Chapter 3—Designing Horse Trails

Once trail analysis and planning are completed, planners know how the trail relates to existing transportation systems and recreation opportunities. The next step is trail layout and design. The design should protect the setting, use an appropriate level of development, meet the needs of trail users, and minimize trail user conflicts.

Trail Settings

The setting is the overall environment of the trail. Three commonly used settings are wildlands, rural, and urban. The terms and definitions may vary from area to area and between organizations. The definition of the setting helps planners and designers make decisions on matters such as the suitability of particular construction methods or maintenance levels. Settings also affect esthetic decisions.

Wildland Settings

Riders place a high value on riding in *wildland settings* (figure 3–1). These areas are generally minimally developed or dispersed multiple-use areas, such as forests, swamps, deserts, or alpine areas. Many National Forest System lands have wildland settings. In some cases, rural road rights-of-way are used for wildland trails. Wildland settings often present the most design challenges because of topography, distance from services, and hazards. When trails are not accessible by motor vehicles, tools and materials may need to be packed in—a significant challenge. In this guidebook, the wildland settings category does not include recreation opportunities in designated wilderness.

Resource Roundup

Best Practices

What constitutes best practices for designing trails? *The National Bicycling and Walking Study* (1994) published by the FHWA, defines best practices as those that "…offer exemplary or model planning guidelines, design standards, development strategies, and management programs that lead to successful bicycle and pedestrian programs." Riders often use the same trails as pedestrians and bicycles. The study lists numerous examples of State and local plans that address individual topics. Some also clarify existing national standards and incorporate regional considerations. The update, *Ten Year Status Report* (FHWA 2004), is available at *http://www.fhwa.dot.gov/environment/bikeped/study.*

Figure 3–1—Trails in wildland settings generally have minimal development and offer the most challenge for trail users.

Resource Roundup

Trails, Naturally

Natural Surface Trails by Design: Physical and Human Essentials of Sustainable, Enjoyable Trails (Troy Scott Parker 2004) has a flexible design system that covers:

- Basic physical forces and relationships
- Trail shaping techniques
- Trail purpose and management

Parker provides an evaluation form that looks at human perception, human feelings, physical forces, tread materials, and tread watershed. This technique helps designers and visitors understand new or complex situations quickly.

Resource Roundup

Horse Power

When trail segments are difficult to reach with mechanized equipment, construction and maintenance crews turn to horse power. *Stock-Drawn Equipment for Trail Work* (Didier and Herzberg 1996) describes the advantages and disadvantages of different types of plows and grading equipment, including photos and sources. The document is available at *http://www.fs.fed.us/t-d/pubs/htmlpubs/htm96232802*. This Web site requires a username and password. (Username: t-d, Password: t-d)

Rural Settings

Rural settings often incorporate some combination of rivers, creeks, unimproved drainages, hillsides, undisturbed open space, and other natural features. They often include open spaces and preserves near highly populated areas or in moderately developed rural regions (figure 3–2). Unusual—but often viable—resources in some areas include contributed rights-of-way and fence setbacks by cooperating neighbors. Safety concerns for riders in rural settings include visibility, interaction with other recreationists, and natural hazards. Rural trails may cross or run at grade parallel to roads with vehicular traffic, a significant safety concern.

Figure 3–2—Trails in rural settings often take advantage of public rights-of-way, such as canals or utility corridors. —*Courtesy of Kandee Haertel.*

Resource Roundup

Trails on Small Properties

Trail Design for Small Properties (Baughman and Serres 2006) provides "…simple, and inexpensive solutions for designing, building and maintaining sustainable trails—trails for hiking, horseback riding, bicycling, cross-country skiing, snowmobiling, off-highway motorcycles, and all-terrain vehicles." Subjects covered include: determining trail uses, selecting a corridor, establishing design standards, marking the trail location, clearing and constructing the trail, installing structures and facilities, and signing. Copies are available from University of Minnesota Extension at *http://shop.extension.umn.edu*.

Urban Settings

Urban settings usually are highly developed or congested areas. Trails in urban settings (figure 3–3) often accommodate many different user groups and frequently require many facilities. Urban trails may share routes with other modes of transportation and often take advantage of roads, utility corridors, developed drainage corridors, and similar rights-of-way. Safety is a significant consideration when animals must mix with motorized traffic and adjust to other aspects of city travel.

Figure 3–3—Shared-use paths in urban settings serve many different user groups.

Appropriate Levels of Development

The appropriate level of trail development is based on local needs and conditions. This guidebook uses the terms *low, moderate,* and *high development* as subjective classifications to describe the degree of development. Specific definitions aren't assigned to the terms, because level of development is relative. For example, high development in a wildland setting may be considered moderate development in a rural area, or low development in a busy urban area. On the other hand, a simple neighborhood trail in an urban area could be similar to a low development trail in a wildland area. Levels of development also may vary on different trail segments within the same trail corridor. Planners usually generate their own definitions based on local conditions and input. This guidebook focuses on development with modest to substantial improvements.

Riders' Needs

Equestrians include youngsters, elders, leisure riders, professional riders, organized groups, novices, people with disabilities, and working ranchers (figures 3–4 through 3–8). Riders recreate singly or in groups, and for many reasons—including pleasure, exercise, or challenge. Popular group trail events include social trips, competitive trail rides, and endurance races. Riders ferry loads or camping gear using *packstrings* or *packtrains*—a group of packhorses or packmules tied together single file and led by one rider. Less common are the drivers of stock that pull carts or

Equestrians include

Figure 3–4—Children...

Figure 3–5—…leisure riders…

Figure 3–6—…organized groups…

Figure 3–7—…people with disabilities...

Figure 3–8—…and the working rancher.

—Figures 3–4, 3–5, and 3–6 courtesy of the Forest District of DuPage County, IL.

carriages. Well-designed horse trails consider the setting of the trail system, the needs of all user groups, and the specific needs of stock and their riders.

Some riders prefer gentle, wide trails, and easy trail access. Others prefer technically challenging situations. The designer uses local guidelines when determining the opportunities to offer trail users.

Horse Sense

Counting on Experience

Planners, designers, and land management agencies expect riders and their stock to be prepared for the riding environment. This includes being comfortable when encountering other trail users and common activities on the trail, at trailheads and campgrounds, and near vehicles. Public trails and recreation sites are not the place for stock or riders that are *green*—or that don't have the skills to handle common situations.

Conflicts

Stock, hikers, runners, and bicyclists sometimes share trail corridors that are modified to meet each user group's requirements. However when conflicts seem likely, land managers may separate trail users on different trails or on different treads separated by buffers. The *Trail Scenarios* section in this chapter has more information about separating trail users.

Motorized traffic is one of the most dangerous hazards to stock. Collisions or conflicts can cause serious injury or death to people and stock. Design that considers the needs of all users is vital.

Resource Roundup

Conflicting User Groups

To learn more about interactions between trail users, see *Conflicts on Multiple-Use Trails: Synthesis of the Literature and State of the Practice* (Moore 1994). The report is available at *http://www.fhwa.dot.gov/environment/conflicts.*

Trail Information Libraries

An abundance of information is available online regarding design and construction of recreation trails. *Appendix B—Trail Libraries, Trail Organizations, and Funding Resources* lists some national organizations that offer sizable online databases or comprehensive links to many other trail resources. Because designing trails is a complex field that requires different areas of expertise, jurisdictions rely on experienced trail designers and specialists.

Lingo Lasso

Shared-Use Trails

Some agencies or groups use the terms *multiple use* or *multiuse* instead of *shared use* when referring to trails and paths. Many of these groups ascribe exact meanings to each term. Others don't distinguish between the terms and use them interchangeably. This guidebook calls paths that accommodate a variety of user groups *shared-use trails*. In this context, a shared-use path or trail is "…a trail that permits more than one type of user and that has a transportation and recreation function." (Beneficial Designs 1999). Figure 3–9 shows pedestrians and horses on a shared-use trail.

Figure 3–9—Hikers and riders often share trails.

Trail Hierarchies

Some agencies and municipalities find it useful to assign a hierarchy to trails, ranging from trails with a major regional significance to trails that access neighborhoods or areas with sparse traffic. Trail classifications can reflect the functions the trails serve, their scale of development, their level of use, and their location in a larger trail system. The Forest Service, MetroGreen, and Scottsdale trail classification systems are discussed in this section.

The Forest Service considers specific trail uses when designing, constructing, and maintaining a trail. Forest Service Trail Classes are basic categories that reflect the desired management of each trail, taking into account other management activities in the area, user preferences, settings, and protection of sensitive resources.

Trail classes also help determine the cost of meeting the national quality standards. The five trail classes range from minimal development to full development as shown in table 3–1. Most of the trails discussed in this guidebook would fall into Forest Service Trail Classes 3 and above (more developed trails).

The Forest Service also uses Recreation Opportunity Spectrum (ROS) and Wilderness Recreation Opportunity Spectrum (WROS) classifications (see *Chapter 7—Planning Recreation Sites).*

Trail Classes Vary—Examples of Trail Classification Systems

Table 3–1—Forest Service trail classes with trail attributes. The general criteria apply to all Forest Service system trails. Most of the trails discussed in this guidebook would fall into Forest Service Trail Classes 3 and above. ROS and WROS classifications are discussed in *Chapter 7—Planning Recreation Sites*.

