

Upper River, Tahquamenon River
Luce County
Tahquamenon River Watershed, last surveyed 2009

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Environment

This segment of the Tahquamenon River is the headwater portion known as the Upper River (Figure 1), and the area of highest gradient as the river flows across glacial outwash deposits. Total length of this segment is 10.4 mi. In profile, the mainstem drainage emerges from a series of steep rolling sand hills, dropping quickly to the three Tahquamenon Lakes. The Tahquamenon Lakes collate drainage from smaller basins higher in elevation, and the river originates from the central lake. From the central Tahquamenon Lake, the river drops 35 ft in 3.1 mi until it reaches County Road 421, a site also known as The Eagle's Nest. The river then drops 111 ft in the next 7.3 mi as it flows downstream to County Road 442. Despite the relatively high gradient of the segment (average of 14.0 ft/mi), substrates until recently were often inundated with deep sand and hydraulic diversity was limited. Large woody debris was often the only solid substrate for colonization by periphyton and aquatic invertebrates. The Upper River segment is approximately 30 ft wide and one to 5 ft deep. Just west of County Road 442, the stream flattens out into a small swampy "spreads," consisting of braided channel morphology fringed with tag alder and cedar. The river pinches back together at County Road 442, and then opens up again into a similar but larger spreads flowage. No streams join the Tahquamenon through this segment. The stream is designated Type 1 for trout, with a stable annual flow. The majority of anglers target the 7 mi between County Road 421 (T47N, R12W, Section 21) and 442 (T46N, R12W, Section 22), although many trout anglers also fish downstream in the eastern spreads.

Coarse-textured moraines and glacial outwash make up 87% of the catchment for this valley segment (Waybrant and Zorn, 2008). These deposits are very porous, allowing ready infiltration of rainfall and melting snow, and provide large quantities of cold groundwater to the Upper River segment. Such stable flows benefit fish populations and limit stream bank erosion. However, lack of high seasonal discharge also limits movement of recently eroded sand substrate in the stream. As a result, stream modifications and logging practices a century ago may still be partly responsible for sand deposits and the sand bedload that exist today in this segment. The Upper River segment in 1994 was inundated with sand substrate that severely limited the aquatic invertebrate community (Taft 1994). At that time, deep sand deposits were found in portions of this segment. The sand had filled any deep holes and widened the stream, such that many areas were 40-50 ft wide with less than one ft depth. Flow velocities were consistent throughout the cross-section, implying almost laminar flow with little turbulence. In other areas, water was being directed into actively eroding banks by downed trees lying across the river channel. The only stable aquatic habitat consisted of submerged logs, which were covered with aquatic insects and periphyton. Banks above the floodplain are steep, and the floodplain is relatively narrow.

History

In an effort to facilitate log floatation and passage, the Detroit, Mackinac and Marquette (DM&M) Railroad Company created the Tahquamenon River Improvement Company in 1882 (Waybrant and Zorn, 2008). The Improvement Company cleared the Upper River segment of all obstructions upstream to the Alger County line in 1883. That early stream modification, however, is no longer evident as natural hydrologic processes in the last century have restored the stream bank and in-stream woody structure back to a more natural configuration. Even so, excessive sand bedload which resulted from past stream modification is the major ecological problem in lower gradient stretches where sand has not moved enough to expose the underlying gravel and rock.

The Upper River segment is classified as top quality trout water, and has a long history of Department of Natural Resources and Environment (DNRE) active management. The most recent management effort has been habitat enhancement. This segment is quite isolated, with only two road crossings. The river mainstem through this segment is managed for a cold water fish community, and specifically for brook trout. A visual survey in 1959 described abundant brook trout and substrate of sand, gravel, and rubble with fair cover. Electrofishing surveys in 1960 also described good brook trout populations, plus some mottled sculpin, blacknose dace and American brook lamprey. A subsequent electrofishing survey in 1968 at County Road 421 found no brook trout, but captured blacknose dace, central mudminnow, Johnny darter, mottled sculpin, and brook stickleback. Supplemental brook trout stocking began in 1983 and continued until 1998.

