BIOLOGICAL SURVEY

of the

LITTLE SANDY AND UPPER LICKING RIVER WATERSHEDS

1941

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to the
DIRECTOR OF THE DIVISION
OF GAME AND FISH

SURVEY REPORT NO.2

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Purpose of the Survey

The primary object of these investigations is to foumulate a systematic stocking policy with the proper species in accordance with the physical and biological conditions of each stream.

The "Trail and Error Method" of stockigg fish is as uneconomical a method for a Game and Fish Department to use as for a tourist bound directly for New York from Kentucky to go by California. The"Trail and Error Method" will work after thousands of dollars have been spent unnecessarly. In using this method, the streams which are suitable to fishes that each receives will become better fishing streams. But on the other hand, if a stream receives fishes and its conditions are unfavorable to that species stocked or even to all species stocked, the fish must die or move out into another stream. In most cases fishes placed in unsuitable water die. Thus no improvement is made in that stream but instead we have a total loss. Our fish are highly restricted in that the type bottom, the amount

of vegetation, the temperature, the kinds and abundance of foods present, the amount andtype of pollution present, etc., are all regulating factors as to whether reasonable success can be expected.

Money spent for stocking streams which are unsuitable for stocking could in most cases be usedto improve that stream by correcting the factors which makes it unsuitable. At the present time we do not have a large enough supply of fishes for stocking purposes to stock our best streams in this state properly. Fish lost by stocking unsuitable streams or lakes is not only a loss of money but also a loss of time in developing and bettering our streams for fishing.

Another purpose of the survey is to determine what fishes each stream already contains and whether the conditions are suitable for the introduction of other species. If a stream is inhabited largely by carp and gars, it would hardly be suitable to the stocking of bass.

Still another purpose of the survey is to

determine the need for stream or lake improvement. Certain streams have a scarcity of pools or cover and thus give little protection to the fish. On the other hand, there may be an abundance of fine pools and plenty of cover but not enough food. A lack of any one of the favorable conditions, whether physical or biological, will tend to produce poor fishing. Therefore, it is obvious that if such unsatisfactory conditions as are present can only be corrected in part, the chances for a stream to provide better fishing will be raised considerably.

The completion of the survey program will provide the Game and Fish Division with the fundamental data necessary to establish a scientific fish management policy for the state.

The Upper Licking River Watershed

The Upper Licking River Watershed

The Licking River rises in the southeastern part of Kentucky in Magoffin County. The air line distance between source and mouth is about 135 miles. The course of the river is extremely meandering so that the distance from the source to the mouth is 320 miles. In some places the river follows a course twelve miles long between points only three miles apart. The basin includes all of the counties of Harrison, Robertson, Fleming, Nicholas, Burbon, and Bath, most of the area of the counties of Kenton, Campbell, Pendleton, Mason, Rowan, Morgan, Magoffin, Menifee, and Montgomery, and small portions of Boone, Grant, Clark, Elliott, Lewis, and Bracken Counties. The total drainage area is 3,673 square miles.

As was stated in my report of last year, certain types of boulders found in the Big Sandy and the upper waters of the Licking River indicates that the ancient Big Sandy River had its headwaters in the Roan Mountain region of western

North Carolina and southwestern Virginia. The occurrence of quartzite boulders on the upper waters of the Licking River indicates the the Big Sandy flowed over the Licking to the northwest. Structural elevation, it is said, along the nearly north and south axis of Paint Creek in Johnson County has operated to bisect the waters ~~wa ters~~ of the Big Sandy and thus form the Licking River.

Throughout the lower central and lower Licking, low spurs and hills, rising to common levels, mark the elevation of the bed of the s tream in the geologic past. The hills and spurs are capped by thin deposits of gravel and silt, not over five feet in thickness. Slight structural irregularities are found at various places in the basin. These minor anticlines have localized oil in commerical quanities.

The topography of the Licking Watershed is generally rugged being hilly to mountainous, except near the head of the South Fork, where

it is rolling. The valley is narrow in most sections. The section below West Liberty to Yale is characterized by narrow valleys. For a bout ten miles before the river leaves the mountain section near Yale, it flows through a gorge called "The Narrows". The river then flows for twenty-six miles through a section where the bottom lands are wide and of low elevation. From this point on to Wyoming the course is through a stretch of alternately narrow and wide sections of the valley. It is in the section from Yale to Wyoming that disastrous floods occur. The Salyersville section also has a flood problem.

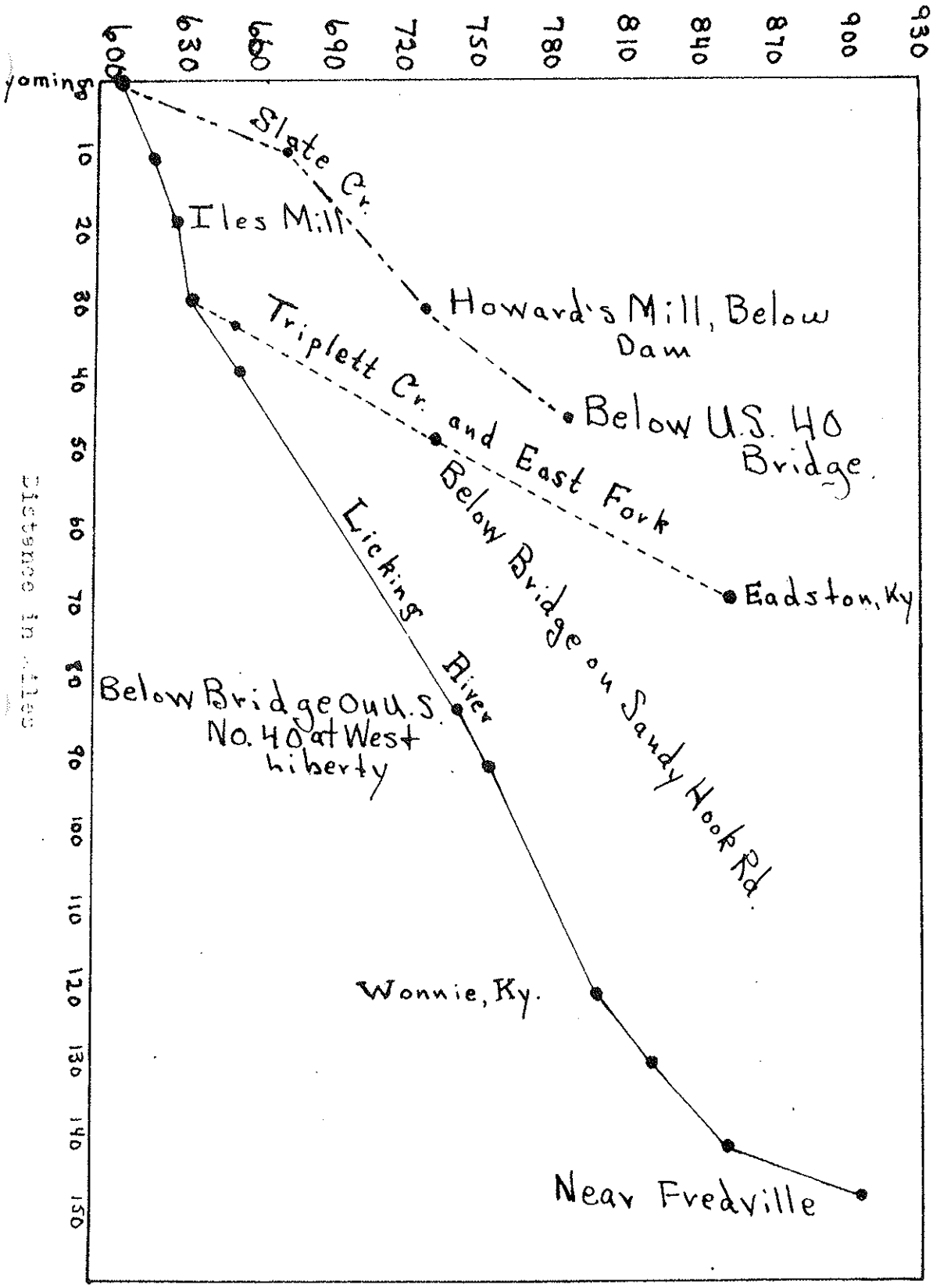
Most of the timber of the watershed has long been cut and it is only in a few sections that goood second growth timber is to be found. The character of the basin is predominantly rural. The average density of population which is about 65 per squafe mile for the entire state is 22.05 per square mile in Menifee, 36.6 por square mile in Morgan, 52.04 per square mile in Magoffin,

40.04 per square mile in Rowan, and 36 per square mile in Bath County. Kenton County has the maximum density of population for the basin with 573.8 per square mile.

At Fredville, which is a small town located in the headwaters of Licking, the approximate elevation is 912 feet. The gradient of that section of Licking River worked this year, that is from the source to Wyoming, is 1.98 feet per mile. Licking River is subject to flash floods due to the steepness of the slopes of the hills in the upper drainage. Many of the slopes have been entirely denuded of its timber, hence, the run-off is greater now than formerly.

At the present time there is no existing navigation project on Licking River. Before the advent of railroads, the stream carried considerable rafting traffic. This has ceased almost entirely due to the fact that most of the timber has been cut and that sawmills are located now in those vicinities where there is timber.

Mineral resources include coal, oil, oil shale, fire clay, building stone, and iron ore.



Profile of Licking River Including Slate and Triplett Creeks

The first iron ore smelting west of the Alleghenies was done near the present site of Owensville about 1790. In 1860, Kentucky ranked fourth among the states in iron production and the Licking Valley ores were largely responsible for its position. Some ore was produced up until about 1917. At the present, iron ore deposits have been worked out for the most part and the reserves are small and of low grade. The fire clays found in Bowan County are of superior quality and considerable quanity. A large number of wells were drilled for oil and gas some years ago in the valley. Vary little oil has bee ever produced ubt considerable amounts of natural gas has been produced in some sections. The reserves of oil shale and coal are large.

THE LARGER TRIBUTARIES OF LICKING RIVER

Elk Creek

Elk Creek rises in the northeastern section of Morgan County and flows in a general easterly direction to its junction with Licking River two and half miles below West Liberty. The watershed of Elk Creek extends, on the east, to the watershed of Paint Creek and on the north to the headwaters of the Little Sandy Watershed.

The creek is about 22 miles long. It flows over a moderate gradient through a rather wide valley for the most part. All of the bottom land has been under cultivation in recent years and most of the slopes have been cleared either for cultivation or grazing. Some very good pools are found in this creek, especially in the lower central section where a relatively light amount of fishing is done in the spring and early summer months. Cover, vegetation, shade, food, and bottom is good. By stocking this creek, as recommended later on in this report under the section of Stocking Policy for the Watershed, fishing should improve rapidly in Elk Creek.

Caney Creek

Caney Creek rises in the southern part of Morgan County and flows directly north through a narrow valley to its junction with Licking River. This watersned is thickly settled for a country section and therefore most all of any growth of timber has been removed. At one time this creek abounded in good fishing but at the present time the creek has filled in so that few if any good pools remain.

A fairly good road runs the entire length of the creek. The Creek receives a small amount of pollution from both coal mines and saw mills. No recommendation is made for the improvement of this stream.

Grassy Creek

Grassy Creek rises in the southern section of Morgan County and flows north to Licking River. The valley for the most part is very narrow and

the banks of the stream are steep and even gorged in the lower section. Here is found a good second growth of timber. The stream is well shaded, has plenty of cover and food.

Form Highway Noumber 40 down stream to the mouth good pools, with a ratio to the riffles of 40-60, are found. In the dry months of late summer and early fall, fish suffer in this stream from a lack of dissolved oxygen. In very dry times the creek is dry except in one or two sections and fish have been known to die by the thousands. It was reported to me by natives in the section that the creek was stocked heavely some six or seven years ago. The fish stocked did fine for a year or two and then beaause of a dry hot summer most all died.

The lower third of this creek could be stocked profitabey perhaps if it were not for the fact that there is some pollution form oil. The amount of pollution received is very small and has little effect except in times when the creek is low and there is no run-off. The coating

of oil on the surface of the water causes the amount of dissolved oxygen present in the water to be so depleted that many fish are lost. Unless this small trickle of pollution can be stopped or until we have more fish for distribution than can be used in our best streams, it is recommended that this creek be left unstocked. Stocking Grassy Creek under present conditions involves a chance of loss of the fish stocked.

Blackwater Creek

Blackwater Creeek, which is as picturesque as any of its size to be found in the state, rises in the southwestern part of Morgan County and flows north to Licking River through steep and abrupt slopes. There is little level upland in this watershed as the entire section is hilly and the valleys are all narrow and steep.

At the present time there is no good road in the watershed except the State Highway through Ezel. However, several county roads are proposed

so that before long the fishing possibilities which Blackwater has should be opened to the public.

Blackwater is only fourteen miles long. However, beginning just below Ezel, excellent pools are found that are well shaded and which contains an abundance of food and cover. The bottom is made up of boulder, rubble, gravel, and some sand. Vegetation is plentiful. The sudden cloud-burst in July of 1939 caused many of the old pools to be cleaned out and still others to be created. Some of the shade was destroyed by the onrush of wa ter but enough large trees are left to well shade the water and protect the banks of the stream. Uprooted trees and huge boulders torn from surrounding cliffs have helped to create new pools.

By stocking this stream with small- mouthed bass it should develope into an excellent fishing stream. No pollution was found in this watershed except drainage from toilets. As the section is sparsely settled, pollution from this source isnegligible.

Fishing Conditions in Magoffin County

Magoffin County, which is centrally located in the Eastern Kentucky Coal Field, is drained entirely by the headwaters of the Licking River. Fishing is relatively light is this county as there is few good fishing streams. Suckers and other coarse fishes are most abundant although, bass and sunfish as well as channel cat fishing is fair in the extreme west end of the county. So far as fishing is concerned, none of the tributaries of Licking River found in Magoffin County are of any value with the one possible exception of Middle Fork. Middle Fork is a short creek arising in the southwestern section of the county. The type, size, and frequency of pools is very poor and because of this, it did not warrant a discussion under a separate heading. Some small-mouthed bass and sunfish fishing is to be found in the creek.

Much illegal fishing is done in the streams of this county. It was reported several times

by different individuals of the county that Licking River is seined practically every day throughout the summer and early fall at various points between the Morgan County Line and Elsie in Magoffin. This is the best fishing region and about the only fishing region found in the county.

Fishing Condition in Morgan County

Morgan County, geographically located in a central position in Eastern Kentucky, is drained entirely by the Licking River. This county has excellent fishing waters not only in the main stream but also in some of its larger creeks. That section of Licking River between Licking River, Kentucky and Rowan County line, offers as good fishing as dose any other section of the entire river. The river in this section is primarily a small-mouthed bass and spotted channel cat region. Many Kentucky bass, as well as the large-mouthed bass, the goggle-eye, and the blue channel cat are also caught. Fishing in the region is relatively light; however, it is practically inaccessible because of a lack of passable roads. Fishing in the region will increase in the near future as roads are improved.

Much illegal fishing is practiced in this county. Seining is a common occurrence over the county especially in the region between West

Liberty and the Nagoffin County line. In 1938 only 117 fisning license were sold in Morgan County out of a population of 15,130. In other words, only seven-tenths(7/10) of one per cent of the total population of this county bought fishing license.

THE UPPER NORTH FORK OF LICKING RIVER

North Fork of Licking River

There are two tributaries of Licking River which have the name of North Fork of Licking. The one under discussion here rises in the northern part of Morgan County, flows west to Rowan County and then southwest, forming the boundary between Rowan and Morgan County until it reaches its mouth below Bangor. The lower North Fork which is much the larger, rises in Lewis County and then flows through parts of Fleming, Mason, Robertson, and Bracken Counties.

The Upper North Fork, which is approximately twenty miles long, flows through steep slopes which are covered with a very good growth of timber. In a few places in the upper section, the stream bed has been changed to make way for a road through the narrow valley. In this section pools were destroyed and converted into swift-water or riffle areas. In one or two places the stream has been shortened by cutting through the neck of a large bend. The water in the cut-

off bend of the creek was impounded by fills in road building and thus two small lakes were formed.

Below Leisure, Kentucky, good pools are found down stream to the mouth. While there is more riffle area than pool, the stream is an excellent small-mouthed bass stream. Overhanging cliffs, large boulders, and brush in the stream offers fine hiding places for young fish. In the lower section, good growths of waterweed also shelters many young fishes. The bottom is made up of rubble, boulder, gravel, and sand. The gradient of the stream is steep generally, though it levels out somewhat in the lower section. Shade is better than fair and food is present in an abundance.

Much seining is done in the stream but little harm is done by this as North Fork contains to many boulders, logs, and clumps of brush. However, dynamiting occurs throughout the year in that section of the stream entirely in Morgan County and therefore should not be stockedin that section. It is recommended that North Fork be stocked between the mouth of Craney Creek and Bangor only.

Beaver Creek

Beaver Creek rises in the central section of Menifee County and flows to the northeast to its junction with Licking River near the Rowan-Bath County line. The creek is approximately eighteen miles long. It flows through a narrow valley which has steep and abrupt slopes that are well wooded. The County seat of Menifee, Frenchburg, is located on the creek in the headwaters. In 1939 the Civilian Conservation Corps built a good road which is passable at all times up Beaver Creek, connecting Frenchburg and Morehead.

Beaver Creek contains a few very good pools of water. The pools are well shaded and have plenty of food and cover. Long shallow areas which have an abundant growth of waterweed and algae offers fine food and protection to the young fish. Natural spawing is adequate to meet the demands of the fisherman as of this year. However, as this section has been opened to more fishing

only recently, it is recommended that it be stocked biennially beginning with the year 1941.

Fishing Conditions in Menifee County

Menifee County is located on the western border of the Eastern Kentucky Coal Field and is drained by both Licking and Red Rivers. Fishing in the county has been extremely light which is probably due to the lack of roads leading to the stream. In 1935 only three tenths of one per cent of the total population of the county bought fishing licenses. In 1938 the noumber buying licenses was doubled. No doubt as roads are further developed, as is being done at present, interest in fishing will be aroused over the county.

