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STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

BOX , CENTENNIAL OFFICE BUILDING • ST. PAUL, MINNESOTA • 55155

NR INFORMATION
(612) 296-6157

FILE NO._____

April 8, 1982

Dear Colleague:

We are happy to forward to you a copy of the Trails Development & Maintenance Manual. This manual will serve as a guide for development of trails in Department of Natural Resources Units in the future.

The manual is intended to be a general how-to book and has been printed in loose leaf form so that additions or deletions can be made as new information is available.

The policies for State, Unit and Grants-In-Aid Trails have not been printed in final form as of this date. They will be forwarded to you as soon as they have been finalized.

We would like to express our appreciation to all the people who contributed to the manual, especially Greg Wimmer who did the artwork.

I hope that you find the manual interesting and informative. Remember, the manual is in loose leaf form so that additions or deletions can be made. If you have any comments, additional information or deletions, please send them to us for consideration.

Sincerely,

DONALD M. CARLSON
Special Assistant to the Commissioner
Trails & Waterways Unit
Box 52 - Centennial Building
Saint Paul, MN 55155-1679
(612)/296-4822

DMC/JWH/jls

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FIGURES

INTRODUCTION

The information contained in this manual has been assembled primarily to assist DNR unit managers and Trails and Waterways personnel in layout, development and maintenance of recreational trails. It is not intended to be a definitive work on the subject of trails.

The first section lists the goal and objective, definitions and terminology.

The second section outlines procedures, responsibilities, authorities and policies which are to be followed when trails are developed by the Department of Natural Resources.

The third section outlines general development processes.

The fourth section lists guidelines for specific trail types, signing procedures and map information.

The final section outlines maintenance procedures.

This manual is intended to be a general how-to book and has been printed in loose-leaf form so that it can be updated periodically.

Goal - The goal is to provide guidelines for acquisition, operation, development and maintenance so that all trails developed or operated by the DNR will be constructed or upgraded to these standards in the future.

Objective - The objective is to provide trail developers with guidelines to follow so that trails in DNR units are standardized in rating, signing, facilities, treadway construction, and maintenance procedures while still maintaining the uniqueness each trail system has to offer.

DEFINITIONS

State Trail

A recreational or commuter route that connects outdoor recreational facilities or has significant scenic, historical, scientific or recreational qualities. State trails include those trails authorized by the legislature (M.S. 85.015) and trails established by the commissioner (M.S. 84.029).

ORA Classification - A state trail which is not within another unit is classified as a major unit of the outdoor recreation system. However, when a state trail is routed through another unit, the trail is classified as a secondary unit within the major unit of the outdoor recreation system. Secondary state trail units may be authorized only when doing so is consistent with the purposes and objectives of the respective units.

Uses - Recreational uses of state trails may include, but are not limited to, hiking, snowmobiling, ski touring, jogging, backpacking, photography, horseback riding, bird watching, and nature study. The state trail policy pertaining to the prohibition or consideration of these and other uses is set forth in section IV, "Recreation Management," of this policy document.

Trails in DNR Units

DNR Forest Trail - A recreational route located primarily within a state forest or forestry-administered lands which is developed and managed in a manner consistent with the other purpose(s) of the forest and the forest's approved management plan.

DNR Parks Trail - A recreational or educational route within a state park which is managed in a manner consistent with the primary purpose of the park and the park's approved management plan.

Uses - Recreational uses of trails in DNR units may include, but are not limited to, hiking, snowmobiling, ski touring, jogging, backpacking, bicycling, hunting, trapping, snowshoeing, photography, horseback riding, bird watching, and nature study. Policy pertaining to the prohibition or consideration of these and other uses is set forth in the "Trails in DNR Units Policy" document. (see Appendix)

Grant-in-Aid Trail

A recreational travel route cooperatively acquired, developed and maintained by local units of government, landowners and trail user groups through the Minnesota Department of Natural Resources' trail assistance program.

Uses - Recreational uses of the grants-in-aid trails presently include snowmobiling, ski touring and horseback riding.

TRAIL TERMINOLOGY

Horizontal Clearance - An area cleared of vegetation, trees, rock ledges, limbs and logs along either side of the trail tread. (See Figure 1)

Sustained Trail Grade - Any grade found on any given mile for more than 20 percent, or 1,040 feet of that mile.

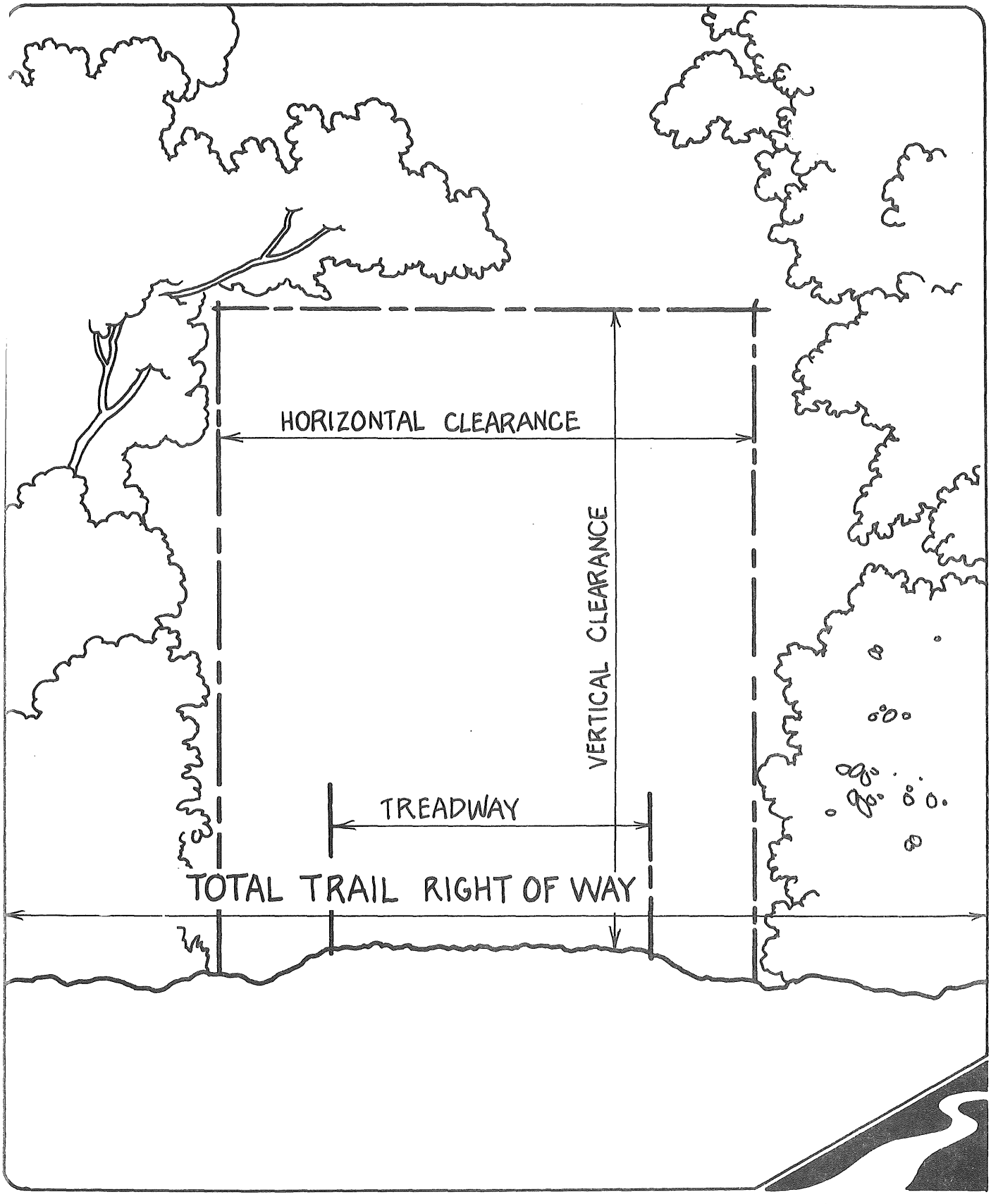
Trail Right-of-Way - The trail itself, plus a margin of land on either side of the trail, which is usually managed for its resource values and is essential to the recreational experience of the user. (See Figure 1)

Trail Treadway - That portion of the right-of-way upon which the intended activity takes place.

Vertical Clearance - An area or canopy above the trail that has been cleared of limbs, rock ledges and vegetation. (See Figure 1)

Trailhead - An access to a trail system which may include a parking area, toilets and other support facilities.

TYPICAL TRAIL CROSS-SECTION



PROCEDURES

Introduction

The Trails and Waterways Unit has been delegated the responsibility of administering funds for developing and maintaining most trails in DNR units. The Trails and Waterways Unit sets program policies, accepts and approves project proposals, provides technical assistance, monitors and audits trail projects and acquires lands for state trails.

The St. Paul office of DNR sets program guidelines and submits budget requests for program funding and monitors this funding. The DNR Regional Trails and Waterways Coordinators are responsible for processing project proposals, providing technical assistance and monitoring trail development and maintenance for unit trails. They are also responsible for State Trail acquisition, development and maintenance.

DNR unit managers in parks and forests are responsible for submitting land acquisition fact sheets, project proposals, implementing management plans and the actual development and maintenance of DNR unit trails.

The Trails and Waterways Unit currently has authority to seek funding for acquisition and development of state trails and DNR unit trails.

Maintenance funds for DNR trails may be provided by the Trails and Waterways Unit based on priorities set by the regional administrator.

Procedures

Types of Projects

At present the Trail Bonding Program for State Parks is only for hiking, biking and ski trails. The bonding program for State Forests is for rehabilitation of all trails including snowmobile and horse trails. In addition, support facilities such as kiosks, trail shelters and interpretive signs can also be funded.

Program Development

A program budget for State Park and Forest trails will be developed before each legislative session in the following manner:

1) Project proposals will be prepared and sent by the Forest or Park manager to their Regional Supervisor and Regional Trail Coordinator.

2) The Regional Supervisor and Trail Coordinator will confer and submit their recommendations to the Regional Administrator.

3) Regional Administrators will review each project and make recommendations to the Special Assistant to the Commissioner.

4) Once all trail proposals are in Central Office, trail staff will meet with appropriate park or forest personnel to develop the unit trail program budget.

Program Implementation

Upon legislative approval of the budget and funds are allocated the following procedures will be followed:

1. Meetings will be held in each region with Engineering, Trails and Park or Forestry staff to review the final trail program budget and to determine whether work will be done by contract or force account.

2. Spending plans will be prepared by Central Office staff to transfer force account project funds to the region for each park or forest.

3. Copies of the spending plan will be sent to appropriate St. Paul and Regional personnel.

4. Upon receipt of the spending plan, the Regional Supervisor and Business Manager will check the computer to assure that funds have been transferred and are available.

5. Once the money has been verified, a copy of the spending plan will be sent by the Regional Supervisor to the Park or Forest Manager.

6. Once the manager has received his or her copy of the approved spending plan, the project can commence.

7. Project dollars must be spent in accordance with the spending plan. Any change in the project must be approved through proper procedures (see page 9)

Reportability

It will be the responsibility of each Forest or Park Manager to prepare a monthly Program Progress Report for trail projects. Copies of each report will be sent to the Regional Supervisor, Regional Trail Coordinator, St. Paul Trail Coordinator and in the case of Parks, the Park Development and Resource Supervisor in St. Paul (see page 9).

General Responsibilities

Central Office

Trails: The Special Assistant to the Commissioner is directly responsible for the overall State Trail Program. His staff, the Trail Project Coordinators, are responsible for implementing and monitoring this program in compliance with approved legislation.

Parks: The Park Development and Resource Supervisor and Park Development Specialist will be directly responsible for implementing Parks' portion of this program. They will be accountable to the Trails and Waterways Unit for all project dollars and will assure that the program is completed as approved by Trails.

Forestry: The Director of Forestry has delegated responsibility for implementation of the trails program to the Regional Forest Supervisors.

Regional Administrators: Regional Administrators are responsible for maintaining the overall Trail Program within their region. They are directly responsible for supervising the Regional Trail Coordinators, and if any problem areas are identified, will inform the Special Assistant to the Commissioner.

Regional Trail Coordinators: Regional Trail Coordinators are responsible for implementing the overall regional Trail Program. They will provide professional expertise when requested by the Regional Supervisor and will assist in monitoring the program. If the Regional Trail Coordinator identifies problem areas, he/she will inform the Regional Supervisor and Regional Administrator of these problems.

Regional Supervisors: Regional Supervisors will be directly responsible for supervising Park and Forest Managers in their region in the implementation of the Trail Program. They will be responsible for assuring that project dollars are spent in accordance with approved Spending Plan and that projects are completed as per Engineering requisitions.

Forest and Park Managers: Managers are directly responsible for the implementation of all force account development projects within their parks or forests. They will maintain a cost accounting for each project (see page 13), prepare Monthly Program Progress Reports, supervise Project Development staff, implement and complete projects as stated in compliance with the final Trail Bonding Program requisitions.

Program Changes

If a Manager wants to change a Trail Project and/or its funding, he/she must review this project with his/her specific Regional Supervisor and Regional Trail Coordinator. In turn, if the Regional Supervisor and Regional Trail Coordinator feel that the project changes are appropriate, they will contact their Regional Administrator with their recommendations. The Regional Administrator will review the proposed changes and will make a final decision. Once a final decision is made, the Regional Administrator will notify all parties of his decision.

FILLING OUT MONTHLY PROGRAM PROGRESS REPORT

These forms should be filled out, accumulating the balance from one month to the next, so totals represent overall program cost since the biennium began.

In order to simplify the procedures necessary in filling out these forms, the following instructions and diagrams have been prepared (see page 13).

Project Status (see page 13)

1. Project: Check the program that the project has been funded out of.

2. Region: Write in Region that park or forest is within.

   Unit: Give name of State park or forest that project is within.

   Date of Report: Self-explanatory

3. Project Number: All project numbers are marked on any Spending Plans received.

   Project Name: State name of approved project.

4. Amount of Project: Write in project dollar amount as stated on approved Spending Plan. If this amount has changed, state why.

5. Starting Date: State date in which park or forest received approved Spending Plan.

   Estimated Completion Date: State the date that you expect the project to be completed. This date may change from one report to another.

6. % Completed to Date: State approximate % of project completed.

7. Annual (Regular M&O Budget) Funds Spent on Project to Date: This would be based on information provided from the green time sheets* It should be the total dollars spent on the project to date for employee services paid out of the annual Maintenance and Operations Account. This should also include fringe benefits; for example, a Park Manager's time when assisting on a project.

8. Actual Project Laborer Funds Spent on Project to Date: This total should represent only the true hours that employees paid out of project have worked on the project. This information would be obtained from the green time sheets* and should include fringe benefits.

9. Equipment Rental to Date: Self-explanatory.

10. Materials and Supplies to Date: Monthly expenditures by AID can be used to determine this figure.

11. Self-explanatory.

12. Self-explanatory.

13. Self-explanatory.

14. Equipment to Date: (Parks only) This should be based on information provided from the green equipment sheets* that are filled out monthly. Dollar amounts should be based on approved equipment rental rates. This information will be used to help replace equipment used on projects.

15. Self-explanatory.

16. Project Comments or Problems: State any comments or problems confronted that month and may request for help if needed.

    If Project Status Form is being filled out for Preventive Maintenance projects, list all projects completed or being worked on for the month.

17. Self-explantory.

    *Note: Green time sheets are only used by park personnel. Forestry will use its regular time sheets.

NA-00050-01
(A-15) Rev. 12-77)

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

Region V Discipline Forestry

Project No. _____

PROJECT PROPOSAL

Date 2-12-80

I. PROJECT:

Name of Project Trail

Area, District, Park _____

Federally Reimbursable? No Project or Source Code _ _ _ _ _ _

AID Chargeable _ _ _ _ _ _ Sequence No. _ _ _ _ _ Object Class Code _ _ _

Estimated Total Cost $ 13000 . 00 (Use page 2 if more than one code.)

C Class of Land Acquired Forestry Location (see map) Sec. 10-11-12-13-14-15 Township 103, Range 7

Acres _____ Miles 8 Detailed explanation of Project: Construct approximat 8 miles of cross-country ski and horseback trail, parking lot, campground, well, shelter and toilets. Also includes signing, seeding and facilities for horseback riders.

I. COST ESTIMATE:

A. Equipment Requirement

Type Size		No. of Hours	Rate/Hour	Total Cost
1 Ton Truck	Truck with Verneer Digger	15	30	$ 450.00
2 Ton Truck	Well puller			500.00
			Total Equipment Hire:	

B. Personnel Requirement

No. of Men		No. of Hours	Rate/Hour	Total Cost
	Equipment Operators			
	Truck Drivers			
1	Carpenters - Fireplace			$ 500.00
3	Laborers	510	5.14	$2,621.40
1	Crew Foreman	170	5.14	$ 873.80
			Total Personnel Hire:	

C. Materials and Supplies Needed

3-Digit Obj. Class Code	Description	Total Cost
	See Attachment	$8,001.65
	Total Materials & Supplies	

FINANCING OF THE PROJECT:

	AID _____ Seqn. #_____ Project or Source _____	AID _____ Seqn. #_____ Project or Source _____	Total
Salaries – Labor	$ 3,495.20		
Salaries – Supervisor			
Equipment Rental with Operator	950.00		
Equipment Rental or Lease			
Gas, Oil, Lubricants	500.00		
Materials & Supplies	6,041.65		
Repairs & Maintenance	500.00		
Development, Minor Construction	500.00		
Bldg. & Construction Materials			
Other Equipment	300.00		
Other Costs (Specify)	660.00		
Totals	$13,246.50		

State equipment, supplies or labor to be used on Project.

Tractor with mower and auger

Shovels, picks, hand tools

One truck

Swartz Bed Truck

SEE ATTACHED MAP

Show location of Project on grid. Be sure to indicate scale. Show sections, townships and ranges. Show existing roads if adjacent to Project area.

Sections _____ Twps. _____

Ranges _____ Scale _____

)posed Starting Date June 15, 1980

)posed Completion Date July 30, 1980 Remarks: _____

FINAL COSTS:

Labor $3,995.20 Equip. Rental $950.00 Materials $8,001.65 Total Cost $12,836.50

)ject Submitted by: District Forester _____
(Print Name) (Signature)

)ject Approved by: _____ _____
(Print Name & Title) (Signature)

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

MONTHLY PROJECT PROGRESS REPORT

1. Project (check one)

   Development ___
   Maintenance ___
   Trail Bonding ___

2. Region ___ Unit (Park or Forest) _____ Date of Report _____

3. Project No. _____ Project Name _____

4. Amount of Project $ _____

5. Starting Date _____ Estimated Completion Date _____

EXPENDITURES TO DATE

6. Amount of annual plan funds spent on project to date $_____

7. Actual project laborer funds spent on project to date $_____

8. Total project labor funds billed to project account to date $_____

9. Equipment rental to date $_____

10. Materials and supplies to date $_____

11. Other to date $_____

12. Total amount spent to date (add lines 8-11) $_____

13. Project balance to date (Subtract line 12 from line 4) $_____

14. Equipment to date $_____

15. This project was (check one):

    Regional Contract ___
    Force Account ___

16. Comments or Problems _____

_____

_____

_____

17. _____
    Manager's signature

ENGINEERING SERVICES

Engineering services available to the divisions are a valuable asset which should be utilized when developing trails. Services available through the DNR Engineering Bureau include: surveying, civil engineering, landscape design, graphics, architecture, bridge plans and others. It is important to understand procedures that are to be followed in requesting these services so that tasks can be accomplished within a given time frame. To request Engineering services, Form A-50 titled "Minnesota Department of Natural Resources, Requisition for Engineering Services" must be completed. (see Page 15). Information needed includes the name of the division for which the work is being done, project name, location, type of account, services requested and adequate coding for budgeting. The project name includes the unit name and type of development. Location information includes the county, section, township, range and an accompanying map. The services requested block should include the specific services needed. Guidelines or constraints of the project should also be included; e.g., request for engineering services for the construction of a bridge: load capacity - five ton, wood decked running surface of eight feet, railing height - five feet, one inch spacing between decking.

Additional information that would directly affect the design of the project should also be included.

When the form is complete, a copy shoud be sent to the Regional Engineer for his information. Then forward it through the same channels as the project proposal. When received, the Central Office Trails staff will add the appropriate AID and Project Number. The requisition will be assigned a Requisition Number and submitted to the section head in triplicate for review and signature. The requisition is then submitted to the Special Assistant to the Commissioner of the Trails and Waterways Unit and the Assistant Commissioner of Administration for review and signature. The requisition is then forwarded to the Bureau of Engineering. The initiation of a requisition can either be done by regional staff or central office personnel.

Field personnel should remember that the Bureau of Engineering has many projects to complete during a biennium. Requisitions should be submitted as early as possible to give the Bureau sufficient lead time to complete work on schedule. Major bridge contracts, for example, can take up to one year to complete. Don't expect immediate action on a requisition unless it has been prioritized by the Division and submitted in a timely manner.

Field Inspection (see page 17)

The final administrative step in trail development is field inspection. Once required contracts have been prepared and engineering involvement identified, the project must be monitored closely through the construction stages.

A-50
Rev. 2/74

MINNESOTA DEPARTMENT OF NATURAL RESOURCES
REQUISITION FOR ENGINEERING SERVICES

DIVISION Parks & Recreation BUREAU _____

PROJECT NAME Temperance River State Park
Trail Rehabilitation

LOCATION _____ COUNTY

SEC. _____ TWP. _____ RGE. _____

RECEIVED

SERVICES REQUESTED:

$11,000 Trails Bonding

Provide plans, specifications, and field supervision in the rehabilitation of foot trails at Temperance River State Park.

This is to include the rehabilitation of the foot trail from the foot bridge to the mouth of the river involving steps and hand railing and wall and overlook rehabilitation along the main river hiking trail.

AID: 347633

DO NOT FILL IN THIS SPACE

REQUESTED BY	APPROVED - SPONSOR	APPROVED - COMMISSIONER	
Wayland K. Porter	Don D. Davison	Eugene Gere	
Parks System Manager	Director	Ass't Commissioner	REQ. NO. 81-25
DATE 1-9-81	DATE	DATE 1/12/81	FILE NO.

ORIGINAL AND ONE COPY TO BUREAU OF ENGINEERING

The unit manager will be responsible for monitoring field work to insure that all funding, trail guidelines and management plans are followed.

The Regional Trails and Waterways Coordinator and St. Paul staff will also monitor projects to see that development is accomplished according to the project proposal and other specifications. A trail project inspection form will be submitted to the Trails Operations Supervisor after each inspection. Copies will be sent to the appropriate Division Director and Regional Administrator for review.

TRAIL INSPECTION FORM

DNR REGION #_____ COUNTY_____

TRAIL NAME_____

STATE PARK_____ CORRIDOR_____

STATE FOREST_____ G-I-A_____

TRAIL USE_____(ie. snowmobile, ski, hike, etc.)

MAP: EXCELLENT_____ GOOD_____ POOR_____

PARKING FACILITIES:
NUMBER_____ CONDITION_____ ESTIMATED SIZE (sq. feet) _____

TREADWAY:
WIDTH_____ TURNING RADIUS_____
VERTICAL CLEARANCE_____ GRADE_____

MAINTENANCE:
NUMBER OF TIMES GROOMED / WEEK _____TYPE OF EQUIPMENT USED_____
GENERAL CONDITION_____

USE:
HEAVY_____(ie. 200 + snowmobiles / weekend day etc.)
MODERATE_____(ie. 100 - 199 snowmobiles / weekend day etc.)
LIGHT_____(ie. 50 - 99 snowmobiles / weekend day etc.)

BRIDGES:
CONDITION_____ CONSTRUCTION MATERIAL_____
WIDTH_____ RAILINGS: YES_____ NO_____

SIGNS:
AS PER DNR SPECIFICATIONS YES_____ NO_____
SIGNING COMMENTS_____

FACILITIES:	NUMBER	CONDITION
REST AREAS	_____	_____
TOILETS	_____	_____
TRASH CONTAINERS	_____	_____

APPROX. ESTIMATED TOTAL # MILES WITHIN SYSTEM_____ MILES

APPROX. # OF MILES INSPECTED_____MILES

APPROX. # OF HOURS INVOLVED IN INSPECTION_____HOURS

DATE OF INSPECTION_____

PERSON CONDUCTING INSPECTION_____

PERSON(S) ACCOMPANYING INSPECTOR_____

GENERAL COMMENTS_____

RECOMMENDATIONS_____

PROCEDURAL POLICY FOR ACQUISITION

1. The regional administrator will, on a case-by-case basis, assign the responsibility for initial landowner contacts to the most appropriate field personnel. The regional administrator, through the trails operations supervisor, may request the assistance of the Land Bureau in initial landowner contact in areas of high priority.

2. Any department personnel initiating trail proposals shall work with the regional trails and waterways coordinator on the project proposal, fact sheet and project maps. The regional trails and waterways coordinator is responsible for necessary follow-up action on potential trail rights-of-way.

3. Upon receipt of the trail proposal and fact sheets, the regional trails and waterways coordinator shall review the proposal and fact sheets for accuracy and feasibility. He may request input from the regional land specialist for fact sheet review and verification of the legal description and other requirements.

4. Proposals (project proposal, fact sheets, and maps) determined to be feasible will be given preliminary approval by the regional administrator and forwarded to the trails operations supervisor.

5. The trails operations supervisor will review proposals and forward to the head of the Trails and Waterways Unit for approval. Fact sheets for approved projects will then be sent to the Land Bureau for appraisal and negotiation. A copy of the transmittal will be returned to the regional administrator.

6. The Land Bureau, upon receipt of the fact sheet and proposal, will notify the regionally-assigned realty specialist for monitoring purposes. The fact sheet will then be assigned for completion of an appraisal report. After review and certification of the appraisal by the Department of Administration, the project will be assigned to a negotiator to purchase the property.

7. Regional administrators will assign management responsibility to the appropriate discipline upon completion of the acquisition.

