

Shenandoah National Park

Trail Maintenance Standards

General Description

Activities covered under this programmatic document include:

- maintaining, repairing, and rebuilding in-kind damaged/deteriorated walls, trail tread, drainage structures, signs, and other structural elements;
- repairing trail bridges including decking, railings, approaches, abutments, and stringers;
- removing fallen trees and rocks and debris from the trail corridor;
- repairing sections where erosion and other landscape processes have compromised trail integrity;
- creating nonpermanent barriers to discourage trail shortcutting, trail widening, and use of informal trails;
- rehabilitating abandoned trail segments;
- maintaining/repairing crushed rock and multi-use trails.
- maintenance and repairs to stairs, railings, and other trail features;
- repair and replacement in-kind of benches; repair, maintenance, and replacement of drift fences; and
- repair and replacement in-kind of signs, kiosks, and wayside exhibits located along park trails.

Work performed must apply the techniques, protocols, and methodologies described in Methodology and Mitigation Measures (below). Work must also occur without significant changes in technology and tools, location, capacity, or appearance.

At the beginning of each season, the Wilderness, Backcountry and Trails (WBCT) Branch Chief will propose the planned annual trail maintenance plan to the Leadership Team and/or Compliance Council. The group(s) will review the proposed activities and determine that they comply with the activities and conditions described in this document. The Environmental Compliance Coordinator will create the necessary documentation based on field reports to create the administrative record for this programmatic.

This PCE is prepared to expand communication, improve operational efficiency, and protect natural and cultural resources and the human environment within Shenandoah National Park. All work done under this PCE should follow the Shenandoah National Park Trail Maintenance Standards as outlined below.

Description of SHEN Trail System

The Civilian Conservation Corps (CCC) and the Potomac Appalachian Trail Club (PATC) built many of the park trails between 1933 and 1942. Today, the majority of trails are well-graded and lead to significant features, connect developed areas, or follow interesting routes. Many trails are linked together and offer a variety of circuit hikes. However, a number of the horse trails and the lesser-used foot trails follow old road beds; some of which are steep, eroded, and poorly designed. Older trails which terminated at the park boundary and had limited or no public access were abandoned. Additionally, remnants of old abandoned fire foot trails can be found throughout the park.

Standards of maintenance on park trails vary depending on a number of factors, including the opportunity class of the (Backcountry/Wilderness Management Plan (BWMP) management zone) in which they are managed, the type of trail (i.e. foot trail, horse trail), whether the trail is within legislatively designated wilderness (restricting the use of power tools and affecting trail condition standards), or has other special legislation or designation attached to it (such as the AT, a National Scenic Trail), and the level of visitor use. Trail standards are listed in Methodology and Mitigation Measures (below). Also note additional standards at the end of this document.

The park's trails vary widely in length, difficulty, access, condition standards, and types of use permitted. The BWMP describes four categories of trails in the park:

Appalachian Trail (White-blazed)

The longest, continuous trail in the park is a portion of the Appalachian National Scenic Trail, or AT, which generally follows the ridge line for 101 miles from Compton Gap to Jarman Gap and is part of the 2,000+ mile route from Maine to Georgia. This segment of the Trail was first built between 1928 and 1932 by the PATC prior to the establishment of the park and construction of Skyline Drive. Much of the Trail was displaced and required relocation during the construction of the Skyline Drive, and currently the Trail crosses the Skyline Drive at 27 places. In 1968, the entire AT was legislatively designated as a National Scenic Trail. The AT is blazed white and maintained primarily by PATC with park staff assistance as necessary.

Foot Trails (Blue-blazed)

Foot trails are blazed blue and lead to many ridges and hollows throughout the Park. Many blue-blazed trails connect with the AT or horse trails (yellow-blazed). Approximately 200 miles of park trails are included in the blue blazed system. Most of these foot trails are maintained primarily by the PATC under a Cooperative Agreement. The park assists PATC with general maintenance activities, major trail rehabilitation projects and large tree blowdown removals.

