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GUIDE TO TRAIL MAINTENANCE TECHNIQUES AND STANDARDS
FOR TRAILS MAINTAINED BY
THE POTOMAC APPALACHIAN TRAIL CLUB
IN
SHENANDOAH NATIONAL PARK



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JUNE 1981

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ACKNOWLEDGEMENTS

The author wishes to thank the Superintendent of Shenandoah National Park and his staff and the Supervisor of Trails and others in the PATC trails program for their advice and comments on an earlier draft of this guidebook. Further comments and suggestions are welcome and should be forwarded to the author.

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Revised 1982

I. INTRODUCTION

This guidebook of trail maintenance techniques and standards was written specifically for overseers and work trip leaders in Shenandoah National Park. The objectives, standards, and techniques described were developed in consultation with the management of the Park and reflect the mutual agreement of PATC and the Park on regular maintenance of trails in Shenandoah National Park. Overseers of the Appalachian Trail and other trails outside of the Park may find the guidebook useful as well. Users of the guidebook are encouraged to forward their comments, suggestions, and criticisms to the author for use in future editions of the guidebook.

II. PURPOSE

The purpose of the guide is to establish trail maintenance objectives and minimum standards for meeting the objectives. In January 1980 Shenandoah National Park and the Potomac Appalachian Trail Club completed a Memorandum of Understanding setting forth PATC trail maintenance responsibilities in the Park. Under that agreement trails are to be maintained to a standard as mutually agreed upon. This guide contains those standards.

Overseers of trails in the Park are expected to meet the objectives given for each type of maintenance activity. The good judgement and experience of each overseer remains the critical element in meeting those objectives. The standards prescribed are broad enough to be tailored to the needs of each trail section and the style of each overseer. The techniques described are basic; each overseer should adapt them as necessary to fit their own style and maintenance needs.

It is expected that regular communication between PATC overseers, PATC supervisors, and Park officials will continue and will allow problems to be identified and differences of opinion to be resolved.

III. PRIORITIES

Priority is to be given to those activities which promote the hiker's safety and which protect the resources of the Park. Thus, all trails are to be adequately blazed at all times, obstructions or undergrowth posing safety hazards are to be promptly removed, proper erosion control techniques are to be practiced, and missing or incorrect signs should be promptly reported to Park officials. In those situations where an overseer is responsible for more than one type of trail, top priority maintenance is to be done on the Appalachian National Scenic Trail, and Non-Wilderness Blue blaze side trails before Wilderness Blue Blaze side trails.

IV. TYPES OF TRAILS

This guide distinguishes between three types of trails (maintained by PATC) for purposes of maintenance standards. Each type of trail and the general approach

to maintenance is described below. A complete list of trails in each category appears in appendix A.

Appalachian National Scenic Trail (AT): As a highly popular and visible trail, the AT must be well maintained at all times. The AT is routinely used by serious backpackers as well as inexperienced day hikers and weekend backpackers. Overseers should recognize this diverse group of users, as well as the symbolic importance of the trail, when judging what maintenance is necessary. Particular problems are summer weed, nettle, and blackberry growth which can severely restrict passage in some areas, and the deterioration of water bars which frequently occurs because of the volume of use of the trail. A spring visit to the trail to re-blaze (if necessary), remove winter stormfall, and clean waterbars, and monthly visits to weed and clip during the summer are essential.

Blue Blaze, Non-Wilderness: These side trails occur entirely outside of designated wilderness areas and are popular with both inexperienced day hikers and backpackers, and with more experienced hikers. Some of the trails are close to campgrounds, overlooks, the Skyline Drive, or to boundary access points, while others are more remote. Many offer spectacular vistas or views of waterfalls. Particular problems include treadway deterioration from overuse or poorly maintained waterbars, many informal, confusing trails created by hikers looking for campsites, fire rings and litter, and shortcutting. A spring visit to the trail to re-blaze (if necessary), remove winter stormfall, and clean waterbars, and periodic summer visits to weed and clip, pick up litter, and destroy fire rings are essential.