LAND ACQUISITION PROCESS

1. FACT SHEET APPROVED by discipline director
2. FACT SHEET RECEIVED by Bureau of Land
3. APPRAISER ASSIGNED by Bureau of Land
4. APPRAISAL CERTIFIED by Department of Administration
5. NEGOTIATOR ASSIGNED by Bureau of Land
6. RELOCATION SERVICES DETERMINED by Bureau of Land or Department of Transportation
7. OPTION SIGNED by property owner
8. OPTION APPROVED by engineering section
9. OPTION APPROVED by Attorney General's Office
10. OPTION APPROVED by Federal Aid Coordinator

    by discipline director (option containing special clause)

    by county board (Wildlife Management Area parcels)

    by LCMR (forestry parcels)

    by Minnesota Historical Society (parks and recreation parcels containing buildings)

    SEQUENCE ESTABLISHED by fiscal section

    SURVEY COMPLETED by engineering section
11. NOTICE OF ELECTION TO PURCHASE ISSUED by Bureau of Land
12. ABSTRACT SUBMITTED by property owner (Prior to Notice of Election to Purchase or within 30 days thereof)
13. PRELIMINARY TITLE EXAMINATION COMPLETED by Attorney General's Office
14. TITLE PERFECTED by property owner
15. CONVEYANCE DOCUMENT DRAFTED AND AFFIDAVIT PREPARED by Attorney General's Office
16. CONVEYANCE DOCUMENT SIGNED by property owner

    AFFIDAVIT SIGNED by negotiator

17. CONVEYANCE DOCUMENT RECORDED AND ABSTRACT CONTINUED TO DATE by county officials

18. NOTIFICATION to field that acquisition is finalized

INVOICE REQUESTED by Attorney General's Office

INVOICE PREPARED by Bureau of Land

INVOICE PROCESSED by fiscal section

WARRANT DRAFTED by Finance Department

19. PAYMENT SENT TO PROPERTY OWNER by Attorney General's Office

FACT SHEET INSTRUCTIONS

1. Parcel numbers will be assigned in St. Paul.

2. List name of fee owner and spouse, if married. List most current address from county recorder or treasurer's records. List address or phone number where fee owner can be contacted if different from above. List any other persons who may have an interest in the land such as trustees or contractors for deed.

3. List name of trail.

4. List county in which the parcel is located.

5. Leave blank.

6. List township, range, section and quarter; also include a copy of the deed or a description of the property from the deed or ownership document. Include a rough sketch of the parcel on an A23 or similar form. Include a topographic map showing a larger portion of the trail so that the specific parcel can be related to the trail and other parcels. (More than one parcel can and should be shown on this map). Also, include the width of the right-of-way discussed with the landowner and an estimate of the acreage based on the right-of-way width.

7. Check type of acquisition discussed with the landowner at the time of contact. If uncertain, explain.

8. Acquisition funds are from Resource 2000 but are approved by LCMR. Check Resource 2000.

9. Leave blank.

10. Leave blank.

11. The statute allowing acquisition for state trails authorized by the legislature is 85.015. For railroad grades not authorized by the legislature, the statute is 84.029. Statutes for parks and forests should be filled in by division office.

12. Explain why parcel is needed and give brief description of the type of land through which the trail will pass.

13. Give the date on which the owner was last contacted and indicated a willingness to sell. Also, explain impression of the landowner's willingness to sell.

14. Include name, address and phone of individual who made contact, in the event that questions arise concerning the fact sheet.

15. Include name and address of the Regional Trails and Waterways Coordinator for State Trails or the unit manager for parks or forests.

16. Briefly explain details discussed at the time the landowner was contacted and any other information which might be helpful to the appraiser.

STATE OF MINNESOTA
DEPARTMENT OF NATURAL RESOURCES
BUREAU OF LAND

LAND ACQUISITION FACT SHEET

1
Parcel No.

2
Name of Owner

3
Project

Address

4
County

City State Zip

5
Region Request No. (office use only)

Home: Office:
Phone

Complete Legal Description: (include rough sketch or plat if partial taking)

6
Section

Township

Range

Estimated Acreage

Interest to be acquired by (check one)

Purchase	( )	7
Easement	( )	
Lease	( )	
Condemnation	( )	
Gift	( )	
Other (describe)		
_____	( )	

Source of funds (check one)

Resource 2000	( )	8
LCMR	( )	
Surcharge	( )	
Public Access	( )	
Gift	( )	
Other (describe)		
_____	( )	

9
Estimated Maximum Purchase Price
(not including relocation benefits)

10
Estimated Amount of Relocation Benefits
(if not applicable, write "none")

11
Statute authorizing acquisition

Justification for purchase and quality of land:

12

BLA 005
Revised 1-11-77

: type of seller:

Willing Seller

Non Committal

Reluctant

13
Date owner indicated a willingness to sell
(must be within previous six months)

14
dual who made contact

Address

Phone

ollowing individual may be contacted for additional information:

15

Title

ss

City

State

Phone

l Contact Comments and/or Instructions:

16

tor

Date

Regional Administrator

Date

submitted to Land Bureau

Date received by Land Bureau

STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

BUREAU OF LAND, ACQUISITION & EXCHANGE SECTION
444 LAFAYETTE RD. • ST. PAUL, MINNESOTA 55101 • PHONE 296-7945 • 296-7949

NAME _____
PROJECT _____
COUNTY _____
PARCEL _____
PURPOSE _____

Dear

Attached is a copy of the "Landowner's Bill of Rights" which explains your rights and obligations in conveying land or an interest in land to the Department of Natural Resources. The information is being presented to you at this time in order that you will be aware of what is involved in the acquisition program.

If you are considering the sale of your land or the conveyance of an easement, please note in particular the fourth paragraph of the attached "Bill of Rights." This paragraph explains your right to hire an independent appraiser and have his appraisal considered in determining the fair market value of your property.

We are asking at this time that you acknowledge having received the attached information and that it has been explained to you. You are not obligated in any way by indicating that you have received the attached information and explanation.

Sincerely,

Merton V. Christian, Supervisor
Acquisition and Exchange Section

MVC:mlm
Attachment

I have received a copy of the Landowner's Bill of Rights and it has been explained to me.

_____ _____
Signed Date

MINNESOTA DEPARTMENT OF NATURAL RESOURCES
LANDOWNER'S BILL OF RIGHTS

As a landowner you and the State have certain rights and obligations when selling your land or any interest in your land to the Minnesota Department of Natural Resources. This letter is to inform you of those rights and obligations. Please read it carefully.

The lands which you have indicated an interest in selling to the Department of Natural Resources will be used for _____. If this use changes prior to purchase, you will be advised.

The State will have your property fairly appraised and will afford you an opportunity to accompany the appraiser during his inspection of the property, if you so desire.

You have the right to retain a qualified independent appraiser to conduct an appraisal at any time prior to certification of the State's appraisal, have that appraisal considered along with the State's in certifying the selling price and to be reimbursed up to $300, pursuant to Minnesota Statutes 117.232, for that appraisal if the land is acquired by the State. If you are considering hiring an appraiser at this time, please advise us in writing within ten days of the date of this letter so your appraisal can be considered prior to the certification process. Any appraiser who submits an appraisal must certify within the appraisal that he has physically inspected the property.

The State is not allowed to discuss price until the appraisal is made and certified and then only with the landowner or his agent.

At the beginning of the negotiation period, you will be given a resume' of the certified appraisal. This resume' will include the final conclusion of value, the total number of acres and types of land appraised, the valuation of all buildings and improvements being purchased, the value of the timber on the tract, and any special damages and/or special elements of value. The same person who prepared the State's appraisal will not negotiate the sale to the State.

You will be paid a fair price for any land sold to the Department of Natural Resources. This price is the fair market value of the property based on the certified appraisal, in addition to any abstracting and recording fees related to the sale. The cost of clearing title, payment of taxes and related attorneys fees are not reimbursable.

If the property is held as security for a loan or advance of credit that requires or permits the imposition of a pre-payment penalty, such penalty shall be reimbursed by the State of Minnesota.

The Department of Natural Resources will acquire your property in the most expeditious manner possible. Unless you specifically request otherwise in writing, the following time periods apply. If no survey is

required, the option period shall not be greater than two months, and if a survey is required, the option period shall not exceed nine months. These time limits do not apply to Wildlife Management Areas where county board approval is required under Minnesota Statute 97.481.

The option, including all special provisions, land descriptions and elements of execution, must be reviewed by the State as to their legality and acceptability. The State shall have 15 days after the date the option is received to examine the option and approve and accept the option. If the option is approved by the State, the effective date of the option is the last date on which it was signed by a landowner as if there was no 15 day examination period. The option period as defined above commences on the effective date of the option. If the State approves the option, it will notify the owner in writing by mail that the option is approved. The State shall also notify the owner if the option is disapproved and the reasons therefore. Notice of Approval is not notice that the State has elected to purchase the property. Failure of the State to notify the owner of approval or disapproval within the 15 day period shall be deemed a disapproval. If the State does not elect to purchase property on which it has approved and accepted an option, it shall pay the landowner $500 after the expiration of the option.

Once the property is optioned, payment must be made no later than 90 days following the Department's Notice of Election to Purchase if the title is marketable and you act expeditiously to complete the transaction. You have the right to accept payment at your election in either a lump sum or by means of up to four annual installments. The State does not pay interest on monies held during an installment agreement.

You have the right to continue occupancy of the property until full payment is made provided, however, that if you elect to receive payment in annual installments, you may retain occupancy only until the first payment is made.

You have the right to accept or reject the Department's offer for the property. If you accept the offer, you may receive or waive any relocation assistance, services, payments and benefits as provided in M.S. 1978, Section 117-52 - 117.521. You also have the right to accept the Department's offer for the property and to contest the relocation assistance and moving expenses, the latter being part of payments and benefits.

You have the right to seek the advice of counsel regarding any aspect of the land transaction. Further, you have the right to have the Department acquire your land by condemnation at your request in writing and with the agreement of the Commissioner of Natural Resources.

You are hereby informed that documents regarding the purchase of your property will be a matter of public record if the property is purchased by the Department.

These landowner's rights are in addition to all other applicable rights and responsibilities as provided in other State and Federal laws which pertain to land acquisition for natural resource purposes.

If you do not unterstand these rights and responsibilities or if you wish additional explanations beyond that given by the individual presenting this letter to you, you may contact the Supervisor of the Acquisition and Exchange Section of the Bureau of Land within the Department of Natural Resources. The address is Room 670-Space Center Building, 444 Lafayette Road, St. Paul, Minnesota 55101, Telephone Number: 1-800-652-9747.

ENFORCEMENT

To encourage safe use of the trails, a common sense approach should be used in enforcing state trail rules and regulations (Minn. Reg. NR 20), and state park rules and regulations. However, in order for citizens to have an enjoyable and fulfilling trail experience, an effective enforcement program is necessary.

Specific regulations govern the use of state trails and state park trails which should be posted conspicuously at accesses, waysides, campgrounds and at other necessary locations. Any violation of the rules and regulations is a misdemeanor subject to a fine of up to $500 and/or 90 days in jail.

The enforcement of trail rules is necessary in order to have a safe trail. However, law enforcement or trail maintenance people are not always available. Trail enforcement programs also depend on a public education effort. This can be accomplished through the use of signs, trail brochures and public meetings with trail user groups. Experienced trail users will be expected to set an example.

Enforcement of regulations is the responsibility of the DNR regional conservation officers in cooperation with local law enforcement agencies. County sheriff's offices along the trail will be asked to aid in controlling trail use. Funds to assist local enforcement agencies in leasing equipment for trail patrol through county sheriff departments may be available from the DNR Trails and Waterways Unit.

Supplementary Enforcement

The following methods of law enforcement are used to supplement the services of conservation officers:

1. Minnesota Statutes 1976, Chapter 84, Section 84.029, specifies that each DNR employee, "while engaged in employment in connection with such recreational areas, has and possesses the authority and power of a peace officer when so designated by the commissioner." Classroom training through the DNR Enforcement Division or Bureau of Criminal Apprehension is suggested to acquaint employees with appropriate methods and actions of peace officers.

2. Commissioner's Order #21 gives DNR employees, while engaged in their employment, the authority to write infractions of the rules and regulations on Conservation Officer Form 145. Such a report consistutes a record of evidence admissible in court. Employees doing this must witness the violation and are advised to understand the constitutional rights of individuals.

TRAIL DESIGN AND CONSTRUCTION

The trail development section outlines the general design and construction techniques for all trails. Guidelines for specific trail types are discussed later in the manual.

Good trails offer variety and excitement for the trail user, yet provide a safe experience. Trails should blend into the surroundings and complement the environment, not conflict with it. Trails should be designed whenever possible to accommodate a summer and winter activity.

Trail Layout

Trail design begins in the office by looking at topographic maps and aerial photos. Suitable areas should be located, taking into account: the type of trail to be constructed, the types of use to be accommodated, expected use, existing or potential facilities, land ownership, topography, diversity of vegetation, points of historic or scenic interest and problem areas such as steep bluffs, bogs, swamps and all highway, railroad and water crossings.[5]

Trails developed in DNR park and forest units should be designed in a loop system. There are many types of loop systems that can be used; the most frequently used types are shown in Figure .

The loop system is very effective because it allows a good deal of flexibility in trail alignment, it returns the trail user to the starting point and allows more miles of trail to be developed in smaller areas.

The following are important points to keep in mind when laying out a trail system:

1. Locate trail systems in a manner which provides for maximum enjoyment, safety and maintenance effeciency.

2. Avoid conflict with other activities within the unit.

3. Provide variety within the system; offer choices in terms of terrain, difficulty and length.

4. For winter use, layout trails in a manner which takes advantage of snow holding and gathering devices. Avoid south-facing slopes and hilltops, tree or fence lines that drift causing maintenance difficulties and open, windy areas which cause problems for the trail user.

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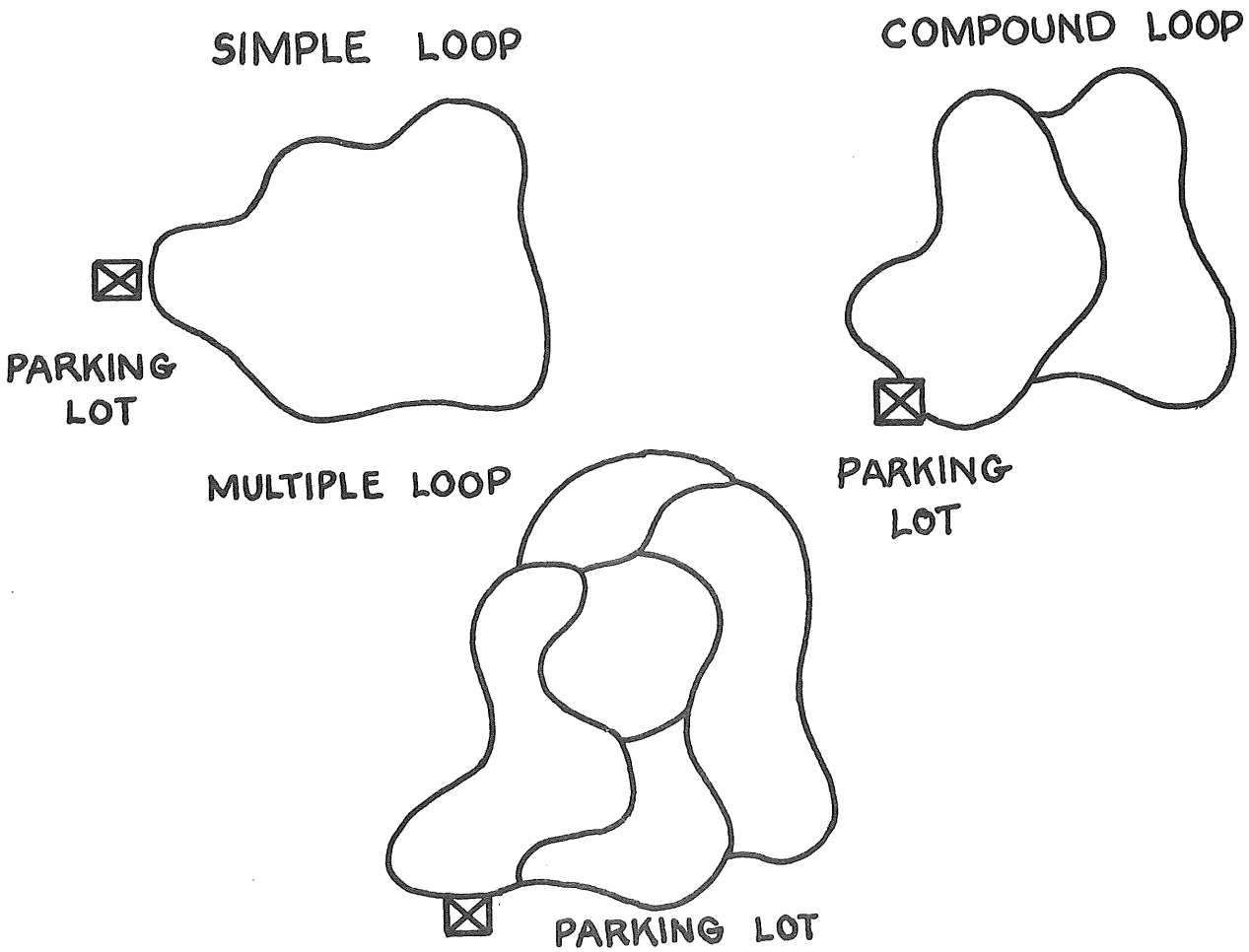
5. Trails Manual, Ontario Trails Council, Ontario Ministry of Natural Resources

FIGURE 2


SIMPLE LOOP
PARKING LOT
COMPOUND LOOP
PARKING LOT
MULTIPLE LOOP
PARKING LOT

5. Achieve a proper balance between flat, uphill and downhill stretches so that the trail is interesting and not monotonous. Ideally most trails should be 1/3 flat, 1/3 uphill and 1/3 downhill.[4]

After considering these and other key points in the office, the selected route should be field-inspected.

Field Layout

Ideally, field inspection should take place in the spring after snow has melted when the horizontal line of sight is at its optimum and natural drainage patterns can be observed.[5]

Starting at the trailhead, the trail alignment established in the office should be walked in both directions to identify problem areas, points of interest, slope angles, sun and wind exposure, drainage, bridge crossings and ease of clearing.

After preliminary field inspection, the route should be flagged with plastic ribbon; large trees to be removed should be marked. Location of all trail improvements such as bridges, corduroy, culverts, special tread surfacing areas, campgrounds, road crossings and parking lots should also be finalized. Specifications for the type of trail use planned should be followed so that the trail meets the needs of the user. Remember that once trees leaf out, ribbons will be harder to see. Therefore, it is better to place too many ribbons, than too few.

Trail Gradient

Trail gradient is an important consideration in trail design. Refer to the specifications section to determine suitable gradients for various trail activities.

Slope is probably the most significant factor when aligning trails. Slope will determine the trail layout pattern and width, curve radius, switchbacks and runouts--depending on the activity involved. Bicycling, snowmobiling and ski touring are activities where gradient is most critical.

Acceptable trail gradients depend on three factors: trail activity, soil structure and ground cover.[5] Trail activities, such as ski touring, require special considerations on both up and downhill sections. Soil structure is critical because of erosion problems that could result from damage done by trail users. Consult local SCS or ASCS offices for detailed soil information.

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[4] The Ski Touring Trail Planner, First Edition; Timothy B. Knopp and Jack P. Maloney, 1972.

[5] Trails Manual, Ontario Trails Council, Ontario Ministry of Natural Resources

Side slope gradients are an important consideration because they effect trail grooming and erosion problems. Side slopes should be avoided whenever possible. When avoidance is impossible, they must be properly designed to avoid later problems. (see Figure 3)

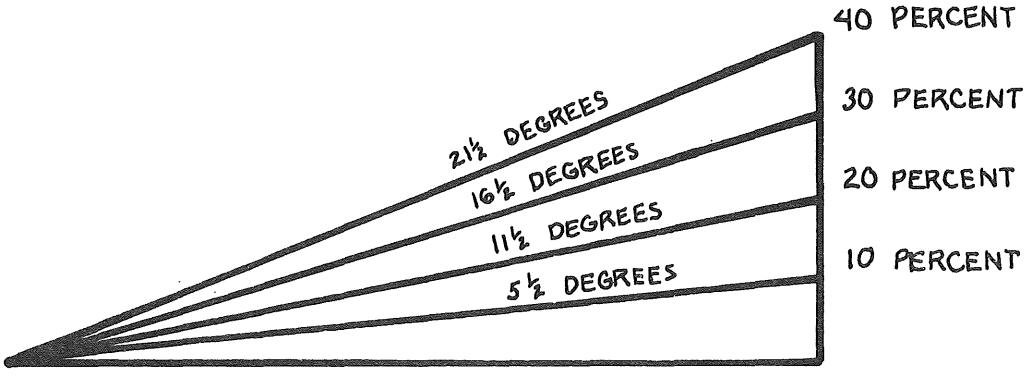
Since snowmobiling and ski touring are two of the most critical activities in regard to gradient, the following information applies mainly to trails designed for these activities.

As the degree of slope increases, the need for larger turn radius, runout and switchback areas becomes necessary. Although curves should be avoided on downhill slopes and at the bottom of hills, some cases may arise where there is no alternative. Thus, the use of the following standards are essential for the safety of the user and for trail grooming ease.

Where a turn is required at the bottom of a slope, either a runout, increased turn radius or a widening of the trail must be provided. As the slope and downhill distance of the trail increase, the width, turn radius or runout should increase accordingly. (see figures 3 , 4 , and 5).

Switchbacks and corresponding turnouts will be used where the slope is steep and sustained. In this case, a switchback should prevent a speed build-up and loss of control.

FIGURE 3



DEGREES AND PERCENT SLOPE:
ADAPTED FROM "THE SKI TOURING TRAIL PLANNER" – FIRST EDITION, TIMOTHY B. KNOPP & JACK P. MALONEY, 1972

FIGURE 4

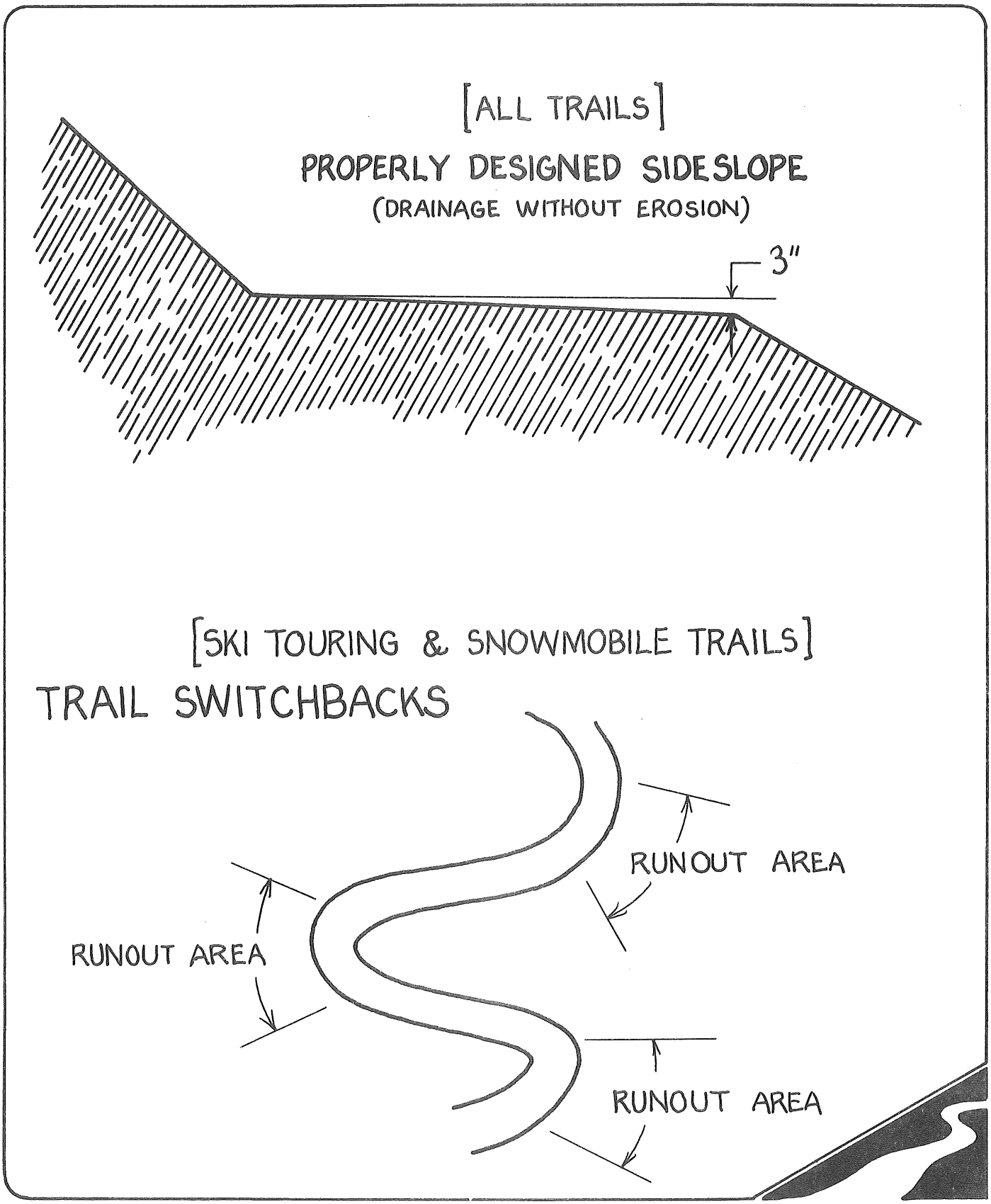
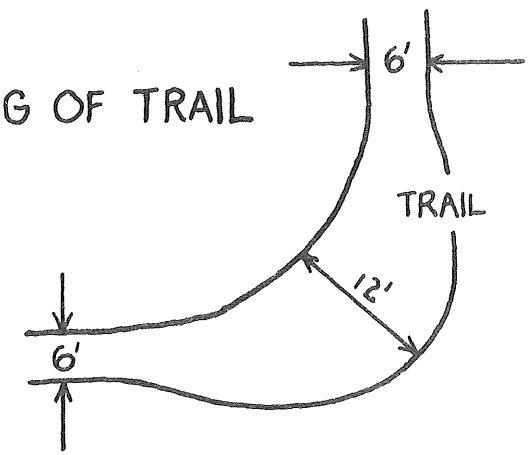

[ALL TRAILS]
PROPERLY DESIGNED SIDESLOPE
(DRAINAGE WITHOUT EROSION)
3"
[SKI TOURING & SNOWMOBILE TRAILS]
TRAIL SWITCHBACKS
RUNOUT AREA
RUNOUT AREA
RUNOUT AREA

FIGURE 5

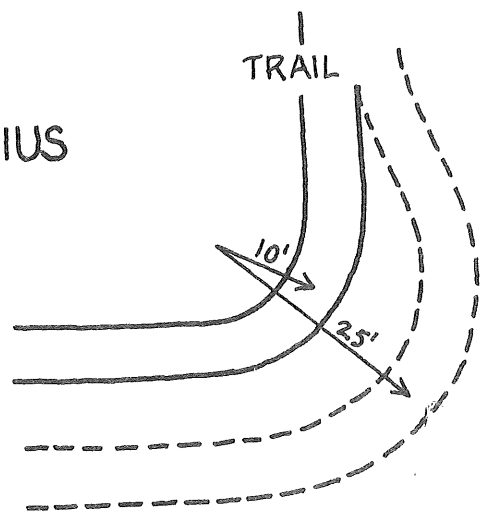
SKI TOURING AND SNOWMOBILE TRAILS

WIDENING OF TRAIL



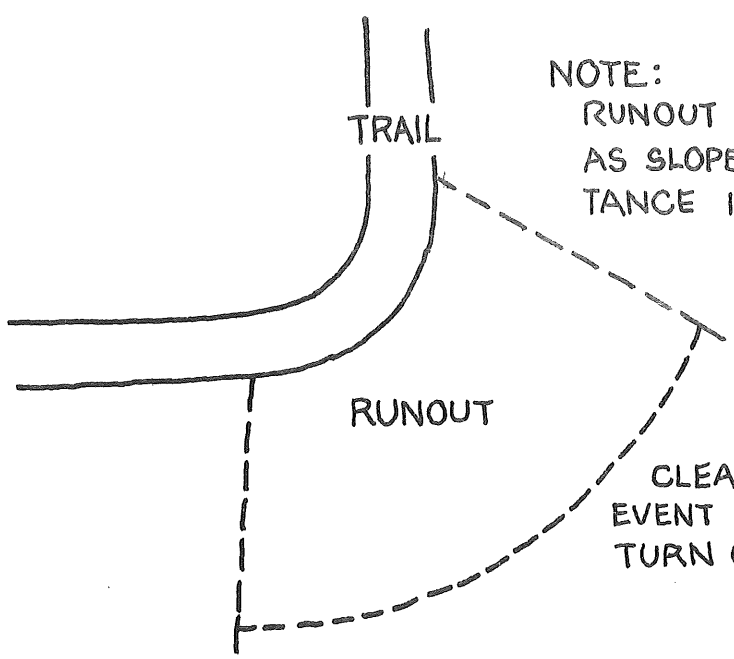
NOTE:
WIDENING OF TRAIL SHOULD INCREASE AS SLOPE & DOWN-HILL DISTANCES INCREASE

TURN RADIUS



NOTE:
TURN RADIUS OF TRAIL SHOULD INCREASE AS SLOPE AND DOWNHILL DISTANCE INCREASE

RUNOUT



NOTE:
RUNOUT SHOULD INCREASE AS SLOPE & DOWNHILL DIS-TANCE INCREASE

Trail Treadway

The ideal surface for most trail activities is a natural surface of grasses. However, planned trail activity, ground conditions and intensity of use are also major factors in determining proper surfacing. Generally, trails built in DNR units should be smooth natural surface with roots, rocks and humps removed.