Horse Trails (Yellow-blazed)

Approximately 200 miles of designated trails and administrative roads are available for horse and pack animal use. Horse trails are blazed yellow, and these are the only trails available for horse and pack animal use.

Limberlost Trail (not blazed)

Limberlost Trail in the Central District contains the only accessible trail segment in SHEN. This loop trail is ideal for people with mobility limitations, novice hikers and families with baby strollers. The trail is 1.3 miles long and features a five foot wide hard-packed trail surface comprised of crushed greenstone. The trail gradient is less than 11% throughout, and there are rest stops and benches every 400 feet. The trail also features a 70' bridge which spans the Whiteoak Canyon Run and a 140' boardwalk which traverses an ecologically sensitive swampy area. Pets are prohibited on this trail.

Role of the Potomac Appalachian Trail Club (PATC)

The park and the PATC have been jointly involved in the stewardship of trails since the 1930's. The non-profit PATC is a member of the Appalachian Trail Conservancy (ATC) with volunteer responsibilities for maintaining the AT and many other foot trails in the park and in Virginia, Maryland, and Pennsylvania. The partnership between the park and the PATC is solidified every five years in a Cooperative Agreement which includes the following objectives:

1. To coordinate maintenance on trails as listed in the Trail System Inventory.
2. To establish procedures for reviewing changes in the park's trails system.
3. To correct hazardous trail conditions at the earliest opportunity.

Several trails are designated as shared maintenance trails under an NPS/PATC co-overseer arrangement. On these trails the NPS crew performs tread maintenance and clears major treefall obstructions. PATC volunteer trail overseers perform blazing, trim vegetation, and clear most (not complex) treefalls. Otherwise the PATC is responsible for performing all routine and recurring trail maintenance on their designated trails, including blazing, trimming and removal of vegetation, clearing treefalls, and construction and maintenance of water control structures. The PATC recruits and obtains volunteers who adopt and oversee maintenance of trail sections. Additionally, the PATC annually organizes the Shenandoah Crew which operates during a four- to six-week period in the park, providing one to two weeks of trails construction and maintenance in each district. The PATC also coordinates trail maintenance workshops for overseers and prospective overseers in cooperation with the park. The PATC manages three maintenance structures (South River, Ivy Creek and Indian Run) for equipment and tool storage and as overnight facilities for PATC-sponsored work trips. In cooperation with other AT Partners, the ATC and the Appalachian National Scenic Trail, the PATC supports SHEN with Trail Patrol and Ridgerunner programs to monitor trail conditions and to provide information and support to visitors and park managers.

All work by the PATC will follow the guidelines of this categorical exclusion.

Trails Maintenance Methodology and Mitigation Measures

Methodology and mitigation measures are determined by the *Shenandoah National Park's 1998 Backcountry and Wilderness Management Plan (BWMP) CHAPTER 8, with update revisions* as stated below.

Trail Maintenance Standards

Trails are much more than just a convenient travel zone for visitors to provide recreation and access to destination backcountry sites. Trails function as a management tool to confine human use and associated resource impacts, serve to regulate access to or away from specified backcountry areas, and improve visitor safety in difficult or unfamiliar natural conditions. Although standards for trail conditions may vary, well maintained trails are important to these objectives so that resource conditions and a quality visitor experience are preserved.

Blazing

Objective: All maintained trails except Limberlost Trail will be blazed to some extent depending on the type of BWMP opportunity class in which the trail falls. The objective in blazing is to mark the trail often enough to guide the hiker and keep the trail distinguishable, but not so often that blazes become a visual intrusion. In the Primitive Wilderness and Primitive Non-wilderness classes, blazing is not necessarily intended for the convenience of the hiker or horse user but to keep the trail distinguishable, open, and maintained for hikers of various ages and experience levels typically travelling in SHEN backcountry.

