Great Smoky Mountains National Park

Trail Maintenance Standards for Concessioner Horseback Riding Trails

June 2013

"Concession trail use will be concentrated in areas where trails are best able to withstand the exceptionally high level of impacts. The National Park Service will construct basic trails of a uniformly high quality, and subsequent maintenance of trails used predominantly by Concessioners will be the responsibility of the Concessioners, under National Park Service guidance and control."

General Management Plan, 1982, Page 31

Introduction

This attachment to the Maintenance Plan provides standards for the maintenance of trails that are maintained by the Concessioner in accordance with the requirements of the Maintenance Plan to the Concession Contract. The trails assigned for maintenance by the Concessioner are the trails used for trips lasting up to two and a half hours (stables other than Cades Cove) or up to one hour (Cades Cove). At stables other than Cades Cove, over 99 percent of all Concessioner trail use occurs on these most popular trips lasting up to two and a half hours, and approximately 90 percent of Concessioner trail use occurs on the trail(s) used for the one-hour ride. The estimated use by the general public of the Concessioner-maintained trails in the Area is less than one percent. The estimated use by the Concessioner's patrons of the Concessioner-maintained trails in the Area is 99 percent.

The trails assigned to the Concessioner for trips lasting longer than two and a half hours (stables other than Cades Cove) are maintained by Area trail crews in accordance with the standards that apply to other Area horse trails. Because Concessioner use of these trails represents less than one percent of all Concessioner trail use, these trails do not require any special measures to ensure adequate maintenance. This requirement does not apply to Cades Cove Riding Stables because this stable does not provide a trip lasting longer than one hour.

As stated in the General Management Plan, Concession trails within the Area receive exceptionally high levels of impacts. The busiest stable in the Area provides horseback rides for approximately 20,000 visitors annually and the least busy stable provides rides for approximately 9,000 visitors annually. The General Management Plan recognized that these trails must be constructed to a uniformly high quality and that mechanized equipment would be required to properly maintain trails. This is the reason that the trails maintained by Concessioners are located in the Natural Environment Type II sub zone where mechanized equipment may be used. With the proper and judicious use of mechanized equipment, as well as hand tools, for regular maintenance, these trails can withstand this heavy use very well with no significant impacts to Area resources.

The following standards are based on the trail standards written in 1967 and again in 1979 at Great Smoky Mountains National Park, as well as excerpts from a U.S. Forest Service trail maintenance handbook. They cover the basics of trail maintenance as taught here in the Area. However, keep in mind that this is just a very basic guide to trail maintenance standards. These standards have been modified, as required, to be applicable to trail maintenance by Concessioners.

Consequences of Improper Maintenance Practices

While proper trail maintenance practices have very satisfactory results, improper maintenance practices negatively impact visitor and employee safety, visitor enjoyment, horse safety and welfare, and Area resources. To understand proper trail maintenance practices, it is helpful to also understand the consequences of improper trail maintenance. For this reason, the following examples of poor trail maintenance practices should be avoided:

- Inadequate hardening of trail bed with crushed rock.
- Use of inappropriate material to fill and harden trail.
- Unauthorized widening or rerouting of trails with mechanized equipment causing resource damage.
- Insufficient number and improperly installed and maintained water bars and drains resulting in ineffective drainage, erosion, standing water, and a muddy trail surface.
- Excessive and ineffective grading of trails with mechanized equipment resulting in loss of soil, unstable trail bed, and the creation of a ridge of soil on the downhill slope side of the trail.

Trail Inspection

Service staff will inspect the trails assigned for use by the Concessioner as part of the annual maintenance inspection of Concessioner facilities and at other times as deemed appropriate by the Service. The results of this inspection will be documented and provided to the Concessioner. The Concessioner will include a plan for addressing Deficiencies in the condition of trails maintained by the Concessioner in the Concessioner Maintenance Plan and Report (CMPR). Service staff will assist the Concessioner in developing a plan and timetable for addressing Deficiencies and provide technical advice. The Area Trails Supervisor will be responsible for scheduling work to correct Deficiencies on trails assigned for Concessioner use but maintained by the Service. Completion of Service inspections and the maintenance of trails maintained by the Service are subject to the availability of funding and staff.

Annual Plan for Mechanized Equipment Use

The Concessioner is required to provide the Concessions Management Specialist with an Annual Plan for Mechanized Equipment Use that is part of the Concessioner Maintenance Plan and Report (CMPR) required by the Concession Contract. This plan will describe the type of equipment, the equipment operators and qualifications, and the scope of work the Concessioner proposes for use during the following calendar year. This plan must be approved by the Superintendent prior to using mechanized equipment for trail maintenance. A form to be used as the basis for this plan is included in these standards.

