north of the Biological Station about a quarter of a mile and extends the same distance. The second, beginning at the edge of the dune, has a dense growth of *Betula alba papyrifera*, *Acer rubrum*, *Populus tremuloides*, and *Populus grandidentata*.

The sand dune is on an exposed beach section lying between Grapevine Point and Pine Point where the wind and waves sweep around with such great force, that they have piled up the loose sand into a dune. It rises in some places to a height of



3ft. - 7in. above the water level, while at its

lowest point it measures 2 ft. - 6 in. The dune has many of the typical sandbinders growing upon it. A list of species showed the following -

*Acer rubrum*

*Ammophila arenaria*

*Arctostaphylos uva-ursi*

*Comandra umbellata*

*Cornus stolonifera*

*Elymus canadensis*

*Elymus baccata*

*Maianthemum canadense*

*Oenothera muricata*

*Poa pratensis*

*Pteris aquilina*

*Rhus Toxicodendron*

*Rosa humilis*

*Smilacina racemosa*

*Spartina Michauxiana*

*Vaccinium canadense*

*Vaccinium pennsylvanicum*

*Vaccinium pennsylvanicum nigrum*

*Spartina Michauxiana*, with its long rootstalk, grows plentifully both on the slope and on top of the dune. *Elymus canadensis* is found in abundance. *Rhus Toxicodendron*, *Salix rostrata*, and *Rosa humilis* are found growing on top.

An abundance count of the dominant species in four, one meter quadrats showed:

	1	2	3	4	Total
<i>Spartina Michauxiana</i>	98	100	92	104	394
<i>Rhus Toxicodendron</i>		40	55	26	121
<i>Vaccinium pennsylvanicum</i>	6	3	9		18
<i>Rosa humilis</i>	7			6	13
<i>Arctostaphylos uva-ursi</i>				22	22

From this, we find *Spartina Michauxiana* in all the quadrats, *Rhus Toxicodendron* and *Vaccinium pennsylvanicum* in three, while *Rosa humilis* and *Arctostaphylos uva-ursi* are

found occasionally.

A frequency count of the dune species showed the following per cents:

<i>Spartina Michauxiana</i>	100%
<i>Elymus canadensis</i>	82%
<i>Rhus Toxicodendron</i>	44%
<i>Arctostaphylos uva-ursi</i>	27%
<i>Rosa humilis</i>	26%
<i>Vaccinium pennsylvanicum</i>	18%
<i>Smilacina racemosa</i>	14%
<i>Vaccinium canadense</i>	8%
<i>Pteris aquilina</i>	8%
<i>Poa pratensis</i>	7%
<i>Acer rubrum</i>	3%
<i>Vaccinium pennsylvanicum nigrum</i>	3%
<i>Maianthemum canadense</i>	1%
<i>Cornus stolonifera</i>	1%
<i>Comandra umbellata</i>	1%
<i>Oenothera muricata</i>	1%
<i>Gaylussacia baccata</i>	1%

*Ammophila arenaria*

In the hollow behind are relic *Pinus Strobus* and *Pinus resinosa* with *Maianthemum canadense* beneath. These point to a former pine growth which bordered the lake. Its beach was the level of the hollow behind the present dune. That the dune is still growing and moving is proved by a small *Pinus resinosa* which the sand has approached and covered to a depth of two feet, leaving about 1 ft. 6 in. above the surface.

A frequency count of the trees in the land behind the dune, showed *Pinus resinosa* and *Acer rubrum* in the lead. They were:

<i>Pinus resinosa</i>	33%
<i>Acer rubrum</i>	26%
<i>Quercus rubra</i>	10%
<i>Amalanchier canadensis</i>	14%

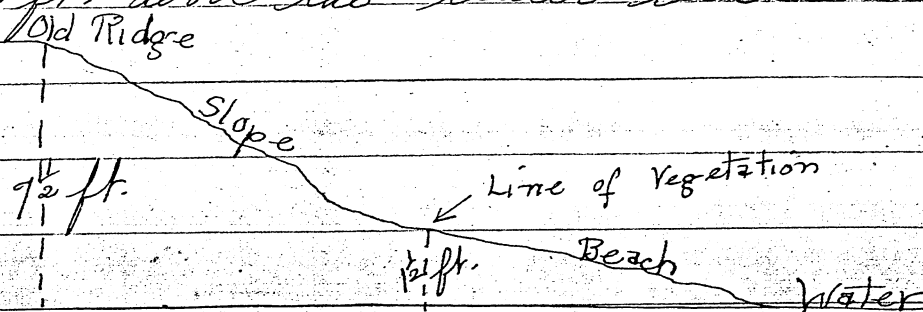
<i>Pinus Strobus</i>	6%
<i>Betula alba papyrifera</i>	4%
<i>Populus tremuloides</i>	3%
<i>Ulmus americana</i>	2%
<i>Populus balsamifera</i>	1%

The conditions found here - sandy lake bottom, strong waves, and wind - are such that the present dune will in all probability grow rapidly and continue moving back upon the associations behind it.

