

Chapter 3

TRAIL LAYOUT

BASIC LAYOUT

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

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

DESIGN CONSIDERATIONS: USER

USE POLICY

The 1982 comprehensive management plan for the trail specifies the following:

All segments of the North Country 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.

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

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

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

Nevertheless, the policy cautions against permitting other uses which might physically damage trail resources or which the trail was not designed to safely accommodate, including safety of the primary users—hikers. The mention of bicycling as a non-motorized activity which might be permitted by a local managing authority was primarily intended to accommodate existing or future rail-trail segments. It was not intended to specifically permit or encourage bicycle use on a section anticipated as, in most cases, a simple footpath. Bicycle use of simple footpath segments was not originally contemplated by the management policies presented in the plan. The mentioning of horse use was intended to allow the North Country NST to utilize segments already developed that permitted horse use, such as the Shore-to-Shore Riding and Hiking Trail (MI), some rail-trail segments, and a few other hardened trail segments. It was not intended to encourage horse use on the typical woods and field footpath segments, most of which lie on sandy, organic, or occasionally wet soil which cannot handle horse traffic without significant trail tread and resource deterioration.

The following paragraphs reflect the NPS perspective, as overall administrator of the trail on bicycle and horse use. These statements are based on the policies in the 1982 plan and the intent of those policies as explained above.

We believe that bicycling is best accommodated as a use on the North Country NST on rail-trail segments and on other short sections of hardened surface (1) specifically designed for wheeled vehicles, where bikes will not damage natural or trail resources, (2) that are parts of previously established multiple use trails that become part of the North Country Trail route, (3) where bicycles can be physically restricted to the designated section, and (4) where bicycle use will not adversely affect the recreational experience of hikers. These conditions generally are not found on the typical, single-track, forested and rural segments of the North Country Trail.

We believe that horse use is best accommodated on the North Country NST on those segments of trail which have been specifically designed and hardened to withstand such use. These conditions generally are not found on the typical, single-track, forested and rural segments of the North Country Trail. Additionally, horse use is perhaps an acceptable use on most trail segments within the prairies and grasslands of North Dakota and western Minnesota, where the character of the North Country NST changes from primarily a wooded experience to primarily a prairie (big sky) experience, passing through many miles of farms, ranches, and grasslands. Here, the flavor of the trail is more "western" than "eastern" and the dryer soils are more forgiving of horse traffic than in wetter, forested areas. In these areas, there may also be opportunities to establish parallel hiking and horse trails, such as along the McCluskey and New Rockford Canals—horses on the old access road and hikers on a foot trail within the boundary of the canal right-of-way.

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.

Investigation of sections where bicycle use is considerable shows that bicyclists tend to ride around waterbars, thus widening the trail. Loosening of the trail tread occurs on uphill and downhill portions, accelerating erosion. Trail tread in sandy soils is churned up even on level stretches, making it unpleasant for hikers. Horses cause either muddy conditions or loose sandy conditions—depending on the soils that are present. Both resultant trail conditions degrade hiker experience because they make for unpleasant, difficult hiking. Horses also damage trail structures (e.g., steps, waterbars, etc.) built to withstand the needs of hikers. When horses cannot cross small bridges over streams or wetlands,

they waded through these sensitive riparian areas causing degradation to the water resource.

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 prohibits the use of trailbikes, snowmobiles, ATV's, etc. on the trail. It also prevents the recognition of marked routes of 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.

OPEN SPACE

It is important to route the trail so that occasional portions are in the open. This provides stimulating experiences: the user can see the sky, feel the sun and gain a contrast to the woodland experience. It enables the user to view the landform 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 that same space, then over into the woodland for a short distance, and then back out into the same open space along the edge.

It is desirable that the trail provides a representative view of the area through which it passes. In North Dakota, western Minnesota, and the agricultural portions of the other states, high percentages of the landscape surrounding the trail are, or were, historically open. In these areas sizeable portions of the trail should pass through or next to open areas. In order to provide variety, wooded areas should be sought. In other areas such as southern Ohio, northern Michigan, and Wisconsin, the landscape is almost entirely forested. In these forested landscapes, the trail should be predominantly forested and incidental openings and old fields sought for variety.

