SOUTH FORK MILLS RIVER TRAIL RESTORATION

By Richard Burns, Forest Hydrologist

FINAL REPORT – December 19, 2000

A project funded by a grant from the North Carolina Clean Water Management Trust Fund and the Division of Inland Fisheries of the North Carolina Wildlife Resources Commission to the North Carolina Council Trout Unlimited and implemented by the USDA Forest Service, National Forests in North Carolina.

INTRODUCTION

The South Mills River is a tributary to the French Broad River and is located in Transylvania and Henderson Counties of Western North Carolina. (NC index 6-54-3) The watershed area is approximately 26,630 acres, the majority under federal ownership. Federal land is managed by the USDA Forest Service as part of the Pisgah District of the Pisgah National Forest (Figure 1). On the map, the upper watershed is the North Fork Mills and the lower watershed the South Fork Mills. Hendersonville, NC is to the southeast of the watersheds.

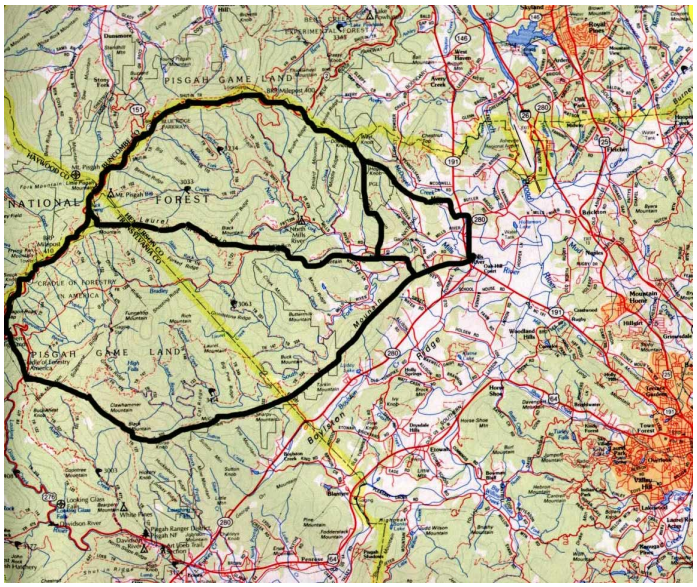

Figure 1. Vicinity map South Fork Mills River

Figure 2. SFMR near Wolf Ford

The South Fork Mills River (SFMR) (Figure 2) and its smaller tributaries are classified State classified WS-II Tr ORW (Watersupply II - Trout - Outstanding Resources Waters) while Bradley Creek and its tributaries are classified WS-I Tr ORW (Watersupply I - Trout - Outstanding Resource Waters). The SFMR streams supply water to three existing municipal water intakes for the City of Hendersonville and a recently completed intake constructed by the Asheville-Buncombe Water Authority. These streams are potential or existing habitat for 33 different aquatic species listed as either Federal or State Threatened or Endangered, sensitive or of concern.

There are approximately 48 miles of designated recreation trails within the SFMR watershed plus a number of unofficial, user-developed trails. Approximately five percent of the designated trails permit hiking only, 25 percent permit both hiking and mountain biking and 70 percent permit hiking, mountain biking and horseback riding.

Many trails are located on old forest roads or old railroad grades. Railroads were constructed for timber harvesting that occurred in the early 1900's prior to federal ownership. Later, truck roads replaced the railroads often on the same grade and alignment. Eventually most roads were closed and many converted to trails. Unfortunately, the railroads and roads commonly were built right beside the river and stream channels.

Recreational trail use is and has been extremely heavy. These trails are used for hiking, mountain biking and horse back riding. They also provide access for hunting and fishing. Most water bars that existed on the old roads were lost through erosion and lack of timely maintenance. Some trails have become chronic sources of sediment for the SFMR, especially those immediately adjacent stream channels. Prior to this project the Forest Service Hydrologist estimated that watershed-wide, as much as 50 percent of the trail surface drained directly to a stream channel, with some trail sections yielding as much as 90 percent of their runoff and sediment to a stream (Figure 3).

Figure 3. Runoff and sediment to the river

PROJECT OBJECTIVES

The project had two specific objectives. First and foremost was to eliminate runoff and chronic sediment yield from approximately 20 miles of trails within the South Fork Mills River watershed. The second objective was to develop and distribute, at least two, information - education pamphlets that describe the potential water quality impacts of trails and suggest what the user public can do to help prevent or correct the problems.

DESCRIPTION OF WORK

Fieldwork was initiated in May 1999 and extended over two seasons, finishing in October 2000. The main focus of the project was the elimination or significant reduction of chronic sediment loading of the SFMR and its tributaries by recreation trails. This was accomplished by the construction of new or the reconstruction of existing water bars (Figure 4). Sediment traps were dug at the end of the water bar outlets if there was not adequate area to infiltrate the runoff (Figure 5).