Blue Blaze, Wilderness: These side trails are wholly or in part in designated wilderness areas. Many are less frequently used and users tend to be more experienced backpackers or day hikers. Access is more difficult and distances are longer. Many of the trails are in remote locations of the Park. At least one visit is necessary each year to clean waterbars, remove obstructions, and blaze as necessary. Trails with high use or particular problems (such as weeds or brambles) should be visited more frequently.

V. BLAZING

Objective: To mark the route often enough to guide the hiker, but not so often that blazes become a visual intrusion.

A. Standards:

1. General

- use 2" X 6" vertical rectangles
- place at eye-level at prominent, eye-catching locations
- use double (one above the other) blazes for sharp turns, at all trail junctions, and at other places the hiker needs to be alert
- blazes should be visible across an intersection with another trail, a stream, or a road
- where two blazes of different colors are used on the same trail, the two blazes are to be placed side-by-side

- blaze more frequently where the trail tread is indistinct or where informal trails may confuse the hiker
- metal diamond markers are to be used only at trailheads and only when the green and white logo is not present
- AVOID OVERBLAZING

2. Appalachian Trail

- use white paint
- re-blaze every other year, or more often to keep blazes visible and to replace missing or enlarged blazes; remove excess blazing
- no more than one blaze should be visible at anytime, unless special conditions warrant; 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

3. Blue Blaze, Non-Wilderness

- use blue paint
- re-blaze every other year, or more often to keep blazes visible and to replace missing or enlarged blazes; remove excess blazing
- no more than one blaze should be visible at anytime, unless special conditions warrant; 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

4. Blue Blaze, Wilderness

- use blue paint
- re-blaze every two to three years or more often to keep blazes visible and to replace missing or enlarged blazes; remove excess blazing
- no more than one blaze should be visible at anytime, unless special conditions warrant; 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 500-700 feet apart; avoid abrupt changes in frequency

B. Technique:

- pick prominent, large, living trees; dark colored bark provides a better contrast for the blaze
- choose trees which are prominent when foliage is out (clip away low bushes or protruding branches to clear the blaze area)
- scrape a 3" X 7" rectangle on thick barked trees
- rub moss and lichen off a 3" X 7" rectangle on thin barked trees
- paint neatly; avoid using too much paint (it will run down the tree)
- blaze in the direction you are hiking; walk back to blaze the other direction
- avoid blazing rocks whenever possible
- to avoid overblazing, err on the side of too few blazes; more can be placed later if needed

C. Equipment:

- 1 gallon bucket with bail
- 1" brush

- blaze paint
 - paint scraper (or light axe - for thick barked trees only)
 - small tin can (for brush when not in use)
 - rags or paper towels
 - piece of aluminum foil (to wrap brush in until cleaning)
 - brush cleaner and hand cleaner (for afterwards)
- (an alternative approach, especially for trails needing touching up rather than re-blazing is to carry a can slightly larger than the paint can and stick the brush between the paint can and the carrying can)

VI. CLIPPING AND WEEDING

Objective: Remove branches, weeds, and brambles that interfere with passage along the trail.

A. Standards:

1. General
 - width will vary with type of trail (see below)
 - steep slopes with thin and unstable soils should have narrower trail treads cleared (roots of trailside vegetation helps stabilize the slope)
 - height should be sufficient to allow a tall backpacker to pass (about 8 feet)
 - cut branches flush with the main stem; shrubs and trees should be cut flush with the ground to avoid leaving hazardous stubs (see Techniques below)
 - remove debris from the trail; scatter if there are large amounts
 - do not grub or remove trailside plants; the remaining plants and root systems help stabilize the soil
2. Appalachian Trail
 - width should be enough to allow hikers in shorts to pass easily without contacting shrubs, weeds, briars, poison ivy or branches (about 3 feet from each side of the trail)
 - complete trail should be weeded and clipped in spring and at least twice more during the summer; wet areas, old fields, and other sections prone to weed and briar growth should be cleared at least once per month from spring through autumn
 - areas in front of blazes should be kept open to allow maximum visibility of blazes
3. Blue Blaze, Non-Wilderness
 - same as Appalachian Trail above
4. Blue Blaze, Wilderness
 - width should be enough to allow hikers, not necessarily in shorts, to pass single file without contacting shrubs, weeds, briars, or branches (about 1-2 feet on each side of the trail)
 - complete trail should be weeded and clipped in the spring of the year; additional weeding and clipping as necessary to maintain the required width and height
 - areas in front of blazes should be kept open to allow maximum visibility of blazes