Trail Tread Hardening

As a result of the heavy and continuous horse traffic on Concession trails used for the one to two- and one-half-hour rides offered by the Concessioner, the application of crushed rock is required to harden the trail tread. The Concessioner will be responsible for applying crushed rock to the trails shown in Attachment 1 of this Maintenance Plan to help prevent erosion and reduce the formation of boggy areas, gullies, and stair steps. Trail hardening with crushed rock is not a substitute for the construction and maintenance of drainage structures and maintenance of the proper trail tread shape but it is an important supplement to these maintenance activities. The Concessioner will specify in the CMPR the types and sources of crushed stone to be used for approval by the Superintendent and will report in the CMPR the actual quantity delivered and applied.

The sections of trail used for rides longer than two and one-half hours that are maintained by the Service do not generally require hardening with crushed rock or require much less hardening.

Equipment Usage

Horse trails maintained by the Concessioner will be of enough width (but no wider than six feet) to allow narrow width equipment to be used to help with trail maintenance. Although appropriate equipment can be used to accomplish a large part of the required trail maintenance, the Concessioner will also use hand tools in situations where mechanized equipment is not available or effective or where this equipment would cause unnecessary resource impacts. The Concessioner must obtain approval from the Superintendent for the specific types of mechanized equipment to be used.
The following types of mechanized equipment are recommended for use on the trails maintained by the Concessioner. Overall width, including blade, should not exceed 60 inches.

- Small to mid-size tracked skid-steer
- Small to mid-size tracked excavator

- Small size dozer (like Sutter 500 trail dozer)

Crushed rock can be delivered to the area of the trail where it is needed using a tracked vehicle with dump bed or trailer with dump bed (like Bosski 1600 UT ATV Wagon). Crushed rock should be applied judiciously to avoid a road-like appearance and to avoid unnecessary cost. It is not usually necessary to apply crushed rock over the entire width of the trail tread. The Concessioner will obtain approval from the Service for any locations where crushed rock will be stockpiled for later use.

Logging/Windfall/Hazard Tree Removal

Logging refers to the initial work necessary to open trails for the season. Trees that have fallen across trails need to be removed to make trails passable to hikers and horse riders alike. Failure to do so often results in users bypassing such obstacles, causing further damage to trailside soil and vegetation. When trees fall across a trail, a section will be removed that will ensure that the remainder of the log does not encroach closer than 3 feet to the center of the trail. If possible, the cut log should be rolled off the trail in its entirety. If the log is too large to move in this manner, it should be cut into smaller sections and again rolled off the path and hidden from view. Every attempt should be made to hide or otherwise camouflage saw cuts along the trails. Hazard trees may need to be removed along trail sides. Hazard trees are those that are in immediate danger of falling across a trail. The Concessioner must obtain approval from the Service prior to removing hazard trees. When cut, the stump will be cut flush with ground level and covered with soil or other small debris. The tree will be fully moved out of the trail and if possible, used for trail construction needs.

Brushing/Pruning/Mowing

Mowing generally refers to the cutting of grasses along the trailside, while brushing/pruning deals with cutting limbs, woody vegetation, and clearance along the trail. The Concessioner must complete brushing and mowing on each trail at least once a year and as needed.

For horse trails, the following clearing standards apply:

Tread width: 4 ft. minimum, 6 ft. maximum*
Clearing width: 4 ft., each side of center
Clearing height: 10 ft.

*In clearing for horse trails, tread width of 6 feet is generally confined to old roadbeds where this width already exists. Minimal clearing width should be necessary when the trail tread is already 6 feet wide. Any portion of existing trail exceeding six feet tread width should remain undisturbed during maintenance activities and be allowed to recover naturally with vegetation. The Concessioner should place large rocks or logs at the edge of the maintained trail tread to deter horses from leaving the maintained tread area.

The sections of concession trails maintained by the Service, rather than the Concessioner, will generally be maintained to a four feet width.

Clearing width refers to a corridor free from overhanging obstacles—either from the side or overhead. It does not mean clearing all vegetation in that corridor such as grasses and other low-lying plants and flowers. Briars, woody vegetation and tree limbs will need to be removed to provide clear and safe access for trail users. All vegetation extending into the clearance zone from live trees or shrubs shall be removed in a manner that leaves a flat or dull cut and does not unnecessarily damage the tree or shrub. Limbs should be flush cut at the trunk just outside of the branch collar.

Individual briars or other thorny plants that hang into the area to be cleared will be cut at their base. Generally, any low-lying vegetation can be left in place. But as the saying goes, "when in doubt, cut it out". Material and limbs that have been cut will be scattered out of sight wherever possible, not left along trailside. Debris can also be used to block shortcuts around trail switchback areas.