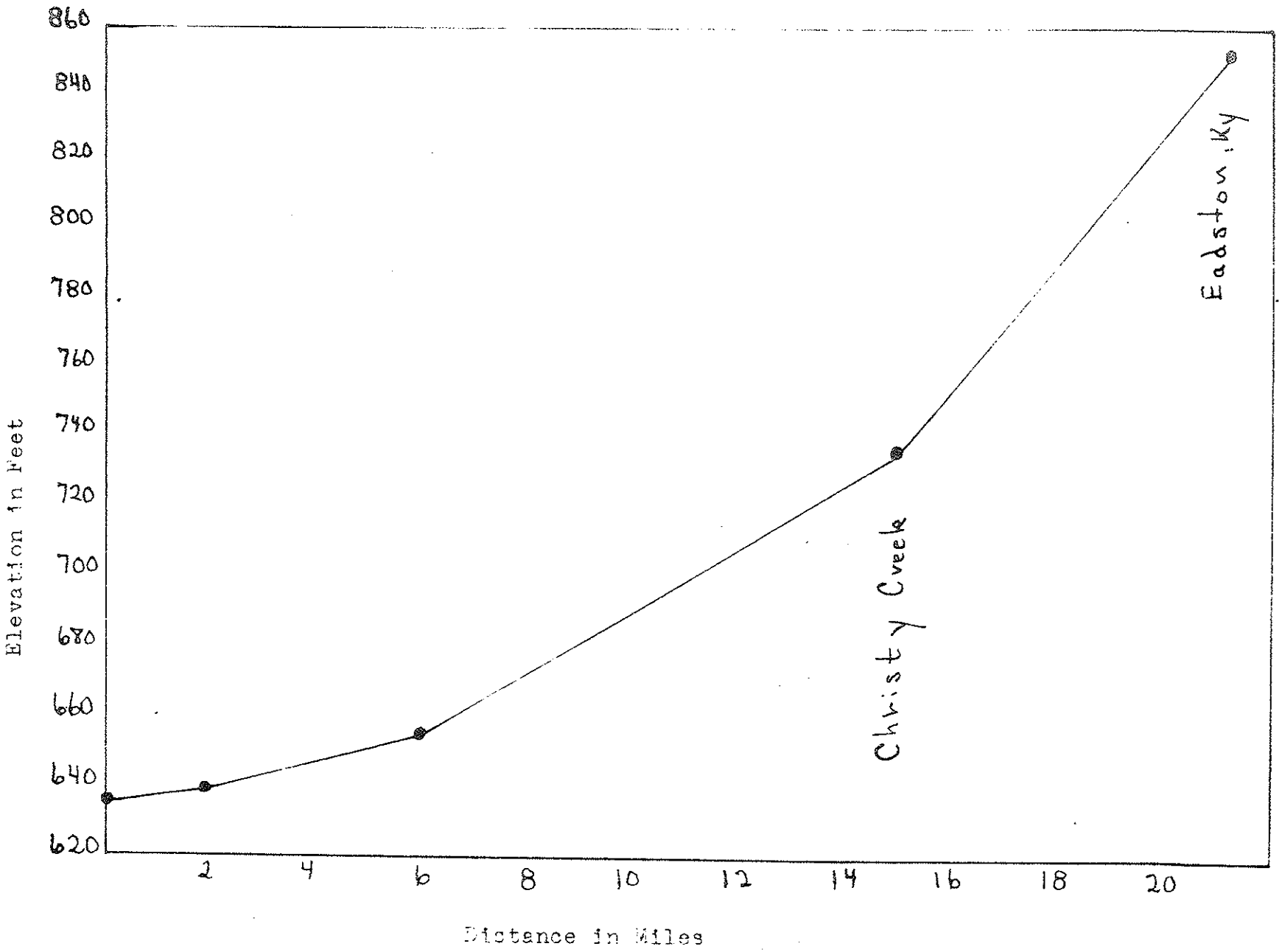
Many good fishing sections are found in the northern and southern parts of the county as well as in connecting counties. Small and large-mouthed bass fishing is excellent in that section of Licking River in Menifee and Morgan counties. It is reported that Red River is also an excellent fishing stream.

Fishing Conditions in Rowan County

Rowan County, located in northeastern Kentucky in the Knobs Belt, is drained entirely by Licking River and its tributaries. The two main tributaries being Triplett Creek and Upper North Fork of Licking. Throughout the county many people are interested in fishing and the problems invloved therein. Most of the people obey our fishing laws and many help in watching the streams to see that still others do no disobey without being reported to the game wardon. Rowan County has an active Game and Fish Club which is partly responsible for the increased interest in fishing.

Probably no better fisning is to be found anywhere in the state than is found in Rowan County. Beside the excellent muskallunge fishing in Triplett, Triplett, North Fork, and that section of Licking above Farmers offers excellent bass, catfish, and sucker fishing of maost all species native to the state. An occasional sturgeon and spoon bill cat is alos reported from Licking River in this vicinity.

TRIPLETT CREEK


Profile of Triplett Creek and East Fork of Triplett
860
840
820
800
780
760
740
720
700
680
660
640
620
Elevation in Feet
2
4
6
8
10
12
14
16
18
20
Distance in Miles
Christy Creek
Edaston, Ky

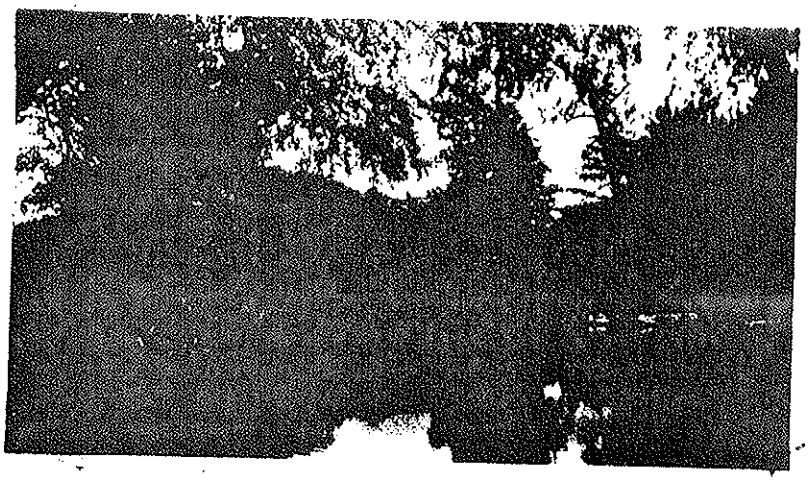
Triplett Creek

Triplett Creek rises in the northern part of Rowan County and flows in a southwestern direction to its junction with Licking River just below Farmers. The main creek is composed of two parts as the main creek itself is only about three miles long. The two main forks of the creek are the North and South Fork. The Triplett Watershed drains two-thirds of the area of Rowan County.

The South Fork of Triplett is approximately seventeen miles long. The valley is relatively wide and the gradient steep. Most of the second growth timber has been removed so that the water rushes off the slopes causing sudden floods in the area. The flood of July 1959 not only destroyed pool areas in the upper region but left the stream with no definite channel. Little other damage was done to the stream itself. The water company of Morehead has erecteda dam across this fork which backs water three-quarters of a mile up

North Fork of Triplett Creek

One of the Better Fishing Streams of this State



Rowan County

stream. Above the dam is found a fair pool of water. It has filled in now though and is comparatively shallow in most section. Several other good pools of water are found in this fork. However sewage from Morehead enters the stream causing it to be polluted for some distance down stream. Stocking South Fork, other than the pool above the dam, is not recommended at this time.

The North Fork which is approximately twenty-three miles long flows through a relatively narrow valley which has a fair stand of second growth timber. In the fall of 1939 a good road was constructed running almost the entire length of the creek making it accessible at all times to the ever increasing demands of the growing number of fishermen of the county.

It is this fork of Triplett that causes the creek to have the name of one of the best fishing streams in Kentucky. An abundance of fine pools are found from Triplett, Kentucky down stream to the mouth. Many of the pools are longer,

wider, and deeper than one might expect to find in a short creek of this nature. The "Weaver Hole" is one on the best examples of a pool of this type. The creek flows over a steep gradient covered by good shade. The bottom is made up largely of rubble, gravel, and sand. The pool-riffle area is about 50-50 or a little better.

The largest muskallunge caught in the state, weighing fourty-two pounds, was taken from Triplett Creek. Muskallunge fishing is excellent in the creek as is small and large-mouthed bass, channel cat, brown bullhead and yellow cat. The Mud Pickerel is taken occasionally but since it seldomly exceeds a length of twelve inches it should not be confused with the muskallunge. The muskallunge caught in streams of Kentucky is very much like the one taken from the Great Lakes. Our species is a subspecies of the more northern form and as might be expected, it differs only in a few minor details from the northern form.

Fishing in North Fork of Triplett is medium to heavy. It is recommended that this creek be

stocked biennially rather than annually since natural spawning is good but not adequate. As this section undergoes further development and if the interest in fishing continues to rise as it has in the past four years in Newton County, the creek will have to be stocked some each year. However, it should be at least five or six years before this requirement of annual stocking will take place.

Triplett Creek

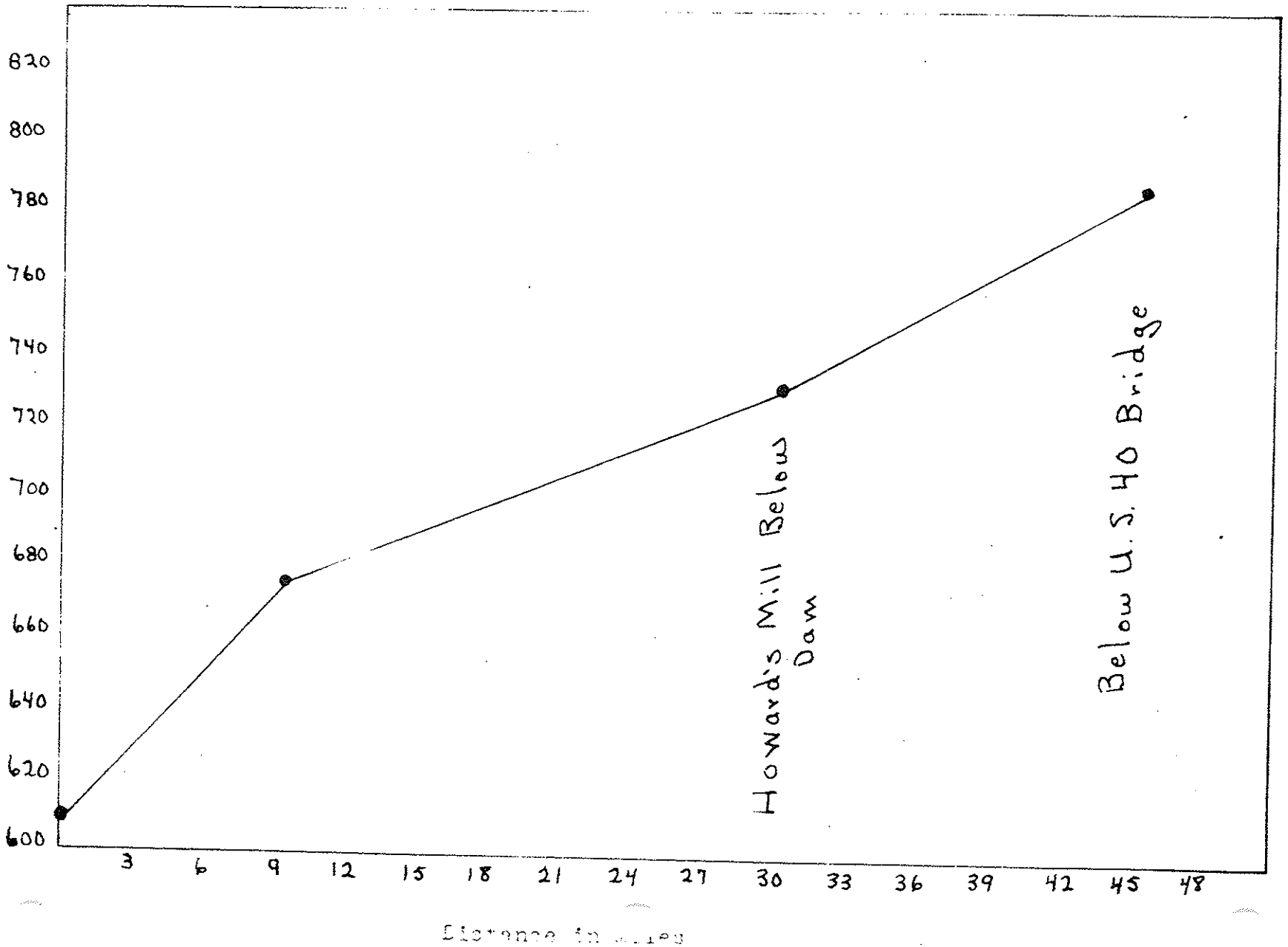
Salt Lick Creek

Salt Lick rises in the northwestern section of Menifee County and flows directly north into Bath to its mouth at Licking River near Salt Lick, Kentucky. When first viewing this creek from the lower section, one would not expect to find any pools of value in the stream. However, above Salt Lick, Kentucky, a few pools of value are found. The creek flows through a rather wide valley and the stream itself is well shaded. In the warmer summer months, the stream becomes low and practically ceases to flow. It is at this time that the oxygen supply becomes dangerously low in the creek.

No stocking is recommended for the creek as the pool value is poor, fishing is relatively light, and natural spawning is thus adequate.

SLATE CREEK

Profile of Slate Creek



Slate Creek

Slate Creek rises in the very southeastern section of Montgomery County and flows north through the eastern section of Montgomery to enter Bath County. Slate Creek again flows north in Bath, draining the central section of the county, to its mouth at Wyoming. The approximate length of the creek is fifty-four miles. The watershed is situated in the outer section of the Knobs Belt of central eastern Kentucky. The creek flows through a narrow and steep valley for the most part. Practically all timber growth has been removed from the more level upland to make way for farming. The steeper slopes and the streams banks do however have a good growth of timber and for this reason more than any one other reason, the creek still has many deep pools.

The gradient of the creek as a whole is steep. The average fall from Highway Number 60 Bridge in the headwaters to the mouth is approximately four feet to the mile. The section of Slate in Montgomery has considerably less fall per mile than does the section in lower Slate. At Howard's

Showing pool areas of Slate Creek near Owingsville

Mill a dam has been erected across the stream which is eighty feet wide and about ten feet high. This is the source of the water supply for Mt. Sterling. The dam backs water up stream for a distance of four miles. This particular pool of water offers good bass fishing and is fished heavily. Many other excellent pools of water are found in the Montgomery County section. All of these are fished heavily.

In Bath County excellent pools are found down stream to about the mouth of Whiteoak Creek. From Whiteoak to the mouth is a riffle area which has a solid rock bottom for the most part. This however, is for a distance of only one mile. The pools have a sand, gravel, rock, with some mud for a bottom, while the riffle areas are made up mostly of rubble, gravel and an occasional solid rock bottom. Shade extends far out over the stream in most cases keeping the water relatively cool. The riffle and shallow water areas have in most places an abundant growth of waterweed and algae where the young fishes can seek food and

Showing Shallow Water Areas and Abundant Vegetation

A Section of Slate Near Forge Mill

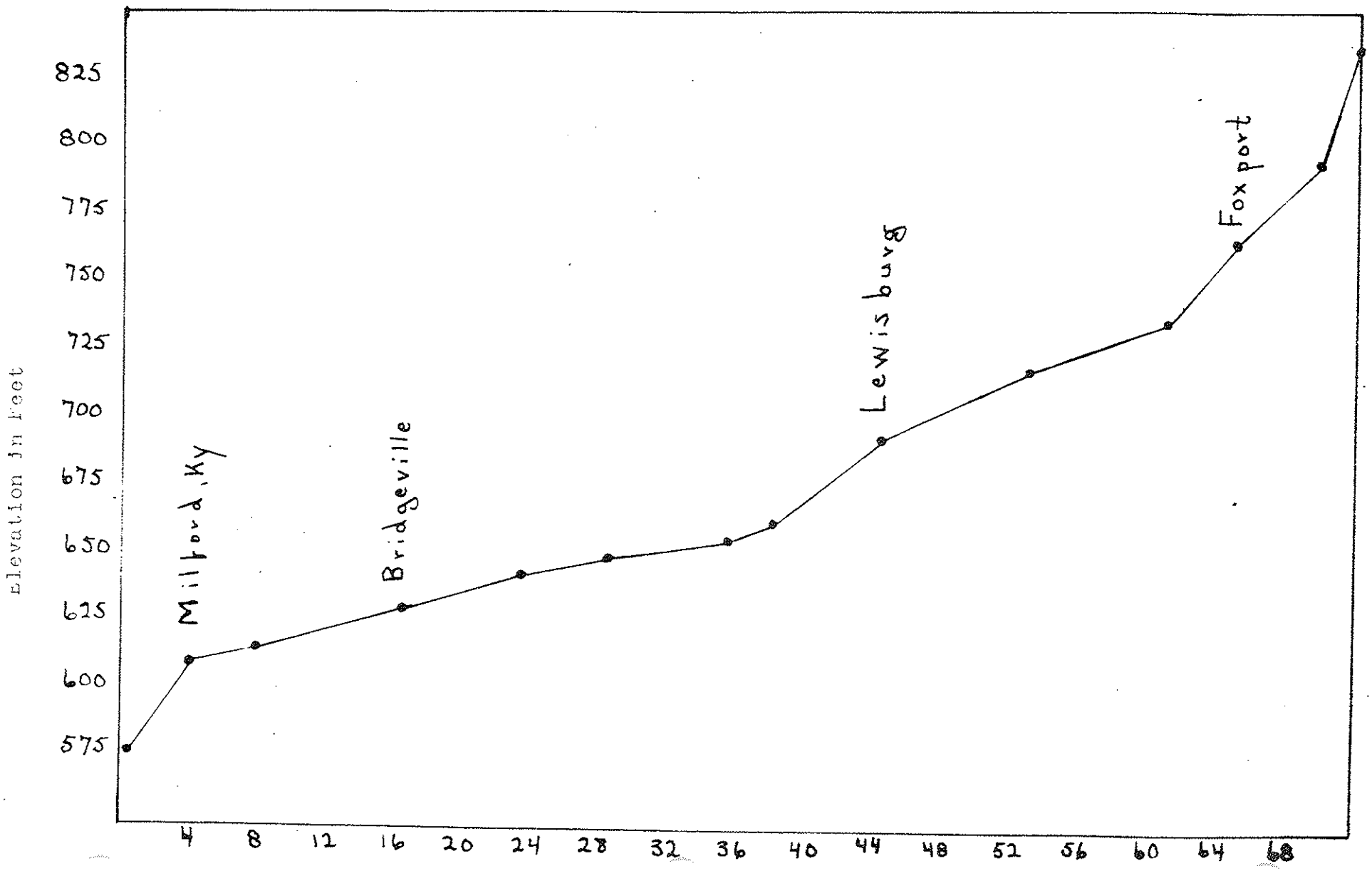
cover while making a rapid growth.

Good roads cover the watershed making the creek accessible to the fisherman at all times. Many people interested in fishing from Lexington to Morehead and from Flemingsburg to Frenchburg regard this as the favorite fishing stream of the section. While Slate Creek is primarily a bass stream, many other species are also taken. It was reported this year that several muskallunge were taken from the creek. Many large channel and blue cats are also taken yearly.

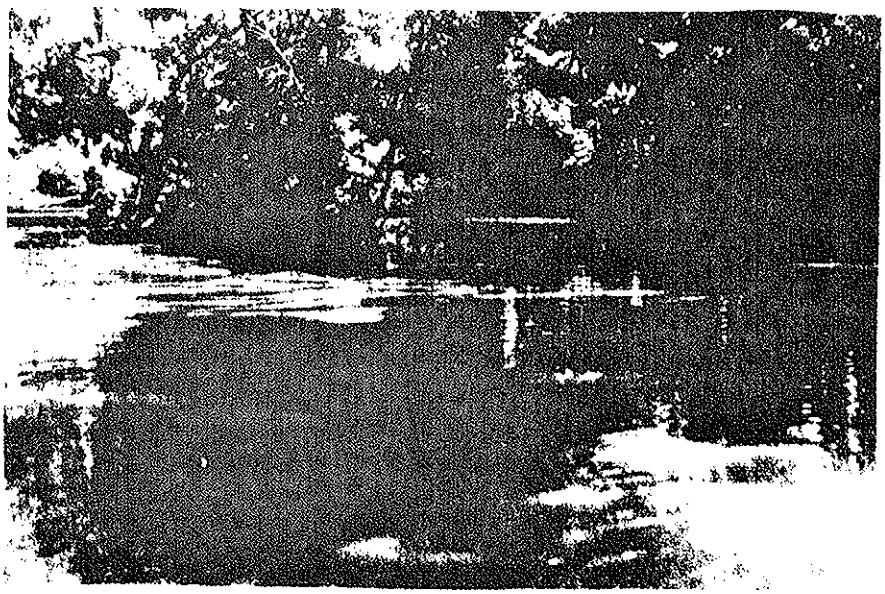
It is recommended that the creek be stocked annually as given later on in this report.