While variety is important, wooded areas are most desirable for hikers and volunteers performing trail maintenance due to the heat intensity incurred in open areas. The amount of maintenance required in open areas is greater because the trail must be mowed several times during the growing season. 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. Greater acceptance can be achieved by routing it along fence rows or through woodlots. 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 to not interfere with farming practices and also avoid the vigorous growth of annuals and perennials found in the opening's sunlight. If a

public trail corridor becomes reality, a vegetative management plan that considers both historical and current vegetation will be prepared.

TERRAIN

It is important that users experience the full array of terrain found along the corridor. The route should be in continuous transition. Portions of the trail 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. should also vary and should be influenced by the natural landform available. The user should also have some experiences left to the imagination. Every hilltop should not be climbed, nor every valley be entered. When designing the route, care should be taken to avoid overly steep grades where environmental damage is likely. It is important to go with the flow of the landforms. Those too steep or erodible should be avoided.

GLACIAL FEATURES

Glacial features are encountered along parts of the North Country NST. Users should be brought in contact with glacial features because they add interest, variety, and offer opportunities for interpretation. The user should be able to experience glacial 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. Trails should never compromise the integrity of outstanding glacial features. Variety is important—too much routing along the same types of features can result in redundancy and boredom.

DESIGN CONSIDERATIONS - ENVIRONMENTAL

Use is light in many locations along the North Country NST, and even poorly designed trail may cause little impact on soils, water, sensitive plants and animals. However, in high-use areas environmental impact is of more immediate concern. Heavy use can destroy the soil structure of the trail and lead to soil erosion, with possible siltation of streams and eventual fish habitat destruction. It can also turn wet areas into muddy ones, trample plants, etc. One of the early signs of damage is an increased prominence of small stones in the trail tread because the surrounding soil particles have been washed away. As time passes, the stones (paving) in the trail become progressively larger in size as water carries away trail material—soil particles first, then sand and stones. If the situation is not corrected small rivulets appear, followed by ditches and gullies.

The trail must be designed to withstand heavy use without destroying the environment.

It must cross the land without causing soil erosion, path widening, vegetative trampling, or spoiling the natural qualities of the area. Once the trail is designed, it must be built properly to achieve environmental safeguards and maintainability of the trail.

Sustainability and durability are key considerations for all North Country NST efforts. To design and build trail correctly at the onset is a wise investment and more economical than to repair or relocate the trail once damage occurs. Facilities which were constructed by the Civilian Conservation Corps (CCC) in the early 1940's are still used. Many of these (including picnic shelters, lodges, trails, stone work, etc.) are as sound today as they were when they were first built because the CCC used quality construction techniques and materials. Trail construction efforts should pattern the quality CCC examples. Using rocks for trail retaining walls requires more effort and expertise than using logs, but the result is a much more durable wall. Sidehill trail construction is more labor intensive than constructing trail directly up the slope but it is much less erodible and sound.

On state or federal lands, an environmental assessment (EA) or similar document which meets the intent of the National Environmental Policy Act (NEPA) is prepared prior to selecting the trail route or doing actual construction. NEPA compliance is also required on projects that use federal funds or when federal officials are doing the planning. The process involves specialists who understand environmental impacts and how to minimize them. Ideally, the environmental assessment process is adopted prior to action anywhere along the trail. When this cannot be done, trail advocates should take positive steps to minimize potential impacts. The scope of this book does not provide a detailed description of all techniques used to protect the environment. However, the general guidelines listed below should be followed (this list is not all-inclusive):

- Design considerations for trail layout fall into one of two major categories: User and Environmental. These may often be in conflict with each other. When conflict exists, err should be on the side of the environment rather than on the side of user convenience or desire.
- When locating or relocating a trail, key places where the trail must pass should first be identified. These could be campgrounds or campsites, scenic view areas, the best stream crossing sites, historical sites, connection spots with other trails, water sources, etc. Next, these locations should be marked on a topographic map or aerial photo. The best way to connect these features, considering slope, soils, and other factors should then be determined .
- Local experts and agency officials should be contacted to learn what fragile soils, threatened or sensitive species, cultural and historical resources, and other opportunities or concerns occur in the corridor. This consultation process should determine if an EA is necessary and minimize passing through any areas of concern.
- In order to avoid damage 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 when it occurs on state or federal lands **or** when it involves federal money or personnel. Project approval regarding historical and archeological concerns usually rests with the State Historic Preservation Office (SHPO).