General Standards for blazing

1. Use 2" X 6" vertical rectangles.
2. Place at eye-level on live trees. Avoid painting rocks.
3. Use double blazes (one above the other) for sharp turns and trail junctions.
4. Blazes should be visible across an intersection with another trail, a stream, or road.
5. Where two blazes of different colors are used on the same trail, the two blazes are to be placed side-by-side.
6. Avoid over-blazing.
7. Cairns, metal diamond markers, etc. should not be used to mark trails.

Standards for Primitive Wilderness and Primitive Non-wilderness Opportunity Classes (blue- and yellow-blazed trails)

1. Use blue paint for maintained foot trails; yellow paint for horse trails
2. Re-blaze only as necessary (generally no more than every three years) to keep blazes visible.

3. No more than one blaze should be visible at any time, unless special conditions warrant (i.e. trail difficult to follow due to overgrown vegetation).
4. When standing at one blaze, pick a prominent spot ahead, walk past it a short distance and blaze the next prominent spot. Blazes should be 300-700 feet apart. Avoid abrupt changes in frequency.

Standards for Semi-primitive Wilderness and Non-wilderness and Threshold Wilderness and Non-wilderness and for Appalachian Trail Wilderness and Non-wilderness Opportunity Classes (Blue-blazed, yellow-blazed, and white-blazed trails)

1. Use blue paint for maintained foot trails; yellow paint for horse trails; white blazes for the AT.
2. Re-blaze every few years to keep blazes visible and to replace missing or enlarged blazes. Carefully remove excess blazing.
3. No more than one blaze should be visible at any time, unless special conditions warrant.
4. When standing at one blaze, pick a prominent spot ahead, walk to it, pick the next good spot and place the blaze there. Blazes should be 300-500 feet apart. Avoid abrupt changes in frequency.

Techniques for Blazing

1. Pick prominent, large, living trees; dark-colored bark provides a better contrast for the blaze.
2. Choose trees which are prominent when foliage is out (clip away low bushes or protruding branches to clear the blaze area).
3. Scrape a 3" X 7" rectangle on thick barked trees, without cutting through the bark
4. Rub moss and lichen off a 3" X 7" rectangle on thin barked trees.
5. Paint neatly; avoid using too much paint (it will run down the tree).
6. Blaze in the direction you are hiking; walk back to blaze the other direction.
7. Avoid blazing rocks.
8. To avoid over-blazing, err on the side of too few blazes; more can be placed later if needed.

Vegetation Maintenance

Objective: To keep hikers and horses in the center of the treadway by preventing trails from being overgrown with vegetation.

General Standards for Vegetation Maintenance

1. Width will vary with type of trail and opportunity class.
2. Steep slopes with thin and unstable soils should have narrower trail tread as roots help to stabilize the slope.
3. Height should be sufficient to allow a tall backpacker or a rider on a horse on yellow-blazed trails to pass.
4. Follow USDA Forest Service guidance on branch trimming to minimize damage to the tree. (See Techniques below)

5. Shrubs and trees should be cut flush with the ground to avoid leaving hazardous stubs (see Techniques below).
6. Remove debris from trail; scatter if there are large amounts
7. Do not grub or remove trailside plants; the remaining plants and root systems help stabilize the soil.
8. Trail vegetation (herbaceous plants, woody sprouts, and grass-like plants on the edge of the trail) should be trimmed to 4 inches, as necessary, in late spring; additional work during summer months may be necessary for high-use trails.

Standards for Primitive Wilderness and Primitive Non-Wilderness Opportunity Classes (Blue-blazed and yellow-blazed trails)

The purpose for trail vegetation maintenance in these areas is to keep the trail open for light travel. Visitor convenience is not a primary objective.