Trail Attributes	Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
	General Criteria: Physical characteristics to be applied to all National Forest System trails				
Tread & traffic flow	★ Tread intermittent and often indistinct ★ May require route finding ★ Native materials only	★ Tread discernible and continuous and rough ★ Few or no allowances for passing ★ Native materials	★ Tread obvious and continuous ★ Width accommodates unhindered one-lane travel (occasional allowances constructed for passing) ★ Typically native materials	★ Tread wide and relatively smooth with few irregularities ★ Width may consistently accommodate two-lane travel ★ Native or imported materials ★ May be hardened	★ Width generally accommodates two-lane travel, or provides frequent passing turnouts ★ Commonly hardened with asphalt or other imported material
Obstacles	★ Obstacles common ★ Narrow passages; brush, steep grades, rocks and logs present	★ Obstacles occasionally present ★ Blockages cleared to define route and protect resources ★ Vegetation may encroach into trailway	★ Obstacles infrequent ★ Vegetation cleared outside of trailway	★ Few or no obstacles exist ★ Grades typically <12% ★ Vegetation cleared outside of trailway	★ No obstacles ★ Grades typically <8%
Constructed features & trail elements	★ Minimal to non-existent ★ Drainage is functional ★ No constructed bridges or foot crossings	★ Structures are of limited size, scale, and number ★ Drainage functional ★ Structures adequate to protect trail infrastructure and resources ★ Primitive foot crossings and fords	★ Trail structures (walls, steps, drainage, raised trail) may be common and substantial ★ Trail bridges as needed for resource protection and appropriate access ★ Generally native materials used in Wilderness	★ Structures frequent and substantial ★ Substantial trail bridges are appropriate at water crossings ★ Trailside amenities may be present	★ Structures frequent or continuous; may include curbs, handrails, trailside amenities, and boardwalks ★ Drainage structures frequent; may include culverts and road-like designs
Signs	★ Minimum required ★ Generally limited to regulation and resource protection ★ No destination signs present	★ Minimum required for basic direction ★ Generally limited to regulation and resource protection ★ Typically very few or no destination signs present	★ Regulation, resource protection, user reassurance ★ Directional signs at junctions, or when confusion is likely ★ Destination signs typically present ★ Informational and interpretive signs may be present outside Wilderness	★ Wide variety of signs likely present ★ Informational signs likely (outside of Wilderness) ★ Trail Universal Access information likely displayed at trailhead	★ Wide variety of signage is present ★ Information and interpretive signs likely ★ Trail Universal Access information is typically displayed at trailhead
Typical recreation environs & experience	★ Natural, unmodified ★ ROS: Often Primitive setting, but may occur in other ROS settings ★ WROS: Primitive	★ Natural, essentially unmodified ★ ROS: Typically Primitive to Semi-Primitive setting ★ WROS: Primitive to Semi-Primitive	★ Natural, primarily unmodified ★ ROS: Typically Semi-Primitive to Roaded Natural setting ★ WROS: Semi-Primitive to Transition	★ May be modified ★ ROS: Typically Roaded Natural to Rural setting ★ WROS: Transition (rarely present in Wilderness)	★ Can be highly modified ★ ROS: Typically Rural to Urban setting ★ Commonly associated with Visitor Centers or high-use recreation sites ★ Not present in Wilderness

—*Adapted from* Trail Class Matrix *(U.S. Department of Agriculture, Forest Service 2005b) at* http://www.fs.fed.us/r3/measures.

The Metro Green Alliance—seven counties in the Kansas City area—uses a different approach. *Design Guidelines for MetroGreen* (Mid-America Regional Council and others 2001) incorporates five trail classes that address different levels of development, amount of use, and user type, as shown in table 3–2. The trail system used in Scottsdale, AZ, consists of primary, secondary, local, and neighborhood trails in natural and built environments (table 3–3).

Trail Classes Vary—Examples of Trail Classification Systems (continued)

Table 3–2—MetroGreen Alliance trail types with trail user characteristics. The MetroGreen Alliance has more than 1,400 miles (2,253 kilometers) of trail, classified into five major categories. MetroGreen Type 3 trails are the only ones designated for riders and may be restricted to equestrians only. When riders share Type 3 trails with other users, a separate horse tread is provided. Type 3 trails provide riding opportunities along multiuse trail corridors within greenways and accommodate a steady flow of two-way horse traffic during peak use. MetroGreen Type 3 trails would have moderate to high levels of development, based on the information in this guidebook.

Trail Type 1	Trail Type 2	Trail Type 3	Trail Type 4	Trail Type 5
No facility development	**Limited development, low-impact uses**	**Multiple-use, unpaved trail development**	**Multiple-use paved trail development**	**Bicycle and pedestrian facilities with the right of way**
✯ Very low volume of use is expected. ✯ Hikers. ✯ Bicycle use should be restricted in most cases.	✯ Generally a very low volume of users is expected. ✯ Hikers, joggers, and perhaps cross-country skiers. ✯ This trail type is not intended for cyclists or other wheeled users.	✯ Low-to-moderate volume of users is expected. ✯ These trails are restricted to pedestrians, bicycles, and equestrians. Equestrian users require a separate trail so that horses do not damage the trail surface. ✯ Wheelchair users and persons with strollers can use unpaved trails if they are designed to ADA [Americans with Disabilities Act] standards and surfaced with compacted crushed stone or other firm surface.	✯ Moderate-to-very high use is expected. ✯ Several users groups can enjoy the trails, including bicyclists, joggers, wheelchair users and rollerbladers.	✯ Moderate-to-high use is expected. ✯ Depending on the specific facility, this trail type serves pedestrians, bicyclists, rollerbladers, etc.

—*Adapted from* Design Guidelines for MetroGreen *(Mid-America Regional Council and others 2001).*

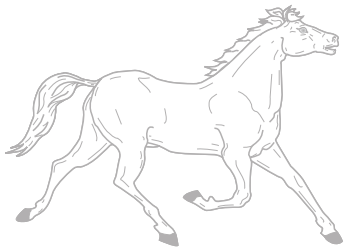
Trail Classes Vary—Examples of Trail Classification Systems (continued)

Table 3–3—Scottsdale, AZ, trail classes and environments. Scottsdale trails are part of a large, multimodal trail system, including 100 miles (161 kilometers) of trail in the McDowell Sonoran Preserve and 224 miles (360.5 kilometers) elsewhere in the city. Scottsdale trails would be considered moderately to highly developed, based on the information in this guidebook.

Environment	Primary Trails	Secondary Trails	Local and Neighborhood Trails
Built environment	✯ Canal banks ✯ Powerline corridors ✯ Scenic corridors ✯ Standard corridors ✯ Drainage corridors ✯ Built open space	✯ Roadside ✯ Nonstreet easements ✯ Drainage corridors ✯ Built open space	✯ Roadside ✯ Alleyways/nonstreet easements ✯ Drainage corridors ✯ Built open space
Natural environment	✯ Washes ✯ Natural open space	✯ Washes ✯ Natural open space	✯ Washes ✯ Natural open space ✯ Roadside with adjacent natural environment

—*Adapted from* Scottsdale Trails Master Plan *(Todd & Associates, Inc., and others 2003).*

A trail's degree of challenge depends on the user. Defining trail challenge—or *trail difficulty*—requires a subjective look at an average trail user's physical ability and skill. Difficulty takes into consideration trail condition and trail elements such as alignment, steepness, elevation gain and loss, and the number and kinds of barriers that must be crossed. Trail length is not considered a difficulty factor, although it is an important consideration. Snow, ice, rain, and other weather conditions may increase the level of difficulty. Because of their subjectivity, trail ratings are not recommended. Instead, provide appropriate information at the trailhead or trail junction so trail users may make informed choices. Visitor information stations can include a map and trail length, maximum grade, sustained grade, elevation change, obstacles along the way, and other relevant information. See *Chapter 12—Providing Signs and Public Information* for further discussion on this topic.



Trail Scenarios

The trail scenarios presented in this section are design approaches that commonly work for riders. These are not the only possible solutions—designers are encouraged to learn about stock and rider needs, and then mix and match trail elements to best fit local conditions and requirements.

From the rider's perspective, trails must have enough space for stock to feel at ease. Stock tend to stay a comfortable distance away from other trail users and from walls or fences they cannot see through or over, sometimes even moving to the far side of the trail to avoid them. Accommodate this behavior by widening the trail, routing it away from disturbing objects or activity, locating the horse tread on the far side of the trail corridor, providing a physical separation or visual screen, installing barriers, or increasing the horizontal distance—also called the *shy distance*—from the discomfort. Shy distance is in addition to tread width.

Trail Talk

On the Edge

Horses and mules are most comfortable in the track that other stock have trod. They favor the outer edge of a tread, especially if this ground is less densely packed. Having a 2-foot shoulder (0.6-meter) of nontread material or a downslope defines the edge to the animal and rider.

In areas with low development, stock tend to travel about 18 inches (457 millimeters) from the edge of the tread surface (figure 3–10, A). Riders often guide their animals farther away from fences or other obstacles because the riders are more comfortable there. The trod area frequently lies 2 feet (0.6 meter) or more away from obstacles (figure 3–10, B). In areas with a high level of development, for example between tall structures, stock tend to walk about a foot (0.3 meter) from the tread edge of a single-lane trail. If there is a 2-foot (0.6-meter) shoulder, this means they travel about 3 feet (0.9 meter) from the wall or building.

