

ICE AGE NATIONAL SCENIC TRAIL



A HANDBOOK for TRAIL DESIGN, CONSTRUCTION and MAINTENANCE

National Park Service • Wisconsin Department of* Natural Resources • Ice Age Park and Trail Foundation



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United States Department of the Interior • National Park Service



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The Ice Age National Scenic Trail (NST) extends for more than 1,000 miles across the State of Wisconsin, winding through a myriad of ecosystems and political jurisdictions. Its design, construction, and maintenance is carried out by government agencies, volunteers from the Ice Age Park and Trail Foundation, and other private organizations in 31 counties. Understandably, the level of trail building experience and expectations have often differed among those involved. With the increasing popularity of the Ice Age NST, there is greater public expectation of a superlative hiking experience on this rare National Scenic Trail. To help meet these expectations, a more consistent application of standards in the development and maintenance of the Ice Age NST are needed across the state.

This handbook was created as a tool for both volunteers and professional staff to achieve more consistency in trail standards. Starting with the primary mission of the Ice Age Trail and the experience it provides to users, the handbook outlines guidelines for maintaining and creating the trail. It also provides a broad range of technical information, such as how to lay out and build the trail, types of trail structures and their required permitting processes, proper maintenance and inventory of existing trail, survey of important trail building tools, and much more.

Some of the direct benefits of following these standards are to:

- ▶ Provide front-line trail builders with additional technical information that will help them create outstanding segments of new trail, improve existing trail, and simplify long term management of the trail.**
- ▶ Achieve greater user satisfaction by creating diverse hiking experiences, providing for basic levels of safety, and developing the trail for a higher degree of accessibility by all people.**
- ▶ Achieve a "consistent look" for the Ice Age NST, which will create wider recognition by the general public as being part of a National Trails System and broaden its support.**
- ▶ Provide a means to identify and evaluate funding needs to improve existing or to create additional segments of trail.**

This handbook is not intended as a substitute for professional expertise provided by engineers and landscape architects. When designing complicated trail routes, trailheads or most importantly, weight bearing structures such as bridges, trail builders are encouraged to contact local experts or staff within the Wisconsin Department of Natural Resources or National Park Service to seek additional advice.

Over time, these standards should be implemented across the entire trail. As old segments of trail are reconstructed and as new trail segments are built, these guidelines should be followed. Local innovation is a trait that is encouraged, but ideas and variations should fall within the perimeters of these standards. As trail development and maintenance experience progresses, and changes in application are suggested, amendments will be incorporated and issued to those holding copies of this handbook.

It is hoped that this handbook will assist and inspire all who are working for the successful completion and maintenance of the Ice Age National Scenic Trail.



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INTRODUCTION

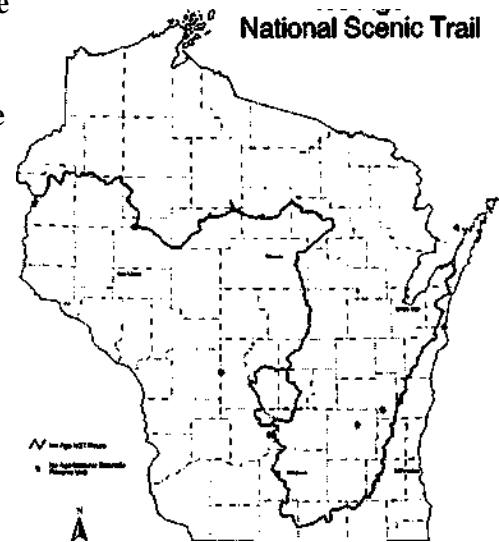
Continental glaciation was important in the formation and modification of physical surface features, including lakes, hills, and ridges in many areas of the Northern hemisphere. About a million years ago a tremendous ice sheet started forming in the Labrador and Hudson Bay Regions of Canada. There were four major ice advances and retreats—the Nebraskan, Kansan, Illinoian, and Wisconsinan stages of the Ice Age. The most recent episode of continental glaciation in North America, known as the Wisconsinan stage, ended 10,000 years ago. Wisconsin contains examples of many landforms that are world-renowned evidence of past glaciation. These include moraines, eskers, kames, kettles, drumlins, wetlands, and lakes.

Wisconsin's efforts to preserve its Ice Age features began in the 1950s. The late Raymond T. Zillmer, a Milwaukee attorney, first proposed establishing a National Park showcasing Wisconsin's glacial features. In 1958, he and others formed the Ice Age Park and Trail Foundation to work for the establishment of an "Ice Age Glacier National Forest Park." The result of this effort was the 1964 authorization by Congress of an Ice Age National Scientific Reserve. Each unit of the reserve protects nationally significant glacial features. There are nine units of the reserve: Two Creeks Buried Forest, Horicon Marsh, Kettle Moraine, Campbellsport Drumlins, Cross Plains, Devil's Lake, Mill Bluff, Chippewa Moraine, and Interstate.

The purpose of the Ice Age National Scenic Trail (NST), as a companion project to the Ice Age National Scientific Reserve, includes preserving some of the finest features of Wisconsin's glacial landscape, as well as other scenic and natural resources, while providing opportunities for low impact recreational and educational use. In addition, the trail connects six of the nine units of the Ice Age National Scientific Reserve, and many other federal, state, county, and local parks. The National Park Service (NPS), Wisconsin Department of Natural Resources (WDNR), private citizen volunteers of the Ice Age Park and Trail Foundation (IAPTF), counties, local governments, and other private organizations are working to help build and maintain the Ice Age NST.

In October 1980, Federal legislation authorized the establishment of the Ice Age NST as a component of the National Trails System (16 U.S.C. 1241 et seq.) It is one of only eight trails authorized by Congress to be designated a NST. Patterned after the renowned Appalachian Trail, NSTs are long-distance, non-motorized trails that follow major geographic features or pass through scenic areas.

In many ways, the Ice Age NST is similar in concept to the Appalachian NST. In other ways it is uniquely different as it takes the visitor through a glacial landscape and promotes, through interpretation, better understanding of the characteristics and formation of this landscape. The Appalachian NST traverses many states and basically follows a mountain range, whereas the Ice Age NST showcases the glacial features of Wisconsin. When complete, the trail will extend over 1,200 miles from Interstate State Park on the St. Croix River in Polk County to Potawatomi State Park in Door County, tracing features left by the last continental glacier that swept over Wisconsin.

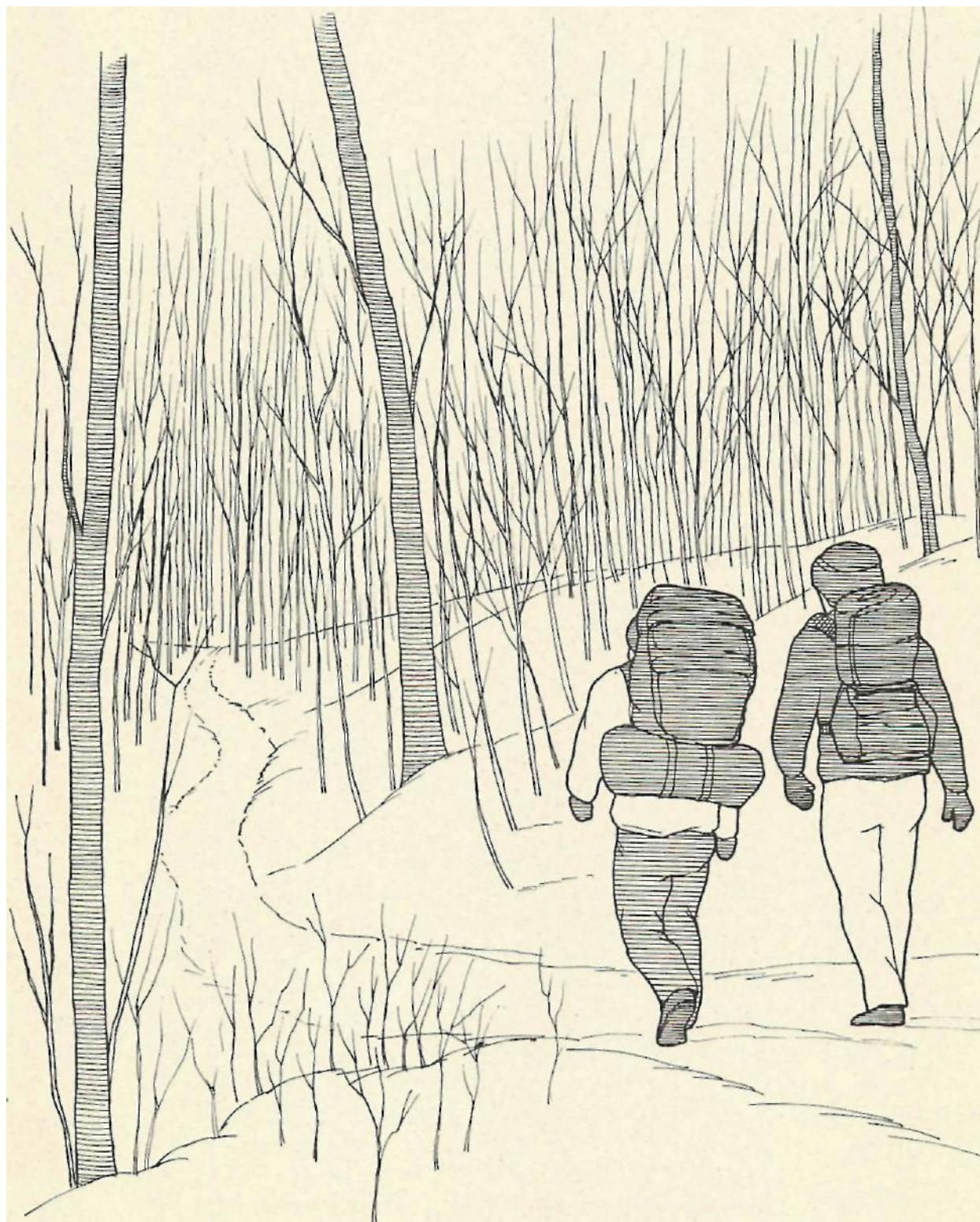


The trail offers a plethora of experiences provided by the diversity of landscapes it traverses. The northern tier of the trail winds through large areas of public lands, such as county forests, state parks and wildlife areas, and a national forest, the Chequamegon, which offers near wilderness experiences. The southern half of the trail meanders through scenic rural farmland where it intermittently passes through quaint villages, towns and cities. These communities offer opportunities to meet local people, find lodging, and restock food and supplies.

The Ice Age National Scenic Trail exists as much for the enjoyment of the casual walker as it does for the long distance hiker. Whether used for an afternoon of walking, a day of cross-country skiing, or a week or month of backpacking, the glacial landscape it traverses offers much to explore. Adventure can be found along sparkling kettle ponds, impressive drumlin fields, pristine trout streams, old logging roads, a sun dappled oak savanna, breathtaking eskers, and a greenway through a local community.

CHAPTER 1

TRAIL HISTORY AND PHILOSOPHY



At a time when our nation was racing to be first to land on the moon, others envisioned trails crossing our continent. A need for trails and other types of recreation facilities was clearly evident in the post-war boom. The Outdoor Recreation Resources Review Commission was created to assess this need and in 1960 their survey ranked "walking for pleasure" as the second most popular form of recreation.

In 1965, the Secretary of the Interior directed the former Bureau of Outdoor Recreation to spearhead a nationwide trails study. In December 1966, the study concluded with the report, "Trails for America." It provided guidance and definition: "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." National scenic trails are to be land-based (i.e., not waterway routes) and generally are to be continuous. The report also called for federal legislation to foster the creation of a nationwide system of trails. (Earlier that year the Secretary of the Interior had submitted proposed legislation to Congress to accomplish this task.) Of the three categories of trails proposed, the report heavily emphasized national scenic trails and the role that they should play in meeting the nation's needs for trail recreation.

On October 2, 1968, President Johnson signed into law the National Trails System Act (Public Law 90-543). Since 1968, eight trails, including the Appalachian, Pacific Crest, Continental Divide, Ice Age, North Country, Florida, Natchez Trace, and Potomoc Heritage, have been authorized as National Scenic Trails. The Ice Age Trail was designated and added to the National Trails System on October 3, 1980 (Public Law 96-370). Today, all of these trails are in various stages of development. Only the Appalachian and Pacific Crest are nearly completed.

As stated in the National Trails System Act:

SEC. 3. (a) The national system of trails should be composed of the following:

(2) "National Scenic Trails, established as provided in Section 5 of this Act, which will be extended trails so located as to provide for maximum outdoor recreation potential and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which such trails may pass. National Scenic Trails may be located so as to represent desert, marsh, grassland, mountain, canyon, river, forest, and other areas, as well as landforms which exhibit significant characteristics of the physiographic regions of the Nation."

The trails' community philosophy holds national scenic and national historic trails as the elite of the extended trails. National scenic trails are continuous and provide access to outstanding scenery and natural landscapes, and link significant natural and cultural features by means of simple pathways. Each national scenic trail has a character and identity of its own, influenced by the landscapes through which it passes.

The long-term goal for the Ice Age 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 except snowmobiles on authorized segments. The National Park Service can certify segments, that meet this intent and other criteria, as part of the Ice Age NST. (Some segments of the trail may be open to one or more non-motorized activities in addition to hiking. Also, legitimate resource management activities sometimes require motorized use.)

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As a "partnership park," the Ice Age NST should meet local needs and blend with the character of the landscape. It also needs to exhibit continuity in character, quality, and visual appeal to sufficiently distinguish itself as a national scenic trail, which offers a higher caliber experience than ordinary trails.

Federal, state, county, and local public agencies, and private landowners participate in hosting, developing, and/or maintaining segments of the trail. Public land managing authorities may wish to enter into agreements with private volunteer organizations like the Ice Age Park and Trail Foundation 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 Ice Age NST should be clearly recognized and identified in the management objectives.

USER EXPERIENCE

Protecting the trail's natural and cultural resources is of utmost importance. Secondly, trail designers and implementers must create the best possible recreational experience for the user. The trail experience is multi-faceted—it offers stimulation of the senses, a place for learning, a feeling of safety, recreation for the soul, exercise for the body, and overwhelming satisfaction.

The routing of the trail should stimulate the user. Variety is critical—sameness and predictability should be avoided. Around every bend, at the end of every straightaway, over the crest of every hill, through the bottomlands of every valley a new experience should be found. The sounds made by the water in a rocky brook or of a breeze sifting through a grove of white pine, the pleasant smell of apple blossoms along a fence row, the relief of the sudden coolness offered by a deep maple woods on a hot, sultry day, the thrill of an unexpected panorama, an intensely yellow field of sunflowers filtered through the branches of an oak opening, or the imprint of sumac against an autumn sky, all singularly or collectively energize senses and create long-term memories.

The trail is a place of learning, not only about the geographies and natural communities and individual species, both human and non-human, but a place where opportunities exist for understanding life and connectedness. The trail is rich in history and pre-history, both geologically and culturally. These aspects must be present to all who use the Ice Age NST so that they have the opportunity to come away from their experience enriched and enlightened.

LOOK OF THE TRAIL

The Ice Age NST should be easily recognized as a national scenic trail. It is important to maintain the aura, reputation, and national importance associated with the NST designation. The public fully expects this and deserves no less. It is important to maintain consistency throughout the entire length via standardized planning, development, implementation and maintenance. The following elements will foster consistency and pride in the trail so that visitors will leave with a positive impression:

- ▶ Quality construction of the trail, parking lots, rest areas, bridges and other structures;
- ▶ Clear and consistent signage with good attention to detail;
- ▶ A well-maintained trail with regular mowing or other vegetative control;

- ▶ **Timely response to problems created by storms or routine wearing out of the infrastructure;**
- ▶ **Regular cleanup of litter;**
- ▶ **Timely response to public concern on trail related problems.**

ENVIRONMENTAL CONSIDERATIONS

National scenic trails should reflect a respect for the land and serve as positive examples which demonstrate that respect. Everyone associated with the trail, in any way, should exercise care not to damage the natural and cultural features that contribute to the beauty and significance of the trail. Everyone has a responsibility, to fellow human beings and to the earth, to treat the land that is temporarily in their care with great respect. To maintain the integrity of the trail's environment, planners, designers, and volunteers should observe the following points as they develop the trail:

- ▶ **Adhere to applicable laws, regulations, codes and standards.**
- ▶ **Insure protection and mitigate impacts to cultural and natural resources.**
- ▶ **Identify and protect threatened, rare or endangered plants or animals.**
- ▶ **Place trail in an environmentally benign location as much as possible. For example, the trail should lay comfortably on the land and avoid unnecessarily steep, erodible, and/or dangerous slopes.**
- ▶ **Skirt or avoid wetlands unless there is a very good reason to enter them—such as bringing the user into intimate contact for interpretive or educational purposes, or because there is no other feasible trail location.**
- ▶ **Be aware of the trail's potential impact to larger habitat areas such as fly ways, breeding grounds, and sensitive plant communities. Once the trail is developed, these situations should be monitored. The trail corridor should also be used as an opportunity to enhance biodiversity.**

ACCESSIBILITY

The Ice Age NST should be designed to ensure that people with a wide range of ability levels have the opportunity to experience the significant resources that make it unique. At the same time, planners should strive to maintain the generally rustic character of a National Scenic Trail. To accomplish these goals, the trail will provide a range of opportunities to accommodate individuals who enjoy a challenge, as well as those who prefer easier, non-strenuous hiking.

Over the past few decades the number of people with disabilities participating in outdoor recreation activities has increased dramatically. (It is estimated that over 43 million Americans have some type of major disability.) Recent trends in our society, influenced by federal laws, have enabled people with disabilities to be actively involved in the mainstream of society and participate in such outdoor experiences as hiking, camping, picnicking, fishing, boating, and water-based recreation. The Ice Age NST offers opportunities for all people.

In this handbook, we refer to three general classes of accessibility—fully accessible, barrier-free, and

not accessible. Because of the length and nature of the Ice Age NST, there are segments that fall within each class. (Recreation Opportunity Spectrum criteria applied—see Chapter 2.)

Fully accessible

Some segments of the trail will be fully accessible. Ideally, these segments would be identified during the trail's corridor planning process. These segments are designed to improve access for people with mobility and/or visibility impairments. They meet a number of specifications addressing width, passing space, surface, running slope, cross slope, edging, clear headroom, rest areas, signage and information points. Some examples of accessible trail are portions of the Ice Age NST that utilize state recreation trails such as the Anaphee, Military Ridge, and Sugar River State Recreation Trails. Ice Age Trail volunteers have built outstanding segments of accessible trail at the Indian Agency House segment in Columbia County and on a portion of the Rib Lake segment in Taylor County. Other fully accessible segments occur in urban settings where the trail has multiple uses, such as the segments that follow sidewalks through the villages of Slinger, Hartland, and Lodi.

A good source of accessibility standards is *Universal Access to Outdoor Recreation*, by PLAE Inc., MIG Communications, 1802 Fifth St, Berkeley, California 94710. (Further discussion about trail construction and design standards is found in Chapter A—particularly in Figure 1.)

Barrier-free

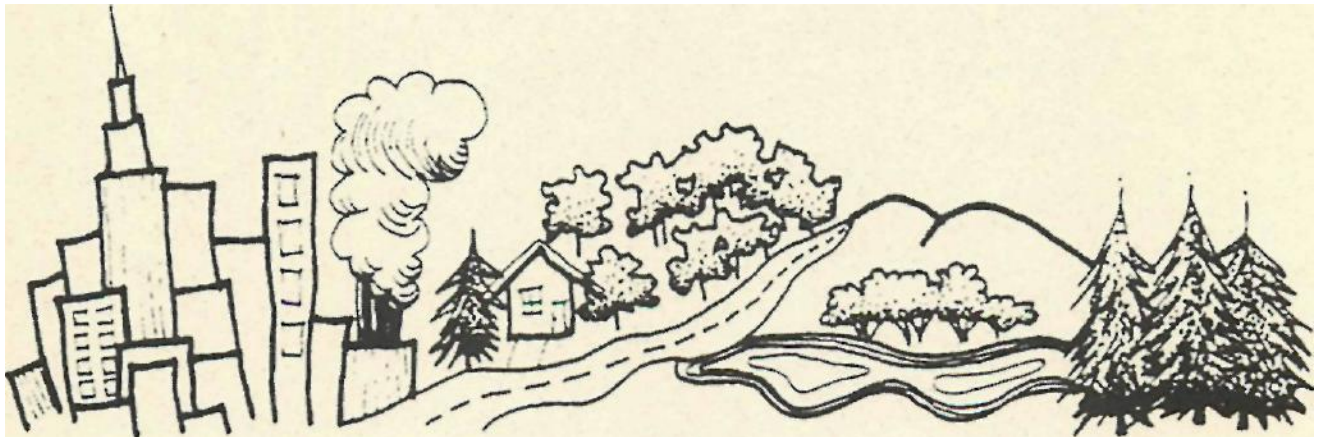
The majority of the trail is and will be designed to provide a more challenging experience, while still accommodating use by individuals with disabilities. Typical trail grades and surface materials are more challenging to persons with limited mobility than a fully accessible trail. However, whenever possible, the Ice Age NST should be established as barrier-free as is practical. A barrier-free trail is developed without impediments such as steps, waterbars, fords, stepping stones, corduroy, and unusually narrow bridges. These types of barriers are often avoidable by choosing another trail location or construction design. Trail segments should be made barrier-free if all it takes is a little extra work or a slightly different location. Standards discussed in Chapters 4 and 5 are specifically designed with the barrier-free objective in mind.

Not Accessible

Some segments of the Ice Age NST cannot be designed to be fully accessible or barrier free. In some cases, the glacial topography of the land and its natural surface of rocks and roots present impediments which cannot be removed without causing major impacts on the environment or drastically altering the desired character of the trail. The width of the trail corridor may be a limitation if it is narrow and doesn't allow room to create slopes that are up to accessibility standards. Other factors influencing decisions on accessibility include the protection of biological and cultural features, and the availability of funding resources to develop and maintain the trail to accessible standards.

CHAPTER 2

RECREATION OPPORTUNITY SPECTRUM: A VEHICLE TO TRAIL LAYOUT AND CONSTRUCTION



URBAN

RURAL/ROADED NATURAL

SEMI-PRIMITIVE

BACKGROUND

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 interests, challenge their abilities, and meet their expectations of a particular activity and setting. Recreation researchers have long recognized the importance of the relationship between expectations and actual settings. Many have suggested that managers should provide a range of opportunities to best serve the diversity of public expectations (Clark and Stanley, 1979).

To serve as a framework for assessing, planning, and managing recreation resources, the USDA-Forest Service developed the **Recreation Opportunity Spectrum (ROS)**, in accordance with the Forest and Rangeland Renewable Resources Planning Act of 1974 (PL 93-378), amended by the National Forest Management Act of 1976 (PL 94-588). ROS allows accurate stratification and definition for classes of outdoor recreation environments. It can be applied to all lands, regardless of ownership or jurisdiction (USDA-Forest Service 1982).

Since the time of its development, the use of ROS has spread among different agencies and groups. The following federal legislation, which requires consideration for accessibility by people with disabilities, documents acceptance of a system such as ROS: *Architectural Barriers Act of 1968*, *Rehabilitation Act of 1973*, and *Americans With Disabilities Act of 1990 (ADA)*. A logical step for the Ice Age NST's *Handbook for Trail Design, Construction, and Maintenance* is to follow ROS. Doing so demonstrates responsiveness to accessibility (depending on the trail setting) and provides a template for determining the degree of trail development needed.

ROS EXPLAINED

The USDA-Forest Service ROS 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 Ice Age NST, these are combined into three categories. The recreation settings used throughout the remainder of this handbook are: urban, rural/roaded natural, and semi-primitive.

Many people associated with the Ice Age NST tend to think of and manage the trail as if it were semi-primitive throughout when, in fact, the surrounding land does not correspond to this level of management. The setting through which the majority of the Ice Age NST passes is rural/roaded natural. Depending on the environmental setting, a specific segment may be a different ROS setting than the grosser classifications.

There may be a few special cases where the trail does not fit easily into one of the three categories, such as a trail located in an urban area that follows a natural feature such as a drumlin or esker. In determining standards for situations like these, be mindful of who the users are and the amount of use that is expected or desired. If in doubt, trail chapters should contact their IAPTF regional field coordinator or the National Park Service. The following is a description of each setting:

- **Urban** settings are characterized by substantially urbanized and modified natural environments. Large numbers of people may be present, both on-site and in adjoining areas. Sights and sounds of people are predominant and experiencing contact with individuals and

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groups is high. Although sites may appear natural, vegetation is often manicured. Facilities for highly intensive motor vehicle use, parking, and mass transit are often available.

Opportunities for competitive and spectator sports, and for passive use of highly human-influenced parks and open spaces are common. Experiencing natural environments, having challenges and risks associated with the natural environment, and using outdoor skills are rare. Sections of the Ice Age NST that follow sidewalks through towns or pass through highly developed linear parkways are described as urban.

Since the trail passes through a number of picturesque small towns or medium-sized cities, particularly in southern Wisconsin, there are a number of segments that fit within the urban category. For example, the trail follows sidewalks through Slinger and Lodi, and highly developed parkways through Janesville and Hartland. The trail also follows greenway systems through a number of cities and regional parks such as those portions through St. Croix Falls, Verona, and Dane County's Ice Age Trail Junction Area. The ROS classification for these greenway systems is probably a blend of the urban and rural/roaded natural setting.

► **Rural/Roaded Natural** settings are characterized by a more natural-appearing environment with moderate evidence of human activity. Resource modification and utilization practices are evident but harmonious with the natural environment. Conventional motor vehicle use is common on paved, graveled, and unsurfaced roads. Interaction between users is low to moderate. Hikers have an approximately equal chance of experiencing contact with other user groups or experiencing isolation from the sights and sounds of humans. Recreation opportunities provide low to moderate challenge and risk. Practice and testing of outdoor skills are suitable in this setting.

As mentioned, most of the Ice Age NST passes through this combined ROS setting. The rural setting has been combined with the roaded natural setting for simplicity because their standards for trail construction are the same. However, there are distinct differences between the two landscapes. Generally, flat and rolling farmland and pastoral settings are *rural*. Evidence of human activity (e.g., hay bales, plowed fields, farmhouses, and frequent road crossings) is present. A degree of isolation is experienced when the trail passes through the isolated woodlots interspersed throughout the landscape. Examples of rural ROS are the farmlands of southern, southcentral and northwestern Wisconsin and suburban developments around cities.

In contrast, *roaded natural* settings are more typical of the predominantly forested areas in northern Wisconsin on county and state forest properties. Most of the public and private forests in Lincoln, Langlade, Taylor, Chippewa, Rusk, Barron, Burnett, Washburn, and Polk Counties fall into this setting.

► **Semi-Primitive** settings are predominantly natural environments of moderate to large size. The area is managed in such a way that the on-site controls and restrictions present are subtle. Motor vehicle use may be prohibited in some semi-primitive areas. Timber harvesting is often present but harvest intensity and schedules are modified. Size of cut areas is smaller, timber harvest may be restricted to once per 20-25 years rather than the normal 10 years, access roads are less developed and farther apart, etc.

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There is a moderate to high probability of isolation from the sights and sounds of humans. Opportunities exist for self-reliance through the application of outdoor skills in a setting that offers a high degree of interaction with the natural environment.

The Ice Age NST has just a few areas that can be described as semi-primitive. Sections of the Ice Age NST corridor that are located within the Chequamegon National Forest in Taylor County are formally designated as semi-primitive. Segments of the Ice Age NST located immediately east of the National Forest in Taylor County and further east into Lincoln County and the New Wood State Wildlife Area could also be described as a semi-primitive setting.

Whether or not an area is semi-primitive is often a judgment call based on factors such as acreage of undeveloped area, road density, degree of timber management, the intensity of sounds and sighting of traffic, or development observed from the trail.

The following criteria may help determine if the lands in question are managed as formally designated areas and distinguish them from the more typical forested (roaded natural) areas:

- ▶ **The area has a definable boundary (roads, streams, etc.).**
- ▶ **The area has at least 2,500 contiguous acres.**
- ▶ **Road densities are low—averaging one mile per square mile.**
- ▶ **The area is generally under one ownership or, if multi-ownership, there is management commitment that the area will be managed as a unit.**
- ▶ **Timber management is of low intensity and frequency. Evidence of management activities is relatively low, consisting of scattered, small, recently regenerated stands.**
- ▶ **Low standard roads—often gated at the periphery of the area.**
- ▶ **There is low interaction between users in a predominantly natural or natural appearing environment.**
- ▶ **Boat and canoe access is generally over trails of varying lengths. Normally, boats and canoes are carried in from the periphery of the area. Some interior lakes may not have developed access.**
- ▶ **Recreation is low key, light-on-the-land in nature and generally dispersed. Low impact activities such as hiking, hunting, cross-country skiing, etc., are emphasized. Campsites are dispersed and primitive in nature. Highly developed bicycle or ORV trails are not allowed, but some areas may allow for occasional motorized use.**
- ▶ **There is owner/manager commitment for this type of management.**

CHAPTER 3

TRAIL DESIGN & IMPLEMENTATION



Nowhere has continental glaciation left a more distinctive imprint on the landscape than in the State of Wisconsin. The last great glacial epoch, the Pleistocene Ice Age, generously provided a well defined terminal moraine and other fascinating geologic and biologic features in virtually every region (except the Driftless Area) and ecosystem of the State. The opportunities to utilize this abundance of natural and cultural qualities of Wisconsin to create a truly diverse and exciting hiking experience for the Ice Age NST are only limited by the imagination of the trail planner or designer.

The Ice Age NST's 1980 authorizing legislation and 1983 Comprehensive Management Plan did, however, provide guidance as to where the trail should be located. The 1983 Comprehensive Management Plan states that the trail "follows a scenic corridor through Wisconsin based on the Wisconsin Terminal Moraine and other glacial features," and mapped an alignment that generally follows the terminal moraine. However, it was understood that this alignment needed refinement. Today, a location that more exemplifies the true intent of the trail's authorizing legislation is being identified through the Federal and State Trail Corridor Planning Process, and the efforts of cooperating partners. This is not always an easy task, since the terminal moraine can be miles in width. However, this expansiveness also provides flexibility since the actual development of the trail is based on willing landowners and avoidance of ever expanding urbanization.

When locating and building new trail, two primary factors that must be taken into consideration are the natural environment and the trail user's experience. This chapter presents an overview of how to design and lay out a trail, including consideration of how the trail affects the environment and the related State and Federal compliance issues. The material that follows incorporates many features of the Trail Corridor Planning Process because, whether there is a formal public planning process or not, the principles, steps, and sequences that lead to the development of a well-designed, low-maintenance, sustainable, and environmentally friendly trail are the same.

TRAIL DESIGN CONSIDERATIONS

Development of the Ice Age NST can have either positive or negative implications for the ecosystem through which it passes. For many who work on this project, there is a desire to see development of the Ice Age NST achieve broader ecosystem benefits than just constructing a recreation trail. A well planned and constructed trail can enhance existing habitat through resource improvement projects such as restoring prairies, providing buffers to sensitive areas, protecting additional lands through acquisition, and educating the public on the immeasurable value of their geologic and biologic heritage. On the other hand, a poorly located and built trail can lead to soil erosion, gullies, and siltation of streams. It can also adversely affect plant and animal communities by allowing hikers to trample important food sources, habitat, or endangered species, as well as destroy the natural qualities of an area.

Ideally, the Ice Age NST should be developed with quality construction materials and techniques to withstand heavy use, safeguard the environment, and minimize maintenance. Sustainability and durability should be key objectives. It should be located on the land in conformance with proper slope and drainage requirements to lessen present and future impacts, and to enhance, as much as possible, the natural biota of the area. The layout of the trail should also provide the user with an exciting, educational, and varied experience.

To achieve this outcome, a systematic evaluation process is needed before a spade of dirt is overturned. This is accomplished through a design process that first looks at the landscape on a gross

scale and moves toward a more detailed, site specific perspective. It identifies goals and objectives for the trail, inventories existing natural features, develops alternatives, and then evaluates their impact on the natural environment.

DESIGN PROCESS

Mission Statement and Goals

Before a trail segment is actually laid out, it is recommended that planners first identify what they want to achieve with its development. For example:

Mission Statement

The Ice Age National Scenic Trail will 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.

Goals

- ▶ Trail is in a visually pleasing corridor that includes scenic vistas.
- ▶ Trail provides for diversity of experiences by passing through a variety of geographic, vegetative, and cultural features.
- ▶ Trail may incorporate existing trails when possible if they meet or can be modified to meet the basic standards for the Ice Age National Scenic Trail.
- ▶ Trail provides connections to other trails, recreation facilities, parks, natural and cultural resource areas, communities, etc.
- ▶ Trail has local landowner support.
- ▶ Trail has the necessary support facilities.
- ▶ Trail makes maximum use of public land 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.

Goals help to focus on the best locations for the trail and justify it to the public. As you will note, the goals identified above are broad in scope. For purposes of this handbook, goals are a generalized statement of the result to be achieved. During the stage of developing trail alignment alternatives, planners/designers may also identify specific tasks or actions that will achieve the desired result or goal. These actions are called objectives.