1. Trail vegetation should be maintained to allow hikers and horse riders to pass single file without contacting shrubs, weeds, briars, or branches (blue-blazed trails about 1 foot on either side of the trail centerline; yellow-blazed trails, 1.5 feet on either side of the trail centerline)

Standards for Semi-primitive Wilderness and Non-Wilderness Opportunity Class (Blue-blazed and yellow-blazed trails)

The purpose for vegetation maintenance in these areas is to keep the trail open for moderate travel. Visitor convenience and safety are also considerations.

1. Trail vegetation should be maintained to allow hikers and horse riders to pass for the most part easily without contacting shrubs, weeds, briars, or branches (blue-blazed trails about 1.5 feet on either side of the trail center line; yellow-blazed trails, 2 feet on either side of the trail center line.).
2. Entire trail should be maintained in spring and at least once during late spring; additional vegetation maintenance may be necessary to maintain the required width and height.
3. Areas in front of blazes should be kept open to allow maximum visibility of blazes.

Standards for Threshold Wilderness and Non-wilderness and for Appalachian Trail Wilderness and Non-wilderness Opportunity Classes (Blue-blazed, yellow-blazed, and nature trails)

The purpose for vegetation maintenance in these areas is to keep the trail open and maintained for heavy travel. Visitor convenience and safety are also primary considerations.

1. Trails should be maintained to allow hiker and horse riders to pass easily without contacting shrubs, weeds, briars, or branches (blue-blazed and AT, about 1.5 feet on either side of the trail center line ; yellow-blazed trails, 2 feet on either side of the trails center line each side of the trail).
2. For blue-blazed trails, entire trail should be maintained in the spring and at least once more during the summer; wet areas, old field, and other sections prone to weed and briar growth should be cleared more often if necessary.

Yellow-blazed trails should be maintained at least once during late spring and more often if needed.

3. Areas in front of blazes should be kept open to allow maximum visibility of blazes.

Techniques for Vegetation Maintenance

The amount of vegetation maintenance is dependent upon the opportunity class. For primitive areas, a minimal amount of maintenance should be undertaken.

1. Low shrubs and young trees are cut flush with the ground to prevent tripping and to reduce sprouting from the stump and roots.
2. Trim branches and stems to prevent snagging passing hikers. Prevent tree injury to the branch bark ridge or the branch collar. The USDA recommends that: "A proper cut begins just outside the branch bark ridge and angles down away from the stem of the tree, avoiding injury to the branch collar. Make the cut as close as possible to the stem in the branch axil, but outside the branch bark ridge, so that stem tissue is not injured and the wound can seal in the shortest time possible." (See USDA Forest Service, "How to Prune a Tree," NA-FR-01-95, revised August 2012)
3. Limbs growing towards the trail should be cut back to the next branch growing away from the trail (to encourage growth away from the trail).
4. It is better to remove all lateral branches than to remove the tree top since removal of the terminal bud will encourage lateral growth across the trail.
5. Grubbing with a cutter mattock or Pulaski may be necessary to clear the tread of long neglected trails back to the approved widths; do not remove any more vegetation than is necessary to define the tread.
6. Park staff may sometimes utilize herbicides in conjunction with vegetation management to reduce re-sprouting (WBCT Branch Chief will contact park IPM coordinator for annual approval of herbicide use).

Clearing Treefalls and Limb Debris

Objective: Perform safe removal of falling/downed dangerous trees and allow passage along the trail while retaining features which contribute to trail maintenance and to user enjoyment. Timely removal of trail obstructions minimizes visitor-created detour trails which degrade the resource and complicate effective trail maintenance.

General Standards for Clearing Treefalls and Limb Debris

1. Safety is the primary consideration. Do not perform work beyond your individual certification. Do not attempt to remove large or "hung-up" trees alone. Do not exceed the capability of equipment or personal skills.
2. Clearing should be done at least once each year in early spring to remove winter storm damage; additional work may be necessary during the year due to storms.
3. Whenever possible, clear downed material to just past the width of cleared vegetation (this width is especially important to allow safe vegetation work in wilderness areas).