B. Technique:

- low shrubs and young trees are cut flush with the ground to prevent tripping and to reduce sprouting from the stump and roots
- trim branches flush with the main trunk of the stem to prevent snagging passing hikers and to prevent ugly stumps
- branches growing towards the trail should be cut back to the next limb growing away from the trail (to encourage growth away from the trail)
- better to remove the whole tree, or all lateral branches, than to remove the tree top, since removal of the terminal bud will encourage lateral growth across the trail
- grubbing with a cutter mattock or pulaski may be necessary to clear the tread of long neglected trails; do not remove any more vegetation than necessary to define the tread

C. Equipment:

- long handled clippers (loppers)
- weebers (swing blades)
- small saws
- Pulaskis or cutter (3#) mattocks (for grubbing out vegetation in the trail tread)
- power weeders (except in Wilderness areas)

VII. CLEARING FALLEN TREES AND WINDFALLS

Objective: Allow passage along the trail while retaining features which contribute to trail maintenance and to user enjoyment.

A. Standards:

1. General
 - 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 or other events
 - clear to the same width used in clipping and weeding
2. Appalachian Trail
 - remove all fallen trees, windfalls, and other obstructions from trail except those which prevent erosion (by acting as water bars), which prevent vehicular traffic (primarily at the trailhead) and which can be easily stepped over without breaking stride; trees not removed should lie flat on the ground and should be less than 10-12" in diameter
 - all obstructions should be removed as soon as possible (particularly from spring through autumn) to prevent danger to users and discourage hikers from walking off of the trail
3. Blue Blaze, Non-Wilderness
 - same as the Appalachian Trail above
4. Blue Blaze, Wilderness
 - remove only those trees, windfalls, or other obstructions which do not lie flat on the ground or which cannot easily be stepped over by a person carrying a backpack

B. Technique:

- remove material far enough from trail side to prevent snagging of hikers
- watch the tension on fallen trees; saw so the natural tension opens the cut rather than pinches the saw
- use pry poles or levers to relieve tension and open the sawcut
- drag windfalls away from the immediate sight of the trail

C. Equipment:

- bow saws (36" or larger are often most effective for clearing windfalls)
- cross-cut saws
- axes
- clippers (loppers)
- chainsaws (use only for major windfalls; use only after proper training and with proper safety equipment; chainsaws are prohibited in Wilderness areas)

VIII. TRAIL TREAD (Erosion Control and Prevention)

Objective: Maintain and restore a trail tread which is safe for users and to prevent the deterioration of the trail resource.

A. Standards:

1. General

- install or install waterbars on all slopes at a frequency sufficient to eliminate water from the trail before erosion occurs
- install check dams in badly eroded trails to retain sediment and restore tread; install waterbars below checkdams if feasible
- keep culverts clear of silt and organic debris
- clear debris from streams downstream from trail crossings (to prevent damming and flooding on the trail)
- dig channels for small stream and springs to cross the trail without travelling along the trail
- remove all accumulated silt and organic debris from all waterbars in spring (before damaging summer cloudbursts hit)
- remove loose stones and other debris which could cause hikers to trip or twist an ankle
- short relocations may be necessary to avoid severe erosion or perennial problem areas (see section IX below)
- build waterbars wide and deep enough to be effective, but not to be an obstacle to the hiker
- discourage shortcutting of switchbacks by blocking shortcuts with branches and other debris

2. Appalachian Trail

- in addition to annual cleaning, all waterbars should be checked 2-3 times each year for damage and wear from heavy foot traffic; restore as necessary

3. Blue Blaze, Non-Wilderness

- same as the Appalachian Trail above

4. Blue Blaze, Wilderness

- annual maintenance should be sufficient; heavily used areas or sections with unusual problems may require additional maintenance.

