RAILS WITH TRAILS

Best Practices and Lessons Learned

U.S. Department of Transportation
Federal Railroad Administration

U.S. Department of Transportation
Federal Highway Administration

MAY 2021

Cover: Blackstone River Bikeway, Lincoln/Cumberland, RI (Photo courtesy of Rails-to-Trails Conservancy)

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED *(From - To)*
May 2021		

4. TITLE AND SUBTITLE

Rails-with-Trails: Lessons Learned

5a. CONTRACT NUMBER
693JJ318N-300043

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Jared Fijalkowski, Gina Filosa, Jamie Young (Volpe Center); Anthony Lucivero (Digital iBiz); Andrea Ferster, Eli Griffen, Kelly Pack (Rails-to-Trails Conservancy)

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

U.S. Department of Transportation
Volpe National Transportation Systems Center
55 Broadway
Cambridge, MA 02142-1093

Rails-to-Trails Conservancy
2121 Ward Court, NW, 5th Floor
Washington, DC 20037

8. PERFORMING ORGANIZATION REPORT NUMBER

DOT-VNTSC-FHWA-21-08

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Department of Transportation
Federal Highway Administration
Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington DC 20590

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

FHWA-HEP-21-017

12. DISTRIBUTION / AVAILABILITY STATEMENT

13. SUPPLEMENTARY NOTES

14. ABSTRACT

This updated Rails-with-Trails: Lessons Learned report documents how the state of the practice, perspectives, and context for rails-with-trails has evolved since 2002 and identifies updated effective practices for each phase of a rail-with-trail project, from development to design to construction, operation, and maintenance.

15. SUBJECT TERMS

Rails-with-trails, shared-use path, trail, multi-use path, multi-use trail

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified	Unlimited	97	19b. TELEPHONE NUMBER *(include area code)*

NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The U.S. Government assumes no liability for the use of the information contained in this document. This document does not constitute a standard, specification, or regulation. It is guidance only and does not create any requirements other than those stipulated in statute or regulation.

The U.S. Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear in this report only because they are considered essential to the objective of the document.

NON-BINDING CONTENTS

The content of this document do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies. While this document contains nonbinding technical information, you must comply with the applicable statutes or regulations.

QUALITY ASSURANCE STATEMENT

The Federal Highway Administration (FHWA) provides high-quality information to serve Government, industry, and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. FHWA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: volumes greater than 1000 L shall be shown in m^3			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
oz	ounces	28.35	grams	g
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi

Continued, next page

SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
mL	milliliters	0.034	fluid ounces	fl oz
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
g	grams	0.035	ounces	oz
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	Kilopascals	0.145	poundforce per square inch	lbf/in^2

**SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)*

Acknowledgements

The authors would like to thank the following people for their contributions to this report:

Abe Anshasi, Nebraska Department of Transportation

Cat Anthony, Virginia Capital Trail Foundation

Clyde Armstrong, MTA Metro-North

Adam Arvidson, Minneapolis Parks and Recreation Board

Jenn Barr, Southeastern Pennsylvania Transportation Authority

Sean Batty, TriMet

Val Beatty, Sound Transit

Brian Beauchamp, Traverse Area Recreation and Transportation (TART) Trails, Inc.

Tony Bellamy, CSX Transportation

Lee Bonner, Nevada Department of Transportation

Jaime Borino, Nevada Department of Transportation

Ann Boulden, Denton County Transportation Authority

Gage Brogan, Milwaukee County Department of Parks, Recreation, & Culture

Steve Brown, Franklin County Metro Parks, Ohio

Katie Chimelewski, CSX Transportation

Jim Cline, Denton County Transportation Authority

Melissa Cook, Wisconsin Department of Natural Resources

Dane Cooley, Utah Transit Authority

Christine Craycroft, Portage Park District, Ohio

Peter Dahlberg, Minnesota Department of Transportation

John Dalton, Massachusetts Bay Transportation Authority

Whitney Davis, Tennessee Department of Transportation

Josh DeBruyn, Michigan Department of Transportation

Jackie Dewolf, Maine Department of Transportation

Robert Folwell, Schuylkill River Greenway Association

Michael Friberg, Peoria Park District

Mark Fuhrmann, Metro Transit

Jeff Fultz, City of Visalia Parks and Recreation Department

John Garner, Western Maryland Scenic Railroad

Jill Mrotek Glenzinski, Wisconsin Department of Transportation

Rachael Griffith, Chester County Planning Commission

James Hannig, City of Milwaukee, Wisconsin

Hugh Hayward, Connecticut Department of Transportation

Clifford Isaac, North Carolina Department of Transportation

Soren Jensen, Midtown Greenway Coalition

Hal Johnson, Utah Transit Authority

Nikkie Johnson, Michigan Department of Transportation

Larry Keniston, New Hampshire Department of Transportation

Lori Kennedy, Canadian Pacific Railway

John Kremer, McHenry County Conservation District

Continued, next page

Acknowledgements continued

Mailia Lautoo, Utah Transit Authority

Lynn Leibfried, BNSF Railway

Brian Lombard, New Hampshire Department of Transportation

Thomas Maziarz, Connecticut Department of Transportation

Megan McIntyre, BNSF Railway

Justin Meko, AMTRAK

Nancy Mendez, City of Whittier, California

Jeffrey Moller, Association of American Railroads

Jason Morris, Norfolk Southern

Brenda Moscoso, Association of American Railroads

Nathan Moulton, Maine Department of Transportation

Don Noble, Rails to Trails of Wayne County, Ohio

Jeffrey Owen, TriMet

Robert Phillips, City of Madison, Wisconsin

Ken Rose, OmniTRAX, Inc

Nina Safavi, City of Burlington, Vermont

Peter Sanderson, Washtenaw County Parks and Recreation Commission

David Schoenmaker, Nebraska Department of Transportation

Barbara Schroeder, Winneshiek County Conservation Board

Jeanne-Marie Souvigney, Livingston Parks and Trails Committee

Randy Sellick, Virginia Department of Transportation

Ian Sikonia, City of Orlando, Florida

Liz Smith, Southeastern Pennsylvania Transportation Authority

Timothy Spencer, Minnesota Department of Transportation

Bill Story, Nevada Department of Transportation

Henry Stroud, Montgomery County Planning Commission

Peter Sutton, Massachusetts Department of Transportation

John Swintosky, Louisville Metro Parks and Recreation, Kentucky

French Thompson, BNSF Railway

Kimberly Tollers, Wisconsin Department of Transportation

Emerson Vorel, City of Denton Parks and Recreation

Shelley Winters, New Hampshire Department of Transportation

Melanie Zlmyeski, Connecticut Department of Transportation

Contents

Continued, next page

Contents continued

Continued, next page

Contents continued

Figures

Continued, next page

Figures continued

Tables

Executive Summary

In 2002, the U.S. Department of Transportation (DOT) published its first *Rails-with-Trails: Lessons Learned* report, which summarized the state of the practice and lessons learned regarding the development, construction, and operation of rails-with-trails. This updated *Rails-with-Trails: Lessons Learned* report documents how the state of the practice, perspectives, and context for rails-with-trails have evolved since 2002 and includes updated effective practices. The information presented in this report is based on extensive research into existing and planned rails-with-trails that involved interviews with railroad officials and trail managers; a literature review of previous rail-with-trail studies; a review of trail planning guidance documents; and input from various railroad and trail professionals.

The term "rail-with-trail" describes a shared-use path or trail open and developed for public use that is located on or adjacent to the rights-of-way of an active railroad or rail transit corridor. The term includes shared-use paths and trails located on or near railroad property which has tracks in place and property used by a railroad company or transit operator for storage, operations, maintenance, or security. Rails-with-trails are fundamentally distinct from "rails-to-trails," in which all rail service has been discontinued or abandoned, tracks and other rail infrastructure are removed, and the entire right-of-way is converted to a shared-use path or trail. Trail users generally prefer separation from active rail lines; however, there are occasions when typography constraints, overpasses, utilities, and other obstacles may require trails to traverse a railroad right-of-way, when permitted.

Of the eight Class I railroads (the nation's largest railroads), four have official written policies of not permitting adjacent bicycle, pedestrian, or multiuse trails within the railroad's right-of-way. The other four Class I railroads do not have official policy regarding rails-with-trails. However, those companies noted that in practice they do not encourage or do not allow parallel trails within the rail right-of-way except on a very limited basis when a proposal meets specific criteria.

Given this context, by the end of 2018, there were 343 identified rails-with-trails in the United States, totaling 917 miles of rails-with-trails in 47 States. The majority of rails-with-trails (68 percent) are located along Class I, II, or III railroads. However, since 2000 there has been an increasing trend of building rails-with-trails along passenger rail and rail transit lines with adequate separation distances (including heavy rail and light rail).

As more communities develop and expand their bicycle/pedestrian and trail networks, active railroad corridors are often identified as potential locations for trails due to the desirable characteristics of such corridors. However, private freight railroads generally do not permit trails within the railroad right-of-way (i.e., within the private property limits owned by the railroad). Freight railroad companies appear to view trails as an incompatible use within the right-of-way of an active railroad, primarily due to the perceived safety risks to railroad workers and the public; increased liability risk to the railroad; and potential impacts to future rail operations. While public transportation agencies share some of these same concerns, they often recognize that rails-with-trails can be an asset to not only the surrounding communities but to the public transit network. Many public transportation agencies actively coordinate with local communities to improve access between existing trails and transit and are increasingly working with communities to develop rails-with-trails along their rail right-of-way, often in conjunction with the development of new or expanded transit lines.

This report identifies effective practices for each phase of a rail-with-trail project, from development to design to construction, operation, and maintenance.

Rail-with-Trail Development Effective Practices

Interviews with, and data from, over 100 rail-with-trail managers, representing nearly 30 percent of all rails-with-trails, make clear that there is no standard or uniform rail-with-trail development process. Rather, the process varies widely depending on many factors, most importantly the location of the trail relative to the active railroad right-of-way, the intensity of the active railroad operations, and the corridor owner. Effective practices for the rail-with-trail development process include:

- **Railroad Coordination:** Trail developers should engage railroads early and often. In addition to the railroad right-of-way owner, trail developers should also engage rail operators and freight customers. Railroad officials should be encouraged to voice their concerns or suggestions, and trail developers should be prepared to provide design and management solutions to address these concerns. In addition, understanding what might incentivize the railroad's approval or support, such as infrastructure improvements at crossings, eliminating at-grade crossings, improving access to the corridor for track

maintenance, installing new signage to address safety concerns, and financial compensation, can help lead to a successful project.

- **Determining Feasibility:** A proposed rail-with-trail project may need to undergo a comprehensive feasibility analysis to determine if the project is feasible, and, if so, how best to implement it. The feasibility analysis should address land ownership and acquisition methods, existing physical and environmental conditions, stakeholder engagement, design and construction considerations, trail use and maintenance, and funding mechanism(s).
- **Locating Rails-with-Trails:** Prior to planning a rail-with-trail, identify and analyze alternatives that avoid locating the trail within a railroad's right-of-way. The planning process should consider whether routing the trail or segments of the trail outside of the railroad right-of-way is feasible, since doing so may simplify some aspects of corridor acquisition and trail development. If there are no viable alternatives to routing the trail within the active railroad right-of-way, plan the trail while considering the effective practices outlined in this report.
- **Involving Stakeholders:** Identifying and involving stakeholders early in the rail-with-trail development process can help create an inclusive and open atmosphere, saving time and energy and helping to avoid conflicts down the line. Stakeholder groups that should be involved include utility companies; State and local transportation, parks and recreation, and health departments; law enforcement officials; adjacent landowners; trail user groups; community groups, and the general public.
- **Environmental Review:** Become knowledgeable of required Federal, State, and local environmental review and permitting processes and design standards. If needed, analyze the environmental impacts prior to acquiring land and designing the rail-with-trail.
- **Consider Involving Intermediaries:** In the early stages of planning, identify the best agency or entity to lead negotiations and/or manage the project. Rail-with-trail project managers may benefit from intermediaries, such as a State DOT, negotiating with a railroad on their behalf.
- **Right-of-Way Acquisition:** Governmental trail developers interested in pursuing a rail-with-trail should acquire the affected railroad property for public ownership whenever feasible, particularly if State law affords governmental entitles greater protection from liability than private landowners.

Risk Management Effective Practices

Liability is frequently raised as a concern in rail-with-trail projects; however, to date, there is very little real-world information on the frequency or outcome of claims involving rails-with-trails. Effective practices for managing risk associated with rails-with-trails include:

- **Legal Research:** Those interested in implementing a rail-with-trail should conduct initial legal research as early in the process as possible. Important information to address includes ownership, easement, and license agreements in the railroad corridor; legal protections available at the State level (e.g., indemnification, applicable State statutes, and trespassing laws); local or State property rights ordinances and information; and trail management organization insurance protection.
- **Indemnification Agreements:** To the extent practicable and reasonable, consider using indemnification agreements to address liability concerns arising out of potential injuries related to trail activities on railroad property. Both trail managers and railroad companies should review State statutes to ensure the validity of indemnification agreements.
- **Trespassing History:** It is important to have corridor-specific information about the frequency and location of trespassing on the corridor, the history of injuries sustained by trespassers and the locations where they occurred, and the number and information about the safety of existing crossings.
- **Signs and Markings:** The *Manual on Uniform Traffic Control Devices* defines the standards for signs, signals, and pavement markings on all shared use paths, including rail-with-trail facilities.
- **Safety Education and Training:** Staff responsible for oversight of trail construction and maintenance should consider developing rail safety training or education programs to ensure that these work activities are conducted safely, without undue risk to workers, and without interfering with train operations.
- **Liability Insurance:** Trail managers should consider obtaining comprehensive liability insurance for key personnel, including directors and officers, and in an amount sufficient to cover foreseeable liability costs unless, as a public agency, it can be determined that there is adequate self-insurance already in place.

Design Effective Practices

There are no national standards or guidelines on rail-with-trail facility design. Instead, trail planners and developers often use guidance from other standards related to shared-use paths, pedestrian and bicycle facilities, railroad facilities, and roadway crossings of railroad rights-of-way. The design of a rail-with-trail project should be based on specific site conditions, trail user needs, State and Federal regulatory requirements, local trail planning and construction guidelines, engineering judgment, and the requirements of the railroad owner(s) and operator(s). Trail planners, designers, and engineers must work closely with railroad staff, including those in the real estate, legal, operations, and maintenance departments, early and often to achieve a suitable rail-with-trail design.

Effective practices for the design of rail-with-trail facilities include:

- **Regulatory Requirements:** Trail developers must adhere to all applicable Federal, State, and local requirements. This applies to all subsequent design recommendations.
- **Setback:** Rails-with-trails should be set back from railroad tracks as much as reasonably possible. When constructed within the railroad right-of-way, the trail should be built on the far edge of the property, where conditions allow. Setback determinations should consider various factors including:
  - » Train frequency, speed, and type of freight transported;
  - » Current and future rail maintenance and operational needs;
  - » Track curvature
  - » Topography and other environmental and physical constraints;
  - » Separation type;
  - » Any applicable State standards; and
  - » Historical patterns of trespassing or vandalism.
- **Separation:** Separation between the rail-with-trail and railroad tracks, which aims to reduce trespassing on the tracks, often takes the form of fencing, ditches, berms, vegetation, or any combination of the these options. When fencing is needed, corridor characteristics, such as the setback distance, location of legal at-grade crossings, and the type, speed, and frequency of rail service will influence the appropriate fencing style, including height and material.
- **At-Grade Crossings:** New at-grade trail-rail crossings present unique challenges and railroads often do not allow them. They should only be proposed where there is no other reasonable alternative. In many cases, a more cost-effective and appropriate solution may be to use existing grade crossings. All affected grade crossings should be reviewed to determine which traffic control devices are required to provide warning and guidance for trail users. All signs, signals, and pavement markings need to conform to the *Manual on Uniform Traffic Control Devices.*
- **Grade-Separated Crossings:** Overcrossings (bridges or trestles) or undercrossings (tunnels or routing a trail under an existing railroad bridge) are another solution for rails-with-trails if an existing crossing is not available. However, these types of grade-separated crossings are expensive to construct. Overcrossings and undercrossings should be designed with approach grades that comply with Americans with Disabilities Act (ADA) guidelines, along with fencing and lighting as appropriate.
- **Accommodating Future Tracks and Sidings:** A rail-with-trail should be designed and located so as not to preclude potential future rail expansion, if expansion is anticipated. Where corridor width, topography, and other factors allow, the rail-with-trail should be located on the opposite side of the railroad, away from proposed track or siding expansion.
- **Access to Stations:** Rails-with-trails along passenger rail lines should be designed to promote access to rail and transit stations, taking into account both accessibility and safety. To facilitate multimodal transportation, secure bicycle parking should be installed near the stations in coordination with the rail or public transportation agency.
- **Drainage:** Consider the impact the rail-with-trail may have on the adjacent rail line's drainage system. In certain cases, a new or modified drainage system might need to be installed to serve both the railroad and trail.

Construction, Operations, and Maintenance Effective Practices

Close coordination among stakeholders during the construction, maintenance, and operations of rails-with-trails is important

to ensure that the trail continues to meet the needs of its users while addressing the safety and security requirements of the railroads. Once open, a rail-with-trail should minimize impacts on the adjacent railroad while offering a safe experience for both trail users and railroad operators.

Effective strategies for constructing, operating, and maintaining rails-with-trails include:

- **Construction Coordination:** Because of the trail's proximity to active rail lines, planning for the construction of a rail-with-trail should be done in coordination with the railroad owner and operator(s). Trail developers should engage railroads as early as possible so that their feedback can be incorporated into a detailed plan for the trail construction phasing and overall construction schedule.
- **Railroad Requirements:** When engaging in construction activities, the trail developer will need to coordinate with the adjacent railroads to address issues related to public safety, potential impact on operations, and protection of rail facilities.
- **Trail Maintenance:** The trail manager should have a comprehensive operations and management plan that details the procedures and responsibilities for both the railroad and trail manager. The plan should include:
  - » Trail closure procedures and details for removing and reinstalling fences or other barriers, including identification of the entity responsible (and any compensation to be provided), if the trail is damanged or destroyed during rail maintenance activities, and
  - » Defined roles for maintaining vegetation, including how often it is maintained and any shared responsibilities.
- **Education:** The trail manager should consult the railroad to determine whether trail user education related to the adjacent railroad activities is necessary. In many cases, railroads and trail developers may agree that signage, adequate setback, and separation between the trail and tracks is sufficient. If more active education is desired or required, the trail developer could conduct online or in-person safety trainings, safety briefings in advance of organized walks, runs, or rides, or direct outreach to schools and workplaces.
- **Security, Crime, and Vandalism:** In many cases, the presence of a rail-with-trail channelizes would-be trespassers onto the trail, reducing trespassing and vandalism. In locations where security remains a concern, the trail manager, in coordination with local police, could establish organized activities and trail patrols. Strategies such as the clearing of vegetation or installation of lighting or damage-resistant fencing can also be effective to help address security concerns along a rail-with-trail, provided regular maintenance is also performed.

Summary

Well-designed rails-with-trails have the potential to provide safe, accessible infrastructure that encourages and enables people to walk and bike for both transportation and recreation as part of their daily lives. Rails-with-trails are not appropriate in every situation, and developing one requires a collaborative approach among railroads, trail developers, and communities to address safety, capacity, and liability issues. Ultimately, successful rail-with-trail design delicately balances the operational, maintenance, and safety requirements of a railroad with the specific needs and characteristics of trail users and the surrounding community.

The Charlotte trail provides for active transportation as well as connections to transit. (Photo courtesy of Rails-to-Trails Conservancy)

Section I: Introduction

Background and Purpose

The term "rail-with-trail" describes a shared-use path or trail open and developed for public use that is located on or directly adjacent to an active railroad or rail transit corridor. The term includes shared-use paths and trails located on or near railroad property that has tracks in place and is used by a railroad company or transit operator for storage, operations, maintenance, or security.[1] Rails-with-trails are fundamentally distinct from "rails-to-trails," in which all rail service has been discontinued or abandoned, tracks and other rail infrastructure are removed, and the entire right-of-way is converted to a shared-use path or trail.

Like all trails, rails-with-trails have the potential to provide benefits to communities, including:

- **Active Transportation:** Rails-with-trails provide safe, accessible infrastructure that encourage and enable people to walk and bike as part of their daily lives.
- **Health and Wellness:** Having access to places for physical activity, such as trails, encourages community residents to participate in physical activity and do so more often.
- **Access:** Trails can bridge gaps within and between communities, creating new access to jobs and services, physical activity, and outdoor recreation, and offering active transportation options to those who are unable or choose not to drive.
- **Economic Development:** As trail systems grow, they spark new investment in trailside businesses and commercial opportunities along the trail route.
- **Protecting the Environment:** Trails contribute to a healthy environment by encouraging active modes of transportation that can reduce air pollution and traffic congestion.

As more communities develop and expand their bicycle and pedestrian and trail networks, active railroad corridors are often identified as potential locations for trails due to the desirable characteristics of such corridors (e.g., gentle grade, existing and maintained or cleared right-of-way) and the connections they provide between communities or destinations. Since the late 1990s, there has been increasing public interest in using land adjacent to rail lines for public shared-use paths and trails, which requires a collaborative approach among railroads, trail developers, and communities to address safety, capacity, and liability issues.

[1] For the purposes of this report, the term railroad includes any publicly or privately-owned entity which carries freight or passengers (whether or not it is in active status), insular tourist or excursion railroads not connected to the general system, and rail transit.

2002 Report	2018
65 Rails-with-Trails Comprising 279 Miles In 30 States	343 Rails-with-Trails Comprising 917 Miles In 47 States

Because of this increasing public interest, stakeholders identified a need to study rails-with-trails . Focus areas included:

- To determine where these trails are appropriate,
- To recommend design treatments and management strategies,
- To find ways to reduce negative trail impacts on railroad industry and enhance positive impacts, and
- To address other public interest considerations.

In response to this need, in 2002, the U.S. Department of Transportation (DOT) published the comprehensive *Rails-with-Trails: Lessons Learned* **report** ("2002 Report"), which summarized the state of the practice and cataloged lessons learned regarding the development, construction, and operations of rails-with-trails.

Since the 2002 Report, the number of rails-with-trails has continued to increase. As of 2002, there were 65 identified rails-with-trails in the United States, comprising 279 miles of rails-with-trails in 30 States. The analysis conducted for this report identified 278 additional rails-with-trails.[2] In total, as of the end of 2018, there are 343 rails-with-trails in the United States, comprising 917 miles of rails-with-trails in 47 States.

Community demand for trails as part of safer, more integrated multimodal transportation networks has been a continued catalyst for the growth of rails-with-trails in almost every State. In particular, rails-with-trails are often seen as a way to close gaps in off-road nonmotorized transportation networks. However, notwithstanding their continued growth, rail-with-trail developers continue to face many of the same challenges as they did decades ago.

The purpose of this report is to document how perspectives and the context for rails-with-trails has evolved along with the state of the practice since 2002. An updated summary of effective practices, along with examples from a variety of rails-with-trails across the United States, are featured throughout the report.

This report considers the perspectives of railroad officials, public agencies, trail planners, and trail users from across the country.

Note that this report does not constitute a standard, specification, regulation, or an endorsement of rails-with-trails.

[2] Some of the additional rails-with-trails identified opened after the 2002 report was released, and some existed prior to the 2002 Report but were not identified in the report.

Methodology

The information presented in this report is based on extensive research into existing and planned rails-with-trails. This work involved a review of literature and interviews with railroads as well as Federal, State, and local transportation agency representatives. Trail managers from across the United States were also included in this review process. Additionally, a literature review was conducted along with data collection and analysis, interviews, and conference presentations.

Literature Review

The study team reviewed existing literature. See Appendix B for relevant rail-with-trail resources. A primary source of information for this report was the Rails-to-Trails Conservancy's (RTC's) 2013 *America's Rails-with-Trails Report,*[3] which describes trends in the growth of rails-with-trails, safety concerns, community benefits, design coordination with railroads and public transit authorities, and liability and risk management. For this report, the study team reviewed and analyzed surveys and interviews from 88 trail managers included in RTC's 2013 report.

Data Collection and Analysis

Information about rail-with-trail trends is based on information in RTC's comprehensive rail-trail and rails-with-trails database, which includes information obtained directly from trail managers and from geospatial datasets.[4] The study team collected data on basic characteristics of rails-with-trails (e.g., total length of trail, length of trail along active railroad corridor, setback distance of trail from track, presence of crossings) through interviews and, where applicable, verified with satellite imagery of the trails. Open ended questions allowed participants to provide more detail about rail-with-trail development, including acquisition, design and construction, as well as perspectives on the interaction among the trail, its users, and the railroad.

Interviews

The study team conducted telephone interviews with 25 trail managers to collect information about the rail-with-trail development process, including challenges and effective strategies for successful project implementation. The team also conducted interviews with 13 State DOTs to gain insight about State policies for rails-with-trails. The study team chose State DOTs to interview with the goal of obtaining a representative sample based on size, geography, and level of information and experience with rails-with-trails. The study team conducted telephone interviews with representatives from the railroad industry, including the eight Class I railroads, a scenic railroad, and the Association of American Railroads to gather feedback on their experience and views of rails-with-trails. Finally, the study team conducted telephone interviews with eight public transportation agencies for insight into their experience with rails-with-trails located along rail transit. See Table 1 for a complete list of the stakeholders interviewed as part of this study.

[3] **https://www.railstotrails.org/resource-library/resources/americas-rails-with-trails/**

[4] RTC's trail finder website, TrailLink.com, is hosted on Amazon Web Services and uses Google Maps API to publish trail maps. Other spatial data sources used to verify length and features of rails-with-trails include ESRI, OpenStreets Map, and the Federal Railroad Administration (FRA).

Table 1: Stakeholders Interviewed

Trail Managers		
City of Burlington (VT)	Chester County Planning Commission (PA)	City of Madison (WI)
City of Milwaukee (WI)	City of Orlando (FL)	City of Whittier (CA)
City of Visalia Public Works Dept. (CA)	Denton Parks & Recreation (TX)	Franklin County Metro Parks (OH)
Livingston Depot Center Trail (MT)	Louisville Parks & Recreation (KY)	McHenry County Conservation District (IL)
Midtown Greenway (MN)	Milwaukee County Department of Parks, Recreation, & Culture (WI)	Minneapolis Park & Recreation Board (MN)
Montgomery County Planning Commission (PA)	Pleasure Driveway and Park District of Peoria (IL)	Portage Park District (OH)
Rails to Trails of Wayne County (OH)	Schuylkill River Greenway Association (PA)	Traverse Area and Recreation Trail (MI)
Virginia Capital Trail Foundation (VA)	Washtenaw County Parks & Recreation Commission (MI)	Winneshiek County Conservation Board (IA)
Wisconsin Department of Natural Resources (WI)		

Trail Managers		
Connecticut DOT	Maine DOT	Massachusetts DOT
Michigan DOT	Minnesota DOT	Nebraska DOT
Nevada DOT	New Hampshire DOT	North Carolina DOT
Tennessee DOT	Vermont Agency of Transportation	Virginia DOT
Wisconsin DOT		

Railroad Industry Stakeholders		
Amtrak	Association of American Railroads	BNSF Railway
Canadian National Railway	Canadian Pacific Railway	CSX Transportation
Kansas City Southern	Norfolk Southern	OmniTrax
Union Pacific	Western Maryland Scenic Railroad	

Public Transportation Agencies		
Utah Transit Authority (UT)	Massachusetts Bay Transportation Authority (MA-RI)	Metro-North Railroad (NY-CT)
Metro Transit (MN)	Sound Transit (WA)	TriMet (OR)
Southeastern Pennsylvania Transportation Authority (PA-NJ)	Denton County Transportation Authority (TX)	

Conference Presentations

The study team presented preliminary and final results of the analysis at several conferences, including:

- International Trails Symposium (2017 and 2019)
- National Off-Highway Vehicle Conservation Council and International Off-Highway Vehicle Administrators Association Joint Annual Conference (2017)
- Walk Bike Places (2018)
- National Highway-Rail Grade Crossing Safety Conference (2019)

During the question and answer portions of these sessions, participants asked questions that relate to the content in this report, particularly regarding liability, coordinating with railroads, trespassing, and safety. Some participants provided examples of their experiences on these topics, which informed the research for this report.

Contents

The report is divided into the following sections:

- **Section II** summarizes trends in rails-with-trails from 1960 to 2018.
- **Section III** summarizes the policies and perspectives on rails-with-trails of railroad companies, public transportation agencies, and State DOTs.
- **Section IV** focuses on the rail-with-trail development process, including feasibility analysis, planning, and land acquisition.
- **Section V** addresses liability and legal tools for managing risk, including insurance, legislation, and indemnification agreements.
- **Section VI** offers effective practices for rail-with-trail design, including setback, separation techniques, signage, and crossing treatments.
- **Section VII** offers effective practices for the construction, operation, and management of rails-with-trails.
- **Appendix A** provides definitions for relevant terminology and acronyms.
- **Appendix B** provides relevant rail-with-trail resources.

Photo of the Nashua River Rail Trail and the Groton School Pond in Groton, Massachusetts. (Photo courtesy of Michael A. White—Wikipedia.)

Section II: Rail-with-Trail Trends

As of 2018, there were 343 identified rails-with-trails in the United States, comprising 917 miles of rails-with-trails in 47 States. Of the 343 existing rails-with-trails in the United States, the year they opened is known for 199 of them.[5] Figure 1 shows the cumulative number of rails-with-trails that opened by decade, along with the cumulative mileage of rails-with-trails by decade. Of the 199 rails-with-trails with known opening years, 78 opened between 2000 and 2018, representing a 64 percent increase from 1960–1999. Those 78 rails-with-trails comprised 189.24 additional miles of rails-with-trails, representing a 41 percent increase in trail mileage from 1960–1999.

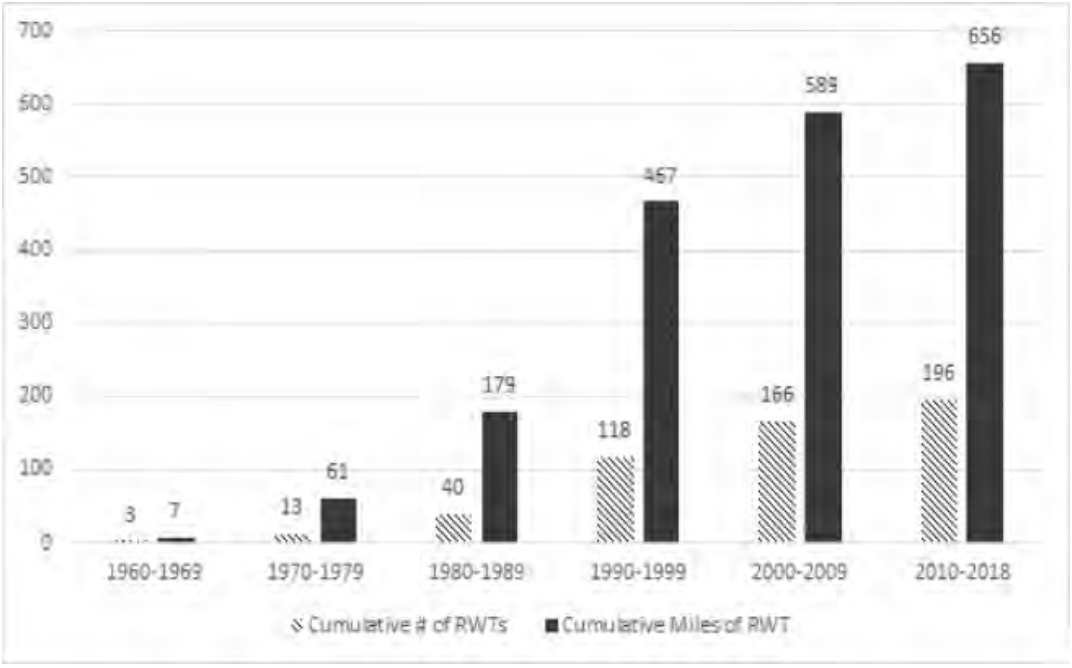


Figure 1: Cumulative Number and Miles of Rails-with-Trails by Decade

[5] Information on the year the trail opened was not available via an online search for 144 trails. The project team attempted to contact a representative for trail to obtain the information; the trail contact was either non-responsive or did not know the year in which the trail opened.

Rails-with-Trails by Region

Region	Number of Rails-with-Trails	Miles of Rails-with-Trails
Northeast	58	164.3
Southeast	45	74.2
Midwest	134	392.3
Southwest	12	44.4
Rocky Mountains	23	51.2
West	73	181.1
Alaska/Hawaii	2	10.0
Total	**347**	**917.5**

Table 2: Number and Miles of Rails-with-Trails by Region

The 343 rails-with-trails are located in 47 States and the District of Columbia. Figure 2 shows a map of rails-with-trails by State, and Table 2 lists the number and miles of rails-with-trails by region.[6] California has the most rails-with-trails, with 43 in the State, followed by Pennsylvania and Illinois, each with 25 rails-with-trails. Wyoming, Hawaii, and Mississippi are the only States that do not have identified rails-with-trails. The regions with the most rails-with-trails are the Midwest with 134, the West with 73, and the Northeast with 58. The high concentration of rail-with-trail facilities in the Midwest may be attributed to the greater amount of railroad infrastructure in the region in comparison to other regions.

