MAINTAINING THE HIGH WATER QUALITY

of

HIGGINS LAKE

Cooperating

Cooperative Extension Service of
Michigan State University
Higgins Lake Property Owners Association
Roscommon County Planning Commission
Roscommon County Road Commission
Roscommon County Board of Supervisors
Township Boards of Gerrish and Lyon
Michigan Department of Natural Resources
U.S.D.A. Soil Conservation Service

By

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In the past few years, property owners have been reporting deteriorating water conditions in Higgins Lake. Their reports include more slimy material on the stones on the bottom of the lake. They also reported more algae growth, evidenced by dead algae being blown upon the shore by the wind.

As more poorly drained sites around the lake were developed for dwellings, some means were devised to drain the land so that septic tanks and drainage fields would function. Seldom were the drains given much planning. They were not designed with the thought of protecting the water quality of the lake. The people affected simply dug a little drain to alleviate their immediate problem.

Property owners became concerned that these ditches were adding pollutants to the lake. Court actions ensued.

The ditches were dug as a result of a change in land use. Land use directly affects the quality of the water in the lake. The question arose, what other land uses and practices in the drainage basin are affecting the water quality of the lake?

This study was made for an inventory of present land use in the Higgins Lake Drainage Basin and what affect this land use is having on the water quality.

The goal is to determine how the land in the basin might be used to its most intensive use pursuant to maintaining the highest quality of the lake. All feasible steps should be taken to prevent added pollutants and nutrients from entering Higgins Lake.

The author walked the entire distance around Higgins Lake in April 1969 taking notes of man made and natural drains into the lake and other possible sources of pollutants caused by present land use.

Preventing pollutants from entering any body of water, whether a stream or lake, is important. It is even more important to prevent pollutants and nutrients from entering a lake because once they enter, they are trapped and cannot be taken out.

Water samples, although unofficial, which were taken and tested in the summer of 1967 and spring of 1969, indicated that phosphates are present in sufficient amounts to support algae growth. The samples taken from near the center of the lake were low in nitrates, however. Both phosphates and nitrates are necessary for plant growth.

HIGGINS LAKE INVENTORY AND HISTORY

The following inventory and history of Higgins Lake was compiled in 1952 by C.M. Taube, then junior fisheries biologist. Michigan Department of Conservation and the University of Michigan cooperated in the study.

HISTORICAL

Higgins Lake is named after Sylvester Higgins, state topographer under Douglas Houghton, the first state geologist who was appointed in 1837. The first major record of the fishing resulted from a census by the Civilian Conservation Corps in the winter of 1935-36 who also mapped the lake in the winter of 1936-37. A biological survey was made by the Department of Conservation in the summer of 1939 and the map completed.

GEOGRAPHICAL AND GEOLOGICAL

Located in Roscommon County, 5 miles west of the village of Roscommon, it is directly north of Houghton Lake. The basin of the lake was formed by large ice blocks which melted as the glacial sheet retreated. The area drained is small and probably does not exceed 50 square miles. Big Creek, a small trout stream on the northwest shore, is the only tributary. There are springs at various points around the shore but it is assumed that hidden springs are the major source of the water supply.

Higgins Lake is actually the head of the Muskegon River being connected to Houghton Lake by the Cut Stream, dredged during the lumbering era to facilitate the floating of logs down to the river.

It has a surface area of 9,600 acres and is tenth in size among Michigan's 11,000 lakes. About one-third of the lake is basal but about half the area of the lake has depths exceeding 50 feet. The maximum depth of 135 feet occurs about ¾ mile east of the south of Big Creek. Only four inland lakes of Michigan are known to have deeper water (Torch, Antrim Co.; Crystal, Montcalm Co.; Lake Louise, Charlevoix Co.; and Mullett, Cheboygan Co.

Sand and gravel are the principal bottom soils from shore to the 70-80 foot depth contours although areas of marl occur in a number of places. A band of marl seldom over 200 feet wide circumscribes the greater part of the basin, beginning at about the 20 foot contour. Muck predominates in the deepest waters while patches of clay are found near the sunken islands. Boulders are common along the northeast and southwest shores.

CHEMICAL AND TEMPERATURE

The water is clearer than that of most lakes and the range of visibility is around 25 feet. It is moderately hard. Alkalinity tests (methyl orange) showed a range of 102-126 parts per million of calcium carbonate (lime). The PH (hydrogen ion concentration) values of 8.0-8.2 further indicate the distinctive alkaline character of the lake and the lack of organic matter in solution. Temperatures in the upper layers of water during the summer may vary greatly from day to day but those in the depths are rather constant.

The range of temperature of the water in August was 70-73 degrees Fahrenheit at the surface and 45-50 degrees at the bottom.

BIOLOGICAL

Vegetation is rather scarce due primarily to the sandy shoals and excessive wave action. When surveyed, plants were confined mainly to a narrow strip of marl bottom between the 10 and 25 foot contours. Although this band of vegetation extended all the way around the lake, it was rarely more than 200 feet wide. Almost all the plants were of the submergent type with pond weeds and musk grass predominating.

A wide variety of forage fishes are present with sand shiners and bluntnose minnows most abundant. An experimental planting of the very prolific lake emerald shiners from the Great Lakes in 1933 failed to establish this species. Other forage fish include the common, spotfin, spottail, mimic, rosyface, redfin and blacknose shiners; northern dace; Iowa and johnny darters; the brook and ninespine sticklebacks; and the muddler.