### The Second Beach Section

This begins abruptly at the end of the sand dune. The beach here is sheltered from the wind and wave action and little sand is piled up. There are three distinct parts here: the beach, the slope, and the old ridge. The beach is broad and gradual. Here grow sedges and grasses at a line

about  $2\frac{1}{3}$  ft. above the water level. The



sandy slope is gradual. Along its sides and at the top, grow large *Betula alba papyrifera* trees, while on the ridge above is a dense growth of young birches, maples, and poplars. A few relic pines are left here. On the ground, *Vaccinium canadense*, and *pennsylvanicum*, and *Pteris aquilina* grow in abundance.

The old ridge at this point goes inland about a half mile, showing that the present beach was built up very rapidly at this point. The land between is filled in with young birches, maples, and poplars. The light here is intense on account of the low growth which

averages from 4-5 ft. The soil is fine and sandy.

That this was probably a part of the great pine section is shown by the burned stumps, old relic pines, *Maianthemum canadense*, *Gaultheria procumbens*, and *Arctostaphylos uva-ursi*. After the pines had been burned out, a growth of *Betula alba papyrifera* became dominant. Another fire destroyed all of these except a fringe along the lake. The few are still noticeable because of their size as compared with the other growth. On the burned land came in the usual growth of *Populus grandidentata* and *Populus tremuloides*. Young *Betula alba papyrifera* trees have a start again and, at present, with the assistance of the small *Acer rubrum* trees are shading out the poplars. Indications point to a future birch-maple association.

A frequency count of trees in this



resulted as follows:

<i>Pinus resinosa</i>	21%
<i>Betula alba papyrifera</i>	17%
<i>Quercus rubra</i>	15%
<i>Acer rubrum</i>	12%
<i>Amelanchier canadensis</i>	12%
<i>Populus tremuloides</i>	10%
<i>Pinus strobus</i>	7%
<i>Thuja occidentalis</i>	2%
<i>Prunus serotina</i>	2%
<i>Populus grandidentata</i>	2%
<i>Alnus incana</i>	1%
<i>Ulmus americana</i>	1%

From this the number of relic pines is found in the lead but on account of the slow growth of the pines, the other trees will in all probability gain rapidly in numbers.

An abundance count of secondary species in 4, one meter quadrats showed:

<i>Gaylussacia baccata</i>	40	6	13		
<i>Spartina Michauxiana</i>	6	9	20	7	
<i>Vaccinium pennsylvanicum</i>	2	64		12	
<i>Comandra umbellata</i>	70	5			
<i>Maianthemum canadense</i>		42			
<i>Diervilla lonicera</i>			37		
<i>Salix rostrata</i>				7	
<i>Vaccinium canadense</i>	2				
<i>Rhus Toxicodendron</i>	11				
<i>Rosa humilis</i>		1			

A frequency count of species found on the slope and on the ridge resulted as below:-

	Slope	Ridge
<i>Vaccinium pennsylvanicum</i>	28%	100%
<i>Gaylussacia baccata</i>	12%	60%
<i>Poa pratensis</i>	24%	20%
<i>Gaultheria procumbens</i>		44%
<i>Phleum pratense</i>	8%	4%
<i>Spartina Michauxiana</i>	20%	4%

	Slope	Ridge
Grass sp.		20%
<i>Elymus canadensis</i>	76%	8%
<i>Vaccinium canadense</i>		16%
<i>Pteris aquilina</i>		16%
<i>Acer rubrum</i>	8%	12%
<i>Populus tremuloides</i>		8%
<i>V. pennsylvanicum nigrum</i>	4%	12%
<i>Rhus glabra</i>		4%
<i>Alnus incana</i>		10%
<i>Maianthemum canadense</i>		4%
<i>Verbascum Thapsus</i>		16%
<i>Rosa humilis</i>		36%
<i>Amelanchier canadensis</i>		12%
<i>Lycopodium sp.</i>		40%
<i>Arctostaphylos rupestris</i>		8%
<i>Salix longifolia</i>		12%
<i>Cornus stolonifera</i>		16%
<i>Taraxacum officinale</i>		4%

Jan. 26, 1913.