4. Crews must follow Job Hazard Analysis (JHA) documents. Appropriate personal protective equipment **must** be worn (e.g, goggles, ear protection, chaps, helmet, and gloves). Personnel should clear trees in pairs and must be certified/qualified by the NPS before performing chainsaw work. Traditional (primitive) tool crosscut saw and grip hoist work can be even more dangerous than chainsaw work in some situations.

Standards for Primitive Wilderness and Primitive Non-wilderness Opportunity Classes (Blue-blazed, yellow-blazed trails)

1. Remove only those treefalls, limb debris or other obstructions which do not lie flat on the ground or which cannot easily be stepped over or walked under by a person carrying a backpack or rider on a horse. It is acceptable to leave some obstructions that can be easily traversed if it adds to the primitive setting or contributes to erosion control.
2. The minimum cleared width should allow persons to walk or ride single file without leaving the treadway.
3. In wilderness, if the widths of treefalls are so large that using primitive tools to remove it would seriously compromise worker safety, consult the WBCT Branch Chief for alternatives such as technical assistance, chainsaw use, or trail rerouting. Relocation or rerouting of the trail should be only considered as a last resort. Minor trail reroutes may qualify under this CE but require park management approval. Steepness of slope, length of detour, and difficulty in getting around the obstacles are factors which should be considered. Chainsaw use under these circumstances requires Minimum Requirements Decision Guide clearance through the project compliance process and requires compelling evidence for need for use of motorized equipment.

Standards for Semi-Primitive Wilderness and Non-wilderness, Threshold Wilderness and Non-wilderness, and Appalachian Trail Wilderness and Non-wilderness Opportunity Classes (Blue-blazed, yellow-blazed trails, nature trails)

1. Remove all treefalls, limb debris, and other obstructions from trail, except those which prevent erosion (by acting as waterbars), prevent access by vehicles at trailheads, and which can be easily stepped over without breaking stride. Trees not removed should lie flat on the ground and should be less than 8" in diameter
2. All obstructions that cause visitors to leave the trail should be removed as soon as possible (particularly from spring through autumn) to prevent danger to users and reduce impact to surrounding resources.

Techniques for Clearing Treefalls

1. Remove material at least far enough from trail side to clear the trail corridor width standard as listed in Vegetation Removal.
2. Be careful of tension on fallen trees; if possible saw so the natural tension opens the cut rather than pinches the saw.
3. Use wedges, pry poles or levers to relieve tension and open the saw cut.

4. Drag treefalls out of the trail corridor, and be sure to minimize disturbance to native plants. Flush cut stumps to the ground to reduce visual impact and to encourage rapid decay of the stump.

Trail Tread (Erosion Control and Prevention)

Objective: Maintain or restore a trail tread (the footpath surface) which is safe for users and prevents the deterioration of the trail and trailside resources.

All maintenance activity expected to occur outside of the original tread and associated water control features do not qualify under this CE and must have park-wide project compliance clearance completed and be approved by the Superintendent.

General Standards for Tread Maintenance

1. Use of natural materials is required in most trail construction work; use of dimension lumber is discouraged and use of pressure-treated lumber is not permitted except for replacement-in-kind for bridges and boardwalks. Creosoted lumber is not permitted.
2. Strip bark from logs to slow rotting and use hardwoods like black locust – live tree use needs prior NPS trail supervisor approval.
3. Install grade dips or install waterbars on all slopes at a frequency sufficient to eliminate water from the trail before erosion occurs. (See Techniques below).
4. Install checkdams in badly eroded trails to retain sediment and restore tread. Checkdams should be limited on horse trails. (See Techniques below).
5. Install retaining walls, steps, log ladders, riprap and turnpikes as needed to stabilize the tread (limit steps and no ladders on horse trails). (See Techniques below).
6. Keep culverts and other drainage structures open and clear of silt and organic debris on an annual basis or more often as needed.
7. Build log or rock open culverts for small streams to cross the trail without travelling along the trail. (See Techniques below).
8. Remove loose stone and other debris which could cause hikers to trip or twist an ankle.
9. Discourage shortcutting of switchbacks by blocking shortcuts with branches and other debris. Heavy materials such as stumps or rocks might be used so that people do not remove them.
10. Staging areas including tools, logs, rocks, and other materials should avoid sensitive areas including wetlands and endangered species (consult Park Botanist). Remove all materials upon project completion; piles of logs cause dead patches of vegetation which are susceptible to colonization by invasive plants.