The game fishes of Higgins Lake include yellow perch, rock bass, smallmouth bass, longear sunfish, whitefish, cisco, lake trout, and rainbow trout. Brook trout have been collected but they were probably migrants from Big Creek. Northern pike and blue-perch (walleye) were scarce at the time of the inventory but some good catches of these species have been made in late years.

Perch are caught most often with rock bass next in order. Whitefish appear plentiful but ordinarily are not taken by anglers. Many are speared during the fall when prevailing weather conditions are favorable to this type of fishing and some are taken through the ice during the winter seasons. As a result of the survey and unsuccessful results from earlier plantings of lake and rainbow trout fry and fingerlings, stocking of these species in larger sizes was made in late years which have since provided some excellent fishing.

Hatchery plantings of Atlantic salmon, landlocked salmon, California salmon, and Montana grayling in earlier years were not successful in establishing these species.

FISHERIES MANAGEMENT

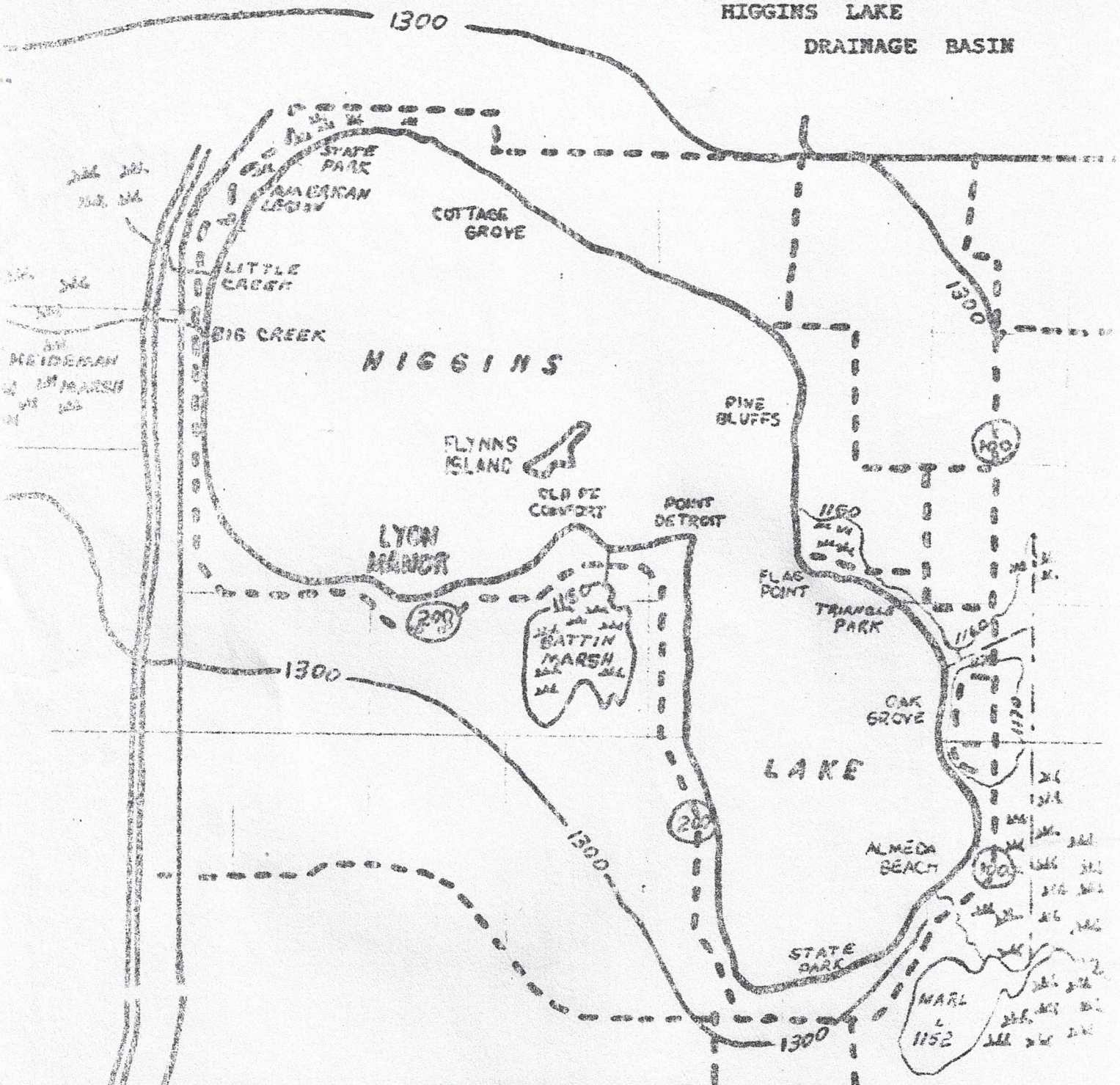
Higgins Lake is classed as a cold, hard-water lake of limited productive capacity. In any successful plan of management of the lake, primary emphasis must be placed on the cold-water species of fish such as lake and rainbow trout and whitefish. Perch, rock and smallmouth bass must also be considered.

The rainbow trout almost certainly do not spawn in the lake. Although conditions may be suitable for lake trout to spawn, there are as yet no records of their natural reproduction. The lake's population of these species must therefore be maintained by continued stocking.