Utilizing the goals, trail planner/designers should first identify a wide area, usually 1-3 miles, within which the trail will be located. This study area is defined by locating large clusters of outstanding glacial and biologic features, public lands, and areas of continuous scenic beauty. It includes

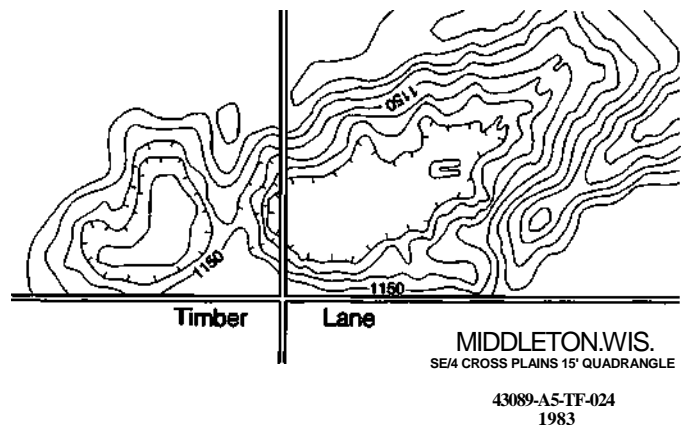
desirable features for the user to walk or gaze upon, or be preserved from human alteration. After these features are mapped, they usually reveal a number of possible route options for the trail. During the formal Corridor Planning Process, this study area results in a clearly defined "corridor of opportunity" that contains all of the possible trail route alternatives.

DATA COLLECTION/SITE ANALYSIS

The study area or potential "corridor of opportunity" is identified using a topographic map, described below. Once this study area is defined, a more detailed inventory of the natural (soils, vegetation, water resources, etc.) and cultural (circulation patterns, cities, etc.) qualities of the area should be completed and then analyzed.

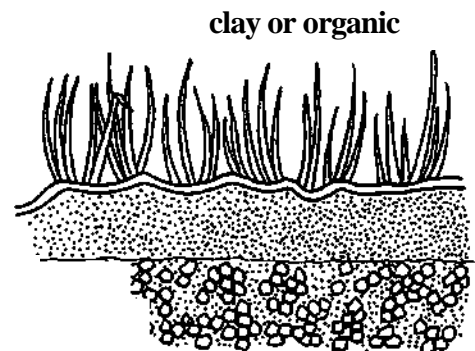
Topography

The basic tool of site planning is a good topographic map that shows the contours of the land and vegetation patterns. A topographic map reveals glacial features, as well as hills, valleys, streams and wetland areas, public lands, cities, and roads. It enables the designer to lay out the trail to accommodate the prevailing slope and drainage patterns in the landscape, connect or avoid important natural features, and provide for a diverse hiking experience. United States Geological Survey (USGS) maps and Geographic Information Systems (GIS) provide this information. USGS maps are the standard for topography on a gross scale. They can be obtained from the Wisconsin Geological and Natural History Survey, Madison, Wisconsin. GIS or an actual topographic survey should be utilized when a more detailed evaluation of a site is required.



Soils

Soil type affects trail tread stability and durability. Identification of soil types within the study area is an important step in determining which areas will easily accommodate a trail, which will require additional soil amendments or structures, and which to avoid altogether. Different soil types have different proportions of sand, clay, silt, or organic matter, which consequently affects their susceptibility to erosion or flooding. In general, soils that are best for trails are well drained with gentle slopes, firm when wet but not dusty when dry, rarely flooded, and have few rocks or stones on the surface. Soils with too much sand can be erodable, or too much matter can be wet and muddy.



The key to locating a trail that minimizes environmental damage is to find the most stable terrain that

connects points of interest along the potential trail route. Areas of heavy, saturated organic soils should be avoided whenever possible. When the trail must pass through these areas, puncheon or boardwalk should be used (see Chapter 5). Soil survey maps describing soil types and their attributes can be obtained from your local County Extension agent.

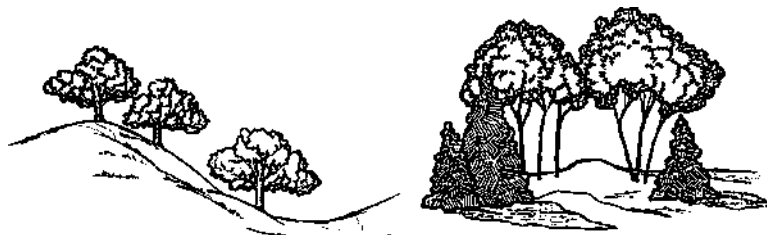
Vegetation

Regional landscapes have plant communities such as Southern Mesic Forest, Northern Dry Forest, etc., that cover the area and create its unique ecosystem. Within these plant communities there may be sites that are particularly beautiful, unusual, rich in species diversity, relatively intact, or very sensitive to any type of development.

These areas should be identified as places to include on the route of the trail, protect and enhance, buffer, or avoid.

Federal and State governments have identified and listed plant species that are either rare or becoming rare due to a variety of factors including habitat degradation, competition, or invasion of exotic species. To obtain information regarding these plants and their possible occurrence within the corridor, contact the WDNR Bureau of Endangered Resources (see Environmental Compliance).

Northern Forest

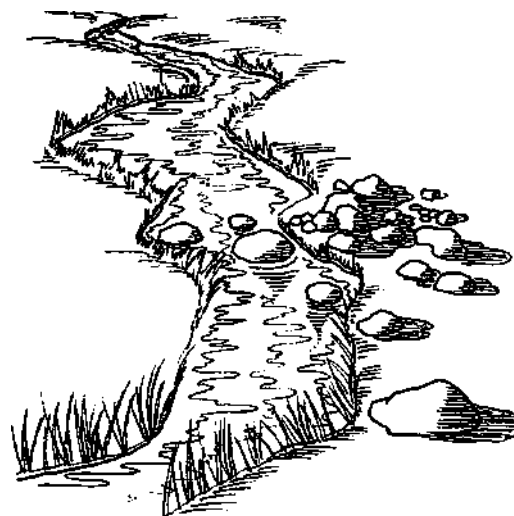


Oak Savanna



Water Resources/Streams

The location of water bodies and streams can be found on most topographic maps. Water bodies are significant to the Ice Age NST because most were created by the glacier, such as kettle ponds or streams and drainageways, and could be an important feature to have along the route. Many of the streams in Wisconsin are part of the WDNR State Fishery Areas system and are frequently surrounded by public lands. A problem with utilizing these areas is that the soil may be too wet for building a trail.

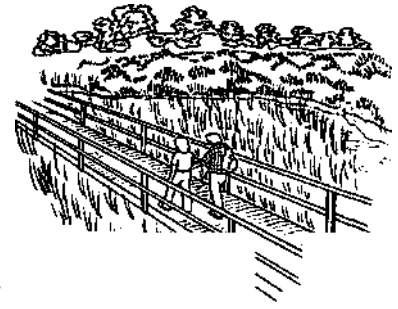


Wetlands

Wetlands are the transition between open water and dry, upland terrain and are generally depicted on topographic maps. To determine if a wet area is a State-designated wetland, contact the local WDNR Water Management Specialist.

Defined as "areas with shallow standing water or seasonal to year-long saturated soils," wetlands can be subdivided into a number of categories such as sedge meadow, shallow marsh, deep marsh, shrub swamp, wooded swamp, bog, etc. 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,

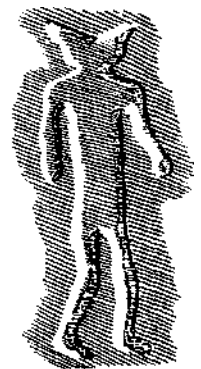
damage to sensitive species, the possibility of changing the natural water levels, etc. For these reasons, wetlands are usually avoided. However, wetlands can provide variety and interest to the trail, and it may be desirable or even unavoidable to incorporate them on occasion. When it is desirable to cross a wetland, do so at its narrowest point and incorporate an appropriate trail structure such as puncheon or boardwalk. Wisconsin requires a permit for altering a wetland. The local WDNR Water Management Specialist should be contacted prior to any wetland activities.



Cultural Resources

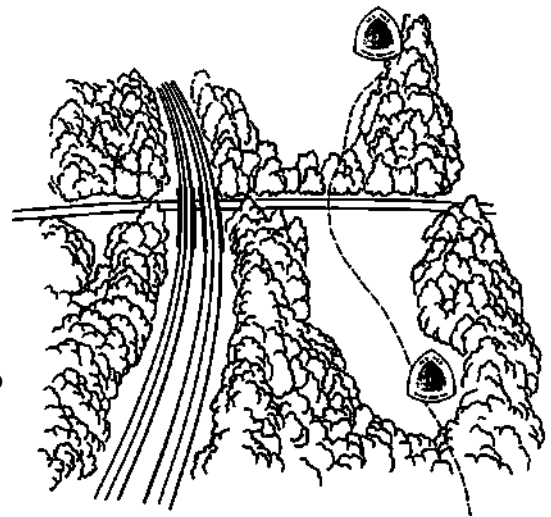
State and local historical societies are great places to find information about cultural resources located within the corridor, both prehistoric and post-European settlement. Historic sites can provide a great opportunity for interpretation and should be mapped as potential points of interest along the trail. However, some sites, particularly archeological sites, need to be avoided to help ensure their protection.

Effigy mound



Circulation Patterns

Another important factor when looking at possible routes for the trail are the primary and secondary roads that slice through the corridor and where they are located. Limiting the number of roads crossed by the trail will decrease unwelcome noise and negative human influences. Major roads that the trail cannot avoid require a considerable amount of time and effort to determine the best location to cross and how. Crossing State and Federal highways, and in some instances county trunk roads, in a safe manner may require negotiating with the respective departments of transportation to provide a pedestrian access either over or under the road.



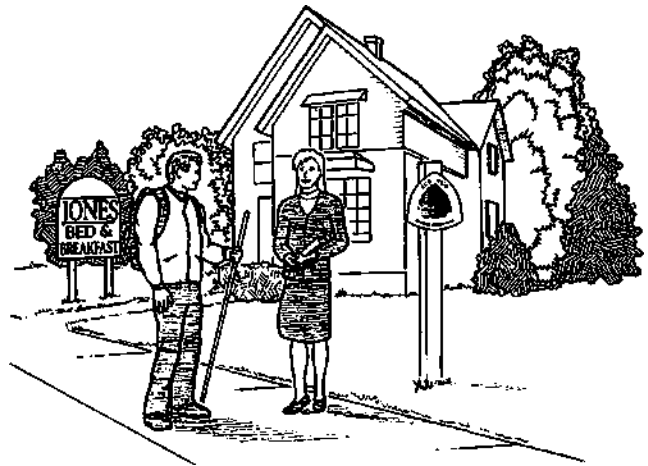
Existing recreation trails should also be part of the corridor analysis. As a regional trail, the Ice Age NST may provide desirable connections to existing trails, or it may use portions of these trails if uses and design standards are compatible.

Towns/Villages/Cities

The trail, particularly in the southern half of the State, cannot avoid going through some urban areas because of sprawling development. While one goal of the trail is to generally avoid areas of human impact, there are a number of reasons why villages, towns, and small cities play a significant role in the design of the trail. These population centers provide necessary support facilities for hikers (Refer to Figure 3, Chapter 6, Standards for Support Facilities), such as overnight accommodations, food, phones, restrooms, etc. They also provide the opportunity for the hiker to learn about the history of the area. The local community benefits by having additional greenspace³⁻⁵

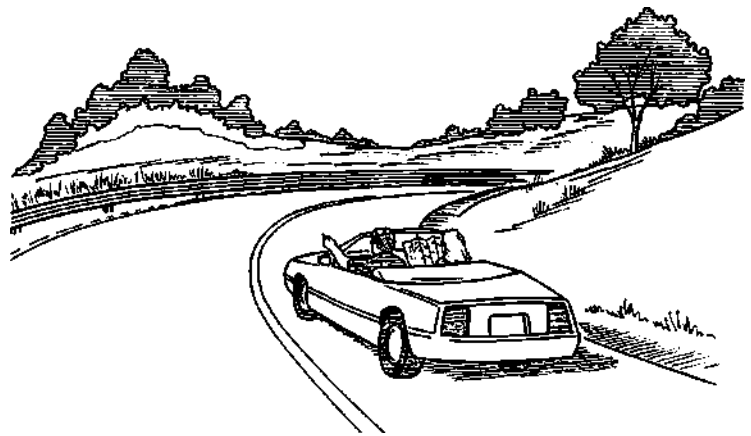
for recreation and education, increased tourism, and access to other regional parks.

Aligning the trail to pass through a community, versus bypassing it, generally takes the trail off of the moraine, or other geologic feature, and out of the countryside. This can complicate matters since the number of landowners and individuals involved in the decision making process for the trail can go up significantly. Therefore, when deciding to take the trail through a community, planners should carefully evaluate their choice. Attributes that favor routing through a community include, but are not limited to: a quaint and picturesque atmosphere, support by local officials and community, adequate support facilities for hikers, other attractions such as interesting local history, interpretive sites, shopping, bed and breakfasts, etc.



Visual Analysis

An extremely important task, but usually one of the last completed, is a visual analysis of the study area. It is important to drive through the area to look at the geological, biological, and cultural features that have been mapped. Where are they best observed? Where are the outstanding views? What other features are scenic? What are the various land uses and where do they occur? Where are the high and low elevation points? What would make a scenic or diverse hiking experience within the corridor? Where could the trail cross roads safely? Also, where are the unsightly features that you do not want located on the trail route such as mobile home parks, landfills, auto salvage yards, etc? It is very useful to write down notes on a map of the corridor to use back at the office when developing alternative routes.



USER DESIGN CONSIDERATIONS

One of the most important questions that must be answered when planning a trail (or any site) is who will use it after it is developed. Knowing who will use a trail determines its layout configuration, width, acceptable slopes, and whether any additional construction or trail surfacing is required to avoid erosion or environmental degradation.

As mentioned in Chapter 1, the Ice Age National Scenic Trail was modeled after the Appalachian Trail, a premier hiking trail. However, there are situations where uses other than hiking occur.



Use Policy

The 1983 comprehensive management plan for the Ice Age NST specifies the following:

The types of use permitted on National Scenic Trails is limited by Section 7(c) of the National Trails System Act (16 U.S.C. 1246 (c)), which states: " The use of motorized vehicles by the general public along any national scenic trail shall be prohibited..." This clearly implies that National Scenic Trails are potentially, but not necessarily, open to all nonmotorized trail activities. However, an exception to the prohibition of motorized use is provided for the Ice Age NST in Section 5(a)(10) of the Act: "Notwithstanding the provisions of Section 7(c), snowmobile use may be permitted on segments of the Ice Age National Scenic Trail where deemed appropriate by the Secretary [of the Interior] and the managing authority responsible for the segment." This is permissive language and does not mean that the entire Ice Age NST will be open to snowmobiling.

Segments currently open to snowmobiling are the portions of the trail that follow or overlap the Ahnapee, Glacial Drumlin, Sugar River, Military Ridge, Mountain-Bay, and Tuscobia State Trails. The comprehensive management plan continues:

All certified segments of the Ice Age NST shall be open to travel by foot, i.e., hiking and backpacking. Other nonmotorized 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.

Uses other than hiking should be permitted only if the activity will not cause significant deterioration of the trail and surrounding environment; the activity can be safely accommodated, i.e., the trail is constructed according to accepted standards for that activity; and the activity does not degrade the quality of the experience of hikers—the primary users. Other uses, which might impact the hiker's experience, physically damage trail resources, or which the trail was not designed to safely accommodate, including the safety of hikers, should be prohibited.

Bicycles and horses, when permitted by the local managing authority, are allowed uses on the Ice Age NST where it overlaps rail-trails, such as the Glacial Drumlin and Sugar River State Recreation Trails (bikes), and the Anaphee and Mountain-Bay State Recreation Trails (bikes and horses). The NPS, WDNR, and IAPTF strongly discourage, and in many cases prohibit, either bike or horse use on the typical tread for the Ice Age NST, which is a simple, single-track, unsurfaced footpath that meanders through woods and fields. Both bicycle and horse use can cause significant resource deterioration without the addition of improvements to the trail tread.

The types of use that are allowed on a segment of trail have major implications for the level of maintenance required and the amount of resource impact that must be mitigated. Foot traffic causes the least impact on the environment. Bicycles cause greater impact, and horses even more.

In regard to motorized use, the National Trails System Act is very clear. It defines national scenic trails as non-motorized trails. Section 7(c) of the Act (16 U.S.C. 1246(c)) limits the types of uses by stating, "the use of motorized vehicles by the general public along any national scenic trail shall be prohibited". This restriction not only prohibits the use of trailbikes, ATVs, etc., on the trail, it also prevents the recognition of marked routes on public roadways as the official route of the trail. Following short sections (less than one mile) of public road is permissible in some circumstances, such as when it is necessary to use a public vehicular bridge to cross a major river.



TRAIL ALTERNATIVES

Once a wide corridor or study area has been identified, natural resources mapped and analyzed, and uses determined, planners can begin to design alternative routes for the trail. There are a couple of reasons to develop more than one route proposal. First, there is rarely only one solution for the trail. Typically, within a 1-3 mile wide corridor, there are a number of possibilities. Second, because all landowner participation is voluntary, trail location needs some flexibility. If a landowner says no to the trail, there needs to be a back-up plan.

It should be noted that in the planning process, the trail alternatives stage occurs concurrent with the preparation of environmental compliance documentation (see page 3-12), and limited landowner negotiations (see page 3-13). All of these processes are fluid until a definite decision is made concerning the location of the trail.

As a reference, the maps that were developed during the data collection/site analysis phase will be very important during the alternatives phase. On a new topographic map or aerial photo "must haves," or key places and features where the trail must pass, should first be identified. These could be outstanding glacial features, scenic views, the best road or stream crossing sites, campgrounds or campsites, historical sites, connection spots with other trails, water sources, etc. The next step is to connect these sites, taking into consideration all of the above described variables (topography/slope aspect, vegetation, soils, etc.), with a journey that is exciting and diverse. This is where the creativity begins. The standards for the trail, trail structures, and support structures detailed in Chapters 4, 5, and 6 should be closely followed at this time to develop alternatives that protect the environment and accommodate the user.

After evaluating the area's resources and determining which have value to the trail, it can be helpful to develop specific objectives in order to focus on possible route locations. For example, taking the goals given on page 3-2:

- **Goal:** Trail is in a visually pleasing corridor that includes scenic vistas.
Objective: Trail will pass through Joe Smith's undeveloped birch forest, meander along the pristine trout stream and kettle ponds at The End of the Glacier County Park, and incorporate views of the outstanding drumlin field from at least three different vantage points.
- **Goal:** Trail provides connections to other trails, recreation facilities, parks, natural and cultural resource areas, communities, etc.
Objective: Trail will link up with Youknowwhat State Recreation Trail to provide access into the Village of Where, and Here and There State Park.
- **Goal:** Trail has necessary support facilities.
Objective: The trail will utilize existing trailheads in the State Forests and County Parks for parking and rest rooms. Because the north end of the trail segment lacks existing facilities, two 6-car parking lots will be developed to accommodate hikers. To provide overnight facilities every 8 miles, trail will go through This and That State Parks for camping and the City of Now for bed and breakfasts.
- **Goal:** Trail provides for a diversity of experiences by passing through a variety of

geographic, vegetative, and cultural features.

Objective: Trail will traverse the terminal moraine and recessional moraines, winding past kettle ponds, kames, and drumlins. Trail will meander around remnants of a large Native American village in Two Arrows County Park and past the Early Settlers Museum in Folksville. Since the predominant presettlement vegetation in the area is oak savanna, a 1,000-acre oak savanna community will be restored/recreated along the trail.

Sometimes the design objectives conflict with each other. When conflict exists, preference should be given to the environment over user convenience or desire.

USER EXPERIENCE

When developing the trail route on a detailed, site specific level, the following factors should be taken into consideration in order to create an optimum experience for the hiker.

Themes/Subthemes

The last amazing glacial event is the primary story or theme behind the Ice Age NST. Within the primary story there are countless subthemes i.e., outstanding views, scenic areas, glacial features and other landforms, unique biological communities, historic sites, etc., around which the trail should be designed. Because of its length, it is useful to break the trail into segments with specific subthemes and destination points.

Vistas/Progressive Realization

Along the route of the trail there are opportunities to take in scenic views or vistas of specific features that the hiker is moving toward or away from. The specific feature with its associated view is the primary focus on which a subtheme for that segment can be developed. As the hiker moves along the trail through valleys and hills, this feature is seen at different vista points along the trail. At each site the feature has changed since it was last seen and consequently it gradually reveals itself as the hiker moves toward it—from a faint outline, to gross masses and then to refined details. This is



called progressive realization. Whether it is a town or a significant geologic feature like the Baraboo

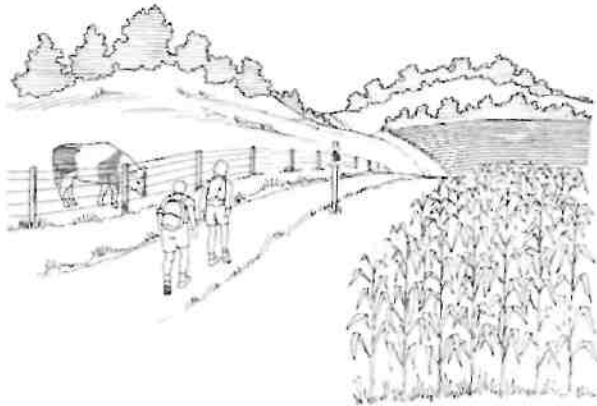


Range, the feature in concert with progressive realization will:

- Act as an impeller — a magnet, drawing hikers from destination point to destination point.
- Create a landmark to orient oneself in the landscape.
- Create mystery and interest along the trail.

Trail Landscape

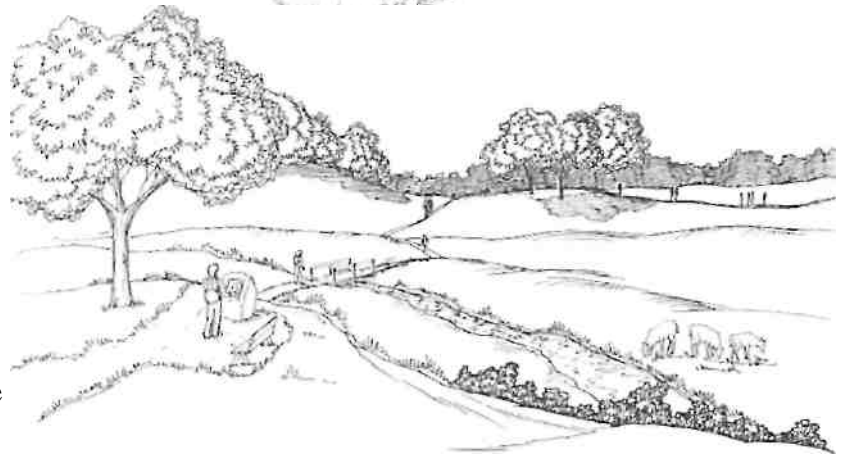
South/Central Landscapes



Northern Landscapes



It is desirable that the trail provide a representative view of the area through which it passes. In southern and central Wisconsin the trail typically winds through open valleys and wooded hillsides in a predominately rural, agricultural landscape. Historically, this landscape was more open but, due to



suppression of fires since the settlers arrived, trees have overtaken what used to be prairie. There is an ongoing effort on the part of public and private organizations to restore prairies along the Ice Age Trail for biological, educational, and experiential purposes. The open areas provided by some restored prairies, but more commonly by agricultural fields, allow the hiker a glimpse into the pastoral landscape of Wisconsin. Therefore, in the south and central areas of the State, sizable portions of the trail should pass through or next to open areas. In the northern part of the State, the landscape is more forested. In these wooded areas, incidental openings and old fields should be sought for variety. Variety in laying out the trail is the key. Too much of anything produces monotony and boredom.

Terrain

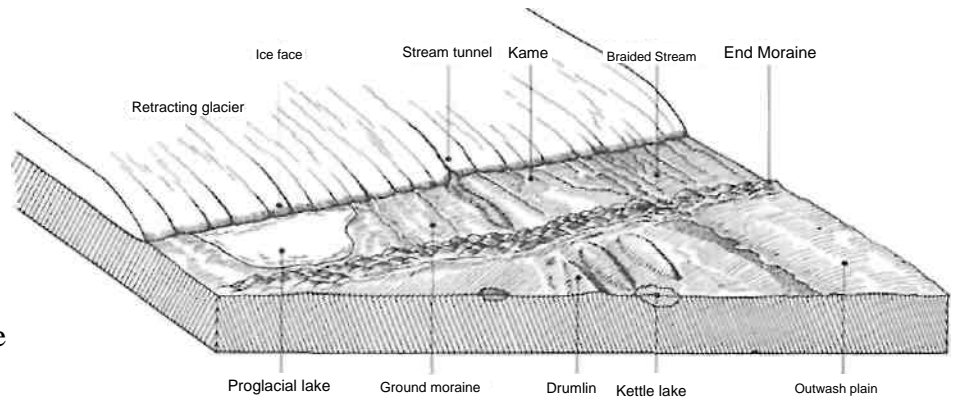
When designing the route of the trail, it is important that users experience the full array of terrain. The route should be in continuous transition. Portions of it should take the user along ridge tops,



while at other times the trail should be routed through more intimate valleys. The lengths of upland, lowland, etc. may vary and should be influenced by the natural landforms available. Some experiences should also be left to the user's imagination. Every hilltop should not be climbed, nor every valley entered. Care should be taken to avoid overly steep grades where environmental damage is likely.

Glacial Features

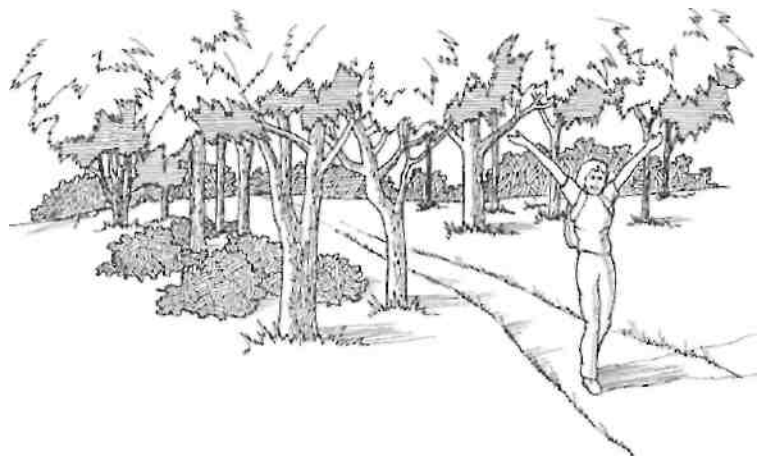
The distinctions between the glaciated and non-glaciated landscape of Wisconsin are the soul of the Ice Age NST because it is through them that the story of the great ice age is told. The components of this landscape—moraines, eskers, kames, drumlins, kettle ponds, outwash plains, etc.—are key features that guide the location of the trail. They also add interest, variety, and offer opportunities for interpretation. The user should be able to experience



these features from a variety of perspectives incorporated in the trail layout (e.g., enabling the user to traverse the entire length of one esker, and then parallel another esker from a sufficient distance to allow for good viewing of the landform). The integrity of glacial features such as kames should be protected. Trail development on kames should be avoided because the soils are too fragile and the slopes are generally too steep. The trail should never compromise the integrity of glacial features.

Open Space/Vegetation

It is important to route the trail so portions are occasionally in the open. This provides stimulating experiences—the user can see the sky, feel the sun, and enjoy a contrast to the woodland experience. It enables the user to view the landforms and natural features from a variety of perspectives, both from long distances and more intimate ones. Some routing might be through the middle of a large open space while some might be along the edge. Other routings might take the user into the middle of an open space, then over into the woodland for a short distance, and then back out into the same open space along the edge.



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Wooded areas can provide heat relief for hikers and volunteers performing trail maintenance. Maintenance will vary depending on what the ROS setting is where the trail is located. Open areas require mowing or brushing equipment to keep the trail open. Trail maintenance through wooded areas is less intense and longer lasting. In agricultural areas, farmers are not likely to want the trail to pass through the middle of their cultivated fields. Benefits of open areas can be provided by routing the trail close enough to large openings to see into them, yet staying far enough in the woods so as not to interfere with farming practices and also avoid the vigorous growth of annuals and perennials found in the opening's sunlight. If a trail corridor becomes publicly-owned, a vegetative management plan that considers both historical and current vegetation should be prepared.

ENVIRONMENTAL COMPLIANCE

Planners need to be aware of environmental compliance requirements as they begin to develop trail alternatives. As an authorized Federal and State project, planning and implementation of the trail requires compliance with the National Environmental Protection Act (NEPA), Wisconsin Environmental Protection Act (WEPA), Endangered Species Act, and Historic Preservation Act. Local experts and agency officials should be contacted early in the planning process to learn what fragile soils, threatened or sensitive species, and cultural and historical resources occur in the area prior to choosing a preferred alternative in order to minimize impacts.



Once a preferred route has been chosen, a more formal review for endangered natural or cultural features must occur before the trail is constructed or structures built, e.g. a bridge. It will also determine if an environmental assessment is necessary. Obtaining these reviews requires two separate procedures. To fulfill compliance for the Endangered Species Act, a Natural Heritage Inventory review of the project is needed. Contact the WDNR Bureau of Endangered Resources to obtain an information request form on which the project and legal description will need to be detailed. A map of the project should also be submitted. Generally most projects do not affect endangered resources. If resources are found, the agency will work with the applicant to evaluate options.

A cultural resource review can be more complicated. In order to avoid damage to or destruction of historic and prehistoric resources, the project must comply with the requirements of the National Historic Preservation Act and the Archeological Resources Protection Act. Project approval regarding historical and archeological concerns rests with the State Historic Preservation Officer (SHPO).

To determine what action will need to be taken, the same information that was sent to the Bureau of Endangered Resources should be sent to the State Archeologist within the WDNR for review. If more than minimal earth disturbance is contemplated (e.g., when constructing a parking lot, digging footings for bridge abutments, etc.), an archeological survey and SHPO approval is required prior to project initiation. Again, in cases where a project is going to be developed on sensitive lands, or is controversial, an environmental assessment may need to be written.

LANDOWNER NEGOTIATIONS

Ideally, the Ice Age NST would be permanently protected and perfectly located to display its outstanding glacial features and create a world class recreation trail. However, the location of the



trail is not always the choice of the planner or trail builder, but rather results from what can be worked out with the landowner. It is also possible that the alignment can change over time.

In agricultural areas, where land is still in production, farmers are not likely to want the trail to pass through the middle of their cultivated fields. Greater acceptance of the trail can be achieved by routing it along fencerows or through woodlots. However, in the future, should the farmer decide to sell the land, a more desirable location for the trail should be sought.

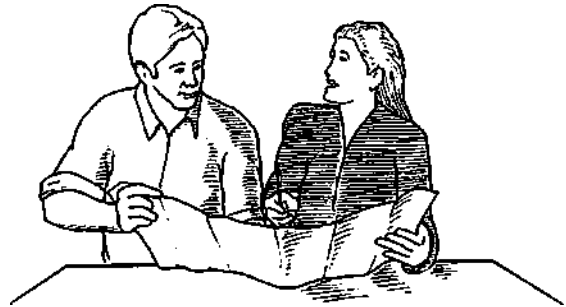
Initial contacts with landowners along a desired route should be done by trail people from the local area who know the landowners. It is helpful if the owner has an interest in or is supportive of the Ice Age Trail project. Their current financial situation and future desires will also influence whether they want to be involved.

In general, there are four mechanisms for obtaining passage for the Ice Age NST across private lands. They are license and handshake agreements, conservation easements, donation, and purchase.

License and handshake agreements allow the trail to cross private land but are not permanent.

Typically, the agreement cites the location of the trail, what uses will be allowed, and who is responsible for trail maintenance. It can be voided at any time. A handshake agreement lets the landowner

"try out" the trail without feeling it is a permanent situation. Sometimes this is the only way to get the trail through for the foreseeable future.



Conservation easements, donation, and purchase are three options that create a permanent route for the trail. There are a number of variations within each category. To find out more about these alternatives, read *Wisconsin's Ice Age Trail, A Guide for Landowners*. You can obtain copies from the Ice Age Park and Trail Foundation office.

FLAGGING THE TRAIL

Once the best route for the trail has been identified and permission from landowners or acquisition has occurred, trail developers may now lay out the trail.

Taking the time to locate and flag the proposed route is a time consuming but important first step. Initially, to get a feel for the area, a field reconnaissance between the two endpoints should be completed. Topographic maps are important and should be used to locate key points that the trail must pass. Once key points are identified, a line may then be flagged to connect them, while attempting to stay within the slope guidelines shown in Figure 1 (Chapter 4). Use of a clinometer is recommended. (See Appendix 3 regarding eye-level survey techniques.) Maintaining a moderate grade



when laying out a trail through hilly terrain can be challenging, and the flag line may have to be moved several times before the best route is located. However, this step should not be abandoned in discouragement. It can save future maintenance headaches and produce a much more pleasurable hiking experience.

TYPES OF TRAIL

Development of the trail varies depending on the terrain through which it is passing. Much of the existing trail has been built as a simple brushed, unsurfaced path. As long as the trail is on fairly level ground and stable soil, this is typically easy to maintain and accomplishes the purpose of the trail. However, once the trail begins to climb or descend, the stability of the trail tread becomes a factor.