Drainage Structure Cleaning and Installation

Drainage is the most critical element of trail maintenance and repair. Improper drainage causes problems creating erosion, bogs, trail cutting, and the general deterioration of trail tread. When drainage can be accomplished by out sloping a trail, this is the preferred method. However, many instances call for the installation of swale drains, grade reversals and/or water bars. Cleaning water bars, swales, and drain dips that are already properly installed, will take place at least two times during the concession operating season and at the end of the operating season. Drainage structures will also be checked and cleaned as needed after unusually heavy rainfall events. A "clean" structure should have a swale or dip with a cross section reflecting a low point that is vertically lower than the trail tread on the downhill side of the drainage structure and appropriately sculpted on the uphill side of the drainage structure to meet finished grade of the trail tread. The drainage structure should be achieving positive drainage and the tail ditch shall be clear of sediment and debris. For drainage structures that do not meet the above definition of clean, the Concessioner will clean the water bar, swales, or drain dips to restore the desired cross section and open the tail ditch.

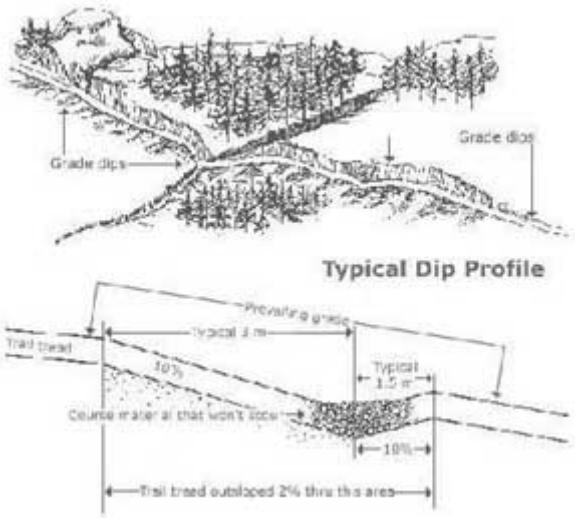
When hard water bars deteriorate or become dislodged, they should be replaced with swales and drain dips. When an additional drainage structure is needed at a new location, a swale or drain dip should be installed instead of a hard water bar.

Grade Dips

The best grade dips are designed and built during the original construction. These are also called terrain dips, Coweeta dips, and swales. Other versions, often called rolling grade dips, or drain dips, can be built on most sidehill trails or constructed to replace waterbars. The basic idea is to use a reversal in grade to force water off the trail without the need for any other structure.

Grade Dip (Swale)

Terrain dips use grade reversal to take advantage of natural dips in the trail. These need to be planned into the trail when it is first laid out. The grade of the trail is reversed for about 3 to 5 m (10 to 15 ft), then "rolled" back over to resume the descent. A trail that lies lightly on the land will take advantage of each local drainage to remove water from the tread as the trail winds around trees and rocks. The terrain dip, which uses existing terrain as the control point for the grade reversal, is a natural part of the landscape.



Grade dips are much more effective than waterbars and require less maintenance. Along with outsloping, they are the drainage structure of choice.

The beauty of terrain dips is that water collected from the hillside is not intercepted and carried by the tread. These grade dips are the most unobtrusive of all drainage structures if constructed with smooth grade transitions, and they require very little maintenance. Be sure to protect the drain outlet by placing guide structures along the lower edge of the tread above or below the outlet.

Another kind of grade dip is the **rolling grade dip**, which consists of a short reversal of grade in the tread. These can be designed into most sidehill trails. If a trail is descending at 7-percent grade, a short climb of, say, 3 to 5 m (10 to 20 ft) at 3 percent, followed by a return to the descent, constitutes a rolling grade dip. Water running down the trail cannot climb over the short rise and will run off the outsloped tread at the bottom of the dip. The beauty of this structure is that there is nothing to rot or be dislodged. Maintenance is simple.

Rolling grade dip designed into the construction of the trail.

If the grade is steep, the tread carries a lot of water, traffic is high, or the soils are erosive, a drain dip may need some additional strengthening. Sometimes a shallow water channel can be constructed in the last several meters of tread leading into the dip. Water follows the channel off the tread without slowing down and depositing soil and debris. A spillway may be needed if there is a potential for headcut erosion in the fillslope. The secret is to keep the water moving at a constant velocity until it is all the way off the tread.

Grade dips should be placed frequently enough to prevent water from building enough volume and velocity to carry off your tread surface. Grade dips are pointless at the very top of grades unless they intercept significant amounts of slope drainage. Usually mid-slope is the best location. Grade dips also should not introduce sediment-laden water into live streams.

Yet another grade dip is the reinforced or armored grade dip. In this dip, a curved water channel is constructed and an angled (like a waterbar) reinforcing bar of rock or wood is placed at the top of the grade reversal. The bar is placed in an excavated trench, with its top edge flush with the existing tread surface so it's not an obstacle to traffic. Essentially, this is a buried waterbar.

