STATE OF NEW YORK
SUPREME COURT COUNTY OF ALBANY

In the Matter of the Application of

PROTECT THE ADIRONDACKS! INC.,

Plaintiff-Petitioner

For a Judgment Pursuant to Section 5 of Article 14 of the New York State Constitution and CPLR Article 78

-against-

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION and ADIRONDACK PARK AGENCY,

Defendants-Respondents.

REPLY AFFIDAVIT OF TATE CONNOR

Index No. 2137-13
RJI No. 01-13-ST-4541

Hon. Gerald W. Connolly

State of New York :
:ss:
County of Essex :

Tate Connor, being duly sworn, deposes and says:

1. I am a Forester I in the New York State Department of Environmental Conservation (DEC or Department) Region 5 in Ray Brook, New York, and am responsible for land use and recreational planning and management of Forest Preserve and other State lands under DEC's jurisdiction. I have extensive experience in the layout and construction of trails on forested lands; I have an Associate's Degree in Applied Science in Forest Recreation from Paul Smith's College (1999) and I have a Bachelors Degree of Science in Forestry from the University of Maine (2003). I am currently the land manager of the High Peaks Wilderness, Dix's Mountain Wilderness, Giant Mountain Wilderness and Hurricane Mountain Wilderness areas of the Adirondack Forest Preserve.

2. My background and experience are more fully described in my August 17, 2016 affidavit in support of the State's motion for summary judgment. *See* Aug. 17, 2016 Connor Aff. ¶¶ 1-3 and Exhibit A (Sept. 23, 2013 affidavit at ¶¶ 5-13, which includes a summary of my trail construction experience [at Appendix A]).

3. I am familiar with this proceeding and submit this affidavit as part of the State's reply on its motion for summary judgment, and in opposition to allegations in new affidavits of Mr. Signell, Mr. Bauer, and affidavits of Mr. Amadon and Mr. Sutherland submitted by plaintiff in response to the State's motion for summary judgment. *See* November 1, 2016 Affidavit of Peter Bauer; September 27, 2016 Affidavit of William Amadon; October 26, 2016 Affidavit of Steve Signell and September 27, 2016 Affidavit of Ronald W. Sutherland.

4. As disclosed in my prior affidavits, I was the construction supervisor for the Seventh Lake Mountain Trail. The Seventh Lake Mountain trail is a multi-use trail designed for safe recreational access to the Forest Preserve with features to control erosion, protect wetlands and streams, maintain the tree canopy and preserve and maintain the essential wild forest character of the Forest Preserve. Detailed responses to plaintiff's prior allegations can be found in my prior affidavits and a description of the basic principles involved in the design and construction of trails is in my September 23, 2013 Affidavit at ¶¶ 22-29.

5. Plaintiff has made many allegations over the past three years regarding the Seventh Lake Mountain Trail, a Class II trail on Forest Preserve land in the Adirondack Park, located in the Moose River Plains Wild Forest, approved in the 2011 Moose River Plains Wild Forest Unit Management Plan (UMP). Record Exhibit (R. Ex) 5 at 116, 119 (alt. 11), 125 (alt. 8). In addition to the above-mentioned affidavits, I also submitted sworn affidavits dated July 14, 2013 (opposing plaintiff's motion for preliminary injunction for the Seventh Lake Mountain

Trail); and September 26, 2016 (opposing plaintiff affidavits of Steve Signell dated Aug. 25, 2016 and Peter Bauer dated Aug. 31, 2016 regarding Class II trails and the Seventh Lake Mountain trail).

6. William Amadon is not qualified to offer expert testimony on proper trail construction and design, particularly with respect to the standards and requirements for trails on Forest Preserve lands. Mr. Amadon says that he works as a "professional trails manager in the Adirondack Park." Sept. 27, 2016 Amadon Aff. ¶ 2. However, his resume does not reflect any experience in construction or design of public trails for multiple uses, or snowmobile trails in the Forest Preserve, as is relevant here. Mr. Amadon's resume indicates that from 1980 to 2015, he was employed in landscape, gardening and greenhouse work, and as a campground facility supervisor responsible for accounting, public relations, facility maintenance and law enforcement. His professional work is devoid of public-use trail construction. Nor does he appear to have any educational background in forestry, as his degree is listed as a "BFA," which upon information and belief, is a Bachelor of Fine Arts. *See* Sept. 27, 2016 Amadon Aff., Ex. A.

7. Mr. Amadon's resume does reflect one year as a coordinator of Champlain area trails. S*ee* Sept. 27, 2016 Amadon Aff., Ex. A. As a resident of the Champlain Valley I am familiar with and have been on many of these trails. None of these trails are on State Forest Preserve lands. Many of these trails cross open farm fields and use old woods routes and do not need extensive trail development as would a multi-use trail in the Forest Preserve. Mr. Amadon alleges that he worked on "development and management" of foot trails in the Champlain Valley from July 2015 to the present, however, upon information and belief there has been very little if any new trail construction during this period of time, because most of the trail system was already built.

8. Although Mr. Amadon claims experience managing trails, he does not list any experience in trail design or construction. He asserts that he is familiar with the requirements for safe snowmobile trails having been an avid snowmobiler in his childhood, between 1965 and 1979. *See* Sept. 27, 2016 Amadon Aff. ¶ 4. However, even if Mr. Amadon's childhood snowmobiling experiences qualified him as an expert, which they do not, the snowmobiling industry and trail standards have undergone extensive changes in the last 37 years. He states no basis for his "acute knowledge" of the differences between Class II trails and foot trails, other than a familiarity with the 2009 Guidance. For all these reasons I take issue with Mr. Amadon's credibility with regard to proper trail construction and design, particularly the standards and requirements for trails on Forest Preserve lands. While some construction features are common to many kinds of trails, there are additional standards unique to the construction of trails in the Adirondack Forest Preserve. E.g. Record Exhibit (R. Ex.) 1 (APA Master Plan at 31-35); Ex. 8 (Management Guidance: Snowmobile Trail Siting, Construction and Maintenance on Forest Preserve lands in the Adirondack Park" [2009 Guidance]); Ex. 12 (2006 Standards for snowmobile bridge design and use of natural materials); Ex. 17 (#84-06 tree cutting policy); Ex. 18 (DEC's LF-91-2 tree cutting policy); Ex. 19 (1986 policy on snowmobile trails). These are some of the standards and policies I follow when constructing trails on the Forest Preserve. Mr. Amadon does not claim knowledge of these standards or policies, which govern this matter.

9. Mr. Amadon and Mr. Bauer allege that Class II trails do not have the character of foot trails. *See* Sept. 27, 2016 Amadon Aff. ¶ 9; *see also* Nov. 1, 2016 Bauer Aff. ¶¶ 5-7.

10. All trails intended for public use are constructed in the same manner with similar components. Trails require defined tread, management of vegetation, proper drainage, and bridges or walkways over water courses, all in a manner that blends with the natural

environment. Class II trails share many of the characteristics of foot trails, including terrain manipulation features, drainage devices, erosion control features, and bridges for natural resource protection and user safety.

11. The character of a trail is also influenced by the natural setting of the forest it is laid out in. Hiking trails going up mountains are intentionally laid out in rocky areas to take advantage of the use of the rocks to help channel water and be used as durable surfaces. In contrast, a trail laid out in rolling open forests will weave along a contour in the slope to allow the water to be drained off the side of the trail when possible.

12. Class II snowmobile trails have the same characteristics as foot trails but to varying degrees. For instance, in the High Peaks area of the Forest Preserve, there are eight different trail classifications, and they differ in terms of width, and drainage devices and terrain manipulation features used. Exhibit (Ex.) A. The classification system for the High Peaks area trails is used in other unit management plans as well.

13. Trail width varies depending on the type of trail. High Peaks classifications allow foot trails to be constructed to a trail corridor width of 6 feet. Ex. A at 256. However, trail construction manuals for the Forest Preserve allowed construction of foot trails up to a width of 8 feet. Exhibit B (p.38). *See also* Nov. 7, 2016 Ripp Aff. ¶¶ 6-7.

14. Terrain manipulation and drainage devices used on foot trails are also used on Class II trails.[1] This is evident in the attached photos I took of foot trails in the Adirondack Forest Preserve Ex. C. Photo 1 shows a feature know as a "bench cut."[2] Mr. Amadon and Mr. Bauer argue that Class II trails require bench cuts several feet high, unlike foot trails. S*ee* Sept.

[1] A description of trail construction features can be found in my affidavit dated August 17, 2016 (Ex. A, ¶¶ 5-13).
[2] Bench cutting is the process of constructing a trail across the side slope of a hill. Cutting into the slope and removal of the cut material creates a stable "bench" on which the trail can be placed. This prevents the trail from sloughing off down the mountain.

27, 2016 Amadon Aff. ¶ 15; *see also* Nov. 1, 2016 Bauer Aff. ¶ 13. However, as photo 1 shows, bench cuts several feet high are in fact used on foot trails in the Forest Preserve, just as they are on Class II trails, for erosion control.

15. Contrary to Mr. Amadon's assertions these trail construction features are not for "ease of travel" but rather for trail sustainability. *See* Sept. 27, 2016 Amadon Aff. ¶ 15. They protect the natural resources of the Forest Preserve by preventing erosion and shedding water off the trail.

16. Mr. Amadon further argues that Class II trails require a flat surface. *See* Sept. 27, 2016 Amadon Aff. ¶ 14. However, like Class II trails, a hardened flat surface can also be found on a hiking trail. Ex. C (Photo 2). Additionally, a feature known as "turnpiking" can also be found on hiking trails and Class II trails. Ex. C (Photo 3). Turnpiking is trail tread that is raised with rocks, gravel or mineral soil contained by wood or rocks borders.

17. Mr. Amadon claims that the challenged connector trails have more stumps than foot trails. *See* Sept. 27, 2016 Amadon Aff. ¶ 16. Generally, for the same width corridor, the stumps would be the same. In areas where Class II trails are laid out on flat sections of the forest floor there is no "grubbing" (the digging out or removing the top layer of the forest floor down to mineral soil) of the top layer duff and soil down to a mineral soil tread, which is normally the case for foot trails. Grubbing would include the removal of stumps and of the organic material off the trail tread of a hiking trail. It is needed to help establish a trail tread that is composed of mostly mineral soil. Exposing the mineral soil on a hiking trail allows the trail to shed water more easily and contributes to it being more sustainable. The tread area (for flat sections) of a Class II trail only needs to be grubbed out for hiking or other non-winter uses, not for snowmobiles.

18. Next, Mr. Amadon alleges that unlike foot trails, Class II trails "are often graded with heavy equipment." *See* Sept. 27, 2016 Amadon Aff. ¶ 18. In addition to the use of hand tools on construction of Class II trials, the 2009 Guidance permits the use of small scale landscaping equipment in the construction of Class II trails. R. Ex. 8 at 8. A discussion of the use of this equipment on construction of the Seventh Lake Mountain trail can be found in the transcript of my deposition in this matter. *See* October 26, 2016 Affirmation of Loretta Simon, Exhibit 3(Jan. 21, 2015 Deposition Transcript of Tate Connor at 52:11; 54:4 use of low impact landscaping equipment).

19. Mr. Amadon complains that bedrock manipulation is highly unnatural. *See* Sept. 27, 2016 Amadon Aff. ¶ 20. But bedrock is manipulated in order to develop and maintain foot trails, too. For example, wooden ladders are pinned to a rock face at the Orebed hiking trail on Gothic Mountain to allow hikers to go up a rock face. Ex. C (Photo 4), and on Hitch up Matilda, in the High Peaks Wilderness, holes were drilled in a rock wall to suspend a bridge over Avalanche Lake. Ex. C (Photo 5).

20. Mr. Amadon also mistakenly alleges that gravel is not used in foot trails. *See* Sept. 27, 2016 Amadon Aff. ¶ 20. The use of gravel or "crush" (broken pieces of bigger rock) is regularly used on hiking trails to help raise the trail tread and harden muddy sections of trails. Ex. C (Photo 6).

21. Mr. Amadon alleges that Class II trails are much wider than foot trails and require "deep and frequent water bars." *See* Sept. 27, 2016 Amadon Aff. ¶ 23. Water bars are an erosion control feature used on all trails. A foot trail on Cascade Mountain in the High Peaks has an example of deep water bars used to allow surface water to flow off the trail and prevent erosion.

This trail has extensive erosion caused by heavy foot traffic on areas greater than the trail's designed width, necessitating deep, oversized water bars. Ex C (Photo 7).

22. Without identifying a specific trail, Mr. Amadon argues that he saw frequent openings in the canopy of Class II trails. *See* Sept. 27, 2016 Amadon Aff. ¶ 24. Because Mr. Amadon identifies no specific locations, I cannot refute this claim specifically. In general, however, the Department strives to preserve the canopy and we largely succeed. Forest canopy preservation varies depending on forest type and natural openings along the routed trail. For instance, wind throw, blowdown and streams create natural openings. As construction supervisor of the Seventh Lake Mountain trail, I can confirm that none of the trail was constructed above a 12-foot height as per the 2009 Guidance and the forest canopy on the trail is mostly intact as a result of not targeting large overstory trees for removal.

23. Mr. Amadon complains that signs on Class II trails are similar to highway signs. The Department places signs on all trails where public access is allowed. Permanent signs on the Seventh Lake Mountain trail, and most trails in the Forest Preserve, utilize a yellow-on-brown format. Additionally, snowmobile clubs are allowed to put up temporary plastic signs for information and safety, as part of their volunteer stewardship agreements with the Department. These signs are smaller than typical highway signs.

24. Finally, Mr. Amadon says that Class II trails are constructed for 25 mile per hour travel. To the contrary, the trails are not designed for high speed, but rather are designed to have curves and twists to help keep speeds down.

25. Mr. Bauer, plaintiff's Executive Director, claims having photographed over 9,000 tree stumps during his visit to the Seventh Lake Mountain trail in July and August 2016. *See* Nov. 1, 2016 Bauer Aff. ¶ 8. However, as I have previously sworn, the tally for tree cutting on

the Seventh Lake Mountain trail was fewer than 1,924 live trees and 161 dead trees. *See* Aug. 17, 2016 Connor Aff. ¶¶ 10, 12. To the extent Mr. Bauer is counting seedlings, saplings or brush under 3" diameter-at-breast height, these are not considered timber sized trees and are not counted. *See* Sept. 26, 2016 Connor Aff. ¶ 14. Additionally, Mr. Bauer does not assert that he has any experience, education or training in trail construction and design, or scientific training in natural ecosystems or identification of plant species, which would qualify him to identify trees or distinguish tree stumps from other woody plants, or to offer an opinion as to whether a stump was caused by human intervention.

26. Mr. Bauer claims to have reviewed my August 2016 affidavit describing my visit to portions of two segments of Seventh Lake Mountain trail. Mr. Bauer claims there is trail erosion as the result of the construction of the Seventh Lake Mountain trail. *See* Nov. 1, 2016 Bauer Aff. ¶ 12. His exhibit B photos show portions of the Seventh Lake Mountain that were routed on old woods routes. The first picture shows two puddles of standing water, with no indication of erosion of soil. The second picture shows a portion of a seasonal stream or spring running along part of the trail tread, which was present prior to building the trail. Pictures 3 and 4 are more examples of seasonal drainage that runs parallel with the trail, occupying part of the trail tread. There is no visual evidence of erosion that is associated with use of this trail since its construction. In all the pictures there is either standing water, indicating a wet section of trail or vegetation and forest floor duff that hasn't been disturbed.

27. Mr. Bauer alleges there is a lack of revegetation on some bench cut areas along the trail. Nov. 1, 2016 Bauer Aff., Ex. D. Not every square inch of the forest is full of vegetation. Large portions of the forest floor have layers of leaf litter in various stages of decay, which create the rich organic matter for more plants to grow. As seen in Mr. Bauer's Exhibit D,

portions of the upslope area of the bench cuts are covered in leaves, which will decompose. Also there is evidence of adjacent vegetation growing over the area. Over time, this area will build a deeper organic layer that will support the growth of more vegetation on the upslopes.

28. Mr. Bauer claims that there are "fields of grass" along the Seventh Lake Mountain trail, and that they are not part of the natural ecosystem. Nov. 1, 2016 Bauer Aff. ¶ 15. Grass is planted as a temporary erosion control measure. *See* Nov. 7, 2016 Ripp Aff. ¶ 16. Grass is shade intolerant and will eventually die, making room for other plants to grow and providing the beginnings of an organic layer of soil for them to grow on.

29. Mr. Bauer claims large pits and holes were left along the trail and they contrast with the surrounding forest. Nov. 1, 2016 Bauer Aff. ¶ 17. The surrounding forest floor is neither flat nor full of smooth transitions. Tree hummocks, rocks and streams contribute to a landscape that is varied. The small areas adjacent to the trail are smoother or feathered vs leaving an unsightly terrain cut when the trail was built.

30. Mr. Bauer claims that roots of trees were destroyed during construction of the Class II trail, alleging that this destruction is different than construction for hiking trails. Nov. 1, 2016 Bauer Aff. ¶ 20. Most trails require some cutting of tree roots along the route, as tree roots extend out from the tree trunks to a width at least as large as the branches of the tree reach. It would be nearly impossible to construct a trail that is grubbed down to mineral soil without cutting tree roots. Hiking trails have an equal amount of root impact and for the most part the root impacts on forest grown trees will not be the leading cause of any mortality.

31. Mr. Bauer alleges that there is woody debris piled up along the side of the trail. Nov. 1, 2016 Bauer Aff. ¶ 21. It is entirely possible that materials are adjacent to the trail, but it is also possible that those materials are the result of blowdown and wind throw that have been

cleared off the trail as part of regular maintenance each year since construction. Since Mr. Bauer, like Mr. Amadon, does not identify particular locations, it is difficult to respond to this blanket allegation.

32. Mr. Bauer describes an area along the Seventh Mountain Lake trail as a 250-yard "mistake." Nov. 1, 2016 Bauer Aff. ¶ 23. In fact, the Department determined that there was a better location for the trail that improved a stream crossing location, which was approximately 250 feet. This area was part of the original carriage trail that the existing DEC trail (prior to 2012) was routed on. The area was wet and needed to be rerouted, to be placed in a more sustainable location. All the trees cut during the construction are included in the tree tallies, including this section. Mr. Bauer would apparently prefer it if the Department did not use better routes when it identifies them in the field.

33. Finally, Steve Signell's comparison of Class II trails in the Adirondack Forest Preserve with trails in the United States Forest Service (USFS) and the National Parks Service National Trails System is not relevant. Oct. 26, 2016 Signell Aff. ¶¶ 11-16. Those definitions do not apply to the Forest Preserve lands that are constitutionally protected, are managed under the State Land Master Plan, and are subject to the many policies and standards set forth above.