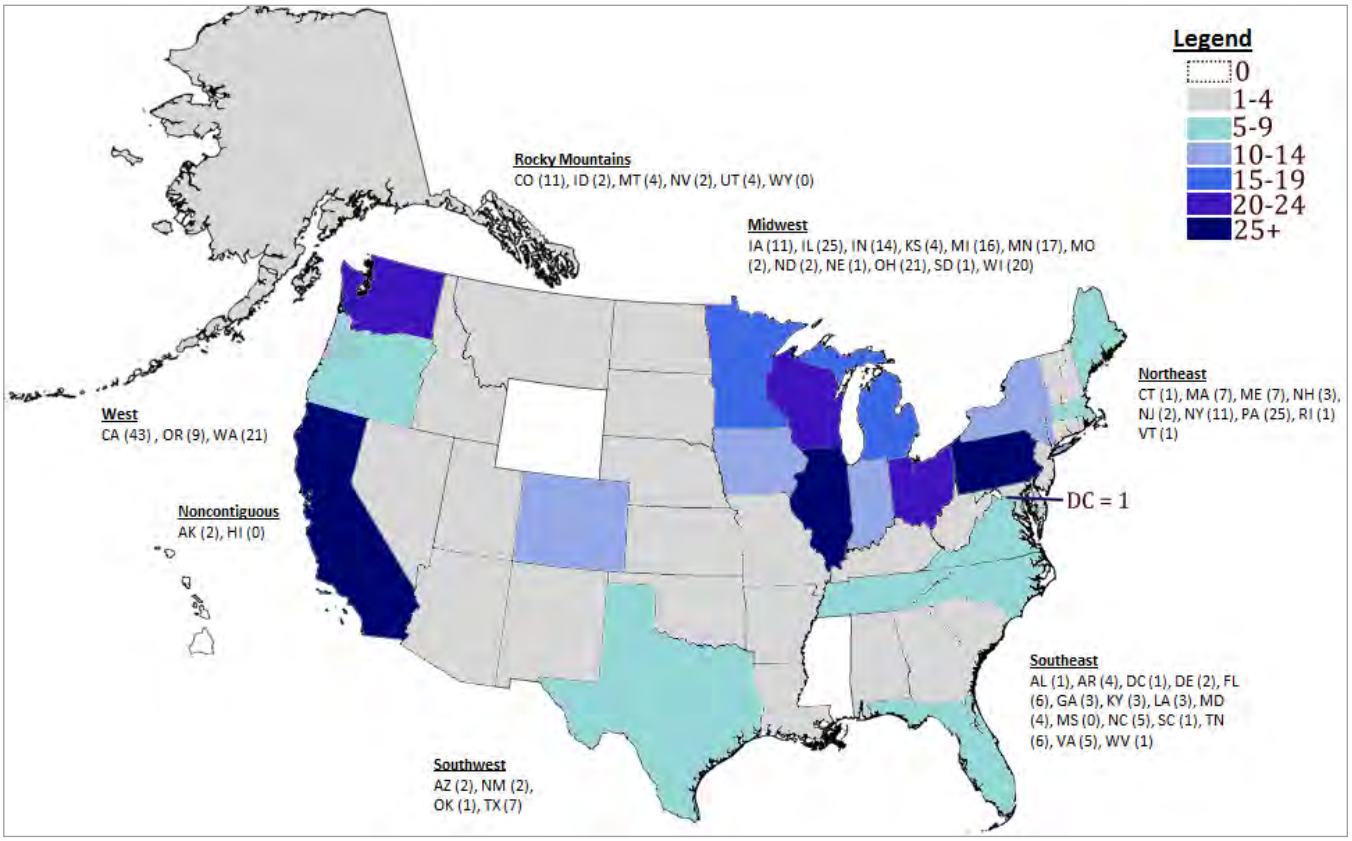


Figure 2: Map of Rails-with-Trails by State

[6] There are four rails-with-trails that cross State lines, which is why the total number is higher than 343.

Rails-with-Trails and Railroad Classes

Based on data for 276 rails-with-trails for which the class of the adjacent railroad is known, over two thirds (68 percent) of rails-with-trails are along freight railroads - including Class I, II, or III railroads.[7] The remaining rails-with-trails (32 percent) are located along passenger rail (Amtrak), tourist or excursion lines, and rail transit (including commuter rail, heavy rail, and light rail). It is important to note that some railroad lines carry multiple railroad classes; for example, a railroad line may have Class I freight and passenger service. In these cases, the primary use of the railroad corridor is used for this analysis.

Figure 3 shows the classes of railroads adjacent to rails-with-trails built between 1960 and 1999, as well as between 2000 and 2018. As indicated in the graph, there has been an increasing trend of building rails-with-trails along passenger rail and rail transit lines and a decreasing trend of building rails-with-trails along freight rail lines. Prior to 2000, only 27 percent of rails-with-trails were built along passenger rail and rail transit lines. Since 2000, 40 percent have been built along passenger rail and rail transit lines.

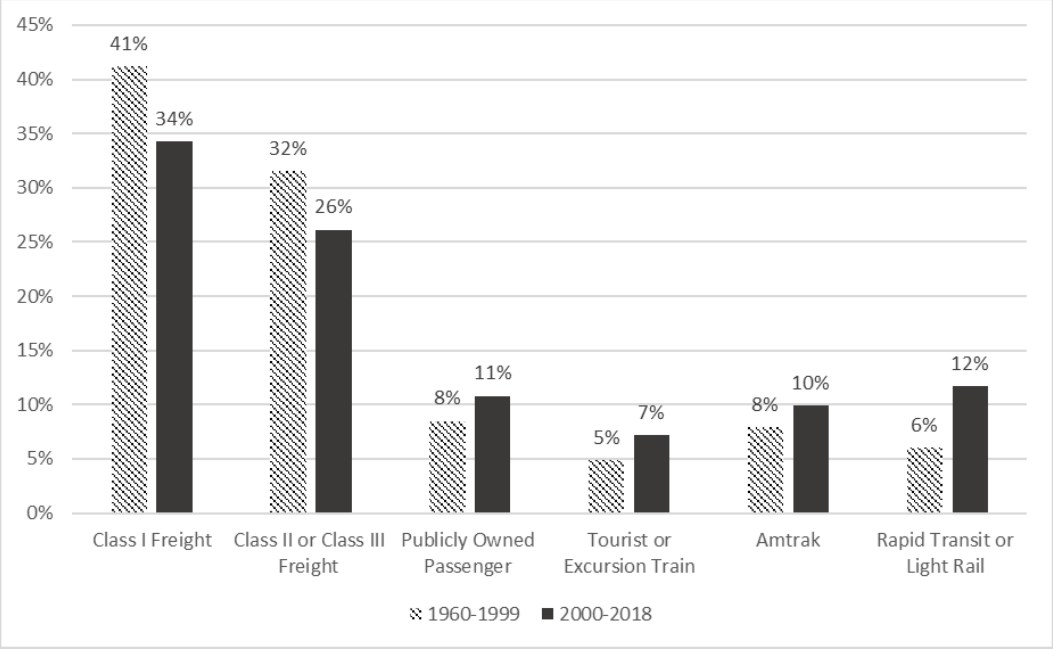


Figure 3: Railroad Classes along Rails-with-Trails: 1960-1999 and 2000-2018 (Sample size: 276)

Location of Rails-with-Trails in Relation to Rights-of-Way

Based on data for 81 rails-with-trails for which the location of the rail-with-trail relative to the railroad right-of-way and the year of opening was available, over half (58 percent) of rails-with-trails are located within the railroad right-of-way[8] or are partially located within the railroad right-of-way. The remainder of rails with trails (42 percent) are located adjacent to but outside of the railroad right-of-way. Figure 4 indicates that, since 2000, a higher percentage of with-trails have been built with segments both within and outside of railroad rights-of-way than before 2000.

[7] In the U.S., freight railroads are designated as Class I, II, or III according to their annual operating revenues. As currently defined by regulations of the Surface Transportation Board (49 CFR Part 1201; General Instructions 1-1), Class I railroads have revenues of approximately $447.6 million or more; Class II have revenues less than approximately $447.6 million but greater than approximately $35.8 million, and Class III have revenues of less than approximately $35.8 million.

[8] The railroad right-of-way refers to the private property limits owned by the railroad.

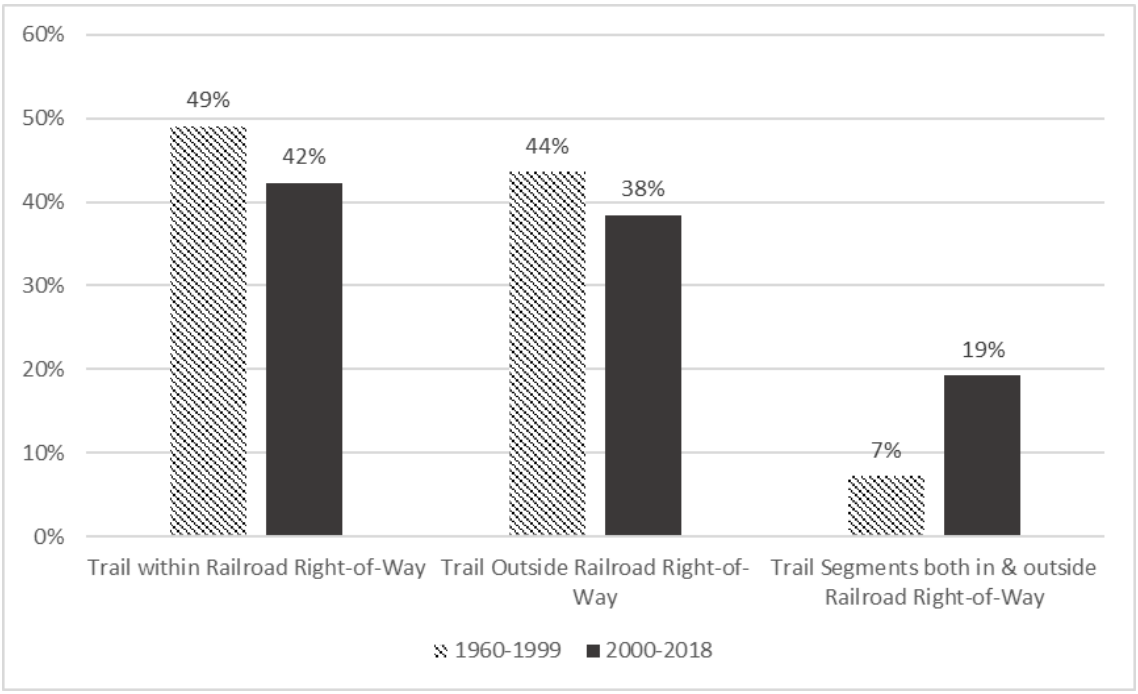


Figure 4: Rail-with-Trail Rights-of-Way: 1960–1999 and 2000–2018 (Sample size: 81)

Class I railroads are less likely than other railroads to have rails-with-trails located within their rights-of-way. Figure 5 indicates that, based on data for 32 rails-with-trails located along Class I railroads for which the location of the rail-with-trail relative to the railroad right-of-way was available, 53 percent are located outside the railroad right-of-way and 47 percent either are are wholly or partially located within the railroad right-of-way.

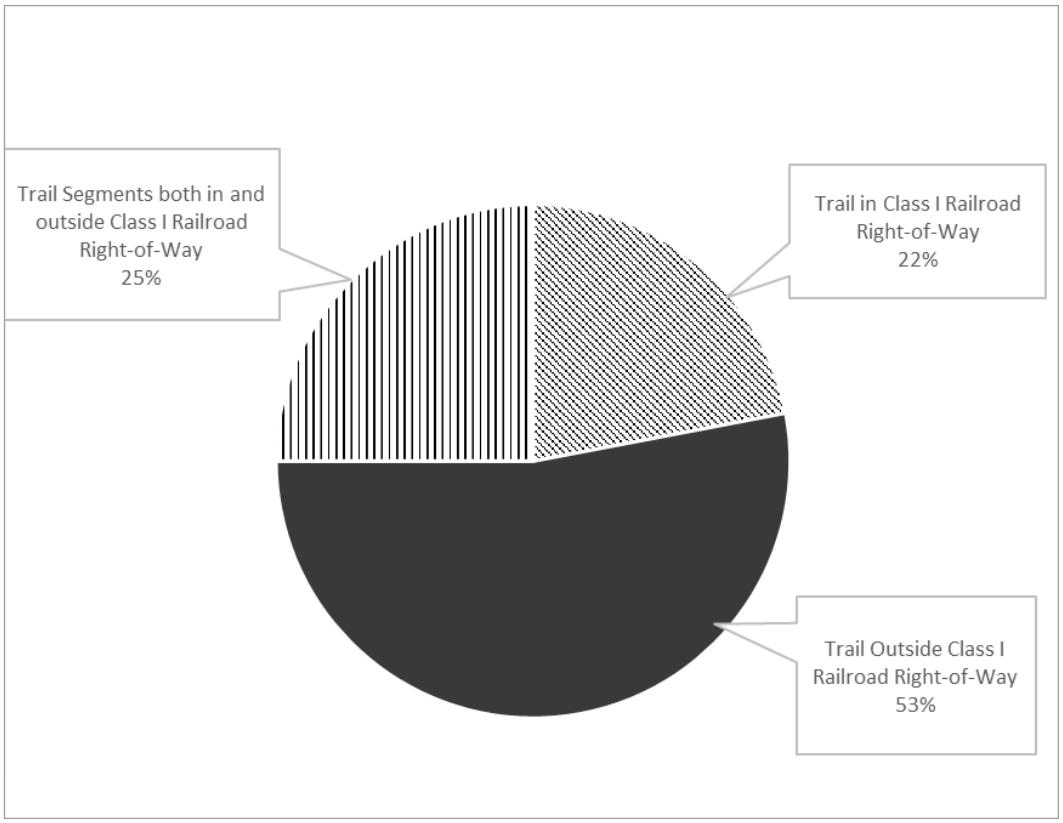


Figure 5: Rail-with-Trail Rights-of-Way on Class I Railroads (Sample size: 32)

International Rails-with-Trails

Rails-with-trails exist in Canada, Australia, the United Arab Emirates, and several countries in Europe. They are sometimes referred to as rail-side trails and occur in a variety of contexts, including alongside urban light rail, freight corridors, tourist trains, and commuter lines.

The E&N Rail Trail Humpback Connector on near Victoria, British Columbia. (Photo courtesy of Capital Regional District)

Canada

Rails-with-trails have been developed in almost every Province that has railroad service, including Nova Scotia, Québec, Ontario, Saskatchewan, Alberta, and British Columbia. They vary in length from less than 100 meters long to several kilometers. Canadian rails-with-trails are built in a variety of contexts: adjacent to corridors with infrequent service as well as busy corridors, along commuter rail lines or freight routes, and along major railroads or spur lines. They are most often smaller segments of a longer trail, with a rails-with-trails portion located on bridges, at choke points, and where the rail corridor was deemed the best alignment for a portion of a trail.

Australia

Rails-with-trails in Australia tend to be most common along the publicly owned passenger railways outside of the larger cities, such as Sydney, Melbourne, and Perth. They are often referred to as "rail-side trails" in the Australian context. Many are built on railway land but are managed by councils, either through the city or shire (a local government entity similar to a county or metropolitan area in the U.S.).

United Arab Emirates

Unlike the US, the United Arab Emirates does not have a large network of rail corridors, but rails-with-trails do exist along rail transit corridors as part of an extensive trail network. For example, the Roads and Transport Authority (RTA) constructed a nine-kilometer cycle track alongside the Dubai Tramway that connects stations with Jumeirah Beach and residential areas. The RTA has a goal of more than 900 kilometers of trail infrastructure to be built in the coming years. Since Dubai is largely an urban environment, most of the metro lines are elevated, with some subterranean sections, and the rail-with-trail is alongside the only at-grade tram line. Because of the design of the relatively new rail systems, even though trails may run parallel to rail lines, they most commonly have a grade separation that negates the need for barriers.

Other

Rails-with-trails have been developed throughout Europe. The Netherlands has many urban bike paths that would be considered rails-with-trails by this study's standards, as Dutch urban separated cycle tracks and trams are often located side-by-side. In the Netherlands, England, and Switzerland, there are also rural routes where intercity trains run parallel to multiuse trails.

Pine Creek Connector Trail alongside SEDA-COG Joint Rail Authority Tracks, Pennsylvania. (Photo courtesy of Simone Collins Landscape Architecture and American Engineers Group, LLC)

Section III: Policy and Perspectives

This section provides information on the policies of railroad companies, including freight, excursion, and passenger railroads, public transportation agencies, and State DOTs regarding rails-with-trails. It also highlights their perspectives on rails-with-trails, including common concerns, as well as design considerations to address the concerns.

Railroad Policies and Perspectives

Railroad Policies

In the U.S., freight railroads are designated as Class I, II, or III according to their annual operating revenues. Of the eight Class I railroads, four have official written policies of not permitting adjacent bicycle, pedestrian, or multiuse trails within the railroad's right-of-way (see sidebar). The other four Class I railroads do not have official policy regarding rails-with-trails. However, those companies noted that in practice they do not encourage or do not allow parallel trails within the rail right-of-way except on a very limited basis when a proposal meets specific criteria. Relatively few of the Class II and Class III regional railroads have official policy regarding rails-with-trails.

Class I Railroad Rail-with-Trail Policies

BNSF Railway and Union Pacific Railroad (UP) jointly issued the *Guidelines for Railroad Grade Separation Projects,*[9] which is a set of planning and engineering guidelines that the railroads use to share their policies on several grade-crossing issues, including trail crossings, with external parties. The UP/BNSF guidelines state that the railroads do not allow rails-with-trails parallel to the track on railroad right-of-way (i.e., the private property limits owned or managed by the railroad) or access roads (i.e., a road used and controlled by the railroad for maintenance, inspection, and repair). Trails that are outside the railroad right-of-way should use barriers such as fences, ditches, or berms separate the trail from the tracks to prevent trespassers from entering the railroad right-of-way. UP and BNSF do not allow rails-with-trails on or cantilevered from railroad bridges. The railroads also prohibit new at-grade trail-rail crossings but may allow new rails-with-trails to cross railroad tracks adjacent to existing at-grade roadway crossings. Rail-with-trail overpasses and underpasses are both allowed, but the document provides extensive guidance for them. The document also outlines requirements for setback, drainage, fencing, signs, and lighting for rails-with-trails.

The CSX *Public Project Information*[10] document provides information to help communities plan and implement projects that may involve the CSX rail property. It includes a section titled *Bicycle/Pedestrian Pathways and Crossings,* which includes rails-with-trails. As described in the document, it is CSX policy not to permit private or public parallel bicycle/pedestrian paths within the railroad's right-of-way. However, CSX will cooperate on parallel trails outside of its right-of-way. For parallel trails outside the railroad's right-of-way, CSX encourages safety measures such as fencing and signage. CSX policy restricts all trails (not just rails-with-trails) from crossing tracks at grade except at existing highway-rail at-grade crossings. Grade-separated trail crossings are preferred in all cases, and are required when a trail crosses the tracks outside of an existing highway-rail at-grade crossing. The document outlines requirements for trails that cross the railroad at existing at-grade highway crossings, including appropriate signage, warning systems, and fencing. Two appendices detail CSX's criteria for overpasses and underpasses of all types, including trails.

Norfolk Southern Corporation's (NS) *Public Projects Manual*[11] is a set of planning, engineering, and contracting guidelines that NS uses to share its policies on a variety of projects initiated by others. It includes a brief summary of rail-with-trail policies as well as a sample engineering drawing for overhead protection of trails beneath NS tracks. NS policy does not allow trails that would permit pedestrian, bicycle, and other recreational traffic to move parallel to trains on NS right-of-way or to cross at grade. For parallel trails, outside of the rail right-of-way, NS encourages several safety measures, including the installation of signage and fencing. NS only allows at-grade trail crossings if they are made at existing highway-rail at-grade crossings. NS allows grade-separated trail-rail crossings; the manual provides specific guidelines for overpasses and underpasses of all types.

[9] UP and BNSF Railway. January 5, 2016. Guidelines for Railroad Grade Separation Projects. Available at **https://www.up.com/cs/groups/public/documents/document/pdf_rr_grade_sep_projects.pdf**.

[10] CSX Transportation. July 2017. Public Project Information: For Construction and Improvement Projects that May Involve the Railroad. Available at **https://www.csx.com/index.cfm/library/files/about-us/property/public-project-manual/**

[11] Norfolk Southern Corporation. September 2013. Public Projects Manual. Available at **http://www.nscorp.com/nscorphtml/pdf/Customers/public_projects_manual.pdf**

Sample Class II and Class III Rail-with-Trail Policies

Class II and III railroads include private, public, and quasi-public entity rail operators. The SEDA Council of Governments (SEDA-COG) Joint Rail Authority (JRA)[12], which represents 11 counties in the Susquehanna River watershed in central Pennsylvania, owns five short line railroads. It developed *Rails-with-Trails Standards*[13] as a guidance document. SEDA-COG JRA opposes trail construction on its property in general but allows exceptions under certain conditions and at its discretion. Conditions under which a rails-with-trails may be allowed on JRA
property include:

- The trail is 50 feet or more away from the track centerline.
- A trail may be allowed at no less than 25 feet away if a chain-link 60-inch-high fence is provided and placed at 25 feet distance from track centerline.
- A trail no more than 20 feet away from track centerline may be allowed for distances of less than 400 yards under extreme circumstances when the trail developer proves that no other viable options exist.
- The trail developer must have a governmental body fund the insurance and indemnification of the railroad.
- Except under particular circumstances, no new at-grade pedestrian/bicycle crossings are allowed, and when exceptions are made, pedestrian crossings must be made public by the established process and sanctioned by the Pennsylvania Public Utility Commission.

The North Coast Rail Authority (NCRA), along with its contract operator, Northwestern Pacific Railroad Company (NWP), operates freight service throughout California's northern coast. NCRA's *Policy and Procedures Manual*[14] includes a chapter on trail projects, including rails-with-trails. The manual provides minimum standards and general requirements for the design, construction, safety, operations, and maintenance of rail-with-trail projects within its right-of-way. The chapter on trail projects references several manuals (such as the California Department of Transportation's (Caltrans) *Highway Design Manual*, Chapter 1000 titled *Bikeway Planning and Design*, and FHWA's *Manual on Uniform Traffic Control Devices* (MUTCD)) as documents that rail-with-trail designs should follow for attributes such as trail width, clearance, setback, and markings. Last, NCRA's manual addresses construction, maintenance, and funding, noting that the agency sponsoring the rail-with-trail project will fund, maintain, and construct the trail without interfering with NCRA operations, unless specifically agreed upon. The NCRA's rail-with-trail guidelines also apply to Sonoma-Marin Area Rail Transit (SMART), the regional transportation district that operates rail transit service along a 70-mile corridor in California's North Bay region.[15]

Railroad Perspectives

The representatives of railroad operators interviewed for this report recognize communities' interest in establishing trails along rail lines due to the linear nature of the rail lines and their proximity to developed areas. However, they also expressed the view that in most circumstances, trails are an incompatible use within the right-of-way of active rail, primarily in terms of perceived safety risks to railroad workers and the public. Some of the railroads cited the following issues when discussing safety concerns with rails-with-trails located in the railroad's right-of way or near the tracks:

- **Trespassing:** Railroad companies spend considerable effort to discourage the public from entering the rail right-of-way and walking on or along tracks through active oversight, community engagement, signage, and fencing. Several railroad companies expressed concern that locating a trail parallel to train tracks would reinforce the public perception that the railroad right-of-way is available for public use as a shortcut and thus increase trespassing.

[12] SEDA-COG is the official name. It was originally the Susquehanna Economic Development Association Council of Governments.

[13] SEDA-COG Joint Rail Authority. June 2008. Rails-with-Trails Standards. Available at **http://www.sedacograil.org/Documents/Rails%20with%20Trails%20Standards%20with%2008%20amendments.pdf**

[14] NCRA. Policy and Procedures Manual. May 13, 2009. Available at **http://www.mendocinocog.org/pdf/Rail-Trail/NCRA%20Trail_Guidelines_8-5-09.pdf**

[15] The NCRA holds a perpetual freight service easement over the SMART Corridor from Healdsburg to Lombard, while SMART holds a perpetual passenger service easement over the NCRA Corridor from Healdsburg to Cloverdale. All guidelines of the NCRA apply to the SMART and NWP corridors and easements, regardless of track ownership.

- **Work Hazards:** The railroad right-of-way includes not only the rail track, it often also includes underground signals, cables, switch-cases, and other infrastructure needed to operate the rail. Beyond the footprint of the infrastructure, additional land is needed to conduct maintenance work on the underground infrastructure. Locating a trail within the rail right-of-way could create a work hazard if crews who work on the underground infrastructure were not permitted to use the trail to conduct their work or were required to conduct their work closer to the active rail.
- **Quiet Zones:** The railroad companies expressed concerns about an increased safety issue when trails are located in quiet zones. The Train Horn Rule (49 CFR Part 222) provides an opportunity for localities nationwide to mitigate the effects of train horn noise by establishing quiet zones. Quiet zones are designated stretches of track where the routine sounding of train horns while approaching public crossings is not permitted during all or part of the day.[16]

The railroads cited the following additional concerns about allowing with rails-with-trails in their right-of-way:

- **Increased Liability Risk:** In addition to concerns about safety liability, the railroads also expressed concern about being held responsible for any structural or physical damage to the trail resulting from railroad operations. They noted that municipalities often try to hold the railroad liable for damage done to sidewalks as a result of vibration caused by rail operations.
- **Limiting Control over Future Rail Operations:** Railroad companies prefer to reserve the railroad right-of-way for railroad infrastructure to ensure that current customer demands are met and to support possible future expansion. The railroads noted that any type of permanent easement on their right-of-way makes it very difficult for the railroad to expand operations or conduct maintenance work. The railroads also noted that, while they would retain the right to remove a trail if they needed the right-of-way for railroad use, it can be politically difficult to remove or relocate a trail once it is in place.

Despite these concerns, several railroad representatives did indicate that, under certain circumstances, a rail-with-trail may be allowed if the railroad determines that the trail can be developed without negatively impacting the railroad. These railroad representatives identified several conditions that should be met if a rail-with-trail is developed, whether in the rail right-of-way or adjacent to it, including:

- A definitive delineation between the trail and the railroad property with a non-traversable fence. Railroads encourage the trail manager to conduct frequent inspections to ensure that the delineation is clear and that the fencing infrastructure is intact and effective.
- Appropriate lighting to illuminate the trail.
- Limited or no vegetation between the trail and the railroad.
- Placement of "no trespassing" signage every 500 feet between the trail and the railroad tracks.
- Ensuring that trail construction and maintenance does not interfere with railroad operations.
- Providing financial compensation. Railroad representatives felt that trail developers often undervalue the railroad right-of-way and expect railroad companies to provide use of their right-of-way for free or at too low a price.

[16] Additional information about the Train Horn Rule and Quiet Zones is available from FRA at **https://www.fra.dot.gov/Page/P0889**.

Freight and Intercity Passenger Rail Safety

In the last 10–15 years, the amount of freight rail traffic has remained somewhat steady[17] but intercity passenger rail (Amtrak) ridership increased, from about 25 million riders in 2004 to 31 million in 2014.[18] Over this time period, overall freight and intercity passenger rail safety has improved. In 2007, there were a total of 2,693 reported injuries and 851 fatalities associated with freight and intercity rail, compared to 2017 when there were a total of 1,711 reported injuries and 821 fatalities.[19] Notably, the vast majority of fatalities have been to trespassers.[20] Notably, the vast majority of fatalities have been to trespassers.[21] Freight and intercity rail highway-rail grade crossing safety has also improved over time: there were 2,942 incidents at highway-rail grade crossings in 2006, as compared to 2,043 in 2016.[22]

Freight and Intercity Passenger Rail Trespassing Trends

The Federal Railroad Administration (FRA) defines a trespasser as a "person who is on the part of railroad property used in railroad operation[s] and whose presence is prohibited, forbidden, or unlawful."[23] Typically, railroad trespassers are pedestrians who walk across or along railroad tracks, using them as a shortcut to another destination. Individuals unlawfully engaging in recreational activities on railroad property, such as biking or operating off-road vehicles, are also considered trespassers.

Trespassing incidents appear to be increasing. For example, between 2012 and 2017, total trespasser casualties (defined as deaths and injuries) reported to FRA increased by over 25 percent (there were 815 total reported casualties in 2012 as compared to 1,042 in 2017).[24]

The San Clemente Beach Trail parallels a corridor owned by SCRRA and operated by Metrolink and Amtrak (Photo courtesy of Rails-to-Trails Conservancy).

Public Transportation Agency Policies and Perspectives

Public Transportation Agency Policies

Several public transportation agencies and rail authorities have developed guidelines for rails-with-trails to provide consistent standards along their routes. As interest in trail development along rail transit corridors increases, public transportation agencies are establishing policies to create a standardized approach to rail-with-trail development.

17 Association of American Railroads data, as measured by total tonnage reported by Class I railroads. Annually between 2008 and 2017, Class I railroads moved between 1.5 and 2 million tons of commodities.

18 **https://www.bts.gov/archive/publications/multimodal_transportation_indicators/2015_08/passenger/amtrak_ridership**. Most recent ridership data compiled by BTS are from 2015, but 2014 is most recent year for which complete annual ridership data are available.

19 **https://safetydata.fra.dot.gov/OfficeofSafety/publicsite/query/query.aspx**

20 About 74 percent of the 2007 fatalities were trespassers; about 80 percent of the 2017 fatalities were trespassers.

21 **https://safetydata.fra.dot.gov/OfficeofSafety/publicsite/query/gxrtally1.aspx**

22 Incidents reportable to FRA must meet the following criteria: (1) involves on-track equipment, (2) involves a highway user, and (3) the accident occurred at a highway-rail grade crossing. More information available at **https://safetydata.fra.dot.gov/OfficeofSafety/Documents/Railroad%20Safety%20Data%20Frequently%20Asked%20Questions.pdf**

23 49 CFR Part 225, per the FRA Guide for Preparing Accident/Incident Reports.

24 **https://safetydata.fra.dot.gov/officeofsafety/publicsite/query/castally4.aspx**

Sample Public Transportation Agency Rail-With-Trail Policies

The Southern California Regional Rail Authority (SCRRA), the designated track owner of the Metrolink rail system that operates in six counties throughout the Los Angeles-San Diego region, developed its *Rail-with-Trail Design Guidelines*[25] to provide uniform and consistent standards for rails-with-trails throughout Metrolink's corridors. The guidelines address clearances, at-grade crossings, surface, utilities, landscaping, fencing, lighting, drainage, and access. In addition, the guidelines address trail construction, maintenance, funding, and exceptions, emphasizing that costs shall be borne by the rail-with-trail developer.

The Utah Transit Authority (UTA) created specific design criteria for rails-with-trails to provide a uniform basis for their functional design and development. The criteria, which are included in UTA's *Light Rail Design Criteria Guidelines*,[26] outline minimum design standards for setback, fencing, trail surface, drainage, landscaping, lighting, signs, striping, roadway interface features, restroom facilities, and crossings. The design criteria have been revised over time as new challenges arise. For example, horses were allowed on rails-with-trails (and all other trails) until it became apparent that horses are prone to getting startled by the train. UTA has found that having design criteria is helpful in proactively coordinating with trail developers to design trails that meet UTA's needs.

UTA's No Trespassing Sign. (Photo courtesy of UTA)

Public Transportation Agency Perspectives

As with the railroads, the priority of public transportation agencies is to provide safe and efficient service. However, public transportation agencies often recognize that rails-with-trails can be an asset to not only the surrounding communities but to public transit. Public transportation agencies often operate as part of broader State or regional entities, many of which have a stated purpose to plan for and provide multimodal transportation systems. Therefore, many public transportation agencies actively coordinate with local communities to improve access from existing trails to transit. In addition, public transportation agencies are increasingly working with communities to develop rails-with-trails along their rail right-of-way, often in conjunction with the development of new or expanded transit lines. These transit agencies view bicycle and pedestrian facilities as complementary for expanding access to their public transit system. Multiuse trails not only provide

[25] SCRRA. May 2010. Rail-with-Trail Design Guidelines. Available at https://www.metrolinktrains.com/globalassets/about/engineering/rail_with_trail_design_guidelines.pdf

[26] UTA. July 2010. Light Rail Design Criteria Guidelines. Available at http://www.rideuta.com/uploads/UTALRTDesignCriteriaRevision5.pdf

The Denton A Train was built alongside an existing trail. The DCTA sees the trail as a way to provide better transportation options overall and boost ridership for public transit (Photo courtesy of RTC).

additional mobility and recreational resources to the local communities, but they also connect trail users to transit systems and can boost transit ridership. In addition, co-locating trail facilities along public transportation corridors can provide key connections to trails for those who would not otherwise have direct access to a trail from their original location.