A cultural resource survey conducted by trained archaeologists is usually required prior to any earth-disturbing activity. In some states an agreement is reached with the SHPO to wait until the initial trail is established before doing the survey, because:

- trail construction normally involves a minimum of earth disturbance,
- most construction is done by hand tools, and
- slight adjustments to the actual alignment are made during the actual construction (to avoid trees, boulders, etc.).

However, whenever 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.

- Quality of trail construction plays a significant role regarding impact on the environment. When a trail is located and constructed so that it requires minimal maintenance, there is less present and future environmental impact. Considerations such as adherence to slope, proper drainage, etc. are important factors.
- The standards for the trail, trail structures, and support structures detailed in Chapters 4, 5, and 6 are designed to protect the environment as well as the user. They should be followed closely to ensure environmental protection.

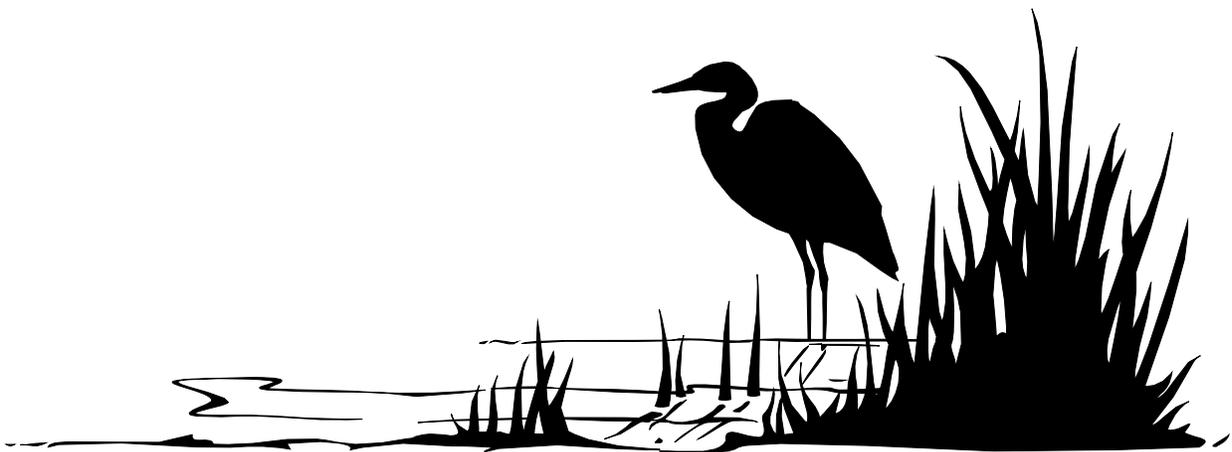
SOILS

When locating the trail, choices must be made between routes that provide more or less soil (trail) stability. The key to locating a trail that is stable and minimizes environmental damage is to find the most stable terrain connecting the key trail

points (see Design Considerations - Environmental section). Areas of heavy, saturated soils or shallow soils should be avoided whenever possible. When the trail must pass through these areas, puncheon or boardwalk should be used (see next section for more detail). Deterioration of the trail from erosion and saturation can be dramatically reduced by designing and constructing the trail on stable terrain.

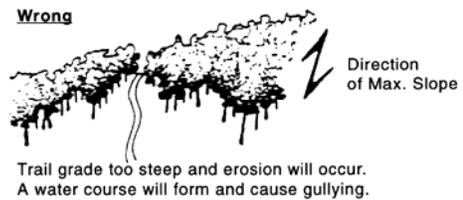
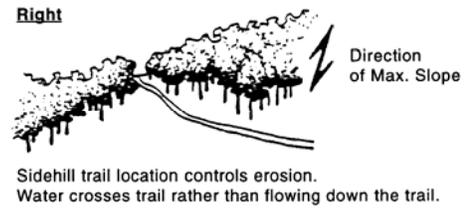
WETLANDS

Wetlands are the transition between open water and dry, upland terrain. The North Country NST passes through wetlands in all seven states—extensively in the Great Lakes region. Defined as "areas with shallow standing water or seasonal to year-long saturated soils," they can be subdivided into a number of categories such as sedge meadow, shallow marsh, deep marsh, shrub swamp, wooded swamp, 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. Most states require permits for altering a wetland. Appropriate officials should be contacted prior to any wetland activities.



