Original: Fish Division
cc: Education-Game
Institute for Fisheries Research
R. S. Marks
E. H. Bacon
O. H. Clark

INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
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ALBERT S. HAZZARD, PH.D.
DIRECTOR

ADDRESS
UNIVERSITY MUSEUMS ANNEX
ANN ARBOR, MICHIGAN

June 19, 1952

Report No. 1338

SURVEY OF SWAN CREEK, (T. 1, 2 N., R. 14, 15 W.), ALLEGAN COUNTY

by

I. A. Rodeheffer and Jason Day

Abstract

Swan Creek, a tributary of the Kalamazoo River, is one of the better known trout streams of southwestern Michigan. Over half of its 12-mile course passes through the Allegan State Forest. The Conservation Department's Wildlife Experiment Station, operated by the Game Division, is located a short distance above the mouth of the stream.

A fisheries survey of Swan Creek, made during the summer of 1947, revealed that a large part of the stream bottom consisted of shifting sand, although some gravel was present. Bottom food organisms were generally scarce, as were good pools, but the stream was found to be fairly well shaded. Lakes at the headwaters and Swan Creek Pond, the latter about 3 miles above the mouth, exerted a warming effect upon the stream, yet most water temperatures were within the toleration limit for trout. The lowest temperatures were found in the vicinity of Iron Bridge. This section apparently also received the bulk of the fishing pressure for the stream as a whole. Carp, suckers, pumpkinseeds, and other warm-water species probably gave trout considerable

competition in the warmer sections of the creek. Trout appeared scarce in these places.

Management recommendations following the survey of Swan Creek called for stream improvement and continued stocking with brown and rainbow trout. Intensive improvement work, consisting of bank stabilization and installation of bank protectors and current deflectors, was done during 1949, 1950 and 1951 above Swan Creek Pond. A total of 235 stream improvement structures have been installed. The trout stocking program has continued.

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Swan Creek is a tributary of the Kalamazoo River. The latter flows through central southwestern Michigan and enters Lake Michigan at Saugatuck.

Swan Creek is the principal drainage system for Valley and Cheshire Townships of Allegan County, and is the outlet for Swan Lake. Swan Lake receives the combined flow of outlets from Mud Lake, Section 10 of Cheshire Township, and Silver Lake in Section 11. Eagle Lake, mainly in Sections 34 and 35 of the same township, receives an outlet from Muskrat Lake in Van Buren County. This stream is only a few hundred feet in length. The waters of these two lakes then flow northward through an outlet from Eagle Lake, approximately 2 1/2 miles in length, and empty into Swan Lake. Duck Lake, in Sec. 36 of Cheshire Township, also gives its waters to Swan Lake, through an outlet which after approximately 2 1/2 miles joins the outlet of Eagle Lake.

Near the junction of Sections 31 and 32 of Valley Township and Sections 5 and 6 of Cheshire Townships, Swan Creek flows into the Allegan State Forest through a heavily wooded area for about 4 1/2 miles between high banks until it reaches Swan Creek Pond. Above the State

Forest, the stream flows from Swan Lake through well-cultivated farm lands over a course approximately 7 1/2 miles in length. Swan Creek from Swan Lake to its mouth is about 15 miles long. The stream enters the Kalamazoo River about a mile below the dam which forms Allegan Lake.

The lakes and tributaries of the Swan Creek drainage system above Swan Lake lie in rich farming areas, but the streams were observed to flow over bottoms mostly of sand. The country is hilly, and farm woodlots shade the streams in many places. The lakes are heavily fished, and a few cottages dot the shores of each of them. All this area is apparently privately owned, except for a public fishing site on Duck Lake.

A survey party consisting of I. A. Rodeheffer and Jason Day, both of the Institute for Fisheries Research, was sent to Allegan County during the summer of 1947 to investigate trout possibilities in several waters. In order to more fully understand the trout possibilities and their limits in Swan Creek, Swan Creek Pond and Swan Lake were included in the study. The survey of the Swan Creek drainage system was made during the period of June 27 to July 21, 1947.

Swan Creek, from Swan Lake to where it empties into the Kalamazoo River, covers a distance of about 15 miles (measured from aerial photos). The dam at M-89 which forms Swan Creek Pond is 3 miles above the mouth of the stream. For survey purposes, this section of stream below the dam was dealt with as a unit, Swan Creek Pond as a unit, the stream above the pond as another unit, and Swan Lake also as a unit. Studies of the pond and lake have been considered in separate reports.