Safety for transit riders, employees, and the public is the main priority for public transportation agencies when considering rails-with-trails. Safety-related design considerations employed by public transportation agencies include:

- **At-Grade Crossings**: Many of the public transportation agencies interviewed for this report seek to limit the number of at-grade crossings on their tracks. Additional safety measures used at locations where trails cross transit tracks include warning signs, gates, and Z-crossings, which encourage trail users to slow down and look both ways before crossing tracks.
- **Fencing:** Most of the public transportation agencies interviewed for this report require fencing in between the tracks and the trail. However, the materials used and height and distance requirements for fencing vary among the agencies.
- **No-Trespassing Signage:** Public transportation agencies often require "no trespassing" signage along their tracks. For example, UTA's design criteria requires "no trespassing" signage to be installed at the separation fence within 50 feet of each track at-grade crossing and at a maximum spacing of 500 feet along the separation fence. Metro Transit in Minnesota also has added enhanced signage to locations where a high volume of trail users cross the transit tracks.

Several public transportation agencies felt that, instead of creating safety risks, rails-with-trails yield safety benefits in terms of their role in reducing trespassing, dumping, vandalism, and illegal track crossings by channelizing pedestrians and bicyclists away from tracks and providing a safe and convenient route for pedestrians who may otherwise trespass on or along the tracks.

While public transportation agencies see rails-with-trails as valuable aspects of multimodal transportation system, several agencies cited a concern that allowing additional uses in their right-of-way, including rails-with-trails, would limit their ability to expand operations in the future. However, as demonstrated by several examples of transit services that were introduced in to an existing rail-to-trail corridor, public transportation agencies are often able to provide for new or expanding transit service while maintaining existing trails.

Rail Transit Safety

From 2006 to 2017, rail transit ridership increased, from 3.7 billion trips in 2006 to 4.8 billion trips in 2017.[27] Over this time period, rail transit injuries and fatalities (excluding those at at-grade crossings) also increased. For instance, rail transit-related injuries increased from 6,902 in 2006 to 8,993 in 2016. Fatalities also increased from 125 to 240 over the same time period.[28]

By contrast, transit-related fatalities at at-grade crossings decreased from 33 in 2006 to 12 in 2016.[29] However, transit-related incidents not resulting in fatalities at at-grade crossings increased, from 176 in 2006 to 471 in 2016.[30] [31]

[27] APTA, **http://www.apta.com/resources/statistics/Pages/ridershipreport.aspx**. Includes data on heavy rail, light rail, and commuter rail.

[28] BTS Transit Safety Data by Mode for All Reported Accidents. **https://www.bts.gov/content/transit-safety-data-modea-all-reported-incidentsb**. These data do not include fatalities reported as suicides.

[29] BTS Transit and Grade-Crossing Fatalities by Rail Transit Mode. **https://www.bts.gov/content/transit-and-grade-crossing-fatalities-rail-transit-mode**

[30] **https://www.bts.gov/content/transit-and-grade-crossing-incidents-rail-transit-mode**

[31] Rail transit incidents reported by BTS rely on National Transportation Database (NTD) and FTA definitions. FTA's reportable incident threshold is when there are one or more injuries requiring immediate medical transportation away from the scene. See notes: **https://www.bts.gov/content/transit-and-grade-crossing-incidents-rail-transit-mode**

Rail Transit Trespassing Trends

Between 2007 and 2013, rail transit-related trespassing events also increased, from 106 in 2007 to 151 in 2013.[32] Between 2007 and 2017, 81 percent of all rail transit-related fatalities were identified as trespassers or individuals who intended suicide.[33] Similarly, fatalities associated with trespassing and at-grade railroad crossings account for 93 percent of all rail-related deaths.[34] The Federal Transit Administration (FTA) reported that between 2007 and 2013, suicides and trespassing event fatalities occurred over five times as often as fatalities from events due to other public behavior.[35]

State DOT Policies and Perspectives

State DOT Policies

The study team identified 11 State DOTs that have or are in the process of developing official design guidelines that give details specific to rail-with-trail design and development (see Appendix B for State rail-with-trail guidelines). Four other States mention rails-with-trails in their overall trail guidance documents but do not provide specific rail-with-trail guidelines.

In all cases, the State DOTs developed rail-with-trail design guidelines to provide trail developers with the resources necessary to meet State design requirements and safety standards. With design guidelines, State DOTs can ensure that there is a baseline for rail-with-trail proposals that helps determine whether a rail-with-trail is feasible.

The State design guidelines identify minimum and desired physical requirements for many rail-with-trail design considerations, including:

- Width of separation between railroad tracks and the trail;
- Barrier presence and height between railroad tracks and the trail;
- Strategies to design within or around narrow corridor widths;
- Providing for drainage under several different cross sections;
- Creating safe crossings; and
- Signage alerting users to hazards and rules that are specific to rails-with-trails.

Nearly all published State DOT rail-with-trail guidelines require that rails-with-trails be set back a certain distance from the track and require some type of barrier between the track and trail. Some States are very specific as to the width of the setback and what type of barrier must be used, including material, height, and varying height requirements depending on setback, train type, train speeds, and train frequency. Like other design features, States have various requirements for bridges and tunnels; some States prohibit shared bridges between rail and multiuse paths, while others allow it.

[32] Note that these data are reported as "suicide or trespasser." There are no separate figures reported for trespassers only. **https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Rail%20Safety%20Statistics%20Report.pdf**

[33] **https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Rail%20Safety%20Statistics%20Report.pdf**

[34] https://www.fra.dot.gov/Page/P0841 and https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Rail%20Safety%20Statistics%20Report.pdf

[35] **https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Rail%20Safety%20Statistics%20Report.pdf**

Most State DOTs indicated that their design guidelines are meant to be flexible and adaptable, as each rail-with-trail project is unique. Some States provide multiple standards to meet a variety of circumstances, while others provide a standard for the most intense conditions, (e.g., those appropriate for high-speed, high-frequency, and/or heavily used rail corridors). In addition to their own guidelines, or in States that do not have written guidelines, some refer to U.S. DOT's 2002 Report for effective practices for separation, barriers, constricted corridor strategies, drainage, crossings, signage, and other design elements and procedures.

The Burlington Greenway in Vermont was the impetus to creating design guidelines for the State (Photo courtesy of Rails-to-Trails Conservancy).

Vermont Rail-with-Trail Guidelines

The Vermont Agency of Transportation includes a comprehensive set of guidelines for rails-with-trails in their *Pedestrian and Bicycle Facility Design Manual.*[36] The manual explains separation distances and setbacks, fence heights, and strategies to work within constricted corridors with images and diagrams. It also discusses pavement and subsurface, and what to consider when there are tracks and ties remaining underneath the trail, for example when a trail is built upon a disused siding (i.e., auxiliary track for meeting, passing, or storing trains). Adaptation of existing or historic structures are addressed, as are considerations for new bridges and tunnels. Setback and barrier options according to train frequency and speed are outlined in a table. In addition to vegetation and drainage, winter use, snow plowing, and seasonal maintenance are also considered, as snowmobiles and cross country skis may be used on some rails-with-trails that are not plowed under snow conditions.

State DOT Perspectives

The roles of the State DOT in rail-with-trail development can be broadly categorized into three categories:

- States with an active role in trail-building, including rails-with-trails when necessary;
- States with a regulatory or review role, working closely with a trail builder and a railroad; and
- States with little involvement in trail or railroad projects.

State DOTs that own rail rights-of-way tend to be more amenable to the development of rails-with-trails because trails alongside rail help to provide transportation alternatives and multimodal connections, furthering their missions of mobility and economic development. Some State DOTs see trails, including rails-with-trails, as drivers of economic development that enhance mobility, quality of life, and recreation opportunities.

[36] Vermont Agency of Transportation. December 2002. Vermont Pedestrian and Bicycle Facility Planning and Design Manual. Available at **https://vtrans.vermont.gov/sites/aot/files/highway/documents/publications/PedestrianandBicycleFacilityDesignManual.pdf**

State Rail-with-Trail Development Examples

The New Hampshire DOT (NHDOT) takes an active role in rail-with-trail development when approached by a trails group or municipality. As private railroads divested themselves of railroad lines within the State, NHDOT purchased several rail corridors to preserve the State's rail network and allow for future rail restoration. NHDOT now enters into operating agreements with private railroad operators to use these State-owned rail corridors. The agency has also allowed rails-with-trails to be built along on one rail line and has discussed the viability of other such installations on other corridors.

NHDOT's rail-with-trail design standards identify minimum safety requirements to be met under any future rail traffic scenario, ensuring full operability of state-owned rail corridors in the future. NHDOT reviews plans submitted by trail developers, comments as needed, and provides staff for a field inspection during the construction phase.

In Connecticut, the State DOT owns a large network of both active tracks and railbanked[37] corridors. The State government also has a robust trail building program. Responsibility for trails is shared between the State DOT and the Department of Environmental Protection, as well as with local governments. The Connecticut DOT manages trail projects they see as having a statewide or a regional scope and is especially focused on completing the East Coast Greenway trail through Connecticut. Smaller spur trails generally fall under the responsibility of local government, and Connecticut DOT will assist in unique situations when there is specialized engineering needed. Connecticut DOT will consider using rails-with-trails to make important connections for a more complete trail network, mainly when there is no other viable alternative to route a trail.

Winnipesaukee, Winnisquam, Opechee (WOW) Trail, New Hampshire. (Photo courtesy TrailLink.com/abeetle)

[37] "Railbanked" refers to corridors that have been acquired by voluntary agreements between railroads and trail agencies to preserve out-of-service railroad corridors as a trail until a railroad might need the corridor again for rail service.

Camp Chase Trail, Ohio (Photo courtesy of Rails-to-Trails Conservancy)

Section IV: Rail-with-Trail Development Process

Interviews with and data collected from over 100 rail-with-trail managers, representing nearly 30 percent of all rails-with-trails, make clear that there is no standard or uniform rail-with-trail development process. Rather, the process varies widely depending on many factors, most importantly the location of the trail relative to the active right-of-way, the intensity of the active railroad operations, and the corridor owner. This section presents common issues, strategies, and effective practices that pertain to the rail-with-trail development process for four types of rails-with-trails: 1) those located within an active railroad right-of-way, 2) those located outside but immediately adjacent to an active railroad right-of-way, 3) those located within or alongside existing or planned public transportation agency-owned right-of-way, and 4) rail-trail to rail-with-trail conversions.

Overview of Rail-with-Trail Development Effective Practices

Many of the effective practices presented in U.S. DOT's 2002 Report still pertain to rail-with-trail development today. However, through the course of this study and other research conducted on rails-with-trails since 2002, new effective practices have emerged for the four types of rails-with-trails. A summary of effective practices for the rail-with-trail development process are outlined below.

- **Railroad Coordination:** Trail developers should engage railroads early and often. In addition to the railroad right-of-way owner, trail developers should also engage rail operators and freight customers. Railroad officials should be encouraged to voice their concerns or suggestions, and trail developers should be prepared to provide design and management solutions to address these concerns. In addition, understanding what might incentivize the railroad's approval or support, such as infrastructure improvements at crossings, eliminating at-grade crossings, improving access to the corridor for track maintenance, installing new signage to address safety concerns, and financial compensation, can help lead to a successful project.
- **Determining Feasibility**: A proposed rail-with-trail project may need to undergo a comprehensive feasibility analysis to determine if the project is feasible, and, if so, how best to implement it. The feasibility analysis should address land ownership and acquisition methods, existing physical and environmental conditions, stakeholder engagement, design and construction considerations, trail use and maintenance, and funding mechanism(s).
- **Locating Rails-with-Trails:** Prior to planning a rail-with-trail, identify and analyze alternatives that avoid locating the trail within a railroad's right-of-way. The planning process should consider whether routing the trail or segments of the trail outside of the railroad right-of-way is feasible, since doing so may simplify some aspects of corridor acquisition and trail development. If there are no viable alternatives to routing the trail within the active railroad right-of-way, plan the trail while considering the effective practices outlined in this report.

- **Involving Stakeholders**: Identifying and involving stakeholders early in the rail-with-trail development process can help create an inclusive and open atmosphere, saving time and energy and helping to avoid conflicts down the line. Stakeholder groups that should be involved include utility companies; State and local transportation, parks and recreation, and health departments; law enforcement officials; adjacent landowners; trail user groups; community groups, and the general public.
- **Environmental Review:** Become knowledgeable of required Federal, State, and local environmental review and permitting processes and design standards. If needed, analyze the environmental impacts prior to acquiring land and designing the rail-with-trail.
- **Consider Involving Intermediaries:** In the early stages of planning, identify the best agency or entity to lead negotiations and/or manage the project. Rail-with-trail project managers may benefit from intermediaries, such as a State DOT, negotiating with a railroad on their behalf.
- **Right-of-Way Acquisition:** Governmental trail developers interested in pursuing a rail-with-trail should acquire the affected railroad property for public ownership whenever feasible, particularly if State law affords governmental entitles greater protection from liability than private landowners.

Types of Rail-with-Trail Projects

There are four distinct types of rails-with-trails: 1) those located within an active railroad right-of-way, 2) those located outside but immediately adjacent to an active railroad right-of-way, 3) those located within or alongside existing or planned public transportation agency-owned right-of-way, and 4) rail-trail to rail-with-trail conversions. Regardless of the rail-with-trail type, trail managers, railroads, and other stakeholders should work together to ensure that rails-with-trails are safe and meet the needs of trail users, the railroad, and the community.

Table 3 outlines the unique considerations for each rail-with-trail type.

Trails within Active Railroad Rights-of-Way

This type of rail-with-trail describes a trail segment located within an active railroad right-of-way, including those owned by private freight railroads, publicly-owned passenger railroads (e.g., Amtrak), State DOTs, and private tourist and excursion railroads. Rail-with-trail development withi n an active rail right-of-way can be contentious and lengthy. Many large freight railroad companies (Classes I and II) do not allow trail development within their rights-of-way. In fact, since 2013, four of the eight Class I railroads have implemented policy that explicitly prohibit trail development within their rights-of-way due to safety and liability concerns (see Section III for more information). However, pursuing trail development in an active railroad right-of-way may be appropriate for short distances or in corridors that allow for a setback greater than 50 feet.

Camp Chase Trail

The Camp Chase Trail, located in Franklin and Madison Counties, Ohio, is nearly 16 miles and part of the larger Ohio to Erie trail system that will cross Ohio. More than 12 miles of the trail exists within the railroad right-of-way through a 2009 easement agreement established between the railroad owner and county park agencies. The 19-foot-wide easement is located near the operating tracks. The trail managers were required to indemnify the railroad owner.[38]

Trails Adjacent to Active Railroad Rights-of-Way

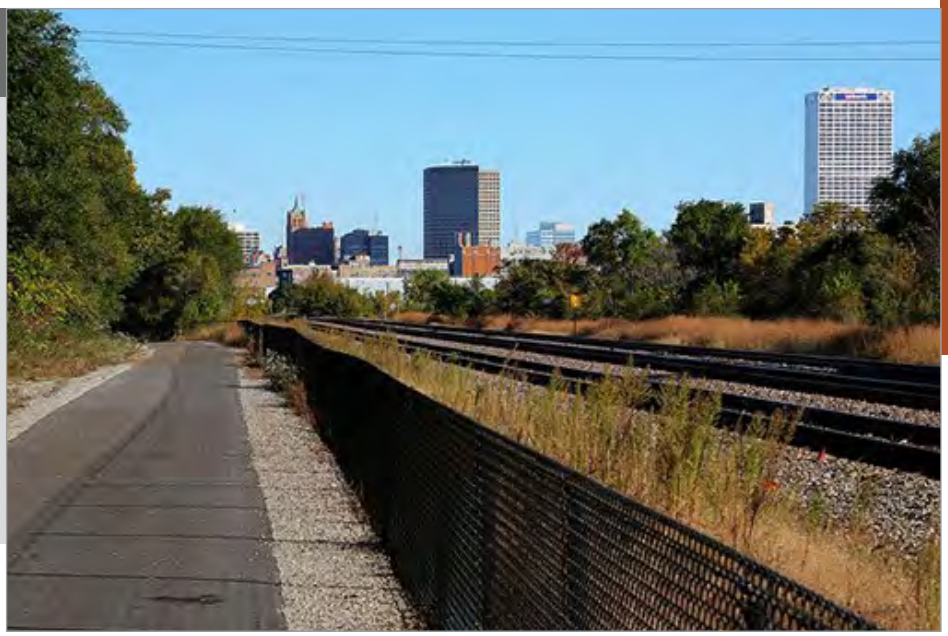
This rail-with-trail type refers to trails that are developed immediately adjacent to, but outside of, a railroad right-of-way. The property on which the rail-with-trail is located is sometimes a utility company right-of-way, an adjacent roadway owned and managed by a public entity, or one or more adjacent private properties. Depending on the width of the railroad right-of-way,

[38] A copy of the easement agreement is available at the Rails-to-Trails Conservancy's Rail-with-Trail website at **https://www.railstotrails.org/build-trails/trail-building-toolbox/basics/rail-with-trail/.**

rails-with-trails of this type can be just as close to active railroad tracks as rails-with-trails developed within active railroad rights-of-way. In this type of rail-with-trail development, the trail developer negotiates with property owners that may be more amenable to trail development (e.g., utility companies). Yet, even if the rail-with-trail is wholly outside of the railroad's active right-of-way, the railroad remains a major stakeholder and should be involved in the planning, design, and construction of the rail-with-trail.

KK River Trail

The Kinnickinnic "KK" River Trail is a 2.3-mile trail in Milwaukee, Wisconsin that provides trail users key connections to the city's broader trail network. More than a mile of the trail runs parallel to an active Canadian Pacific railroad right-of-way. Although the trail was developed on city-owned land, the railroad was engaged in the trail development and planning processes.



Kinnickinnic "KK" River Trail, Wisconsin (Photo courtesy of John December)

Table 3: Effective Practices for Rail-with-Trail Development for the Four Rail-with-Trail Types

Within Active Railroad Right-of-Way	Adjacent to Active Railroad Right-of-Way	Within or Adjacent to Public Transportation Right-of-Way	Rail-Trail to Rails-with-Trails Conversion
• Identify where alternative routing outside of the active railroad right-of-way may be feasible and research ownership of adjacent parcels. • Identify and engage both railroad owner and operator(s). • Identify and engage rail customers along the corridor that may be impacted by trail development. • Where grade-separated crossings are identified or recommended, document clearance requirements (for bridges) or protective overhead barriers (for tunnels and underpasses).	• Although the railroad may not be as impacted, engage them throughout the planning process as a stakeholder. • Identify and engage corridor owner(s) throughout the project. • Identify and engage rail customers along the corridor that may be impacted by trail development.	• Trail planning may occur as part of transit project planning or after its development. Seek opportunities to incorporate the trail as part of major infrastructure (e.g., an elevated platform), even if the trail will need to be constructed in later phases. • Encourage safe and accessible connections to transit stations. • A public transportation agency may be more supportive of rail-with-trail development than other rail operators. Where a transit line is planned within a freight or heavy passenger rail corridor, consider asking the public transportation agency to lead negotiations for the rail-with-trail project on the rail-with-trail project manager's behalf.	• Trail closure during railroad construction and maintenance might be necessary. Be sure to alert trail users and the public. • Existing tunnels and bridges may need to be redesigned and rebuilt to accommodate both rail and trail. Depending on which entity maintains authority over these structures, the trail may need to be removed and rerouted from existing bridges and/or tunnels. • Adjacent landowners and community members may have concerns about the changing landscape and required trail closures. Engage community stakeholders that will be impacted by these changes.

County Line Trail

The County Line Trail was the first rail-with-trail in Ohio. Half of the current trail was donated to the county, while the remainder was purchased from private landowners alongside the CSX tracks. Wayne County Trails Association (WCTA) developed the trail using funding from the Ohio DOT and through partnerships with city and county agencies. The CSX line is a heavily-used double-track freight corridor, with trains running every 10–15 minutes at fairly high speeds. When developing the trails, the WCTA engaged in discussions with both CSX corporate headquarters as well as local representatives. Negotiations with the railroad to develop the rail-with-trail were smooth, likely due to the fact that the trail is separated by a great distance from the tracks and is not on railroad right-of-way. There is an average of 200 feet between the active tracks and the multiuse trail, as well as a ditch. However, near crossings, the trail comes within 25 feet of the rail. WCTA has developed a positive relationship with CSX, often storing railroad materials such a ties or ballast stone on county property adjacent to the tracks. The successful implementation of the County Line Trail was aided by persistence, keeping safety the primary concern for all involved, and building personal relationships to work together toward a common goal.

Trails within or Adjacent to Public Transportation Rights-of-Way

This rail-with-trail type refers to trails that are developed in or adjacent to public transportation agency rights-of-way, either as part of larger multimodal transportation corridor projects or alongside existing transit rights-of-way. As mentioned in Section III, public transportation agencies often see rails-with-trails as complementary to the public transportation system. Increasingly, public transportation agencies actively incorporate trail development as part of their rail transit expansion projects. Incorporating trails into these types of plans from the beginning can streamline the rail-with-trail development process, typically due to a coordinated planning approach when the rail developer is also the rail-with-trail developer, and because such projects often do not involve additional property acquisition for the rail-with-trail.

There are also several examples where transit has been added to existing railroad rights-of-way, or where railroads have downsized track operations allowing for transit to be developed in former freight corridors. This evolution has provided unique opportunities for rail-with-trail development that often complements and enhances access to rail transit.

Porter Rockwell Trail, Utah. (Photo Courtesy of Jim Olson, http://www.utahhikes.net)

Porter Rockwell Trail

Nearly the entire length of the 10.7-mile Porter Rockwell Trail in Draper City, Utah parallels a Utah Transit Authority (UTA) corridor that provides light-rail service. Draper City has a license agreement with UTA to use a portion of the right-of-way for trail use.[39] UTA required a 24-foot minimum setback and reviewed and approved all trail planning documents.

Rail-Trail to Rail-with-Trail Conversions

Recently, a fourth rail-with-trail type has emerged: trails developed in formerly active railroad corridors (traditional rail-trails) that incorporate new rail service, typically public transit. Rail-trails that are developed using the Federal railbanking statute are required to allow for the reactivation of rail service if and when it is deemed necessary.[40] In rare instances, if rail service is reactivated in a rail-trail corridor, the trail is either removed or relocated. Some examples include the use of a former railroad corridor for commuter rail or light rail transit expansions, as occurred in Denton, Texas (see case study) and is currently occurring along a portion of the Capital Crescent Trail in Montgomery County, Maryland, for the development of a new light rail corridor that will connect into the Washington Metropolitan Area Transit Authority's (WMATA) Metro rail system. Another rail-trail to rail-with-trail conversion is occurring in southwest Pennsylvania where the Montour Trail Council leases portions of its trail corridor to a freight rail operator.

Denton Branch Rail Trail

When the Denton Branch Rail Trail first opened in 2001, it was a classic rail-trail story. The city of Denton built the 8.6-mile trail after UP Railroad pulled the tracks off the former Denton Branch corridor, once part of the renowned Missouri-Kansas-Texas Railroad. Even as Denton city officials were finalizing their purchase of the corridor to build a trail back in 1993, they knew their region, part of the Dallas/Fort Worth metropolitan area, would continue to grow and that the corridor might someday see rail service reactivated to serve commuters.

After its inception in 2003, the Denton County Transportation Authority (DCTA) began to make plans to construct a commuter rail line connecting Denton to the Dallas Area Rapid Transit network. In 2006, DCTA and Denton city officials reached an agreement: DCTA would build parts of the A-train commuter rail on the corridor where the trail sits and would build a new concrete trail alongside the trail. The new Denton Branch Rail Trail and the 21-mile commuter rail system A-train simultaneously opened in the summer of 2011.

The trail extends from the new Denton Downtown Transit Center on Hickory Street south to Swisher Road in Lake Dallas, with many trail access points at public streets. In addition to the downtown transit center, the trail also connects with Med Park Station. In 2016, DCTA added 4 miles of trail between Old Town Lewisville to Hebron Station, and in the summer of 2018, DCTA plans to open an extension between Lake Dallas and the Highland Village/ Lewisville Lake Station.

Denton Branch Rail Trail, Texas. (Photo courtesy of Bob Tickner)

[39] A copy of the license agreement is available on the Rails-to-Trails Conservancy's Rail-with-Trail website at **https://www.railstotrails.org/build-trails/trail-building-toolbox/basics/rail-with-trail/**

[40] Section 8(d) of the National Trails System Act [16 U.S.C. § 1247(d)] refers to "the national policy to preserve established railroad rights-of-way for future reactivation of rail service, to protect rail transportation corridors, and to encourage energy efficient transportation use." Railroad corridors that are "railbanked" under this statute preserve corridors for future rail use and allow interim trail use.

Determining Feasibility and Developing a Plan

Many aspects of planning, design, and construction that apply to "typical" shared-use path development also apply to rails-with-trails. In fact, rails-with-trails often exist as segments of more extensive shared-use paths or trails that may diverge from the active rail corridor to follow other corridors (e.g., inactive or abandoned rail corridors, waterways, utilities). When considering a rail-with-trail project, whether it is wholly rail-with-trail or part of a larger trail project, the trail developer may need to conduct a comprehensive feasibility analysis of the project. The elements of the feasibility analysis will vary depending on two main factors: 1) the preferred location of the trail relative to the active rail corridor (i.e., whether it is located within or immediately adjacent to the rail right-of-way), and 2) the owner of the corridor. Figure 6 provides example steps to take in conducting a feasibility analysis.

Most rail-with-trail feasibility analyses take a comprehensive look at a project, including the existing physical conditions and community impacts, and propose preferred and alternative routings, in order to answer an inherent question: is this project feasible, and if so, what are strategies for implementation? Generally, trail planners should address the following elements as part of a feasibility study:

- Land ownership and proposed method(s) of acquisition
- Existing physical and environmental conditions
  - » Document geological, hydrological, structural, and other conditions, and estimate the capital and maintenance costs.
  - » Document current safety hazards and observed behaviors (e.g., trespassing, dumping) that the trail may mitigate.
  - » Indicate if there are known or anticipated environmental constraints and route alternatives for areas where remediation efforts would greatly affect rail-with-trail development. Analyze the environmental impacts prior to acquisition and design.
  - » Comprehensively examine and outline the need for new or modified bridges and trestles along the trail.
  - » Inventory existing sidings.
  - » Identify existing utilities in the corridor, cataloging ownership, location, and any easement agreements with the railroad company.
  - » Identify how the existing railroad drainage system will be maintained. Prototype designs of any changes along with cost estimates should be included if the rail-with-trail will impact the existing drainage system in any way, factoring in trail surface runoff.
- Stakeholder engagement
  - » Demonstrate community support and/or opposition and input.
  - » Involve appropriate government agencies, elected officials, and other key decisionmakers and stakeholders.
  - » Document the permitting, approval and other requirements for all phases of trail development and management/maintenance.
- Design and construction considerations
  - » Identify any locations where the trail will need to cross the railroad corridor and determine if at-grade crossings can be avoided or designed for safety.
  - » Determine the minimum allowable distance between the trail and the railroad tracks.
  - » Consider what types of separation between the railroad tracks and the trail will help maintain and enhance safety.

- » Identify costs associated with construction. Construction permits and railroad services can be expensive. Aside from the fees required to secure various permits, expenses may include planning or engineering services (e.g., plan review, attending project meetings, travel, accommodation costs), legal fees, onsite monitoring, and flagging services.

- Anticipated trail use, maintenance, and future uses of the corridor
  - » Conduct an analysis of access to the trail from local communities.
  - » Assess and address how the trail will affect railroad maintenance access, how vegetation management will occur, and explore the development of an operations and maintenance plan.
  - » Assess future expansion plans from the railroad owner and operators, no matter how remote the possibility of track expansion may seem. This should include an assessment of the impacts of future rail expansion on trail operations, including long-term closures or detours and construction disturbances (e.g., noise, heavy vehicle traffic, debris).
  - » Site-specific analysis should be included whenever equestrian use is anticipated for a new rail-with-trail.
- Funding
  - » Identify all potential funding mechanisms at all levels of government (e.g., local, State, Federal) and private sources.

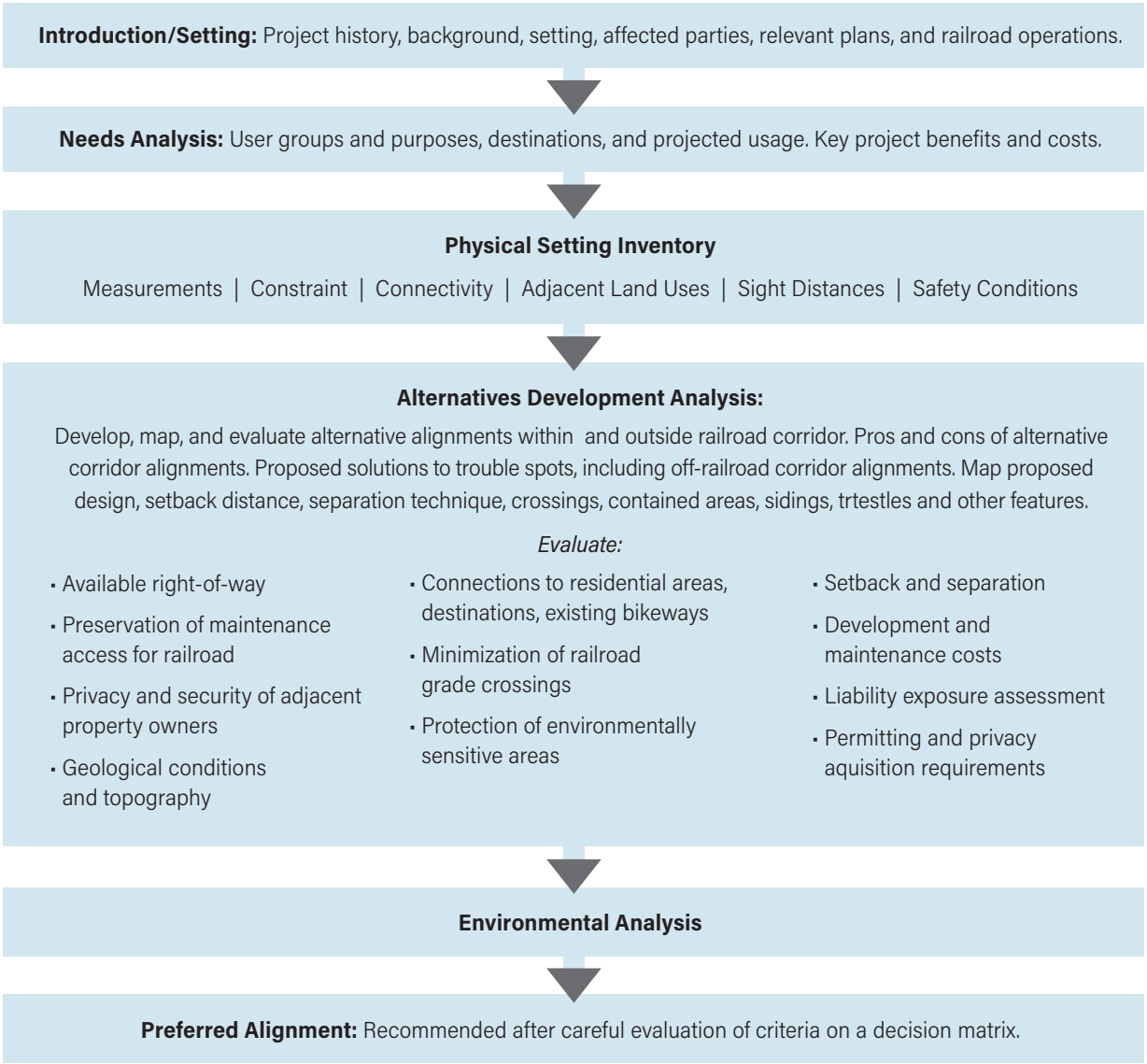
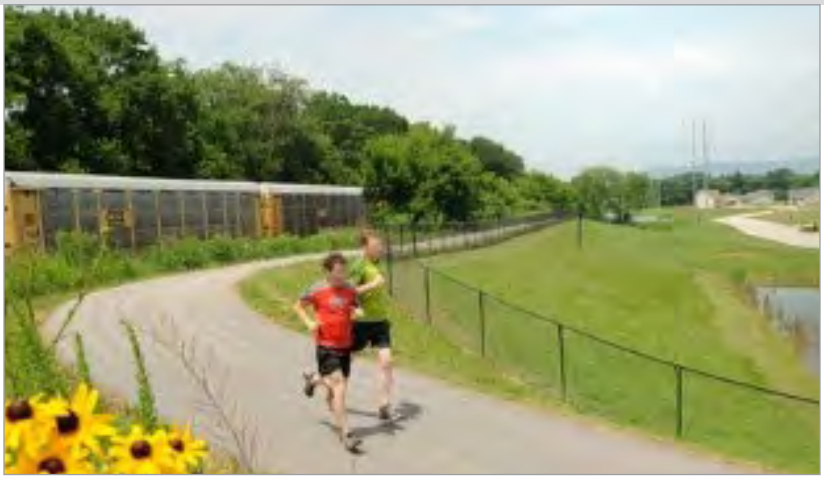


Figure 6: Steps in a Feasibility Study

Rail-with-Trail Planning in Chattanooga, Tennessee and Washington, DC

As many more cities, regions, and States proactively plan and develop integrated nonmotorized transportation systems, identifying potential corridors for rail-with-trail development can be a strategy for increasing nonmotorized transportation connectivity. In Chattanooga, Tennessee, the city worked with local advocates and its metropolitan planning organization to identify active railroad corridors, and assess their feasibility for improving the city's bicycle and trail network.[41]

A coveted corridor in Washington, DC has been eyed by the city for decades to help bring improved, safe trail connections to parts of the city that have little or no bicycling infrastructure.[42] These examples demonstrate that rail-with-trail planning can occur using a more proactive inventory strategy to identify rail-with-trail opportunities, or by using other planning activities (e.g., development of a multimodal network master plan) that allow active railroad rights-of-way to clearly emerge as unique opportunities to for trail development.



