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Report 153

REPORT ON THE STREAM IMPROVEMENT WORK ON THE EAST BRANCH OF THE BLACK RIVER

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To our old and tried methods of conserving and increasing the trout supply, namely: introduction, propagation, and protection,—there is now being added a new method—habitat improvement or trout stream improvement.

We are all aware of the great importance of correct habitat or proper environment for the maintenance of animal life. The quickest and most thorough way to drive an animal from a region is to destroy that habitat. It is well known, for example, that the forest species disappeared as the farm lands advanced. When man alters or destroys the proper environment of an animal, it is forced to move on or perish.

The purpose of trout stream improvement is to provide more and better fishing for the angler. It aims to accomplish this desired end by restoring the trout streams (as nearly as possible) to their former natural conditions, and by scientific methods to make environmental conditions even better than they were formerly. The principle of environmental improvement is the production and maintenance of situations which are necessary and conducive to growth survival, and reproduction of trout. These conditions are pure water of a suitable temperature, sufficient quantities of food organisms, good pools, hiding places and shelter for all times of the year and for all sizes of trout, adequate spawning areas, suitable waters for the rearing of young.

The industries of man have destroyed some or all of these conditions in many of our streams. By removing the forest and allowing the land to burn over, man has

destroyed shade and decreased the flow of springs. The outcome is the warming of the streams so that they become unsuitable for trout life or unfavorable for a large production of trout. Lumber driving necessitated the removal of jams and other cover, and widened the streams creating numerous open, shallow stretches absolutely devoid of pools or cover, and entirely unsuitable for trout. Deforestation accelerated erosion. Immense quantities of sand are being added to our streams every year and sand is the most ruinous element in Michigan trout streams. It fills up the pools, covers the spawning beds, and encroaches upon the food producing areas to form actual aquatic deserts. Shifting sand bottom is barren of food. In it there is virtually no animal life suitable for trout food. Consequently an unimproved sand section can not support many trout.

All the factors listed above are necessary for good trout production. If only one of these is absent or poorly developed, the trout production will be certainly lessened, this condition becoming the limiting element in trout increase. In the East Branch, specifically from the Lower Dam to the Dam in the gravel bottom section, the absence of pools, and cover ~~is~~ are the limiting factors whereas, lack of cover and adequate food supply ~~are~~ were limiting factors in the sand section of the stream, extending from the Upper Dam to the Lower Dam.

Trout will not stay in a section that has no pools. While they can and do feed in a shallow, swift section of the stream, they remain in such a section only if there be some pools nearby, since trout do not like to lie in swift water. They require deep, quiet, sheltered places where they need not be continually fighting the current. The capacity of a pool is limited and the number and size of trout in a given section depends on the number and size of the pools in that section. Thus if there are not sufficient pools in a given section, increasing the number of pools will provide homes for more trout--increasing the trout population in that stretch of the stream. The large trout require more spacious pools. These must be present or provided if the fish are to remain in a desired section of stream. Deep pools where the water is quiet and warm in winter are also needed as wintering places. It is therefore evident

that in a stretch where the number of pools is a limiting factor in trout production, it is necessary to increase the number and size of the pools, if we wish to bring the production of trout up to its maximum. A deflector which accelerates the current and directs it against a cover or digging log below, forms a pool beneath the cover. Where pools have been filled with sand, another use can be made of a correctly placed deflector—namely cleaning out the pool and bringing it back to original conditions. Very good pools can be made at bends by throwing the current along the bank. The pools alone are not sufficient; there must be cover over these pools if many trout are to remain in them.

Many streams have an abundance of good pools but they are so open that trout will not lie in them. There is only cover enough, usually, for a few small fish and not enough to give shelter to large fish. A section of stream will retain only as many fish as there are good hiding places for retreat in time of danger. Trout prefer some dark, quiet spot under a log or a floating raft. Thus, the holding capacity of a stream depends largely upon the degree of development of pools and cover. Nevertheless, the number of trout remaining in the stream can be increased by the addition of artificial hides. It has been found practicable to add shelters in several different ways. At bends, it is well to use bank covers. Vaft and triangle covers have been generally successful. At short bends, where erosion of the bank is taking place, adding sand to the stream, boom covers work efficiently; for not only do they afford good shelter but they prevent the eroding of the bank. Square cover traps are used in the center of the stream where it is shallow on both sides. Proper installation of cover encourages the fish to spread out with the advantage of a larger feeding range. While cover will help to increase the holding capacity of a stream it can increase it only in so far as there is enough food to support the added number of trout.

Of the factors necessary for really large trout production the food supply is probably the most important. In order to increase it, there must be provided a fitting environment for the insects and minnows upon which trout feed. Therefore trout stream improvement includes not only the protection of pools and shelter for

the trout, themselves, but also the improvement of insect habitats.

There are several methods of enlarging the food store. A sand section is barren of insect life and the only food encountered in such a section is to be found in occasional patches of dark mucky material along the edges of the stream, in plant beds, or in various piles of brush or rubbish lodged in the stream. The aim, then, in the problem of food is to furnish more insect-rearing areas. The installation of deflectors can accomplish this. The accelerated current running around the end of the deflector removes the sand, piling it up as a bar in the quiet water below the deflector. Mucky material settles on this bar in this same quiet area below the deflector. This material is the natural home of burrowing mayflies and midges which are produced in large numbers and form a suitable diet for young trout. Plant beds begin in this dark material. Thereafter, in supporting the trout population, the plants provide shelter for many insects and food for some species of insects. These plants also give shelter to the little fish. The quiet water below these deflectors becomes warmer than that in the current, resulting in a greater production of food. This nursery can be made better by fastening brush to the deflector and letting it float on the downstream side. The brush shortly becomes covered with aquatic insects, adding more food. It gives cover to the young trout and protects them, not only from the large cannibalistic fishes, but also from fish eating birds. We have provided, at this point, shallow warm water, an abundance of food suitable for young trout and minnows, and adequate shelter,- in all, a very good nursery.

If gravel lies under the sand, food production can be increased in another way. The accelerated current caused by the deflector removes the sand from the gravel, uncovering vegetable areas of gravel bottom. Just since gravel is the natural home of many aquatic insects—producing large numbers of caddis flies, May flies, and stone flies,—the food productivity of the stream is greatly increased in this way.

Accelerating the current will in itself produce more food, for swift water supports many more caddis larvae than slow water. Some forms, also, such as stone flies, live only in swift water. The barriers, themselves, become covered with the larvae of caddis flies, black flies, and sort in midges, and furnish excellent places for the transformation of insects. In these ways it is possible to increase many times the food supply of a sand area. This, in turn, enlarges the carrying capacity for trout in that area.

Even in gravel areas which are naturally many times as productive as sand areas, the quantity of food can be increased. I have already stated that to remove the sand from the gravel is to aid food production. It is not necessary, however, for the sand to cover the gravel entirely in order to cut down the food supply. A mere sprinkling of sand around each pebble or small stone, filling up the crevices around them, will cut production in half by reducing the surface, which is required for the attachment of insects. It is possible to accelerate the current by means of a deflector so that the sand is removed and made to form a small deep bar, leaving the gravel clean and water-sorted, and in such condition that the supply of food is materially increased.