This short-reinforced grade dip can be built to replace waterbars on existing trails, especially trails used by wheeled vehicles. Well-located waterbars can be converted by constructing a curved water channel and recontouring the outslope from the top of the bar. For longevity it is best if the bar is reseated so that the top edge is flush with the existing tread surface and the channel is constructed with the correctly angled bar as the reference point.

The outlet is critical. It should be at least 500 mm (1.5 ft) wide, and outsloped. In shallow dips the task is to prevent berms, soil buildup, and puddling. Reinforced spillways may also be needed.

To be effective, drainage structures must keep the speed, volume, and distance traveled by water down the trail to a minimum. When possible, divert the water as soon as possible off the trail, minimizing the need for additional bars down the trail. The terrain often limits exact placement of a bar. A trench is dug across the trail at a minimum 45-degree angle. Those at 45 degrees or more tend to be self-cleaning if the water flow is sufficient.

No matter what the grade, where the ground slope below the trail will allow, the tread should be out sloped 5-8% to assist in drainage.

Trail Tread Maintenance

As noted above, tread should be worked to out slope at about a 5-8% grade. On trails traversing hillsides, slough is the name given to soil, rock, and silt that have accumulated on the inside of the tread,

narrowing the walkway. Berm is the debris that has built up on the outside of the tread, forming a barrier that prevents water from moving off the trail. Both slough and berm can become overgrown with vegetation. This causes horses and hikers to gradually move down slope of the original path causing additional, and in some cases, severe impact to surrounding resources. The removal of slough and berm is among the most important tasks facing maintenance crews. One must remember when removing slough and berm, you must reshape the tread to restore a slight out slope that will allow water to drain immediately away from the trail rather than running down it.

In flat areas of the trail with poor drainage, bogs and puddles will occur. To resolve these issues the Concessioner has a few options:

1. Drain the area: Ditching toward a slight slope of the landscape may be enough to move the water flow away from the area.

2. Build a turnpike: Turnpikes lift the tread above saturated soil. Turnpikes are both labor and material intensive but tend to work very well depending on location. The Concessioner must obtain Service approval for the location and method of installation prior to constructing a turnpike. In most cases, the Service, rather than the Concessioner, would construct turnpikes.

3. Move the trail: Concessioners will not re-route a trail without explicit, advance approval from the Service. In most cases, the Service, rather than the Concessioner, would complete any re-routing of a trail. There may be times when re-routing a trail makes more sense than fighting through wet ground. However, the Service will determine if a trail re-route is required and will prioritize this work according to the availability of funding and staff to complete this work. In addition, a review of environmental and cultural resource impacts will have to be completed prior to rerouting a trail.

Attachment 2
Great Smoky Mountains National Park
ANNUAL PLAN FOR MECHANIZED EQUIPMENT USE
Concession Horseback Riding Stables Trails

Plan for Calendar Year: _____

Date Plan Submitted: _____

Concessioner: _____

Stable: _____

Equipment Proposed for Use:

Type of Equipment (e.g., Tractor, Chainsaw)	Make and Model	Size (e.g., Engine size, blade width)	Ownership of Equipment	Name of Operator(s)	Where Equipment Will Be Used (e.g., One-Hour Trail)*

Operators:

Name of Operator	Driver's License Number	Driver's License State	Years of Experience	Description of Experience/Training in Operating This Type of Equipment

NOTE: Concessioner is responsible for submitting updates to this list if other operators will be used.

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Proposed Schedule for Use of Equipment and Intended Use:

Type of Equipment (e.g., Tractor, Chainsaw)	Specific Dates – Pre-season	Specific Dates – During Season	Specific Dates – Post-Season	Approximate Frequency – Routine Trail Maintenance	Intended Use

* For each type of equipment listed, also mark on a copy of a trail map the locations where you propose to use equipment.

Proposed Crushed Rock Usage:

Type of crushed rock	Purpose	Source (name and location of quarry)	Approximate quantity to be used during the year	Where Crushed Rock Will Be Applied (e.g., One-Hour Trail)*

* For each type of crushed rock listed, also mark on a copy of a trail map the locations where you propose to apply crushed rock.

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Concession Horseback Riding Stables Trails

PLAN REVIEW AND APPROVAL (Subject to any restrictions/changes noted below):

SUBMITTED BY (Concessioner):	RECOMMENDED BY:	APPROVED BY:
Signature	Signature	Signature
Title	Title	Title
Date	Date	Date

Restrictions/Changes Applicable to Approval:

1. All work will be in accordance with the standards described in the ***Trail Maintenance Standards for Concessioner Horseback Riding Trails*** that are included as Attachment 1 to the Maintenance Plan.