South Chickamauga Creek Greenway, Chattanooga. (Photo courtesy The Trust for Public Land)

Environmental Considerations

Trail developers may need to conduct an environmental review to consider the proposed rail-with-trail's potential impacts on the environment to comply with applicable State and Federal law.[43] Environmental considerations and analyses may include various aspects of the trail's impact on the environment and human health and safety, including:

- Riparian zones;
- Light and glare;
- Geology, soils, and hydrology;
- Biological resources;
- Land use;
- Cultural resources;
- Aesthetics;
- Noise levels; and
- Environmental contaminants.

Trail managers should be aware that State and Federal environmental protection requirements for trail development may be at odds with the railroad's expectation of corridor management for efficient rail service operation. This could prove especially true when a rail-with-trail project interacts with protected wildlife and natural environments.

[41] Chattanooga Department of Transportation. 2015. Connecting Chattanooga Neighborhoods by Rail-Trail: An Examination of Railroad Corridors **https://www.railstotrails.org/resource-library/resources/connecting-chattanooga-neighborhoods-by-rail-trail/**

[42] **https://www.railstotrails.org/resource-library/resources/new-york-avenue-rail-with-trail-draft-concept-plan/?q=&a=Rails-to-Trails%20Conservancy&t=All&s=District%20Of%20Columbia&g=All**

[43] The National Environmental Policy Act and its implementing regulations (40 CFR §§ 1500-1508) requires Federal agencies to consider the potential environmental consequences of their proposals, document the analysis, and make this information available to the public for comment prior to implementation. Many States and local jurisdictions have their own environmental requirements.

Metropolitan Branch Trail in Washington, DC. (Photo courtesy TrailLink.com/cindyd)

> "The railroad's requirements and all the permit requirements can be in conflict with one another. For instance, the railroad wants vegetation cleared and wide-open gravel ballasts but—in the case of the Border-to-Border [Trail]—it runs along the Huron River, a State designated protected waterway, which means protected habitat, vegetation, and natural aesthetics. Striking the balance between two opposing requirements can be also be challenging."
>
> *– Peter Sanderson, Principal Park Planner, Washtenaw County Parks, Border-to-Border Trail, Michigan*

Environmental Contaminants

Dealing with known, potential, or perceived contamination along the corridor is one of the most common environmental considerations for rail-with-trail projects. Contamination does not necessarily prevent the development of rails-with-trails if appropriate steps are taken to ensure the safety of trail users.

The type and extent of contamination along rail corridors fall into two general categories: 1) residual contamination that may be found along any stretch of corridor, and 2) contamination associated with industrial uses. Trail developers should conduct due diligence and inventory potential hazards along the corridor and perform necessary remediation actions before and during design and construction.

There are typically two phases to environmental site assessments. Phase I typically includes the review of records, a site inspection, and interviews with property owners, neighbors, and local government officials. Since railroads often use chemicals for corridor and track maintenance (e.g., herbicides for vegetation control, creosote for preservation of wooden ties) and sometimes transport hazardous materials, contamination risk is an inherent aspect of most railroad corridors. Therefore, an environmental site assessment for rail-with-trail projects will generally involve a Phase II assessment, which involves soil sampling and laboratory analysis, to reveal levels of contamination and help determine appropriate steps for remediation and/or routing and design strategies to avoid human exposure to contaminated areas. In some cases, a Phase II assessment will reveal high levels of contamination that may extend beyond the desired trail corridor boundary and may require mitigation action by the corridor owner.

Remediation strategies range from the removal and replacement of top soil or clay to the construction of an impervious surface over the contaminated area to prevent further leeching or harmful contact for trail users and trail neighbors. When the trail is open, signage and fencing can be used to protect trail users from exposure to known contaminants. Trail managers should coordinate with their State environmental agency to ensure proper compliance and to consult on the assessment and potential remediation processes. Additionally, trail managers should develop a comprehensive management plan that includes risk management for the open trail and the designation of a qualified person or department to regularly inspect the trail to identify potential hazards.

Border-to-Border Trail, Michigan (Photo courtesy of mlive.com/Ryan Stanton)

Whittier Greenway Trail

The City of Whittier, California, agreed to be responsible for the assessment and resulting clean-up of an area that was part of a perpetual easement with UP Railroad to develop the Whittier Greenway Trail, a current rail-with-trail project. Discovery of a high level of contaminations on the site led to testing of adjacent residential properties—also highly contaminated—which required clean-up by the railroad on all affected properties. The city secured a grant from the Environmental Protection Agency (EPA) prior to acquisition of the easement that helped defray costs associated with necessary environmental remediation. The city also procured additional environmental liability insurance.

Burlington Greenway

A planned extension of the eight-mile Burlington Greenway in Vermont is adjacent to a Superfund site, which is creating challenges to accessing the trail in a constrained area (the trail is bounded by Lake Champlain on one side and urban development on the other). The EPA requires minimal impact to the Superfund site to limit further contamination. As a result, the rail-with-trail will have to work around the site, which may require building bridges. Because environmentally contaminated sites impact both route planning and cost estimating, it is important to identify and consider them early in the planning process.

Involving the Stakeholders

Identifying and involving stakeholders early in the rail-with-trail development process can help create an inclusive and open atmosphere, saving time and energy and easing negotiations down the line. Most successful rail-with-trail projects have involved a variety of stakeholders from the beginning stages of development, including not only the trail manager and the affected railroad(s), but also representatives from the following groups:

- Utility companies (e.g., telephone, cable, water, sewer, electric, and gas);
- Metropolitan planning organizations; transportation, public transit, parks and recreation, and health departments;
- Law enforcement officials;
- Adjacent landowners;
- Trail user groups;
- Community groups; and
- The general public.

Hank Aaron Trail, Milwaukee (Photo courtesy of Ben Carter)

Utility companies should be consulted throughout the rail-with-trail development process to identify existing utilities along the corridor, inform design choices, oversee construction activities, and potentially time utility infrastructure maintenance or improvements with rail-with-trail construction. In addition, a wide range of government agencies should be involved early in the development process, as rail-with-trail development may impact existing planning efforts in the area or other elements within their purview. Law enforcement officials can provide insight on existing safety challenges in the area and suggest improvements during design.

Successful planning is key to coordinating a broad set of stakeholders. Adjacent landowners, trail user groups, community groups, and the general public should also be engaged throughout the rail-with-trail development process. Extensive engagement, such as via public workshops, will ensure the public is fully informed of temporary and permanent changes to their community, and provide ample opportunity for the public to give input on design choices to create a rail-with-trail they are likely to support and use. Railroad officials should be invited to public workshops and encouraged to voice their concerns or suggestions whenever possible.

> "Coordinate early, make sure you've got the right partners at the table, be organized on what the vision is, and have a clear idea of what you want. It means a lot of conversations with all the partners."
>
> – *James Hanning, Pedestrian and Bicycle Coordinator, City of Milwaukee, Wisconsin*

When engagement falters or collaboration proves to be difficult, rail-with-trail developers may find it helpful to form a corridor management committee to give all identified stakeholders a formal voice. The committee may serve as the primary decisionmaking body (as it is in the case of the planned rail-with-trail along an upcoming extension of the Metro Blue Line light rail transit in Minneapolis, Minnesota) or it may serve in more of an advisory role.

Railroad Coordination

Rail-with-trail planners may find it difficult to identify the appropriate person at a Class I or other nonlocal railroad to contact about a project. Large railroads can have thousands of employees in numerous States; few, if any, have a person who deals specifically with rail-with-trail projects. The decisionmaking process, as in all large organizations, involves multiple departments and professionals in a variety of disciplines.

Railroad company representation should include staff from the real estate, operations, maintenance, and legal departments of both the owner of the rail corridor and any operators on the line. In some cases, one company, such as a Class I freight railroad, will own the corridor, while regional rail, Amtrak, Class II or III freight, or even another Class I railroad will operate over the line. Rail-with-trail developers should engage with all rail operators on the corridor, not just the corridor owner, to determine their needs and concerns. Stakeholder discussions should also involve railroad customer representatives when appropriate, such as in cases where the rail-with-trail will run close to customer facilities or operations, cross a spur track, or where the railroad operator otherwise desires their input.

Rail-with-trail developers may benefit from intermediaries negotiating with a railroad on their behalf. For example, a public transportation agency that is planning a light rail line within an existing rail corridor may be uniquely positioned to assume responsibility for rail-with-trail negotiations, since they will already be discussing acquisition and construction within the rail corridor and may have already established a relationship with the railroad. Similarly, State agencies may be in a position

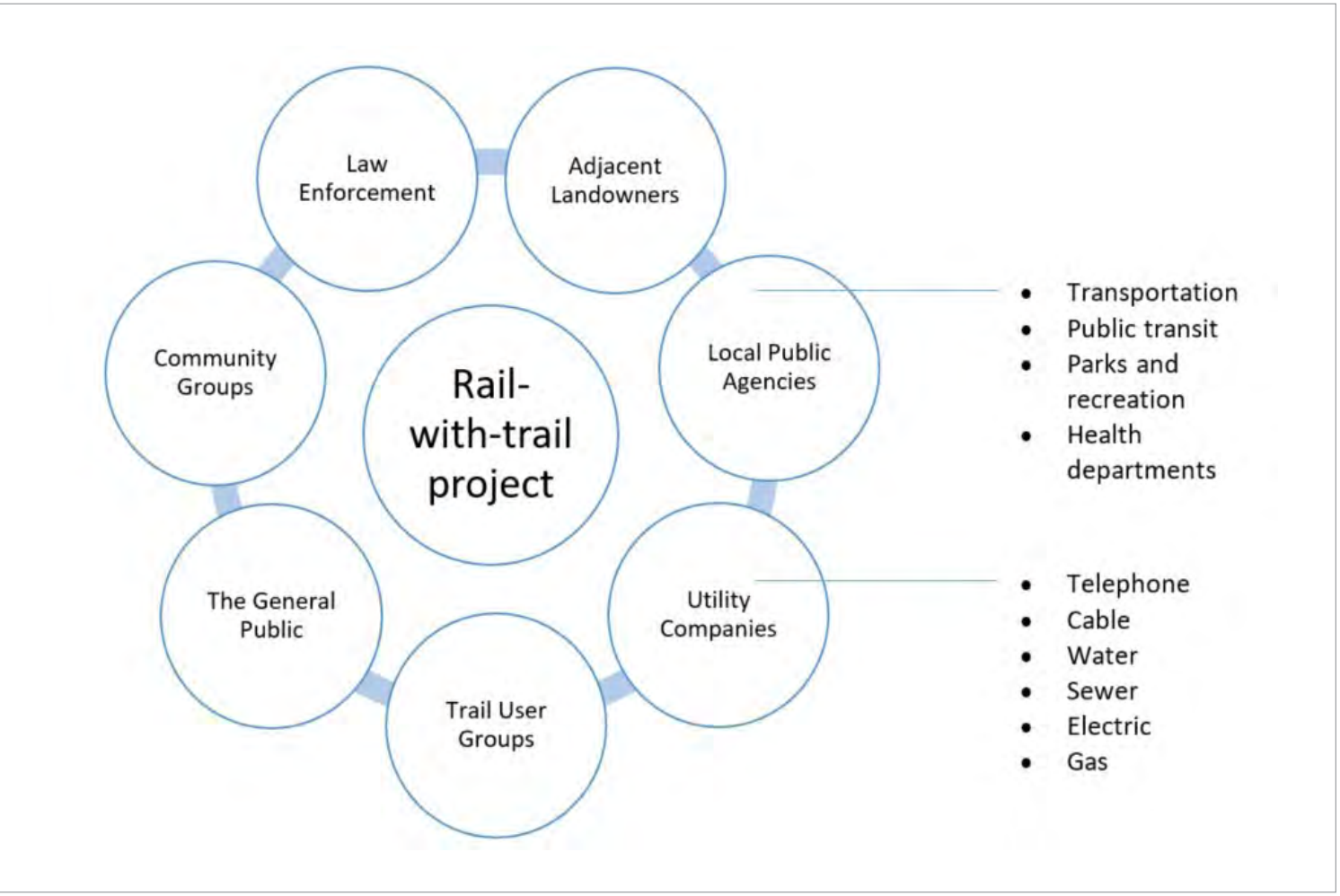


Figure 7: Stakeholders in the Rail-with-Trail Development Process

to provide incentives to the railroad, like land swaps or major infrastructure improvements, in exchange for access to the corridor for trail development. In such cases, coordinating the rail-with-trail project with the rail corridor owner and operator via an intermediary might be the preference of all affected parties, as it is likely to consolidate and centralize negotiations and eliminate duplicative efforts.

Southwest Commuter Path

Negotiations for the Southwest Commuter Path in Madison, Wisconsin, took place between rail-with-trail developers and both the Wisconsin DOT (the corridor owner) and Wisconsin Southern Railroad (the operator). While the trail developer registered Wisconsin DOT's preference for concurrence from the operator in rail-with-trail negotiations, the City of Madison also identified the State's "positive approach to bicycles as a form of transportation" and feeling that "it is part of their mission to support bicycle transportation" as key to getting the Southwest Commuter Path built.

Border-to-Border Trail

On Washtenaw County's Border-to-Border Trail, Washtenaw County Parks & Recreation (WCPR) led the rail-with-trail development effort. The rail corridor was used lightly for freight under ownership of NS, which was not amenable to conversations about a rail-with-trail. In 2013, Michigan DOT acquired the corridor and it has since seen a large increase in Amtrak passenger trains. Michigan DOT was open to discussing a rail-with-trail and has helped broker a relationship with Amtrak. WCPR was required to meet both Michigan DOT design requirements and Amtrak's safety standards, which included exploring all other route alternatives, allowing space for a second future track and a service road, not adding new at-grade crossings, installing fencing along the entirety of the corridor, and providing vertical separation where possible. WCPR works primarily with Michigan DOT on review and approvals of trail design, but does submit plans to Amtrak for review for anything that interacts with the rail corridor, such as fencing, barriers, grading and drainage, and clearing and grubbing. WCPR attributes their successful partnership with Michigan DOT and Amtrak to the following practices:

- Start discussions with the railroad very early on and expect the process to take some time.
- Expect to follow the railroad's processes throughout.
- Safety should be the number one priority at all times.
- Use professional networks to find the right contacts at the railroad.

Madison's Southwest Commuter Path (Photo courtesy Rails-to-Trails Conservancy)

Right-of-Way Acquisition and Use

As is the case with traditional rail-trail projects, there are several methods to gain control of, or acquire, property for rail-with-trail development. The acquisition method affects both the ease of the project and the allocation of potential liability (liability is further discussed in Section V). There are three common types of property arrangements for rails-with-trails: 1) full transfer

of ownership; 2) acquisition of easement; or 3) a lease or license. Each acquisition method is discussed in more detail below.[44]

Based on data for 84 rails-with-trails for which the acquisition method is known, more than half (52 percent) were developed under an easement, lease, or license agreement. There are rare instances of the trail-managing agency providing an easement or lease agreement to a railroad company.[45] These occur in cases where former railroad corridors are owned by the trail manager and rail service returns.

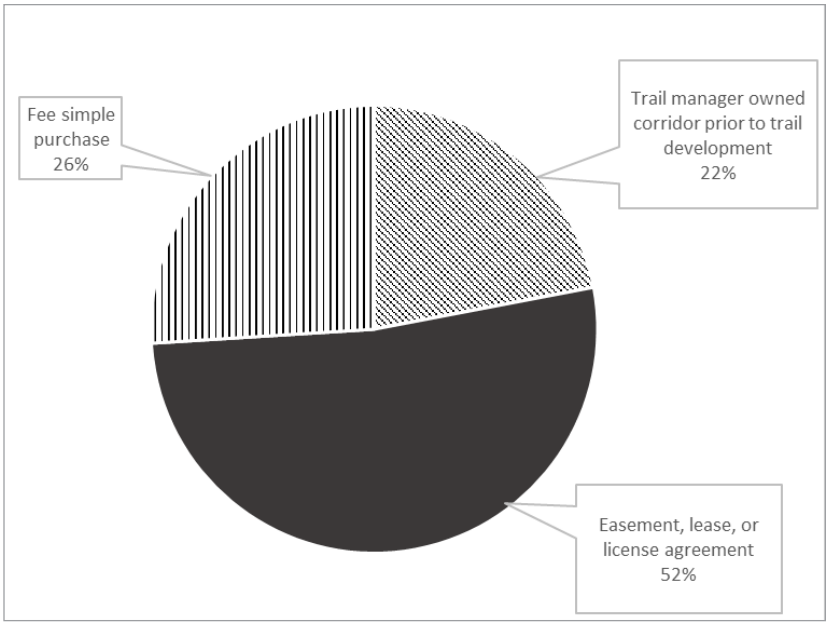


Figure 8: Reported Acquisition Methods for Rails-with-Trails (Sample size: 84)

Regardless of the acquisition method, most railroad companies will expect financial compensation for purchase or use of their corridors. Trail developers that are negotiating with railroads for access to their rights-of-way should be fully prepared to have the corridor appraised. Funding for rail-with-trail corridor acquisition is usually obtained through a variety of Federal, State, local, and private funds. There are rare instances of property donation, which the property donor can use for tax deduction.

Some other unique challenges and considerations related to corridor acquisition include:

- **Trail Corridor Width:** Acquiring adequate right-of-way for both trail development and operations/maintenance should be considered in the feasibility study and planning phase. In constrained areas, the trail developer and railroad should work together to develop creative solutions. However, there are instances of easements as narrow as 15 feet that accommodate trail development.
- **Use of Adjacent Publicly Owned Corridors:** Many active railroad corridors exist adjacent to public roadways. Trail developers should understand where right-of-way boundaries exist and determine if acquiring access within the road right-of-way is an easier path forward. State DOTs and other roadway managing agencies may have existing easements with the railroad to utilize their right-of-way.
- **Federal Requirements:** Freight railroads are subject to the regulatory authority of the Surface Transportation Board and are also subject to regulation by the FRA. Any use of the right-of-way cannot interfere with current or potential future freight rail service and must comply with FRA safety regulations.[46]

Full Transfer of Ownership

Obtaining full fee simple ownership of the rail-with-trail corridor gives a trail manager the most flexibility to design and develop a rail-with-trail project. In a full transfer of ownership, the trail developer or the local government purchases the land needed for the rail-with-trail from the railroad or corridor owner. This can be costly, and railroads are rarely interested in selling their land. In most instances, fee-simple (i.e., full ownership) acquisition is not necessary for rail-with-trail development, and frequently is not an option.

[44] Sample agreements for each of these arrangements are available at Rails-to-Trails Conservancy's Rail-with-Trail website: **https://www.railstotrails.org/build-trails/trail-building-toolbox/basics/rail-with-trail/**

[45] In 2010 the Montour Trail Council (MTC), managers of the Montour Rail-Trail—Westland Branch in Washington County, PA, provided a 30-year lease to a company that is now operating rail service on a segment of corridor that was owned by MTC prior to this rail service reactivation. Additionally, the Heritage Rail Trail County Park in York County, PA provides a lease to an excursion railroad operator for the tracks adjacent to the trail.

[46] FRA's safety regulations are found at 49 CFR Parts 200–299.

Easements and License Agreements

Easements are acquired when the landowner is willing to grant to another party the right, preferably permanent, to a particular use of the property. The landowner retains title to the land while relinquishing most of the responsibility for management of the property. The trail manager may be able to obtain a permanent easement on a property for a lower price than a fee-interest acquisition, in return for a limited right to use the property for trail purposes. The easement is recorded in the jurisdiction's land records, so the easement right survives property transfer. The right to transfer the easement interest, however, may or may not be restricted in the easement agreement.[47] Table 4 provides a listing of typical easement agreement considerations.

Table 4: Typical Easement Agreement Considerations

From the trail manager's perspective, an easement agreement should:	From a railroad's perspective, an easement agreement should:
1. Guarantee exclusive use. **2.** Be granted in perpetuity. **3.** Include air rights if there is any possible need for a structure. **4.** Broadly define purpose of the easement and identify all conceivable activities, uses, invitees, and vehicular types allowed to avoid any need to renegotiate with the landowner in future. **5.** State that all structures and fixtures installed as part of trail are property of grantee. **6.** Limit grantor indemnification to trail-related activities only.	**1.** Provide conditions for termination of the easement, such as discontinuance of use of, or failure to maintain, the trail, or if the trail becomes a significant safety or liability problem. **2.** Indemnify the railroad against trail-related trespasser and other trail-related activities, consistent with applicable law. **3.** Place responsibility for ensuring reasonable railroad access to the tracks, and for needed trail repairs or improvements, on the public agency. **4.** Outline maintenance and management procedures and responsibilities. **5.** Retain approval rights for any improvement on the land subject to the easement.

A license or lease is usually a fixed-term agreement that provides limited rights to a particular licensee or lessee for a particular use of the property. Typically, these are employed in situations when the property cannot be sold (e.g., a publicly owned, active electrical utility corridor), in the case of interim property owners or trail managers, or where the owner wants the ability to control the use (through the terms of the license) or to retain a right to revoke the permission and regain control over the property. A license is often non-exclusive and non-transferable, and is not recorded. Depending on the terms of the license agreement, the trail manager may be subject to some limitations that could present challenges for trail development and operation. Table 5 provides a listing of the typical considerations for a license agreement.

[47] Sample agreement documents (easements and license) are available at Rails-to-Trails Conservancy's Rail-with-Trail website: **https://www.railstotrails.org/build-trails/trail-building-toolbox/basics/rail-with-trail/**

Table 5: Typical License Agreement Considerations

From the trail manager's perspective, a license agreement should:	From a railroad's perspective, a license agreement should:
1. Provide an acceptable term length with an option to renew. **2.** Identify all conceivable activities, uses, invitees, and vehicular types. **3.** Allow for railroads to review and approve the plan within a time limit. **4.** Provide clarity on maintenance responsibilities. **5.** Narrow potential environmental liability for preexisting conditions. **6.** Limit grantor indemnification to trail-related activities only. **7.** Specify limits on other uses of license property.	**1.** Allow for temporary trail closures for railroad maintenance activities. **2.** Include a revocable clause, including removal, if the trail becomes a significant safety or liability problem. **3.** Indemnify the railroads against trail-related trespasser activities and other trail-related activities, consistent with applicable law. **4.** Place responsibility for ensuring reasonable railroad access to the tracks, and for needed trail repairs or improvements, on the public agency. **5.** Outline maintenance and management procedures and responsibilities.

When easements, licenses, and other use agreements are employed for rail-with-trail corridor acquisition, indemnification agreements can address liability concerns and good design can reduce liability risks. However, the ability to indemnify other parties is not always available to State and local governments, as explained in Section V.

Rail-with-trail projects should always consider the potential need for additional tracks or sidings in the future. Easements or license agreements should include language related to the removal or relocation of the rail-with-trail if this need should arise. The license or lease should include a sufficiently long term so as to allow the trail manager to obtain satisfactory return on its investment in development of the rail-with-trail and/or provide for reimbursement for the amortized value of any improvements made by the trail manager, if the lease or license is terminated prior to the end of the useful life of these improvements.

Schuylkill River Trail, Pennsylvania. (Photo courtesy of traillink/jmcginnis12)

Section V: Liability and Legal Tools for Managing Risk

Liability is frequently raised as a concern of both railroads and trail developers in rail-with-trail projects. In the context of rails-with-trails, liability refers to civil (not criminal) liability and means the obligation of a trail manager or railroad to pay or otherwise compensate a person who is harmed through some fault of the trail manager or railroad. Several liability questions relating to rails-with-trails are largely a matter of State law, which varies from State to State, and cases with different facts may have different outcomes. This report does not explore the specifics of State laws related to liability.

Keeping those limitations in mind, this section discusses the principles governing liability in the context of rails-with-trails, including both statutory and common law standards, and the available legal tools for reducing a railroad's or trail manager's exposure to liability.[48] This section is a high-level overview of liability and legal tools and is not intended as legal advice. It does not address the fairly extensive body of law dealing with disputes related to ownership and acquisition of railroad corridors, nor does it address the general safety issues and regulatory framework applicable to railroad operations in general.[49] Further, this section does not address the many other ways in which a railroad or trail manager can be liable for damages, such as through the violation of laws or legal principles prohibiting pollution or discrimination, or through noncompliance with government regulations. Consult an attorney for issues specific to your railroad or trail project.

U.S. DOT contracted with the Rails-to-Trails Conservancy to conduct a legal analysis that included review of State laws and statutes relating to rails with trails. The legal analysis is available on the Rails-to-Trails Conservancy's website at https://www.railstotrails.org/build-trails/trail-building-toolbox/basics/rail-with-trail/.

Overview of Risk Management Effective Practices

Effective practices for managing risk associated with rails-with-trails are:

- **Legal Research:** Conduct initial legal research as early in the process as possible. Important information to address includes ownership, easement, and license agreements in the railroad corridor; legal protections available at the State level (e.g., indemnification, applicable State statutes, and trespassing laws); local or State property rights ordinances and information; and trail management organization insurance protection.

[48] "Common law" standards are those developed by judges through custom and case-by-case litigation and set forth in published judicial decisions that are considered precedent in factually similar contexts within jurisdictions.

[49] For more information about rail safety, see FRA's website at **https://www.fra.dot.gov/Page/P0843**

- **Indemnification Agreements:** To the extent practicable and reasonable, consider using indemnification agreements to address liability concerns arising out of potential injuries related to trail activities on railroad property. Both trail managers and railroad companies should review State statutes to ensure the validity of any such indemnification agreements.[50]
- **Trespassing History:** It is important to have corridor-specific information about the frequency and location of trespassing on the corridor, the history of injuries sustained by trespassers and the locations where they occurred, and the number and information about the safety of existing crossings.
- **Signs and Markings:** The *Manual on Uniform Traffic Control Devices* defines the standards for signs, signals, and pavement markings on all shared use paths, including rail-with-trail facilities.
- **Safety Education and Training:** Staff responsible for oversight of trail construction and maintenance should consider developing rail safety training or education programs to ensure that these work activities are conducted safely, without undue risk to workers, and without interfering with train operations.
- **Liability Insurance:** Trail managers should consider obtaining comprehensive liability insurance for key personnel, including directors and officers, and in an amount sufficient to cover foreseeable liability costs unless, as a public agency, it can be determined that there is adequate self-insurance already in place.

Perspectives on Risks and Benefits of Rails-with-Trails

As discussed in Section III, the perspectives of various stakeholders (e.g., private railroad companies, public transportation agencies, and trail managers) toward rails-with-trails depends on their respective organizational and operational missions. Railroads, particularly Class I railroads, express concern that rails-with-trails may expose their companies to greater risk of liability due to increased trespassing on the active right-of-way and interference with railroad operations. For rails-with-trails proposed to be located within active railroad rights-of-way, the railroad will weigh the safety and liability risks against potential financial and other gains. Therefore, minimizing these risks is a key component of a successful rail-with-trail. Many of the concerns associated with safety and increased liability can be addressed by employing good design practices to discourage or reduce trespassing opportunities, by using available legal tools for avoiding these consequences, and through indemnification agreements. While public transportation agencies are likely to share the same concerns as railroads, many view rails-with-trails as a way to provide safe and convenient routes for pedestrians and bicyclists to access rail transit.

Trail managers also are concerned with safety and liability, but view these concerns largely as a design and management issue rather than seeing them as obstacles or impediments to developing rails-with-trails. Trail managers should also note that private railroads sometimes require barriers between the railroad tracks and trail, additional insurance, or indemnification agreements that reduce the railroad's liability for trespassing on railroad property.

Legal Frameworks Governing Railroad and Trail Manager Liability

Common law principles establish the degree to which a person owes a "duty of care" to another, governing the extent to which a person can be found liable for negligence if another is injured by the breach of this duty. As the owners and/or occupiers of their rights-of-way, railroads and trail managers have varying duties of care that they owe to persons both on and off their premises. In addition, railroads have a duty to exercise reasonable care on their premises to avoid an unreasonable risk of harm to others who may be off the railroad premises, such as through derailments or objects that may hang off or fall from the trains. The degree of such responsibility takes into account the particular circumstances of a case.

[50] See FRA website https://www.fra.dot.gov/eLib/Details/L20496 for a Matrix of Statutes and Laws pertaining to rails-to-trails.

In most States, the duty of care owed to persons who enter another's property depends on whether the injured person is considered a trespasser, a licensee, or an invitee. Trespassers are due the least duty of care, while invitees are due the most.[51] However, the duty of care owed to persons can be altered through legislation, such as recreational use statutes.

Definitions (note that specific definitions of terms may vary from State to State):

- **Invitee**: A person entering upon the property of another for business purposes or because of a public invitation extended by the property owner.
- **Licensee**: A person who is privileged to enter or remain on land by virtue of the possessor's consent, such as a social guest. The fact that the possessor knows of the intention to enter and does not prevent it is not necessarily a manifestation of consent, and therefore is not necessarily permission. Likewise, "[e]ven a failure to post a notice warning the public not to trespass cannot reasonably be construed as an expression of consent to the intrusion of persons who habitually and notoriously disregard such notices."[52]
- **Trespassers**: A person that enters any private property without permission of the owner or without having an official reason. All 50 States have laws criminalizing trespass and providing for minimal punishment. A number of States specifically forbid trespassing on railroad property and facilities.[53]

Courts applying these common law categories have developed a series of exceptions, recognizing that certain landowners may owe a heightened duty of care even to trespassers where their land is a place of danger or, in the case of railroads, they are operators of "dangerous instrumentalities."[54] These common law exceptions to the general rule that the railroad owes no duty of care to trespassers are:

- **Known or Habitual Trespass:** The known-trespasser rule states that a landowner who knows of or reasonably anticipates the presence of a trespasser in a place of danger owes a duty of ordinary care to protect or warn the trespasser about that dangerous condition.
- **Discovered Trespass:** Under the "last clear chance" doctrine, railroads have a duty to use reasonable care to avoid injury to a discovered trespasser, such as where a member of a train crew observes a trespasser in danger on the tracks.
- **Young Children:** Under the "attractive nuisance" doctrine, a majority of States hold railroads to a duty of exercising reasonable care for young children when the railroad knows or should know that such children are likely to trespass in a particular area.

A railroad should weigh and balance three factors when deciding whether to allow a rail-with-trail on its right-of-way or determining the indemnity and insurance coverage appropriate for a given rail-with-trail: (1) the extent, if any, to which the rail-with-trail will elevate the railroad's common law duty of care to any particular individual; (2) the increased or decreased likelihood of an injury occurring as a result of the rail-with-trail, and (3) the potential applicability of a statute, such as a recreation use statute, to protect the railroad. Each rail-with-trail project will have unique characteristics affecting the extent, if any, to which a railroad's liability is potentially increased.

[51] A 2012 Amendment to the Restatement [Restatement (Third) of Torts: Phys. & Emot. Harm § 51 (2012)] published by the American Law Institute (ALI), removes the three strict "entrant" categories and says landowners should have an integrated and general duty of reasonable care. This duty of care applies to all visitors on a property owner's land, other than "flagrant" trespassers. Several States have abolished the distinction between invitees, licensees, and trespassers, and established a unitary duty of reasonable care by landowners. See **http://centerjd.org/content/faq-trespasser**.

[52] Section 330 of the Restatement (Second) of Torts (1965).

[53] See FRA's Compilation of State Laws and Regulations Affecting Highway-Rail Grade Crossings at **https://www.fra.dot.gov/StateLaws**.

