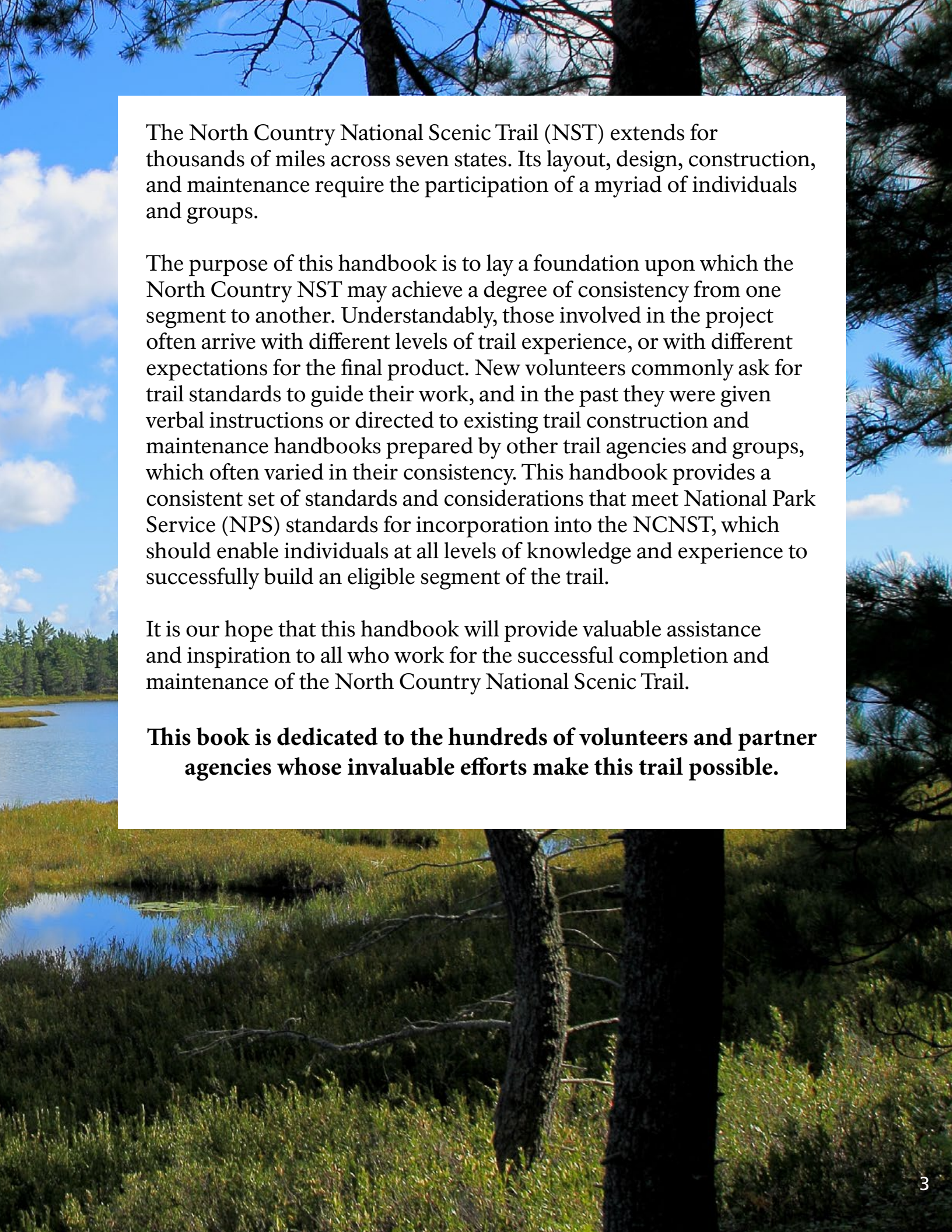
NORTH COUNTRY TRAIL
HANDBOOK

Planning | Design | Construction | Maintenance


Photo: Dave Johnson

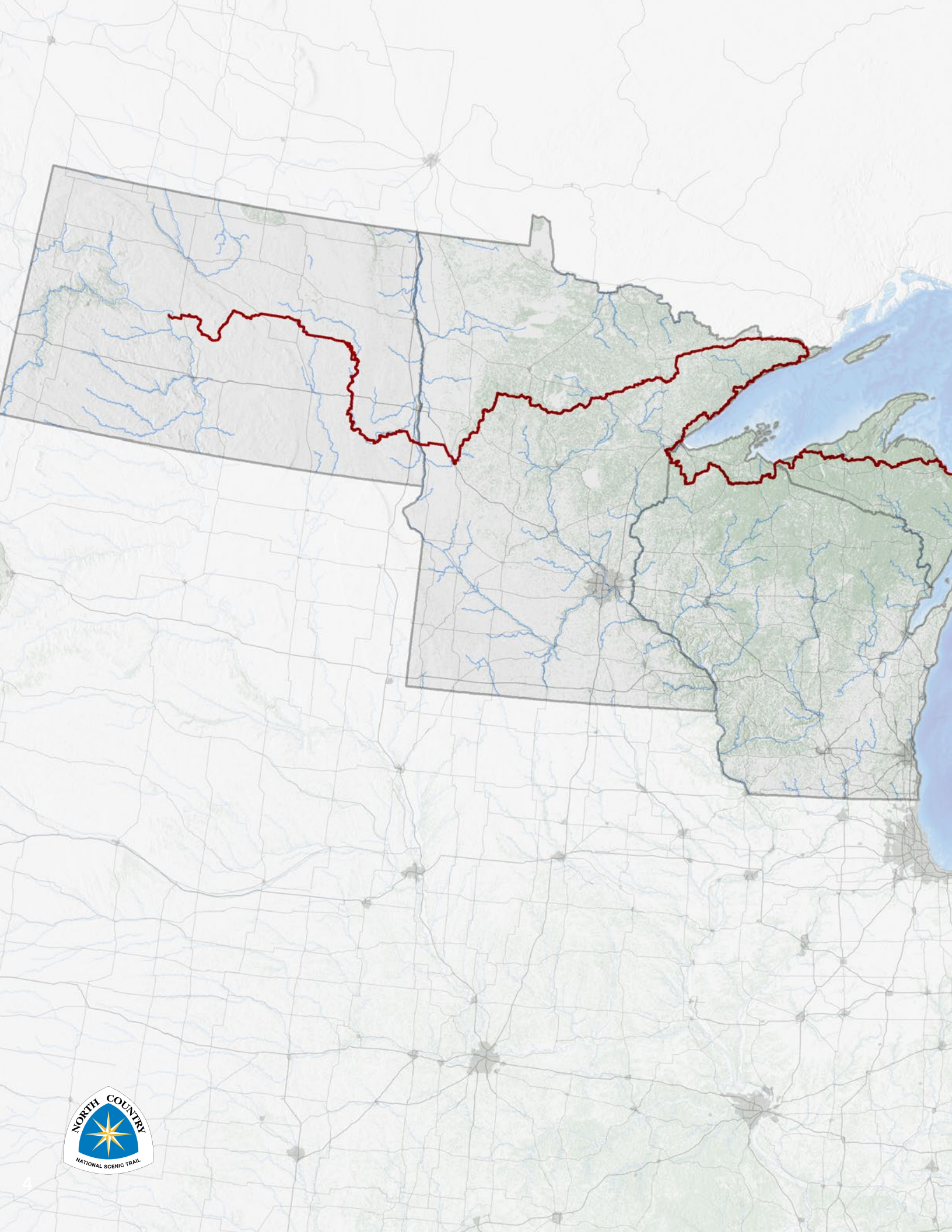


The North Country National Scenic Trail (NST) extends for thousands of miles across seven states. Its layout, design, construction, and maintenance require the participation of a myriad of individuals and groups.

The purpose of this handbook is to lay a foundation upon which the North Country NST may achieve a degree of consistency from one segment to another. Understandably, those involved in the project often arrive with different levels of trail experience, or with different expectations for the final product. New volunteers commonly ask for trail standards to guide their work, and in the past they were given verbal instructions or directed to existing trail construction and maintenance handbooks prepared by other trail agencies and groups, which often varied in their consistency. This handbook provides a consistent set of standards and considerations that meet National Park Service (NPS) standards for incorporation into the NCNST, which should enable individuals at all levels of knowledge and experience to successfully build an eligible segment of the trail.

It is our hope that this handbook will provide valuable assistance and inspiration to all who work for the successful completion and maintenance of the North Country National Scenic Trail.

This book is dedicated to the hundreds of volunteers and partner agencies whose invaluable efforts make this trail possible.



Upon completion, the North Country National Scenic Trail will be the longest in the National Trails System, stretching 4,600 miles over seven states from the middle of North Dakota to the Vermont border of New York. The planned trail traverses through a National Grassland, ten National Forests, more than 150 federal, state and local public lands near three of the Great Lakes past countless farmlands through large cityscapes over many rivers and through the famed Adirondacks.

Whether visitors plan to hike just a few miles or a longer overnight backpacking trip, the North Country Trail offers diverse landscapes and hiking opportunities.

1

ONE

About the NCNST

What is the NCNST, what makes it special, and how is it managed?

2

TWO

Route Planning

Before designing a new segment of the NCT, make sure the route is in compliance with guidelines and properly protected.

3

THREE

Trail Design

Good trail design should accommodate as many people as possible and be thoughtfully laid out to provide the best user experience.

4

FOUR

Trail Construction

Constructing a sustainable, accessible trail that requires minimal maintenance.

5

FIVE

Maintenance

Maintaining the trail in a safe and seasonally efficient manner.

6

SIX

Sign Standards

Signs are the primary way the public identifies the NCT; consistency is key.

T

SEVEN

Tool Appendix

Select the right tools for the job and use them safely.

A

EIGHT

Appendices

8 Photo: Dave Johnson

1

About the NCNST

Introduction

When completed, the North Country NST will extend from the vicinity of Crown Point, New York, to Lake Sakakawea State Park on the Missouri River in North Dakota, where it joins the route of the Lewis and Clark National Historic Trail. Currently, the length of the trail is officially 3,240 miles. By the time it is completed, the trail is expected to exceed 4,600 miles.

Threading its way across the landscape, the North Country NST links outstanding scenic, natural, recreational, historic, and cultural areas in seven northern states. Unlike the Appalachian, Pacific Crest, and Continental Divide NSTs, which follow mountain ranges, the North Country NST journeys through a variety of environments in the northeastern and north central United States. Beginning among the grandeur of the Adirondack Mountains in New York, the trail meanders westward through the hardwood forests of Pennsylvania, through the countryside of Ohio and southern Michigan, along the shores of the Great Lakes, and through the glacier-carved forests, lakes, and streams of northern Wisconsin and Minnesota, before its western terminus in the vast plains of North Dakota.

The diversity of landscapes and of scenic and historic features along the North Country NST is perhaps the trail's most appealing quality. Large areas of publicly owned lands, such as national forests, major state parks and forests, and the Adirondack Park in New York, offer wilderness and near-wilderness experiences. Remote sections of the trail offer solitude as well as outstanding scenery—for instance, the 42 miles of trail within Pictured Rocks National Lakeshore in Michigan follow the shore of Lake Superior and feature Grand Sable Dunes, Twelve Mile Beach, and colorful Cambrian sandstone cliffs. The portions of the trail that pass through or near villages, towns, or cities, offer trail access points, accommodation, resupply opportunities for long-distance users, and interesting historic and cultural features.

The North Country NST exists for a diverse group of users. Whether trail users are interested in an afternoon of walking, a day of cross-country skiing, or a week or month of backpacking, adventure is found along forested pathways, marshes and bogs, waterfalls, sand dunes, tallgrass prairies, old logging railroad grades, lighthouses, Revolutionary War forts, and small rural communities. From the Missouri River in North Dakota to the shore of Lake Champlain in New York, diverse features along the trail illustrate how the land was formed, how it has been settled, and how it has been used and altered by humans.

History of the NCT

On February 8, 1965, President Lyndon Johnson delivered what is known as the Natural Beauty Message, in which he called for the development and protection of a balanced system of trails in both the Nation's metropolitan areas and countryside, in cooperation with state and local governments and private interests. "We can and should have an abundance of trails for walking, cycling, and horseback riding, in and close to our cities," the President said. "In the backcountry we need to copy the great Appalachian Trail in all parts of America." In response to President Johnson's message, the Secretary of the Interior directed the former Bureau of Outdoor Recreation to spearhead a nationwide trails study.

By December 1966, the study concluded with the report "Trails for America," which provided guidance and definition for the development of trails. "A standard of excellence in the routing, construction, maintenance, and marking consistent with each trail's character and purpose should distinguish all national scenic trails. Each should stand out in its own right as a recreation resource of superlative quality and of physical challenge," the report said. The report defined National Scenic Trails as land-based and generally continuous, and it called for federal legislation to foster the creation of a nationwide system of trails.

Congress spent the next two years working on the national trails legislation, with input from public and private interests. On October 2, 1968, President Johnson signed into law the National Trails System Act (Public Law 90-543, 90th Congress), which set in motion a process to create a network of National Scenic and National Historic Trails. The call of hikers and others who sought retreat from a hectic world had been answered. Opportunities to explore America along scenic pathways, at a walking pace rather than at freeway speeds, became a reality.

The North Country National Scenic Trail (NCNST or NCT) was designated and added to the National Trails System on March 5, 1980.

The long-term goal for the North Country NST is to establish a continuous trail that meets the federal legislative intent. It is to be developed and managed as a premier hiking trail, nationally significant in its scenic and recreational qualities, and closed to motorized use. Segments which meet this intent and other criteria can be certified by the National Park Service as part of the North Country NST.

As a partnership park, the North Country NST should meet local needs and blend with the character of the landscape. It should also exhibit continuity in character, quality, and visual appeal sufficient to distinguish itself as a National Scenic Trail and should offer a high caliber experience to its users.

1965
President Lyndon Johnson delivered the Natural Beauty Message

1966
Trails for America Report released, NCT listed as a potential NST

1968
National Trails System Act Passed

1980
The NCNST is designated and added to the National Trails System

1981
The North Country Trail Association Established

Foundation of the NCT

The North Country Trail is a truly special recreational resource. It is the longest National Scenic Trail in the United States. It is not confined to and does not follow a clearly discernible geographical feature as do many other National Scenic Trails. Instead, it meanders through seven northern states, taking users through a fascinating diversity of scenic, historic, cultural, and natural landscapes and recreational features. By doing so, it showcases some of the best scenery of the Midwest, Great Lakes and Northeast Regions of America.

The North Country Trail provides an opportunity to explore a slice of America at a slower pace and to enjoy a retreat from the hectic routine of everyday life. It exists as much for the enjoyment of the casual user as it does for others who are inspired to travel its entire length, providing outstanding opportunities for recreation, education, inspiration, solitude, and enjoyment.

In fulfilling its purpose to expose users to the diversity of the scenic, natural, cultural, and recreational resources along its route, the North Country Trail incorporates many existing trails, some of which currently permit other non-motorized uses as determined by their individual managing authorities. However, the North Country Trail is managed primarily for hiking and backpacking, with a focus on protecting the trail experience and ensuring user safety and resource preservation.

Nature & Purposes Statement

The nature and purposes of the North Country Trail is to provide a non-motorized trail that offers world-class walking and hiking experiences within a protected trailway and landscape through the northern heartlands of America.

The Trail reflects a tapestry of people both past and present, woven together with the places and stories that define them. The grandeur of rugged mountains, vast prairies, deep woods and placid lakes, the tranquility of rural farms, the variety of working landscapes, the boundless horizons of the Great Lakes, the splendor of true wilderness, and the nostalgia of historic canal towpaths and communities intertwine to create a natural and cultural tapestry of great breadth and depth.

Linked by common commitment, the trail engages and supports a multitude of public and private partners and volunteers working to create a continuous pathway telling this story.

Trail Philosophy

National Scenic Trails are viewed as elite examples of the extended trails system: they are intended to be continuous from end to end, to provide access to outstanding scenery and natural landscapes, and to link significant natural and cultural features by means of simple pathways.

The Appalachian NST is generally held up as a model example of a National Scenic Trail. The popular image of the trail is that of a simple pathway through primarily wooded areas that provide outstanding views of the surrounding mountains. As a result, these two elements are often seen as necessary for any NST. However, each National Scenic Trail has a character and identity of its own, influenced by the unique and diverse landscapes through which it passes.

Federal, state, local, and private landowners or managers participate in hosting, developing, and/or maintaining segments of the trail. Public land management authorities may wish to form agreements with private volunteer organizations to carry out trail development and maintenance activities while retaining overall management control of their lands. Whatever the arrangements, the national significance and integrity of the North Country NST should be clearly recognized and identified in the management objectives.

Fundamental Resources and Values

Fundamental resources and values (FRVs) are those features, systems, processes, experiences, stories, scenes, sounds, smells, or other attributes determined to warrant primary consideration during planning and management processes because they are essential to achieving the nature and purposes of the trail and maintaining its significance. Fundamental resources and values are closely related to a trail's legislative purpose and are more specific than significance statements.

Fundamental resources and values help focus planning and management efforts on what is truly significant about the trail. One of the most important responsibilities of NPS managers is to ensure the conservation and public enjoyment of those qualities that are essential (fundamental) to achieving the purpose of the trail and maintaining its significance. If fundamental resources and values are allowed to deteriorate, the trail purpose and/or significance could be jeopardized.

The following fundamental resources and values have been identified for North Country National Scenic Trail:

- **The Trail Experience.** The wide variety of terrain, flora, and fauna offers everything from a leisurely afternoon stroll to a multiday, rigorous long-distance hiking challenge. Open to travel by foot its entire length, much of the trail is simple earthen footpath. In some areas, the trail is shared with other nonmotorized users and is built to different standards to accommodate those uses. These are primarily in urban settings. In every locale, opportunities abound for bird watching, botany, photography, and wildlife study, either alone or as an experience shared with others seeking the respite of the outdoors.

- **Connectivity and Protection of Significant Natural and Cultural Resources, Stories, and Viewsheds.** The National Trails System Act calls for "the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which such trails may pass." In 2009, through an amendment to the National Trails System Act, the National Park Service was given authority to acquire lands from willing sellers on which to establish the trail and protect additional significant natural and cultural resources and viewsheds along its length. As they are protected, they will be included as fundamental resources of the North Country Trail.

- **The Trail's Tireless Volunteers.** As stated in section 2(c) of the National Trails System Act: "The Congress recognizes the valuable contributions that volunteers and private, nonprofit trail groups have made to the development and maintenance of the Nation's trails. In recognition of these contributions, it is further the purpose of this Act to encourage and assist volunteer citizen involvement in the planning, development, maintenance, and management, where appropriate, of trails." Since the early 1980s, the North Country Trail Association with its chapters and affiliates has been the principal partner with the National Park Service working to create and maintain the trail. The tireless and motivated volunteers are truly the soul and spirit behind the operation and management of the trail, forging local partnerships with landowners and engaging people of all ages with the wonder of the trail.

- **The Trail's Collaborative Partnerships**. Federal, state, and local land managers, nonprofit organizations, and corporate and private landowners demonstrate their recognition of the importance of the trail by working to offer access to the trail for both users and the trail maintainers in order to share the beauty and the recreational opportunities of the local landscape. Hundreds of townships and municipalities, many corporate and nonprofit partners, and a multitude of private property owners all make significant contributions to the development, maintenance, and protection of the trail.

NCT Certification

Certification is an important way to for the National Park Service to record and track segments of the trail as they are completed, designed and constructed to federal standards. Certification ensures that trail segments are planned and constructed in optimal locations where they can be reasonably expected to remain long term (20+ years) in the condition documented on the date of certification. However, certification does not convey to the federal government any property rights or management authority over the lands on which the trail lies. Once a segment is certified by NPS, the North Country Trail emblem is posted at selected locations along its route, and the segment is recognized as an official part of the North Country Trail.

The NCT emblem is ONLY authorized for use on segments that have been officially certified by NPS.

Certified segments MUST be non-motorized and be open to foot traffic along its entire length.

The preparation and completion of the NPS Certification Application Form is a collaborative effort between the maintaining organization, the easement/ permit holder, and the landowner/manager. Therefore, it is important to establish communication early with an NPS Trail Planner to ensure that any issues are addressed and resolved before submitting a Request for Certification.

Sample Certification Form

Management Policy

Are there any restrictions (such as seasonal or other closures) and/or fees impacting access?

Trail Segment Description

Length of trail. Description of trail setting and key destinations within the trail segment and trailway.

Trail design / cross-section (Natural footpath? Paved? General dimensions. If design varies, please explain).

Approved use(s) of the trail. Explain how uses were determined.

Does this trail segment follow the route identified in the CMP or subsequent plans or Optimum Location Review (OLR)? If not, explain.

If applicable, has the public land managing authority designated a corridor for the trail to protect the scenic quality and other values of the trail? Explain.

Are there any other agreements, relationships or plans that could have an impact upon the planning, design, construction or maintenance of the trail segment?

Beyond the Trailway

Does this segment connect to other certified segments of the North Country Trail? If so, please briefly describe these other segments- approved uses, design, etc.

What land uses or activities exist along both sides of the trail or trailway? (Agriculture, housing development, forestry, etc)

Does the managing authority identify other uses that will impact the trail or trailway? (Timber and veg management, communication corridors, energy extraction, other recreation uses in the area, etc.)?

Local and/or Regional Trail or Outdoor Recreation Plans

Are there any approved public trail management plans, local jurisdiction outdoor recreation plans, or similar documents for the area? If so, explain how the trail segment is in harmony with the plan(s).

Have public land managers or local jurisdictions, as applicable, been kept informed of the progress of trail development?

Legal Trail Access mechanism (Identify and explain only those that apply and attach documentation):

- Fee simple (note owner name)
- Access easement (identify parties and lifetime of easement)
- Access Agreement (identify parties and lifetime of agreement)
- Lease (identify parties and lifetime of lease)
- Permit (Identify parties and lifetime of permit)
- Simple letter/handshake (identify parties and rationale)

Future Trail Maintenance

Are the signers of this document in agreement regarding trail repair, maintenance and management of the segment? Identify responsibilities, limitations, etc.

Are there any future plans for the trail not included elsewhere in this Agreement?