A late July 1991, 500 ft survey was conducted at County Road 421. Only 16 brook trout were captured, of which two were legal size (7+ in). The trout were also growing about 1 in slower than the state average. Brook trout comprised 72% of the catch biomass, as they shared the river with panfish, shiners and a northern hog sucker. Because of previous concerns about the trout population and stream habitat, the DNR in 1993 asked the Department of Environmental Quality-Surface Water Quality Division to survey this water using their habitat evaluation protocol. Subsequently, Taft (1994) rated the fish community "good," but with reduced density. Only 26 brook trout were captured, with none of legal size, and 24 were 4 in or smaller. The habitat rated "poor," or severely impaired, due to lack of available cover, lack of riffles or runs, and deep sand deposition. In one area, the depth of soft sand was greater than 4 ft in the stream channel. Even so, the stream banks received high scores for stability, vegetative cover, and cover type. Despite the poor substrate rating, some spawning habitat existed further upstream that allowed some natural reproduction. Taft's conclusion, however, was that the trout fishery could be enhanced by the addition of sand traps, in-stream large woody debris exposed above the sand, and other stable cover.

Following Taft's recommendation, a 1998 Fisheries Division electrofishing survey was conducted prior to beginning an extensive stream enhancement effort. That survey documented a total of 408 brook trout from two sites of 1,000 and 500 ft. However, less than 5% were legal size, and their collective weight totaled only 13.5 lbs. Ten other species were captured, including burbot, creek chub, common shiner, largemouth bass, longnose dace, log perch, central mudminnow, pumpkinseed sunfish, mottled sculpin, and brook stickleback. Trout were growing slowly, at 1.2 in slower than the state average. Although the Upper River was still receiving 2,000 yearling brook trout annually, they were not showing up in the survey. Trout were so small that 95% of trout captured in August were smaller than the size of the yearlings stocked in May. In addition, growth analysis showed that 95% were young-of-the-year, rather than yearlings from the stocking project. Sand had filled in almost all deep holes, and the only substrate available for aquatic invertebrate colonization was partially buried large woody

debris. Survey catch results and habitat assessment results showed strong indication that older trout left this portion of the river to find areas with more suitable holding waters and denser forage base. The other alternative scenario, death of 2,000 yearling stocked trout between May and August, would likely have been catastrophic and cause for public outcry from anglers, which never occurred. For that reason, the decision was made to conduct an extensive stream enhancement project. The stocking program was stopped in 1998.

A multi-year habitat enhancement effort took place from 1999-2001 encompassing about 6 mi of this section. The effort was almost entirely directed at in-stream woody structure, with some minor removals and much placement modification (Figures 2, 3). Visual surveys during and following the work showed some surprisingly rapid habitat changes. In some instances, removal of one downed tree resulted in new flows scouring a channel more than two ft depth within one hour. In other instances, banks that had been actively eroding were isolated from the new stream channel by the next morning. Modifying placement of in-stream materials to narrow the existing channel several times exposed gravel substrate within 24 hours. In addition, scoured sand was re-deposited by water currents into backwater areas, effectively narrowing and deepening the channel. Judicious removal or modification of large woody debris allowed scouring of deep holding water underneath that structure and increased habitat diversity in the channel. Above all else, the effort was designed to be as natural-looking as possible.

The Upper River segment was designated in the state-wide Status and Trends program for long-term evaluation. The schedule was for surveys during three consecutive years, then three years off, and then three more years of surveys. The survey program began in 2003, not long after the habitat work was completed. The 2004 survey showed positive changes in the brook trout population relative to both 1998 and 2003. Brook trout collected in 2004 totaled 950 fish, 33.2 lbs, and only 3% were of legal size. The 2005 survey captured 573 fish weighing 26.8 lbs, with 8% of legal size. Growth was slightly faster than the state average. This water had not been stocked since 1998, and the trout fishery was not only self-sustaining, but apparently still improving. The changes occurred despite intense fishing pressure and harvest resulting from the habitat and fish population changes (unpublished angler reports).

A 2005 visual survey of the previous work site showed good habitat retention. A full 90% of the main channel in the 4 mi furthest upstream contained cobble rock and gravel. Abundant woody structure had water-scoured holes underneath, and most sand banks were vegetated near the water level. However, over thirty new problem areas were documented. Some recently fallen trees were again directing current into erodible banks, while others were capturing branches with their lower limbs, forming large log jams. Shoreline observations showed hundreds of still vertical, dead or dying conifers. Most are leaning toward the river. Those observations imply that this stream section will require periodic maintenance.