[54] The vitality of these exceptions, such as the "last clear chance" doctrine, has been lessened as a result of the current trend by a majority of states to move away from a standard in which the plaintiff's own '"contributory negligence" bars any recovery. Instead, the majority of States now adopt a comparative negligence standard under which liability is apportioned between the parties according to their degree of fault, subject to certain limits. See, .e.g. Renz v. Penn Cent. Corp., 87 N.J. 437, 435 A.2d 540 (N.J., 1981) (refusing to apply a State statue according absolute immunity to railroads from civil liability to trespassers in light of adoption of comparative negligence standard in the State).

Recreational Use Statutes

State recreational use statutes are one way to address a railroad's concerns about a rail-with-trail increasing their liability risk. These statutes, which have been enacted in all 50 States and the District of Columbia, typically limit the liability of landowners for injury to recreational users unless landowners intentionally, willfully, or recklessly injure or endanger trail users.[55]

Indemnification and Insurance

Notwithstanding the immunity conferred by a recreational use statute, an injured trail user may still bring a claim against the railroad, the trail manager, or both. Most rails-with-trails agreements will therefore include extensive provisions detailing indemnification and insurance responsibilities among the parties. Such agreements should ensure that the railroad retains no liability for injuries to or claims by trail users or arising from trail use. At the same time, many agreements provide that the railroad retains liability for injuries or damage not attributable to trail use.[56]

[55] The Rails-to-Trails Conservancy maintains a list of recreational use statutes by State at **https://www.railstotrails.org/resource-library/resources/recreational-use-statutes/**

[56] The Rails-to-Trails Conservancy provides additional information on liability and trail insurance at **https://www.railstotrails.org/build-trails/trail-building-toolbox/management-and-maintenance/liability-and-trail-insurance/**.

Tracks and trail share a structure on the Hockhocking Adena Bikeway in Ohio. (Photo courtesy of the Rails-to-Trails Conservancy).

Section VI: Design

There are no national standards or guidelines for rail-with-trail facility design beyond those that are applicable to all shared-used paths or at-grade crossings. Instead, trail planners and developers often use guidance from other standards related to shared use paths, pedestrian and bicycle facilities, railroad facilities, and roadway crossings of railroad rights-of-way. Such guidance includes the U.S. Access Board's guidelines for streets and sidewalks, outdoor developed areas, and buildings and sites and the AASHTO *Guide for the Development of Bicycle Facilities, 4th Edition* (AASHTO Guide).[57] It is important to note that the requirements included in the MUTCD apply to rails-with-trails.[58]

The design of a rail-with-trail project should be based on site-specific conditions, trail user needs, State and Federal regulatory requirements, local trail planning and construction guidelines, engineering judgment, and requirements of the railroad owner(s) and operator(s). Trail planners, designers, and engineers should work closely with railroad staff, including those in the real estate, legal, operations, and maintenance departments to achieve a suitable rail-with-trail design.

Railroad operating and signal departments should be included in any design discussions that may impact rail operations and safety. The day-to-day experiences of these professionals can be instrumental in helping to avoid or minimize potential problems. For example, they may be more acutely aware of trespassing trouble spots, recurrent vandalism, areas with difficult sight lines or weather-related concerns, as well as train movement patterns and frequency. Further, because train crews deal firsthand with the emotional burden of striking a pedestrian on the tracks, railroad input on crossing design, separation, safety education, and other anti-trespassing interventions should be weighed heavily in the planning and design processes. Their unique perspectives could lead to design strategies that may not have been originally considered by trail developers, including efforts to improve sightlines, relocate at-grade crossings, relocate or reconfigure sidings, enhance train signals and communications, and reorient train operations.

Ultimately, successful rail-with-trail design delicately balances the operational, maintenance, and safety requirements of a railroad with the specific needs and characteristics of trail users and the community.

This section describes effective practices for rail-with-trail facility design including many key design elements. These effective practices are derived from extensive research into existing and planned rails-with-trails that involved interviews with railroad officials and trail managers; a literature review of previous rail-with-trail studies; a review of trail planning guidance documents; and input from experienced railroad and trail professionals.

[57] *AASHTO Guide for the Development of Bicycle Facilities, 4th Edition.*

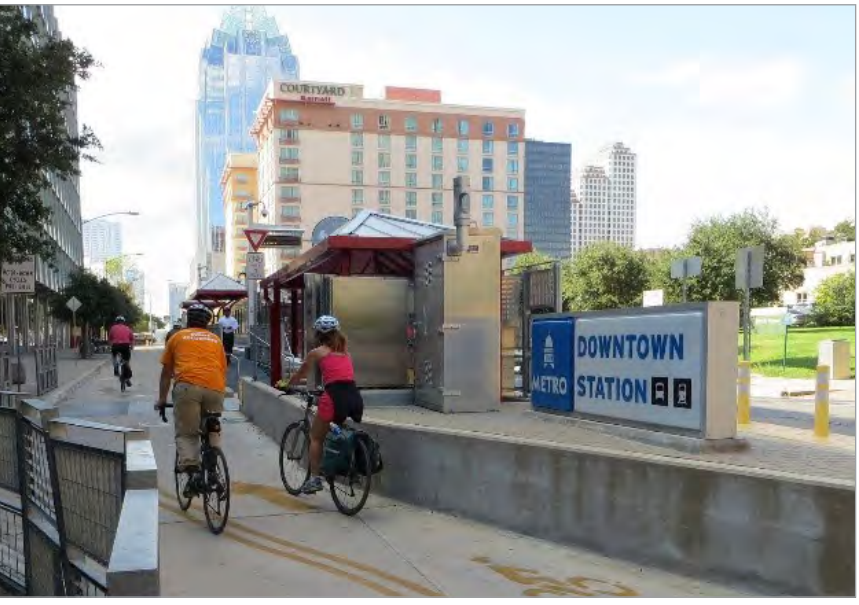
[58] FHWA. May 2012. *Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition with Revisions Number 1 and 2 incorporated.* Available at **https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm**.

The effective practices that follow in this section are suggestions based on collective knowledge and synthesized research, rather than rigid standards or guidelines that would apply to every rail-with-trail project.

Overview of Design Effective Practices

A summary of effective practices for the design of rail-with-trail facilities is as follows:

- **Regulatory Requirements:** Trail developers must adhere to all applicable Federal, State, and local requirements. This applies to all subsequent design recommendations.
- **Setback:** Rails-with-trails should be set back from railroad tracks as much as reasonably possible. When constructed within the railroad right-of-way, the trail should be built on the far edge of the property, where conditions allow. Setback determinations should consider factors including:
  - » Train frequency, speed, and type of freight transported;
  - » Current and future rail maintenance and operational needs;
  - » Track curvature,
  - » Topography and other environmental and physical constraints;
  - » Separation type;
  - » Any applicable State standards; and
  - » Historical patterns of trespassing or vandalism.
- **Separation:** Separation between the rail-with-trail and railroad tracks, which aims to reduce trespassing on the tracks, often takes the form of fencing, ditches, berms, vegetation, or any combination of these options. When fencing is needed, corridor characteristics, such as the setback distance, location of legal at-grade crossings, and the type, speed, and frequency of rail service will influence the appropriate fencing style, including height and material.
- **At-Grade Crossings:** New at-grade trail-rail crossings present unique challenges and railroads often do not allow them. They should only be proposed where there is no other reasonable alternative. In many cases, a more cost-effective and appropriate solution may be to use existing grade crossings. Any grade crossing should be reviewed to determine which traffic control devices are required to provide warning and guidance for trail users. All signs, signals, and pavement markings need to conform to the Manual on Uniform Traffic Control Devices.
- **Grade-Separated Crossings**: Overcrossings (bridges or trestles) or undercrossings (tunnels or routing a trail under an existing railroad bridge) are another solution for rails-with-trails if an existing crossing is not available. However, these types of grade-separated crossings are expensive to construct. Overcrossings and undercrossings should be designed with approach grades that comply with Americans with Disabilities Act (ADA) guidelines, along with fencing and lighting as appropriate.



- **Accommodating Future Tracks and Sidings:** A rail-with-trail should be designed and located so as not to preclude potential future rail expansion, if expansion is anticipated. Where corridor width, topography, and other factors allow, the rail-with-trail should be located on the opposite side of the railroad, away from proposed track or siding expansion.
- **Access to Stations:** Rails-with-trails along passenger rail lines should be designed to promote access to rail and transit stations, taking into account both accessibility and safety. To facilitate multimodal transportation, secure bicycle parking should be installed near the stations in coordination with the rail or public transportation agency.

The Lance Armstrong Bikeway in Austin, Texas facilitates multimodal options for access to the metro station. (Photo courtesy of the Rails-to-Trails Conservancy).

- **Drainage:** Consider the impact the rail-with-trail may have on the adjacent rail line's drainage system. In certain cases, a new or modified drainage system might need to be installed to serve both the railroad and trail.

Setback

Setback is the distance between the edge of a rail-with-trail and the centerline of the closest active railroad track. The range of setback on existing rails-with-trails varies considerably, from seven to 200 feet, with an average of approximately 32 feet.[59] A comparison of rail-with-trail setback with both train speed and frequency reveals little correlation, with some trails reporting a narrow setback existing along high speed and frequently traveled rail lines.

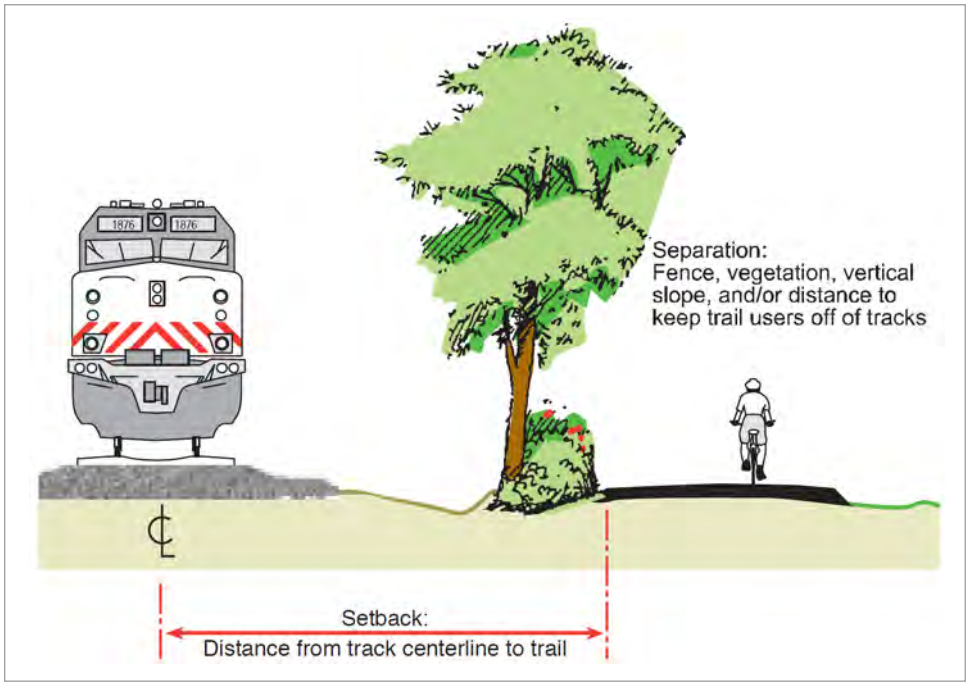
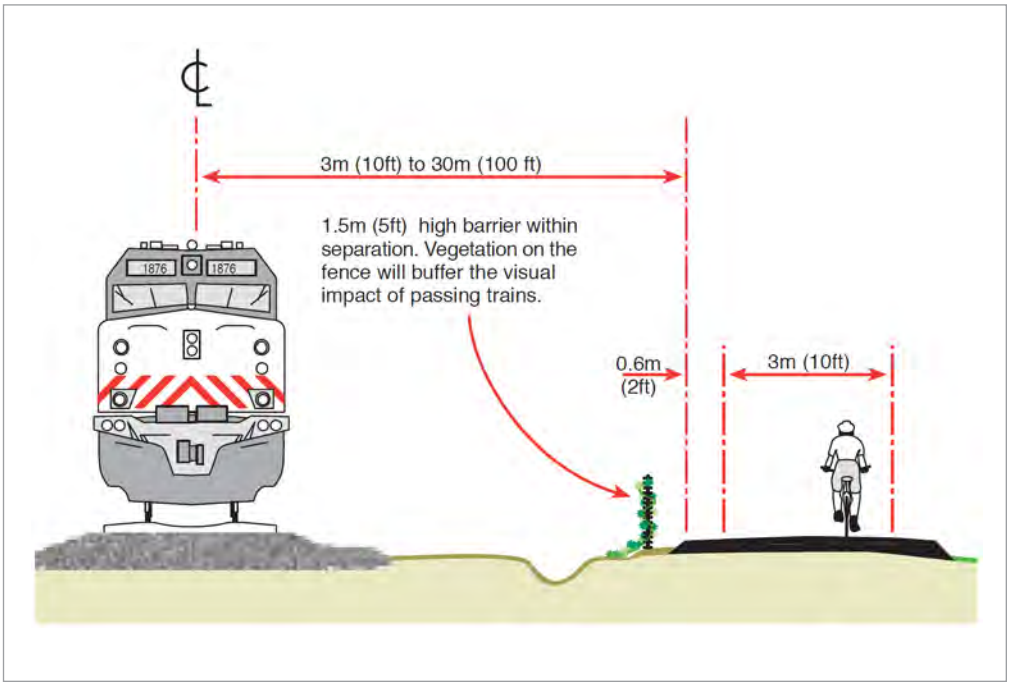


Figure 9: Setback and Separation Definition.

Figure 10: Minimum Rail-with-Trail Setback Depends on the Specific Situation



[59] These calculations are based on a sample size of 78.

Setback Examples

The Inland Rail Trail in San Diego County, California reports a seven-foot setback along a rail corridor with up to 70 trains per day traveling up to 60 miles per hour. Parts of the Frisco Trail, opened in 2006, are as close as two feet to the edge of the active Arkansas & Missouri Railroad line through downtown Fayetteville, Arkansas, while a section of the Camp Chase Trail in Columbus, Ohio, opened in 2016, features 10 feet of setback from the parallel Camp Chase Railway line at its narrowest point. Managers for rails-with-trails with narrow setback report few problems with trail operations or incidents occurring due to the trail's proximity to the active rail. The Montour Trail in Pennsylvania's Allegheny County features a setback distance of 14 feet along a Wheeling and Lake Erie Railway line where the trail manager reports trains travel only once a day at a speed of 10–20 miles per hour.

The Frisco Trail in Arkansas has some sections with a very narrow setback distance. (Photo courtesy of the City of Fayetteville)

There is no consensus on setback requirements nor is there a method to calculate the appropriate minimum setback based on corridor characteristics. While guidance documents do provide information on minimum setback standards for bicycle facilities and adjacent walkways, these sources are not considered appropriate for a rail-with-trail.[60]

In most cases where the rail-with-trail is constructed within the railroad right-of-way, the railroad's planning and engineering guidelines will dictate minimum setback distance or the railroad will determine setback as part of the acquisition agreement. At an absolute minimum, trail users must be kept outside the "dynamic envelope" of the track; that is, the space needed for the train to operate. According to the MUTCD, the dynamic envelope is "the clearance required for light rail transit traffic or a train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure." [61] The dynamic envelope includes the area swept by a turning train. Trains might also disturb flying debris from the railbed, including ballast rocks or objects deliberately or accidentally placed on the rails, and debris or freight might fall off trains or hang off rail cars. Rail-with-trail planners should account for these possibilities when considering setback.

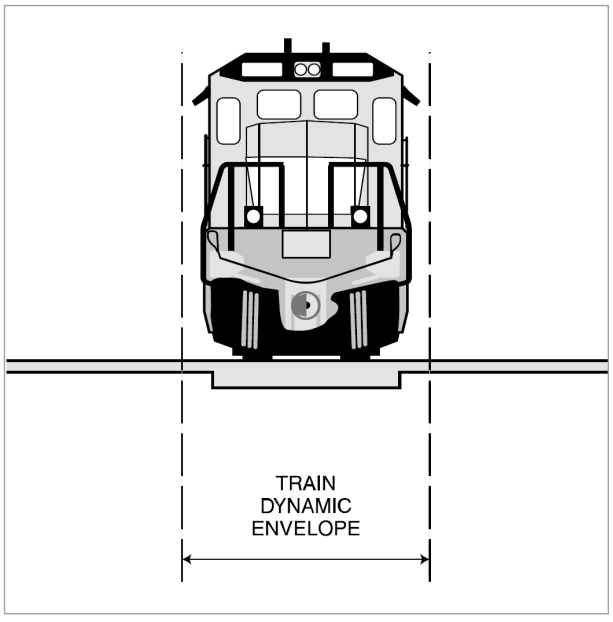


Figure 11: Dynamic Envelope Delineation (MUTCD Fig. 8A-1.)

[60] The *AASHTO Guide for the Development of Bicycle Facilities* includes minimum setback standards but it does not specifically consider the characteristics of adjacent rail use. Many States' Public Utilities Commissions also outline minimum setback standards, also known as "clearance standards" for adjacent walkways, which represent the legal minimum setbacks based on the physical size of the railroad cars. These setback standards are commonly employed along all railroads and at public at-grade crossings. However, these setback distances are geared towards railroad workers and are not considered generous enough for the public.

[61] Section 1A.13, MUTCD (2009).

Regardless of the trail's location relative to the railroad right-of-way, several factors should be considered when determining the minimum setback for a rail-with-trail to ensure safety of both rail and trail operations. Such factors include:

- Train speed, frequency, and type (e.g., freight, passenger, transit);
- Current and future rail maintenance and operational needs;
- Track curvature;
- Topography and other environmental and physical constraints on or adjacent to the railroad corridor (e.g., existing fencing or other structural impediments);
- Trespassing patterns;
- Separation type, such as fences or vegetation; and
- Any applicable State standards.

Constrained Areas

In many cases, an adequate setback distance can be achieved along most of a corridor. However, certain constrained areas, for example, those with challenging terrain, will not allow for the desired setback width. While a railroad corridor may be 100 feet wide or greater, the track may be within a narrow cut or on a fill section, making the placement of a rail-with-trail very difficult. Rails-with-trails in very steep or rugged terrain or where there are numerous bridges and trestles simply may not be feasible given the need to keep a minimal setback from the tracks, allow railroad maintenance access, and still have a reasonable construction budget. Relatively narrow setback distances may be acceptable to the railroad, trail manager, and design team in certain constrained areas and for very short distances, especially along relatively low-speed lines with low train frequency, or in areas with a history of trespassing where a trail might help alleviate a current problem. Safety should not be compromised at these pinch points; instead, additional right-of-way should be acquired to allow for a greater setback distance or a physical separation should be used between the trail and railroad tracks.

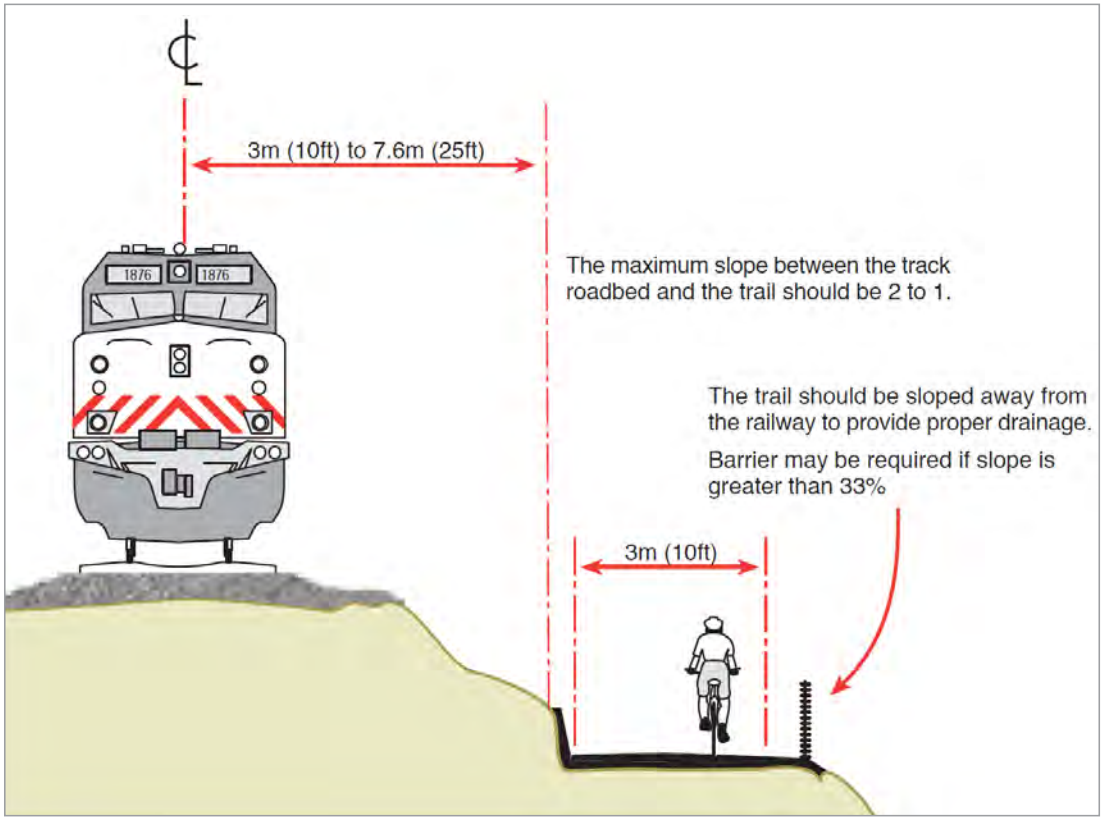


Figure 12: Minimum Rail-with-Trail Setback—Fill Sections (Depending on Situation)

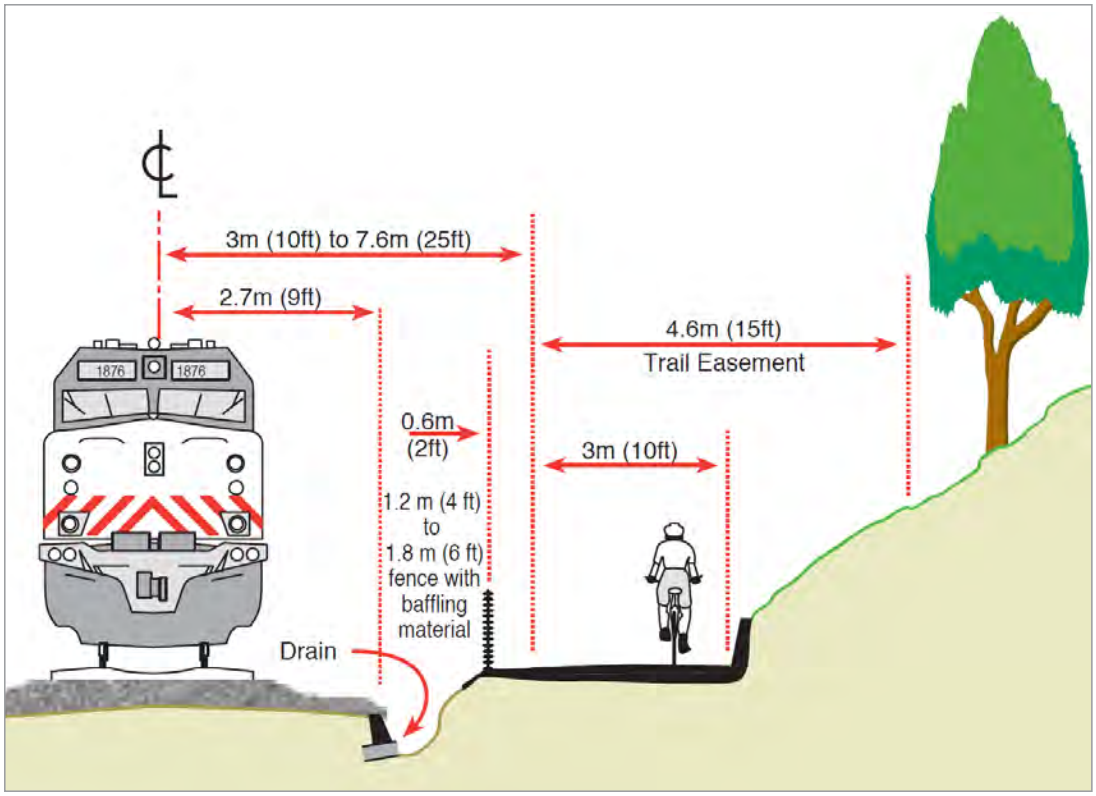


Figure 13: Minimum Rail-with-Trail Setback—Constrained Sections (Depending on Situation)

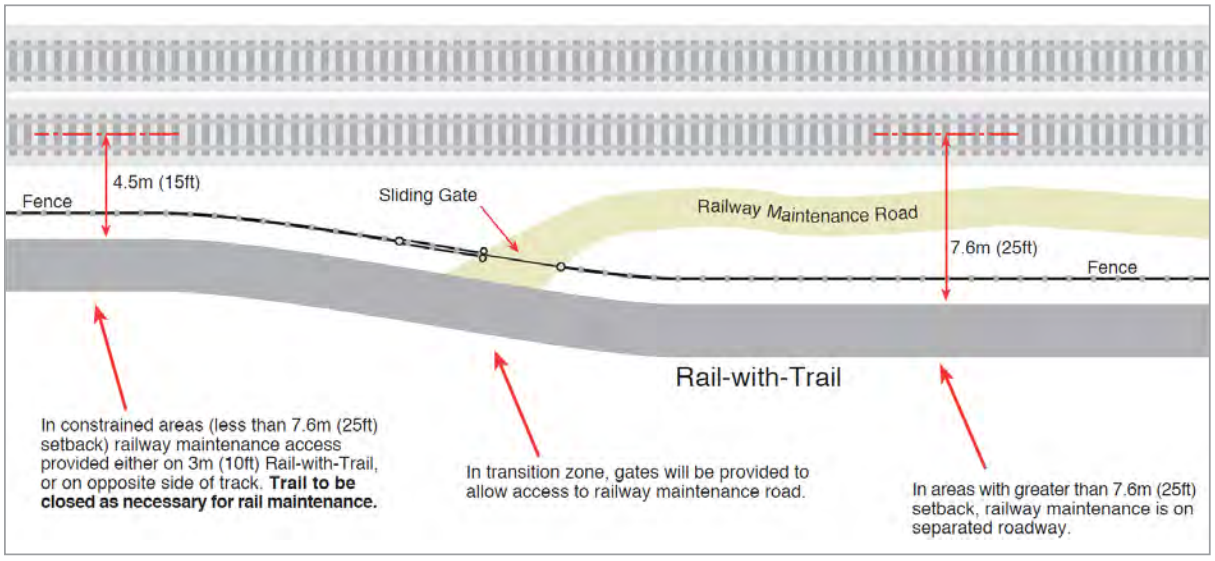


Figure 14: Sample Maintenance Access Transitions

Separation

Most rails-with-trails have some type of separation feature or landform, whether natural or constructed, between the trail and active rail line to maintain safety and prevent trespassing. Many railroads will request or require fencing between a trail and an active track, especially in areas with a narrow setback. Other barrier types, such as vegetation, ditches, or berms, often provide adequate separation, particularly in areas with wider setbacks. Where such barriers exist naturally between the tracks and planned location of the trail, fencing or other barrier requirements may not be needed to maintain safety and prevent trespassing. Using a combination of separation techniques is common; this is especially true in constrained areas, where multiple separation techniques in tandem may enable the use of narrower setback distances.

Based on data for 106 rails-with-trails for which the presence (or absence) of a barrier between the rail-with-trail and the railroad tracks was reported, 87 percent have some sort of barrier, and 13 percent have no barrier. For rails-with-trails that have opened since 2000, the percentage with barriers increases to 96 percent, indicating that the recent practice has been to install some sort of barrier between the rail-with-trail and railroad tracks (see Figure 15).

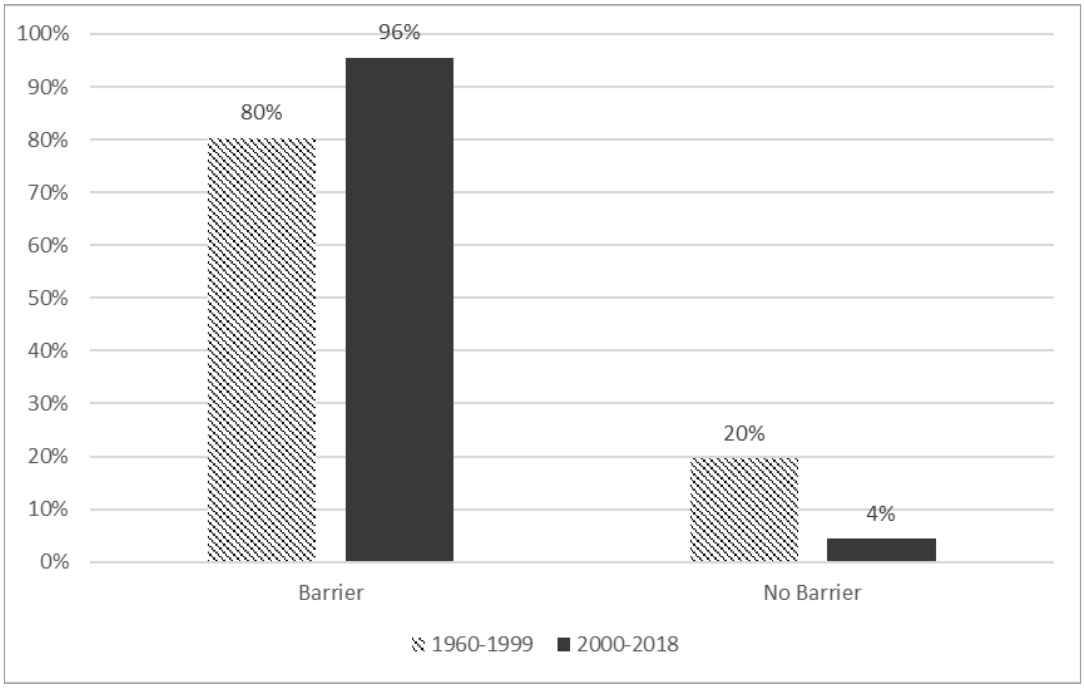


Figure 15: Barriers between Rails-with-Trails and Railroad Tracks (Sample size: 106)

Common barriers between rails-with-trails and railroad tracks include fencing, vegetation, grade separation, ditches, and concrete walls. Many rails-with-trails have more than one barrier type. Figure 16 shows the distribution of these barrier types for trails built between 1960 and 1999 and between 2000 and 2018. Fencing has become a more popular choice since 2000, as 86 percent of rails-with-trails built since 2000 include fencing. Likewise, the other barrier options have become less popular since 2000.

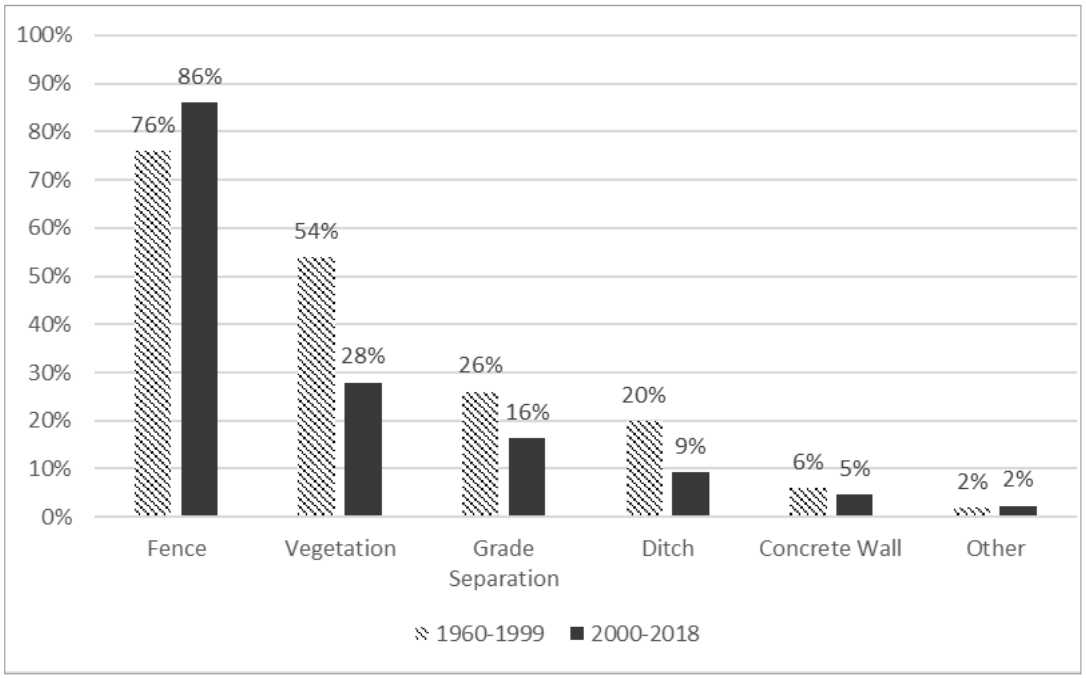


Figure 16: Barrier Types: 1960–1999 and 2000–2018 (Sample size: 93)[62]

[62] Note: some trail managers reported multiple barrier types for their rails-with-trails, so the percentages add to more than 100.