There have been no plantings of other species in the lake since 1941. The warm-water fish that are adapted to the lake which include smallmouth bass, rock bass and perch, are maintaining themselves by natural reproduction.

Due to the deficiency of vegetation and other natural cover, 45 brush shelters were placed in Higgins Lake in 1933. In the fall of 1949, the Department placed an additional 318 shelters. Fish congregate around such structures and their concentration in this manner is believed a practical way to improve angling where a scarcity of natural cover in a great expanse of water causes a wide dispersal of the fish.

HIGGINS LAKE
DRAINAGE BASIN



All rain and snow that fall within the 13000 foot contour line, drains towards Higgins Lake. County road 100 forms the rim of the basin on the east. The water east of County road 100 tends to drain towards Marl Lake, however the Kennedy drain diverts some of the water into Higgins Lake.

The area east of Triangle Park drained to the south and into the lake near the Kennedy drain. Low naturally wet areas are indicated by marsh symbols .

SOURCES OF POLLUTANTS

Drains, and ice caused erosion, wave action erosion, and road end erosion are four major causes of pollution of Higgins Lake. No doubt dissolved nutrients from septic systems are reaching the lake but there is no accurate method of determining this. No direct lines to the lake were observed.

The following pages will be devoted to describing the four problems that can be seen and discuss ways of correcting them.

Drains into the Lake

It must be remembered that there are nearly 50 square miles of land in the Higgins Lake Drainage Basin. All of the water that falls as rain or snow upon this land drains into Higgins Lake by nature. Much of it soaks into the ground and flows as ground water and enters the lake as springs. Before dwellings ringed the lake it made little difference if water stood on the surface, later to soak into the ground or evaporate. Now, however, if water stands in someones lawn, the least damage it does is cause malfunctioning of the sanitary system. Flooded septic tanks can be a source of pollution to the flood water which eventually flows over land and into the lake.

In the trip around the lake, 26 inlets into the lake were noted. These included Big and Little Creeks, the Kennedy, Battin, and Lyon Manor drains.

Along the north west shore from the public access to the Conservation Training School, the shore is low and mucky. Nineteen of the drains, ditches and tile, were located along this stretch. Big and Little Creeks are included in this number.

Some of the drains were carrying organic sediments into the lake, causing an accumulation of organic matter on the lake bottom. Humus, which is the near end product of organic matter is from three to six percent nitrogen. This is a source of that nutrient.

Drains are necessary because of the dwellings along the lake. The drains would carry much less pollutants if they were properly designed to eliminate organic and soil sediments from entering the lake. Properly designed drains are needed to prevent flooding of septic tanks and disposal fields.

Correct drainage will be more benificial to the lake than allowing septic tanks to be flooded, thus contaminating the water before it enters the lake.

Three of the nineteen drains drain the American Legion grounds. They go through organic soil and carry organic sediments into the lake.

There are two small ditches coming from the North Shore State Park. These flow through sandy soil so were not carrying as many organic sediments. The quality of the water from both of these sources might be improved with the installation of a "blind inlet."

Drainage problems exist for part of the area surrounding Triangle Park. If this land is to be further developed, drainage will be necessary to meet the health regulations regarding the high water table.

There are several alternatives. Two alternatives are: 1) Zone the low areas to discourage subdivision. No additional drainage would be needed with this choice. 2) Construct a drain into Higgins Lake. T is would permit further subdividing of that area.

The Battin Drain drains part of the water from the Battin marsh. Waters from a marsh are usually reddish in color due to the tannin which it contains. Although pure tannin is colorless, the phlobotannins form a red phlobophene precipitate. Tannins are a carbohydrate which contain little or no nitrates. The water from Big and Little Creeks is just as red and discolors the lake along shore for a mile.

When a sample of water was taken at the outlet of the Battin Drain, water was backed up, flooding lawns in the area. The unofficial test indicated that the coliform count and nitrates were higher than water samples taken from other parts of the lake. The coliform count in the Battin water was 590 per 100 ml, in Big Crek it was 340 and in Little Creek, 120.

Floyd Carpenter, Roscommon County Sanitarian, took water samples at the outlet of the Battin Drain, at Magnolia Avenue, and at County Road 200. In all of the samples, the fecal coliform was less than 100, which is not considered seriously contaminated.

Perhaps the most simple solution to the Battin problem might be to fill in the drain south of County Road 200. A stand pipe or other overflow device installed to take excess water from the marsh and into the lake. This would not eliminate all of the water from the marsh from entering the lake, but the volume would be reduced considerably. Some means of preventing the flooding of the yards in the area north of County Road 200 must be found so that septic tanks will not be flooded, thus contaminating the water with coliform before it enters the lake. A proper drainage system for that whole area would be designed.

The Lyon Manor drain outlets at the end of Williams Street. This was installed primarily to drain County Road 202. It collects water from nearly one mile up County Road 202. It goes underground at County Road 200 and then along Williams Street to the lake. The water flows over hard surface road on 202, therefore it picks up very little soil sediment, however it does pick up dust, oil and grease from use by cars. It also picks up soil sediment at the corner of County Road 202 and 200 where the water runs across a gravel parking lot. This particular system has four catch basins to trap sediments. Before County Road 202 was hard surfaced, much sediment would collect on 200 and some would find its way to the lake. The drain is an improvement over the previous condition. There are low areas along Road 202 where some of the water might be diverted into a sediment trap, however, people have built dwellings in them. This might be something to consider for the future.