Additional habitat enhancement was begun in 2008, based on results documented from the 2005 visual survey. The effort included clearing of log jams and protection of eroding raw sand banks from currents deflected by downed timber. Results were positive, as recently deposited sand was again scoured from most of the river main channel throughout a 4 mi distance.

Current Status

In 2009, an electrofishing survey was conducted through the same 1,000 ft site as the previous (2003-2005) surveys. Survey protocol during 2009 was that only brook trout were collected. A total of 503 trout were captured, weighing 20.3 lbs, with 6% of legal (Table 1). Growth rate was 0.2 in slower than the state average (Table 2), somewhat better than observed in 2005.

Analysis and Discussion

The Upper River appeared to be supporting a considerably increased angling harvest since 2002 (unpublished angler reports). Even so, brook trout population dynamic parameters were similar to those measured in 2005, implying that the population had stabilized. Numbers were high, growth rate was good and the length frequencies showed the continued presence of legal fish. Positive angler comments indicated that the brook trout population in recent years was self-sustaining despite the intensive angling pressure and harvest. There appeared to be no need for further stocking.

Management Direction

There is potential for future habitat degradation and resulting decline of the brook trout population. Without ongoing maintenance work in the Upper River, sand will again smother the rock rubble, fill deep holes, widen the river, and destroy much of the macroinvertebrate community. Riparian soils are highly erodible, and there are many dead or dying conifers along the river bank. Periodic habitat work is necessary to retain the excellent in-stream habitat now existing in the Upper River.

Angler access is another source of bank erosion. The State of Michigan-owned access site for the 2009 electrofishing survey features a level parking area with a steep 15-20 ft sand bank to the river's edge (Figure 4) and a vegetated two-step drop 100 ft downstream. There, a narrow, flat floodplain collects loosened sediment before it reaches the river. Despite the more environmentally sound alternative immediately downstream, anglers continue to slide down the sand bank, causing increased erosion into the river. A possible bank protection project will entail a log fence barrier along the top of the sand bank, and a sign pointing to the path at the two-step drop.

There appear to be no other management concerns at this time.

References

- Historical files are kept at the Newberry Operations Service Center, 5100 S. M-123, Newberry, MI 49868
- Taft, W.H. 1994. A biological survey of the upper Tahquamenon River, Luce County, Michigan, July 26, 1994. MDNR-Surface Water Quality Division, Lansing, MI, report# MI/DNR/SWQ-94/095.
- Waybrant, J.R., and T.G. Zorn. 2008. Tahquamenon River Assessment. Michigan Department of Natural Resources, Fisheries Special Report 45, Ann Arbor.

Figure 1. Map of the Upper Tahquamenon River, Luce County, between County Road 421 and County Road 422. River distance between the bridges is about 7.3 miles.