Plant beds and productive dark rock plate are easily started behind the barriers in the same way as in the sand areas. (If, however, there is not already a stand of aquatic plants in the stream they must be planted for a beginning.) The new plant beds will be very helpful, because in a gravel bottom area, they are usually not developed in sufficient quantity. In order to support all types of trout, a variety of conditions and a variety of foods are needed. The new water nurseries will provide the needed variety of conditions and will add large quantities of insects, as well as minnows, to the fish, for this mucky material is even more productive than gravel. Plant beds which are usually scarce in gravel areas, grow behind these barriers, as experiments have shown. They offer more foods than any other medium, and give excellent cover.

Riffles,—the fast-water, food-producing areas, or larders of a stream,—can

be formed by the proper location of deflectors. These swift water areas are teeming with life, whereas, in gravel areas, where the current is slow, there are fewer insects.

Deflectors in combination with covers can be utilized to make ideal fly fishing conditions. Raft or bank covers can be placed below deflectors, so the current from the deflector flows the length of the cover. The deflector concentrates the drifting food into one food channel, sending it along the edge of the cover. A trout can, in this way, lie in security in the still water under the cover with all the drift food continually flowing past his nose. He has only to move a few feet in order to have access to the supply. It is apparent that trout have definite food channels in which to feed. Because they do not range all over the stream, they generally lose a greater part of the drifting food. By concentrating the drifting food into a single narrow channel, we induce an added consumption of drift food. In reality, we thus increase the food store. The fisherman who drops his fly into this food channel, if the trout are feeding, has a reasonable chance of taking one or more.

The result of removing lifeless sand from productive gravel, accelerating the stream to produce riffles, producing warm water nurseries with rich, muck bottoms, producing plant beds, and adding brush and logs for the development of insect life, must be a tremendous increase in food production in any stream. This augmented food supply supports a much larger population of trout, which is the end that fish men desire.

From the foregoing discussion it is apparent that mucky bars or flat and gravel areas found in the barriers will be of benefit to the stream. It was for the purpose of determining to what extent these had been produced that the work was reobserved in July of this year. Every patch of gravel exposed by the removal of sand in the sand section below the upper dam is of benefit to the stream as are the mucky flats produced behind the dams since they are even greater food producers than the gravel areas. A check was made also to determine the depth of pools found on the occurrence

and effectiveness of wings and covers. Pools were needed very much in the rocky section below the lower dam, since any deepening of the water in the section would be a benefit. Besides rechecking I spent six days reconditioning the barriers and installing some brush shelters, with the aid of one man.

Rechecking consisted of examining each barriers and recording the size of sand bars and mucky areas formed, the size and depth of pools created, the area of gravel bottom exposed, the general deepening of the section, and the general condition of the barriers.

Perhaps there is no better way of giving an adequate idea of what each barrier has accomplished than to describe the stream around each barrier before and after improvement. In determining the general deepening of the stream, measurements of depth were taken across the stream from right to left. All measurements were taken at every yard and all were taken in inches. Measurements to determine the extent of deepening caused by covers were taken at every yard from the up stream end to the downstream end. The barriers are numbered 502 to 510 inclusive.

Each barrier will be taken up separately and the changes it has caused will be noted. Corrections have been made for changes in water level

Barrier 502. Wing type.

This barrier has a large mucky bar below it where none existed before. A 21 inch pool has been formed just behind the barrier and there is a second pool just below that.

Former depth across stream: 12-17-17-21-15-14-12-14-10-15-12 inch

Present depth across the stream: 14-21-13-17-13-16-13-14-14-15-16 inch

Barrier 503. Cover.

This barrier which was built of stone was taken out by the flood this spring. It has been replaced by a triangle cover type.

Barrier 504. Wing.

Former depths across stream: 7-7-10-11-14-14-17-14-12-10 inches

Present depths across stream: 8-8-10-11-14-15-21-23-22-18 inches.

This barrier makes a very good riffle. It produces a fine place for young trout below the barrier.

Barrier 505. Cover.

This barrier is giving good cover over a pool which was formerly 23 inches deep and is now 38 inches deep, due to the current from the barrier above.

Former depths across the stream: 22-20-23-23-22-16-11-11-13 inches

Present depths across the stream: 35-27-26-23-23-18-14-11-9 inches.

Barrier 506. Wing.

There is now a muck bar below the barrier where formerly there was none. The pool three paces below the barrier on the right side was 18 inches deep and it is now 25 inches deep.

Former depths across stream: 13-17-24-22-17-11-9-10-9 inches

Present depths across stream: 13-19-23-24-21-16-8-13-10 inches

This barrier is making a good riffle and there is a good hide under the stump at its outer end.

Barrier 507. Wing.

There is now a silt and muck bar below the barrier where before there was none. The pool four paces below on the left which was formerly 18 inches deep is now 27 inches deep.

Former depths across stream: 6-9-11-11-11-11-21-21-15 inches

Present depths across the stream: 10-13-17-17-17-17-20-20-20 inches

This barrier makes a good riffle.

Barrier 508. Cover.

Former depths across stream: 5-15-19-20-23-21-21-14-11 inches

Present " " " : 15-17-25-23-23-32-32-28-13 inches

This barrier is making a very good hide and it has been deepening the pool below it, as shown by the measurements.

Barrier 509. Wing.

During high stages the water bar runs over the barrier and forms a pool

behind it 16-19 inches deep. It has caused a large mucky area to be formed behind it which was not there before.

Former depths across the stream: 10,18-17216-20-20-18-17-19 inches

Present depth across stream: 13-18-19-19-19-18-19-1-1 inches.

This barrier makes a long fast water riffle below.

Barrier 510. Dover and diverter.

The barrier has made several pools and is also creating a very good cover and hide for the fish. The pool 4 paces below on the left was 16 inches deep and it is now 19 in. deep. There are three pools formed, one on each side and one underneath the barrier, two of these are 23 inches deep and one is 27 inches deep. The barrier gives cover over these.

Former depth across the stream: 9-13-1-15-19-18-12-17-1-13-13 inches

Present depth across the stream: 11-1-17-1-21-18-15-20-18-19 inches

Barrier 511. Wing.

A silt bar has formed below this barrier and a shore bed has begun on it. This is very good for food production. The riffle below is good.

Former depths across: 4-6-10-12-12-16-16-15-14-13-13 inches

Present depths across: 11-11-14-14-18-17-19-19-15-14-13-inches

Barrier 512. Dam.

This barrier has deepened the water above so as to form a good pool. The water falling over the stones has formed a pool on the downstream side of the dam as is shown in the measurement.

Former depths: 6-8-11-8-13-14-13-16-9-11 inches

Present depths: 9-13-3-11-12-20-20-24-20-21-15 inches

Barrier 513. Wing.

This wing is built in two parts so that the water passing through a gap in the center forms a pool on the right side of the stream. This pool is 7' 9". long and 24 inches deep. The riffles formed below are good. And the depth below in those riffles was 14 inches and it is now 17 inches. Former

Former Depth across: 5-9-11-14-13-13-11-13-13-12-13 inches

Present depth across: 9-14-16-17-18-14-17-17-18-14 inches

Barrier 514. Wing.

This barrier has caused a mucky bar to form below it and shore beds are starting on it. The water going over the barrier at high water has formed a pool below it 18 inches deep. In the fast water below the barrier the water is now 21 inches where before it was 16 inches.

Former depth across: 14-15-12-13-12-10-11-11-11-14-15-13 inches

Present depth across: 14-19-13-15-14-12-12-16-17-16 inches

Barrier 515. V-type.