SLOPE LOCATIONS

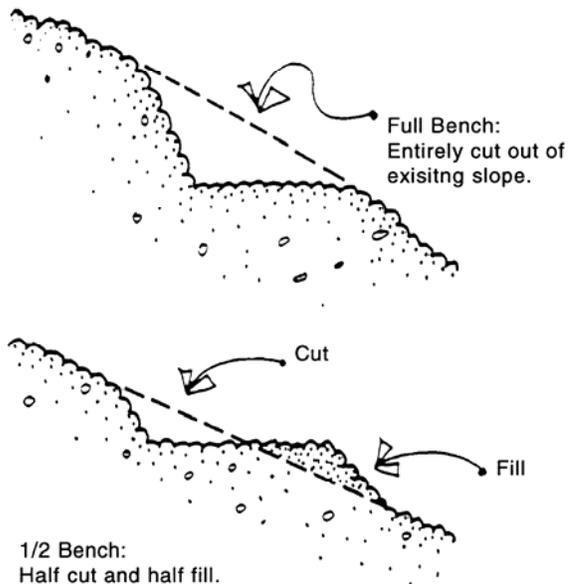
Another key factor in determining the stability of a trail is slope location. The best way to prevent erosion in hilly terrain is to construct the trail on sidehill locations and maintain moderate grades (see Chapter 4). Even on moderate slopes, the trail should never go straight up the slope of the 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 downhillside. Sidehill construction makes it easier to maintain moderate grades, further reducing erosion.



Sidehill construction requires more skill and initial work. However, in the long run, it provides the most stable trail, less environmental damage, and less work. When employing sidehill trail construction,

it is important to do the job properly. Poorly constructed sidehill trail can cause difficult hiking and sore ankles if the hiker has to walk with one leg higher than the other. The trail tread must be excavated so that it is nearly level with only a slight outward pitch to allow water to cross the trail and continue downhill. This requires builders to construct either half- or full-benched trail tread. A half-benched tread (sometimes called balanced tread construction) means that half of the tread is on solid excavation and half is on the fill. Full-bench tread construction means that the entire tread is on a solid excavated area.

Typical Sidehill Construction

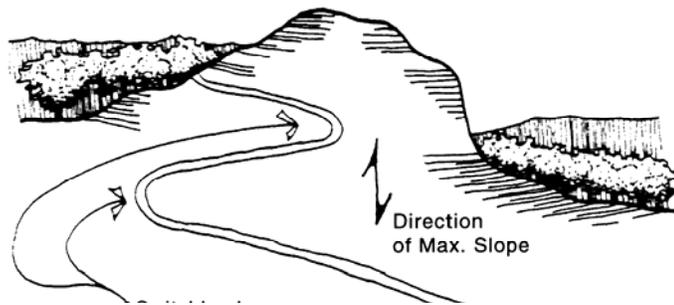


Whenever possible, a full-bench tread should be constructed because it is more stable. The excavated soil is allowed to "waste" below the trail and does not become part of the trail tread. Other labor-intensive techniques, such as rock or log cribbing, may be required in steeper areas.

Maintaining a moderate grade when laying out a trail through hilly terrain can be challenging. Taking the time to locate and flag the proposed route is a time consuming but important first step. Topographic maps should be used to locate key points that the trail must pass. These points could include vistas, campsites, stream crossings, etc. Once key points are identified, a line should be flagged to connect them, while attempting to stay within the slope guidelines shown in Figure 1 (Chapter 4). This flag line may have to be moved several times before the best route is located. This step should not be abandoned in discouragement. It can save future maintenance headaches. (See Appendix 4 regarding eye level survey techniques.)