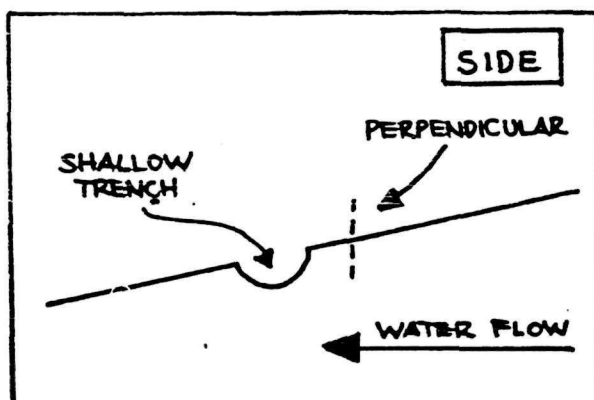
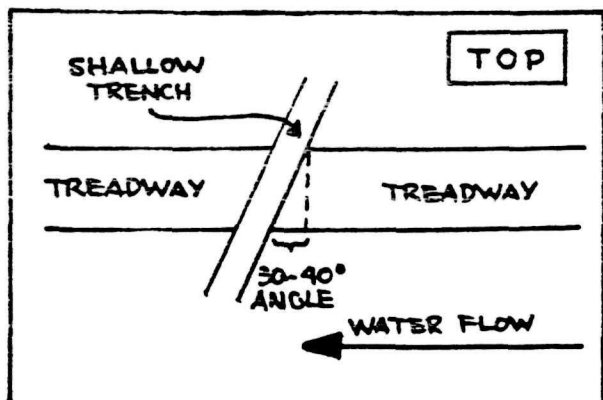
B. Technique

1. Waterbar Construction (refer to sketches on pp. 8-9)

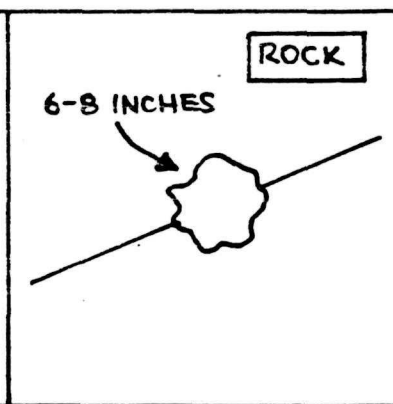
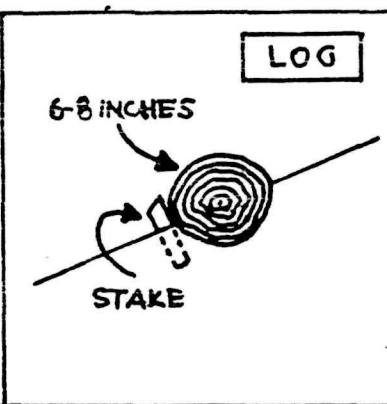
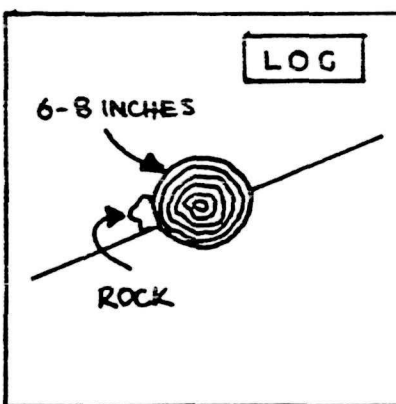
- choose locations along the trail which naturally tend to allow water to leave the trail; turns in the trail should be used when possible; use locations of old waterbars if restoring them; whenever possible place waterbars near the top of a slope to prevent water from gaining momentum
- construct a "bar" by digging a shallow trench at a 30-40 degree angle from the perpendicular of the trail and placing in it 6-8" rocks or a 6-8" diameter log; rocks or logs should protrude about 4" above the level of the tread on the downhill side; cover rocks with small rocks and soil to create a mound; secure logs with wooden stakes or rocks on the downhill side; cover stakes or rocks with soil; compact well (note: where loose soil is plentiful, as in restoring old waterbars, constructing the bar with well packed soil is easier, but may require more maintenance)
- slope the trail above the bar gently towards the bar to create a broad trench; lowest point of the trench should be at the bar and should be below the level of the trail tread on the downhill side
- 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.
- drainage ditches alongside the trail may be used to move water to a suitable location for drainage away from the trail
- compact waterbars well so that use will not damage them; do not leave protruding rocks or stakes which could trip a hiker
- fallen logs lying directly on the ground and which can be easily stepped over make good waterbars; leave them in place when appropriate