Sidehill Trail Construction

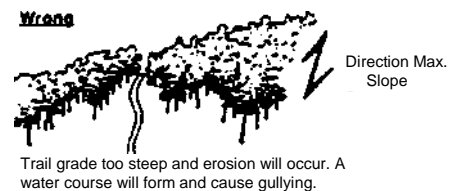
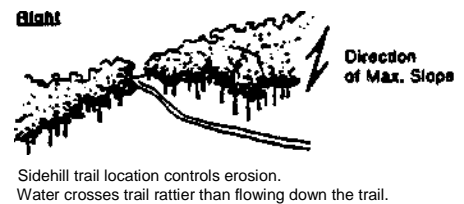
The best way to prevent erosion in hilly terrain is to construct the trail on sidehill locations and maintain moderate grades (see Chapter 4). Even on moderate slopes, the trail should never go straight up a hill. Wending the trail across the face of the hill, gradually gaining altitude by using sidehill 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 downhill side. Sidehill construction makes it easier to maintain moderate grades, further reducing erosion.

Sidehill construction requires more skill and initial work than a brushed path. However, in the long run, it provides a

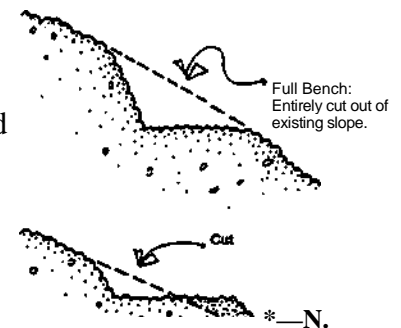
more stable trail with less environmental damage. When employing sidehill trail construction, it is important to do the job properly. Poorly constructed trail can cause difficult hiking and sore ankles if the hiker has to walk with one leg higher than the other. The trail tread must be excavated so that 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 either half- or full-benched trail tread. A half-benched tread (sometimes called balanced tread construction) means that half of the tread is on an excavated area and the other half is on fill.

Full-bench tread construction means that the entire tread is on an excavated area; there is no fill. This tread is very stable. 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 rip rapping or log

cribbing, may be required in steeper areas.



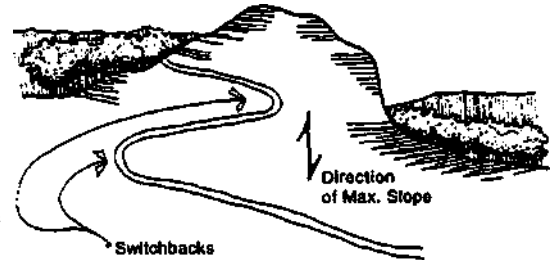
Typical Sidehill Construction



1/2 Bench: Half cut and half fill.

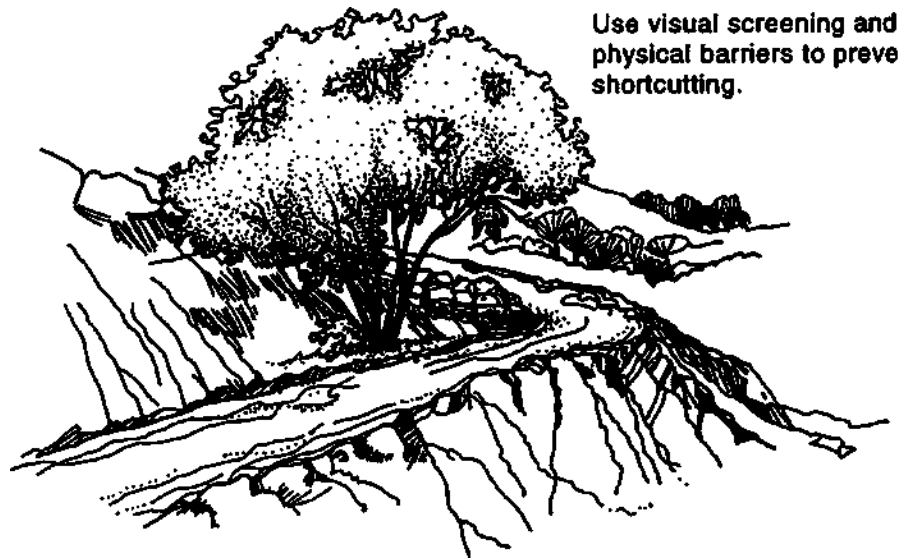
Switchbacks

To ascend or descend a steep slope, switchbacks are one method that can be used to maintain the grade of the trail while gaining the required elevation. Rather than going up a steep climb, they continue the trail on a moderate grade in one direction, then reverse direction, and continue to climb at a moderate grade. Because switchbacks lengthen the trail, are boring to walk, are difficult to construct and maintain, and are often shortcut by hikers, they should be minimized in number and frequency.



The manner in which switchbacks are placed on the land is critical. To avoid hikers shortcutting them, switchbacks and turns should provide the easiest, most attractive route for ascending and descending, and their visibility should be limited.

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. A trail with switchback layout is also enhanced by increasing the length of trail between switchbacks into grand sweeps and by varying the length and placement of adjacent switchback legs.



Use visual screening and physical barriers to prevent shortcutting.

Proper switchback construction requires specific techniques. On sideslopes of less than 20 percent, the switchback should be treated like 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 built. Excavation should start along the 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. Turns should be flat. This requires careful location, or construction of cut and fill sections, or retaining walls.

Spur Trails

These are dead end trails that provide access to facilities or features near the main trail such as viewpoints, campsites or shelters, and water. Spur trails can also lead from a trailhead to the main trail. They can enhance the recreation experience by allowing visitors to see interesting features that the main trail misses, and help control overuse of sensitive sites. They force the hiker to make a

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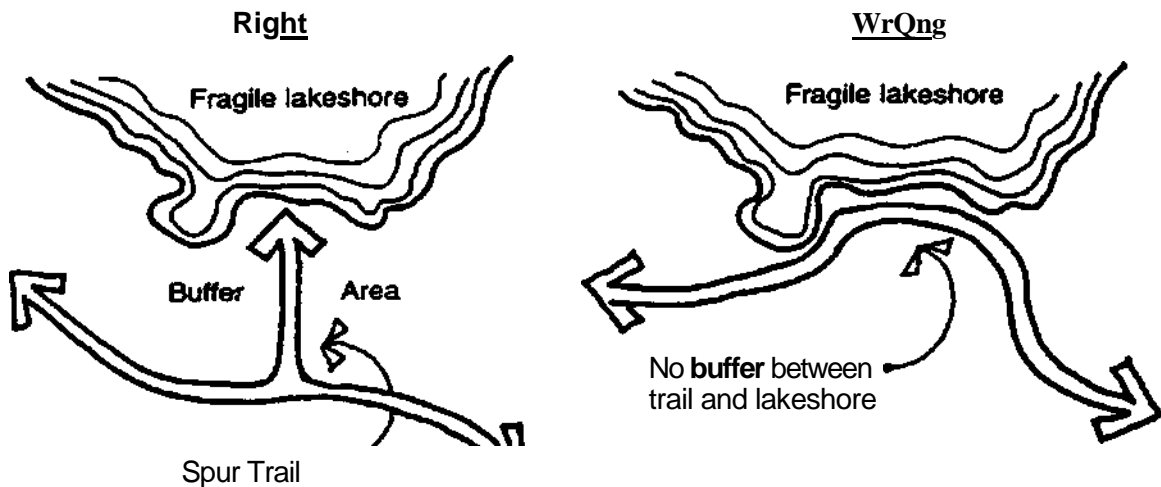
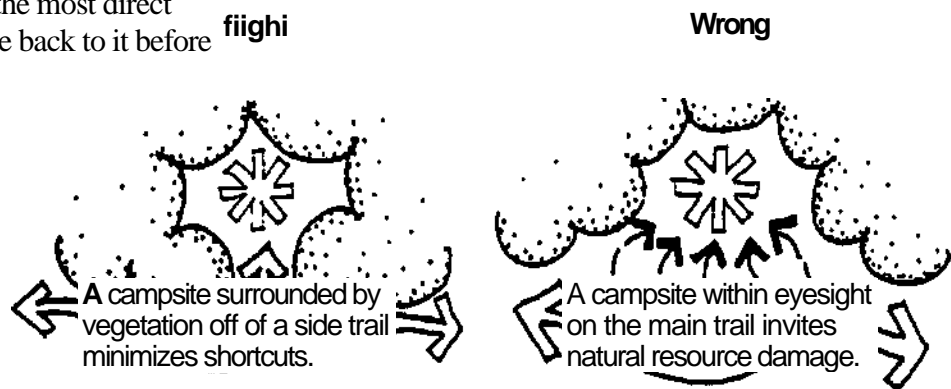
conscious choice to leave the most direct (main trail) route and double back to it before continuing their journey.

In almost all cases, it is desirable to locate campsites and shelters on a spur trail, out of sight of the main trail. This eliminates widening and trampling of the approaches to the

campsite and provides for less disturbance to campers already using the site. When a campsite/shelter is located within sight and sound of the main trail, hikers gradually widen the approach to it and enlarge the campsite itself by taking shortcuts and destroying the vegetation. To minimize shortcutting, the spur trail should be the easiest, shortest, and most logical route to the amenity. Campsites and shelters should be located at least 200 feet off the main trail (especially in heavy use areas) unless rugged terrain or ownership patterns limit this distance. Less used sites can be a shorter distance away depending on the circumstances.

Drinking water sources, ponds and lake shores, fragile escarpment edges, and other areas containing fragile plants or unstable soils are often protected by bypassing the feature. However, if this is done, much of the interest of the trail will be missed and hikers will establish their own impromptu trails to reach the site anyway, often causing more impact.

The best compromise is to limit access to the least sensitive part of the attraction via a spur trail. This reduces the impact by limiting the access to a single point and potentially reducing the number of users. If an existing main trail is causing undue impact to a sensitive area, relocating the trail away from the feature and providing access via a spur trail is a consideration. The main trail should be kept far enough away from the attraction so the sensitive area is not obvious and impromptu trails do not develop. A new location should be selected where views of the feature will be available from the



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main trail to satisfy the user, further reducing the number that follow the spur trail.

In order to provide variety and interest along the main trail, spur trails are not always recommended. The main trail can be routed past features that can withstand more impact. To reduce overuse, trail developers should try better trail construction, moving the trail to a more stable terrain nearby, or educating users. A balance between the environment and recreation is the goal. However, when questionable conditions occur, the environment should have priority.

CHAPTER 4

STANDARDS FOR TRAIL CONSTRUCTION



The ultimate objective of trail standards is to provide for an enjoyable hiking experience. In order to achieve this objective, standards must ensure high-quality construction and maintenance, a consistent look, and a basic level of safety. They should also provide for persons with disabilities where appropriate, and protect the natural resources through which the trail meanders. The following standards were developed to meet these objectives without compromising the character of the trail, or imposing undue hardship upon those who maintain the trail.

Figure 1 on page 4-5 summarizes the desired trail standards according to the Recreation Opportunity Spectrum (see Chapter 1 to determine level of accessibility). Since the trail passes through three recreation settings (see Chapter 2), it will change accordingly. However, the trail will still be recognizable as the Ice Age NST through consistency of signage, blaze color, and clearing width. Improvements to a particular trail segment should be made if it is significantly below the standards. Trail realignment or heavy maintenance are good opportunities to reconstruct the trail up to standard.

TREAD WIDTH

Tread width is 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 underlying, smooth structure is still in place.

CLEARING WIDTH

Clearing width is the area kept free of brush, limbs, briars, tall grass, weeds, and other obstructions which could slap against the hiker or their pack, or soak them after brushing against them following a rain or heavy dew. In heavily wooded areas, simply pruning limbs will normally maintain the clearing width. Here, 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 where sensitivity to the aesthetics or natural resources of the surrounding area is needed. For example, in wooded areas, there are occasions when 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 aesthetic reasons—not merely to reduce trail construction/maintenance efforts. When the trail crosses fields or prairies, it is suggested that as a minimum, the entire clearing width should be mowed. Widening the mowing area may also create a variety of visually pleasing clearings. These clearings may highlight a bright clump of wild flowers or a flowering shrub such as a hawthorn or dogwood.

Figure 1 (on page 4-5) shows the clearing width on each side of the 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

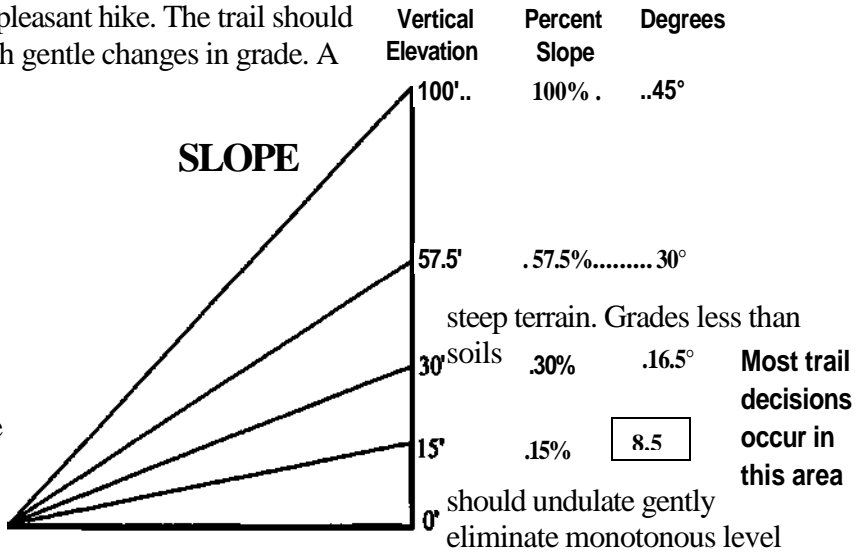
The trail should be cleared to a height of 8 feet (10 feet within Wisconsin DNR properties). If the trail is in an area of deep snow and it receives winter use, clearing may have to be higher.

SLOPE (SUSTAINED)

The slope (grade) of the trail 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 hilly areas with gentle changes in grade. A

sustained slope is a consistent grade that is greater than 100 feet in length.

To minimize erosion and increase hiker safety, the slope should normally be less than 10%—even in 7% in all soils are ideal, but in sandy they 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 to provide natural drainage and to 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 (see Chapter 10—Selecting the Right Tool).

SLOPE (MAXIMUM)

While reasonable efforts should be made to construct the trail using the sustained slope guidelines, there are situations 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 that exceed the sustained grade standards should 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

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 Figure 1. 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 constitutes a drop of 1.2 inches.

ACCESSIBLE TRAIL STANDARDS

These standards apply only when a trail segment is designed to be fully accessible. Figure 1 specifies the maximum distance between passing and rest areas. Each passing space should be 60" x 60". At intervals specified, rest areas are built adjacent to passing areas and may include a bench or other facilities. (Additional site details can be found in the appendix)

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.

Figure 1 shows a range of surfaces that are acceptable in the various ROS settings. While several options are shown for rural/roaded natural areas, the preference is for native surfacing. The Accessible Surface Standards apply only when a trail segment is designed to be fully accessible. Wood chips should not be used to correct wetness problems. They only add more organic material to the site and compound the problem when they rot. Also, wood chips cannot be used on steeper slopes, as they do not stay in place. They are acceptable on relatively level sections of trail to smooth an otherwise rough tread surface and to help retard weed infestation and wear of the natural surface.

Figure 1: Ice Age Trail Construction Design Standards

Standards (desired)	ROS CLASS		
	Urban	Rural & Roded Natural	Semiprimitive
Tread Width Hiking Segments Accessible Segments	48" 60"	24" 36"	18" 28"
Clearing Width (each side of tread)	24"	12" (WIDNR-24")	12"
Clearing Height (minimum)	10'	8' (WIDNR-10')	8'
Slope (max. sustained) Hiking Segments Accessible Segments	10% 5%	10% 5%	15% 12%
Slope (max.) Hiking Segments Accessible Segments	15% for 100' 8% for 100'	20% for 100' 10% for 50'	30% for 100' 10% for 50'
Cross Slope (max.)	3%	5%	8%
Accessible Segment Standards Passing Spot Int.-max. Rest Area Interval-max.	N/A 1,200'	600' 1,200'	1,200' 1/2 mile
Surfaces Accessible Surfaces	Asphalt, concrete, stabilized aggregate, screening ⁽¹⁾ , wood chip, sod. Asphalt, concrete, stabilized aggregate.	Native, wood chip ⁽²⁾ stabilized aggregate, screening ⁽¹⁾ Asphalt, stabilized aggregate.	Native Native, stabilized aggregate

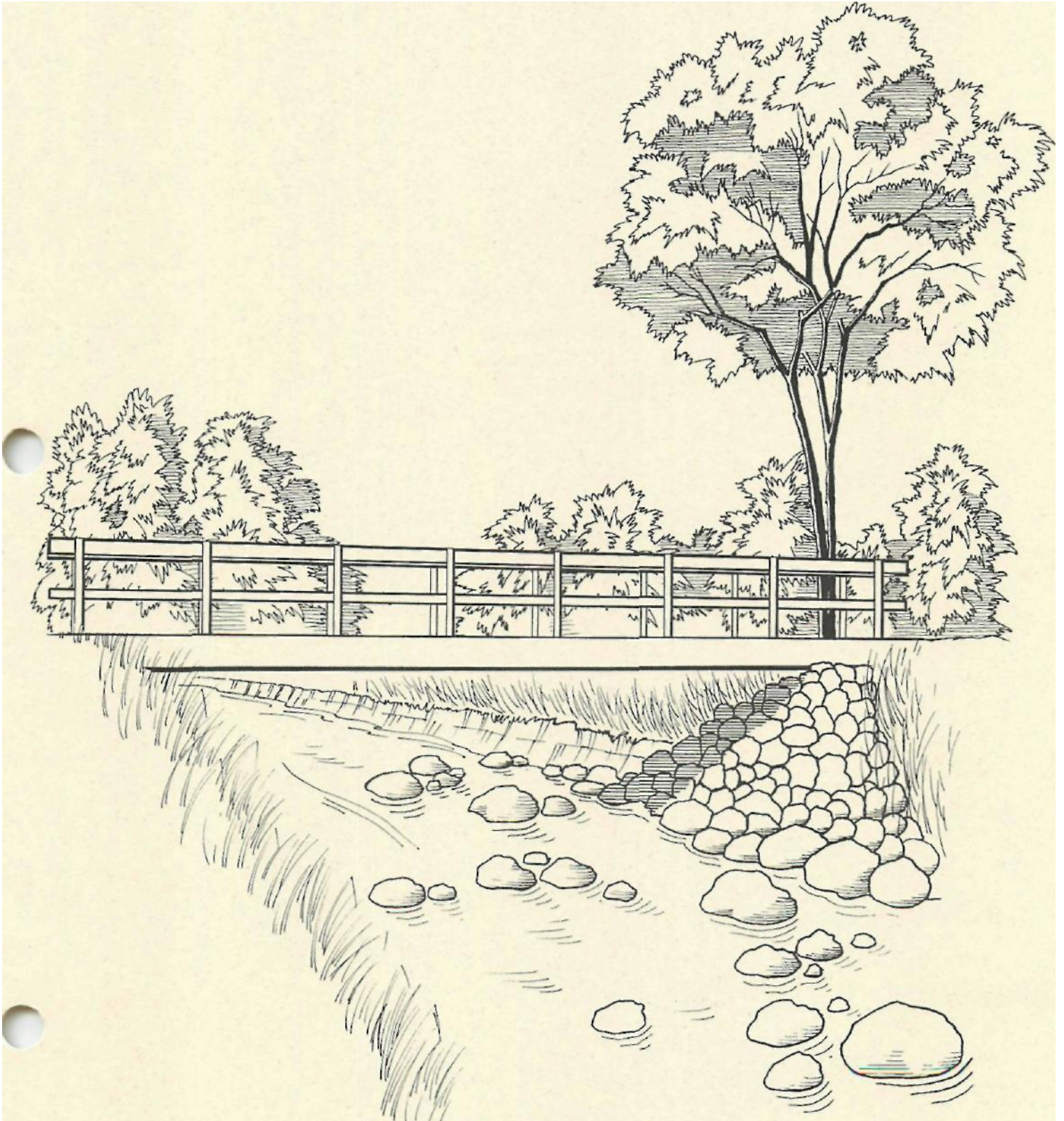
(1) Limestone screenings include the fines.

(2) Not in wet areas-adds to problem.



CHAPTER 5

TRAIL STRUCTURES



Trail structures discussed in this chapter are those that are necessary for safe passage over wet areas, or topographical or human barriers. Temporary structures and those to avoid are also described. Standards are summarized in Figure 2 (page 5-13).

Trail structures are necessary to meet the demands of various situations. The decision to build a trail structure should be in response to user safety and environmental protection issues—not user convenience issues. Structures require a major commitment of both initial and subsequent costs, time, and maintenance. In addition, construction over designated wetlands or navigable streams can be difficult and require permits. Therefore, whenever possible, the trail should be located to avoid areas with seasonal or year-long water problems. Where wet areas are unavoidable and rerouting is not possible, structural improvements should be used to protect those areas and provide a dry, stable treadway for the Ice Age NST, except during inclement weather or heavy dew. Hikers should not have to wade through streams or saturated wetland areas; this is not only unpleasant and dangerous, but potentially damaging to the environment.

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. Rock, as used by the CCC, makes a longer lasting retaining wall, bridge sill, or water bar than wood. Certain species of wood are more durable than others and should be used. If native materials are used, the source site should be left in as natural condition as possible.

WATER CROSSING STRUCTURES

The State of Wisconsin and Federal governments have rules regarding water crossing structures and placement. Chapter 30, Wisconsin Statutes, requires permits for any work on beds or banks of navigable streams and Section 401 of the Clean Water Act gives the WDNR jurisdiction over wetlands. The Clean Water Act, Section 404 also gives the U.S. Army Corps of Engineers jurisdiction over wetlands and waters of the United States. It is necessary to work closely with the Wisconsin Department of Natural Resources and U.S. Army Corps of Engineers to ensure that all specifications are met and all required permits obtained. It is also recommended that applicants contact local zoning agencies to insure compliance with county, town, city and/or village ordinances. Plenty of lead time is critical as this can be a lengthy process, depending on the stream being crossed and the complexity of the structure. Once the decision has been made to build, you will need to consider the following:

- ▶ Any water feature that shows up on a USGS map, intermittent or not, is considered navigable and would require a Wisconsin Statute, Section 30.123 permit, if crossed by a bridge or culvert.
- ▶ Bridges spanning 35 feet or more require public notice before building.
- ▶ Boardwalks and puncheons, if in a riparian setting, and if below the ordinary high water mark (OHWM) on a navigable water feature, would require a Wisconsin Statute, Section 30.12 permit. These structures should be constructed using high quality materials and building techniques so as to encourage circulation of air and water.

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- ▶ In wetlands, the use of fill requires a Section 404 permit from the Corps of Engineers. However, the use of fill is discouraged in favor of the structures mentioned above.

To initiate obtaining the necessary permits, or if there is any question on whether a permit is needed, you will need to speak to a WDNR Water Management Specialist. To determine who is the Water Management Specialist for your area, check listings at the following website:

www.dnr.state.wi.us/org/water/fhp/people/wms.htm or contact the WDNR office within the region where the site is located. To find which WDNR Region, see Appendix 5 for a Regional Map.

The WDNR Regional office phone numbers are as follows:

- Northeast Region: Green Bay (920) 492-5800
- Northern Region: Rhinelander (715) 365-8900, Spooner (715) 635-2101
- South Central Region (608) 275-3266
- Southeast Region: Milwaukee (262) 263-8500
- West Central Region: Eau Claire (715) 839-3700

The WDNR Water Management Specialist can tell you whom to call at the Corps of Engineers to obtain federal permits.

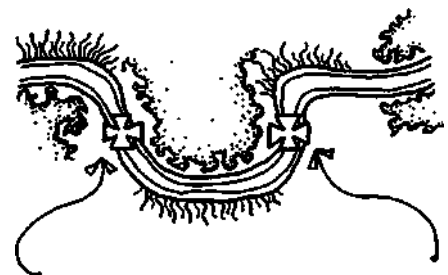
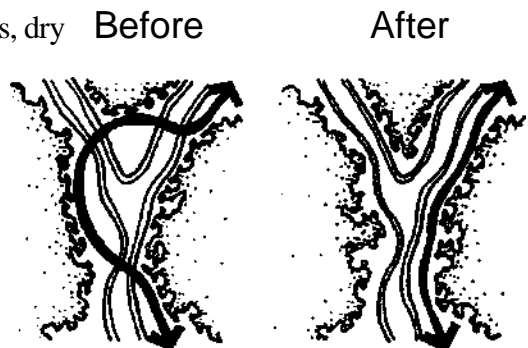
Bridges, boardwalks, culverts, and puncheon are four of the most environmentally sound and commonly used structures to cross water. Their descriptions are as follows.

Bridges

Bridges are structures for crossing permanent and seasonal streams, dry ravines or gorges, and other obstacles in a safe, environmentally sensitive manner. They are also expensive to build, require regular inspections, and need frequent maintenance. All stream crossings and other potential locations for bridges should be reviewed by qualified personnel or engineers to determine whether they are really necessary or if other alternatives, such as rerouting the trail or using a culvert, are better solutions.

The difference between a bridge and other water crossing structures is that it spans a definable stream, ravine, or other obstacle, rather than resting on a long series of sills (puncheon) or posts (boardwalk). However, like a boardwalk, a bridge can have one or more piers. To cross a wetland or general surface water typically requires a boardwalk or puncheon. Situations requiring hybrid solutions may occur where a wetland with a stream flowing through it will have a bridge placed over the stream and a boardwalk constructed over the wetland attached to it.

Safety is a primary reason for constructing any bridge and a consideration in the bridge design. For these reasons, a bridge



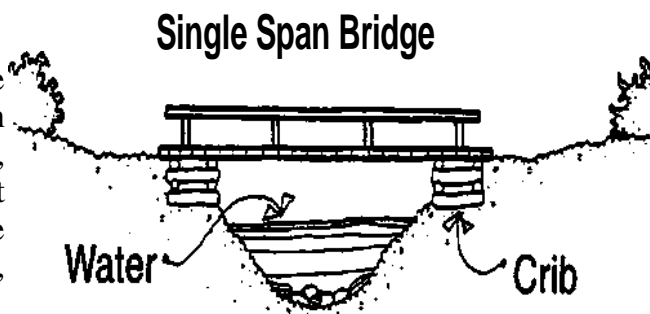
Best bridge sites are midway between turns.

is often appropriate when crossing even small streams or dry ravines. One of the best locations for a bridge is where the stream or ravine has a narrow crossing and high banks on both sides to anchor the ends of the bridge. Whenever possible, the entire wet area should be spanned, or ramps built as an approach to an elevated bridge. This eliminates the need for steps, which are an accessibility barrier.

Design of the bridge must provide for clearance of high water, ice, debris and navigation under the bridge during normal flow conditions or at the very minimum a portage around the bridge. Bridges built with an adequate opening to accommodate floodwaters have a better chance of survival. Before initiating any construction drawings, contact the local WDNR Water Management Specialist to obtain this information. When designing a bridge, assistance should be sought from agency partners, private engineering consultants, or other qualified personnel (see Bridge Engineering).

Bridge Design - There are many potential bridge designs that ensure adequate public safety. Creativity is encouraged. The look and design of the bridge should emphasize the ROS setting and harmonize with the surrounding landscape. In urban and suburban settings, the bridge may have a polished look; in a semi-primitive setting, it may look more rustic. Whenever you design a bridge, please refer to standards shown in Figure 2, page 5-12.

A ravine or gorge over 10 feet wide can often be crossed with a single-span bridge. single-span bridges normally require fill or rip rap on each bank, two to three solid timber or laminated support beams, a board deck, railings, etc. In areas where the span becomes too long for a single-span bridge, a suspension bridge may be necessary.



Bridge width - Bridges should generally be designed to accommodate the kind of use and the numbers of users expected. They should also be designed to provide for passage of wheelchairs. Bridges allow users to traverse a trail barrier and because they are long-term investments, requiring a substantial commitment of funds, they should not become a barrier in and of themselves. Therefore, the minimum width should be as shown in Figure 2, page 5-12. These widths provide accessibility, even on trail segments that are not specifically designed to be barrier-free or fully accessible.

Consideration should also be given to providing for mowing-equipment crossings, if needed for maintenance beyond the bridge, and in some cases larger maintenance and emergency vehicles. A wider bridge should also be considered in urban locations, areas of high use, or where other user groups, such as bicyclists or horseback riders, may share the trail.

Bridge railings - Railings are necessary for safety and to increase visitors' level of comfort. Bridge railings will generally be a minimum of 42" in height, but may be higher when crossing highways.

Bridge engineering design -All trail bridges must be designed to bear loads that meet or exceed current management standards for architectural design and engineering of pedestrian structures, as well as provide for visitor safety, accommodation of flood waters, etc. To achieve this objective, a licensed engineer should either design or review the construction drawings and their elements (stringer size, strength, snowload, peak flows, etc.) prior to construction.



If a bridge is being funded through the National Park Service's Challenge Cost Share Program, the project sponsor should provide information regarding the need for the bridge, a map of its location, copies of permits, and construction drawings that show the bridge's span, height, materials used, and other details. All construction drawings must have the stamp of a licensed engineer.

Bridge inspection and maintenance - Bridges require periodic maintenance to insure their stability and safety. Debris should be removed, bolts checked and tightened, sills inspected for rot, etc. 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 vigilantly watch for hazardous conditions between inspections, and should also routinely inspect smaller bridges.

Boardwalks

Typical locations where boardwalks can be utilized are cattail and deep marshes, or other water bodies that have little fluctuation in water level and flow. Boardwalks commonly cross areas that have deeper water than can be crossed by puncheon.

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. Also, the decking on a boardwalk is laid perpendicular to the direction of traffic flow, 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. Hybrids between boardwalks and puncheon are common. Wetland crossing permits are typically required.



Since boardwalks are a major, long-term investment, and they often cross moderately deep water, the standards specified in Figure 2 should be used to provide a safe crossing and wheelchair passage. 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. A kickplate should be added to the structure 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. Minimum width of a boardwalk should be 28 inches between the kickplates. Depending on the situation and the desires of the local manager, handrails are optional.

Culverts

Culverts are cylinder-shaped passages generally made of non-rusting metal or plastic and come in various lengths and diameters. They are used to pass water under the trail, and are an

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excellent alternative to bridges. Culverts are generally more cost effective than bridges, are easier to install because they come in one piece, and are very unobtrusive. Once a culvert is installed, maintenance is limited to insuring that the interior is kept free of debris and that the soil or riprap around the inlet and outlet is not eroding.



End View

Culverts are most effective for small creeks or intermittent streams with

Flow

limited peak flows, and in natural drainage-ways, where minimum excavation is required. They also can be used in flat areas to provide equalizing cross-drainage or turnpike sections, and to

Water

reduce the damming effect. They are not appropriate in locations where it is difficult to haul a large and heavy object into the site. Also, at locations where the intent is to draw attention to a stream by providing an aesthetic crossing, or if the experience of the sound of boots on wood decking is important, then a bridge should be built.



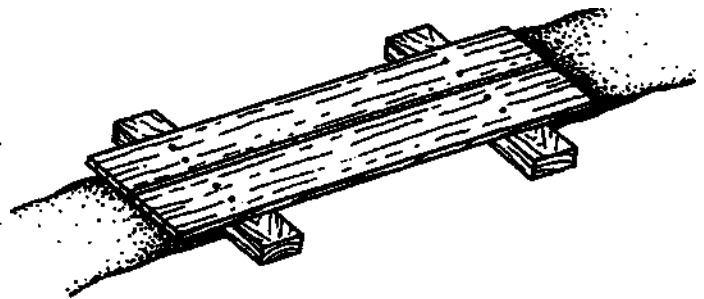
As with bridges, professional engineering advice should be sought to insure that the culvert is sufficiently sized to accommodate peak flows. Pipe diameters less than 12 inches may present frequent cleaning problems. If the stream is a navigable waterway, permits will be required. Your local Water Management Specialist can make this determination for you.

Some basic principles should be followed when installing culverts. Culverts should be placed 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, which also provides tread for hikers. Railings protecting the trail user may be attached if the width of the pipe is narrow or long in length.

Puncheon

A puncheon is an effective way to cross some types of bogs, shallow marshes, and wooded wetlands. A puncheon provides a hardened surface on muddy or wet areas that are not feasible to drain and where environmental damage is a concern. Most puncheons are constructed of wood—often sawed, treated lumber or native logs that elevate the trail's tread above the problematic surface. The boards or logs are laid parallel to the direction of the trail, and the support structures (sills) rest directly on the ground.

Puncheons 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 type of material depends on a number of factors — the distance from an access point, the 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. Puncheons are 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, 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. In order to achieve the puncheon width specified in Figure 2, two 2" x 8" or 2" x 10" planks should be used.

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. Adding gravel or rock fill at the ends of the puncheon will help the soil withstand the impact of hikers.

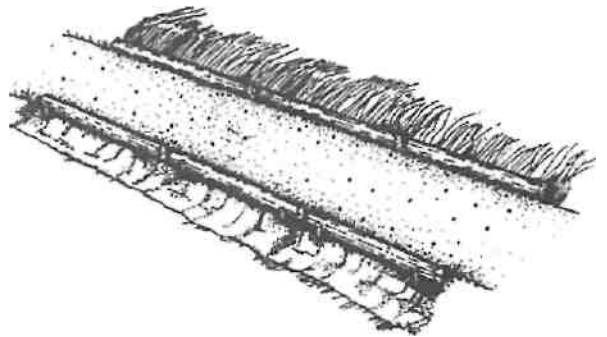
In areas subject to flooding, such as along streams or near beaver activity, a puncheon is not a good choice because it can float out of position or even completely away. In these areas, relocating the trail or using boardwalk should be considered (provided it is protected from spring floods along streams).