THE LOWER NORTH FORK OF LICKING RIVER

Profile of Lower North Fork of Licking River



Picture Taken at Bridge on Mt. Carmel
Tollsboro Road

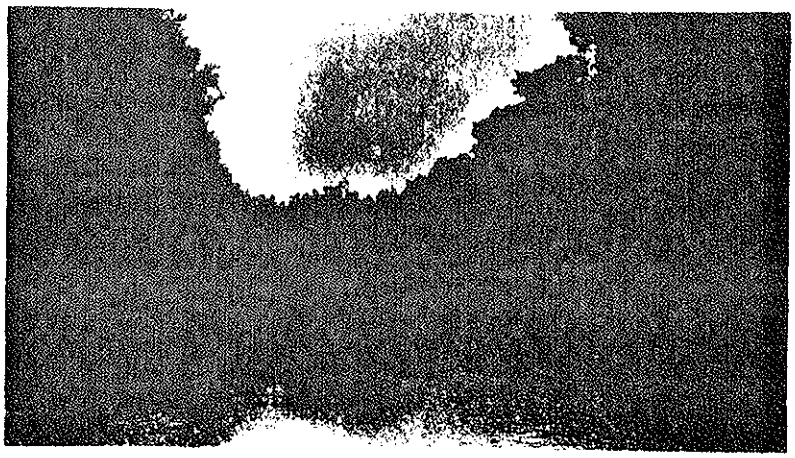


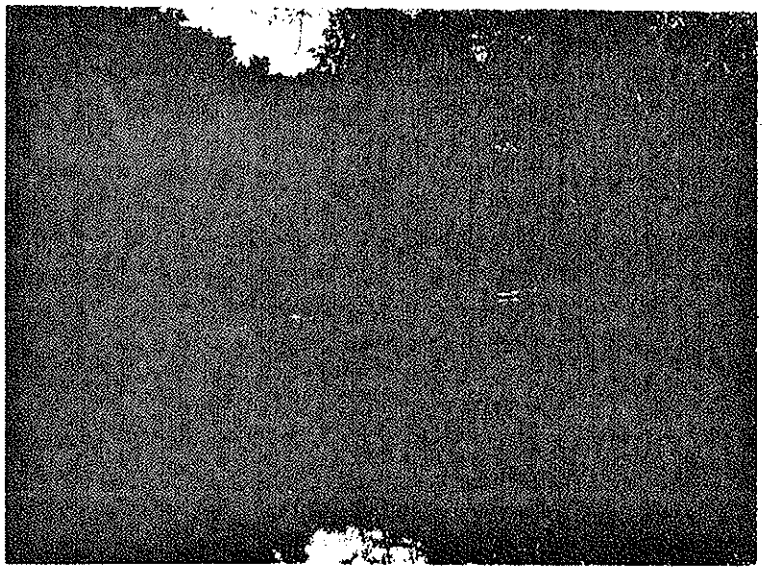
Showing the beginning of the better pool areas
in North Fork

Lower North Fork of Licking

North Fork rises in southwestern Lewis and northeastern Fleming Counties and flows northwest to Mason County. Across Mason County the creek flows directly west, then forms the boundary line between Bracken and Robertson Counties as far as Santa Fe. Here the creek enters Bracken County to empty into Licking just west of Milford. The entire length of the creek is approximately 77 miles. The headwater region is fed by many springs, none of which give out a very large volume of water but some of which are sulphur water. The most famous of the sulphur water springs is Bowman Springs.

That section of the creek above the Mt. Carmel - Tollsboro bridge is made up of long shallow and riffle areas. Parts of this section ~~has~~ have little fall. For this reason and for the fact that the valley is wide and has been largely cleared, this headwater region has much mud bottom. Begining below the above section and continuing





Upper Central Section of North Fork

on down stream to the mouth of Wells Creek is found the only good section of the stream. Below this point and on down stream to Milford the creek has little value. In this section the creek has little fall per mile and here again we find the more shallow areas with mud bottom. Shade in the area has been almost totally destroyed. The valley is wider than on other sections and therefore is cultivated frequently. Durning heavy showers the plowed fields contribute much silt or mud which causes the almost continous roily condition of the creek during the late spring and summer.

Fishing in North Fork is good some years while very little is caught in other years. The Lewisburg-Taylor Mill section offers fair fishing practically every year. A Noumber of unfavorable conditions exist in this creek and which affect or rule fishing conditions. The first serious condition is that of the large amount of silt in the creek. Should there be heavy showers

immediately after spawning, practically all of the fry are destroyed by the soil washing from newly cultivated fields and by the silt already present in the stream in such large amounts in both the headwater and lower sections. Silting of the bottom dilutes the settling organic material to such an extent that the bottom animals have a poor food supply. Too sediment has destroyed, in over Half the creek, the weed beds which furnish shelter and food. At least two thirds of the available spawning grounds which North Fork had thirty years ago has been destroyed. The gravel bars have largely been covered except in the upper central section. Once the fishes have deposited their eggs, it is silt that covers and destroys most of them.

The long periods of muddy water also affects natural spawning in that successive spawning does not take place to any great extent. Should there be a cold spring and the temperatue of the water slow to rise, only a small percentage of the bass would be expected to spawn durning this

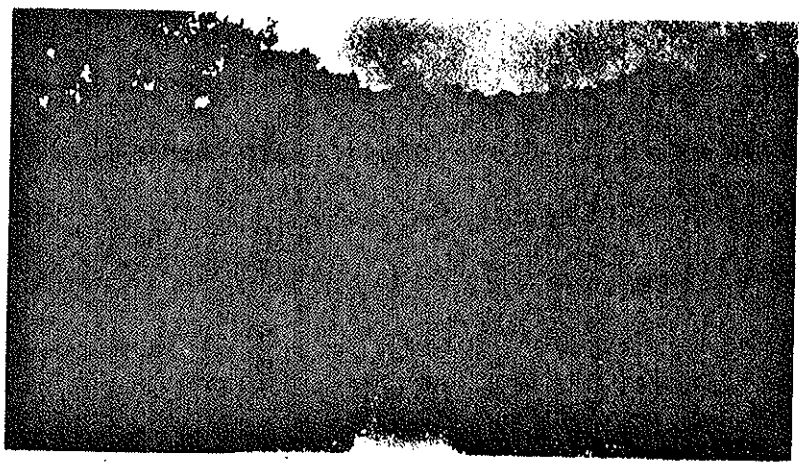
time. In some streams where conditions are not as bad as they are in North Fork, this late spawning would result in the saving of many thousands of fry. As of this year and of a large percentage of former years, as far as could be ascertained, the creek remains muddy until late summer. Therefore good fishing could only be expected in the creek three or four years after each successful spawning season.

On checking the growth rate of bass in North Fork and after comparing it with that of other streams, it was found that the young have a comparatively high rate of growth. Some few sections of the stream have a fair amount of available food but the stream as a whole only has a poor amount of food for the fishes. The fast growth rate of fish in North Fork is probably influenced by the fact that competion for food is less keen than in more normal streams. In other words, while fewer fish are permitted to survive, they have a faster growth rate because there is more food available per fish.

Forage fishes are relatively scarce in the creek. This of course is a limit on the food supply and causes cannibalism among bass. By stocking North Fork with such minnows as the stone roller (Campostoma anomalum), the fat head (Pimephales promelas), and the blunt-nosed minnow (Hyborhynchus notatus, fishing would improve.

It is recommended that land owners along this creek be urged to plant and to allow to grow, teees and shrubs along the banks. The creek banks should have at least a twenty-five foot wide belt on either bank next to the stream. This will not only benifit the fish in the stream but also the landowner himself. Once a farm bank is set up with a good growth of trees and the like and if the strip of trees and shrubs along the bank is wide enough, much of the silt that is now washed away by the creek will be conserved. Also much of the silt now in the creek will be washed out and the stream returned slowly to its

Showing North Pork in the Lower Section.

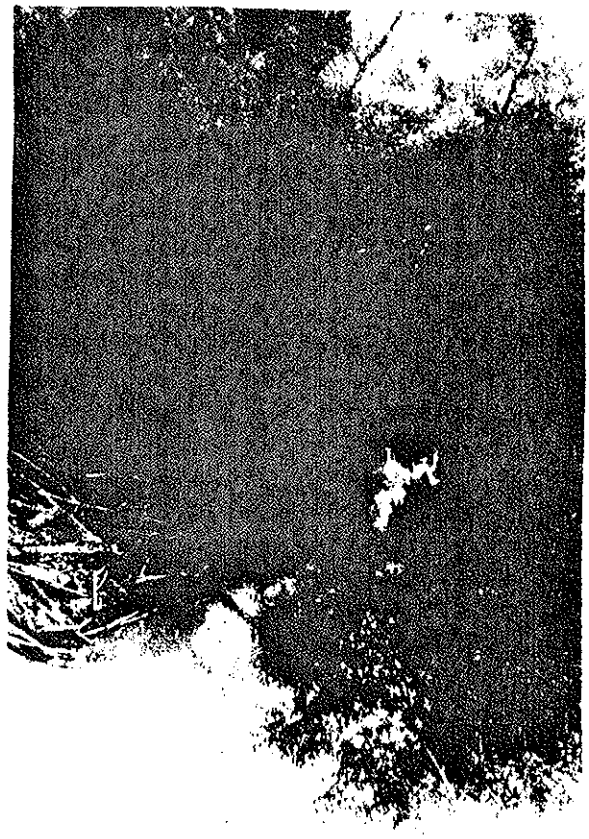


Note the Cultivation of the Stream Banks

former bed which is now in places covered to a depth of five to ten feet by silt deposits. Little planting of trees would have to be done along the creek as the banks have to be cleared constantly by the farmer now. Twigs broken from the many willows found along North Fork and pushed into the earth would soon develope a protective growth strip. As these willows developed, other species of trees would find roots and growing spaces.

In the lower central section many piles of brush and logs are found in the creek. These have several beneficial effects rather than a harmful one. These stream obstructions create pools not only up stream but also below in the final stages. As the pool up stream fills in, the permanent pool is created below the obstruction. In places the brush and logs serve as deflectors in widening and deepening the stream. Also the brush and logs serve as shelter for the young species and "spawning grounds" for some mature forms.

Showing North Fork Near Mouth of Clark's Run. (Lower Central Section)



By a graph of the percentage of saturation of of dissolved in this creek, it is plainly shown that dissolved oxygen in low in the entire creek. In the pool above the old dam site at Taylor's Mill, dissolved oxygen was found to amount to only 2.9 parts per million. Beginning at the mt. Carmel - Toolsboro bridge, dissolved oxygen decreased in amount present down stream to a point just below Taylor's Mill. This is accounted for in part by the fact that riffles or objects which might cause the aeration of the water decrease down to the same point. Also mud is washed into the stream carrying with it organic matter which on decaying removes oxygen from the water. More mud or silt is found in this section and the section beginning at Well's Creek and extending down stream to Milford than in any other parts of the stre m. Shade is far less abundant in these same divisions. Thus, the water reaches a higher temperature and is able to hold less oxygen.

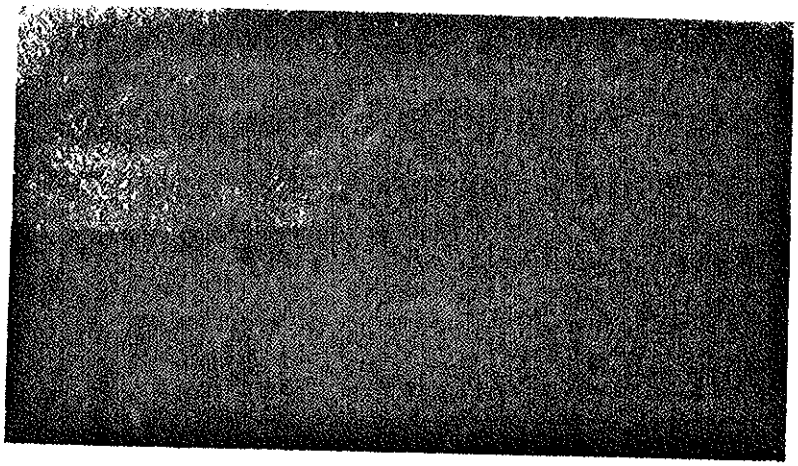
Streams, lakes, or ponds often contain enough dissolved oxygen for the adult fish but not enough

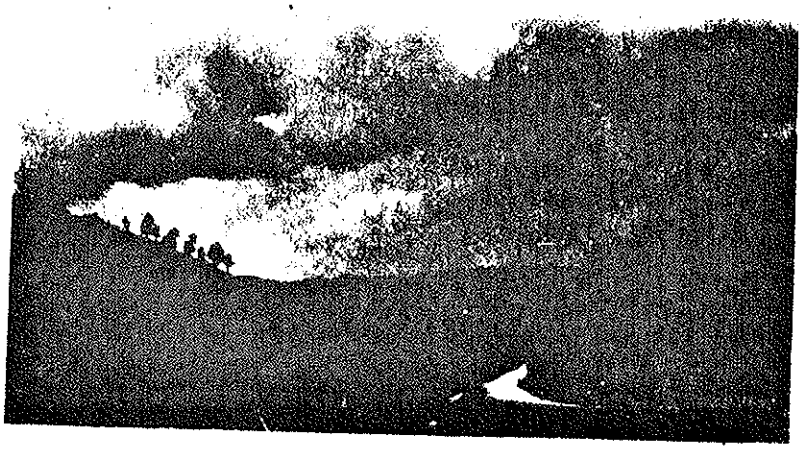
for good spawning conditions. Over spawning grounds oxygen should be present in amounts from 7 parts per million up to 8.5 parts per million.

Tributaries of the Lower North Fork

No tributary of North Fork offers fishing water except in a few creeks just at the mouth. Philips, Lees, Shannon, and Big Willow are the largest creeks which empty into North Fork. Each of these creeks have two or three pools just above its mouth that will average sixty feet long about one and half feet deep. It is in these creeks and other small ones on this watershed that many fish spawn each year. The young are able to make a fast growth on account on the abundance of food and shelter. Were it not for these tributaries, fishing in the main stream would not be as good as it now is.

The Watershed of Little Sandy River

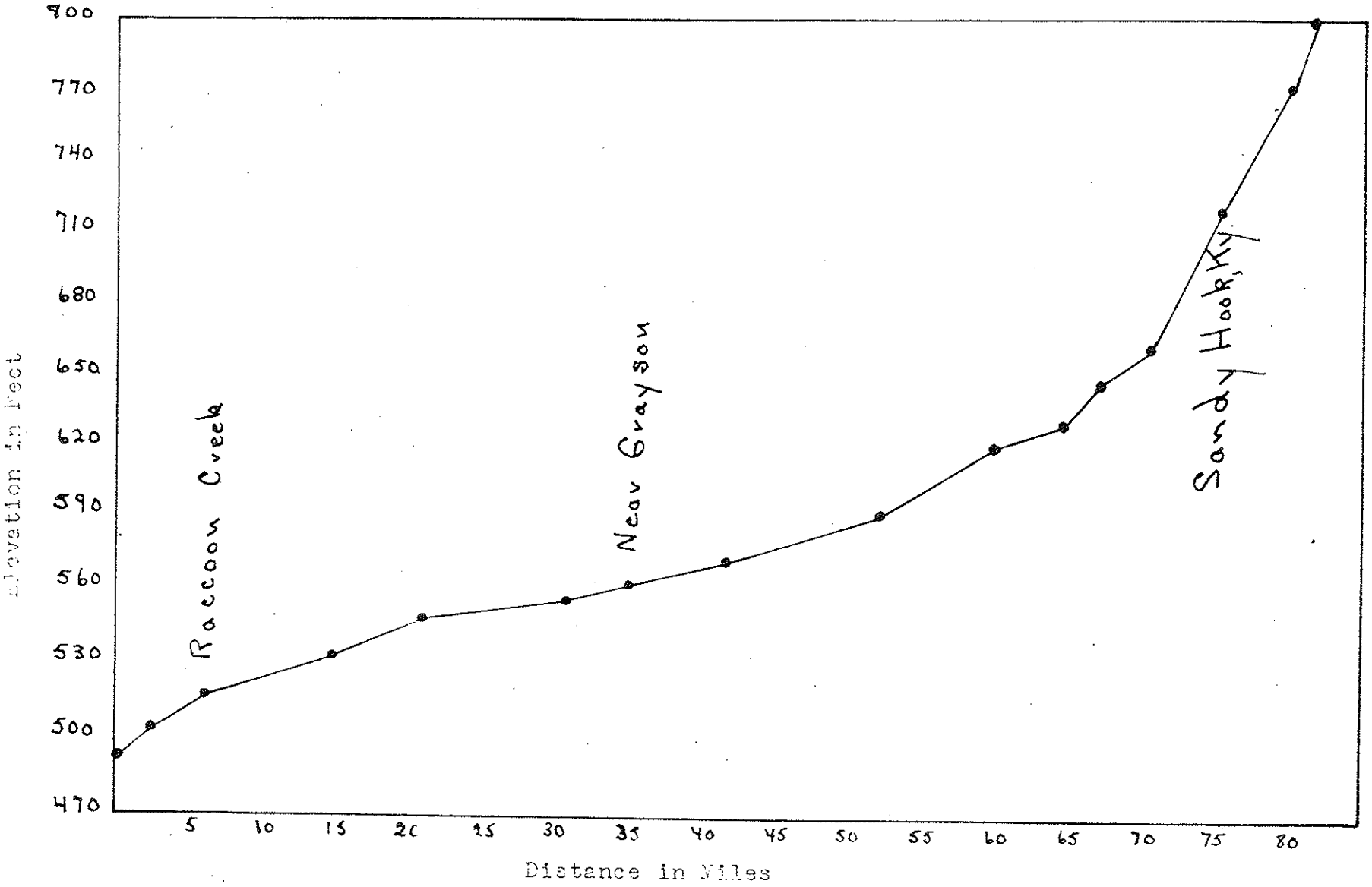




Elliott County

THE LITTLE SANDY RIVER WATERSHED

PROFILE OF LITTLE SANDY RIVER



Little Sandy River Watershed

The Little Sandy river rises in the south-western section of Elliott County and flows north draining the entire county. Physiographically, this headwater region is a part of the Allegheny plateau. No where in this section is to be found flat or undulating land, either in the bottoms or uplands. Elevations vary in the section from approximately 604 feet on the river near Cresco to 1500 feet. Practically every tributary west of the river and about half of those on the east side are gorged and can only be reached by traveling certain definite routes. The streams with the exception of the upper section of Middle Fork and Newcombe Creek are in much the same condition as they have been for years. The Little The Little Sandy in the section especially above Sandy Hook and even on down to the mouth of Laurel Creek has had much of its timber cut and the narrow valleys have been cultivated. As a whole however, very good shade remains along

Section of Little Sandy Near Sandy Hook

Elliott County

the creek in this section. Above Sandy Hook no pools of any value are found. Beginning at the Sandy Hook Bridge abd continuing on down stream through Elliott County, excellent pools are found which are served by good gravel or rubble bars. The Many overhanging boulders from the cliffs offer excellent hiding places for the young and large alike as does the abundant growth of water-weed on the gravel and sand bars. Probably one of the best sections of the entire stream for small-mouthed bass is found just belowSandy Hook down stream to Cresco. Huge boulders falling from surrounding cliffs have creeted many fine pools in the section. With the exception of the extreme headwater region, the watershed contains a good second growth of timber. For this and other reasons, the stream has suffered little by the washing in of silt by rains. As might be expected in a region of this type, practically every piece of bottom land which could possibly be cultivated has been cleared to the waters ege and plowed. Fortunately enough, such bottom

land which could possibly be cultivated has been cleared to the waters edge and plowed. Fortunately enough such bottom land is extremly limited and therefore silt is not a problem of this section. However, farmers of the section should be urged to leave the protective strip of trees and shrubs along the banks even in this section so as to preserve the stream in its best condition.. The approximate length of the entire Little Sandy is eighty seven miles while twenty miles of the river is found in Elliott County.