Swan Creek below the Dam on M-89

Swan Creek below the dam on M-89 receives the flow from Swan Creek Pond and is also fed by numerous springs along its banks. There is

some flooding of this area in the spring of the year. During the spring of 1947, the water was 3 feet above the present level of the dam which at the time of the survey had a head of 10 feet, 3 inches. In the spring, about one-half to 1 mile of the lower end of the stream floods from backup of the Kalamazoo River. There was no noticeable pollution in the waters above, but the Kalamazoo River was reported badly polluted, and water backing up into Swan Creek perhaps carried pollution.

The immediate banks, as well as the surrounding country, along this 3 miles of stream is wooded, and much of the stream is shaded most of the time. Most of the stream flows through a deep valley with steep wooded sides. The Conservation Department's Wildlife Experiment Station is located on the bank of the stream, about one-fourth of a mile above its mouth. Between the Experiment Station and the "Nudist" camp grounds, about three-fourths of a mile upstream from the Experiment Station, the steep banks of the valley are used for an archery range.

The stream is open to public fishing and is equipped with camping and picnic grounds. The water was found sufficiently cool for trout, but few trout were being caught. The survey party heard of only one trout caught during July, 1947, even though the stream had been planted with 500 legal rainbows and 500 legal brown trout in the spring of 1947. Allegan sportsmen reported that this stretch of stream furnished good trout fishing before the dam was built. No trout were seen in this part of the stream during the survey. Carp were numerous, and in the lower quarter mile of stream 14 carp, estimated to weigh 1 to 4 pounds, were seen. In the upper part, just below the dam, 9 additional carp of similar size were counted. In the stream back of the Experiment Station, 3 largemouth bass and 4 pumpkinseeds were

observed. Seining was attempted here without success, largely due to the extreme muckiness of the bottom. In two large, deep holes just below the dam at M-89, the following fish were observed: 1 northern pike, 2 largemouth bass, 5 pumpkinseeds, 7 bluegills, 3 perch, 25 suckers, 9 carp, 1 creek chub, and 5 common shiners. Fishing with hook and line took 3 perch, 7 pumpkinseeds, 5 bluegills, 3 green sunfish, 14 common shiners and 1 golden shiner.

Spawning grounds were limited in this lower section of stream since the bottom was almost entirely sand except for about 100 yards below the dam where there were gravel and large stones. The lower quarter mile of stream was mucky and silty, and had very little flow where it emptied into the Kalamazoo River. Numerous springs flowed into the stream throughout the wooded area.

Three stations were selected for physical, chemical and biological data. One was near the mouth just above the Wildlife Experiment Station. The second station was almost half way between the mouth and the dam just below the footbridge going to the "Nudist" camp, and the third was about 100 yards below the dam at M-89.

The average width varied from 27 to 34 feet, depth ranged from 1 to 2 feet, and velocity ranged from 0.8 to 1.2 feet per second. The volume increased from 40 cubic feet per second near the M-89 dam to 51 c.f.s. near the mouth on July 8, 1947. The temperature on this date decreased from 67° F. at the dam to 64° F. at the middle station, and increased again to 66° F. near the mouth. On this date the highest air temperature recorded was 77° F.

Pools averaged about 4 or 5 per hundred yards of stream, including a few good, deep pools, such as occur at a bend in a stream. Long,

narrow pools under overhanging branches were common in the upper half of this section of the stream. The bottom was almost entirely shifting sand, except just below the dam where it was gravel and stone, and the lowermost end where the bottom was muck and silt. Shade was dense along most of this stretch of stream, and the places where one could fly-fish were limited.

The shifting sand bottom supported little plant life; algae and mosses were the only forms of aquatic plants found in the stream. Likewise, fish foods were sparse. At the lower station, sowbugs were found among rocks that were used to make a small dam across the stream. Only a few caddis fly larvae were found in a square-foot bottom sample from the silty bottom. Fresh-water shrimp and midge larvae were present in small numbers at the two upper stations, with the addition of a few leeches at the upper station near the dam on M-89. The volume of fish foods varied from one-half to 1 1/2 cubic centimeters per 2 square feet of bottom sample.

The dissolved oxygen values were 8.2 parts per million at the upper station, 7.2 ppm. at the middle station, and 7.5 ppm. at the lower station. The methyl orange alkalinity varied from 119 to 124 ppm.