If a summer activity is planned, wet trail sections will require an elevated tread such as corduroy, turnpiking or a boardwalk. (see figures 6, 7 and 8). Fabric mat may be used in some instances.

In areas where heavy use causes soil compaction or vegetation removal, or in areas of erodable soils, other surface treatments may be necessary. A properly applied surface can do much to combat trail degradation. The Bureau of Engineering should be consulted to determine surface suitability.

NOTE: It may not be necessary to apply special surfaces throughout the trail. Cost alone is one reason; aesthetics is another.

Drainage

Wet areas along the trail cause development and maintenance problems and should be avoided whenever possible. Water collecting on or running down the trail will cause erosion and hinder year-round trail use. Several methods can be utilized to prevent such problems. (see figures 6 thru 12). Outsloping of the trail tread, crowning, ditching, water bars, water dips, bridges, culverts, corduroy, turnpiking and boardwalks are most often used. Use of these treatments will depend on the type of trail use and soil types. Fabric mat, although relatively expensive, can be placed under fill to build up an elevated, relatively problem-free tread.

Bridges

Trail bridge size and width depend on trail activity, expected use and size of maintenance equipment.

Always align the bridge to permit a straight-on, gradual approach.[4] Bridges should be constructed at the narrowest point of the stream and built at least 1-2 feet above the high water mark. Contact the Bureau of Engineering for bridge designs and the Regional Hydrologist to determine stream flow and high water marks. Permits may be required from the Division of Waters and/or Corps of Engineers prior to construction. Fisheries personnel should also be consulted. In some instances a culvert may be cheaper to build and easier to maintain. (see figures 11 and 13). Generally, bridge railings should be four feet high.

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[4] The Ski Touring Trail Planner, First Edition, Timothy B. Knopp and Jack P. Maloney, 1972

FIGURE 6

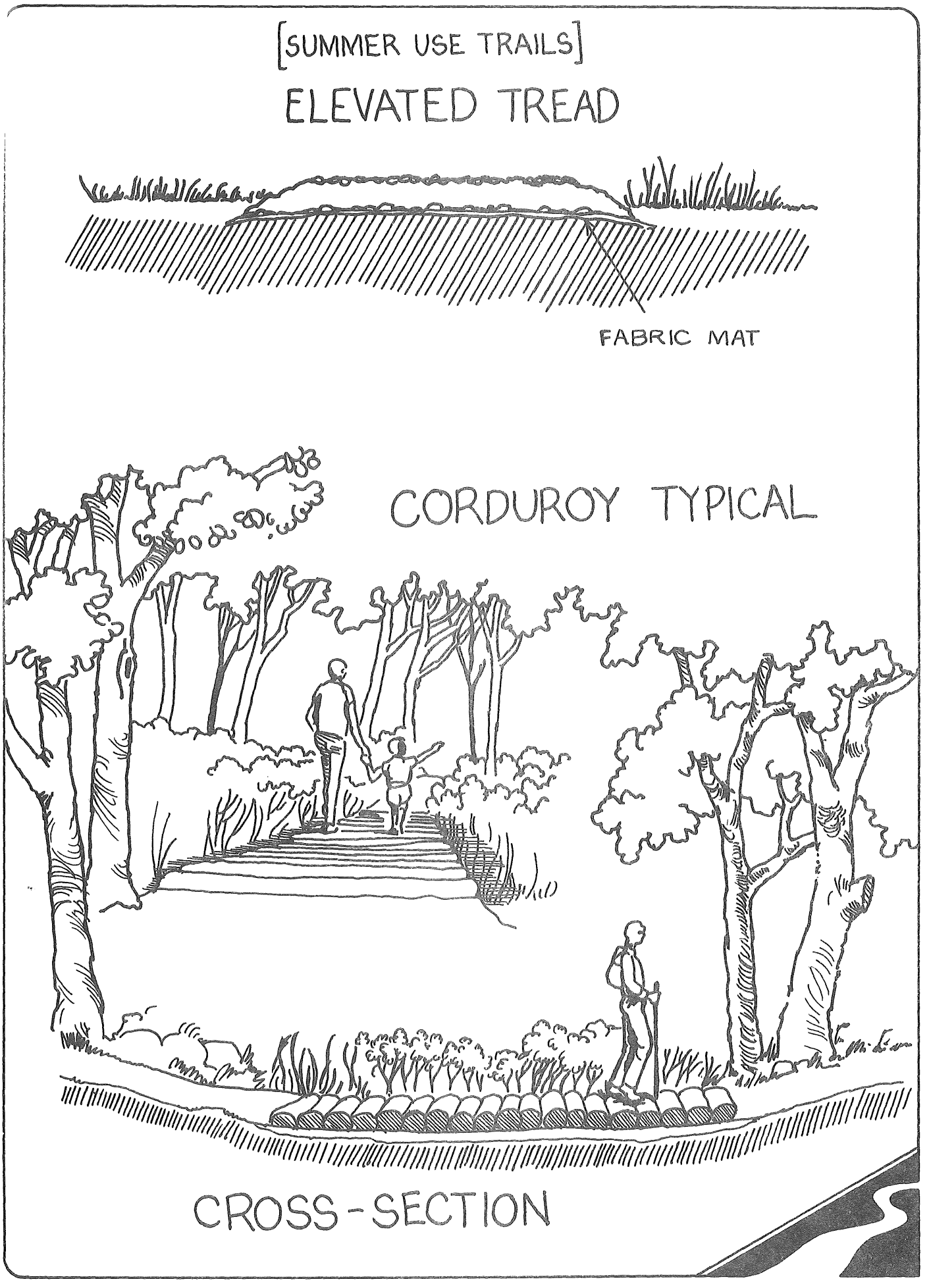
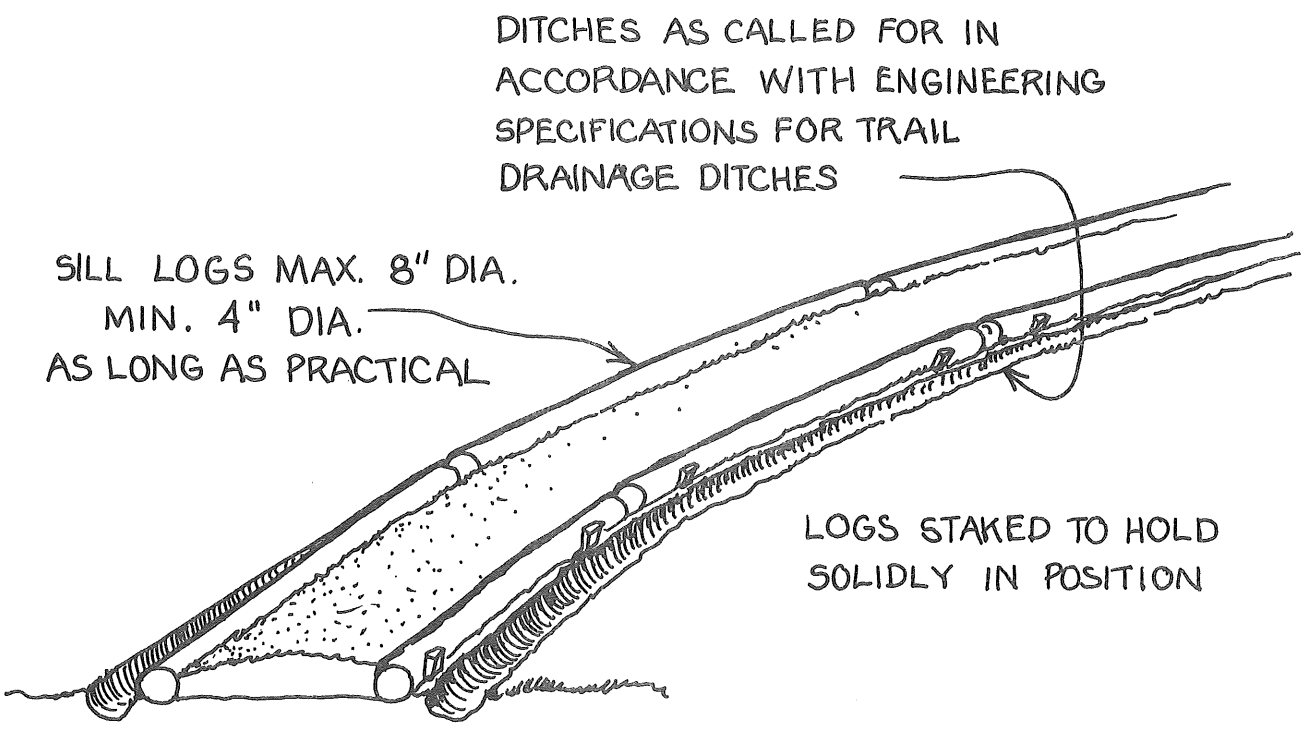

[SUMMER USE TRAILS]
ELEVATED TREAD
FABRIC MAT
CORDUROY TYPICAL
CROSS-SECTION

FIGURE 7

TRAIL TURNPIKING

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



NOTE: USED IN LOW WET AREAS

FIGURE 8

BOARDWALK

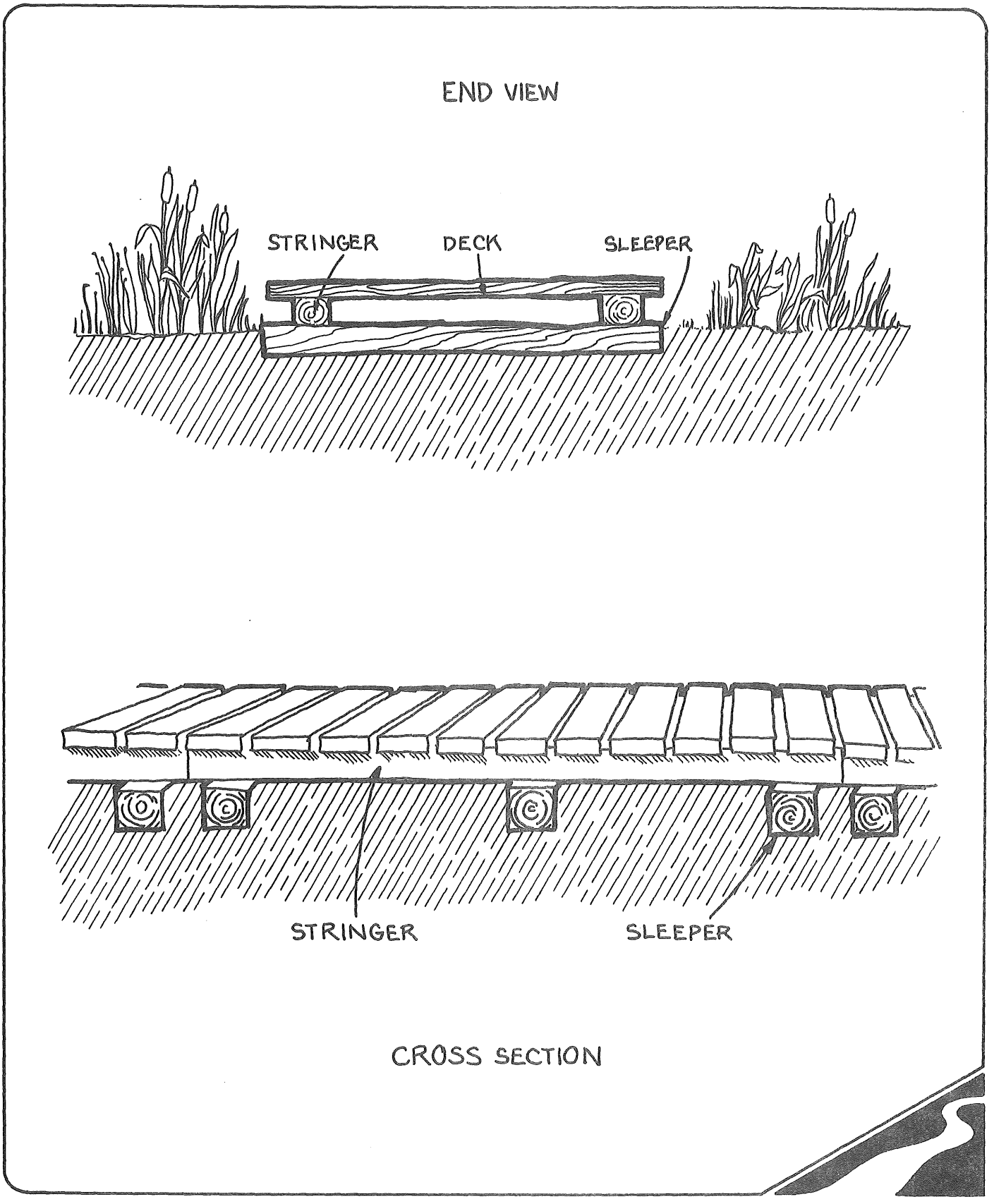


FIGURE 9

TRAIL PUNCHEON

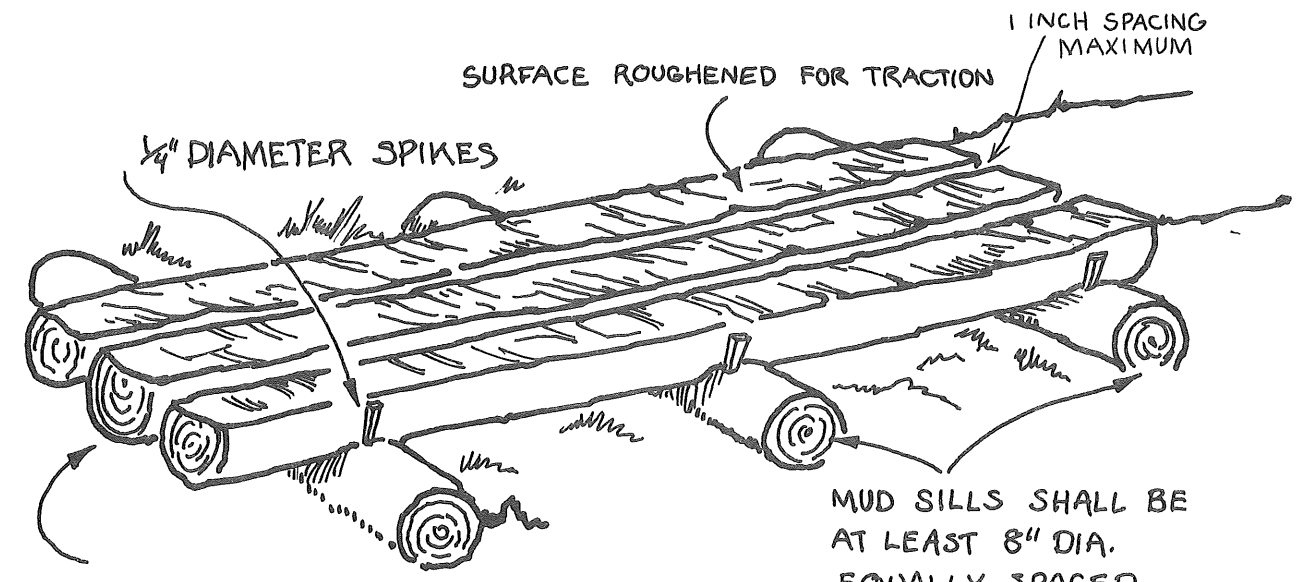
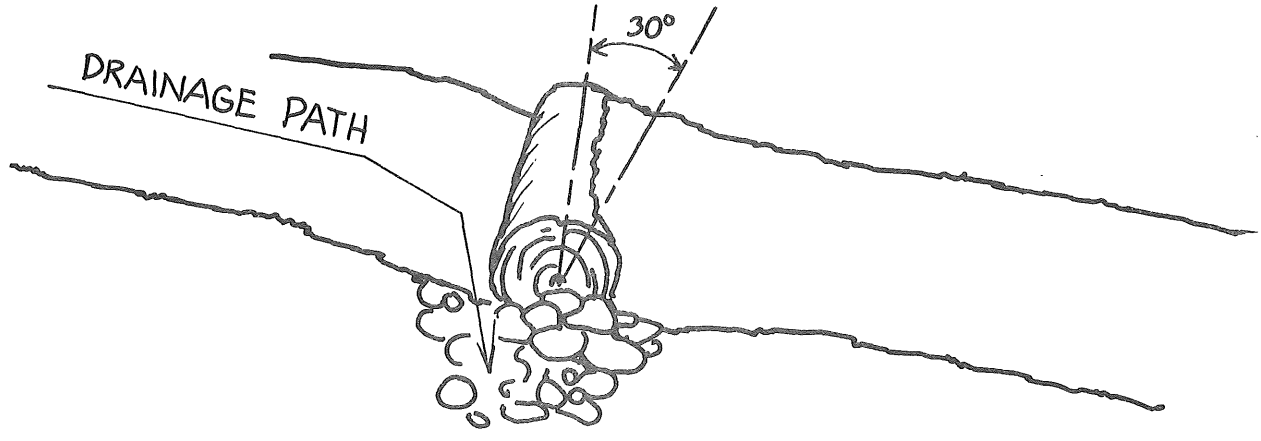
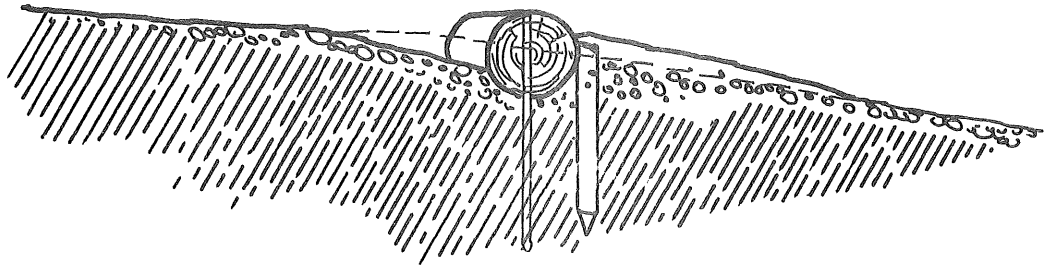


FIGURE 10

WATER BARS



NOTE: LANDSCAPE SOIL TO TOP OF WATER BAR ON DOWNHILL SIDE



NOTE: LOG IS HELD IN PLACE BY STEEL PIN AND/OR WOODEN STAKE. BELOW STONES ARE USED AS A WATER BAR.

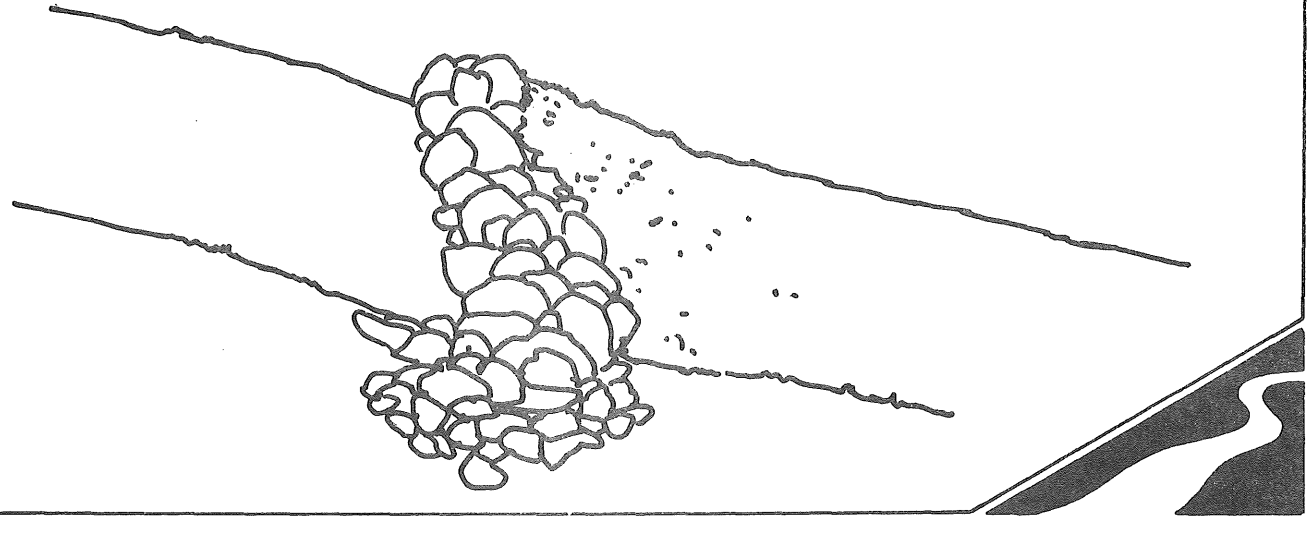
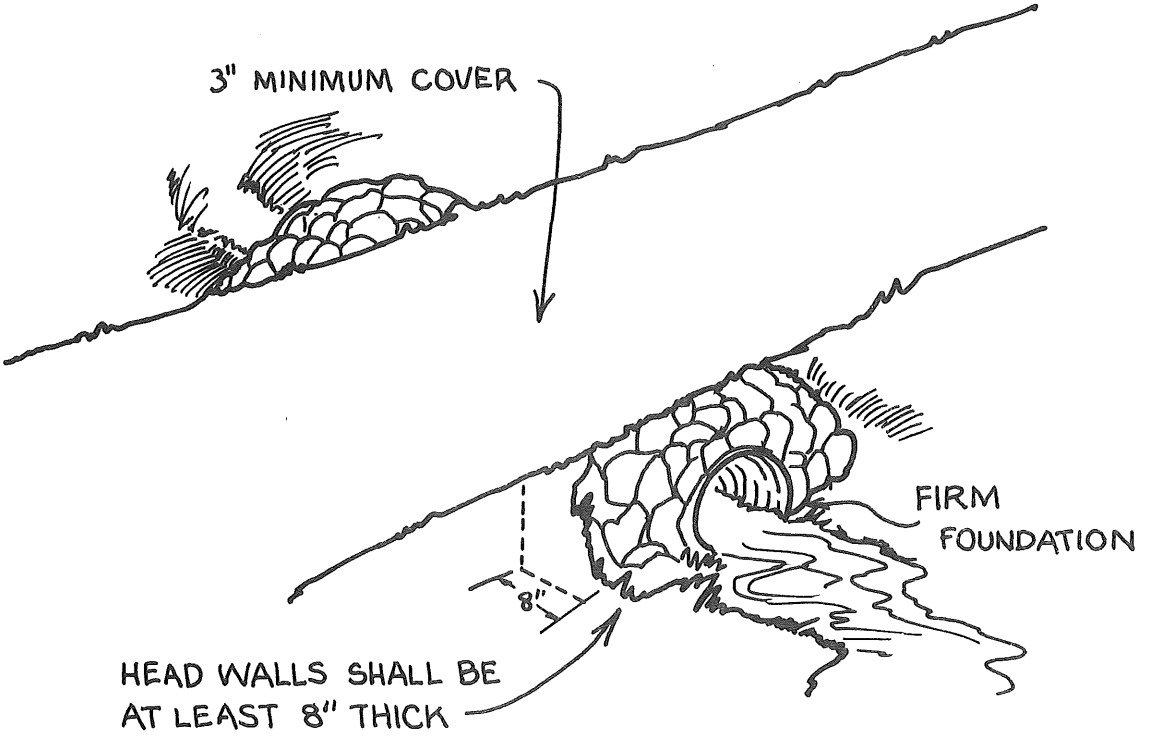