Standards for Primitive Wilderness and Primitive Non-wilderness Opportunity Classes (Blue-blazed and yellow-blazed trails)

1. Annual maintenance may be sufficient; sections with unusual problems may require additional maintenance. The prevention of erosion and other resource damage should dictate the frequency of maintenance, with minimal amount of work.

Standards for Semi-Primitive Wilderness and Non-wilderness, Threshold Wilderness and Non-wilderness, and Appalachian Trail Wilderness and Non-wilderness Opportunity Classes (Blue-blazed, yellow-blazed, nature trails)

1. All waterbars should be cleaned and restored at least once each year to mitigate erosion damage and wear from heavy foot or horse traffic.

Techniques

Waterbar, lateral drain, grade dips and culvert construction

1. Restore old waterbars and grade dips (instead of creating new) if possible. Choose locations along the trail which naturally tend to allow water to run off the trail such as turns in the trail. Place waterbars near the top of a slope to prevent water from gaining momentum.
2. Construct a waterbar by digging a shallow trench at a 30-45 degree angle from the perpendicular of the trail and placing in it large rocks or a 10 to 12" log. Rocks or logs should protrude about 6" above the level of the tread on the downhill side. Grade dip construction is similar but is not hardened with rock or log.
3. Avoid placing waterbars that exit directly into waterways – allow water to fan out instead.
4. Slope the trail above the bar gently toward the bar to create a broad trench. The lowest point of the trench should be at the bar and should be below the level of the trail tread on the downhill side. Do not expose so much of the downhill side of the waterbar that it becomes undermined by erosion.
5. The waterbar should extend past the tread on both sides of the trail. The trench should extend beyond the waterbar and should be fanned out to assure that water is adequately dispersed and does not return to the trail. Compact waterbars well so that use will not damage them. Do not leave protruding rocks which could trip a horse or hiker.
6. Lateral drains alongside the trail may be used to move water to a suitable location for drainage away from the trail.
7. An open culvert is built much like a waterbar, but is hardened with rocks or logs on both sides of running water.
8. Fallen logs laying directly on the ground and which can be easily stepped over may make suitable waterbars and checkdams.

Waterbar, lateral drain and culvert maintenance

1. Remove all loose material from the trench or culvert; clear trench outside of tread to allow water to move away from the trail.
2. Dig or scoop out accumulated silt from the trench or culvert; put all accumulated soil on the back side of the waterbar. Do not throw the soil to the side of the trail. Soil is a precious commodity as evidenced by eroded trails. Larger rocks may be thrown to the side of the trail. The bottom of the trench next to the bar should be slightly below the level of the tread on the downhill side of the bar.
3. If necessary, rebuild or repair the bar, drain or culvert itself.
4. Liners may be added to old metal culverts. Occasionally deteriorated culverts on old roads are removed instead of being replaced, and a water bar or open culvert is constructed to replace the former culvert.
5. Clean dirt from tools and boots before moving to a new location when cleaning these structures because the disturbed soil is often a source of weed seed, and waterbars exit areas often have weeds growing in them.

Checkdam, step, turnpike, and retaining wall construction and maintenance

1. These trail structures occur only within the treadway (unlike waterbars, which extend beyond in order to remove water from the trail).
2. Reconstruction and repair of deteriorated historic CCC-era dry-laid rock retaining walls will follow the Secretary of the Interior's Standards for Restoration as directed by the SHEN Cultural Resource Management Specialist. The NPS trail crew must photograph (and GPS if possible) before and after work on the section of cribbing wall targeted for repair; the damaged area and its reconstruction should be carefully documented for park records.