It is questionable if this part of Swan Creek can become good for trout as long as trout must compete with other species. Carp were abundant in July, and it was reported they were very much more plentiful in the spring. Numerous other species of fish were present, and undoubtedly competed with trout.

Swan Creek from Swan Creek Pond to Swan Lake

Swan Creek, from where it empties into Swan Creek Pond to its source at Swan Lake, is about 12 miles long (measured from aerial

photographs). Swan Creek at its source is swampy. The stream here is heavily overgrown with plants, including yellow water lilies. It flows through a swampy valley for about 2 miles below Swan Lake. The stream then flows through pasture lands. Up to this point, the main supply of water is from Swan Lake and surface runoff. Signs on trees and other marks along the bank show that the water level in the spring of 1947 was about 3 feet above the level found during the survey. Local residents reported this as having been the highest ever noted.

Below the bridge over county highway No. 406, 3 miles below the lake, the stream receives water from numerous springs. From this bridge, all the way to where it empties into Swan Creek Pond, about 9 miles, the creek is shaded by large trees and brush. Four and a half miles below this bridge the stream enters Allegan State Forest, and this section of the stream is known as good trout water.

On July 9, 1947, stream temperatures taken about three-fourths of a mile and 2 miles below Swan Lake registered 69° F. when the air temperature was 78° F. Water temperature at the bridge on county road No. 406, 3 miles below Swan Lake, registered 68° F. The temperature ranged from 68° F. to 70° F. at this point on several July days when the range of air temperature was 74° F. to 80° F. Readings taken where the stream enters the State Forest, a mile east and 1 1/4 miles north by road of where it crosses highway No. 406, were 66° F. and 68° F., with the air temperatures 74° and 80° F. Temperatures taken at the Iron Bridge, in Section 29 and about three-fourths of a mile above Swan Creek Pond, were 59° F. on July 9 with the air temperature at 78° F. and 58° F, and on July 21 the air temperature was 65° F.

It is up and down from the Iron Bridge in Section 29 where most of the trout fishing is done on Swan Creek. On July 9, the survey party covered about a quarter mile of stream below the bridge and observed 9 brown trout from 7 to 10 inches in length. That part of the stream from a short distance above the Valley-Cheshire township road to where it empties into Swan Creek Pond, a distance of about 4 miles, is undoubtedly good trout water. Much of this stretch is heavily wooded with overhanging bushes, so fly-fishing is difficult. Allegan sportsmen reported that this part of the stream has always been good for trout but difficult to fish.

Stocking records for 1945, 1946 and 1947 show that this part of the stream, in Sections 20, 29, and 32 of Valley Township, was heavily stocked with trout. In 1945, these three sections received 2,000 8-inch brown trout and 1,700 rainbow trout 7 1/2 to 8 inches in length. In 1946, the plantings consisted of 2,500 brown trout 7 1/2 inches long and 1,300 rainbow trout 8 inches in length. In 1947, Sections 32 and 29, 20, and Section 9 (the latter enclosing the lowermost part of Swan Creek) received altogether 1,000 legal rainbows and 500 legal browns.

A seine collection, from about 300 feet of stream just above highway No. 406, consisted of the following species of fish: 6 northern pike, 1.8 to 5.6 inches long; 1 largemouth bass, 1.1 inches; 1 warmouth, 4.2 inches; 4 yellow bullheads, 0.5 to 2.8 inches; 36 golden shiners, 4 to 5 inches; 20 mudminnows 0.7 to 3 inches, 10 Johnny darters 0.7 to 2 inches; and 18 muddlers 0.7 to 3 inches.

Trout spawning grounds in the stream were limited because almost the entire bottom, even in the part regarded as fairly good trout water, was shifting sand. The upper part of the stream, where it flowed through swamp lands, probably provided good pike spawning grounds.

No predators other than 3 water snakes were seen.

Three stations for physical, chemical, and biological data were selected between Swan Lake and Swan Creek Pond. The first, regarded as Station No. 4 for Swan Creek, was just above Swan Creek Pond. The second, Station No. 5 for Swan Creek, was located at the Iron Bridge in Section 29, on the stretch of stream recognized as trout water. The third station, No. 6, was established 200 yards above highway No. 406.