Certain waters must drain directly into Higgins Lake It is imperative that these drains be properly designed to prevent as much pollution as possible. One method of preventing additional drains from being put into the lake is to zone land which is marginal for development to discourage development.

There are three small drains just above Flag Point. These drains alleviate a high-water condition for those pe people who have dwellings at this point. Most of these dwellings are used only in summer so they have not had a real problem with the high water. However, when these are used year round, it will be necessary to make some improvement in the drainage. The problem is greater tha first appears, because there is a fairly large swamp just to the east of this point, which is a collection basin for water draining as far away as Pioneer Hill, which is two miles to the north east of Flag Point. Sometime in the future, if these dwellings are to be used year round, a well designed drain will be necessary to prevent flooding of septic tanks and drainage fields and to clarify the water going into Higgins Lake

SOIL SEDIMENTS

Soil sediments being eroded into the lake is a source of nutrients. Sediments gradually and slowly but surely fill in the lake as well as supply nutrients for weed growth.

Ice Caused Erosion

Ice action does not push soil into the lake but pushes it in a pile and loosens and makes it more susceptable to wave action. Erosion caused by ice is the most difficult one to control. Every situation is different.

Ice erodes in two ways. One is when ice expands upon freezing. In the expansion process, the ice bulldozes soil toward shore.

Lowering of the water level in the fall of the year cuts the damage done by this erosion because it occurs on the lower beaches less susceptible to erosion.

The second type of ice erosion is caused by ice being blown upon shore. It bulldozes stone, soil, trees and even poorly constructed seawalls.

Lowering the water level gives some protection from this type of erosion, but other measures must also be taken.

Wave Action Erosion

Waves are constantly eating away at the shore line. In many places waves under cut the bank, causing soil to drop into the lake.

Eventually the new deposit of soil is washed out into the lake and forgotten, except the owner's property is that much smaller than previously and a new load of nutrients added to the lake.

Road-End Erosion

Road-end erosion is an important source of soil sediments. The author counted 80 roads which either ended at the lake or at a boulevard. Where the road ended at a boulevard, many times the property owner dug an access to the lake, thus for all erosion purposes the road ended at the lake. Most of the roads have quite steep slopes, so are subject to erosion.

There are two good examples of how road ends can be designed to protect them from eroding.

At the end of Maple, south of Detroit Point, is an example of perhaps the most economical way, yet effective way of preventing raod end erosion. The road was chip and tarred to the waters edge. The road is sloped to the center to collect and carry drainage water over the hard surface. This avoids eroding soft ditch material that occurs from a standard road design. The banks of the road, which are 10 feet high, were sloped and seeded to grass. Water, from these sodded banks, runs onto the hard surface of the road.

An additional step to prevent undercutting at the water's edge would be to run a concrete slab into the lake to a point where there would be no danger of under cutting. A second choice would be to put stone rip-rap at the very end of the hard surface of the road. It is hard to make a durable bind between hard surface and stone rip-rap. Use by people and water action will eventually cause a break-down between hard-surface and stone rip-rap.

Another good example of road end treatment is at the end of Berdel road, DeWitt's landing. This is a little more elaborate than necessary, but is very effective. It does have a concrete surfade all the way into the lake which prevents under cutting by wave action.

Care must be taken any time a hard surface is used to carry water that the hard surface does not become a means of channeling water along beside it, thus causing more severe erosion of the softer soil material. A small amount of this type of erosion was occuring at DeWitt's landing. Considerable amounts of erosion were caused in this matter at several other places where hard surfaces were used to control erosion.

In several places, the hard surface of the road ended at the top of the slope. This left the steep slope to erode. Newman road at Triangle Park is a case in point.

It is not necessary to make a boat ramp at the end of each road. If the road end is too steep for automobile use, stone rip-rap can be used to stop erosion at the water's edge and vegetation planted on the higher part of the slope.

Boulevards present another problem because they encourage an over use of the property between the boulevard and the lake. The property between Sheridan and Sam-O-Set boulevards and the lake is in a badly eroded condition.

Much of the erosion is caused by over use. Very little vegetation was growing to protect the banks. People cut through the bank between the boulevard and lake for access, leaving bare banks to erode. Only a few people were taking any steps to protect the bank from further erosion. Many of the property owners favor closing the boulevards as a means of preventing further sediment erosion into the lake. This may be necessary. Public access may have to be limited to areas that can be properly maintained and supervised if this type of soil erosion is to be prevented.

Parks and Public Access Erosion

Parks and points of public access have unique problems due to the large amount of use these places receive. The two State Parks have some advantage in that they have some control over the number of people in the park at any one time.

South Shore State Park

The bank above the beach area has erosion. This is caused by wave action plus surface water from the park area. The loss of beach was being corrected by hauling in new sand. This practice may not be in the best interest of the lake in the long run. It represents a filling in of the lake. There was one log jettie that was collecting sand and working well for them. Perhaps a series of jetties with some protection of logs at the bank above the beach would prevent further erosion and still maintain a natural appearance. Perhaps with as much foot traffic as this park receives, some un-natural stone or concrete revetment may be needed to prevent the shore line from advancing into the park area any further than it has.