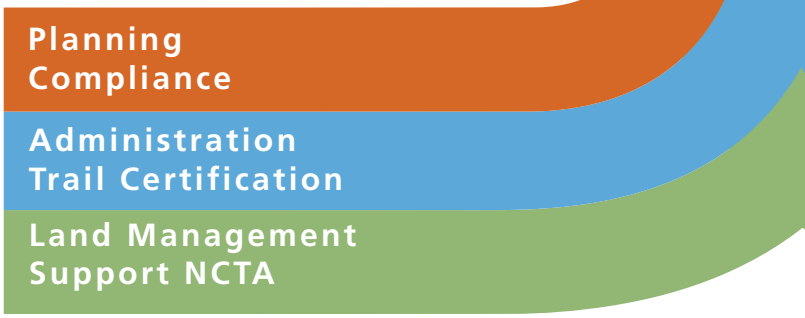
The National Park Service

NPS Mission Statement

The National Park Service (NPS) preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The National Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

The National Trails System is the network of scenic, historic, and recreation trails created by the National Trails System Act of 1968. These trails provide for outdoor recreation needs, promote the enjoyment, appreciation, and preservation of open-air, outdoor areas and historic resources, and encourage public access and citizen involvement. The North Country National Scenic Trail is a unit of the National Trails System and a component of the National Park system.

National Park Service staff administer the overall mission of the North Country Trail and the National Park System with guidance provided by the Regional Office. The National Park Service office of the North Country Trail provides several essential functions. NPS staff ensure that volunteers and partners are conducting work in a safe and sustainable manner while also honoring the purpose and mission of the North Country Trail. Additionally, they work behind the scenes to protect the trail from potential impacts including infrastructure such as cell towers, highways and pipeline projects. The NPS is also responsible for establishing the standards on many of the essential components of the trail such as safety, construction, signage and maintenance, as well providing funding for essential operations and projects wherever possible.



The North Country Trail Association

NCTA Mission Statement

The mission of the North Country Trail Association (NCTA) is to develop, maintain, protect and promote the North Country National Scenic Trail as the premier hiking path across the northern tier of the United States through a trail-wide coalition of volunteers and partners.

The NCTA unites individuals, affiliated trail groups, local chapters, corporate sponsors and others united in support of building and maintaining the NCT and telling its story. A 501(c) 3 non-profit organization of volunteers along the seven-state trail and elsewhere, the NCTA partners with the National Park Service in bringing the North Country Trail to local communities.

Guided by a Board of Directors that sets policy and program direction, provides fiduciary oversight and hires the executive director, the staff of the NCTA conduct the actual business of the Association. Staff provides direct support to NCTA volunteers, chapters and board committees; leads projects and programs in marketing & outreach, trail management and protection; conducts development and fund-raising, does advocacy work and manages the many business functions of an association, from membership to finances.

The NCTA staff provides support for chapter business functions, creating efficiencies in non-profit financial management, charitable registrations, IRS reporting, managing relationships with government agencies, keeping records and more in order to make it easier for chapters and volunteers to do what they love most–hike and build trail. NCTA staff creates space for volunteers and chapters to more effectively, safely and productively accomplish their mission.

NCTA's Volunteer Resource Center contains videos, documents and tools for NCT volunteers working on trail construction, maintenance, outreach and more. https://northcountrytrail.org/volunteers/resources/

 Photo: Dave Johnson

2

Route Planning

Objectives

The North Country National Scenic Trail shall have a treadway that is enjoyable and reasonably safe for hiking. The trail shall be designed, constructed, and maintained to minimize its impact on the natural resources of the surrounding area while taking advantage of scenic, educational, and cultural opportunities. Basic principles to consider are:

- Trail is in a visually pleasing corridor that incorporates as many scenic and other points of interest as possible.
- Trail provides for diversity of views and experiences by passing through a variety of geographic, vegetative, and cultural features.
- Trail incorporates existing trails when possible if they meet or can be modified to meet the basic standards of a National Scenic Trail.
- Trail provides connections to other trails, recreation facilities, parks, resource and cultural areas, communities, etc.
- Trail requires minimum maintenance while providing ecological variety.
- Trail avoids the more developed portions of rural areas.
- Trail reflects the mood and atmosphere of the area it traverses.
- Trail has local landowner support.
- Trail has the necessary support facilities.
- Trail makes maximum use of public lands and other large holdings—provided that other desirable trail qualities are present. Public land should not be used solely because it is there. For instance, if it is entirely wetland there is probably a better location.

The 1982 comprehensive management plan for the trail specifies that all segments of the North Country NST shall be open to travel by foot, i.e., hiking and backpacking.

Other non-motorized uses, including bicycling, horseback riding, cross-country skiing, snowshoeing, and jogging, may be permitted on a given segment according to the desires and policies of the managing authority responsible for the segment.

Multiple uses of the trail for activities other than hiking including those which can take place during the same season and/or those which take place during other seasons of the year, should be considered. A managing authority responsible for a relatively short segment of the trail should consider the uses permitted on adjacent segments of the trail and consult with the responsible managing authority when considering additional uses on its own segment.

Uses other than hiking should be permitted only if the activity will not cause significant deterioration of the trail and surrounding environment and the activity can be safely accommodated, i.e., the trail is constructed according to accepted standards for that activity.

Some have misinterpreted the first two statements to mean that the NPS encourages as much multiple use as possible. Instead, the policies convey the fact that the North Country NST, like the Appalachian NST, is primarily intended to be a hiking trail. However, recognizing that the route of the North Country NST incorporates many existing trails, and the fact that the trail will only exist through the voluntary cooperation of others who see the trail as a way to meet their own objectives, the decision to permit non-motorized uses has been left to local managing authorities.

Recreation Opportunity Spectrum

The great outdoors offers a tremendous diversity of recreational opportunities. Equally diverse are the public's recreational interests and needs. From city parks to pristine wilderness, people look to the outdoors to satisfy their desires, challenge their abilities, and meet their expectations in a particular activity and setting. Recreation researchers have long recognized the importance of the relationship between expectations and settings.

The current ROS of the USDA-Forest Service divides recreation settings into six broad categories which, at times, overlap—urban, rural, roaded natural, semi-primitive motorized, semi-primitive non-motorized, and primitive. In the interest of simplicity and considering the nature of the North Country NST, these are combined into four categories. The recreation settings used throughout the remainder of this handbook are: urban, rural/roaded natural, semi-primitive, and primitive. The standards found in this manual are categorized by these ROS settings.

NPS adapts this system to give a broad yet defined context for what type of signage, accessibility standards, construction methods and uses might be appropriate to consider on a particular segment of the NCT. While many segments fall into the semiprimitive category, if there is doubt about how to appropriately classify a particular segment, NPS staff should be contacted for assistance.

Many people associated with the North Country NST tend to think of and manage the trail as if it were semiprimitive throughout, when in fact the degree of land development that surrounds certain segments is inconsistent with this more restrictive level of management. At times it is difficult for volunteers and local trail managers to determine the class of an area so that the appropriate trail standards can be applied.

ROS Setting	Environment	Contact with Other Groups	Outdoor Skills/Risk	Isolation	Improvements
Urban	Urbanized and modified natural environments	High chance	Low use of outdoor skills needed	Low isolation from populated spaces	Fully developed trailheads with restrooms and amenities
Rural/Roaded	Natural appearing, moderate evidence of human activity	Equal chance of solitude and contact with others			
Semi-primitive	Predominately natural areas of large size	Low	Medium to High	High	
Primitive	Only designated wilderness	Low	High	High	None

Primitive | Semi-Primitive | Rural/Roaded | Urban

Accessibility

The North Country NST offers a broad spectrum of opportunities for all people.

Since National Scenic Trails are administered by the federal government, they are subject to accessibility standards set forth by those agencies. The US Forest Service has a published Accessibility Guide for Trails (FSTAG) that can be viewed for specific details on making trail segments accessible.

The purpose of FSTAG is to provide guidance for maximizing accessibility while also protecting the natural setting. Specifically, the standards set forth in the FSTAG accomplish the following:

- Maximize accessibility
- Protect forest resources and the environment
- Preserve the recreation experience
- Provide for equality of recreation opportunities
- Are enforceable and measurable
- Address public safety
- Are based on independent use by people with disabilities
- Comply with ADA, section 504 and to the greatest extent the federal accessibility guidelines
- Integrate universal design and policies

Accessibility guidelines apply in 3 instances:

1. New or altered trail
2. Have a designed use of hiker/pedestrian
3. New trail segments that connect directly to an already accessible trail or trailhead

How does accessibility fit into this range of opportunities? We certainly don't want to pave the wilderness. However, when the decision is made to construct or alter a building, trail, recreation site, or other facility, we must ask, "How can we design and build this to ensure all people have an equal opportunity to use this facility?" The key is to ask this question before the facility has been designed and built or purchased. Then we can provide facilities for use by all people to have the opportunity to enjoy the outdoors.

The guidelines are focused on specific segments of trail where accessibility is reasonably attainable and would not change the character of the trail or the hiking experience, and may not always be applied to primitive long distance trails. Still, those working on behalf of the North Country Trail should strive to provide accessibility to the greatest extent possible.

Conditions of Departure:

1. Where compliance would cause substantial harm to cultural, historic, religious, or significant natural features or characteristics
2. Where compliance would substantially change the physical or recreation setting or the trail class, designed use, or managed uses of the trail or trail segment or would not be consistent with the applicable land management plan
3. Where compliance would require construction methods or materials that are prohibited by federal, state, or local law
4. Where compliance would be impractical due to terrain or prevailing construction practices

Managed Use – Modes of travel that are actively managed and appropriate. There can be more than one managed use per trail segment.

Designed Use – The intended use that influences design of the trail and subsequent maintenance parameters. A trail may be managed for multiple uses, but every segment has only one "designed use" (requiring the most demanding design). FSTAG applies to trails with a designed use of hiker-pedestrian rather than managed use. There is only 1 designed use per trail segment.

Optimal Location Review (OLR)

Optimal Location Review (OLR) is a process to document selection of the best location for the trail and identify the land needed for the trail within the determined route corridor. An OLR helps to ensure the route meets the intent of Congress to locate the NCT in a way that highlights the scenic, natural and historic qualities of the area. The optimal location of the trail should provide the most desirable recreation setting, connect any outstanding natural or cultural features, and allow for safe use and access to trailheads, suitable water sources and camping sites.

The National Park Service North Country Trail Office has developed an OLR handbook that explains the process for locating gaps in the NCT where the trail has not yet been developed, or to relocate the trail when there are changes in land management or opportunities to reroute through a more sustainable, permanently-protected location. As the administrators of the trail, the National Park Service is responsible for selecting the trail route in conjunction with state and local governments and private landowners that have jurisdiction over the land where the trail is located.

Any NCT partners may initiate an OLR process; however, the National Park Service should always be consulted on the process, especially when land acquisition decisions affecting the trail route are being considered.

The OLR should identify not only the optimal location for the trail tread, but also the optimal trailway. The trailway is often defined by the viewshed, or what can be seen from the trail. In wooded areas the trailway might be a few tree lengths wide, while in open areas, it might extend several miles across a river valley. It's important to always look at the bigger picture in terms of providing a balance between the best trail experience for the users, taking advantage of what's best in the landscape, and the feasibility of making it happen.

Once an organization has made a rough determination as to where an optimal route might be, the next step is to initiate contact with the land owners to seek permission to access the property, scout potential trail routes and discern the possible interest of the property owners to partner with the Trail. Because land ownership changes over time, a land-owner saying no to proposed trail construction or changes is not necessarily a deal-breaker, but rather just an immediate consideration to take into account, as the option may be available again in the future if the land changes hands.

With all the information in-hand (scenic quality, natural, historic or cultural values, property owner interest and overall feasibility) organizations can then compare alternative routes to determine the optimal trail location.

For more detail and clarification on the OLR Process, contact the NPS NOCO office.

Summary of Steps in OLR process:

1. Identify Project Leaders and Stakeholders

2. Set Objectives for Optimal Location

3. Inventory

- Identify end points. Describe existing trail at these points and issues with the current route.
- Identify scenic qualities and other values within a corridor area.
- Identify existing planning documents that may impact or inform decisions.
- Gauge interest of property owners regarding partnering with NCT.

4. Analysis

- Identify alternative routes and trailways. Describe and analyze each, including the currently used route.
- Rank alternative routes and trailways against objectives.

5. Identify Optimal Route and Define Trailway

6. Prepare Document and Get Signatures.

Support Structure Planning

Although support structures provide convenience, comfort, and/or sanitation for hikers, they are not necessary for trail construction itself. Structures require additional cost, planning, and often professional construction to meet local codes.

The need for support structures, along with the local chapter's capacity to maintain them long term, should be thoroughly evaluated.

Structures should be built of quality material to provide longevity and should be designed to harmonize with the surrounding environment. If native material is used, the source site should be left with as natural of an appearance as possible. The chart below includes standards and explanations of some structures. Others are more fully explained in subsequent text.

Trail Support Structure Standards

Standards (Minimum)	Urban	Rural and Roaded Natural	Semi-primitive	Primitive
Primary Trailhead(1)	As needed	Spacing 5 miles or less when actual use is high. Spacing 10 miles or more when actual or desired use is low.	Spacing 10 miles or more	*
Campsite/Shelter	N/A	Spacing 8-15 miles. Especially needed when dispersed camping along the route is not permissible.		*
Developed Water	Obtain from public facility or home	Spacing 10-15 miles when potable or treatable water is not available	Spacing 20-30 miles when potable or treated water is not available.	*
Toilet Facility	As needed.	At high use areas, campsites, trailheads, and other public areas as necessary	As needed for resource protection	*
Bench	May be provided at selected view spots or rest areas.		N/A	*

(1) Primary trailheads provide parking for a number of vehicles and contain a bulletin board or kiosk for trail information. They may be part of an existing recreation facility or may be located where the trail crosses a highway or major road.

Secondary trailheads may also be established. These may have one or two small vehicles spaces or a parking is not provided/ discouraged because of safety considerations. They may include a small bulletin boards or kiosk with trail information. Generally, these will be used when it is necessary to gain access to the NST via other trails. The secondary trailhead should be located where the named trail intersects the NST or at the beginning of the access trail. Secondary trailheads may be found in remote areas where major roads are far apart.

* In Primitive ROS (Wilderness) structures are provided only for visitor safety or resource protection— not for visitor convenience or comfort.

Water

Potable water is extremely important to backpackers. It can be obtained from domestic water systems at developed camp and picnic grounds, administrative sites, roadside parks, homes along the route, or from filtered or chemically treated natural sources of water.

In addition to a water source near campsites and shelters, a source should be available about every 5 miles along the trail. The trail should be located to allow hikers periodic access to clear, permanent streams, lakes, or springs which will not quickly clog a portable water filter.

Trailhead Parking

When possible, parking areas should be located on public lands and provide access to more prominent natural features along the trail in the course of a day hike. Access trails can be used to connect parking areas with the main trail. The distance between trailhead parking areas can vary considerably depending upon the need. Typically they are between 5 and 15 miles apart.

Campsites or Shelters

In many areas, particularly publicly-owned forests, dispersed camping is allowed. Hikers may camp at any point along the trail as long as they follow local guidelines. In areas such as state and national parks or wildlife refuges, camping is restricted to designated sites or developed campgrounds. When the trail crosses private land, camping of any kind is usually prohibited by the landowner. In large areas of public land, developed campgrounds may be located near the trail. There are also private campgrounds along the way.

The desired distance between camping areas along the trail is 8 to 15 miles. The land manager or landowner should be contacted before development of a site occurs. The choice between developing a campsite or a shelter often is based on local preference.

Sites for overnight facilities must be selected carefully to withstand user impact. Use should be diverted from heavily eroded, delicate, or impacted sites. Hikers should be directed to overnight sites by maps, guidebooks, and signs.

In selecting a site for a campsite or shelter, the following should be considered:

- If possible overnight facilities should be located no more than one day's hike apart (8 to 15 miles).
- Sites should be isolated to reduce vandalism and unauthorized uses. Sites should be located at least one mile from public roads.
- Low knolls or gradual slopes that allow water to drain away and soils that are able to withstand impacts with little erosion are the best choice for an overnight facility. Low lying areas, where drainage may be poor, and areas subject to flooding should be avoided.
- Vegetation or topographic features that provide partial shade and shelter from high winds should be a consideration, but these spaces should not be so enclosed to block the sun or attract mosquitoes.
- Facilities should not be located in areas that present safety risks, such as near cliffs, or in areas subject to flash flooding, rockfalls, lightning, or other natural hazards.
- Campsites or shelters should not be located directly on the shorelines of lakes or other water bodies, and should not be readily visible from the water. A glimpse of the lake or water body from the campsite is ideal.
- Sites should be located at least 200 feet from the main trail unless topography or ownership patterns dictate otherwise. Some agencies require the campsite to be even farther from the trail. A small sign or marker on the main trail should indicate obscure sites.
- The site should accommodate no more than 7 to 10 persons. One or two flat tent sites should be included or constructed.
- An adequate, year-round source of water for cooking and washing is essential. While close proximity to water is desirable, hikers will accept sources up to ½ mile away. For sanitary purposes, it should be no closer than 150 feet to the actual campsite.
- Some type of privy or wilderness latrine (a wooden box and seat or fiberglass riser over a pit) should be provided. This should be located 100 to 200 feet downwind and at least 200 feet from the drinking water source and any surface water. It should also be located so that the land does not slope toward the drinking water source.
- A fire ring or pit may be provided, especially at heavier used sites where wood supply is abundant. This is preferable to several impromptu fire sites. Fire rings and pits need frequent monitoring and maintenance.
- Trash receptacles should not be provided. All trash should be carried out. Pack it in/pack it out.

26 Photo: Tara Thayer

3

Trail Design

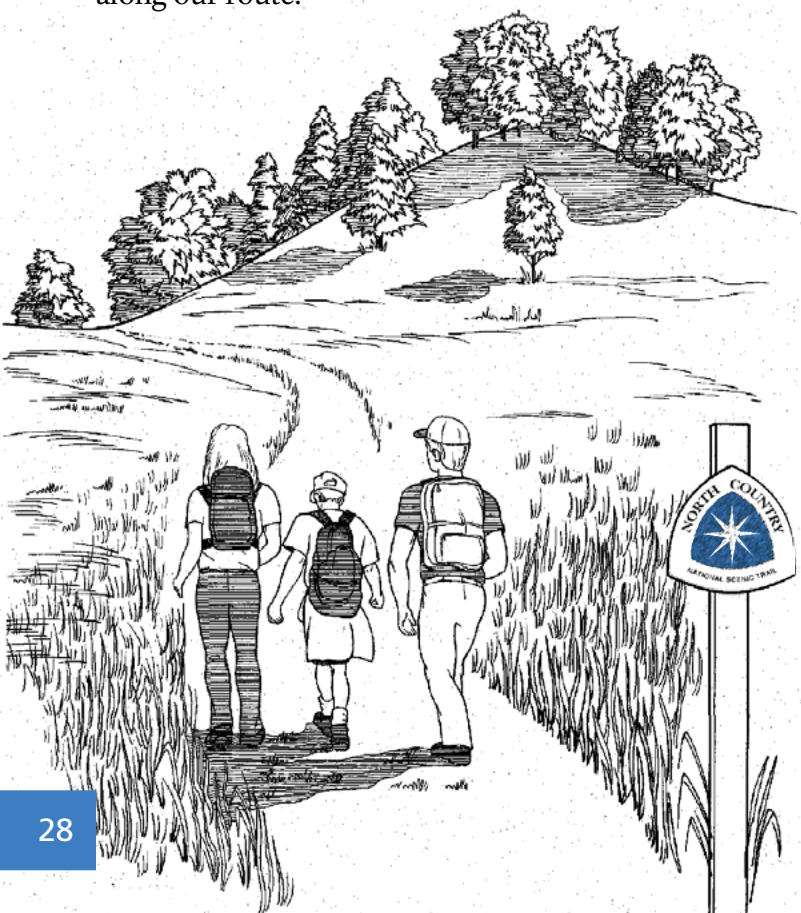
Objectives

Route planning is just one aspect of planning a trail. Once a general route is determined, the next step is not as simple as constructing a trail over the path of least resistance from point A to B.

There are important differences between route planning and trail design. Route planning, discussed in the previous section, is concerned with the initial practical considerations of the trail-- identifying the general corridor through which the trail will pass; learning about local laws, permits, and land ownership; and studying topographic maps to get a more specific idea of landscape features.

But before breaking ground on trail construction, trail planners must take into account another type of planning: trail design. Good trail design can be the difference between a memorable, spectacular trail and an unremarkable, forgettable one.

We each have an intuitive sense of good design. When we enter spaces, we might notice that they feel cozy and welcoming, or bright and airy, or even oppressive or gloomy. When we walk, bike, or drive anywhere, our route is often determined not only by the most direct road or path available to our final destination, but also by our mood and by the points of interest along our route.



The best trails give users the sense that they are being pulled along, that there is always something of interest just up ahead. Without this feeling, trail users can get bored. The idea isn't that moving through the trail is effortless, but that there's a constant sense of interest in the landscape so that the walk doesn't begin to feel monotonous between the bigger highlights of the trail.

While out scouting, a trail planner should keep an eye out for elements in the environment that add interest to the trail that aren't necessarily along this path of least resistance. For instance, they might notice an interesting rock feature that the trail could wind past, or a hill that would offer a moderately challenging climb before rewarding the trail user with a great view of the surrounding landscape at the summit.

Good trail design also takes into account environmental considerations. Although routing the trail past a beautiful natural feature may add interest, it might also inadvertently lead to destruction or damage to a sensitive area. Careful trail design allows users to enjoy these types of features while also protecting them from harm or degradation.

Local Law Compliance

Good route planning involves being aware of local laws and regulations. The NCNST is routed through seven states and numerous regions, counties, and individual communities, as well as publicly- and privately-owned lands. Trail construction must comply with any regulations implemented by those who own the land through which it passes. Many jurisdictions require permits to construct trails or to undertake projects in environmentally-sensitive areas. This permitting process can take a significant amount of time, and can cause significant delays if not applied for in a timely manner. The NPS does not have the capacity or the local knowledge to know what local rules might exist in any particular area along the trail corridor. Therefore, it is primarily the responsibility of the volunteers to be aware of local ordinances and make sure they are in compliance before pursuing a project on behalf of the North Country Trail.

Elements of the Trail Space

Though we can often sense when something is well-designed, what's hard is putting a name to those particular elements that make a space, path, or object compelling or interesting. The common factor shared between the following three elements of trail design is that they add visual interest and contribute to the sense of being swept along from one part of the trail to the next. Once we can identify them, we can use them to our advantage when designing a new trail segment.

Anchors

An anchor is something that trail users can see in the distance that stands out from the surrounding landscape-- a giant boulder, a flowering plant, a lone tree in the middle of a field, even a mountain peak far away. The anchor point draws the eye to it because it's noticeably different from the rest of the scenery. Just as the anchor on a ship holds the ship in place, the anchor element holds trail users' attention and draws them closer, contributing to the feeling of being pulled along the trail.