OTHER TRAIL STRUCTURES

Causeway or Turnpike

The trail's tread can be elevated through poorly drained areas by using rock, gravel, or earthen fill to create 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. Small stones, gravel, soil, or a mixture of materials should be added on top of the medium-sized fill to ensure a smooth walking surface. This surface should be rounded 2" above the elevation of the defining logs or rocks to provide better drainage and to allow for settling.



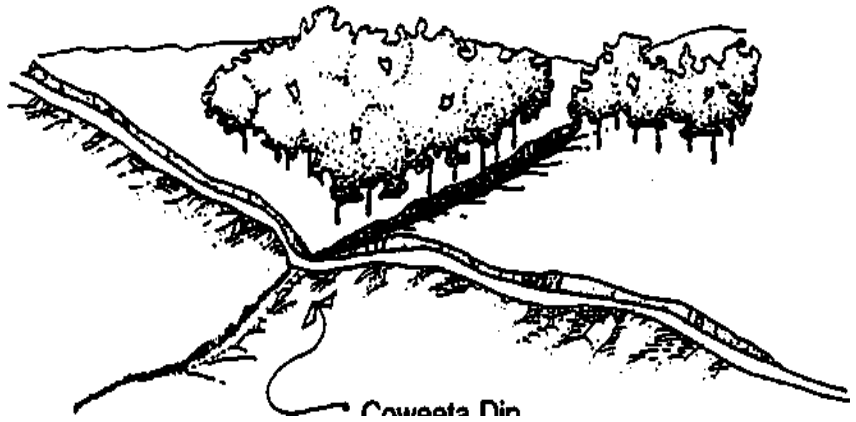
A ditch can be dug parallel to both sides of the causeway to improve drainage. This variation is often called a turnpike.

The material excavated from the ditches can be used to help fill the causeway. To allow passage of

water under the structure in areas of periodic flooding, small culverts should be used.

Coweeta Dips

Coweeta Dips, or 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



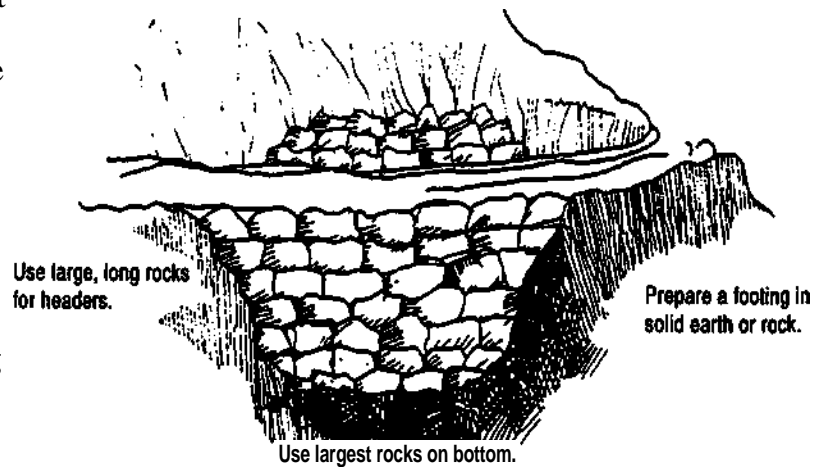
long, sustained grades. Coweeta Dips are most effective when built as part of the original trail construction, but can be used when relocating short problem areas if the terrain allows. On ascending trail segments the trail should level every 50 to 100 feet followed by about 15 feet of **slightly** descending trail before continuing upward. This almost imperceptible descent creates a dip (low point) and forces water coming down the trail to gently drain off. The dip itself requires no construction other than careful building of the trail to establish the dip's alignment. Care should be taken to ensure that the exit point of the drainage from the trail does not result in erosion.

Since a place is needed to discharge the water, Coweeta Dips usually are best suited on sidehill trails. Coweeta 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.

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 1930s are still functional today.

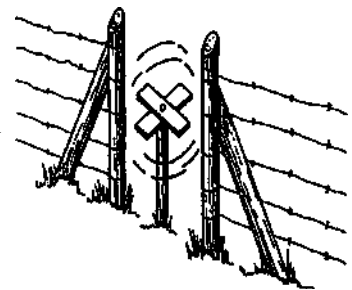
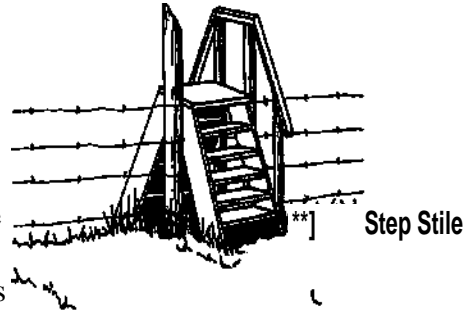
Sound, durable rocks with good, angular (rather than rounded) bearing surfaces are the preferred material because of their locking



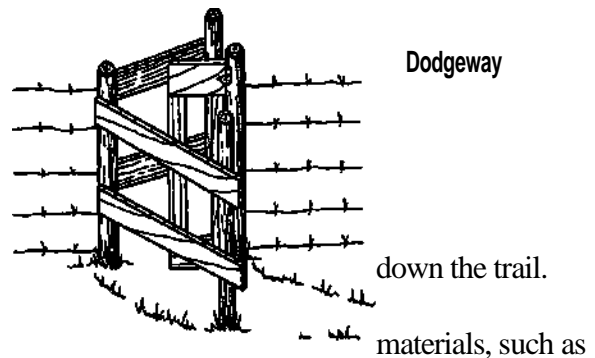
ability. Native decay-resistant or treated logs can also be used if rock is not available. The foundation must rest on solid earth or rock to obtain a rigid, safe retaining wall. The thickness of a rock retaining wall at the base should be at least one half the height of the wall or a minimum of 2' if the vertical height is less than 5'. The outer face of the wall should have an inward slope of at least 2" to 3" 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.

Stiles

Stiles are typically used to pass over or through fences that surround pastures and other agricultural fields that most often occur on private land. These fences separate fields of different uses, as well as keep animals confined to a specific location. In these situations, it is important to work with the landowner to minimize the number of stiles required, and to ensure the type of stile(s) and location(s) is compatible with their needs. If stiles are used, turnstiles and dodgeways are the least problematic because they are partially accessible. Step stiles create a difficult barrier for many trail users and maintenance equipment such as mowers. They should be placed only when there is no other alternative. In areas where user conflicts exist, a stile can effectively serve as a barrier to unauthorized use by horses, bicycles, and ORVs.



Gates could serve the same purpose as a stile but they are more expensive to construct and maintain. There is also the possibility that a gate will be left open, allowing livestock to escape.



Water Bars

Water bars are structures that slow the flow of water and divert it off the trail. They work by reducing the speed, volume, and distance water travels. Traditionally, water bars have been built with rocks and logs, but other non-traditional rubber belting, have also been used in recent years. These innovations offer greater accessibility to some, but may take away from the natural character of the trail.

During new trail construction, the use of water bars should be minimized through careful siting of the trail or by using Coweeta dips. However, where water flowing down the trail is anticipated, it is better to install water bars immediately than to wait for erosion to occur.

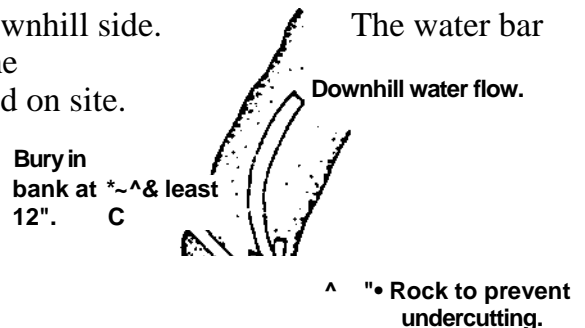
Spacing - Deciding on the actual number and spacing of water bars depends on the amount of water entering the trail, the steepness of slope, the construction of the treadway, and the availability of places to divert the water. Final placement of water bars is dictated by terrain. They must be placed where diverted water does not return to the trail. If this is not possible, a water bar should not be installed (e.g., where the trail lies in a high banked swale that requires extensive excavation in order for the water bar to function properly).

Frequency of Water bars - The greater the slope and the more water channeled by the trail, the greater the need for water bars. They should be placed below all points where a significant amount of water enters the trail. On uniform sustained grades, water bars should be placed near the top of the hill to divert water before it does damage, with others constructed periodically down the grade to keep water flow to a minimum.

Material Type:	2% grade	4% grade	6% grade	8% grade	70% grade	12% grade
Loam	350'	150'	100'	75'-50'	**	**
Clay-Sand	500'	350'	200'	150'	100'-50'	**
Clay or Clay-Gravel	-	500*	300'	200'-150'	100'	75'

Key: ** These grades are not recommended in this type of soil. - No diversion required for soil stability.

Construction - After water bar spacing and location is determined, a trench should be dug across the trail at about a 45-degree angle. Water bars may slow water too much, causing it to clog with silt and debris if placed at less than a 30-degree angle. Those placed at 45-degrees or more will tend to be self-cleaning. The trench should be deep enough to contain about 1/2 of the diameter of a log water bar or 2/3 of the height of the rocks used for a rock water bar. The water bar should be a minimum of 4" above the level of the ground on the uphill side and should extend 12" into the side of the hill and 6" beyond the side of the trail on the downhill side. The water bar should be securely fastened in place using one of the techniques illustrated (right), or with stakes obtained on site.



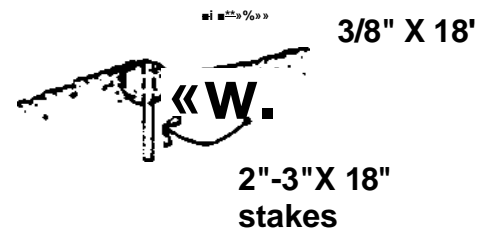
Re-bars are often used to fasten log water bars in place. When used, holes are drilled through the log at a slight angle and the re-bars driven so that no portion protrudes above the log. If using native material for stakes, a tree 2" to 3" in diameter should be cut into 18" pieces. The stakes should be driven on each side of the log water bar, with the tops of the stakes slanting over the bar, pinning the log to the ground. The stakes should be flush with the top of the water bar, excess should be trimmed to

avoid creating a tripping obstacle or loosening that would result from being kicked.

On the uphill side of the water bar the tread should be graded down into the trench. The trench should be deep enough to accommodate the amount of rain it will receive in a typical storm, yet not too high to interfere with the ease of the hiker. All excavated soil and rock should be placed on the downhill side of the bar and packed so the tread is flush with the top of the water bar. The best water bars are subtle, low structures, which are barely noticeable. Water bars require regular maintenance so that they continue to function properly. Accumulated soil and debris must be cleaned out at least annually.

Fasten with Rebar

or fasten with staking



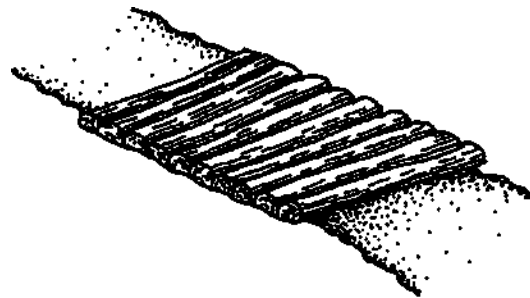
TEMPORARY MEASURES

Corduroy

Corduroy construction is basically a primitive type of puncheon. It consists of laying native logs perpendicular to the trail to harden it through areas of unstable or saturated soil. If corduroy is left exposed, it provides uneven, slippery footing that is uncomfortable for the hiker, and does not convey the impression of a well-designed trail.

The installation of corduroy may also have environmental ramifications. Used in a bog or wetland situation, corduroy can change the natural flow of water, the water level, the species composition, or kill the upstream vegetation. Covered corduroy involves considerable modification to the site and is not recommended in the types of soils/sites where corduroy is typically employed. Wetland permits are usually required. Other alternatives such as puncheon or boardwalks are less intrusive on the site.

Consequently, on the Ice Age NST, corduroy is not acceptable, except as a temporary measure until a more permanent solution can be installed, and then only in areas that are not defined as wetlands.



STRUCTURES AND SITUATIONS TO AVOID

Fords

Due to safety concerns, legal implications, and the "dry boot" philosophy, fords should not be used. Not only can it be unsafe to ford a stream, but descending steep, often slippery stream or ravine embankments can also be dangerous because of the possibility of falling or injuring oneself. Trails entering streams can also cause erosion and severely degrade stream quality.

Fording on new sections of trail should not be accepted and any fords on existing trail segments should be bridged as soon as funding is available.

Steps and Perrons

Steps and perrons (elongated steps—more like a series of connected platforms) should be avoided. 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 a difficult but otherwise 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 the trail to traverse a hill at a much steeper-than-desirable grade. In these types of circumstances, steps may be the only alternative.

Step construction details are not provided (other than Appendix 1) since use of steps is limited. Local experts and a copy of the Appalachian Trail Conference's *Trail Design, Construction, and Maintenance* by Birchard and Proudman are good references.

Stepping Stones

Stepping stones should not be used to cross streams. On navigable streams, or streams with fish populations, stepping stones are opposed by state agencies 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 everybody. Instead of stepping stones to cross streams, a bridge should be installed.

Figure 2: Ice Age National Scenic Trail Design Standards for Trail Structures

Standards (desired)	ROS CLASS		
	Urban	Rural & Roaded Natural	Semiprimitive
Bridges (width) Hiking Segment Accessible Segment	60" 72"	36" 48"	36" 36"
Bridge Railings Hiking Segment Accessible Segment	Y Y	(1) (1)	(1) (1)
Bridge Rail Height	42"	42"	42"
Bridge Kickplate Required (2) Hiking Segments Accessible Segments	Y Y	N Y	N Y
Hiking Segments Accessible Segments	N/A N/A	16-18" width N/A	16-18" width N/A
Boardwalk (4) Hiking Segments Accessible Segments	60" 72"	36" 48"	36" 36"
Culverts (5)	OK	OK	OK

(1) Whether a railing is required is subject to policies of managing authorities, site characteristics, and common sense. Railings are almost always needed except, if the bridge is very wide, the crevasse shallow, or the length of the bridge very short.

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

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

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

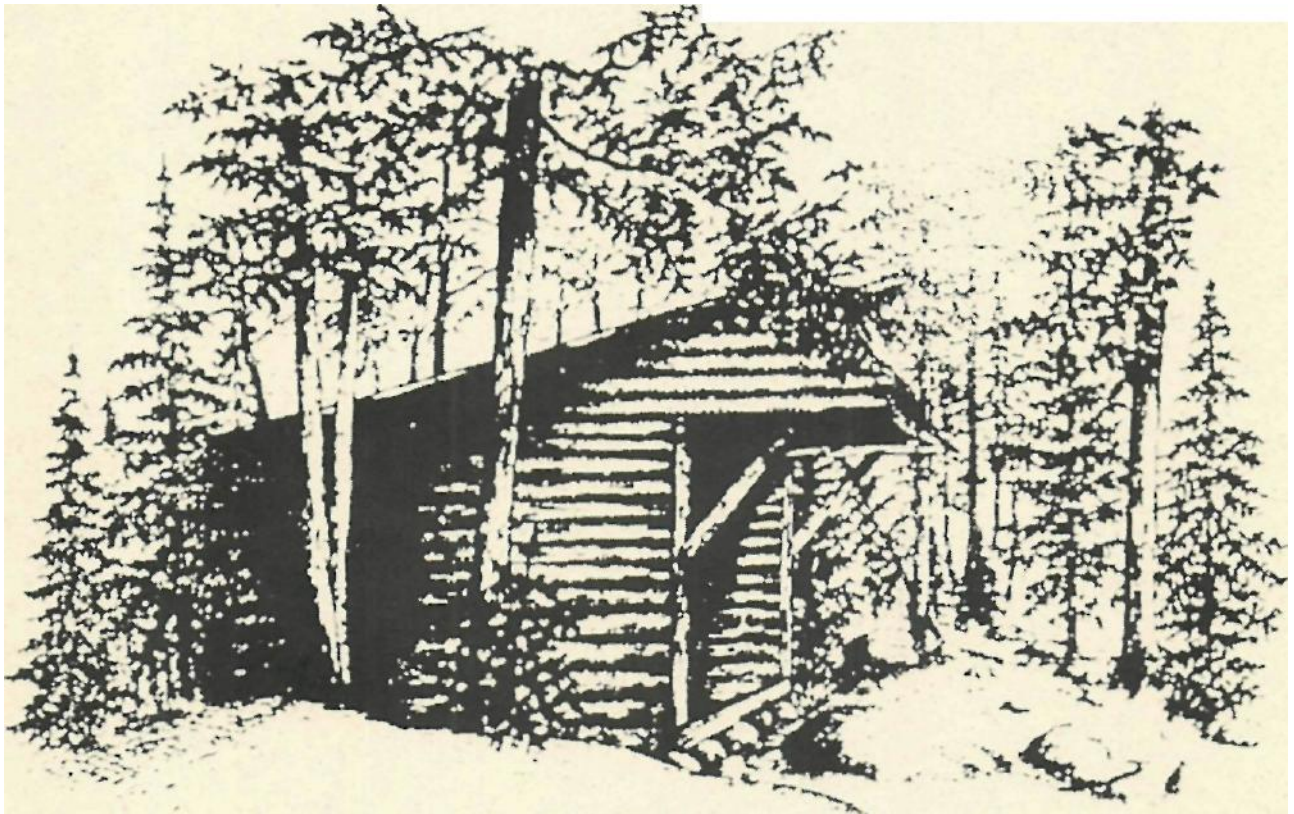
(5) Length must be calculated to provide for 2:1 fill slope beyond the normal trail clearing.

Size (engineering consultation) to accommodate peak flows. Water crossing permits often required.

CHAPTER 6

SUPPORT STRUCTURES

iv*



Support structures provide for hiker convenience, comfort, or sanitation. They are not necessary for the completion of the trail itself. 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 site from which it was obtained should be left as it was found, if at all possible. Figure 3 includes standards and explanations of some structures. Others are more fully explained in subsequent text.

Figure 3: Ice Age National Scenic Trail Standards for Trail Support Facilities

Standards (minimum)	ROS CLASS		
	Urban	Rural & Roded Natural	Semiprimitive
Primary Trailhead	As needed	Spacing 5 miles or less when actual or desired use is high. Spacing 8-10 miles or more when actual use is low.	Spacing 10 miles or more.
Campsite/Shelter	Hotels, Bed and Breakfasts	Spacing 8-15 miles. Especially needed when dispersed camping along the route is not permissible.	Spacing 8-15 miles. Especially needed when dispersed camping along the route is not permissible.
Developed Water	Obtain from Public Facility	Spacing 10-15 miles when potable or treatable water is not available.	Spacing 20-30 miles when potable or treatable water is not available.
Toilet Facility	Obtain from public facility	At high-use areas, campsites, trailheads, and other public areas as necessary.	As needed for resource protection.
Parking Lots (composed of asphalt or gravel)	No less than 5 car spaces. (45'-50')	No less than 5 car spaces. (45'-50')	No less than 5 car spaces. (45'-50")

1) Primary trailheads provide parking for five or more vehicles and are generally located on well-traveled state, county and town roads. They have a bulletin board or kiosk for trail information and may provide water and toilets. They are frequently part of an existing recreation facility.

Secondary trailheads typically provide parking for less than five vehicles, or even no parking because of trail design or safety considerations. Kiosks with trail information are encouraged, but water and toilets are optional. Secondary trailheads may be used when it is necessary to gain access to the NST via other trails. In this situation, the secondary trailhead may be located where the named trail intersects the NST, or at the beginning of the access trail. Typically, secondary trailheads are located on low-traveled roads.

TRAILHEAD PARKING

Parking areas should be located on public lands, when possible, and spaced to provide a suitable day-hiking experience. The distance between trailhead parking areas can vary considerably, depending upon the need and the ROS designation (See Figure 3). Typically, they are between 5 and 15 miles apart. Parking areas may also be connected to the main trail via access trails.

CAMPsites OR SHELTERS

In many areas, particularly federal, state, and county owned forests, dispersed camping may be allowed. Through the Chequamegon National Forest, Ice Age NST hikers may camp at any point along the trail as long as they stay 100 feet from all roads, trails, and surface water. Hikers should also practice minimum-impact camping techniques. In areas such as state parks, camping is restricted to designated campgrounds. When the trail crosses private land, camping of any kind is usually prohibited by the landowner. Private campgrounds are also found along the trail. The desired distance between camping areas is 8 to 15 miles.

Before a site is designated and developed for overnight facilities, the owner of the property, whether public or private, must be contacted to obtain permission. Sites should be selected carefully to withstand user impact. Development should be diverted from heavily eroded, delicate, or impacted sites. The choice between developing a campsite or a shelter is often based on local preference. Ideally, needed overnight facilities will eventually be acquired by the trail organization or public agency. Hikers should be directed to overnight sites by maps, guidebooks, and signs.

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

- ▶ Overnight facilities should be located no more than one day's hike apart (8 to 15 miles). Availability of good sites and access to water will influence actual site location.
- ▶ Sites should be as isolated as possible to reduce vandalism and other unauthorized uses.
- ▶ 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 caused by high water or beaver activity should be avoided.
- ▶ Attractive vegetation or topographic features that provide partial shade and shelter from high winds should be a consideration.
- ▶ A site that is partially exposed is desirable. Some exposure can provide an interesting view, allow for breezes to disperse mosquitoes, and perhaps catch the first rays of the morning sun. However, a campsite should not stand out or detract from a neighbor's view.
- ▶ Facilities should not be located in areas that present high safety risks, such as on a cliff, or in areas subject to flash flooding, rockfalls, lightning, or other natural hazards.
- ▶ Campsites or shelters should be located a reasonable distance from the main trail. They should not be located 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.

- ▶ Overnight facilities should not be visible from the main trail unless topography or ownership patterns dictate otherwise. Some agencies require the campsite to be even farther from the trail.
- ▶ 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 desirable. While close proximity to water is a priority, hikers will accept sources up to *Vi* mile away. For sanitary purposes, it should be no closer than 150 feet from the actual campsite.
- ▶ Some type of privy 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 fire pit may be provided, especially at heavily used sites where wood supply is abundant. This is preferable to several impromptu fire sites. A food hanging pole or "bear pole" should be located near the fire ring or any other area used for cooking.
- ▶ Trash receptacles should not be provided. All trash should be carried out or burned.

WATER

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

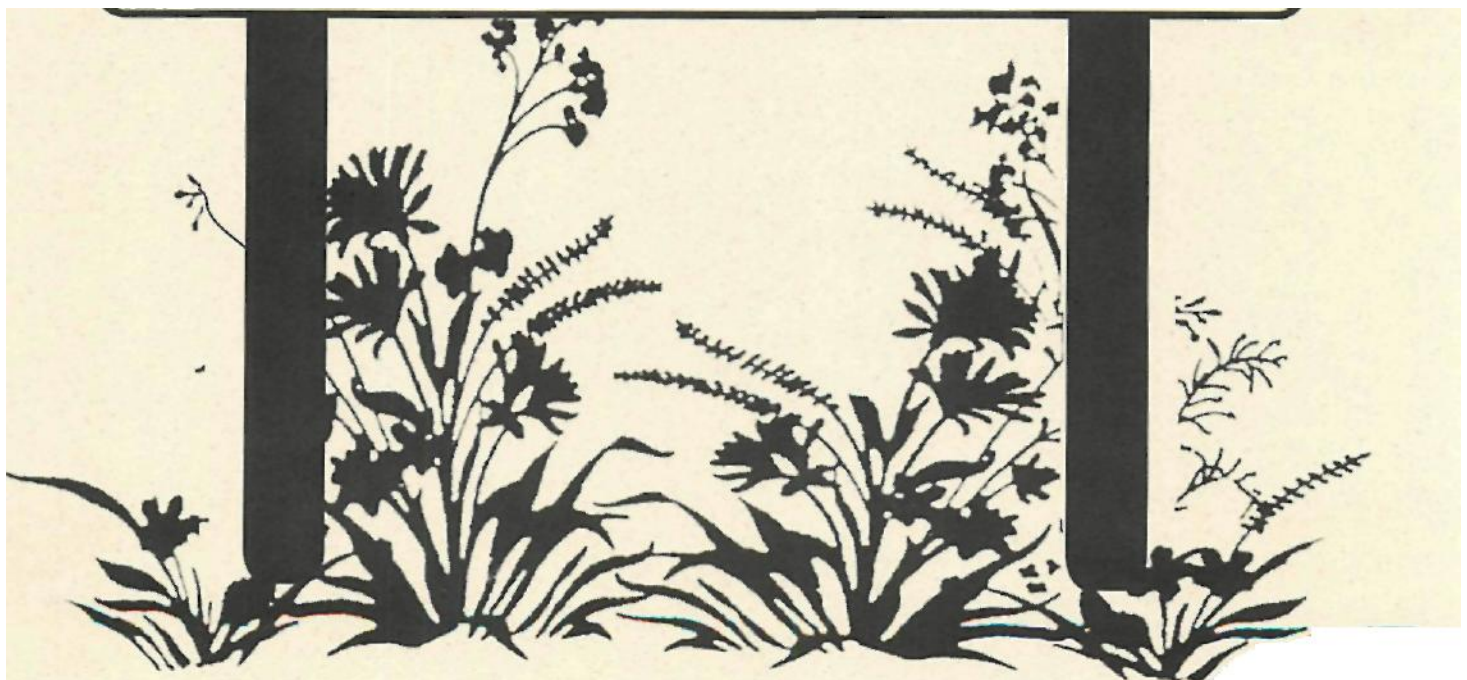
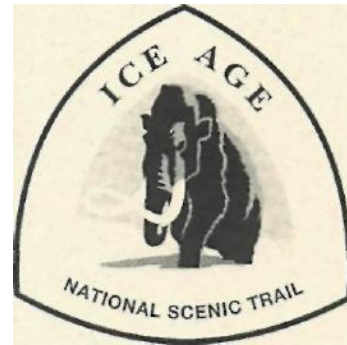
If an area does not have a clear, natural, or domestic water source available, one should be developed according to the schedule shown in Figure 3.

CHAPTER 7

SIGNAGE FOR THE ICE AGE NATIONAL SCENIC TRAIL



Ice Age National Scenic Trail



Ice Age National Scenic Trail Handbook-

In earlier times, Native Americans lashed the limbs of maple saplings or bent the entire sapling and tied it in place to mark a trail—thus leaving a sign for others. In traveling to the inland fur-gathering areas, French-Canadian voyageurs created "lop trees" to mark the portages and guide them through the maze of waterways. These early signs were a basic form of communication.

Just as the Native Americans and voyageurs used signs to find their way through difficult areas, today's trail users rely on signs and symbols to find their way and to better understand the landscape around them. 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 and management activities along the trail. They also list regulations and guidelines and serve to control unwanted or illegal activities. Most importantly, they direct the hiker by identifying the route.

Signs are probably the quickest and easiest way to leave the trail user with a positive impression. If the signs are of high-quality, well-maintained, and properly located, other trail problems which are harder to solve are often overlooked (e.g., wet areas). Signs are one of the easiest ways to increase the public's awareness of and support for the trail.

Signs also meet other objectives:

- Provide positive exposure of the trail to attract more users.
- Educate the user about the trail through trailhead kiosks.
- Reassure the user that he/she is on the right trail and will not get lost.
- Control trail usage and educate the public for a safer, more enjoyable, environmentally friendly experience.

The public agencies and private organizations that manage segments of the Ice Age NST often use a variety of signing methods. However, for the Ice Age Trail to be recognized as a National Scenic Trail along its entire 1,200-mile route, signs and their locations must be standardized. Managing authorities (e.g. WDNR, Counties, etc.) and Trail Segment Leaders are urged to identify signing needs as part of the annual trail assessment process. An inventory of existing signs should be regularly updated. It is recommended that, as new signs are needed or existing signs need replacement, the uniform signing standards suggested in this chapter be followed.

Application of these standards needs to be balanced with aesthetic considerations to avoid over-signage. Each segment of trail should contain a limited "set" of signs. Existing "sets" should be evaluated to determine if they contain the essential elements or whether they over-burden the system and contribute to "sign pollution". When replacing old or damaged signs, every effort should be made to place new signs back in the same locations, and not just add signs to the system.

For Ice Age NST purposes, signage can be separated into two categories: external and internal. External signs identify and provide information to the motoring public on how to reach the trail. Internal signage is directed toward the trail user. External or "highway" signs need to be coordinated with public highway agencies.

TYPES OF SIGNS

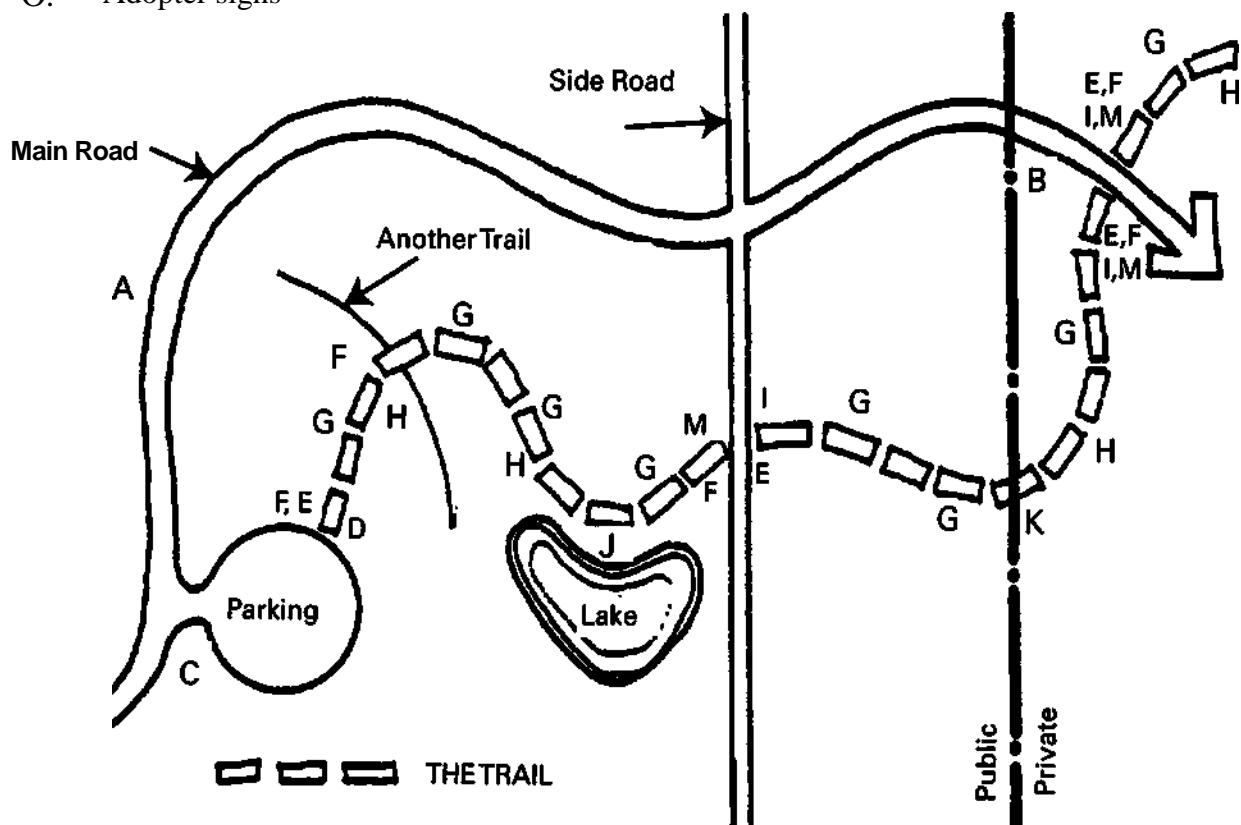
The following types of signs and markers will be discussed in this chapter. See Location of Signs diagram for their relative locations.

External

- A. Highway Information Sign
- B. Highway Warning Signs

Internal

- C. Trailhead Entrance Sign
- D. Trailhead Information Kiosk
- E. Regulatory (usage control) signs
- F. Route Confirmation Markers (trail logo)
- G. Reassurance markers (blazes)
- H. Direction change (arrows)
- I. Road Crossing signs
- J. Interpretive signs
- K. "Crossing Private Land" signs
- L. You-Are-Here signs
- M. Destination signs
- N. Boundary signs
- O. Adopter signs



As you can see, there is an amazing array of signs that could be used. However, primarily because of financial constraints, implementation of these standards will have to be phased in over a period of time. Health and safety signs should be installed first. Suggested priorities for internal signage are as follows:

Primary

Regulatory/Use, Route Confirmation, Reassurance markers (blazes), Direction Change (arrows), Road Crossing, "Crossing Private Lands"

Secondary

Trailhead Entrance, Trailhead Information Kiosk, Adoptor, Boundary

Tertiary

Interpretive, Destination, You-Are-Here Signs

A. Highway Information signs

These are the typical recreation-related signs seen along highways, with white lettering on a brown background. They can only be installed with the approval of the responsible highway department or agency that controls the road—such as the Wisconsin DOT. The Wisconsin DOT performs their own design work and has their personnel install these signs. They expect to be reimbursed for their efforts. Their cost per sign on state highways is approximately \$500. On freeway systems, because of the sign's size and materials, it is \$4,000-\$5,000 per sign.



The purpose of these signs is to direct motorists to trailheads and parking. The recommended wording is: *Ice Age National Scenic Trail* with a large arrow. Highway departments calculate the size of the sign based on the posted highway speed limit and the Manual of Uniform Traffic Control Devices (MUTCD). MUTCD is a nationally accepted signage system and is used by all of the involved highway departments in Wisconsin.