FIGURE 11

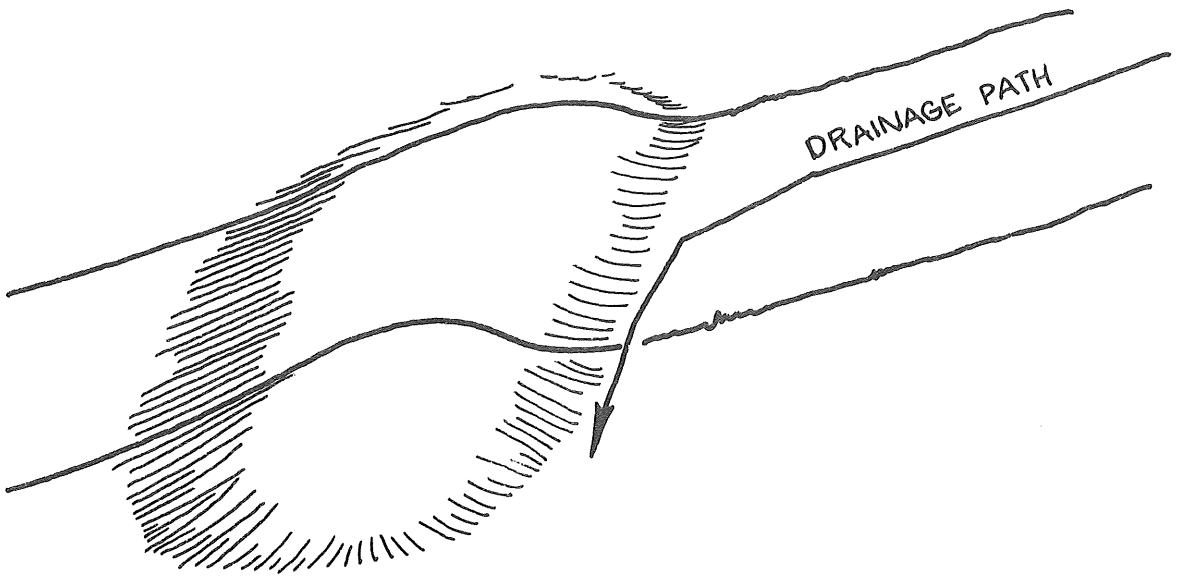
CULVERTS



HEADWALL OF NATIVE STONE STONE SHALL BE AT LEAST 4" IN IT'S SMALLEST DIMENSION

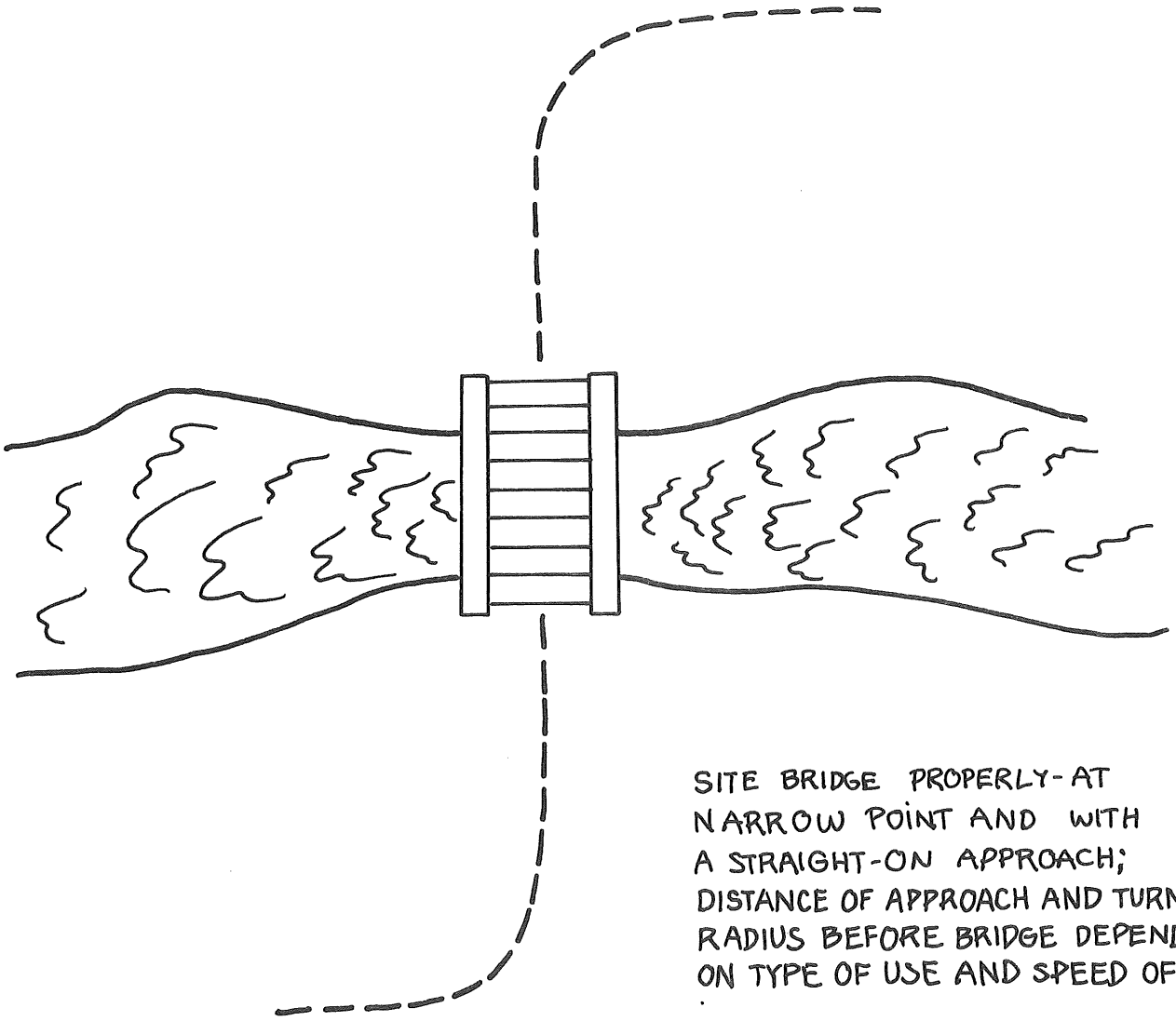
FIGURE 12

NATURAL WATER BAR



NOTE: A NATURAL METHOD OF TAKING WATER OFF A TRAIL, BUILD A HUMP A FEW INCHES HIGH AND ANGLED TOWARD THE LOW SIDE, REPEAT THIS WATER BAR AS NECESSARY TO DIVERT WATER BEFORE EROSION BEGINS. (A DEPRESSION BUILT IN THE SAME MANNER WILL ALSO WORK.)

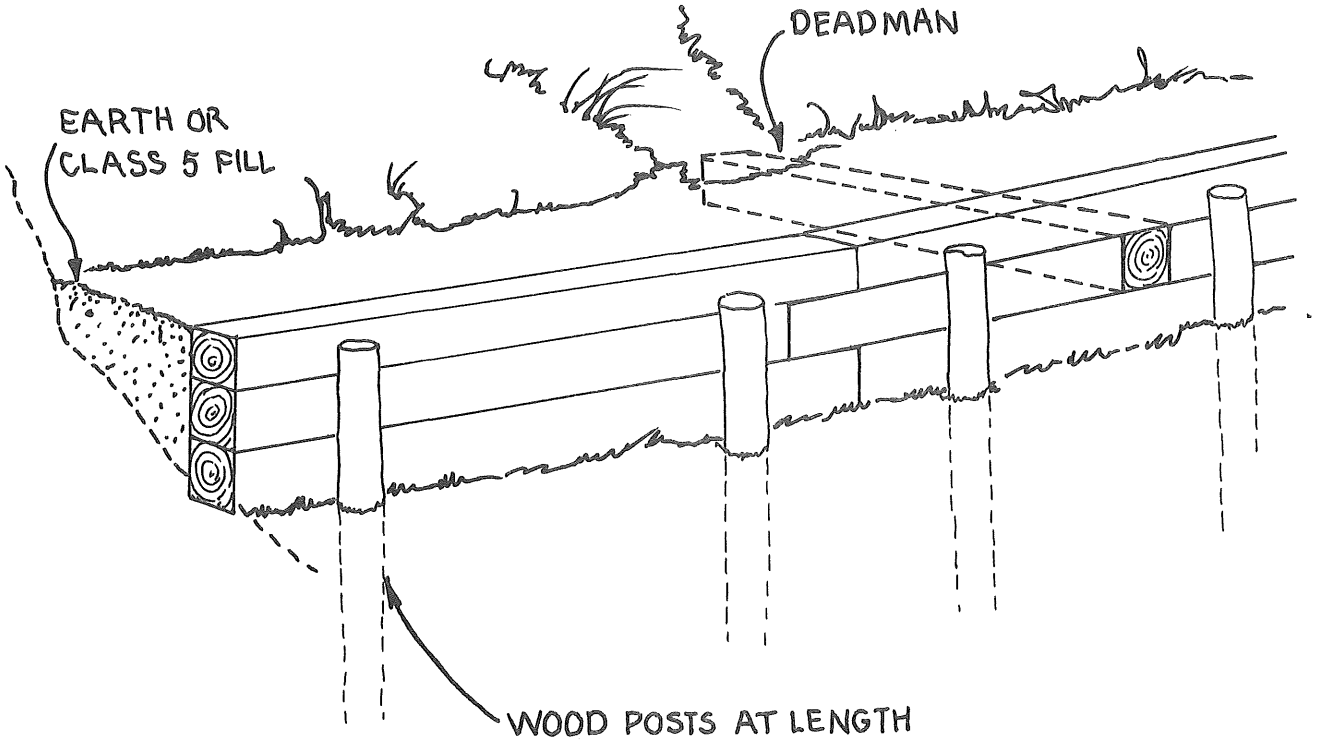
FIGURE 13



SITE BRIDGE PROPERLY-AT NARROW POINT AND WITH A STRAIGHT-ON APPROACH; DISTANCE OF APPROACH AND TURN RADIUS BEFORE BRIDGE DEPENDS ON TYPE OF USE AND SPEED OF USER.

FIGURE 14

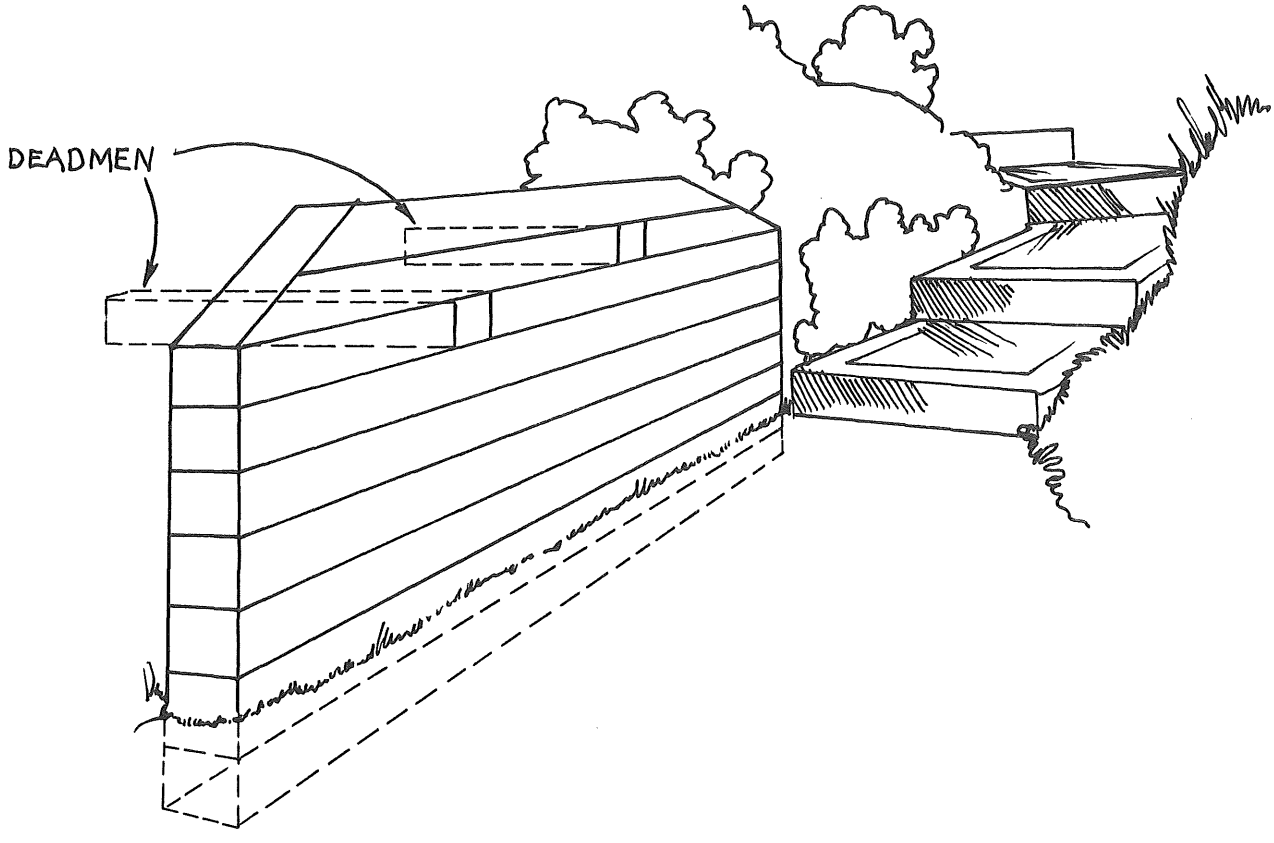
TRAIL RETAINER



NOTES: TIMBERS TO BE 6"X6"X8" ROUGH SAWN
TREATED WITH CHEMONITE OR AN EQUAL
- FASTEN POSTS TO TIMBERS WITH RING
SHANKED 80d POLE BARN NAILS
7 INCHES LONG

FIGURE 15

RETAINING WALL



NOTE: TIMBERS USED ARE ROUGH SAWN 6X6 FULL DIMENSION

Facilities

Facilities provided along a trail depend on location, length of the trail, expected use and intended types of trail activity. Trail systems should include a parking area, toilets and information board at the trailhead. Other facilities might include a trail center, trail shelters, log benches, campsites, picnic sites, scenic overlooks, hitching posts, bike racks, etc. See the specifications section for recommended facilities.

Parking lot size will vary depending on the intended use. Snowmobile and horse trails require larger lots to accommodate trailers. The size for a 25 car/trailer lot is 300' x 92'; a larger area is preferable to allow flexibility in design.* Ski and hiking trail parking lots can be smaller because users generally do not have trailers. The standard lot for 25 cars without trailers is 70' x 180.* Overuse of curbs and islands make snowplowing difficult.

Pit toilets should be located near the parking lot and along longer loops of a trail system. Numbers needed depend on expected number of users.

An information board should be located at the start of the trail and include a large-scale map of the area, snow conditions, emergency phone numbers, etc.

Trail centers should be designed to meet the needs of users in the most safe and efficient manner possible. Most trail users do not expect a fancy building but prefer a location where they can warm up, eat lunch and visit with other trail users. Fireplaces should be located so that various groups may share its use without congesting doorways or hallways.

Trail shelters should be placed at 5-10 mile intervals** on ski trails and 15-25 mile intervals on snowmobile trails. Shelters should be located in scenic areas and situated in a manner which blocks the prevailing wind. An outdoor fireplace or fire ring equipped with a heat reflector should be located in front of the shelter. Placement may vary because of shelter size or location. If it is located too close to the shelter, smoke will be a problem; if it is too far away, it will provide no benefit to the user.

Log benches along ski trails at 3-5 mile intervals provide a place for the skier or hiker to rest and enjoy the surroundings. Benches should be constructed in scenic locations, located so the user's back is to the prevailing wind and built to a height 2-3 feet above maximum expected snowfall.

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* Minnesota DNR - Bureau of Engineering, Landscape Architecture Section

**Minnesota DNR - Bureau of Planning and Research - SCORP Survey 1978

FIGURE 16

ONE WAY TRAIL HEAD TYPICAL

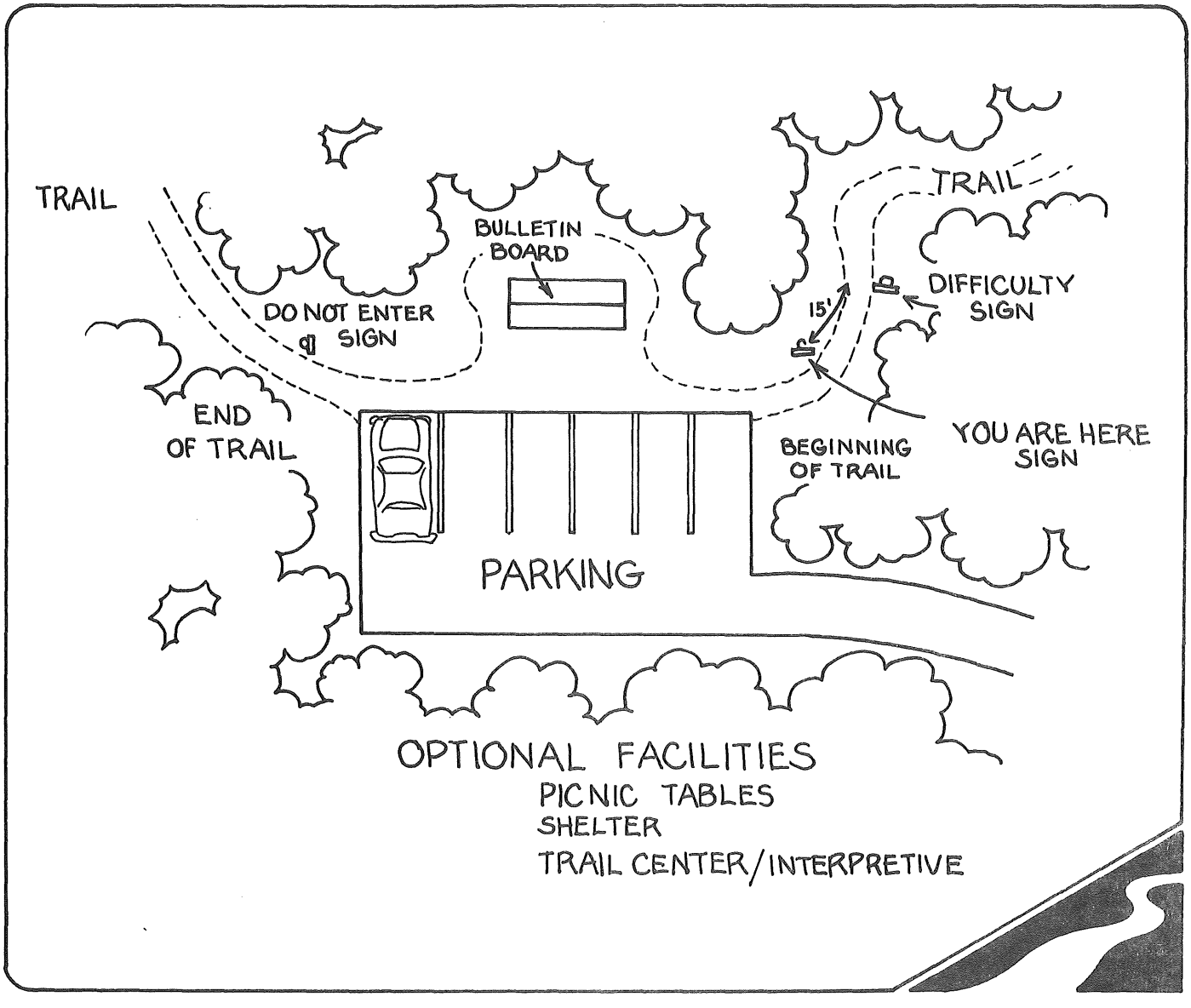


FIGURE 17

REST AREA TYPICAL

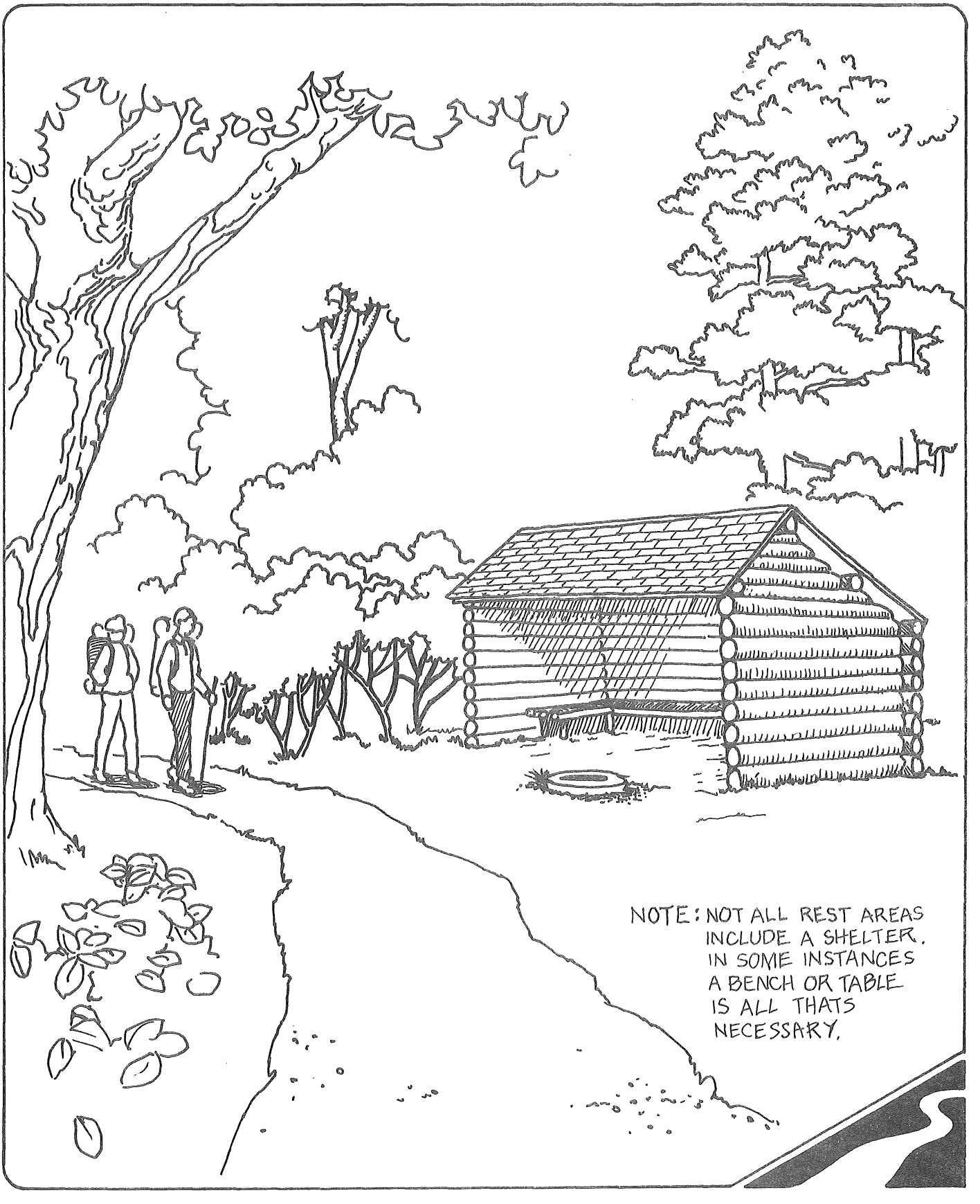
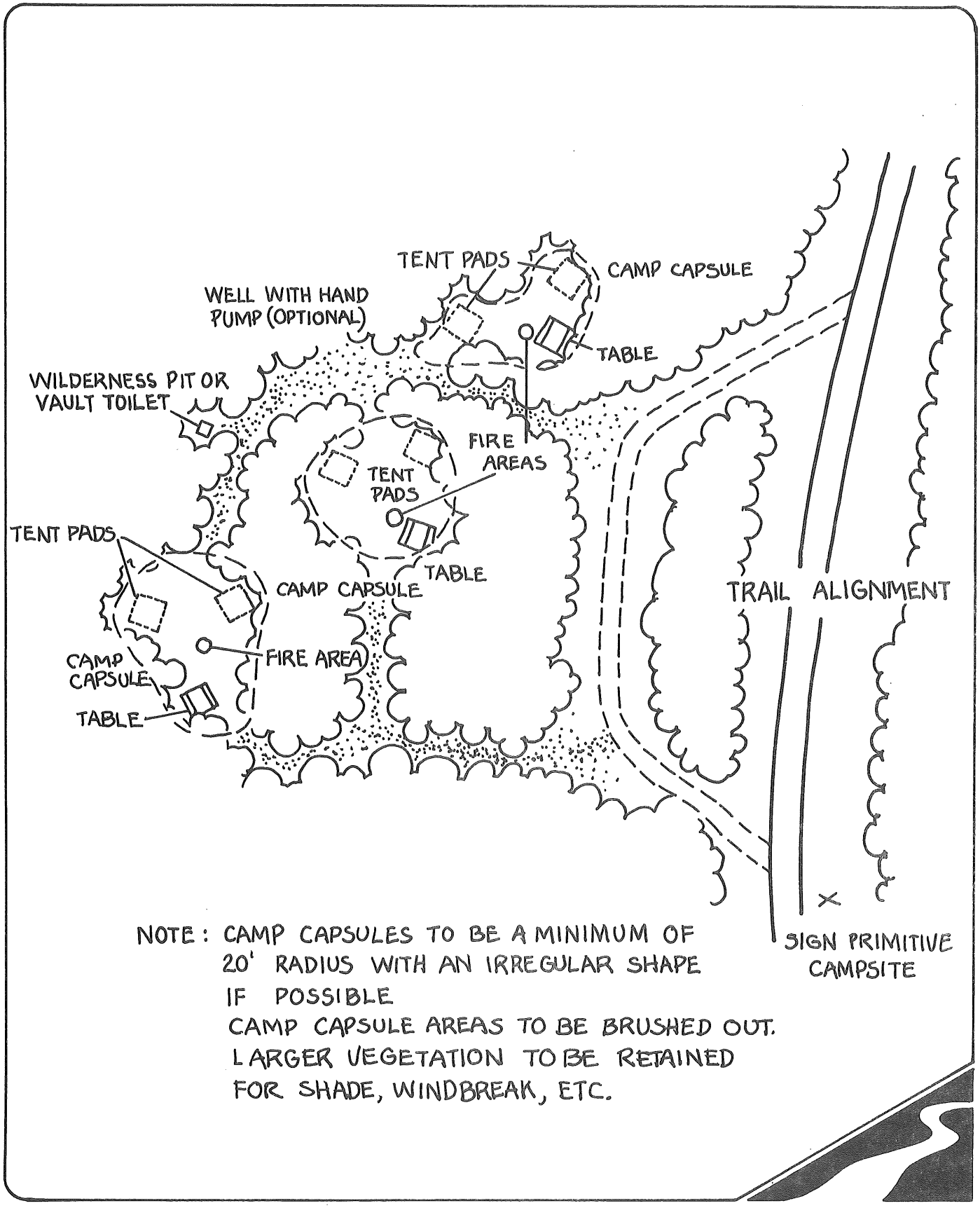


FIGURE 18

PRIMITIVE CAMPSITE TYPICAL



Camping and rest area facilities may be provided along the trail to permit overnight use. They should be designed according to site specifics such as soil, vegetation, area and location.