The amount of horizontal shy distance an animal needs in addition to tread width depends on the trail design. Bill Archibald (personal communication) of the Canadian Equestrian Federation suggests using reasonable design parameters, based on what is appropriate for average riders. Too much shy distance may be counterproductive, because a startled animal that wants to bolt may take advantage of the available space. Experienced stock, under the control of experienced riders, often get by with 3 to 4 feet (0.9 to 1.2 meters) of horizontal shy distance. They usually keep within the normal 5- to 6-foot (1.5- to 1.8-meter) tread width on many horse trails, provided there is adequate clearance on both sides of the tread.

Trail Talk

On the Edge (continued)

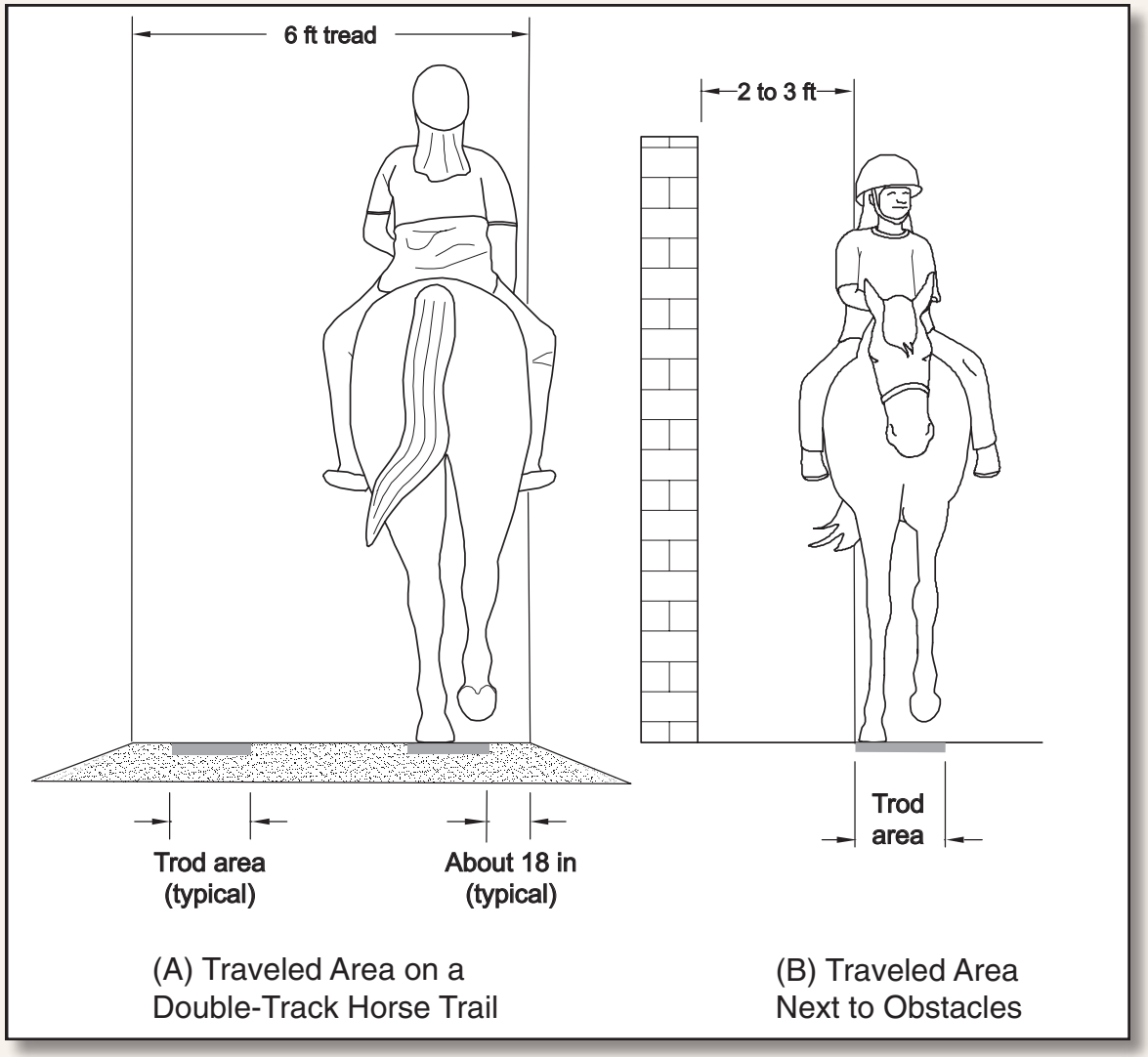
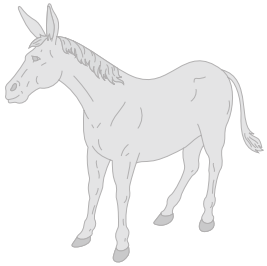


Figure 3–10—Traveled area on horse trails. In rural or suburban areas, stock tend to walk 18 inches from the edge of the tread (A) except when passing. Riders, on the other hand, tend to guide horses and mules 2 to 3 feet away from buildings and obstacles (B). —*Adapted with permission from sketches by Bill Archibald.*



Resource Roundup

Trail Planning

Trails for the Twenty-first Century: Planning, Design, and Management Manual for Multi-use Trails, 2d Edition (Flink and others 2001) is a popular reference for trail developers. The detailed guide addresses developing trails in former railroad corridors, but the concepts apply to all shared-use trails.

Designing Shared Use Trails

Designing Shared Use Trails to Include Equestrians (O'Dell 2004) is an equestrian overview of trail design. More information is available at *http://www.americantrails.org/resources/trans/transhorse.html*.

Equestrian-Only Trails

Single-tread trails reserved exclusively for horses and mules—also called *bridle trails*, *bridle paths*, or *bridleways* in urban settings—are uncommon in the United States. Figure 3–11 shows a trail that could be designated for equestrians only or for shared use. Most public trails are designated for shared use, although there may be instances where a trail is not appropriate or safe for all users—for example, a narrow and winding recreation trail with a steep dropoff.

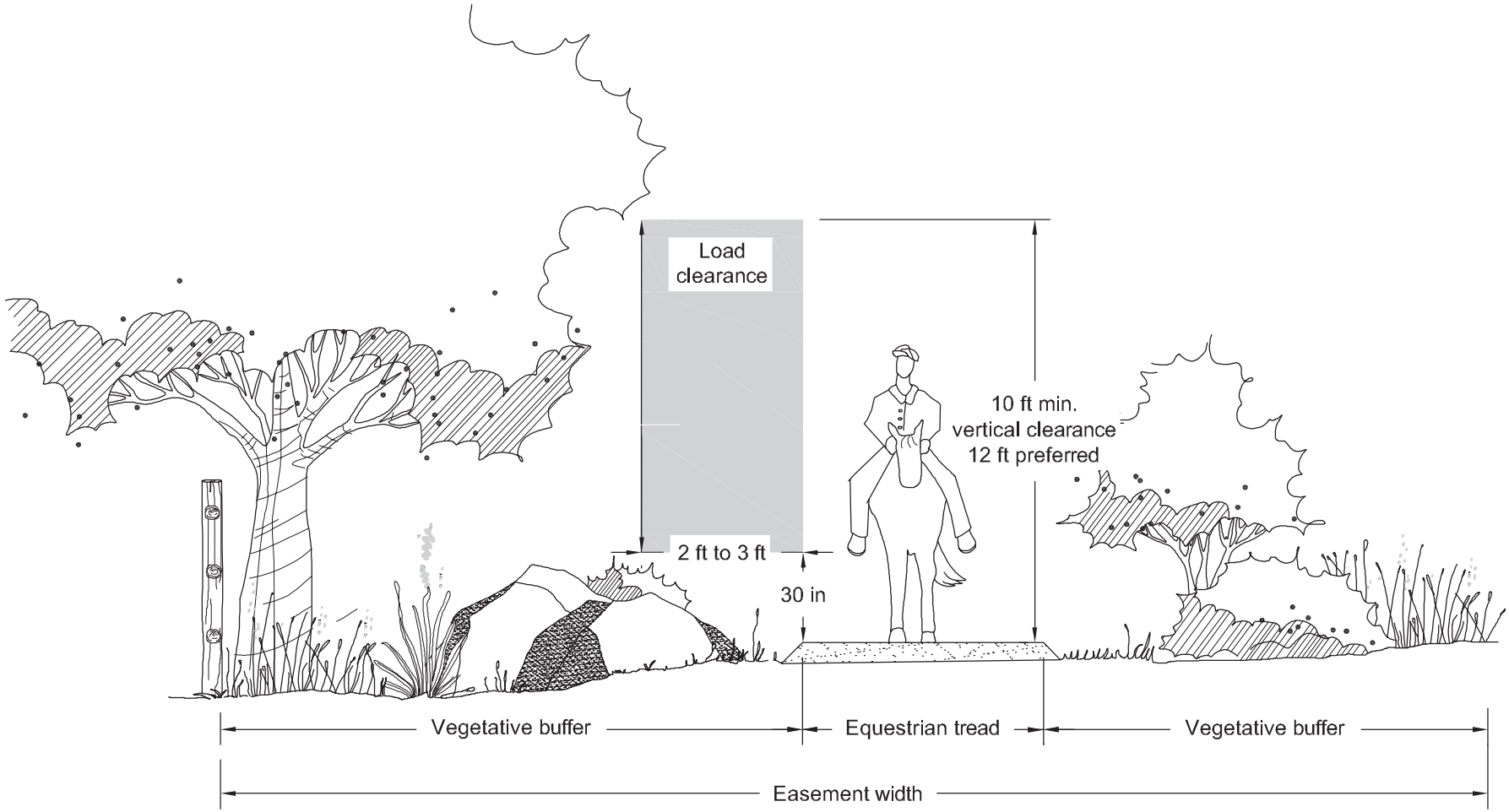


Figure 3–11—An equestrian-only trail for riders and their horses and mules. Such trails may be called bridle trails, bridle paths, or bridleways.

