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REPORT NO. 499

NOTES ON RECENT INSTALLATIONS OF STREAM IMPROVEMENT BY MECW

From October 5 to 8, 1938, the writers accompanied Mr. Roy Johnstone and Mr. A. E. Cook on a trip devoted to the inspection of various stream improvement projects being carried on by state CCC camps, under the general direction of Mr. Johnstone.

As a generality it may be remarked that a greater part of the work examined appears to be well designed and executed, and to be accomplishing the physical modifications expected of it. Attention is called, however, to Report No. 497, in which it is emphasized that the most critical present need of Michigan streams is for repair and maintenance of existing improvements rather than for additional work; and that the former should take priority over the latter should it prove impracticable to carry on both simultaneously.

There follows a series of observations and comments on each of the construction projects inspected.

Big Betsy River

The work examined is located northwest of Shelldrake in Sec. 21 of T. 50 N., R. 6 W. Here the stream flows over a shifting sand bottom through a low, wide valley. The banks, seldom over three feet high, are almost entirely devoid of shade, as is the valley for several hundred yards on either side. It is said that this valley is the bed of a former artificial

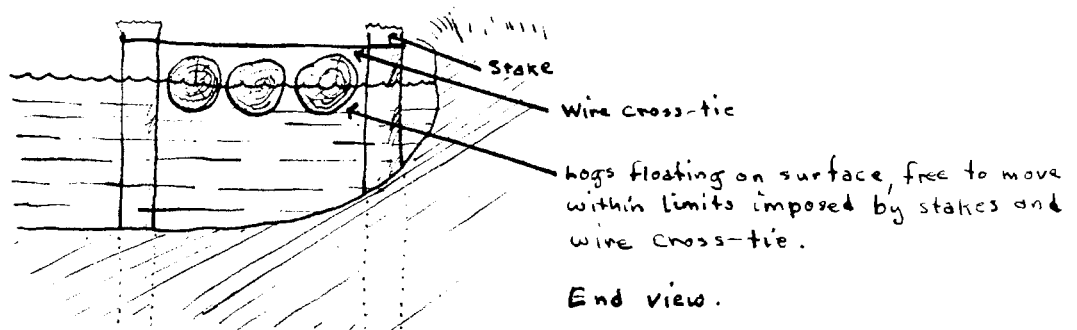
lake whose impounding dam went out eighteen or twenty years ago. This probably explains the fact that few trees have invaded the area and that such scant shade as exists is afforded by sparse growths of scrubby willow. Below the site of the old dam excellent alder shade occurs, while above the former limits of the lake is a typical heavy swamp forest dominated by arbor vitae cedar and black spruce.

The major improvement types encountered here, all of log construction, are: V deflectors with open apex directed downstream and bridged by a submerged digging log; double wing and reverse deflectors, often with stumps moored just below in the hope that the accelerated current will produce protected holes under them; and bend rafts and boom covers devoted to the dual function of supplying sorely needed fish cover and checking bank erosion.

The various deflectors seemed to be operating efficiently. Bank ends have been deeply inset and stakes cut off at the water line, two features which should materially aid the structures in surviving ice and flood action. It is likely, however, that the digging logs at the ends of these structures may prove of more harm than good. V deflectors, double wings and reverse deflectors have often been seen to accumulate excessive quantities of drift material, which usually results in an unfishable blockade of the channel and untimely loss of the entire structure. When drift accumulates, hole digging is greatly accelerated, often wholly or partially undermining stakes. Since the jam also offers much greater resistance to pressure of water and ice, the structure is likely to go out. This has been observed on the Pigeon and West Branch Sturgeon Rivers (see Report No. 497) following floods.

The mooring of stumps below deflectors is laudable so long as such moorings are designed to allow considerable fluctuation in level. Those in the Big Betsy are, in the main, wired to stakes driven in the bank. Their greatest danger is removal by ice.

Pend rafts and bank covers in this section have been anchored ingeniously to allow their rising and falling with the current (see sketch).



If they are able to withstand ice action they should be very effective in providing much-needed shade and fish cover. It is probable that they will retard bank erosion, although complete stoppage is not to be expected unless they silt in, when their cover value will be destroyed.

It would be desirable to make experimental streamside plantations of various trees and shrubs, especially alder, red osier, white cedar, black spruce and black locust, the last named being especially effective on eroding banks.