Distance between campsites and rest areas depends on the type of use for which the trail is being constructed. Hiking and ski touring trails should have rest areas at 5-mile intervals or less.** Snowmobile trail rest areas are needed at 10-25 mile intervals.** Campsite intervals vary according to the number of users and may also depend on the location of suitable areas. If the trail is heavily used for hiking, campsites should be more closely spaced.

Steps

Steps may be necessary in areas of steep terrain or highly erodible soils. Figures 20 thru 23 show various designs that can be utilized. Prior to construction, the Bureau of Engineering should be consulted. Whenever possible, steps should be avoided since their use will restrict trail activity to summer use or cause inconvenience to other trail users such as skiers and handicapped citizens.

Road Crossings, Curves and Sight Distance

Road crossings should be kept to a minimum and alternative routings or grade separations such as culverts should be selected whenever possible. If a road crossing is necessary, the following minimum sight distances, in either direction, for varying road class intersections will apply:

State and Federal Highways	800 feet minimum
County Roads	500 feet minimum
Local and Forest Service Roads	400 feet minimum

Crossings must be made perpendicular to the road at a location which affords the minimum sight distances. Crossings should not be located at the foot of a hill or near a curve in the road. Stop signs should be erected at the edge of the road right-of-way and a stop ahead sign should be placed a minimum of 300' before crossing. State or county highway departments should be contacted to obtain necessary permits. These agencies may also have other requirements which must be followed.

Curves in trails for ski touring and snowmobiling should be as gradual as possible. The minimum turning radius for the trail should be consistent with the speed of the user; the faster the user goes, the more gradual the curve should be. For snowmobiles, the minimum turning radius is about 50 feet; 100 feet is preferred. Curves on snowmobile trails should be controlled so that a forward visibility of 100 feet is maintained whenever possible. If this minimum distance cannot be maintained, a caution sign should be placed at least 100 feet prior to the curve which should be marked with arrows placed on the right-hand side of the trail.

** Minnesota DNR - Bureau of Planning and Research - SCORP Survey 1978

Throughout a snowmobile trail system a horizontal sight distance of 50 feet must be maintained with 100 feet preferred. These sight distances are considered minimums and may not be adequate due to factors such as trail conditions, physical ability of drivers and the type of snowmobile.

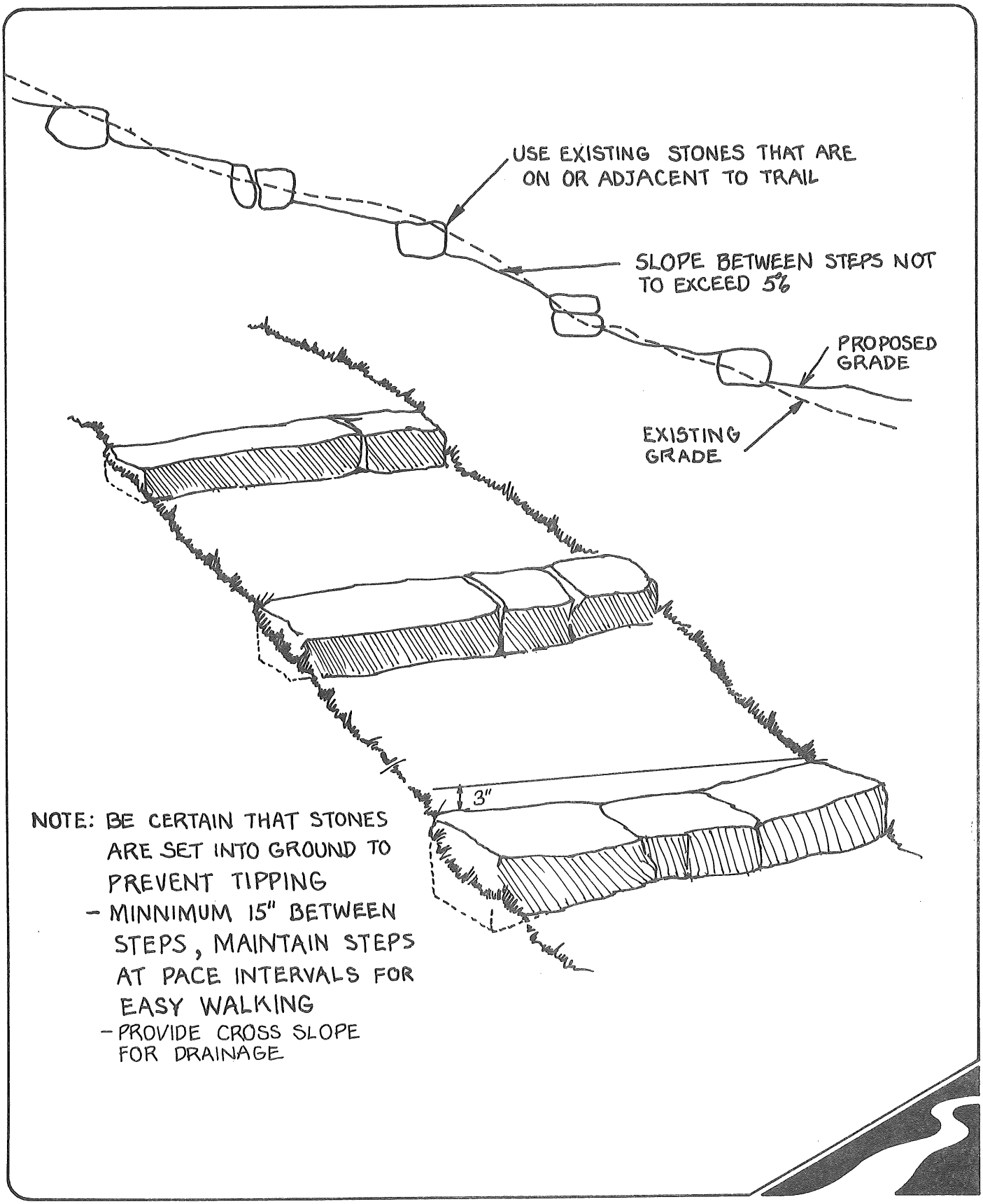
Whenever minimum sight distances cannot be followed, a caution sign should be placed prior to the restricted sight area. Determine where signs are necessary by riding the trail and deciding where signs are most necessary. Too many signs may cause the user to ignore them. It may be helpful to have other snowmobilers ride the trail and suggest locations where signs are necessary.

Gates and Barriers

Gates and barriers are designed to allow appropriate trail users and block incompatible uses. Gates and barriers are only recommended when signing and enforcement cannot take care of problems. (see figures 24 and 25).

FIGURE 19

STONE STAIRWAY TYPICAL

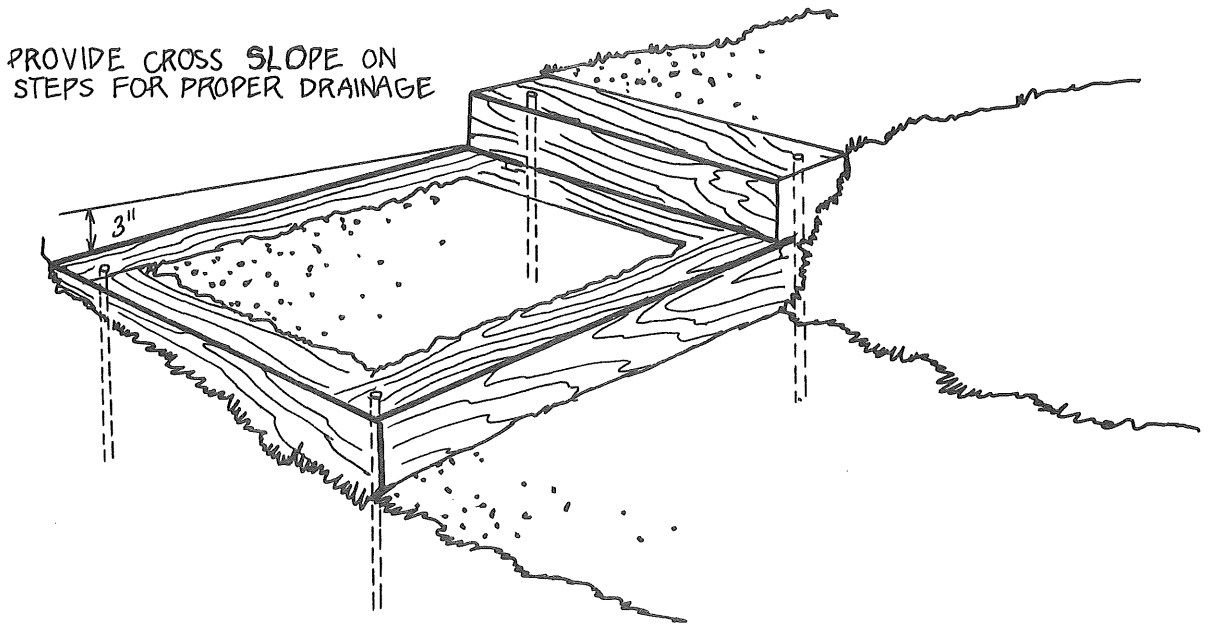


NOTE: BE CERTAIN THAT STONES ARE SET INTO GROUND TO PREVENT TIPPING

- MINNIMUM 15" BETWEEN STEPS, MAINTAIN STEPS AT PACE INTERVALS FOR EASY WALKING
- PROVIDE CROSS SLOPE FOR DRAINAGE

FIGURE 20

TRAIL SWITCHBACK LANDING-TYPICAL



NOTE: ALL TIMBERS TO BE TREATED - FASTEN TIMBERS TOGETHER BY TOE-NAILING WITH 80d RING SHANKED POLE BARN NAILS - SECURE FABRICATED LANDING TO GROUND WITH ½" RE-ROD PINS

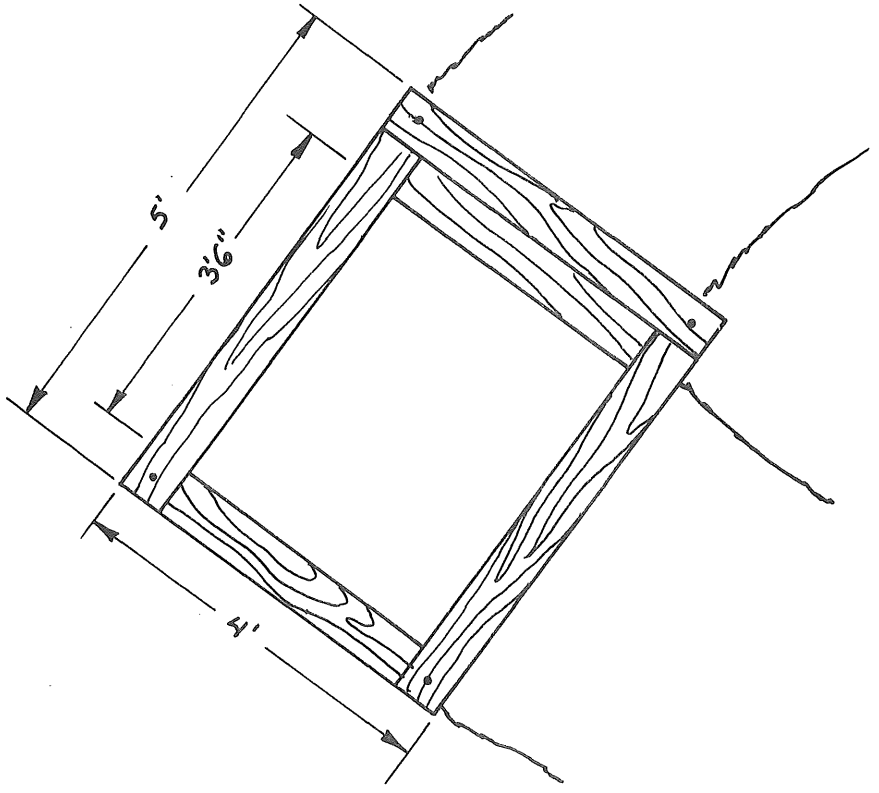


FIGURE 21

TRAIL STAIRS TYPICAL

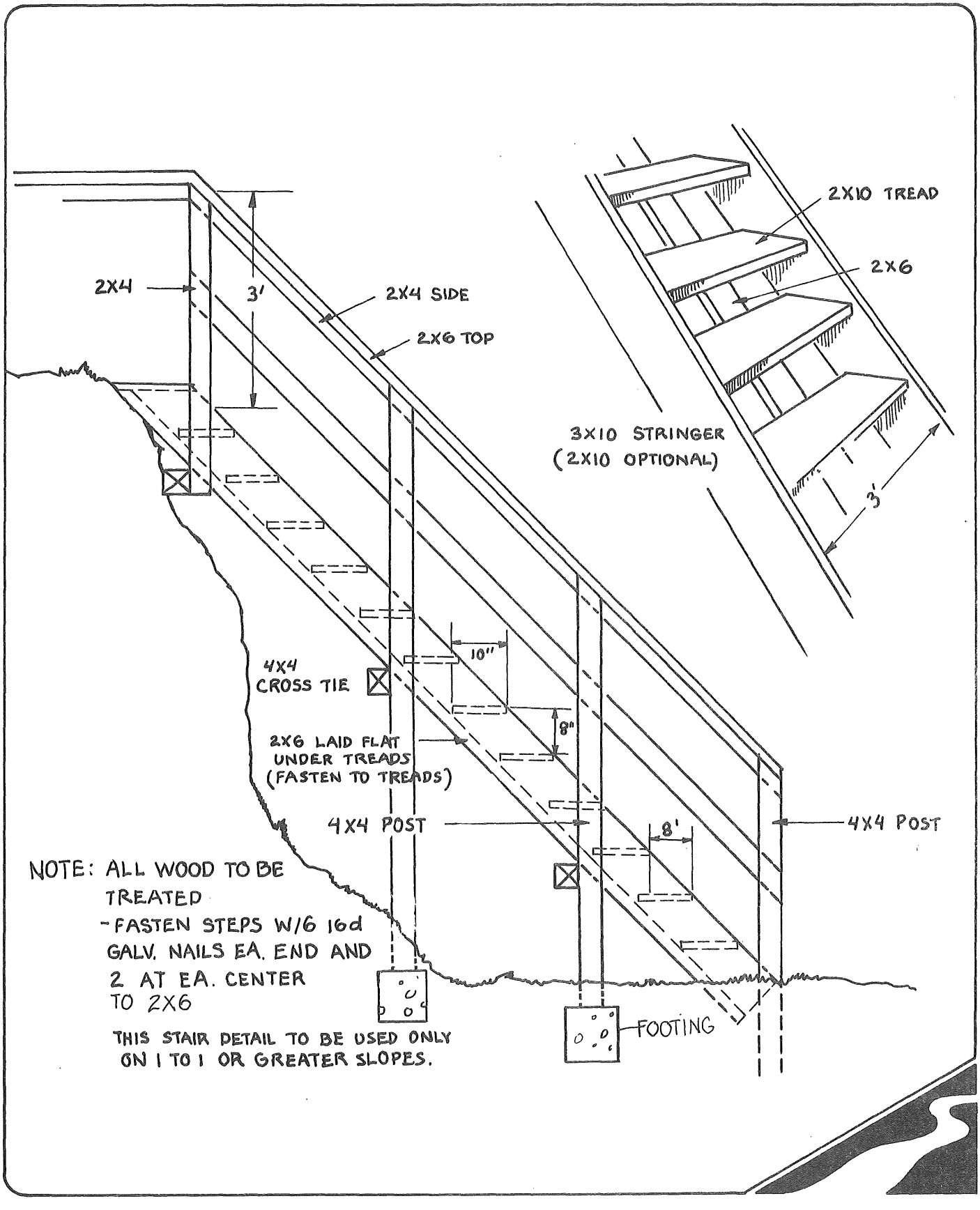


FIGURE 22

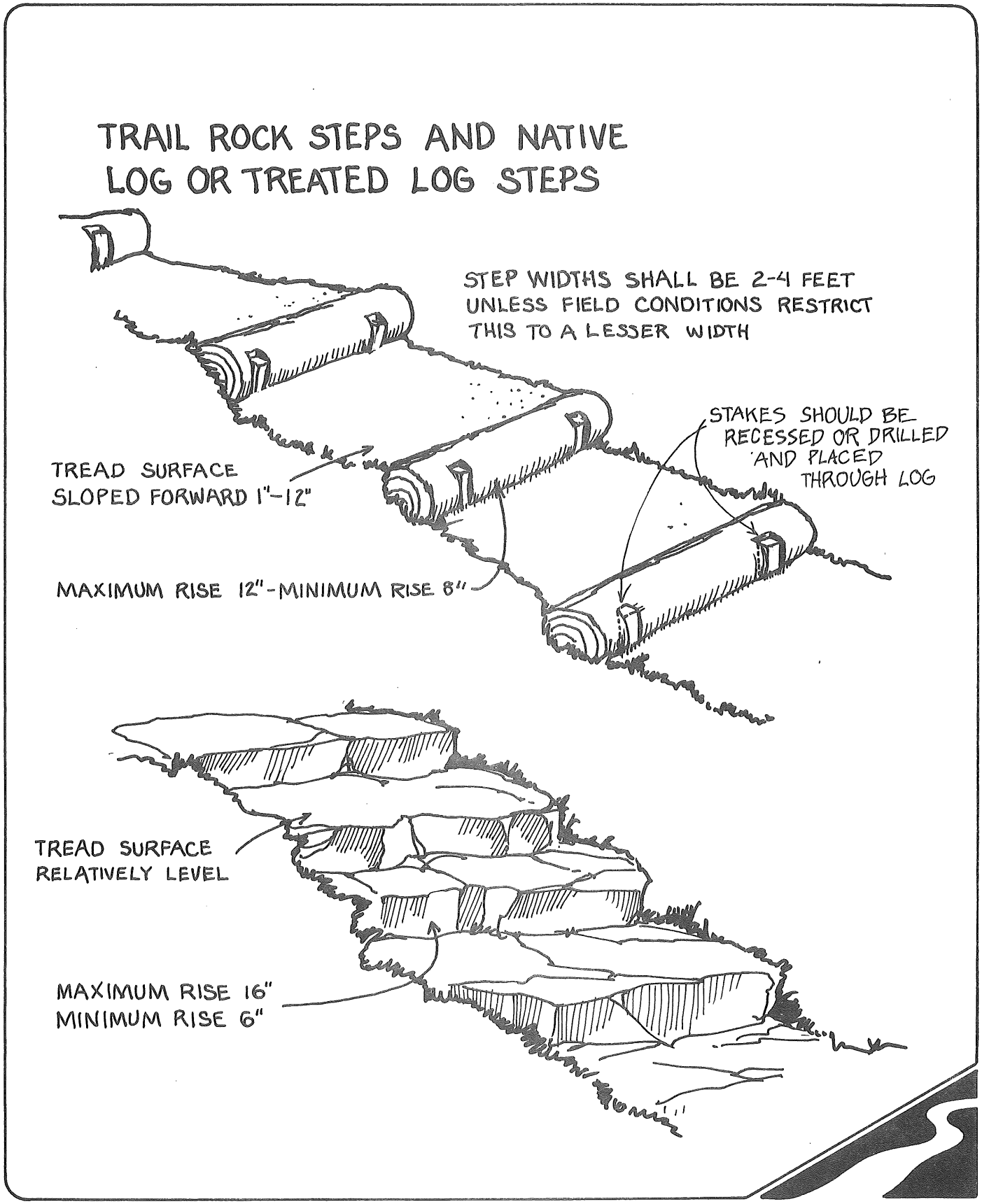

TRAIL ROCK STEPS AND NATIVE
LOG OR TREATED LOG STEPS
STEP WIDTHS SHALL BE 2-4 FEET
UNLESS FIELD CONDITIONS RESTRICT
THIS TO A LESSER WIDTH
STAKES SHOULD BE
RECESSED OR DRILLED
AND PLACED
THROUGH LOG
TREAD SURFACE
SLOPED FORWARD 1"-12"
MAXIMUM RISE 12"-MINIMUM RISE 8"
TREAD SURFACE
RELATIVELY LEVEL
MAXIMUM RISE 16"
MINIMUM RISE 6"

FIGURE 23

TIMBER TRAIL STEPS TYPICAL

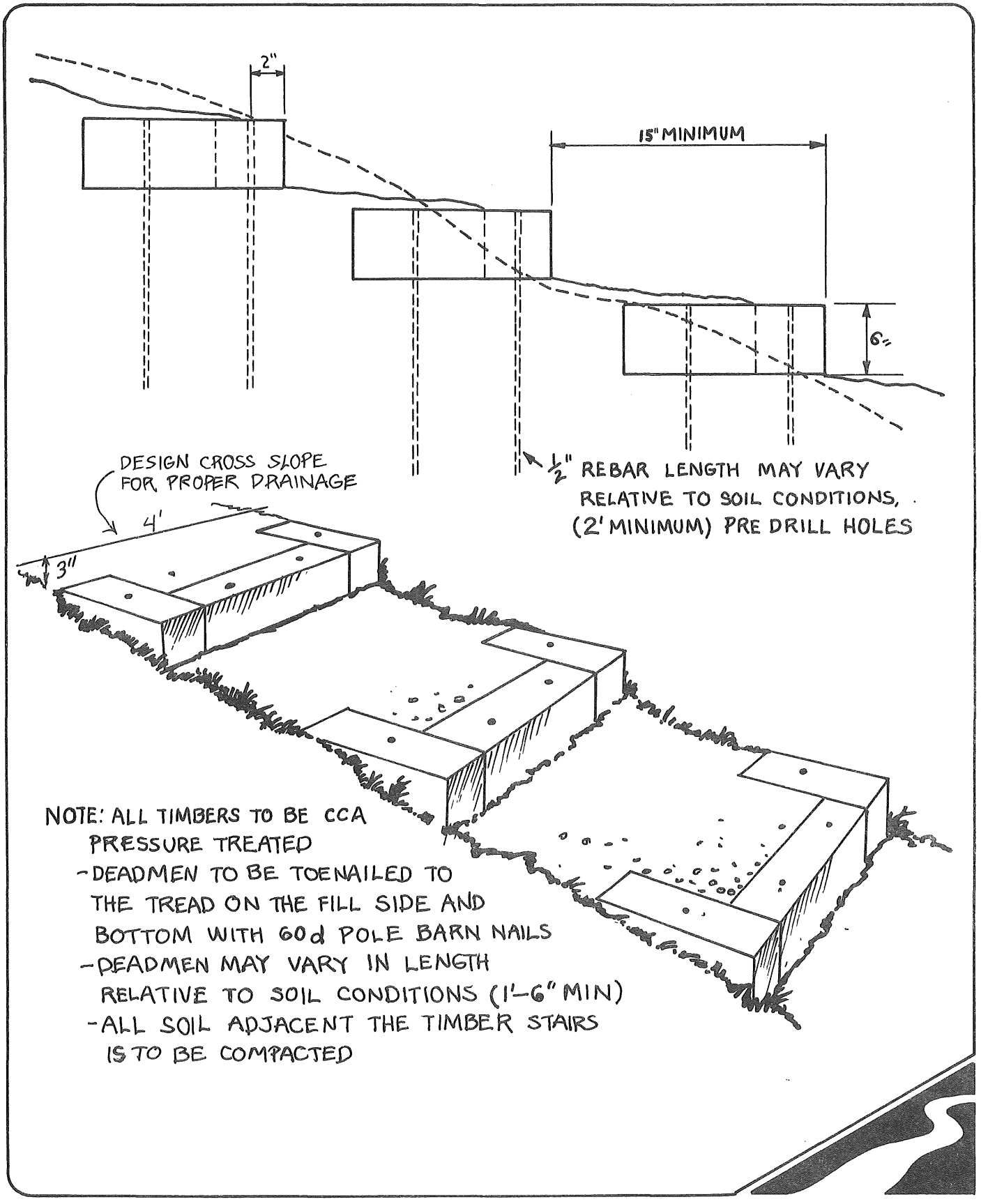
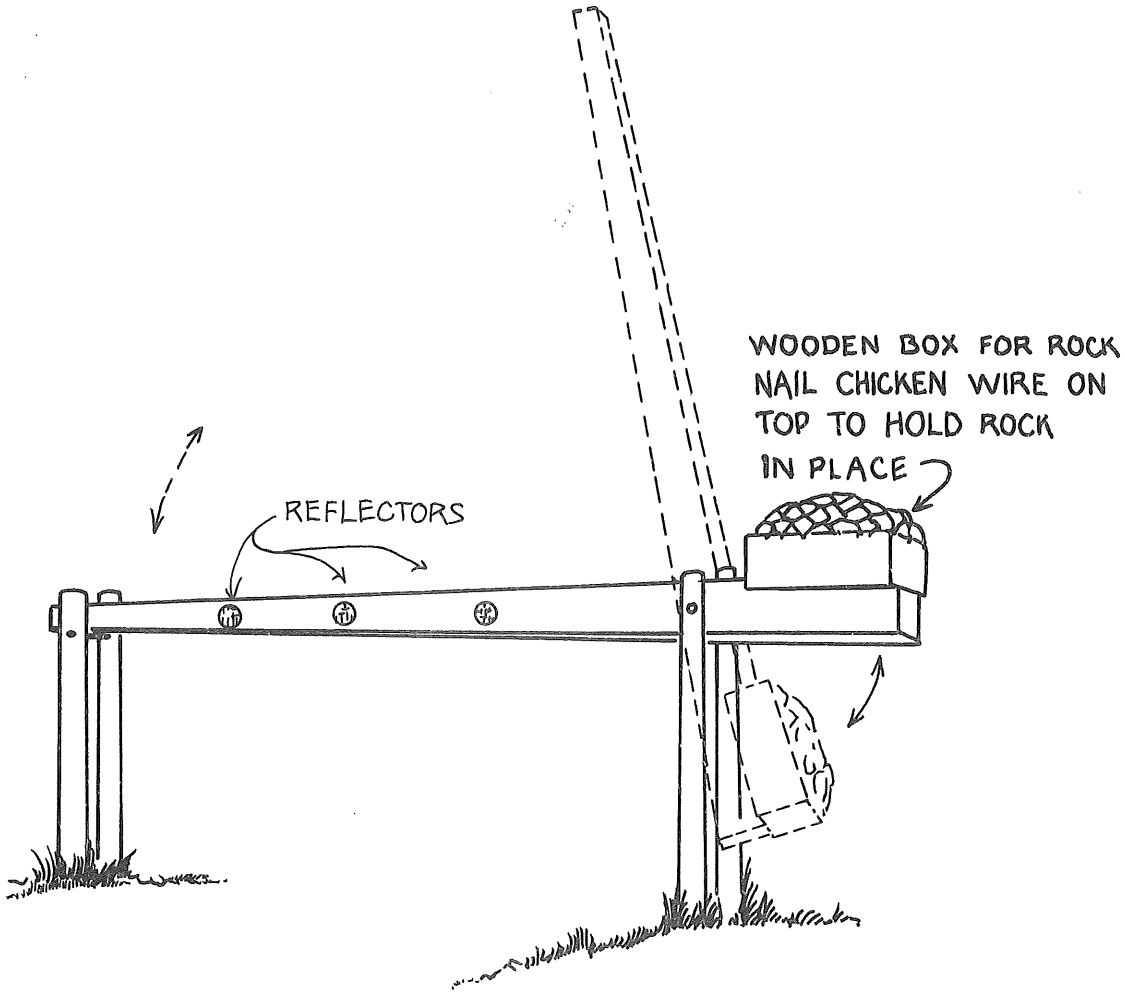