TATE CONNOR

Sworn to before me this
16 day of November, 2016

Kathy R Scriver
Notary Public

Kathy R. Scriver
Notary Public, State of New York
No. 01SC6146364
Qualified in Franklin County
Commission Expires May 15, 2018

AFFIDAVIT OF TATE CONNOR SWORN TO NOVEMBER 16, 2016

EXHIBIT LIST

Exhibit A	High Peaks Wilderness Complex Unit Management Plan excerpt (Trail classifications)
Exhibit B	Trail Construction and Maintenance Manual
Exhibit C	Photographs of foot trails in the Adirondack Forest Preserve

Photo 1	Bench cut
Photo 2	Hardened surface on hiking trail
Photo 3	Turnpiking
Photo 4	Wooden ladders on rock face (Orebed trail to Gothics Mountain)
Photo 5	Walkway on rock wall on Avalanche Lake
Photo 6	Gravel used on foot trail (Indian Pass trail)
Photo 7	Water bar on foot trail (Cascade Mountain)

EXHIBIT A

Department of Environmental Conservation

Office of Natural Resources - Region 5

High Peaks Wilderness Complex Unit Management Plan

Wilderness Management for the High Peaks of the Adirondack Park

March 1999

New York State Department of Environmental Conservation
George E. Pataki, *Governor* John P. Cahill, *Commissioner*

TRAIL CLASSIFICATION SYSTEM - HIGH PEAKS WILDERNESS AREA

TITLE	EXAMPLE	MARKING	TREAD	BARRIERS	USE LEVEL	ACCEPTABLE MAINTENANCE
I. Unmarked Route	Fisherman's Path	None	Intermittently apparent, relatively undisturbed organic soil horizon	Natural obstructions present, logs and water courses	Occasional	None
II. Path	Table Top herd paths	Intermittent	Intermittently apparent, compaction of duff, mineral soils occasionally exposed	Same as unmarked route	Low, varies by location	Intermittent marking with consideration given to appropriate layout based on drainage, occasional barrier removal only to define appropriate route.
III. Primitive	Wallface Ponds	Trail markers, sign at junction with secondary or other upper level trail	Apparent, soil compaction evident	Limited natural obstructions (logs and river fords)	Low	Drainage (native materials) where necessary to minimize erosion, blowdown removed 2-3 years, brushing as necessary to define trail (every 5-10 years), bridges only to protect resource (max - 2 log width), ladders only to protect exceptionally steep sections, tread 14"-18", clear: 3' wide, 3' high.
IV. Secondary	Phelps Mtn. Mt. Colden	Markers, signs with basic information	Likely worn and possibly quite eroded. Rocks exposed, little or no duff remaining	Up to one year's accumulated blowdown, small streams.	Moderate	Drainage where needed to halt erosion and limit potential erosion (using native materials), tread hardening with native materials where drainage proves to be insufficient to control erosion. Remove blowdown annually. Brush to maintain trail corridor. Higher use may warrant greater use of bridges (2-3 logs wide) for resource protection. Ladders on exceptionally steep rock faces. Tread 18"-24". Clear 4' wide, 3' High.
V. Trunk Trail or Primary	Van Hoevenberg (Mt. Marcy)	Markers, signed with more information and warnings.	Wider tread, worn and very evident. Rock exposed, possibly very eroded.	Obstructions only rarely, small streams	High	Same as above; Plus: regular blowdown removal on designated ski trails, non-native materials as last resort, extensive tread hardening when needed, bridge streams (2-4 logs wide) difficult to cross during high water, priority given to stream crossings below concentrations of designated camping. Tread 18"-26", clear 6' wide, 8' high, actual turn piking limited to 2% of trail length.

TRAIL CLASSIFICATION SYSTEM - HIGH PEAKS WILDERNESS AREA						
TITLE	**EXAMPLE**	**MARKING**	**TREAD**	**BARRIERS**	**USE LEVEL**	**ACCEPTABLE MAINTENANCE**
VI. Front Country	Visitor Information Center	Heavily marked, detailed interpretive signing	Groomed	None	Very High	Extensive grooming, some paving, bark chips, handicapped accessible. This is to be implemented within 500' of wilderness boundary.
VII. Horse Trail	Cold River Loop	Marked as Trunk or Secondary	Wide tread, must be rather smooth.	Same as trunk trail.	Moderate to High	Same as trunk trail, except use techniques appropriate for horses. Bridges: 6' minimum width with kick rails, non-native dimensional materials preferred. Tread: 2'-4' wide, clear 8' wide, 10' high.
VIII. Ski Trail	Whale's Tail	Marked High. Special markers, sign at all junctions with hiking trails.	Duff remains. Discourage summer use	Practically none due to hazards.	High	Focus on removal of obstructions, maintenance should be low profile, tread determined by clearing 6' (Should be slightly wider at turns and steep sections. Provide drainage using native materials to protect resource.

EXHIBIT B

TRAIL CONSTRUCTION and MAINTENANCE MANUAL

N.Y.S.D.E.C. Division of Operations

Manual Committee

Douglas Fletcher, Chairman
Donald Smith
John Dalton
Bruce Richards
Gary West

Trail Construction and Maintenance Manual

Introduction

The purpose of this manual is to demonstrate some basic fundamentals of trail work and set guidelines of uniformity in maintenance of DEC trails for our personnel.

The manual states guidelines for the design, construction, and maintenance of trails as hiking, horse, snowmobile, canoe, and cross-country ski trails. The ideas can be directly applied to the trails but some on-site decisions will have to be made to adapt these ideas to fit specific situations. For example, two different types of drainage techniques can be used together such as steps with a water-bar placed above them to curb erosion problems. Experience in trail work is an important ability which allows the trail worker to develop a feel of what device will solve the problem and when to use that technique again.

The major purpose of constructing and maintaining any trail system is to provide an enjoyable outdoor recreational experience for the trail user.

Important Key Factors

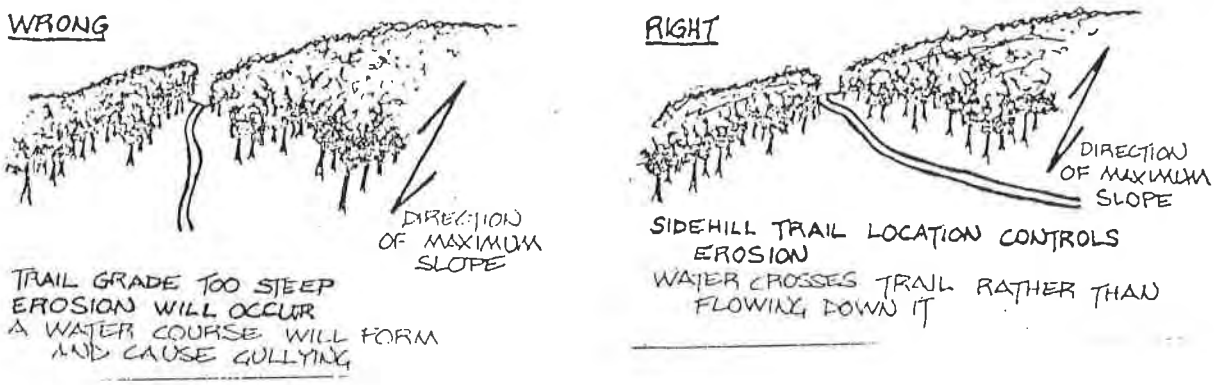
1. Layout

Trail Location: One of the most important steps in trail development is the location of the trail. After full approval is obtained from the field office or supervisor in charge, field work can begin.

In layout of the trail, locating the general course of the trail with survey flagging is a good idea. Flagging the trail location should be done carefully and double checked to make sure layout is correct. The trail location should be checked at different times

during the year to make sure all factors have been properly considered. The best time for trail layout is during spring or fall when leaves are off the trees. Trail alignment is easier at this time as the visibility of terrain factors such as slope, surface drainage features and obstacles show up better. For winter snow oriented trails, inspect trail in winter when snow is present, check amount of snow and look for drainage problems that will require maintenance. Try to locate trail away from wet or swampy areas to avoid mud maintenance problems. Locating the trail where steep hills are present, use sidehill trail location to prevent serious erosion gullying, wherever possible.

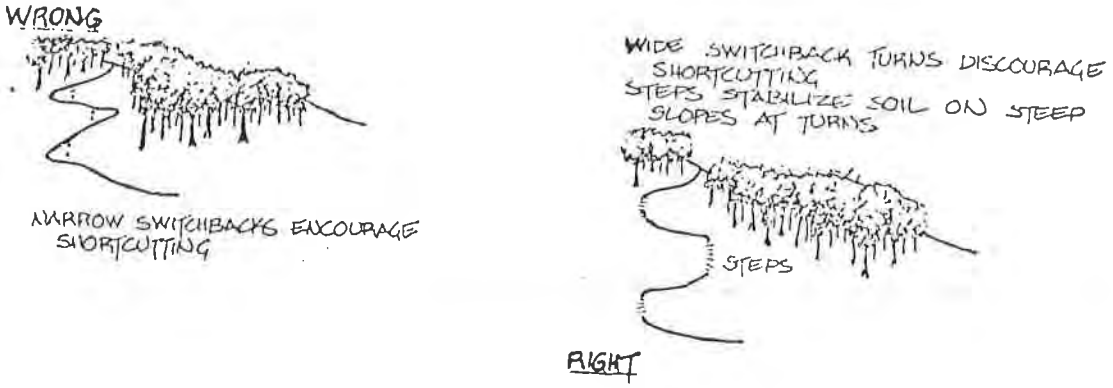
TRAIL LOCATION



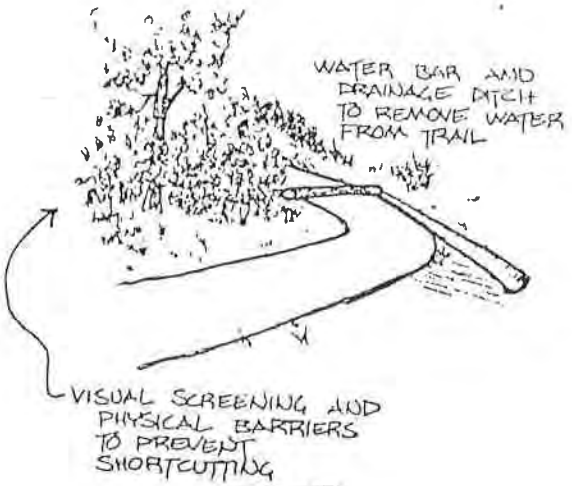
Usually the steeper the slope to be crossed by a trail, the narrower the trail tread should be constructed.

Switchback: Where steep slopes are present another method of dealing with erosion is with the use of switchbacks. The point where a trail turns to wind back is called a switchback. They should only be used when absolutely necessary as they are difficult to build and maintain.

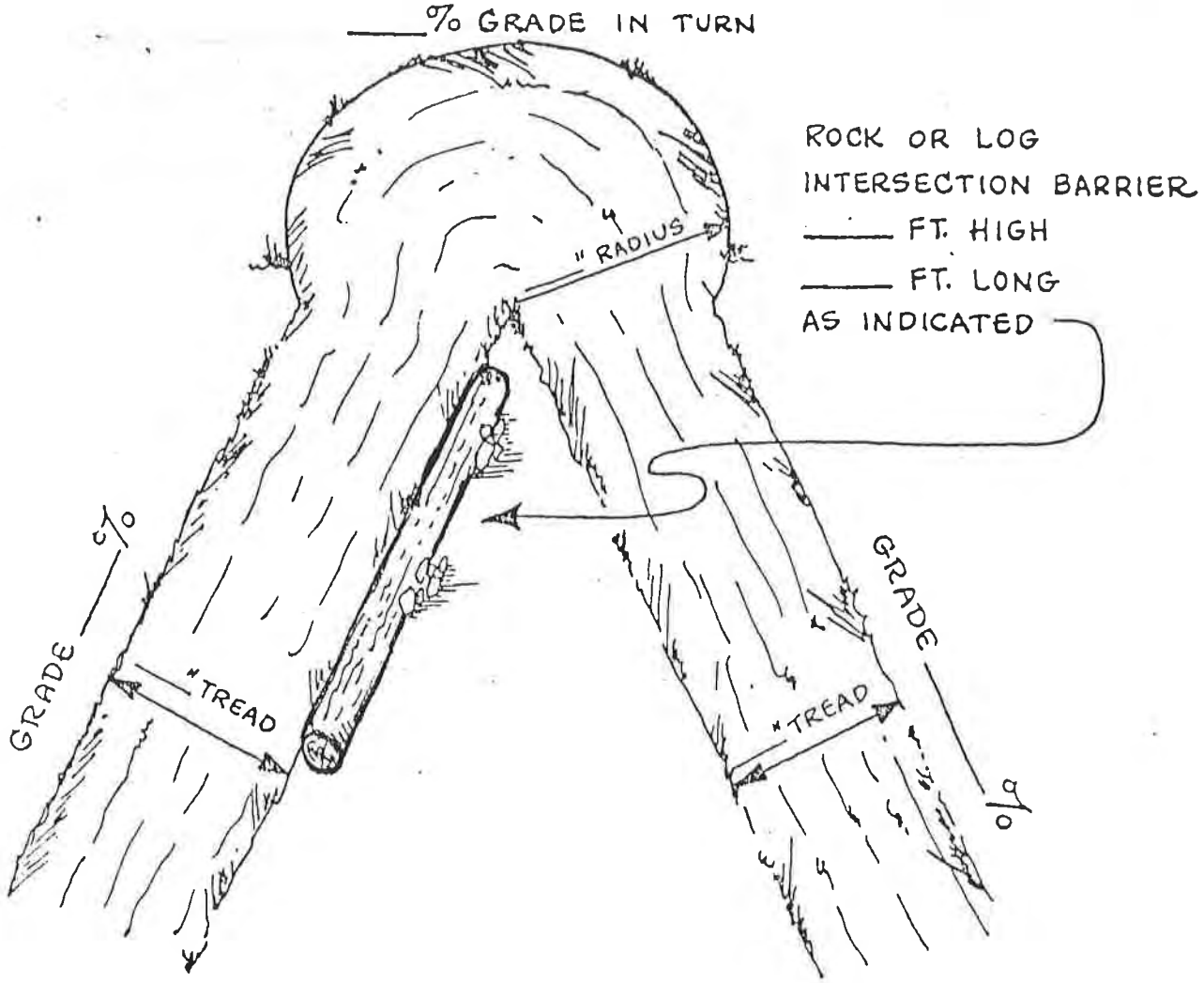
When switchbacks are not designed properly, when the legs are too close together, hikers will shortcut the trail causing the erosion process to set in. Try to keep one leg of switchback not visible from another to prevent shortcutting. Generally switchbacks should not be used on short, frequently used trails. They are best used on long trails where there is enough room and cover to screen the switchback legs.



SWITCHBACK



TRAIL SWITCHBACKS

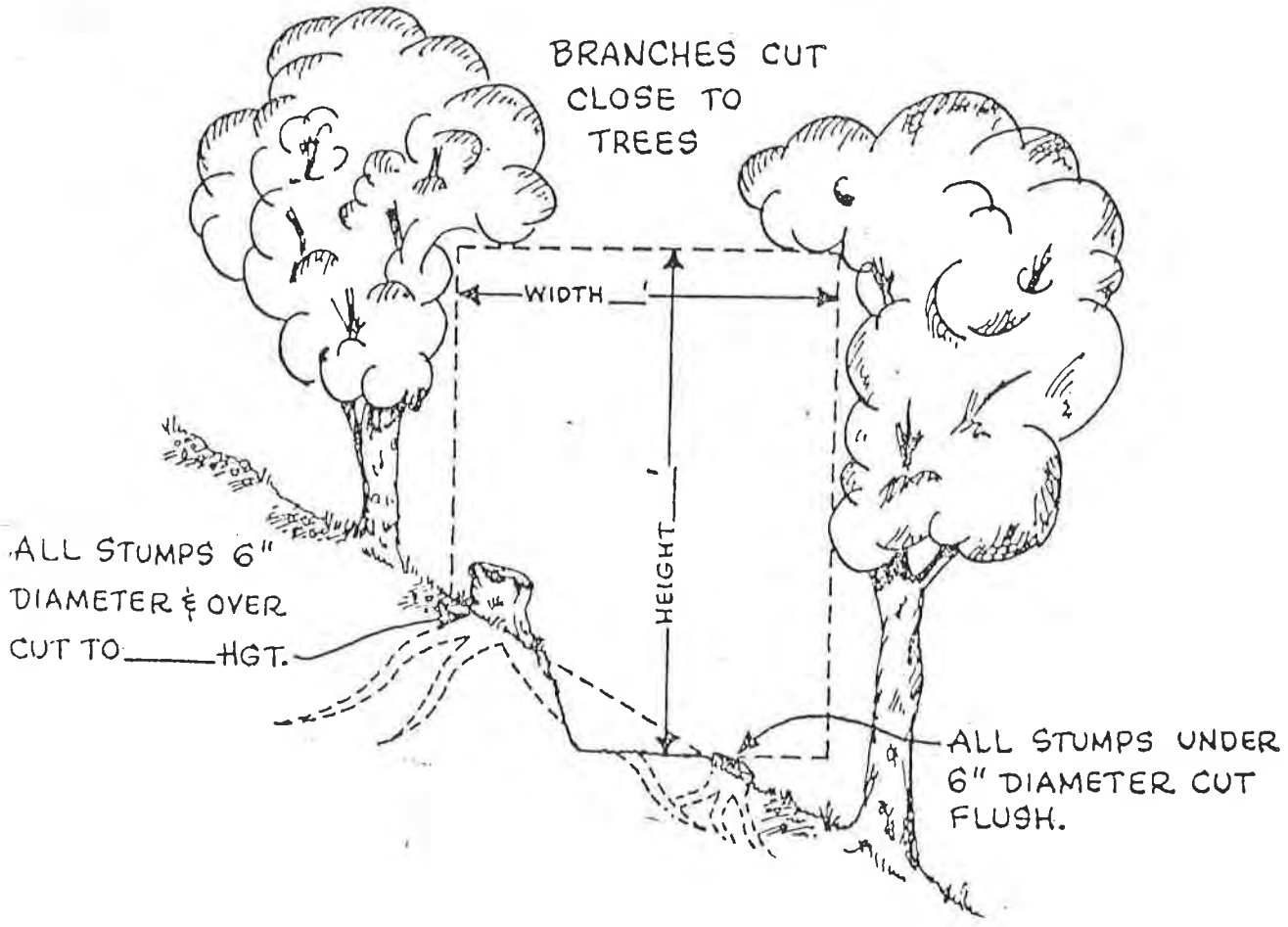


SWITCHBACK DETAIL

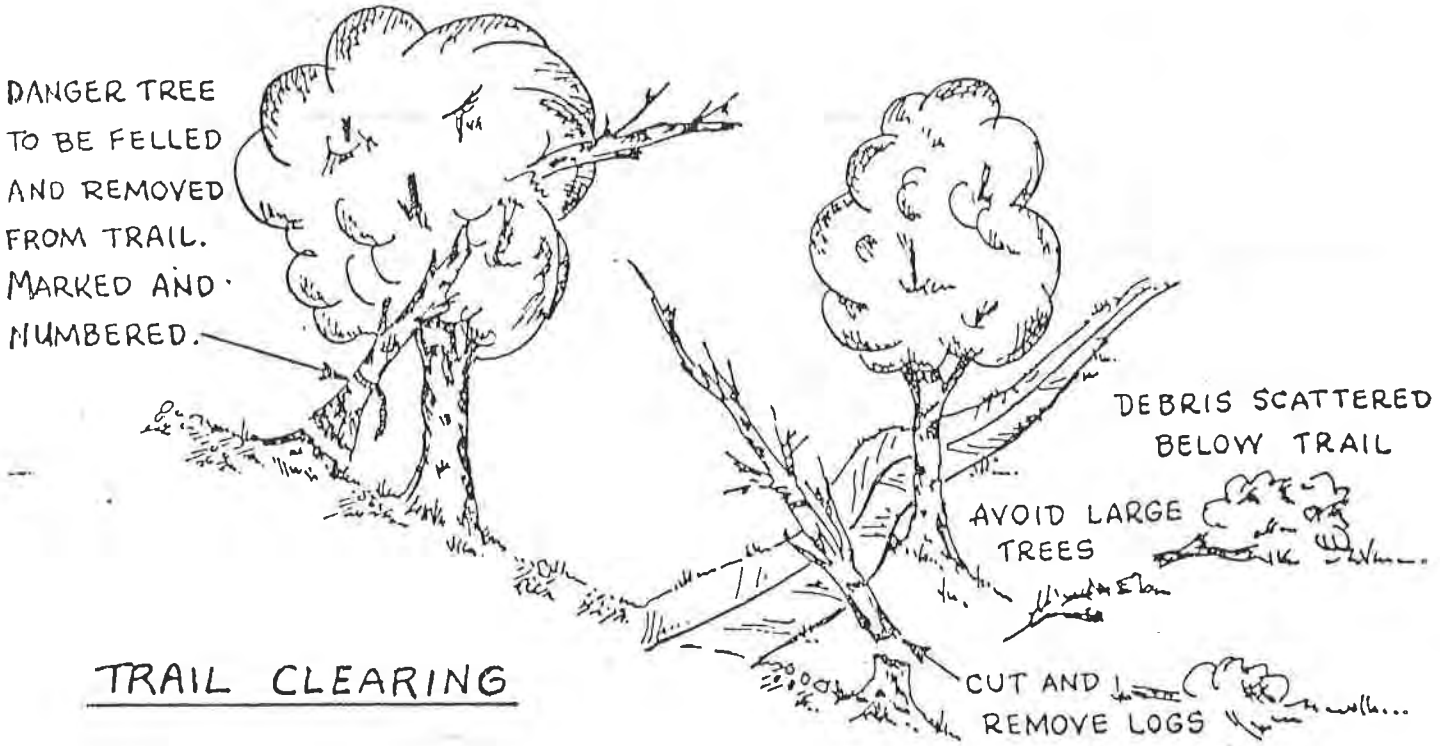
2. Clearing of Trails

The basic step in trail construction is establishing proper trail dimensions, the clearing of trails. The trail width will vary depending on the trail's purpose, its use, and the type of terrain. Trails should be cleared to accommodate the activity safely and comfortably as far as side and overhead brushing; when cutting always allow for wet (rain or snow covered) branches or brush interfering with the trail clearance.