The depth of the water in the opening of the V was 12 inches and it is now 34 inches.

Former depths across 3-3-4-11-10-16-11-12-13-10-6 inches

Present depth across: 12-18-9-12-16-20-19-18-17-16-15 inches

The water going over the top of the barrier during high stages has formed pools below it.

Barrier 516. Log across the stream

Material has collected in front of the log and at it's right and to form a hide for trout.

Barrier 517. Wing.

This barrier has directed the water along the left bank where there is very good cedar shade. There is now a pool all along the left bank. This pool is 32 inches deep in one place where it was formerly 19 inches. A bar formed below the barrier and there is an area of riffles below on the left.

Former depths across: 6-10-14-14-14-11-9-8-7-7-6 inches

Present depths across: 12-14-13-13-15-16-13-13-11-13-13 inches

Barrier 518. Wing.

A mucky area has been formed both above and below the barrier. The pool below on the left side has been deepened from 16 inches to 27 inches

Former depth across: 2-3-4-6-7-8-12-16-1[illegible]-17-16 inches

Present depth across: 6-10-9-14-14-17-15-18-20-20 inches

Barrier 519. Ving.

Below the barrier where the water was formerly 18 inches deep there is now a pool 12 ft. long and 32 in. deep. The material from the pool is formed into a gravel bar just below.

Former depth across: 5-9-15-9-11-11-9-9-8-7-3-2-3 inches

Present depth across: 10-17-20-18-21-17-16-16-17-21-20-18-14 inches

Barrier 520. Ving.

The pool below on the right was 18 inches deep and it is now 21 inches deep.

Former depths across: 7-10-12-12-13-9-9-9-8-7-5 inches

Present depths: 6-14-19-21-21-26-22-20-18-14-13-11 inches

Barrier 521. Ving with an opening in its center.

A sand bar with a mucky covering has been built up behind the barrier. The water passing around the end of the barrier has deepened the water in the channel from 10 inches to 21 inches.

Former depths across: 10-13-14-14-10-10-10-11-8-9-8-8 inches

Present depth across: 10-17-17-20-12-14-1[illegible]-12-10-9-15-19 inches

Barrier 522. A-type.

A sand bar has formed below the barrier and the quiet water within the A is a good place for young fish. The water passing to each side has formed channels. At the lower end of the barrier on the left, the depth was 15 inches and it is now 23 inches. On the right it was 11 inches and it is now 20 inches.

Former depths across: 6-12-10-9-8-8-7-11-13-12-10-11-7 inches

Present depth across: 9-10-1[illegible]-11-14-14-14[illegible]14-17-13-14-1[illegible] inches

Barrier 523. Cover.

This barrier was designed to give shelter, not to dig. It is furnishing shelter.

Barrier 524. Cover.

While the barrier was built primarily for cover it has dug a pool beneath it because of the swift water from Barrier 522. This gives cover along the bank.

Former depths along the cover: 7-11-7-10-10-9-11-11-7-8 inches

Present depths along the cover: 15-20-19-20-19-14-17-14-12-12 inches

Barrier 529 V-type

A dark salty bar has collected behind each wing. A very good chance channel bed has formed below the wing on the right side. This accelerates the water a great deal and produces a riffle for a long distance down stream. The former depth in the channel was 16 inches and now it is 28 inches. A pool has been formed below the channel which is 15 ft. wide. Depth across it are 14, 27, 25, 19, 20 inches.

Former depths across stream: 6-4-5-7-9-12-13-13-11 inches

Present depths across stream: 17-17-13-10-11-14-17-15-10 1/2 inches

Barrier 526. Wing.

This barrier throws the current strongly to the left side and it has deepened the water there. A large coarse bed-covering about 300 sq. ft. was formed behind the barrier. This should greatly increase the food supply.

Former depth across: 7-12-10-12-11-11-12-9-7-7-4 inches

Present: 14-13-14-12-13-15-11-12-13 inches

Barrier 527 Wing type

This barrier is making a good riffle and is in general improving the section.

Former depth across: 6-9-10-13-17-14-13-6 inches

Present depth across: 6-11-17-16-16-15-17-12 inches

Barrier 528. Wing.

A sand bar has been built in front of the barrier at its inner end. The water going over the top of it during high water has formed a 15 inch pool just below the barrier. This is good for young trout. A dark mucky covering has been found behind the barrier. The pool below on the left has been deepened from 22 to 27 inches.

Former depths across: 8-5-4-8-7-11-11-9-13-16

Present depths across: 9-13-11-13-14-13-13-17-18-17 inches

Barrier 529. Left over.

This barrier is furnishing very good cover along pools.

Barrier 530. I-type.

During high water the water has gone over the top of the barrier forming a 15 inch pool and a gravel bar further below. The channel on the left has been deepened from 17 inches to 22 inches.

Former depth across: 9-11-11-9-6-5-6-8-9-8-9-17-14 inches

Present depths across: 11-13-13-8-8-8-8-11-11-17-20-20-22 inches

Barrier 531. Planting wing in midstream.

The water has dug under the barrier forming a 21 inch pool beneath it. On the left the water has been deepened to form a pool 30' x 8' and 23 inches deep.

Former depth across: 6-8-10-12-12-8-7-7-8-10-12-17-16 inches

Present depths across: 6-9-18-11-10-10-8-9-9-10-22-19-16 inches

Barrier 532. Wing.

This barrier makes a fast riffle along the left bank and throws the current into the bend below. Along the left side the water has been deepened from 16 inches to 26 inches.

Former depths across: 6-9-8-7-8-9-8-10-8-5 inches

Present depths across: 11-16-16-12-14-14-13-13-12-9 inches

Barrier 533. Triangle Dover.

This barrier is forming a very good cover and making a fine pool

Former depths across: 9-11-9-12-18-22-20-10-5 inches

Present depths across: 9-11-15-17-27-36-32-21-17 inches

Barrier 534. Cover.

This barrier is serving to protect the bend as well as giving cover. It is made of logs, stumps, and brush and has collected more to improve it.

Former depths along the cover: 17-23-21-29-32-31-29-30-26-23 inch

Present depths along the cover: 25-28-27-31-33-34-29-18-24-26 inch

Barrier 535. Wing.

Bare beds are beginning both above and below the barrier. A 25 inch pool has formed along the right bank under the cedars.

Former depths across: 15-15-14-13-13-14-11-4-3 inches

Present depths across: 16-17-20-22-18-19-14-11-21-10 inch.

Barrier 536. Cover type.

This barrier has held very well and is giving excellent cover and protecting the bank against further erosion. Natural drift has added to this cover. The water is now 37 inches deep under the cover.

Former depths across in front of cover: 21-34-33-26-21-11-8-4 inches

Present " " " " " " : 18-30-34-34-34-31-24-16-11 inches.

Barrier 537. Wing.

The stream here was very wide and shallow. The purpose here was to confine the water to one side and thus narrow the stream, as this immense flat was of no use, merely warming the water. The barrier has very successfully accomplished the aim. The water has been deepened above the barrier and by sending the current to the left a good pool has been formed there. The water was formerly 1. inch deep here and now there is a pool 50 ft. x 16 ft. and inches deep.

Former depths across: 15-9-7-6-5-4-3-2-2-2-3-7-1-22-3-17 inches

Present depth across: 12-6-3-0-2-0-0-0-2-0-2-0-0-2-3-11-23-33-33-36 inches

The zeros indicate the portion of the stream from which the water has been diverted.