North Shore State Park

The North Shore State Park does not have the beach that the south shore has. It does have some erosion on the banks where people walk down to the lake. If the eroded areas were sloped back and planted to vegetation they could be stabilized. Paths could be used to guide people to the lake over less vulnerable areas.

Gerrish Township Park

The Gerrish Township Park has a fairly flat beach not as subject to as much erosion, however one tree near the

lake indicates that the ground level at one time was about three feet higher. Jetties could protect this beach from long shore currents.

Lyon Township Park

The Lyon Township Park sets on top of a fairly high bank. Foot traffic up and down the slope has contributed to much loss of soil to the lake. A cement block well pit stands four feet in the air because soil has eroded from around it.

Planting of vegetation of the steep banks will stop erosion. A rail fence around the top of the bank will help keep people off of the steep banks. Access to the lake can be gained by walking down Phoenix Avenue.

A more direct route to the lake would be a set of steps. The park has a joint erosion problem with Phoenix Avenue. Perhaps the problem can be solved jointly with the Lyon Township Board and County Road Commission.

Beaver Creek Township Park

The Beaver Creek Township Park is in pretty good condition. There is some erosion along side the boat ramp. This gully can be filled with stones and the water diverted over the boat ramp to protect the soil at the side of it.

Public Access, West Shore

The Public Access on the west shore has a gully running almost the full length of the drive and parking area. This condition is quite common to this type of public access. The sediment movement could be stopped by covering the lot with black top. The water could be channeled over a boat ramp into the lake. There is opportunity here to divert the water to low areas on either side of the parking lot where it could then soak into the ground and be filtered before entering the lake.

EROSION CONTROL

Several methods of controlling lake shore erosion can be employed.

Wave Action	
Jetties	Stone
	Log
Rip-rap	Stone
Ice Action	
Sea Wall	Concrete

Many attempts had been made to control erosion by property owners. Only a few are successful.

Jetties

Wind causes waves which either hit the shore directly or from an angle. When the waves hit at an angle, it is called a long shore current. When a log or pile of stones is placed out into the lake, perpendicular to the shore, the long shore current is broken up. These structures are called jetties. Jetties are most effective when a number of them are placed in succession to form a tooth-like pattern. Jetties catch and retain the beach material being carried along the shore by the currents.

The jettie should slope down into the lake. The log jettie needs to be anchored below the bottom so that ice will push up over it and not take it out.

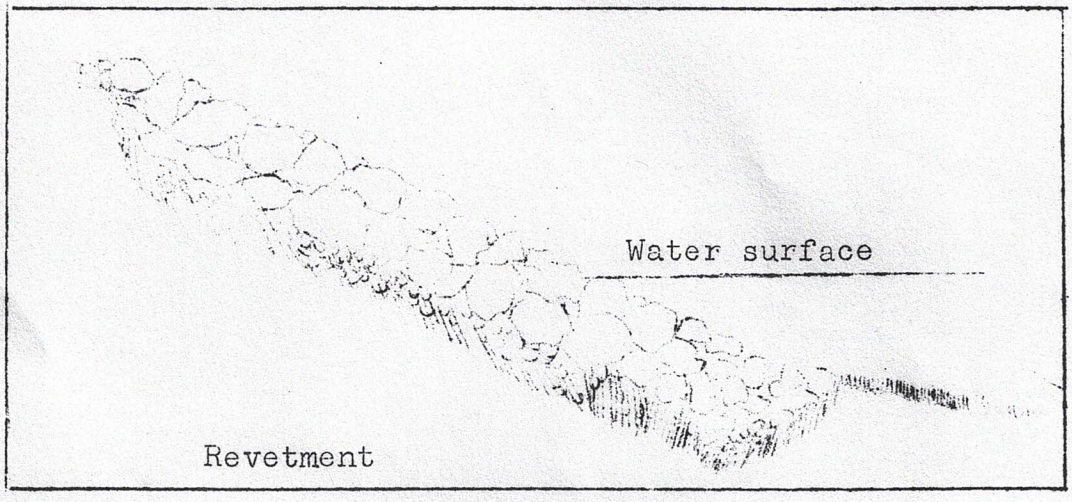
Sometimes a log revetment is used in conjunction with the jetties to protect the shore from waves that come straight into the shore. This works well where the bank is not steep.

Revetments

Where there is a steep bank a stone revetment is necessary to stop wave action erosion. It can give some protection against ice erosion, but one should realize that ice can easily move the stone. If a stone revetment is used it should be recognized that it may be necessary to rebuild it every ten or fifteen years. Large stones will give more protection from ice than will smaller stones.

A stone revetment consists of a blanket of stones placed directly on the bank. The bank should be graded to a slope no steeper than 2 horizontal to 1 vertical before placing the stone.

Revetments often fail because bank material is leached out from underneath. The danger of failure in this manner can be minimized by placing a layer of small stone or gravel against the bank before the larger stones. The larger stones should be hand placed using smaller stones to fill the spaces between the larger stones. The rip-rap should extend below the base of the bank to provide a good foundation for the revetment. This requires some trenching and back filling at the bottom of the revetment.