TRAIL CLEARING

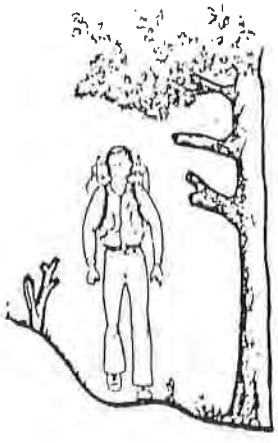


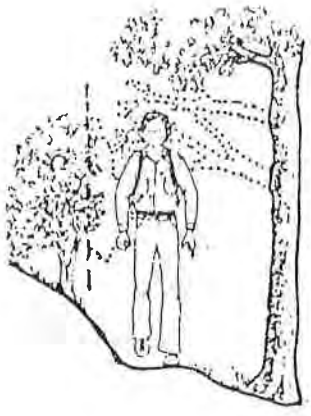
Proper clearing will reduce the expense of maintaining the trail and time involved in working the trail, over a period of time. When clearing the trail, all blowdown must be cut-out the full trail tread width and removed from the trail.



TRAIL CLEARING

Brush and sapplings along the edges of the trail must be cut at ground level to avoid sharp dry stumps and stubbles which are safety hazards for trail users. All brush should be removed from the trail tread and scattered below trail. All dead and dangerous trees along the trail should be cut down as preventive maintenance and removed from trail tread. Any roots and stumps should be cut and removed also.





3. Drainage and Erosion Control

Once the layout and clearance of the trail tread is finished then drainage and erosion control measures have to be installed. One of the most important steps in trail construction is providing for adequate drainage and control of erosion.

There are two types of drainage, surface drainage and cross drainage. When surface drainage is not under control, erosion destroys the trail tread fast causing gouging and ravines. With cross drainage the water force from creeks, springs, or side slope run-off can cause serious washouts of trail tread.

Waterbar: Waterbars are designed to direct surface water (from heavy rain or snow run-off) off the trail before it has reached a high velocity to prevent serious erosion damage to trail tread. It lowers the amount of water running down a trail eliminating ruts and ravines. This device will help prevent erosion on new trails as well as help control erosion on older trails when worked in maintenance schedules.

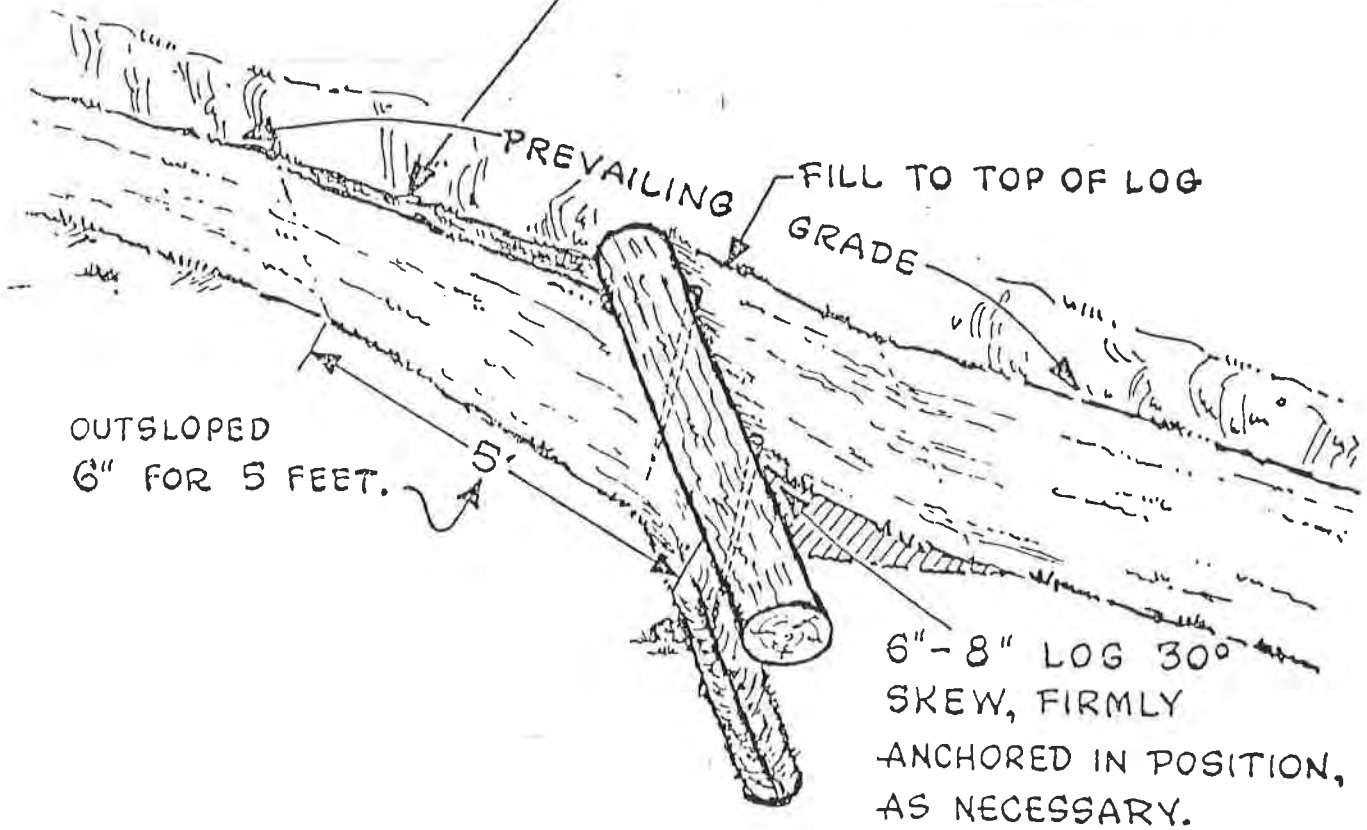
To install a waterbar, dig a ditch a little larger than the log to be used. The bar should lie almost flush with the downhill side of the trail and be buried to approximately half its diameter on the uphill side. This prevents water from undercutting the log. The log should extend one foot beyond each edge of the trail to keep water from returning to the trail below the bar. Stakes two to three inches in diameter and three feet long are used to secure the log after it is in place in the ditch. To prevent tripping trail users, cut the stakes flush with the top of the log. Starting about five feet before the bar, the trail should be outsloped until a verticle distance of six inches is attained at the bar, enabling the bar to function properly and prevent clogging.

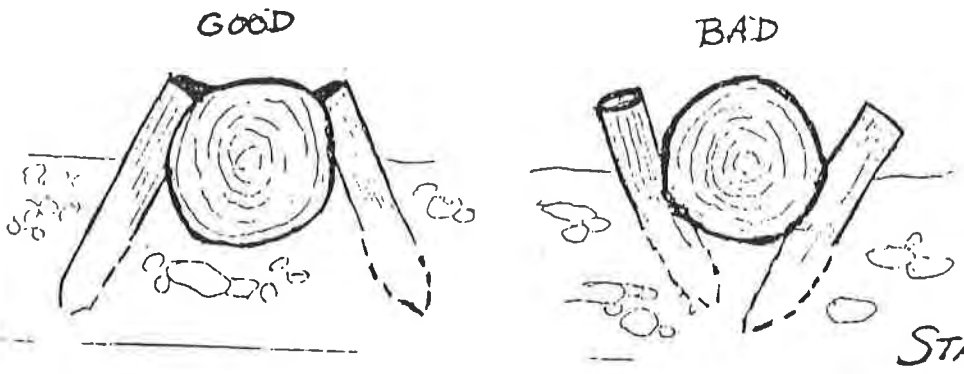
TRAIL WATER BAR

WHERE NEEDED TO COLLECT WATER, CONSTRUCT A DITCH HERE FOR 5 FEET AS PART OF THIS SPECIFICATION.

SPECIES SELECTION

1. SPRUCE
2. HEMLOCK
3. CEDAR

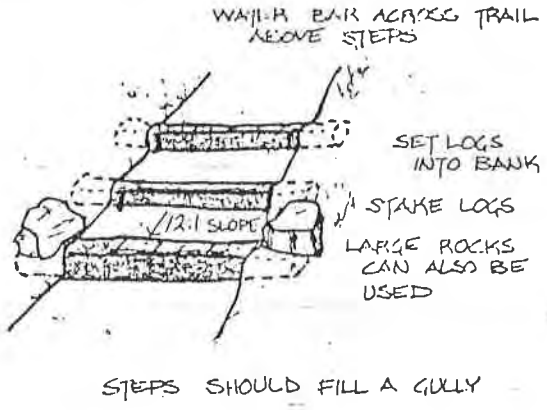


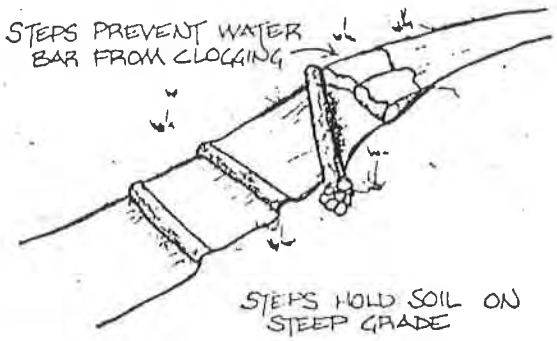


STAKE SUPPORTS

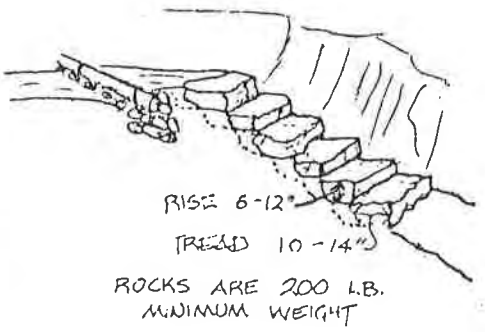
Steps: On steep slopes, steps should be used for stabilization and retension of trail tread material, and steps aid hikers in climbing slopes.

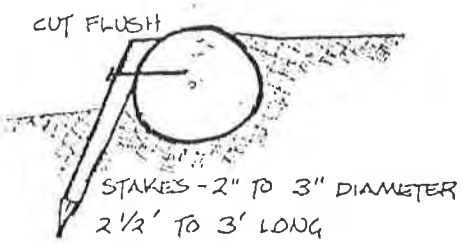
LOG STEPS





OVERLAPPING ROCK STEPS

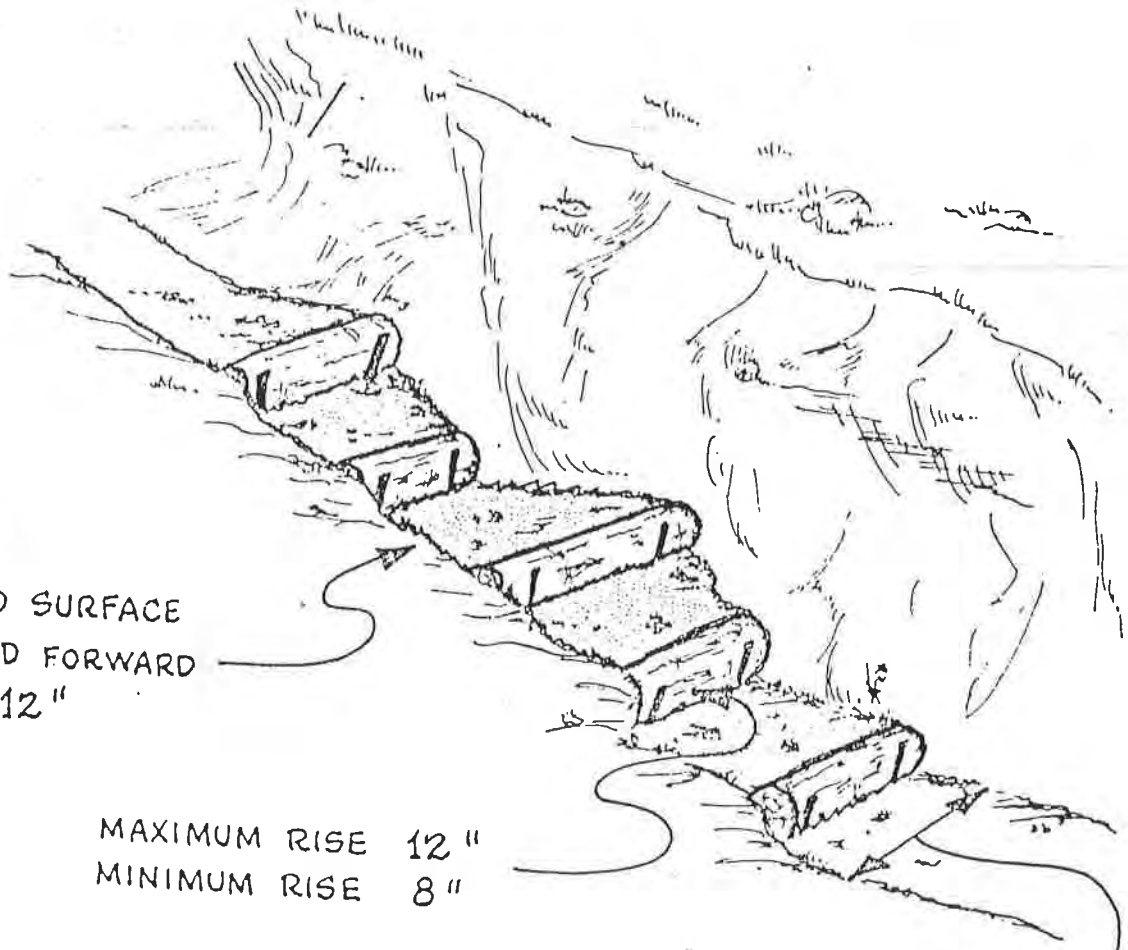




Steps can be constructed of logs or rock or pressure treated timber. They also work well filling in gullies that surface drainage water create. On steep slopes, a waterbar above or ahead of a series of steps works well as an erosion control device. Steps hold the soil and a waterbar placed above the steps prevent them from washing out.

Log Steps: When using logs, remove all limbs, trim knots flush, cut ends neatly and peel the bark. Remove all debris from the trail afterwards. Then for log steps, dig a trench approximately one-third the diameter of the log and set it into the trench. Drive a stake

NATIVE LOG OR TREATED LOG STEPS



TREAD SURFACE
SLOPED FORWARD
1" : 12"

MAXIMUM RISE 12"
MINIMUM RISE 8"

STEP WIDTHS SHALL BE 2-4 FEET UNLESS FIELD CONDITIONS RESTRICT THIS TO A LESSER WIDTH

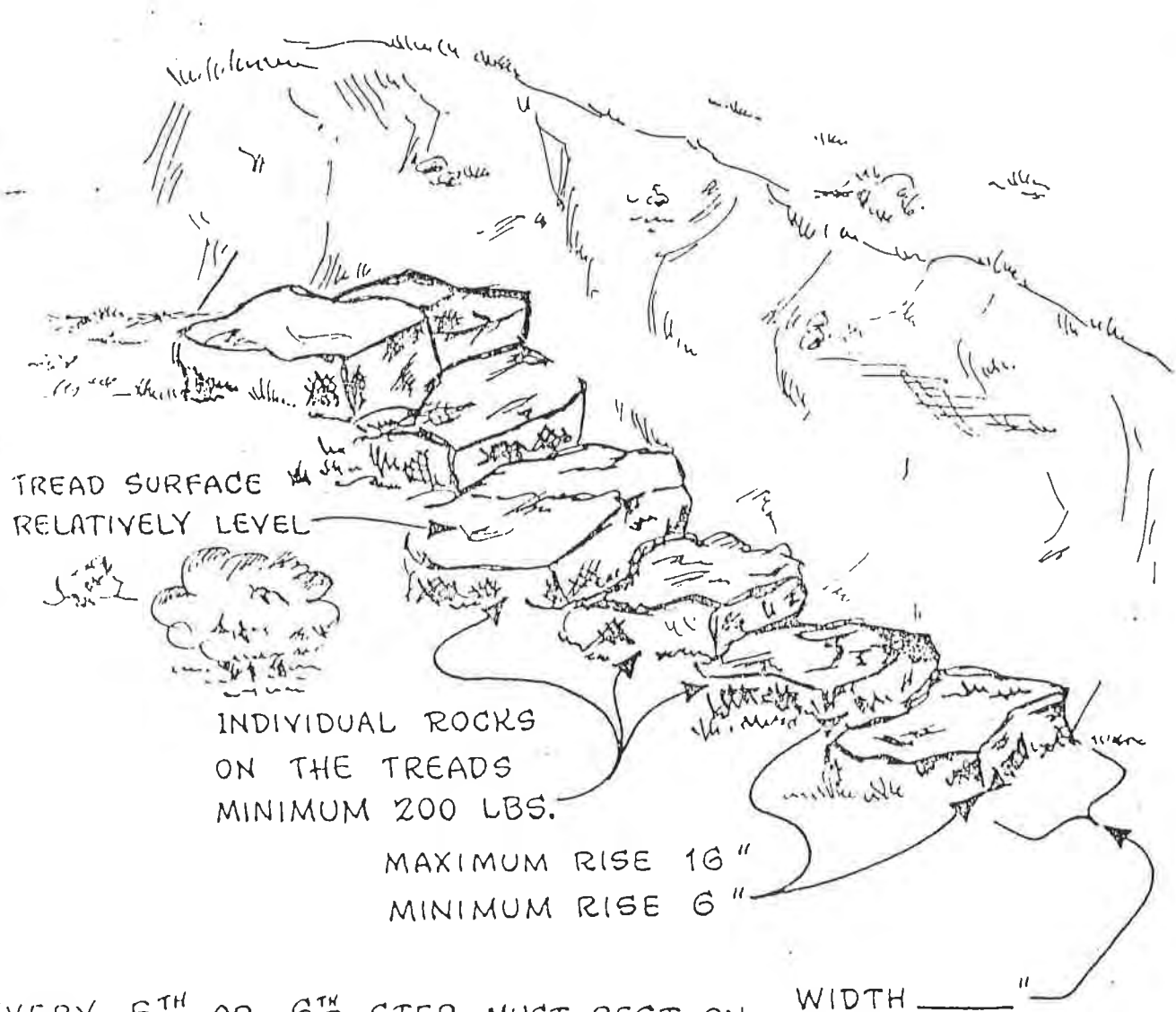
FOR NATIVE LOG STEPS THE MAXIMUM DISTANCE BETWEEN LOGS IS 3'.