Trail Talk

Mixing Bicycle and Horse Use

Whether or not riders and bicyclists can share a trail without conflict depends on local circumstances and customs. It also may reflect the local cycling style—mountain bikers have different needs than road cyclists. While there are situations where bicyclists and stock don't coexist well, in other situations they may be very compatible. Here are three approaches:

- ✯ The American Association of State Highway and Transportation Officials (AASHTO) generally finds it undesirable to mix stock and bicyclists on paved shared-use trails. Paved shared-use trails are common in areas with high and moderate levels of development. *The Guide for the Development of Bicycle Facilities* (AASHTO 1999) recommends a separate bridle trail in such cases. The reasoning is that many bicyclists are ill-informed about the need to slow down and make room for stock, and stock may be unpredictable if they think a bicyclist poses a danger.
- ✯ The Pedestrian and Bicycle Information Center (PBIC) notes that some rural trails with hard surfaces already include a soft shoulder for joggers (*Rails and Trails: Design of Trails* 2005). The PBIC recommends providing a parallel trail with suitable surface for stock where there is adequate space.
- ✯ Michael Kelley, in a 1998 address at the *National Symposium on Horse Trails in Forest Ecosystems* held at South Carolina's Clemson University, made a case for trails shared by mountain bikers and riders. "My basic thesis is that horses and bikes can, and must, share trails together with all other nonmotorized users. I hope to show that problems are often matters of perception rather than reality, and those that are real can almost always be solved with a proactive approach…

"Trail width necessary to accommodate both uses is subject to controversy. Some jurisdictions, particularly those that formed regulations during the early days of mountain bikes, require road sized-trails in order to accommodate both uses. Nowadays, more information and experience indicates that significantly smaller trails are better for multiple-use. Narrow trails tend to slow users down, and in that respect, are less dangerous. The narrower the trail, and the more features such as turns, rises and falls, obstructed views, and occasional protruding rocks or roots, the slower mountain bikers will go. Most experienced mountain bikers would rather ride these challenging trails than smooth, wide open trails that encourage high speeds.

"Width of trails can depend upon proximity to urban areas. In the San Francisco Bay Area, China Camp State Park is very close to large population centers. Its multiple-use trails are 4- to 5-feet (1.2- to 1.5-meters) wide, become narrower as vegetation fills in, and accommodate horses and bikes very well. In the backcountry, a trail wide and tall enough for a horse can accommodate a hiker."

Shared-Use Trails

Unless designated otherwise, recreation trails are shared-use trails. The two basic types of nonmotorized shared-use trails are:

- ✯ Trails with a single tread for all users
- ✯ Trails with multiple treads to accommodate specific user groups

Single-tread, shared-use trails work well when all user groups are compatible. Trail and tread requirements vary by jurisdiction or area of the country. Figure 3–12 shows a typical section of a single tread trail in DuPage County, IL. Multiple treads in a single trail corridor allow separation of uses that might conflict. In areas where stock may encounter motor vehicles, other considerations apply.

Riders and their stock, hikers, runners, bicyclists, people with disabilities, and other users can safely share the same well-designed trails. For example, joggers and riders are usually compatible. Both groups appreciate unpaved tread and slow trail traffic. Bicyclists and horses or mules may have conflicts. Road bicyclists—as opposed to mountain bikers—usually appreciate pavement, a surface that is not best for stock. Because the sudden appearance of bicyclists may unnerve stock, many people recommend separating bicycles and stock. This is not the only solution. Different communities and organizations resolve conflicts differently. Some put all trail users on one path, others provide separate treads or separate routes.

No matter which approach is selected, involving all user groups is imperative. If separate treads are chosen, beware of the *someday syndrome*—building one tread and putting off development of other treads until *someday*—when more funds are available. This practice can alienate whole groups of trail users.

Lingo Lasso

That's Typical

When engineers and landscape architects use the term *typical*, they generally are referring to:

- A typical section—A drawing or description, often of a road or trail, that defines the parts, such as right-of-way limits, pavement widths, shoulder widths, ditches, medians, and so forth. The builder uses the typical section as a construction guide for the entire project unless otherwise directed. Figure 3-12 is a typical cross section for a trail.
- Items that are identical—An item on a drawing or plan that is used to represent all like items on the page. The dimensions are followed by the word *typical* or *typ.*, often in parentheses. Measurements and descriptions for the individual item apply to all the others. By labeling only a single item, the page is easier to read. The vertical clear zone in figure 3–12 is the same on both sides of the trail, but only one is labeled: *12 ft clear zone (typical).*

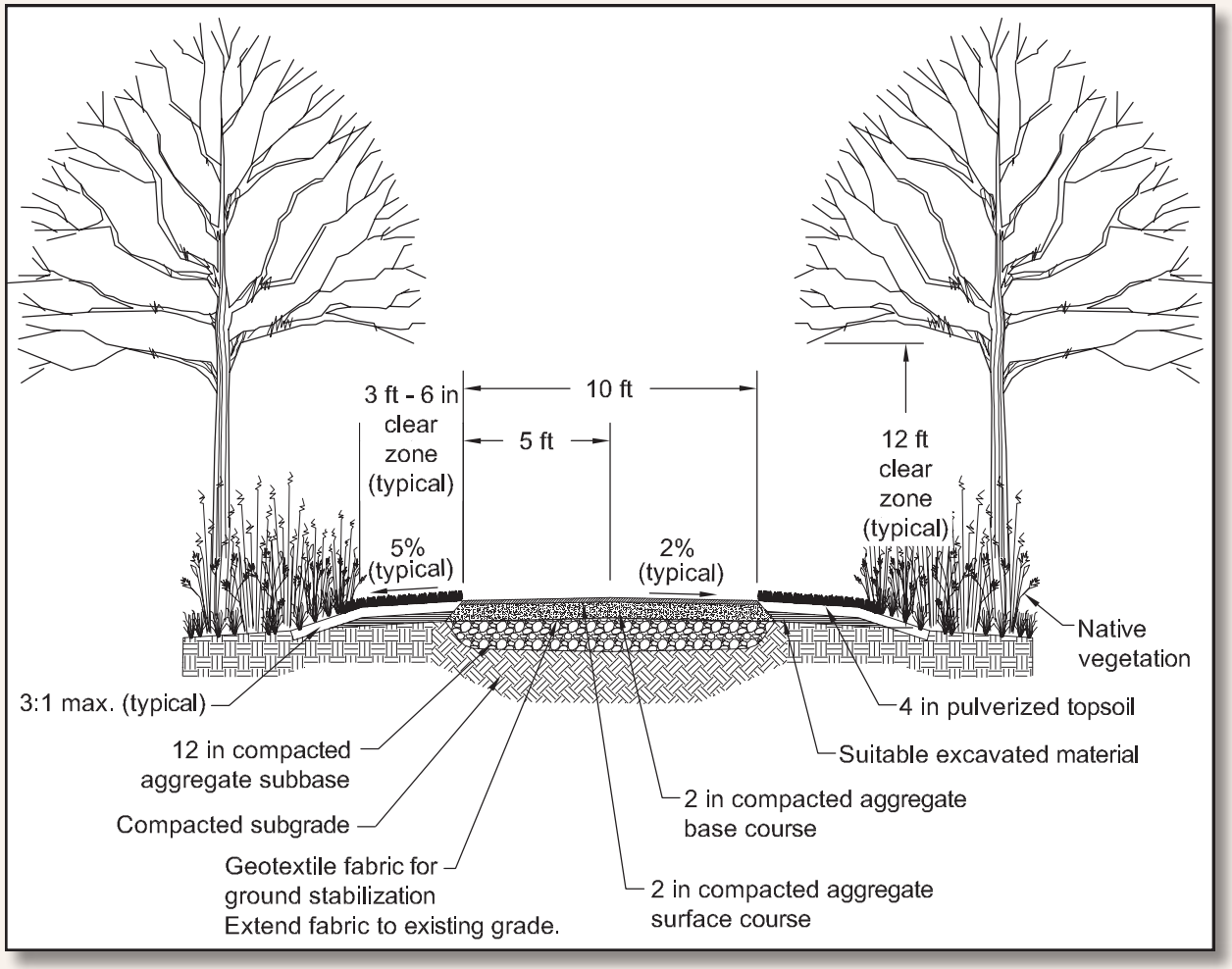


Figure 3–12—A typical trail section used by the Forest Preserve of DuPage County, IL. —*Courtesy of Forest Preserve District of DuPage County, IL. The original figure was edited for clarity.*

Shared-Use, Single-Tread Trails

Single-tread trails are generally restricted to areas where the potential conflict between trail users is low. Riders and pedestrians are user groups that generally are compatible on single-tread trails. Single-tread trails can have single or double lanes—or *tracks*. On single-track tread, trail users walk single file. On double-track tread, two trail users can walk side-by-side or in opposite directions. Figure 3–13 shows a single-tread trail with a double track and shoulders.