Elizabeth J. Robertson

South Carrollton, Kentucky  
August 16, 1956.

D. C. H. Stockard, Director  
U. of Michigan Biological Station.

Dear Dr. Stockard:

How kind of you to suggest that I visit the Biological Station! My most appreciative thanks. I shall come some summer soon, if possible. Not next summer for it is already planned. Maybe the next, or the one after that,

The Lycopodium collection would not she it, but everybody signed up for Botany visited Camp Creek the same day Fred Law and I did. That was a summer of exploration. Dr. Burns took all Botany students on all field trips. He did not slight many areas. We had six day weeks, carried lunches, and were in the field from early morning until midafternoon. Toward the last week Dr. Burns looked up registration cards and began figuring what each student needed to fill the chinks of the course he had selected. After which life was different,

My 1912 collecting, on the other hand, was done alone for the most part. To increase my time for actual collecting Dr. Gleason and Dr. Harper identified all grasses and sedges that gave me any trouble, and Fred Law did much of the drying and mounting of my specimens.

My sister Elizabeth died when half through medical school. I did not go through her stored notebooks until recently. Among them I found the enclosure I am sending them because they may have some slight value, incomplete as they are, to someone doing research at the Station. I should have sent them with the pictures but had not found them then. Please do not feel that this requires any acknowledgment in the busy closing days of camp. We will speak of it when I come up.

Sincerely yours,  
Maud R. Jacobs  
(Mrs. Maud Robertson Jacobs)

Insects

Field notes

July 8<sup>th</sup>

We collected in the  
Gorge North of Douglas  
Lake.

Weather - fair but windy.

Brook habitat - The  
place here consisted of  
a two forked shallow  
stream pretty well  
filled with mossy logs.

Collecting was done  
along the banks, under  
the moss, under the  
bark of logs, on the  
surface, in the water,

and debris at the bottom.  
If surface forms were  
found water striders  
and water bugs.  
larvae were abundant.  
The black fly larvae  
were found crawling  
on dead leaves and partly  
submerged in shallow  
shaded places.

July 15, 1912

Slope habitat - From  
the stream, there is a  
small level stretch of  
land and a steep  
sandy slope to the  
grade above. The forms

collected were grasshoppers,  
crickets, moths, water flies,  
beetles, stone flies, dragon  
and damselflies, lace-wings,  
and caddis flies. Ants  
were found in abundance  
at the foot of the slope.  
Most of the crickets  
were found at the  
foot. Stone flies were

Slope habitat - from  
the stream, there is a  
small level stretch of  
land and a steep  
sandy slope to the  
grade above. The forms

common to this  
habitat were grasshoppers,  
crickets, moths, robber-flies,  
beetles, stone flies, dragon  
and damsel flies, lace-wings,  
and caddice flies. Ants  
were found in abundance  
at the foot of the slope.  
Most of the crickets  
were found at the  
foot. Stone flies were  
found clinging to the  
bark of trees which  
they resembled very  
much. Dragon and  
damsel flies were  
mostly on rushes or  
grasses by the stream

or in damp places.  
Up the slope itself  
were the butterflies,  
moths, and robber flies.

July 29, 1912

Grade - At the top  
of the slope on the  
sand grade and in  
the hollows, grasshoppers  
were most numerous.

Striking examples of  
protective coloration were  
observed. Bees and ants  
were found in the  
sand hollows. A number  
of damsel flies were

found here which was  
not their natural habitat.

July 30, 1912

North Fishtail Beach  
Pools - Aquatic life.

The first pool or lagoon  
studied was almost  
grown full of Scirpus  
and pond lilies. The  
water here was stagnant  
and it



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July 30, 1912

North Fishtail Beach  
Pools - Aquatic life.

The first pool or lagoon  
studied was almost  
grown full of Scirpus  
and pond lilies. The  
water here was stagnant  
and rich in insect life.  
No vegetable feeders  
were found. The conclusion  
was reached that any  
such forms as had  
been here had been  
eaten by other larvae.  
The struggle for existence

here was tremendous.

Different kinds of larvae feed upon each other while in some cases larvae feed upon their own kind. The vegetation here serves many purposes such as

(1) Hiding - serves to hide the larvae from other carnivorous feeders.