SPECIES SELECTION

1. SPRUCE
2. HEMLOCK
3. CEDAR

into the ground at each end of the log on downhill side of step (stake two to three feet long), and spike them to the step. Cut the top of the stake flush with the top of the log step to prevent a tripping hazard. Backfill behind the log and tamp hard to compact soil to hold in place. Follow same procedure with other steps. Be sure to hew the top surface of the logs to make them easy and safe to walk on.

TRAIL ROCK STEPS



EVERY 5TH OR 6TH STEP MUST REST ON A NATURAL SOLID FOOTING.

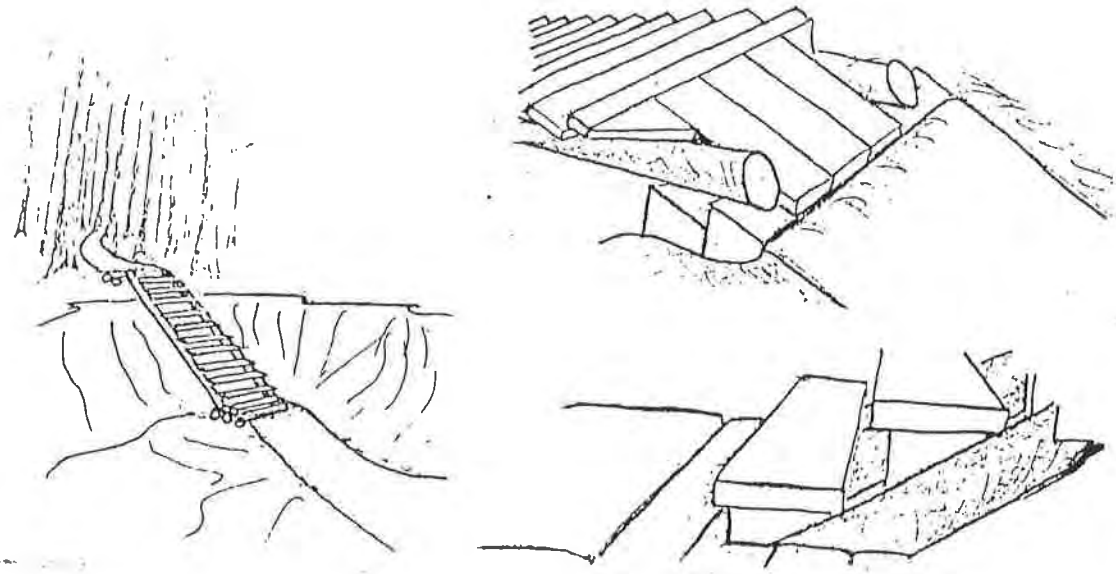
THE LOWER FRONT EDGE OF EVERY STEP MUST REST FIRMLY ON TREAD BELOW.

Rock Steps: When constructing start from the bottom of a slope and work upward. Dig a hole in the trail where the bottom step is to be placed, setting stone with the widest and flattest surface placed up, providing a smooth and level tread to step on. Allow enough space between each step for safe easy walking. The top step should be flush with the normal trail tread. Steps should be angled outward slightly to allow for surface drainage off step and off trail. Fit each stone carefully to ensure solid foundation, with no rocking or shifting when stepped on. Overlapping rock steps will aid in stability and hold in place. As with wood steps it is advisable to place a waterbar above the steps to divert surface run-off.

A trail step ladder, rock or log cribbing, or a special technique as a combination of crib and ladder may fit the bill for construction on top of or next to a gully when steps cannot be built because of severe erosion.

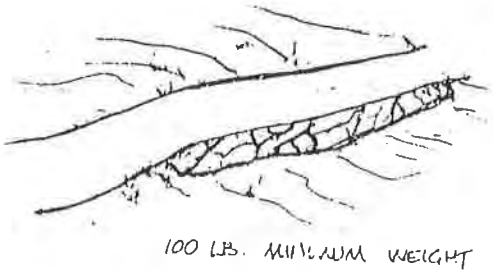
Step Ladder: It is important to secure the base of the ladder, anchored to the ground so it does not shift. The base may have to be cribbed to provide a suitable support for the ladder. Large stones placed at the bottom of the ladder help to stabilize it in place. Material for ladder can be logs or pressure treated lumber.

TRAIL STEP LADDER

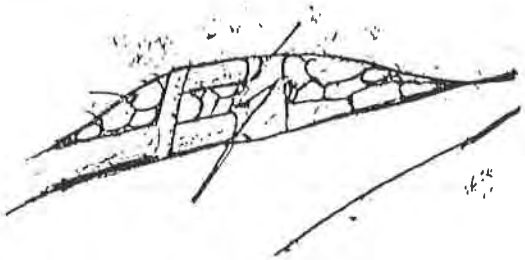


Rock Cribbing: This can be used to stabilize the low side of a trail. To construct, dig a trench in which the rocks can be set as though constructing rock steps. Place rocks to have a tight fit together.

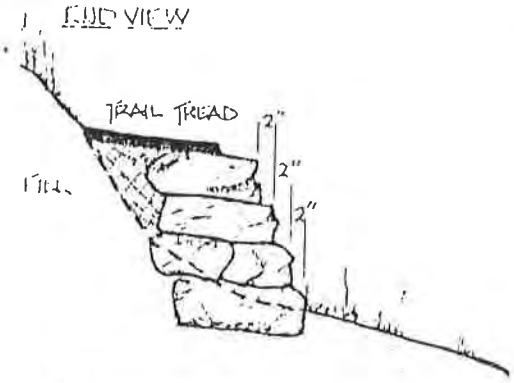
ROCK CRIBBING



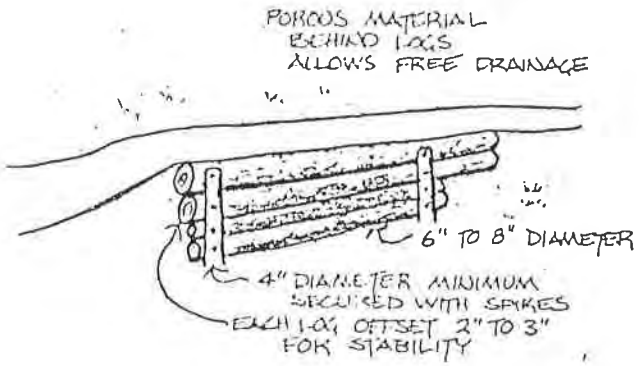
LOG & ROCK CRIBBING AND ROCK CRIBBING



ROCK WALL CRIB



LOG CRIBBING



Log Cribbing: This serves the same purpose as a rock cribbing. Logs are laid along edge of gully and then firmly secured with large stakes, but logs can also be secured against rocks and trees that are next to the trail. Logs can also be placed across the tread as combination spacers, steps and retainers. Logs should be six to ten inches in diameter, straight, peeled with limbs cut flush. When building a log crib with one log on top of another, offset the next log back toward the tread by two to three inches to add stability to the structure. Cribbing can also be used to reinforce and stabilize banks on uphill sides of a trail. Variations can be used in combination depending on the terrain and drainage problem of that particular site.

TRAIL ROCK CRIBBING

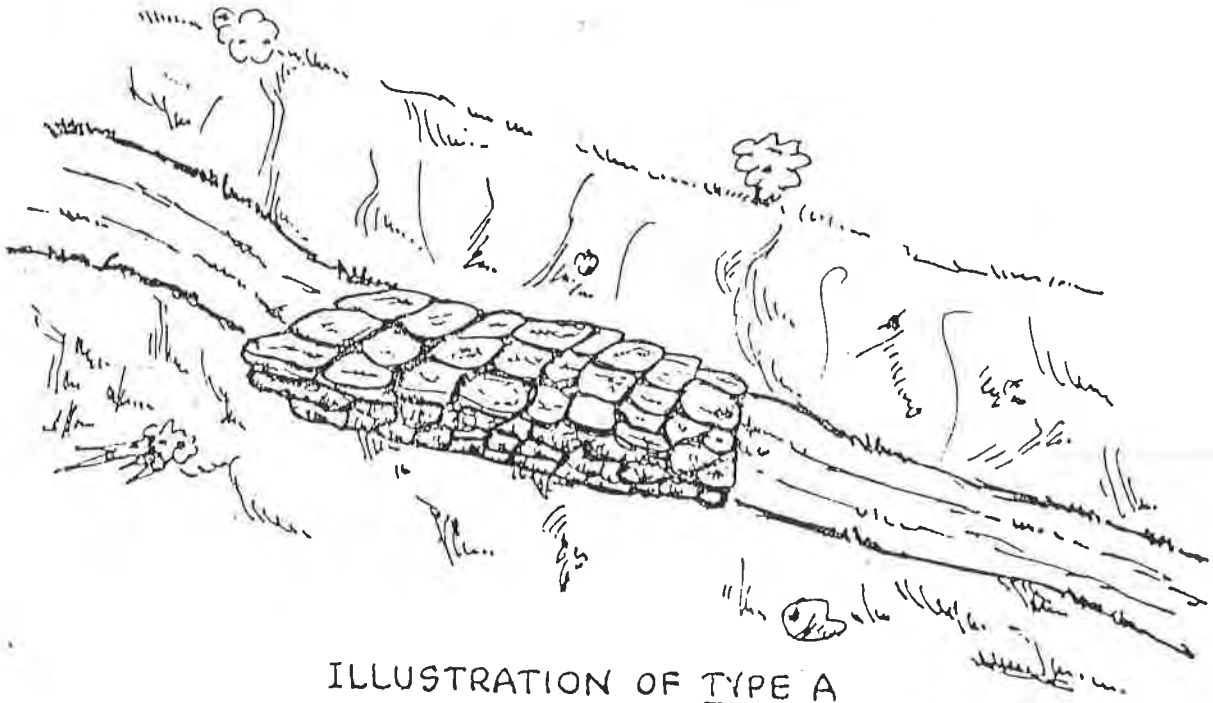


ILLUSTRATION OF TYPE A
(TYPE A...MAXIMUM DEPTH 2' OR UNDER)
WIDTH____"

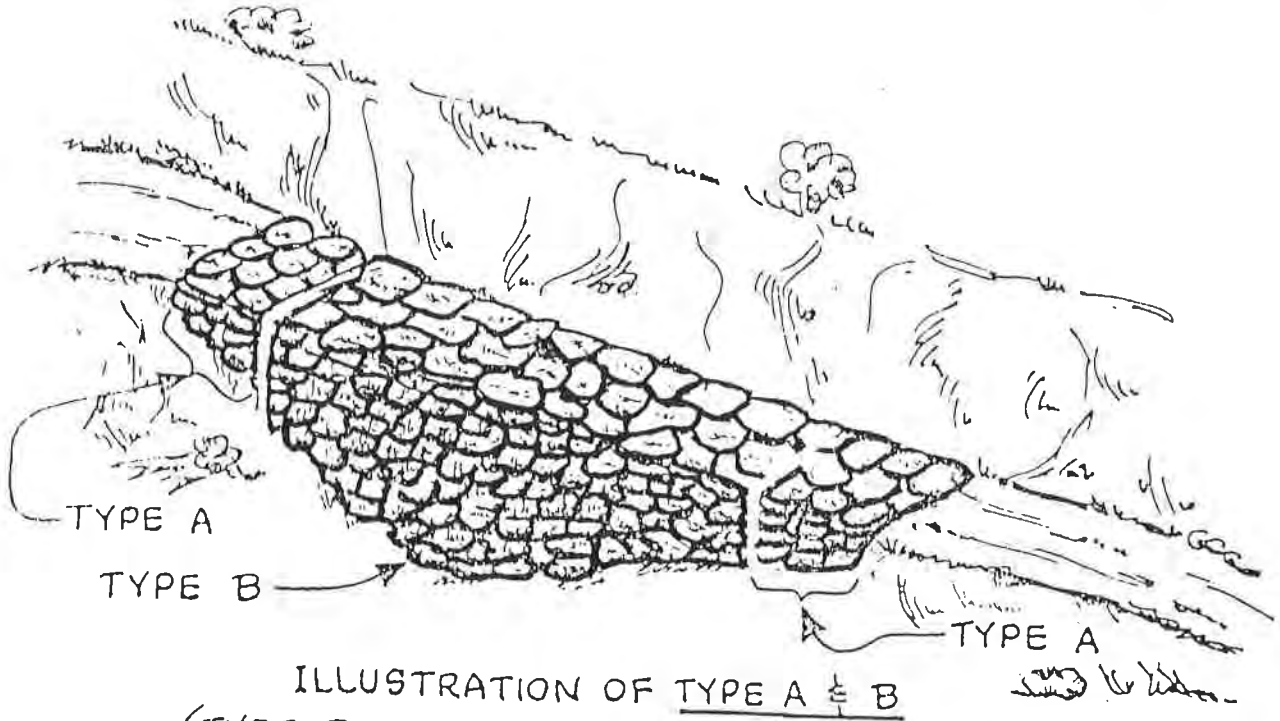
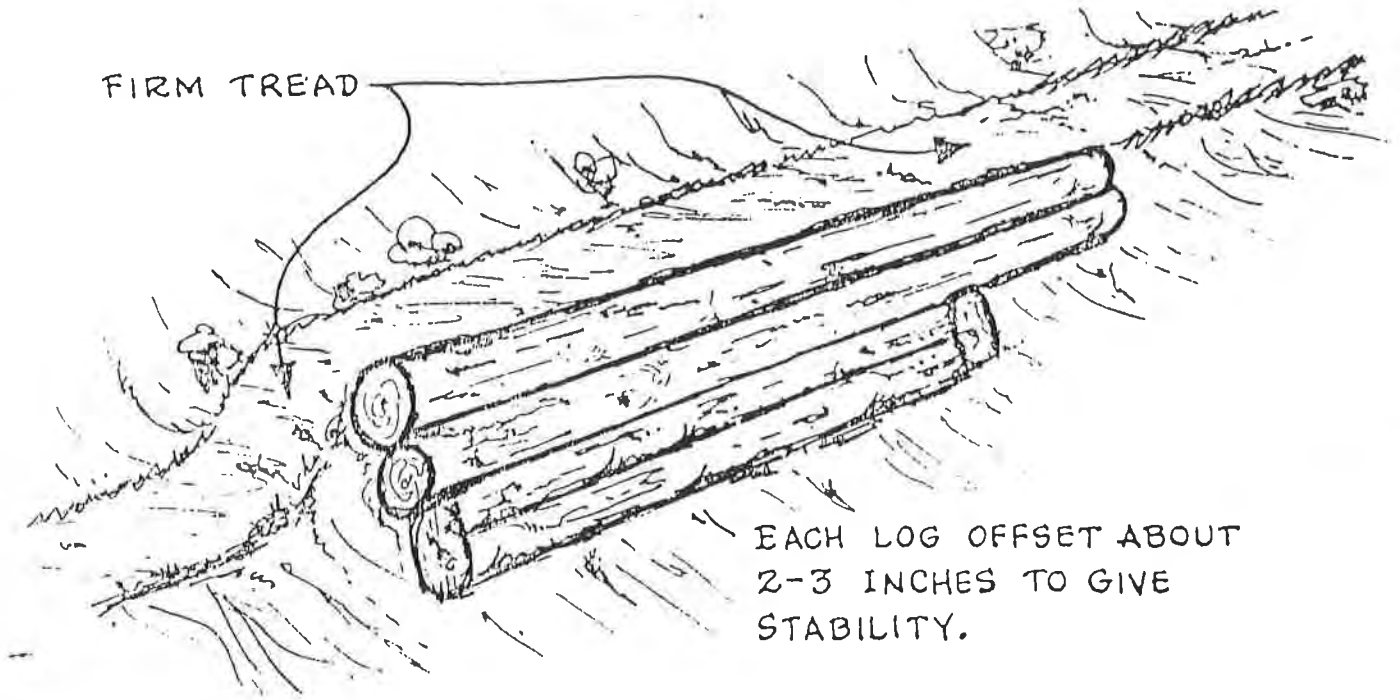
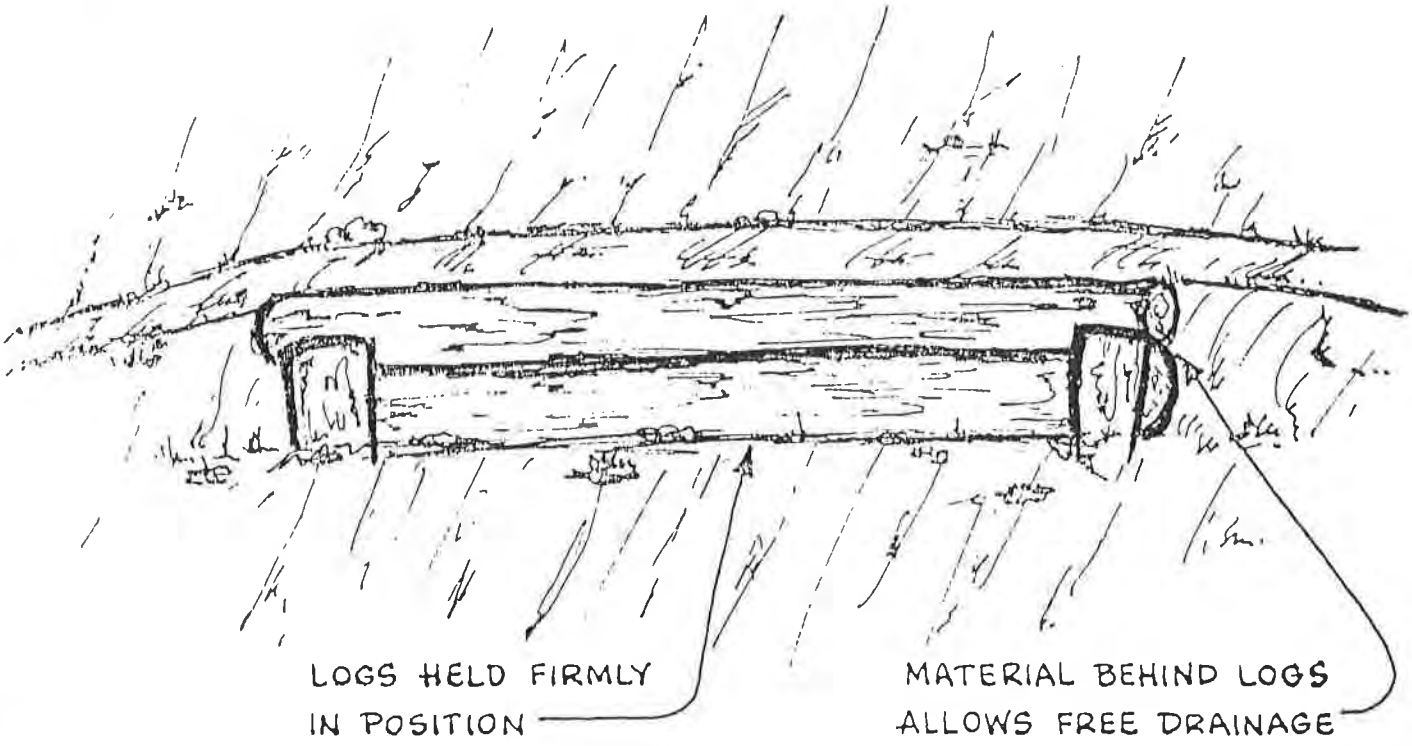


ILLUSTRATION OF TYPE A & B
(TYPE B...MAXIMUM DEPTH OVER 2')
WIDTH____"

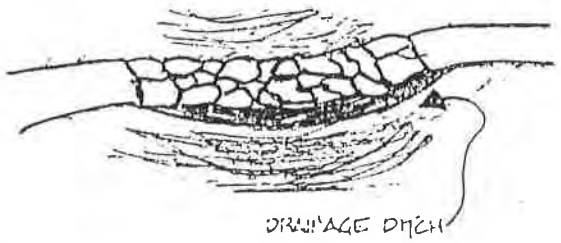
TRAIL LOG - CRIBBING





Rock Tread: One stabilizing method of trail tread through boggy, swampy areas is rock tread construction. Rock tread is a series of large stepping stones, flat surfaced rocks set in a bed of gravel fill four to six inches deep with a drainage ditch for surface run-off.