B. Highway Warning Signs

There are two types of signs that warn motorists of people crossing the road. They are the Pedestrian Crossing and the Recreational Trail Crossing Signs. These signs are installed in advance of trail crossings where trail use and road conditions warrant. These signs are especially important where visibility is limited due to road curvature, vegetation, or hills.



The Pedestrian Crossing Sign is a standard MUTCD Warning Sign. They are diamond shaped and have black lettering on a yellow background. The Recreational Trail Crossing Sign is rectilinear with white lettering on a brown background. If these signs are needed, the highway department should be contacted for concurrence. They may or may not install them.

Ice Age National Scenic Trail



C. Trailhead Entrance Sign

Trailhead Entrance Signs are installed at trailhead locations where parking is available. For the Ice Age NST there are two categories of trailheads: primary and secondary. Primary trailheads are generally located on major county trunk roads or state highways and accommodate five or more cars. Secondary trailheads are located on low traveled town and county roads, and provide parking for less than five cars.

At a primary trailhead location, the Trailhead Entrance Sign should be the standard NPS metal sign with white lettering on a brown background and read "Ice Age National Scenic Trail" with the trail logo on the right side. Because the NPS logo is on the sign, the trail segment that the Trailhead Entrance Sign is located on needs to be certified. The sign is generally 3' x 6' but depending on the site and

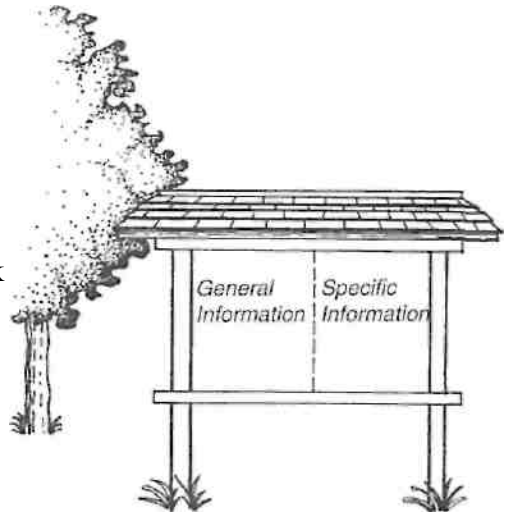
the managing authority, may be smaller. The sign is typically mounted on solid, well-designed wooden, stone, or combination support structure. Optionally, a matching metal segment name strip could be mounted underneath the main sign to indicate the trail segment name. If a name strip is used, the lettering and color should match the main sign. At secondary trailheads, the historically used wooden trailhead sign is acceptable.

Entrance signs are usually two-sided and placed perpendicular to the highway, located just off the right-of-way and near the entrance road. This increases effectiveness in directing the user to the trailhead. However, because of site conditions, some entrance signs may be one-sided and placed parallel to the road. If the sign is placed in the right-of-way, a permit must be obtained from the responsible highway department.

There are many places where the trail begins at or crosses major roads, but there is no parking available for a trailhead. In this case Trailhead Entrance Signs should not be used because this would cause confusion to the motoring public regarding where to park. In this instance, the entrance to the trail from the road could be marked with a Carsonite or wooden post with an attached marker or decal identifying the trail. These should be placed parallel to the road. (See I—Road Crossing Signs).

D. Trailhead Information Kiosk

A Trailhead Information Kiosk should be installed at all primary trailhead locations. This structure should be built within 50 feet of where the trail leaves the parking lot and should include a double bulletin board either on one side or back to back. A well-designed and maintained trailhead kiosk presents a variety of information and serves to reduce the number of signs along the trail.



On the double bulletin board, one display panel should contain general information about the trail, such as the NPS brochure. It should depict the general location of the trail in relation to other major landmarks.

The other 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, information about temporary trail detours, and, if desired, an adoptor sign.



OPEN TO

All kiosks should be weather-tight to either protect permanent information such as maps and regulations, or utilize weather/vandal resistant materials such as waxed poster board, fiberglass embedment, or other durable materials. Cluttering the kiosk with quickly prepared information on 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. Kiosks are good locations to install trail registers.



**And Other
Non motorized
Uses
CLOSED
TO ALL**

**To provide a
non motorized
recreation
experience.**

E. Regulatory/Usage Control Signs

While kiosk information should maintain a primarily positive tone, it is recommended that trail segments have signs which show acceptable and unacceptable recreational uses at all access points such as trailheads, road crossings, junctions with other types of trails, etc. This is especially important where problems have occurred.



There are two options for regulatory signs.
(1) Carsonite type posts with strip decals or

4" x 4" treated wood posts with 3 ½ inch metal decals, or (2) larger format signs mounted on Carsonite or wooden posts—to be used where the standard 3 ½ inch wide vertical decals are not prominent enough, such as at busy trailheads or major road crossings. If certified, the regulatory signs should be placed directly below the Ice Age NST logo. The managing agency's emblem, i.e., WDNR, County, etc., may also be included under the regulatory decal. Decal designs may be selected from Carsonite's Travel Management Signing system.

In order to avoid over-signing, regulatory signs will emphasize the permitted use. On a particular segment where non-permitted uses are a problem, the international symbol for banning, the circle with a slash, can be added lower on the post to help control the problem. 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.

F. NPS Route Confirmation Marker (Ice Age NST emblem/logo)

On NPS certified sections of the trail, the 3 ½ rounded triangle mammoth trail emblem/logo should be placed at all access points, road crossings (even drivable woods roads), and intersections with other trails. They should be located on both sides of all such crossings and intersections perpendicular to the trail. The trail logo should also be sited periodically along the trail route in both directions, approximately every ¾ to 1 mile. These markers are made of plastic or aluminum for nailing to trees and posts. They are also available in Carsonite decal format. In Carsonite format, they should be used in conjunction with mile-posts—if mileposts are used—and the Carsonite usage strip decal at access points and road crossings. Once a segment of trail is certified, confirmation markers will be supplied by the NPS to the segment's trail managing authority.

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

On uncertified segments of trail, the Ice Age Park and Trail Foundation's Ice Age Trail logo (yellow with the State of Wisconsin and the trail in black) may be used in place of the NPS certification logo.



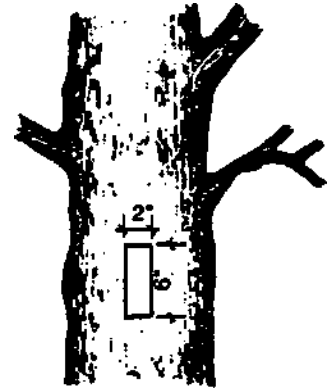
G. Reassurance Markers (Blazes)

Reassurance markers are the paint or nail-on "blazes" used to indicate the trail and reassure hikers that they are on the right path. Since it is not cost-effective or desirable to use the NPS trail logo as the sole marker along the trail, reassurance markers (which are less costly and prone to vandalism) are used continuously between points where the official trail logo has been placed, even along road segments.

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Place blazes carefully; the trick is to not over-blaze a trail to the point where it detracts from the natural surroundings and takes excessive labor to maintain; nor to under-blaze a trail where users may become confused. Well-defined trail sections with a distinct trail tread do not need to be marked as frequently as less-defined sections. Pay particular attention to marking intersections and road crossings. After an intersection or road crossing, place a reassurance marker a relatively short distance after the intersection or road (roughly 75 to 200 feet). Be sure to clearly mark sections where the trail is vague, where old paths cross the trail, or other areas where users might miss or stray from the trail. Be conservative and use discretion when placing blazes; it is better to improve the trail tread than to place more markers.

When determining where to blaze, trail developers should walk the trail from both directions, and not just paint a blaze on each side of one tree. Visually, the trail is different depending on which direction you are hiking. It is not desirable to have more than one blaze visible in either direction at any one time. Blazes are placed on posts or trees, slightly above eye level so that hikers can see them easily. In areas where the trail receives significant snowfall, blazes may be placed slightly higher. Care should be taken to avoid marking large or picturesque trees. In open areas, blazing should be on posts.



Painted blazes are more vandal-resistant than nail-on blazes, but may require more frequent maintenance. 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, file, wire brush, 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 1-1/2" brush. Others use a 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!

Nail-on blazes are more costly than painted blazes. If they are preferred, affix yellow blazes to trees using only aluminum nails, and do not pound them in all the way—leave approximately 1/4" between the back of the nail head and the bark. Vegetation should also be pruned from in front of the blazes to ensure visibility in all seasons. On private lands, the choice between painted or nail-on blazes should be determined by the landowner.

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

1. Both paint and nail-on type blazes should be 2" x 6" vertical rectangles. The 2" x 6" rectangular shape is large enough to be easily seen without being visually obtrusive and is the most universally accepted style of trail blazing. The 4" x 7" diamonds used in some areas are acceptable, but not preferred, and should be phased out whenever possible. As budget allows, the NPS may supply (limited) yellow plastic blazes to partners who choose to use them.
2. Throughout the trail, the standard colors are yellow for the Ice Age NST and blue for spur or access trails which connect to the Ice Age NST. Loop trails which incorporate the Ice Age NST, or longer side trails which connect to the Ice Age NST can be marked in a color of choice other than

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yellow or blue. The paint of choice is any high-quality gloss or semi-gloss exterior acrylic latex paint such as Sherman Williams Metalatex. Another source for paint is Nelson Paint, which is specially formulated to last on trees (Nelson Paint Company, P.O. Box 2040, Kingsford, MI 49802; 906-774-5566). The paint is Nelson's Boundary Marking Paint, brush-on type. It can be obtained from Forestry Suppliers, Ben Meadows, and other forestry supply sources.

3. In non-forested areas, blazes should be placed on wooden or Carsonite posts 4 to 5 feet above the ground. Typically, treated 4" x 4" posts or Carsonite posts are used if emblems or other signs/decals are to be attached. Round wooden posts are acceptable if a rasp is used to flatten the surface where the blazes, arrow, emblem, or signs are to be attached.

H. Directional Change (Arrows)

These 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. Signing for hikers coming from either direction should be done.



Arrows are the turn indicator of choice for the Ice Age NST. If Carsonite posts are used, the standard Carsonite arrow decal is acceptable (3" x 3" yellow on brown). If a directional arrow is nailed to a wooden post, the sign should be 4" x 4". The color of the arrow is the same yellow color as the blazes being used along the trail, on a brown background.

I. Road Crossing Signs

Road crossing signs are composed of a collection of other types of signs found in this chapter. There are a number of reasons for their use. First, they alert the trail user to upcoming road crossings and where to find the trail once the road is crossed. They also increase the motoring public's awareness of the trail, and create a "look of continuity." At many road crossings, signing may be subtle if calling attention to the trail is not desirable. This is especially true where unacceptable parking situations could develop. Carsonite posts or treated 4x4 wood posts should be used at these locations, and where the trail crosses other significant trails, logging roads, or low speed township or county roads. Road crossing signs should include:

1. Trail logo.
2. Directional arrows if there is a short jog in the trail.
3. Regulatory/Usage signs.
4. Name of road being crossed.

The name of the road (4.) should be placed on the backside of the post facing the hiker, not the road. Use 1" white vinyl lettering for this purpose. It can be found at local sign shops and, if desired,

custom made into a vertical format. The Ice Age NST decal and usage information should be placed on the side of the post that faces the road.

At major road crossings, it may be appropriate to add a 9" trail emblem. If used, these should be mounted on a post facing and parallel to the road at the edge of the right-of-way.

If information regarding trail identification (trail logo) and regulatory uses is considerable, and may visually overwhelm one post, trail developers should consider using an additional post to separate trail identification from regulatory uses.

J. Interpretation Signs

The landscape that the Ice Age National Scenic Trail meanders through has an amazing story to tell about continental glaciation. However, interpretation is currently very limited and occurs primarily at interpretive centers located in a few of the Ice Age National Scientific Reserve Units. Optimally, interpretation should occur at trailhead kiosks or in brochures rather than signs along the trail. This is because interpretive signs are a major investment in time and money, expensive to install and maintain, subject to vandalism, and can be a visual intrusion along remote sections of the trail. However, there are sites where their placement is warranted. Whatever medium is chosen, all interpretative signing should be made to quality standards which complement and enhance the prominence and identification of the Ice Age National Scenic Trail.

Sunrise Lake

There are three basic types of interpretive signage. They range from very simple to complex. They are Identification Signs, Interpretive Signs, and Wayside Exhibits.

1. Identification Signs: Identification signs are the simplest form of interpretation and are relatively inexpensive. They are routed wood signs with only one or two words that label features (and occasionally dates) along the trail. These features may consist of lakes, landforms, historic sites or public/private land boundaries. Besides identifying a significant feature, they also allow the hiker to find their own location on a map in relation to what they are seeing. It is desirable to use identification signs for sites listed on destination signs.

Examples of appropriate signs are:

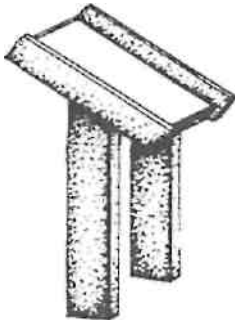
Camp 6, Wood Lake, Parnell Esker, Whitewater Lake, and Holy Hill

These signs should have 1-1/4" blue letters coated with clear varnish on 4" wood boards. Paint color should match the blue color used for spur access trails.

The other two types of signage, interpretive and wayside exhibits, should not be installed without a coordinated interpretive plan, which may involve the formation of an interpretive planning team. Complete details of the interpretive planning process can be found in the 1995 Handbook—*National Scenic and Historic Trails-Wayside Exhibit Guidelines* available through the Ice Age Park and Trail Foundation or NPS Ice Age NST office. This handbook also contains detailed information on the content and design of Wayside Exhibits. With long, linear sites such as the national trails, the importance of continuity in design is perhaps much greater than in a small, consolidated park. Using

he directions found in the handbook reduces cost, saves time, and allows the public to easily identify the trail as part of a nationwide group of scenic and historic areas. Caution should be used to avoid over interpretation. Wayside Exhibits should follow the NPS specifications, and the NPS should be involved in their planning whenever these projects are being considered.

2. Interpretive Signs: These provide an interpretation option that is not as elaborate or expensive as wayside exhibits. They do not have as complex a mounting system and may be smaller in size. However, they include graphics as well as descriptive text and, thus, are true interpretive signs — in contrast to *identification signs* which merely label features. They are intended to interest and educate the hiker and to interpret specific sites, fauna, or flora — briefly showing details and giving descriptions of sites or objects without lengthy interruption of the visitor's trail tour. These signs should be high quality and constructed of durable material resistant to the natural elements and vandalism. The color should be black lettering on buff background. The size varies, but is typically from 15" x 18" to 24" x 36". If there is a need for recurring signs along the trail, these are a cost-effective option—the first sign costs the most. For example, it may be desirable to interpret an esker or a kettle lake in a dozen or so locations.



3. Wayside Exhibits: These are the largest, most sophisticated, and expensive of the interpretation options. Significant natural features or cultural resources may warrant the larger size and more complete interpretation which can be presented in this format. Like *interpretive signs*, they are intended to interest and educate the hiker and may be used to more fully explain historical events or sites, glacial landscapes or features, plant and animal communities, etc.— where a major statement regarding the subject needs to be made. Their intended use is to show details, actions, etc., which are not clearly visible to the visitor upon casual observation. Major exhibits will occur much less frequently than *identification or interpretive signs* for a number of reasons. They are expensive to develop and maintain and, if used too frequently, can take away from the character of the trail. Also, because of their large financial investment, wayside exhibits are typically located on public lands where they can be monitored for vandalism, such as state or county parks. Major wayside exhibits usually requires the participation of the National Park Service's Harpers Ferry Center.

K. "Crossing Private Land" Signs

Not all of the Ice Age NST is on permanently protected public lands; much of it is located on private lands. Those sections that are located on private lands are dependent on the good-will of landowners for its existence. To maintain their cooperation, efforts must be made to encourage users to behave properly. One way to assist in this effort is to alert hikers when they are entering private property, and to educate them about proper conduct. This sign is intended to serve that purpose and must be located accurately.

The top portion of the sign should read, "PRIVATE LAND, USE OF THIS LAND IS A PRIVILEGE AND NOT



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YOUR RIGHT. STAY ON THE TRAIL."

The bottom half of the sign reads, " The Ice Age Trail depends upon the cooperation of many landowners. Please respect the land you travel through. Camping, fires and vehicles are prohibited. This Trail Segment is CLOSED DURING DEER GUN SEASON."

This sign is brown with white lettering.

L. You-Are-Here Signs

These map signs are optional. They may supplement maps at trailhead kiosks and other key locations, such as trail intersections, along the route. You-Are-Here signs are most likely found in state parks or other places that have a highly developed, complex or confusing trail network. The other indicated methods to mark and identify the trail make You-Are-Here signs generally unnecessary. On the Ice Age NST, they are the exception rather than the norm.

M. Destination Signs

Destination signs show direction and distances to various attractions 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

Dundee Trail Shelter (#3)	6 mi.
Butler Lake	7.4 mi.
Parnell Trail Shelter (#4) Parnell	11.8 mi.
Tower	12.1 mi.

the trail. If someone knows that there is a waterfall, lake, or other attraction down the trail, they may be tempted to hike to it. Destination signs supplement *identification signs*. They are optional but desirable. These signs will have medium blue letters on natural wood with a coat of clear gloss, or semi-gloss varnish.

The trail name should have 2" letters and the destination names should have 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:

- ▶ Name of the trail.
- ▶ Significant destinations such as rivers, road crossings, shelters, campsites, water falls, etc., along the trail.



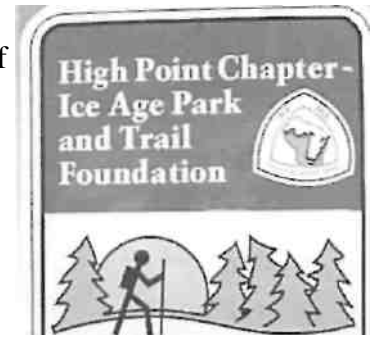
- ▶ Direction to these destinations indicated by arrows (arrows may not be needed, depending on sign placement—for instance if a sign is placed on each side of a road).
- ▶ Distance to the destinations in miles and tenths.

N. Boundary Marker Signs

In those locations where a corridor or easement has been acquired, these signs are used to permanently mark the boundaries of public and Ice Age Park and Trail Foundation owned properties. They are not necessary where the trail passes through large areas of public lands. White Carsonite posts with medium blue decals and white lettering should be used. One side of the post should say "Private Land Behind This Sign". The other side should say "Property Boundary, National Scenic Trail Corridor Behind This Sign".

O. Adopter Signs

While these signs are optional, it is often desirable to identify the volunteer(s) responsible for the maintenance of a particular segment of the trail and recognize their efforts. Trail adopters typically are assigned a segment of trail between two identifiable points—such as road crossings. Adopter signs are typically located at the trailhead, affixed to the Carsonite or wood post which holds the Regulatory Usage and Route Confirmation Markers (Items E and F) or on the Information Kiosk (Item D). A variety of formats that recognize the efforts of the group are acceptable.



*This Trail Section
Adopted By*

Steve Clark

SIGN MAINTENANCE

Signs convey many different types of information and it is critical to maintain them.

They are also a highly visible indicator of the quality of a trail system. Maintenance or lack of maintenance leaves the visitor with a positive or negative impression about the trail. Well-maintained signs that are repaired promptly convey a sense of pride and reduce further vandalism. Signs that are damaged from shooting, faded or brittle from long exposure, and those that are simply missing should be replaced. Also, signs that no longer convey a good impression or serve their intended purpose should be repaired or removed. Periodic painting and other maintenance is a necessity and will prolong the life of a sign.

Priorities for sign maintenance are the same as priorities for signage needs on pages 2 and 3. Health and safety issues should come first.

Figure 4. Ice Age National Scenic Trail Sign Summary

Sign Type	Material	Background Color	Letter Color	Letter Size
Highway Information Sign	Aluminum or HDP	Brown	White	MUTCD-varies
Highway Warning Sign-Pedestrian Crossing	Aluminum or metal	Yellow	Black	MUTCD-varies
Trailhead Entrance Sign	Aluminum or HDP	Brown	White	8"
Trailhead Information Kiosk	Wood	Brown	NA	NA
Regulatory/ Usage Signs	Decal, Aluminum, Plastic	Brown	White	Varies
Blazes-Main Trail	Paint, Aluminum, Plastic	Yellow	NA	NA
Blazes-Spur or Access Trail to IAT	Paint, Aluminum, Plastic	Blue	NA	NA
Directional Arrows	Decal, Aluminum, Plastic	Brown	Yellow	Varies
Interpretation #1	Wood	Natural Wood	Medium Blue	1-1/2"
Interpretation #2 and #3	Fiberglass Embedded	Buff	Multi-color	Varies
Crossing Private Land	Plastic, Aluminum	Brown	White	NA
Destination Signs	Wood	Natural Wood	Medium Blue	Trail Name-2" Destinations-1"
Boundary Markers	White Carsonite Post	Medium Blue	White	NA
Adopter Signs	Decal, Plastic, Aluminum	Brown	White	NA

Key: HDP=High Density Plywood MUTCD=Manual of Uniform Traffic Control Devices

NA=Not Applicable

CHAPTER 8

SAFETY CONSIDERATIONS FOR TRAIL WORKERS

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 into planning for a continued safe work record.

Above all else, consideration should be given to maintaining the proper attitude about safety. 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.

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. When tools are carried correctly, injuries due to accidentally falling on them are reduced. 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 executing a job should be implemented. Crew members should look around to make sure no one is in harm's way and that there is plenty of room to swing safely. If necessary, first clear brush or limbs 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, lack of energy, and hypothermia 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. *Machismo* should be saved for the football field—it's easier to be carried off a football field than it is to be carried out of the woods.
9. Crew members should be aware of their physical condition and limitations—weariness can lead to accidents.

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 safety responsibility. Every work leader should learn and teach his/her crew safe work habits and see that these practices are implemented. Every tool is a potential source of injury and everyone cannot 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.

Sample Checklist

- ▶ Tools (list)
- ▶ First Aid kit
- ▶ Insect repellent
- ▶ High energy food (list)
- ▶ Water (adequate amount for conditions and crew members)
- ▶ Individual water containers
- ▶ Extra rain gear or plastic garbage bags
- ▶ Extra gloves
- ▶ Hard hats
- ▶ Eye & ear protection
- ▶ Other personal protective equipment (PPE)
- ▶ Compass
- ▶ Topo maps
- ▶ Project maps and plans
- ▶ Trail brochures

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- ▶ Membership information
- ▶ Copies of "Safety Rules"

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, may bring hatchets for most jobs. 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 he/she knows 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, determine 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 (see poisonous pests below).

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.

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

Special Considerations When Working with Youth

If supervising young people (especially teens who have a history of problems) crew leaders may need to reprioritize what they consider acceptable teen behavior. Crew leaders of youth are to be congratulated for having accepted such an important and challenging endeavor. The first prerequisite is to learn stress reduction and relaxation techniques. The following tips may be helpful:

1. Safety is priority from the very beginning. Crew leaders should let members know that mishandling of tools or abusive behavior toward others is not tolerated. State your reasons clearly—that you genuinely care about the crew members, the continuation of the program, and performance quality.
2. Crew leaders should establish a rapport by doing things with the teens that are fun (like jumping in a lake, or picking berries) and by being tolerant of other bothersome things the youth might do (like when they start making fun of the functional clothes crew leaders wear).
3. It is essential for crew leaders to have a sense of humor.
4. Crew leaders should be impeccable role models—but not afraid to admit their own mistakes.

5. Crew leaders should empower the youth with a can-do spirit—not a spirit of invincibility but one of humble self-reliance built upon cooperation.

Working with youth, especially those often referred to as "at-risk", is not something that is for everyone. It is a job that can be both extremely rewarding and extremely frustrating. However, it is clear that teaching youth the importance of respecting themselves and each other, by practicing safety and strong work ethics, can make a real difference in their lives and in the life of the trail.

Using the Right Tool for the Job

Using the right tool for the job is directly related to safety. Using the incorrect tool for the job can lead to tool breakage, slips, and injuries. For instance:

- ▶ A shovel should not be used to chop away at a large root in the ground. Shovels were designed for digging and moving dirt—not chopping solid wood. A cutter mattock, pulaski, or axe should be used for chopping.
- ▶ A small hammer should not be used to drive spikes into railroad ties. Carpenter's hammers (16-ounce claw hammers) are made for nails—not spikes. A 4-pound hammer or sledge should be used to drive spikes.
- ▶ A bow saw should not be used like a weed cutter. Bow saws are designed to cut through wood—not swung at weeds or brambles. A Suwanee Sling or other weed cutter should be used to cut weeds.

Using tools improperly is one of the chief causes of accidents. Chapter 10 should be studied to understand which tools can best do the work that awaits the crew.

First Aid

Ideally, all crew leaders should be certified in first aid by the American Red Cross. A first aid kit should be checked, complete, and large enough for the crew and the job at hand. Above all, it should be taken along on the job, and crew members advised of its location. Professional assistance may be hours away.

Poisonous Pests

Ticks - Wood ticks are a nuisance, but seldom pose medical problems. Skin and clothing should be checked and any ticks that are found should be removed.

Deer, or bear ticks, on the other hand, are potentially very dangerous. These ticks, which are much smaller than wood ticks, can carry the bacteria that causes Lyme Disease. Generally, only about one percent of all deer ticks are infected with the Lyme disease bacterium. However, in some areas more than half of them harbor the microbe. Most people with Lyme disease become infected during the summer, when immature ticks are most prevalent. Except in warm climates, few people are bitten by deer ticks during the winter months. Ticks should be removed from clothing and body as soon as they are observed. Research suggests that a tick must be attached for many hours to transmit the Lymes Disease bacterium, so prompt removal can prevent the disease. A thorough tick-check at the end of the day is advised. Immature deer ticks are only about the size of a poppy seed and may easily

be mistaken for a freckle or a speck of dirt. The risk of developing Lyme Disease from a tick bite is small—even in heavily infested areas. Most physicians prefer not to treat patients bitten by ticks with antibiotics unless they develop symptoms of Lyme Disease.

Tips for Personal Protection

- ▶ Wear light-colored clothing so ticks can be easily spotted.
- ▶ Wear long-sleeved shirts and closed shoes and socks.
- ▶ Tuck pant legs into socks and tuck shirt into pants.
- ▶ Apply insect repellent containing permethrin to pants, socks, and shoes, and compounds containing DEET on exposed skin. Do not overuse these products.
- ▶ Walk in the center of trails to avoid overgrown grass and brush.
- ▶ After being outdoors in tick infested areas, remove, wash, and dry clothing.
- ▶ Inspect your body thoroughly, and carefully remove any ticks.
- ▶ Inspect pets for ticks.
- ▶ Your local health department and park or agricultural extension services may have information on the seasonal and geographic distribution of ticks in your area.

How to Remove a Tick

- ▶ Tug gently but firmly with blunt tweezers near the "head" of the tick until it releases its hold on the skin.
- ▶ To lessen the chance of contact with the bacterium, try not to crush the tick's body or handle the tick with bare fingers.
- ▶ Swab the bite area thoroughly with an antiseptic to prevent infection.

Mosquitos - Like wood ticks, mosquitoes are a nuisance but they are not particularly a safety hazard. Repellents should be used and/or long sleeved shirts and long pants worn. Herbal repellents can be used to cut down on the amount of DEET found in other repellents, if workers prefer.

Poison Ivy - Some people are extremely allergic to this easily identified plant. If seen, others should be alerted to its location so they can avoid it. A line of Technu® products, available in most drug stores, can help prevent contracting the poison.

Poisonous snakes - Poisonous snakes are rarely found along the Ice Age National Scenic Trail. The only poisonous snakes in Wisconsin are the Eastern Timber Rattlesnake whose habitat is found in the Baraboo Range in Sauk County, and the Massasagua which can be found along the Mississippi River bottoms. Even though encounters with poisonous snakes are rare, the following advice should be taken. Generally, snakes will move away from people if they hear them coming. The danger from poisonous snakes is greatest when the snake is surprised. In poisonous snake country, gloves should be worn when moving fallen logs or other debris, high-top leather boots should be worn, stepping

over large logs should be avoided and crew members should take care where they put their hands and feet.

If working in poisonous snake areas, a first aid class should be taken or first aid books made available to crew leaders and members so appropriate action can be taken in case someone is bitten. Generally, if a doctor can be reached within one to two hours, drastic measures of treatment such as incisions and tourniquets should be avoided. The person with the bite should be kept calm and escorted to the nearest doctor immediately. The injured should not run as this will cause the heart to more quickly pump the poison throughout the body. From most locations it is feasible to reach a doctor within the one to two-hour time frame. If a crew is working in a remote area, members should be prepared to administer first aid.

Spiders - Like snakes, poisonous spiders are infrequently encountered and are no more common in the woods than in a typical backyard. However, the brown recluse spider may be present in some areas, so an inspection of seldom-worn clothing is recommended prior to dressing. Sleeping bags should also be shaken out before use.

Deer Flies and Black Flies - Wearing hats and long sleeve clothing is the best preventive measure for these nuisances.

Yellow-Jackets and Hornets - These pests can cause painful stings and more serious allergic reactions. Persons who know they are allergic should carry a complete sting kit including antihistamine inhalants and other supplies. Crew leaders should check with crew members to see if anyone is allergic and to be sure they have their kit with them. The crew first aid kit should also be equipped with both "sting-kill" ampules and treatment for allergic reactions.

All members should be aware of insect nests and warn others of their presence. It is often the second and later crew members who get stung, as the first person who steps into or bumps a suspended nest has moved out of harms way by the time the insects attack. Yellow jackets typically nest in the ground while hornets build their nest in bushes and trees. If the pests cannot be killed and the nest destroyed, work elsewhere until a later date. If a nest is discovered the area should be marked with flagging or a temporary sign to alert others.

At certain times of the year and in certain kinds of weather, yellow jackets seem to be more aggressive. Generally this is in late summer and fall and during periods of dry weather. During these times, yellow jackets are attracted to food and drink. All members should be alert when eating or drinking pop to avoid getting a yellow jacket in the mouth. A sting in the tongue is particularly serious as the tongue can swell and quickly block the airway.

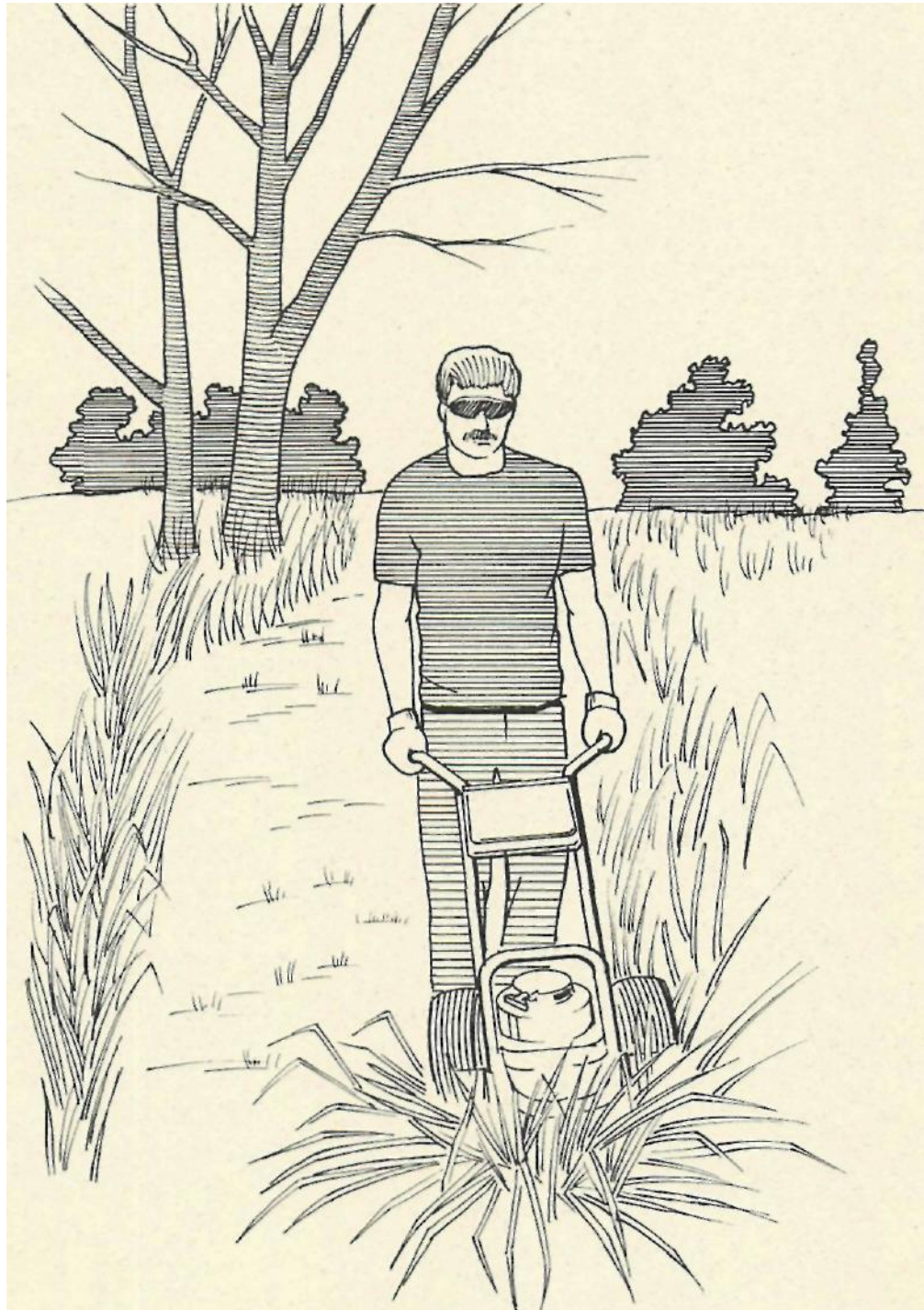
Simple Precautions

Crew members should work in clothing that covers most of the skin. Good quality work boots (best if they have a steel toe), a hard hat and gloves should be worn. With power equipment (like a chain saw) safety goggles, ear protection, and high quality chain saw chaps should be used.