(2) Furnishes supports for crawling out. After the larvae have developed into adults and wish to leave the pool, they climb out by means of

these stems.

(3) Breeding places.

Certain forms prefer certain kinds of plants for breeding.

(4) The Photosynthesis of plants supplies oxygen which these stagnant pools otherwise would not have.

(5) Attract

for crawling out. After the larvae have developed into adults and wish to leave the pool, they climb out by means of

these stems.

(3) Breeding places.

Certain forms prefer certain kinds of plants for breeding.

(4) The Photosynthesis of plants supplies oxygen which these stagnant pools otherwise would not have.

(5) Attract as resting places, beach forms which accidentally fall off into the water and serve as food for surface forms.

(6) The sun's rays would penetrate clear to the bottom of the

water. The vegetation shades the water and forms which like darkness.

Power of Flight  
Aids in distribution  
Avoid danger  
Go out for temporary flight for mating

### Second Beach Pool.

Zones of life here are well defined.

1. Submerged
2. Floating
3. Brusher

Electric light bugs seem by reason of size to control the environment.

### Beach Habitat

Sandy  
Temperature - heat  
Exposed to the light except for a little fringe of vegetation.

Moist except for a superficial layer which has a dirt...

are with dependent.

1. Submerged
2. Floating
3. Bubblers

Electric light bugs  
seem by reason of  
size to control the  
environment.

### Beach Habitat

Sandy  
Temperature - heat  
Exposed to the light  
except for a little  
fringe of vegetation.

Moist except for a  
superficial layer which  
has a distinct life of  
its own. The vegetation  
here is rushes and  
willows.

Vegetation low - distinct  
zone here from the  
forest line behind.

Galls

Willow gall - dipterous

Cecidomyada - Hessian  
fly always live in the  
terminal bud of the  
willow. Difficulty in  
studying galls is there  
may be several kinds  
in one gall.

August 12, 1912

Bessie Brook

Insect life very abundant.

Whirligig beetles in large  
colony when disturbed by the  
boat scattered but soon  
collected again.

Short bodied water-striders  
very abundant.

Habitat: The water here  
varies in depth from only  
a few inches to four feet.

August 12, 1912

Bessie Brook

Insect life very abundant.  
Waterbugs beetles in large  
colony when disturbed by the  
boat scattered but soon  
collected again.

Short bodied water-striders  
very abundant.

Habitat: The water here  
varies in depth from only  
a few inches to four feet.  
Current sluggish emptying  
into the lake very slowly. The  
bottom is soft and mucky.

Growth of all aquatic  
especially rank here. Both  
water, lilies, and many  
Potamogetons in abundance.  
There is in appearance

a thick carpet of plant growth beneath the surface. Many of these have a distinct insect life connected with them.

Yellow Lily pads - Bellura sp.

The larvae of this species, (in appearance about 2-3 inches long, light greenish, body round) burrows thru the middle of the leaf petiole (or sometimes even the flower petiole) for a little distance. It lives on the inside pulp of the lily petiole burrowing in as its food supply decreases. This larva

lives head downward in the petiole, backing up and projecting the tips of two posterior spiracles above the leaf into the air. On the top of the leaf, around the burrow, is a mass of excrement thrown up by the larva. Observations as to the length of time it



petiole (or sometimes even the flower petiole) for a little distance. It lives on the inside pulp of the lily petiole burrowing in as its food supply decreases. This larva

lives head downward in the petiole, backing up and projecting the tips of two posterior spiracles above the leaf into the air. On the top of the leaf, around the burrow, is a mass of excrement thrown up by the larva. Observations as to the length of time it stayed up and down in the petiole showed:

Up.	Down.
2 min. 9 <sup>3</sup> / <sub>5</sub> sec.	3 min. 40 sec.
1 " 5.5	3 " 29 <sup>3</sup> / <sub>8</sub>
2 " 45 sec.	

If this larva is torn from its home

and dropped into the water, it swims with an undulatory movement, shedding water because of an oily secretion of the body.

It has three pairs of true legs on three thoracic segments.

Prolegs on segments 6, 7, 8, 9, and 10 of the abdomen.

- ~~one, four, near~~
1. Wet sandy part first section from water's edge - Tiger beetles.
  2. Low vegetation - salix, milkweed,
  3. Shrub zone - larger willows, alders, a number of the flowering plants.