As the stream enters Carter County, the valleys begin to widen out and the country to flatten somewhat. However in the upper section of the county the land is too rooling and the valleys too narrow to support much agriculture. This section still has a good second growth of timber for this reason. As the river approaches Grayson, the valleys become wide and flat and it is here that much farming is done and much silt begins to enter the river. Pools several miles are found here though and even to the exclusion

of spawning grounds. The bottom of the stream in this section is mostly sand with some mud, gravel, and rubble bottom being found in the more shallow areas. Shade is heavy to light, averaging about medium. Vegetation in the section (lower section of Carter County) is scarce as is food. This is caused mostly by the almost continuous roily condition condition of the water here. Light is thus cut off from the plankton therefore limiting its growth and the continuous settling of sand and mud covers up any waterweed that might start a growth. While the average fall per mile for the river is something like 3.5 feet, the gradient of this section is slight as might be expecting from the large noumber of very long deep pool. Approximately two-thirds of Carter County is drained by the Little Sandy, the other third being drained by Tygart Creek. Little Sandy flows through Carter County for a distance of thirty two miles.

The river in its northward course leaves Carter to enter Greenup County, across which it

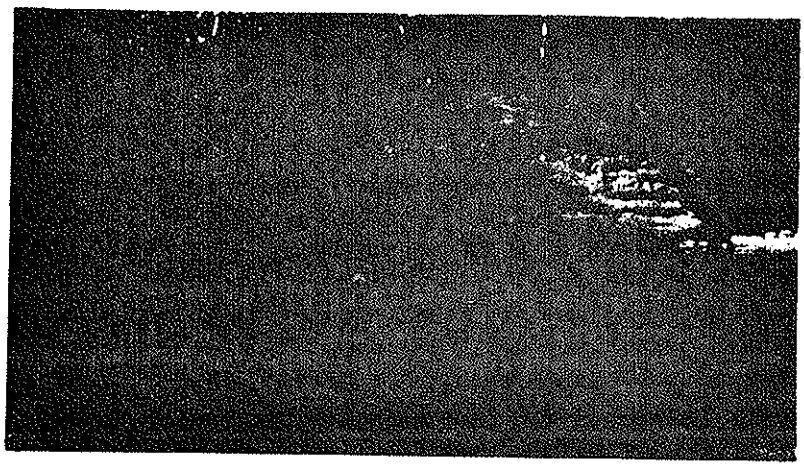
flows generally northward to the Ohio hiver at Greenup, Kentucky. This section is much the same as the above lower section of carter. The same long pools which are shaded a little more are found here alos. The valley is relatively wide in most places so that here as above most of the timber has been removed and the tillable land plowed. The river is usually trubid in this section and especially so in the lower half of the river. As in the Lower North Fork of Licking many eggs and fry are destroyed by silt in the river. The two streams differ entirely however in that there is a narrow protective growth of trees along Little Sandy in this section. The silt problem could only be corrected here by establishing at least a sixty foot protective strip along the banks. Even this would fail to entirely correct the problem as so much of the watershed in this lower section has been cleared and cultivated.

THE LARGER TRIBUTARIES OF THE LITTLE SANDY RIVER

Laurel Creek

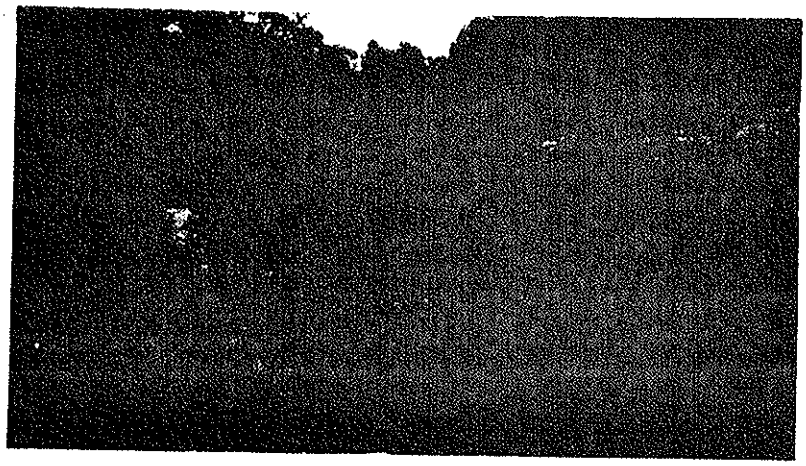
Laurel Creek, which is the first creek of any size or value to enter Little Sandy in the headwater region, rises in the extreme eastern edge of Rowan County and flows almost directly east to the Little Sandy near Newfoundland. The stream flows through an extremly valley which is gorged almost its entire length. The cliffs along the creek are so high and steep that it is impossible to reach Laurel except in two or three places. Beginning at the mouth and traveling up stream for alomst one mile no pools of any size are found. In this section the stream is narrown a nd has a sand bottom. Going on up stream and beginning at Jones Branch very excellent pools are found as to type, size, and frequency. The bottom is made up of rubble, gravel, sand, and boulder. Vegetation, food, and shelter is abundant. In spite of the excellent conditions found in the creek, fishing is extremly poor and is caused by the fact that every pool in

the stream is dynamited at least once a year as was reported by natives of the region. This is borne out too by the scarcity of all types of fishes in the creek. The young bass that were taken fromthe creek has made an almost astonishing growth since the few fishes have an abundance of food.



Laurel Creek near Rocky Branch

Laurel Creek in Central
Section



Middle Fork

Middle Fork rises in the central southern section of Elliott County and flows to join with Little Sandy. In the headwaters of the creek the slopes are steep and the valleys relatively narrow. Below Fannin the creek is gorged and accessible from only a few places. The watershed as a whole has a good second growth of timber as most of the slopes are too steep to cultivate. The riffle-pool area is about 60-40. Those pools which are present are excellent, well shaded, and contain an abundance of food as does the riffle and whallow water areas. The creek is well suited to the stocking of small-mouthed bass and it is recommended that the creek be stocked with such.

A good variety of fishes is found here. Various species of minnows and darters are abundant, many trout-perch were seen as was the case with the long-eared sunfish. Once Middle Fork is stocked it should support much fishing after several years.

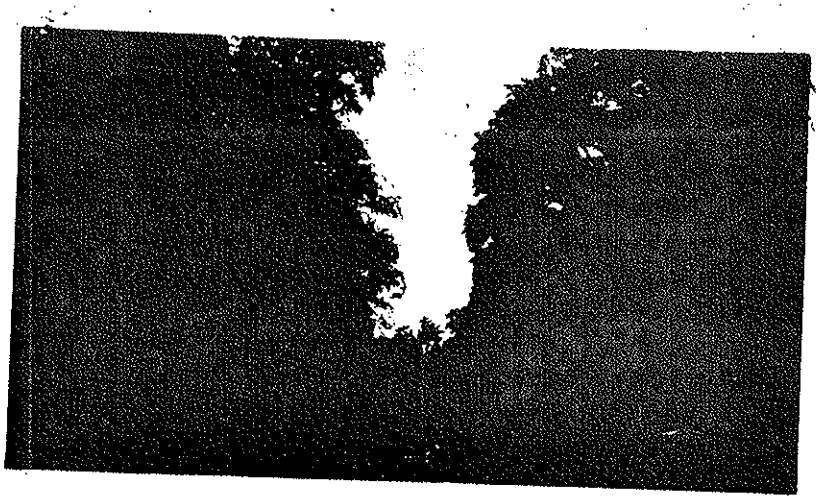
Newcombe Creek

Newcombe Creek rises in the southeastern section of Elliott County and flows to Little Sandy at a point near Green, Kentucky. The watershed is more rooling and the valleys wider than is found in any other tributary of Little Sandy in Elliott County. The pool value of this creek is poor as riffle areas and long shallow sections are prevalent.

Situated in the upper section of the creek is found many oil wells and several coal mines. Pollution is heavy from both sources. Fish life is affected in the entire length of the creek. Because of this pollution, the creek should not be stocked under any conditions.

Pollution from the wells could be and should be stopped. The companies should be required to drain the waste oil from the various storage tanks into pools. As the pools fill, this oil could be destroyed by burning. Pools should also be made below abandoned wells and those which leak oil. By using this method all pollution from oil could be destroyed.

Little Sandy River Argillite, Kentucky



Greenup County

Caney Creek

Caney Creek is composed of two main forks, Big and Little Caney which come together only one mile above its mouth. The creek rises in the northeastern section of the county and empties into Little Sandy just below Green , Kentucky. As in other creeks of this section, the creek is gorged for its entire length and can be reached only in two places by a car and very few more by walking. Much of the rolling uplands have been cleared. In this immediate valley however, timber growth is heavy. The pool-riffle area is about 50-50, the pools being of an excellent type, frequency, and size. The creek is only fifteen miles long but it contains much more fishing water than does many other larger creeks. There is no need of stocking this creek at the present as naturql spawning is quite adequate.

Big Sinking Creek

Big Sinking Creek rises in the northwestern section of Elliott County and flows eastward into Carter to the Little Sandy. The watershed of this creek is much the same as those described from Elliott County. The creek is gorged down to about three miles of the mouth. From there to the mouth the slopes are steep and the valley narrow. The watershed has a good growth of timber. The pool value of the creek in the central portion is relatively good while in the lower section, all pools are shallow and scarce. The bottom of the creek as a whole in gravel, rubble, and sand.

The stocking of Big Sinking is not recommended at this time because the creek is practically inaccessible. When the surrounding country has been opened up more than it now is, this creek could be stocked to some advantage.

Little Fork of Little Sandy

Little Fork rises in Elliott County and flows north into Carter to its mouth just above Grayson. The creek is approximately 34½ miles long and it is second in size only to the East Fork of Little Sandy. The entire valley of the creek is moderately wide and the hills are rooling. The timber of the watershed has long been cut and it is only in a few sections that second growth timber is found to any extent. Shade along the stream has largely been destroyed and in few places does one find a wider protective growth strip along each bank than eight feet. Most of the shade is amde up of willows. Every year as has been done for years, much of the valley and many of the slopes have been cultivated.

At the present time silt offers a serious problem in Little Fork. Most of the bottom is made up of sand and mud. After heavy showers the soil from cultivated fields has found its way into the stream. The stream remains roily

East Fork of Little Sandy

The East Fork rises in the northeastern section of LawrenceCounty and flows in a generally northward direction through Boyd and Greenup Counties to the Little Sandy near Argillite. The approximate length of the creek is 46 miles making this tributary the largest of any other of the entire watershed. Though the entire stream is in an mountainous sedtion, the hills are relatively low and rooling and the valley moderately wide. The upper half of the creek is thickly settled and has been more highly developed than the sparsely settled region in Greenup County. All timber of any value has long been cut and it is in few sections where even good second growth timber is found.

The stream as a whole has a fair amount of shade. While the pool value of the creek is low, excellent long stretches of shallow water are found. These abound in shelter of every kind and contain a fair amount of food. In the middle

and lower upper section, vegetation is abundant. In the lower section this has been largely destroyed by silt as have the gravel and rubble bars. The middle and upper sections have an abundance of spawning grounds. In this section many young bass were seen. (Kentucky and small-mouthed bass).

The creek is well served by roads making it accessible to all fishermen of the region. While fishing in the stream could not be classed as heavy, it is the one fishing stream for many of the section. The creek should be stocked biennially with small-mouthed and Kentucky bass.

THE FISHES OF THE LICKING AND THE LITTLE SANDY WATERSHEDS

The Fishes of the Licking and the Little Sandy Watersheds

All of the fishes collected for this report were taken by the writer by means of a 4 x 6 foot minnow seine. In one or two instances a specimen of a species that had previously been reported from these streams could not be obtained. This case the collectors anme is given.

The catches of the fishes were preserved in a solution of eight per cent formaldehyde and carefully labelled as to date, location, and the type of stream. In the early winter months, the fishe s were sorted as to species and placed in separate containers here in our museum. A complete record is on file for each species as to the exact location where it was taken, the date collected, the type of bottom, etc. From the two watersheds, 92 species of fish were collected. From the entire state, 158 species of fish have been found as of this date. This includes 1 species of the duct-billed cat, 2 sturgeons, 3 gars, 1 dogfish, 3 mooneyes, 2 herrings, 1 gizzard shad, 1 fresh water eel, 19

1. Brook Lamprey - Lampetra aepyptera

This species is known to the fisheramn as the mud eel. The young lampreys are exceedingly active creatures. They move rapidly through water or mud by the quick lateral movements of the body. This lamprey appears to spend most of its time in the mud where they feed on the microscopic organisms contained in it. The adult lamprey is injurious to the sturgeon and other large fishes in that it is a parasite of these forms.

2. SHovel-nosed Sturgeon - Scaphirhynchus platorynchus

This fish has not beeen taken in Licking River in recent years but formely the species was common. The species has been known to reach alenghh of 8 feet and aweight of 200 pounds.

3. Long-nosed Gar - Lepisosteus osseus

This is the common species of gar in Kentucky, being much too common in all of our larger streams. It is a voracious, active, and well protected fish which is the enemy of practically all other fishes in our waters. It is not a scavenger and its flesh

is not fit for food.

4. Mooneye - Hiodon tergisus

This fish which was at one time common in Licking River is now seldomly taken. It is a handsome species that will rise to the fly but its flesh is poor and the bones are small and numerous. By many fisherman the mooneye is regared as one of the smartest of fishes. It will rise to taste a fly, let go and be gone Before the fisherman has time to strike.

5. Blue Herring - Pomolobus chrysochloris

This fish has not been taken in recent years. Formely it was taken in the Little Sandy in large noumbers. The species is a marine form which enters the rivers to spawn. While in the rivers at spawning time, its flesh is said to be lean and worthless but when taken from salt water in the winter, it is more highly esteemed as food.

6. Gizzard Shad. Dorosoma cepedianum

The gizzard shad is common in the streams of both watersheds. Its greatest value is the abundance of food which it furnishes for the better fishes.

7. American Eel. Anguilla rostrata

The eel is among the most voracious of fish but it is chiefly a scavenger in its feeding habits. For amny years the spawning habits of this fish reamined a secret until it was discovered that eels migrate to the sea near the Bermuda Islands to spawn. Only the young return to fresh water as the old menbers die.

8. Redmouth Buffalo. Although this species is not as abundant as it once was, it still is taken from the larger streams. It grows to alarge size, sometimes weighing as much as 40 to 50 pounds. Though the flesh is of poor quality, it is everywhere used as food.

9. Carp Sucker. Carpiodes carpio

This fish is seldom found in the smaller streams and no where is it found in abundance. The species is closely related to the blunt-nosed river carp which is more abundant. The carp sucker is sold for food but is flavorless and soft.

10. Quillback. Carpiodes cyprinus

This fish is commonly found in the larger streams although it is no where abundant, It is worthless as a food fish.

11. Fine-scaled Sucker. Catostomus commersonnii commersonnii

The fine-scaled sucker is one of the most common suckers in all streams. In spring it bites freely at small hooks baited with worms. The flesh is firm and sweet but full of small bones.

12. Hog Molly. Hypentelium nigricans

This sucker is taken in all streams of the two waterhseds and occurs more often in collections than any other sucker. This fish is seldom seen swimming about because for a large part of the time it rests motionless on the bottom. When disturbed, it darts away for a short distance to settle to the bottom and to hide itself once more among pebbles, leaves, and sand.

13. Chub-sucker. Erimyzon oblongus claviformis

This is one of the more common suckers of the northern states but has been rarely taken in

Kentucky. It is of small size seldomly exceeding a length of ten inches. The chub-sucker is a bottom feeder.

14. Striped Sucker. Minytrema melanops

The sucker is mainly a species of creeks and smaller rivers. It grows to alength of 18 inches but as it is no where abundant, it has no noticeable value.

15. White-nosed Sucker. Moxostoma anisurum

This sucker is another one of its family which is never found in abundance. It reaches e lenght of two feet although a catch of this size is rare.

16. Black Mullet. Moxostoma d. duquesnii.

The status of this spesies and the next are indicated in Hubbs 1930 review of the suckers.

17. Moxostoma erythrurum. Golden Mullet

This fish is fairly common in all streams of the two watersheds. It seens to avoid a muddy bottom and to show a preference for flowing water. The sucker succumbs to impure conditions readily, sometimes perishing in vast numbers. The fish remains

in the deeper pools in summer and then hibernates in the winter. Large specimen are often taken in the spring when it is traveling up the smaller streams to spawn. This sucker is a very good food fish except for the many small bones.

18. Short-headed Sucker. Moxostoma breviceps

This sucker although rarely if ever now taken from the two watersheds was at one time relatively abundant in Little Sandy. It resembles the golden mullet closely but does not have its preference for clear and swifly flowing streams.

19. Red-bellied Minnow. Chrosomus erythrogaster

One of the most beautiful of all our fishes. It lives to great degree on vegetable matter and hense serves as an excellent forage fish. In breeding males, the abdomen is a bright red and the fins are highly colored. The fish seems to prefer clear cool gravel bottom streams but a few collections were made from bottoms of mud.

20. Creek Chub. Semotilus a. atramaculatus

According to my collection this fish attains

a larger growth than does any other minnow. The total length of my largest specimen measures 8½ inches. The creek chub spawns on a bottom of coarse gravel where a nest is constructed of clenaed gravel made ina ridge about one foot wide and from one to fifteen feet long. The building of the nest and the guarding of the eggs is all done by the male. From my collections it would seem that this fish prefers the smaller clearer streams.

21. Rosy Dace. Clinostomus vandoisulus

The rosy dace occurs in much the smae locality as the red-bellieldace. Both species have not been found to occur in abundance in any one locality.

22. Red-sided Dace. Clinostomus elongatus

This species has been taken but one in Kentucky and that was by the writer from Lick Fork of Upper North Fork of Likcing In Rowan County. It is aminly a northern species ranging from Pennsylvania to Minnesota.

23. Southern Black-nosed Dace. Rhinichthys atratulus obtusus

This species is usually taken from clear cold streams having a coarse gravel or rubble bottom.

24. Northern Long-nosed Dace. Extrarius aestivalis hyostomus

This species ossurs rather frequently in central and upp Licking River. From my collections it seems to prefer a clean bottom of either sand or gravel and swiftly flowing water.

25. Kentucky Chub. Nocomis micropogon

In my collections this is a swift water species which prefers a hard bottom. It is one of the most active of its tribe and will bite at small hooks baited with white grub. The species makes an excellent bait for fisherman.

26. Store's Chub. Hybopsis storerianus

This is a minnow of the large streams , widely distributed in our watersheds, though rare in all sections. In all but one collection, the species was taken from the main river.

27. Big-eyed Chub. Hybopsis amblops amblops

In my collection of the species, I found it to occur as often in the rivers as in the creeks. It is rather widely distributed and often found to occur in large noumbers.

28. Southern Emerald Shiner. Notropis atherinoides dilectus

The shiner is rather an uncommon species of the watersheds though it appears to be widely distributed.

29. Rosy-faced Shiner. Notropis rubellus

The minnow occurs in streams of both watersheds and is rather common and widely distributed.

30. Silver Shiner. Notropis photogenis

This another minnow which is closely related to N. atherinoides and N. rubellus. The three are usually regarded as shiners by the fishermen who makes no distinction between them.