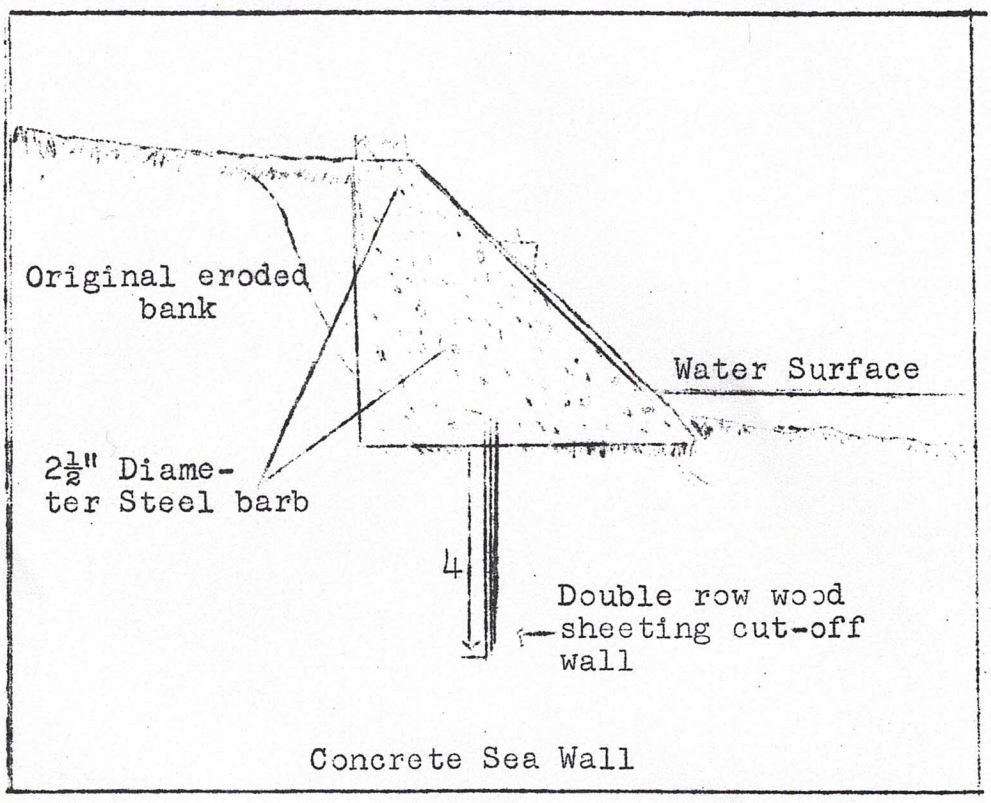


Sea Walls

Sea walls are used to perform the dual function of protecting vulnarable portions of shore area from wave and ice action and at the same time keeping the high banks behind the wall from sliding into the lake. They should be used where no other type of structure will do the job. Sea walls may be constructed with vertical or sloping faces, however, because there are so many disadvantages of the vertical wall this paper will only consider the sloping wall.

A gravity-type concrete wall such as that shown in the illustration may be built without engineering design if the conservative dimensions shown are adhered to. The Gravity-type wall utilizes its own weight for stability. It requires only a small amount of steel to resist temperature stresses.

The purpose of the cut-off wall at the bottom is to decrease the seepage under the wall. During storm periods, the earth behind the wall becomes saturated, with the result that water tends to flow under the wall toward the lake at rather high velocities, carrying bank material with it and eventually undermining the wall.



Revetments or Sea Walls plus Jetties

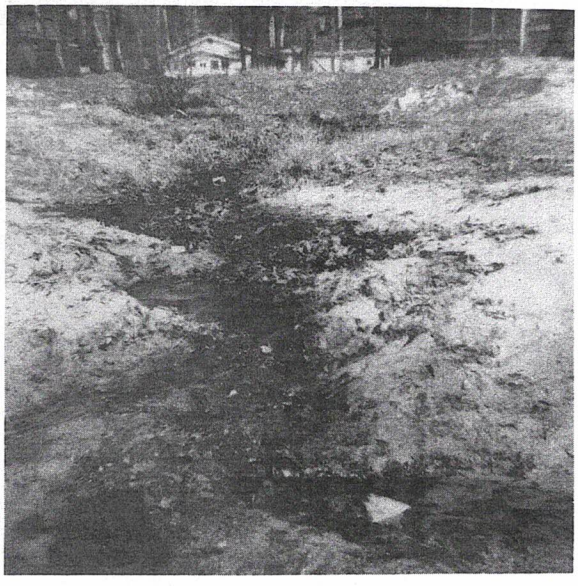
The use of a jettie system in conjunction with sea walls or revetments tends to offset the tendency of these structures to promote scouring. The presence of the jetties eliminates the high velocities in front of the wall and retains or even builds the beach.

SOME SOURCES OF SEDIMENT

Shore soil loosened by ice and eroded into the lake by wave action.

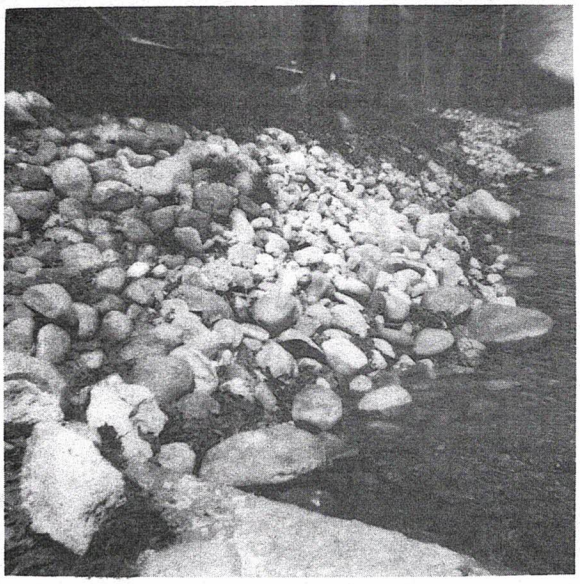
Beach erosion caused by wave action and use by people.