Barrier 538. Wing.

The pool 5 paces below the barrier on the right side has been deepned from 10 inches to 24 inches. This is now a very nice pool.

Former depths across: 14, 10-12-16-14-12-10-9-5 inches

Present depths across: 13-15-13-17-15-14-10-9-5 inches

Barrier 539. Triangle Cover

This barrier was grown by the addition of drift material and it is giving good cover.

Former depths across: 7-7-8-13-16-19-17-23-24-12 inches

Present depths across: 7-11-13-19-20-27-25-17-15-18-12 inches

Barrier 540. Wing.

The pool on the right has been deepened 6 inches so it is now 2 inches deep and it is a good pool.

Former depths across: 13-13-10-7-8-10-9-8-4-3 inches

Present depths across: 13-11-14-13-17-14-13-12-12-11 inches

Barrier 541 Bank Cover

This is giving good cover and the current going under it has deepened the water. The pool just below has been changed from 15 inches to 21 inches.

Former depths along the cover: 1-13-13-15-15-18-18-18-14-16-19-20-19-21XX inches

Present depths along the cover: 16-14-16-14-18-21-20-19-19-21-22-21-20-19 inches

Barrier 542. L-type.

The purpose of the barrier is to throw the current to both sides of the stream. The barrier is partially responsible for the deepening of the water under barrier No. 541. The water was 11 in. deep three paces below on the right and it is now 1- inches deep.

Former depths across: 5-5-5-5-6-6-9-13-16-17-1 inches

Present depths across: 17-17-10-10-10-12-18-22-20-17-17-1 inches

Barrier 543. Cover.

This barrier is doing very little as cover. The front log has done some diving.

however, as the following measurements show.

Former depths: 13,-16-15-15-18-21-21 inches

Present depths: 21-25-21-21-23-22-21 inches

Barrier 544. A-type.

This barrier divides the current and sends it to both sides of the stream. It has dug pools on the left side since most of the water goes to that side. The pool on the left has been deepened from 27 inches to 32 inches. There is a quiet area within this barrier suitable for young fish.

Former depths across: 12-15-10-9-7-8-12-23-32-36 inches.

Present depths across: 14-9-6-13-15-14-15-25-37-40 inches.

Barrier 545. V-type

The relatively quiet water above the right wing has encouraged a very small charr bed to develop into a large bed. The channel has been deepened to 45 inches.

Former depths across: 5, 8, 10, 10, 10, 11, 11, 10, 8, 7 inches

Present depths across: 8-12-20-19-18-17-16-12-6-9 inches

Barrier 546. Wing.

This barrier makes the water very swift and throws it under the cover just below. Four paces below on the left the water was 19 inches deep and now it is 24 inches deep. Opposite the end of the barrier the water is 32 inches deep.

Former depth across: 7-4-7-7-6-10-12-15-16-18-15 inches

Present depth across: 9-18-15-15-12-9-9-10-11-12-15 inches

Barrier 547. Bank Cover.

This is giving very good shelter. The fast water flow along it full length.

Former depth along barrier: 12-15-16-18-19-19-17-17-13-18-18-13 inches

Present depths along barrier: 14-19-21-25-31-26-25-27-22-19-19-15 inches

Barrier 548. Half Cover Type.

This barrier is making very good cover along the bank.

Former depths along the cover: 23-2 -22-20-17-14-20-20-20 inches

Present depth along the cover: 27-27-2 -25-17-20-19-20-20-19-23 inches

Barrier 549. Cover type.

This one was made of stumps and it is the only one that went out entirely.

Barrier 550. Raft cover type.

This is an excellent cover and it has formed a very deep pool beneath it. This is now one of the best pools on the river.

Former depths along front of the barrier: 18-20-21-19-17-19-22-21-26 inches

Present depths along front of the barrier: 16-21-26-27-29-36-43-44-41 inches

Former depth under the cover 28 in. Present depth 57 inches.

Barrier 551. Raft Cover type.

This is a very large cover. It is built partly to give cover and partly to protect the bank. This is one of the barriers that was repaired this year.

Former depths along the cover: 17-17-20-20-21-24-28-31-32-43-3[illegible]-35-27-22-22-20-18"

Present depths along the cover: 22-24-26-25-27-28-33-35-33-34-35-33-31-31-25-25-23 inches

This barrier should protect the high mucky bank which is now being so severely eroded that it threatens to undermine the road.

Barrier 552. Wing.

This wing has done very good work. It has a very good muck flat below it and it has dug some nice pools. The pool below on the left which was formerly 24 inches deep is now 36 inches deep.

Former depths across 4-5-11-8-11-11-13-16-23-19-19 inches

Present depth across: 13-21-27-23922-22-28-31-31 inches

Barrier 553. Cover.

This barrier is furnishing cover over the pool created by the new wing just above.

Depth top to bottom of cover: 30-32-37-28-24 inches

Present depth top to bottom of cover: 32-30-27-26-24 inches.

Barrier 554. Wing.

The sand which ~~has~~ was along the right has been totally removed. There is now a very good riffle where the water goes around the end of the barrier. The pool three paces below on the right was 32 inches deep and it is now 33 to 34 inches deep.

Former depths across: 17-17-12-13-14-14-14-16-14-11 inches

Present depths across: 25-37-28-22-22-25-22-21-16-16-22 inches

Barrier 556. Bank Cover Type.

This barrier is giving good cover and it is causing the water to dig a pool under it.

Former depth along the cover: 12-19-18-16-16-16-15-15-17-14-17-21-17 inches

Present depth along the cover: 16-18-25-25-21-18-18-18-17-12-22-20 inches

Former depths across: 8-14-16-13-14-13-13-10-7 inches

Present depths across: 18-19-18-16-18-19-17-14-8 inches

Barrier 556. Boom cover type.

The purpose of the barrier is to prevent the erosion of the bank. It has also caused a deep pool to be formed beneath it by forcing the current down. This is a very large cover. This year poles were placed under the material to keep it from sinking when it becomes waterloged. The cover has made the water swifter on the right and caused it to dig there.

Former depth on the right half of stream: 2-5-5-6-5-6 inches

Present " " " " : 11-9-14-13-15-14 inches

Formerly the water was 21 inches deep under the cover and it is now 47 inches deep under the cover.

Former depth along boom: 12-14-18-20-9-13-10-13-10-8-9-10-9-7-5-4-4-7-13-13-14-14-14-18-21-24-22-22-23-22-21-19 inches

Present depth along the boom: 27-30-29-24-27-26-27-25-23-21-22-24-21-20-18-22-25-25-29-29-30-33-31-33-37-38-34-32-37-35 inches.

Barrier 537. V-type

This is a very good barrier. It has formed some nice pools and it is making fast water in a section which before was slow.

There is a very large and fine mucky area below the left wing. Also there is a fine pool behind each wing. Formerly three paces below the opening of the V, the water was 20 inches deep and it is now 40 inches deep.

Former depths across the stream: 19-16-20-21-21-20-18-15-14 inches.

Present depths across the stream: 57-52-46-45-35-38-38-33-33 inches

Barrier 558. Cover ~~along~~ along bank.

The cover is of no use for large fish. It can be used only by young fish. Dark mucky material is collecting around this cover.