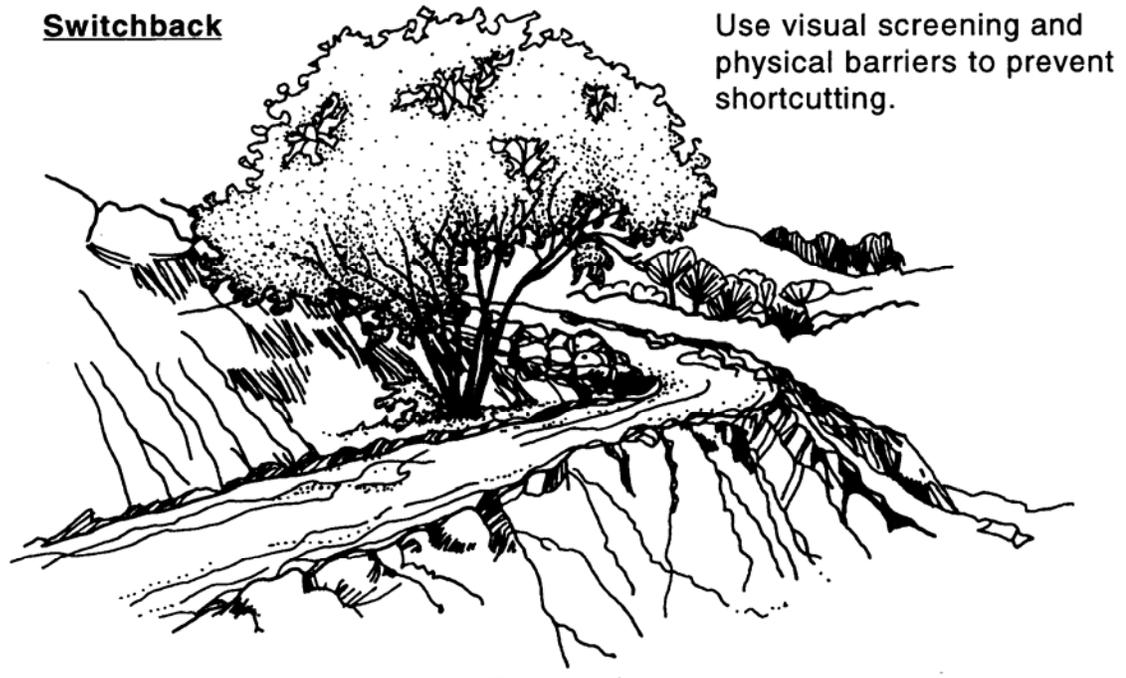
Several existing trails were laid out without considering slope guidelines. As sections of these trails become problem areas, it may be easier to relocate sections rather than repair the poor location.

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



Proper switchback construction requires specific skills (details can be found in Appendix 1). The manner in which switchbacks are placed on the land is critical to creating a maintenance-free section. They must provide the easiest, most attractive route for ascending and descending so that hikers do not shortcut them. Turns should be flat. This requires careful location or additional construction of cut and fill sections or retaining walls. On sideslopes of less than 20 percent, the switchback should be treated as any other section of the trail by following a long, radius curve. If the centerline grade is steeper than desired, the radius should be shortened and a conventional 8-foot radius switchback should be built, with the upper and lower legs meeting at the radius point. Excavation

should start along the upper slope line of the upper leg and be carried down to grade at the radius point before starting the lower leg. To provide proper drainage, the upper leg should be cut well beyond the radius point, then shaped and the turn area completed. Whenever possible, the frequency and visibility of turns should be limited to avoid shortcutting. The layout should vary.



Switchback legs should be situated so that they are not visible from each other. Turns should be looped around large boulders or fallen trees, or where vegetation obstructs the view of an adjoining leg. If this is not possible, rock or log barriers should be placed between the upper and lower legs of the switchback. To prevent cross-cutting inside the switchback, 15 to 30 feet of barrier should be installed (placed back from the turning point).