Frequent water and rest stops are recommended. Crews should use common sense and not try to do more than is prudent.

CHAPTER 9

MAINTENANCE



The objectives of trail maintenance are to provide for user safety, access, and convenience, protect adjacent resources, and 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. This is one of those conundrums. If a trail segment is not maintained, people will not hike it because they probably cannot find it. There is also a responsibility to provide the public with what we are advertising—a quality National Scenic Trail experience. All trail should be maintained in the best condition possible—a well-maintained trail guarantees its use and helps ensure its future support.

TRAIL ASSESSMENT AND INVENTORY

Trail Assessment

One way to document maintenance needs, or to just provide information on the condition of the trail, is through the use of a trail assessment or inventory form (see Appendix 3). For routine maintenance, a detailed trail condition assessment may not be necessary. However, 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, during a routine walk-through, a severely eroded, lengthy trail section may be noted. Since the best solution for a severely eroded trail section may be to relocate it, the work is not within the capabilities of an individual maintainer to correct immediately. In that case an assessment is needed so that the major needs can be relayed to the local managing authority and the NPS. With this information in hand, funding or labor can be committed to assist in correcting the problem. A maintenance assessment can also serve as a basis for applying for Challenge Cost Share funds.

Inventory

A more detailed inventory of trail features and required maintenance is desirable as the trail moves closer to completion, trail managers become more knowledgeable, and the partnership (NPS, WDNR, and IAPTF) increases management oversight capability. An electronic database is capable of generating various reports, including maintenance needs, utilizing 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. This level of detail should be implemented someday. 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 their software programs.

There are two ways to collect data for this type of database:

Paper Forms - Persons using this method walk the trail and enter the data on a series of forms. The data from the forms is then manually typed into the electronic database back in the office.

GPS/GIS - Persons using this method walk the trail with a Global Positioning System (GPS) unit, keying in the data points and mapping the trail as they go. Back in the office, data from the GPS unit is downloaded to a computer and processed into various formats and transferred to a Geographic Information System (GIS). This method is not widely available yet. It not only provides a detailed inventory of various trail features, but also can be used to produce a very accurate trail map. Eventually, the entire trail will be mapped with this method and included in a GIS.

MAINTENANCE ACTIVITIES

When assessing trail maintenance needs, the following groups of general maintenance categories should be considered. Some of the more common maintenance activities required to remedy deficiencies identified during the annual trail evaluation could include:

<p>Trail Maintenance-Vegetation Brushing/clearing areas Remove fallen trees/branches Hazard tree removal Slope revegetation Backslope grooming Vista Maintenance Poison Ivy Removal (herbicide)</p>	<p>Structure Maintenance Bridge Repair Cribbing/retaining wall repair Barriers/guardrail repair Steps/perron repair Fence/gate/stile repair Shelter repair</p>
<p>Tread Maintenance Grading tread slough and slide removal slump repair filing erosion ditches grubbing rocks/roots/stumps Spot surfacing Turnpike section repair Surface replacement (similar material)</p>	<p>Sign Maintenance Sign repair/rehabilitation Sign replacement Blaze repairing and maintenance Cairn repair Barricade/closure device repair</p>
<p>Drainage Maintenance Cleaning/Repairing Structures culverts waterbars coweeta dips drainage ditches Replacement of existing structures culverts/underdrains Install additional drainage structures waterbars culverts grade dips</p>	<p>Litter Clean-up Old dumps near trail Current discarded litter</p>

Trail Maintenance-Vegetation

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. Consideration may be given (especially on exotic species) to treating these cut stumps with herbicide, after obtaining proper approval.

Unless prohibited, using power mowers in open grassy areas or power brush saws in brushy areas should be considered.

In high-use sections of the trail or near camping areas, dead or dying trees that could possibly fall across the trail or camping area should be removed. In Semi-Primitive ROS areas, only those trees that may be a serious hazard to users should be removed.

Wrong



Right



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 usable. If repairs are necessary, they should meet or exceed the original construction specifications.

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 (see bridge inspection requirement in Chapter 5). 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.

Sign Maintenance

See discussion in Chapter 7.

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 midsummer 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. 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.

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- ▶ Complete the larger jobs that could not be accomplished in the spring.
- ▶ Maintain and improve water bars, drainage ditches, and all trail structures.
- ▶ Be alert for noxious or exotic plant species—remove, kill, 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.

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. A good reference on crew organization is the Appalachian Mountain Club's *Organizing Outdoor Volunteers*.

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 (see Chapter 10 for tool suggestions).

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

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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.

All flagging, construction stakes and debris, litter, etc., should be removed.

MAINTENANCE AND CONSTRUCTION TIPS

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

Vegetation and natural debris should be re-used as much 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.

When constructing new trail, a short, unworked section should be left next to access roads until last—this helps eliminate premature use.

As construction and maintenance is finished on a segment, clean-up should also be completed. Postponing trailside cleanup until later is poor procedure—it seldom gets done.

Time should be taken to do the job correctly the first time around to avoid having to repeat the task.

Clearing

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

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 ft 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.

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

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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.

Painting

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

- A 7" 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"x 6".
- Old gloves, a wire brush, and a 2 Vi" paint scraper are handy tools to bring along.
- Paint can be kept in an old, snap-top detergent pail or large-mouth screw top plastic container. Applying small amounts of paint to the brush can ensure a neater job.
- A painted wooden box 11" x 13" x 1/4" plywood, with raised ends for handles, is a convenient way for one person to carry supplies. These supplies may include several colors of paint (yellow, brown, bark, blue) and wash water, as well as nails, hammer, lagbolts, wrench and brushes. A plastic bag can be attached to carry paper towels and plastic bags.
- Extra plastic bags kept in the vehicle are handy. Brushes can be wrapped in plastic so they won't dry out until cleaned back at the trailhead or home. Bring along water and detergent to clean the brushes. An old gallon milk container is a good way to carry extra water.

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.

CHAPTER 10

SELECTING THE RIGHT TOOL



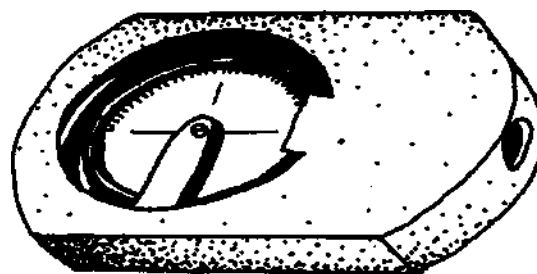
A wide variety of tools are available for trail use. Local and individual preferences often dictate the kinds of tools which are chosen for various tasks. Some of the most commonly used tools and their functional purposes are identified in this chapter. A few tips on using the tool safely and effectively are also included. Every trail maintainer needs to learn how to choose the correct tool for the job, use it effectively and safely, and care for and store it properly. Purchasing high quality tools initially is more cost effective—long-term performance exceeds those of lower quality.

The right tool should be used for the job. Substitutes are dangerous and ineffective. Tools should be kept in good condition—throwing them on the ground can damage them. A file should be carried for spot-sharpening edges throughout the work day. Tools should be carried with the appropriate guards in place. At the end of the work day, all tools should be cleaned, sharpened, lightly oiled, and stored properly.

HAND 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.



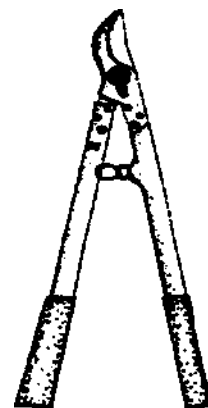
Tips: Both eyes must be kept open when sighting through the clinometer (see Eye-Level Survey Techniques in Appendix 3).

Lopper

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



Hand Primer

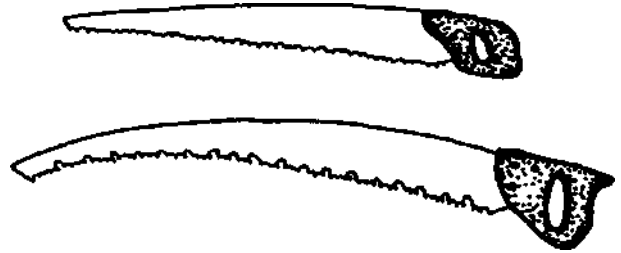
Uses: Cutting small branches encroaching on the trail. Also useful for cutting protruding roots that are tripping hazards. Mostly used for trail maintenance.



Tips: Handier and lighter to carry than a lopper when only minor pruning is needed—it should be carried in hand while hiking to clip small branches as encountered.

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.

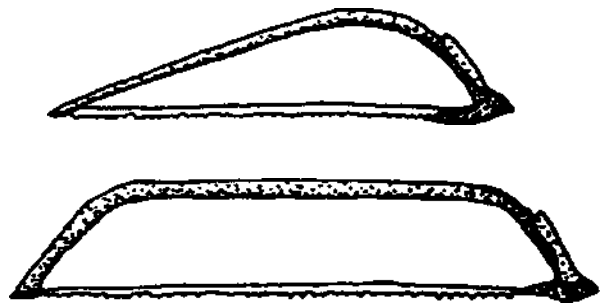


Tips: Pruning saws should be resharpened often. A light coat of oil should be applied to the blade after each use.

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.

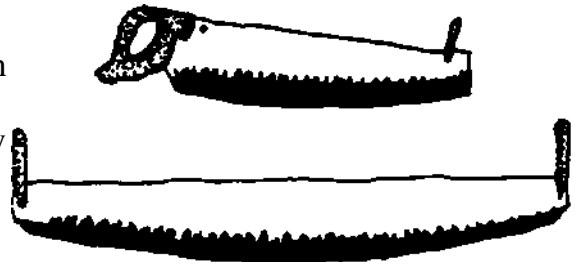
Safety: Same as pruning saws. PPE includes leather gloves and hardhat.



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. Even though they are called one-person, an optional second handle

can be added. Two-person crosscuts are 5 to 8 feet 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 Crosscut Saw Manual by Warren Miller, U.S. Forest Service Equipment Development Center, Missoula, MT. This is available from the Government Printing Office in Washington, D.C.

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: 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.

Pole Primer 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.

*Pole saw (top)
and Pole pruner (bottom)*



Axe

Uses: Clearing blowdowns, limbing trees, felling 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. It will also not bind in a log like a saw blade. 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: 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 positioned 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.

Brush Hook or Bush Hook

Uses: Cutting small saplings and brush too heavy for a weed whip. Swung like an axe, the brush hook's long handle and heavy head give it a powerful cut.



Tips: The blade should be kept sharp using a curved-edge whetstone.

Safety: Because twigs or limbs can catch the blade on the back swing or where space is limited, extra care should be taken to avoid accidents. A good grip on the handle is necessary, and it is important that the user keep clear of other workers. PPE includes a hardhat, leather gloves, and heavy leather boots.

Swede Axe

Uses: Cutting small saplings and brush that are too heavy for a weed whip and for cutting in cramped places. Its shorter handle and lighter weight make it faster, easier to control, and safer than an axe or brush hook. The thin, flat, replaceable blade cuts easily through springy stems and may be sharpened with a sharpening stone or file.



Tips: The blade should be replaced when it becomes badly nicked.

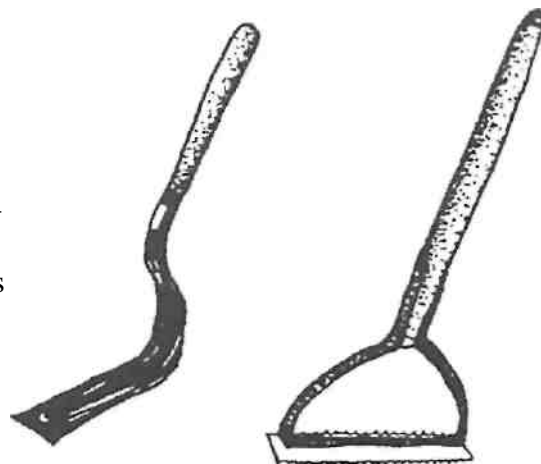
Safety: Same as the brush hook. PPE includes a hardhat, leather gloves, heavy leather boots. Inexperienced workers should also wear leg protection (chaps).

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



*L-shaped weed whip (left)
Triangular-frame weed whip (right)*

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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.

Suwanee Sling

Uses: This is essentially a heavy duty weed whip that also has an axe blade. It does the same work as the weed whip, but can also cut through larger materials that may be occasionally encountered.

Tips: The tool's heavier weight allows it to more easily cut off larger material than a weed whip.

Safety: Same as a weed whip.

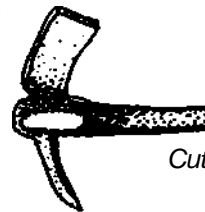
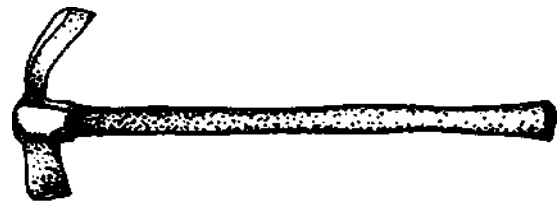
Pick Mattock and Cutter Mattock

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.

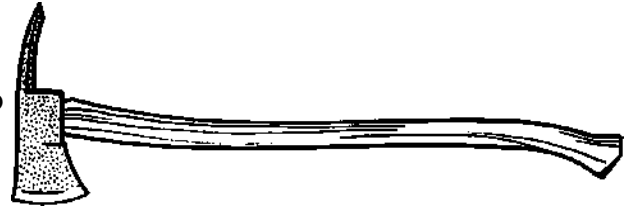


*Cutter Mattock (top)
Pick Mattock (bottom)*

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.

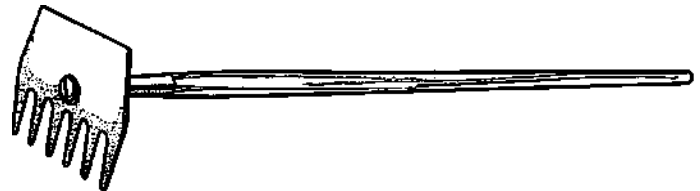


Tips: The axe end is sharpened and maintained like an axe, and the mattock end is sharpened like a true mattock. The pulaski's mattock blade can serve as a substitute adze if it is sharpened to a keen edge. If a pulaski is going to be used as an adze, it should not be used for any other purpose.

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 or tamping loosened material 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.

Council Rake (Fire Rake)

Uses: Constructing and maintaining trail. The council rake looks like a section of sickle bar mower on the end of a straight handle. It is used for the same purposes as a McLeod.



Safety: A sheath should be in place during transport. Leather gloves are recommended.

Shovel

Uses: Shovels are used for cleaning waterbars, culvert outlets, and diversion ditches, digging and moving soil and other granular material. 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.



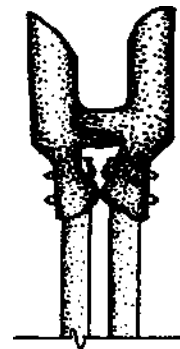
Tips: The blade, including most of the blade's sides, should be kept sharp. A firefighter stance should be taken to more effectively and safely move material—the user should bend at the knees and rest the elbow of the hand holding the forward end of the handle on the inside of his/her knee. This is the 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.

Posthole Digger

Uses: Digging holes for footings, posts, etc.

Tips: There are two basic types of post hole diggers—clam-type and auger-type. The clam-type is the most versatile of the two and can be used in a wide variety of soils. The auger-type works well only in sandier, dryer soils. It will not work in rocky soils and it is hard to clear of excavated material if the soil is wet.



Safety: Soil should be lifted from the hole with leg muscles—not back muscles. If the wooden handles are too flexible or the collar becomes bent, fingers can get pinched when the handles are closed. Leather gloves are recommended.

Sledgehammer

Uses: Breaking rocks, driving posts or stakes, nudging a heavy



timber into place, driving large spikes. Sledgehammers are primarily used during construction phases.

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. 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.

Crowbar (Rock Bar)

Uses: This is an essential tool for prying and levering large, heavy objects such as boulders, logs, and beams. 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.

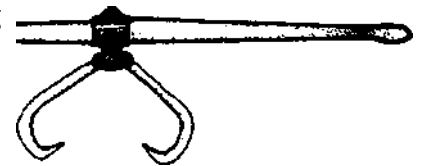
Tips: For most purposes, a 54" size seems to work best.

Safety: Since the 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.

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.



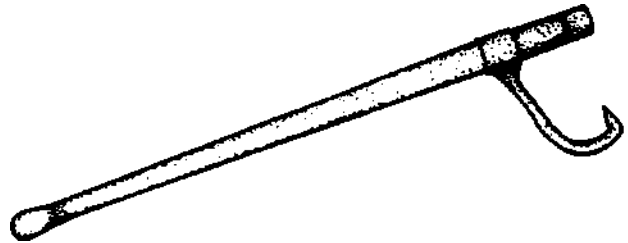
Safety: The user should stand behind the handle of the carrier, facing the direction of travel and place both hands on the handle, bend at the knees, and all workers lift at once.

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.

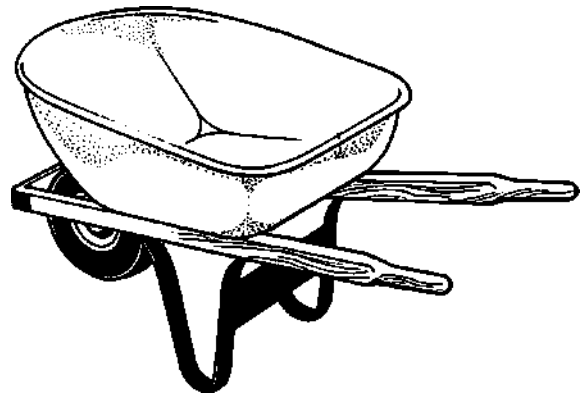


Safety: The user should exercise caution not to roll logs onto his/her (or someone else's) toes. Logs may roll too fast and get away. Potential for severe injury is present whenever heavy weights are being moved. PPE includes leather gloves and heavy leather boots. Hard-toe boots provide an extra measure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

Wheelbarrow or Two-Wheel Cart

Uses: Moving loose material or supplies considerable distances.

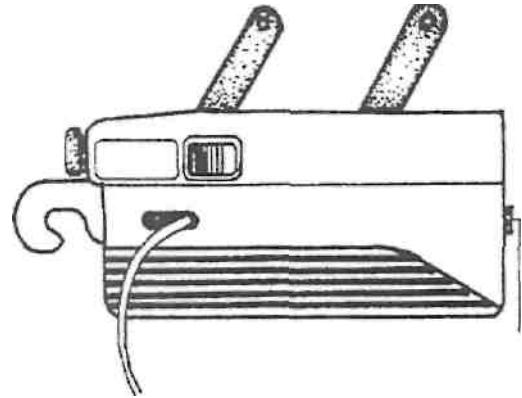
Tips: Two-wheel carts have better balance and can often carry heavier loads— however, they require wider space to maneuver. Whether a wheelbarrow or a two-wheel cart, models should be obtained with large balloon tires. The small-wheeled garden variety is useless for trail work.



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 most common and simplest winch is the ratchet-and-pawl cable winch, usually known as a come-a-long. The inexpensive models are useless 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.



What seems to be the most popular cable winch among trail workers is a more sophisticated model known as the Griphoist® 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 should be used to anchor the winch to a tree and to harness rocks or logs. Chains can also be used, but in most situations the nylon sling can do the same job with less weight and less damage to the anchor tree. 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.

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Uses: 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 Griphoist® winches, can empower small crews to do great things.

Tips: 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.

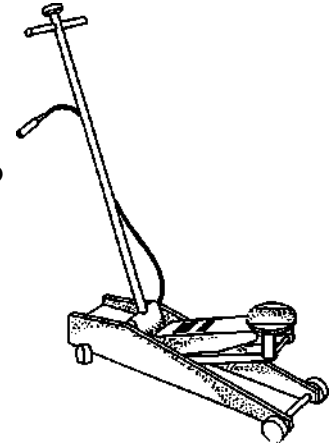
Rigging systems are most appropriate when there is a considerable amount of work to do at one site—such as when constructing a bridge, retaining wall, steps, or shelter. On this type of project a crew will not want to go back to the old method of brute force once they acquire the skill to effectively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

Safety: 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.

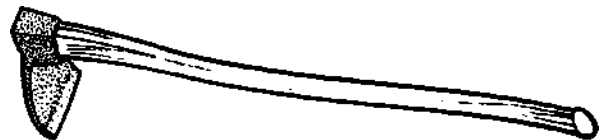


Adze

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.

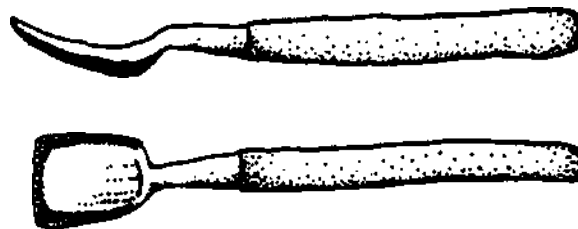
Safety: The user should exercise caution so as not to cut his/her feet or shins. When standing on the log being hewed, the toe of the front foot should be elevated so that a glancing blow can only strike the bottom of the sole of the boot. Only the back of the heel of the front foot should be resting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

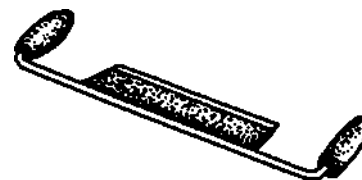
Tips: The spud has three cutting edges. All three should be sharpened on the top side only. A file should be used—a fine edge is unnecessary. Timbers peel much easier during the spring when the sap is flowing freely. Logs can be peeled in the spring and stockpiled for later use during the construction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

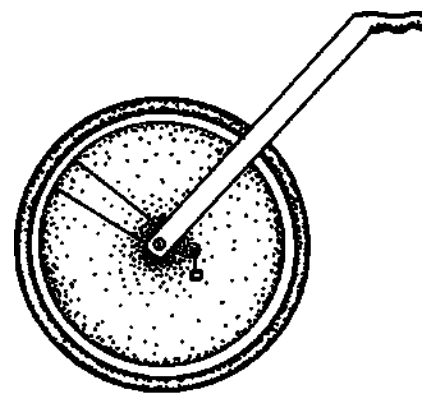


Tips: Users should acquire a true draw knife that has its handles at a right angle to the blade—rather than a bark knife that has handles in line with the blade. Bark knives are meant only for smoothing rough bark—not removing it.

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

Measuring Wheel

Uses: Measuring trail that is completed or under construction.



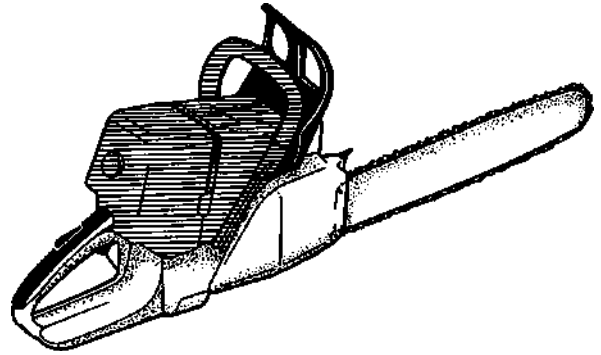
POWER TOOLS

When the situation allows, the use of power tools is appropriate along much of the Ice Age NST. In most situations, power tools can substantially increase production. They allow fewer people to construct or maintain a given amount of trail in less time. However, they have certain drawbacks which 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.

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, srench, plastic wedge).



Safety: Chainsaws are one of the most dangerous pieces of power equipment. They should be used only by experienced workers (preferably those who have undergone training and are certified for chainsaw use). Required PPE includes leather gloves, ear muffs, eye protection, hardhat, and kevlar (or similar) saw chaps. Chainsaws should not be operated without the above PPE.

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 Jonsered 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.

A stout, flexible forked sapling (about 1" in diameter at the base) that has been cut about 4 1/2 to 5' 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. Its natural springiness allows it to be used like a pitchfork. This scatters the brush so that it is not visibly concentrated, and is more efficient than bending to pick up and discard each piece by hand.

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.

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.

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DR Field Mower

Uses: This sturdy mower is an excellent choice for cutting heavy grass, weeds, briars, and even saplings up to 7" 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.



APPENDIX 1

CONSTRUCTION SPECIFICATIONS FOR TRAIL STRUCTURES

Appendix 1 provides sample specifications for a number of trail structures. It demonstrates one or more technically correct ways to construct a structure but it is not intended to restrict local creativity. The intent is to provide a suggested method when local plans are not available.

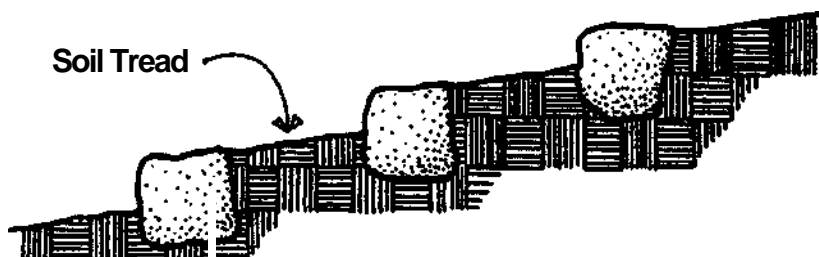
Trail Stairways

Riser - Tread Relationship

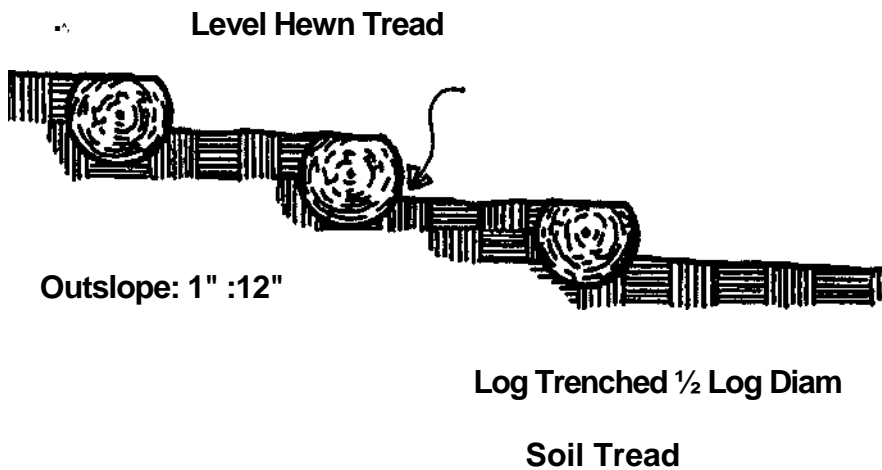
<u>Riser</u>	<u>Tread</u>	
4"	19"	
5"	15"	Riser
6"	12 1/2"	
7"	10 3/4"	<u>Tread</u>

Rock Riser Stairway

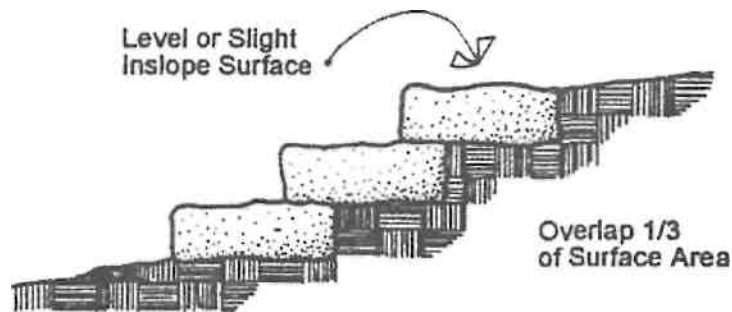
Outslope: 1" : 12"