Two-Hearted River

Work on this stream was examined, chiefly at a point about three miles east of the Superior CCC camp on Perch Lake. This project is entirely devoted to erosion control measures. Installations have been made in 1934, 1935, and 1938. A good idea of the general character of the construction may be had by examining the appended photographs.

In this section the stream bottom contains considerable quantities of gravel and rubble. The banks, as shown in the photographs, are very high, steep, and badly eroded.

Log terraces, apparently quite stoutly constructed, are designed to hold back the sand until plantings or natural reproduction of grasses and shrubs become established sufficiently to bind the shifting slope. Sea walls

placed at the foot of the bluff are intended to arrest direct erosion by the current. Judged on the basis of comparable installations of previous years, notably those along the Pere Marquette River at Erwin's Bank and near the mouth of Kinne Creek, much of the future success of this work depends upon continued efficiency of the sea wall.

Installations made on the Two-Hearted during 1938 appeared to be more substantial than those of earlier years, where in one instance the sea wall has been damaged enough to allow resumption of current erosion. Most of the older work, however, is still holding. Bracken fern, Equisetum (horse-tail) and young aspen saplings are starting to establish (see photographs).

The only question to be raised about this work concerns the advisability of installing pretentious and expensive erosion control structures at a few isolated points relatively near the mouth of a stream a large part of whose banks are eroding, almost from the headwaters. Owing to practical difficulties in transporting CCC crews to critical areas out of the working range of any camp (which applies to a large part of this stream), most erosion control projects are located more by the dictates of convenience than by those of greatest need. As a result, such projects appear comparable to the determined caulking of a few knotholes to keep the wind out of a room whose doors and windows are open.

East Branch Fox River

Erosion control work inspected at the Fox River Bearing Station shows the greatest promise of success because the sea wall is constructed solidly of limestone slabs, the natural force of the current is not great, and the sand slope is already supporting patches of sand-binding vegetation (see photograph). It is of interest to note in the photograph that the log terraces have been leveled off by sand filling almost to the normal angle of repose.

Black River

The section examined lies just below the U. S. 2 bridge in Mackinac County, T. 43 N., R. 8 W., Sec's. 19-20. Most of the structures, installed in 1935, are of two types: log and pole raft covers, and log-core boulder and stone wing deflectors. Those seen were in excellent condition, were operating efficiently, and presented a most pleasing, natural appearance (see photograph). This installation well exemplifies the claim that stone and boulder materials, when available in adequate size and abundance, lend themselves to effective, natural-appearing improvement devices much more readily than do wooden materials. From the standpoint of durability no complaint can be made. The work was inspected by one of the authors December 22, 1935, only a few months after its installation. In 1938, no apparent change could be detected.

Dense growths of alder fringe ~~and~~ overhang the stream, effectively preventing erosion and providing an ample supply of shade.

This work should continue to operate at peak efficiency for many years to come.

Carp River

This river was inspected at a point a few miles northwest of Brevort. Here the work consisted of erosion control similar to that seen on the Two-Hearted but on a smaller scale, and of numerous deflectors, covers and rafts composed almost wholly of logs, poles, stumps and deadheads. Most of the latter have been covered with thick sod, which, however, was not wired down (see photograph). For this reason it is very likely that a large part of it will be ^{washed} ~~eroded~~ away by the action of ice and spring floods. Underpass logs, almost always of dubious value, may increase bank erosion in the section examined. Even these structures are sodded.

Manistee River

An inspection was made of work placed only a few miles below the source, in T 29 N., R. 4 W. Here the exceedingly tortuous channel winds through flat, open country, with very little natural shade. (The lack of shade is probably due to the old lumbering dam at DeWard, which, when still in place, flooded this section.) Large quantities of deadfalls are present and afford a certain amount of much-needed cover. Improvements (see photographs) have been constructed of available wooden materials and have been designed to restrict the rather wide, shallow channel (long wing deflectors) and to provide holes and cover (stumps and underpass deflectors.) In the main the structures are natural in appearance and are apparently durably constructed. The double construction of the underpass deflectors results in exposure above water of the upper element, lending a flavor of artificiality to an otherwise natural appearing series of devices.

Further downstream are some erosion control projects which, following the common pattern of log terracing with plantings of sand-loving grasses and shrubs, appear to be quite successful.