31. Common Shiner. Notropis cornutus chrysocephalus

The common shiner is found in practically every stream both large and small of the two watersheds though it shows a preference for small streams. It is a bait and forage fish of considerable value. Many fishermen regard this minnow as the best black bass bait.

32. Steel-colored Shiner. Notropis whiplii

This fish has a wide occurrence over the

watersheds but it is not as abundant as the above species. It is collected most often in swift flowingwater.

33. Spot-finned Shiner. Notropis spilopterus

The spot fin and the above minnow usually occur together and are separted only by the ichthyologist.

34. Northern Sand Shiner. Notropis deliciosus stramineus

This is one on the more abundant species of minnows. It shows a preference for creeks and smaller streams with clean bottoms and flowing water. It feeds mostly on a mixture of aquatic insects, crustaceans, and chance vegetation.

35. Mimic Shiner. Notropis v. volucellus

Species not at all common. The fish closely resembles the snad shiner above and is separated from it with some difficulity.

36. Ghost Shiner. Notropis volucellus buchanani

This and the above minnow so closely resemble each other that only the ichthyologist can recognize the two forms.

37. Bull-eyed Minnow. Notropis boops

Taken from North Fork of Triplett Creek in Rowan County only.

38. Red-finned Shiner. Notropis u. umbratilis

This and the two next species are very difficult to distinguish between. All are exceedingly handsome spesies, especially during the breeding season. I have found this group to occur most often in the larger creeks.

39. Northern Red-finned Shiner. Notropis umbratilis cyanocephalus

40. Notropis ardens lythrurus.

This form occus more rarely than does the two above.

41. Silver-jawed Minnow. Ericymba buccata

This fish which is so abundant in creeks and smaller streams is especially interesting because of the tubular cavities in the bones of the lower law and side of the head. Although most of my collections have been from cleam bottoms, I have often found it to occur in streams of mud bottom in some abundance.

43. Sucker-mouthed Minnow . Phenacobius mirabilis

This minnow is easily recognized by its sucker type mouth. It is found most often is swift water with a coarse gravel bottom according to my collections.

44. Fathead. Ceratichthys vigilax taurocephalus

The fathead was taken only once this year and that from the Little Sandy near Green, Kentucky. In my collections, it has shown a preference for mud and snad bottom.

45. Blunt-nosed. Minnow. Hyborhynchus notatus

This as a widely distributed minnow of the watersheds although it is abundant only ina few localities. It is well know to the fisherman as this species and the creek chub are most often used for bait. It spawns from May to the middle of June, the eggs being placed on the flat lower surface of submerged objects near the bottom.

46. Northern Fathead. Pimephales p. promelas

The minnow is taken most often from creeks having a mud bottom. It is a very valuable fish in the it is an excellent forage species.

47. Silvery Minnow. Hyboganthus nuchalis

Not of this collection. Takem from Little Sandy by Gilbert and Henshall in 1888.

48. Stoneroller. Campostoma a. anomalum

This species is distinguished from all other minnows by the great lenght of its intestine which is wound arounf the air-bladder. The fish lives near the bottom in the more shallow places. It is a desirable forage fish in that it offers little or no competition with the young of game fishes. The food of the species consists mostly of microscopic plants

49. Blue Cat. Ictalurus furcatus

The blue cat frequents the deeper water coming out only to spawn in the spring and summer. Unfortunately the species is not common in the watersheds. Its flesh is of excellent quality and flavor.

50. Southern Channel Cat. Ictalurua lacustris punctatus

In the wo waterhseds under discussion, this is the most common of all the larger catfishes. Although specieman have been taken weighing as

much as twenty pounds the more common weight is four or five pounds.

51. Yellow Cat. Ameiurus natalis

This species is the least common of any of the bullhead family. All of the species resemble each other so closely that they are not often distinguished by the fisherman. The food and habits of all are virtually identical.

52. Common Brown Bullhead. Ameiurus n. nebulosus

The bullhead can live where few others can survive for when the dissolved oxygen content is past the point of supporting life in other fishes, it can come to the surface and renew the air in its air or swim-bladder. The fish is able to live in dried out pools for some days by burying itself in the mud.

53. Northern Black Bullhead. Ameiurus m. melas

This is the most common of the three forms found in the streams of the watersheds.

54. Stone Cat. Noturus flavus

This interesting little fish occurred in

Licking River and its larger tributaries under stones in swift water. It has little food value on account of its small size which seldom exceeds twelve inches.

55. Freckled Stonecat. Schilbeodes nocturnus

This species has been extremely rare in my collection having occurred only once and that from Little Sandy River.

56. Mat Tom. Schilbeodes miurus

This species is abundant over the streams of the three watersheds. Although said to prefer a swift current my collection of the species has been from the more quiet part of the stream. It occurs equally as often in the main stream as in the creeks.

57. Little Pickerel. Esox vermiculatus

This species occurs in Triplett Creek only so far as is known. It is of small size never exceeding a lenght of twelve inches nor a weight of more than a pound. It feeds entirely on animals and is justas voracious as the muskallunge.

Muskallunge. Esox masquinongy ohiensis

This is a destructive fish which has been reported to reach a weight of 80 pounds and a length of 6 feet. This southern form is a variety of the more northern forms.

59. Top Minnow. Fundulus notatus

This fish is widely distributed over the Licking Watershed in the more sluggish streams.

60. Trout-perch. Percopsis omiscomaycus

Although found in the Licking Watershed, the species is more widely distributed and more abundant in Little Sandy.

61. Brook Silverside. Labidesthes s. sicculus

A delicate and exquisite little fish well distributed over the Licking Watershed.

62. Wall-eyed Pike. Although this species has not occurred in my collection, it has been reported by fisherman of both watersheds. It is essentially a piscivorous fish. According to Forbes and Richardson, at least600 fishes from three to four inches long

are required for the maintenance of one wall-eye. The maximum length of the wall-eye has been reported to be three feet and a weight of twenty-five pounds.

63. Sand Pike. Cynopeeca canadensis

This is a much smaller species than the preceeding and is now rarley taken. It has been reported from Little Sandy by Gilbert and Henshall in 1888. Like its larger cousin, it feeds entirely on fish.

64. Logperch. Percina c. caprodes.

In my collection this darter has occurred equally as often from the rivers as from the creeks. It does occur more often in larger creeks than in the smaller ones. This species is sometimes taken on a hook although, it rarely exceedsa length of six inches. It is one of the more common darters and is known to many of the sportsmen.

65. Black-sided darter. Hadropterus maculatus

A beautiful darter which is well suited to the aquarium. It prefers clear water and a bottom of gravel. This species is relatively common in all streams of the watersheds.

66. Slender-headed Darter. Hadropterus phoxocephalus

Although this species has not been reported from Kentucky since 1892, it is common in Licking River. Apparently the darter inhabits only the larger streams as it was taken only from the river itself.

67. Gilded Darter. Hadropterus evides

This is the first time that this species has been reported from eastern Kentucky. No where is it found in abundance. It shows a preference for the clear swift waters of the larger rivers.

68. Hadropterus scierus. Dusky Darter

The species is very rare and occurs in limited noumbers only in Little Sandy. From my collection it has shown a preference for a sand bottom and moderate current. This is the first time that the species has been reported from Kentucky since 1892.

69. Copeland's Darter. Cottogaster coplandi

A relatively common species in my collection from the central part of Licking River althougn reported as rare bu other collectors.

70. Shumard's Darter. Imostoma shumardi

This species occurred wholly along the course of the central part of Licking River. It is extremely rare and has not been reported from Kentucky since 1892 where it was found in the the western part of the state.

71. Northern Green-sided Darter. Etheostoma blennioided blennioided

A very common darter of the larger creeks which prefers swift water on rocky riffles.

72. Johny Darter. Boleosoma nigrum nigrum

The Johny darter is one one the most abundqnt species of its family in these streams and has the widest distribution. It occurs most often in branches and small creeks though it appears often in my collection from the river.

73. Sandy Darter. Ammocrypta pellucida

Though rare in the Little Sandy Watershed, the species in common and fairly abundant in Licking River. It shows a preference for rivers with a shady bottom and a moderate current. It is an interesting species in that it buries itself in the sand, leaving only the head to be seen.

74. Variegated Darter. Poecilichthys variatus

This darter though reported as rare by other collectors, has been rather common in my collection from larger creek and rivers. It prefers swift water and rocky riffles.

75. Spotted Darter. Poecilichthys maculatus

Although reported as occurring in the lower part of Licking River, this species has not been found by me. However, no collections have been made in the vivinity from which it occurred.

76. Tippecanoe Darter. Poecilichthys tippecanoe

As of my collection this is the first time that the species has been reported from Kentucky, It is extremely rare and occurs no where in abundance.

77. Banded Darter. Poecilichthys zonalis zonalis

This common and relatively abundant sepecies inhabits the swifter parts of a stream on a bottom of gravel or rubble. It occurs most often in the larger creeks and smaller rivers that have an abundant growth of vegetation.

78. Rainbow Darter. Poecilichthys c. caeruleus

This brilliant darter is a widespread species although it occurs in few places in abundance. It was found equally as often in still water as in swift.

79. Orange-throated Darter. Poecilichthys s. spectabilis

This species closely resembles the above and is only separated from it by the ichthyologist. It is widely distributed in the Licking drainage but rare in the Little Sandy.

80. Fan-tailed Darter. Catonotus flabellaris flabellaris

This is a very widely distributed species of the two waterhseds. It prefers a sandy bottom and a moderate current according to my collections.

81. Large-mouthed Bass. Huro salmoides.

A widely distributed species of the two watersheds but whcih is not as abundant as the Kentucky and small-mouthed bass.

82. Kentucky Bass. Micropterus p. punctulatus

A common species and one which is more abundant than the large mouth.

83. Small-mouthes Bass. Micropterus dolomieu

Another widely distributed species which is the most common game fish of the watershed.

84. Green Sunfish. Lepomis cyanellus

A rather rare species in the Little Sandy but common in the Licking drainage. It prefers a quiet current and is not at all particular about the type of bottom.

85. Bluegill. Lepomis incisor

The largest of the sunfishes, reaching a weight of about one pound. It moves in schools and my be caught with most anykind of bait. It is the gamest of all fishes it's size.

86. Chain-sided Sunfish. Lepomis macrochira

This species resembles closely the bluegill from which it is separated with some doubt. It has about the same distribution though not as abundant.

87. Long-eared Sunfish. Lepomis megalotis megalotis

This species is one of the most beautiful of all of our fishes and is the most common member of its family. It is found in the larger streams

as well as in the small. The fish is extremely variable in color and form.

88. Goggle Eye. Ambloplites rupestris

This fish which is usually found in streams along with the small-mouthed bass seems to be no where abundant in the watershed. It reaches a length of 12 inches and a weight of 1½ pounds. When first caught, the fish puts up a vigorus fight which it usually fails to keep up.

89. White Crappie. Pomoxis annularis

The crappie is a fish found in ponds and sluggish dtreams. It reeches a weight 3 pounds and a length of 15 inches. When caught in clear water, it is an excellent pan-fish.

90. Drum. Aplodinotus grunniens

The drum is well distributed over the Licking Watershed and is particular interesting because of the peculiar grunting noise which it makes by changing the air in its air-bladder. Specimens have been obtained of this fish as long as four feet although examples of this length are rare. It is said to reach a weight of sixty pounds.

91. Northern Muddler. Cottus b. bairdii

Although this species is usually found further northward than Kentucky, it is the only species of its family found in eastern Kentucky so far. It inhabits the clear rocky branches and no where was found to be common.

Chemical Investigation of the Upper Licking and the Little Sandy Watersheds

Chemical Investigation of the Upper Licking and the Little Sandy Watersheds

When large areas are to be surveyed, it is usually possible to sample most of the stations only once. Stations are established on an average of every three miles along any given stream and an analysis of a sample of the water at the station is made. The analytical studies in this report include oxygen, carbon dioxide, hydrogen ion concentration, and alkalinity. The value for dissolved oxygen is reported in percentage of saturation as well as in parts per million. The point at which the dissolved oxygen is so reduced as to present a lethal condition for fishes is difficult to define. As to whether a given species of fish will live in water containing a certain amount of dissolved oxygen depends on the temperature of the stream. Too different quanities of oxygen are required by different species of fish. As a whole, 3.5 parts per million of oxygen might be regarded as the point at which most fishes die. Some fishes

will not survive in water containing a higher percentage of oxygen than this point given here, while other fishes can live if the oxygen is lower than 3.5. The dissolved oxygen content of streams normally varies according to physical conditions such as stream flow, stream fall, and temperature; according to the oxygen removed by aquatic organisms; according to the oxygen produced by aquatic plants; and the oxygen demand of the organic detritus in the stream.

So far as the hydrogen ion concentration is concerned, a pH of 4.0 is lethal for fishes in all waters. Some types of acid have higher penetrative properties andthus fishes are killed in less acid waters of about 5.5. Most fishes are killed by the acid wastes mainly through the precipitation and coagulation of the mucus of the gills and the coagulation of the gill membranes themselves. The coagulation of the gill may not take place but the lethal action of the kation of the acid will kill the fishes. On the alkaline side a pH value of 8.5 orslightly

more is not harmful to most fishes.

There is relatively little pollution in the streams fo these watersheds. Except in one or two instances, all pollution occurrs on streams to small for stocking purposes. Futhermore, the amount interring the larger streams has been so dilluted that it has little effect. Pollution from oil wells and storage tanks occurrs in a few localities. This has already been discussed fully under the discussion of the creeks on which it occurrs. Pollution from coal mines is at this time practically negligible. Mine water enters a few very small braches but it is netrualized in a short distance. Mine pollution may increase as the large coal reserves are tapped from time to time.

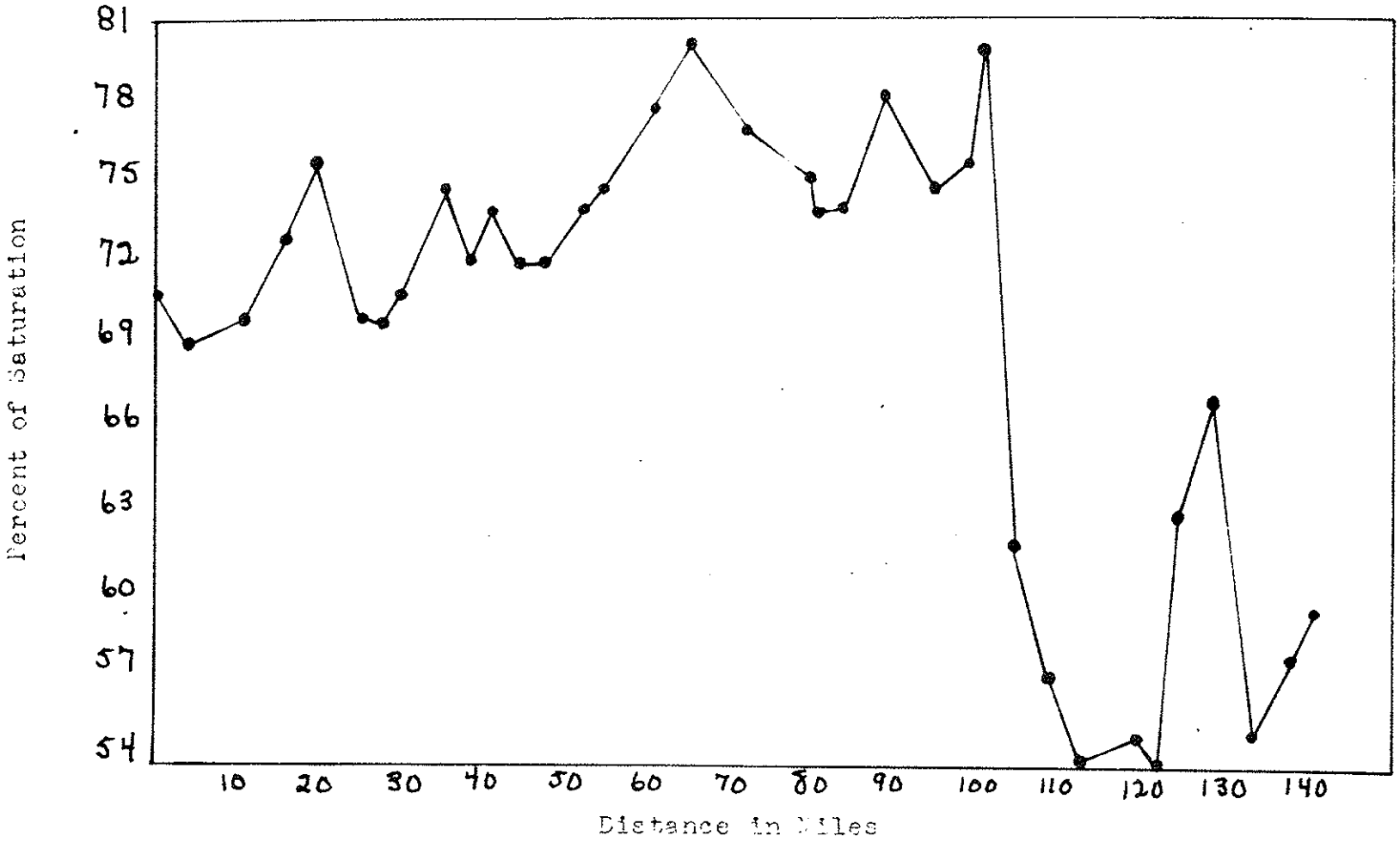
On the Little Sandy little domestic sewage enters the stream except at Grayson. The Licking River system receives pollution from Salyersville, West Liberty, Morehead, and Owingsville. This is not causing a great feal of trouble at the present as is shown in the following tables.

Saw dust at Boyalton from a noumber of mills

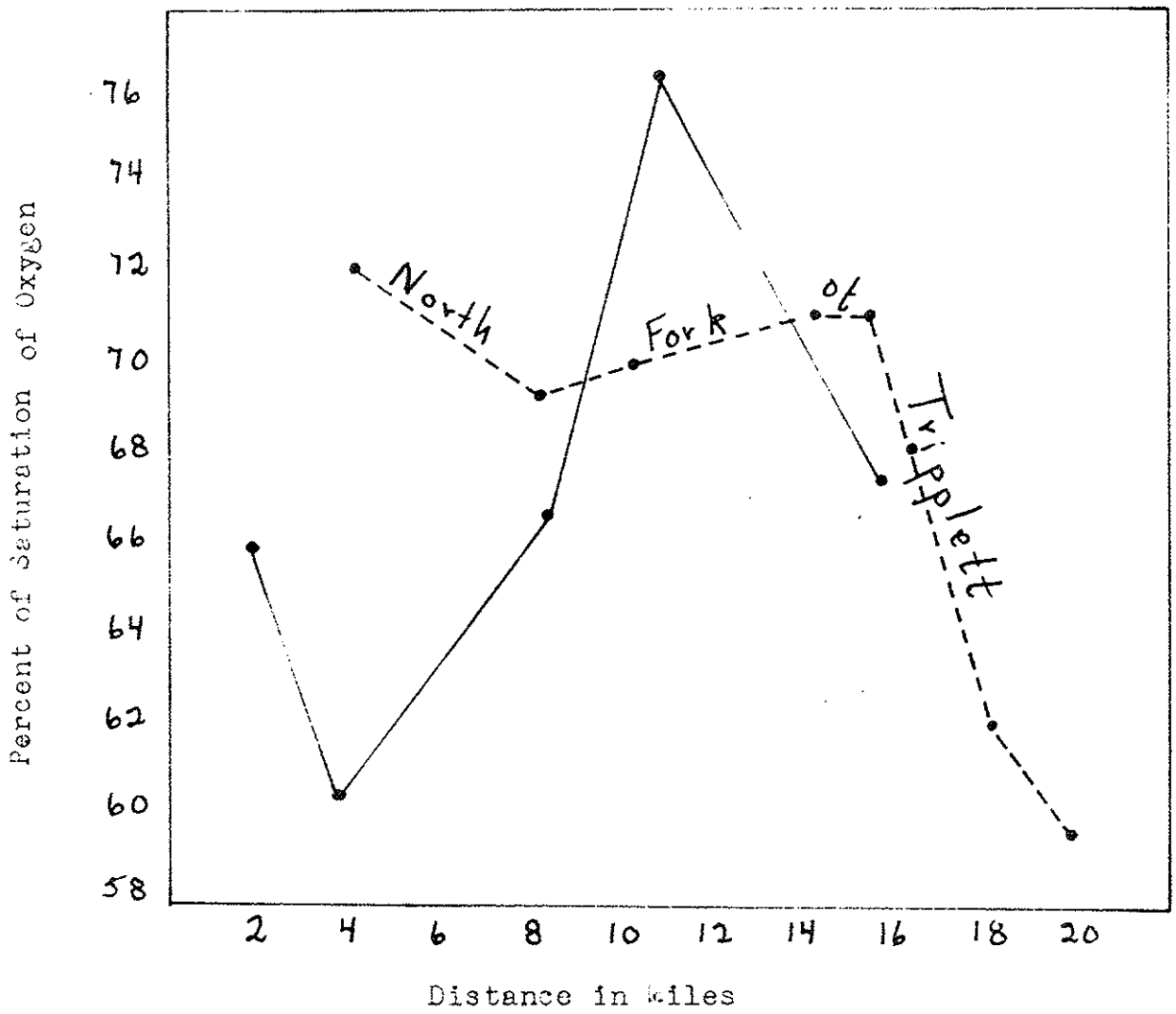
is causing pollution on this part of Licking River in Magoffin County. The saw dust is placed on the banks of the stre ams by the three mills. In times of high water this is picked up by the stream.

