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STABILIZATION OF AN ERODED RIVER BANK

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Several photographs illustrate the progress of plant invasion and growth on a bank where attempts were made nearly 30 years ago to correct erosion of the slope. The bank is located on the Pine River, a major Michigan trout stream which is a branch of the Big Manistee River.

The normally clear water of Pine River takes on the color of creamed coffee after heavy rains. This turbidity is caused mainly by erosion of high, sand and clay banks. The resulting silt load destroys habitat of fish and fish-food organisms when it settles in pools and gravel areas. The situation doubtless was much worse 30 years ago, before any improvement work was done on the stream.

The high bank to be described was not included in improvement work done by the Michigan Department of Conservation on a portion of the stream system in 1952-54, but a current deflector installed in the mid-1930's apparently encouraged stabilization. The bank borders the north side of Pine River at a broad U-bend in Section 12 of North

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Newkirk Township, Lake County. It is sometimes called Canfield Rollway in reference to the lumbering era of the late 1800's when the virgin pine timber was cut. The logs were rolled down into the river and floated to mills at Manistee.

The erosion-prone, sand and clay bank extends 100 feet from brink to base, and is about 500 feet long. I estimate the angle of slope to be 50° - 70°. In this vicinity the stream is 30-60 feet wide and averages about 2 feet deep; some pools are as deep as 7 feet. The bottom soils are gravel and sand, with occasional patches of hardpan clay.

I first photographed the bank and deflector while employed as a creel census clerk on Pine River during the 1939 trout season (Fig. 1a). Other pictures of the site were taken in subsequent years. By 1964 it was apparent that the photographs told a story of the progress of stabilization.

The origin of the deflector is not known exactly, but it almost certainly was built by C. C. C. enrollees, who were supervised by U. S. Forest Service personnel, between 1936 and 1939. Much of the stream flow against the base of the high bank was diverted by the structure toward the low, well-stabilized left bank, thereby protecting the steep slope from undercutting. The deflector consists of rocks 3-18 inches in diameter, and presently is about 40 feet long (Fig. 1e). Displacement of many of the rocks by floods and people have reduced its effectiveness. Yet by 1966 the device still exerted some of the

effect which its designer had envisioned. Several wooden deflectors installed nearby, contemporaries of the rock deflector, were either in serious disrepair or completely washed out by 1939.

A photograph taken of the bank in 1938 is on file at the Institute for Fisheries Research. Besides suggesting that some vegetation may have been planted on the slope, this picture shows log-supported terraces on a small area, which probably were constructed when the current deflector was installed. The location of the terraces is not included on my 1939 photograph (Fig. 1a), but it appears in the 1947 photograph and is marked with an x (Fig. 1b).

The bank was eroded and bore very little vegetation in 1939 (Fig. 1a). A picture taken eight years later (Fig. 1b) shows marked improvement and that the spread of plants was mainly downstream from the vicinity of the deflector. Some invasion had also occurred below the rim on the downstream side of the bank, the side most resistant to stabilization.

Vegetation appreciably extended its coverage during the next three years (Fig. 1c), but also further erosion occurred. On the resistant area, some of the shrubbery apparent in Figure 1b is absent in Figure 1c. Also, a red pine (Pinus resinosa) that stood on the brink in 1947 (an arrow on Figure 1b points to the base of the trunk) was gone by July 1950; what likely were its remains lay at the base of the slope (Fig. 1c).

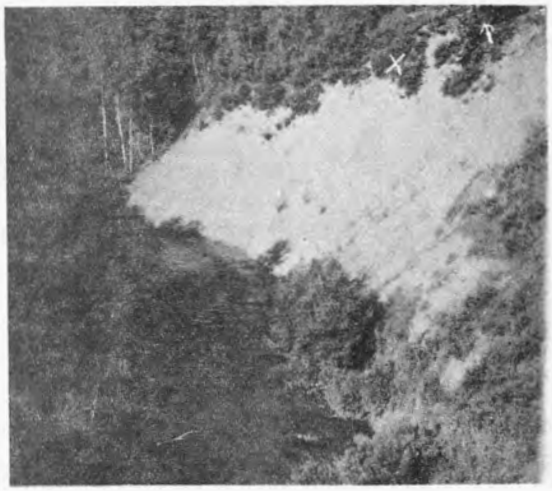
Vegetation covered much of the bank by 1964, even on the retarded area (Fig. 1d).

In August 1966, I took more photographs and examined the bank in some detail. Stabilization of the downstream side of the slope had suffered a recession. A strip of bank was denuded from top to bottom, and much of the sand had gone into the river (Fig. 1e). People sliding down the slope evidently caused most of the damage. The bank is on a public access site which is used by canoeists and tourists as well as fishermen.

The progress of stabilization was excellent upstream from the "slide" (Figs. 1e and 1f). Some 20 species of the more prevalent terrestrial plants were noted. No one species was distinctly dominant, but goldenrod (Solidago sp.) was especially conspicuous. Several grasses were present. Although abundant on the upland, bracken (Pteris aquilina) and sweet fern (Myrica asplenifolia) were scarce on the bank. Shrubs included alder (Alnus sp.), willow (Salix sp.), sumacs (Rhus typhina and R. copillina), wild grape (Vitis sp.), prickly ash (Zanthoxylum americanum), hawthorn (Crataegus sp.), black raspberry (Rubus occidentalis), blackberry (Rubus sp.), and wild rose (Rosa sp.). (Besides anchoring the soil, the briary shrubs doubtless also discourage foot traffic on the slope.) The trees were mainly black cherry (Prunus serotina), black locust (Robinia pseudo-acacia), and three species of poplar--Populus tremuloides, P. grandidentata, P. balsamifera. Quaking aspen (Populus tremuloides) and shrub-size black locust were most abundant.

Hindsight suggests that stabilization of this bank could have been hastened by additional practices, such as (1) providing a deflector

a



b

c

d

e

f

Figure 1. --Stages in the restabilization of a Pine River bank. Photographs a and f are upstream views; the others are downstream views. Dates pictures were taken: a--1939; b--August 1947 (the x shows the location where terraces were built about 10 years previously); c--July 1950; d--September 1964; e and f--August 1966.

immediately upstream from the resistant area, (2) riprapping the base of the incline with rock, and (3) planting vegetation to augment natural seeding. Protecting the bank from foot traffic with fencing would also have brought about quicker and more permanent stabilization.

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