FIGURE 24

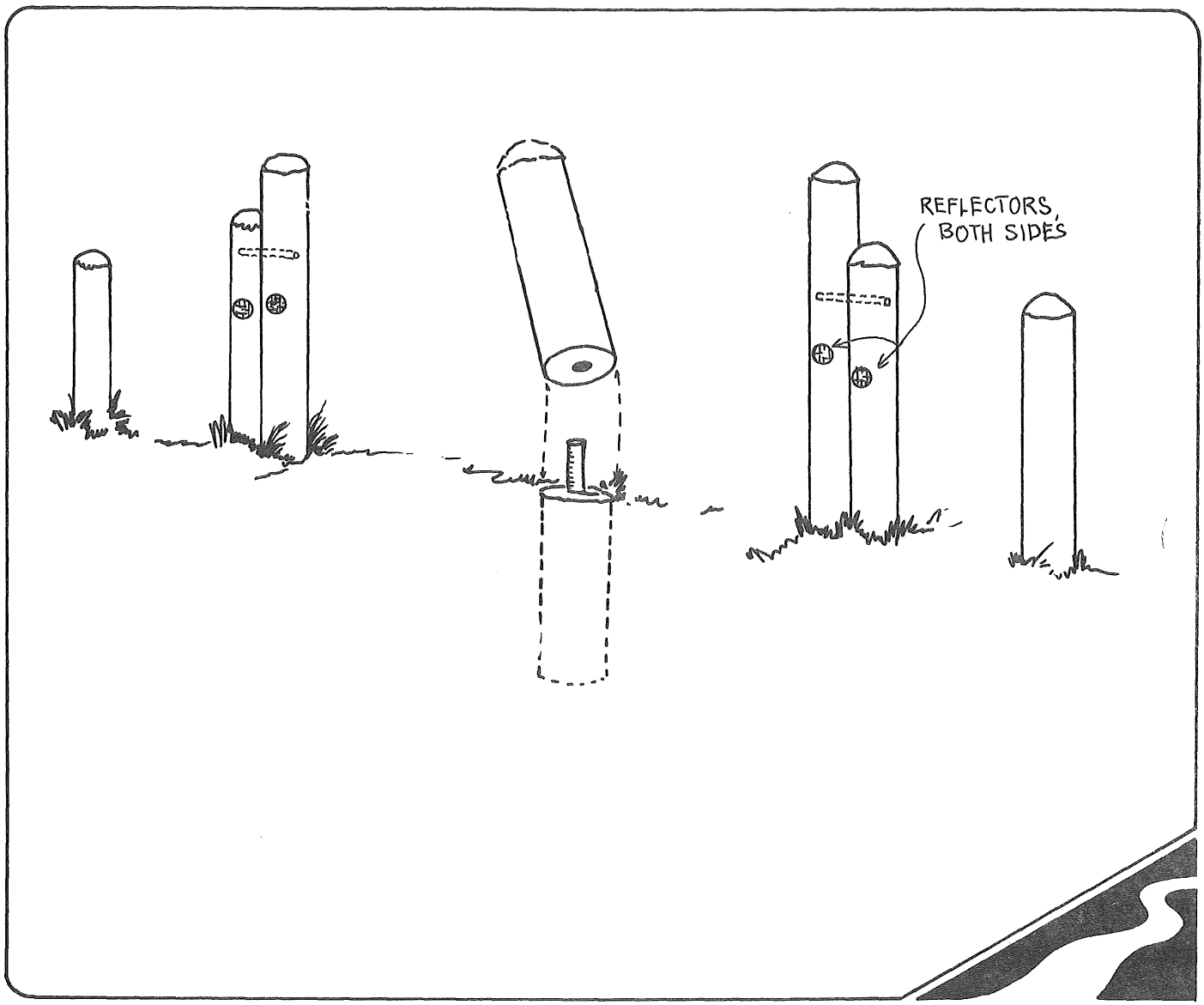
ROAD BARRIER



NOTE: DIMENSIONS WILL VARY ACCORDING TO THE SIZE AND LENGTH OF BARRIER

FIGURE 25

TRAIL GATE



TRAIL CLEARING

Full Tree Removal Method:

This should be used in areas with limited or marginal soils, and where trees are large and have extensive root systems. It causes limited soil disturbance because when the full tree is removed, the roots will break loose from the main bole of the tree, leaving a limited depression. Major problem with this technique is that excessive damage will be sustained to surrounding trees due to lack of control over the direction of the falling tree.

Trail construction using the full tree removal method is as follows: A caterpillar, grapple-skidder or equivalent is used to push over trees intact within the desired clearing limits. Crews use chain saws to limb and cut the trees into manageable lengths. The slash will either be scattered in the woods, piled for burning or chipped. Tree lengths can be hauled out and sold, cut up for firewood or used for trail or facility construction. The equipment works ahead of the crew, pushing trees down. After the cutting crew has finished, a caterpillar will be used to shear off a thin layer of topsoil, thus removing brush and leveling the trail. The debris (stumps, brush, etc.) can be pushed back into the woods or buried so it is not visible from the trail; small stump dumps can be located in strategic spots along the trail which are not visible from the trail and which do not exceed four feet in height.

High Stump Method:

This can be utilized in areas where tree species are small to moderate in size (6 to 16 inches DBH) and where soils are stable in nature and not rocky. The method causes maximum soil disturbance. A large percentage of roots stay with the stump and large amounts of soil cling to the roots, leaving large depressions.

Treadway construction is accomplished by the following techniques: all trees are removed by cutting crews, leaving three to four foot stumps. The slash will either be scattered in the woods, piled for burning, or chipped. Leaving stumps at this height facilitates easier removal by heavy equipment. The tree itself will be cut up into manageable lengths, hauled out, sold or cut for firewood. A D-6 caterpillar or equivalent is used to remove stumps and shear off a thin layer of topsoil, removing brush and filling holes. A small caterpillar can be utilized for final shaping of the treadway. The debris is then pushed back into the woods so it is not visible from the trail or disposed of by the use of debris or stump dumps. Burying may also be desirable.

Low Stump Method:

This technique should be utilized in areas where fragile soils are prevalent or in mature open hardwood forests where trees are widely spaced and the ground is relatively level. Vegetation removal, using

this technique, will involve the use of a brushcutter or back pack brush saws. Cut tree stumps close to the ground and remove rocks, fallen logs and other vegetation by hand or with brush cutter. When using this method, trees over eight inches DBH should be avoided. If larger trees must be cut, use of a stump chipper may be necessary.

When using a machine brush cutter, slash can be thrown in the trailway and mulched. When a pack pack brush saw is used, brush and slash will be scattered away from the trail, piled, burned or chipped.

If humps in the trail need to be leveled or side hill cuts have to be made, a small caterpillar (D-2 or equivalent) can be utilized. After any of the mentioned techniques are utilized, the trail route should be inspected and all tree limbs overhanging the right-of-way should be removed to the desired height. Remember that evergreens will droop more with snow on them.

When pruning, the first cut should be an undercut flush to the trunk of the tree, preventing stripping of bark or splintering when the branch falls. After the initial undercut, sawing of the branch should be continued from the top. Heavy branches should first be cut off a foot or more from the proposed final cut; the remaining stub is removed as described earlier.

Abandoned Railroad:

The physical construction of a trail on an abandoned railroad grade is considerably easier because a definite pathway is already present. The initial step in construction is tie removal and disposal, afterwhich the grade itself will be bladed and shaped with a motor patrol or caterpillar to the desired clearing limits.* If an additional treadway is to be constructed along the grade, but within the railroad right-of-way, one of the listed techniques will be utilized.

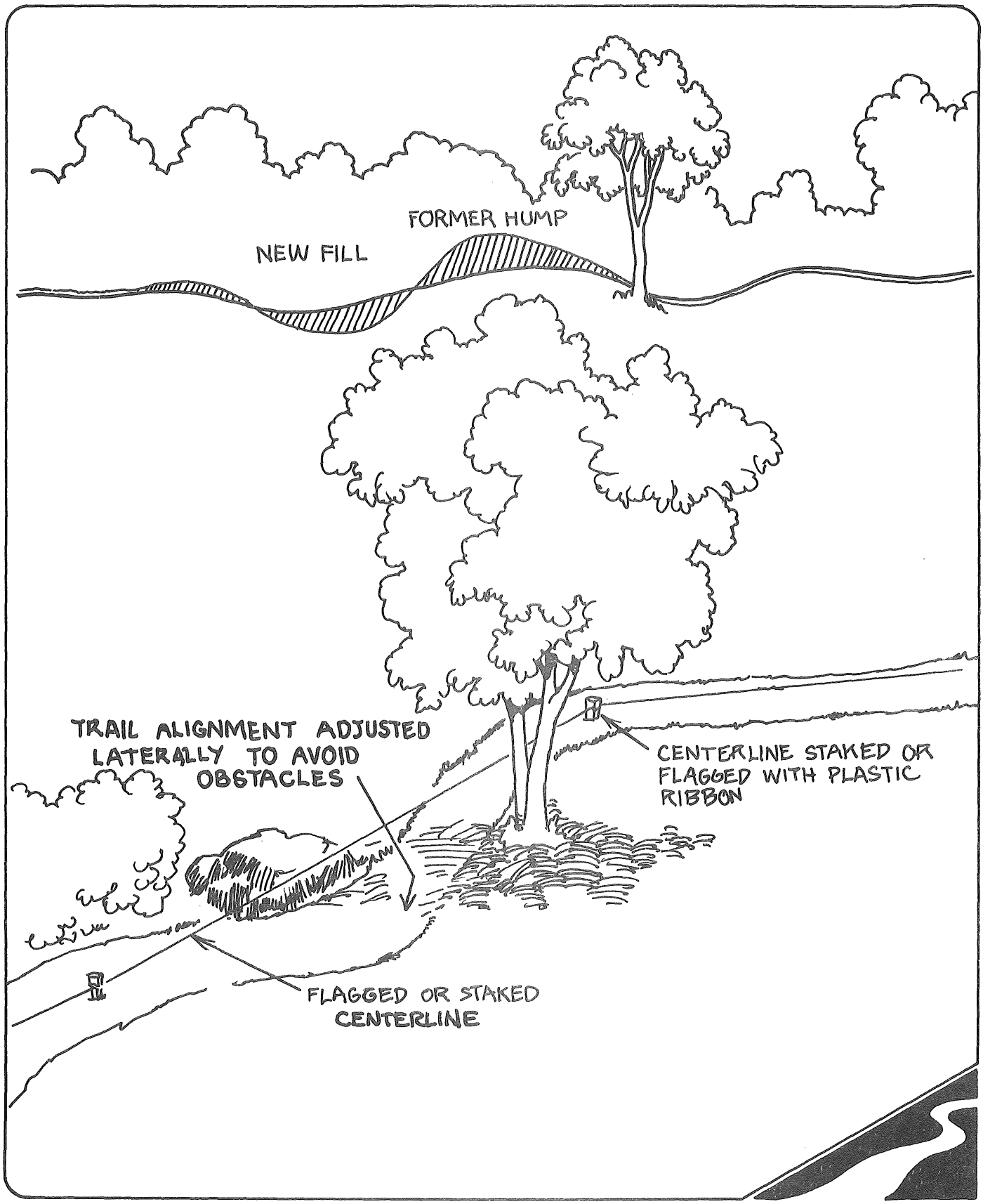
*NOTE: Special conditions should be included in any purchase agreement with a railroad to insure that tie removal is conducted in a manner that does not destroy the grade. A clause should also be included to insure that useable ties are removed and drainage structures are kept in a useable condition.

Open Areas

Open grassy areas require little development, other than leveling. If the land is uneven, a caterpillar can be brought in to level off humps and other uneven areas the trail passes through. When the trail is relatively flat, a disc can be used to prepare the treadway for seeding.

FIGURE 26

TRAIL TREAD EXCAVATION



TRAIL SPECIFICATIONS

Introduction:

The following criteria are established as guidelines for unit managers and development personnel. The guidelines will be helpful in establishing trail systems in state units which are consistent or uniform in safety, signing and facilities available. Yet, the systems can be vastly different in experience levels and aesthetic quality. Guidelines are established with this thought in mind and options are offered that vary with the unit's resources.

In summary, the guidelines are a starting point from which a unit manager or trail development specialist will choose the criteria which best meets the needs of that unit and its potential trail users. Existing trails should eventually be brought up to these specifics. However, because of budget uncertainties, a timetable for this cannot be given.

SNOWMOBILE TRAIL SPECIFICATIONS

I. Trail Right-of-Way:
Width varies depending on the unit involved; state trails are 20' minimum--100' preferred. In parks and forests, right-of-way width will vary according to the management plan objective.

II. Trail Tread Width:

One-Way Traffic	-	8' minimum	-	10' preferred
Two-Way Traffic	-	10' minimum	-	14' preferred

III. Horizontal Clearance - 2' either side of trail tread

IV. Vertical Clearance - 10' above maximum expected snow base
12' preferred

V. Turning Radius - Flat - 100' preferred - must be signed with caution signs if less
Hilly - Same as above - Curves with less than 50' will have a run-out area of 15' on the outside of curve. (Longer turning radiuses reduce maintenance costs.)

VI. Gradient - Maximum sustained grade of 25% (a sustained grade is any grade found on any given mile for more than 20% or 1,040' of that mile).[9] Shorter steeper slopes are possible if the approach and runout are straight and at least as long as the slope itself.
10-25% - Ideal
25% - Maximum Sustained [13,9]
40% - Maximum Short Distance (50 yards or less)

VII. Sight Distance:
Varies with the maximum speeds that the snowmobile will be travelling.

Minimum Sight Distance - 50
Preferred Sight Distance[14] - 100' or more

Where these minimum sight distances cannot be maintained, warning or caution signs will be posted at least 100' in advance of the problem area.

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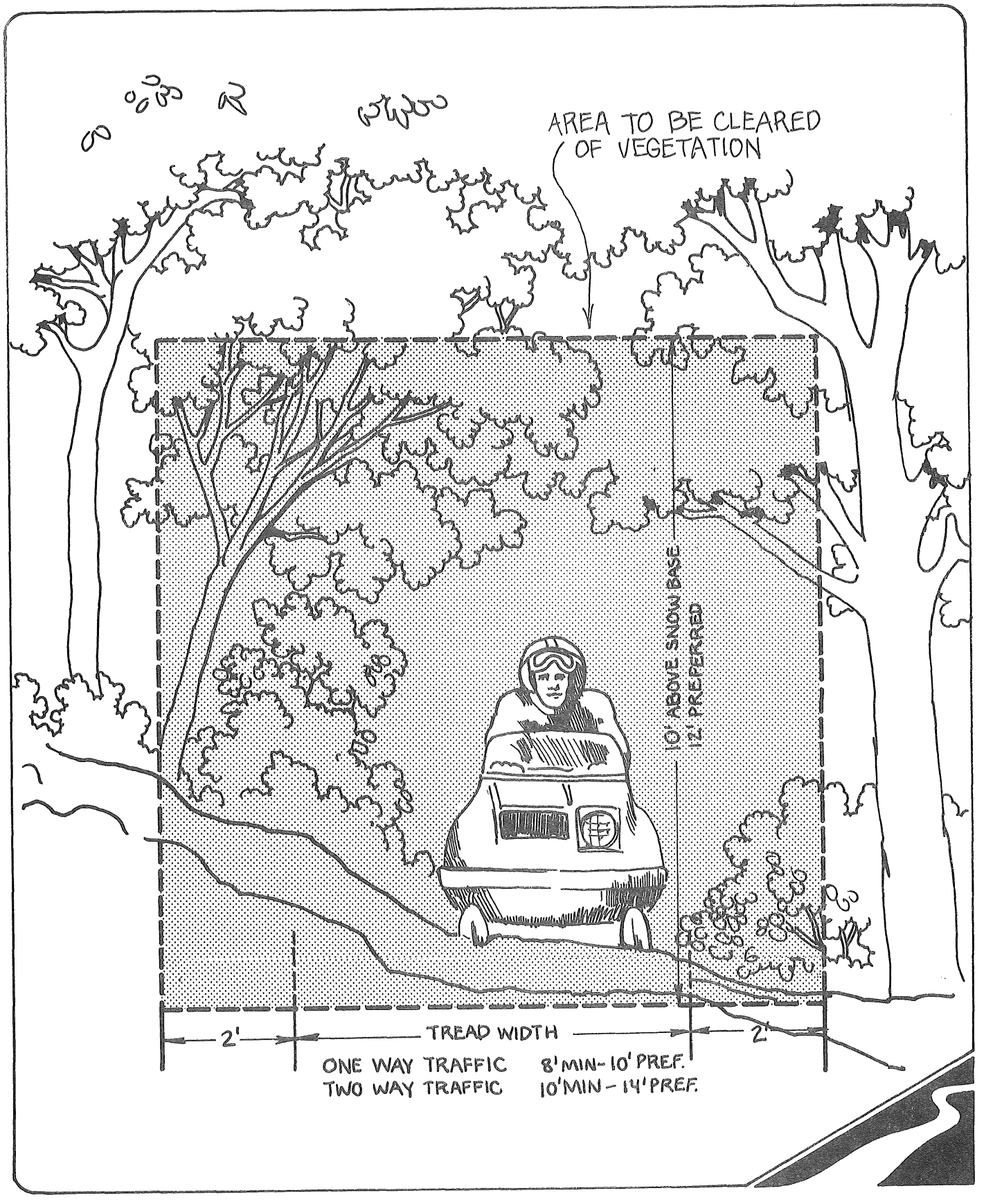
[9]New Mexico State Trails Handbook, New Mexico Parks and Recreation Commission, Santa Fe, New Mexico, 1974

[13]Sno Tracks Guide to Trail Grooming, Market Communications, Inc, 1976

[14]A Guide to the Development and Maintenance of Good Snowmobile Trails, Bombardier Limited Valcourt Quebec, 1972, page 9

FIGURE 27

SNOWMOBILE TRAIL



VIII. Bridges:

Placement - Permits may be required from Division of Waters and/or Corps of Engineers. Approaches should be flat, straight and provide adequate sight distance on the stated criteria.

Width - 8' minimum (outside railing to outside railing)
10' preferred

Capacity - 5 tons minimum (depends on size of maintenance equipment)

IX. Underpasses:
10' x 10' - 1 trail activity
2 - 10' x 10' if more than one treadway and incompatible uses are accommodated.
Intersections: Approaches to intersections should have grades of 5% or less to allow speed control. Intersections should be cleared to a diameter twice the trail width.

X. Compatible Uses:
Winter - none
Summer - horse, hike or bike

Incompatible Uses:
Winter - ski touring
Summer - N/A

XI. Surfaces:
Ideal - natural, smooth, free of stumps, roots, rocks and other projections
Appropriate Alternate - Limestone, asphalt, gravel, corduroy, etc.

XII. Facilities:
Required - Parking area for cars with trailers
- Toilets
- Information board

Recommended - Trail shelter if trail is longer than 15 miles

Optional - Trail center, picnic tables, rest areas, etc.

SKI TOURING SPECIFICATIONS

I. Trail Right-of-Way:
Most trails designed for DNR units should be in a loop system (see Figure). Right-of-way width will vary depending on the management objective of the unit.

II. Trail Tread Width:
*One-Way - Intensive Use - 10'-12'; one or two tracks set
Moderate Use - 6'-10'; one or two tracks set
Low Use - 6'; one or no tracks set

*Two-Way - 10'-12' (not recommended for DNR units)
- Only where necessary for access

Downhill sections will widen at the bottom as the degree of slope increases. Uphill slopes where herringbone or side step is necessary must be 8'-10'.

III. Horizontal Clearance - 2' either side of trail treadway

IV. Vertical Clearance - 10' above expected snow depth. Allowance for snow build-up on limbs should also be taken into consideration.

V. Turning Radius - 50' minimum, 100' preferred
--Curves should be avoided on downhill slopes and at the bottom of hills
--If a curve is necessary, provide a runout, widen the trail or increase turn radius
--As degree of slope increases, length, runout, width of trail and turn radius should also increase.

VI. Gradient:[4]
Easy - Ideal - 0-10%
Maximum Sustained - 10%
Maximum Short Distance (less than 50 yards) - 10%
Preferred Length - 5K

More Difficult - Ideal - 0-15%
Maximum Sustained - 15%
Maximum Short Distance - 25%
Preferred Length - 10K

*NOTE: These are maximum standards for smooth, wide, straight trails with good outruns. Trail loops should be designed so that the system allows skiers a variety of distances to ski.

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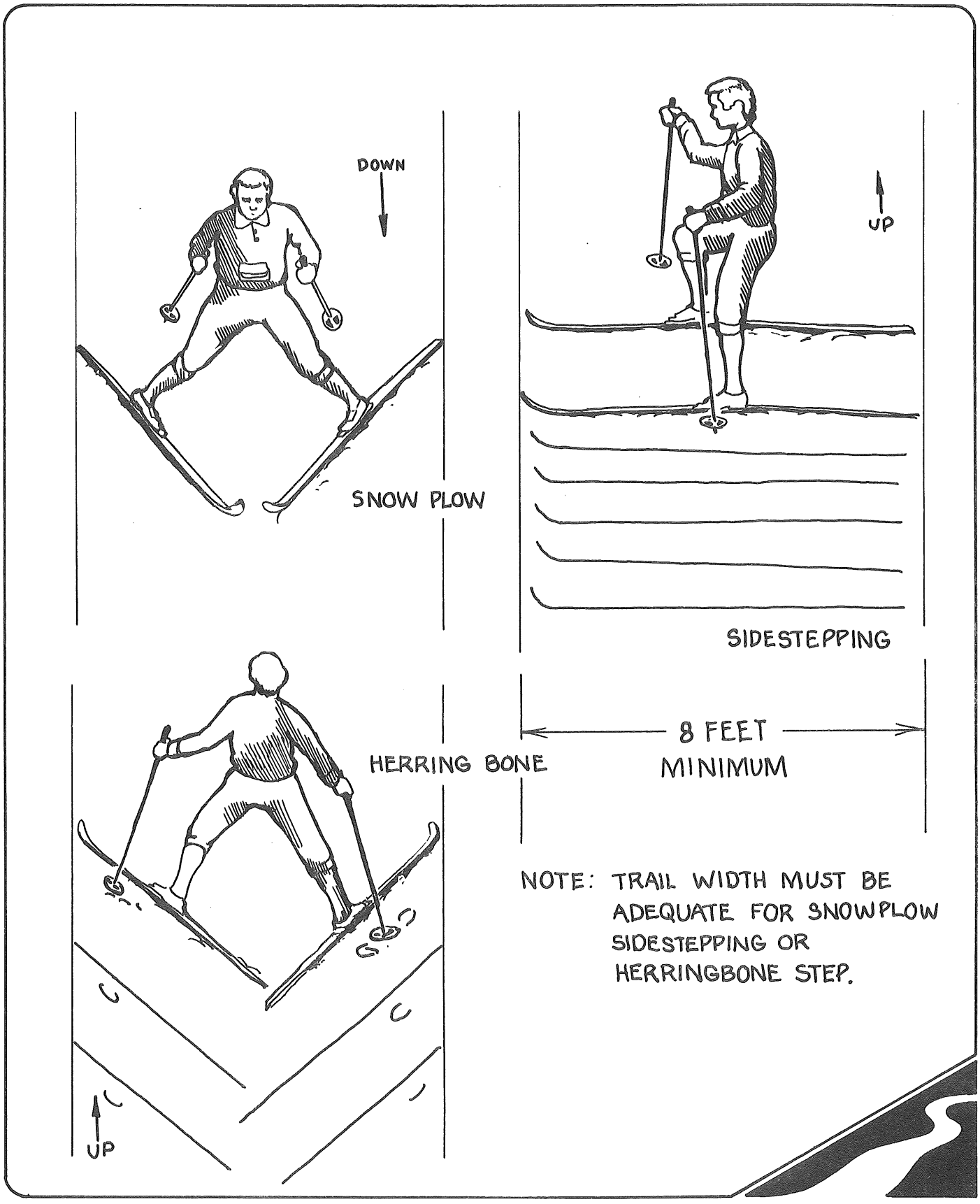
[4] The Ski Touring Trail Planner, First Edition, Timothy B. Knopp and Jack P. Maloney, 1972

FIGURE 28


DOWN
SNOW PLOW
UP
SIDESTEPPING
HERRING BONE
8 FEET
MINIMUM
NOTE: TRAIL WIDTH MUST BE ADEQUATE FOR SNOWPLOW SIDESTEPPING OR HERRINGBONE STEP.
UP

Most Difficult - Ideal - 0-20%
Maximum Sustained - 25%
Maximum Short Distance - 40%
Preferred Length - less than 15K

1.6 Kilometers = 1 mile

VII. Sight Distance:
Trails should avoid long straight stretches, but curves should be gradual enough to permit the skier to glide through them. Sharp choppy curves should be avoided.