Riprap and obstructions

1. In order to minimize trail width expansion, riprap, large stones or fallen logs may be placed alongside the trail. These obstacles narrow the treadway where it is too wide, otherwise encourage hikers and horses to stay in the center of the treadway, or stabilize a small section of tread where a larger retaining wall is unnecessary. These materials must be used wisely, as material alongside the trail can prevent water from naturally running off of the trail.

Obtaining tread material

The following are good sources for tread fill material:

1. Deposited material from up-trail erosion (i.e. waterbars, checkdams).
2. Material from the footpath or within the road bed.
3. If other sources are not available, material may also be pulled from the unvegetated banks or berms of the footpath area. Avoid using undisturbed ground and areas with native vegetation.
4. For crushed stone trails such as Limberlost, purchase anti-erosion base, gravel and crushed stone. Avoid limestone rock in this area. Limited amounts of this material may be stored on pre-approved hardened areas near the trail.

5. If the trail area is located near a road, the Maintenance Division or an outside source may be able to supply gravel tread mix by dump truck.

The source for tread material needs beyond the above must be approved by WBCT Branch Chief. Borrow pits are not to be dug. Any disturbance of the soil beyond the trail tread, berms, and associated water control features itself do not qualify under this CE and must have park-wide project compliance clearance completed and be approved by the Superintendent.

Stream Crossing Construction and Maintenance Standards

Objective: To provide a stream crossing within the trail corridor that promotes hiker safety and resource protection. A clearly-defined stream crossing, particularly at moderate- to high-use trail areas, serves to confine visitor use and impacts to the established trail. In addition to visitor safety and convenience, bridges and boardwalks can prevent wetland and streamside impacts.

Each type of water crossing has consequences for the recreation experience and the lands being accessed. Stream banks and stream beds are constantly changing. Choose wisely from the range of available options before committing present and future resources to a crossing. There are approximately fifteen bridges and boardwalks along park trails. Building materials for bridges and boardwalks are replaced in-kind as needed. Materials include stone, metal and WBCT Branch Chief-approved, pressure treated lumber.

General Standards for Stream Crossing Construction and Maintenance:

1. Wet crossings will be maintained to a maximum tread width of 4 feet for hiking trails and up to 10 feet for horse trails.
2. Blazes should be visible at all crossings.
3. Approaches should be well maintained to provide definition.
4. Stepping stones should be large, fairly flat on top, and stable.
5. Space stones for the average stride, taking children and short strides into consideration (approximately 2 feet apart).

Standards for Primitive Wilderness and Primitive Non-Wilderness Opportunity Classes (Blue-blazed and yellow-blazed trails)

1. Visitor convenience is generally not an objective.
2. Crossings provided primarily for resource protection.
3. Occurrence of storm and/or high stream flow events dictate frequency of maintenance, with minimal amount of work.
4. Approaches should be solid, firm, and at less than 30% slope when possible.
5. Stream crossings should not be placed at sites where stream depth typically exceeds 2 feet.
6. Bridges and boardwalks will not be constructed in Wilderness areas.

Standards for Semi-primitive Wilderness and Non-Wilderness, Threshold Wilderness and Non-Wilderness Opportunity Classes (Blue-blazed and yellow blazed trails)

1. Visitor convenience may be an objective in addition to visitor safety and resource protection.
2. Occurrence of storm and/or high stream flow events dictate frequency of maintenance, with minimal amount of work. Additional maintenance may be required on some high use trails.
3. Approaches should be solid, firm, and at less than 20% slope when possible.
4. Stream crossings should not be placed at sites where stream depth typically exceeds 1 foot.
5. Bridges and boardwalks will be maintained but no new structures are anticipated.