Former depth across stream: 7-13-15-15-16-15-18-16-15-16-10 inches

Present depth across stream: 15-16-19-19-18-17-16-18-19-14-12 inches

Former depth along barrier: 10-17-13-13-13-13-16-16-15-15-15-16-16 inches

Present depth along barrier: 19-18-19-18-17-17-18-17-17-17-20-19-19 inches

Barrier 559. Wing.

The chara beds behind the barrier are larger and denser. Formerly the water in the channel made by the barrier was 2- inches and now it is 27 inches.

Former depths across: 7-12-17-19-20-22-23-2 -19 inches

Present " " : 12-18-19-19-22-25-25-25-19 inches

Barrier 560. Raft cover.

There beds have developed near this barrier.

Former depths along the raft: 2 -22-23-26-25-27-28-25-25 inches

Present " " " " : 26-24-30-32-32-24-25-24-25 inches

Former depths across the stream: 18-19-25-26-25-21-17 inches

Present " " " " : 21-22-26-28-27-22-19 inches

Barrier 561. Wing.

There is a large, fine, mucky area behind the wing. Also the water coming over the top during high water has formed a good pool behind the barrier.

Former depths across the stream: 1 -23-25-27-22-19-20-21-18-17 inches

Present depths across the stream: 21-25-2 -27-26-25-19-17-20 inches

Barrier 562. Tepee-type

The barrier has built up a sand bar behind it and has made a long pool on the right which extends almost to the barrier below. There are also numerous patches of chara below.

Former depths across: 21-19-21-20-22-22-13-17-16 inches.

Present depths across: 24-26-25-24-23-22-25-27-16 inches

Barrier 563. K-cover type.

This is an exceptionally good barrier. It has dug a deeper hole than any other barrier. Formerly the water was 25 inches deep on each side of the barrier. Now it is 28 inches deep on the left side and 66 inches deep on the right side.

Former depths across the stream: 12-13-14-18-23-24-27-26-17 inches

Present depths across the stream: 23-28-40-36-25-25-22-19-11 inches

Barrier 564. Room cover type.

The purpose of the barrier was to prevent further washing of the large sand bank just below the bridge at the farm. It has succeeded in this for from all appearances, this bank has not eroded during the past year. This barrier is also giving very good cover over a large area and it is causing the current to dig a pool at its lower end. This pool is now 50 inches deep.

Barrier 565. Cover.

This barrier is giving cover at a bend in the stream where the current strikes the bank. It has caused the hole under it to be greatly deepened during the past year. Last year the water was 32-36 inches deep along the cover. This year the depths along it are 46-51-60-63-60-56-51-51-[illegible] inches. This makes a very good hole since it is attractive to fish and can be fished easily.

Barrier. Raft Cover.

The primary purpose of this barrier is to give cover but it also has deepened the water to a certain extent.

Former depths along the cover: 22-21-22-2[illegible]-31-21-[illegible]-27-[illegible]-32 inches

Present " " " " : 27-24-27-31-[illegible]-24-[illegible]-27-34-3 inches

Barrier 567. Bank Cover type.

This barrier is forming a very good shelter. Cover is needed right here since shade is poor. The current passing under this barrier has dug a pool.

Former depths across stream: 14-12-[illegible]-12-2[illegible]-28-28-2[illegible]-19 inches

Present depths across stream: 9-1[illegible]-18-29-22-33-31-27-27 inches

Former depths along the cover: 2[illegible]-25-28-32-27-25-13-11 inches

Present depths along the cover: 27-31-31-31-27-23-27-32 inches

Barrier 568. Triangle Cover type.

This barrier has formed a pool and is making good cover.

Former depths across the stream: 11-14-20-20-19-21-16-23-21-19 inches

Present depths across the stream: 28-26-27-26-23-30-31-31-31-23 inches

Barrier 569. Raft Cover type.

While the barrier is designed primarily for cover, it has deepened the water around it, making a good place for trout.

Former depths across stream: 11-17-19-13-25-25-28-13-21 inches

Present depths across stream: 12-17-24-28-30-32-27-32-27 inches

Barrier 570. Wing.

This barrier was built so the water would go under it and scour out a hole beneath it. It has done the work very well. The protection afforded by the barrier has caused the channel to increase in size.

Former depths across: 10-21-24-13-19-27-25-23-20-19-15-12-6 inches

Present depths across: 19-28-31-35-36-36-37-31-27-19-12-13-13 inches

Barrier 571. Wing.

This barrier is located in a slow section of the river. It is accelerating the water, and making the usual quiet water behind the barrier.

Former depths across: 15-19-17-26-17-23-27-23-20-21 inches

Present depths across: 24-2 -29-30-32-35-35-33-20-21 inches

Barrier 572. Bank Cover.

This barrier is doing good work. The wing just above it is sending the current along its side causing a pool to be formed. This type of barrier which is along the bank is one of the best since it is easy to fish along it.

Former depths along the cover: 21-19-21-20-23-26-28-25-26-26-25 inches

Present " " " " : 28-27-28-35-33-37-[illegible]-30-31-25 inches

Barrier 573. Bank Cover.

The pool under this cover is being deepened by the wing above. This pool is now 54 inches deep at its deepest.

Former depths along the cover: 37-3 -28-30-38-38-38-41-40-inches

Present depths along the cover: 38-31-33-42-44-44-45-46-40 inches

Barrier 574. Boom cover type.

This is a very large cover. Its purpose is to give a refuge on the bend of the river where it is located and to prevent erosion of the bank.

Former depths along the boom: 22-21-19-19-1[illegible]-19-28-33-40 inches

Present depths along the boom: 23-26-42-40-42-43-4[illegible]-32-38 inches

Barrier 575. Bank Cover.

This barrier gives shelter in an otherwise open section. It has not deepened the pool under it to any extent.

Former depths along the cover: 29-27-38-30-33-30-27-29 inches

Present " " " " : 34-33-34-32-32-28-29-26 inches

Barrier 576. Bank Cover.

This is a small bank cover which gives the effect of overhanging banks, a retreat which large fish prefer.

Former depths along the cover: 28-29-31-31-30-32-33-33-29-29-28 inches

Present " " " " : 31-32-33-33-33-34-29-32-31-30 inches

Barrier 577. Bank Cover.

This barrier is a small, narrow cover also along the bank over a pool which was formerly open.

Barrier 578. Bank Cover.

This barrier is giving good cover for the full length of the bend.

Barrier 579. Raft Cover.

Since the section of the river here is very unshaded and unprotected this type of barrier is needed here.

Barrier 580. Raft Cover.

This barrier is for a similar purpose as the one above. It gives cover in an otherwise open stretch.

Barrier 581. Raft Cover.

Same as 580.

Barrier 582. Wing.

This is the first barrier in the section below the upper dam. Here the river is of different character. It has a harder bottom with some sand, and it is much shallower. This wing directs the stream along the right bank where there is some natural cover in the form of alders and deadheads. Here on the right the water has been deepened from 11 inches to 23 inches. A sand bar and a mucky flat have been formed behind the barrier and the high water has cut a 14 inch pool immediately behind it. This is a good place for smaller fish. The pool on the right is now deep enough and there is good cover on it, so it is a fine place for the large trout.

Former depths across the stream: 8-8-5-7-7-11-12-10-10-8-4-3-2 inches

Present " " " " : 16-14-21-19-18-16-15-20-19-18-16-12-14 inches

Barrier 583. Wing.