North Branch Au Sable

Recent installations were viewed near Bottell's property just below the Otsego County line. Here the stream is about 100 feet wide, comparing in width and depth with more familiar sections nearer Lovells. However, the bottom differs strikingly in being almost uniformly composed of sand and fine gravel, instead of coarse gravel. Judging from appearances, aquatic vegetation grows more prolifically than downstream in the gravel sections. Very dense, heavy beds of Potamogeton filiformis occur across most of the width of the stream. When seen, the late summer development of algae was also at its height, long streamers of Spirogyra being attached to the Potamogeton.

The improvements consist chiefly of long wing deflectors of logs banked with gravel; V deflectors similarly constructed; and submerged digging logs designed with the hope that they would create openings in the weed beds. Some of the deflectors direct the current under moored stumps or digging logs. Long wings and the broad, obtuse-angled V-deflectors are of a type which has proven successful in the Lovells section of the North Branch. Near Bottell's the materials used seemed none too sturdy, and final judgment must be withheld until they have gone through a winter. This stream is not normally subjected to heavy flooding or ice action, so the work may hold without damage. The digging logs have been able to clear weeds from only that portion of bottom lying under the log and extending for about 12 to 15 inches below it. Stumps and digging logs at the ends of deflectors are likely to meet the fate already predicted for similar devices in the Big Betsy River.

Sod placed on the North Branch structures should be wired in place by binder poles.

Tobacco River

(Examined by Hazzard and Trautman, November 1, 1938). Improvements in this stream were inspected just below the state trout rearing station. The work, consisting largely of dams with central or lateral spillways, and anchored stumps, is without doubt the sorriest example of stream improvement thus far observed. The rocks employed are very small (no larger than a man's head), and have been taken from the stream bed, despite the fact that an ample supply of large boulders is available along the road near the stream. Numerous pine deadheads were observed along and in the stream above the rearing ponds.

Boulder or log wing deflectors used in conjunction with bank and bend rafts would be much more suitable barrier types for this stream. The low-center rock dams as installed above the rearing station are very natural in appearance, and should also be a desirable type of improvement for this stream.

In addition to the above, the work is poorly constructed and too much concentrated. It is likely that most of it will go out with the spring rains.

Summary

1. Wing deflectors of large stone and boulder materials as exemplified by those in the Black River, Mackinac County, are greatly to be preferred over other types of construction, from the standpoint of efficiency, durability, and naturalness of appearance.

2. Submerged digging logs located at the apex of an open V deflector are of doubtful value because they (a) tend to undermine the deflector, jeopardizing its permanence and nullifying its ability to create stable sand muck bars, and (b) are very likely to accumulate drift in quantities sufficient to tear out the deflector, or at least to seriously inconvenience the angler; and they may increase erosion.

3. In unshaded sections it would be desirable to make experimental plantings of streamside trees and shrubs to see if they might not give greater dollar-for-dollar improvement than conventional barriers.

4. Erosion control work following the standard log terrace pattern appears to be successful. It is to be seriously questioned, however, whether installation of isolated control work on a stream eroding throughout its course is justifiable.

5. Whenever it is thought desirable to cover improvement devices with sod, this should be wired in place by the use of binder poles to prevent its washing away with high water.

6. Digging logs of the transverse, I deflector type, are of dubious value. They almost always appear artificial, they may increase erosion, and are likely to go out through drift lodgment.

INSTITUTE FOR FISHERIES RESEARCH

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Recently completed erosion control work on Two Hearted River. Note tendency of sand to level off terraces.



Erosion control work on Pere Marquette River just below mouth of Kinne Creek. Note points where sea-wall is broken. Age of work at time of photographing about four years.



Erosion control along raceway, Fox River Rearing Station. Note stability of stone sea-wall, and establishment of vegetation on sand slope which has filled log terraces to normal angle of repose.



Four year old log and boulder wing deflector in Mackinac County, Black River. This is one of the best possible types of construction if necessary materials are available.



Sod covered bend raft in Carp River near Brevort. Unless sod is wired down it is certain to be damaged and stripped away by ice and high water.



Log and stump barriers in Manistee River west of Gaylord. In the main, these structures are in harmony with their surroundings, and seem to be performing as expected. Isolated digging logs, as seen in the foreground, are of questionable value.



North Branch Au Sable near Boutell's cottage. These wing deflectors should do good work, although the sod should be held on with binding poles. Digging logs at end are of questionable value.



Structures in Tobacco River below rearing station.



Structures in Tobacco River below rearing station.