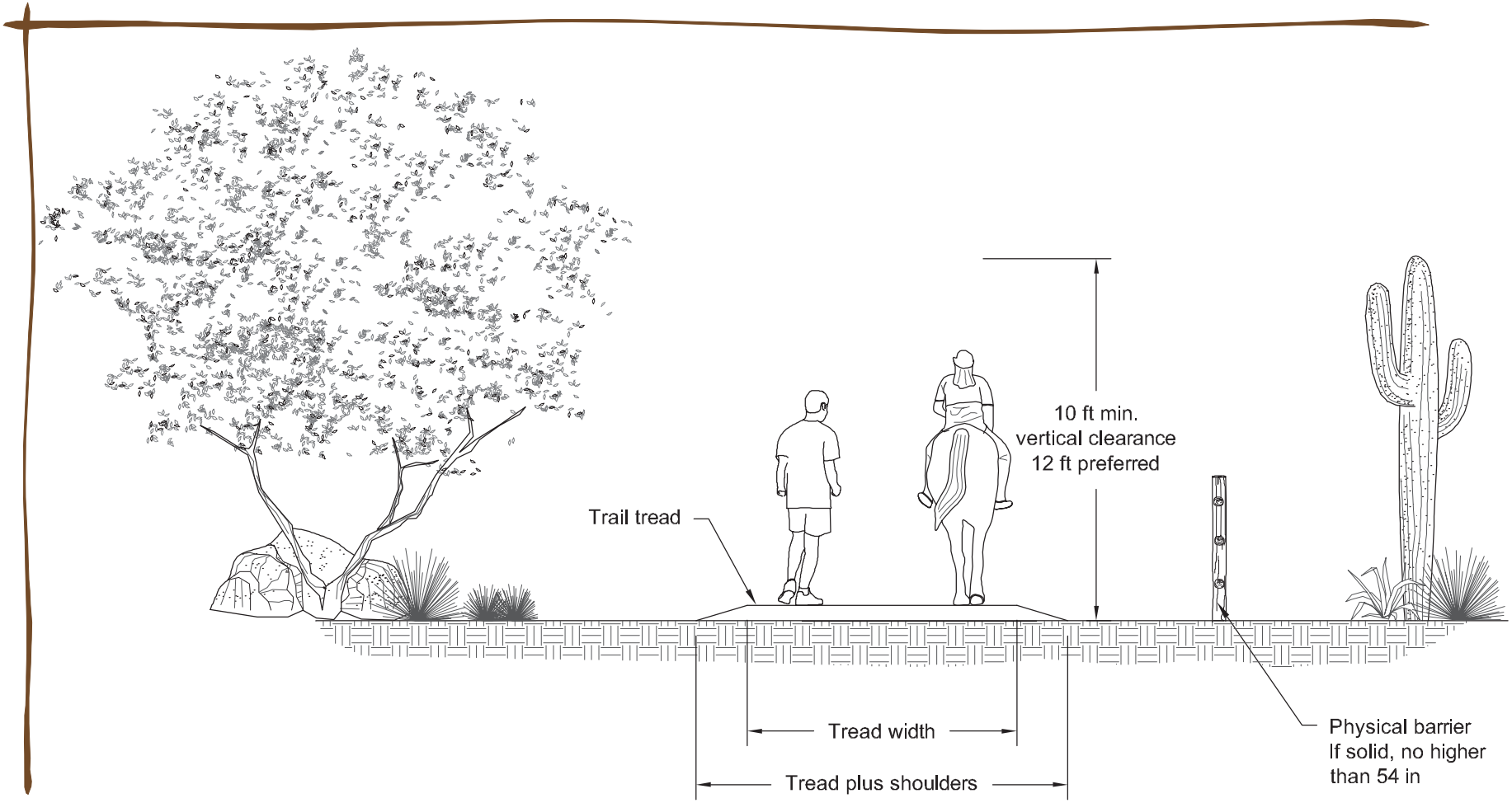


Figure 3–13—A shared-use, single-tread trail with double track (two lanes).

Shared-Use, Separate-Tread Trails

As the number and frequency of trail users increases, so does the demand for two separate treads to reduce conflicts. Part of the appeal is that an unpaved tread offers a different trail experience than a paved tread. Another factor is that riders, joggers, people with disabilities, and other recreationists who travel at low-to-moderate speeds often prefer separation from faster trail users, such as bicyclists. An example of separate treads is a paved path for bicyclists and other wheeled users and an unpaved tread nearby for equestrians and joggers (figure 3–14). It is possible to designate each tread for single use, if the conditions warrant. For example, if the trail has two unpaved treads, one tread could be designated for riders, and the other tread could be designated for pedestrians.

The most highly used trails require trail users to pass each other. Treads can be separated by distance and by visual screens. High- and moderate-use trails sharing highly developed trail corridors often have separate treads divided by at least a 6-foot- (1.8-meter-) wide vegetation buffer or barrier. In some areas, the treads are separated by an elevation change.

Figure 3–14—Trail corridors with paved and unpaved treads accommodate multiple users, such as riders with horses, pedestrians, joggers, and bicyclists. Vegetation and distance help separate users and minimize conflicts.

The alignment of separate treads can be different—each tread following its own optimum route for grades, curves, sight lines, obstacles, attractions, and so forth. When the trail corridor width is constrained and trail use is moderate, a less desirable—but workable—approach is to locate hard and natural treads side by side with little—2 to 3 feet (0.6 to 0.9 meter)—or no buffer area between them. Unpaved cross trails can connect separate trails or treads at convenient locations. Unpaved spur trails can access points of interest. Occasionally, separate unpaved treads merge into a single tread at road or bridge crossings, separating again on the other side of the constriction.

Trail User Separation

There are many methods of separating trail users, including time, distance, screening, barriers, elevation, or some combination of these factors. An example of time separation is a trail used by cross-country skiers in winter and by riders in summer. Trails also can be used by different groups on alternating days. A variation would be alternating groups during the week and on weekends.

Multiple Treads Separated by Distance

When riders must be separated from other trail users, the preferred method is by physically separating the trail treads. In areas where there is adequate space, include vegetation in the separation (figure 3–15). Preserve existing plants or use new landscape materials to visually separate the two treads. When landscaping, don't plant trees and shrubs so densely that stock cannot see what is on the other tread. Well-spaced vegetation will provide some visibility, and stock will be more comfortable.

Trail Talk

Parting of the Ways

To facilitate consistently designed trails and trailheads, the town of Gilbert, AZ, established *Trail Design Guidelines* (DFD CornoyerHedrick 2001). The guidelines specify a minimum width of 10 feet (3 meters) and a preferred width of 12 feet (3.6 meters) for horse trails. The minimum easement width for horse trails adjacent to a public right-of-way is 25 feet (7.6 meters). The town requires a buffer that is 6 feet (1.8 meters) or wider separating horse treads from shared-use treads. The town prohibits horse trails that parallel an active railroad track. Except at bridge crossings, horse trails don't encroach within 6 feet (1.8 meters) of canals or irrigation ditches.

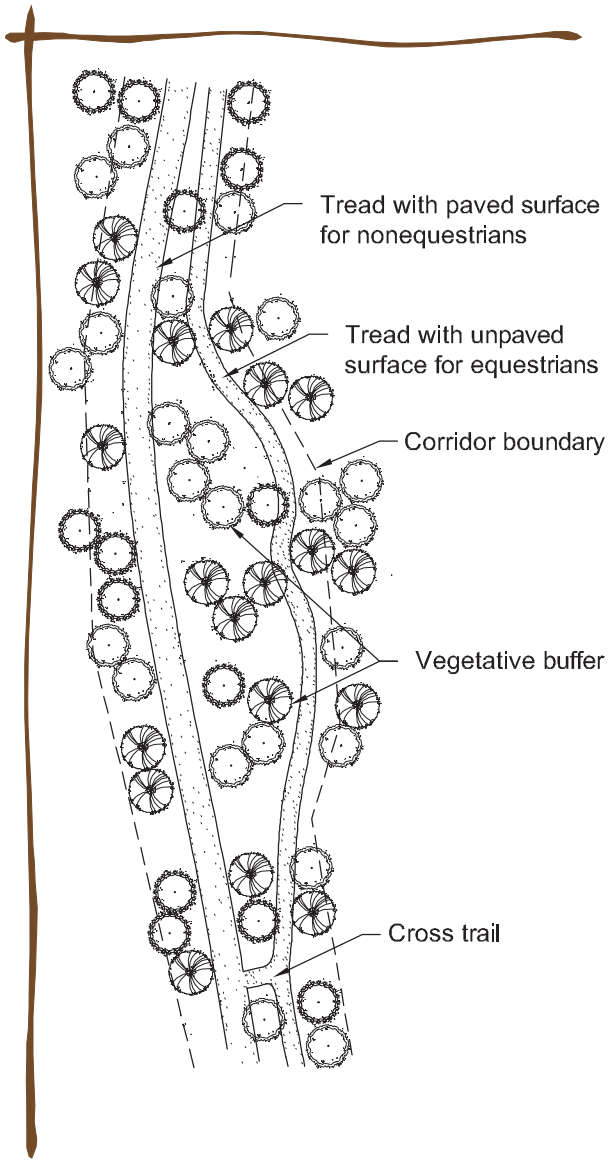


Figure 3–15—A shared-use trail with multiple treads—an unpaved tread for riders with animals and a paved tread for other users.