LICKING RIVER -- PERCENT OF SATURATION

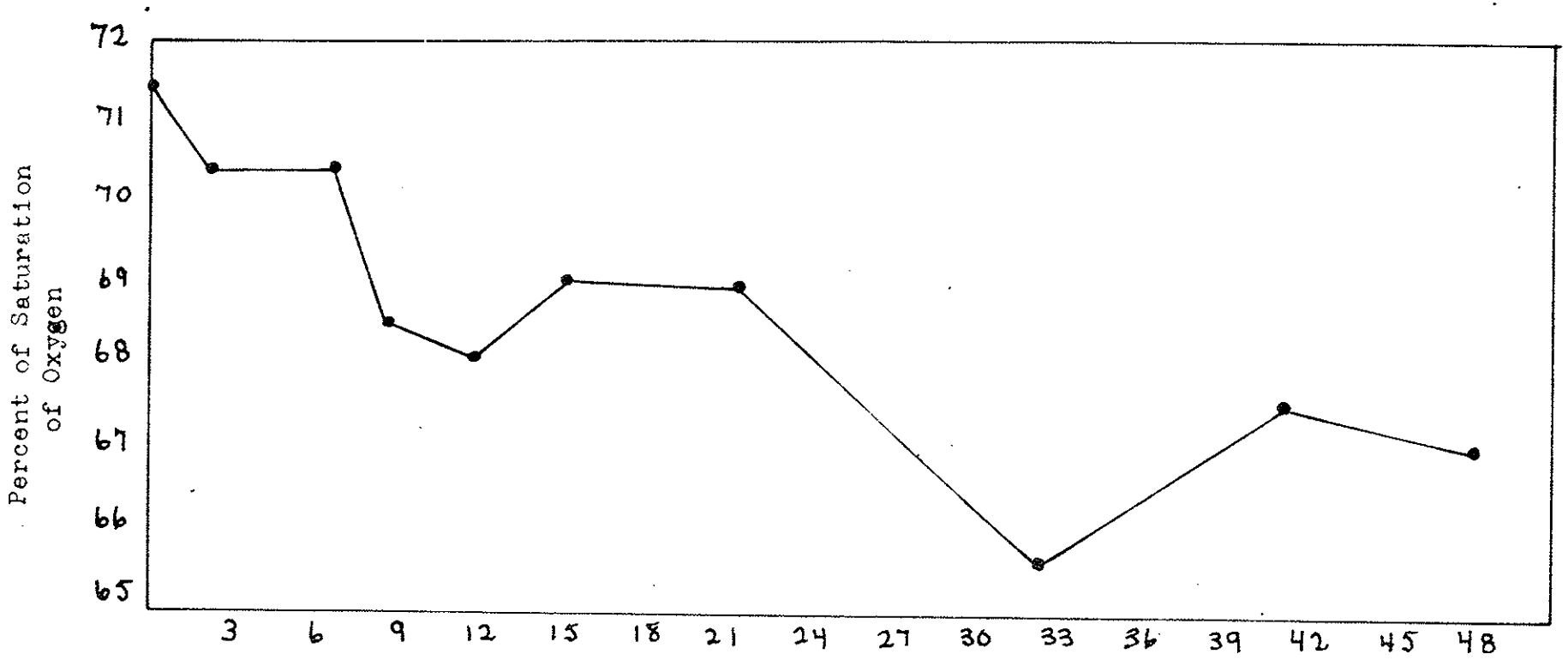
OF O.. SLM.



TRIPLETT CREEK AT NORTH FORK OF TRIPLETT --PERCENT OF SATURATION

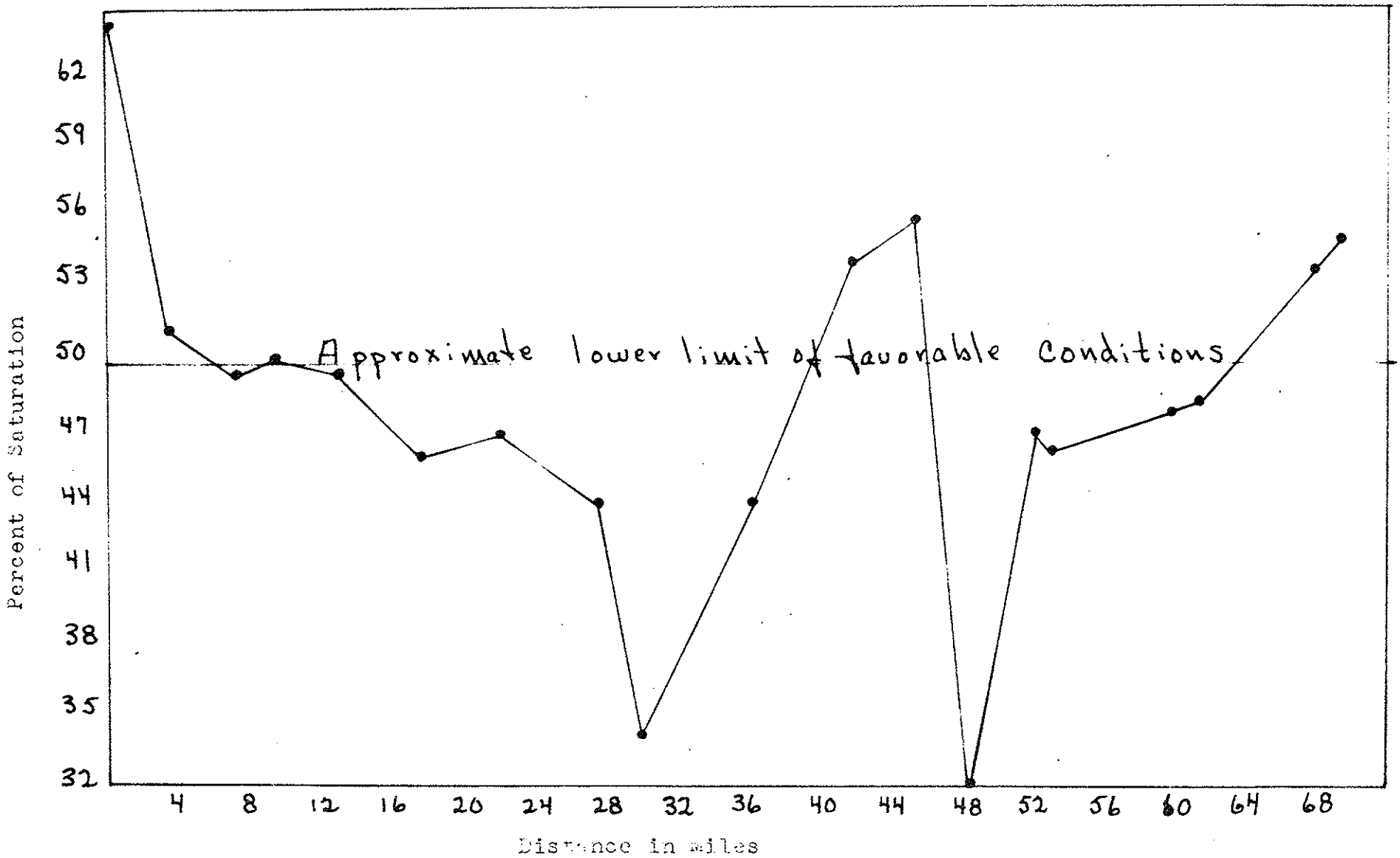


SLATE CREEK -- PERCENT OF SATURATION OF OXYGEN

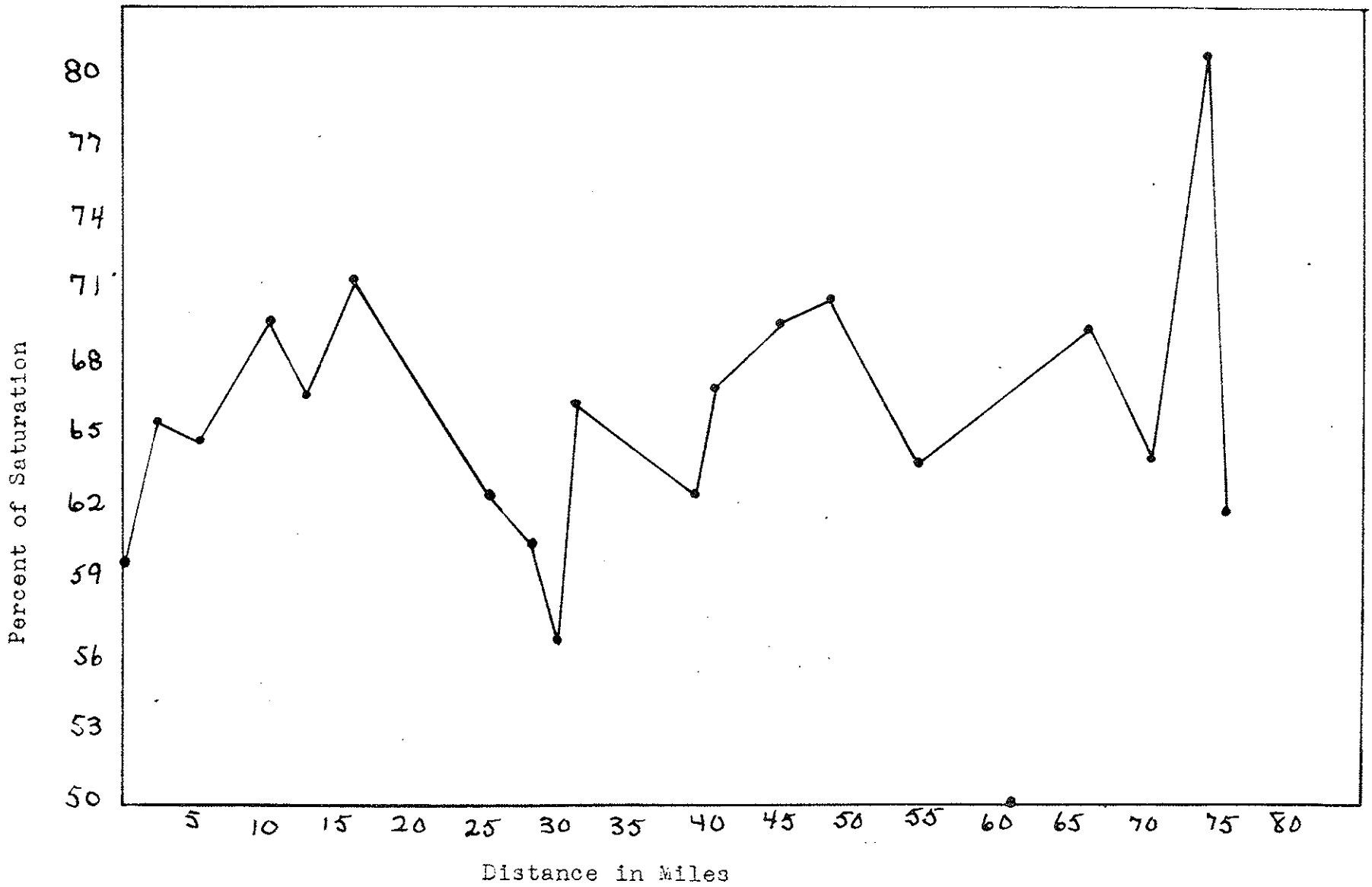


LOWER MONTH LOOK OF LIGHING -- PERCENT OF SATURATION

OF OXYGEN



LITTLE SANDY RIVER -- PERCENT OF SATURATION
OF OXYGEN



Chemical Analyses of Little Sandy River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Little Sandy at N. Howards Cr.	5/30	8:35	79	74	5.4	62.2	3	122	7.4
	Little Sandy at Wells Cr.	5/30	8:15	77	74	7.1	81.5	1	118	7
	Little Sandy at Sandy Hook Bridge	5/30	8:00	77	73	5.6	64.5	4	120	7.1
	Ruin Cr. Below Falls	5/29	3:00	87	86	6.1	79.6	0.5	140	7.4
	Little Sandy at mouth of Laurel Cr.	5/30	10:00	84	76	6	70.3	3	116	7.2
	Laurel Cr. at mouth	5/30	10:05	84	74	4.9	56.4	8	126	7.2
	Laurel Cr. At Rocky Br.	5/30	3:00	86	71	7.3	82.6	0	144	7.8
	Middle Fk. at mouth of Rt. Fk.	5/29	11:15	84	80	7	86.7	1	110	7.2
	Middle Fk. at Pannin	5/29	11:30	85	80	5.3	65.6	8	60	6.6
	Newcombe Cr. 2 miles below Fks.	5/29	10:35	83	80	5.3	68.1	8	64	5.7
	Newcombe at mouth of Rt. Fk.	5/29	10:45	83	80	5.	61.9	10	74	6.6

Chemical Analyses of Little Sandy River and Tributaries

p No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO 2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Left Fk. of Newcombe at Lick Br.	5/29	9:20	78	73	6.3	72.5	4	78	6.8
	Left Fk. below Mare Br.	5/29								Acid
	Little Sandy At Green, Ky.	5/30	10:15	84	76	4.3	50.4	4	118	7.3
	Caney Cr. Near mouth	5/30	11:10	83	77	5	59.6	2	140	7.3
	Caney Cr. At Wemberly Br.	5/30	12:30	86	74	7.1	81.7	0.5	160	7.8
	Little Caney At mouth	5/30	11:15	83	77	5.1	60.8	5	144	7.4
	Little Sandy at mouth of Little Gimlet Cr.	6/6	9:00	76	70	5.8	64.5	3	98	7.2
	Little Sandy At Mill Dam	6/6	10:20	78	69	6	64.5	4	100	7.2
	Little Sandy at mouth of Buck Br.	6/6	11:10	82	70	5.6	62.2	3	100	7.2
	Little Sandy at mouth of Clifty Cr.	6/6	1:00	86	76	6.1	71.5	5	96	7
	Little Sandy At Carrel Br.	6/6	1:10	86	76	6	70.3	1	94	7.2

Chemical Analyses of Little Sandy River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Big Sinking Cr. at mouth	6/3	12:15	84	71	6.3	71.3	0.5	80	7
	Big Sinking At mill Cr.	6/3	8:30	78	70	6	66.7	1	86	7.2
	Little Sandy at Hog Br.	6/6	2:00	86	75	5.8	67.8	4	86	7
	Little Sinking at Aden	6/3	9:55	81	75	4.9	45.7	4.5	58	6.8
	Little Sinking at Grahn	6/3	9:45	81	75	4.6	53.9	6	54	6.2
	Little Sandy near Leon	6/6	2:15	86	74	5.5	63.3	5	90	7
	Little Fork at Wallohole Cr.	5/29	9:15	78	72	5.5	62.2	2	52	6.8
	L. Fk. at Elliott-CarterCo. Line	6/5	10:05	79	71	6.4	72.3	2	50	7
	L. Fk. at Justice Br.	6/5	8:45	75	70	6.2	68.9	2	48	6.8
	Dry Fk. at Lick Br.	6/5	8:35	74	68	5	54.5	4	48	6.8
	Dry Fk. at Webbville	6/5	8:30	74	68	5.7	62.1	3	52	6.9

Chemical Analyses of Little Sandy River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Dry Fk. at Willard	6/5	8:15	74	69	5.8	64.3	4	48	6.9
	Little Fk. at Johns Run	6/5	11:20	82	72	4.8	57.2	5	52	6.9
	Little Fk. at Huffs Cr.	6/5	11:30	82	71	4.3	47.5	3.5	54	6.9
	Straight Cr. at Denton	6/5	1:40	84	81	5.2	64.4	4	64	6.9
	Straight Cr. At Mt. Savage, Ky.	6/5	1:30	84	76	4	46.3	6	60	6.9
	Little Fk. ½ mile below Hitchens	6/5	11:35	82	72	4.6	52.09	3	56	6.9
	Little Sandy at Bridge above Grayson	6/4	3:20	85	74	5.8	67.05	4	78	7
	L. Sandy at Bridge below Grayson	6/4	4:00	84	74	5.7	65.6	6	74	6.9
	Stinson Cr. near mouth	6/4	3:35	87	76	5.7	66.8	4	58	7
	L. Sandy at Bridge below Grayson	6/7	8:40	82	73	5	57.6	7	74	6.8
	Barrett Cr. ar mouth	6/7	8:00	81	71	5	56.6	3	48	6.9

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Chemical Analyses of Little Sandy River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Barrett Cr. near Gregoryville	6/7	8:30	82	72	4.7	53.2	2	54	6.8
	Little Sandy at Pactolus	6/7	9:00	82	74	5.3	61.05	4.5	88	7
	Evermann Cr. at Lindsay Chapel	6/7	8:50	82	71	5.2	58.8	6	66	7
	Little Sandy at Scoll Br.	6/7	12:00	87	75	5.4	63.3	4	86	7
	East Fk. at Argillite Bridge	7/9	8:00	77	74	5	57.6	6	56	6.8
	East Fk. at Wolfpen Br.	7/9	9:35	73	74	4.9	55.4	8	54	6.8
	East Fk. at Danleyton	7/9	11:00	80	75	5.1	59.7	8	58	7
	East Fk. near Chadwick Cr.	7/9	1:05	82	74	4.8	55.05	6	60	7
	East Fk. at Naples	7/9	1:15	82	74	5	58.6	4	64	6.8
	Williams Cr. near mouth	7/9	1:20	82	77	6	71. 5	4.5	58	6.9
	Williams Cr. at Princess	7/9	1:35	82	77	5.9	70.4	9	62	6.6