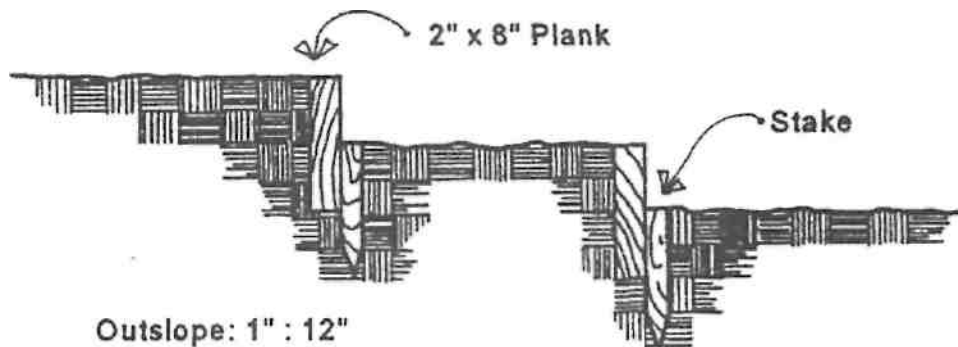
Log Riser Stairway



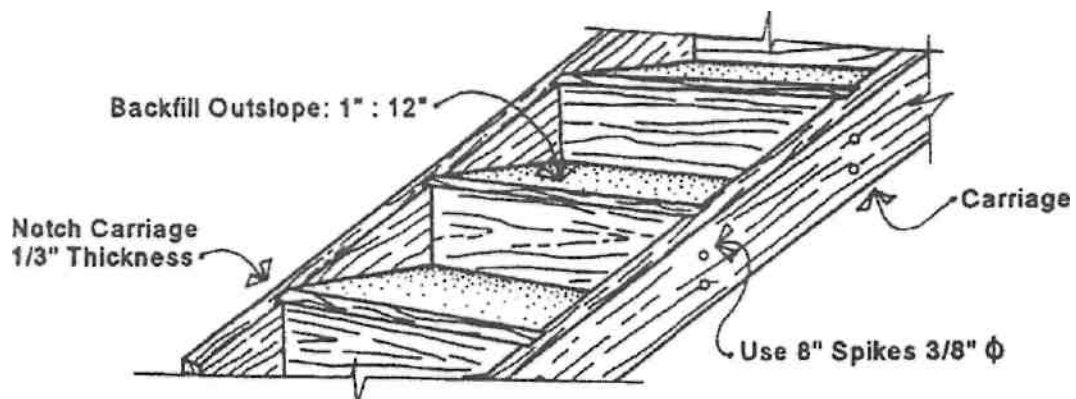
Overlapping Rock Stairway



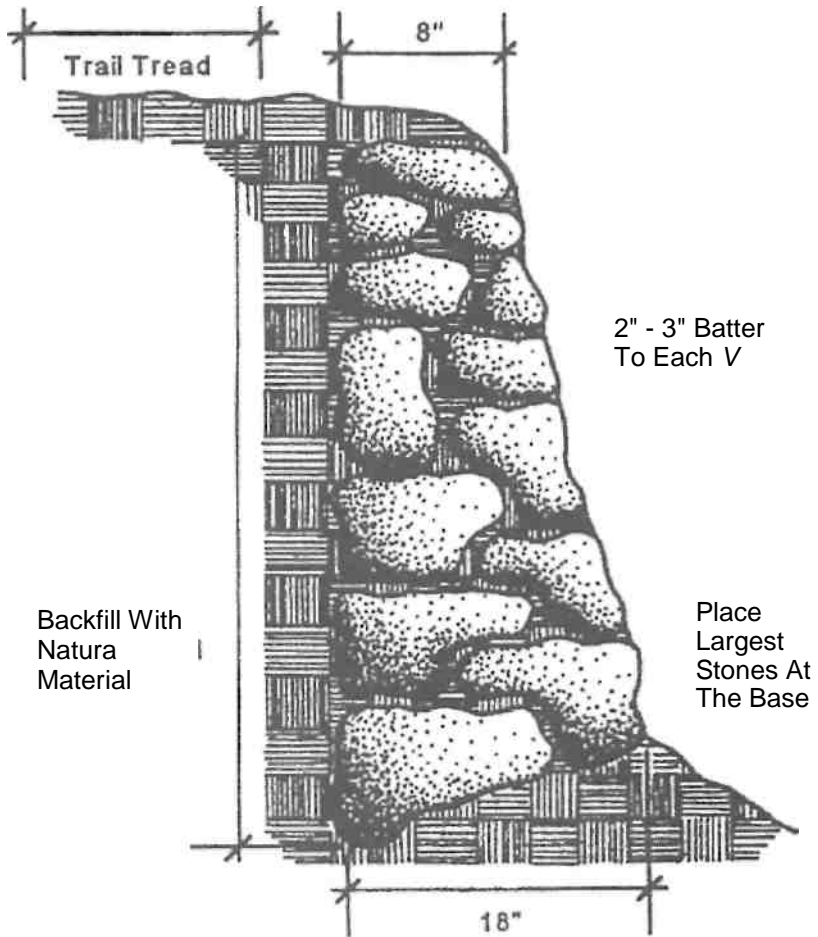
Plank Style Retaining Stairway



Crib-Ladder Stairway

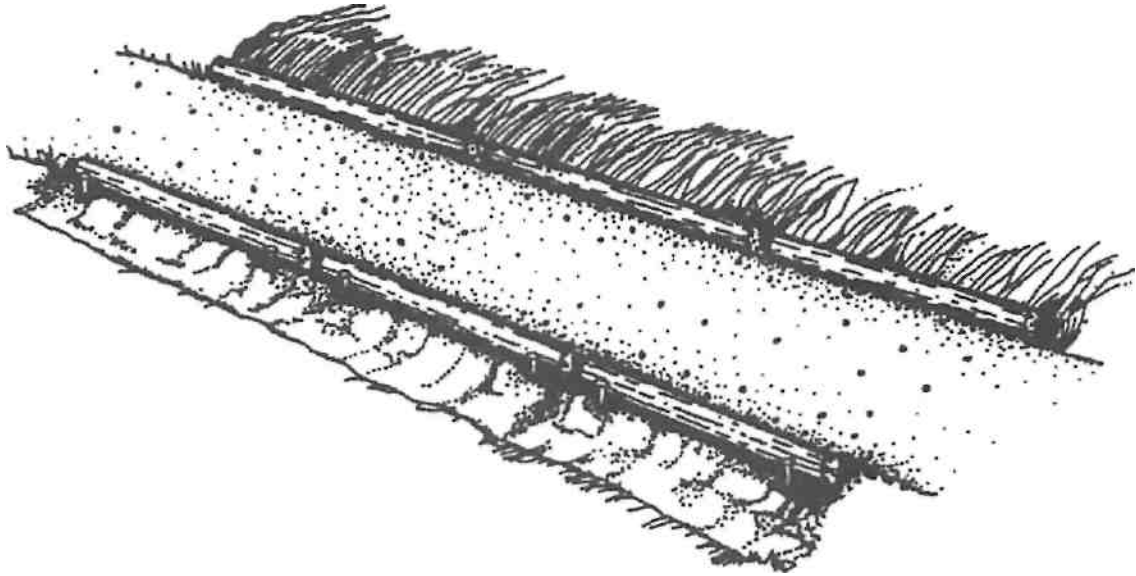


Retaining Wall Section

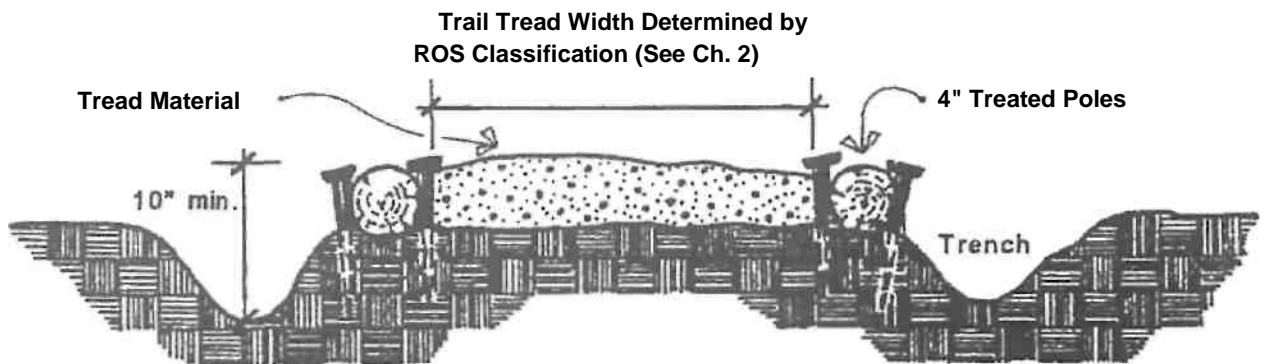




Turnpike

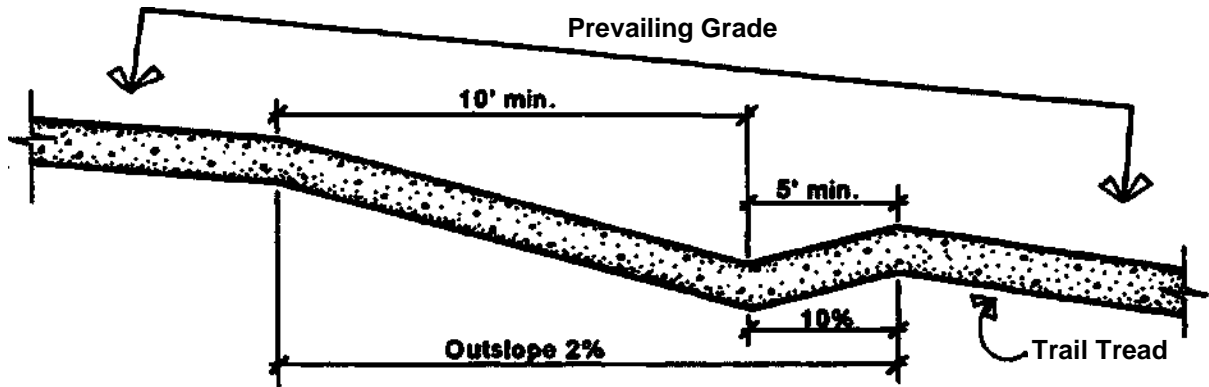


Turnpike Section

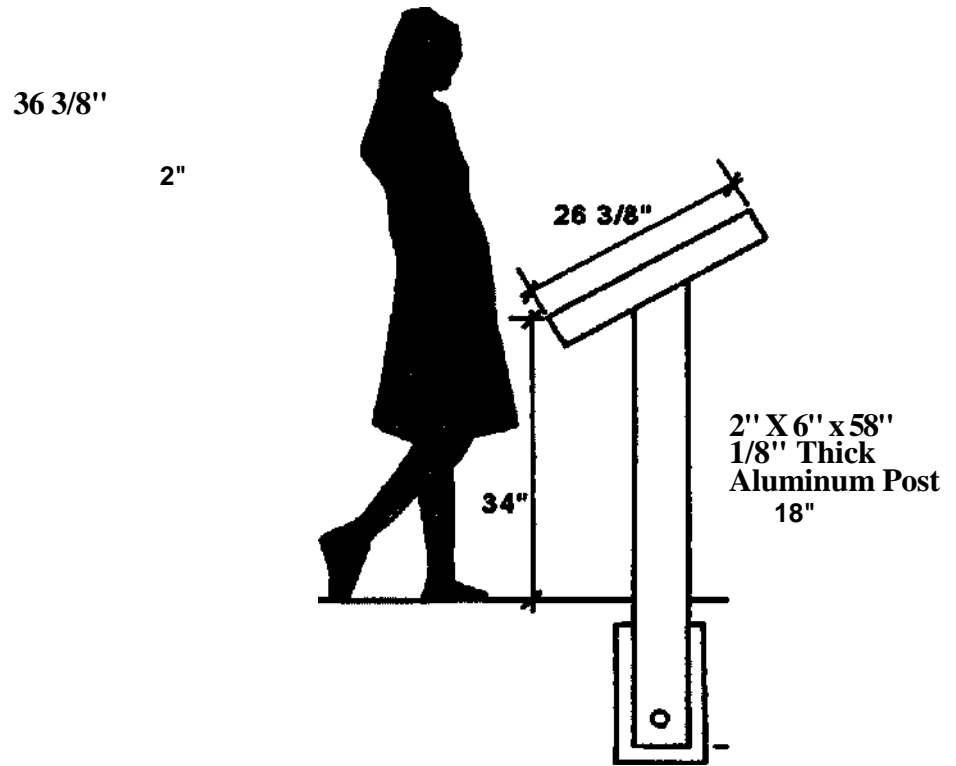




Coweeta Dip Plan View



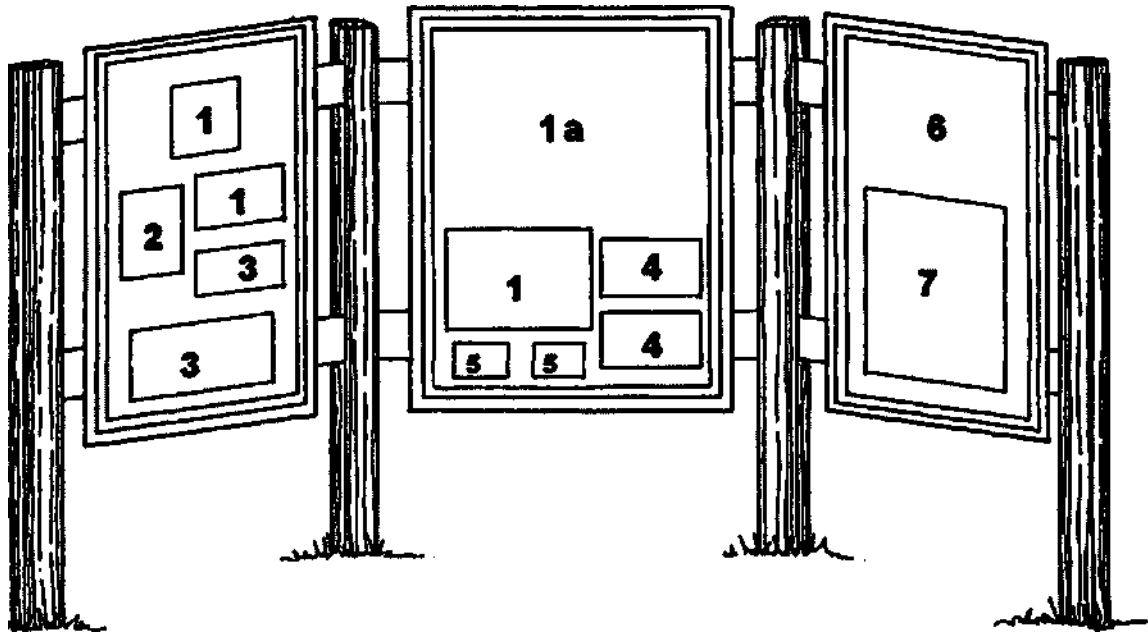
Wayside Exhibit Format



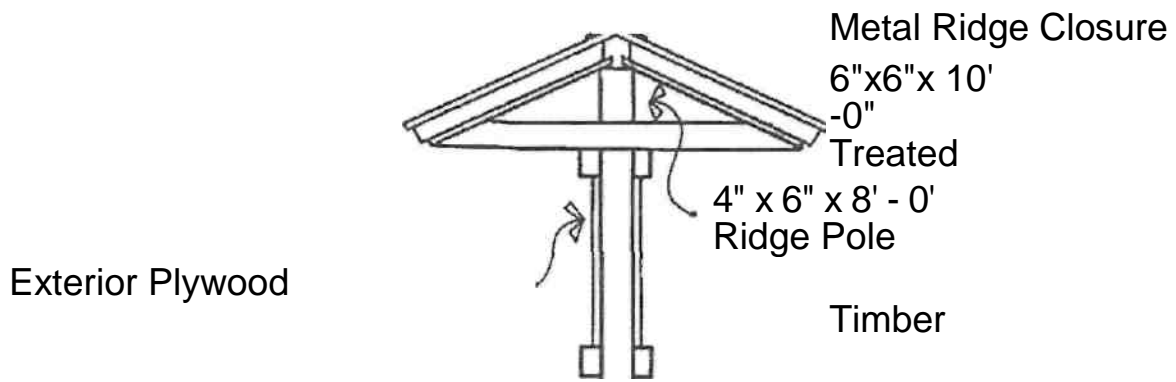
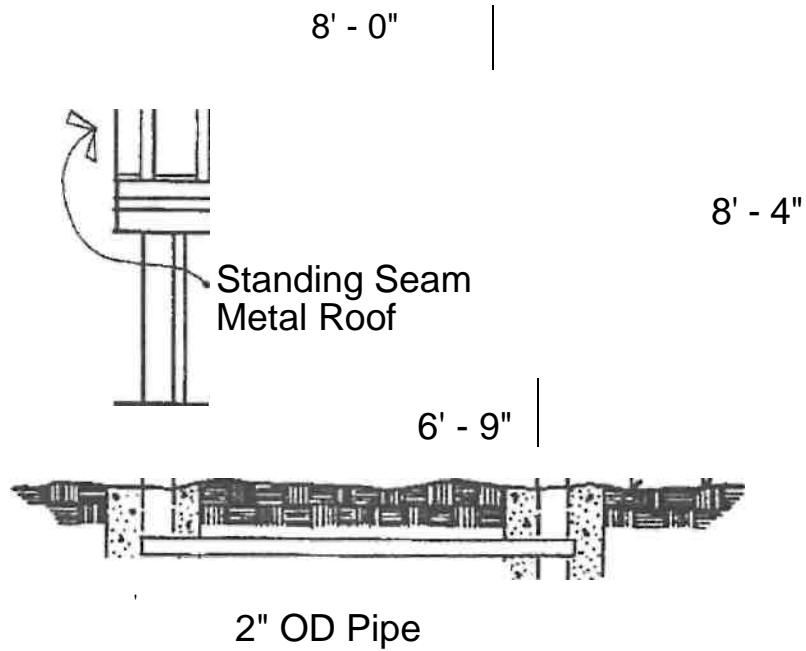
A Suggested 3-Panel Display Arrangement

Adapted from *Standards for Forest Service Signs and Posters*

- | | |
|-----------------------------------------|--------------------------------------------------------|
| 1) Recreation activity information | 4) User etiquette |
| 1a) Recreation activity information map | 5) Supervisor's directives |
| 2) Visitor registration | 6) Safety/emergency information |
| 3) Environmental awareness | 7) Local interest: weather, community activities, etc. |



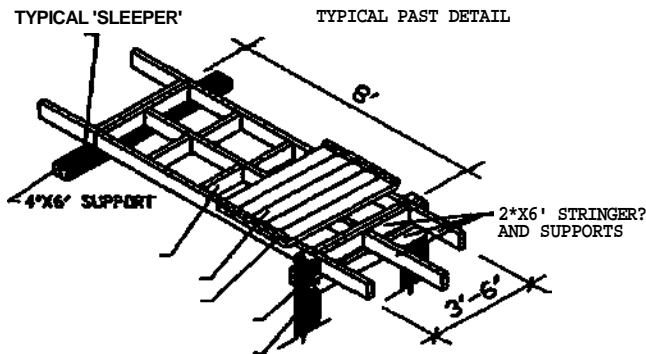
Trail Information Sign/Kiosk Option



Concrete Footing

TYPICAL BOARDWALK DETAILS WAUKESHA / MILWAUKEE COUNTY CHAPTER ICE AGE PARK & TRAIL FOUNDATION

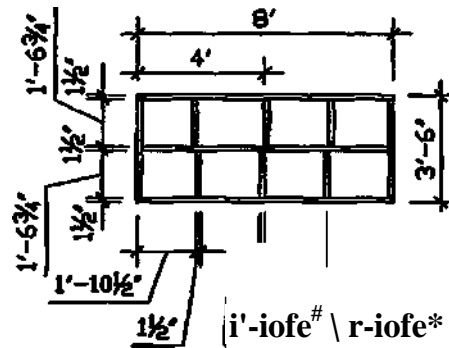
02/28/01



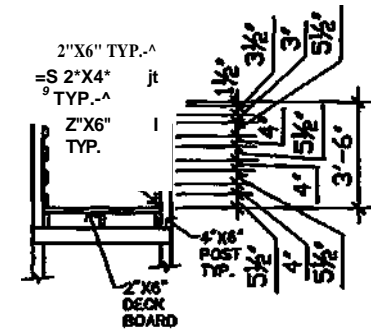
DETAIL
BEAM
SUPPORT 1M
CENTER 2"x6"x4"
DECKING
KICK
40C6" POST
3/8" CARRIAGE BOLTS

WITHOUT RAILING

TYPICAL POST DETAIL

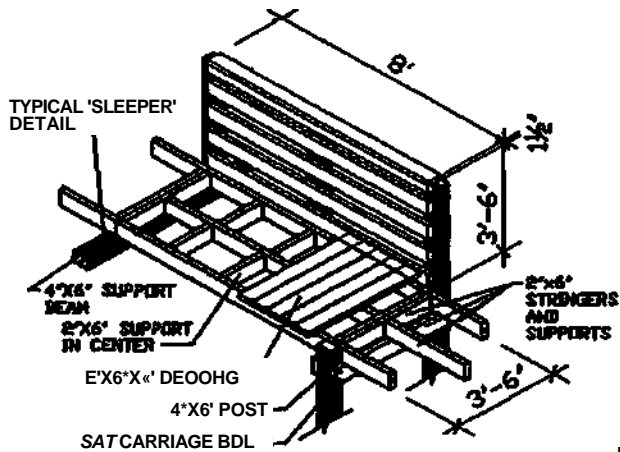


PLAN VIEW

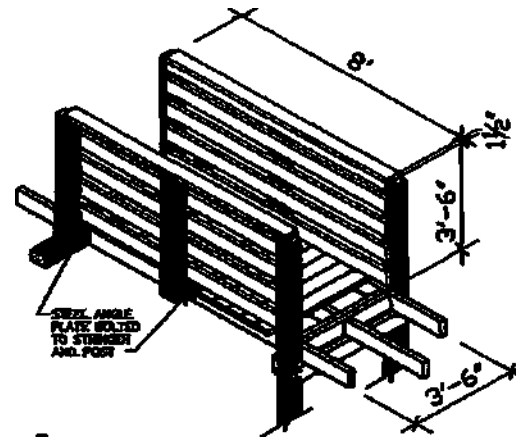


END VIEW

NOT TO BE USED FOR REFERENCE PURPOSES ONLY AND ARE NOT INTENDED TO BE USED AS AN ENGINEERED DRAWING



[WITH RAILING]



SPECIFICATIONS FOR BRIDGES USING W (WIDE FLANGE) I BEAMS FOR THE SUPPORT STRUCTURE.

KEY 8 W 10 The first number (8) indicates the depth of the beam (8° in the example), the second number (10) indicates the weight in pounds per lineal foot of beam (10 lbs. In the example).

 The number in parentheses (a) is the maximum spacing in feet between lateral supports.

12 FOOT WIDE BRIDGES

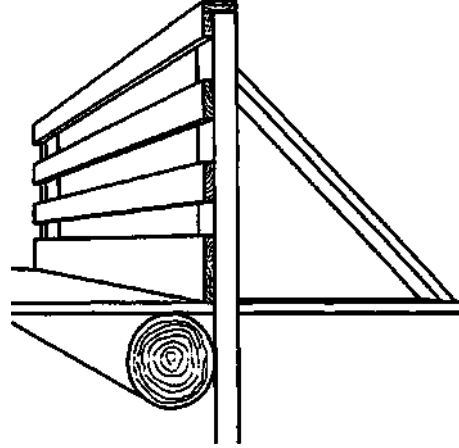
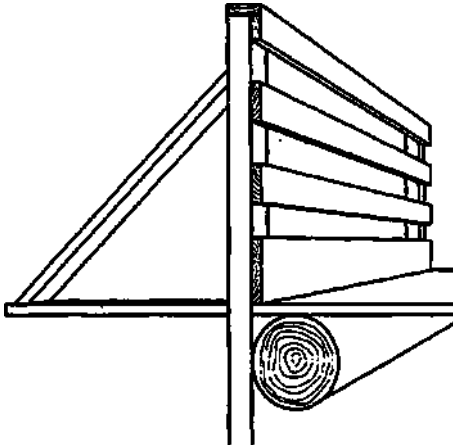
		NUMBER	OF	BEAMS	
<i>LENGTH</i>	6	5	4	3	2
20*	6 W 20 (6.4)	6 W 25 (6.4)	10 W 15 (4.2)	10 W 19 (4.2)	12 W 19 (4.2)
25'	8 W 21 (5.6)	12 W 14(3.5)	12 W 19 (4.2)	14 W 22 (5.3)	14 W 26 (5.3)
30'	10W 22 (6.1)	12 W 22 (4.3)	14 W 22 (5.3)	14 W 26 (5.3)	16 W 31 (5.8)
35'	14 W 22 (5.3)	12 W 26 (6.9)	14 W 30 (7.1)	14 W 34 (7.1)	18 W 35 (6.3)
40'	14 W 26 (5.3)	14 W 30 (6.0)	14 W 38 (7.1)	14 W 48 (7.2)	18 W 46 (6.4)
45'	14 W 34 (7.1)	14 W 38 (7.1)	14 W 48 (7.2)	14 W 61 (10.6)	18 W 60 (8.0)
50'	14 W 43(8.4)	16 W 40 (7.4)	14 W 61 (10.6)	14 W 82 (10.7)	16 W 89 (10.9)

10 FOOT WIDE BRIDGES

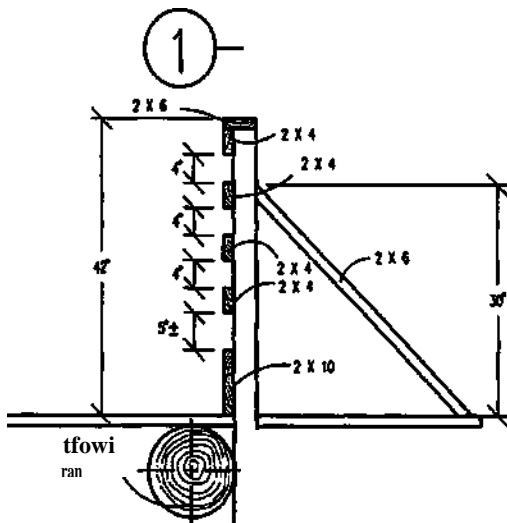
	NUMBER	OF	BEAMS	
<i>LENGTH</i>	5	4	3	2
20'	8 W 10 (4.2)	10W 11.5 (3.8)	12 W 11.8 (2.7)	12 W 16.5 (4.1)
25'	10W 11.5 (3.8)	12 W 14 (3.5)	12 W 16.5 (4.1)	12 W 22 (4.3)
30'	12 W 14 (3.5)	12 W 16.5 (4.1)	12 W 19 (4.2)	14 W 26 (5.3)
35'	12 W 16.5 (4.1)	12 W 19 (4.2)	14 W 22 (5.3)	14 W 30 (7.1)
40'	12 W 19 (4.2)	12 W 22 (4.3)	14 W 26 (5.3)	18 W 35 (6.3)
45'	12 W 22 (4.3)	14 W 26 (5.3)	14 W 30 (7.1)	16 W 40 (7.4)
50'	14 W 22 (5.3)	16 W 26 (5.6)	14 W 34 (7.1)	18 W 40 (6.4)

8 FOOT WIDE BRIDGES

	NUMBER	OF	BEAMS
<i>LENGTH</i>	4	3	2
20'	8 W 10 (4.2)	10 W 11.5(3.8)	12 W 14 (3.5)
25'	10W 11.5(3.8)	12 W 14 (3.5)	12 W 19 (4.2)
30'	12 W 14 (3.5)	12 W 16.5 (4.1)	12 W 22 (4.3)
35'	12 W 16.5 (4.1)	12 W 19 (4.2)	14 W 26 (5.3)
40'	12 W 19 (4.2)	14 W 22 (5.3)	14 W 30 (7.1)
45'	12 W 22 (4.3)	14 W 26 (5.3)	14 W 34 (7.1)
50'	14 W 22 (5.3)	16 W 26 (5.6)	18 W 35 (6.3)

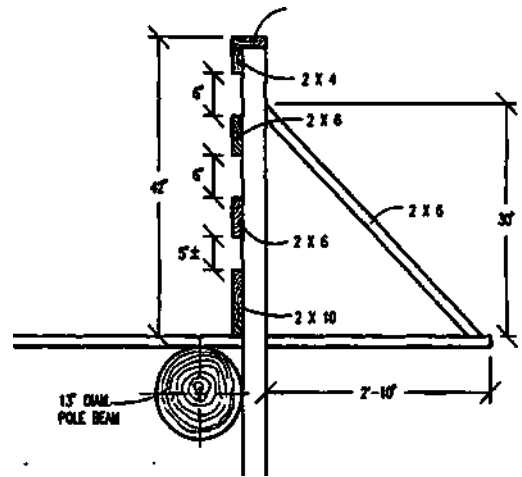


**SNOWMOBILE
BRIDGE**



PERSPECTIVE

SCALE 1/2" = V



2X6

**RAILING DETAIL w/ 2 X
4 RUNNERS**

SCALE 1/2" = r

A

2X4

4X4 POST
(UN)

c ----- t-vr ----- Jr

**TOP RAILING DETAIL
SUPPORT 2-6" O.C.**

SCALE 1" = r

**RAILING DETAIL
w/ 2 X 6 RUNNERS**

SCALE 1/2" = V

B

2X6

4X4 -POST
(UK)

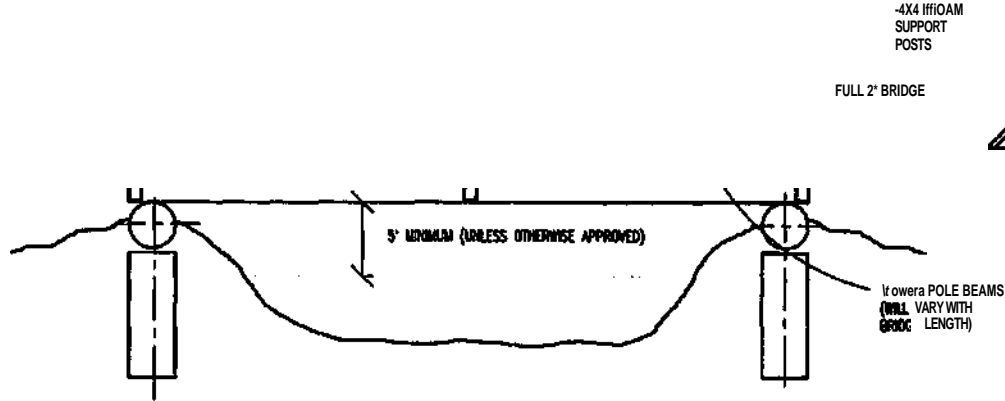
2X4

**TOP RAILING DETAIL
SUPPORT 8-0" O.C.**

SCALE r = V

GROUND

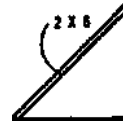
SHOW FOR AN 8' X 16' BROGE



RAILING SIDE ELEVATION

SCALE 1/4" = 1'

(6)



fit 6
PB-2X4

2X6

Y-2X6

2X10
n
£E

2X6
2X4



O.

2X6

2X6

2X10

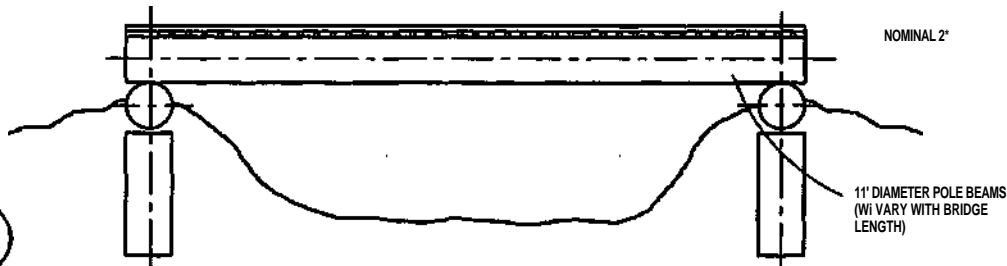
53

RAILING FRONT ELEVATION

SCALE 1/4" = 1'

(7)

GROUND

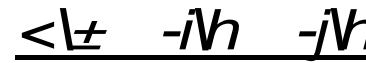


3 SUPPORT POLES & KICK PLATES SIDE VIEW

SCALE 1/4" = 1'

8

2 X 6 KICK PLATE



FRONT ELEVATION

SCALE 1/4" = 1'

(9)

%&*!

List of Prefabricated Bridge Manufacturers

Anderson Enterprises
Route 2, Box 159AA
Eau Claire, WI 54703
(715) 874-6543

[Prefabricated steel bridges with
wood decks (Installation available).]

Sales Representative:
Bud Flood 1832 Illinois
Avenue Stevens Point,
WI 54481 (715)344-8243

Wheeler Consolidated
Box 26100
St. Louis Park, MN 55426
(612) 929-7854

[Precut wood bridges for on-site assembly]

Sales Representative:
Bud Flood
1832 Illinois Avenue
Stevens Point, WI 54481
(715)344-8243

Continental Bridges, Inc.
Route 5, Box 178
Alexandria, MN 56308
(800) 328-2047

[Prefabricated steel bridges with wood decks.]

Custom Manufacturing
606 Delco Drive
Clinton, WI 53525
(608) 676-2283

[Kits of bridges include pre-drilled steel I-beams and cross members, wood
deck planks, pre-drilled wood posts and wood railings (Installation available).

Sentinel Structures
477 South Teck Avenue
Peshtigo, WI 54157
(715)582-4544

[Precut wood bridges for on-site assembly - laminated wood beams also
available.]

Bridge Contractors

- ◆ Flannery Trucking
606 South Grandview
Crandon.WI 54520
(715)478-2415
[Constructs abutments and crane service to install bridges]
- ◆ Horizon Construction
4100 Campbellsport Drive
P.O. 439
Campbellsport, WI 53010
(414) 533-8490
[Constructs abutments, installs prefabricated metal bridges and does site grading]
- ◆ Krueger and Stienfest
P.O. Box 159
Antigo.WI 54409
(715)627-7020
[Installs pilings and bridges]
- ◆ Ruzic Construction
W 4897 Highway 73
Neillsville, WI 54456
(715)743-4138
[Builds and installs metal, timber and concrete bridges. Pile driving available]
- ◆ Smith Construction
Route 1
Wabeno, WI 54566
(715)473-5324
[Wood truss bridge assembly]
- ◆ Bean's Inc.
Route 1, Box 181
Chaseburg, WI 54621
(608)452-3169
[Have installed Wheeler bridges]
- ◆ Fenner Excavating and Trucking
Cty J and 10th Avenue
Friendship, WI 53934
(608) 339-9072 [Have
installed Wheeler bridges]

Ice Age National Scenic Trail Handbook

- + Great Lakes Marine Contracting
N256 Hwy. 49
Weyauwega, WI 54983
(414) 867-3455 [Have installed Wheeler bridges]

- ◆ Lakeland Landscaping
7828 Parkside Court
Minocqua, WI 54548
(715)284-9491
[Have installed Wheeler bridges]

- ◆ Lunda Construction Company
Box 669
Black River Falls, WI 54616
(715)284-9491 [Have installed Wheeler bridges]

- ◆ McMullen & Pitz Construction Co.
17 Maritime Drive
P.O. Box 8
Manitowoc, WI 54221 (414)682-0131 [Have installed Wheeler bridges]

Bridge Material Sources that Offer Special Values

Isaksson Lumber Co., Inc. - (HCR Box 15, Herbster, WI (715) 774-3381) saws pine lumber and has rough sawed and smooth finished pressure treated lumber from stock or to special order.

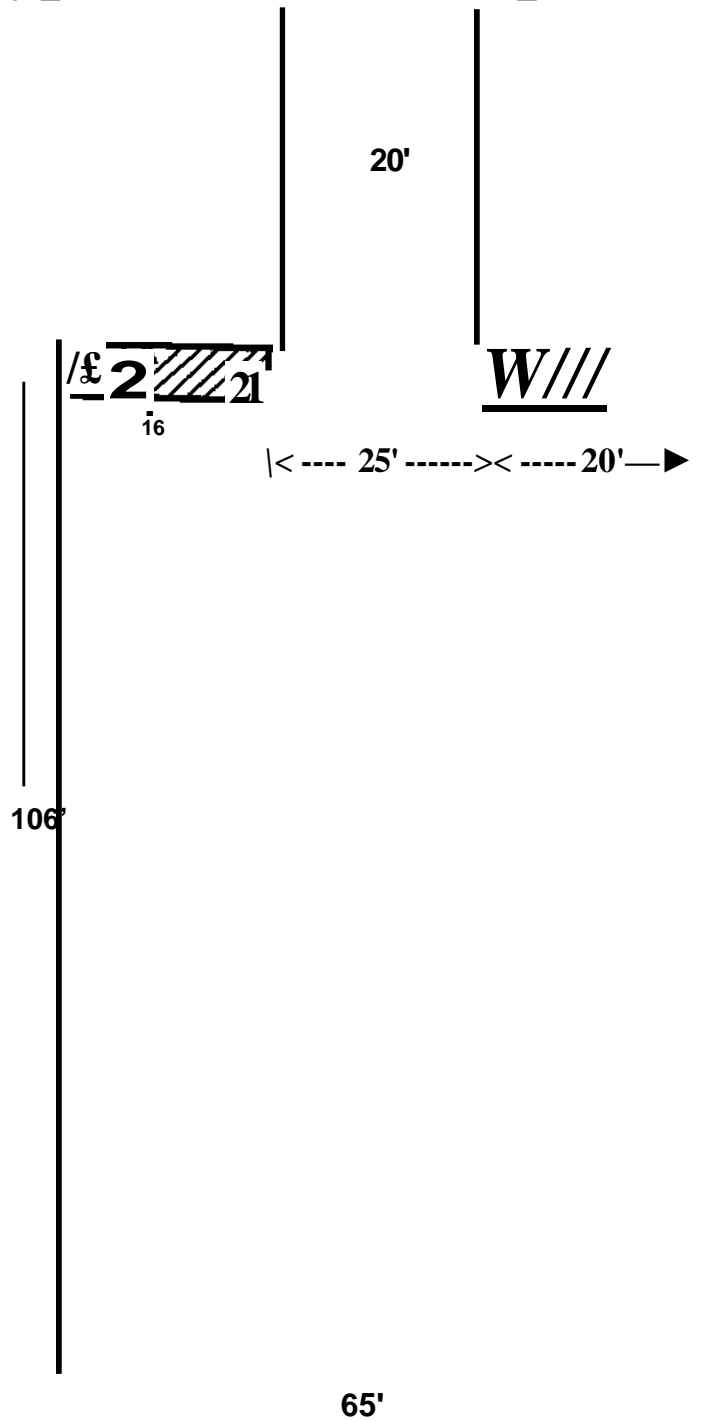
Fastenal - good source for bridge hardware

National Steel Fabricators - (W16890 U.S. Highway 8, Rice Lake, WI 54868) can provide bridge engineering service, drawings and steel fabrication.