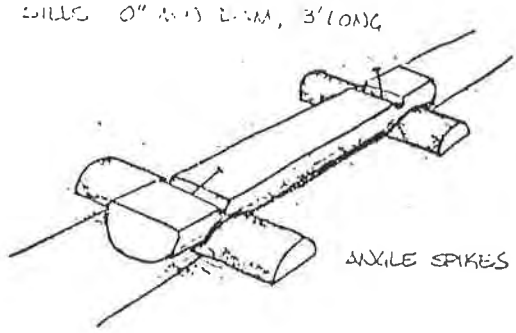
ROCK TREAD



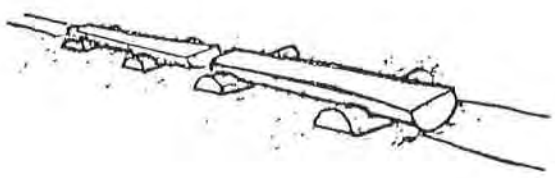
Single and Double Log Bridge: Crossing over muddy areas of the trail is aided by the construction of timber bog bridges. Using logs, this method consists of one or two stringer logs spiked to base sill logs, which are supported by rocks or firm ground for stability. The bridge tread surface should be hewn level. Stringer logs should not come in contact with soil to prolong bridge life. When cutting material on-site, make sure all limbs are cut flush with log and ends are cut neat. Pressure treated material is also used on this type of bridge when available.

SINGLE LOG BRIDGE

STRINGER - 8" MIN DIAM.
SILLS - 6" MIN DIAM., 3' LONG



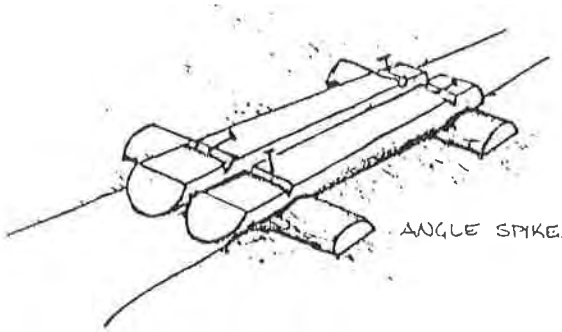
PLACE SILLS 12" FROM ENDS OF STRINGER



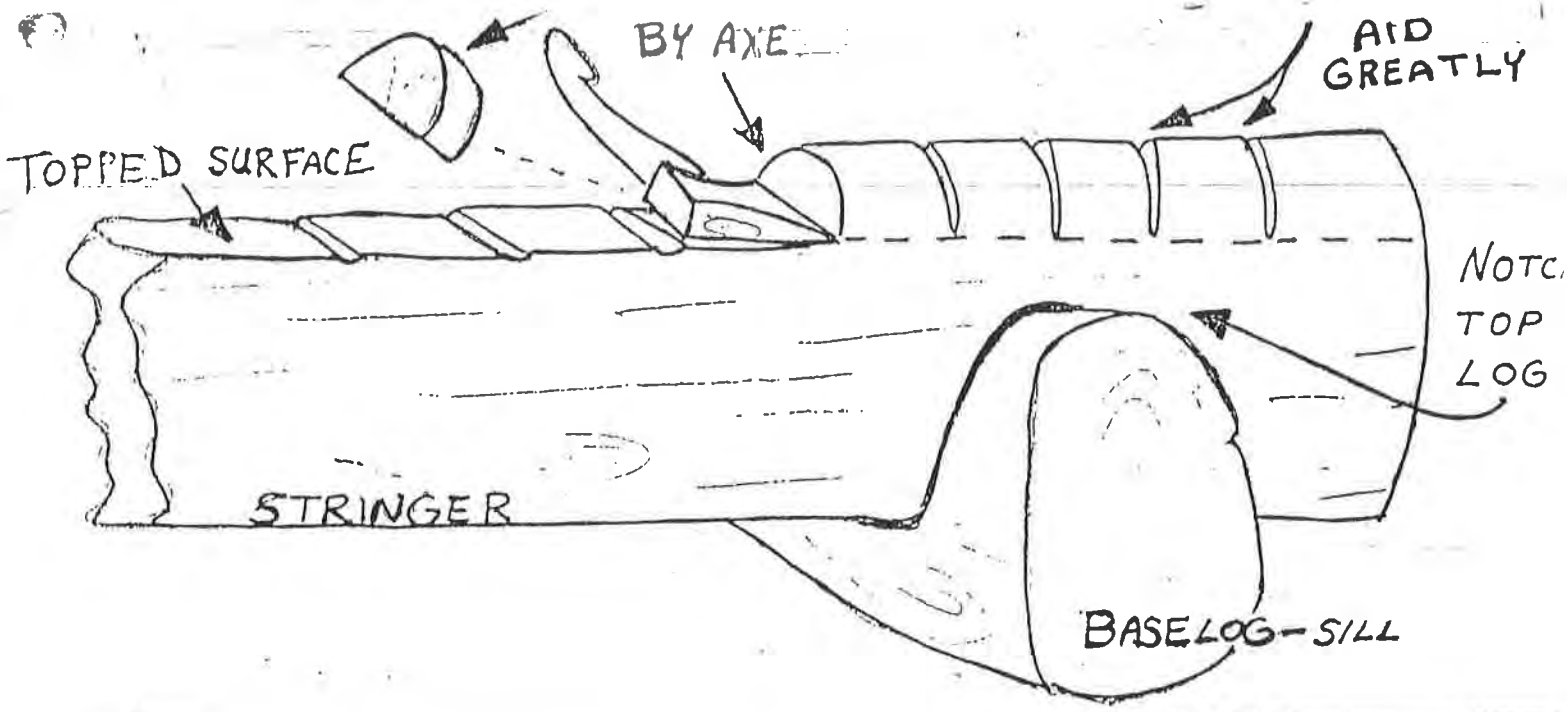
BRIDGES SHOULD BE PLACED NO MORE THAN 6" APART

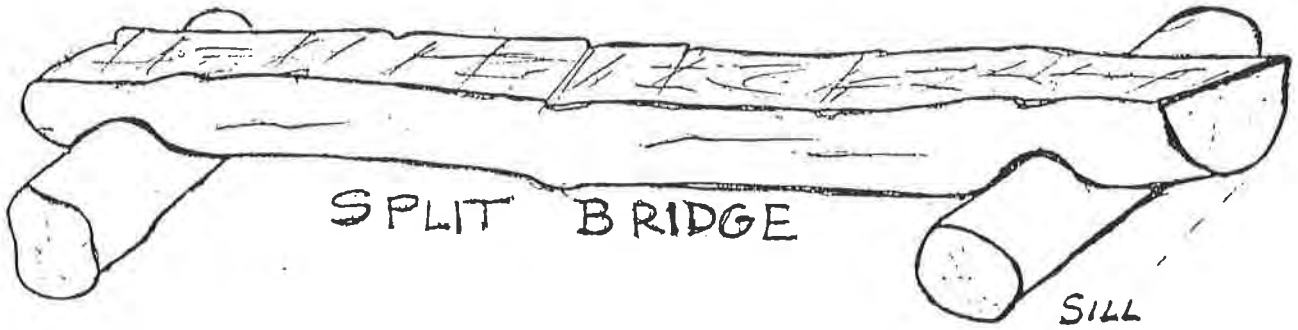
DOUBLE LOG BRIDGE

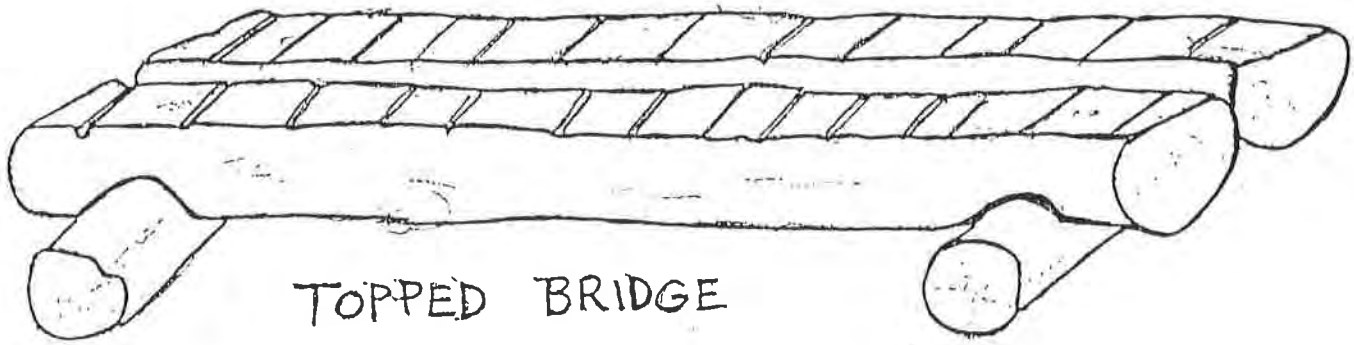
STRINGERS - 8" MIN DIAM.
SILLS - 6" MIN DIAM., 3' LONG

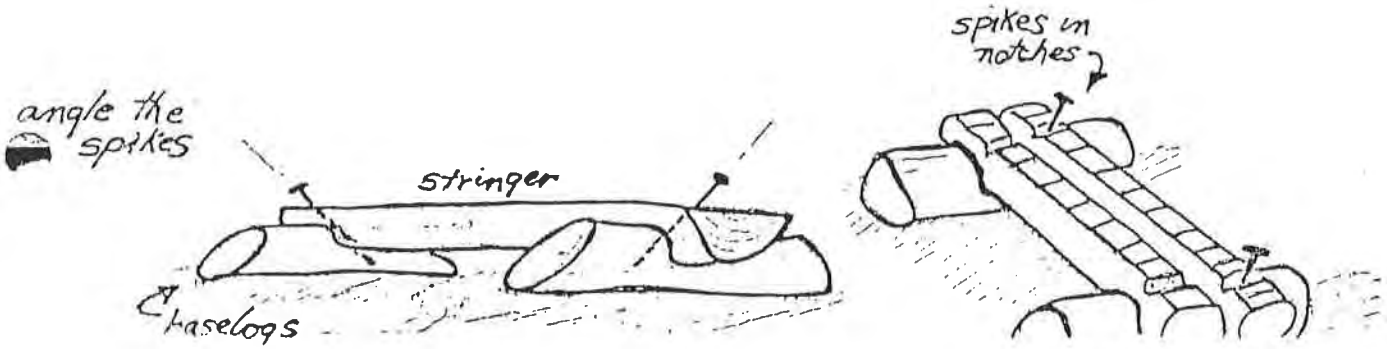


PLACE SILLS 12" FROM ENDS OF STRINGERS

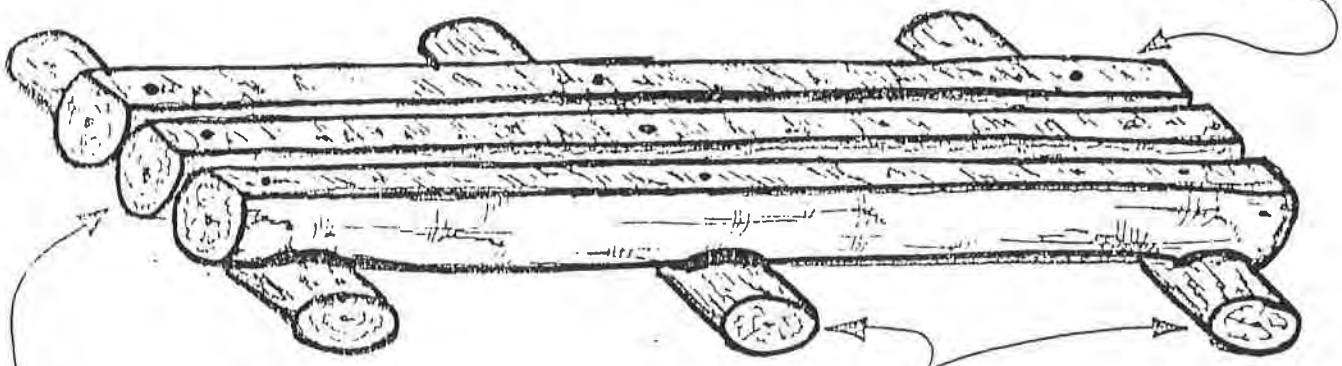

BY AXE
AID GREATLY
TOPPED SURFACE
NOTC
TOP LOG
STRINGER
BASELOG-SILL

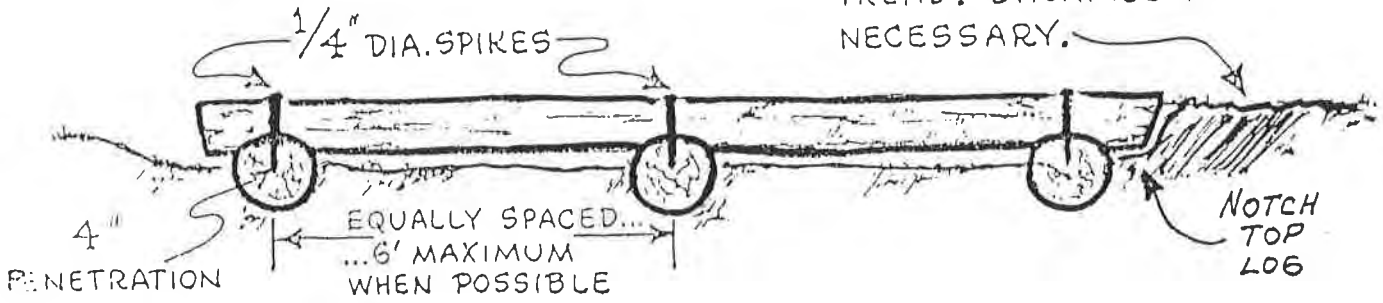

SPLIT BRIDGE
SILL

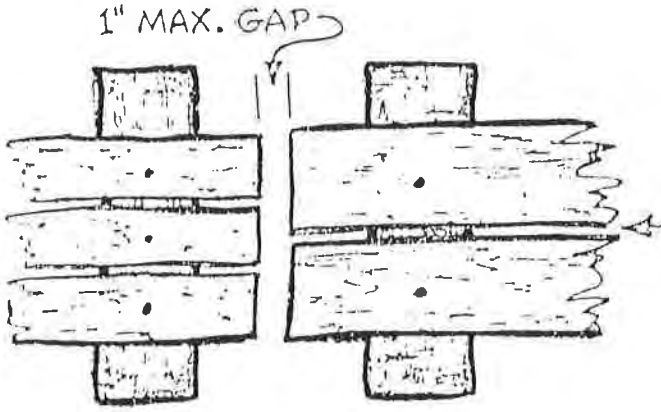

TOPPED BRIDGE


angle the spikes
stringer
baselogs
spikes in notches

TRAIL BRIDGE
(NATIVE MATERIAL)







TYPICAL JOINT

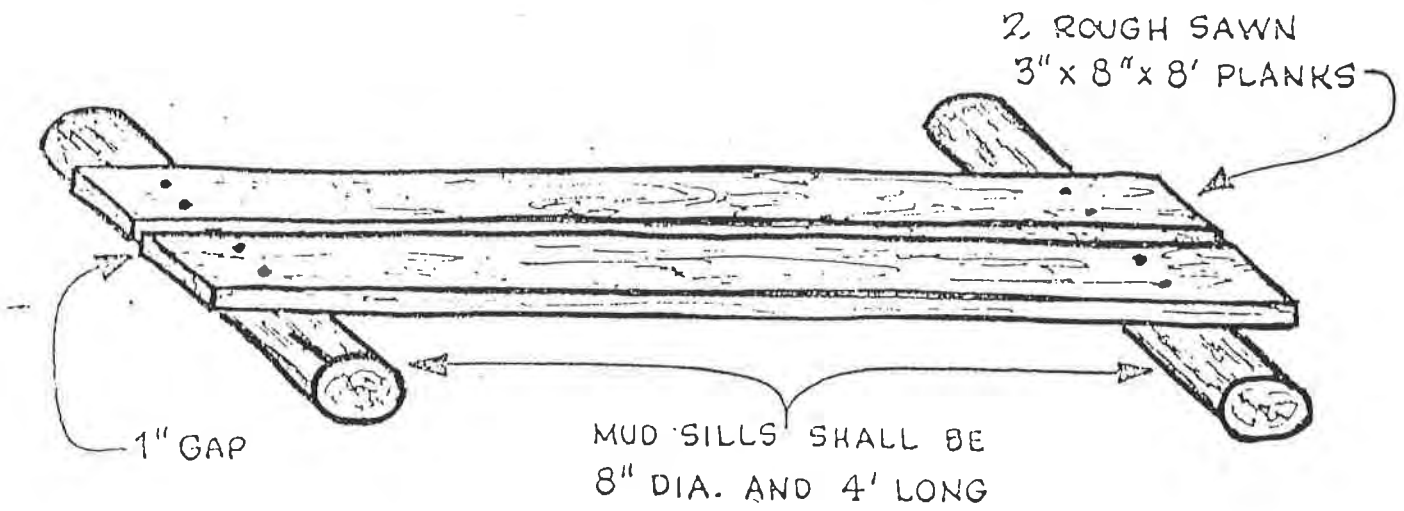
LOGS SHALL BE STRAIGHT OR HEWED SO THAT GAPS SHALL NOT EXCEED 2"

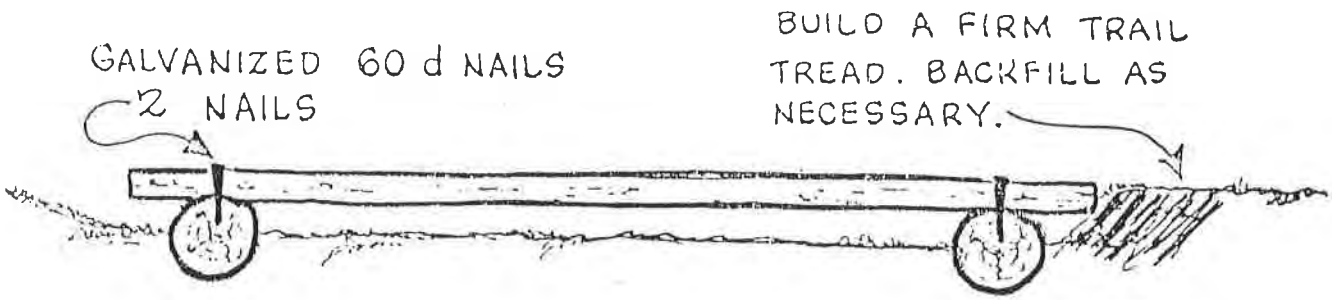
SPECIES SELECTION

1. SPRUCE
2. HEMLOCK
3. CEDAR

Special note: With bridges and trail ladders, you must check with your supervisor to obtain permission before constructing new ones or replacing old ones.

