



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



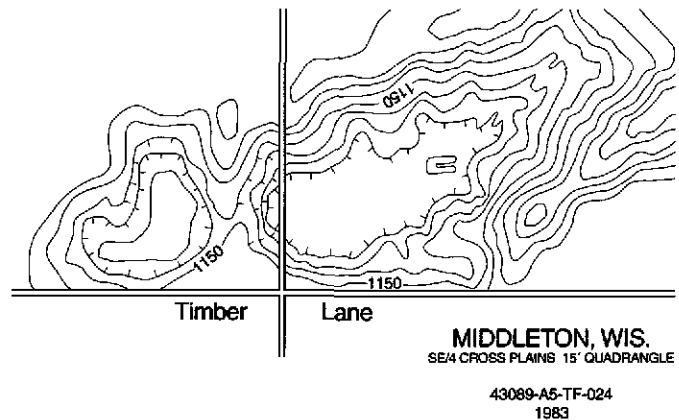
desirable features for the user to walk or gaze upon, or be preserved from human alteration. After these features are mapped, they usually reveal a number of possible route options for the trail. During the formal Corridor Planning Process, this study area results in a clearly defined "corridor of opportunity"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

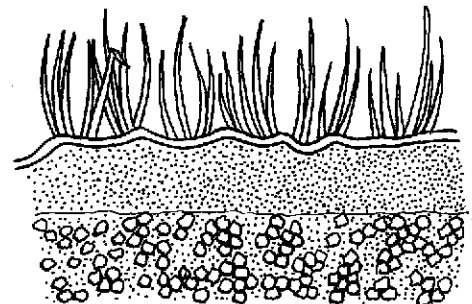
Topography

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 clay or organic 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.



Oak Savanna

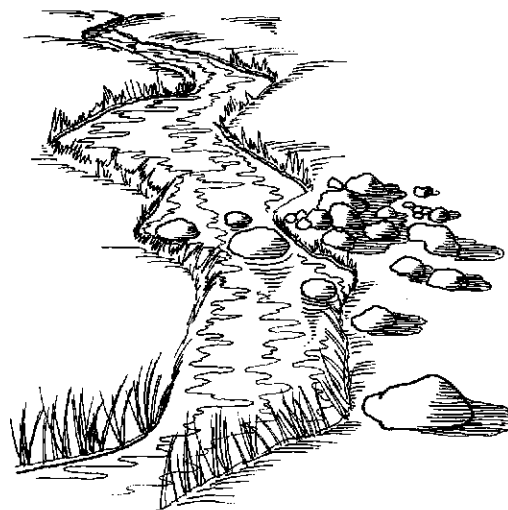
Northern Forest

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).



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

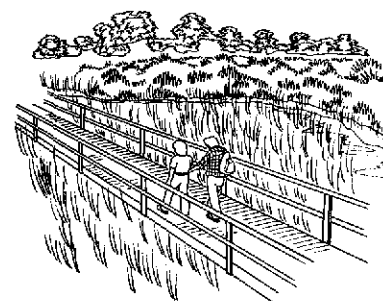
Wetlands

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,



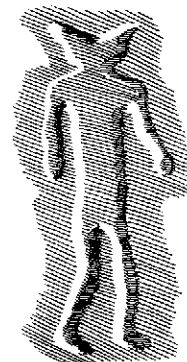
damage to sensitive species, the possibility of changing the natural water levels, etc. For these reasons, wetlands are usually avoided. However, wetlands can provide variety and interest to the trail, and it may be desirable or even unavoidable to incorporate them on occasion. When it is desirable to 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

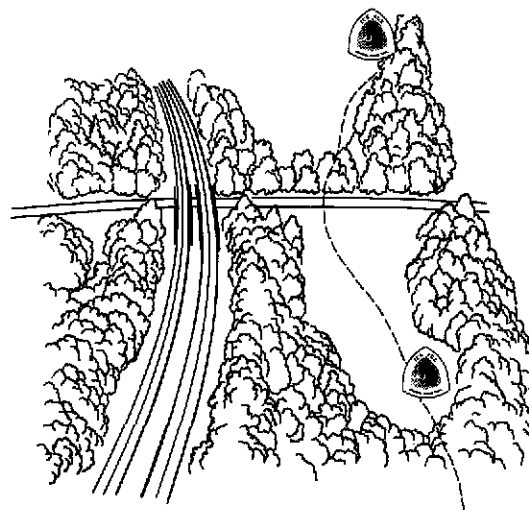
State and local historical societies are great places to find information about cultural resources located within the corridor, both prehistoric and post-European settlement. Historic sites can provide a great opportunity for interpretation and should be mapped as potential points of interest along the 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.

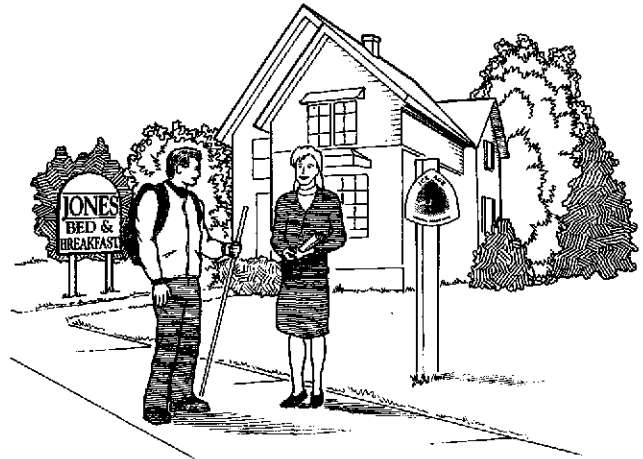
Towns/Villages/Cities

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 greenspace



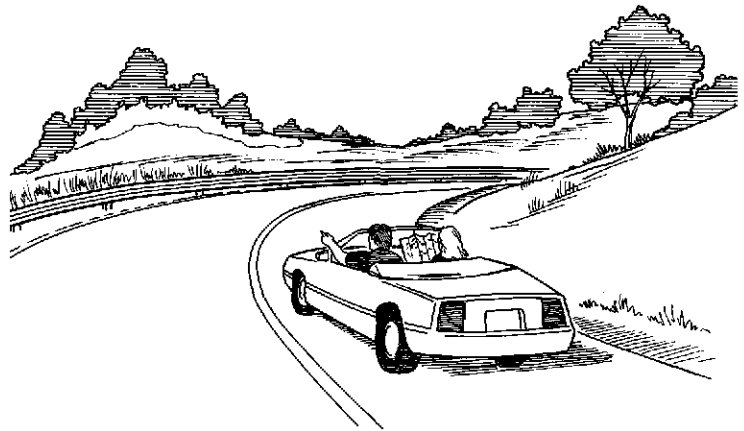
for recreation and education, increased tourism, and access to other regional parks.

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