Chemical Analyses of Little Sandy River and Tributaries

ap No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO 2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	East Fk. at Road No. 60 Bridge.	7/9	2:45	83	75	5.8	67.8	4	68	6.9
	East Fk. At Laurel Cr.	7/9	3:20	83	75	6.1	71.50	4	66	7
	East Fk. at Four Mile Creek.	7/9	3:30	83	76	6	70.3	5	64	7
	All corn Cr. near mouth	7/11	11:20	81	76	5.9	69.1	2.5	54	7
	Wilson Br. At Midland Trail	6/7	1:20	88	79					Acid
	Wilson Br. At Joe Br.	6/7	2:30	88	78	4.8	58.3	10	46	6.2
	Little Sandy at Frazier Br.	6/30	9:45	78	74	5.5	63.3	3.5	74	6.9
	L. Sandy at mouth of Oldtown Cr.	6/30	8:10	77	74	6.3	72.5	2	76	7
	Oldtown Cr. at mouth	6/30	10:05	79	73	6.8	78.3	1.5	66	6.8
	N. Fk. of Oldtown at mouth	6/30	9:50	78	74	6.6	76.7	1	70	7
	Oldtown Cr. above mouth of N. Fk.	6/30	9:50	78	72	6.7	75.8	1	64	6.9

Chemical Analyses of Little Sandy River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO 2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Little Sandy at Long Br.	6/30	11:15	80	74	5.9	67.9	2	74	7
	L. Sandy at Claylick Cr.	6/30	11:25	80	73	6.2	71.4	2	72	7
	L. Sandy at Argillite Bridge	6/30	11:30	81	74	6.1	70.2	2.5	76	7
	Cane Cr. At mouth	7/10	10:40	89	78	5.6	68.1	4	60	7
	Cane Cr. at Bunnewell	7/10	8:55	82	77	6	71.5	3.5	68	6.8
	Cane Cr. at Coal br.	7/10	8:45	81	77	6.3	75.1	2	62	6.8
	Sandsuck Cr. near mouth	7/10	1:00	91	80	6.1	75.5	3	64	7
	Little Sandy at mouth of Raccoon Cr.	7/11	11:15	81	75	5.6	65.6	3.5	72	6.8
	L. Sandy near Whetstone Cr.	7/11	11:05	80	75	5.5	64.4	4	70	6.8
	L. Sandy at Womack Br.	7/11	10:10	78	74	5.8	66.8	3	74	7
	L. Sandy just above Falls	7/11	10:05	78	75	5.7	66.80	3	68	6.8

Little Sandy River and North Fork of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO 2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Little Sandy River at mouth	7/11	9:55	78	75	5.2	60.7	5	64	6.7
	N. Fk. of Licking at Valley Sch.	8/9	12:30	78	76	4.7	55.09	2	52	7
	N. Fk. at Foxport Bridge	8/9	1:00	78	76	4.6	54.04	1.5	48	6.9
	N. Fk. at Mt. Carmel Tollsboro Bridge	8/9	1:10	78	77	4.1	48.9	3	84	7.4
	Philips Cr. Near mouth	8/9	1:20	79	77	4.6	54.8	4	160	8
	N.Fk. at Mason-Fleming Co. line	7/26	9:00	78	74	4.2	48.3	4	130	7.3
	N. Fk. at Indian Cr.	7/26	11:00	82	75	4	46.8	4	142	7.4
	N. Fk. at Stonelick	7/26	12:45	84	74	4.1	47.2	2.5	146	7.4
	N. Fk. at Taylors Mill	8/10	9:25	73	71	2.9	32.8	8	152	7.5
	N. Fk. at Lewisburg	8/10	9:00	71	71	5	56.6	0	166	7.6
	Mill Cr. near mouth	8/10	9:10	71	70	6.1	67.8	5	202	8

North Fork of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	N. Fk. at Bridge on Ky. Rd. No. 24	8/10	8:10	69	71	4.8	54.3	2.5	170	7.5
	N. Fk. Ay Wells Cr.	8/10	7:45	68	71	4	44.05	3	178	7.6
	Wells Cr. at mouth	8/10	7:45	68	69	5.9	64.3	1	190	7.6
	Lees Cr. at lower bridge	8/8	8:30	70	70	4.6	51.1	1	200	7.9
	Lees Cr. at upper bridge	8/8	9:35	72	70	4.9	54.5	1.5	220	8
	N. Fk. at Murphysville, Ky	8/10	11:00	75	70	3	34.4	4.5	190	7.5
	N. Fk. at Clarks Run	8/10	3:00	77	71	4	44.05	3	196	7.5
	Clarks Run at mouth	8/10	3:05	77	74	5.3	61	2	226	8.2
	Shannon Cr. at lower bridge	8/10	1:00	78	70	6.3	70.07	0	230	8.2
	Shannon Cr. at bridge Rd. 62	8/10	1:20	78	72	6	69.1	1	234	8.2
	N. Fk. near Abigail	8/18	9:30	84	74	4.1	47.2	5	186	7.6

North Fork of Licking and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	N. Fk. at Bridgeville bridge	8/18	10:35	86	73	4	46	6	194	7.6
	N. Fk. 2 miles below Bridgeville	8/18	1o:50	87	74	4.3	49.5	4	188	7.7
	N. Fk. near Camp Cr.	8/18	12:00	88	75	4.2	49.2	4	190	7.6
	Camp Cr. near mouth	8/18	12:05	88	76	6.5	76.1	0.5	198	7.9
	Camp cr. near mouth of Kitty Br.	8/18	12:15	88	74	6.7	77.1	o	204	8
	N. Fk. near mouth of Saltlick	8/18	1:55	89	75	4.3	50.4	4	188	7.6
	Saltick Cr. near mouth	8/17	3:00	88	72	6.2	70.2	1	208	8
	Panther Cr. near mouth	8/17	10:00	86	74	5.9	69.1	2	200	8
	Little Panther at mouth	8/17	10:00	86	73	6.1	70.2	1	210	8.2
	N. Fk. At Santa Fe bridge	8/17	12:50	88	73	4.3	49.5	4	188	7.6
	N. Fk. at Milford	8?17	11:25	87	73	4.5	51.8	2.5	194	7.6

Chemical Analyses of Licking and Licking River Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO 2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Big Willow near mouth	8/19	9:20	81	70	6.2	68.9	0.5	215	8.2
	Big Willow, centtral section	8/19	11:00	86	72	6.1	69.07	0	220	8.2
	N. Fk. at mouth of Big Willow	8/19	2:25	88	73	5.1	58.7	4	196	7.7
	N. Fk. near mouth	8/19	2:40	88	73	5.6	64.51	2	200	7.8
	Licking River at Salt Lick Cr.	8/30	9.15	73	69	5.5	59.9	1	56	7.1
	Licking just above Heyalton	8/30	9:25	73	69	5.3	57.7	2	58	7.2
	Licking at mouth of Oakley Br.	8/30	9:30	73	70	5	55.5	3	50	7.1
	Licking at Stinson Cr.	8/31	2:45	82	71	5.2	58.8	4	50	7
	Licking near Mason Cr.	8/30	10:45	75	70	6.1	67.8	1	52	7.1
	Licking at mouth of Burning Fk.	8/30	10:55	75	69	5.8	63.2	1	54	7.2
	Licking below Salyersville	8/31	10:50	77	70	4.9	54.5	6	56	6.9

Chemical Analyses of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Middle Fk. below forks	8/30	12:00	78	71	5.4	61.1	2.5	56	7
	Middle Fk. at bridge on Ky. 30	8/30	12:20	78	70	5.6	62.2	1.5	56	7
	Middle Fk. near mouth	8/31	11:05	78	72	5.1	57.7	3	56	7
	Licking at Gifford	8/30	1:35	80	71	4.9	55.4	3	60	7.4
	Licking near Johnson Fk.	8/30	1:40	80	71	5.2	58.8	2	66	7.4
	Johnson Fk. near mouth	8/30	1:50	80	72	5.5	62.2	2.5	54	7
	Johnson Fk. at mouth of Cow Cr.	8/30	2:00	80	73	5.3	61.05	4	54	7
	Licking at mouth of Grape Cr.	8/31	9:30	73	68	5	54.5	2	48	7.2
	Licking at Wonnie	8/31	9:45	73	69	5.3	57.7	1	54	7.1
	Licking at mouth of Lick Cr.	9/1	8:45	70	70	5.6	62.2	3	56	7.2
	Lick Cr. at lower bridge	9/1	9:20	72	71	4.3	48.68	8	50	6.9

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Chemical Analyse of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Lick Cr. near mouth of Raccoon Cr.	9/1	9:25	72	71	4.4	49.8	8	54	7
	Licking near Rockhouse Cr.	9/18	9:00	72	70	7.2	80	2	64	7.2
	Licking near Lacy Cr.	9/18	9:20	73	69	7	76.3	1	62	7.1
	Licking at U.S. 40 upper bridge	9/18	10:15	75	70	6.8	75.6	6	60	6.9
	Licking at War Cr.	9/18	10:25	76	70	7	77.8	4	64	7
	Licking at Jones Br. bridge	9/18	11:40	78	70	7.1	78.9	5	64	7
	Licking below West Liberty	9/18	1:20	80	71	6.6	74.7	6	62	6.9
	Licking at mouth of Elk Cr.	9/18	1:35	80	70	6.7	74.5	4	62	7
	Elk Cr. at mouth	9/18	1:40	80	72	6.8	77	2	74	7.2
	Elk Cr. at Mordica Br.	9/18	1:55	80	72	7.3	82.6	2.5	78	7.2
	Elk Cr. Near Indian Cr. bridge	9/19	8:15	69	69	7	76.3	1	74	7

Chemical Analyses of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Elk Cr. at Elamtp n	8/19	8:25	69	69	7.3	79.6	0.5	74	7
	Licking at Licking River P. O.	9/16	12:30	78	70	6.8	75.6	4	70	7.2
	Caney Cr. near mouth	9/16	12:40	78	72	7	79.2	3	50	6.9
	Caney Cr. at Philips Br.	9/16	1:35	78	72	6.9	76.02	4	52	7
	Caney at State Rd. bridge	9/16	2:40	79	73	6.6	76.03	6	56	7
	Little Caney near mouth	9/16	2:45	79	74	6.4	73.6	6	50	6.6
	Caney Cr. at Malone	9/16	2:55	79	73	6.8	78.3	4	56	7
	Grassy Cr. at State Rd. bridge	9/8	8:30	69	69	7.1	77.4	2	140	7.3
	Caskey Fk. at mouth	9/8	8:35	69	69	7.3	79.6	1.5	144	7.4
	Grassy at upper Long Br.	9/8	8:45	70	69	6.8	74.1	3	138	7.3
	Grassy at lower Long Br.	9/8	8:55	70	68	7.5	73.5	2	148	7.4

Chemical Analyses of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Licking at Muscle Shoals	9/16	9:30	75	69	7.1	77.4	6	74	7.2
	Licking near mouth of Blackwater	9/14	9:45	78	69	7.4	80.6	1	74	7.2
	Blackwater Cr. near mouth	9/14	10:00	73	68	7.6	82.8	0.5	148	7.4
	Blackwater Cr. near Dennis Br.	9/14	12:45	81	69	7.4	80.6	2	150	7.5
	Blackwater Cr. near Ezel	9/14	1:05	81	70	7.7	85.6	1	154	7.6
	N. Fk. of Licking at Wrigley	9/20	12:30	70	69	6.7	73.06	4	70	7
	N. Fk. at Devils Fk.	9/20	12:40	71	69	7.1	77.4	2	100	7.1
	N. Fk. at Bucket Br.	9/20	1:30	72	69	7	76.3	1	98	7.2
	N. Fk. near Barber Br.	9/30	3:05	74	65	6.9	72.2	2	88	7.2
	N. Fk. near Paragon	9/30	2:30	74	64	6.8	71	3	86	7.2
	N. Fk. at Pickett Br.	9/30	2:30	75	64	6.9	72.2	3	84	7.1

Chemical Analyses of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	N. Fk. at Bangor	9/30	1:30	75	63	6.6	67.7	4	80	7
	Licking at Twolick Br.	10/5	12:10	74	64	7.2	75.4	2	72	7.3
	Licking at Fuget Br.	10/5	11:50	73	65	7.1	74.4	1.5	70	7.4
	Licking at mouth of Beaver Cr.	10/5	10:45	71	65	6.9	72.2	1	68	7.4
	Beaver Cr. at Frenchburg	10/13	12:00	70	66	6.6	70.5	3	46	7
	Beaver Cr. at Clifty Br.	10/13	12:15	71	65	6.7	70.2	3	44	7
	Beaver at Myers Cr.	10/13	2:20	70	66	6.5	69.5	2.5	44	7
	Beaver at Brushy Fk.	10/13	2:25	70	65				42	6.9
	Beaver near Murder Br	10/20	10:40	68	64	6.6	69.2	4	40	7.1
	Beaver Cr. at Leatherwood Cr.	10/20	10:55	69	64	6.8	71	4.5	42	7
	Licking at Claylick	10/5	9:30	67	64	6.9	72.2	1.5	68	7.3

Chemical Analyses of Licking River and Tirbutaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Licking at Warix Cr.	10/5	9:15	66	64	7	73.3	1	70	7.4
	Licking near Cogswell Sch.	10/6	9:25	68	65	7.1	74.4	1.5	70	7.4
	Licking at Cave Run	10/6	12:05	76	65	6.9	72.2	2	68	7.3
	Licking at mouth of Caney Cr.	10/6	12:20	77	65	7.2	75.4	2	72	7.4
	Licking at Scott Cr.	10/6	9:45	70	64	7	73.3	2.5	70	7.4
	Licking at mouth of Green Br.	10/6	1:40	78	65	6.8	71	3	68	7.3
	Licking at Farmers	10/6	2:35	78	65	6.7	70.2	3	68	7.2
	Licking below mouth of Triplett Cr.	10/6	3:50	77	66	6.6	70.5	4	66	7.2
	Triplett Cr. at Perry Br.	10/3	9:00	63	57	7	67.5	2	46	7
	Triplett at Rodburn	10/3	8:50	63	58	7.1	68.4	1.5	42	7
	Christy Cr. at mouth	10/3	11:30	74	61	7.6	76.3	0.5	74	7.3

Chemical Analyses of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Christy Cr. at Oldtown Cr.	10/3	11:40	74	60	8	80.4	0	74	7.4
	Triplett at Brady Bridge	10/3	8:40	62	59	6.8	66.9	3	60	7.2
	Triplett at Bluestone Bridge.	10/3	7:55	58	59	6.2	60.9	6	64	7.2
	Triplett at Murphy Br.	10/3	7:45	58	59	6.7	66	4	60	7.1
	Dry Cr. at mouth	10/3	1:30	79	62	6.6	67.7	2.5	60	7.2
	Dry Cr. at Hall Br.	~~10/3~~	1:45	79	63	6.7	68.7	2	62	7.2
	N. Fk. of Triplett near Bull Fk.	10/4	3:20	80	65	6.9	72.2	3	58	7
	N. Fk. of Triplett at Logan Br.	10/4	2:00	81	65	6.6	69.2	2	58	7
	N. Fk. of Triplett at Brushy Cr.	10/4	12:45	79	64	6.7	70.2	3	56	7
	N. Fk. of Triplett at Weaver Br.	10/4	12:30	78	65	6.8	71	2	56	7
	N. Fk of Triplett at Tackett Br.	10/4	10:45	69	64	6.8	71	4.5	54	7

Chemical Analyses of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	N. Fk. of Triplett at Clear Fk.	10/4	10:35	68	63	6.7	68.5	3	52	7.1
	N. Fk of Triplett at Rock Fk.	10/4	9:15	63	61	6.2	62.3	5	54	6.9
	N. Fk. of Triplett at Holly Fk	10/4	9:00	63	60	5.9	59.2	7	54	7
	Salt Lick Cr. at Salt Lick, Ky.	10/11	8:20	59	63	5.5	57.5	4	52	7
	Salt Lick above Mudlick Fk.	10/11	8:85	59	64	5.3	55.5	4	52	7
	Mudlick at mouth	10/11	8:25	59	62	5.5	56.4	2	50	6.9
	Salt Lick near Salt Lick Sch.	10/11	9:40	60	63	5.1	52.3	5	48	6.9
	Salt Lick near Hicks Holl.	10/11	9:45	60	63	5	51.3	4.5	50	7
	Salt Lick at Pendleton Br.	10/11	9:50	60	62	4.9	50.3	5	52	7
	Salt Lick at Suddith	10/11	10:00	61	62	5	51.3	4	50	7
	Licking River at Iles Mill	10/10	1:20	73	68	7	76.3	2	68	7.2

Chemical Analyses of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Licking at mouth of Bluebank Br.	10/10	3:30	71	69	6.6	73.4	3	70	7.3
	Licking River at Moore's Ferry	10/11	2:25	66	70	6.3	70	4	68	7.3
	Licking River at Johnson Ford.	10/27	10:10	78	65	6.6	69.2	3.5	68	7.2
	Licking River at Wyoming	10/27	9:50	78	65	6.8	71	3	74	7
	Slate Cr. at mouth	10/27	8:35	77	66	6.7	71.6	1	176	7.8
	Slate Cr. near Happy Holl. Br.	10/27	8:30	77	66	6.6	70.5	1.5	176	7.8
	Slate Cr. At Forge Mill	10/27	8:25	76	67	6.6	70.58	1	174	7.8
	Slate Cr. at mouth of Prickley Ash Cr.	10/27	8:15	76	66	6.4	68.4	2	170	7.9
	Slate Cr. at Rd. No. 60 bridge	10/28	8:30	70	64	6.5	68.1	4	172	7.8
	Slate Cr. at Mill Cr.	10/28	8:40	71	64	6.6	69.1	3	168	7.8
	Mill Cr. at mouth	10/28	8:45	71	63	6.1	62.6	4	180	7.9

Chemical Analyses of Licking River and Tributaries

Map No.	Name of Stream and Location of Sample	Date	Time	Degrees F.		Dissolved Oxygen		CO_2 p.p.m.	Alkalinity MO. in p.p.m.	pH
				Air	Sample	p.p.m.	% saturation			
	Slate Cr. near Saltwell Cr.	10/28	9:35	73	64	6.6	69.1	1	174	7.9
	Slate Cr. at Howards Mill	10/30	12:40	74	62	6.4	65.7	4	176	8
	Spenser Cr. near mouth	10/30	12:55	74	66	7.3	78.07	1	204	8.2
	Slate Cr. near Spenser Cr.	10/30	1:05	74	63	6.6	67.7	3	172	7.9
	Slate Cr. near Sycamore Cr.	10/30	2:25	75	63	6	61.6	4	166	7.6
	Slate Cr. at Rd. 40 bridge	10/30	2:40	75	64	6.4	67.08	1	170	7.8

STOCKING POLICY FOR THE WATERSHED

Stocking Policy For the Watershed

As was stated earlier in this report many physical, chemical, and biological factors determine the suitability of waters for stocking purposes. Each kind of fish has its own environmental requirements which it must have before it can live and reproduce its kind. Often the enviromental requirement of one species will overlap those of one or more species. Therefore, we often find a noumber of different species living together in harmony in ome stream. However, the exact species one finds in any stream depends entirely on the type stream. One is not apt to find a muskallunge in a shallow stream in Kentucky nor do we find sand darters on a mud bottom. Biological factors, such as the type and amount of food present, serve by indicating the species and the noumber of that species to be planted. Little good would result by planting bass in a stream which is practically barren so far as food is concerned nor would stocking a streem that already contains all the fish that it aan support be of any help in creating good fishing.

The kind of fish to be planted in any stream is most often determined by studying the kinds of fishes already in the stream. This includes a study to determine whether the species to be planted is present and thriving in the stream, whether other fishes present would harm the growth of the species to be stocked, and a careful environmental analyses of the suitability of the water.