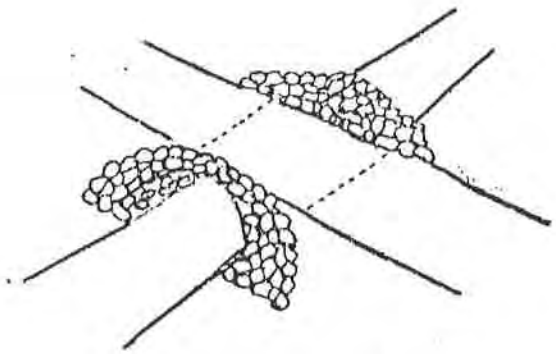
TRAIL BRIDGE
(Treated Material)

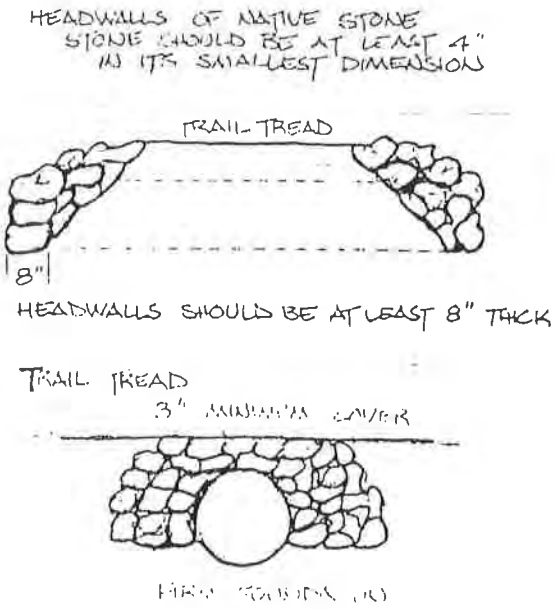




Culvert: Crossing streams can be done by constructing a bridge, developing a ford with stepping stones, or with culverts to allow water to flow under the trail. Rock, log, and box culverts can be constructed instead of installing metal ones as the need or location allows.

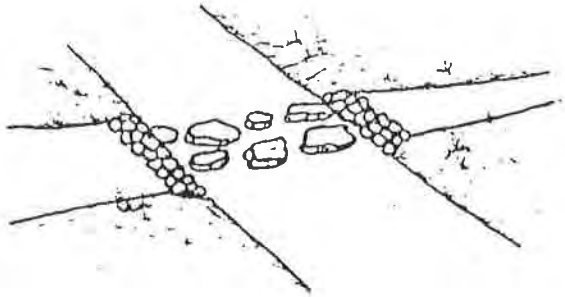
CULVERT





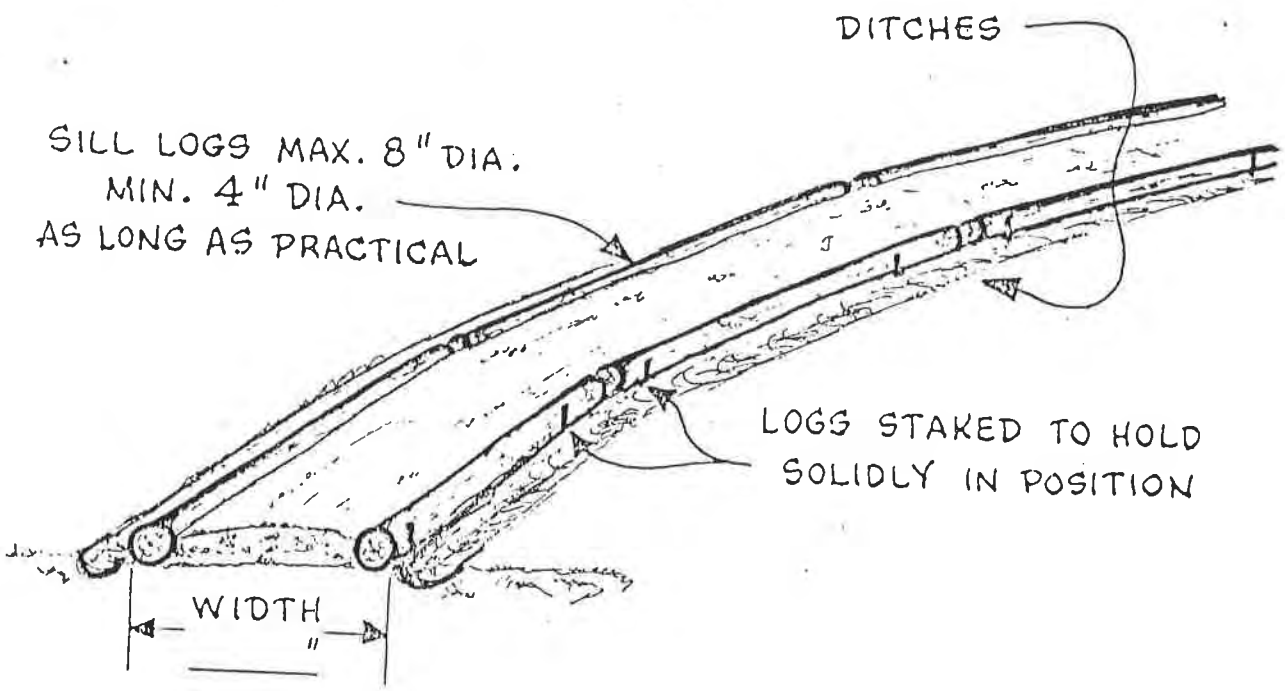
Stepping Stones: A normally shallow stream can be crossed through the use of stepping stones. These stones should be flat and large enough for stability for a hiker with a heavy pack to step on safely and comfortably. Place close together in the stream for easy steps without falling and not blocking the flow of the stream. About half of the height of the stepping stones should be above water to ensure a dry surface to walk on.

STEPPING STONES



Trail Turnpiking: Through muddy and swampy sections of trail, trail stabilization is achieved by the use and construction of this technique. Select straight natural material, diameters from four to eight inches and as long as practical. Cut all knots flush with the log, peel bark for longer life, ends cut neat and square. Stake sill logs firmly in place, fit trail matting into log form, filling with gravel or other suitable fill, tamping to compact fill for stability.

TRAIL TURNPIKING



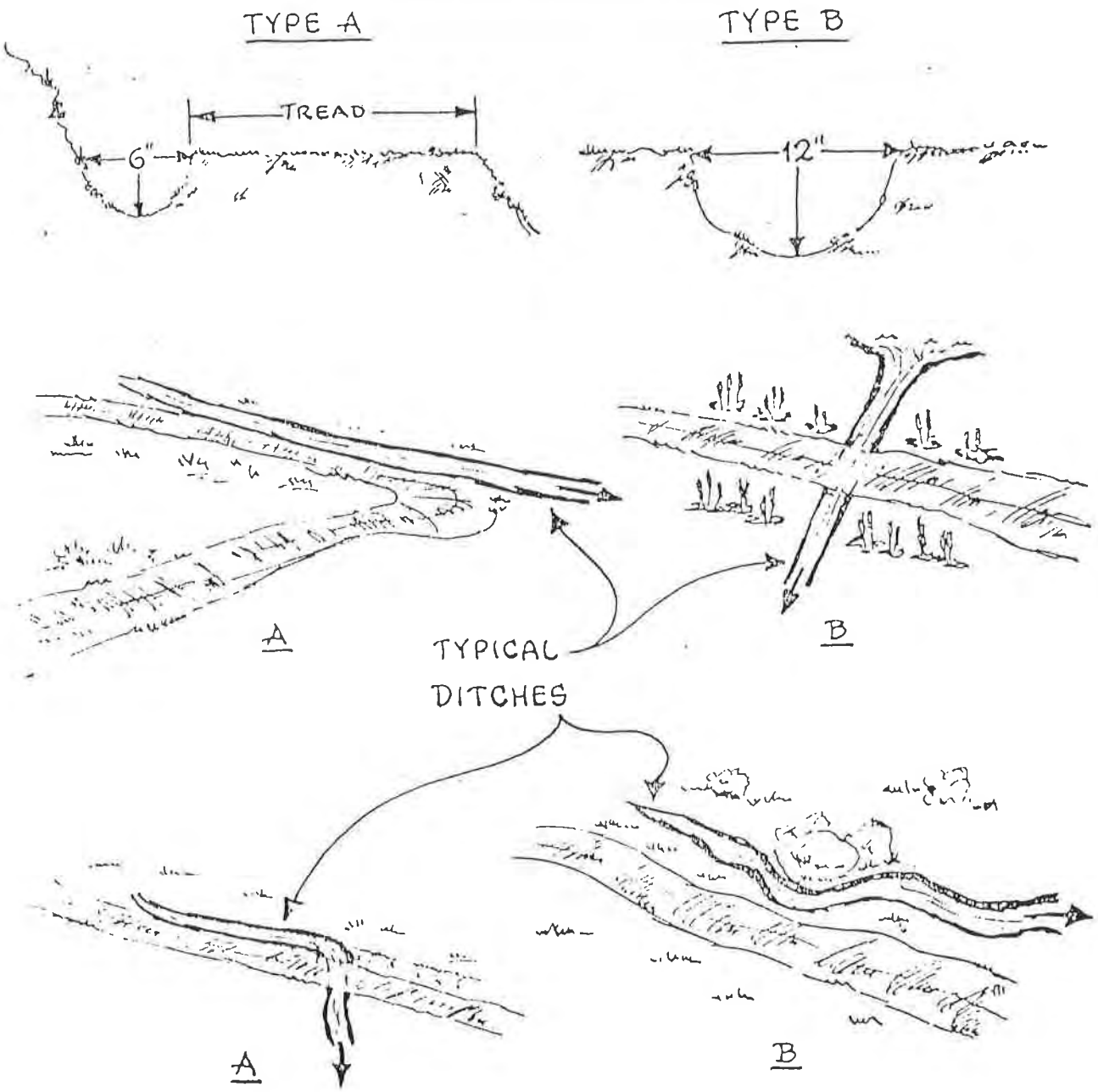
PRIORITY FOR SPECIES SELECTION

1. SPRUCE
2. CEDAR
3. HEMLOCK

SILL LOGS SET ON NATIVE MATERIAL, AND FILLED BETWEEN WITH MATERIAL FROM DITCHES OR OTHER LOCAL MATERIAL. FILL IS TO BE COMPACTED AND OUTSLOPED 1" : 12"

Trail Drainage Ditches: The technique used to dry up areas of muddy, wet spots where there is a place for surface run-off to go off the trail. In constructing ditches cut all roots and remove them from the ditch. A cutter mattock is an efficient tool for this job. Leaves, branches, and all other debris should be removed. These should be checked and cleaned periodically to ensure proper drainage.

TRAIL DRAINAGE DITCHES



4. Marking

On a new trail where the tread is not worn in, trail markers should be placed close enough to be visible from one to the next. The markers should be placed high enough to be visible even when snow is deep on the trail. Usually the higher the markers are placed the better, to protect against vandalism. Nail enough to hold the marker on the tree and also allowing enough space for tree growth. In an open field area, marker posts should be set in the ground and markers attached on both sides of the post in the trail direction. Cairns should mark the trail above tree level on high moutain tops. These vary in size depending on the availibility of rock. Large, flat rocks should be used for the base layer. The upper surfaces of the rocks in the following layers should slope toward the center of the cairn giving stability to the marker.

A WELL MADE CAIRN: rocks lean toward center, and joints are broken.

5. Signs

These are important for the trail users information and direction to destination points. Signs should be accurate to detail (milage) and should be located at key locations as trailheads, intersections, midway points, etc., to assist the public.

Signs should be checked during routine maintenance of trail systems and replaced when missing or destroyed. Signs should be placed so a person knowing nothing about the area can travel without becoming

lost and be able to reach their destination. They are especially important at trailheads and intersections.

On special trails such as ski trails and snowmobile trails, signs should be placed at hazardous or dangerous places along the trails. Caution signs denoting steep grade or bridge ahead prepare the user of potential hazards. Ski trails should be listed and signed according to degree of difficulty, easy, intermediate and most difficult (expert). Also curves on steep grades would alert the user and caution them as to what is ahead.

6. Economy of Construction

The cost of construction should be minimized where possible. A way of doing this is on-site cutting of construction material (whenever permitted) for building, as stringers and decking material for bridges over streams; small log bridges covering muddy sections of trail, and waterbars. On-site also saves transportation costs of material to work locations which can be expensive in time and money. When on-site cutting is permitted, cut trees far enough from the trail to buffer the area cutting from the trail to eliminate complaints. The choice of on-site construction material should be carefully selected, for example spruce and cedar far out-last balsam or poplar as a bridge stringer or bread decking, resulting in a longer life and more stable structure with less man-hours spent on maintenance and construction. Peel the bark off all logs used for longer life.

7. Points of Interest

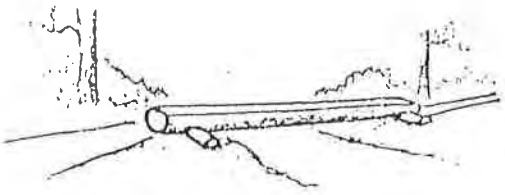
When laying-out proposed trail, try to keep interesting spots near (not on but close to) the trail such as vistas, geological points of interest as rock formations, ledges, lakes, ponds, and large interesting trees, to add versitility to the trail. This gives the trail user some personal interest and satisfaction in the trail and generally exposing to the public all the regions natural beauty. Historical landmarks should also be included where possible, such as old towns, logging camps, etc.

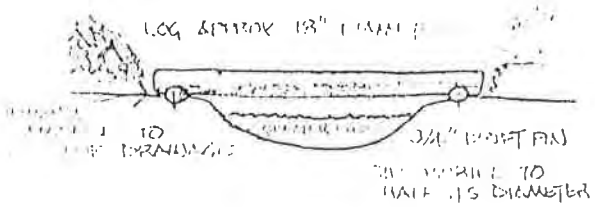
8. Bridges

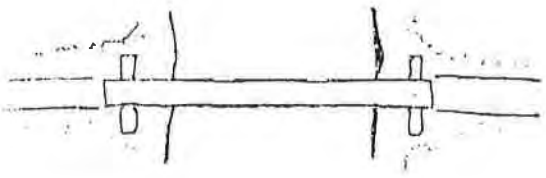
When construction of bridges is needed on a trail, try to choose the crossing at a narrow section of the trail to keep the span length as short as possible. Locate the crossing at right angle to the stream flow. Also construct the approach of the trail to the bridge as even and square as possible to avoid turns at the bridge entrance. Make sure there is adequate high-water clearance at peak rates of flow so the bridge will not be washed out with spring high water. Bank abutments and stringer supports can be built up to ensure adequate clearance.

On some streams, single or double foot log bridges can be built. Logs should be peeled and hewn flat on one side to provide level walking surface. Bottom of log should be high enough for proper stream and debris clearance. Log sills should support log bridge, securely fastened and keep log off ground surface.

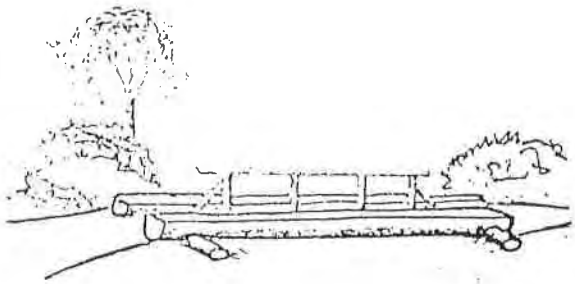
SINGLE FOOTLOG BRIDGE

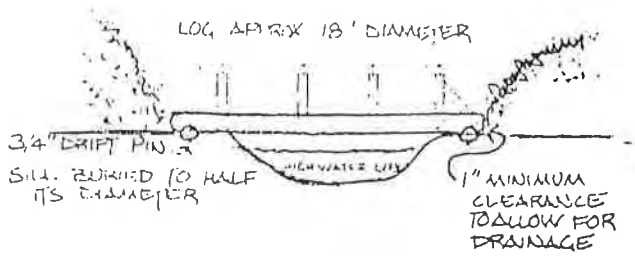


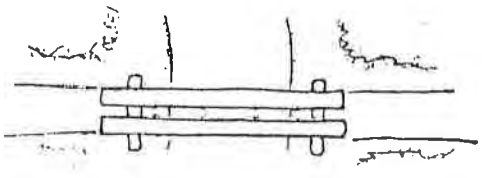




DOUBLE FOOTLOG BRIDGE

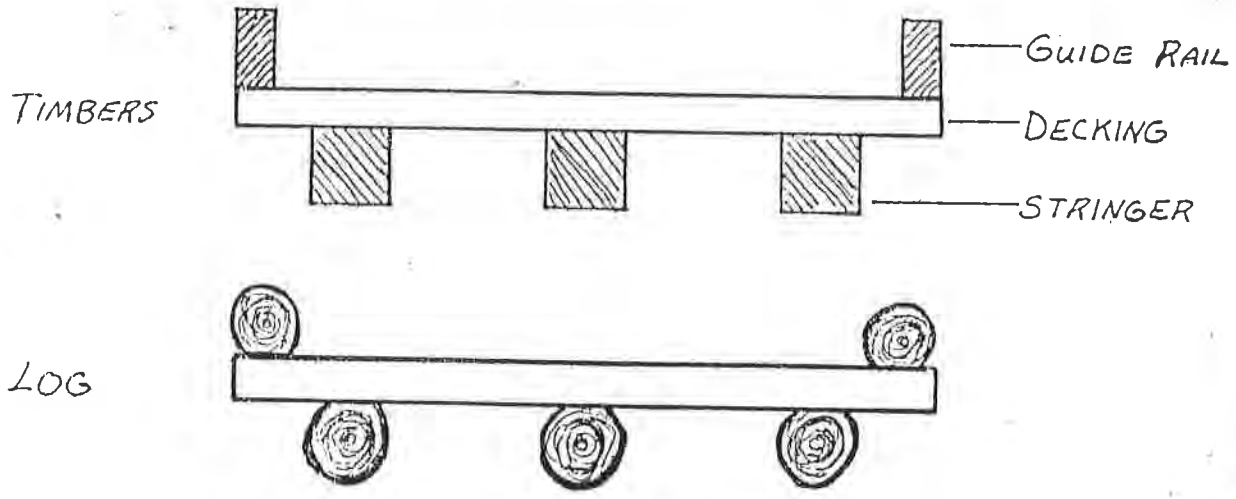






Crossing larger streams requires more complex bridge plans, which have larger stringers, cribbing wing supports on banks of the stream and three inch pressure treated decking.

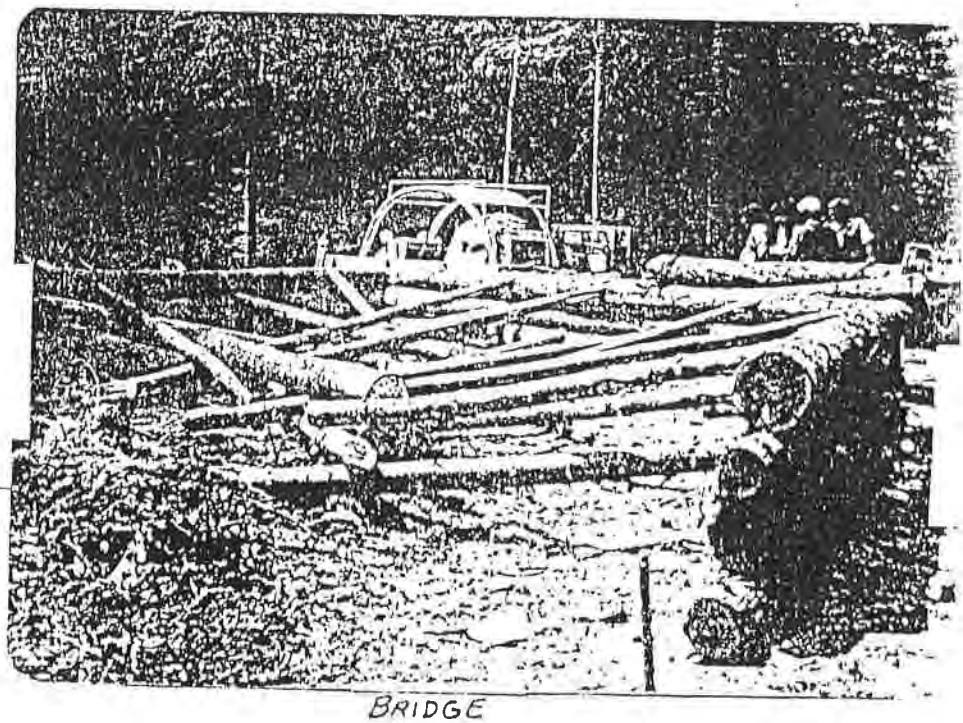
Below is a simplified example of diagram showing basics of bridge construction.