Spittle insects tend to be on high plants with leaves closely clustered.

Ants in all three overlapping

- ~~same, some beach~~
1. Not sandy part first section from water's edge - tiger beetles.
  2. low vegetation - salsia, milkweed,
  3. Shrub zone - larger willows, alders, a number of the flowering plants.

Spittle insects tend to be on high plants with leaves closely clustered.

Ants in all three overlapping but mostly in region of low vegetation or under logs and sticks.

Dragon  
Damselfly  
Wedge (Chironomids)

Majority of forms taken plant eating - few predaceous forms on the beach. Ants are not

predaceous in the sense  
of killing other insects  
but quite often use them  
when found dead.

Paper

F.

Sand forms

Ground beetles

Cucullidae

Acrididae

Carabidae

Tiger beetles

Grasshoppers

Crickets

Gryllidae

Low vegetation forms

Leaf beetles

Black wasp

Spittle insect

Milkweed butterfly

Red beetle

Ants

Higher vegetation zone

Leaf and tree hoppers

Skatzenzger

Willow gall

Forms common in the three  
zones.

Wameel flies

Dragon flies

Widges

	Height above water	length of Section	Height at which vegetation begins
Section I.	3 37 33 26		
Section II		7 ft. 7 inches 320 yds.	1 foot 6 in.
Section III	8 ft. 9 in. 11 ft. 9 in.	160 yds.	2 ft. 4 in.

Section III.	Height of Ridges above water	Height of Dune	Height at which vegetation begins
	7 <sup>6</sup> - 15 <sup>6</sup>	27 - 3	2 ft - 1 <sup>2</sup> ft.

Width of beach - 20 ft.  
 Numerous sandbars built out.  
 Dune behind these Ridges behind extremely high

Section IV.

Three distinct planes of vegetation are to be seen here. They are -  
 The Scirpus Association,  
 The Dune Vegetation, and  
 The Ridge.

One mile north of camp. Water shallow for 50-60 ft. out; bottom rocky; Scirpus abundant on the damp beach and out into

Section VII.

Width of area  
Narrow zone  
Dune  
Ridge

Section IV.

Three distinct planes of vegetation are to be seen here. They are -  
The Scirpus Association,  
The Dune Vegetation, and  
The Ridge.

One mile north of camp. Water shallow for 50-60 ft. out; bottom rocky; Scirpus abundant on the damp beach and out into the shallow water. Beach here wet, sandy, some parts pebbly.

Beach varies from 20-40 ft. wide.



The Dune here is not very high; rather flat, hollow behind filled in with

various bog or lagoon plants. Soil dry, sandy; atmosphere dry-temperature hot. Plants tend to grouping altho not distinctly as Milkweed, Wild Grape, etc. Wind and wave action such as to build ~~out~~ <sup>up</sup> a dune into the .

### Slope and Ridge

The slope here is very abrupt; vegetation along its side being sparse consisting mostly of Wild Grape, horse-tail, young Betula. On top, extending back about two feet is a thick carpet of moss and lichen behind which grow Gaylussacia and Vaccinium.

### Conclusions

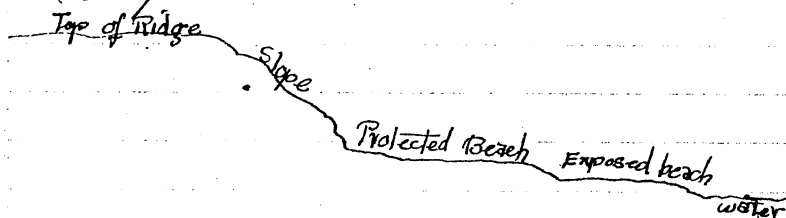
Spartina Association is growing on dune as was shown by  
Buried pine tree  
Piling of sand around plants



Section IV  
Arctostaphylos very abundant

Three distinct planes  
of vegetation are to be seen  
here.

One mile north of  
camp. water off shore  
shallow, bottoms pebbly,  
Scirpus abundant



In the shallow water  
grows *Scirpus americanus*  
and *S. validus* of which the  
latter is more plentiful.  
The exposed beach or the  
part generally covered  
by water has mostly

Keel ice-ridges formed here 12

dune. On the slope and top of the dune were found mostly *Spartina* and *Elymus* both sand-binders. In the hollow behind the dune were a few relic *P. resonosa* and *P. Strobil.* *Rhus typhina* plentiful. Strength of the current at this spot and wind has piled up the dune. In the hollow *Maianthemum* plentiful. Pine tree growing lower on the beach covered except for upper branches - shows dune is moving.