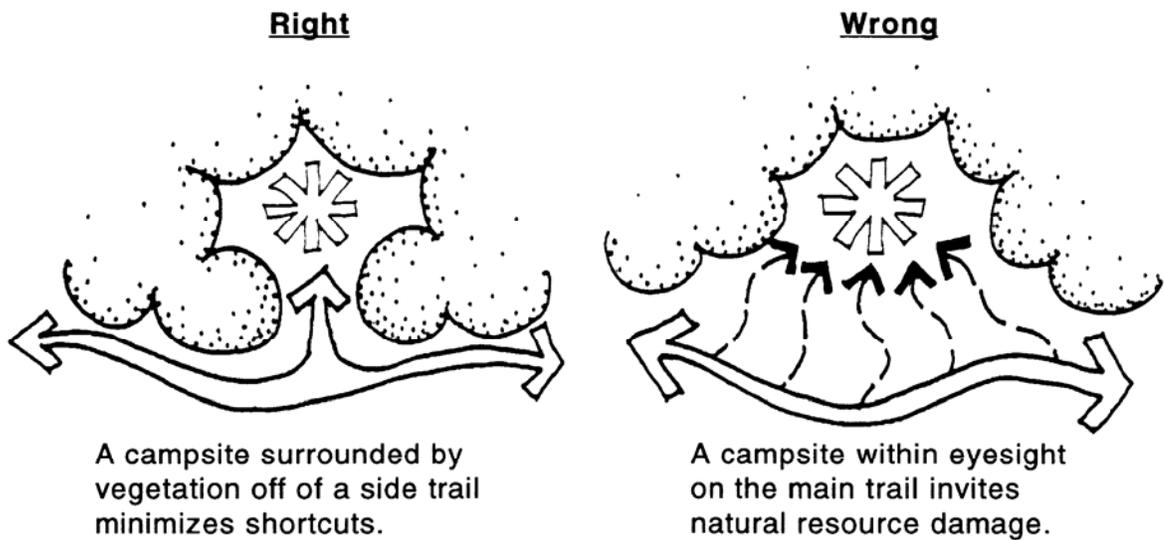
SPUR TRAILS

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 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 of the main trail, hikers gradually widen the approach to it and enlarge the campsite itself by taking shortcuts and destroying the vegetation. If the hiker can see or hear others using a campsite/shelter and the terrain is open, he/she will shortcut.

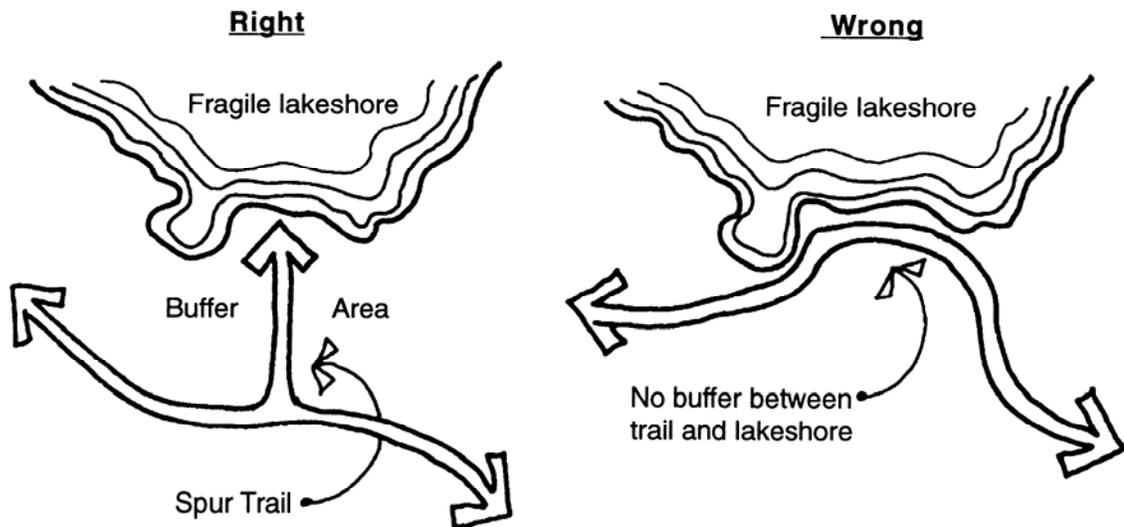
To minimize shortcutting, trail alignments and junction locations that make the established trail the easiest, shortest, and most logical route, should be used. An established campsite/shelter (especially in heavy use areas) should be at least 200 feet off the main trail unless rugged terrain or ownership patterns limit this distance. Less used sites can be a shorter distance away depending on the circumstances.



Drinking water sources, pond 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 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. Reduction of feature overuse should be tried first by 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.