BRIDGE (CROSS-SECTION)

TABLE OF STRINGER SIZES

BRIDGE SPAN	3 STRINGERS Lumber	3 STRINGERS Logs	4 STRINGERS Lumber	4 STRINGERS Logs
	3" x 6"	7"	3" x 6"	6"
	3" x 8"	8"	3" x 10"	8"
	3" x 8"	10"	3" x 12"	9"
	4" x 10"	11"	4" x 12"	11"
30'	6" x 12"	13"	6" x 12"	12"
35'	6" x 16"	14"	6" x 14"	14"
		16"	8" x 16"	15"
38'		17"	8" x 16"	16"

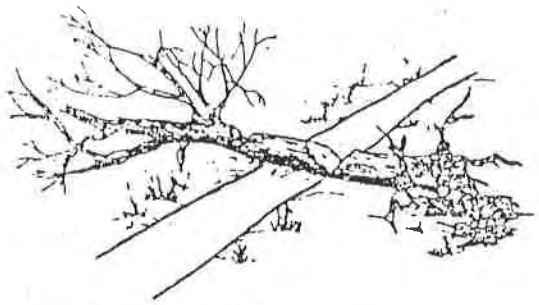


BRIDGE

9. Maintenance

The trail will require annual clearance of small brush, blowdown of fallen trees and branches and their removal. The trail should be cleared enough to have the trail pleasant to use and easy to follow. Annual clearance involves the removal of leaners too. All blowdown should be removed from the full trail width.

BLOWDOWN REMOVAL



TWO CUTS NEEDED TO TAKE OUT A BLOWDOWN

If blowdown has been present on a trail for a long period of time, new paths are worked around the obstacle. All blowdown should be cut and removed to avoid these paths, bringing the trail back to its original form. Notes should be made at this time as to other trail maintenance problems such as erosion wash-outs, culverts plugged with leaves and branches, excessive brush growth narrowing trail tread, to assist in the planning of future maintenance priorities and work to be done. Trails with excess grass and brush should be mowed annually. Mowing eliminates the later problems of brush growing into the trail. Mow as close to the ground as possible. Low shrubs and small trees should be cut close to the ground to prohibit tripping and this keeps the stumps from sprouting and interfering with trail tread. When side limbing and brushing, cut branches as close to the tree as possible to eliminate dangerous spikes.

Every year all bridges should be checked for structural soundness. During this inspection abutments, stringers, treads and handrails should be checked and repaired. Any ditches or run-off routes around bridge approaches and abutments should be cleaned of debris for proper drainage. All ditches on trail sides or road edges should be cleaned for drainage. Waterbars need to be checked and cleaned if necessary.

Any wet spots or mud holes should be drained by digging run-offs with a shovel and then fill in with gravel. For deep mud holes, first put in stones to create a sound solid base and then cover with gravel fill. On over-used trails the tread wears and exposes tree roots, which should be cut and removed to prevent accidents.

On sections of trail where all maintenance steps have failed, relocation of the trail is a last resort. In relocation of an undesirable portion of trail, the factors of drainage have to be applied. Locating the treadon higher ground with proper drainage will eliminate the maintenance problem.

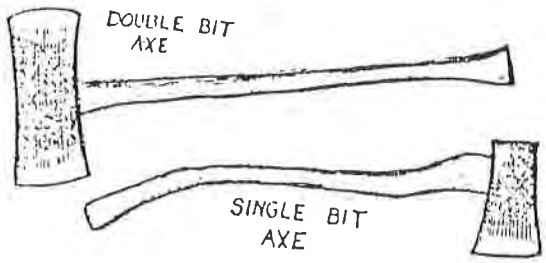
According to the State Land Master Plan, the use of motorized equipment (such as chainsaws) in wilderness areas for routine maintenance is prohibited, (except for the period of April 1 through May 24, as per Department Policy, 1976, Commissioner Berle). Therefore the general maintenance of the wilderness area trails has to be planned accordingly. Use of hand tools such as cross-cut, bow saws, axes (single and double bitted), pick and cutter mattocks, crowbar, shovels, cum-a-longs, etc., have to be used to best advantage in blowdown clearance, maintenance and construction. Hand tool use requires more time than power equipment use so this has to be figured in when considering how long the job will last. Also certain structures are noncomforming in wilderness areas so check with your supervisor before any major construction, to obtain permission for the work project.

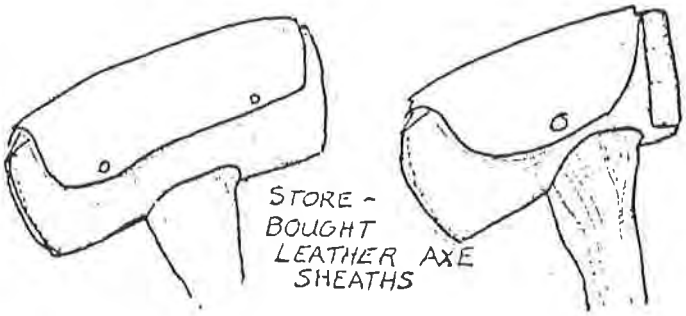
Hand Tools: Handles should be kept smooth and tight. Cracked or broken handles should be replaced with new ones before using again.

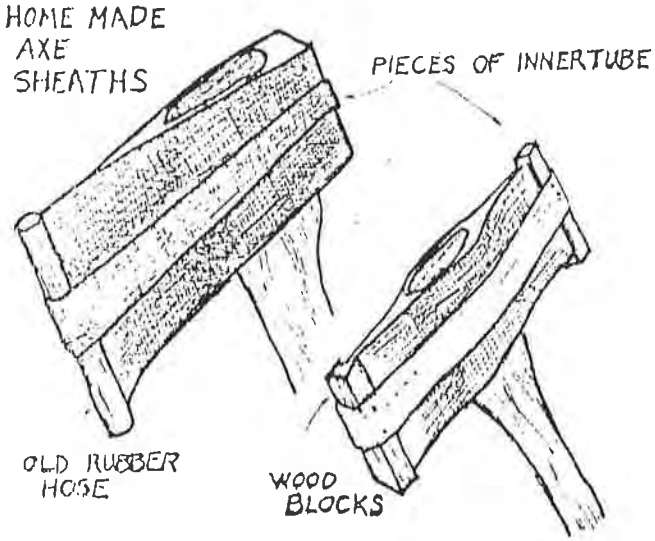
Keep cutting edges sharp. All cutting tools are actually safest when kept sharp, including axes. This is because the axe will penetrate the wood rather than deflect in a dangerous glancing blow. It is the dull tool that can deflect out of control causing accidents.

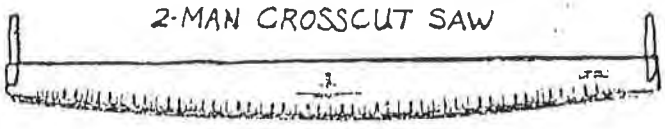
Do not dull cutting edges in storage or in transit to the work site. Cover cutting surfaces with a sheath to protect both the tool and the user from accident. Keep the metal surfaces lightly oiled to prevent rust.

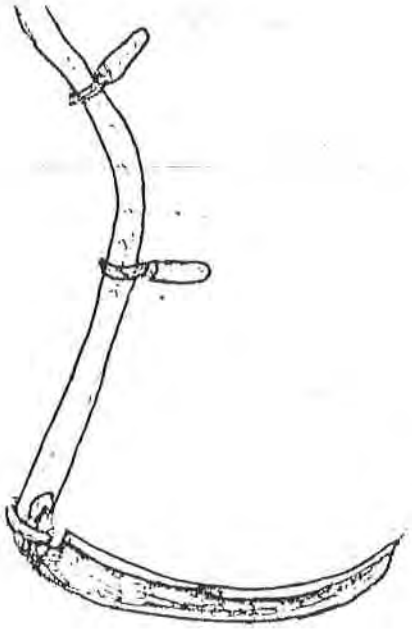
Never carry tools over the shoulder. Instead carry at the side with cutting edges away from the body and the grip at the center of balance or behind the head of the tool. Clean and check tools after use for damage and repair if necessary.



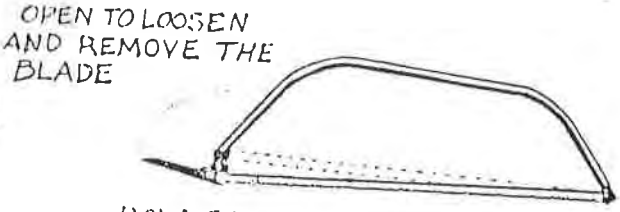




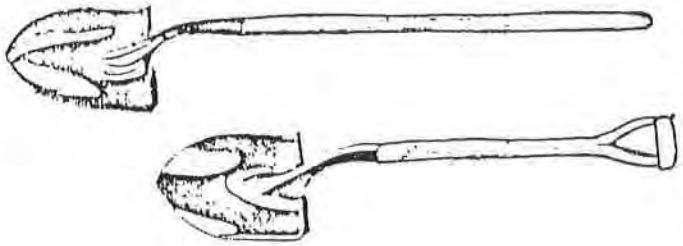




SCYTHE + SNATH

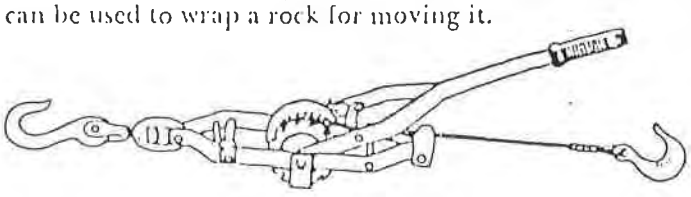


BOW SAW WITH DISPOSABLE BLADE
AND CLAMP-TYPE HANDLE



Long handle and "D" handle shovels

Come-alongs or cable jacks are sometimes needed for moving large rocks or logs. Most are available with varying pull capacities, anywhere from one ton to three or four tons. The lighter, open-faced, ratchet type with cable is most commonly used. Cable, chain or tire chains can be used to wrap a rock for moving it.



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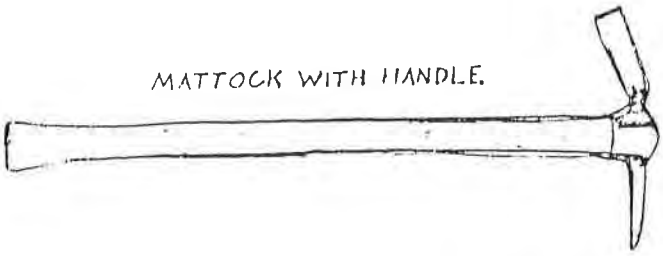
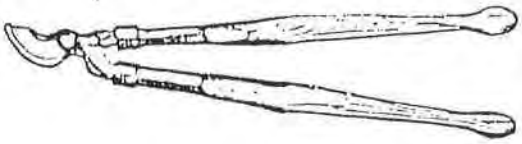


SLIDING BLADE TYPE
WOODEN HANDLES



Weekly Reports: Every week a report should be made of what trails were maintained, including the type of maintenance done, (waterbar, ditching, blowdown removal, etc.), and man hours involved.

Each trail crew will work out of a specific area such as the Saranac Inn work circle, the Lake Colden work circle, or the Santanoni work circle. Each work circle will be responsible for certain assigned segments of trails. For example, the Lake Colden work circle will be responsible for the section of trail from Lake Colden to Algonquin Peak. On the work report, the crew leader, when doing trail maintenance on this section of trail, will log this on his report, stating what was accomplished, such as blowdown removal, drainage construction, marking of this trail. In this way an organized account of what has been done on each section of trail can be recorded and documented.

WEEKLY REPORT

Name_____ Work Circle_____

Project_____

Date	Trails Patrolled and Work Accomplished	Hours

10. Safety

Equipment: hardhats
axes -sharp cutting edge with cover
-sound handles; heads on tight
brush pruners
bow saw
chainsaw -scrench & round file
first aid kit

Felling trees

Dead trees

-check for dead top & branches in tree and surrounding trees 'widow makers' be aware
-fungus growth & cracks in tree trunk usually indicate rotten or hollow center, which leaves no felling hinge, tree could go anywhere
-excessive wind affects felling; speed & direction
-excessive lean without proper felling notch can cause 'barber-chair' which is splitting of tree trunk length-wise
-plan two escape routes @ 45 angle from tree fall
-clear all brush & obstacles away from base of tree before cutting

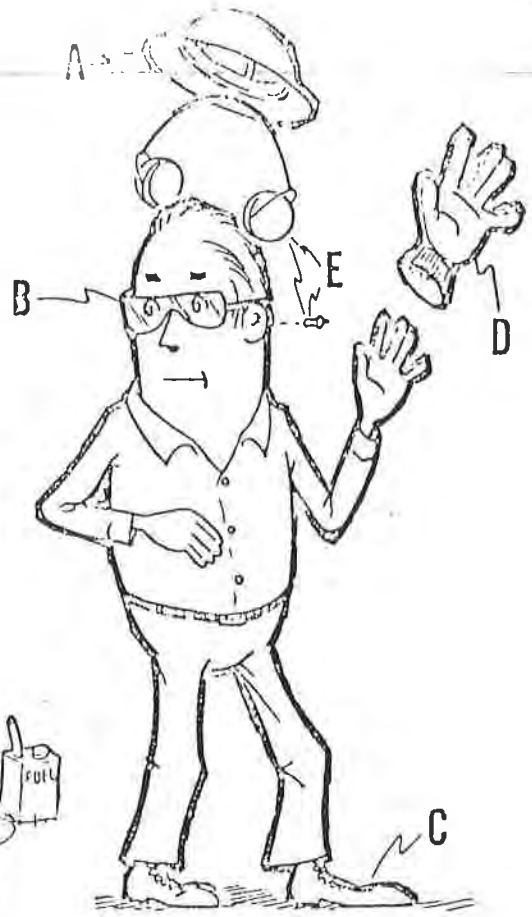
Live trees

-check tree as above
-place felling notch on the side of desired path, cut in one-third diameter of tree
-back cut one to two inches higher than first notch cut; remember not to cut felling hinge off on back cut
-as tree starts to fall, move away from base as 75% accidents happen within three feet radius of base ; watch for tree butt, can go straight back or go sideways fast; can pivot over obstacle
-after tree is down, check for sapplings or bent limbs trapped underneath called 'spring pole' which are dangerous is cut wrong
-before felling
make sure no one is within two tree lengths of felling tree

SAFE AND EFFICIENT OPERATION OF YOUR CHAIN SAW

READ YOUR OWNER'S MANUAL AND ALL SUPPLEMENTS (if any enclosed) thoroughly before operating your saw.

WEAR CLOSE-FITTING AND PROTECTIVE CLOTHING including, (A) safety hat, (B) goggles, (C) shoes, (D) gloves, and (E) ear plugs or sound barriers.



DON'T USE ANY OTHER FUEL than that recommended in your Owner's Manual.

REFUEL IN A SAFE PLACE. Don't spill fuel or start a saw where you fuel it. Do not refuel a hot saw - allow it to cool off. Be certain the saw has dried thoroughly before starting, if fuel has been spilled on the unit.

DON'T SMOKE while fueling or operating the saw.

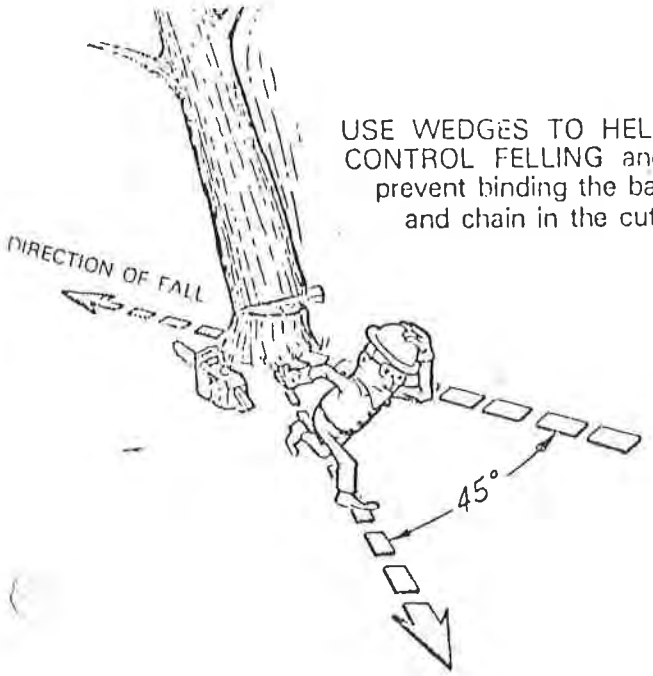
START YOUR SAW WITHOUT HELP. Don't start a saw on your leg or knee. Never operate a chain saw when you are fatigued.

KEEP ALL PARTS of your body and clothing away from the saw chain when starting or running the engine. Before you start the engine, make sure the saw chain is not contacting anything.

BEWARE OF KICKBACK! Hold saw firmly with both hands when engine is running; use a firm grip with thumbs and fingers encircling the chain saw handles and watch carefully what you cut. Kickback (saw jumps or jerks, up, or backward) can be caused by:

- STRIKING LIMBS or other objects accidentally with the tip of the saw while the chain is moving.
- STRIKING METAL, cement, or other hard material near the wood, or buried in the wood.
- RUNNING ENGINE SLOWLY at start of, or during cut.
- DULL or LOOSE CHAIN.
- CUTTING ABOVE SHOULDER HEIGHT.
- INATTENTION in holding or guiding saw while cutting.

- The purpose of the chain brake (on ... equipped) is to reduce the hazard from "kickback" but it can not provide the measure of protection intended if the saw is operated carelessly. The brake can only be engaged when the front handle (frame and grip) is held directly behind the brake lever. It WILL NOT be engaged in the event of "kickback" if the front handle is held on the side or in any way other than directly behind the brake lever. DO NOT attempt to try to make the saw "kickback" to test or demonstrate the chain brake.



USE WEDGES TO HELP CONTROL FELLING and prevent binding the bar and chain in the cut.

BE SURE OF YOUR FOOTING and pre-plan a safe exit from a falling tree or limbs.

DO NOT SET A HOT SAW DOWN in areas where flammable material is present.

WE STRONGLY RECOMMEND you do not attempt to operate the saw while IN A TREE, ON A LADDER or ON ANY OTHER UNSTABLE SURFACE. If you elect to do so, be advised that these positions are EXTREMELY DANGEROUS.

WHEN CUTTING A LIMB THAT IS UNDER TENSION be alert for springback so that you will not be struck when the tension is released.

USE EXTREME CAUTION when cutting small size brush and saplings because slender material may catch the saw chain and be whipped toward you, or pull you off balance.

VIBRATION - Avoid prolonged operation of your chain saw and rest periodically, especially if your hands or arms start to have a loss of feeling, swell or become difficult to move. These conditions can reduce your ability to control a saw.

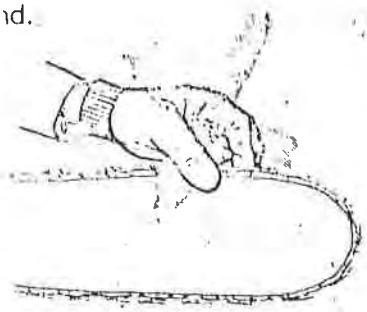
EXHAUST FUMES - Do not operate your chain saw in confined or poorly vented areas.