The entire project was field designed and constructed using equipment rental. An on-site Forest Service representative identified specific sites for the treatments. Water bars and sediment traps were constructed

Figure 4. New water bar

Figure 5. New sediment trap

using either a rubber tired tractor-mounted backhoe (Figure 6) or a mini-excavator (Figure 7). All the treated trails are open to horses trails, which means they are wider than foot trails. Hence the equipment, especially the mini-excavator, was narrow enough to negotiate the trails without creating additional damage. Field design allowed the placement and construction of the water bars and traps to be adjusted to the specific site conditions rather than be locked into fixed design.

Figure 6. Backhoe working trail

Figure 7. Mini-excavator working trail

A typical trail section was on a three to eight percent grade, was somewhat entrenched and had a surface of small rocks and soil. Runoff flowed along the trail for distances of 150 feet or more before being diverted into a small hollow or flowing stream. Trail grades actually ranged from zero or flat to 20 percent or more. Some trail was outsloped while other sections were in old railroad through-cuts or were entrenched six to eight feet. Surface materials ranged from, loose sand on several flat areas to large boulders and bedrock.

Water bars were constructed using material from the trail itself, spoil from an adjacent sediment trap, or borrow from the cut slope. Water bars were spaced closely to minimize the volume of runoff at any one outlet. This resulted in water bars about every 75 to 150 feet depending on the trail grade. Water bars were constructed high enough to withstand the use pressure but low enough so they did not generally impede the user.

After construction, bare or disturbed soil was immediately seeded with annual rye grass. Annual rye grass was chosen because it provides quick cover and is not persistent. It does not create long-term competition for native species while actually creating more favorable sites for the establishment of natives. Volunteers from Trout Unlimited over-seeded many of the water bars in October 1999 since the original seeding was not as successful as desired.

Trail hardening with clean one-inch stone was only applied to trail sections very close to the Turkey Pen trailhead. This included just the section from the gate to the river and the section immediately across the river going upstream. This section of trail has the heaviest use since it is one of the principal accesses to the trail network. Generally only water bars were hardened. Even though hardening was needed on many other sections of the trail, there was no efficient or economical way to get the stone to the sites.

PROJECT ACCOMPLISHMENTS

Trails treated: The trails treated included: 10 miles of the South Mills River trail, two miles of the Bradley Creek trail, 1.5 miles of the Mullinax trail, one mile Cantrell Creek trail and a very short section of the Buckhorn Gap trail. The available miles of trail originally proposed for treatment was over-estimated. During the project it was found that the middle section of the South Mills River trail could not be accessed without causing excessive physical damage with the equipment. Also the Buckhorn Gap trail became too narrow for the tractors. Forest Service or volunteer hand crews will treat these later. All water bars from the gate at Turkey Pen to the river were hardened, as was the entire last 2000 feet of steep trail before the river. Also all water bars in the steep section immediately beyond the river crossing were also hardened. This latter section of trail had been a significant source of sediment to the SFMR mainstem.

River crossing: Horseback riders heavily use the first main river crossing of the Bradley Creek trail. The approaches were always muddy and funneled trail runoff directly into the river (Figure 8). The approaches were hardened with oversized (3-inch diameter) clean stone so the horses would no longer erode the riverbanks or churn the bottom (Figure 9). Trail runoff entering the crossing was nearly eliminated by bracketing the approaches with new water bars and sediment traps. After more than a year of use, the crossing appears very stable and non-polluting. Three other main river crossings were stable, non-eroding and only required eliminating the trail runoff entering the river.

Figure 8. Muddy river crossing, Bradley Ck Trail

Figure 9. Stabilized river crossing

Wolf Ford Trailhead parking lot: The trailhead parking lot at the end of the Wolf Ford Road (old gaging station) was a major source of runoff and sediment to the river just as it entered its gorge. Several

hundred feet of gravel road, road ditch and about 0.75 acres of gravel parking area drained directly to the river at two different places. The parking area was reshaped so runoff was directed into sediment traps. An existing culvert was also directed into a sediment trap and an additional culvert installed to further disperse ditch flow. Visitor paths accessing the camping area and the horse access to the river were hardened with clean gravel. This work eliminated nearly all the runoff and sediment that had reached the river from the road and parking lot.

Boy Scout Eagle project: A local Boy Scout volunteered, for his Eagle Scout service project, to improve a trail crossing over a small direct tributary of SFMR. This crossing, at the end of a badly eroding trail section, was constantly muddy and contributing sediment to the river. The Scout, with his Troop, hardened the crossing approach to support horse use and built a small log bridge for foot traffic. Runoff into the crossing was eliminated with machine built water bars.

Trail user video: A short video entitled "Better Trails Through Trail Runoff Control" was produced to increase user awareness of trail runoff problems. The video describes the current problem and demonstrates that diverting trail runoff with water bars will protect both the trail and the nearby streams. A new idea of "Adopt a Waterbar" is presented; encouraging each user to take a few minutes on each trip to make sure that "their" waterbar on their favorite trail is properly functioning. If it is not working, the user is encouraged to do whatever is needed, such as cleaning the outlet or trough, to restore "their" water bar.

