

Use of Stock to Maintain and Construct Trails in the Eastern United States

Eric Sandeno

Abstract—Trail construction and reconstruction utilizing stock is rare in the eastern United States. The Hoosier National Forest is the only forest in the Eastern Region of the Forest Service with its own pack string. The Hoosier is also the only forest in the eastern United States to utilize pack strings from western forests to complete trail work within wilderness. For the past 4 years, the Hoosier National Forest has taken great strides to improve trail and resource conditions in the Charles C. Deam Wilderness and to provide opportunities for solitude and an overall quality recreation experience for forest visitors. To improve conditions, the forest has partnered with the Bridger-Teton National Forest in the Inter-mountain Region of the Forest Service to provide two packers and a mule string of eight animals for the month of May each of the past 4 years. During this time, 13 miles (21 km) of trail have been constructed and over 600 tons of gravel have been moved using only a mule string and hand tools.

The Charles C. Deam Wilderness is located in the Hoosier National Forest, in Indiana, about 15 miles (24 km) south-east of Bloomington. The 12,953-acre (5,242-ha) area was designated wilderness by Congress in 1982 and includes features such as continuous forest canopy, steep ridges, five caves, five cemeteries, and 12.5 miles (20 km) of shoreline on Monroe Lake. The area at one time supported 78 homesites connected by 57 miles (92 km) of road. Negative effects due to past uses, a proliferation of user made trails, and erosion prompted the Forest Service to address the most appropriate way to protect the wilderness resource.

In June 2001, the Hoosier National Forest released the Charles C. Deam Wilderness Trail Project Environmental Assessment (EA) and five Decision Notices and Findings of No Significant Impact. This EA analyzed four separate trail relocation projects totaling 3.2 miles (5 km) of trail construction in the wilderness. In 2005, a Categorical Exclusion was completed and a Decision Memo signed for another 1.3 mile (2 km) trail construction project in the wilderness.

The purpose of these projects is to provide quality recreational opportunities and manage for safe public access to the Charles C. Deam Wilderness while providing for the protection of natural resources. The proposals are consistent

with direction found in the *Hoosier National Forest Land and Resource Management Plan 1991 (Forest Plan)* for Management Area 5.1 (Wilderness) (USDA 1991a). The proposed actions were designed to respond to goals provided in the *Forest Plan* for managing the Forest for people. Forest goals include providing ways for people to enjoy and view the Forest and its many ecosystems in harmony with the natural communities existing there.

The projects selected focused on locations along existing trails in the wilderness that were wet or muddy for much of the year, were eroding, were located in old entrenched roadbeds, and/or were seasonally flooded by backwater from Monroe Lake. These situations caused trail users to go around the muddy spots or create new crossings to bypass the high water and continue along the trail. The result has been widening and braiding of trails, creation of user trails off the main trail system, and accelerated erosion of certain trail sections.

All projects involved relocating trail segments utilizing trail construction methods that meet the intent of the 1964 Wilderness Act and Forest Service direction regarding trail construction in wilderness. In agreement with the Wilderness Act of 1964, wilderness use and administration is typically completed using primitive methods. Any device for moving people or material in or over land and water that uses machines that require a motor, engine, or air, having moving parts, that provides a mechanical advantage to the user is not allowed. Work completed by Forest Service employees must be completed using only primitive tools. Employees must acquire and maintain necessary skills for primitive travel by foot, horse, canoe, or other non-mechanical means. Only unique primitive skills were utilized during trail construction.

The Hoosier National Forest is not properly equipped with all the required tools to complete several miles of trail construction. Specifically, the soil types in Indiana require additional hardening/surfacing to protect the trail tread from eroding. Transporting enough gravel to surface trails within a wilderness setting, using minimum tools, requires a mule string to move materials. The Hoosier National Forest made an arrangement with a trail crew from the Salmon-Challis National Forest in Idaho to assist with the first of the trail construction projects. Due to record rains and flooding in the spring of 2002, the Salmon-Challis crew was sent home early and the project was delayed to allow soils in the project area to dry.

By the time the project area had dried out enough to continue trail construction, the Salmon-Challis National Forest crew was no longer available. The Hoosier National Forest made arrangements with the Bridger-Teton National Forest in Wyoming to provide a packer and a mule string of eight animals to come to Indiana in early summer 2002. The

Eric Sandeno, Outdoor Recreation Planner, Hoosier National Forest, IN, U.S.A.

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Hoosier National Forest also hired a five-person seasonal trail crew to assist with construction efforts. This partnering with the Bridger-Teton National Forest in 2002 has now led to 4 years of collaborative efforts between the two national forests and a successful completion of all projects utilizing minimal tools. During the past 4 years, 13 miles (21 km) of trail have been constructed (inside and outside wilderness) and over 600 tons of gravel have been moved using only a mule string and hand tools.

Trail construction and reconstruction utilizing stock is rare in the eastern United States. The Hoosier National Forest is the only forest in Region 9 with its own pack string. The Hoosier is also the only forest in the eastern United States to utilize pack strings from western forests to complete trail work within wilderness. For the past 4 years, the Hoosier National Forest has taken great strides to improve trail and resource conditions in the Charles C. Deam Wilderness and to provide opportunities for solitude and an overall quality recreation experience for forest visitors. A large part of the trail construction process in Indiana is hardening the trails with gravel. The use of the mule string is critical to placing gravel along the newly constructed trail.