VIII. Bridges:

Placement - Should have straight gentle approach which allows skiers to stop before bridges.

Width - 6'-10' (narrow bridges become narrower as snow piles on them); (as necessary to accommodate grooming equipment)

Capacity - 5 tons or depends on size of maintenance equipment

IX. Underpasses - Culvert 10' x 10' minimum

Intersections - Approaches to intersections should have grades of 5% or less to allow speed control. Intersections should be cleared to a diameter twice the trail width.

X. Compatible Uses:
Winter - none
Summer - hiking, bicycling, handicapped

Incompatible Uses:
Winter - snowmobiling
Summer - N/A

XI. Surfacing:
Ideal - natural, smooth, free of stumps, roots, rocks, bumps and other projections
Appropriate Alternate - rough clearing and mowing

XII. Facilities:
Required - Parking area, toilets, information board

Optional - Trail shelters at 5-10K intervals, trail center, picnic tables, benches, etc.

HIKING TRAIL GUIDELINES

I. Trail Right-of-Way:
Of sufficient width to screen out undesirable sights and sounds. Should offer a variety of scenery and terrain.

II. Trail Tread Width:
Day Use - 4'-8'
Backpacking - 2'-6'

(Trail generally narrows on steep slopes)

III. Horizontal Clearance - 2' either side of treadway

IV. Vertical Clearance - 8'

V. Turning Radius - Long straight stretches should be avoided

VI. Gradient:[16]
Desirable Grade - 0-5%
Maximum Sustained Grades - 25%
Maximum Sustained Grades for Less than 50 Yards - 40%

NOTE: steps, switchbacks, water bars, or tread armor may be needed on slopes over 25%, depending on soil types.

VII. Sight Distance - not applicable

VIII. Bridges:

Placement - above high water mark

Width - 4'-6' - Day Use
2'-4' - Backpacking

Capacity - depends on maintenance vehicles to be used

Fords - slow moving water less than 18" may be forded; permits may be required.

IX. Underpasses - Does not apply

X. Compatible Uses:
Winter - snowshoeing, ski touring or snowmobiling depending on trail width
Summer - horseback riding on limited-use basis

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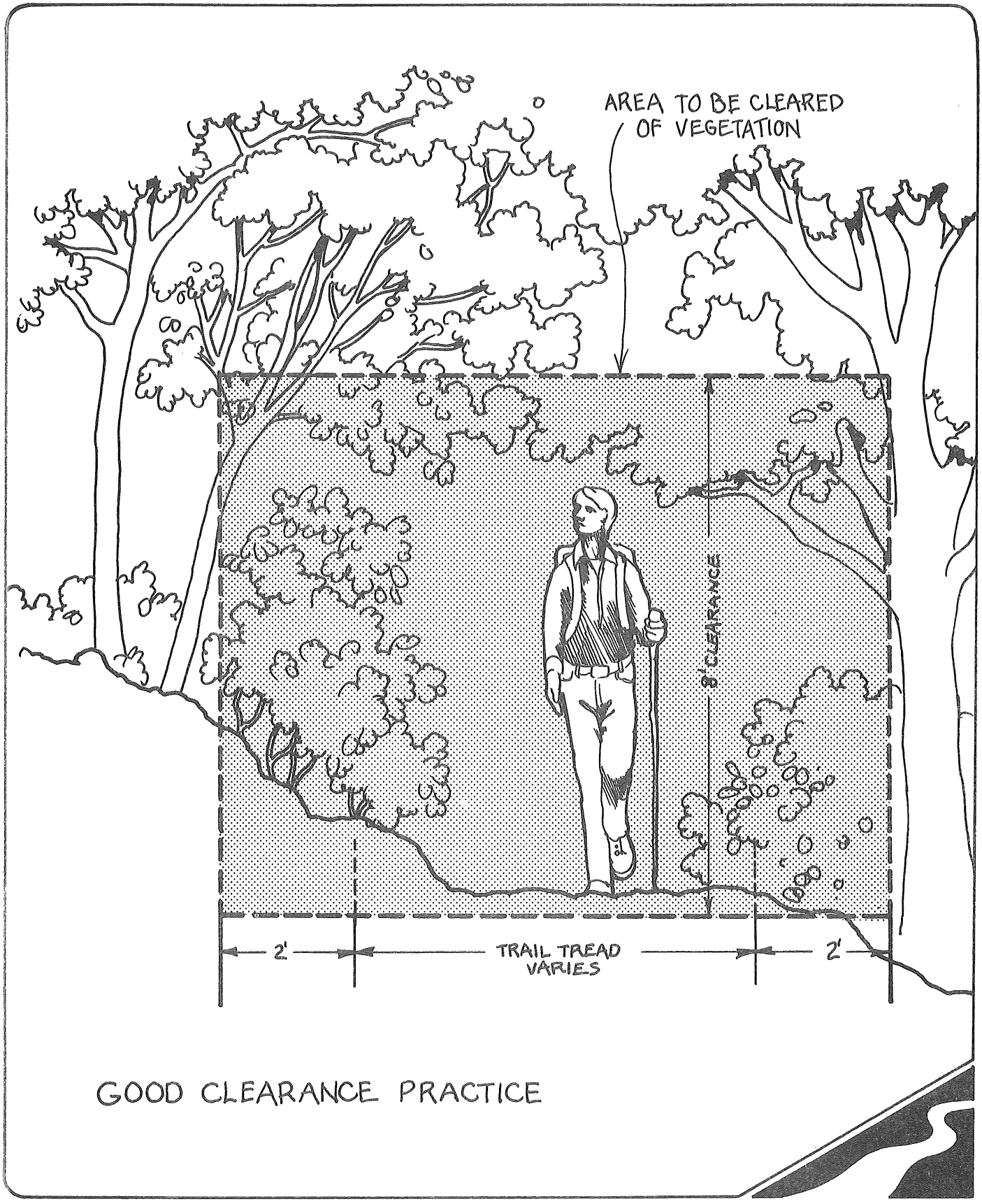
[16] Trail Specifications, Wisconsin DNR - Bureau of State Parks and Recreation, Madison, Wisconsin

FIGURE 29

HIKING TRAIL



GOOD CLEARANCE PRACTICE

Incompatible Uses:
Winter - not applicable
Summer - horses on heavily used hiking trails

XI. Surfaces:
Natural, smooth, except for persistently wet sites where corduroy, turnpiking or boardwalks are necessary.

Appropriate Alternate - limestone, woodchips, gravel

XII. Facilities:
Required - parking area, information board, toilets

Optional - trail center, trail shelters, picnic area, campsites, interpretive signing, water, etc.

HORSE TRAIL GUIDELINES

I. Trail Right-of-Way:
Of sufficient width to screen out undesirable sights and sounds.
Should offer a variety of scenery and terrain.

II. Trail Tread Width: 6'-10'

III. Horizontal Clearance - 2' either side of trail

IV. Vertical Clearance - 12'

V. Turning Radius - N/A

VI. Gradient:[5]
Ideal - 0-10%
Maximum Sustained - 10%
Maximum Sustained less than 50 yards - 20%
Water bars and special surfacing may be necessary on slopes to prevent erosion

VII. Sight Distance: N/A

VIII. Bridges:
Placement - above high water mark

Width - 8'

Capacity - 5 ton - depends on maintenance equipment and length of bridge

Fords - slow moving water less than 18" may be forded (contact Division of Waters and Fisheries for permits)

IX. Underpasses - 10' x 10' culvert

X. Compatible Uses:
Winter - snowmobiling or cross-country skiing
Summer - hiking (if not heavily used by horses)

Incompatible Uses:
Summer - bicycling

XI. Surfacing:
Crushed gravel 3/8" or less is recommended in areas where existing soils are unstable and/or poorly drained. Little treatment is required elsewhere.

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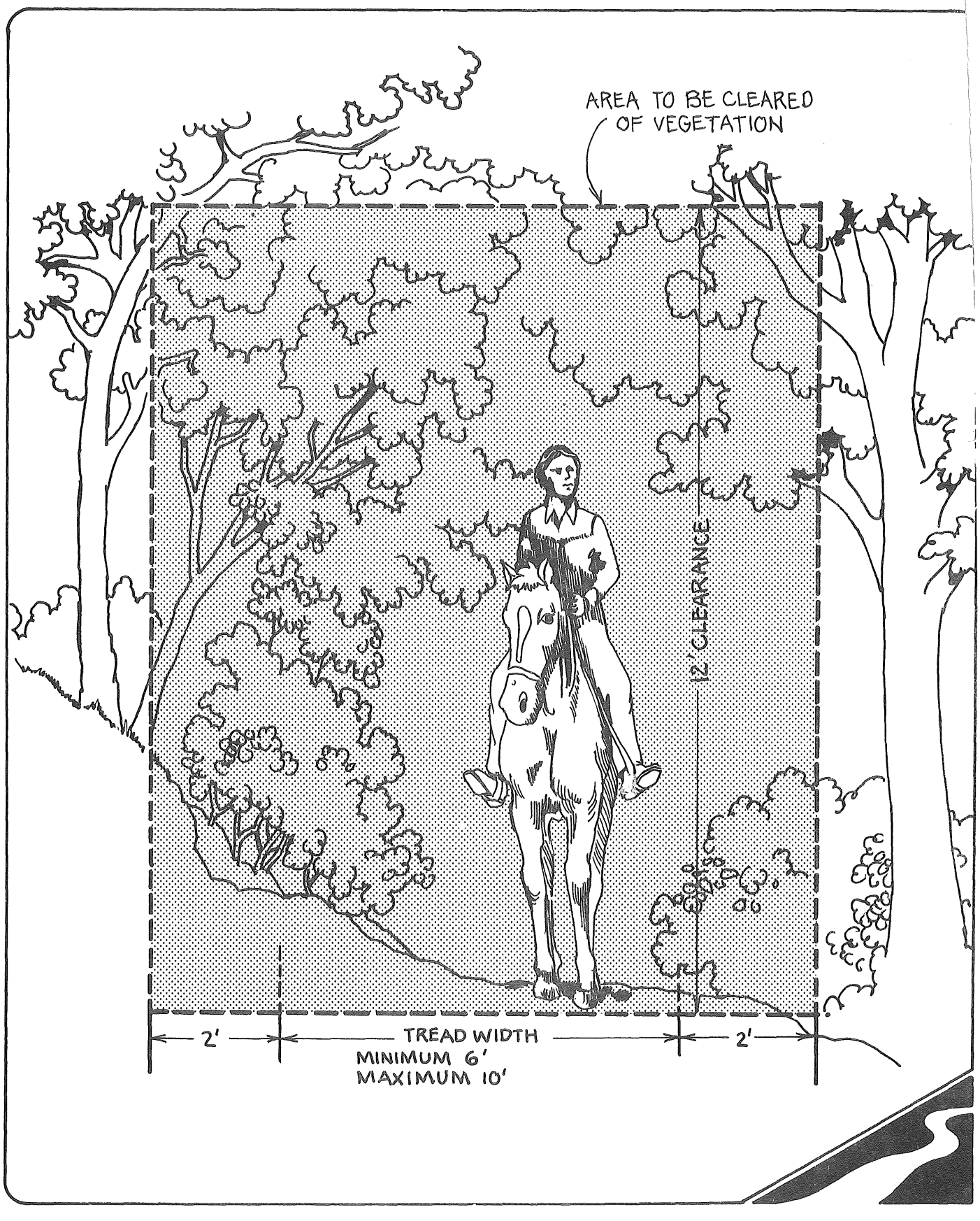
[5] Trails Manual, Ontario Trails Council, Ontario Ministry of Natural Resources

FIGURE 30

HORSE TRAI



Soil should be: 1) of compacted materials
2) tolerant to normal use and resistant to erosion
3) useable when wet; not dusty when dry

Corduroy sections should be covered with compacted soil for an even tread.

XII. Facilities:

Required - parking lot for cars with trailers, toilets, trail information board, hitching posts or tether lines.

Optional - trail center, trail shelters, picnic area, campsites, water

BICYCLE TRAIL SPECIFICATIONS

I. Trail Right-of-Way: Preferred - 100'
Minimum - 20'

II. Trail Tread Width:[8]
One-way Traffic - 4' minimum - 6' preferred
Two-way Traffic - 8' minimum - 8' preferred
6' may be utilized in areas of moderate to low use

III. Horizontal Clearance - (either side of trail tread): 2'

IV. Vertical Clearance - 10'

V. Turning Radius[8]- $R=1.25V + 1.5$ R is radius of curvature in feet
V is velocity in miles per hour

VI. Gradient:[9]
Ideal - 0-3%
Maximum Sustained - 8-10%
Maximum Short Distance - 15%

VII. Sight Distance:[11] 50' minimum; 100' preferred

VIII. Bridges: smooth planking, straight approaches

Width - 8'-10'

Capacity - 5 tons or depends on size of maintenance equipment

IX. Underpasses - 10' x 10' box culvert

X. Compatible Uses:
Winter - snowmobiling or cross-country skiing
Summer - hiking and handicapped (limited use)

Incompatible Uses:
Winter - N/A
Summer - horseback riding

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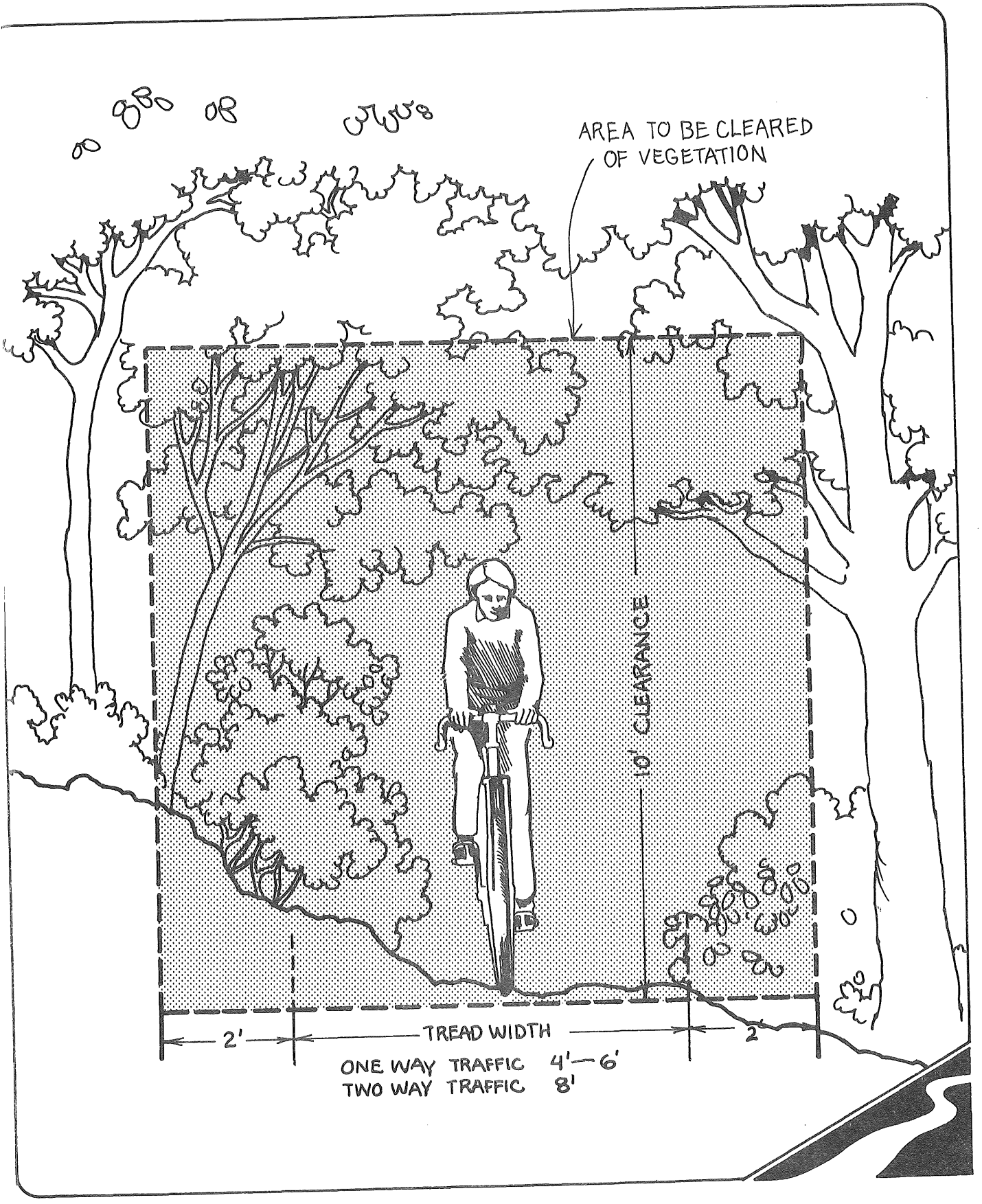
[8] Bicycle Trail Manual, Minnesota DNR - Parks and Recreation, Engineering and I & E, June 1975

[9] New Mexico State Trails Handbook, New Mexico Park and Recreation Commission, Santa Fe, New Mexico, 1974

[11] Bikeways Guide: Model Criteria for Bikeways and Recreational Lanes Within the Highway Right-of-Way, Transportation Planning; Minnesota State Planning Agency, November 1974, page 9

FIGURE 31

BICYCLE TRAIL



XI. Surfacing:
asphalt, limestone, Lignin, etc., depending on availability of materials. Contact Bureau of Engineering.

XII. Facilities:
Required - parking area, toilets, information board

Optional - campsites, picnic area, bike racks, picnic shelter, etc.

ACCESSIBILITY TRAILS

For complete guidelines on handicapped trails, see Access For all - A Workbook For Outdoor Accessibility, Minnesota DNR, June 1979

Signing:

Signing on trails should be designed to provide direction, information and safety for trail users. Major signing areas will be at the trail head, trail junctions and in areas where safety of the user is involved. Trail head and trail junction signs will provide maps showing route designation, distance, trail difficulty (ski touring trails), flow and location of support facilities. Safety signs will caution users of steep slopes, bridges or highway crossings and other hazardous trail conditions.

Signs on all trails should be kept at a minimum and be well placed. An informational board (kiosk or large bulletin board) will be at all trail heads, informing the public of rules and regulations, location of nearest emergency services, hours of operation and a map including distances in kilometers or miles, difficulty, trail direction and location of available facilities.

Signs placed out on the trail will include "you are here" designations, degree of difficulty (ski touring trails), reassuring blazers, caution signs, do not enter signs, stop signs, interpretive signs, etc.

"You are here" (trail junction signs) will be located at trail heads and trail junctions. These will indicate flow, degree of difficulty, distance in miles or kilometers, facilities and will pinpoint the location of a given sign in relationship to the total trail system. Signs will be installed within ten feet of the trail or trail junction and will be clearly visible to users. They will be placed at trail junctions in a manner that best accommodates trail users. All "You are Here" signs will be oriented to the north. (As the user is looking at the sign they should be facing north).

Placement of most signs should be on the right-hand side of the trail just off the main treadway but within clearing limits. Signs should be attached to posts placed 2-3 feet off the treadway and 3-4 feet above expected snow depth. Attach them securely with lag screws or carriage bolts. Wood or metal posts may be used depending on location and availability.

Degree of difficulty signs on ski touring trails will be placed at trail heads and junctions. The difficulty classification will include metal signs depicting easier, more difficult and most difficult trails.

These signs will be placed on the trail edge within 15 feet of the trail junction or within easy view from the junction.

The only directional sign used on the trail will be trail junction blazers, directional blazers and reassuring blazers. These metal signs will be 5" x 7" or 9" x 12" and diamond shaped. Signs will be placed in open areas or where a trail user may become confused.

If uncertain about the effectiveness of signing, invite a local trail user to identify where deficiencies may exist.

Suggested Signing Program:

The following is the basic sign program recommended for DNR trails: (See Sign Manual for specifics concerning the DNR signing system)

1. Identification of DNR Units (See pages 12-15 of DNR sign manual) (NR8-401, 402)

   A. Guide signs on trunk highways identifying the main entrance or main road leading to the trail may be erected and maintained by Minnesota DOT.

   B. The DNR will provide guidance signs on local roads to the trail system. Although counties are not under any requirement to sign DNR facilities and units, many are willing to do so.

   C. Where a trail system abuts the highway, DNR will provide directional signs.

2. Boundary Signs (NR8-104) to be placed every 1,000' on metal posts at the edge of the right-of-way on state trails.

3. Trail Head - The following signs should be located near the parking lot at the start of the trail.

   A. Major Information Board (NR8-718, 719, 720, 721)

REQUIRED	OPTIONAL
1) Map of trails	1) Registration
2) Distance of various routes	2) Interpretive information
3) Difficulty (ski touring trails)	3) Trail conditions
4) Rules and regulations	4) Hours of operation
5) Trail uses permitted and prohibited	5) Fee required
6) Address of person in charge of trail operation and maintenance (unit Manager)	
7) Emergency telephone numbers	
8) Where and to whom to go in case of emergency	

   B. You Are Here (NR8-820, 821) - to be located at the trail head and all intersections with other trails. Required on all ski trails; recommended on all other trails.

1) Direction of trail (one-way, two-way)
2) Difficulty of each loop (ski touring)
3) Trail distances (miles or kilometers)
4) Location of facilities
5) You are here location marker

4. Information (NR8-300)

A. Use Designation (NR310, 311, 312) - located at all intersections where compatible users may enter the trail.

B. Interpretive - (NR8-701, 702) - located at points of interest along trail. Consult regional naturalist for recommendations concerning interpretive signs.

5. Traffic (NR8-400)

A. Stop (NR8-405)
1) Trail use - ski touring, snowmobile, horse and bicycling
2) Location: every public road or railroad crossing

B. Stop Ahead (NR8-406)
1) Trail use - snowmobiling and bicycling
2) Location: 300 feet before public road or railroad crossing

C. Do Not Enter (NR8-407)
1) Trail use - all
2) Location: intersections, one-way trails, prohibited areas

D. Yield (NR8-408)
1) Trail use - all
2) Location: intersections with other trails in open areas. May also be used at private trail crossing found on railroad grades.

E. Caution (NR8-409)
1) Trail use - all
2) Location: all potentially hazardous areas such as cliff edges, rock falls, steep hills, congested areas, bridges, sharp ditches, sharp curves

F. Trail Difficulty (NR8-410, 411, 412)
1) Trail use - ski touring
2) Location: start of each loop and all intersections

G. Reassuring Blazer (NR8-413) orange - snowmobile; blue - ski touring
1) Trail use - all
2) Location: where required to reassure trail user he is on the right trail, more in open areas, less in thick woods. May also be needed at unused road or trail intersections.

H. Directional and Various Trail Junctions (NR8-414)
   1) Trail use - all
   2) Location: based on trail junction. Directional arrows should be placed prior to sharp curves and turns, distance will depend on anticipated speed of user. On snowmobile trails, these signs should appear at least 50' prior to the curve or junction.