The average width of the stream just above Swan Creek Pond was 33 feet, with an average depth of 7 inches. The velocity was about 2 feet per second, and the volume 33 c.f.s. At the Iron Bridge the average width was 19 feet, the average depth 1.1 feet; the velocity was 1.3 f./s. and the volume 28 c.f.s. At highway No. 406 the average width was 14 feet and the depth 1.1 feet. The velocity was 1.1 f./s. and the volume 15 c.f.s.

The water was clear and colorless.

Pools were infrequent for the lowest station, but those present were generally large and deep. At the Iron Bridge, pools averaged about 4 or 5 per 100 yards, the majority of which were large and some deep. They had been made by bends in the stream and fallen trees. At the third station there were fewer pools but these were good. Particularly was this true in the wooded section below the road. In practically all instances the bottoms of the pools, as well as the shallower areas, consisted of sand. Much of the stream was shaded, either from large trees or bushes.

Algae and mosses were the only vegetation found at the two lower stations, but at the upper station Anacharis was common and some Potamogeton was found.

Bottom organisms were generally sparse, particularly at the lower two stations. Fresh-water shrimp were the most plentiful form at all three stations. Bloodworms were found at the lower and upper stations. At the upper station, crayfish were very abundant. Twelve of these were taken in 2 square feet of bottom sample, and many were caught when seining.

Oxygen tests showed 8 parts per million of oxygen at the lower station, 9.3 ppm. at the middle, and 7.3 ppm. at the upper. Methyl orange alkalinity varied from 118 to 136 ppm.

Management Recommendations and Practices

Continued stocking of the upper waters of Swan Creek with legal-length brown and rainbow trout was recommended following the biological survey. Installation of deflectors and other stream improvements between Swan Lake and Swan Creek Pond was considered desirable, and some brushing out of this section to make the stream more accessible to fly fishermen was regarded a possibility. The section below Swan Creek Pond was not considered worthy of management for trout because of the prevalence of carp and other competing species.

Instensive stream improvement above the pond, in township sections, 29, 32, and 17, was carried out during 1949, 1950 and 1951. The improvement work included bank stabilization, installation of bank protectors and current deflectors, and cleaning out of brush and barriers that had obstructed flow. A total of 235 structures have been installed, a list of which is appended to this report. Additions and repairs to structures were made in 1950 and 1951, and these also are listed. Stocking of the upper parts of Swan Creek with legal-sized brown and rainbow trout has been continued each year since the survey.

Stream Improvement Structures in Swan Creek, Allegan County

Structures Installed in 1949 - T. 2 N., R. 14 W., Secs. 29, 32

Number		Length	Angle
1.	Double wing deflector (sheet-pile) each with trailer log	12' & 15' 15'	45°
2.	Digger log	25'	90°
3.	Bank protector	8'	Parallel
4.	Digger log	20'	90°
5.	Single wing deflector (sheet-pile) with trailer log and digger log at terminal end.	24' 20'	30°
6.	Bank protector	20'	Parallel
7.	Single wing deflector (sheet-pile) with trailer log	15' 20'	30°
8.	Digger log	10'	80°
9.	Single wing deflector (sheet-pile) with trailer log	25' 20'	45°
10.	Tree stump	3' dia.	Center of stream
11.	Digger log	20'	90°
12.	Single wing deflector (logs & sheet-pile) with trailer log	30' 10'	30°
13.	Bank protector (logs & limbs)	20'	Parallel
14.	Bank protector (logs, limbs & brush) with digger log spanning stream	30'	Parallel
15.	Digger log	15'	90°
16.	Single wing deflector (logs & brush)	30'	30°
17.	Bank protector (logs & limbs)	20'	Parallel
18.	Bank protector (log)	20'	Parallel
19.	Digger log	15'	80°
20.	Single wing deflector (sheet-pile) with trailer log	20' 20'	45°

21.	Digger log	10'	80°
22.	Single wing deflector (log & sheet-pile) with trailer log	20' 10'	30°
23.	Bank protector (logs, limbs and brush)	60'	Parallel
24.	Bank protector (logs)	25'	Parallel
25.	Digger log	15'	60°
26.	Bank protector (logs and limbs)	35'	Parallel
27.	Single wing deflector (log & sheet-pile) with trailer log	30' 30'	60°
28.	Digger log	20'	90°
29.	Single wing deflector (sheet-pile) with trailer log	25' 15'	45°
30.	Tree stump	30" dia.	Center of stream
31.	Digger log with bank protectors	15'	90°
32.	Tree stump	2' dia.	Center of stream
33.	Bank protector (log, limbs & brush)	15'	Parallel
34.	Digger log	25'	90°
35.	Bank protector (logs)	40'	Parallel
36.	Bank protector (logs)	10'	Parallel
37.	Digger log	10'	80°
38.	Bank protector (logs)	10'	Parallel
39.	Bank protector (log & limbs)	40'	Parallel
40.	Single wing deflector (logs & sheet-pile)	20'	60°
41.	Bank protector (log, limb & brush)	20'	Parallel
42.	Digger log	15'	80°
43.	Single wing deflector (sheet-pile) with trailer log	35' 40'	60°
44.	Digger log	20'	80°