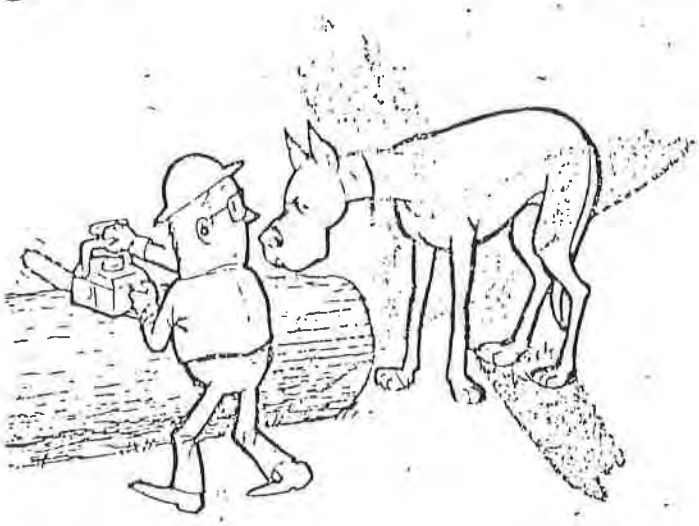
OBSERVE ALL LOCAL FIRE PREVENTION REGULATIONS. We recommend that you keep a fire extinguisher and shovel close at hand whenever you cut in areas where dry grass, leaves or other flammable materials are present.

NOTE: Spark arrester screens are available for installation in your muffler where fire regulations require them. Check local regulations for your special requirements.

CARRY YOUR SAW WHEN MOVING BETWEEN CUTS and before setting it down. Always carry the chain saw with the engine stopped, the guide bar and saw chain to the rear, and the muffler away from your body.

DON'T TOUCH or try to stop a moving chain with your hand.



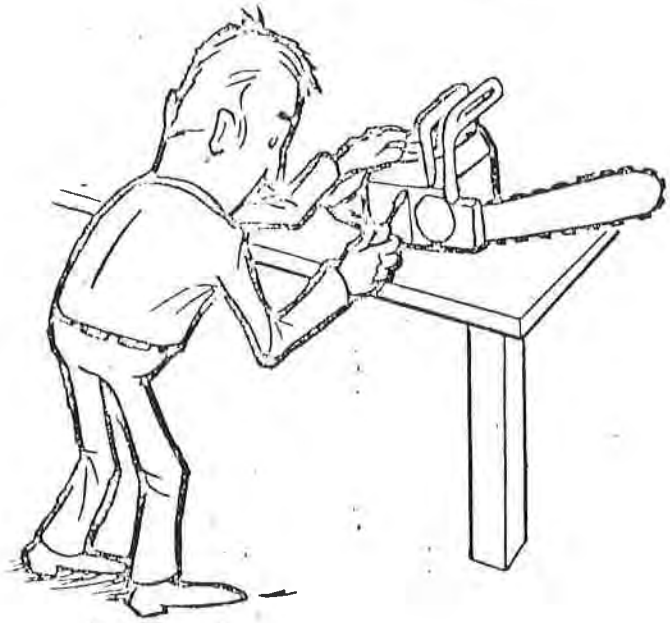


DON'T ALLOW ANY OTHER PERSON or ANIMAL CLOSE to a running saw or where a tree is being cut down.

DON'T TOUCH or let your hand come in contact with a hot muffler, spark arrester, or a spark plug wire. Don't run the saw without a muffler, exhaust stack, or a spark arrester. Keep screens and baffles clean.

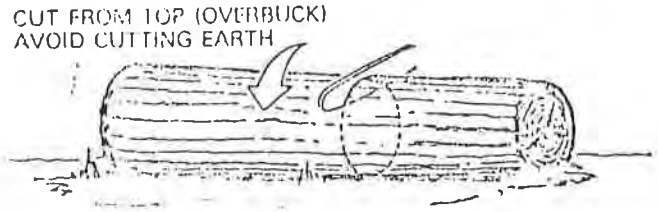
DON'T ALLOW DIRT, FUEL, or SAWDUST to build up on the engine or outside of the saw.

KEEP ALL SCREWS and FASTENERS TIGHT. Never operate a chain saw that is damaged, improperly adjusted, or is not completely and securely assembled. Be sure that the saw chain stops moving when the throttle control trigger is released. Keep the handles dry, clean, and free of oil or fuel mixture.

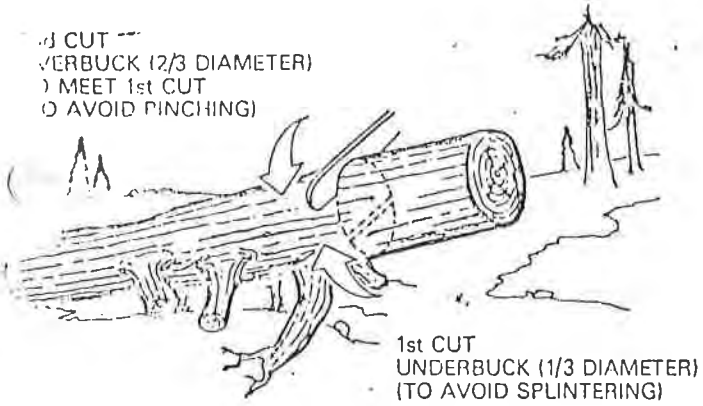


KEEP THE CHAIN SHARP and SNUG on the GUIDE bar.

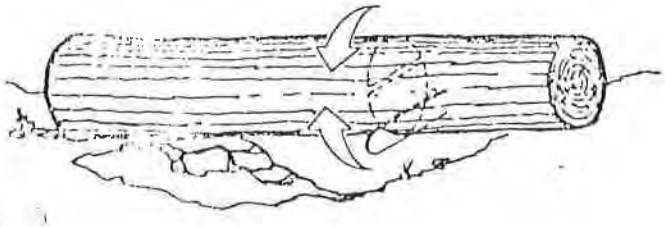
G SUPPORTED ALONG ENTIRE LENGTH



G SUPPORTED ONE END

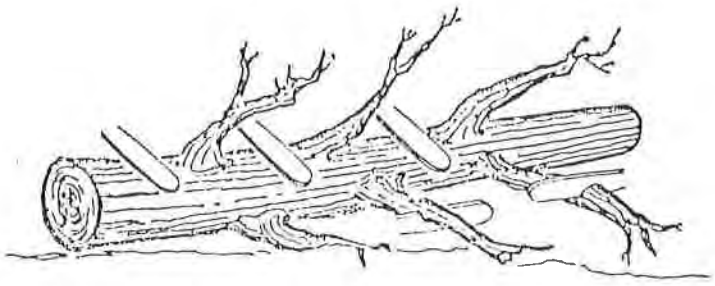


LOG SUPPORTED ON BOTH ENDS



When bucking on a slope, always stand on the up hill side.

LIMBING

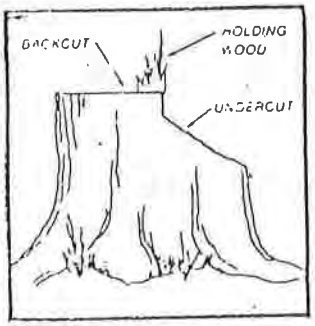


KEEP THE LOG OFF THE GROUND.
DO NOT REMOVE SUPPORTING LIMBS UNTIL AFTER THE LOG IS BUCKED INTO LENGTHS.

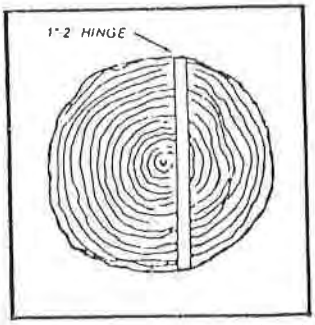
WOOD UTILIZATION

FELLING AND BUCKING

If you are a chain saw operator who uses his saw primarily for cutting firewood, you may not become involved in tree felling since most likely you will be cutting dead and down timber. However, sometime you may attempt to fell a tree. Just remember that felling and bucking both take special skills, require utmost caution, and necessitate the use of safety precautions.

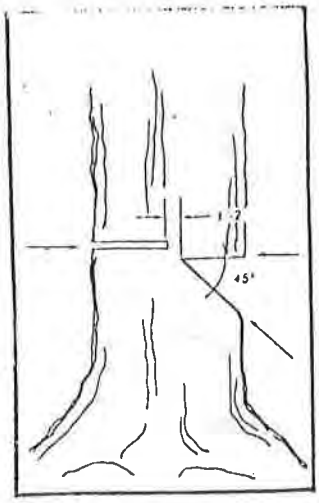


The features of this stump indicate [illegible] felled tree



One to two inches of wood between the undercut and back cut act as a hinge

Small trees can usually be felled in any direction. With large trees, however, especially those that lean or have heavy branches on one side, you may have little choice in which direction they fall. The direction of fall can be changed by wedging and holding the corners of the cut, but this requires experience and should not be attempted by a novice.



Felling a tree is accomplished with three cuts

Never approach a tree without first looking to see if there are loose limbs or dead wood hanging ready to drop at the slightest movement of the tree or gust of wind. Note particularly whether the limbs of the tree you are going to fell are entangled with those of nearby trees. If there is entanglement, use the utmost care in felling because some limbs will break off when the trees part. The same precaution should be exercised if felling dead trees as the top may break off due to the sudden movement of the tree.

The actual process of felling a tree is accomplished with three cuts. The face of the tree, or direction in which the tree will fall, requires a horizontal cut and a sloping or angle cut of at least a 45 degree angle. The horizontal cut should be three to four inches deep for each 12 inches in diameter. These two cuts are called the undercut. An inch or two of uncut wood is left between the undercut and backcut. This acts as a hinge to hold the tree in line as it falls. As the

Trail Types and Specifications

1. Hiking

trail clearances: width: 4 - 8' overhead: 10'

bridge: width: 5 - 6'

In cutting clearances, keep in mind the safety and comfort of the recreational hiker, with full pack, under all weather conditions including rain and snow which will bend the saplings and small brush into the tread area. Trail tread should be cut to compensate for this amount of clearance. A snow fall of four to six feet of snow will require proper overhead cutting for snowshoe or ski usage. When cutting tree branches, cut as close to the tree as possible to avoid leaving sharp spikes which when dry are hazardous if bumped against by tripping or falling. The same applies to sapplings and small brush, cut as close to ground surface as possible to avoid sharp stumps, cut with brush clippers instead of an axe.

A well cleared trail is one which a hiker with pack can walk on without touching limbs, trees or brush when wet or dry.

Trail Types and Specifications

2. Horse

trail clearances: width: 8' maximum overhead: 10'

bridge: width: 5' minimum to 8' maximum

fords: width: 10'

When trails are located on truck trail roads, ditches should be cleaned of brush and leaf build-up to ensure adequate drainage and culverts should also be cleaned to handle rain and snow thaw drainage. If these are not cleared periodically, wash-outs can occur to road bed and culvert areas creating dangerous conditions for horse and rider. This will eliminate time and maintenance expenses later that result from improper preventive maintenance. All blowdown should be cut and cleared full trail width including ditch area for proper clearance and drainage. Overhead clearance is important and should take into account wet leaves hanging into the ten foot zone, cut and remove from trail. Any log blowdown should be completely limbed as close as possible to log to eliminate dangerous spikes. Side cutting as close to the ground level as possible on saplings and brush so no stumps or stubs are present.

At all rest areas and lean-to and camping sites, hitching rails should be constructed for tie-ups for horses. Trails to watering holes as brooks or water source should be built to water horses.

On horse trails the use of any kind of corduroy bridging is prohibited. This method should not be used.

Trail Types and Specifications

3. Snowmobile

trail clearances: width: 8' maximum overhead: 10'

bridge: width: 8' maximum

Cut blowdown out of the trail the complete tread width for maximum clearance of trail. Overhead cutting is important, plan enough clearance with four to six feet of snow covering trail tread, and brush and saplings bearing snow and ice pulling them into trail space.

When side cutting brush and saplings, cut as close to the ground level as possible to avoid stubbles and stumps and to allow snowmobilers to be able to use the trail system with a minimum amount of snow cover. Also any large stones or obstacles should be removed to ensure a smooth tread and usage with limited snow cover.

Wet, boggy spots should be covered with bridging to allow safe comfortable passage on snowmobile. During summer maintenance, try to drain these mud or wet spots to eliminate winter problems.

When planning a new snowmobile trail, locate the trail where proper drainage will eliminate the problem of muddy spots. Ditches and culverts will help control wet areas where they can be used. Where these devices are in place, periodic ditch and culvert cleaning will be needed for maintenance.

Special caution signs for hazardous areas should be used to warn the snowmobiler of steep grades, sharp turns, gates, bridge ahead, road crossing, etc. This would make the experience more enjoyable and safer for the user.

Trail Types and Specifications

4. Cross-country (Nordic) Ski

trail clearances: width: Wilderness: 4' overhead: 10'

width: Wild Forest: 8' overhead: 10'

bridge: width: 5 - 6'

In wilderness areas, trail width should be limited to four feet with clearance overhead ten feet compensating again for winter snow fall.

In wild forest areas width six feet with overhead ten feet.

On steep slopes approaching a bridge, design the approach trail to the bridge gradually without sharp turns for safety reasons and ease of skiing for the beginner. On other areas where easy approaches are not possible to bridges off steep slopes, warning signs should be posted before the skier reaches the dangerous section.

All side cutting should be as close to the tree or ground level as possible to avoid stubs and stumps which would interfere with limited or minimal snow level skiing.

Ski trails should be listed and signed according to the degree of difficulty; easy, intermediate, or expert (most difficult).

Turns at the base of steep hills should be wide enough for turn-outs, making it easier to ski around the turn safely.

Trail Types and Specifications

5. Canoe

trail clearances: width: 8' maximum overhead: 10'

bridge: width: 5 - 6'

In maintaining canoe trails, clearances have to be made for user transporting canoe overhead without interference from brush and limbs. Trail tread should be clear of any stubs and stumps and roots which could cause user to trip and fall causing injury. All obstacles should be removed from the trail. In cutting and removing blowdown, cut and remove entire trail width for proper clearance and comfort and safety of user. Mud hole and wet spots should be bridged where possible, avoid using corduroy method which is slippery when wet from rain or snow melt.

Multiple Use of Trails

Depending on the time of year, whether summer or winter, certain trails have a multiple use function. In the summer time the trail may be a horse trail but when covered with snow in the winter its use turns to snowmobiling. The same is true with hiking trails, summer hiking and in winter skiing or snowshoeing.

When doing maintenance on these trails, one has to keep their multiple use concept in mind when cutting blowdown, side cutting, bridging, etc.

Interior Facilities

1. Lean-to

For general maintenance every time trail crews are around a lean-to site, they should check it for any damage, structural soundness, check roof, shingles, floor and sides. Clean up any garbage found in or around the lean-to area. Also check fireplace, picnic table, and pit privy for possible repair and make sure entire area is clean and sanitary.

Inspect the overhead tree canopy of the area for any dead or dangerous limbs or trees that could fall on users of the facility. If tree cutting is needed, cut the tree down and limb the tree, cut the wood for fireplace burning by campers.

Locate lean-to site away from the main trail, near a water source. A short spur trail can connect the main trail to the lean-to for users privacy. Signs may be needed from main trail to the lean-to. Locate the lean-to and pit privy at least 150' from any source of water.

2. Tent sites

Inspect the entire area for garbage. Check fireplace and pit privy for damage or repair. Inspect overhead tree canopy for dead or dangerous limbs or trees, cut and remove if necessary for safety. Cut blowdown wood for fireplace burning.

The site should not be directly on the trail. Locate tent site away from main trail with a spur trail. This allows for camper privacy while using the site. Locate near a source of water but stay at least 150' from water source. Locate the pit privy at least 150' from any water source too.

Interior Facilities

3. Interior Headquarters

Annually inspect cabin for structural soundness, check roof, shingles, siding, foundation for possible repair and maintenance.

Check entire area for any garbage and collect if present.

Inspect the overhead tree canopy of the area for any dead or dangerous trees that could fall on the cabin. Cut and remove any that could be hazardous to the residents or public.

Check information signs and rehab if weathered badly or if any information is in error.

4. Trailhead

Proper parking space should be allowed in order to handle the number of vehicles expected to use the trail system. Also adequate room for a vehicle and horse trailer at trailheads where horses are departing from should be considered. Space has to be available for turning and parking without interference with other trail user vehicles. The same is true with snowmobile trailers and vehicles. Sanitary facilities should be included such as pit privies and maintained. A trail information and registration box should be available. Signs should be present giving direction and information to users as how many miles to a certain location or facility as lean-to, etc.

Check for garbage and litter around trailhead area. Check for any dead or dangerous trees around parking areas which could fall and damage vehicles parked there. Make sure all guard rails are in

place and sign posts and signs are alright. Wooden items should be stained periodically for preserving wood and for well kept appearance. Parking lots should be maintained as far as grading, filling pot holes, etc.

Illustration List

BIBLIOGRAPHY

Environmental Conservation Handbook, Public Use Management Handbook, "Guidelines for Selection Trails & Terrain for Nordic Skiing."

"For the Safe and Efficient Operation of your Chainsaw," McCulloch Corporation.

Indiana Department of Natural Resources, Division of Outdoor Recreation Quarterly Bulletin, "Hoosier Snowmobile Trails '80 - '81" vol. 11 number 4 Dec. 1980.

Indiana Trails Construction and Maintenance Manual, Department of Natural Resources, Indianapolis, Indiana.

Johnson, Walter W., "Wood Utilization," Extension Forest Products Specialist, The Pennsylvania State University, Cooperative Extension Service.

Proudman, Robert D. 1977. AMC Field Guide to Trail Building and Maintenance. Appalachian Mountain Club.

Report of the Colorado Recreational Trails Committee, Denver, Colorado.

Trail Construction Manual, Tennessee Department of Conservation, Nashville, Tennessee 37203.

U.S.D.A. Forest Service, Milwaukee, Wisconsin 53203.
"Travelway Guides Eastern Region," August 1980.
"R-9 Trail Construction Specifications."
Alesch, Richard, "Guidelines for Developing Ski Touring Trails," National Park Service, Denver, Colorado.

U.S.D.A. Forest Service, Washington, D.C. 20013.
Deer, Dorothy, "How to Keep Trails Smooth."
Vint, Bill, "How to Build A Snowmobile Trail."
Knopp & Maloney, "Ski Touring Trail Planner," 1973, U.S. Ski Association - Central Division.

EXHIBIT C

PHOTO 1

Picture of bench cut on Hurricane Mountain trail from Rt 9N, Hurricane Mountain Wilderness Area.

A properly cut bench cut that allows water to be shed directly off the side of the trail to prevent erosion. Note the tall cut on the upslope

PHOTO 2

Picture of trail Turnpiking and linear ditching on Pharaoh Lake Trail, Pharaoh Lake Wilderness Area.

Trail tread raised up and hardened with rock, gravel and mineral soil to keep the hikers out of the mud. Drainage ditch to help direct surface water away from raised tread.

PHOTO 3

Picture of Turnpiking and linear drainage ditch on Pharaoh Lake Trail, Pharaoh Lake Wilderness Area
Trail tread was raised so that water wasn't running down the middle of the trail.

PHOTO 4

Picture of Ladders on Orebed Trail to Gothics Mtn, High Peaks Wilderness Area. Ladders are bolted to the bedrock to allow hikers to climb up the bedrock

PHOTO 5

Picture of walkway and ladder (with railing) on Avalanche Lake Trail, High Peaks Wilderness Area. Walkway and ladder constructed to assist hikers in walking over boulders and bedrock

PHOTO 6

Gravel on the Indian Pass foot trail

PHOTO 7

Picture of Cascade Mountain Trail, High Peaks Wilderness Area

Showing waterbar across the hiking trail extending through the forest.