The video will be distributed to Trout Unlimited chapters, cooperating agencies and various user groups. Since it is short, about 12 minutes, it is hoped that it will receive widespread viewing and will be suitable for continuous showing at public events such as fairs and outdoor shows.

Presentations: Presentations have been made to several groups and agencies to raise the awareness of the existing trail runoff problems. This included governmental agencies and user groups. Several "show me" trips in the project area have also been made. Presentations and other discussions about the project, its implementation and results have led to a number of similar projects within the Forest Service on other Districts. Several private organizations have expressed interest in implementing similar projects in other watersheds.

Awareness pamphlets: A basic user awareness pamphlet has been drafted, but not finalized. Three versions will be produced: one each for hikers, bikers and horse users. Each version will feature the targeted users in photographs or diagrams, but will contain similar information. An additional pamphlet will be written focusing on the runoff control problems and why it a problem for trails and streams. These should be finalized by April, 2001.

Trail user comments: Throughout the implementation, the project was discussed with trail users who passed the equipment. Nearly all the comments were very supportive of the work and its objectives. The mountain bicyclists especially like the new water bars. Other users expressed appreciation that the mud holes had been eliminated.

MONITORING

Suspended sediment sampling: Ten single-stage suspended sediment samplers were installed in the project area with the cooperation of the Tennessee Valley Authority (Figure 10). These samplers collect a sample of stream water whenever the flow rises to the top of the sampler tube. Samplers were all set to collect a sample at about the same stream height, which is approximately ¾ of bankfull. This common height setting was to make the samples more comparable to each other since they would be collected at

about the same point on the rising storm flow hydrograph. TVA analyzed the samples for the Forest Service.

Due to the lack of large rain events during the project, only three sets of samples were collected in 1999 and only four sets in 2000. Since the initial samples may have been collected at different points within the storm event, direct comparisons between samples may not be valid. The small total number of samples makes it difficult to detect changes at any of the stations. For this reason, the Forest Service intends to continue collecting samples for several years to determine trends in sediment loading in the project area.

Figure 10. Suspended sediment sampler

Biological monitoring: One set of benthic samples was collected as the project was being started. A second set of samples has been collected, but the results are not yet available from the lab. Since the river is already ORW, it is not anticipated that biological monitoring will detect any change in benthic conditions as a result of the trail runoff control.

Visual observations: Since monitoring changes in suspended sediment loading is difficult, visual observations of runoff and sediment deposits are invaluable. Sediment and leaf deposits were observed in many traps following rainstorms. This showed that material and runoff that previously reached the river was now being stopped. Long sections of trail, which pre-project were free of leaves due to flow on the trail, remained leaf-covered throughout the wet seasons (Figure 11). This indicates there was no longer sufficient runoff on the trail to wash off the leaves. Based on these observations it is the opinion of the Forest Hydrologist that as much as 90 percent of the runoff that previously reached the river from the treated trails has been stopped.

Figure 11. Treated trail with runoff controlled

CONCLUSIONS

Trail runoff control does work. Sediment that previously ran to the river is now deposited in traps or in filter areas. Runoff is being diverted from the trail. Leaves now cover the trail in the fall. Theoretically, the river now has extra sediment transport capacity to move out old sediment deposits from it channel. This will gradually improve both the water quality and the in-stream aquatic conditions.

Trail runoff control can be implemented with small machines, especially mini-excavators. This equipment only needs four to five feet of clearance, which is common on horse trails. Cost of runoff control is low, averaging $2,000 to $3,000 per mile for the equipment only. Once trails have been treated, future maintenance can be done easily with hand labor.

ACKNOWLEDGEMENTS

The USDA Forest Service, National Forests in North Carolina, gratefully acknowledge the support of this project by the North Carolina Council Trout Unlimited. Without their help, the grant for funding this project by the North Carolina Clean Water Management Trust Fund and the Division of Inland Fisheries, North Carolina Wildlife Resources Commission, would not have been possible. The Forest Service Hydrologist also acknowledges the support and encouragement of the NC-CWMTF and the WRC Inland Fisheries to pursue this project and grant. In particular the help of David Stewart NC-TU, Fred Harris WRC, and Tom Massey CWMTF, was greatly appreciated. Thanks also are due the volunteers from the Land of Sky Chapter Trout Unlimited for their help.

VIDEO AVAILABILITY

Copies of the video are available for $6.50 each from:

Trout Unlimited, LOS Chapter
c/o Richard G. Burns
P. O. Box 492
Fairview, NC 28730

Please make checks payable to Trout Unlimited, LOS Chapter

For more information contact Richard Burns at 828-257-4214 or Email at rgburns@fs.fed.us.