Edges

An edge is a continuous line or a transition zone between two visual elements. Many edges exist in nature: for example, a river and its opposite bank, a lakeshore and its surrounding forest, or the border of a meadow.

Though an edge adds visual interest, a trail shouldn't necessarily follow directly along it. Even the most spectacular natural feature can stop feeling so spectacular after looking at it for a long time from only one perspective. We're attracted to edges because we want to see what's on the other side. If a trail follows along one side of a river, eventually the trail user may begin to wonder when they get to cross the river, or see it from a higher or lower point. A well-designed trail crosses back and forth between these edge thresholds.

Gateways

Gateways are natural framing devices, such as cliffs, canyons, large trees, mountain passes or even bridges that give the visual effect of compressing an open space.

Gateways create a sense of anticipation as we approach them, a sense wonder as we pass through them, and a sense of satisfaction as we're rewarded with learning what's on the other side. Gateways are more rare than anchors and edges, but because of this they often feel more special to trail users and increase the quality of their experience on the trail.

Design Considerations

Use is light in many locations along the North Country Trail. This means that even a poorly designed segment of the trail may result in little impact on soils, water, sensitive plants, and animals in these areas. However, environmental impact is of more immediate concern in high-use areas. Heavy use can destroy the soil structure of the trail and lead to soil erosion, turn wet areas into muddy ones, trample plants, and cause serious environmental degradation. Especially as use of the trail grows over time, it must be designed to prevent or withstand these effects. The trail must cross the land without causing soil erosion, path widening, vegetative trampling, or otherwise spoiling the natural qualities of the area. Even if a trail segment is designed with these environmental safeguards in mind, it must then be properly constructed and maintained to ensure they are upheld.

Sustainability and durability are key considerations for all North Country NST efforts. To design and build trail correctly at the onset is a wise investment, much more economical than to repair or relocate the trail once damage occurs. In the early 1940s, the Civilian Conservation Corps (CCC) used quality construction techniques and materials to construct facilities on our public lands, and many of those facilities—picnic shelters, lodges, trails, stone work—are still in good condition and in frequent use to this day. Trail construction efforts should pattern the quality examples of CCC construction. For instance, it requires more initial effort and expertise to construct retaining walls along a trail using rocks instead of logs, but the result is a much more durable wall. Sidehill trail construction is more labor-intensive than the construction of a trail directly up the slope, but the former technique results in a trail that is less susceptible to erosion. These designs and construction techniques help ensure that the trail will remain accessible and structurally sound for years to come.

On federal lands, an Environmental Assessment (EA) or similar document which meets the intent of the National Environmental Policy Act (NEPA) is prepared prior to selecting the trail route or doing actual construction. NEPA compliance is also required on projects that use federal funds or when federal officials are doing the planning. The process involves specialists who understand environmental impacts and how to minimize them. State governments have similar compliance mandates, but these regulations and what is required may vary from state to state. In either situation, when an Environmental Assessment process is required, the study must be completed and a decision to implement the proposed project must be issued by the responsible agency official before any work may begin. Even after the study is complete, trail advocates should take steps to minimize potential environmental impacts.

The scope of this book does not provide a detailed description of all techniques used to protect natural, cultural, and historic resources, but the general guidelines listed below, although not all-inclusive, should be followed:

- Design considerations for trail layout fall into one of two major categories: user and environmental. Sometimes conflicts arise between the two, and trail planners must make tough decisions about prioritizing an element of the trail that may enhance user experience—for example, access to a particular natural feature or viewpoint, or a shortcut to avoid a steep climb—or that which preserves or protects the environment—such as routing the trail away from a sensitive habitat. In these cases, trail planners should prioritize a minimal environmental impact over user convenience or desire.
- When locating or relocating a trail, it is important to first establish or identify the key locations through which the trail must pass; for example, campgrounds or campsites, scenic overlooks, low-water crossings, historical sites, intersections with other trails, or water sources. These features should be marked on a topographic map or aerial photo to help planners determine the best way to connect them while taking into account factors such as slope and soils.
- Trail planners should consult with local experts and agency officials to determine if fragile soils, threatened or sensitive species, cultural and historical resources, or other elements exist within the trail corridor, and to determine if an EA is necessary and minimize the trail's passage through any areas of concern.

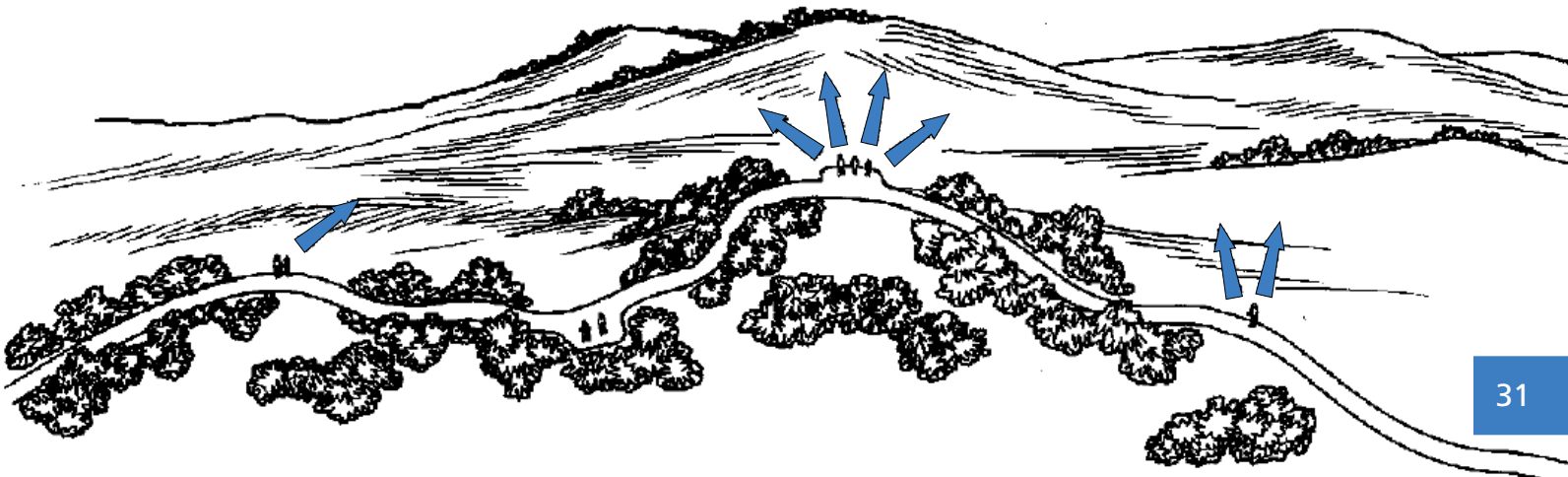
- When a project occurs on state or federal lands or when it involves federal money or personnel, it must comply with the requirements of the National Historic Preservation Act and the Archaeological Resources Protection Act to avoid damage or destruction of historic and archaeological artifacts. Project planners should usually consult with the State Historic Preservation Office (SHPO) for project approval.
- A cultural resource survey conducted by trained archaeologists is usually required prior to any earth-disturbing activity. However, in some states, trail planners reach an agreement with the SHPO to wait until the initial trail is established before doing the survey. This is because trail construction normally involves a minimum of earth disturbance, most construction is done by hand tools, and slight adjustments to the actual alignment are made during the actual construction (to avoid trees, boulders, etc.).
- Whenever more than minimal earth disturbance is being considered (e.g., when constructing a parking lot, digging footings for bridge abutments, etc.), an archaeological survey and SHPO approval is required prior to project initiation.
- The quality of trail construction plays a significant role regarding impact on the environment. When a trail is located and constructed so that it requires minimal maintenance, there is less present and future environmental impact. Considerations such as adherence to slope, proper drainage, etc. are important factors.
- Standards for the design and construction of the trail, trail structures, and support structures are intended to protect the environment as well as the user and should therefore be followed closely.

Terrain

A well-designed route should be in continuous transition: users should be able to experience the full array of terrain found along the trail corridor. The trail should lead the user along ridge tops and down through low, intimate valleys. There should be variation in the lengths of upland and lowland trail, which should be influenced by the natural landforms of the area. However, not every hilltop should be climbed, or valley traversed. For instance, when designing the route, planners should take care to avoid overly steep grades where erosion that leads to environmental damage is likely.

Open Space

Open spaces are an important aspect of the trail experience. Users can see the sky, feel the sun and feel the contrast to enclosed woodland spaces. Open spaces allow users to view the landforms and natural features from different perspectives—both from long distances and more intimate ones. Planners may route one section of the trail through the middle of a large open space, while another trail segment may trace the edge of a clearing. Overall, each section of the trail should represent the larger area through which it passes. In North Dakota, western Minnesota, and the agricultural portions of the other states, high percentages of the landscape surrounding the trail are or were historically open, so in these areas, sizable portions of the trail should pass through or next to open areas. In contrast, in southern Ohio, northern Michigan, and Wisconsin, the landscape is almost entirely forested, so the trail should be predominantly forested, though planners may seek incidental openings or fields to add interest and variety.



Wetlands

Wetlands are the transition between open water and dry, upland terrain. The North Country NST passes through wetlands in all seven states—extensively in the Great Lakes region. Defined as "areas with shallow standing water or seasonal to year-long saturated soils," they can be subdivided into a number of categories such as sedge meadow, shallow marsh, deep marsh, shrub swamp, wooded swamp, and bog. Wetlands are fragile sites and often contain an abundance of sensitive species such as orchids, pitcher plants, and other unusual plants and animals. Passing through wetlands presents obvious problems—soil stability, damage to sensitive species, and the possibility of changing the natural water levels—so for these reasons, wetlands are usually avoided. However, wetlands can provide variety and interest to the trail. When it is desirable or unavoidable to cross a wetland, do so at its narrowest point and incorporate an appropriate trail structure such as puncheon or boardwalk. Most states require permits for alterations to a wetland, including the construction or installation of trails, culverts, or bridges. Appropriate officials should be contacted prior to any activities within a wetland area.

Glacial Features

Glacial features are encountered along parts of the North Country NST. Glacial features add interest and variety to the trail and offer opportunities for interpretation, so the trail layout should encourage the user to experience glacial features from a variety of perspectives. For instance, a well-designed trail that passes a glacial feature might enable the user to traverse the entire length of one esker, then parallel another esker from a sufficient distance to allow for good viewing of the landform. However, planners should use caution to never compromise the integrity of outstanding glacial features such as kames, where soils are too fragile and the slopes are generally too steep to sustain a trail.

Soils

The amount of soil present can affect trail stability. Deterioration of the trail from erosion and saturation can be dramatically reduced by designing and constructing the trail on stable terrain. Areas of heavy, saturated soils or shallow soils should be avoided whenever possible, but when the trail must pass through these areas, a puncheon or boardwalk should be used.

The Natural Resource Conservation Science web soil survey is a user-friendly tool that explains the properties of different soils across landscapes and maps the varied regions where they exist.

https://websoilsurvey.sc.egov.usda.gov

Spur Trails

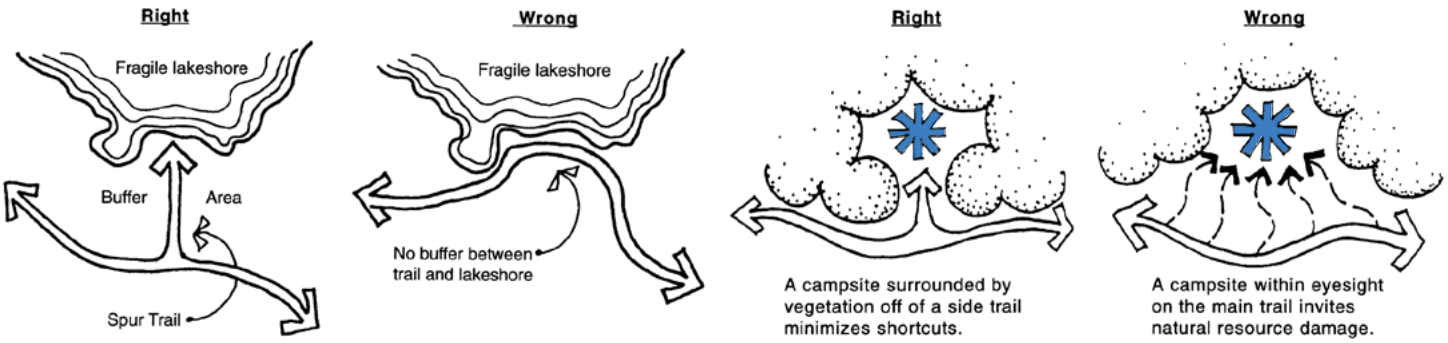
Spur trails provide access to facilities, features, or access points such as trailheads, viewpoints, campsites or shelters, and water that are located a short distance from the main trail. These short trails can enhance the recreation experience by providing access to interesting features that the main trail misses, or by preventing the overuse of sensitive sites.

In almost all cases, it is desirable to locate campsites and shelters on a spur trail and out of sight of the main trail. When a campsite or shelter is located within hearing or sight distance of the main trail, hikers tend to take shortcuts, which destroys vegetation and gradually widens the approach, eventually enlarging the campsite itself. To minimize shortcutting, planners should implement trail alignments and junction locations that make the established spur trail the easiest, shortest, and most logical route. An established campsite or shelter (especially in heavy use areas) should be at least 200 feet off the main trail unless rugged terrain or ownership patterns limit this distance. Less popular sites can be a shorter distance away depending on the circumstances.

Sometimes the best way to protect environments that contain fragile plants or unstable soils is to bypass the feature altogether. However, bypassing drinking water sources or areas of interest may instead inadvertently encourage hikers to establish their own impromptu trails to reach the sites anyway—often causing increased negative impacts to the area. The best compromise is often to provide limited access to the least sensitive part of the attraction via a spur trail. This reduces the impact by restricting the access to a single point and potentially reducing the number of users. Therefore, if an existing main trail is causing undue impact to a sensitive area, one solution is to relocate the trail away from the feature and instead provide access to the area via a spur trail.

To further reduce the number of users that follow the spur trail, the main trail might be rerouted so that it provides satisfying views of the feature from a distance. Spur trails are not always recommended; sometimes it is better to reroute the main trail past different features that can withstand more impact. As well, feature overuse can be reduced by educating users about the sensitive nature of different environments.

The goal is to find a balance between environmental protection and trail user experience, but if resources begin to show evidence of adverse effects from use, that balance needs to tip in favor of protecting the environment.



Slope Locations

Another key factor in determining the stability of a trail is slope location. The best way to prevent erosion in hilly terrain is to construct the trail on sidehill locations and maintain moderate grades. Even on moderate slopes, the trail should never go straight up the slope of the hill. Winding the trail across the face of the hill, gradually gaining altitude by using sidehill trail construction and broad, sweeping switchbacks, provides for a more stable trail because surface water does not run down the trail. Instead, it crosses the trail and disperses on the downhillside. Sidehill construction makes it easier to maintain moderate grades, further reducing erosion.

Sidehill construction requires more skill and initial work. However, in the long run, it provides the most stable trail, less environmental damage, and less maintenance. When employing sidehill trail construction, it is important to do the job properly. Poorly constructed sidehill trail can cause difficult hiking and sore ankles if the hiker has to walk with one leg higher than the other. The trail tread must be excavated so that it is nearly level with only a slight outward pitch to allow water to cross the trail and continue downhill. This requires builders to construct a full-benched trail tread meaning the entire tread is on a solid excavated area.

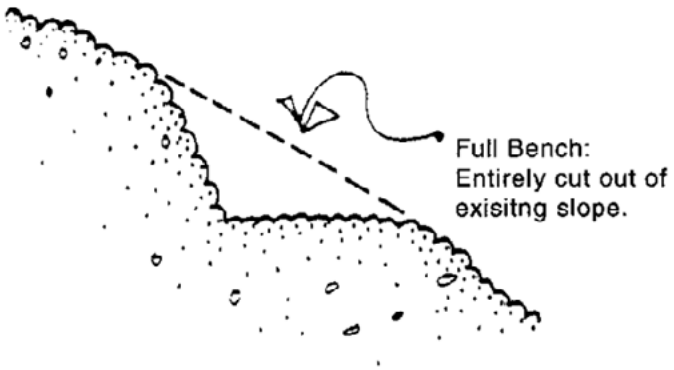
Whenever possible, a full-bench tread should be constructed because it is more stable. Half-bench construction is no longer considered sustainable.

The excavated soil is allowed to "waste" below the trail and does not become part of the trail tread. Other labor-intensive techniques, such as rock or log cribbing, may be required in steeper areas.

Maintaining a moderate grade when laying out a trail through hilly terrain can be challenging. Taking the time to locate and flag the proposed route is a time consuming but important first step. Topographic maps should be used to locate key points that the trail must pass. These points could include vistas, campsites, stream crossings, etc. Once key points are identified, a line should be flagged to connect them, while attempting to stay within the slope guidelines. This flag line may have to be moved several times before the best route is located. This step should not be abandoned in discouragement. It can save future maintenance headaches.

Many existing trails were laid out without considering slope guidelines. As sections of these trails become problem areas, it may be easier to relocate sections rather than repair the poor location.

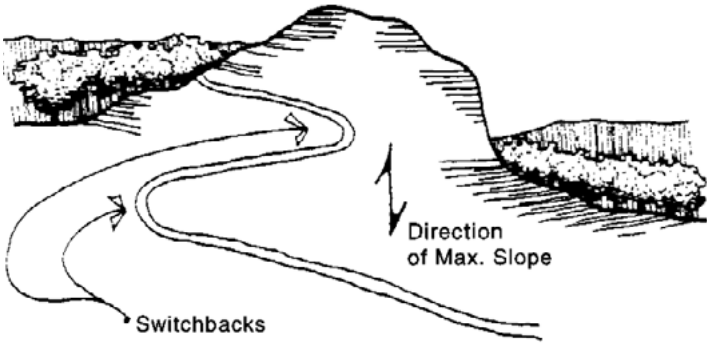
Typical Sidehill Construction



Switchbacks

Switchbacks are one method that can be used to maintain the grade of the trail while gaining the required elevation—especially when there is limited working area. Switchbacks should generally be minimized in number and frequency because they are difficult to construct and maintain, lengthen the trail, are boring to walk, are difficult to drain, and are often shortcut by hikers—thus increasing erosion problems. A trail with switchback layout is enhanced by increasing the length of trail between switchbacks into grand sweeps and by varying the length and placement of adjacent switchback legs.

The manner in which switchbacks are placed on the land is critical to creating a maintenance-free section. They must provide the easiest, most attractive route for ascending and descending so that hikers do not shortcut them. Turns should be flat. This requires careful location or additional construction of cut and fill sections or retaining walls. On sideslopes of less than 20 percent, the switchback should be treated as any other section of the trail by following a long, radius curve. If the centerline grade is steeper than desired, the radius should be shortened and a conventional 8-foot radius switchback should be built, with the upper and lower legs meeting at the radius point. Excavation should start along the upper slope line of the upper leg and be carried down to grade at the radius point before starting the lower leg. To provide proper drainage, the upper leg should be cut well beyond the radius point, then shaped and the turn area completed. Whenever possible, the frequency and visibility of turns should be limited to avoid shortcutting. The layout should vary.
Switchback legs should be situated so that they are not visible from each other. Turns should be looped around large boulders or fallen trees, or where vegetation obstructs the view of an adjoining leg. If this is not possible, rock or log barriers should be placed between the upper and lower legs of the switchback. To prevent cross-cutting inside the switchback, 15 to 30 feet of barrier should be installed (placed back from the turning point).



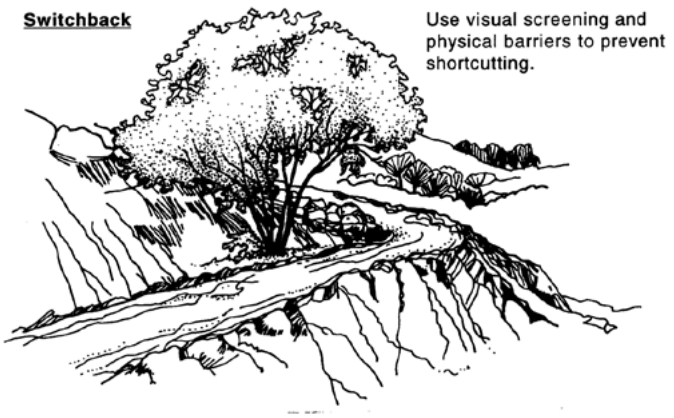


 Photo: Andrew Flynn

4

Trail Construction

Objectives

The objective of trail construction standards is to ensure:

- A consistent look without compromising local character
- A high standard of quality without over-building
- A basic level of safety without removing all risk
- Accessible portions without compromising the character of the trail
- Environmental and resource protection
- Long-term trail sustainability

Trail construction standards were developed to meet these objectives without compromising the character of the trail or imposing undue hardship upon those who maintain the trail. For instance, whenever it is possible to retain the foot-trail-through-the-woods character, but still allow a very determined, mobility-impaired individual to get through simply by increasing trail width by an inch or two, it should be done. There are case-by-case exceptions, but every effort should be made to conform to the trail standards when building or rebuilding trail.

The North Country NST passes through a variety of recreation settings (ROS). Therefore, the trail should not and will not look exactly the same from end to end. It is not appropriate to build the trail to urban standards in a semi-primitive setting, or vice versa. For this reason all standards are based on the ROS setting. Consistency is achieved through standardized signing, blaze color, and the way that a segment of trail occurring in a particular ROS setting will look similar to a segment in another area with the same ROS setting.

The Trail Construction Standards chart on the following page summarizes the desired trail design standards. If a trail segment is significantly below these standards, it should be gradually improved. If no attempt is made to rectify the situation, it may be de-certified or closed. Whenever a portion is being reconstructed or receiving heavy maintenance, attempts should be made to bring it up to standard. Although these guidelines do not prevent a particular trail segment from exceeding desired standards, it should not be assumed that doing so is always desirable, as routinely exceeding the standards may adversely impact the hiker experience by changing the character of the trail, can have negative effects on the environment, or may require maintenance and upkeep by partner organizations that is unsustainable over time. However, exceeding trail standards in selected locations may be appropriate, such as the trail segment in the Little Miami Scenic Trail (OH)—a converted rail-trail that accommodates multiple use and is designed as fully accessible.