45.	Digger log	15'	90°
46.	Bank protector (logs)	10'	Parallel
47.	Digger log	20'	90°
48.	Bank protector (logs)	30'	Parallel
49.	Digger log	15'	80°
50.	Bank protector (log, limb & brush)	20'	Parallel
51.	Digger log	20'	90°
52.	Digger log	15'	90°
53.	Digger log	25'	90°
54.	Digger log	20'	90°
55.	Bank protector (log & limb)	30'	Parallel
56.	Digger log	15'	80°
57.	Bank protector (log, limb & brush)	20'	Parallel
58.	Bank protector (log, limb & brush)	25'	Parallel
59.	Single wing deflector (log & sheet-pile) with trailer log	25' 25'	45°
60.	Bank protector (log, limb & brush)	25'	Parallel
61.	Digger log	25'	90°
62.	Bank protector (log, limb & brush)	40'	Parallel
63.	Single wing deflector (sheet-pile)	25'	45°
64.	Bank protector (log, limb & brush)	20'	Parallel
65.	Bank protector (logs & roots)	30'	Parallel
66.	Digger log	15'	80°
67.	Tree stump	4' dia.	Center of stream
68.	Bank protector (log, limb & brush)	35'	Parallel
69.	Bank protector (limbs & brush)	30'	Parallel
70.	Single wing deflector (limbs & brush)	10'	60°

71.	Digger log	25'	90°
72.	Bank protector (log, limb & brush)	10'	Parallel
73.	Digger log	25'	90°
74.	Single wing deflector (sheet-pile) with trailer log	35' 30'	60°
75.	Bank protector (log & limb)	30'	Parallel
76.	Bank protector (log & limb)	15'	Parallel
77.	Digger log	30'	90°
78.	Bank protector (limbs)	10'	Parallel
79.	Single wing deflector (log & limb)	15'	30°
80.	Digger log	15'	90°
81.	Bank protector (log, limb & brush)	40'	Parallel
82.	Bank protector (log & limb)	10'	Parallel
83.	Bank protector (log, limb & brush)	60'	Parallel
84.	Digger log with log deflector attached	20' 10'	90°
85.	Digger log	10'	90°
86.	Bank protector (log)	10'	Parallel
87.	Bank protector (log & limb)	15'	Parallel
88.	Bank protector (log, limb & brush)	45'	Parallel
89.	Digger log	12'	90°
90.	Bank protector (log & limb)	40'	Parallel
91.	Digger log	20'	90°
92.	Bank protector (log & limb)	10'	Parallel
93.	Bank protector (logs)	15'	Parallel
94.	Bank protector (logs)	20'	Parallel
95.	Digger log (tree)	30'	60°
96.	Bank protector (logs)	30'	Parallel

97.	Bank protector (log & limbs)	35'	Parallel
98.	Bank protector (log, limb, and brush)	20'	Parallel
99.	Single wing deflector - digger (plank)	30'	80°
100.	Bank protector (limb & brush)	10'	Parallel
101.	Bank protector (log, limb & brush)	35'	Parallel
102.	Bank protector (log & limb)	20'	Parallel
103.	Bank protector (limb & brush)	10'	Parallel
104.	Bank protector (log & limb)	30'	Parallel
105.	Bank protector (log & limb)	20'	Parallel
106.	Digger log (two trees)	25'	90°
107.	Bank protector (log & limb)	20'	Parallel
108.	Bank protector (log & limb)	10'	Parallel
109.	Bank protector (log & limb)	20'	Parallel
110.	Digger log with bank protector	15'	90°
111.	Bank protector (log & limb) with digger log	15' 15'	Parallel 90°
112.	Single wing deflector (log & limb) with digger log	20'	30°
113.	Digger log	15'	90°
114.	Bank protector (log & limb)	20'	Parallel
115.	Bank protector (log, limb & brush)	15'	Parallel
116.	Bank protector (logs)	10'	Parallel
117.	Bank protector (log & limb)	20'	Parallel
118.	Bank protector (log, limb & brush)	35'	Parallel
119.	Single wing deflector (log, limb & brush)	20'	45°
120.	Single wing deflector (log, limb & brush)	25'	30°
121.	Single wing deflector (log, limb & brush)	15'	45°
122.	Bank protector (log & limb)	20'	Parallel