This barrier has formed a very good pool on the right side. This pool is now 20 inches deep and about 25 yds. long. There is also another pool immediately behind the barrier.

Former depths across the stream: 8-17-19-13-11-8-9-7-5 inches

Present " " " " : 21-23-27-22-15-14-14-13-13-12 inches

Barrier 584. I-type

The right channel has been plugged up converting the barrier into a wing. A sand bar is forming here on the right. It is composed of the sand that is continually washing down from the dam. A gravel bar has formed behind the barrier at approximately its center.

Former depths across: 8-8-8-8-8-8-8-8-10-12-11-14 inches

Present depths across: 14-12-13-15-12-14-21-23-26-29-32-24-20 inches

Formerly the water was 11 inches deep below on the left. Now it is 34 inches deep and a very large pool has been formed. This pool is 50 ft. long and averages about 30 inches deep.

Barrier 585. V-type.

This barrier has formed several pools. There is one 5 paces below on the right 27 inches deep which was formed by the high water going over the barrier. Formerly there was a foot of water in the center of the stream and now there is a pool 15 ft. by 15 ft., and 43 inches deep. A gravel bar has formed below on the left.

Former depths across: 3-8-11-11-11-13-13-11-8-5-5- inches

Present depths across: 16-18-16-23-35-42-28-32-17-19-11 inches

Barrier 586. Bank Cover.

This is primarily a cover type and it has not dug the pool deeper. Dark mucky material is collecting under it.

Barrier 587. Wing.

This barrier has formed a very large mucky area below it which is covered with shallow still water. I noted that this area was swarming with life and a school of minnows were swimming over the area. On the right a pool has been formed, and at the bottom gravel has been sorted and washed.

Former depth across: 1-6-8-10-11-14-15-16-17-17 inches

Present depth across: 14-26-26-26-26-22-22-25-24-25-26-26 inches.

Barrier 588. Bank Cover.

This cover is opposite wing# 587. It is over 90 feet long but it is narrow. It forms a hide similar to an overhanging bank. This is a very good cover.

Former depths along the cover: 17-19-20-21-20-19-19-1 -17-17-17-18-19-20-21-20-
18-15-1 -12-10-7 inches

Present depths along the cover: 25-19-26-27-27-2 -2 -26-27-26-26-27-28-28-27-27-27-23-
27-27-24 inches

This deepening along the cover is caused by the wing.

Barrier 589. Bank Cover

This cover is successful judging from the number of fish that remain under it. It is so located at the bend that the current swings along it. It, too, gives the effect of an overhanging bank. The beaver have piled brush on top of it and improved it.

Former depths along the cover: 24-26-25-26-29-29-30-25-27-25-25-26-23-27-26-22-22 inches

Present depths along the cover: 30-32-34-37-39-41-38-37-36-36-32-33-35-34-34-32-30 inches.

Barrier 590. Boom cover type.

This boom cover extends across a very wide bend where the stream is eroding the bank. It will give cover to a number of fish and it should prevent erosion. This year poles were put under the cover to prevent the materials sinking when they become water-logged. This barrier has deepened the pool 12-17 inches.

Barrier 591. Wing.

This is the beginning of the sand section. The character of the stream changes here. It becomes wider and slower with flat marsh-grass banks. This barrier is low. During high water a pool has been formed just behind it. Sand is collecting in front of it.

Former depths across the stream: 8-8-8-15-20-20-19-18-14-11-9-5 inches

Present " " " " : 12-15-13-18-19-16-16-15-24-19-20-22-22-19 inches

Some gravel has been uncovered on the right.

Barrier 592. Wing.

This barrier has caused a large pool to form below on the ~~right~~ left and in the bottom of this pool it has uncovered about 60 square feet of gravel. A sand bar has been found below the outer end, and a pool on the right side under the alders.

Former depths across the stream: 6-6-5-6-9-15-19-22-26-25-23 inches.

Present depths across the stream: 21-21-20-20-24-27-26-21-16-14-15 inches

Barrier 593. Wing.

This barrier is doing excellent work. It has found a pool on the left 40 ft. long and 38 inches deep. It has also built up a bar below the lower end and there are some plant beds below the pool on the left. Behind the barrier a gravel area of 180 sq. ft. has been uncovered. This will greatly aid the food supply in the sand section. It has also formed a pool on the right 50 ft. long, 15 ft. to 10 ft. wide and 37 inches deep.

Former depths across stream: 15-16-13-20-20-20-19-18-15-10 inches

Present depths across stream: 35-26-38-37-32-29-33-33-30-37 inches

Barrier 594. Wing.

This year a brush shelter was put in just below the barrier over a pool formed along the right bank. The sand bar formed by the wing extends 40 ft. down stream and comes to within 4 inches of the surface. It is covered with rich mucky material. Aquatic plants have begun to grow on the right near the bank. Behind the wing about 60 sq. ft. of gravel has been exposed by the removal of the sand. Gravel has been exposed along the left bank, also. The pool along the bank was formerly 31 inches deep; now it extends along the bank for over 100 ft. and is 48 to 50 inches deep. It is a fine one since the alders and marsh grass give cover over it.

Former depths across: 13-13-13-13-13-13-14-13-12-15-13- 8 inches

Present depths across: 22-24-27-23-27-30-20-33-29-29-30-30 inches

Barrier 593. Wing.

Some gravel has been exposed on the right side of the stream and the sand has been piled in a bar below the barrier. The plant bed on the right side has greatly improved. A 28 inch pool has been formed in the center just below the barrier, and the pool on the right has been deepened from 31 inches to 40 inches. The latter pool extends to the next barrier. There is a 41 inch pool near the left bank immediately behind the barrier. The sand is very deep here and thus it is necessary to remove a great deal of it before the gravel can be exposed.

Former depth across: 31-30-21-15-14-14-13-11-11-11-8 inches

Present depths across: 40- 0-35-37-39-34-33-20-15-19-20 inches

Barrier 595. Bank Cover.

This cover is a raft made of poles and fastened along the bank. The wing above directs a good channel along the length of it. It is making good cover over a pool which is now quite deep. Formerly the water was 30 to 33 inches deep under the raft The present depths along its edge are 42-41-42-45-46-33-40-38-40-39 inches.

Barrier 597. V-type.

Formerly there was a poor section with a shifting, sure and bottom. Insect

counts taken here showed that there was absolutely no life of that kind in the sand. This whole sand section, in fact where the sand is drifting, is barren. All the food present occurs in the mucky deposits along the bank. The barrier has made three large pools. One behind each wing and one in the center in the channel. The pool on the left has a gravel bottom and is 42 inches deep. The pool in the center is 10 ft. wide, 35 ft. long, and 25 to 38 inches deep. A gravel area of 75 sq. ft. has been uncovered here. On the right a gravel area of 450 ft. has been uncovered. This pool is 32 inches deep.

Former depths across: 12-15-15-20-18-17-15-15-15-13-13-13-12-8 inches

Present depths across: 22-27-34-30-20-37-38-25-26-35-43-31-12-8 inches

Barrier 598. Wing.

This wing has built up a sandbar behind it which is, in normal water, above the water. Two pools are present here. The one on the right near the bank is 25 inches deep. On the left where the current flows along the bank under the overhanging alders there is now a pool 60 ft. long and 49 inches deep. This pool was formerly 37 inches deep.

Former depths across: 6-8-12-10-10-12-11-19-32-35-30 inches.