2. Check Dam Construction

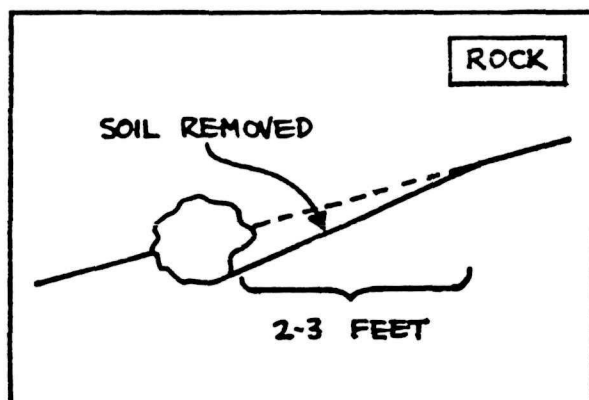
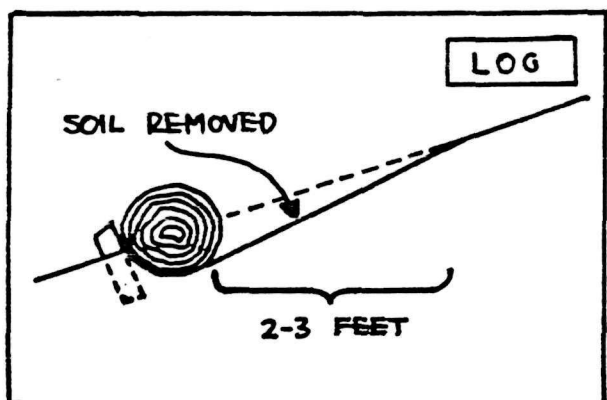
- construct a simple wood or rock waterbar perpendicular to the trail to collect silt and organic debris washing down the trail; construction should be substantial enough to prevent hikers stepping on the dam from breaking it down
- when the area behind the dam is full, build another dam further down the slope
- fallen logs lying directly on the ground and which can be easily stepped over make good check dam; leave them in place if appropriate



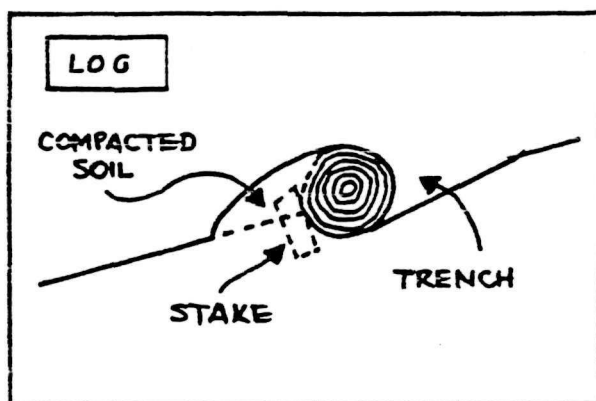
- (A) Dig a shallow trench that extends past both sides of the treadway. The trench should be at a 30-40° angle from the perpendicular of the trail, and it should point downhill.