Trail Construction Standards

ROS Class Standard (Desired)	Urban	Rural and Roaded Natural	Semi-primitive	Primitive
Tread Width				
Hiking Segments	48”	24”	18”	*
Accessible Segments	60”	36”	28”	
Clearing Width (each side of tread)	24”	12” (WIDNR-24”)	12”	*
Clearing Height (min.)	10’	8’ (WIDNR-10’)	8’	*
Max Sustained Slope				
Hiking Segments	10%	10%	15%	*
Accessible Segments	5%	8%	12%	
Slope (max)				
Hiking Segments	15% for 100’	20% for 100’	30% for 100’	*
Accessible Segments	8% for 30’	10% for 50’	10% for 50’	
Cross Slope (Max)	3%	5%	8%	*
Accessible Standards				
Passing Spot Interval	N/A	600’	1200’	N/A
Rest Area Interval	1200’	1200’	1/2 miles	N/A
Surfaces	Asphalt Concrete Stabilized aggregate Screening Wood Ship Sod	Native Stabilized-aggregate Screening	Native	Native Native
Accessible Surfaces	Asphalt Concrete Stabilized Aggregate	Asphalt Stabilized-aggregate	Native Stabilized-aggregate	

* (WIDNR) Standards on Wisconsin DNR managed land

Trail Construction Definitions

Tread Width

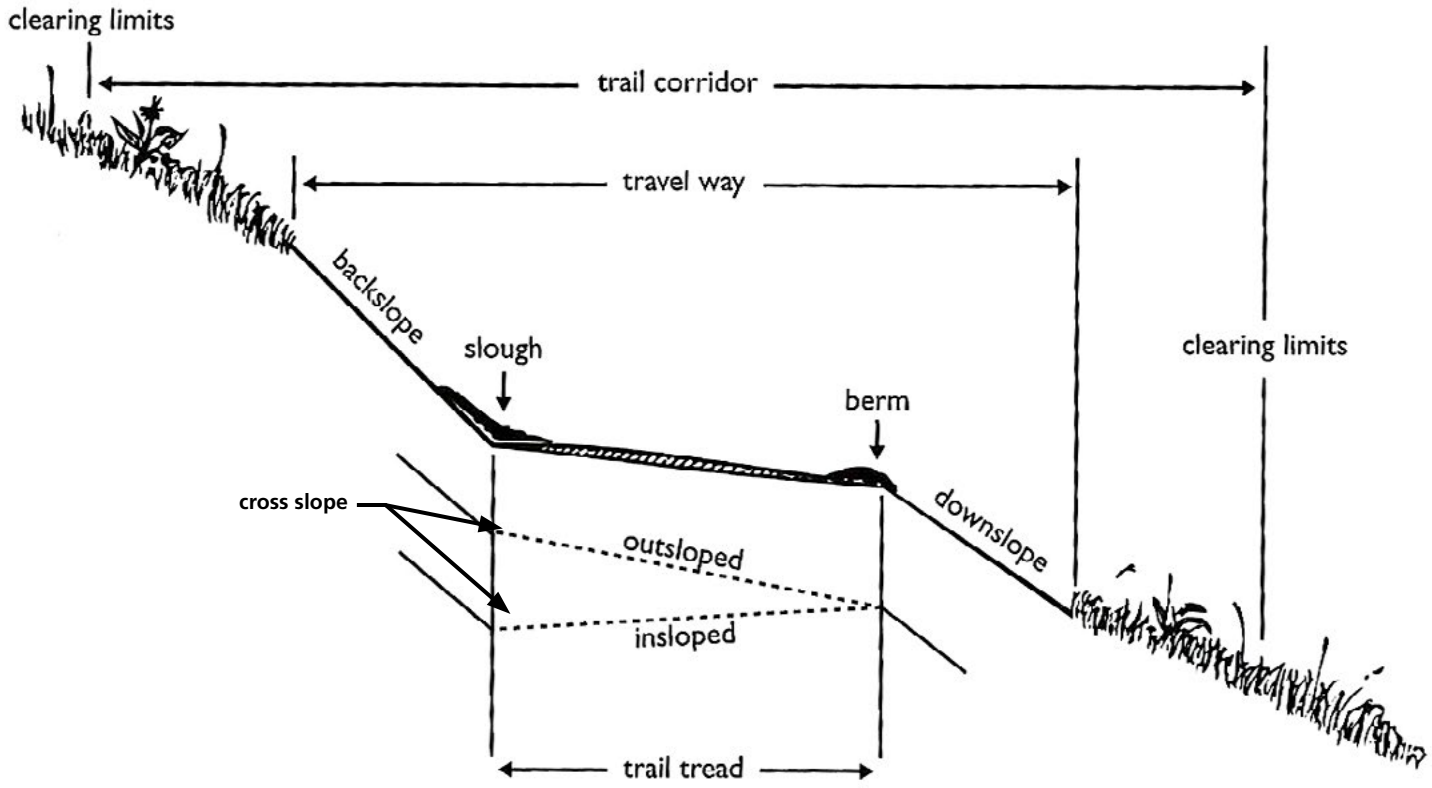
Tread width refers to the actual walking surface of the trail—whether native soil, grass, or surfaced. Initial tread should be constructed or smoothed to this standard. In less-used areas the bare tread may gradually transform into a tread that needs to be mowed. This is acceptable as long as the basic underlying, smooth structure is still in place.

Clearing Width

Clearing width refers to the area that should be kept free of brush, limbs, briars, tall grass, weeds, and other obstructions which would slap against the hiker or their pack, or soak them following a rain or heavy dew. In heavily wooded areas, the clearing width is normally maintained simply by pruning limbs, as the area between the edge of the tread and the edge of the clearing is normally leaf litter or short herbaceous plants. While four feet is the average standard width, some variation is allowed and encouraged—it is visually appealing and often more sensitive to adjoining natural resources. In wooded areas, occasionally it is desirable to narrow the clearing width in order to route the trail between two large, visually interesting trees. Generally, the trail winds between existing medium to large size trees, and is created by cutting only smaller trees and saplings. Narrowing the clearing width below the desired standard is done only for reasons of aesthetics—not merely to reduce trail construction/maintenance efforts. When the trail is crossing fields or prairies, it is suggested that as a minimum, the entire desired clearing width should be mowed. It may be desirable to widen the mowing to create a variety of gentle undulations, which may highlight a particularly bright clump of wild flowers or a well-developed flowering shrub such as a hawthorn or dogwood.

In selected wooded areas (especially near roads) a common practice is to reduce the clearing width for a short distance (25 to 100 feet) to discourage unauthorized use by ATVs, horses, etc. However, a reduction in clearing width may compromise accessibility.

The figure below shows the clearing widths on either side of the trail tread. On a hiking segment in a rural area, the total clearing width would be the 24-inch tread plus 12 inches on each side for a total of 48 inches (the commonly accepted 4-foot clearing window).



Clearing Height

Clearing height refers to the area directly above the trail that should be cleared of overhead obstructions. The trail should be cleared to a height of 8 feet (10 feet within Wisconsin DNR properties), as at this height, branches that could snag on a tall hiker's extended pack or attachments, such as a fishing rod, are removed, as well as branches that could restrict the trail when weighted with rain or snow. If the trail is in an area of deep snow and it receives winter use, clearing height may need to be higher. Whatever the reason for a higher clearing height, an overhead canopy of branches should remain to slow the growth of grasses and shrubs that thrive in sunlight.

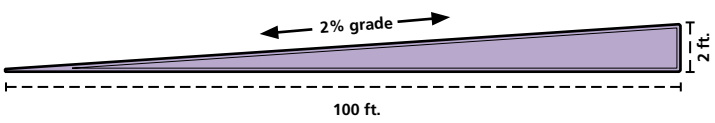
Slope (Sustained)

The slope (grade) of the trail refers to the change in elevation of the trail over its length, and may be the key factor contributing to tread stability. Trail grades must be moderate to promote a stable, maintainable tread and a more pleasant hike. The trail should be designed to traverse a hilly area with gentle changes in grade. Grade and slope are interchangeable terms.

To avoid erosion, the slope should normally be less than 10%—even in steep terrain. Grades less than 7% in all soils are ideal, but in sandy soils are almost a necessity to prevent erosion. In flatter areas, trail should be located so that there is some grade to provide for proper drainage. A grade should undulate gently to provide natural drainage and to eliminate monotonous level stretches and long, steep grades that are tiring to trail users.

Slope can be calculated in degrees, but is normally calculated in percent by dividing the vertical distance by the horizontal distance and multiplying by 100 (10 feet of rise/100 feet of horizontal distance X 100 = 10%). An easier, more accurate way to determine slope is through the use of a tool, about the size of a compass, called a clinometer. By sighting through the clinometer, the percent of slope can be read.

Percent of grade = $\frac{\text{rise}}{\text{run}}$



Slope (Maximum)

While reasonable efforts should be made to construct the trail using the sustained slope guidelines, there are occasions where doing so is impossible. Because of terrain obstructions, such as cliffs, it may be necessary to use a short, steep segment to regain access to more moderate slopes. In these instances, the maximum slope guidelines should be used and additional erosion control measures incorporated. Sections of trail exceeding the sustained grade standards should normally be less than 100 feet.

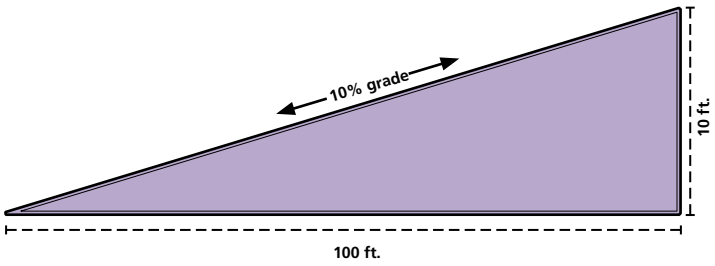
In some areas, it may be necessary to go up a very steep slope for a short distance. In these areas, steps may be necessary but should be considered as a last resort due to the barrier they impose on many people.

Cross Slope (outslope/inslope)

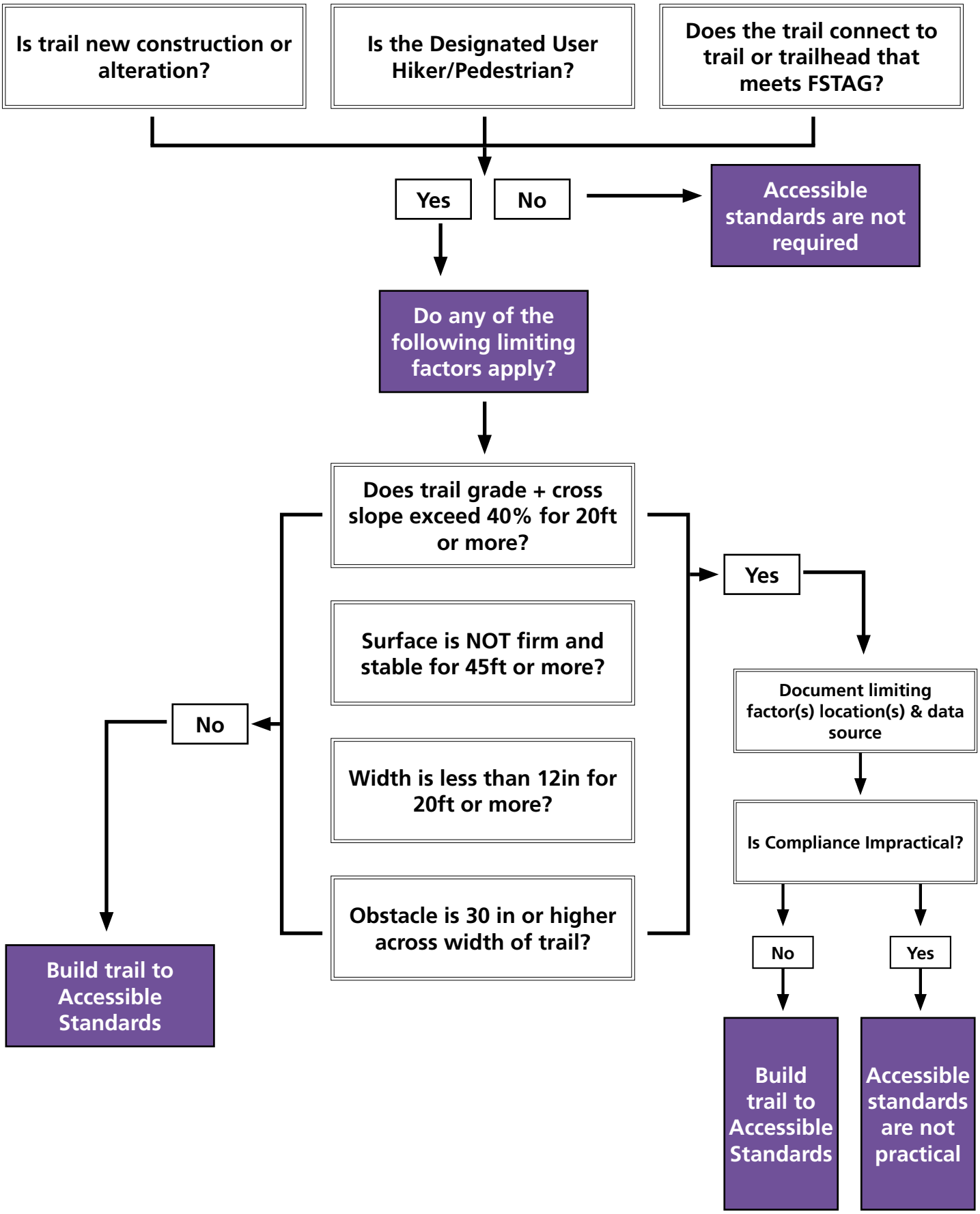
Cross slope refers to the slope across the width of the trail - for instance, the difference in heights between a hiker's left and right feet. Cross slope is a consideration when constructing trail across the face of a hill (sidehill trail). Some degree of cross slope, or out slope, is desirable so that water moving down the face of the hill continues across the trail. A cupped trail or a trail that slopes back into the hill collects water and is undesirable. However, the cross slope should not exceed the percentages shown in the standards chart. Cross slopes greater than those shown make walking on the trail uncomfortable and serve as an impediment to mobility-impaired individuals. A 5% cross slope on a 24-inch tread amounts to a drop of 1.2 inches.

Trail Surface

In most cases, the native material found during trail construction will be satisfactory for surfacing the trail. However, if the material consists of large amounts of topsoil or organic matter, it should be set aside for later use as a cover and planting surface for exposed sub-soil.



Determining Accessibility



Accessibility Standards

When a trail segment is designed to be fully accessible, it must meet certain width standards. The Trail Construction Standards Chart specifies the maximum distance between passing and rest areas: each passing space should be 60" x 60". At specified intervals, rest areas are built adjacent to passing areas and may include a bench or other facilities.

Trail surfaces can also affect accessibility. The Trail Construction Standards Chart shows a range of surfaces that are acceptable for use in the various ROS settings. While several options are shown for rural/ roaded natural areas, the strong preference is for native surfacing. The Accessible Surface Standards apply only when a trail segment is designed to be fully accessible.

A few specifics:

- The minimum clear tread width for an accessible trail is 36 inches.
- Trail facilities or support structures must be accessible, regardless of whether or not the trail leading to those facilities is accessible.
- Maintenance is not subject to FSTAG (It's not changing the nature or intent of the trail).
- Routine maintenance of an accessible trail does not need to occur more frequently simply because it was constructed in compliance with FSTAG.

For more information, consult with the Forest Service Trail Accessibility Guide.

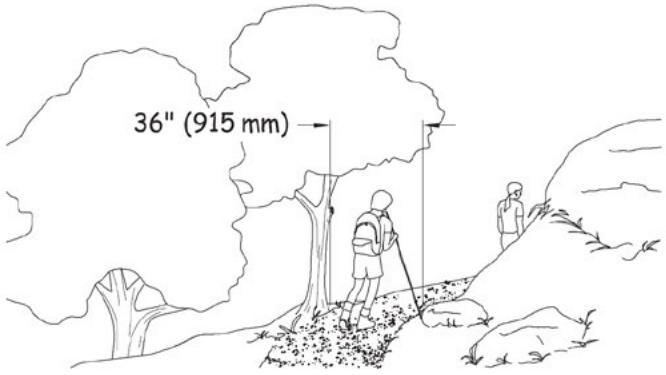


Figure 1- Clearing width requirements.

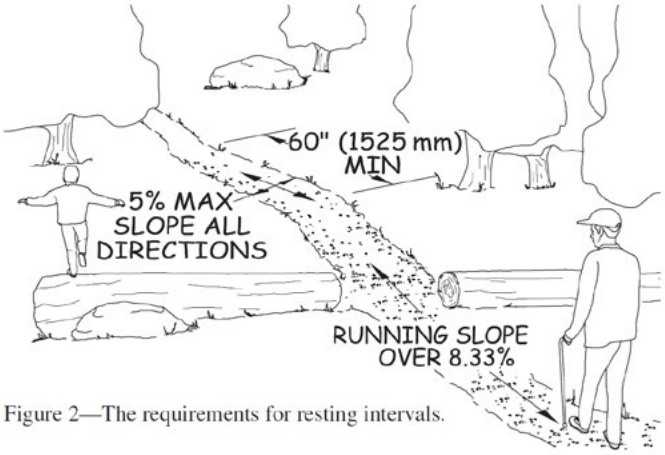


Figure 2—The requirements for resting intervals.

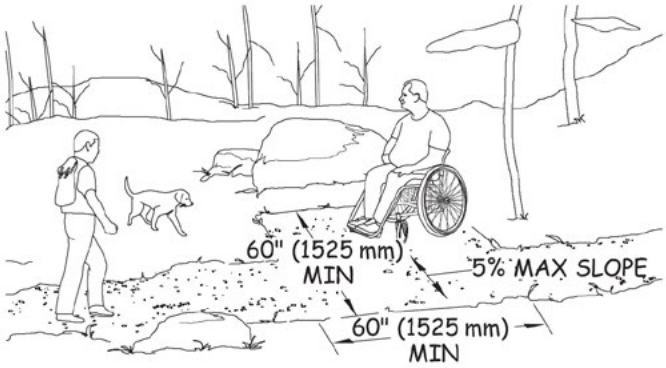


Figure 4—The requirements for passing spaces beside the trail.

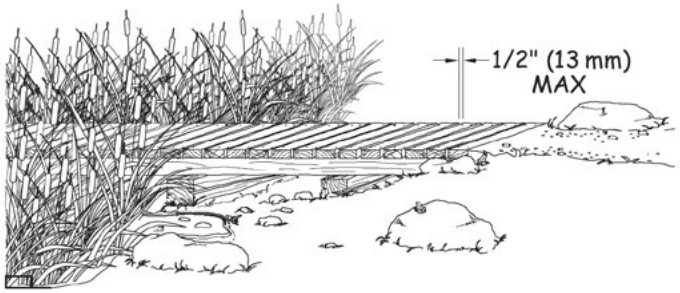


Figure 5—The requirements for openings that are perpendicular to the direction of travel on trail surfaces.

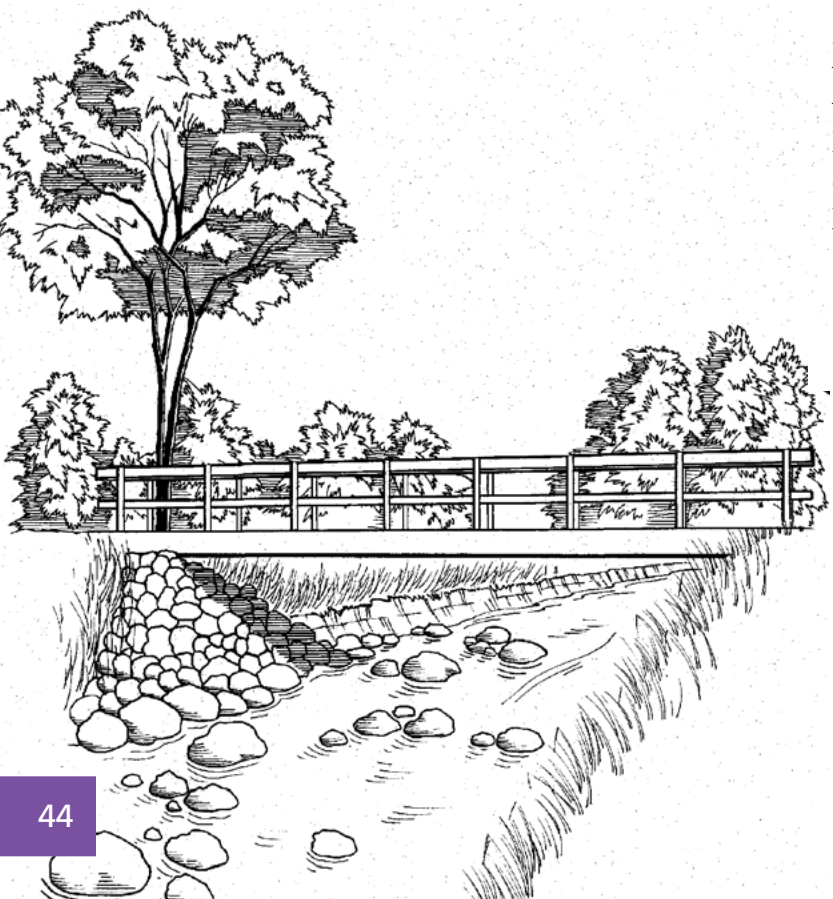
Trail Structures

The trail structures that are discussed in this chapter refer to those structures which are necessary to ensure safe trail passage, the protection of sensitive areas, and overall trail stability. Trail structures are normally built in response to user safety and environmental protection issues—not user convenience issues. In this context, almost all structures referred to here—such as bridges, puncheon, boardwalks, steps, and stiles—are those that assist trail users in passing through or across wet areas or open water or across topographical or human-caused barriers. Standards for trail structures are summarized on the following page.

While trail structures are often necessary, they may also require a major commitment of initial and subsequent costs, time, and maintenance. Therefore, it is recommended that trail planners consider alternatives to trail structures when appropriate. The simplest technique to correct a problem should be attempted first to see if it resolves the issue; if not, a structure can always be incorporated at a later date. For instance, if an existing mudhole is causing problems on the trail, the most straightforward and cost-effective solution may be to dig a small drainage ditch. If the mudhole firms up after a year or two, the solution was easy, quick, and inexpensive. If the drainage ditch doesn't resolve the issue, another alternative to building a structure may be to re-route the trail; even this seemingly major action is sometimes the best long-term solution. If neither of these solutions are viable, however, consider a trail structure. Perhaps a few well-placed, flat stepping stones or a small section of puncheon or turnpike will do the trick.