Scarpus vegetation. It is wet, sandy. Some parts composed of small pebbles carried up by the waves. This beach is generally from 25 to 40 ft. wide. The

The protected beach or second level has a distinct vegetation. Soil sandy with little leaf mold. Atmosphere dry - Temperature hot. Plants tend to be in groups as Milkweed, Wild Grape. Wind and wave action such that the beach is being rapidly built out.

1912

Section III or IV

Protected beach



Numerous sandbars all along  
 this section covered with water  
 most of the year growing  
*Eleocharis palustris* thickly  
 among the *Saripus*

<i>Rosa humilis</i>	36%
<i>Amalanchier canadensis</i>	12%
<i>Lycopodium</i> sp.	40%
<i>Arctostaphylos uva-ursi</i>	8%
<i>Salix longifolia</i>	12%
<i>Cornus stolonifera</i>	16%
<i>Taraxacum officinale</i>	4%

Copied in report

Section II. 1912

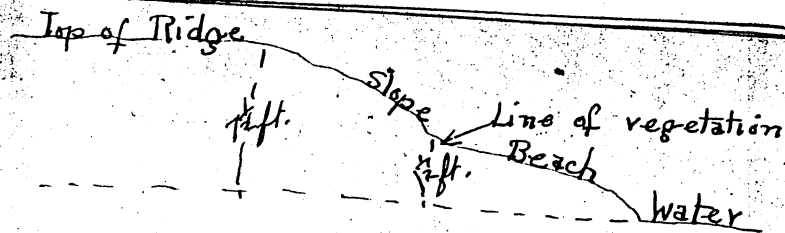
*Pinus resinosa* and *Pinus*  
 strobis on the ridge back  
 lake - a long

*Pinus resinosa* and *Pinus strobus* on the ridge back from the edge of lake - a long stretch of pines here was mowed by the fire. A few *Populus* trees are growing along the vegetation line on the back which is broad and slopes gradually. Vegetation 12 ft. above water level. Real ice-ridge formed here 72

Section II 1912

36%	<i>Rosa humilis</i>
12%	<i>Amelanchier canadensis</i>
40%	<i>Lycopodium sp.</i>
8%	<i>Urtica dioica</i>
12%	<i>Salix longifolia</i>
16%	<i>Cornus alternifolia</i>
4%	<i>Juncus effusus</i>

Copied in report.



Beach - grass growing from line of vegetation.

Slope - *Spartina*, *Rhus*, *Acer*,

Top of R. - *Pines*, *Vaccinium*, *Arctostaphylos*

*Betula Consoies*.

Within the limits of this section was a *consoies* of *Betula alba papyrifera*. It extends about 160 yds. along the beach and has an elevation of from  $7\frac{3}{4}$  -  $11\frac{3}{4}$  ft. above water level. The height above water at which vegetation begins is  $2\frac{1}{3}$  ft. The shore vegetation is mostly *Salix* and grasses.

The sandy slope is gradual with <sup>young</sup> *Betulas* along its sides and at the top. On the ridge above is a dense growth of young white birches, maples, and poplars. A few relic pines are left. On the ground, *Vaccinium* and *Pteris* thrive. The old beach which is to be plainly seen at most places from the lake shore here goes back for

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ground, *Vaccinium* and *Pteris*  
thrive. The old beach which  
is to be plainly seen at  
most places from the lake  
shore here goes back for  
about a half mile showing  
that the shore was at one  
time built up very fast  
at that point. The level stretch  
between is filled with young  
*Betulas*, *Acers*, and *Poplars*. The  
light on this part is intense;  
the soil sandy; the vegetation  
about 4-5 ft. in hight.

At one time this was

probably a pine section  
as is shown by the  
presence of burned stumps,  
old relic pines, *Maianthemum*,  
*Gaultheria*, and *Arctostaphylos*.  
After these had been burned  
out, a growth of *Betulas*  
came in. Another fire  
destroyed all these except  
a few at the edge of the  
water. This *Betula* fringe  
is still plainly evident. On  
the burned section came in  
the usual growth of *P.*  
*grandidentata* and *P. tremuloides*.  
Young *Betulas* again got  
a start and at present  
with the young maples  
are shading out the poplars.  
No other ridge evident so no sand  
dune. Water comes clear up to the young  
growth at the top of the ridge.