Fencing

Fences are the most common type of separation between rails-with-trails and active railroad tracks. To promote safety and minimize trespassing, railroads often request that trail developers install and maintain fencing with specific height and material requirements. Even if a railroad does not require fencing along most of the rail-with-trail, it may require fencing near at-grade crossings

There is a range of fencing types that vary in terms of design, material, durability, and cost. Trail developers should coordinate with railroad maintenance personnel as well as representatives from local utilities whose facilities share the corridor to determine the appropriate fencing type for the project.

Corridor characteristics, such as setback distance and the presence of legal at-grade crossings in the area, will influence the appropriate rail-with-trail fencing height and material. Railroads may require taller fencing or fencing made of a different material near at-grade crossings. In sections of rail-with-trail where legal crossings are infrequent or where trespassing has been a demonstrated problem, some rail-with-trail managers have installed taller fences to further discourage trespassing.

The type, speed, and frequency of rail service on the adjacent track may also influence the fencing height and material chosen. Faster trains are likely to send debris flying at a greater force than slower trains. A higher and more durable fence may be needed to deflect debris moved by higher-speed trains or to discourage trespassing.[63] It is also important to consider how a new fence might inhibit the movement of wildlife.

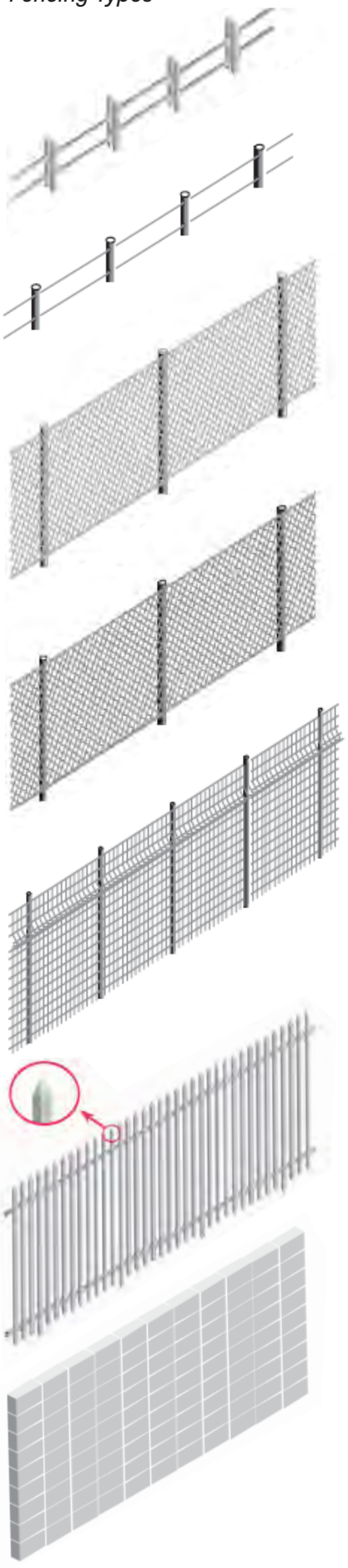
While fencing can provide safety benefits and reduce trespassing, it also can reduce visibility. It is often important to maintain visual access to the trail corridor from adjacent land uses so that portions of the trail do not become isolated from public view. This is especially true in areas where perceived or actual levels of crime are high. Fence design in these instances should not block visual access to the trail corridor; a shorter height or transparent fencing style, such as chain-link, may be appropriate. In all areas, care should be taken to ensure tall fences do not impede sight-distance at grade crossings, both for trail users and railroad operators. Depending on how far the fence is from the nearest track, a dense, high fence could possibly partially obscure the visibility of curved track ahead for train crews.

Installing and maintaining fencing can be costly, especially when considering the cost of flaggers that railroads typically require for any maintenance work within their right-of-way. Improperly installed or maintained fencing may do little to impede trespassing and may require frequent repair or replacement at the trail manager's expense. For all but the most heavily-constructed fencing, people find ways to cut, climb, or otherwise overcome fences if so inclined. However, despite the potential for damage and inability to prevent all trespassing, fencing costs can be justified by their effectiveness in channelizing trail users and reducing trespassing along the adjacent tracks.

> "I think the fences have improved safety. Before the trail people were walking everywhere and crossing the tracks all over the place."
>
> –Jeanne-Marie Souvigney, Livingston (Montana) Parks and Trails Committee

[63] For more information on the uses of high-security fencing to prevent right-of-way trespassing see *FRA's High-Security Fencing for Rail Right-of-way Applications: Current Use and Best Practices* (2015) available at **https://railroads.dot.gov/elibrary/high-security-fencing-rail-right-way-applications-current-use-and-best-practices**.

Fencing Types



- **Wood-Rail Fence:** Where trespassing is not as much of a problem, a low wood-rail fence can still serve as an effective reminder to trail users to stay off the tracks.

- **Post and Cable:** This inexpensive fence type may be used on a rail-with-trail where trespassing has not been a problem, there is adequate setback, and the fence serves primarily to demarcate the railroad property boundaries. The fence provides little screening or anti-trespassing features.

- **Chain-Link:** Chain-link fences are popular due to their effectiveness in keeping trail users off the tracks, relative low cost, and ease of maintenance. Chain-link fencing may not be visually appealing for rural areas where there is no history of trespassing, nor is it likely to be very effective in any areas with a history of trespassing, because it is very easy to cut and vandalize. Most chain-link fences may tend to project the image of an urban or industrial environment. For this reason, trail developers may wish to explore using other, more appealing types of fences whenever possible.

- **Chain-Link with Barrier:** Similar to chain-link, but with either a plastic woven fabric or wood battens in the chain-link material, providing a solid-type barrier to help catch debris and provide wind and visual buffering.

- **Israeli-Style Steel Fence:** Sometimes referred to as"Israeli-style" fencing for its use in Israel to protect kibbutzs, this product is more expensive than chain-link, difficult to vandalize, difficult to scale, and relatively easy to repair if cut. It would be inappropriate for areas requiring aesthetic treatment, and provides limited screening or buffering benefits.

- **Wrought Iron Picket Fence:** This is the most vandal-resistant fencing and is used in locations that have a history of trespassing. It is virtually impossible to cut and difficult to scale. Because of its cost and visual impact, it is typically used at specific locations rather than along an entire corridor.

- **Wall:** Very rarely used due to its cost and visual impact, solid concrete block walls are virtually indestructible and offer complete buffering and screening from rail debris or trains. A wall may be appropriate where a rail-with-trail must be placed very close to tracks for short distances. Walls are most commonly used in areas where a grade separation requires a retaining wall adjacent to the trail. Walls should be designed in coordination with railroad engineering personnel, because a wall can impact the structural integrity of the rail bed, alter drainage patterns in the rail corridor, and, in some circumstances, impede access by railroad maintenance forces.

Figure 17: Fence Types

Fence Examples

During negotiations for development of the Southwest Commuter Path in Madison, Wisconsin, the Wisconsin & Southern Railroad requested an eight-foot-high fence between their active rail line and the trail. Trail planners negotiated the height down to five feet, with the understanding that if the railroad were to find evidence that the fence height was insufficient, the trail manager would install a taller fence.

UP Railroad required an eight-foot fence along the Whittier Greenway Trail in Whittier, California. The trail has several grade crossings and uses art-enriched fencing at these locations to provide a more welcoming feel for trail users and to visually denote trailheads at these locations.

Along a planned extension of the Border-to-Border Trail in Washtenaw County, Michigan, Amtrak and Michigan DOT are upgrading the existing track to accommodate high-speed trains. The railroad is requiring the installation of a heavy-duty fence designed specifically to absorb the impact of any debris that might be blown around by a train passing at a high rate of speed.

Art-enriched fencing to be installed at road crossings on the Whittier Greenway Trail (California) (Photo courtesy of the City of Whittier).

Vegetation

Whether natural or planted, vegetation can serve as both a visual and physical barrier between a track and a rail-with-trail. The density and species of plants in a vegetative barrier determine how effective the barrier can be in deterring potential trespassers. A dense thicket can be, in some cases, just as effective as a fence in keeping trail users off the tracks. Even tall grasses can discourage trail users from venturing across to the tracks, although they may be less effective than trees and shrubs. Vegetation typically takes a few years after being planted to become an effective barrier. During this time, separation between the rail-with-trail and track may need to be augmented with other temporary barriers until planted trees and

hedges have sufficiently matured. As with fencing, vegetation should not block the public's view of an approaching train or trail user at grade crossings, nor should it impede trail users' views of roadway or train traffic at crossings.

The railroad's vegetation management practices should be considered during design to ensure that vegetation along the trail is compatible with such practices. The railroad might set guidelines for the type of vegetation permitted and the minimum distance at which it may be planted along their tracks. Further, to maintain its tracks and crossties, the railroad might use aggressive herbicide that can also affect vegetation along the rail-with-trail and potentially harm trail users. In such cases, trail developers and the railroad should explore nontoxic substitutions or impose a geographic or frequency limit on their use.

A row of trees forms a vegetative barrier separating the tracks from the Libba Cotten Bike-way in North Carolina. (Photo courtesy of the Rails-to-Trails Conservancy)

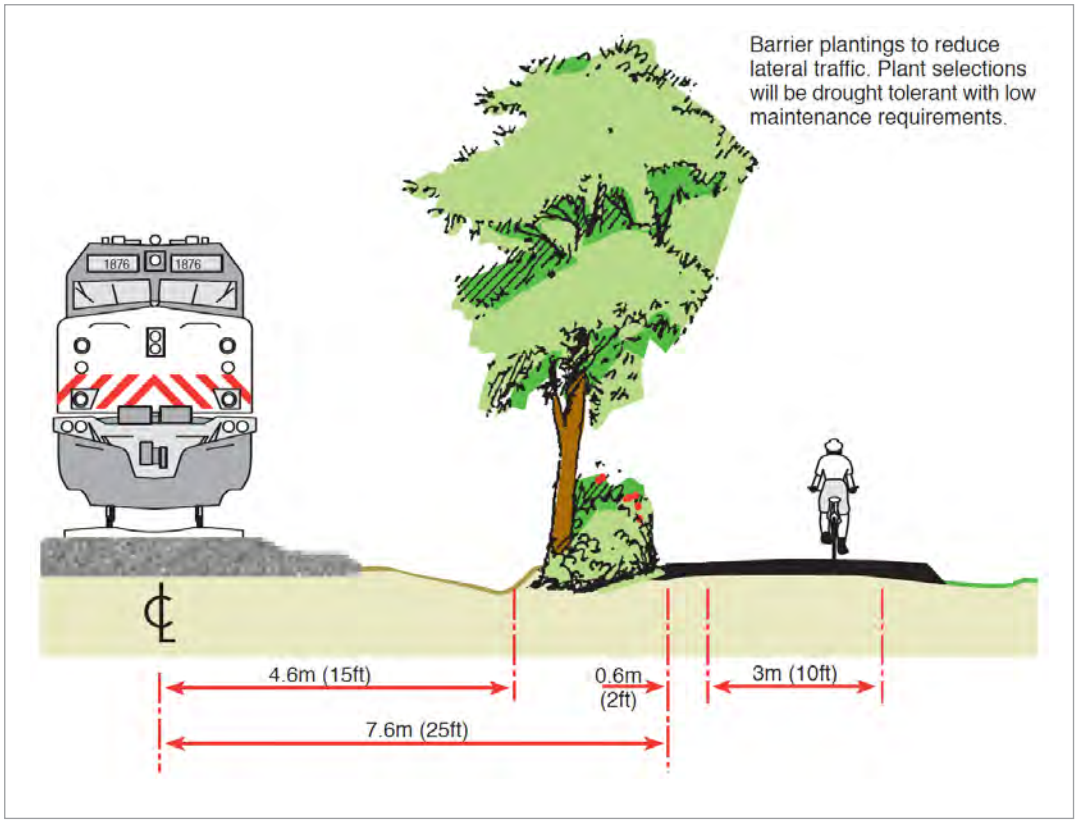


Figure 18: Trail Separation Example—Using Vegetation as a Separation Technique

Ditches

Many rail corridors contain drainage ditches that run adjacent to the tracks. The deeper and wider these ditches are, the more difficult they are to cross on foot, and thus the greater deterrent to trespassing they may provide. The presence of water in the ditch also will naturally act as a deterrent. Trail and railroad track drainage needs must be considered in the design process, especially if a ditch is planned to be constructed.

Vertical Separation

Vertical separation achieves many of the same benefits as other separation strategies and is very common where a rail-with-trail is located along numerous cut-and-fill locations. In cases where the rail-with-trail is at a significantly lower elevation than the tracks, the setback becomes less important than the amount of vertical separation, which effectively addresses trespassing concerns. In cases with vertical separation of greater than 10 feet, the danger from falling objects may increase. A fence or barrier at the top of the slope may help prevent injuries on the trail below. In situations where the trail is higher than the parallel rail line, fencing can be used as a secondary separation technique to prevent trail users from trespassing or trail debris from falling on the track.

Vertical separation combined with a fence and retaining wall on the Santa Fe Trail in New Mexico. (Photo courtesy of Scott Belonger, P.E., Associate Principal for Loris and Associates)

Crossings

The point at which trails cross active tracks is an area of great concern to railroads, trail planners, transportation agencies, and trail users. For years, railroad owners, the FRA, FHWA, and State DOTs have worked to reduce the number of at-grade crossings to improve safety, lower maintenance costs, reduce liability exposure, and increase the efficiency of service. Adding a new at-grade crossing presents significant challenges. In fact, many government agencies and railroad owners have adopted policies of not allowing new at-grade crossings. In these cases, using existing grade crossings, building grade-separated crossings, or designing the trail to avoid crossing tracks are alternatives.

Based on data for 242 rails-with-trails for which the presence of trail/track crossings is known, 54 percent have trail/track crossings and 46 percent do not. For trails that have opened since 2000, the percentage of rails-with-trails with trail/track crossings increases to 60 percent, indicating that more recent rails-with-trails have crossed railroad tracks in some way (see Figure 19).

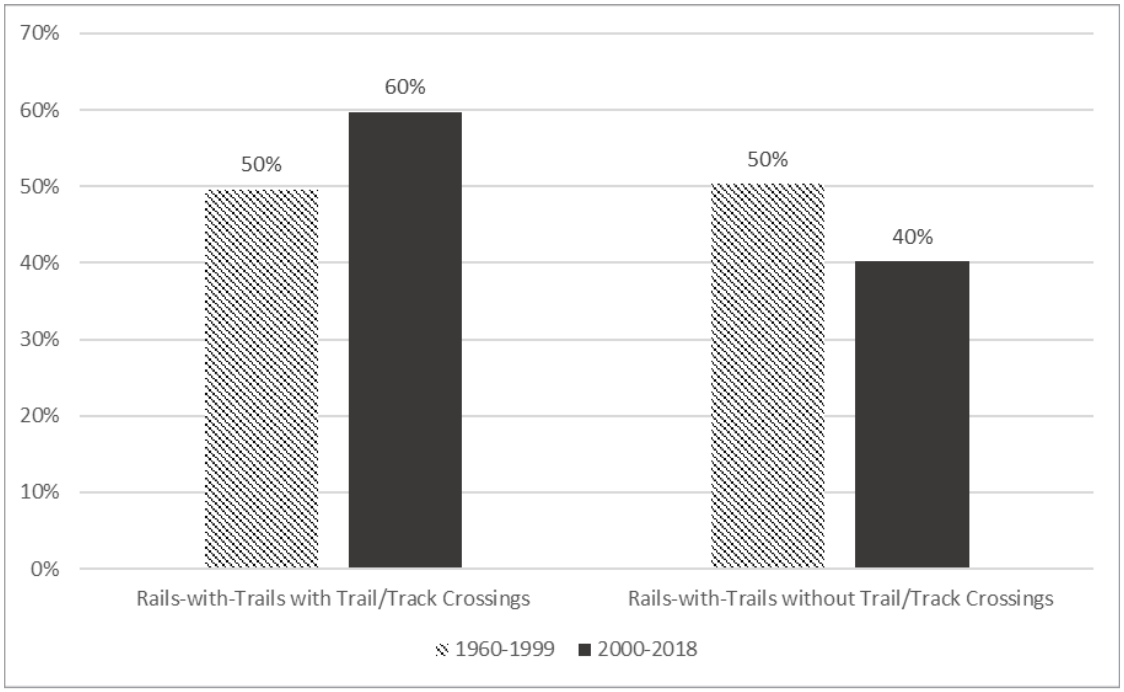


Figure 19: Rails-with-Trails with and without Trail/Track Crossings (Sample size: 242)

Rails-with-trails often cross railroad tracks at grade or via bridges or tunnels, and some rails-with-trails have multiple crossing types. Figure 20 shows the distribution of these trail/track crossing types for trails built between 1960 and 1999 and between 2000 and 2018. Since 2000, it is somewhat less common for rails-with-trails to include at-grade trail/track crossings, though the percentage is still above 50 percent. There has been a decrease in the presence of bridges carrying rails-with-trails over railroad tracks, but an increase in tunnels carrying rails-with-trails below tracks.

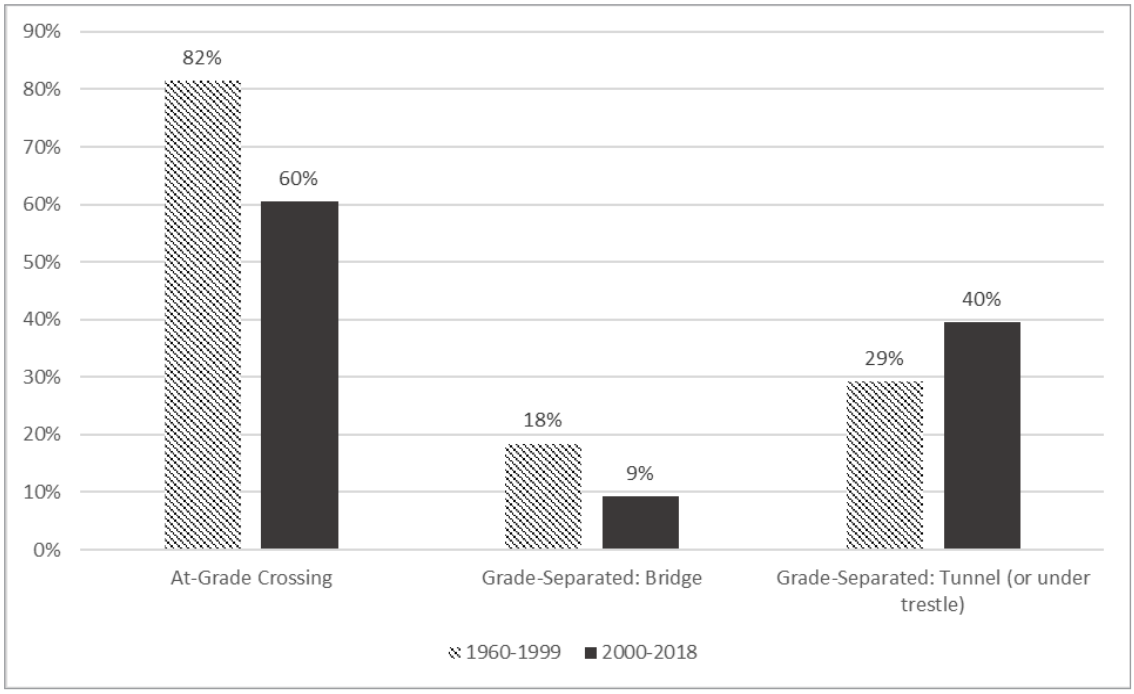


Figure 20: Types of Trail/Track Crossings (Sample size: 108)[64]

[64] Note: some trail managers reported multiple trail/track crossing types for their rails-with-trails, so the percentages add to more than 100.

When designing a rail-with-trail, trail developers should carefully evaluate all potential crossings, with consideration given to:

- Train frequency and speed;
- Location of the crossing;
- Sight distance;
- Approach grades and angle;
- Crossing surface;
- Lighting; and
- Warning devices (e.g., passive and/or active).

To address any potentially hazardous conditions that may be present (or to enhance safety treatments) at any grade crossing, an onsite Diagnostic Team of stakeholders to assess the situation is highly recommended. Typically, the Diagnostic Team consists of representatives from railroads, State and local authorities, U.S. DOT, trail user groups, engineering consultants, and other participants.

The following sections describe design considerations for various crossing types.[65]

At-Grade Trail-Rail Crossings

Location of the Crossing

If a new at-grade trail-rail crossing is the only option, it should be designed to reduce illegal track crossings by channelizing users to the intended crossing location. At-grade trail-rail crossings should not be located on railroad curves or other places where sight lines are poor. Crossings also should not be located where trains may regularly stop on the crossing, limiting access to the trail and presenting opportunities for trail users to cross between or under railroad cars, which is very unsafe and illegal. When new at-grade crossings are not permitted, the rail-with-trail design will need to channelize users to cross the tracks at existing roads or develop a grade-separated crossing.

Sight Distance

Adequate sight distance is important for any at-grade crossing, but particularly at crossings lacking active warning devices such as flashing lights or automatic gates. Bicyclists, pedestrians, and other trail users should be given sufficient time to detect the presence of an approaching train and determine whether they should either stop and wait, or continue across and clear the crossing safely before the train arrives.

The following three elements promote the safe movement of trail users across railroad tracks:

- **Advance Notice of the Crossing:** The first element concerns stopping sight distance, a common consideration in highway intersection design. The stopping sight distance is the distance required for a trail user to see an approaching train and/or the grade-crossing warning devices, recognize them, determine what needs to be done, and then come to a safe stop 12 feet clear of the nearest rail, if a stop is necessary. This point usually will be marked by a pavement marking in advance of the crossing. This sight distance is measured along the trail, and is based on a trail user traveling at a given speed, and coming to a safe stop.
- **Properly Located Traffic Control Devices:** The second element involves locating the appropriate traffic control devices (e.g., crossbuck signs) at grade crossings. Traffic control devices should be seen from an adequate distance in order for the observer to take appropriate action. The MUTCD, available from the Federal Highway Administration at https://mutcd.fhwa.dot.gov, contains guidance and standards for the proper use of signs, signals, and pavement markings on roadways and pathways.
- **Ability to See an Approaching Train:** The third element concerns the trail user's ability to see an approaching train to decide whether it is safe to cross. Two kinds of sight distance considerations are involved for safe movement across the crossing: the sight distance available in advance of the crossing and the sight distance present at the crossing.

Approach sight distance (also known as corner sight distance) involves the clear sight line, in both directions up and down the tracks, that allows a trail user to determine in advance of the crossing that there is no train approaching and it is safe to proceed across the tracks without having to come to a stop. These sight triangles, which depend upon both train speed and trail user

[65] See TRB Transit Cooperative Research Program (TCRP) Report 175: Guidebook on Pedestrian Crossings of Public Transit Rail Services (2015) for more information on engineering treatments designed to help improve pedestrian safety at light rail, commuter rail, and streetcar crossings. Available at **http://www.trb.org/Main/Blurbs/172320.aspx**

speed, are determined as shown in FHWA's *Railroad-Highway Grade Crossing Handbook.*[66] Where sight triangles are obstructed by vegetation, topography, or structures, or where clear sight triangles cannot otherwise be obtained, the trail should have additional warning signs or a reduced advisory speed posted in advance of the crossing. STOP or YIELD signs will accompany crossbucks at passive crossings.

Clearing sight distance, which applies to all crossings without automatic gates, involves the clear sight line, in both directions up and down the tracks, present at the crossing itself. A trail user stopped 15 feet short of the nearest railroad track should be able to see far enough down the track in both directions to determine if they can move across the tracks, to a point 15 feet past the far railroad track, before the arrival of a train. At crossings without gates that have multiple tracks, the presence of a train on one track can restrict trail users' view of a second train approaching on an adjacent track.

Approach Grades and Angle

The AASHTO Guide[67] provides recommended grades for shared use paths. The Architectural Barriers Act (ABA) Accessibility Guidelines, adopted as standards by the U.S. Department of Defense, the U.S. General Services Administration, and the U.S. Postal Service, provide requirements for accessible facilities for Federal outdoor developed areas.[68] The ABA standards for Federal outdoor developed areas call for grades of five percent or less, but grades over five percent are allowed for short distances in specific circumstances. Grades over five percent are not recommended for crossing approaches. In general, the trail approach should be at the same elevation as the track. Steep grades on either side of the track can cause bicyclists to lose control, may distract trail users from the conditions at the crossing, and may block sight lines. In addition to the ABA standards, the U.S. Access Board is also developing guidelines that cover access to streets, sidewalks, and shared use paths.[69] Trail developers on non-Federal lands may look to these guidelines for guidance on providing accessibility for individuals with disabilities.

A trail/track crossing on the Camp Chase Trail in Ohio. The trail bends in order to cross the tracks at 90°. (Photo courtesy of the Rails-to-Trails Conservancy)

Another critical issue, particularly for bicyclists and people with disabilities, is the angle of crossing. The AASHTO Guide makes the following statement with respect to the crossing angle of a shared use path at a railroad track:

> "The likelihood of a fall is kept to a minimum where the roadway or shared use path crosses the tracks at 90 degrees. The preferable skew angle between the centerline of the tracks and the bikeway is between 60 and 90 degrees, so bicyclists can avoid catching their wheels in the flange[way] and losing their balance…Efforts to create a right-angle crossing at a severe skew can have unintended consequences, as the reversing curves needed for a right-angle approach can create other concerns for the bicyclists. It is often best to widen the roadway…to allow bicyclists to choose the path that suits their needs the best." (Section 4.12.1, p. 4-38)

[66] FHWA. July 2019. Railroad-Highway Grade Crossing Handbook, Revised Third Edition. **https://safety.fhwa.dot.gov/hsip/xings/com_roaduser/fhwasa18040/**

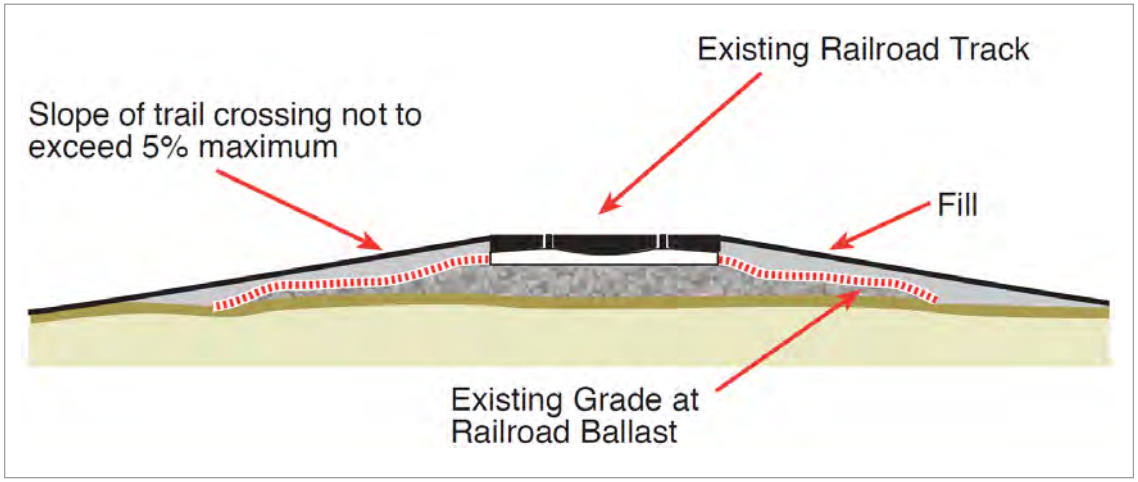
[67] AASHTO *Guide for the Development of Bicycle Facilities, 4th Edition.*

[68] Architectural and Transportation Barriers Compliance Board. 2014. Outdoor Developed Areas: A Summary of Accessibility Standards for Federal Outdoor Developed Areas. **https://www.access-board.gov/guidelines-and-standards/recreation-facilities/outdoor-developed-areas/a-summary-of-accessibility-standards-for-federal-outdoor-developed-areas**

[69] United States Access Board. Streets & Sidewalks. **https://www.access-board.gov/guidelines-and-standards/streets-sidewalks**

Flangeway is the term used for the groove between the rail and the pavement edge. The standard flangeway width for commuter and transit at-grade crossings is 2.5 inches and 3 inches for freight railroads. Flangeways are usually wider than bicycle tires and wheelchair casters. For this reason, crossings should be perpendicular; acute angle crossings are not recommended. In addition, a rail-with-trail should cross the railroad where the track is straight. Where the track is curved, sight distance is restricted and the rails may be at different levels.

Figure 21: Approach Grade at At-Grade Crossings



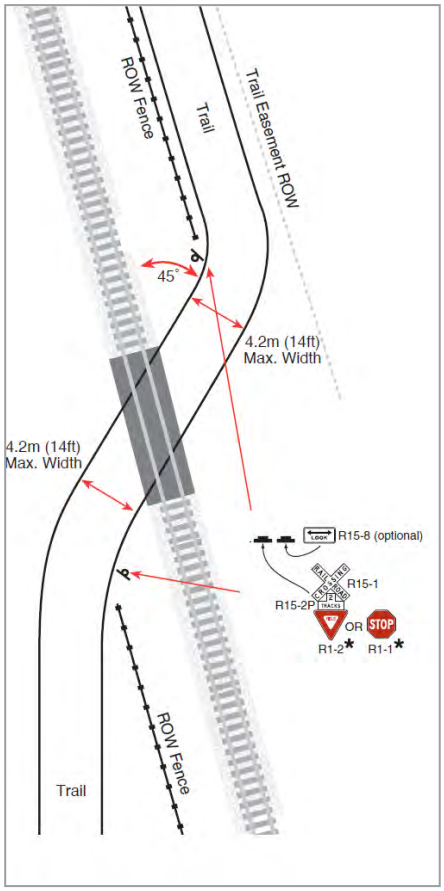


Figure 22: 45° Trail-Rail Crossing

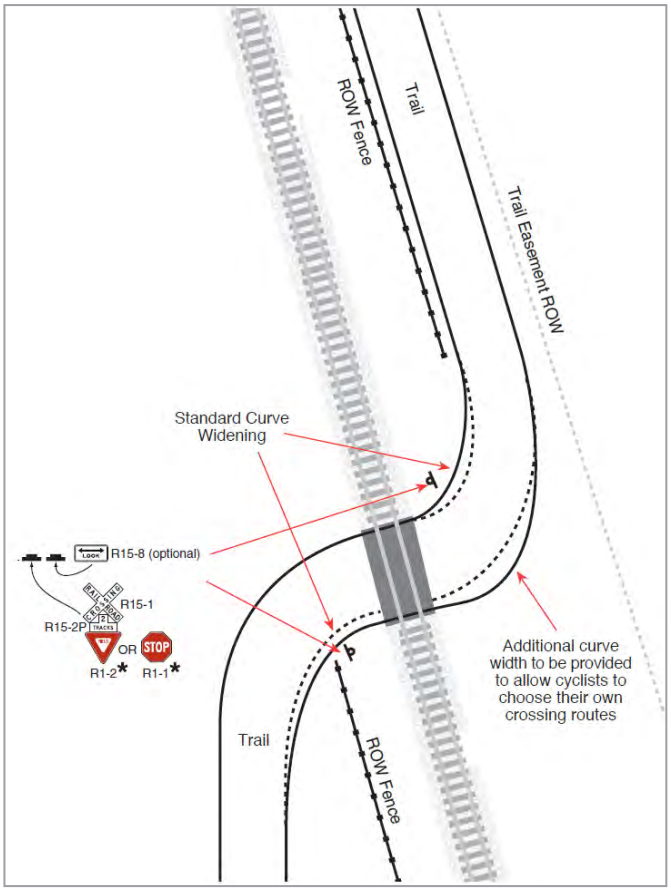


Figure 23: 90° Trail-Rail Crossing

Crossing Surface

The smoothness of the crossing surface has a profound effect on trail users. Sudden bumps and uneven surfaces can cause bicycle riders to lose control and crash and are difficult for wheelchair users to navigate. A crossing surface in poor condition will focus trail user attention on choosing the smoothest path over the crossing, while diverting attention away from warning devices or an approaching train.

The AASHTO Guide notes, "The four most common materials used at grade crossings are concrete, rubber, asphalt, and timber. Concrete performs best, even under wet conditions, as it provides the smoothest ride. Rubber crossings are quite rideable when new, but they are slippery when wet and degrade over time. Asphalt is smooth when first laid, but can heave over time and needs maintenance to prevent a buildup next to the tracks. Timber wears down rapidly and is slippery when wet." (Section 4.12.1, p. 4-38).

Portage Hike and Bike Trail

The Portage Hike and Bike Trail runs for nearly ten miles between Ravenna and Kent in Ohio. The Portage Park District was granted an easement for a trail from the Private Industry Council that owns the adjacent railroad. There had initially been a problem with vehicles driving on the trail, but installing collapsible bollards in the center and on sides where necessary has resolved the issue. There is one crossing where an obtuse angle proved dangerous as bicycle tires got caught in the tracks. The angle of crossing was changed to be more perpendicular to the rail line to mitigate this safety issue.