Sentinel Structures (477 South Tech Avenue, Peshtigo, WI 54157, (715) 582-4544) sells laminated wood beams for bridges up to 100 feet long.



Typical 20 or 10 car parking lot



20 car lot would be $106' \times 65'$; 10 car lot would be $106' \times 45'$. Surface could be either asphalt or gravel. Scale: $1''=20'$

Typical 1-10 car parking lot

Entry
Road

20'

16

X

20'

|

25'

45'

Typical parking lot of 1-10 spaces including one disabled accessible. Surface could be either asphalt or gravel. Scale: 1"=20'



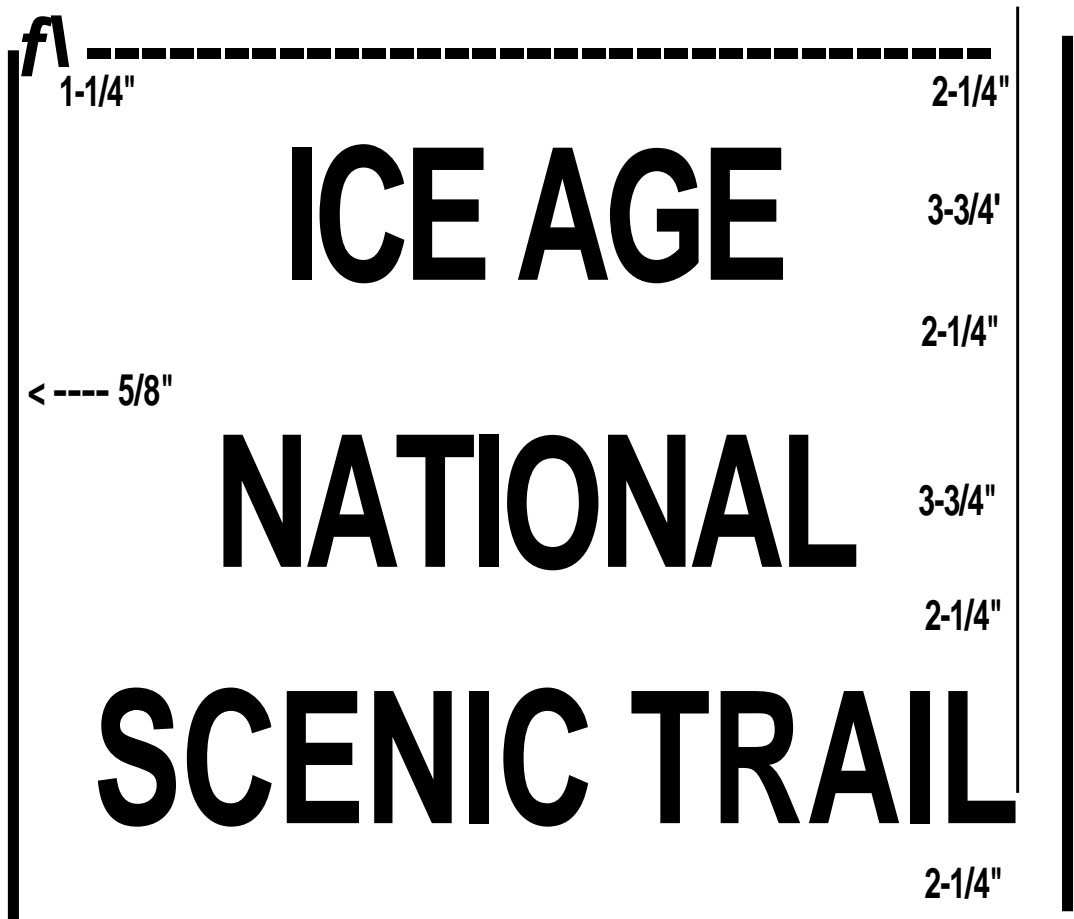
Alternate 10 car parking lot

56'

65'

APPENDIX 2
SIGN SAMPLES

Highway Information Sign



36" X 20-1/4"

Regulatory/Usage Control Sign





Trailhead Entrance Sign



Access Sign

**Ice Age Trail
Access 0.5 mi.**

Volunteer Maintenance Sign

**THIS TRAIL IS
MAINTAINED
ENTIRELY BY
VOLUNTEERS!**

If you are interested in
volunteering, please call the
Ice Age Park & Trail Foundation
at 1-800-227-0046

Wood-Routed Trailhead Entrance Sign

ICE AGE TRAIL 
Wood Lake Segment

Message

Wood Lake
Tower Road

5 Miles
8.5 Miles

APPENDIX 3

EYE LEVEL SURVEY

Ice Age National Scenic Trail Handbook

An eye-level survey allows one or two individuals to locate and lay out a trail in hilly terrain. Sometimes called an eye-level flagline, the purpose is to establish a correct grade for the trail. The basic equipment needed is a clinometer and flagging. For a more complete job, or when laying out a trail that will not be constructed for some time, construction stakes, pin flags, and a notebook to record readings are needed.

Step 1: From maps or first-hand knowledge, establish key points where the trail must be located. These include campsites, water sources, scenic vistas, stream crossings, etc.

Step 2: Scout the trail. Determine the best way to get from one major point, identified in step 1, to another. Scouting merely means to begin at the first key point and walk toward the next key point to determine if a route is feasible. This step may involve several attempts before the best route is found. In places, you may want to hang some temporary flagging.

Step 3: If after reaching key point number 2, and a feasible route has been found, flag the trail on the return trip to key point number 1. Flagging should be complete enough so that the construction crew can determine the centerline of the trail. When tying flagging on trees, it is recommended to place the knot so that it is facing the trail. This indicates to the construction crew where you intend the trail to be located in relation to the tree. In areas of gentle topography, simply flag the trail location going by what "feels good" ~ considering all important location factors such as drainage, scenery, gentle curves, variety, maintainability of trail, and ease of construction. Eye-level surveying is employed in step number 4.

Step 4: Eye-level surveying is used to maintain the correct grade (generally 7 to 10 percent) on hills. If working with a partner, stand face-to-face in a level area. Sight through the clinometer to determine a feature on your partner's body that is level with your eyes by rotating the clinometer to a zero percent reading. This may be your partner's hairline, nose, mouth, shirt pocket, etc. Remember this feature.

The objective is to establish a uniform trail grade from the top to the bottom of the hill. Begin at the top or bottom of the hill by tying a piece of flagging at your eye-level. If working with a partner, the person with the clinometer stays at this position while the partner walks ahead along what appears to be the feasible trail route. As long as the hillside is uniform, the partner can walk as far away as they can be easily seen through the clinometer. If there are undulations in the hillside, the partner should stop at each break in topography. The person with the clinometer sights the eye-level feature of the partner and has them move upslope or downslope until the desired grade (say 8 percent) is read in the clinometer. The clinometer person then walks forward to the partner's position, and hangs another eye-level flag. The process is then repeated until the hill is traversed. If working by yourself, walk forward and take readings on the last eye-level flagging. Move up or down slope until the correct reading (8 percent) is obtained.

Repeat the process using eye-level survey on hills and gut feelings in gentle areas until key point number 1 is reached. If the same people who are laying out trail are doing the construction, no further flagging or staking is necessary. Subsequent steps merely refine the staking of the trail so that a trail construction crew can more easily

determine what is intended, or to identify and record amounts of work for planning the job.

Step 5: Since the eye-level flagging is tied on a tree or limb, it is generally off to the side of the trail's desired centerline. Consequently, the construction crew may have a difficult time placing the trail on the ground exactly as is desired. To eliminate any confusion, at each eye-level flagging location, sight through the clinometer at the previously hung flagging until a reading of 0 percent is established and drive a construction stake into the ground where you are standing. This is the trail's centerline.

Concurrently, the survey can be refined by writing the survey station number on the stake and recording construction information in a survey notebook. From the beginning point, measure to the stake with a steel or cloth tape. For example, if it is 185 feet, record this number on the stake and in a survey notebook as 1 + 85. Measurements to subsequent stakes are added to the previous measurements so that at the end of a mile the stake would read 52 + 80 (5,280 feet from the beginning). Useful information can be recorded in a simple table that meets your needs. An example is shown below.

Station	Percent Grade 1	Clearing Needed 2	Grubbing Needed 3	Excavation Needed	Percent Sidehill
0+00	8	Light	Medium	Light	15
1+85	8	Medium	Medium	Heavy	40
2+50	7	Light	Light	Medium	25

- (1) To the next station.
- (2) Clearing refers to the amount of trees, saplings, brush, and large fallen logs that need removal.
- (3) Grubbing refers to stumps and roots that need to be removed.

Step 6: Use a series of pin flags to show the curvature (centerline) of the trail between the stations.

APPENDIX 4

WORKING WITH LANDOWNERS

GENERAL AGREEMENT
BETWEEN THE NATIONAL
PARK SERVICE AND

_____ (landowner)

CONCERNING THE ICE AGE
NATIONAL SCENIC TRAIL

Article I - Background and Objectives

This agreement is made and entered into, by and between the National Park Service, hereinafter referred to as the "NPS," and the above named landowner, hereinafter referred to as the "landowner," in furtherance of the purposes of and pursuant to the powers and authorities contained in the National Trails System Act of October 2, 1968, as amended [16 U.S.C. 1241 et seq.], hereinafter referred to as the "Act."

On October 3, 1980, Congress amended the Act to authorize and establish the Ice Age National Scenic Trail, hereinafter referred to as the "Trail," as a component of the National Trails System [94 Stat. 67; 16 U.S.C. 1244(a)(10)]. The Trail meanders through Wisconsin for approximately 1,200 miles from Potawatomi State Park in Door County to Interstate State Park in Polk County, generally following the terminal moraine and other landscape features left by the last glacial advance. The Secretary of the Interior was assigned administrative responsibility for the Trail.

The Act provides, in Section 7(h) [16 U.S.C. 1246(h)], that when determined to be in the public interest, the Secretary of the Interior may enter into written cooperative agreements with States or their political subdivisions, landowners, private organizations, or individuals to operate, develop, and maintain any portion of a national scenic trail either within or outside a Federally administered area. Such agreements may include provisions for limited financial assistance to encourage participation in the acquisition, protection, operation, development, or maintenance of such a trail, provisions providing volunteer in the park status (in accordance with the Volunteers in the Parks Act of 1969) to

individuals, private organizations, or landowners participating in such activities, or provisions of both types.

The Act also provides in Section 7(e), that the Secretary charged with the administration of a national scenic or national historic trail may enter into agreements with landowners, private organizations, and individuals for the use of lands for trail purposes.

This agreement is for the purpose of documenting the cooperative involvement of a private landowner in the completion and long-term management of the Trail and clarifying the responsibilities of each party for the Trail.

Because the Trail involves only a small portion of Federal lands and the Act provides that the development, operation, and maintenance of the Trail shall be a cooperative venture, with special emphasis on the participation of private volunteer trail organizations and private landowners, the Secretary of the Interior has determined it to be in the public interest to enter into this agreement.

The Secretary of the Interior has delegated overall administrative responsibility for the Trail to the NPS. The NPS, in cooperation with other public and private interests, completed a Comprehensive Plan for Management and Use of the Trail in September 1983. The NPS is responsible at the Federal level for carrying out the provisions of the Act as they relate to the Trail by coordinating, guiding, and assisting the efforts of others to acquire, develop, operate, protect, and maintain the Trail in accordance with the comprehensive plan.

Article II - Statements of Work

/L The NPS agrees:

1. To recognize the landowner as a Volunteer-in-Park (VIP) through execution of an agreement for individual voluntary services. The purpose of a VIP agreement is to formalize the commitment of a volunteer to the Trail and provide them with the protection enjoyed by Federal employees in circumstances of tort claims and injury compensation. Recognition of the landowner as a VIP shall be contingent on their agreeing to meet the record keeping and reporting requirements of

the program. Essentially, this is an annual reporting of any hours spent maintaining the trail.

The Volunteers in the Parks Act (16 U.S.C. 18g) authorizes the Secretary of the Interior to accept the services of volunteers for activities in and related to areas administered by the Secretary. While acting within the scope of their agreed responsibilities, individual volunteers would be considered as Federal employees for purposes of tort claim provisions of Title 28 of the United States Code and with regard to compensation for work injuries.

Individual Volunteers-in-the-Parks (VIPs) receive protection under the Federal Tort Claims Act and the Federal Employee Compensation Act while working within the scope of their responsibilities. Under the Federal Tort Claims Act (FTCA), any tort claim filed by a citizen, against trail club organizations and their members or other individuals who have entered into a Cooperative Agreement with the NPS, for personal or property injury sustained while using the Ice Age NST, arising from VIP activities, would be handled by the NPS as it does claims against employees. An investigation of facts is made by a designated Tort Claims Officer and reported to the Solicitor's Office for review.

A determination of Federal Government liability in each case is made and any award paid to a claimant(s) is borne by the Government. The FTCA grants jurisdiction for actions on monetary claims for injury, property loss or death "caused by the negligent or wrongful act or omission of any employee of the Government"....

It is also possible that an injured party may choose to proceed against a participating trail club or individual personally, pursuant to the legal action, rather than following the Federal Tort Claim procedure. In this case, we would expect the Department of Justice to defend the action. It is Department of Justice practice to represent Federal officials who are sued personally for actions that arise while within the scope of their employment. This should also be true for VIPs acting within the scope of their volunteer agreement....Therefore, if the claimant chooses to file suit, VIPs should normally be represented in court and court costs covered by the Government....As with Government employees, volunteers are protected for their negligent actions as long as it can be shown that they were acting within the scope of their responsibilities.

2. To provide training and assistance on trail development, operation, maintenance, protection, publicity, and public relations, as needed—should the landowner take an active interest in constructing or maintaining the trail across his/her property. Much of this will be accomplished by encouraging the local Ice Age Park and Trail Foundation (IAPTF) chapter or individual members to work closely with the landowner.
3. To facilitate communication and contact between the landowner and local IAPTF members or chapter if it is not occurring satisfactorily.

B. The Landowner agrees:

1. To allow passage of the Ice Age NST across his/her property. The original route location and any subsequent changes shall be as approved by the landowner. Property is shown on the attached plat map(s). NOTE: Please submit along with this agreement to NPS.

Ice Age National Scenic Trail Handbook

- 2. To allow members of the IAPTF and other volunteers working with them to follow the trail route as needed to construct and maintain the trail to accepted standards. Typically, the trail consists of cleared space 4 feet wide and 8 feet high; tread width of about 18 inches; and yellow 2X6 inch painted or plastic blazes affixed to trees or posts at reasonable intervals. If affixed to trees, aluminum nails will be used. No trees shall be removed without explicit permission of the landowner except for small saplings and limbs encroaching into the trail clearing.**
- 3. To allow recreational passage by members of the IAPTF and the general public free of charge.**
- 4. To protect the trail, to the extent possible, from activities which destroy or damage the tread or the trail markings.**
- 5. To protect the trail, to the extent possible, from unauthorized motorized activities and to report such activities to the local IAPTF representative.**
- 6. To restrict activities such as dumping of trash, garbage, and other unsightly or hazardous materials on or in close proximity to the trail and strive to protect the natural scenic values of the area.**
- 7. To provide for the protection of the trail, through contractual restrictions—if timber is cut immediately adjacent to the trail. This could include prohibitions on skidding along or across the trail except at reasonable intervals, slash removal from the trail and an adjacent reasonable distance, and protection of trees bearing the painted or plastic trail markings. It also includes notifying the local IAPTF representative of the anticipated cutting so that provisions can be made for temporary or permanent trail rerouting.**
- 8. To provide an annual verbal or written estimate to the NPS by September 15 of the number of hours that he/she has spent actively working on the trail.**
- 9. To permit the removal of trail markings and any other trail improvements (that are removable) within a reasonable time after this agreement expires or is terminated, if and when it does.**

C. The NPS and Landowner agree:

1. To coordinate their activities and programs related to the Trail to assure that the efforts of each party complement those of the other.
2. That uses are restricted to foot travel only—including snowshoeing and possibly cross country skiing. Bicycles, horses, and all motorized vehicles are not permitted.
3. That the landowner shall have the right to incidental, occasional passage along the trail by motorized vehicle for non-recreational activities such as the gathering of firewood, routine farming practices, and other similar personal activities.

Article III - Term of Agreement

This agreement shall continue in effect for 5 years from the date of the last signatory party unless terminated at an earlier date in accordance with Article V. At the expiration of this agreement, it may be successively renewed for additional periods by mutual agreement of both parties after reviewing its benefits.

Article IV - Key Officials

The key NPS officials are the Superintendent, Ice Age and North Country National Scenic Trails, and the Manager, Ice Age NST, both located at 700 Rayovac Drive, Suite 100, Madison, Wisconsin 53711.

The key landowner is as shown above, located at _____

Article V - Termination

This agreement may be terminated upon 60 days advance written notice given by one party to the other, or it may be terminated earlier or revised by mutual consent of both parties. Termination of this agreement does not affect any operation and maintenance agreements which either party may

have with other cooperators.

Article VI - Standard Provisions

The obligation of the NPS and the Landowner to perform the responsibilities specified in this agreement is contingent upon the necessary funds being available through governmental appropriations or other sources. No legal liability on the part of the NPS or the Landowner to carry out such responsibilities shall arise unless and until funds are available to cover the expenses associated with performing the responsibilities specified herein.

Additional NPS Provisions

Nothing in this agreement shall affect or interfere with fulfillment of the obligations or exercise of the authority of the NPS or any other Federal Agency to manage the lands along the Trail route (within the boundaries of areas they administer) and the programs under their jurisdiction in accordance with their basic land management responsibilities.

No member of or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit. During the performance of this agreement, the participants agree to abide by the terms of Executive Order 11246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex, or national origin. The participants will take affirmative action to ensure that applicants are employed without regard to their race, color, religion, sex, or national origin.

IN WITNESS WHEREOF, the parties hereto have executed this Memorandum of Understanding as of the last date written below.

Superintendent, Ice Age and North Country National Scenic Trails,
National Park Service

Date

Landowner

Date

TRAIL FAQ's:

What is the Ice Age Trail?

Officially named the "Ice Age National Scenic Trail", it is one of only eight national scenic trails in the United States, a 1,100-mile national walking/hiking trail located in and unique to Wisconsin. About 600 miles of the trail are now available for use. Wisconsin's Department of Tourism recognizes the trail as Wisconsin's number one outdoor recreational resource. It has been featured in National Geographic and Backpacker magazines.

What does the trail have to do with the Ice Age?

The route of the trail approximates the last stopping point or terminal edge of our most recent glaciation. The trail does diverge some places to include other features of the glacial landscape and/or scenic views of the "Driftless Area".

What and where is the "Driftless Area"?

It is the southwestern quarter of the state that has been untouched ("unglaciated") by ice sheets. It's a landscape deeply cut by ancient streams into narrow, twisting valleys and ridges. The surface landforms in the driftless area are much older than those in the rest of the state.

Recent glacier? When was that?

The last glacier that covered much of Wisconsin consisted of 6 large lobes reaching its greatest extent about 14,000 to 16,000 years ago before beginning to melt back. This most recent, named the Wisconsin glacier, was part of a much longer period of glaciation that covered most of northern North America, as far south as the Missouri and Ohio River Valleys. The last stage is called the "Wisconsin Glaciation" because its effects are more noticeable here than anywhere else in the U.S.

What can I see along the trail that was caused by the glacier?

A variety of geological landforms associated almost exclusively with the work of glaciers is more conspicuous here in Wisconsin than anywhere else in the world. Features like moraines, eskers, erratics, kettles, drumlins, kames, and lakes can be seen from the trail at various points throughout the state.

Glacial Features

Moraine - A ridge - - Formed by the gravel, sand and boulders carried along by the glacier and deposited where the glacier stopped. Some ridges are only 20'- 30' high while others in the Kettle Moraine rise 250' to 300'.

Esker - A sinuous ridge - - Formed of rounded sand and gravel deposited by the streams that flowed through tunnels at the base of the glacier.

Erratics - Boulders - - Carried long distances by the glaciers and deposited where the glacier melted, they tend to be smooth and rounded. Look for them because they signal the terminal moraine.

Kettle - A surface depression or pothole - - Formed by large, detached blocks of melting ice that were buried under moraines. As the ice melted, the moraine material

collapsed into the resulting hole forming funnel-shaped hollows. Some kettles are more than 20 feet deep.

Drumlin - An elongated hill - - formed from the debris carried by the glacier and deposited as it moved along. These streamlined, elongated hills show the direction the ice was moving. The Capitol in Madison sits atop a drumlin.

Kame -A conical hill - - composed primarily of water-rounded sand and cobbles, streams that flowed downward through cracks in the ice left these deposits.

Dells/Dalles - A gorge - - cut by the torrents of meltwater released by the melting glacier or draining glacial lakes. Some dramatic examples: the Dells of the Eau Claire, the Wisconsin Dells, and the Dalles of the St. Croix.

Outwash plain - A sandy plain - - Formed when glacial meltwater streams in front of the glaciers spread over a very wide, flat area. The sand was swept along into both glaciated and unglaciated areas by the water.

Lakes - Wisconsin contains over 15,000 lakes. Two hundred named lakes and several hundred other lakes and ponds will be found along the Ice Age Trail.

Where can I find the trail?

Trail segment brochures are available for completed portions of the trail. Each brochure contains a map of a specific segment as well as information about the geology and landscape of the area. Brochures can be ordered:

- By writing to the Ice Age Park & Trail Foundation, 207 East Buffalo St., Suite 515, Milwaukee, WI 53202-5712
- By calling the Foundation: 800-227-0046
- By emailing the Foundation: iat@execpc.com
- At the Foundation's website: www.iceagetrail.org

How did this trail system get started?

It all began in the 1950's with Milwaukee native Ray Zillmer's idea of a 1,000 mile long park and hiking trail (hence the name 'Park' and Trail Foundation) that would wind through the state connecting communities and outstanding glacial features. The Foundation was established in 1958 to make the idea a reality. Ray died in 1960, but in 1964 the Ice Age National Scientific Reserve act was passed. In 1980 Congress recognized the national significance of the trail by designating it a National Scenic Trail (NST).

There are nine areas in Wisconsin designated as Scientific Reserves where outstanding examples of glaciation can be seen. They are:

- Two Creeks Buried Forest - approx. 15 mi. N. of Manitowoc
- Northern Kettle Moraine State Forest - N.W. of Milwaukee
- Campbellsport Drumlins- approx. 18 mi. S.E. of Fond du Lac

- Horicon Marsh
- Cross Plains - approx. 7 mi. W. of Madison
- Devil's Lake State Park
- Mill Bluff State Park - approx. 2 mi. N.W. of Camp Douglas
- Chippewa Moraine - approx. 19 mi. N. of Chippewa Falls
- Interstate State Park - at St. Croix Falls near the Wisconsin/Minnesota state line

Can I bike, cross-country ski, horseback ride or camp on the trail?

The trail is intended for **low-impact** activities like walking, backpacking, hiking, cross-country skiing, and snowshoeing. Different segments of the trail are owned by different entities (some is private land, for example) so usage is dictated by the desires of the owner. Some segments of the trail do coincide with state bike trails where biking is allowed.

Some segments also have designated campsites or pass near public camping facilities. Check with the Ice Age Trail chapter in the area you plan on visiting to see what rules apply. County chapter coordinators and their phone numbers are listed in each issue of **Mammoth Tales** (the quarterly newsletter of the Ice Age Park & Trail Foundation) or you can get the information by calling the Foundation headquarters in Milwaukee (800-227-0046).

Who owns and manages the trail?

A variety of partners own and manage segments of the trail. Among them: the Wisconsin Department of Natural Resources, the Ice Age Park & Trail Foundation, the National Park Service, the U.S. Forest Service, county and municipal park and forestry departments, and other civic entities and private landowners.

Where does the money come from to buy land for the trail?

Financial sources are federal, state, county, and private. The Foundation, much like The Nature Conservancy, purchases land with privately donated funds. The state of Wisconsin acquires land through its Stewardship Program, a portion of which is designated for the trail. It is through the foresight and generosity of all these donors that the Ice Age Trail protects the land and glacial features for future generations to enjoy.

Is the Ice Age Trail like the Appalachian Trail?

Not entirely, although both are National Scenic Trails. The Appalachian Trail is twice as long, about 2,200 miles and runs through 14 states, seldom intersecting a town or community. The Ice Age Trail will be about 1,100 miles long and totally contained within Wisconsin. One of the virtues of our trail is its involvement with the diverse communities along its route. It was designed to connect communities, not avoid them. In fact, more than 20% of Wisconsin residents live within 10 miles of the trail. The Ice Age Trail was designed very specifically to preserve and protect Wisconsin's **cultural** as well as its glacial heritage.

FOUNDATION FAQ's:

What is the Ice Age Park & Trail Foundation?

The Ice Age Park & Trail Foundation (IAPTF) is a nonprofit, volunteer-based organization headquartered in Milwaukee, Wisconsin. There are 21 local volunteer groups ("chapters") with more than 3,200 members in Wisconsin and 4,000-plus members nationwide. Through a cooperative agreement with the Wisconsin Department of Natural Resources (DNR) and the National Park Service (NPS), the Foundation staff and volunteers work to build and maintain the many segments of the Ice Age Trail.

Ice Age Park & Trail Foundation

Mission Statement

To preserve Wisconsin's cultural and glacial heritage along the Ice Age Trail for the education and enjoyment of present and future generations.

How can I participate and support the Trail?

You can become a member of the Ice Age Park & Trail Foundation for \$15/students and seniors, \$20/individuals, and \$30 for families. Contributions in any amount are welcome and are tax deductible. A portion of each member's dues is allocated to that member's local chapter to assist in the cost of maintaining the trail there.

Membership applications are available from local chapters or in each issue of Mammoth Tales as well as through the other contact sites given previously.

Members receive the quarterly newsletter, Mammoth Tales, and local chapter newsletters when available. They are also invited to take part in the Foundation's Annual Meeting and other informational and social events held throughout the year.

What is the Waushara County Chapter's relationship to the Ice Age Park and Trail

Foundation MAPTFV?

The Waushara Co. Chapter is one of 21 volunteer groups ("chapters") that maintain and promote the trail from end-to-end. They are the Foundation's "cutting edges" of trail development.

The Mission of the Waushara County Chapter is to work as the local managing entity of the Ice Age Park and Trail Foundation to:

- >Preserve Wisconsin's glacial heritage for the enjoyment of present and future generations,
- >Create a volunteer chapter that takes an active interest in the development, construction, maintenance, and protection of the trail in Waushara county, and
- >Provide membership of all ages, especially youth and families, a hiking and cross county skiing trail for all to use.

Where is the Ice Age Trail in Waushara County?

The Ice Age Trail in Waushara County generally follows the maximum extent of the glacier's movement. Two completed segments in the southwestern part of the county are located

within the Chaffee and Wedde Creek State Fishery Areas. Within the town of Deerfield, new trail will be completed by Summer 2001. This area of the trail, the Deerfield Segment, lies entirely on private property, and will cover roughly 4-5 miles.

Completed trail segments in Waushara County include:

- Chaffee Creek Segment Trailhead: 3 miles south of Coloma at the I39 southbound rest area
- Wedde Creek Segment Trailhead: DNR parking area off Czech Ave. in the Town of Richford

How can I locate these trail segments?

Foundation segment maps are not currently available for Waushara County. You can receive information and trail directions by calling Tom Pintar, the county chapter coordinator, at 715-228-2095.

What activities does the Chapter offer?

A wide variety of activities for many different interests and ages:

- Trail building - Every year volunteers are constructing new segments, maintaining the existing segments, and working on signage construction.
- Educational & entertainment - Chapter members lead interpretive walks emphasizing local geology, wildlife, and plants and wildflowers for many area school children. Annual chapter events include the Fall Hike-A-Thon in September, and a candlelight ski event in February.

Can all members of my family get involved?

Absolutely! Folks of all ages who are interested in any of the activities mentioned above are enthusiastically welcomed. If special instruction is needed, we will provide it. Adults have many opportunities to contribute to trail development and promotion. Both adults and children are offered opportunities to help maintain the local trail segments, and volunteer at various chapter trail events, like the fall hike and candlelight ski.

How can I learn more about and become involved with the Ice Age Trail in Waushara County?

There are many active volunteers willing to tell you about the trail and the work of the chapter. Several are listed below. Feel free to call them for further information.

- Chapter Coordinator - Tom Pintar, Coloma 715-228-2095
- Landowner Contact - Clyde Samsel, Hancock, 715-249-5602

APPENDIX 5

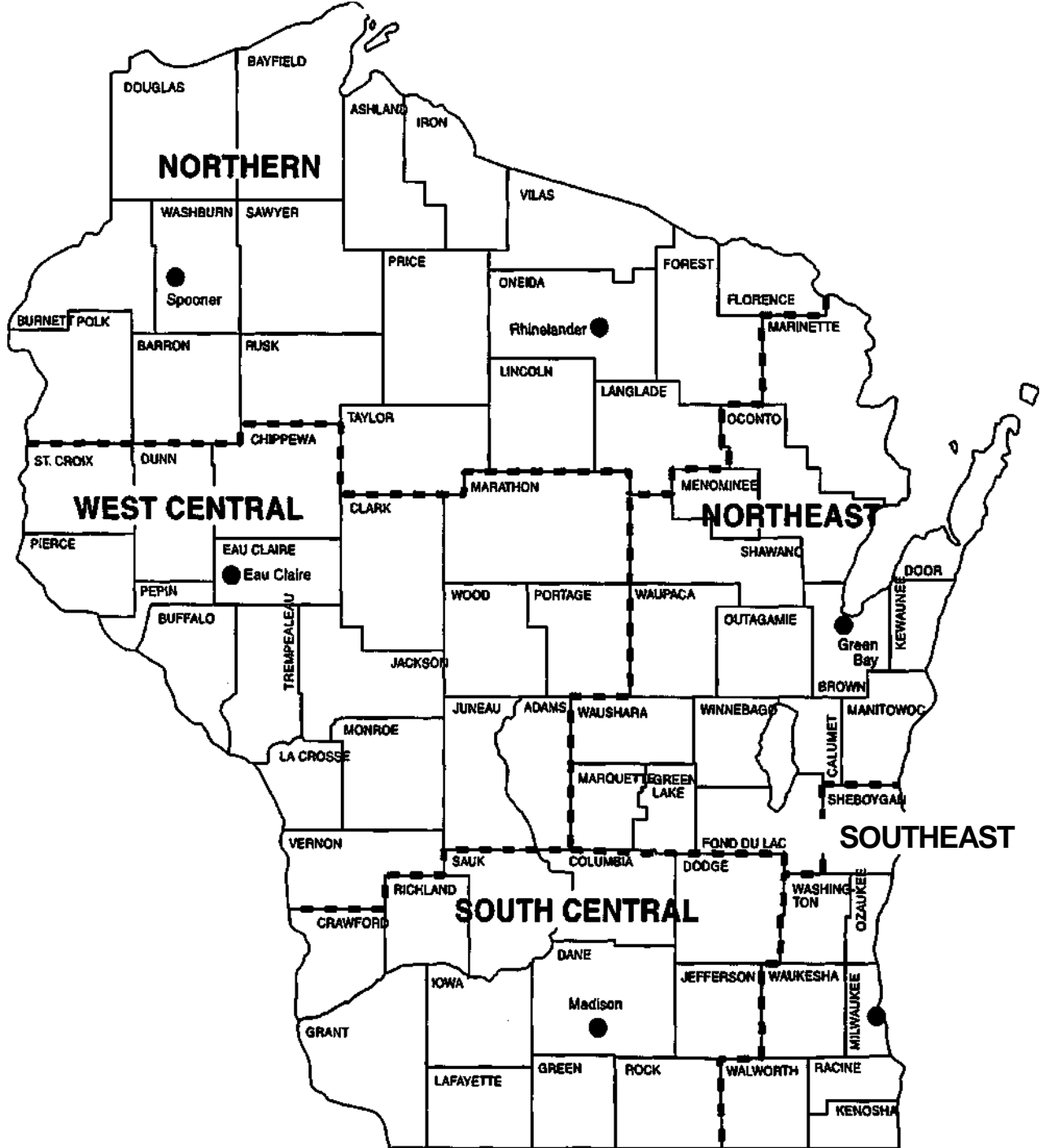
DEPARTMENT OF NATURAL RESOURCES REGIONAL OFFICES

Ice Age National Scenic Trail Handbook

Region Offices

Department of
Natural

275-3266



NORTHERN REGION

Department of Natural Resources
810W. Maple Street Spooner, WI
54801 (715)635-2101

Department of Natural Resources
P.O.Box 818 Rhinelander, WI 54501
(715) 365-8900

WEST CENTRAL REGION

Department of Natural Resources
P.O.Box 4001
Eau Claire, WI 54702-4001
(715) 839-3700

NORTHEAST REGION

Department of Natural Resources
1125 N. Military Avenue P.O.Box
10448 Green Bay, WI 54307 (920)
492-5800

SOUTHEAST REGION

Resources
2300 N. Dr.
Martin Luther
King Jr. Dr.
P.O.Box
12436
Milwaukee, WI
53212
(414)263-8500

SOUTH CENTRAL REGION

Department of
Natural
Resources
3911 Fish
Hatchery
Road
Fitchburg, WI
53711 (608)

**State of
Wisconsin
Department of
Natural Resources**

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- **Regional Boundaries**
- **Region Offices**

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Milwaukee

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