Present depths across: 26-33-3 -25-24-34-30-36-41-45-12-32 inches.

60 paces below this a brush shelter was put in this year.

Barrier 599. Wing.

Former depth across 11-12-15-18-13-20-21-14-15-14-12-8-6 inches

Present " " 14-14-18-21-17-16-17-20-19-22-23-22-17-14 inches

Barrier 600. Cover.

This cover is doing very little good. The main purpose is to shut off a secondary channel to the right.

Barrier 601. Cover.

This barrier is giving good cover along the bank and has due to some extent.

Former depths along the cover: 27-28-24-13-17-17-18-18-19 inches

Present depths along the cover: 31-33-30-25-23-22-23-25-25 inches

Barrier 602. V-type.

This barrier has done very good work. It has moved a great deal of sand and made three large gravel bottom pools. The one below the right wing extends down to the next barrier. The pool on the right is 20 by 30 ft. in size and is 33 inches inches deep. The one on the left is 30 by 20 ft. and 25 inches deep. In the channel formed by the V the water is 27 inches deep, and below, the fast water from the barrier has formed a pool along the bend 100 ft. long and 38 inches deep.

Former depths across: 4-8-5-3-4-5-6-8-17-15-13-7-5-12 inches

Present " " : 8-10-23-31-32-30-24-24-25-28-27-32-28-30 inches

Barrier 603. Wing.

This barrier is causing the current to dig along the left side. Here it has formed a pool along the bank 10 ft. wide and 37 inches deep. It has exposed over 150 sq. ft. of gravel.

Former depths across: 6-7-10-12-13-15-17-19-25-28-30 inches

Present depths across: 19-22-14-19-20-25-24-31-30-38-34 inches

Barrier 604. Raft Cover.

This is a floating raft placed in the center of the stream. It gives shade and shelter and is also deepening the water under it. Formerly the pool under the raft was 26 inches deep and now it is 38 inches deep. A sand bar has formed below, now covered with chara,-a real benefit to the stream. There is also a new gravel bottom pool on the right 30 ft. long.

Former depths across: 9-15-25-26-27-28-19-17-22-20 inches.

Present depths across: 32-32-20-30-33-3 -27-27-20-21 inches

Barrier 605. Wing.

A gravel area has been uncovered behind the barrier and the pool formed is 30 inches deep. The pool along the left bank under the alders has been improved.

Former depths across: 16-15-17-15-19-17-17-12-10-10-9-10-5-4-4-5 inches.

Present depths across: 21-24-21-22-26-23-27-18-19-15-16-12-12 inches

Barrier 606. Wing.

The entire right side of the stream has been cleaned of sand and the gravel

exposed. A pool has been formed behind the wing.

Former depths across: 11-15-21-24-25-26-24-22-16-13-11-12-9-5-6 inches

Present depths across: 13-23-28-30-32-31-37-31-26-37-20-21-2 -13 inches

Barrier 607. Bank cover.

This cover is opposite the end of barrier number 606. The current flows along its edge and it forms good cover along the bank.

Former depths along the cover: 13-17-15-17-23-26-24-20-21 inches

Present " " " " : 19-26-27-30-23-30-25-26-23 inches

Barrier 608. Cover.

Drift material--logs, sticks, and brush--have caught on the barrier. The sand has been removed from an area underneath and around the barrier and piled into a bar below. The water is 30 inches deep under the cover.

Former depths across: 4-12-16-17-20-20-19-22-12-15-12-8 inches

Present depths across: 11-15-20-30-29-32-32-34-28-32-26-30 inches.

Barrier 609. Wing.

A sandbar has been built up below this wing. The pool on the left has been improved. It has been deepened from 26 inches to 36 inches. This pool is now 60 ft. long and has good cover since it is overhung with dogwood.

Former depths across: 1-2-4-7-6-7-8-9-10-13-11-23-22-25-28 inches

Present " " : 13-1 -16-16-19-17-15-17-17-25-28-31-27-24 inches

Barrier 610. Cypress.

This barrier has formed a long gravel area on each side and underneath it. It has uncovered about 400 sq. ft. of gravel on the left side and formed a pool 22 to 32 inches deep. There is a large sandbar below the barrier.

Former depths across: 21-22-27-23-23-19-13-17-17-17- inches

Present " " 26-32-31-26-29-25-24-23-22-22-22-inches

Barrier 611. Wing.

This barrier has formed a sand bar and a large rocky area below it. Two pools have been formed, one at the inner end of the barrier on the left, and a large one, 20 ft. wide, 60 ft. long and 41 inches deep on the right.

Former depths across: 25-26-22-18-17-15-16-15-13-11-3-4 inches

Present depths across: 30-33-30-30-31-35-37-30-23-21-26-27 inches

Barrier 612. Wing.

This barrier directs the current along the outside of the bend forming a pool there. A large sandbar has been built up at the inside of the bend. Sand has been removed from the left side of the stream exposing a gravel bottom on that half. This pool is 32 to 38 inches deep.

Former depths across: 5-6-8-9-11-18-26-29-26-27-32-23 inches.

Present " " : 13-14-13-18-23-28-31-27-30-32-39-30 inches

Barrier 613. Bank Cover.

This is a long ~~barrier~~ cover extending around the outside of the bend. The current is directed along it by the two preceding barriers. It is making an attractive shelter.

Former depths along the cover: 30-36-42-40-3 -35-34-3230-36-36 ins.

Present " " " " : 37-42-45-49-48-45-43- 3-43- 8-49 inches.

Barrier 614. Wing and I-type.

This barrier has exposed a large gravel area. The sand has been removed from the gravel for a distance of 30 ft. below. A 41 inch pool has been formed on the left side and a 56 inch pool on the right side. These are two very nice pools.

Former depths across: 9-9-11-10-15-17-10-11-13-1 -18-11 inches

Present " " : 19-18-20-13-27-24-26-28-22-21-18 inches.

Barrier ~~615~~ 615. Raft Cover.

A hole 52 inches deep has been formed due to the above barrier under this cover. Formerly the water was 30 inches deep here.

Barrier 616. Combination I and V-types.

This barrier has two openings through which the current is forced. This section was almost all sand bottom and now it is practically all gravel bottom. The channels have been deepened from 7 to 22 inches. There is a good riffle below each of the openings.

Former depths across: 9-13-11-17-12-11-10-12-11-7-8-6-3-5-7-[illegible] inches

Present depths across: 19-21-21-26-22-17-17-20-19-17-16-13-22-11-12-8 inches

Barrier 617. Raft cover along the bank.

This cover is built so it is just at the edge of the food channel created by the barrier above.

Former depths across: 21-18-27-30-27-19-11-9-9 inches

Present " " : 50-52-48-39-26-17-15-9-9 inches

Former depths along the cover: 20-26-34-35-36-36-34 inches

Present " " " " : 34-44-47-49-51-49-52.

Barrier 618. Raft Cover Type.

This barrier gives cover along the bank. Like the one just above it has deepened the water around it to a certain extent.

Former depths along cover: 27-23-29-26-26-24-21-8 inches

Present " " " : 37-35-33-30-24-23-23-23 inches

Barrier 619. Combination wing and L-type.

A sand bar has formed below both wings. Gravel has been exposed in the pool below on the left which is now 28 inches deep. This pool was 14 inches deep. A 22 inch pool has been formed on the right. A pool has been formed in the center with a deepening of the water from 14 to 29 inches.

