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Trout Habitat Improvements On Hay Creek

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"When we try to pick out anything by itself, we find it is hitched to everything else in the universe." - John Muir -

Instream habitat for trout in the Driftless Area of southeast Minnesota was degraded by agricultural which was the major landuse of the area. Rich soil, timber, and water attracted settlers to the region who in turn removed the native vegetation for agriculture, fuel, and lumber (Waters 1977). Large woody debris, used to create and maintain fish habitat naturally, was eliminated (Hicks 1991). Increased flooding, erosion, and sedimentation was caused by settlers who plowed the uplands and logged and pastured the slopes (Waters 1977). The sedimentation covered the stream bottom and stream bank vegetation (Trimble and Lund 1982). Interestingly, the brown trout is not native to this region but is more suited to the warmer and murky water than the native brook trout (Becker 1983).

Land use of this region has improved; erosion and sedimentation has decreased and infiltration increased (Trimble and Lund 1982). However, the instream trout habitat has degraded. Flooding prevented natural habitat from thriving because native stream vegetation had been replaced with agriculture or had not been growing long enough after restoration (Thorn 1992). It may take 25-100 years for stream corridors to produce woody debris to begin restoration of pools, riffles, and trout cover (Armentrout 1991). Habitat improvements have been made occasionally since 1950 in these streams, and habitat improvement projects have been funded annually since 1970. Hay Creek, located in this region, was improved in 1979 (Thorn 1/88).

Hay Creek runs through Goodhue County, Minnesota at T112N and R15W. The major water source for the stream comes from water seepage and springs located at the mouth of the stream (Thorn 5/88). Gentle gradients occur in the upland agricultural areas, but where it drains into the Mississippi River it has eroded through the limestone bedrock, forming rough valleys with hardwood covered slopes. Land use was pasture at the Hay Creek study area and before improvement, stream banks were nonvegetated and severely eroded. Only eight meters of OBC (Overhead Bank Cover) was present and low quality pools provided the remaining trout cover (Thorn 1/88). An increase in the number of anglers was not logical until habitat improvement increased the standing crop of trout (Thorn and Hawkinson 1978). Success of stocking to increase standing crops has been limited by poor survival of stocked trout (Johnson 1983). Trout stocking ended in Hay Creek in 1982.

Habitat improvements in Hay Creek were planned and completed by Fisheries Management (DNR) and headed by Mark Ebbers. This stream is a representative for other agriculturally degraded streams. About 19.5 km of Hay

Creek is managed for brown trout (*Salmo trutta*), blacknose dace, white sucker, and brook sticklebook (Thorn 1/88). I assume the species other than the brown trout are managed for just because they thrive in the same habitat as the game fish. Hunt states,"... the goal of habitat improvement is to produce larger trout...". During 1978-79, 1.2 km of Hay Creek was improved at a cost of $25,561/km. Included in this habitat improvement was the addition of three instream structures (adding 60m of permanent OBC), and 635m of streambank was riprapped with large rock. A 657m section of the middle of the stream project was fenced annually with single strand electric wire to exclude cattle during the summer (Thorn 1/88).

The improvements to the stream all improve habitat for the trout, but in different ways. OBC was constructed by pounding pairs of five-foot long wooden pilings into the stream bottom and nailing stringer planks of green-cut hardwood across the tops of them. These stringer planks provide a support for the green hardwood planks nailed on top of them parallel to the stream bank with a width of three to five feet. Stones, dirt, and seed are placed on top of the deck to construct a new streambank. Stream flow, confined by the artificially narrowed banks, scours a pool under most of the length of each structure (Hunt 1988). They provide shading, which minimizes thermal stress from solar radiation, overhead cover for fish, and provide shelter (Simonson 1988). Another attempt at habitat improvement was riprap. The idea behind the use of riprap was to reduce erosion of stream banks and provide hiding cover by the space between the rocks at an inexpensive price. Heavy equipment was used to slope the eroded banks to a 30-45 degree profile. Truckloads of rock are then dumped down the slope to create a five foot base. The soil is then pushed back over the top of the rocks to create a more aesthetically pleasing appearance (Hunt 1988). The final measure taken to improve stream habitat was fencing the stream off from cattle. Cattle exclusion was expected to allow the growth of riparian vegetation, narrowing and deepening of the stream, and development of undercut banks (Hunt 1988).