Sediments enter the lake at the end of Hislip Avenue.



Organic sediments enter the lake from this drain on American Legion property.

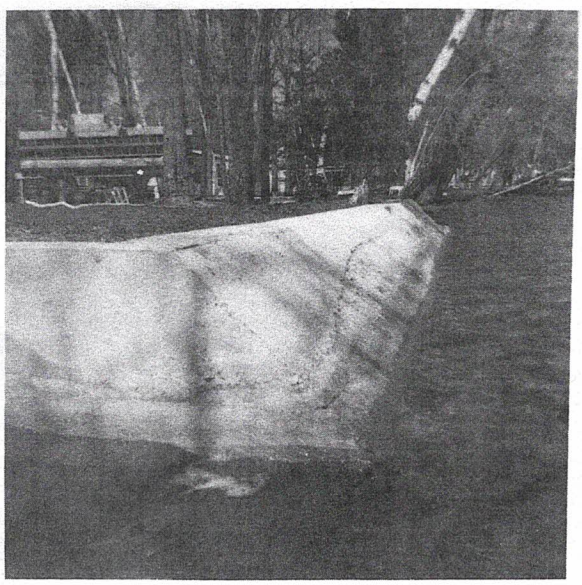
EROSION CONTROL METHODS



Stone Rip-rap Revetment gives excellent protection against wave action and surface water, only partly effective against ice erosion.

Log Jetties, perpendicular to the shore, protects the beach from long shore currents. Log revetment, parallel to the shore protect shore line.

This concrete sea wall is the most effective structure in protecting the shore from ice erosion. The one to one slope permits the ice to move up and over. A perpendicular wall is often times pushed out by ice. The wall protects against wave action erosion also. Walls should be used where nothing else will do the job