Trail Talk

Making Do

Trail corridors—especially in urban areas—are often not as wide as would be ideal for multiple treads. Planners and designers resort to working with the space that is available, designing compact trails with multiple treads. Bill Archibald (personal communication) sketched shared-use trails that fit within converted urban corridors and residential lanes. The tread widths are shown in figure 3–16. These trail widths only apply in tight corridors and represent the minimum for shared-use situations—additional width and more separation between treads would be better. The widths shown assume that riders and their mounts have at least average trail experience, and are comfortable in the setting. The recommended minimum width is 8 feet (2.4 meters) for double-track horse trails and 6 feet (1.8 meters) for single-track horse trails.

In urban canyons, short trail segments through narrow corridors may be unavoidable (figure 3–16, A). When riders are passing or meeting other trail users in narrow segments, they must use extra care. While not ideal, these trails are workable. Avoid long stretches with narrow trail corridors, and be sure to consider air exchange, light, and adjacent activities, among other factors. For more information on air exchange in urban canyons, see the *Modifications of Highway Air Pollution Models for Complex Site Geometries*, an FHWA *TechBrief* (no date) available at *http://www.tfhrc.gov/structur/pubs/02036/02036.htm.*

Some older urban areas have former dray lanes that can be used as recreation trails. The dray lanes, which usually measure 26 to 33 feet (7.9 to 10 meters), originally accommodated horse-drawn freight wagons and trucks that backed in at right angles. A 26-foot lane between walls or buildings (figure 3–16, C) accommodates five compact treads for recreation use as follows:

- Down the trail corridor center is a single, 6-foot (1.8-meter), packed-aggregate bikeway.
- On each side of the bikeway is a 4-foot (1.2-meter), unpaved walkway for pedestrians and joggers.
- On the outside of each walkway is a 6-foot (1.8-meter), single-track tread for equestrians that accommodates one-way travel. Each equestrian tread includes a 2-foot (0.6-meter) shoulder, which often has underground drainage.

Many residential lanes are 20 to 22 feet (6.1 to 6.7 meters) wide with fences or walls on either side. A 20-foot lane can be tightly configured with an 8-foot (2.4-meter) paved bikeway in the middle, a 5-foot (1.5-meter) pedestrian walkway on one side, and a 7-foot (2.1-meter) equestrian tread on the other side (figure 3–16, B). While not ideal, the 7-foot equestrian tread allows stock to pass each other on occasion. This configuration works when converting lanes to greenways.

Making Do (continued)

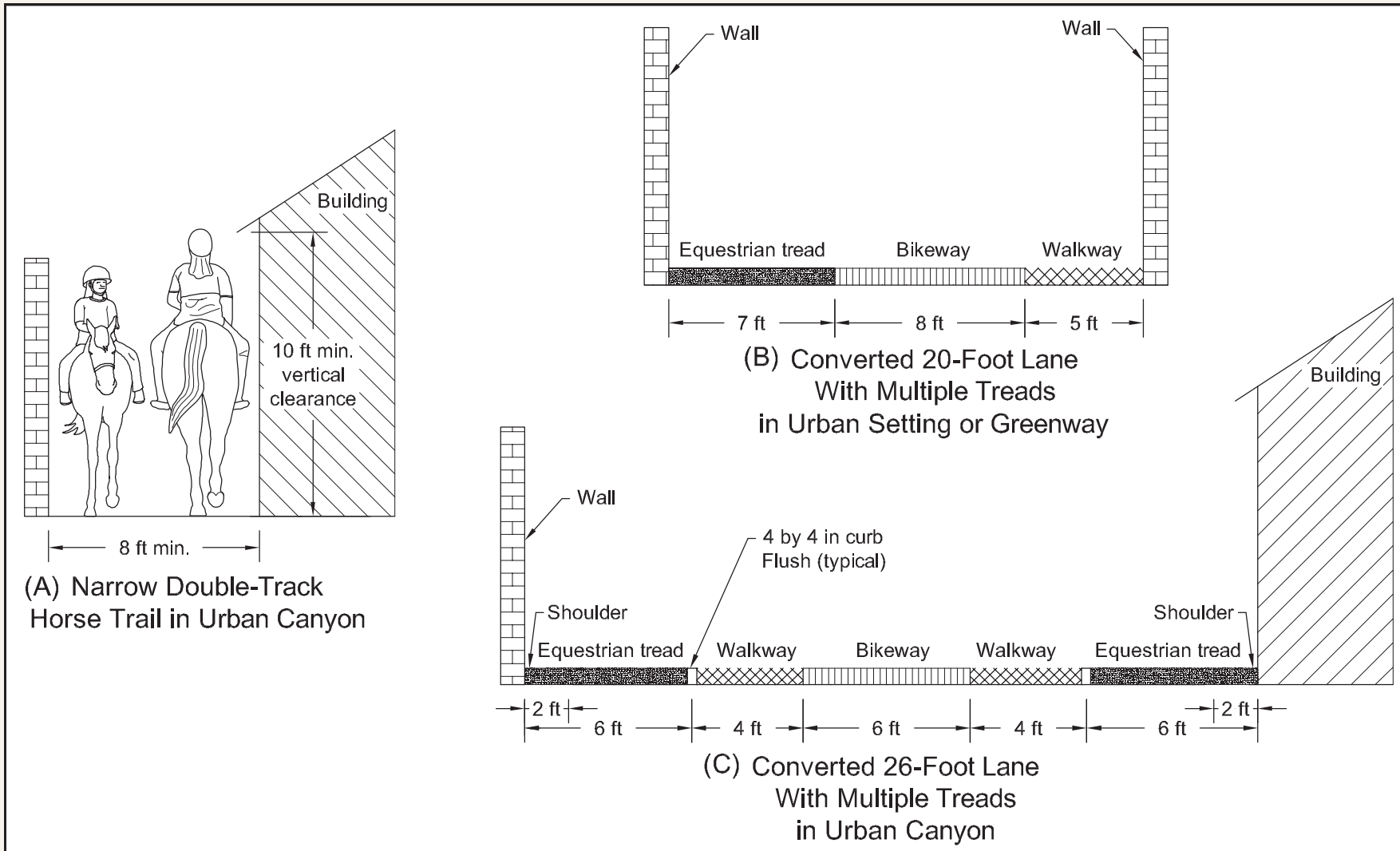


Figure 3–16—Shared-use trails in constricted urban spaces. Riders must use extra caution when meeting or passing in narrow corridors (A). Long stretches with narrow corridors are inadvisable. The 7-foot equestrian treads in a 20-foot converted lane can accommodate one-way travel with occasional passing or infrequent two-way travel (B). Caution: solid barriers higher than 54 inches severely limit a trail animal's peripheral vision and sense of security. The 6-foot wide equestrian treads in a converted 26-foot dray lane each accommodate one-way travel (C). *—Adapted with permission from sketches by Bill Archibald.*

Multiple Treads Separated by Barriers

When other types of separation are not appropriate or there is limited space, a barrier between treads may help prevent conflicts or reduce hazards (figure 3–17). When considering barriers, consult governing land agency requirements. Barriers also must meet applicable safety requirements.