123.	Single wing deflector (log, limb & brush)	20'	45°
124.	Single wing deflector (log, limb & brush)	15'	45°
125.	Bank protector (limb & brush)	30'	Parallel
126.	Single wing deflector (log & limb)	25'	45°
127.	Bank protector (logs)	15'	Parallel
128.	Single wing deflector	15'	60°
129.	Digger log	15'	80°
130.	Single wing deflector (log & limb) with digger log (fallen tree)	30' 25'	45° 80°
131.	Digger log with bank protection on each end.	30'	90°
132.	Single wing deflector (log & limb)	10'	30°
133.	Bank protector (logs)	15'	Parallel
134.	Single wing deflector (log & limb)	10'	45°
135.	Bank protector (logs)	15'	Parallel
136.	Single wing deflector (logs)	30'	90°
137.	Single wing deflector (log & limb)	10'	80°
138.	Single wing deflector (log & limb) with digger log	10' 25'	90° 90°
139.	Single wing deflector (logs) with digger log	15'	45°
140.	Digger log with bank protection at each end.	25'	60°
141.	Digger log with single wing deflector at bank	20' 8'	80° 80°
142.	Digger log (fallen tree)	20'	90°
143.	Bank portector (log & limb)	50'	Parallel
144.	Single wing deflector (log & limb) with digger log	20' 20'	60° 90°
145.	Digger log	20'	70°
146.	Bank protector (log & limb)	35'	Parallel
147.	Bank protector (logs)	30'	Parallel
148.	Single wing deflector (logs) with digger log	15' 5'	60° 60°

149.	Bank protector (logs)	20'	Parallel
150.	Bank protector (limb & brush)	15'	Parallel
151.	Single wing deflector (logs) with digger log (fallen tree)	15' 15'	30° 80°
152.	Digger log	10'	90°
153.	Bank protector (log & limb)	30'	Parallel
154.	Single wing deflector (log, limb & brush)	30'	30°
155.	Digger log	25'	80°
156.	Single wing deflector (log & limb) with digger log (fallen tree)	15' 15'	45° 80°
157.	Single wing deflector (limb & brush)	20'	15°
158.	Bank protector (log, limb & brush)	20'	Parallel
159.	Digger log	20'	80°
160.	Digger log with bank protector	20'	90°
161.	Bank protector (log, limb & brush)	10'	Parallel

Structures Installed in 1950 - T. 2 N., R. 14 W., Secs. 29, 32

Number		Length	Angle
20A.	Digger log	20'	60°
37A.	Tree stump with bank protector	10'	Parallel
61A.	Single wing deflector (log, limb & brush)	25'	45°
94A.	Double wing deflector (sheet-pile)	12' 15'	60° 60°

Structures Installed in 1951 - T. 1, 2 N., R. 14 W., Sec. 17

Number		Length	Angle
A1.	Bank Protector (logs & poles)	24'	Parallel
A2.	Bank protector (logs)	8'	Parallel

A3.	Bank protector (logs)	47'	Parallel
A4.	Bank protector (logs & poles)	12'	Parallel
A5.	Bank protector (poles)	22'	Parallel
A6.	Bank protector (logs)	20'	Parallel
A7.	Bank protector (logs)	21'	Parallel
A8.	Bank protector (logs & poles)	55'	Parallel
A9.	Bank protector (logs)	15'	Parallel
A10.	Bank protector (logs)	6'	Parallel
A11.	Bank protector (logs)	8'	Parallel
A12.	Bank protector (log, poles & brush)	57'	Parallel
A13.	Bank protector (logs)	10'	Parallel
A14.	Bank protector (poles & brush)	35'	Parallel
A15.	Single wing deflector (sheet-pile) with trailer log	22' 25'	60°
A16.	Single wing deflecter (sheet-pile) with trailer log	18' 22'	60°
A17.	Single wing deflector (sheet-pile) with trailer log	20' 20'	60°
A18.	Bank protector (poles & brush)	25'	Parallel
A19.	Digger log	6'	90°
A20.	Bank protector (logs)	10'	Parallel
A21.	Bank protector (logs & poles)	16'	Parallel
A22.	Bank protector (logs & poles)	12'	Parallel
A23.	Bank protector (logs & poles)	15'	Parallel
A24.	Bank protector (logs & poles)	11'	Parallel
A25.	Bank protector (logs & poles)	10'	Parallel
A26.	Bank protector (logs & poles)	10'	Parallel
A27.	Single wing deflector (sheet pile) with trailer log	25' 15'	60°
A28.	Bank protector (logs & poles)	12'	Parallel
A29.	Bank protector (logs & poles)	15'	Parallel