Barrier 620. Square Cover Type.

This barrier has caught drift material, improving the barrier to some degree. A large bar has been formed and the water deepened on both sides and under the cover. The pool on the left is 32 inches deep.

Former depths across: 8-12-11-16-20-15-13-13-16-17-14-5 inches.

Present " " : 19 27 28 34 28 25 28 24 22 19 23 27 inches

Barrier 621

This was an experiment. A log was wired to two stakes for the purpose of cleaning the sand from the gravel. It has not been very successful. Chare holes have increased in size.

Former depths across: 3-7-8-16-15-23-212-21-20-18-15-12-11 inches

Present depths across: 9-17-23-24-29-29-31-32-24-26-22-19-20 inches

Barrier 622. Cover.

A large sandbar has been formed just below the barrier. It is made up of the sand removed from under the cover.

Former depths across: 3-9-16-20-19-20-15-14-21-26-23-20-14 inches

Present depths across: 6-21-25-30-28-31-34-33-33-25-31-27-24 inches

Barrier 623. Wing.

This barrier has uncovered a very large gravel area. It has removed a greater part of the sand from the stream bed for a distance of 100 ft. below. Three pools have been formed. On the right at the inside of the barrier there is a 27 inch pool. In the center at the opening in the barrier there is a 27-inch pool 20 ft. long and 27 inches deep. The pool on the left along the bank is 30 inches deep and extends down under the next barrier.

Barrier 624. Bank Cover.

This is a long narrow cover along the bank which creates conditions similar to an overhanging bank.

Former depths along the cover 21-22-23-24-22-22-24-[illegible]-24-23-22-22-22-20-20-19-21-20-15-20-21-18-13 inches

Present depths along the cover: 29-32-32-33-[illegible]-31-[illegible]-33-33-[illegible]-29-27-28-25-26-27-28-27-27-31-25-18 inches.

Barrier 625. Bank Cover.

This is also a long narrow cover built close to the bank. This year this barrier and the one above were fastened by means of stakes so they cannot sink when they become waterlogged.

Former depths along the cover: 18-18-22-22-21-18-18-20-13-21-23-22-24-[illegible]-28-27-26 inches

Present depths along the Cover: 24-24-[illegible]-27-27-[illegible]-25-24-25-26-29-29-33-3[illegible]-33-33- inches

Barrier 627. Wing.

This long wing was not staked when it was built. It has moved down stream a short distance and most of the water was flowing under it instead of around the end. This year it was staked to hold it in place and it was banked with stones and gravel to send the water around the end.

Former depths across: 18-16-15-10-6-6-8-7-6-6-5-5-7 inches

Present " " : 22-25-17-12-9-9-10-6-6-6-7-6-5 inches

Barrier 626

This barrier is just below the lower dam. It gives cover and has deepened the pool at its left end. This barrier and most of the following ones were built by Mr. Webster and some of the club members.

Barrier 628. Wing.

This barrier has been greatly improved by a cedar falling over it from the right bank. It now acts somewhat as a dam and the water going over the top has dug a pool below it. Drift has caught on the cedar to make cover.

Barrier 629. Dam.

This barrier has dug a good hole beneath it on the left end. Drift material has caught on this barrier giving cover. A gravel bar has been built up below from the material taken from the hole on the left.

Former depths across: 2-34-3-28-23-23-23-18-16 inches

Present depths across: 30-30-37-36-28-27-31-30-30 inches

Barrier 630. Wing.

This is ~~going~~ giving some cover and forming a riffle.

Former depths across: 8-10-11-13-16-14-10-9-7-6-6-inches

Present depths across: 10-20-21-2[illegible]-23-20-19-19-15-13 inches

Barrier 631. Wing.

This barrier is loosely built so the water goes through and under it.

Former depths across: 5-1"-1"-13-1"-1"-1"-1"-1"-5"-10 inches

Present " " " : 1"-17-15-1"-1"-13-11-1"-1"-9-7 inches

Barrier No. Nine.

This bar does not extend on to the bank. It is held with stone. There is an 18 inch pool three meters below under the dam.

Former depths across: 5"-10-11-12-1"-1"-1"-15-1"-1"-1 inches

Present depths across: 7-1"-1"-13-1"-1"-1"-17-17-13-1"-1" inches.

Barrier No. Ten.

This bar is built of lava and old water stones.

Former depths across: 14-17-15-1"-1"-17-17-17-11-12-1" inches

Present depths across: 13-15-17-1"-17-17-17-17-15-17 inches

Barrier 34.

This barrier consists of a low projection out from a natural form. It has made a pool at its outer end.

Barrier 35. Dam.

Beaver used the barrier as a basis for a dam. They built it high, but water seeping under it eventually ruined the dam, as the picture will show it. There is now a very small hole about 1 ft. deep at this point where the water went under the dam.

Barrier 36. Stone.

These are dam wall. They are 4 stone pool on each side and forming a bar behind them.

Former depths across: 7-11-14-13-13-12-15-11-7 inches.

Present " " : 13-15-15-17-1"-12-17-1"-- inches.

Barrier 37. Stone

This stone was washed away.

Barrier 38. Dam.

This barrier makes a very nice ripple. The current flows to the left. There is a 20 inch pool here.

Former depths across: 5-7-1"-1"-1"-1"-11-11-8-7-1" inches

Present " " : 15-1"-15-1"-15-1"-13-14-13-15-1"-17 inches.

Barrier 639. V-type.

The opening of the barrier has been plugged by beaver. Some places have been built up by them and the inner section improved and strengthened so that the water is ponded above and made somewhat deeper. The stream is very wide here. This makes a still water area which serves as a resting place.

Barrier 640. Wing.

This barrier was built by the crew under my direction. It makes very fast water on the right and creates a riffle for a long distance downstream.

Former depths across: 11-13-13-11-14-15-14-13-0-5 inches.

Present " " : 14-16-16-16-16-17-18-18-14-12 inches.

Formerly the water was 14 inches below on the right and now it is 26 inches deep. A mucky area has formed behind the barrier.

This year a triangle cover type barrier was built just below this barrier.

The deepening of the pools in the boulder section below the lower dam has not been very extensive due to the extreme hardness of the bottom. The benefits and accomplishments of the work cannot however be judged solely by the deepening of pools for the stream has been benefited in several other ways. Cover and shelter, one of the greater limiting factors, has been added to, and the stream has been made much more attractive to fish. There are now places where they can stay off on their migrations. Catch records show that since improvement, fish have stayed in sections where they did not stay before. When a section is properly improved fish will desert other less desirable sections, coming to the improved section. While on their migration they take up their holdings under the shelters and in the pools created by the improvement work. Riffles, fast and slow water areas, and greater food production are also responsible for making the stream more satisfactory to fish and thus increasing their supply. I believe I can conclude that the improvement work has considerably helped fishing conditions. Creel census returns bear out this statement.

Recommendations

Some work still remains to be done on the East French. A few more barriers can be added, also some brush shelters are needed.

In places where aquatic vegetation is not beginning well it should be planted.

Ventures should be taken to improve the dam so it will not be necessary to add sand. This sand is being washed downstream where it is continuously covering gravel areas.

The levels of the dam should be kept as constant as possible, since floods are harmful to insect life. When the water is lowered or shut off the shallow flats on which the insects live become dry, resulting in the loss of much food for the trout.