Trail structures should be built of quality, long-lasting material and designed to harmonize with the surrounding environment. Minor structures such as puncheon, turnpike, retaining walls, culverts, and small bridges can be built of suitable native material, if it is available. The most durable material should be used. Rock—as used by the CCC—makes a longer lasting retaining wall, bridge sill, or water bar than does wood. Certain species of wood are more durable than others. When native materials are used, the source site should be left in as natural a state as possible.

Whenever possible, the trail route should be located to avoid areas with seasonal or year-long water problems. Trail construction in these areas is both difficult and expensive. In addition, permits are usually required for crossing officially defined wetlands or navigable streams. Where wet areas are unavoidable, structural improvements should be used to provide a dry, stable treadway. When planning or constructing trail in wet areas, keep in mind the "dry boot" philosophy, except within ROS primitive areas and during inclement weather or heavy dew. Hikers should not normally have to wade through streams or saturated wetland areas—this is not only unpleasant and dangerous, but potentially damaging to the environment.



Trail Structures Design Standards

ROS Class Standard (Desired)	Urban	Rural and Roaded Natural	Semi-primitive	Primitive
Bridges				
Hiking Segments	60”	36”	28”	*
Accessible Segments	72”	48”	36”	
Bridge Railings				
Hiking Segments	Y	Formula (1)	Formula (1)	Formula (1)
Accessible Segments	Y	Formula (1)	Formula (1)	N/A
Bridge Rail Height	42”	42”	42”	42”
Bridge Engineering Design	Y	If length > 25 ft. or height > 5 ft.	If length > 25 ft. or height > 5 ft.	If length > 25 ft. or height >5 ft.
Clearance above Navigable Waters	5 ft.	5 ft.	5 ft.	5 ft.
Bridge Kickplate Required (3)				*
Hiking Segment	Y	Y	Y	
Accessible Segment	Y	Y	Y	
Puncheon (4)				*
Hiking Segment	60”	36”	28”	
Accessible Segment	72”	48”	36”	
Boardwalk (5)				*
Hiking Segment	60”	36”	28”	
Accessible Segment	72”	48”	36”	
Culverts (7)	Consult	Consult	Consult	Consult

(1) Railings are required if: (½ length X height^2)/width = 40

(2) Navigability as defined by the individual state. Clearance requirement may vary.

(3) Kickplates are often included for safety when handrails are not required.

(4) Puncheon rests on sills and is generally less than 1' high.

(5) Boardwalk is generally less than 2' above water level and should have kickplates.

(6) Generally not acceptable—but can be used as a temporary measure in areas not defined as wetlands.

(7) Water crossing permits often required for culverts. Length must be calculated to provide for 2:1 fill slope beyond the normal trail clearing. Size (engineering consultation) to accommodate peak flows.

* In Primitive ROS (wilderness), structures are provided only for visitor safety or resource protection—not for visitor convenience or comfort.

Boardwalks

Boardwalks are used to cross areas that have deeper water than can be crossed by puncheon. Typical locations are where the trail has to cross a cattail area, deep marsh, or other water body that has little fluctuation in its level and flow. The distinction between a boardwalk and puncheon is that the surface of a boardwalk is constructed of boards that are perpendicular to the direction of the trail, and the entire structure is supported by posts driven or anchored into the bottom of the wetland, similar to a dock. Boardwalks do not rest on sill logs. Another distinction is that puncheon is normally less than a foot above the surrounding wetland, while a boardwalk can be 2 to 3 feet above the water—like an elongated dock. Wetland crossing permits will almost surely be required to build a boardwalk.

Boardwalks are normally made of treated material. If they cross areas of fluctuating water levels, the support posts need to be driven deep into the substrate or anchored in concrete to prevent the boardwalk from lifting or warping. Since boardwalks are a major, long-term investment, and they often cross moderately deep water, the standards specified are designed as an accommodation to safety and provide for wheelchair passage. A kickplate is required to reduce the chance of falling into the water when the boardwalk is slippery due to rain, frost, or ice. The kickplate also makes the boardwalk safer for wheelchairs. The width should be a minimum of 28 inches between the kickplates. Depending on the situation and the desires of the local manager, handrails are optional.

Causeway

When enough rock, gravel, or earthen fill is available, the trail tread can be elevated through poorly drained areas by using a causeway or turnpike. This permanently hardens the tread and is a useful technique when soils are poorly drained but do not have standing water as found in a wetland. A typical causeway is built by first defining the width of the trail tread with parallel rows of rocks or logs. The defining rows also serve to retain the fill. When in place, the filling process should begin with medium- sized stones that will allow water to pass under the causeway. A fill of small stones, gravel, soil, or a mixture of materials should be continued to create the elevated causeway and ensure a smooth walking surface. The surface should be rounded 2 inches above the elevation of the defining logs or rocks to provide better drainage and to allow for settling.

A ditch can be dug parallel to and on both sides of the causeway to improve drainage. This variation is often called a turnpike. The material excavated from the ditches can be used to help fill the causeway.

Bridges

Bridges are structures for crossing permanent and seasonal streams, dry ravines or gorges, and other obstacles in a safe, environmentally sensitive manner. The use of bridges to cross streams and ravines is strongly encouraged.

Keep in mind that constructing and maintaining a bridge is a major, long-term investment. Bridges are expensive to build, require regular inspections, and need frequent maintenance. All stream crossings should be reviewed to determine whether or not they are really necessary. Perhaps the trail was originally laid out to cross a stream several times because it simplified construction. Evaluating the route may show that the number of crossings can be reduced. The possibilities should be studied carefully. Relocation may often be safer and less expensive than building a bridge.

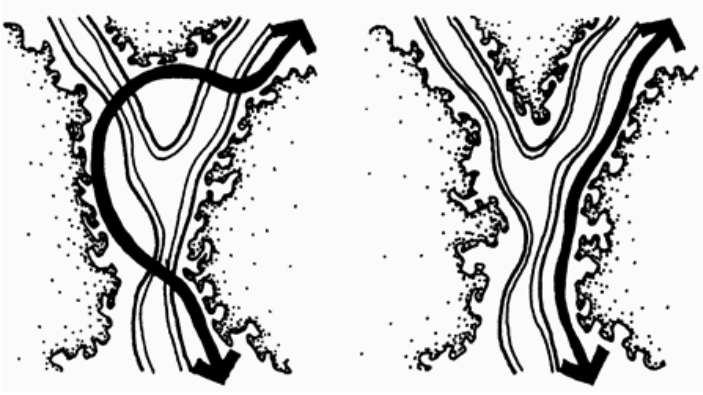
Each state and federal agency has its own laws, policies, and regulations regarding bridge specifications and placement. It is necessary to work closely with local officials to ensure that all specifications are met and all the required permits obtained. Plenty of lead time is critical as this can be a lengthy process, depending on the stream being crossed and the complexity of the bridge.

Safety of the user is a primary reason for building any bridge and a consideration in the design of the bridge itself. Not only can it be unsafe to ford a stream (see section on fords), but descending steep, often slippery stream or ravine embankments can also be dangerous because of slipping and falling hazards. The steeply descending trail is a source of erosion that can degrade stream quality. For these reasons, a bridge is often appropriate when crossing even small streams or dry ravines.

Bridge locations should be carefully evaluated. The clearance of the bridge must provide for passage of high water, ice, and debris. Only bridges built with an adequate opening to accommodate such flood waters will survive. Generally, the highest reasonable height above the stream should be sought. A location that is narrow and has a high bank or ledge to anchor the ends of the bridge is best. Such a site can eliminate the need to construct cribs.

The volume of flood water and the bridge height needed can be estimated from careful observation and research. However, observation will probably only yield information on recent high water levels, not historical peak flows. Determining peak flows is a complicated process which considers specific elements such as the size of the watershed and historic precipitation—it is best done by someone trained in this area. In addition to safety considerations, this is one reason why the Structure Design Standards call for engineering design on all bridges that are greater than 25 feet in length or higher than five feet. Assistance should be sought from agency partners, the Natural Resources Conservation Service (formerly the Soil Conservation Service), private engineering consultants, or other qualified personnel.

Whenever possible, the entire wet area should be spanned, or ramps used to get onto an elevated bridge. This eliminates the need for steps which are an accessibility barrier. As seen in the section on steps and perrons (later in this chapter) it is recommended that steps be minimized.



Carefully evaluate the trail's route before building a bridge. Often a better location can be found that does not require bridge construction.

Type of Bridges

There are many different bridge designs that ensure adequate public safety at water crossings while maintaining the appropriate ROS setting of the trail. All bridges should incorporate high quality materials and workmanship. There are three major categories of bridge designs:

1. Puncheon type
2. Single span stringer bridges
3. Multi-span bridges, suspension bridges, and other more complicated designs.

The height and span of the bridge, plus the applicable ROS setting, determines what kind of bridge structure to build and what materials to use. When the span is less than 10 feet and the bridge is not subject to flooding, a simple puncheon type bridge may suffice.

Crossings over 10 feet wide can often be crossed with a single-span bridge. These normally require the construction of cribs or fills on each bank, two to three solid timber or laminated support beams, a board deck, etc. Depending on the circumstances and dangers, a railing may be required.

In areas where the span becomes too long for a single span bridge, the design becomes more complicated. Multi-span bridges with a support structure(s) in the middle of the stream, or a suspension bridge, may be necessary.

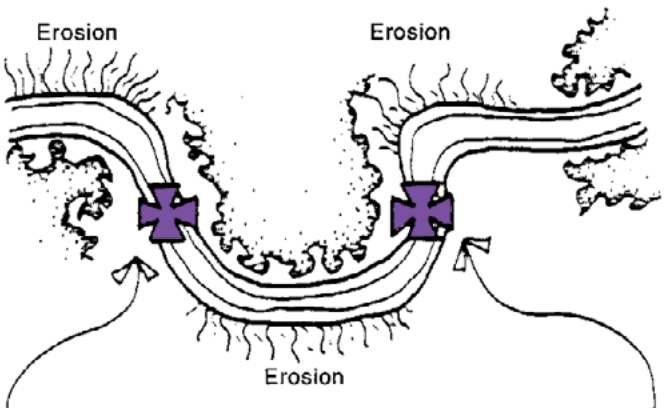
Bridge width - Because bridges provide passage over a trail barrier, and because they are long-term investments requiring substantial commitment of funds, they should not become a barrier in and of themselves. If a mobility- impaired individual has successfully negotiated a segment of trail, the bridge should not be the bottleneck that is impossible to cross because of its width. Therefore, the minimum clearance width should be selected to minimally accommodate accessibility, even on trail segments that are not specifically designed to be barrier-free or fully accessible.

Bridge railings - A railing is often necessary for visitor safety and to increase the comfort level of users. Considerations such as depth or swiftness of water, height above the ground or water, length and width of the bridge, desired experience level, and other factors help determine when railings are necessary, and whether one or two railings are installed. Weather related factors such as ice, snow, frost, rain, and the increased chance of slipping and falling from the bridge need to be considered. Besides the element of danger, another consideration is that there are some trail users who are simply frightened of walking across what they consider to be a narrow structure. Some agencies will insist that railings be placed on every bridge because of their concern for liability. These and other factors argue for railings.

In some situations railings may actually increase the risk of someone falling. This train of thought follows that if a railing is present, a user will linger longer on the bridge rather than hurrying across to solid ground, thus increasing their exposure to the hazard. Another consideration is that railings are often considered to be the weak point of a bridge. Depending on the method used to fasten the railings to the bridge deck, trapped moisture can lead to decay of the railing support or the main beam of the bridge. If this goes undetected, it could lead to a railing giving way if someone leaned on it. In situations where there is little danger, the inclusion of railings can change the character of the trail and the user experience—it is not desirable to over-build.

Bridge rail height - When railings are necessary, 42 inches is the standard height adopted by a number of state and federal agencies. It is a common height that provides for a fair degree of visitor safety and therefore is the accepted standard for the North Country NST.

Bridge engineering design - Bridges must be



The best bridge sites are midway between turns.

Dual Railing

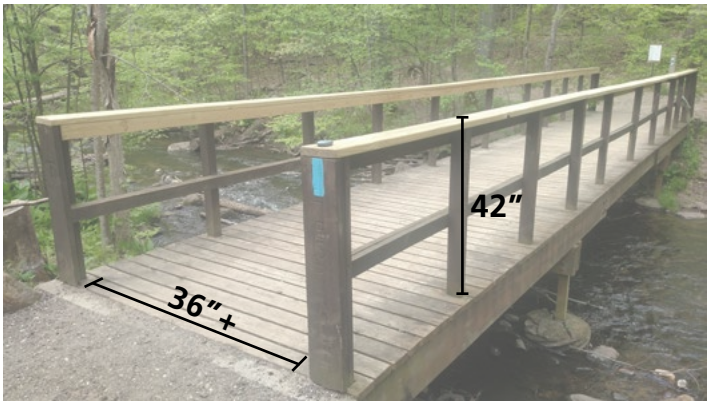
Suspension Bridge

A-Frame or A-Truss Bridge

designed to provide for visitor safety, withstand snow loads, accommodate flood waters, etc. A bridge is a major investment and it is common sense to seek engineering consultation for certain bridges—those greater than 25 feet in length or greater than 5 feet in height. The National Park Service, the Forest Service, and other agencies generally require that an engineer either develop or review all bridge plans. While it is specified that engineering design or review is required only on certain bridges, agency partners should be consulted because they may have more stringent standards.

Bridge over navigable waterway

Bridge clearance above navigable waters - Navigability is defined by the individual state, and they may base their determination on a historical use of the stream—can a log be floated down the stream? Generally, if a canoe can be floated down the stream during spring flows, it is considered to be navigable. The individual states may require the issuance of a permit before spanning a navigable stream; the permit will specify the clearance heights. Generally, this is 5 feet above the water surface, but it is recommended that this be confirmed with state agencies during the permitting process.



Accessible Bridge

Rolling Grade Dips (Drain Dips)

Grade dips are created when a short section of the trail is built with a grade slightly opposite to the prevailing grade. These are one of the most effective drainage techniques in trail construction, blend aesthetically into the landscape, and are almost maintenance free. They are cost-effective in controlling erosion and reduce the monotony of long, sustained grades.

Dips are most effective when built as part of the original trail construction, but can be used when relocating short problem areas if the terrain allows. On an ascending trail segment the trail should level every 50 to 100 feet followed by about 15 feet of slightly descending trail before continuing upward. This almost imperceptible descent creates a dip (low point) and forces water coming down the trail to drain off—less than a foot of elevation is lost for the hiker. The dip itself requires no construction other than careful building of the sidehill trail to establish the dip's alignment.

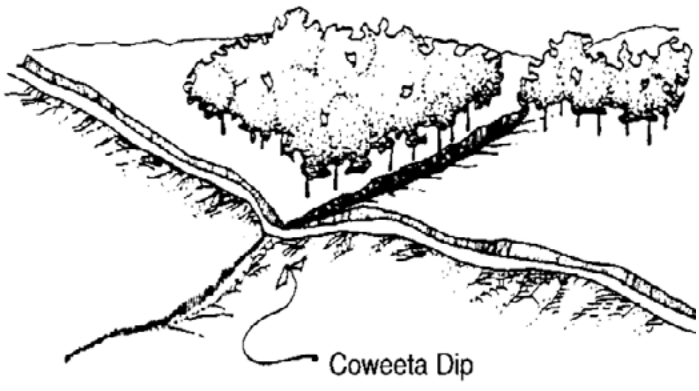
Since a place is needed to discharge the water, grade dips usually are best suited on sidehill trails. Grade dips take advantage of the natural roll and drainage of the landscape. They should be positioned naturally into the terrain for maximum function without being obvious. Spacing should be varied to make the trail more interesting.

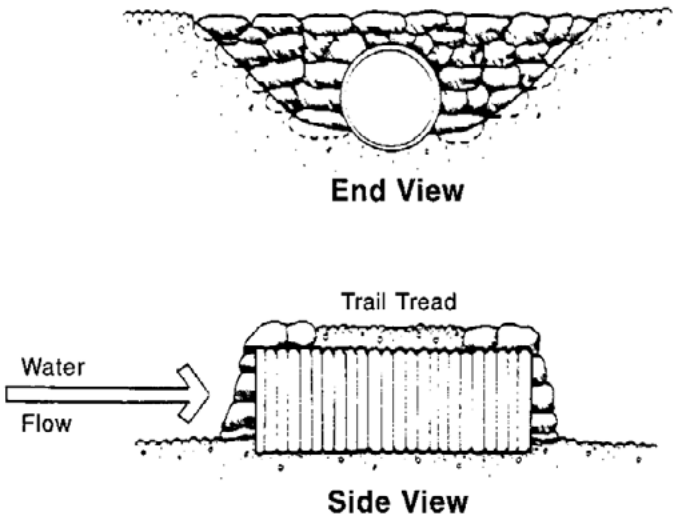
Culverts

Culverts are used to pass water under the trail. They are an excellent alternative to a small bridge and can be used to accommodate water flow from either spring runoff or small permanent streams. Culverts are most effective in natural drainage places where minimum excavation is required. They also can be used in flat areas to provide equalizing, cross-drainage under causeway or turnpike sections, and reduce the damming effect.

Culverts may be more cost effective and less obtrusive than a bridge, but will likely require a permit since they could impede the flow of the water way. They are easier to install in most instances. They can be constructed of rock, logs, corrugated metal, corrugated plastic, or other suitable material. As stream size increases, engineering advice should be sought to insure that the culvert is sized to accommodate peak flows. If the stream is permanent or is a designated trout stream, permits should be obtained.

While culvert installation sounds simple, there are some basic principles which must be followed for the installation to last. Culverts should be installed with a gentle down-stream gradient of around 2% and should be properly bedded to ensure continued performance. If metal or plastic pipes are used, a minimum of 6 inches of soil (free of sharp rocks) is recommended for pipe cover. Pipe diameters less than 12 inches may present frequent cleaning problems.





Fords

Due to safety concerns, legal implications, and the "dry boot" philosophy, fords should not be used as part of the North Country NST. Fording is not acceptable on any new sections of trail and any fords on existing trail segments should be bridged as soon as funding is available. A possible exception to this policy is across very small streams in ROS Primitive areas.

Drownings have occurred when hikers attempted to wade seemingly innocuous streams during high water periods. One unfortunate incident involved an experienced hiker (who had logged over 26,000 trail miles) who attempted to wade what by all appearances was a 25-foot-wide, shallow, Arkansas stream. The creek was not over knee deep and was not cold. However, it was fast flowing and treacherous enough to knock the hiker off his feet and sweep him to his death.

Water is more than a short-term springtime concern on the North Country NST, especially as the trail corridor follows long distances through the lake states. Water does not dissipate as quickly as in hillier areas, and lasts well into the summer. Permanent solutions (e.g., bridges) are more appropriate for these areas than fording.

Stepping Stones

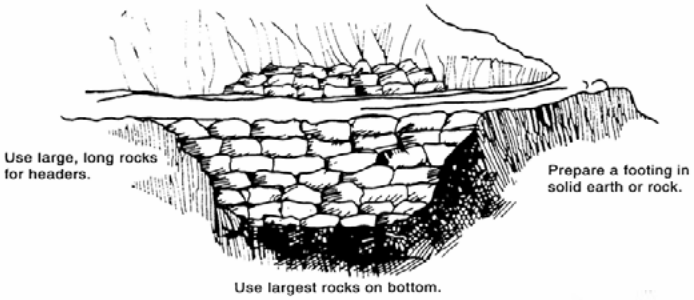
Stepping stones can effectively harden the trail tread across short wet areas or mud-holes. Suitable large, flat stones that are firmly set in the trail so that they do not shift—which may otherwise cause hikers to lose their balance—may be the least expensive, most durable solution to a problem area. Cut rounds of log should not be used as substitute stepping stones as they become slippery with moss and are a safety hazard. They are also less durable and convey the impression of poorly designed trail.

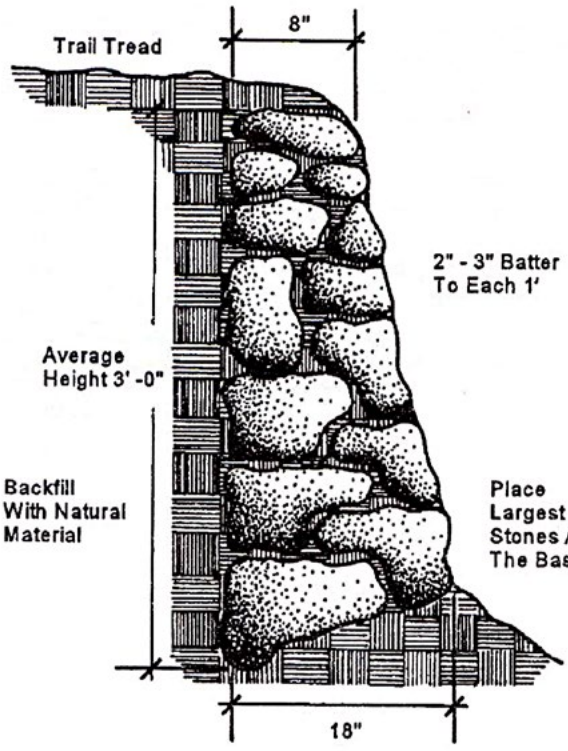
Generally, stepping stones should not be used to cross streams unless the stream is very small and requires only a few stones. Even then, they should only be used in places where the bank is solid and will not erode. Many state agencies oppose the use of stepping stones on navigable streams or on streams with a fish population because they can create an artificial barrier to water flow or modify the fish habitat. Stepping stones also pose a barrier to accessibility and can become slick with moss and water—a falling hazard for all persons. If practical, stepping stones should be avoided or considered only as a temporary solution until a bridge can be installed.

Retaining Walls

Retaining walls are structures of stone or wood designed to stabilize the trail base on steeper side slopes. They are time consuming to construct but may be necessary to prevent soil slide or slump when sidehill trails are crossing the face of a slope that exceeds 40% to 50%. Retaining walls are a long lasting investment—many constructed by the CCC in the 1930's are still functional today.

Sound, durable rocks with good, angular (rather than rounded) bearing surfaces are the preferred material because of their locking ability and durability. Native decay-resistant or treated logs can also be used if rock is not available. The foundation must rest on solid earth or rock to obtain a rigid, safe retaining wall. The thickness of a rock retaining wall at the base should be at least one half the height of the wall or a minimum of 2 feet if the vertical height is less than 5 feet. The outer face of the wall should have an inward slope of at least 2 to 3 inches for every foot of height. Drainage is required around, beneath, or through the wall so that water will not accumulate behind it and build up pressure which could destroy the wall.