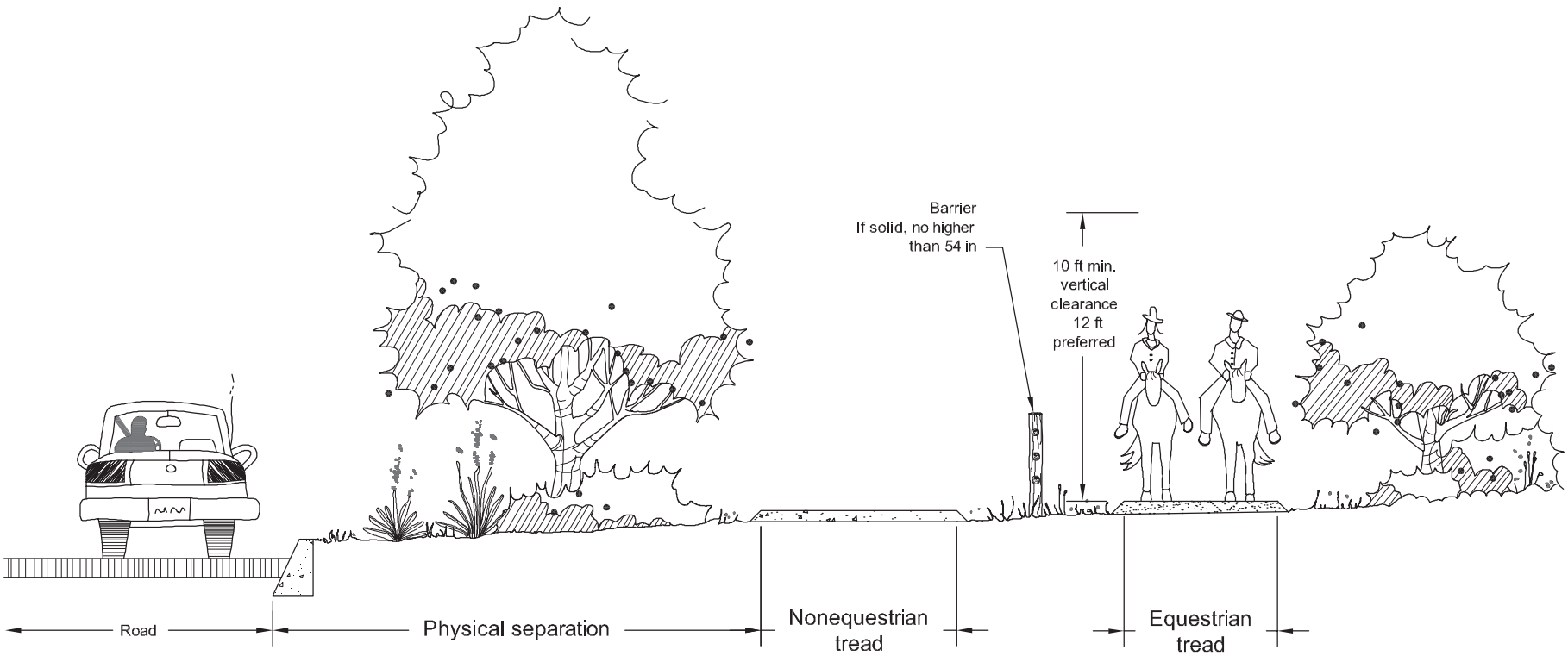


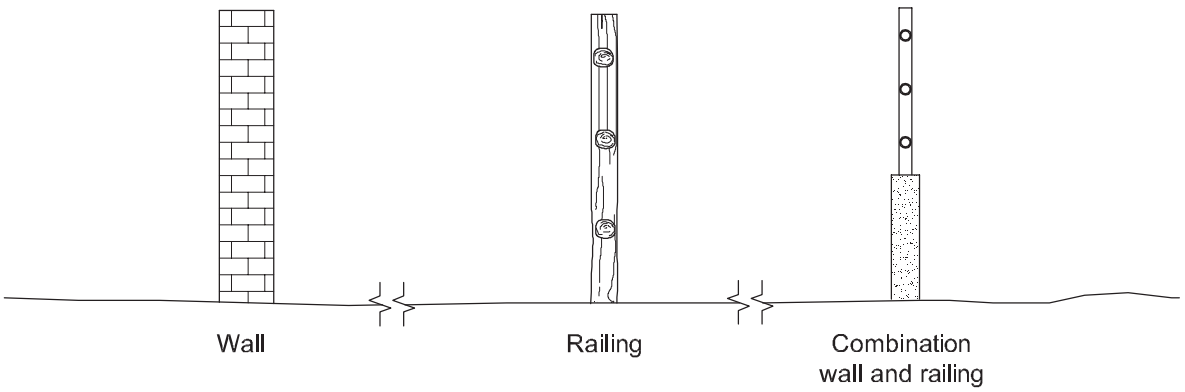
Figure 3–17—A shared-use, multiple-tread trail using physical separation and a barrier as separators.

Trail Barriers, Walls, and Bollards

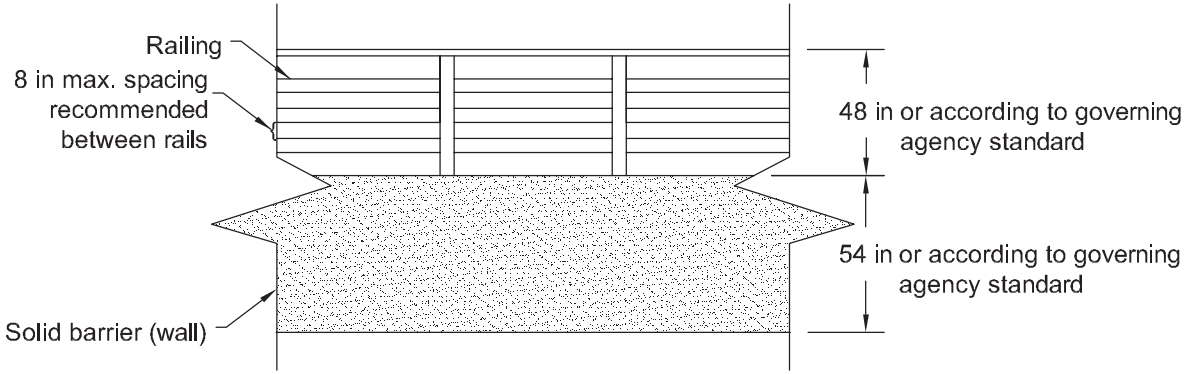
Barriers improve safety for all trail users—they can prevent a scared animal from running into the path of others. A substantial barrier between trail users also reduces the risk that people unfamiliar with horses and mules will frighten them. The barrier must be sturdy and tall enough to gain a horse's respect or the animal may attempt to run through or jump over it. Chain link or split rail fences are not adequate, and may even be dangerous. When designing barriers, avoid sharp edges, protruding fasteners, or vertical supports that could hurt riders or stock.

Barriers and Walls

When barriers (figure 3–18) are necessary, options include low walls, fences, and railings. The accepted height for most equestrian barriers is 54 inches (1,372 millimeters), similar to the AASHTO (1996) requirements for railings on equestrian bridges. Solid barriers higher than 54 inches severely limit a trail animal's peripheral vision and sense of security. High trestle bridges, overpasses, or other potentially dangerous situations may require higher barriers. Consider adding railings to low walls if more height is needed. Consider adaptations when solid walls end abruptly. One method is to taper the wall height gradually, allowing the animal to get adjusted to the view.



Common Barrier Types
End View



Combination Wall and Railing
Elevation View

Figure 3–18—Common styles for horse-friendly barriers. The barrier must be sturdy and tall enough to gain a horse's respect or the animal may attempt to run through or jump over it. Caution: solid barriers higher than 54 inches severely limit a trail animal's peripheral vision and sense of security.

When solid walls are used, vegetation on the side facing the trail can soften the structure's appearance. Figure 3–19 shows treads separated by a railing that has vegetation. Near urban areas where crime may be a concern, trim adjacent trail vegetation to less than 3 or 4 feet (0.9 or 1.2 meters) high to minimize hiding places.

Barriers that separate trails from a pasture or livestock enclosure may pose challenges for riders. Pastured animals frequently run to meet approaching trail users, causing some inexperienced stock to run away. Many horses and mules fear aggressive dogs and unfamiliar livestock, including llamas, cattle, goats, sheep, and pigs. Keep the trail away from potential conflicts with farm and exotic animals, if possible. Barriers that block the riding stock's view of the pasture may be an option.

Barriers also are useful for keeping riders and other trail users away from hazards. For example,

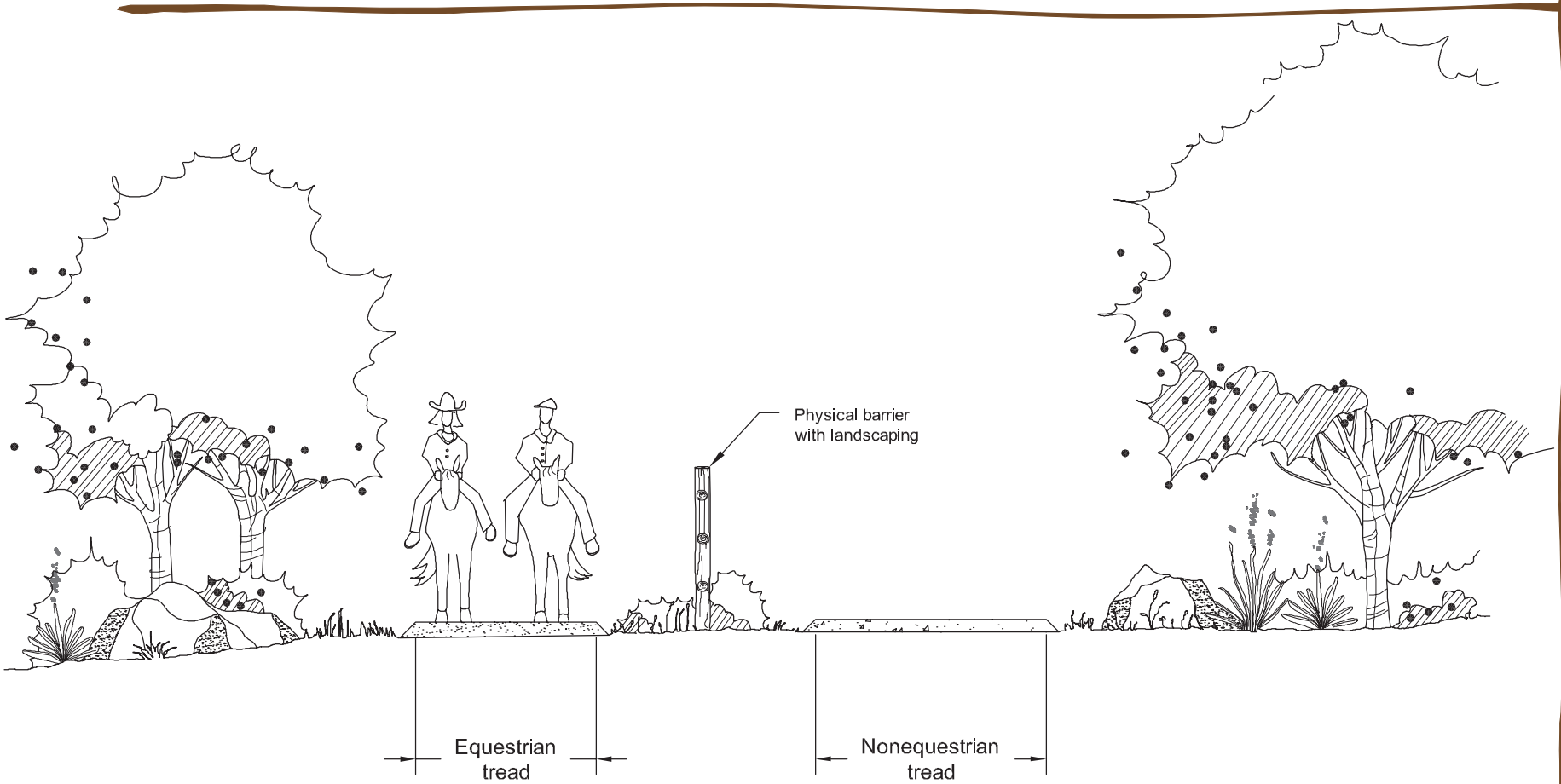


Figure 3–19—A trail with multiple treads separated by a barrier with landscaping.