According to a study recently conducted on the Hoosier National Forest by Aust and others (2005), hardening trails with gravel is a useful tool in preventing erosion. A number of tread hardening techniques may be employed during original trail construction or during subsequent reconstruction and maintenance. Wet soils can be capped with crushed stone, or excavated and replaced with crushed stone or other suitable fill material (Meyer 2002). Large stones are often used to form a stable base in wet soils, often capped with crushed stone and “crusher fines” or “whin dust” (screened material less than ¼ inch [6 m]) to provide a smoother tread surface that can be periodically hand or machine graded (Scottish Natural Heritage 2000). In Scotland, aggregate placed on top of geosynthetics has been used to effectively “float” trails over deep peat substrates (Bayfield and Aitken 1992; The Footpath Trust 1999). Even soils that are not seasonally wet may require capping with crushed stone to create a tread surface capable of sustaining heavy horse or motorized traffic. Trail surfacing provides two basic functions: it can enhance the trafficability and/or it can reduce erosion. Surfacing such as gravel is commonly used to enhance the trafficability of wet areas. Unfortunately, applications of gravel to trafficked wet areas can be lost as the gravel is churned to lower horizons. Use of larger stone or geotextile underneath the stone can deter this problem and greatly enhance the longevity of the trail. As previously mentioned, gravel can be used to protect bare soil from the erosive forces of water. In general, larger sizes of stone withstand traffic better, but smaller stones provide a smoother walking or traveling surface.

Trail construction for these projects was unique and innovative to meet the requirements for trail construction in a congressionally designated wilderness. Since only primitive tools could be used, all aspects of this project required innovative thinking to properly protect soil, water, and wilderness resources.

The following procedures were used during work on trail construction projects in the Charles C. Deam Wilderness:

- **Layout and design**—The forest engineer, wilderness ranger, and wilderness manager designed and laid out the trail construction locations by walking and

re-walking the proposed routes several times. During layout and design, trail grade was not allowed to exceed 10 percent. Each new section of trail was walked, flagged, and trail grade checked.

- **Clearing**—Minor clearing of some vegetation along the selected routes was completed using crosscut saws, bow saws, and clippers. In some cases, the original route was slightly altered to minimize vegetation that needed to be removed. Only vegetation within 3 feet (1 m) of the centerline of the trail was trimmed or removed. No overstory trees were removed during this process.
- **Plow**—A Vulcan Hillside Plow was used to cut a “scratch line” along the new trail segments. The plow was harnessed to a Forest Service mule and a minimum of two drivers was required during the two-week plowing operation. Utilizing a plow in a wooded setting is very difficult work for the mule and drivers. The original plow broke during construction, so a new plow and several plow points were purchased from an Amish family in southern Indiana.
- **Grade**—After plowing the trail, a grader was harnessed to the Forest Service mule to establish a trail tread. During the grading process, the trail was outsloped, to reduce the chance for water to run directly down the new trail adding sedimentation into the watershed. As with the plowing process, grading is difficult, hard work.
- **Turnpikes/switchbacks**—Special structures, such as turnpikes or switchbacks were constructed to minimize the potential for erosion. Large rocks were carried by hand to the switchback locations. Approximately 250 large, flat rocks were used for each of the switchbacks. Geotextile was also applied in some areas to further reduce the risk of sedimentation. Materials such as logs and rolls of geotextile were packed to the site using the mule string.
- **Surfacing**—Due to soil types found in Indiana, a gravel surfacing was added to protect the soil and minimize the chances for soil erosion, boggy areas, or sedimentation. According to FSH 2309.18, some type of surfacing is often required for very high use trails or when soil, moisture, and volume of traffic make it impossible to hold the trail tread (USDA 1991b). When available, river gravel from nearby dry streambeds was shoveled into 5 gallon (19 liter) buckets and hand loaded into gravel panniers and hauled to the trail using horses and mules. When a native supply was not available, gravel was hauled by mule string to the site from the nearest trailhead. However, one project was located along Lake Monroe, 5 miles (8 km) from the nearest trailhead. Gravel was hauled in five gallon buckets by boat and then loaded on the mule string where it was finally taken to the trail. To load the gravel on the boat, the forest designed a conveyor system that was 60 feet (18 m) long. Gravel was loaded into buckets, sent down the conveyor, and loaded on the boat.
- **Final beautification**—Gravel was compacted into place using the flat surface of McLeod’s. Check dams were built where needed and other minor adjustments to the trail, including any rehabilitation of the worksite, were finished.

Use of primitive tools, including mule strings is very rare in Indiana. Since the Charles C. Deam Wilderness is the only

congressionally designated wilderness in the state, forest visitors are not used to seeing primitive tools in use. While preparing the mule string every morning at the trailhead or completing work on the trail, interested observers would stop by and ask questions about the project, the use of minimum tools, wilderness management in general, and the unique methods that were used to construct the trail.

Due to the cooperation of three national forests, and the countless hours (including weekends) of hard work, all construction projects in the Charles C. Deam Wilderness have been completed using only primitive tools.

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