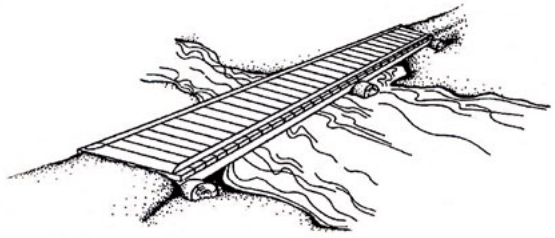


Puncheon

Puncheon is an effective way to cross some types of bogs, shallow marshes, and wooded wetlands. It uses sawed, treated lumber or native logs to elevate the trail tread above wet areas that are not feasible to drain. It provides a hardened surface that lasts for many years depending on the material used. The walking surface is parallel to the direction of the trail, and the support structures (sills) rest directly on the ground. The use of puncheon is strongly recommended since a wet, muddy trail and the damage caused from hiking directly through wetlands are undesirable. A puncheon bridge can range from as little as 10 feet to hundreds of feet long for crossing a swamp.

Puncheon can be constructed using either native or milled materials and often is a combination of the two. Most typically, the sill logs are made of long lasting native material (such as cedar, tamarack, locust, etc.) and the walking surface is made of heavy, treated planks. The determination of the material depends on a number of factors—the distance from an access point, ability to haul materials to the site, the availability of native materials, the skills available for the difficult job of hewing native puncheon, the desired length of time between replacement, and the ROS setting.

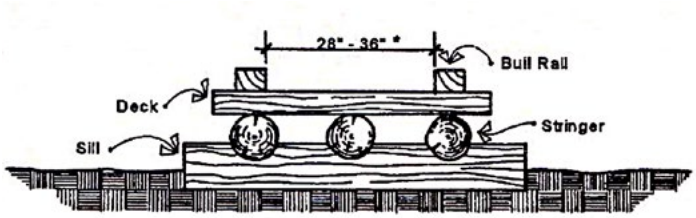
Once the route through a wetland is chosen and the trail is cleared, the first step is to obtain and place the sill logs. These rest directly on the wet soil and vary in length from about 3 feet to 5 or 6 feet depending on the amount of support provided by the wetland. The stringers (walking surface) are then placed on top of the sill logs and secured in place with large spikes. If native logs are used as stringers, some notching and fitting has to be done so they do not rock on the sills. Puncheon is normally built in 8 to 10-foot sections with no more than 6 inches from the end of one section to the beginning of the next. When treated planks are used, the ends typically rest directly on the sill logs—often without gaps between the sections. In this situation, one sill is located directly at the junction between two sets of planks. However, because planks have more flex, a center sill may be needed.



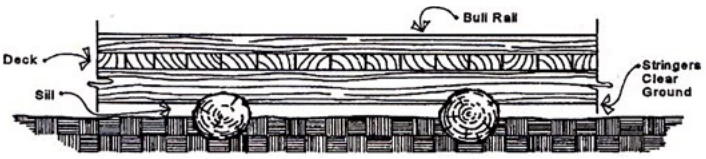
Built-up Puncheon

The trail tread at both ends of the puncheon must be solid and dry; otherwise, the stepping-off point may become soft and muddy, eventually requiring the construction of an extra section of puncheon. It may be necessary to place several flat stepping stones at the ends of the puncheon to help the soil withstand the impact of hikers.

In areas subject to flooding, such as along streams or near beaver activity, puncheon is not a good choice because it can float out of position or even completely away. In these areas, relocating the trail or using boardwalk should be considered (provided it is protected from spring floods along streams).



Cross Section



Linear Section

Boardwalks vs Puncheons

The distinction between a boardwalk and puncheon is that the surface of a boardwalk is constructed of boards that are perpendicular to the direction of the trail, and the entire structure is supported by posts driven or anchored into the bottom of the wetland, similar to a dock. Boardwalks do not rest on sill logs. Another distinction is that puncheon is normally less than a foot above the surrounding wetland, while a boardwalk can be 2 to 3 feet above the water—like an elongated dock. With boardwalks, wetland crossing permits will almost surely be required.

Stiles

A stile is a structure that facilitates a fence crossing. Pastures and other agricultural fields often occur on private lands and are separated by fences. These are primarily in rural/roaded natural ROS settings but also can occur in other areas. While it is desirable to minimize as many fence crossings as possible, they are impossible to avoid altogether. Whenever a fence must be crossed, it should be equipped with a stile to facilitate hiker passage and eliminate fence damage.

Gates could serve the same purpose as a stile but they are more expensive to construct and maintain. There is also the likelihood that a gate may be left open allowing livestock to escape. The landowner should always be consulted to ensure that the stile is located and constructed to meet their needs. In areas where user conflicts exist, a stile can effectively serve as a barrier to unauthorized use by horses, bicycles, and ORVs.

There are a wide variety of stiles in use, including step stiles, turnstiles,and dodgeways or pass-throughs. The stile of choice is often determined by the area's cultural traditions.

Step Stile

Turnstile

Dodgeway

Steps and Perrons

Steps and perrons (elongated steps—more like a series of connected platforms) should be avoided when possible. In most cases, proper trail layout can alleviate the need for steps. These structures are difficult and time consuming to properly construct and often create an unnecessary impediment. They make an otherwise difficult but accessible section of trail inaccessible. Even persons who are generally considered to be ambulatory, but who may have knee or hip problems, find steps more difficult to negotiate than gradual inclines.

In some cases there may be unavoidable topographical barriers—such as where an escarpment separates two moderately sloped grades—or land ownership patterns that restrict where the trail can be built, forcing it to traverse a hill at a much steeper-than-desirable grade. In these types of circumstances, steps may be the only alternative.

Waterbars

Waterbars are rock or log structures that divert water off of the trail. Often referred to as an “old-school” technique, many waterbars can still be found along the North Country Trail. On older (steeper) trails, waterbars may have been the only effective way to divert water from the trail. Modern sustainable trails have replaced the use of waterbars with rolling grade dips installed on existing trail or grade reversals designed into new trail segments. Where waterbars exist, trail maintainers should clean them frequently; by clearing a two-shovel width apron for water to efficiently flow off of the trail.

Safety

National Scenic Trails have had impressive safety records over the years. With so many volunteers contributing thousands of hours each year, under arduous conditions, this is remarkable. Most volunteers and crew leaders understand the importance of being safe and are mindful about protecting themselves and others. Still, it is easy to become lax and forget basic safety rules. It is impossible to cover all aspects of safety in this handbook—there are entire books written on the subject. Crew leaders and others are encouraged to investigate more detailed sources of information such as agency specific safety handbooks, manufacturer's instructions accompanying individual tools, and on-the-job training from more experienced workers. The purpose of this chapter is to remind trail workers of some basic common-sense rules and offer brief insights for a continued safe work record.

Above all else is attitude! Crew leaders should not make the assumption that everyone thinks the way they do. Considerable time should be spent going over safety rules before each work-outing.

More information about effective Crew Leadership is available through NCTA's Crew Leader Training program. Completing this training is recommended for all prospective NCT Crew Leaders.

SAFETY RULES

1. Tools should be carried in the safest way. The tool should be gripped by the handle about 6 inches behind the head (or at the balance point) and carried to the side, on the down-slope side of the body rather than over the shoulder or as a walking stick. This prevents injuries due to falling on the tool, since it can be easily tossed away when carried correctly. Tools with sharp blades should be carried with the blade facing the ground and equipped with a sheath to prevent accidental cuts and to retain their sharp edge. The sheath should remain on the tool while it is carried to the worksite and removed only when used. Bulky or clumsy items should be held with two hands or carried by two people.
2. Plenty of room should be allowed between volunteers for walking and working—generally 10 feet between each crew member.
3. Crew members should always be aware of what others are doing and take full responsibility for their own safety and the safety of others.
4. The right tool should be used for the job.
5. The "Scan-Shout-Swing" order of doing things should be implemented. Crew members should look around to make sure no one is in harm's way and there is plenty of room to swing safely. If necessary, brush or limbs first should be cleared to avoid injury from a deflected tool. Second, intentions should be communicated and third, when all is clear, crew members may proceed.
6. Trail hazards should be removed as they are encountered, or their presence communicated to other workers down the line—either verbally or with a temporary sign (for instance, a temporary sign could warn others of a nearby yellow-jacket nest or a poorly supported leaning tree). Hazards should be removed as soon as practical to prevent others from being harmed.
7. Dehydration, heat stroke, hypothermia, and allergic reactions are life-threatening concerns. First aid supplies should be kept on hand and every crew member should know what is available and where it is kept. If working in remote locations, someone should know the crew's location and expected time of return.
8. Crew members should be aware of their physical condition and limitations—weariness can lead to accidents.
9. Chainsaw operators cannot work alone. Sawyers must have a swamper at all times.
10. Any crew or individual going out into the woods should carry a phone, radio, or SPOT device that provides reliable communications to emergency responders and have an up-to-date emergency response plan.

NCTA Crew Leader Training

See the NCTA's Crew Leader Training Program, which goes into greater depth about safety.

Leading a Work Outing

Safety is the number one priority in all volunteer trail operations. Crew leaders are responsible for briefing crew members to maintain a safe working environment and instilling in them a sense of responsibility. Every work leader should learn and teach his/her crew safe work habits and see that these practices are adhered to. Every tool is a potential source of injury and everyone can not be watched at all times. Therefore, ground rules must be established at the beginning and taught by example.

The correct tools for the job should be selected and inspected. Blades should be sharp, handles smooth, and heads securely fastened. Tools should be properly cared for and used correctly. Crew leaders should demonstrate proper carrying and handling techniques before leaving the parking lot. See some suggested safety guidelines in Chapter 10 - Selecting the Right Tool.

Careful planning will prevent problems during the outing. A checklist of supplies and safety-briefing points is a must.

Crew Leader Kit Contents

- ☐ First Aid Kit
- ☐ Insect Repellent
- ☐ Extra Food and Water
- ☐ Extra PPE (Personal Protective Equipment)
- ☐ Compass and Map
- ☐ Project Plans
- ☐ NCTA/Chapter info
- ☐ Trash bag
- ☐ Radio/Spot/Communication Device
- ☐ Flagging Tape or Pin Flags
- ☐ Injury Reporting Kit
- ☐ Extra Volunteer Agreements

All potential participants should be told what they are expected to bring prior to the work-day. Normally, participants are responsible for their own footwear, rain gear, and gloves. There will always be a few who need an item, so crew leaders should bring extra, if they are available.

Sometimes people will bring their own tools. This is fine as long as their tools are in good condition and appropriate for the project. Inexperienced workers, for instance, seem very fond of hatchets. They are ineffective for trail work when compared to loppers, bow saws and other trail tools. Crew leaders should be firm about leaving such tools behind, and should check all personal tools for soundness.

Just because a person has brought a tool from home does not mean that they know how to use it correctly. Time should be taken to discuss proper use of all tools that are going to be used that day. If there are more tools than people, the determination has to be made as to which ones are really necessary and which ones should be left behind. In most cases crew members should not carry more than one tool, except when walking in to major project sites. An exception to this is when small tools such as wire cutters for old barbed wire can be carried in a pocket or day-pack. In addition to teaching basic rules, a crew leader must also discuss other precautions.

Crew leaders must be aware of any signs of fatigue, dehydration, or heat stroke among crew members. If someone seems to be having trouble, crew leaders do not need to draw undue attention to it, but should not ignore it either. Crew leaders should ensure that everyone is getting enough rest periods and water.

This should be a good experience for everyone—if the experience is positive, people will come back for the next work-outing.

56 Photo: Dave Johnson

5

Maintenance

Objectives

The objectives of trail maintenance are to:

- Provide for user safety, access, and convenience
- Protect adjacent resources
- Preserve trail investment

Maintenance begins immediately following trail construction and is a continuous process.

Sometimes questions arise whether seldom used stretches of trail are worth the time and effort required to maintain them. However, if the trail is not maintained, why should anyone hike it? All trail should be maintained in the best condition possible—a well-maintained trail is self-perpetuating.

Inventory

As the trail moves closer to completion, as trail managers become more knowledgeable, and as the NPS or the North Country Trail Association (NCTA) and its affiliates increase management oversight capability, it may be necessary to create a more detailed inventory of trail features and required maintenance; an electronic database is capable of generating various reports including maintenance needs. Managing authorities should consider an inventory similar to either the Appalachian Trail Conference's TREAD database, or the proposed Ice Age NST Trail Inventory and Assessment Process. It is beyond the scope of this handbook to develop a database format or require the various local trail managing authorities to use it. If current managing authorities desire a detailed inventory, they are encouraged to proceed—keeping in mind that the selected format and the computer software should be compatible with other authorities, and that the data be easily convertible to those software programs.

Trail Assessment

A detailed trail condition assessment may not be necessary for routine maintenance, but there may be sections of the trail where it is not possible to complete all maintenance immediately or where more help in terms of labor and/or money is needed. For example, a trail maintainer may notice a severely-eroded, rather lengthy trail section during a routine walk through, and while the best solution may be to eventually relocate this section of the trail, it may not be possible to correct immediately. In that case, a maintenance assessment is needed to let the local managing authority and the NPS know about any major needs. With this information at hand, it may be possible to find the funding or labor to correct the problem. A maintenance assessment can also serve as a basis for applying for NCTA Field Grants or other available project funds. A trail assessment or inventory form may be used to conduct an annual trail assessment and document heavy maintenance needs or simply collect information on the condition of the trail over time.

Maintenance and Construction Tips

Each work trip should be organized so every section of trail is left as complete and finished as possible.

Flagging should be carried for temporary trail marking or to identify work to be done.

Find a use for as much disturbed material as possible. On every trail there are points where excess material must be removed and sections where material will be needed. Rock and soil removed from a cut on one section can be used as fill on another nearby section. A trail does not have to be worked progressively from beginning to end. Priority should be given to sections needing the most attention. The cut sections may be worked first, followed by the fill areas. Water diversions should be installed prior to trail surfacing work to allow for natural drying and easier working conditions. If two crews are working along the same trail, work assignments and locations should be scheduled to allow for exchange of equipment and materials.

To help eliminate premature use when constructing new trail, leave a short, unworked section between the new trail segment and access roads until the end of the project.

Complete clean-up at the same time as construction and maintenance are finished in a segment. Postponing trailside cleanup until later is poor procedure—a delayed cleanup seldom gets done.

To avoid having to repeat a task, take the time to do the job correctly the first time around.

Cleanup

The trail must be cleared of all debris following clearing or heavy maintenance. Maintenance results should appear neat and hardly noticeable to a hiker. Inadequate clean-up can spoil even the most thorough clearing job. One person on the crew should be assigned responsibility for this job. All cut growth should be carried off the trail and scattered—not piled. If eroding gullies are nearby, the cut material can be placed in the gully to slow the flow of water and catch sediment (see the third item under maintenance tips-clearing).

All flagging, construction stakes and debris, litter, etc., should be removed. Follow Leave No Trace principles.

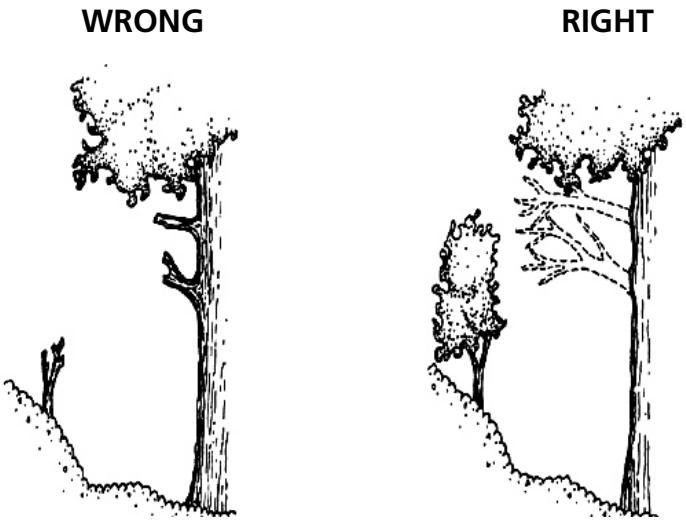
Vegetation Maintenance

All side branches extending into the trail clearing should be cut flush with the parent branch or stem, leaving no stubs. This is safer, lasts longer, and also allows for the wound to heal naturally. Small trees and shrubs within the tread should be grubbed out to prevent tripping. Holes should be filled and compacted. Trees and brush outside the tread (but inside the trail clearing) should be cut as close to the ground as possible, leaving no sharp pointed stumps or stems. If necessary, consider treating some cut stumps (especially exotic species) with herbicide — after obtaining proper approval.

Unless prohibited because of ROS setting, consider using power mowers in open grassy areas or power brush saws in brushy areas. Fallen branches and trees should be removed except for a few large trees/logs near access points (see maintenance tips). On larger logs, remove a section only the width of the tread to further restrict unwanted use

In high use sections of the trail or near camping areas, remove dead or dying trees that have a high probability of falling across the trail or camping area. These hazard trees are extremely dangerous and should only be removed by experienced sawyers who are trained and certified to fall standing trees.

In Primitive ROS areas, only those trees that pose an immediate and serious hazard to users should be removed.



Tread Maintenance

When tread repair is needed, it should be restored to the original design condition, free of loose stones, rock points, stumps, and roots. Attention should be given to dips and outsloping so that water does not collect on the trail.

Drainage Maintenance

Proper drainage protects the trail from erosion damage. Trails should be routinely inspected to ensure that all culverts, dips, waterbars, drainage ditches, etc. are free of debris and ready to function properly at all times—especially during the rainy season or spring runoff. Routine maintenance is not only necessary, but valuable in terms of labor, material, and money saved on emergency repairs, and in the number of days the trail is useable. If repairs are necessary, they should meet or exceed the original construction specifications.

Trail and Support Structure Maintenance

The major consideration in structure maintenance is safety. Bridges, stiles, boardwalks and all support structures should be routinely inspected in order to ensure safe conditions and intended function. Minor maintenance of structures should be provided by the adopter or trail crew. Deficiencies requiring major efforts should be planned as a separate project. Unsafe structures must not remain unattended. If work must be temporarily deferred, an alternate trail route should provide a bypass of the hazard.

Bridge Maintenance

Bridges require periodic maintenance to insure their stability and safety. Debris should be cleaned from cribbings, bolts checked and tightened, sills inspected for rot, etc. Bridges should be carefully checked by trail maintainers and all major bridges (>25 feet long or > 5 feet high) should be inspected by qualified personnel at least once every three years. This inspection should be documented. In addition, trail club members should be alert to the development of hazardous conditions between inspections, and should also routinely inspect smaller bridges.

Organizing the Crew

Experience and knowledge of the trail will help determine what tools to take and how many persons to recruit. The most efficient way to manage trail crews goes by various names—the "overseer" system, the "trail sponsor" system, the "adopt-a-trail" system. The key is that one person is responsible for a particular segment of trail on a permanent basis, if possible. It is their responsibility to see that the trail segment is maintained, either working by themselves or by recruiting helpers. The advantage of this system is that the adopter becomes well acquainted with the segment, can deal efficiently with problem areas, and can judge how much and how often work is needed to keep the segment maintained. A disadvantage of this system is that a segment can become so familiar that problems are overlooked or it becomes boring for the adopter. One way to overcome this problem is to rotate adopters between segments every few years.

The annual trail evaluation or a pre-workday trip by the adopter can serve as an assessment of the work to be done and will facilitate crew organization. Two to four persons can usually maintain 3 to 5 miles of trail per day—depending on the individuals, terrain, vegetation, and the number of maintenance problems.

The exact kind and number of tools for a crew varies from one part of the country to another. In general, tools which are capable of cutting weeds, pruning branches, removing logs, digging and leveling trail, and cleaning waterbars are desirable. It is advantageous to rotate tools among trail workers to provide relief from repetitive motion and effort.

Clearing

For light pruning work that is within reach, hand pruning shears (like those used by a gardener) are quicker and easier than long handled loppers.

A stout but flexible forked sapling (about an inch in diameter at the base) that has been cut about 4 ½ to 5 feet in length (with about a 10" fork at the end) is a very useful tool for flinging small limbs out and away from the trail. When following someone who is using a power brush saw, it is also an excellent tool for flinging the cut brush out of the trail. Used like a pitch fork, it scatters the brush so that it is not visibly concentrated, and is much more efficient than bending to pick up and discard each piece by hand.

A couple of large down logs should be left near trail entry points to discourage wheeled use. Farther down the trail, a section the width of the trail tread can be cut out of large fallen logs for the same purpose.

All main stems or trunks should be cut as close to the ground as possible—or grubbed out. It is very important to avoid leaving short stubs (trippers) as they are a safety hazard. Cut hardwood stems resprout easily, therefore, grubbing is the preferred method as it is a one time treatment.

Larger logs should be carried to the downhill side of the trail and placed perpendicular to the face of the hill to prevent them from rolling and creating a safety hazard.

If a branch needs to be pruned, it should be cut next to the trunk. If not cut next to the trunk, these safety hazards tend to develop suckers or side branches which will have to be cut again and look unnatural. Large limbs should be undercut first to prevent peeling the bark from the main stem when the branch falls.

Conifer branches and weak trees, such as alder, are easily weighted with heavy snow or rain and may require extra clearing.

Signs

When using Carsonite posts, the optional anchor at the bottom should always be installed. This makes them even harder for vandals to remove from the ground while adding little expense.

When installing wooden posts, a piece of scrap lumber should be nailed to the lower part of the post. It is easier to nail it parallel to the post—this method is just as effective as a perpendicular arrangement and allows for a smaller post hole.

Blazing

Clean, neat ways to carry and apply paint should be practiced. The following suggestions should be considered:

- A 1" wide brush spreads wider during painting. Some prefer using a 2" brush and little pressure so that the blaze doesn't get too wide.
- To illustrate the proper blaze size, a dollar bill is very close to 2"x6".
- Flat grey or brown spray paint should be carried for use in obliterating old trail blazes. The Buckeye Trail Association also recommends Sherman Williams Yuma green paint to obliterate old blazes.
- Old gloves, a wire brush, and a 2 ½" paint scraper are handy tools.
- Paint can be kept in an old, snap-top detergent bottle. Applying small amounts of paint to the brush can ensure a neater job..
- A paint brush and a small can (to hold paint) are easily carried inside a gallon paint bucket. For comfort, a piece of hose can be slipped over the paint bucket handle or it can be replaced with a wooden handle.
- Cans lined with plastic bags make for easy cleanup.
- Extra plastic bags kept in the vehicle are handy. Brushes can be wrapped in plastic so they won't dry out until cleaned at home. Another method is to bring along mineral spirits or water (depending on type of paint used) to cover the length of the brush bristles. This can be stored in a sturdy, sealable container. Extra care should be taken to avoid leakage.