Trail Talk

Transparent Barriers

See-through barriers, such as chain link or picket fences, may confuse stock because the slats or wires break up the view. The driving range on the Point Grey Golf Course in Vancouver, BC is bordered by a chain link fence. When stock walk alongside it, sometimes they are uncomfortable with the distorted view of the activity. In addition, when stock glimpse movement at their sides and low to the ground, such as sailing golf balls, their survival instinct may kick in.

Mitigation measures can make stock more comfortable. Driving range employees installed a dark green strip of fabric on the fence to screen the view. Because the view from the trail to the range is clear for quite some distance, stock have time to view the activity and become accustomed to it.

stock may be more comfortable along steep drops and precipices than their riders. From a horse's perspective, the edge is a safe place to be—predators are not likely to come from below. Design barriers in such areas with smooth, continuous surfaces that cannot catch the load, a rider's foot, or the stirrups.

Trail Talk

Slippery Slope

Design Guidelines for MetroGreen (Mid-America Council and others 2001) recommends railings or safety barriers where the trail is adjacent to ditches or steep slopes that rise more than 1 foot (0.3 meter) in 3 feet (0.9 meter) and also have a dropoff of more than 2½ feet (0.8 meter). They also specify railings when slopes this steep are within 6 feet (1.8 meters) of the trail edge. Railings begin at least 8 feet (2.4 meters) before the vertical hazard and extend at least 8 feet beyond the hazard. Rail height is 54 inches (1,372 millimeters) with a maximum opening of 4 inches (102 millimeters). The guidelines stipulate using flanged ends on rails to reduce the risk of injury if trail users collide with them. The guidelines also suggest a minimum 3-foot (0.9-meter) shoulder from the trail edge to the rail.

Bollards

Barrier posts—or *bollards*—frequently are installed on nonmotorized trails to block motorized use (figure 3–20). One bollard is usually enough to let motorists know the trail is not open to them. If more than one bollard is needed, install an odd number. Two bollards may confuse riders, possibly channeling them into the center of the trail or contributing to conflicts with other trail users. Three bollards send a clearer message. Placing bollards 5 to 7 feet (1.5 to 2.1 meters) apart allows mounted riders to pass between them with relative ease and restricts passenger vehicles and trucks. Spacing bollards 3 to 4 feet (0.9 to 1.2 meters) apart restricts UTVs and most adult-sized ATVs. However, this spacing is too narrow for a trail animal to go through comfortably. Consider using a stepover gate to restrict ATVs and motorcycles. Consult *Chapter 10—Securing Horses and Mules* for more information on stepover gates. Bollards at vehicle intersections must meet applicable regulations, such as AASHTO requirements. Bollards should be placed where they will not interfere with sight or stopping distances. Bollards may have lights to guide trail users after dark, and they may be lockable, removable, or recline to allow authorized vehicle access.

Figure 3–20—An uneven number of bollards is less confusing to trail users than an even number.

Trails Adjacent to Roads

When trails are next to busy roads, there is always a chance that a trail animal will become excited and run into traffic. In areas with low or moderate development, or in places where traffic speeds are relatively low, a comfortable distance between road and trail may suffice (figure 3–21). Places where traffic moves more quickly require greater physical separation. It may be best to provide a sturdy barrier. Trails with barriers along streets and highways must not only meet the needs of stock, but also the safety requirements for motorized traffic. The barriers can be costly and they need regular maintenance.

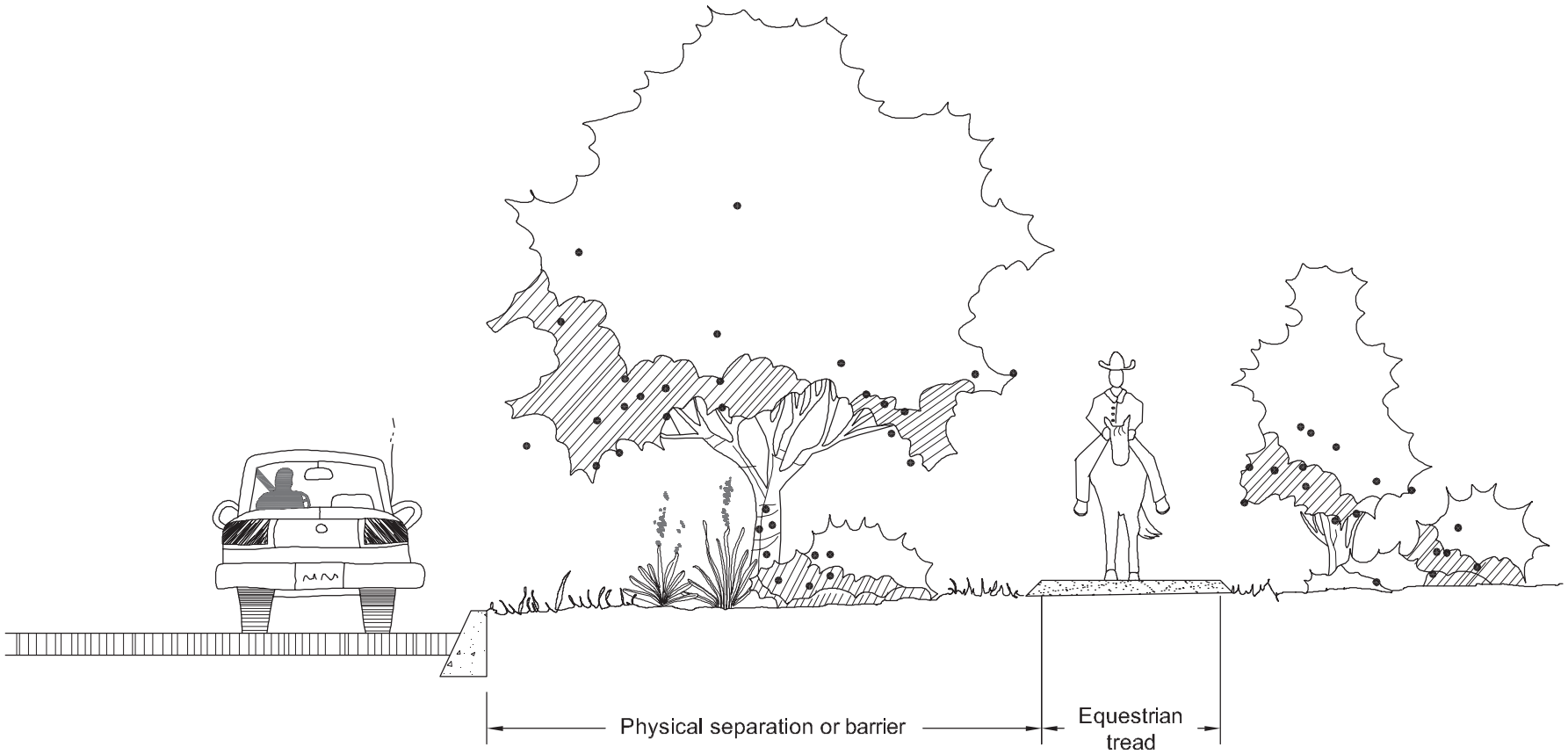


Figure 3–21—Distance separates a horse trail from an adjacent road. A safety barrier could be used instead of distance. Roadside barriers must meet the safety requirements for motorized traffic.

The accepted height of most equestrian barriers is 54 inches (1,372 millimeters). To reduce the risk that a horse might jump the barrier, make it at least 60 inches (1,524 millimeters) tall. Choose barriers that can withstand the force of a trail animal attempting to run through them. An example of an acceptable barrier is a steel railing. If a railing is used, include vegetation at the bottom to screen traffic from the horse's view. Avoid railings with posts or edges that can injure a trail animal or rider.

Occasionally, it may be necessary to completely block the horse's ability to see the source of noise. An example would be a trail that is immediately adjacent to high-speed roads where the sight of oncoming traffic would probably alarm the horse more than just traffic sounds alone.

Alternative Shared Corridors

In many areas of the country, existing corridors could serve more than one purpose. Consider incorporating horse trails into alleys, utility rights-of-way, and public or private roads with private access. These corridors serve as alternatives for horse trails if they are wide enough, don't have pavement, and the governing authority approves their use. Other potential trail routes include abandoned roads and inactive railroad corridors.

Resource Roundup

Converted Rail Trails

These organizations offer online information regarding conversion of former rail lines into recreation trails:

- Rails-to-Trails Conservancy (RTC) at *http://www.railtrails.org*
- National Trails Training Partnership (NTTP) at *http://www.americantrails.org/resources/railtrails*
- Pedestrian and Bicycle Information Center (PBIC) at *http://www.bicyclinginfo.org/rt*

—Courtesy of Kandee Haertel.