The Diagnostic Team may require a specific type of crossing surface material that meets slip-resistance standards. Flangeway filler strips, typically made of rubber, are available to help ease the transition from trail to track and reduce the potential for caught wheelchair or bicycle tires. The railroad must approve any such modification to its tracks.

Lighting

The Diagnostic Team may determine a need for lighting along the trail leading up to or at the grade crossing location. Therefore, the team will evaluate and identify the locations of lighting fixtures and the recommended lighting levels. Lighting must be directed towards the trail surface and not pointed towards the locomotive engineer's line of sight.

Warning Devices

Many types of warning devices are available for use at grade crossings. The MUTCD states, "Because of the large number of significant variables to be considered, no single standard system of traffic control devices is universally applicable for all highway-rail grade crossings. The appropriate traffic control system…should be determined by an engineering study involving both the highway agency and the railroad company."[70] The Diagnostic Team will consider variables such as train frequency, train operating characteristics, and volume of trail users to determine the necessary warning devices to be installed.

There are two categories of warning devices: passive and active. Passive warning devices are those that cannot be made to change their function or appearance upon detection of the approach of a train. Existing at-grade trail-rail crossings typically have some sort of passive warning device, such as a railroad crossbuck sign. Active warning devices can change their appearance upon detection of the approach of a train so as to advise trail users of the approach or presence of a train at the crossing. Active warning devices include bells, flashing-light signals, automatic gates, and other devices that are activated by the detection of an approaching train. All warning devices at crossings should be compliant with MUTCD requirements. See Figure 24 for an example of signing and markings for a pathway grade crossing.

[70] Section 8A.02, MUTCD (2009)

Warning Device Examples

At a crossing along the Louisville Loop in Kentucky, trail developers followed MUTCD requirements regarding passive warning devices, including pavement markings and crossbucks immediately in advance of the crossing. MUTCD-compliant warning signs farther in advance of the crossing give trail users adequate distance to stop in the event a train is present or approaching.

Along Michigan's Border-to-Border Trail, there is one at-grade crossing of a rail line owned by Michigan DOT that carries Amtrak service. The crossing is located in a constrained area where an alternative route for the trail was not possible. Active warning devices used for the crossing include gates, flashing lights, and bells.

PASSIVE WARNING DEVICES

The MUTCD requires that all "pathway grade crossings" without active warning devices have a crossbuck assembly in each direction.[71] Refer to the MUTCD for further guidance regarding the location and retro-reflectivity of these signs.

The MUTCD makes the following statements about the use of STOP and YIELD signs at highway-rail grade crossings: "A YIELD sign shall be the default traffic control device for Crossbuck Assemblies on all highway approaches to passive grade crossings unless an engineering study performed by the regulatory agency or highway authority having jurisdiction over the roadway approach determines that a STOP sign is appropriate."[72] This may also apply to trail crossings, as determined by an engineering study that considers the number and speed of trains, sight distances, the collision history of the area, and other factors.

The MUTCD applies to all signals, pavement markings, and traffic control devices, whether on roads or on shared use paths. The MUTCD provides specifications on sign shapes, colors, dimensions, legends, borders, and illumination or retro-reflectivity. Section 2A.06 notes that "State and local highway agencies may develop special word message signs in situations where roadway conditions make it necessary to provide road users with additional regulatory, warning, or guidance information, such as when road users need to be notified of special regulations or warned about a situation that might not be readily apparent."

The MUTCD does not require pavement markings at trail-rail crossings, but states that "If pathway users include those who travel faster than pedestrians, such as bicyclists or skaters, the use of warning signs and pavement markings in advance of the pathway grade crossing should be considered."[73] The MUTCD contains warning signs that can be used to indicate the configuration of the upcoming crossing, or to otherwise warn users of special conditions. MUTCD signs that may be appropriate for rails-with-trails are shown in Figure 25.

If used at trail-rail crossings, pavement markings may include an "X", the letters "RR", and/or a stop bar line. For unpaved trails, consideration should be given to paving the approaches to trail-rail crossings, not only so that appropriate pavement markings can be installed, but also to provide a smooth crossing. If it is not possible to pave the approaches, additional warning devices may be appropriate.

[71] Section 8D.05, MUTCD (2009)

[72] Section 8B.04, MUTCD (2009)

[73] Section 8D.03, MUTCD (2009)

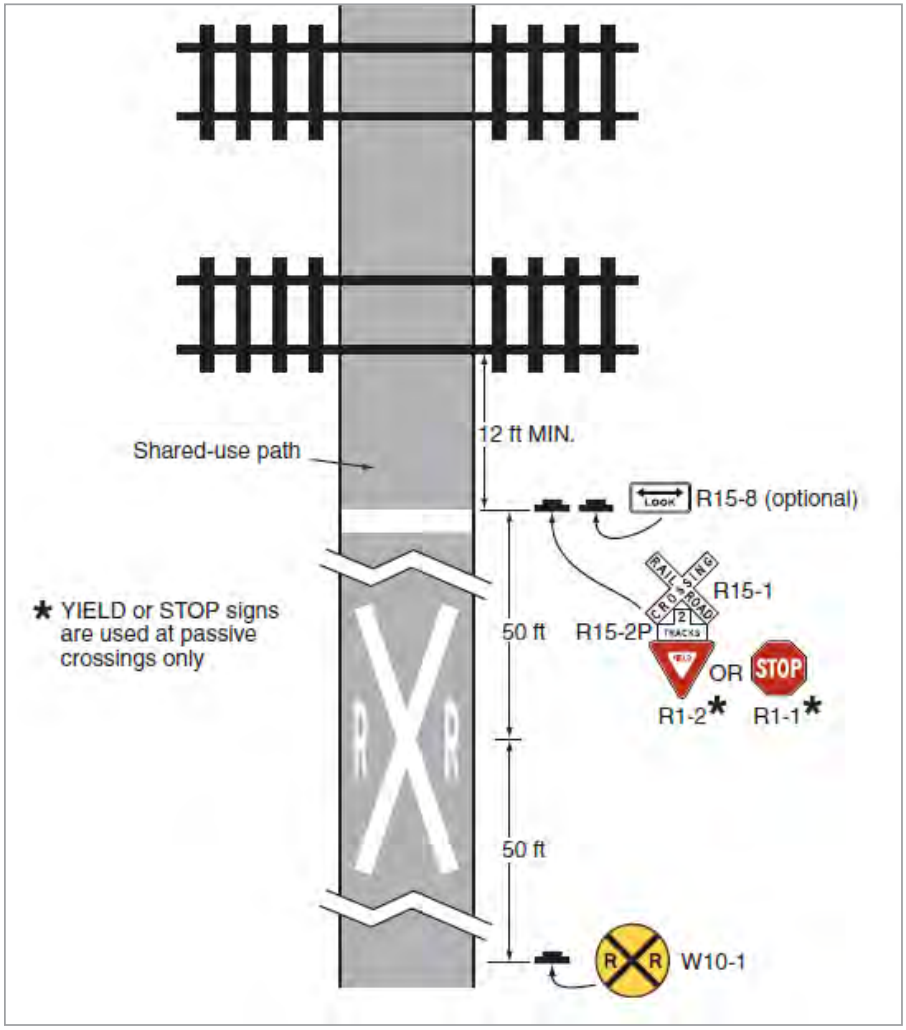
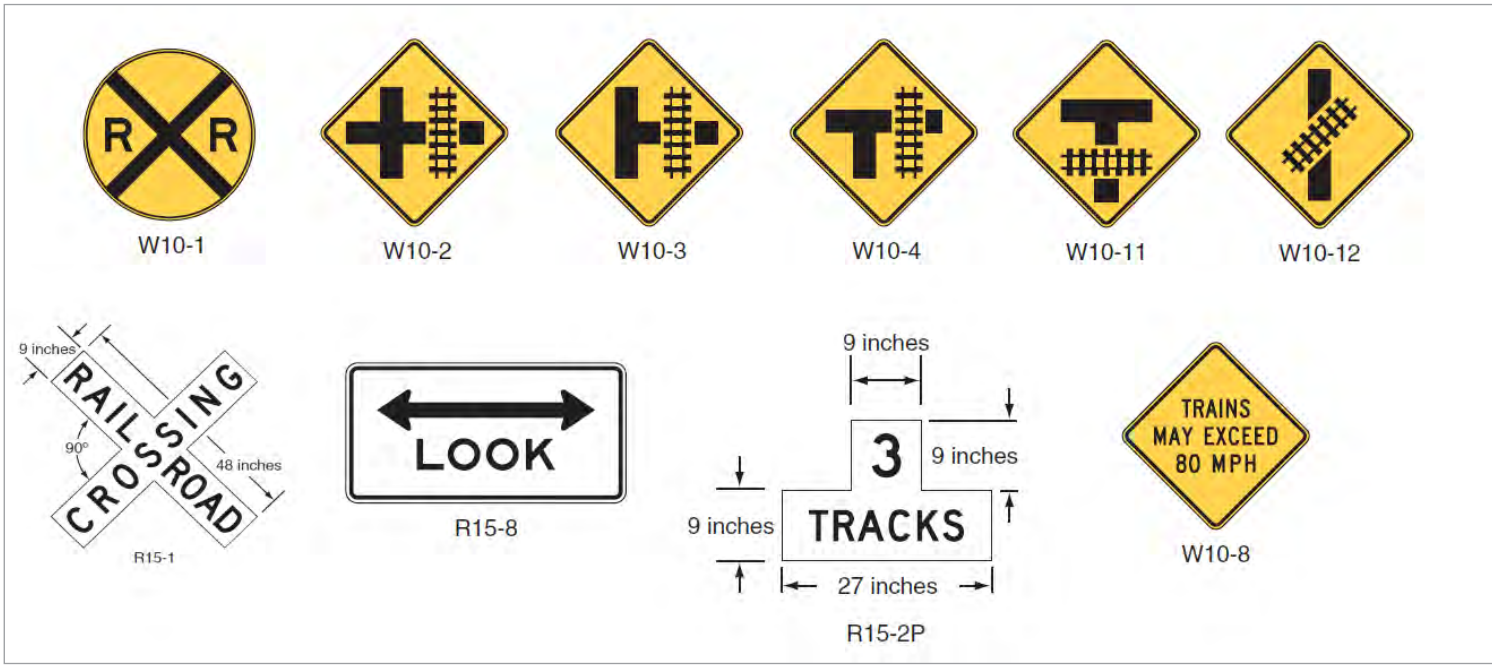


Figure 24: Example of Signing and Markings for a Pathway Grade Crossing (MUTCD Fig. 8D-1)

Figure 25: MUTCD-Approved Railroad Warning Signs that May be Appropriate for Rail-with-Trails. See MUTCD 2009 Figure 8B-1 and Figure 8B-4. See MUTCD 2009 Table 8B-1 for information on grade crossing sign and plaque minimum sizes.



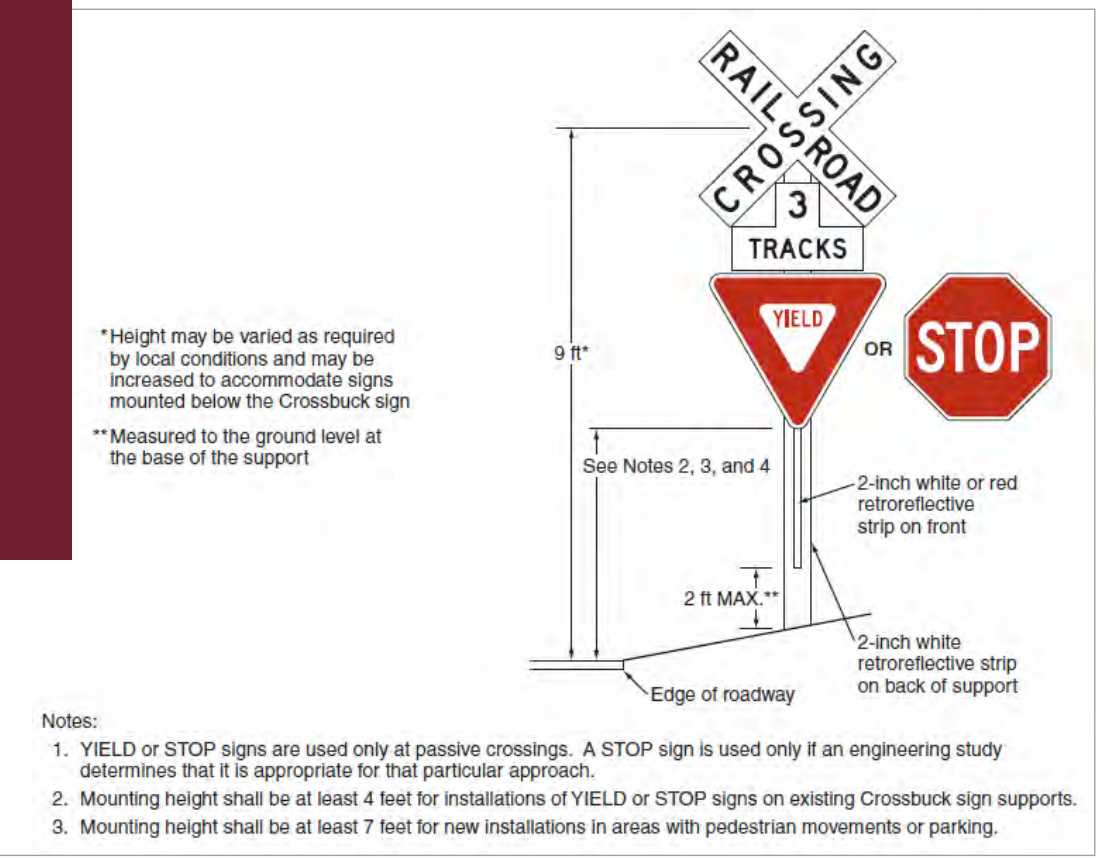


Figure 26: Highway-Rail Crossing (Crossbuck) Sign with a Yield or Stop Sign (MUTCD 2009 Fig. 8B-2)

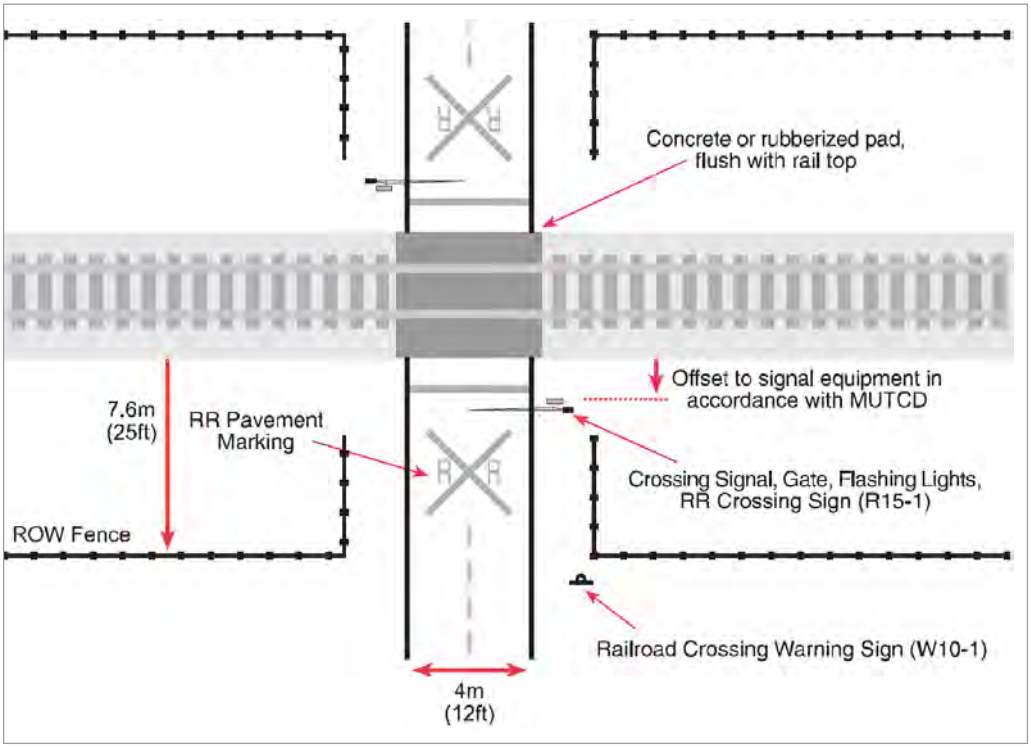


Figure 27: Crossing Equipped with Active Warning Devices and Fences

ACTIVE WARNING DEVICES

Active traffic control systems advise trail users of the approach or presence of a train at railroad crossings. Requirements regarding the appropriate uses, location, and clearance dimensions for active traffic control devices at highway-rail crossings can be found in Chapter 8C of the MUTCD. In addition, Chapter 8D of the MUTCD contains more specific, but less comprehensive, recommendations for pedestrian and bicycle signals at pathway-rail crossings. An additional resource on the selection of traffic control devices is FHWA's *Railroad-Highway Grade Crossing Handbook.*[74]

Flashing light signals combined with swing gates may be appropriate in cases such as these:

- High-speed transit or freight rail,
- Limited sight distance,
- Multiple tracks, and
- Temporary sight obstructions, such as standing freight cars.

It is important to note that the same traffic control devices that generally keep a road user from crossing a track may not prevent a pedestrian or bicyclist from proceeding through a crossing. Pedestrians and bicyclists may be reluctant to stop at barriers and will often find a way to proceed over, under, or around barricades.

[74] https://safety.fhwa.dot.gov/hsip/xings/com_roaduser/fhwasa18040/

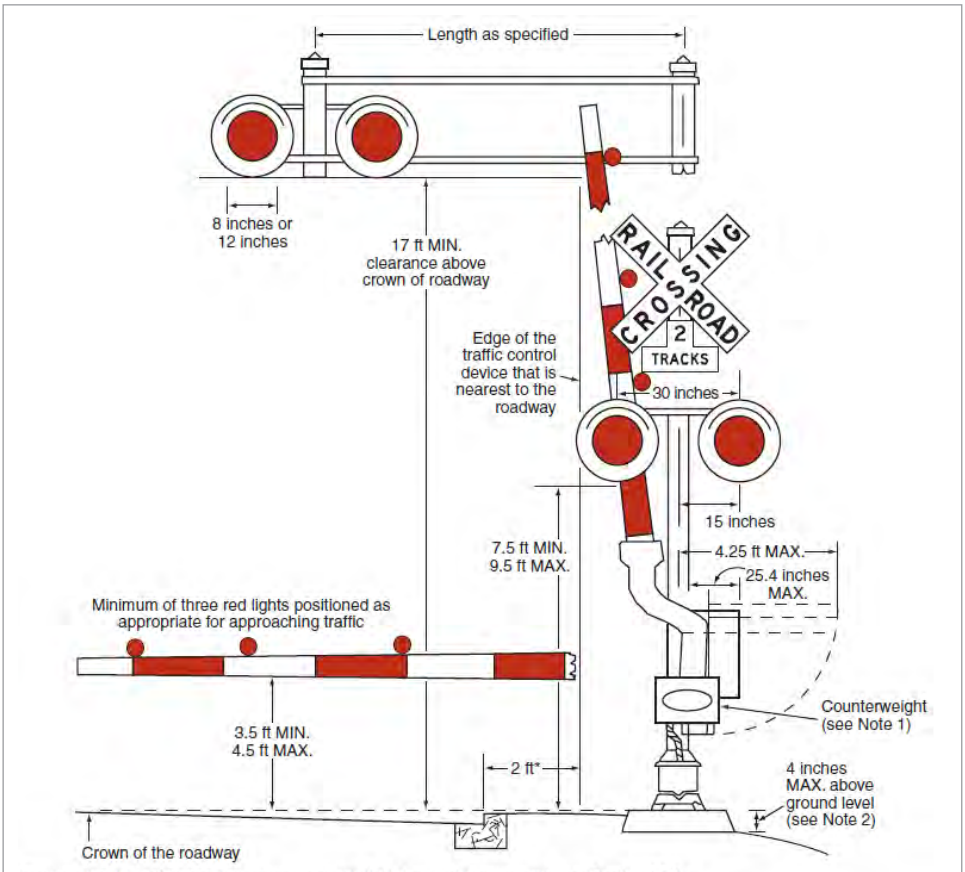


Figure 28: Clearances for Active Traffic Control Devices at Highway-Rail Grade Crossings (MUTCD Fig. 8C-1)

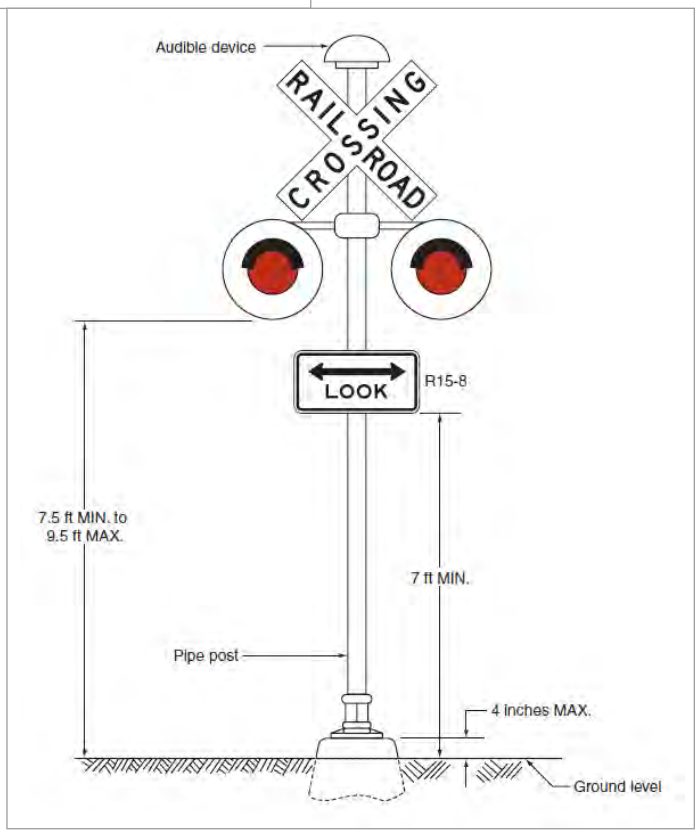


Figure 29: Example of Flashing Light Signal Assembly for Pedestrian Crossings (MUTCD 2009 Fig. 8C-4)

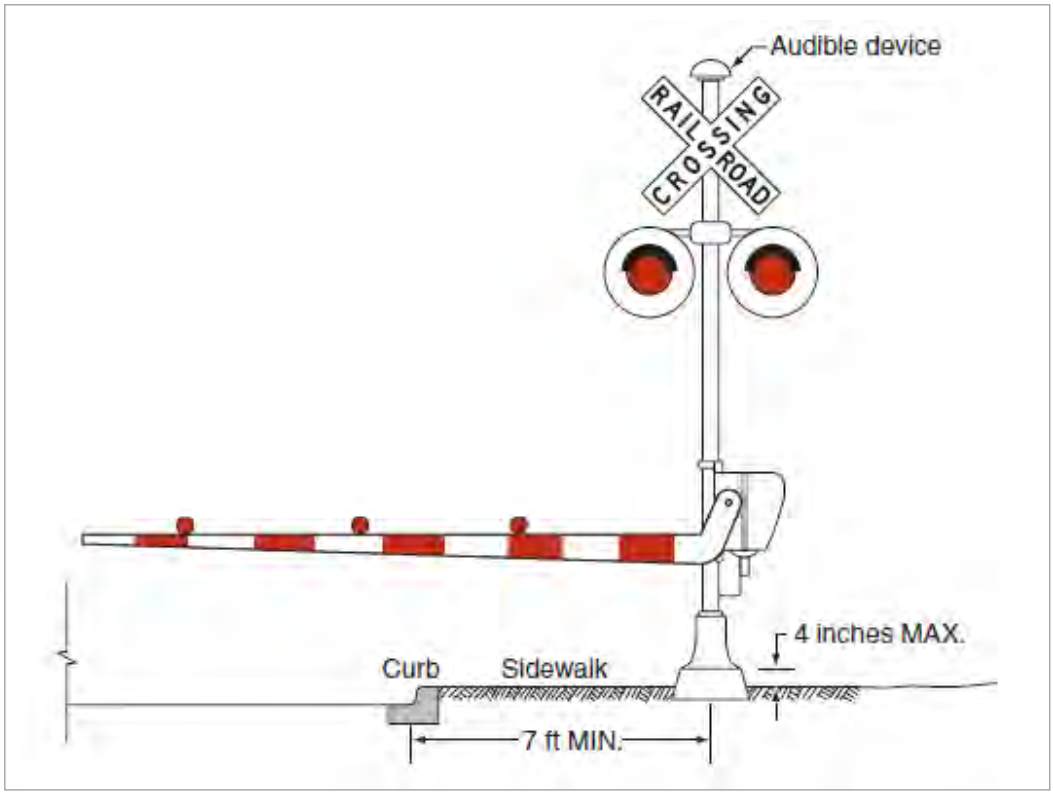


Figure 30: Example of a Shared Pedestrian/Roadway Gate (MUTCD 2009 Fig. 8C-5)

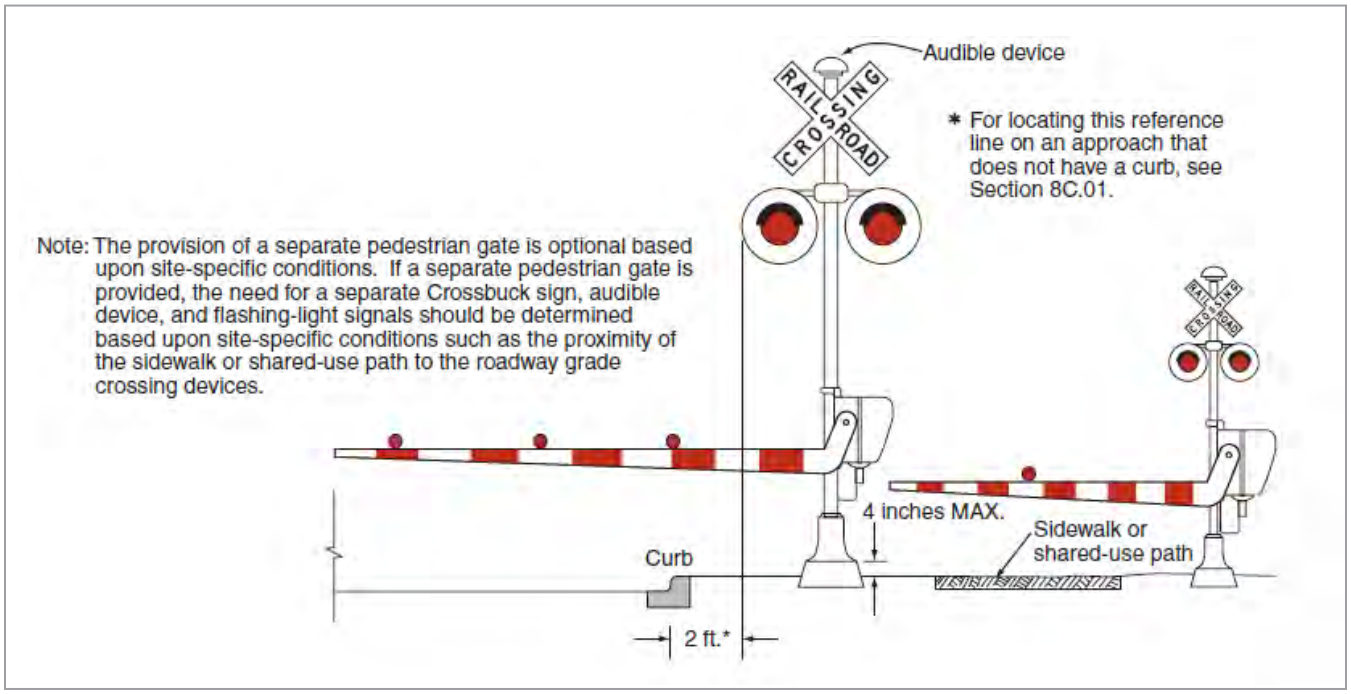
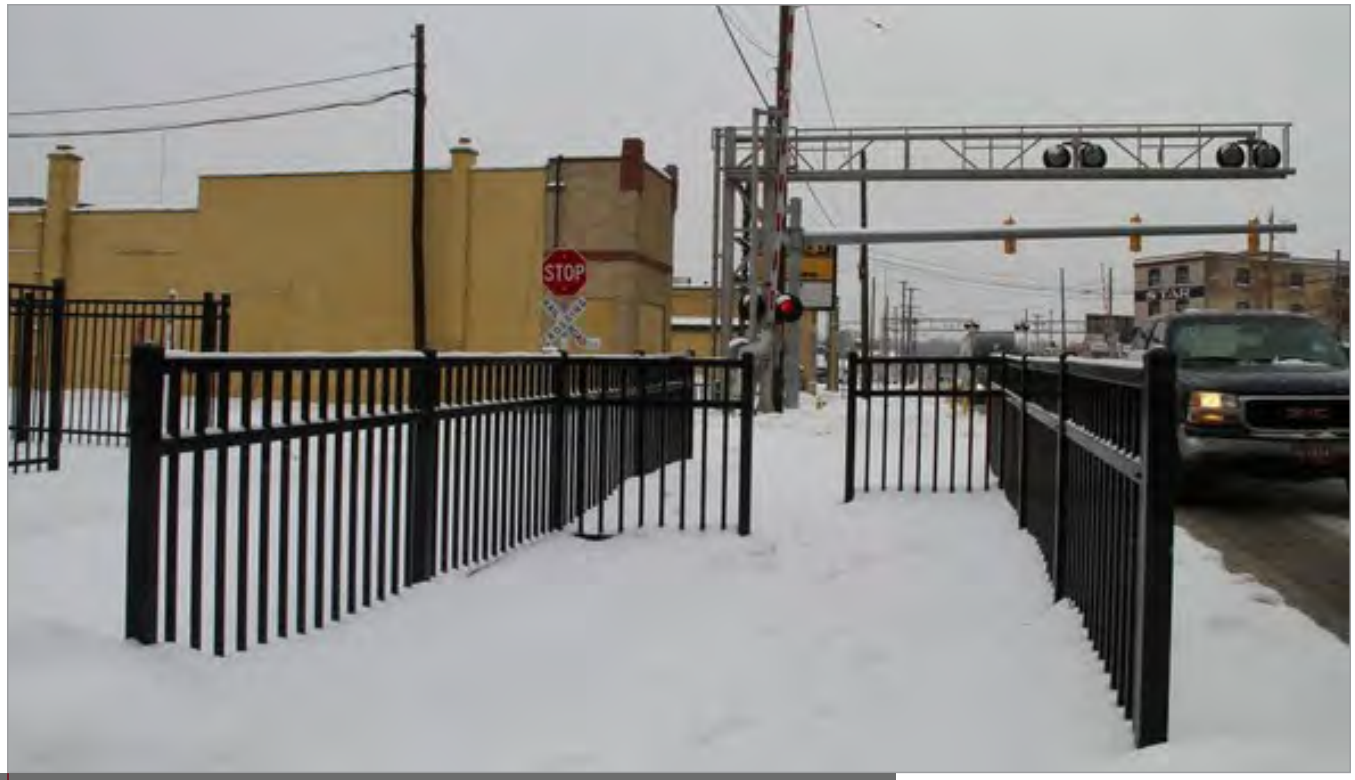


Figure 31: Example of a Separate Pedestrian Gate (MUTCD 2009 Fig. 8C-6)



Kalamazoo River Valley Trail

Along an extension of Michigan's Kalamazoo River Valley Trail that opened in 2017, gates were installed to force bicyclists to dismount at rail crossings where fears had emerged regarding trail users not paying attention as they crossed an in-use rail line. Michigan DOT and Amtrak, who jointly have authority over the crossings, required the installation of the gates, which they also designed

Gates on the Kalamazoo River Valley Trail force bicyclists to dismount before crossing the tracks. (Photo courtesy of Malachi Barrett/MLive.com)

No Train Horn/Quiet Zones

Where a rail-with-trail crosses a track at-grade in quiet zones[75] (areas where trains do not sound their horns in advance of the crossing), additional steps should be taken to mitigate the increased risk that results from the silencing of the horn. New at-grade crossings in quiet zones must include flashing lights and gates. The MUTCD also requires a "NO TRAIN HORN" sign or plaque in each direction at highway-rail grade crossings where a quiet zone has been established;[76] this feature should be installed at trail-rail grade crossings as well. FRA regulations also require that a diagnostic team review be conducted of each trail-rail crossing that will be included within a proposed quiet zone.[77] Establishing an adequate approach angle and sight distance are of the utmost importance, and the diagnostic team may recommend lighting the crossing.

[75] For more information on the Train Horn Rule and Quiet Zones, see **https://www.fra.dot.gov/Page/P0889**.

[76] Section 8B.29, MUTCD (2009).

[77] See 49 CFR § 222.27(b). Trail-rail crossings are considered pedestrian crossings for purposes of 49 CFR Part 222.