An instructional video on blazing technique can be found in NCTA's Volunteer Resource Center.

Frequency of Maintenance

Most trail segments need maintenance about three times per year.

Prior to Memorial Day

This may be the maintenance period that involves the most work. The objective is to get the trail ready for the spring hikers. In addition to general trail cleanup, some of the more important tasks are to:

- Remove tree limbs and fallen trees from the trail, and prune encroaching limbs as needed.
- Repaint or replace the blazes if they are faded or missing. (Be sure that they are not obscured by vegetation—consider growth that occurs before the next maintenance).
- Make sure that all signs and trail emblems are in place and well maintained.
- Inspect for water in the trail and take corrective action.
- Carefully inspect all bridges—immediate safety needs should be met and tasks which are too large for immediate action noted.
- Maintain all trailheads, campsites, and other support structures.
- Keep a list of larger jobs or those that require different tools that will require attention at some other time.
- Schedule time for major projects that were identified—round up tools and helpers.
- Pick up litter.

Mid-Summer

Early July is a good time to take care of annual growth so that the trail is kept clear and relatively easy to hike. The hiker should not be assaulted by weeds and briars. Some of the key jobs for mid-summer are to:

- Mow or cut all weeds, brambles, briars, and high grass encroaching on the trail. On sections of the trail that pass through fields or other places receiving direct sunlight, mowing may have to be done on a more frequent basis—perhaps monthly throughout the summer. Brambles and briars may need to be grubbed out by the roots to prevent rapid regrowth.
- Prune all brush and overhanging limbs that have grown into the trail clearing—all blazes and signs must be visible.
- Complete the larger jobs that could not be accomplished the previous spring.
- Maintain and improve water bars, drainage ditches, and all trail structures.
- Be alert for noxious or exotic plant species—remove or inventory them for future vegetative management projects.
- Pick up litter.

Fall

Fall maintenance is geared toward preparing the trail for the winter months. This is a time to:

- Finish any uncompleted jobs and recheck blazes and signs—replace and repair as necessary.
- Be sure that campsites and shelters are clean and in good repair.
- Contact landowners to thank them for their support.
- Pick up litter.

BLANK

64 Photo: Sarah Gray

6

Sign Standards

Sign Types and Their Use

Trail users rely on signs and symbols to navigate the trail and to better understand the features of different areas. Signs identify and label facilities and points of interest. They warn hikers of dangers and unusual trail conditions. They educate hikers in the proper use of the outdoors and promote the protection of nature. Signs explain and interpret interesting natural and cultural features as well as management activities along the trail. They also list regulations and guidelines and serve to control unwanted or illegal activities. Perhaps most importantly, they direct the hiker by providing destinations and distances along the route.

Signs are probably the quickest and easiest way to leave the trail user with a positive impression of the trail. If the signs are high quality, well maintained, and properly located, trail users are often more apt to forgive trail problems that are harder to solve, such as wet areas. Consistent signs are the quickest way to increase the trail's identity and the public's support for the trail.

Some objectives of consistent trail signage are:

1. Provide positive exposure of the trail to attract more users
2. Educate the user about the trail through trailhead kiosks
3. Reassure the user that they are on the right trail and will not get lost
4. Control trail usage and create a safer, more enjoyable, environmentally friendly experience

These objectives should be balanced with aesthetic considerations to avoid "sign pollution."

While the public agencies and private organizations that manage segments of the North Country NST often use a variety of signing methods, it is desirable to standardize the types and locations of signs along the trail for the benefit of trail users and maintenance crews. While sign standards on the NCNST call for new signs to replace some of those currently in use, this does not need to occur until the existing signs are no longer in a suitable condition.

Highway Signs

Warning (Pedestrian Crossing) Signs

These are standard MUTCD Warning Signs. They have black lettering on a yellow background. If these signs are needed, the highway department should be contacted for concurrence. They may or may not install these signs. These can be installed in advance of trail crossings where trail use and road conditions warrant. These signs are especially important where visibility is limited and/or traffic volume and speed is high.

Highway and Entrance Signs

Highway signs are the typical white lettering on brown background recreation-related signs seen along highways. They can only be installed with the approval of the responsible highway department or agency that controls the road—such as the DOT in a particular state. These signs are uncommon, and usually are only needed in places where a trailhead happens to be located along a high-speed highway.

There may be other locations and situations where a type of entrance sign or a smaller version may be appropriate to call attention to the trail—such as at a major recreation site. Coordinate directly with NPS if a type of entrance sign is needed.

Reassurance and Blazing

It is not cost effective or desirable to use the official trail logo as the sole marker along the trail. Other types of markers which are less costly, less visually obtrusive, and less prone to vandalism should be used between points where the official trail logo has been placed. Reassurance markers are the painted or adhesive "blazes" that mark the trail.

Blazes are placed on trees or posts, slightly above eye level so that hikers can see them easily when traveling in either direction, keeping in mind winter usage and snow depth. They should be placed on trees or objects that are more visible or "eye-catching." Blazes should be within "line of sight"—when standing at a blaze marker, after taking a few steps forward the hiker should be able to see the next one. One well-placed blaze is better than several that are poorly placed. Blazes should be continuous where feasible, even along road segments and other obvious parts of the trail. See the NCTA policy for blazing along roadways.

Blazes should be placed immediately beyond any trail junction or road crossing, even if there is a directional sign. A second blaze (for safety) should be placed within another 50 to 100 feet. Otherwise, it is not desirable to have more than one blaze visible in either direction at any one time. Striking a balance so as not to "over-blaze" or "under-blaze" is the key. (An exception to the continuous blazing policy occurs in ROS primitive areas or Wilderness areas where blazing is not generally allowed.)

Nail-on blazes are not desired and the painted version is always the most desired form of blazing where possible. Painted blazes are often more vandal resistant than other types. Sometimes, they may not be possible due to the absence of features to paint a blaze on, such as in grassland areas with sparse tree cover. In those cases, a Carsonite post with an adhesive blaze can be used to mark the trail.

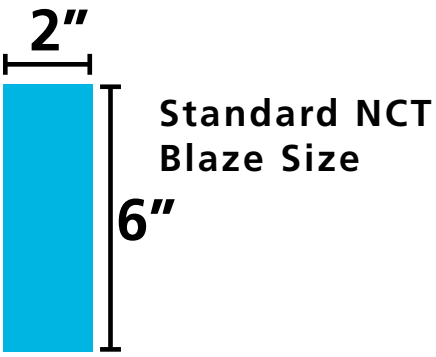
Edges and corners should be crisp and sharp. If paint is used, dripping paint, blotches, and over-sized blazes should be avoided. On rough barked trees, the tree will first need to be smoothed using a paint scraper or draw knife. Once the bark is smoothed, there are a number of successful paint-blazing techniques. Some trail maintainers paint free hand, using a 2" brush. Others use a sized stencil and apply the paint with a brush, sponge, dauber, etc. A high quality, glossy, exterior acrylic paint such as Sherman Williams Metalatex or Nelson Boundary Paint should be used for long durability. Spray paint is discouraged as it is more expensive and does not last as long.

Neatness counts.

Vegetation should be pruned from in front of the blazes to ensure visibility in all seasons. If nail-on blazes are required for a particular section of trail, the NPS has a limited ability to provide them. When requesting nail-up blazes, justification will be needed, indicating a specific reason for not using paint or adhesive blazes. If affixing nail-on blazes to trees, only aluminum nails should be used. On private lands, landowners should be contacted for preference.

NCNST Blaze Standards

Public agencies and private organizations which manage trails incorporated into the North Country NST route have established various methods of marking trails. Their blazes and other markings are a variety of shapes, sizes, and colors. To achieve as much consistency as possible the following standards are preferred:



1. All blazes should be 2”× 6” vertical rectangles. The 2”× 6” rectangular shape is large enough to be seen easily without being visually obtrusive and is the most universally accepted style of trail blazing. The diamonds and nail-up blazes used in some areas by the managing authority are acceptable, but not preferred, and should be phased out whenever possible. To facilitate this movement, the NPS can supply (limited) plastic or aluminum blazes with color to non-Federal partners choosing to use nail-on blazes.

2. Throughout the trail, the color of choice for blazes is medium blue. The ideal blue color is available in a long lasting paint, specially formulated to last on trees (Nelson Paint Company). The paint is Nelson’s Boundary Marking Paint, blue brush-on type *(Pantone 306)*. Nelson can also supply white boundary paint for spur trails. Nelson paint is the standard source used by NPS when paint is requested.
   - ✶ In New York, the North Country NST follows the Finger Lakes Trail for approximately 350 miles. The Finger Lakes Trail is blazed with white paint. Therefore where the two trails coincide, the color of choice is white.
   - ✶ The Buckeye Trail Association uses Sherman Williams Satin Sweeping Blue 2408. Consult with BTA or see the BTA Adopters Handbook for paint color before blazing BTA segments.

3. In non-forested areas, blazes should be placed on wooden or Carsonite posts 4 to 5 feet above the ground. Round posts are acceptable for blazes only. Treated 4”×4” posts or Carsonite posts are required if emblems or other signs/decals are to be attached.

4. Spur trails should be distinguished by white paint (except along the Finger Lakes/North Country Trail where they will be painted the specific color of the adjoining connector trail).

Confirmation/ID Signs

Use of the official North Country Trail emblem is only permitted along sections of the trail that have been certified by the National Park Service (see section on Certification). On certified sections of the trail, the 3 1/2" trail logo should be placed at all road crossings (even drivable woods roads), intersections with other trails, and periodically whenever appropriate along the trail. Generally they should be about ½-mile apart, but frequency should increase in areas where there are numerous roads and intersections. These markers are made of plastic or aluminum for nailing to trees and posts. When nailing markers or signs to trees, only aluminum nails should be used. They are also available in Carsonite decal format. In Carsonite format, they should be used in conjunction with the Carsonite usage strip decal at access points and road crossings, and periodically with blazes in non-forested areas. Confirmation markers will be supplied by the NPS.

The larger 9" emblem is typically used at trailheads, major road crossings, and other locations where more visibility is desired.

Urban Markings

NPS has developed a unique blazing system for use in urban areas (usually Trail Towns) that blends in better with an urban landscape than the painted blazes. These should be used sparingly and only as appropriate along city sidewalks and existing urban trails. Using these types of markers randomly on the trail and in the woods is not an appropriate use.

The North Country Trail emblem is an official trademark, and unauthorized use is illegal.

Directional Change Indicators

Directional change indicators are necessary in places that require extra hiker alertness (e.g., important turns, junctions with other trails, and other confusing locations). They should be used sparingly so that they do not become meaningless or visually obtrusive. They are unnecessary at gradual turns and well-defined trail locations such as switchbacks. A reassurance marker should be placed so that it can be seen from the direction indicator. Signs should be visible to users coming from either direction.

North Country NST Direction Indicators

Double blazes are the turn indicator of choice for the North Country NST. Again, because of the great diversity of this trail, flexibility in the use of directional markers is allowed. Several options and combinations of one or more of the options are acceptable.

Directional markers are shown below in order of preference.

1. The preferred way to indicate major turns along the trail is with two blazes—one placed 2 inches above the other and offset in the direction of the turn. Arrows are a less preferred option.

2. At trail junctions and where the trail jogs for a short distance down a road, a double blaze is preferred, but an arrow is acceptable. At all turns, but particularly at trail junctions when turning along a road, a single reassurance marker should be visible from the direction indicator.

3. If Carsonite posts are used, the standard Carsonite arrow decal is acceptable (3”× 3”, cream on brown). If a directional arrow is nailed to a tree or wooden post, the sign should be 4” × 4”. The color of the arrow is the same color as the blazes being used along the trail, on a brown background.

Continue Straight

Trail Left

Trail Right

Regulatory Signs

It is recommended that all trail segments have signs posted at entry points that explain acceptable and unacceptable uses. While signage should maintain a positive tone, this information is especially important to post in areas where problems have occurred.

There are two options for regulatory signs: (1) Carsonite type posts with strip decals as shown below, or (2) larger format signs mounted on Carsonite or wooden posts—to be used where the standard 3" wide vertical decals are not prominent enough, such as at busy trailheads, major road crossings or problem areas. This strip decal should be placed directly below a trail identification emblem and can be followed by any managing agency's or organization's logo.

In order to avoid over-signing, these should emphasize the permitted use. On segments where non-permitted uses are more frequently experienced, international symbols with a "slash" can be added lower on the post to help control the problem.

These signs should be placed at all access points such as trailheads, road crossings, junctions with other types of trails, etc. Further usage control measures, such as barriers or stiles, may have to be employed in those areas where the trail is subject to illegal use.

Specific Use Signs

"Crossing Private Land" Signs

The North Country NST crosses private lands in many locations. Trail passage is at the mercy of the landowner and is dependent upon their cooperation. Therefore, efforts to foster and collectively maintain good-will must be practiced. One way to assist in this effort is to educate hikers about proper conduct when crossing private lands and to notify them when they are entering private property, using signs such as the examples shown here. These signs must be located accurately, and the top portion of the sign should read, "PRIVATE PROPERTY".

The lower part of the sign may contain smaller text such as the following: "The North Country NST depends on the cooperation of many private landowners. Please respect the land you travel through. Foot travel only is permitted. Camping, fires, hunting, and straying from the trail is prohibited. Enforced by the County Sheriff." This sign is yellow with brown lettering.

Boundary Marker Signs

In locations where the trail skirts private property and unintentional trespassing could be an issue, boundary marker decals can be used. Requests for these decals can be made to the NPS Office. (NPS Supply Order Form)

Additionally, in locations where a corridor or easement has been specifically acquired for the trail, a boundary marker sign should be used to permanently mark the trail corridor boundary. The National Park Service will work with a supplier to develop these decals when/if the need arises.

Trailhead Information Sign/Kiosk

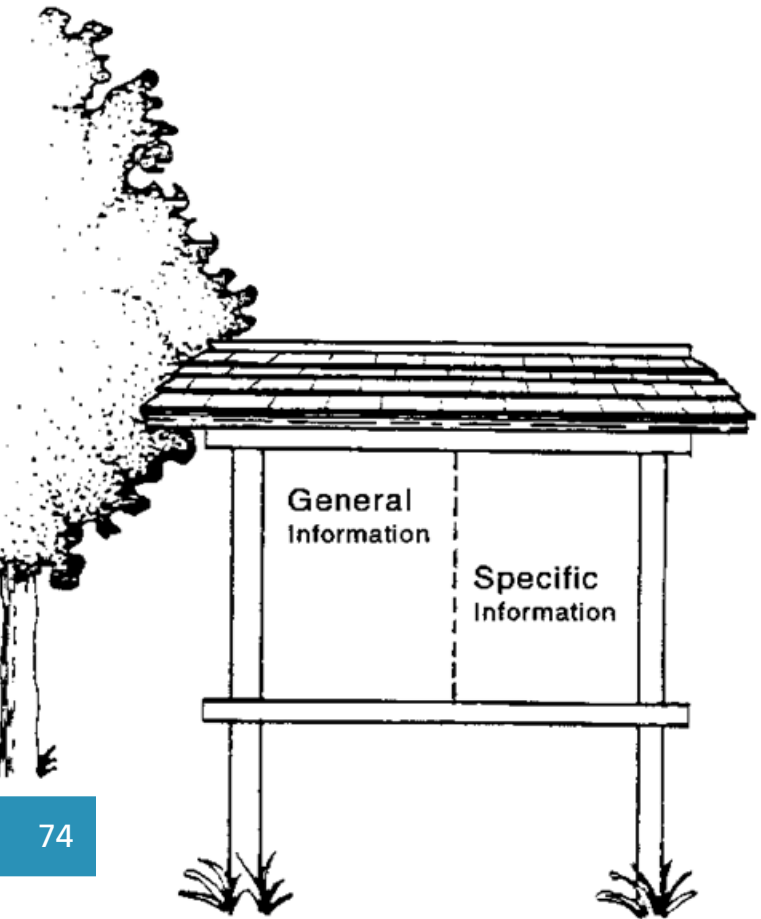
A trailhead sign or kiosk should be installed at all primary trailhead locations where parking is available. This structure should be built within 50 feet of where the trail leaves the parking lot and should include a roof and a double or triple bulletin board structure. Some agencies on the North Country NST have adopted a triple bulletin board constructed with a roof. A well designed and maintained trailhead kiosk presents a variety of information and serves to consolidate signing clutter that otherwise would be more spread out along the trail.

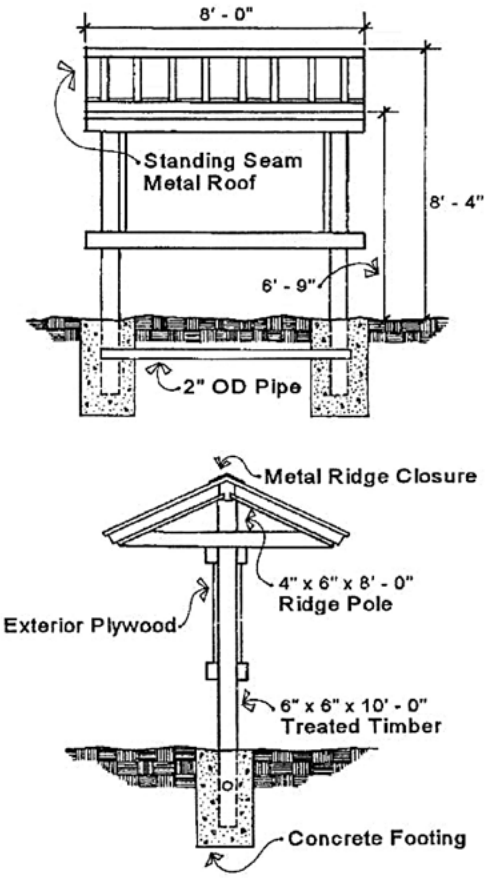
The left display panel should contain general information about the trail (the seven-state map)—similar to the map and information shown on the NPS brochure. It should depict the general location of the trail in relation to other major landmarks, such as the Great Lakes.

The right display panel should contain specific information about the trail segment, including local trail interpretation. A map should show the trail as far as the next trailhead in either direction. It should also include regulatory and safety information and information about temporary trail detours.

All kiosks should be either weather-tight to protect permanent information such as maps and regulations, or utilize weather/vandal resistant materials such as waxed poster board, fiberglass embedment, or other long lasting materials. Cluttering the kiosk with quickly prepared information on short lasting paper should be avoided. Frequent, regularly-scheduled maintenance of kiosk displays is imperative for maintaining a professional appearance. Replace faded display materials as necessary, remove spider webs, dead bugs, accumulated moisture, and so on. Additional interpretive information can be included on the segment map panel. Kiosks are good locations to install trail registers. Design specifications for one style of kiosk are shown below.

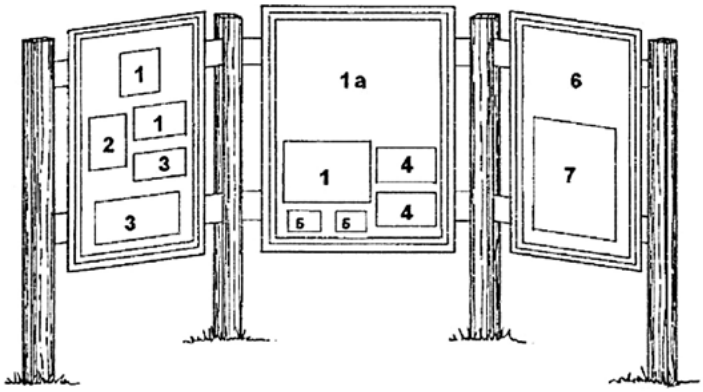
Consult the land manager for existing signage standards that may exist for kiosks.





A Suggested 3-Panel Display Arrangement

1) Recreation activity information
1a) Recreation activity map
2) Visitor registration
3) Environmental awareness
4) User etiquette
5) Supervisor's directives
6) Safety/Emergency information
7) Local interest weather, events



Destination Signs

Destination signs show direction and distances to various spots along the trail. They are an important source of information both for long distance hikers and day hikers, and can serve to increase the use on under-used sections of the trail; if a user knows that there is a waterfall, lake, or other attraction down the trail, they may be more tempted to hike to it than if they had not seen the sign. Destination signs supplement the identification signs shown in paragraph J-1. They are optional but desirable. These signs will have blue letters on natural wood-color background.

The trail name will be 2" letters and the destination names will be 1" letters. Appropriate places for these signs are: trailheads, major roads, shelters, trail junctions, and spur trail junctions (to indicate distance to water or shelter). They may contain the following information:

1. The name of the trail,
2. Significant destinations along the trail such as rivers, road crossings, shelters, campsites, waterfalls, etc.
3. The direction to these destinations indicated by arrows (arrows may not be needed, depending on sign placement—for instance if a sign is placed on each side of a road), and
4. The distance to the destinations in miles and tenths.

Sign Maintenance

Sign maintenance is critical to the operation of a quality trail system. Well maintained signs that are repaired promptly convey a sense of pride and reduce further vandalism. Signs are a highly visible representation of the quality of the trail. Their maintenance or lack of maintenance leaves the visitor with a positive or negative impression. Special attention should be given to those that are damaged from shooting and other factors, those that are faded or brittle from long exposure, and those that are simply missing. All signs that are damaged or weathered so they no longer convey a good impression or serve the intended purpose should be repaired or replaced. Periodic painting and other maintenance is a necessity and will prolong the life of a sign.

Priorities for sign maintenance are:

1. Signs required for user safety,
2. User restrictions and advisory signs,
3. Destination and identification signs, blazes, and trail logos, and
4. Informative and interpretive signs.

 Photo: Dove Day

Tool Appendix

Selecting the Right Tool

A wide variety of tools are available for trail use. Local and individual preferences often dictate the kinds of tools which are chosen for various tasks. Some of the most commonly used tools and their functional purpose are identified in this chapter. A few tips on using the tool safely and effectively are also included.

Every trail maintainer needs to learn how to choose the correct tool for the job, to use it effectively and safely, and to care for and store it properly. The right tool should be used for the job. Substitutes are dangerous and ineffective. Purchasing high quality tools initially is often more cost effective, since they have better long-term performance.

- Trail maintainers should use Personal Protective Equipment (PPE) and should follow proper safety procedures when handling tools.

- Tools should always be carried with the appropriate guards in place.

- Tools should be kept in good condition; throwing them on the ground can damage them, and a file should be carried for spot-sharpening edges throughout the work day.