The habitat improvements to Hay Creek were evaluated three years and seven years after the initial intervention. The physical characteristics measured were as follows: pool, riffle, and total lengths; pool, riffle, and total area; pool, riffle, and average width; pool area with water >46cm. Physical characteristics during the summer were also compared before and after cattle exclusion on both the fenced and unfenced area (Hunt 1/88). The most important physical change in the stream was the increase in area deeper than 46cm. Most of the physical characteristics within the first three years after the habitat improvements. Physical changes in fenced and unfenced areas of the improved area were similar, therefore, summer fencing did not improve stream morphology (Hunt 1/88). An increase in brown trout biomass and density was noted and attributed to increased overwinter survival or movement into improved areas and not to changes in growth. The increase in overwinter survival was attributed to the increased cover provided by OBC, riprap, and aquatic vegetation (Hunt 1/88).

Angling pressure may have reduced the rate at which brown trout responded to habitat improvements of Hay Creek (Hunt 1/88). Research done by Hunt recommends that long-term angling rates should not exceed 40% for brown trout greater than 150 mm. Hunt also believes the benefits from habitat improvement in Hay Creek outweigh the costs of habitat improvements. A projection over 25 years, since the beginning of the habitat improvement to this stream, reveal that the annual cost of the improvements is $1,282 and the state would bring in $13,390 annually from anglers. This produces a $12,108 in revenue for the state (Hunt 1/88).

Investigations into habitat improvement techniques and long-term management have been researched since the evaluation of Hay Creek habitat improvements. Riprapping has little relation to trout population characteristics and is very expensive, it should be used only for erosion and not as a primary source of cover. Rocks function as energy-saving feeding sites rather than cover from predators for brown trout (Hunt 5/88).

Instream habitat devices manipulate stream characteristics, and accelerate recovery of damaged streams and provide a short term solution for stream restoration until long term goals are met (Swales 1989). Therefore, short-term management (20-25 years) uses OBC to provide immediate cover for trout and provide deep water for larger trout, and riprap to reduce bank erosion. Long-term management (>25 years) should consider variables to maintain cover and habitat complexity after in-stream work deteriorates. Long-term land use changes may restore meandering to increase stream length and reduce gradient, pool length, and velocity, and improve riffle quantity and quality (Hunt 1992).

In conclusion, this project lacks a few aspects of the restoration process. As eluded to earlier, the main objective of this project was to improve brown trout habitat to increase the size of fish and the number of anglers. This interest in one species creates a stream corridor habitat that is not diverse. In affect, the DNR was mainly interested with re-vegetating the banks with plants that would limit erosion and provide OBC and not with plants that would improve overall habitat of the stream corridor. There was no mention of trying to restore the natural plant communities that existed before degradation. Diversity is important in most ecosystems; therefore design projects should meet the broadest habitat requirements that can be encompassed while still meeting basic objectives (Seehorn 1992).

When setting goals, consider not only the target species, but also the associated community organisms and overall aesthetics of the program. Even though summer fencing did not produce changes in the stream channel of Hay Creek, anglers preferred the fenced section for aesthetic values and lower turbidity. This was the first mention of ecosystem or aesthetics through all of my research. More consideration should be given to the aesthetics and multiple

functions of the site; a trout stream bank could also be used as bike or walking path while maintaining its ecological integrity.

Will a holistic look at the stream corridor and its appearance become important criteria or just a passing thought for habitat improvement planners. Jumping up a scale to the watershed rather than the stream itself is a recent development. The problem may lie in trying to get different governmental departments to work together. For example, a stream that lies in two different counties may not be restored in the same manner due to the lack of communication. For this reason working at a watershed or eco-region scale makes sense.

I question as to how severely degraded must a stream or watershed be for the DNR or Trout Unlimited not to accept a project proposal. If the water quality was so poor that very few species were able to survive would the project still be proposed? Even though I question this being a restoration project that improves the whole ecosystem I cannot find fault in the improvements this project and others like it have done to reduce problems within the watershed.

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