I. Snowmobile Trail (NR8-415)
   1) Trail use - snowmobiling
   2) Location: start of trail and all trail intersections with other use trails

J. No Snowmobiling (NR8-416)
   1) Trail use - ski touring
   2) Location: start of trail, all intersections with snowmobile trails and road open to snowmobiles

K. Motorized Vehicle (NR8-403, 417, 418)
   1) Trail use - all
   2) Location: where necessary to permit or prohibit use, used primarily on state trails or in state parks

6. Temporary and Special Signs

A. Trail Closed (NR8-511)
   1) Trail use - all
   2) Location: all points where users could enter the trail

B. Handicapped Accessible and Decals (NR8-605, 609)
   1) Trail use - all trails with facilities for the handicapped
   2) Location: trail head and facilities

C. Grant-in-Aid (NR8-608)
   1) Trail use - snowmobile, ski touring, horse
   2) Location: all intersections of DNR and GIA trails, also at GIA trail heads

D. Mileage Markers (optional)(wood routed)
   1) Trail use - all
   2) Location: at intervals of miles or kilometers
   3) Mileage markers can be very helpful to the trail user and manager. They let trail users know the distance they have travelled or must travel to return to the trail head. They can help the manager easily identify maintenance problem areas and can also be useful to help locate injured or stranded trail users.
   4) Ski trails (use kilometers)

FIGURE 32

SIGNING A TYPICAL TRAIL

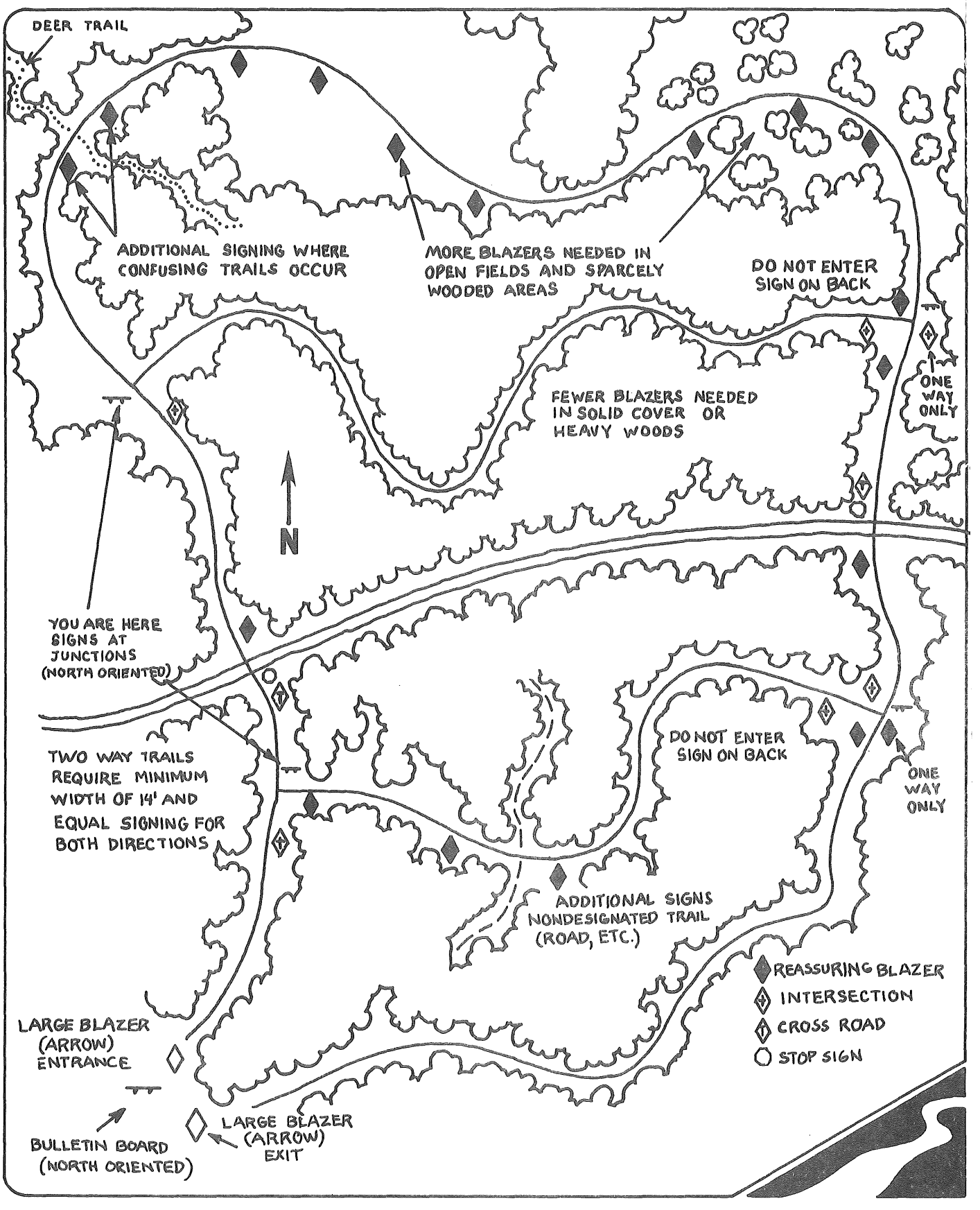


FIGURE 33

SIGN LOCATIONS

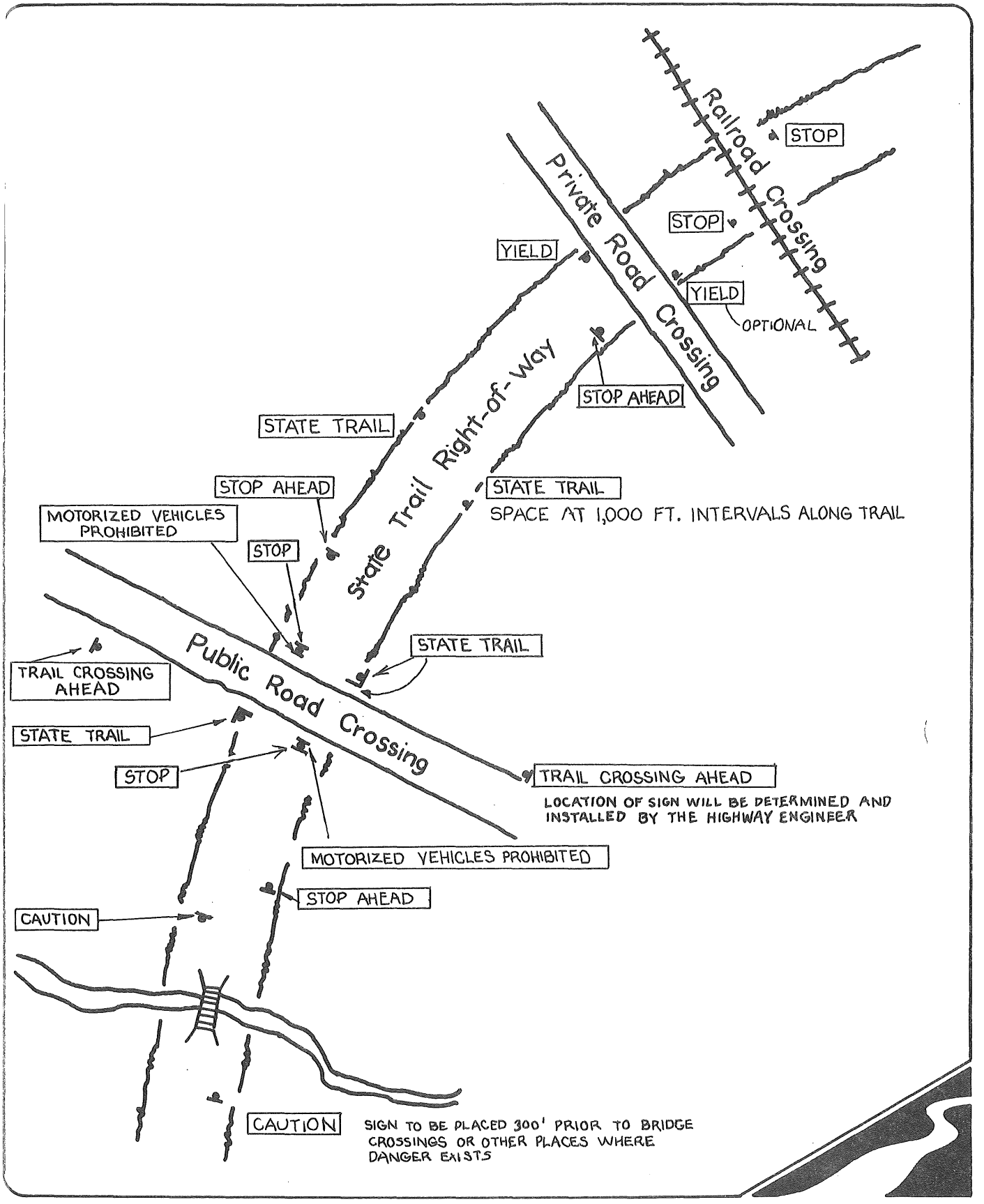
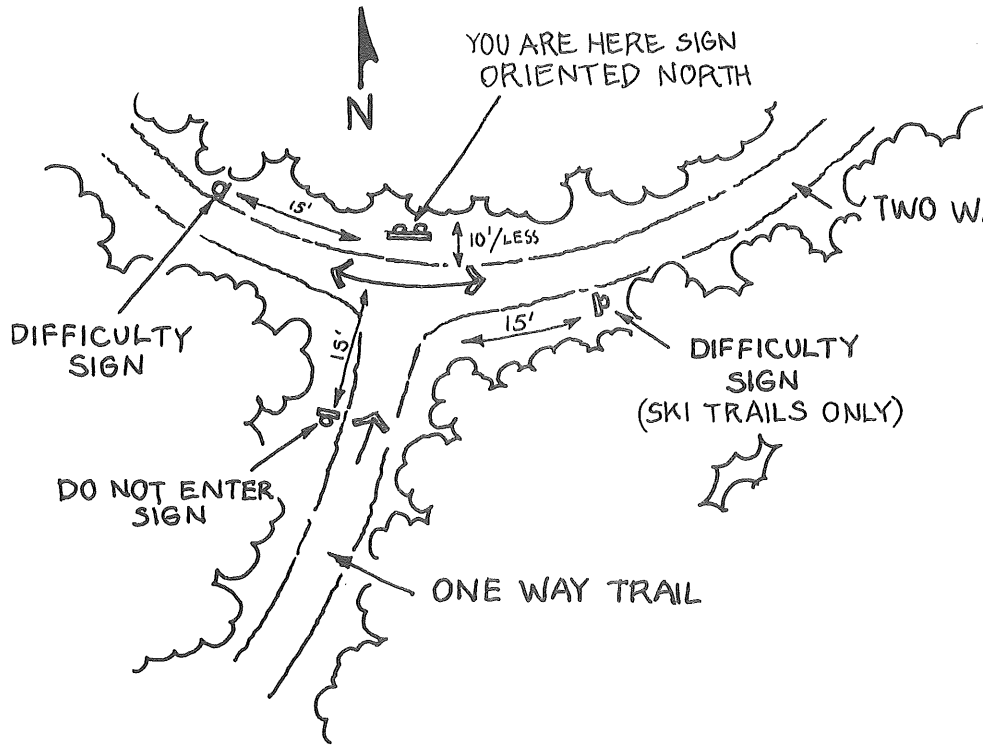


FIGURE 34

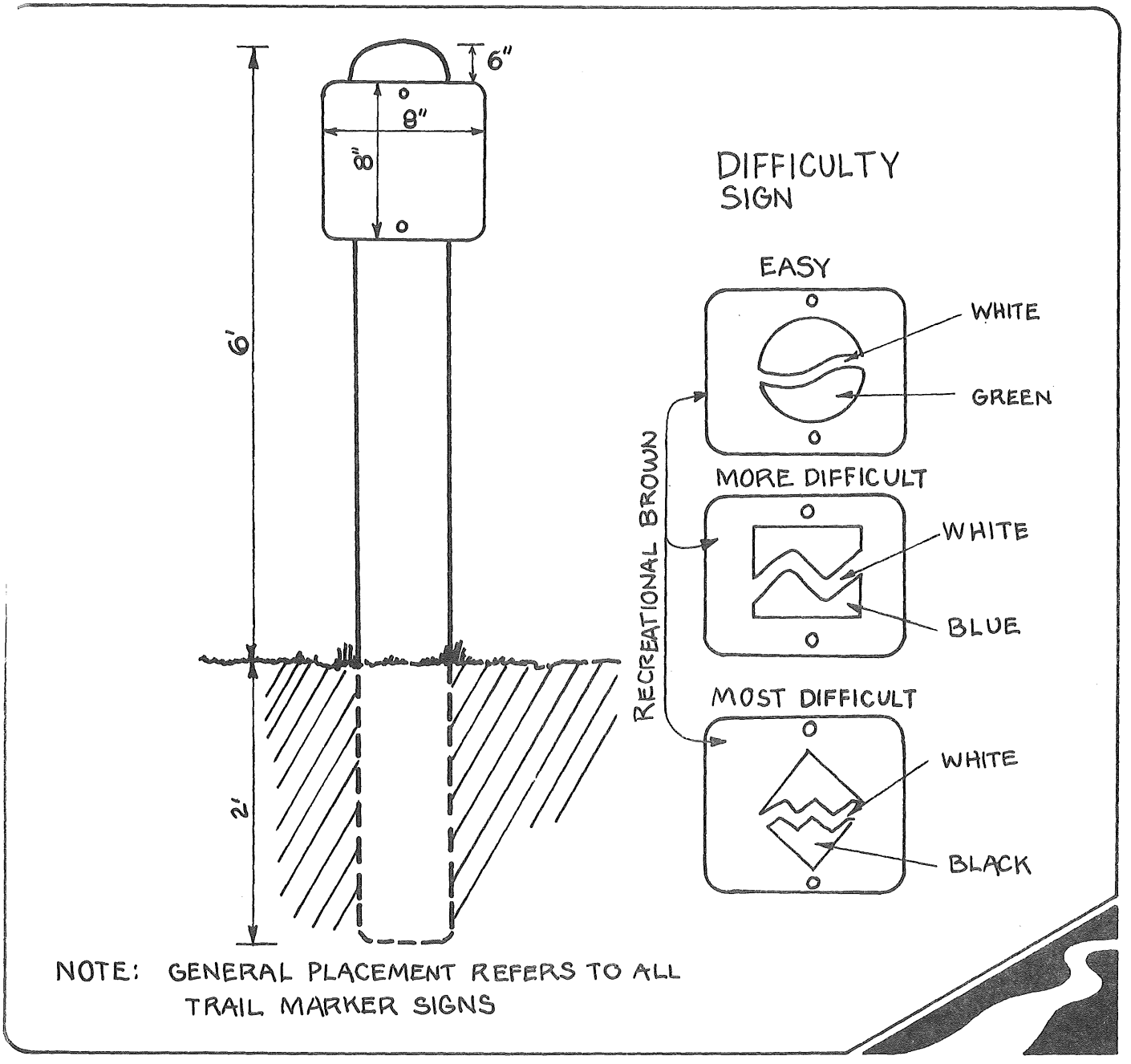
SIMPLE TRAIL JUNCTION



NOTE: THE PLACEMENT OF SIGNS & NUMBER OF SIGNS IS DEPENDENT ON THE NUMBER OF TRAILS INTERSECTING THE JUNCTION AND DIRECTION OF TRAILS

FIGURE 35

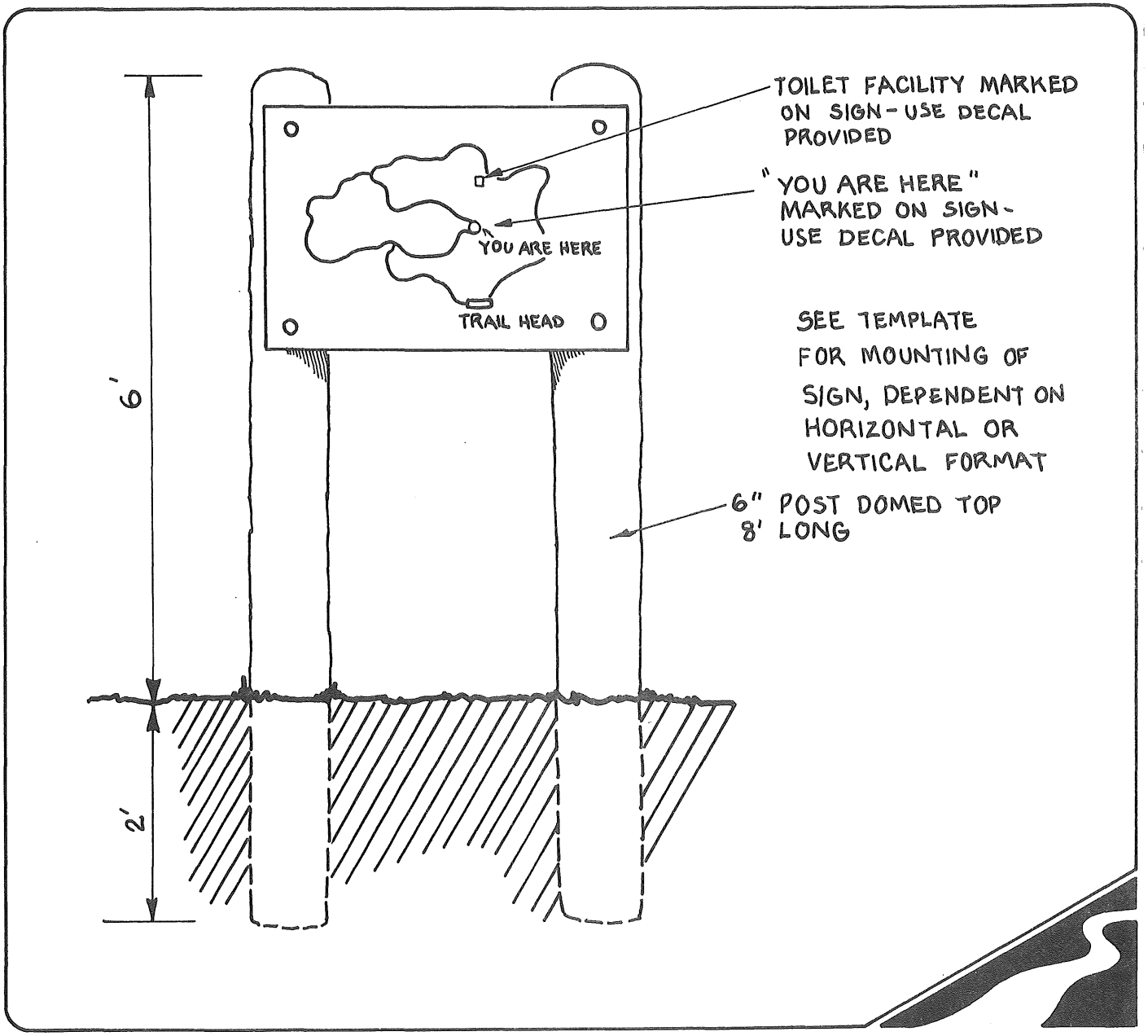
SIGN PLACEMENT



NOTE: GENERAL PLACEMENT REFERS TO ALL TRAIL MARKER SIGNS

FIGURE 36

"YOU ARE HERE" SIGN — METAL



TRAIL USER MAPS

Accurate maps of the trail system should be prepared for distribution to users. They should be available at the trail head, DNR offices, other locations convenient to the public and should include the following data:

Trail name or names (if more than one trail system in the forest)

Trail location (give directions how to get to the trail system parking lot from the nearest town and major highway. A small state map showing the general location in the state could also be used.)

Trail length (show the number of miles for each segment or loop)

Trail use (Identify loops or segments designated for specific uses; i.e., hiking, snowmobiling, horse, ski touring, trail-bike, hunting) (Identify portions of the trail too wet for summer use)

Ownership (Identify areas where trespass could be a problem)

Trail connections (Identify other trails the trail connects to such as: state park, state trails or grant-in-aid trails)

Trail information (Give name, address and phone number of administrative office which should be contacted for information. Phone number of local conservation officer may also be helpful).

Bridges (Show all bridge crossings)

Trail difficulty (ski trails -- identify loops as easier, more difficult and most difficult)

Roads (Identify maintained state forest roads and portions used as trails; also identify roads not maintained, but suitable for hiking)

Mark on map the location of the following, where applicable:

Parking lots	Public water accesses
Shelters	Canoe campsites
Sanitation facilities	Points of interest (explain)
Picnic areas	Lookout towers
Campgrounds	Power lines
Scenic overlooks	Other recreation facilities

Mark on map and/or list locations where the following would be available:

- Gas
- Food
- Lodging
- Nearest DNR office
- Bus service
- Repair services
- Medical facilities
- Law enforcement agency
- Other helpful information

MAINTENANCE PROCEDURES

Introduction

The quality of a trail will largely depend on the maintenance it receives. An effective maintenance program will require seasonal attention, along with specialized equipment. Procedures will vary according to the anticipated trail activity.

Trail maintenance includes treadway stabilization, vegetative management, facility upkeep, grooming, sign replacement, fencing, weed control and enforcement. The user's experience will depend largely upon the frequency of many of these functions. The need for grooming is dependent on 1) intensity of use, 2) snow trail conditions and user expectations (In some cases, users prefer ungroomed trails). Brushing and clean-up operations are mandatory during the summer to provide safe, unrestricted travel by hikers, backpackers and horseback riders.

The goal of trail maintenance is to continue to provide a safe and stimulating trail experience and to prevent degradation of the trail environment. Proper trail management practices are central to this goal. Several practices listed in the maintenance section will have to be performed annually on each type of trail, regardless of its respective use.

ANNUAL MAINTENANCE ACTIVITIES

Snowfree Seasons (Non-surfaced Trails)

Condition Report - The unit manager should inspect each trail under his jurisdiction annually to determine maintenance funding needs. This report should be based on his estimate of work that will have to be done to correct unsafe situations and protect the investment made. The report should then be submitted via channels so that maintenance funds can be budgeted for.

Clearing - Remove down trees across the trail, dead trees leaning over the trail and prune limbs that interfere with the user. Brush out trail to minimum vertical and horizontal distances as required for intended activity.

Trail Tread - Fill holes and smooth tread with appropriate materials. Drain mudholes. Remove loose rocks and tree roots from the tread. Provide additional base where required. Shape trail tread to permit proper drainage.

Drainage - Check all drainage structures (culverts, water bars, ditches) and clean if necessary to assure proper drainage. Replace damaged structures.

Erosion - Check all structures (rip-rap, retaining walls, etc.). Also check trails for any new erosion problems and be especially watchful in cut and fill areas.

Seeding - Should be done according to the recommendations listed by the seed manufacturer. However, heavy use of the trail during these periods may alter the seeding schedule somewhat. Prior to seeding, the area should be raked or disced to loosen the soil. Seed should then be distributed evenly according to recommended rates. Slope areas should be mulched to encourage faster growth and to prevent erosion.

Mowing - The trail treadway or shoulders of the treadway should be mowed periodically. Mowing keeps down weeds and eliminates breeding areas for insects. Frequency of mowing is governed by the type of use, frequency of use, type of grass, season, rainfall and availability of maintenance funds.

Trail Facilities - Parking areas, campgrounds, rest areas, bridges, shelters and other development should be inspected regularly. Parking areas will have to be plowed or the surface repaired. Vault latrines should be pumped, wells inspected and trash cans emptied according to use. Bridges should be inspected annually and damaged decking and railings should be replaced or reinfored. Trash along the treadway should also be picked up regularly.

Signs - Replace missing or damaged signs.

SNOW SEASONS

Snowmobile

Grooming should be started early in the season so that a firm base is established. When 8" to 10" have accumulated, packing procedures can begin. This will provide approximately 2"-3" of solid base which facilitates grooming throughout the season and in many cases, can extend the life of the groomed treadway. It is best to pack or groom a trail as soon after a snowstorm as possible.

Moguls in a trail are probably the most common problem encountered in grooming. The best technique in removing moguls is to cut them at their base. To do this adequately, the drag must have a retractable cutting blade either manual or hydraulic.

A technique that should be used in grooming is staggering the dragging of the trail from one side to the other. This will bring in snow from the edges. Also, in some cases small wings have been constructed on drags to bring in snow from the sides.

Another technique sometimes used is night grooming. Studies have shown the ideal grooming temperature range is 5 below to 15 above. To groom within this range, especially during the latter part of the season, night grooming is essential. Besides lower temperatures at night, in some cases snowmobile traffic is reduced enabling a freshly groomed trail to settle and freeze. Unfortunately, night grooming necessitates personnel rescheduling and also creates potential safety problems for operators and users.

Ski Touring

Ski touring trails require regular maintenance. Trails should be groomed (track set) after every appreciable snowfall or periods of drifting, before and after heavy use periods, or whenever the tracks are obliterated.

Grooming should insure a safe and enjoyable skiing experience. For example, on steep upgrades where skiers would have to herringbone or snowplow, tracksetting is unnecessary. Also, in some cases tracksetting on steep downhills can create a dangerous situation because a skier may not be able to maneuver in the tracks. When grooming, stay in the middle of the trail so the corresponding tracks are set in the middle. When any major curves are negotiated, the turns should be made gradually. Also, a slight curve in the trail can be straightened by setting the tracks to the inside of a curve.

TRAIL SURFACE MAINTENANCE

Bituminous

A bituminous trail may require surface patching, seal coating, clearing of tree limbs, brushing and mowing along shoulders, patching of shouldering, sweeping and opening of drainage systems.

There are two general types of asphalt patching: hot mix and cold mix. Hot mix is used in large patch areas. It is applied at about 400 degrees centigrade. When cooled, it will set up permanently. Hot mix is the most expensive of the two methods. Cold mix is used primarily in small patching areas and is temporary in nature in that it never completely sets up and will become soft in hot weather.

Limestone

Limestone trail maintenance includes many of the same things that are incorporated in bituminous maintenance. These include shoulder maintenance, brushing and mowing. The trail treadway maintenance varies considerably in that limestone can be graded or dragged to remove rough spots or ruts. Patching involves filling holes with limestone, wetting and then compacting.

Clay with Calcium

The standard shoulder maintenance, along with brushing and mowing as previously mentioned, would apply here also. The unique maintenance technique for this surfacing would be an application of calcium chloride to the trail annually.

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Timber Cutting and Extractive Operations

Adjacent to a Recreational Trail

on State Lands

Division of Forestry
Circular Letter 3501

I. Timber Cutting

When a timber permit is sold adjacent to or upon an established state trail, DNR trail, forestry trail, parks trail or grants-in-aid trail, or the trail is used (any part of the right-of-way) for access to a timber-cutting site, the following regulations will prevail.

1. No cut products will be piled, landed or stored upon the established right-of-way.

2. No slash or logging debris will be left to remain upon the right-of-way after the cutting of the trees.

3. Logging equipment, buildings or facilities shall not be parked, stationed or erected upon the trail right-of-way.

4. Trucks and logging equipment are not allowed to use the treadway for access to the timber operation unless jointly approved by the regional trails and waterways coordinator and the area forester and then only when the use of the trail does not jeopardize the safety of the trail users or the condition of the trail surface.

5. In the event it is impossible or impractical to conduct a timber sale under the above conditions, the area forester and the regional trails and waterways coordinator will establish a temporary alignment for the duration of the sale.

6. Any ruts, holes or other damage to the trails caused by the loggers will be repaired by the logger as directed by the area forester before the sale is closed.

7. The establishment of the temporary alignment for the purpose of conducting a timber sale upon the trail right-of-way will not excuse the logger from items 1, 2 or 6.

8. Safety signs (example: Danger, Trucks Hauling, Timber Cutting) will be posted at least 200 feet beyond both ends of any segment of the trail of a timber cutting operation and at least 200 feet on either side of where logging equipment and trucks are using the right-of-way.

II. Extractive

When an extractive earth operation is conducted adjacent to an established state trail, DNR trail, forest trail, park trail or grants-in-aid trail, or any part of the trail right-of-way is used for extractive purposes or access to the extractive operation, the following regulations will prevail:

1. No vegetative debris, waste earthen materials or commercial products will be piled or stored upon the right-of-way.

2. No equipment, buildings or facilities shall be parked, stationed or erected upon the trail right-of-way.

3. Extractive equipment and trucks are not allowed upon the treadway for access to the operation unless approved by the trails and waterways coordinator and then only when the use of the trail does not jeopardize the safety of the trail users or the condition of the trail surface.

4. Safety signs (example: Danger, Trucks Hauling, Mining Operations) will be posted at least 200 feet beyond both ends of any segment of a trail of an extractive operation and at least 200 feet on either side of where the extractive equipment and trucks are using the trail right-of-way.

5. If it is impossible to carry on an extractive operation under the conditions outlined above, the officer in charge of the operation and the regional trails and waterways coordinator will establish a temporary alignment for the duration.

6. In the event the extractive operation makes the trail alignment impractical to use after the closure, the unit responsible for the operation will assist in the development of a new permanent alignment.

7. Any ruts, holes or other damage to the trails caused by the extractive operation will be repaired by the operator as directed by the Department of Natural Resources officer in charge of the operation.

8. The establishment of a temporary alignment for the purpose of an extractive operation upon the trail right-of-way will not excuse the operator from items 1, 2 or 7.