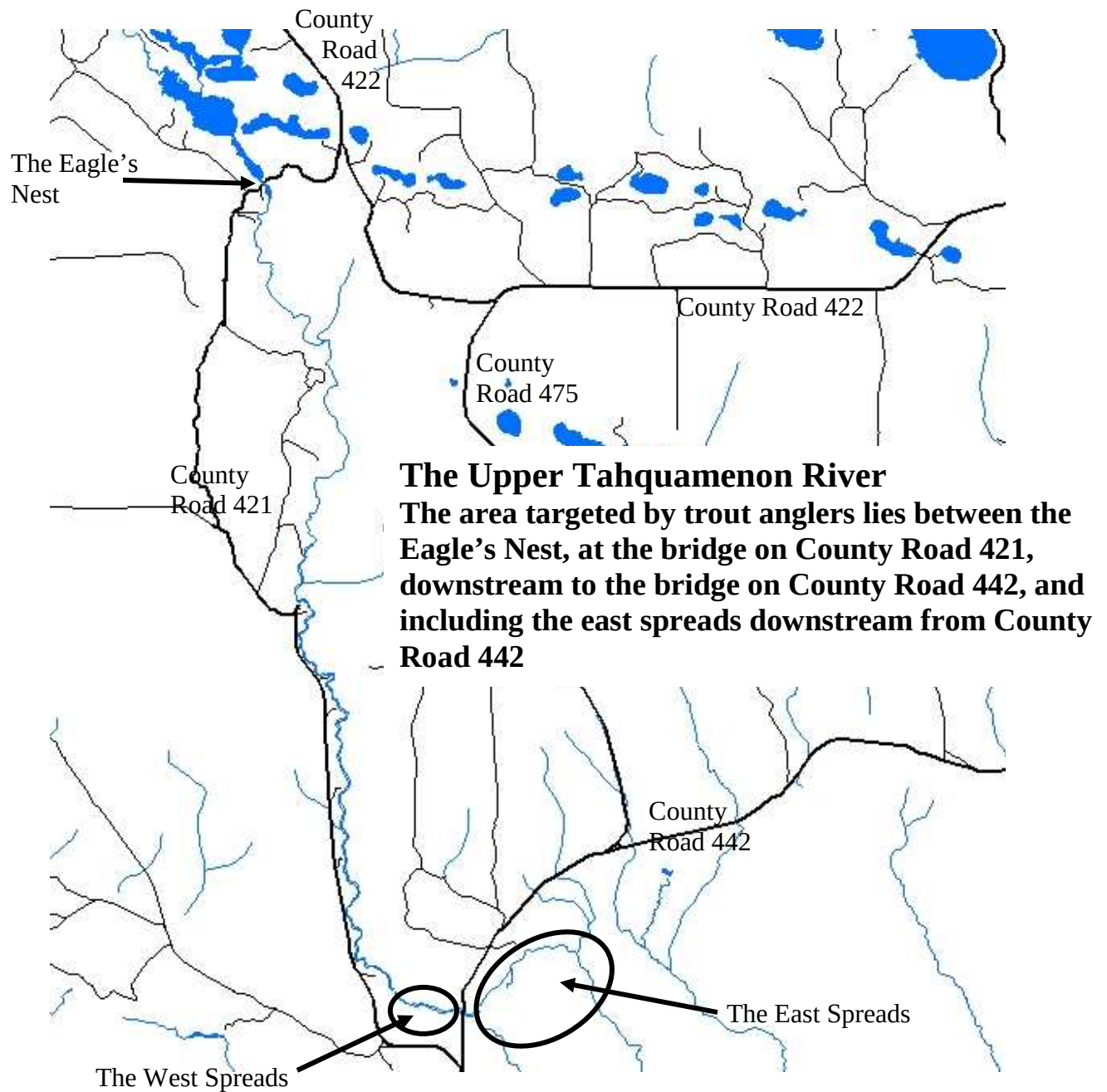


Figure 2. Before and after examples of stream work completed in the Upper River, Tahquamenon River, Luce County, 1999-2001.



Before stream work



After stream work

Figure 3. Before and after examples of stream work completed in the Upper River, Tahquamenon River, Luce County, 1999-2001.



Before stream work



After stream work

Figure 10. The sand bank at the parking site for the State of Michigan owned access site, designated as the standard survey site for status and trends sampling, Upper River, Tahquamenon River, Luce County, T47N, R12W, Section 34.



Table 1. Number, weight, and length indices of fish collected from the Upper River, Tahquamenon River, Luce County by stream electrofishing, August 31, 2009.

Species	Number	Weight (lbs.)	Length range (in.)*	Average length	Percent legal size**
Brook trout	503	20.3	2 – 10	4.3	6

* Note some fish were measured to 0.1 inch, others to inch group: eg., "5"=5.0 to 5.9 inches; "12"=12.0 to 12.9 inches; etc.

** Percent legal size for angling harvest.

Table 2. Weighted mean length and age composition for brook trout sampled from the Upper River, Tahquamenon River, Luce County by stream electrofishing, August 31, 2009.

Species/Age	Number aged	Length range (in.)	State average len. (in.)	Weighted mean len. (in.)	Weighted age freq. (%)	Mean growth index [*]
Brook trout						-0.2
Age 0	20	2.2 – 3.9	2.9	3.3	60	
Age I	30	4.0 – 7.0	5.7	5.4	34	
Age II	17	6.9 – 10.5	8.5	8.5	7	

* Mean growth index is the average deviation from the state average length at age.