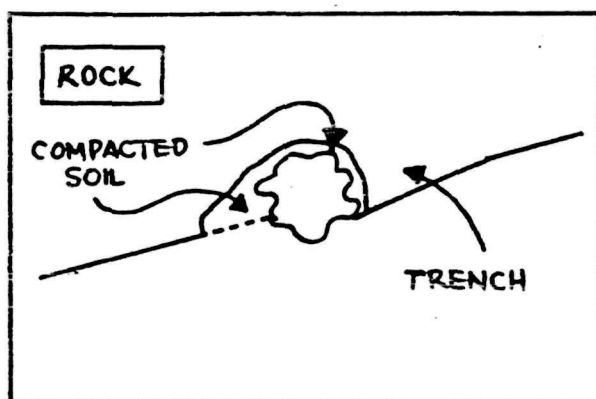
- (B) Place a 6-8 inch log, or 6-8 inch rocks, in the trench. Secure the log on the downhill side with wooden stakes or small rocks.



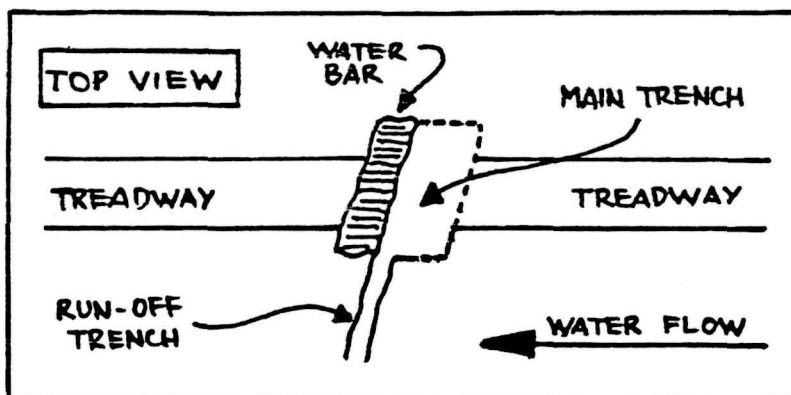
- (C) Dig a gradually deepening trench that ends right against the log or rocks, starting 2-3 feet above the bar. The lowest point of the trench (just above the bar) should be lower than the level of the undisturbed treadway just below the bar.



- (D1) Log: Place dirt on the downhill side of the log and compact well. Leave the uphill face of the log uncovered.



- (D2) Rocks: Cover the rocks with dirt and small stones to create a mound. Compact the material well. Be sure that no parts of the rocks are left uncovered.



- (E) Dig or clear a trench beyond the end of the waterbar to assure that water will not flow back onto the treadway.

3. Waterbar Maintenance

- remove leaves, twigs, and other loose material from the trench; clear trench outside of treadway to allow water to move away from the trail
- if necessary, dig or scoop accumulated silt from the trench; 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; slope the trench gradually uphill away from the bar
- if the trail below the waterbar shows signs of erosion, place material removed from the trench in the eroded areas; compact this material by walking over it several times
- if necessary, rebuild or repair the bar itself (log bars may become displaced and will eventually rot; stone bars may become displaced or compacted)

C. Equipment

- pick-mattock or cutter-mattock
- shovel
- saw (for log bars)
- ax (for log bars)
- folding shovel (GI trenching tool) - for annual maintenance

IX. NEW CONSTRUCTION (RELOCATIONS)

Objective: To promote hiker safety or protect the trail resource by improving trail access, avoiding serious erosion or other trail tread problems, or avoiding major storm damage.

A. Standards:

- the Park and the Supervisor of Trails must be consulted in advance on all relocations, regardless of length
- all relocations of 100 feet or less may be approved by the District Ranger and District Foreman
- all relocations in excess of 100 feet must be approved by the Superintendent, after consultation with the Supervisor of Trails
- flagging of proposed relocations is to be done only after permission is granted by the appropriate Park authority
- all "new" trails must be proposed in writing, through the Supervisor of Trails, to the Superintendent for review before any flagging or route marking is conducted

B. Techniques:

- all relocations and new trails are to be constructed in a manner which promotes hiker safety and resource protection (especially erosion control)
- overseers should consult with the Supervisor of Trails and the Park on recommended techniques; appendix D contains trail construction references

X. LIAISON WITH SHENANDOAH NATIONAL PARK AND SUPERVISOR OF TRAILS

Objective: To assure regular communication between the Club and the Park on trail conditions and trail work accomplished and to allow early resolution of differences of opinion about trail maintenance issues.