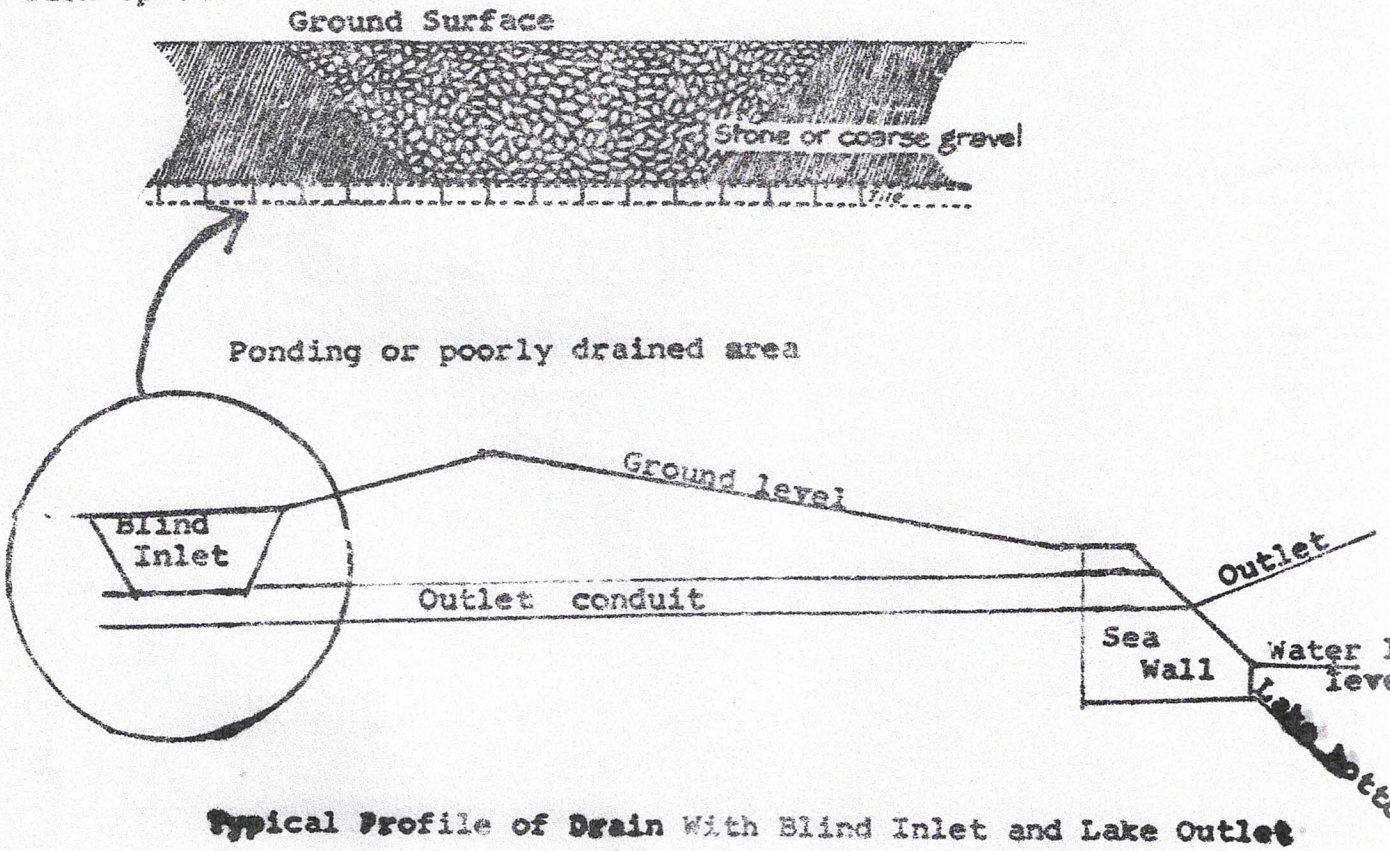
Blind Inlet or French Drain

"The blind inlet is used to remove surface and subsurface water. The rate of removal of impounded water is much slower than that of the surface inlet or open ditch and may not be adequate for large amounts of impounded water.

A method of constructing a blind inlet is as follows: A section of the tile trench above the tile is filled with broken brick or tile, stone, gravel, or crushed rock, or a combination of these materials. The fill should be carefully selected and placed around and about six (6) inches above the tile to meet filter requirements. Above this point up to within twelve (12) to eighteen (18) inches of the ground surface, the material should be graded upward from course to fine and covered with porous topsoil. Graded gravel filters may also be used to construct the blind inlet."

The water quality of the drainage water entering the lake is improved, over that coming from an open ditch, due to the filtering action of the blind inlet. The water quality can be further improved by using topsoil with a sod cover for the upper twelve (12) to eighteen (18) inches of filter material, rather than gravel, crushed stone, etc. The topsoil can also filter out some of the nutrients in the water, as well as solid particles. The gravel or crushed stone will only filter solid materials. However, the size of the blind filter with topsoil will have to be larger than the blind filter using gravel, etc., to drain the same amount of water over a certain period of time.

The figures below show a typical drain with blind inlet. Problem areas need to be considered individually and a drain designed to fit each specific area.



Typical Profile of Drain With Blind Inlet and Lake Outlet

Soil Conservation Service

1."National Engineering Handbook", Section 16, Chapter 5 U.S.D.A Soil Conservation Service.

VEGETATIVE COVER

The primary purpose for planting vegetation on the lake shore is to stabilize it against erosion caused by surface water running over the bank. Planting material can be functional and beautify the bank as well. Grass and low growing shrubs are prefered to tall growing trees for erosion control on steep slopes because they cover the soil much better. Tall, mature trees shade the ground, leaving much of it bare and subject to erosion. Naturally, some trees are desirable, but keep them far enough apart so that there is enough sunlight on the ground to grow some cover.

Grass

Kentucky blue grass and creeping red fescue are some of the best plants to protect soil against the erosion forces of wind and rain. The plants grow close together and have a fiberous root system which holds the soil in place. These are grasses which appear in most lawns in Michigan. They grow best if the slope is no greater than 1.5 horizontal to 1 vertical, however, under special care, grass can be established even on steeper slopes. Grass grows best where there is full sun or only partial shade.

Juniper

Andora and Sagent are low growing junipers which add beauty to the bank and can be grown on fairly steep slopes. Because of their spreading nature, they give good protection to the slope. They can be set out among rocks and other larger plants; however, they need lots of sunlight.

Willow and Dog Wood

Willow and dog wood are plants that will grow well in soil with a high water table. These two plants work in well with stone rip-rap. They will grow through the stone structure and help make it look more natural. The roots will help keep the stones in place. The willow should be of the low shrubery type and not the willow tree. The red stems of the dogwood add color to the landscape.

Autumn Olive

Autumn Olive may be used higher on the bank. It is only moderately effective as an erosion-control plant. Because it is a nitrogen fixing plant, it is uaually vigorous and particularly useful on infertile sites such as sandy eroded lake banks. On bare areas, the light shade, deep roots, and added nitrogen encourage natural establishment of grass and other soil protecting plants. Wildlife find food and shelter in these plantings.

The plant matures from 10 to 15 feet in height. They should be planted six to eight feet apart. In spring, autumn olive has an abundance of sweet scented flowers. They are yellow, small and trumpet shaped. When autumn olive berries ripen, they are red with brown scales.

CONCLUSIONS

Although the first recipients of lake improvement will be the people who own property contiguous to the lake, Higgins Lake is a natural resource which belongs to all the people of Michigan. Much of the tax base for Lyon and Gerrish township is dependent upon property contiguous to or in close approximation to the lake. The county road commission does not derive any direct revenue from the increase value of property due to the lake. However, being in service to the people of Roscommon County, it should also be interested in what is beneficial to those people.

Each interest group must do their part in preventing pollutants from entering the lake, but it will be necessary for one group to take leadership to coordinate activities and to see that the work is done. The property owners stand to lose or benefit the most, but are not the sole beneficaries. The Higgins Lake Drainage Basin Study Committee, which represents all interested parties, could best coordinate the preservation activities; however, they are not an action group. Therefore, the study committee can continue to gather and coordinate information, the property owners can assume leadership in getting the necessary work done.

IT'S THE LAW

Before you put any erosion control structure into the lake, obtain a permit from the Department of Natural Resources. You can obtain an application from the district office.