A30.	Single wing deflector (logs)	12'	45°
A31.	Single wing deflector (log, pole & limbs) with trailer log	6' 15'	60°
A32.	Single wing deflector (logs & poles)	22'	45°
A33.	Single wing deflector (sheet pile)	20'	60°
A34.	Single wing deflector (sheet-pile)	20'	90°
A35.	Double wing deflector (logs)	R.15' L.30'	60° 60°
A36.	Digger log with bank protection	20'	60°
A37.	Double wing deflector (sheet-pile)	R.23' L.12'	60° 60°
A38.	Single wing deflector (poles & limbs)	30'	60°
A39.	Bank protector (logs & limbs)	48'	Parallel
A40.	Single wing deflector (logs, poles & limbs)	72'	30°
A41.	Single wing deflector (limbs)	22'	45°
A42.	Single wing deflector (sheet pile & logs)	45'	45°
A43.	Bank protector (log, limb & brush)	40'	Parallel
A44.	Single wing deflector (log & pole)	60'	30°
A45.	Bank protector (log, limb & brush)	80'	Parallel
A46 to A57.	Not recorded		
80-A.	Single wing deflector (sheet-pile)	22'	45°
80-B.	Single wing deflector (sheet-pile) with trailer log	22' 24'	60°
82-A.	Single wing deflector (sheet-pile)	10'	45°
82-B.	Single wing deflector (log & pole)	25'	30°
84-A.	Bank protector (pole, limb & brush)	12'	Parallel
85-A.	Bank erosion control (logs)	20' x 16'	Parallel
87-A.	Double wing deflector (sheet-pile)	L.12' R.15'	45° 60°
88-A.	Bank protector (log & limb)	12'	Parallel

89-A.	Bank protector (log & pole)		15'	Parallel
	with bank erosion control (log & pole)	50'x	30'	Parallel
90-A.	Single wing deflector (sheet-pile)		14'	80°
92-A.	Single wing deflector (sheet-pile)		12'	45°
94-B.	Single wing deflector (sheet-pile)		10'	60°
94-C.	Single wing deflector (sheet-pile)		12'	45°

Additions and Repairs on Swan Creek - Stream Improvement Structures, 1950
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Number	Type of Structure	Repair Work
8.	Digger log	Log & limb bank protection added.
	Single wing deflector	Sheet-pile added to bank half - log capped.
39.	Bank protector	Added logs & limbs.
49.	Digger log	Log and limb bank protection added.
59.	Single wing deflector	Added sheet-pile to log half - log capped.
60.	Bank protector	Added log and limbs.
64.	Bank protector	Added limbs & brush.
65.	Bank protector	Added limbs & brush.
69.	Bank protector	Added limbs & brush
84.	Digger log	Added sheet-pile making deflector with digger end - log capped.

Stream Improvement Structures, 1951 - T. 2 N., R. 14 W., Secs. 29, 32

5.	Single wing deflector	Added sheet-pile to bank section. Added 12' log to trailer log.
7.	Single wing deflector	Added sheet-pile to bank section. relocated trailer log.
9.	Single wing deflector	Added sheet-pile to bank section.
20.	Single wing deflector	Added sheet-pile to bank section, built bank protection.

26.	Bank protector	Added logs & limbs.
28.	Digger log	Reenforced bank with sheet-pile.
35.	Bank protector	Added logs.
37.	Digger log	Reenforced bank with sheet-pile.
65.	Bank protector	Added logs & poles.
81.	Bank protector	Added logs & poles.

INSTITUTE FOR FISHERIES RESEARCH

I. A. Rodeheffer and Jason Day

Approved by: A. S. Hazzard

Typed by: M. C. Tait