A. Standards:

1. Shenandoah National Park

- whenever possible, trail overseers and work trip leaders should check in with entrance stations and district offices to discuss work accomplished and to exchange information about trail conditions; if possible, overseers should inform Park authorities in advance of plans
- trail overseers should meet in person, or talk by telephone, with the appropriate district ranger or staff at least once each year
- trail maintenance problems beyond the capability of the overseer are to be reported at once to the appropriate district ranger
- all missing or incorrect signs should be noted and reported promptly to the appropriate district ranger
- overseers and work crew cars should be parked at overlooks and parking lots; fire roads are to be used for ferrying tools and work crews only; authorization to use fire roads must be obtained in advance from the appropriate district ranger

2. Supervisor of Trails

- reports on work accomplished are to be submitted promptly to the Supervisor of Trails; if possible the standard reporting form should be used; work reports should describe the section of trail maintained, the date of the trip, leader of the trip, work accomplished, remaining work to be done (and approximate date for doing it, if known), other participants on the trip, and other relevant trail condition information
- overseers should consult with the Supervisor on all relocations and major trail maintenance problems; if conditions are beyond the capability of the overseer, the Supervisor will assist the overseer in arranging a work party or in seeking assistance from the Park

XI. OTHER

- overseers and work trip leaders should wear some PMTC identification (such as a shirt or jacket or knapsack with a Club patch) while conducting trail work; all trail workers should be prepared to talk with hikers about their activities and the role of the Club in the Park
- overseers and work trips should remove all litter visible from the trail and, when appropriate, obliterate fire rings and illegal campsites

APPENDIX A
CLASSIFICATION OF BLUE BLAZED SIDE TRAILS

North District

Dickey Hill
Little Devil Stairs
Elkwallow
Possums Rest
Pole Bridge Link
Compton Peak

Central DistrictNON-WILDERNESS

Saddle (Old Rag)
White Oak Canyon
Hawkesbill
Dark Hollow Falls
Lewis Spring
Betty's Rock
Miller's Head
South River Falls
Little Stony Man
Mill Prong Spur
Laurel Prong
Crescent Rocks

WILDERNESS

Fork Mt.
Oventop-Pass Mt.
Big Blue
Overall-Beecher Ridge
Peak
Big Devils Stairs
Butterwood Branch
Jeremy's Run
Knob Mt. Cutoff
Overall Run
Piney Branch
Piney Ridge

Buck Hollow
Buck Ridge
Sams Ridge
Broad Hollow
Catlett Mt.
Hannah Run
Catlett Spur
Leading Ridge
Crusher Ridge
Hot-Short Mt.
Indian Run
Corbin Mt.
Corbin Hollow
Robertson Mt.
Naked Top
Powell Mt.
Lewis Mt. East
Lewis Mt. West
Poosin Hollow
Hensley Church
Jones Mt.
Staunton River
Cat Knob
McDaniel Hollow
(cont.)

South District

Doyle River

Beldor Ridge
Gap Run
Rocky Mountain
Brown Mt.-Rocky Mt.
Rocky Mt. Run
Rockytop
Lewis Peak
Austin Mt.
Furnace Mt.
Furnace Mt. Summit
Trayfoot
Rocks Mt.
Turk Mt.
One Mile Run
Big Run
Riprap
Wildcat Ridge

APPENDIX A (cont.)

WILDERNESS

Jones Mt. Cabin
Corbin Cabin Cutoff
Nicholson Hollow
Ridge (Old Rag)
Cedar Run
Rose River Loop
Saddleback Mt.