- At the end of the work day, all tools should be cleaned, sharpened, lightly oiled, and stored properly.

Measuring Tools

Clinometer

Uses: A clinometer is an essential tool when locating and laying out a trail. This compass-sized tool allows the user to measure the slope (grade) of a hill or trail.

Tips: Both eyes must be kept open when sighting through the clinometer.

Measuring Wheel

Uses: Measuring trail that is completed or under construction. Sometimes site conditions are more appropriate to use a measuring wheel rather than a GPS because of tree cover. A measuring wheel will also give a more accurate distance in the field when traveling over steep slopes. The wheel measures the slope distance traveled rather than just the linear distance as though it were measured on a map.

Tips: Dont forget to look up!

Pruning Saw

Uses: Cutting limbs encroaching on the trail. Can also be used for cutting small trees or shrubs at the base and removing small to medium sized windfalls. Pruning saws come in a wide variety of sizes and tooth patterns. They range from small folding models with 6" to 8" blades to those with blades up to approximately 26" in length. Blades are curved and cut only on the back-stroke—a handy feature when removing hard to reach limbs.

Tips: Pruning saws should be resharpened often. A light coat of oil should be applied to the blade after each use.

Safety: Except for folding models, pruning saws should be kept in a sheath when not in use. A hand holding a limb or sapling should not be crossed beneath the hand pulling the saw—this can lead to a nasty cut when the saw comes through the limb sooner than expected. Personal Protective Equipment (PPE) includes leather gloves and a hardhat.

Bow Saw

Uses: Cutting limbs, small trees, and small to medium sized windfalls —essentially the same as pruning saws except that bow saws can cut larger material. Bow saws have blades ranging from about 21" to 36" in length. The smaller saws are generally triangular in shape and work well for pruning. Their shape limits the length and depth of the stroke to material less than 4" to 5" in diameter. The larger saws are bow-shaped and can cut material up to 8" in diameter, but are more prone to twisting and binding in the cut.

Tips: Bow saws cannot be resharpened due to the hardness of the blade. When the blade becomes dull, rusty, or bent, it should be replaced. It should be wiped with light oil before storing. Smaller saws are more useful—use another tool for cutting large material.

Safety: Same as pruning saws. PPE includes leather gloves and hardhat.

Loppers

Uses: Cutting selected limbs or saplings during construction and maintenance phases. Larger models can cut limbs approaching 2 inches in size.

Tips: High quality loppers with replaceable parts should be used. Saplings should be clipped flush to the ground and limbs flush to the tree. Loppers must not be thrown on the ground as this may clog the head and dull the blades. At the end of the day, the blade should be cleaned and wiped with light oil.

Safety: Leather gloves and a hardhat should be worn. Eye protection is also recommended.

Crosscut Saw

Uses: Cutting large blowdowns and felling timber. Crosscut saws are available in two basic designs—one-person and two-person. The one-person models are generally 3' to 4' feet in length and are perhaps most useful for clearing blowdowns. Two-person crosscuts are 5' to 8' in length, with a handle at each end. Both types are useful for constructing trail structures in remote areas.

In combination with an adze, two-person crosscut saws are especially good for creating a level walking surface on native log bridges. Crosscut saws (especially two-person models) require special skills and care, but are nevertheless an attractive, lightweight alternative in remote areas. In formally designated Wilderness Areas, where power tools are not allowed, crosscut saws are perhaps the only alternative for cutting large material. In less remote areas, they are used only occasionally as the axe, bowsaw, and chainsaw perform the same jobs.

Tips: One of the biggest problems with crosscut saws is finding someone who is competent in sharpening them—if no one is available to correctly sharpen the saw, there is no use purchasing one. What was once fairly common knowledge has been largely forgotten, except by those individuals who still routinely work in remote areas. Skills in using and sharpening the saws can be learned through on-the-job experience with wilderness rangers, or by participating in a good workshop such as a Wilderness Skills Workshop conducted by the Student Conservation Association. Another source of training is the *U.S Forest Service Crosscut Saw Manual* by Warren Miller, U.S. Forest Service.

A crosscut saw should never be placed in the dirt—the teeth should remain clean and sharp. Generally, the saw is leaned against a tree when not in use, but care must be taken to ensure it does not fall to the ground.

Safety: Users must be trained and certified for cross cut saws. To protect both the user and the saw, a sheath should always be used. These can be manufactured using sections of old fire hose or assembled from plywood. Several good commercially manufactured sheaths are also available. As with any sharp tool, extreme caution should be used to avoid cuts. Required PPE includes a hardhat and leather gloves.

Weed Whip

Uses: The weed whip is swung back and forth like a golf club and cuts grass, weeds, light brush, briars, and small tree seedlings. It is a very effective tool for clearing new growth along the trail.

Tips: Weed whips come in two basic varieties—L-shaped and triangular-framed. The second variety is more stable, cuts larger material, and is recommended. It is fairly easy to break the wooden handle—for this reason, consider the Suwanee Sling.

Safety: Plenty of space should be left between the user and others. The handle should be held firmly in both hands and swung rhythmically back and forth. Strong swings should be made to prevent the blade from bouncing or glancing off springy growth. The tool should be carried or stored with a sheath in place. PPE includes leather gloves and leather boots.

BLANK

Axe

Uses: Clearing blowdowns, limbing trees and hewing flat surfaces. Axes demand a great deal of practice to use safely and effectively and are used less today than they were in earlier times. They have largely been replaced by various saws and other cutting tools, but nevertheless, the axe is versatile, simple to maintain, and in skilled hands can be as fast and effective as other tools. There are two basic kinds of axes—the single-bit and the double-bit. Double-bit axes are generally preferred as they have better balance and allow one blade to be kept razor sharp for cutting while the other blade can be used for chopping roots and cutting in dirty wood. Single-bit axes are sometimes considered to be safer than double-bit axes primarily because there is less chance to fall on an exposed blade.

Tips: Effective axe work requires a great deal of practice, but the skills required are not as demanding as those required for crosscut saws. Skills can be acquired through working with experienced individuals or by participating in a good workshop such as a Wilderness Skills Workshop conducted by the Student Conservation Association.

On downed logs, a notch that is twice as long as the diameter of the log should be made. The blows should progress through the log and alternate from one side of the notch to the other. When removing a limb from a downed tree, the direction of the blow should be made from the root-end of the tree rather than down into the crotch.

Safety: Felling trees with axes is prohibited. Limbing and bucking with saws is safer, easier, and provides more desirable results. Before cutting, all limbs and brush that might interfere with swinging should be removed. Springy branches or broken limbs that might deflect the blade should be avoided. The user's feet should be separated at shoulder width and firmly planted. When limbing or hewing a downed tree, the user should stand on the side opposite the one being cut to keep the tree between the blade and the user's shins. When not in use, or when carrying the axe, the blade should be covered with a sheath. PPE includes a hardhat, leather gloves, heavy leather boots, and eye protection. Inexperienced users should also consider wearing shin guards and toe guards or hard toe boots.

Pole Pruner and Pole Saw

Uses: Cutting overhanging limbs that cannot be reached with bowsaws, loppers, and other short-reaching tools. Pruners and saws are often combined on the same handle to allow for more flexibility.

Tips: When cutting larger limbs with the pole saw, it is best to use a two-step process. In the first step, a 4" to 6" stub is left by making an under-cut and then a cut from the top of the limb. This prevents stripping the bark from the trunk of the tree. In the second step, the stub is removed flush with the trunk.

Safety: Fingers should be kept out of the pruning head. The rope may snag unexpectedly and cause the blade to close causing a serious cut. When using the saw, eye protection will prevent saw dust from getting into the user's eyes. Required PPE includes eye protection, hardhat, and leather gloves. Policies and training requirements for chainsaws shall apply to poles saw utilizing a chainsaw as the cutting head. Felling trees with a pole saw is prohibited.

Shovel

Uses: Digging and moving soil and other granular material. Shovels are used for cleaning waterbars, culvert outlets, and diversion ditches. They are also used for leveling a base for sill rocks, steps, etc. In trail work, long handled, round-pointed shovels are almost exclusively used. A variation is the fire-shovel which has the advantage of being lighter weight and easier to carry.

Tips: The blade, including most of the blade's sides, should be kept sharp. A firefighter stance should be taken to more effectively and safely move material—the user should bend at the knees and rest the elbow of the hand holding the forward end of the handle on the inside of his/her knee. This is the power hand. The other hand holds the end of the handle and serves as the guide hand. The user should swing from side to side, keeping the elbow on the knee, cutting the soil with the side of the shovel that is opposite the power hand and moving it laterally with the continuation of the swing. For right handers, the power hand is the right hand and the right elbow rests on the right knee. Cutting is done with the left edge of the shovel and material is moved to the left. This technique does not work when digging a deep hole or ditch. The advantage is that the power comes mostly from the leg muscles—not the back muscles.

Safety: The most common injuries when using a shovel are back injuries. Bending from the knees instead of the waist will help prevent injury. Leather gloves are recommended.

Pick Mattock

Uses: A mattock is a heavy, strong, and popular tool that may be used for the roughest of work. Its primary use is for digging and moving dirt and rocks, cutting through roots, and unearthing boulders. It is especially useful when building new trail (especially sidehill trail), installing steps and waterbars, and other heavy work. The mattock's heavy weight allows it to move more material with less effort.

There are two kinds of mattocks—pick mattocks and cutter mattocks. Both have an adze blade, but the pick mattock has a pick, opposing the adze, whereas the cutter mattock has a cutting blade. The pick mattock is most useful in hard or rocky soil where the pick is useful to break up the soil or pry out rocks. The cutter mattock is more useful in deeper, rooty soil where the cutter is needed to sever roots.

Tips: As with other swinging tools, the user should blend force with accuracy.

Safety: Choking up on the handle should be avoided—a glancing blow may strike the user. If breaking rock, goggles should be worn. PPE includes heavy leather boots and leather gloves.

Pulaski

Uses: The pulaski combines the blade of an axe with a narrow grubbing blade. It was developed for fighting forest fires, but is also helpful in trail work. It is not as balanced or safe as the axe, nor as efficient as the mattock for moving soil, but it serves two purposes and saves weight if tools need to be carried long distances. If considerable amounts of axe work or mattock work are needed, the pulaski is a poor choice.

Tips: The axe end is sharpened and maintained like an axe, and the mattock end is sharpened like a true mattock. The pulaski's mattock blade can serve as a substitute adze if it is sharpened to a keen edge. If a pulaski is going to be used as an adze, it should not be used for any other purpose.

Safety: The pulaski can be dangerous due to its two sharp blades. It should always be stored and carried in a sheath. The same safety practices as used for an axe should be followed. PPE includes a hardhat, leather gloves, and heavy leather boots. Inexperienced users should have shin guards and possibly hard-toe boots.

McLeod

Uses: Constructing and maintaining trail. The McLeod is a heavy-duty combination hoe and rake. It has six digging (or rake) teeth opposite the hoe blade. It is useful for removing duff layers and loose ground debris to create a level trail. It can also be used to chop off light brush and roots. It must be supplemented with a mattock or other digging tool when there is considerable digging or heavy brush.

Tips: The hoe blade should be kept sharp.

Safety: Adequate space between workers should be determined before swinging this tool. Leather gloves are recommended.

Wheelbarrow or Cart

Uses: Moving loose material or supplies considerable distances.

Tips: Two-wheel carts have better balance and can often carry heavier loads— however, they require wider space to maneuver. Whether a wheelbarrow or a two-wheel cart, models should be obtained with large balloon tires. The small-wheeled garden variety is not useful for trail work.

Log Carrier

Uses: Carrying and moving heavy logs and timbers. The log carrier looks like a giant ice tong with long wooden handles. It is a two-person tool.

Tips: Many hands make light work. There is no rule that says how many log carriers and pairs of people should be assigned to a log. As many log carriers and people should be used as will comfortably fit along the length of the log to make the load manageable.

Safety: The user should stand behind the handle of the carrier, facing the direction of travel and place both hands on the handle, bend at the knees, and all workers lift at once. Forearms should be roughly parallel to the ground when in the lifting and carrying position. Heavy weights are involved so caution should be used. Feet should be kept from under the log. PPE includes heavy leather boots and leather gloves.

Peavy or Cant Hook

Uses: Rolling and positioning logs and timbers. This includes rolling the log to move it to another site or to rotate it in place. The main difference between these two tools is the shape of the tool's end. Peavys have a straight spike at the end whereas cant hooks have a short gripping tooth. Both are used for essentially the same purpose. Peavys are quicker to reposition when rolling a log some distance and for maintaining momentum. Cant hooks provide for more precise rotating. When arranged as opposing pairs, either tool can serve as a log carrier if a true log carrier is not available.

Safety: The user should exercise caution not to roll logs onto his/her (or someone else's) toes. Logs may roll too fast and get away. Potential for severe injury is present whenever heavy weights are being moved. PPE includes leather gloves and heavy leather boots. Hard-toe boots provide an extra measure of protection.

Sledgehammer

Uses: Breaking rocks, driving posts or stakes, nudging a heavy timber into place, driving large spikes. Sledgehammers are primarily used during construction phases.

Tips: Hit it with the heavy end.

Safety: Before swinging, the user should make sure others are clear and obtain a firm stance with feet spread to shoulder width and firmly planted. PPE includes leather gloves and eye protection. When striking rocks, goggles should be worn.

2½ or 3-Pound Hammer

Uses: Driving survey stakes, spikes, and other uses that are too demanding for a regular claw-hammer, but do not require the heavy duty blows of a sledge.

Safety: Required PPE includes leather gloves and eye protection.

Rock Bar

Uses: This is an essential tool for prying and levering large, heavy objects such as boulders, logs, and beams. Rock Bars/Crowbars are heavy-duty steel and vary in length, weight and diameter. In general, crowbars have a chisel tip on one end and a rounded handle on the other. They are usually 1" to 1½" in diameter and vary between 40" and 62" in length.

Tips: For most purposes, a 54" size seems to work best.

Safety: Since the rock bar/crowbar often lifts and moves heavy loads, it can be dangerous. Fulcrums and footholds should be secure. The user should stay out from under the bar and the load being moved, and avoid levering with the bar between his/her legs. Undivided attention should be given during use to avoid mashed fingers and toes or other injuries. As with any lifting device, the user should lift with the legs—not the back. PPE includes leather gloves and heavy leather boots. For additional safety, hard-toe boots are advisable.

Rigging

Rigging refers to a system of cables, pulleys, and winches used to suspend and move heavy loads to a work site or into place. Rigging systems, powered by GriphoistR winches, can help small crews do heavy work in an efficient manner.

The set-up and use of a rigging system requires a sophisticated level of knowledge and special training or experience. It should not be attempted without this knowledge as severe accidents, caused by the heavy loads or a breaking cable, could occur.

Rigging systems are most appropriate when there is a considerable amount of work to do at one site—such as when constructing a bridge, retaining wall, steps, or shelter. On this type of project a crew will not want to go back to the old method of brute force once they acquire the skill to effectively utilize rigging.

Similar to the safety practices shown under cable winches, but even more critical with rigging because the heavy loads are suspended and can fall on workers.

Hydraulic Jack

Uses: Raising heavy weights such as a corner of a shelter that has settled, or a bridge beam so that shims can be placed or the abutment build up. Can also be used to level heavy stone steps or any other structure—as long as room can be created to insert the jack under the object.

Safety: When working under heavy objects, there is always the danger of having it fall and crush whatever is under it. Extreme caution should be used when any part of the body is beneath the structure until it is securely in place.

Cable Winch

Uses: To drag or swing heavy rocks or logs into place. When construction projects involve heavy stone or wood, ordinary hand tools may be insufficient.

Tips: The inexpensive models are not useful except for the lightest of jobs. The better models can move substantial loads without breaking but are limited by the length of cable that can be wound around the spool (usually about 25'). Because of this limitation, hauling material a considerable distance requires frequent re-anchoring of the winch.

The Griphoist® Winch is the most popular cable winch. In addition to being a very strong winch, its biggest advantage is that it is a continuous cable puller. In other words, a cable of any length can be used. This allows for long pulls without having to re-anchor. These hand-powered winches use a pair of wire rope grips to pull a separate length of cable through the winch. Using the Griphoist®, a trail worker can stretch a cable all the way across a stream or ravine and pull a bridge timber into place. They also provide the basic lifting power for a "rigging" system.

Nylon slings, not chains, should be used to anchor the winch to a tree and to harness rocks or logs. The winch cable should be kept freely suspended, rather than dragging it through dirt or rock, to avoid fraying and deterioration of the cable.

Safety: The user should stay out from under the load. Where the load may roll free and tumble or slide dangerously, a barrier should be built to stop it. PPE includes leather gloves, boots, and hardhats.

Timber Tools

Adze

Uses: An adze is essentially a form of a plane. Its use is for finishing (hewing) of beams and logs to form a flat surface—such as the walking surface of a native log bridge.

Tips: This tool should be kept very sharp and used only for hewing. It should be handled very carefully and contact with the ground avoided. It should always be protected with a sheath. A good adze is hard to find—a source is where old tools are sold.

Safety: The user should exercise caution so as not to cut his/her feet or shins. When standing on the log being hewed, the toe of the front foot should be elevated so that a glancing blow strikes the bottom of the sole of the boot. Only the back of the heel of the front foot should be resting on the log. PPE includes heavy leather boots and leather gloves.

Spud

Uses: Also called a bark spud, this tool is used to push and pry the bark from green timbers. Removing the bark slows the rotting process. Although an axe can be used to remove bark, a spud peels much faster, particularly during the spring and early summer.

Tips: The spud has three cutting edges. All three should be sharpened on the top side only. A file should be used—a fine edge is unnecessary. Timbers peel much easier during the spring when the sap is flowing freely. Logs can be peeled in the spring and stockpiled for later use during the construction season.

Safety: The user should always push away from the body and keep hands and feet, as well as other workers, away from the front of the blade. Spuds often slip and can make serious wounds. Leather gloves are recommended.

Draw Knife

Uses: Peeling small diameter logs and poles or performing finish work on timber surfaces. Draw knives are normally used on smaller diameter material than are spuds, but on difficult to peel logs can out-perform spuds.

Tips: Users should acquire a true draw knife that has its handles at a right angle to the blade—rather than a bark knife that has handles in line with the blade. Bark knifes are meant only for smoothing rough bark—not removing it.

Safety: Draw knifes are razor sharp so caution is necessary. Leather gloves are recommended.

Power Tools

When the situation allows, the use of power tools is appropriate along much of the North Country NST. In most situations, power tools can substantially increase productivity. They allow fewer people to construct or maintain a given amount of trail in less time. However, they have certain drawbacks that must be recognized. Power tools can increase the potential for an injury—especially in the hands of unskilled workers. Users must be particularly cautious to prevent injury to themselves or their co-workers and must wear PPE at all times. Power tools are generally heavier to carry than hand tools. They may not be worth the extra effort if long distances are being covered where only incidental work will be performed or the worksites are widely scattered. And, of special importance, they are prohibited in Primitive ROS areas (formally Designated Wilderness Areas).

Brushsaw

Chainsaw

Lawnmower

DR Field Mower

Chainsaw

Uses: Cutting medium to large size blowdowns, clearing heavy sapling growth during trail construction, cutting trees into pieces for wood construction projects.

Tips: Saws with 16" blades are generally adequate for most trail work. Models should be obtained with chain brakes, vibration damped handles, and high quality mufflers. The user should carry a tool kit in a pack (file, scrench, plastic wedge).

Safety: Chainsaws are one of the most dangerous pieces of power equipment. All hand-held chainsaws must be equipped with a chain break. They must only be used by those who have undergone training and are certified for chainsaw use. Sawyers may not conduct saw work that exceeds their level of certification unless supervised by a higher-level sawyer. Sawyers may not work alone. Required PPE includes hearing protection, eye protection, hardhat, and saw chaps. Additional PPE may be required by the local land manager/owner. Chainsaws shall not be operated without wearing the required PPE.

Lawnmower

Uses: An ordinary side-discharge mower can be effectively used for clearing and maintaining trail—except in extremely rocky terrain. For grass, ferns, and weeds (up to knee high) many feel that a lawnmower is more effective than a brush saw. It is more readily available and less expensive than a DR Field Mower®, but not as durable or powerful.

Tips: A mower with a 22" to 24" cut and adjustable wheels seems to work well. Wheels should be set as high as possible. A mower with a universal blade for easy replacement is desirable.

Safety: Rotary mowers can throw objects, injure others, and can cause severe injury to the operator's extremities if a hand or foot gets under the mower deck. The operator should insure that other workers keep a considerable distance from the mower so that thrown objects do not cause injury. Extra caution should be used when operating on slopes, or if the vegetation is wet, to avoid slips and possible operator injury (see owners manual). Sturdy leather shoes (not jogging shoes) should be worn. Ear protection should be worn if using the mower for extended periods or the muffler is louder than 80db.

Brushsaw

Uses: Constructing and maintaining trail through areas of heavy brush, grass, briars, and sapling sized trees. They allow one person to rapidly clear large areas. In some situations a DR Mower® can accomplish the same tasks easier and quicker—especially in grass and smaller brush.

Tips: Brushsaws come in a variety of sizes. Trail work requires a more powerful unit than one that is used for lawn trimming. Generally, a brushsaw with an engine of 35cc to 80cc and bicycle-type handlebars is recommended. For durability, a known brand such as Stihl, Husquevarna, or Jonserud should be obtained. These saws also come with a variety of blades depending on the material to be cut. Trail work requires a saw type or a universal grass-brush blade—not a string cutter.

The brushsaw is supported by a shoulder harness, but can still become very tiring. Users should work in teams to make the job easier and switch positions regularly. When not cutting, the other person can remove brush from the trail.

Safety: The brushsaw's open blade is on the end of a wand, and can snag and swing violently to the side, making it more prone to injure other workers rather than the operator. Other workers should stay clear. Required PPE is ear protection, eye protection, gloves, leather boots. Hardhats are recommended.

DR Field Mower®

Uses: This sturdy mower is an excellent choice for cutting heavy grass, weeds, briars, and even saplings up to 1" diameter. A DR Field Mower® is simply a walk-behind brush-hog that is useful during trail construction and trail maintenance. It is more useful than a sickle-bar type mower because the material is chewed up and does not need to be removed from the trail as much as with a sickle-bar mower.

Safety: The mower can throw objects and injure others. Other workers should be kept at a safe distance away from the mower. PPE includes ear protection and leather gloves.

BLANK

BLANK


National Park Foundation™
NATIONAL PARK SERVICE
north country trail ASSOCIATION
www.nps.gov/noco
www.northcountrytrail.org
Photo: Ben Harker