Techniques for stream crossings without a bridge or boardwalk

Construction

1. Use existing features when possible (boulders, ledges, etc.).
2. Minimize movement of rocks within the stream bed.
3. When constructing stepping stones, use high lines to relocate rocks whenever possible.
4. Stream bed may require prep work to insure stepping stone stability.
5. Stepping stones may need to be shaped before placement.
6. Work should be performed during periods of low stream flow.
7. Use minimum tool concepts. Get the job done with the least long-term impacts.

Maintenance

1. Stepping stones may need to be stabilized due to heavy use or high stream flow
2. Stepping stones should be kept free of logs, limbs, and other debris to prevent damming.

Techniques for Maintaining Bridges and Boardwalks

1. Inspect structures for safety at least once per year. Repair as needed.
2. Clean and treat lumber at least every 3 years to prolong useful life and prevent formation of slippery growth. Treating requires tarps under bridge to catch drips/spills.
3. Replacement of the decking and treatment of decking will be approved by the WBCT Branch Chief. Wood treatment chemicals will be approved through the NPS Integrated Pest Management process.

New Trail Construction or Relocations

All proposed new trail constructions, new trail bridges or boardwalk, or trail relocations do not qualify under this CE and must have park-wide project compliance clearance and be approved by the Superintendent. Project clearance must be obtained anytime disturbance is to occur outside of the existing trail tread, berms, and associated water

control structures (anything beyond what is described in these standards). Any Superintendent-approved trail relocations and new trails are to be constructed in a manner which promotes hiker safety and resource protection.

Additional Standards to Limit the Spread of Invasive Plants

Use the guidance in Appendix A to minimize the spread of invasive plants.

1. Before annual work plans are completed, Natural Resources staff and the Compliance Council will provide locations where extra precautions should be taken to protect rare plants and to prevent spread of particularly problematic species. See Appendix for more information on best management practices related to invasive plants.
2. Trail crew members are responsible for inspecting all packs, gloves, boots, clothing, hand tools, and equipment (including motorized and non-motorized wheeled vehicles) to make sure they are free of soil clumps, and plant parts prior to entering the park and prior to moving to a new work location within the park to prevent the spread of non-native species.
3. Soil disturbance shall be minimized to the greatest extent possible to reduce disturbance to native plants and reduce the potential for the introduction or spread of invasive non-native plant species.
4. Trail work activities shall be restricted during saturated soil conditions or severe weather conditions to avoid damage to soils and vegetation.
5. Mechanized equipment shall be moved to the work site using established trails and roads, and will not be taken on short-cut routes through the forest. Special care will be used when crossing water ways with mechanized equipment to ensure no or minimal damage to stream banks.
6. When possible trail work should start in areas clear of invasive plants and move toward infested areas. After work in an infested area and before leaving a trail, workers should clean seeds and soil from their boots, and equipment.
7. Stage equipment and supplies on durable surfaces on roads or on the trail tread. Avoid staging on rare plant areas, and, when possible, on other actively growing vegetation--including invasive plant infestations.
8. When using mechanized equipment, provide temporary barriers to protect existing trees, plants, and root zones from gashing and soil compaction damage.

Additional Standards to Protect Endangered Species

The following additional standards apply to trail sections in the Pinnacles, Stony Man, Hawksbill, and Rose River areas (as shown in Appendix C), the red segments in Figures 1-4). Within these locations, a minimal level of maintenance will occur in order to provide for visitor use and safety.

Minimize ground disturbance associated with trail maintenance.

1. Do not collect logs off-trail. No trail maintenance involving rock collection or rock disturbance outside of the trail tread will occur, except during periods of dry weather (after a week or more of no precipitation on-site).
2. Work following major storm events that result in emergency trail conditions identified as an immediate visitor safety concern are exempt from these standards. During these situations, trail maintenance will occur as quickly as possible, regardless of weather conditions.

When possible, trail maintenance work that involves a higher level of ground disturbance (e.g. cleaning water bars) will be concentrated during work periods prior to May or after October.