In this report the following types of streams are not recommended for stocking: polluted waters, posted streams or private lakes, and seasonal or streams to small for bass.

Explanation of Tables.

LENGTH IN MILES. This refers to the entire length of a stream unless another division of the stream is given. The length in this case refers only to the distance in the the section given.

AVERAGE WIDTH. This is the average for all stations and does not refer to any particular point.

AVERAGE DEPTH. Readings in the table is for the

entire section of the stream given. At a given station the average depth is secured at one half of the distance between the one shore and the middle, at the middle, and at apoint mid-way between the middle and the opposite side. The readings are added and divided by 1 more than the noumber of readings. This is to allow for 0 depth at each side.

BOTTOM. Abbreviation used.

Ru. - Rubble, a term applied to irregular stones ranging in size from an egg up to a boulder a foot in diameter.

Bo. Boulders.

Gr. - Gravel.

Sa. - Sand

Si. - Silt

M. - Mud

POOL GRADE. S refers to size, T to type, and F to frequency of pools.

SIZE. 1. Pools with average width or length much greater than the width of the stream.

2. Pools having a length equal to the width

of the stream.

3. Pools shorter than the width of the stream.

Type. 1. Deep exposed pools containing a great luxuriance of aquatic plants harboring a rich fauna; or deep pools with abundant shelter.

2. Pools intermediate in depth, shelter and plant abundance.

3. Shallow exposed pools without shelter.

Frequency

1. More or less continuous pools -- about 75% to 25% relation of pools and riffle area.

2. 50-50 relationship between pools and rapids.

3. Pools infrequent with long stretches of shallow water.

By giving the entire combination on the above in the tables, it is beleived that a better stream picture will be presented than had the combinations been reduced to A, B, C grades.

Abbreviations Used in Stocking List

Sm. B. -- Small-mouthed Bass

Lm. B. -- Large-mouthed Bass

R.B. -- Rock Bass or Red Eye.

Ky.B. -- Kentucky Bass

Bl. G. -- Blue Gill

Shade	Game Fish Present	Fish Recommended	Section to be Stocked	Miles in Section	Remarks
Good	None	None	None		
Fair	None	None	None		
Good	Bass	None	None		
"	"	"	"		
"	"	"	"		Natural spawning adequate
"	"	"	"		
Fair	"	"	"		" " "
Good	"	Sm. B. Bream	Entire	7	
"	"	" "	War Dr. to West Liberty	8 ½	
"	"				
"	"	Sm. B. R. E.	Entire	4	

Map No.	Name of Stream	Tributary To	Section Surveyed	Date	Length in Miles	Average Width in Feet	Average Depth in Feet	Velocity	Vegation	Bottom	Pool Grade
	Licking River	Ohio	Source to Goldia	9/6	15½	11	.4	Moderate	Common	G. Sa. R.	$S_3T_3F_3$
	Licking River	Ohio	Goldia to Royalton	9/9	4½	12	.5	"	"	Sa. Gr. Be.	$S_3T_2F_3$
	" "	"	Royalton to Salyersville	9/4	11½	20	.7	"	Rare	Sa. Gr.	$S_2T_2F_3$
	" "	"	Salyersville to Wonnie	9/5	16	25	1	"	Common	Sa. Gr. R.	$S_2T_2F_3$
	Middle Fk.	Licking	Lower	9/5	12½	16	.7	"	"	Gr. Sa.	$S_2T_2F_2$
	Johnson Fk.	"	"	9/7	12½	10	.4	"	"	Gr. Sa.	$S_3T_3F_3$
	Lick Cr.	"	"	9/7	9½	15	.5	"	Rare	Gr. R. Sa.	$S_2T_2F_3$
	Licking	Ohio	Wonnie to Morgan Co. Line	9/7	7	30	1.2	"	Common	Gr. Sa. R.	$S_1T_1F_2$
	"	"	Magoffin Co. Line to War Cr,	9/10	9½	36	1.4	"	"	Gr. Sa.	$S_1T_2F_2$
	"	"	War Cr. to Elk Cr.	9/11	12	38	1.4	"	"	Gr. Sa.	$S_1T_2F_2$
	Elk Cr.	Licking	Mouth to Mordica Br.	9/12	4	30	1	"	"	Gr. Sa. R.	$S_2T_1F_3$

Shade	Game Fish Present	Fish Recommended	Section to be Stocked	Miles in Section	Remarks
Good	Bass	Sm. B.	Mordica Br. to Straight Cr.	5.	Stock occasionally . Fishing is light
"	None	None	None		
"	Bass	"	"		See discussion of this cr.
"	"	Sm. B.	Entire	12½	Stock occasionally
"	None	None	None		
"	Bass	Sm. B.	Entire	9	Fishing is light
"	"	Sm. B.:R.E.	From Ezel to mouth	7	Occasional stocking
"	"	None	None		See discussion of this creek.
"	"	Ky. B.	Craney Cr. to Bangor	9½	Stock occasionally. Fishing light.
"	"	Ky. B. SM.B	Entire	10½	
"	"	None	None		

Map No.	Name of Stream	Tributary To	Section Surveyed	Date	Length in Miles	Average Width	Average Depth	Velocity	Vegation	Bottom	Pool Grade
	Elk Cr.	Licking	Indian Cr. to Williams Fk.	9/12	5	25	.9	Moderate	Common	Gr. Sa.	$S_1T_1F_3$
	Caney Cr.	"	Lower	9/11	16	20	.8	"	"	" "	$S_2T_2F_3$
	Grassy Cr.	"	Lower	9/13	13	30	.9	"	Rare	Gr. R. Sa. Bo.	$S_1T_1F_2$
	Licking River	Ohio	Elk Cr. to Pleasant Run	9/16	12½	45	1.8	"	"	Gr. R. Sa.	$S_1T_1F_1$
	Pleasant Run	Licking	Lower	9/15	6	8	.2	"	"	Gr. R.	$S_3T_2F_3$
	Licking	Ohio	Pleasant Run to North Fk.	9/17	9	58	2.	"	"	Gr. Sa. R.	$S_1T_1F_1$
	Blackwater Cr.	Licking	Section below Ezel	9/14	14	30	1.	"	"	Gr. Sa. Bo. R.	$S_1T_1F_2$
	Upper North Fk.	Licking	Source to Bucket Br.	9/15	8	18	.5	"	"	Gr. Sa. Bo.	$S_1T_1F_3$
	" " "	"	Caney Cr. to South	9/20	10½	30	1.2	"	"	Gr. Sa.	$S_1T_1F_2$
	Licking	Ohio	North Fk. to Beaver Br.	10/14	10½	68	2.	"	"	Sa. Gr.	$S_1T_2F_$
	Beaver Cr.	Licking	Frenchburg to Coal Cave Br.	10/13	10½	14	.5	"	Common	Gr. Sa.	$S_2T_2F_$

Shade	Game Fish Present	Fish Recommended	Section to be Stocked	Miles in Section	Remarks
Good	None	None	None		
"	Bass	"	"		Natural Spawning Adequate
Moderate	Bass Muskellunge	Ky.B.	Warix Run to Green Br.	11	
"	"	None	"		
Good	"	Sm. B.	Entire	7½	Natural spawning good. Stock occasionally. Fishing light
"	"	Sm. B. Ky.B.	Little Brushy to Clear Fk.	7	" 2 " "
"	None	None			
"	Bass	"			See discussion of this creek.
"	Bass	Lm. B	Pool above dam to ~~Morehead~~	1	Stock occasionally.
Fair	"	None	None		
"	"	"	"		

3

Map No.	Name of Stream	Tributary To	Section Surveyed	Date	Length in Miles	Average Width	Average Depth	Velocity	Vegation	Bottom	Pool Grade
	Myers Cr.	Beaver	Lower	10/13	6½	6	.2	Moderate	Common	Sa. Gr.	$S_3T_3F_3$
	Beaver Cr.	Licking	Coal Cave Cr. to mouth	10/17	5⅔	25	1.	"	"	Sa. Gr.	$S_1T_1F_3$
	Licking	Ohio	Beaver Cr. to U. S. 60 Bridge	10/12	18	85	2.5	"	Rare	Gr. Sa. M.	$S_1T_1F_1$
	Triplett Cr.	Licking	Mouth to Frks.	10/9	5	40	2.	"	"	Sa. G. Gr.	$S_1T_1F_2$
	North Fk. of Triplett Cr.	"	Mouth to Little Brushy	10/10	7½	44	1.6	"	Abundant	Gr. Sa.	$S_1T_1F_1$
	" " "	"	Little Brushy to Triplett, Ky.	9/28	10	40	1.8	"	Common	Gr. Sa.	$S_1T_1F_2$
	Bull Fk.	N.Fk. Triplett	Lower	9/29	7	8	.2	"	"	Gr. Sa.	$S_3T_3F_3$
	East Fork of Triplett	Triplett Cr.	Mouth to Bracy	10/30	6½	30	1.2	"	"	Gr. Sa.	$S_1T_2F_3$
	" " "	" "	Bracy to Big Perry Cr.	10/27	6	20	.7	"	Rare	Gr.	$S_1T_1F_3$
	Christy Cr.	East Fork	Lower	10/27	11	10	.5	"	"	"	$S_2T_2F_3$
	Licking River	Ohio	U. S. 60 Bridge to Moore's Ferry	10/10	17½	90	2.5	"	"	Gr. Sa. S. M.	$S_1T_1F_1$

Grade	Game Fish Present	Fish Recommended	Section to be Stocked	Miles in Section	Remarks
Good	Bass	Ky. B.	Johnson Ford.	1	
	"	None			Natutal spawning good
	None	None			
Moderate	Bass Muskallunge	Sm.B.	Forge Mill to Happy Holl.	4	Heavy Fishing
Abundant	Bass	Ky. B., Sm.B R. E.	Entire	14	" "
"	"	" " "	"	11	" "
"	"	" " "	Pool above dam	3	This scetion fished heavily.

Map No.	Name of Stream	Tributary To	Sections Surveyed	Date	Length in Miles	Average Width	Average Depth	Velocity	Vegation	Bottom	Pool Grade
	Licking River	Ohio	Moore's Ferry to Wyoming	11/2	11½	95	2.8	Moderate	Rare	Sa. Gr. R.	$S_1T_1F_1$
	Salt Lick Cr.	Licking	Mouth to Hicks Holl.	11/11	9	10	.8	"	Common	Sa. Gr.	$S_1T_1F_5$
	Mud Lick Cr.	Salt Lick	Lower		9	9	.3	"	"	Gr. Sa.	$S_3T_3F_3$
	Slate Cr.	Licking	Mouth to Prickley Ash Cr.	10/25	7½	65	2.	"	"	Gr. Sa. R. Be.	$S_1T_1F_1$
	Slate Cr.	"	Prickley Ash to Saltwell Cr.	10/23	14	60	2.4	"	"	Gr. R. Sa.	$S_1T_1F_1$
	" "	"	Saltwell Cr. to Howard's Mill	10/24	11	52	1.8	"	"	Gr. R. Sa.	$S_1T_1F_1$
	" "	"	Howard's Mill to U. S. 40 Bridge	10/26	17	25	1.4	"	"	Sa. Gr.	$S_1T_1F_3$

Shade	Game Fish Present	Fish Recommended	Section to be Stocked	Miles in Section	Remarks
Good	Bass and Crappie	None			
"	"	"			See discussion of this drainage
Fair	"	"			Dissolved oxygen content of water is low.
Fair	"	"			Young fish and eggs would be destroyed by the large amount of sil this stream.
Good	"	"			
Fair	"	"			
Poor	"	"			
Fair	"	"			
Good	"	"			
Poor	"	"			
Fair	"	"			

Map No.	Name of Stream	Tributary To	Section Surveyed	Date	Length in Miles	Average Width	Average Depth	Velocity	Vegation	Bottom	Pool Grade
	Lower North Fork	Licking	Bowmen Springs to Foxport.	7/13	4½	16	.8	Moderate	Rare	M. Sa.	$S_2T_2P_3$
	" "	"	Foxport to Mason Co.	7/14	7½	34	1.5	"	"	Sa. Gra. M.	$S_1T_1P_1$
	" "	"	Fleming Co. Line to Indian Cr.	7/19	7	40	2	"	"	M. Gra. Rubble.	$S_1T_1P_1$
	" "	"	Indain Cr. to Taylors Mill	7/25	5	36	2.4	"	"	M. S. Gra.	$S_1T_2P_1$
	" "	"	Taylors Mill to Rd. 24 Bridge	7/27	4½	39	1.5	"	Common	Sa.Gra M. S.	$S_1T_2P_1$
	" "	"	Rd. 24 Bridge to Murphysville	7/31	10	40	2.2	Sluggish	Rare	M. S.Sa.	$S_1T_2P_1$
	" "	"	Murphysville to Pommel Cr.	8/1	6½	26	1.8	"	"	M. S. Sa.	$S_1T_2P_1$
	" "	"	Pommel Cr. to Panther Cr.	7/29	6½	28	2	Moderate	"	Sa. M.S. Ru. Gra.	$S_1T_2P_1$
	" "	"	Panther Cr. to Salt Lick Cr.	8/21	12	25	2.3	"	"	M. Sa. S. Gr.	$S_1T_1P_1$
	" "	"	Salt Lick Cr. to Santa Fe.	8/24	2½	30	2.5	Sluggish	"	M. S. Sa.	$S_1T_1P_1$
	" "	"	Santa Fe. to Mouth	8/25	7	38	2.6	Moderate	"	Sa. Gr. Ru. M.	$S_1T_1P_1$

Map No.	Name of Stream	Tributary To	Section Surveyed	Date	Length in Miles	Average Width	Average Depth	Velocity	Vegation	Bottom	Pool Grade
	Little Sandy River	Ohio River	Source to Sandy Hook	5/11	8½	15	.5	Moderate	Rare	Sa. Gr. Be.	$S_3T_3P_3$
	" " "	" "	Sandy Hook to Green, Ky.	5/16	9	26	1.7	"	"	Gr.R. Sa.	$S_3T_3P_3$
	Middle Fk.	Little Sandy	Source to Rocky Br.	5/12	8	20	1.2	"	Common	Gr.Ru. Sa.	$S_2T_1P_2$
	Newcombe Cr.	" "	Source to Laurel Br.	5/9	11½	14	.8	"	Rare	Sa. Gr.	$S_3T_3P_3$
	Laurel Cr.	" "	Entire	5/17	12	24	1.	"	Common	Gr.R.Sa. Bo.	$S_1T_1P_2$
	Little Sandy	Ohio	Green, Ky. to Cresco	5/13	12½	40	1.5	"	Rare	Sa. Gravel	$S_1T_1P_3$
	Caney Cr.	Little Sandy	Big Caney	5/19 & 5/23	15	37	.9	"	Common	Sa. Gr. R.	$S_1T_1P_2$
	Little Sandy	Ohio	Cresco to Deer Cr.	6/4	8½	44	1.6	"	Rare	Sa. Gr.	$S_1T_1P_2$
	Big Sinking	Little Sandy	Central and Lower	4/25	20	30	1.	"	"	Sa. Gr.	$S_2T_1P_3$
	Little Sinking	Little Sandy	Central and Lower	4/26	9	15	.5	"	"	Sa. Gr. Bo.	$S_2T_1P_3$
	Little Sandy	Ohio	Deer Cr. to Pope Holl.	6/4	11	48	2.2	"	"	Gr. Sa.	$S_1T_2P_1$

Shade	Game Fish Present	Fish Recommended	Section to be Stocked	Miles in Section	Remarks
Fair	Bass	None	None		
"	"	Sm. B.	Entire	9	
Good	"	" "	Central	4	
Fair	None	None	None		
Good	Bass	"	"		See discussion of this creek
"	"	Sm. B.	Cresco	6	
"	"	None	None		Natural spawning adequate
Good	"	Sm.B.	Entire	8½	
"	"	None	None		
"	"	"	"		
"	"	Sm.B.;Ky.B.	Entire	11	

Map No.	Name of Stream	Tributary To	Section Surveyed	Date	Length in Miles	Average Width	Average Depth	Velocity	Vegation	Bottom	Pool Grade
	Little Fk.	Little Sandy	Mouth to Readville	4/27	8	33	1.5	Moderate	Rare	Sa. Gr. S.	$S_1T_2F_2$
	Little Fork	" "	Readville to ElliottCo.	4/28	11	40	1.3	"	"	Sa. Gr. S. M.	$S_2T_3F_2$
	" "	" "	Upper section	5/10	13	16	.4	"	Moderate	Sa. Gr.	$S_3T_3F_3$
	Straight Cr.	Little Fork	Lower	4/18	9½	10	.7	"	Common	Gr. Sa.	$S_2T_3F_3$
	Dry Fork	" "	"	4/19	10	13	.7	"	Rare	Sa. Gr.	$S_2T_3F_3$
	Barrett Cr.	Little Sandy	Entire	4/13	11	12	.3	"	Common.	Sa. Gr.	$S_3T_3F_3$
	Little Sandy	Ohio	Pope Holl. to Pactolus	6/2	6	80	3.5	Sluggish	Rare	Sa. S. Gr.	$S_1T_2F_1$
	Evermann's Cr	Little Sandy	Lower half	5/1	7½	8	.4	Moderate	Rare	Sa. Gr.	$S_2T_3F_3$
	Little Sandy	Pactolus to Greenup Co.	Entire	4/22	5½	78	2.4	"	"	Gr. Sa. S.	$S_1T_1F_1$
	" "	Carter Co to Oldtown	"	5/3	5½	75	2.	"	"	Sa. Gr. S.	$S_1T_1F_1$
	Oldtown Cr.	Little Sandy	Lower	5/4	9	10	.3	"	Common	Gr. Sa.	$S_3T_3F_3$

Shade	Game Fish Present	Fish Recommended	Section to be Stocked	Miles in Section	Remarks
Poor	Bass	None	None		See discussion of this Creek
Fair	"	"	"		" " " " "
Good	"	"	"		
Fair	None	"	"		
Fair	Bass	Ky.B. Bl.G.	Pool above dam at Pactolus	1	
Good	None	None	None		
Fair	None	None	None		
	Bass	"	"		
Good	"	Ky.B. R.E.	Entire	5½	
"	"	None	None		
Fair	None	"	"		

Shade	Game Fish Present	Fish Recommended	Section to be Stocked	Miles in Section	Remarks
Good	Bass	None	None		
Fair	Bass	None	None		
Good	"	Ky.B.;Sm.B. R.E.	Entire	8	
"	"	" "	"	4½	
Fair	"	None	None		See discussion of watershed
"	"	"	"		

Map No.	Name of Stream	Tributary To	Sections Surveyed	Date	Length in Miles	Average Width	Average Depth	Velocity	Vegation	Bottom	Pool Grade
	Little Sandy	Ohio	Oldtown to Argilltie	6/23	6	75	3.4	Sluggish	Rare	Sa. S. Gr.	$S_1T_2F_1$
	East Fk.	Little Sandy	Mouth to Indian Run	7/9	4½	30	1.4	"	"	Sa. S. M.	$S_1T_2F_1$
	" "	" "	Indian Cr. to Boyd Co.	7/8	8	26	1.	Moderate	Common	Gr. R. Sa.	$S_1T_1F_2$
	" "	" "	Greenup Co to U.S. 60 Bridge	7/9	4½	25	.9	"	"	Gr. Sa.	$S_1T_1F_2$
	Little Sandy	Ohio	Argillite to Allcorn Cr.	6/20	7	80	4.	Sluggish	Rare	Sa. S. Be.	$S_1T_1F_1$
	Little Sandy	"	Allcorn Cr. to Mouth	6/21	6½	80	5.	"	"	Sa. Gr. S. Be.	$S_1T_1F_1$