Grade-Separated Trail-Rail Crossings

Grade-separated crossings—overpasses and underpasses—can eliminate conflicts at trail-rail crossings by completely separating the trail user from the active rail line, although usually at considerable expense. New grade-separated crossings generally involve the following:

- **Trail Bridge:** Trail bridges should be constructed to meet required minimum train clearances and the structural requirements of the rail corridor. The bridges should have adequate fencing to prevent debris from falling onto the active tracks below.
- **Trail Tunnel:** Installing a trail tunnel, which is often a new box culvert installed under active railroad tracks, requires close coordination with the railroad, as the construction may disrupt railroad operations. Trail tunnels must be constructed to meet the structural requirements determined by the heavy loads of trains above. Fencing should be installed adjacent to the tracks above the tunnel and along the trail's approach to the tunnel to discourage trespassing.
- **Locate the Rail-with-Trail under an Existing Rail Bridge:** Rails-with-trails sometimes pass under existing railroad bridges. In these situations, trail planners must allow for adequate vertical clearance for the rail-with-trail. AASHTO guidelines recommend a vertical clearance of 10 feet, with a minimum of 8 feet of clearance in constrained areas.[78] Railroads will also likely require the installation of a covering over the trail where it passes under the railroad to prevent trail user injury from falling debris. Where the rail-with-trail must run directly over a waterway to pass under the bridge, such as via a boardwalk, additional environmental impacts may result.

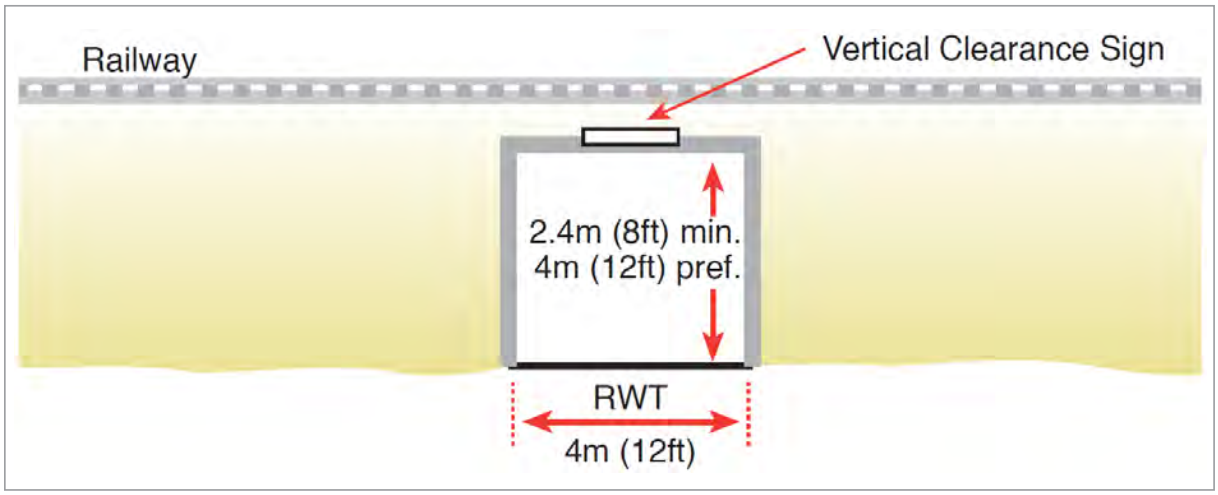


Figure 32: Rail-with-Trail Culvert under Tracks

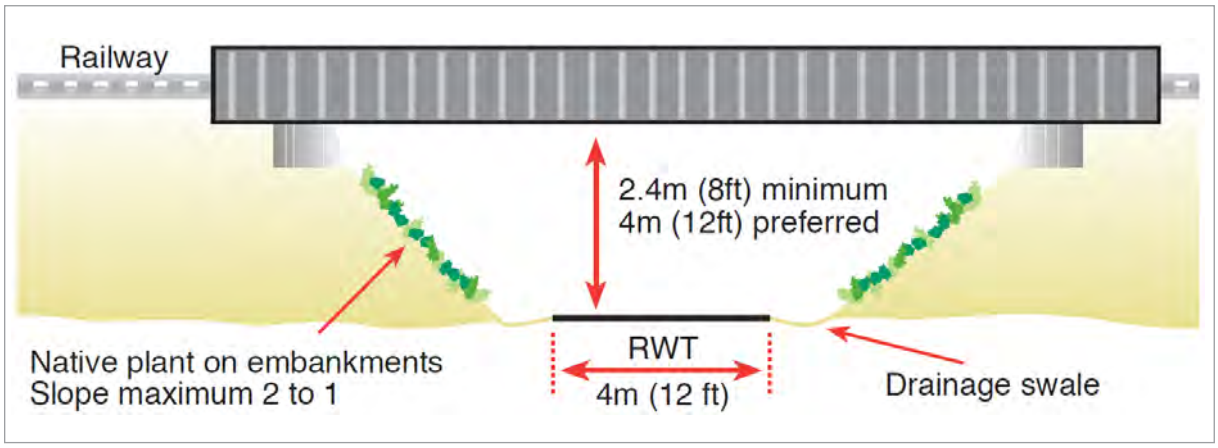


Figure 33: Rail-with-Trail Track Undercrossing

[78] AASHTO Guide for the Development of Bicycle Facilities, 4th Edition.

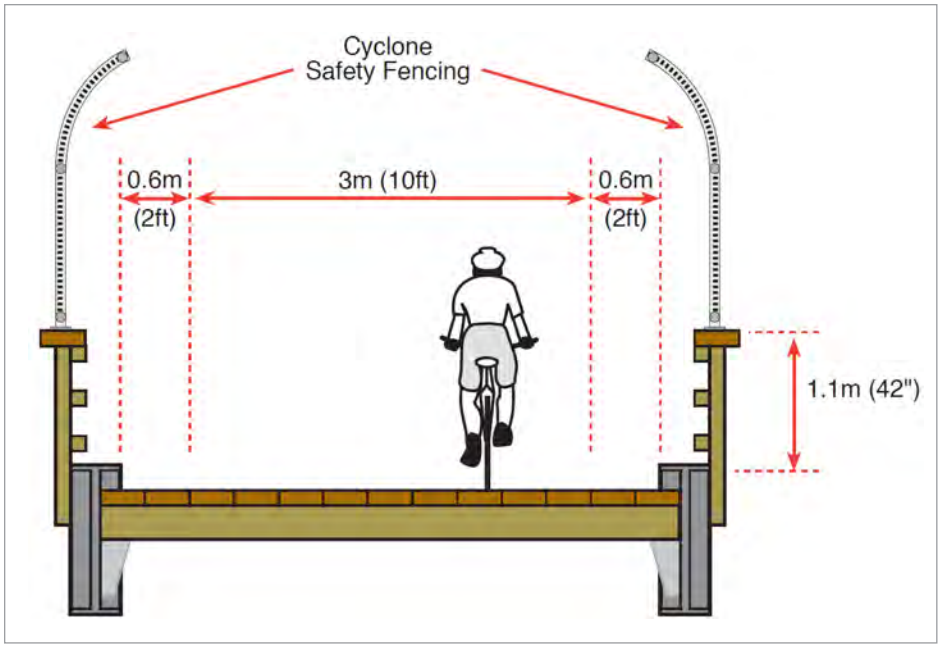


Figure 34: Rail-with-Trail Track Overcrossing

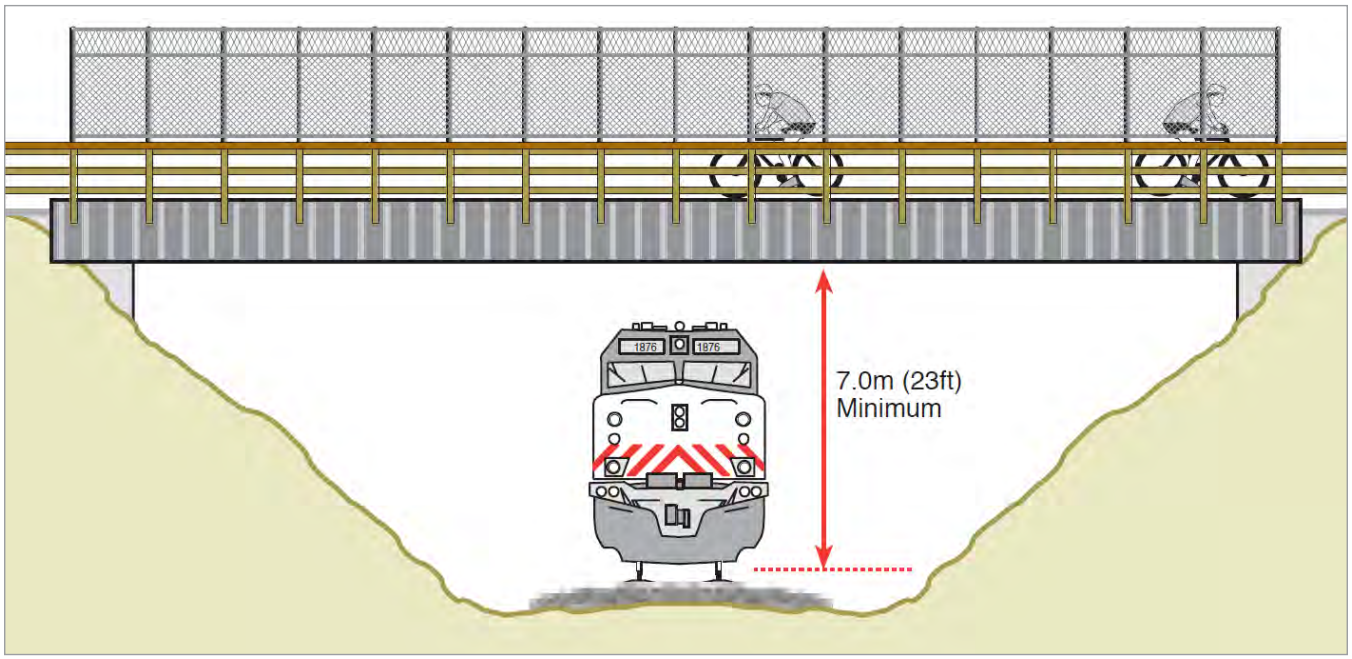


Figure 35: Rail-with-Trail Track Overcrossing (Meets Amtrak-Required Clearance Height for Non-Electrified Track)

Wherever a rail-with-trail bridge or tunnel is constructed, it should be designed to meet the current and future operational needs of the railroad, such as required vertical clearance for double-stacked trains. Dark, isolated underpasses that are hidden from public view can attract illegal activity, so they should be designed to be as short as possible to increase the amount of light available and thus decrease their attractiveness for crime. Adequate artificial lighting is also extremely important. Further, the decision to construct a bridge or underpass should be made in full consideration of the additional maintenance these facilities require.

The AASHTO Guide[79] offers specific design dimensions and lighting guidelines for bridges and tunnels. According to the guide, the minimum clear width of the pathway on a bridge or through a tunnel should be the same as the width of the approach path, with an additional two feet clear area on the sides, if space is available. Therefore, the width of a tunnel or bridge on a 10-foot-wide trail would be 14 feet. The AASHTO Guide recommends a vertical clearance of 10 feet, with a minimum of 8 feet in constrained areas. Larger horizontal and vertical clearances may be needed for certain types of maintenance and emergency vehicles. Future needs for vehicular access should be taken into consideration when designing these structures.

Approach grades for bridges and tunnels on rails-with-trails should follow AASHTO guidelines and be accessible to and usable by individuals with disabilities.

Grade-Separated Trail-Rail Crossing Examples

Trail Bridge: On Wisconsin's Hank Aaron State Trail, Canadian Pacific required a new rail-with-trail bridge to be built 24 feet above the tracks and to have sufficient fencing. The fencing is curved towards the top to prevent objects intentionally or accidentally falling onto the tracks below.

Rail-with-trail under an existing rail bridge: An example of this type of grade-separated trail-rail crossing can be found along the Border-to-Border Trail in Dexter, Michigan. The trail was constructed as a wooden boardwalk over Mill Creek where it passes under the active rail line owned by the Michigan Department of Transportation and operated by Amtrak. Despite the railroad bridge's stone construction, a roof was installed over the trail to protect trail users from falling debris.

Border-to-Border Trail in Dexter, Michigan where the boardwalk portion passes underneath a stone arch railroad bridge. Trail roof can be seen under the bridge on the right. (Photo courtesy of the City of Dexter)

At-Grade Trail-Road Crossings

At-grade crossings between rails-with-trails and roads can be complex areas that require the designer to think from the perspective of all types of users who pass through the intersection: train crews, motorists, bicyclists, and pedestrians. Typically, such crossings require the involvement of both the road agency and the railroad company. Each crossing must be evaluated on a case-by-case basis through engineering analysis.

Trail-road intersections are covered in detail by both the AASHTO Guide and the MUTCD. While these manuals do not specifically recommend solutions for rail-with-trail crossings, they cover basic safety principles that apply to all at-grade trail-road crossings. Variables to consider when designing trail-road intersections include right-of-way assignment, traffic control devices, sight distances, access control, pavement markings, turning movements, traffic volume, speed, and number of lanes.

[79] AASHTO Guide for the Development of Bicycle Facilities, 4th Edition

In 2018, the Transportation Research Record published an article titled *Rails-Next-to-Trails: A Methodology for Selecting Appropriate Safety Treatments at Complex Multimodal Intersections*.[80] The University of Washington researchers propose a methodology for addressing safety issues at locations where rails-with-trails and railroad tracks cross roadways. The methodology addresses the design of the crossing and information to be provided to all users (train crews, motorists, bicyclists, and pedestrians). It is meant to incorporate the professional judgment of the agency evaluating the crossing with a prescriptive approach to designing intersections where rails-with-trails cross roadways.

There are three methods for handling at-grade rail-with-trail-road crossings:

- **Signalized Crossing** (see Figure 36): This is the most costly option, as it involves a reconfiguration of the road and installation of traffic signals and signage. However, it may be appropriate on high-speed, high-volume roadways. The new signal should be coordinated with other nearby signals so as to preclude two contradicting signals being given simultaneously.
- **Unsignalized Crossing** (see Figure 37): Unsignalized crossings, those without traffic signals or other active warning devices, can create safety hazards for trail users and motorists along busier roads, but may be acceptable where sight lines are good and traffic volumes are low.
- **Reroute Trail Users to the Nearest Signalized Intersection** (see Figure 38): This is likely to be the preference of the road agency, as it would not require a new signal or as much new signage. However, depending on the detour distance required for trail users to resume their route and the frequency of such crossings, trail users may be inclined to continue straight instead of crossing at the light, potentially negating the safety benefits of this crossing type (though this can be mitigated with barriers). In cases where the nearest signalized intersection is on the opposite side of the tracks, requiring trail users to cross the tracks twice would pose additional safety risks and should be avoided.

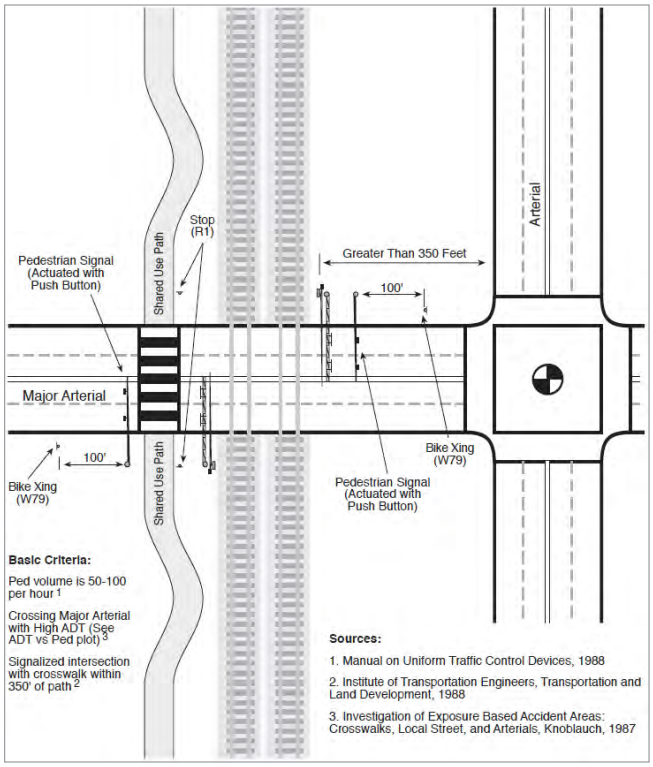


Figure 36: Roadway Crossing Type 1 (Signalized Crossing)

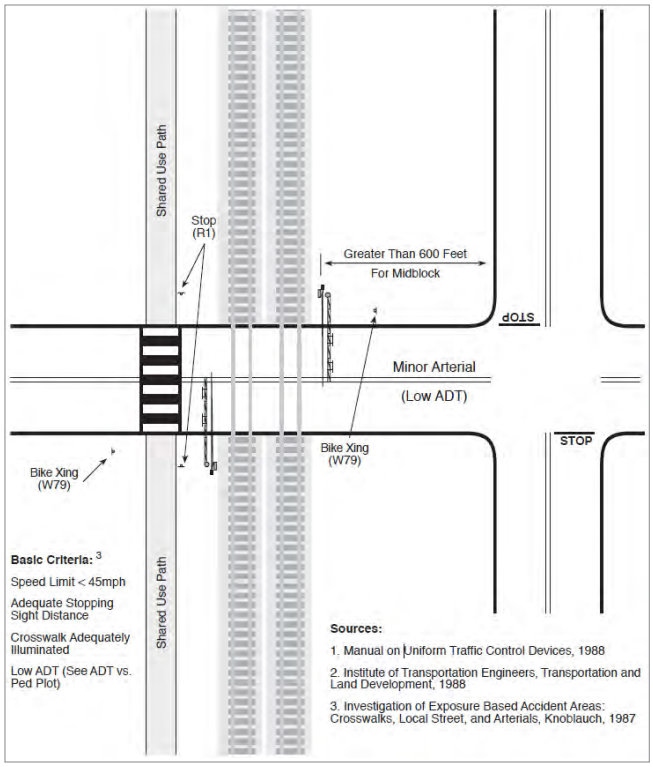


Figure 37: Roadway Crossing Type 2 (Unsignalized Crossing)

[80] *Rails-Next-to-Trails: A Methodology for Selecting Appropriate Safety Treatments at Complex Multimodal Intersections.* 2018. Transportation Research Record, 2672(10), 12–27. **https://doi.org/10.1177/0361198118792763**

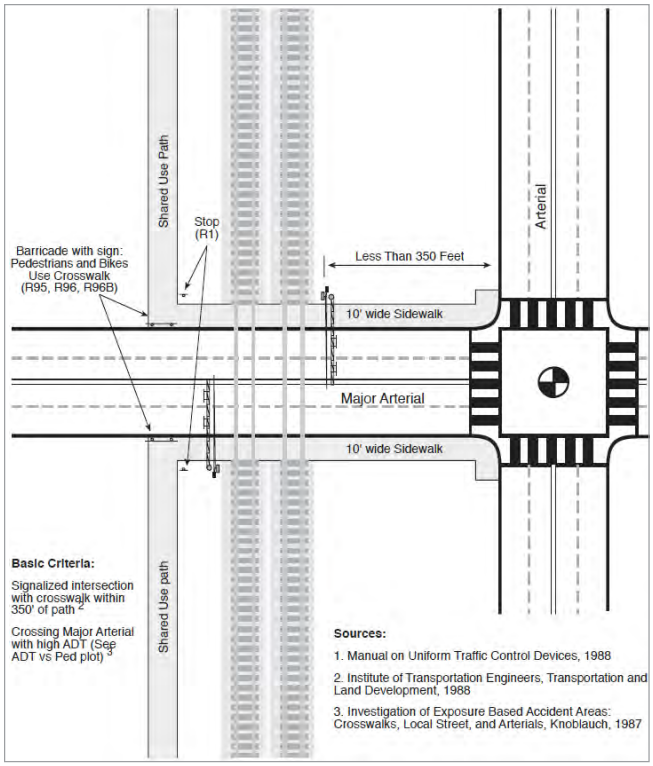


Figure 38: Roadway Crossing Type 3 (Reroute Trail Users to Nearest Signalized Intersection)

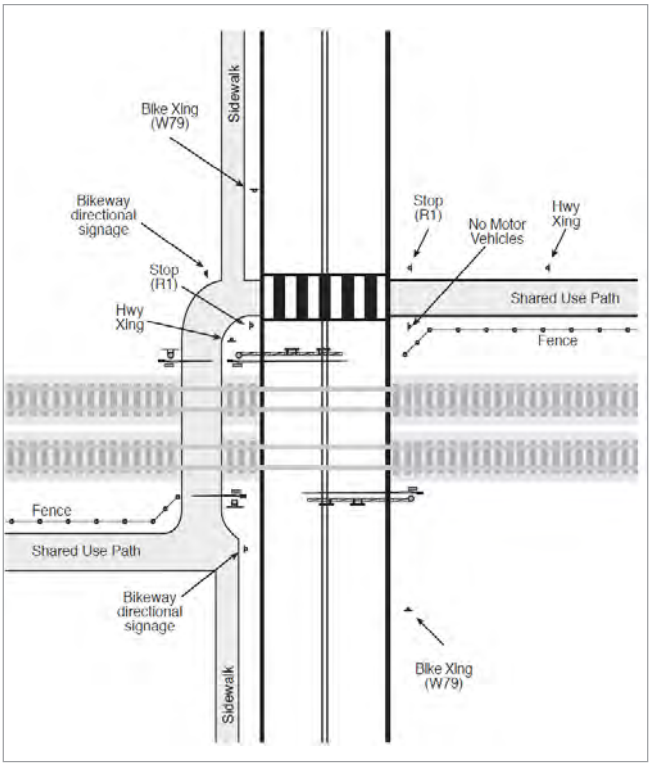


Figure 39: Roadway and Track Crossing

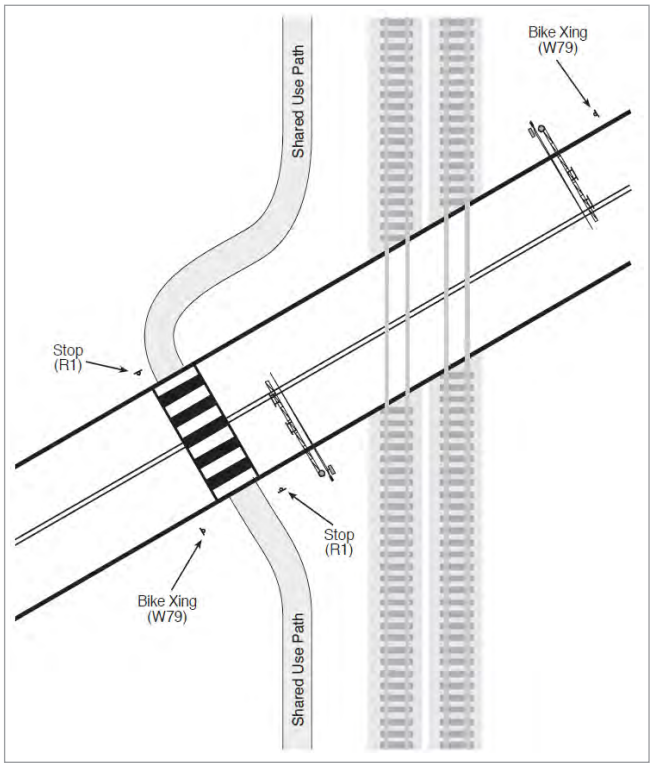


Figure 40: Angled Intersection with Roadway

While new at-grade crossings between trail users and the tracks should be avoided whenever possible, sometimes a rail-with-trail must move to the opposite side of a rail line at a road crossing. This is undesirable, as there will naturally be competition for trail user attention between the successive trail-road and trail-rail crossings, potentially raising safety concerns. If such a crossing must be installed, the passive or active warning devices discussed earlier in this section should be evaluated.

For any of these crossing designs, road users should be warned of both types of crossings (trail-rail and trail-road). Care should be taken to keep warning devices simple and clear; ambiguous and overly complicated signage and pavement markings can distract both motorists and trail users. If a pedestrian-actuated traffic signal is warranted at a mid-block rail-with-trail-road crossing, the traffic signal should be interconnected with the active warning devices at the railroad crossing. This may require interconnection and preemption of the highway traffic signals at any adjacent intersection within 200 feet of the rail-with-trail crossing

If automatic gates are used, they should be placed between the trail-rail crossing and active track(s). Where possible, the stop line on the road should be located behind the trail crosswalk. However, if the crossing is located at too great a distance from the automatic gate, the stop line should be placed in a standard position near the gate, and a DO NOT BLOCK CROSSWALK sign should be used at the trail crossing.

If active warning devices are used, they should make trail users aware of approaching trains. Trail users may either elect to travel straight across the road, or may exit the trail and continue their journey on the roadway. In this scenario, turning movements towards the tracks could be hazardous if the trail user is unable to view active warning devices, or if sight distances are restricted. The angle of approach for these trail users must be considered when placing warning devices. In cases where flashing light signals (post mounted) are used, it is important to locate these devices so that they can be seen by trail users, and to include bells and other audible warning devices to provide additional warning to bicyclists and pedestrians. This is especially true where a rail-with-trail crosses a road and rail line in immediate succession. In these cases, automatic gates should extend across both the road and trail, or a separate gate scaled appropriately for the trail should be installed, as is the case along New Mexico's Santa Fe Rail-Trail, which upgraded their crossing treatments.

At-Grade Trail-Road Crossing Examples

The Montgomery County, Pennsylvania, portion of the Schuylkill River Trail features approximately 45 instances where the trail crosses roads at-grade alongside the adjacent tracks used by NS, Amtrak, and SEPTA (Southeastern Pennsylvania Transportation Authority) regional rail service. Montgomery County hired a consultant to assess 20 of the crossings and develop a standard treatment (signage, pavement markings, gates, and bollards) that will be used as a template for existing and future crossings. Crossings needing improvement will be noted and ultimately upgraded. A specific priority is identifying the safest location for a vehicle to stop at the crossings when a train or trail user is present.

Schuylkill River Trail in Pennsylvania. (Photo courtesy of the Circuit Trail Coalition)

The Oregon DOT has produced a guidebook that suggests appropriate treatments for rail-with-trail crossings at-grade, as the "possible conflicts at intersections within these design parameters are of concern to ODOT."[81] The guidebook's methods and suggested treatments may be useful to trail developers and railroads working to develop or improve a rail-with-trail.

[81] https://www.oregon.gov/ODOT/Programs/ResearchDocuments/SPR794_MultiModalIntersections.pdf

Grade-Separated Trail-Road Crossings

Where a proposed rail-with-trail will cross a major road or highway carrying heavy traffic volumes and/or traffic at high speeds, grade separation should be explored regardless of where the adjacent railroad tracks are located.

Utilities

Railroad corridors provide an ideal, uninterrupted conduit for utility infrastructure. Many types of utilities, including water, sewer, natural gas, electric, and fiber optic, can have their lines buried underground along a railroad corridor, while telecommunications, cable, and electric utilities can run above and across a corridor. While it is not uncommon for a trail to be constructed on top of a subsurface utility, there typically are easement restrictions and requirements that will impact the trail design, location, and feasibility. To avoid redesign costs and future disruptions, involve the proper utility agencies and stakeholders in the early stages of planning.

Most railroads have internal communication systems that can be located underground or on poles within their corridors. Railroads may require trail developers to locate the rail-with-trail far from these communications systems, or relocate them per the railroad's specification.

Rails-with-trails may be constructed with buried conduit under or adjacent to the path to serve existing or future utilities. Conduit and auxiliary equipment (e.g., repeater boxes) should not present slip, trip, or fall opportunities, visual obstacles, or other hazards, nor should it interfere with railroad operations or maintenance. Railroad, trail developer, and utility representatives should meet to discuss any concerns or requirements related to the adjacent rail use.

Schuylkill River Trail

In some cases, a parallel utility line may provide the ideal, off-corridor opportunity for rail-with-trail development. The Valley Forge-to-Philadelphia portion of Pennsylvania's Schuylkill River Trail, for example, is built on an easement granted by a utility company that parallels a SEPTA rail transit line. Their agreement requires the trail manager to perform corridor maintenance, such as mowing and trash pickup. The utility also requires them to remain at least 15 feet from the power transmission structures.

Schuylkill River Trail along SEPTA transit line with power transmission structures. (Photo courtesy of Google)

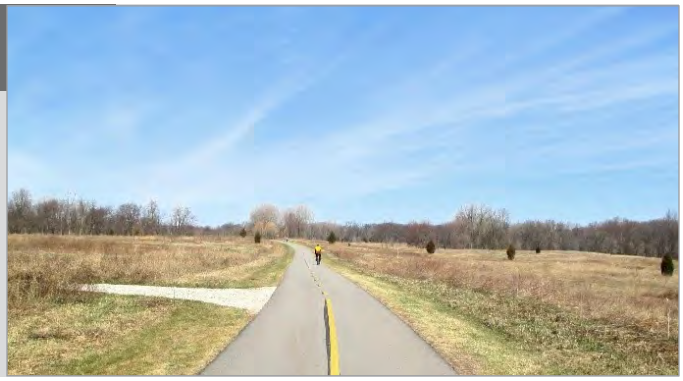
Accommodating Future Tracks and Sidings

The possible addition of new tracks or sidings will have a direct impact on rail-with-trail design and alignment. In many cases, a railroad may not have specific expansions plans, but may want to reserve room to expand in the future if it is needed. In other cases, a public transportation agency may already have plans to use part of the corridor for future transit or commuter rail service. Where specific plans for additional tracks exist, the rail-with-trail project could be deemed infeasible within the rail right-of-way.

In all cases, a rail-with-trail should be designed and located so as not to preclude potential future rail expansion. Where corridor width, topography, and other factors allow, the rail-with-trail should be located on the opposite side of the proposed track or siding expansion. Alternatively, the rail-with-trail should be located at the extreme edge of the rail right-of-way to allow sufficient room for additional tracks.

Border-to-Border Trail

In the case of the Border-to-Border Trail in Washtenaw County, Michigan, Michigan DOT had developed plans to upgrade the tracks for use as a higher-speed passenger rail corridor. The design for the new section of the Border-to-Border Trail includes ample room for the existing track, a second track, and a service road.



The Border-to-Border Trail in Michigan (Photo courtesy of trailink.com/dgoodwin).

Access to Stations

As noted previously, rails-with-trails along passenger rail lines can be complementary to the rail system. When designed effectively, rails-with-trails can enhance passenger access to rail and transit systems and can increase trail access to users.

Access to rail and transit stations may be built into the trail design, taking into account both accessibility and safety. If the entrance or exit of a rail station is immediately connected to the trail, proper signs should be installed near the stations to notify trail users of pedestrian traffic exiting stations, and vice versa. To facilitate multimodal transportation, and in accordance with FTA recommendations,[82] bicycle parking should be installed near the stations in coordination with the rail or public transportation agency.

Where rail stations are located on the opposite side of the tracks from the trail, a tunnel or bridge could be constructed to provide safe access. In some cases, trail-rail grade crossings to facilitate access to the station may be appropriate. Such crossings must follow accessibility and MUTCD requirements.

Metropolitan Branch Trail

In Washington, DC, a bicycle/pedestrian bridge was installed over active Amtrak, CSX, and regional rail tracks to provide direct access from the Metropolitan Branch Trail to the Washington Metro's Rhode Island Avenue–Brentwood station. In this case, strict construction guidelines from all the rail operators had to be followed, and the bridge had to be built high enough to accommodate double-stack trains. Similarly stringent guidelines and construction processes would likely need to be followed for any new bridge or tunnel crossing of an active rail line to reach a transit station.

Metropolitan Branch Trail in Washington DC, with bridge over railroad connecting Metro station to trail. (Photo courtesy of Google)

[82] Federal Transit Administration. 2017. Manual on Pedestrian and Bicycle Connections to Transit. **https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/64496/ftareportno0111.pdf**

Railroad Bridges

Railroad bridges have the potential to loom large as a challenge to the overall feasibility of a rail-with-trail project. Virtually all railroad corridors will have at least some minor bridges or culverts, either as part of the local drainage system or the local network of streams and creeks. In some cases, there will be longer bridges over roads, rivers, or canyons. Railroads are generally opposed to sharing existing rail bridges with trails, whether or not there is space to accommodate a trail. In almost all cases, railroad bridges are not designed to accommodate pedestrians or cyclists and thus represent a real safety hazard to trespassers and a major challenge to overcome for successful rail-with-trail development.

If a rail-with-trail project includes the construction of a new bridge over a waterway, trail planners will have to consider the potential environmental impacts on the water below. Trail planners will also need to comply with FHWA's floodplain regulation (23 CFR 650 Subpart A) during planning, environmental review, design, and construction. These environmental considerations might affect the feasibility of the entire project. Regular consultation with and permitting from local, State, and Federal agencies will likely be required, potentially adding significant time and expense to the rail-with-trail project.

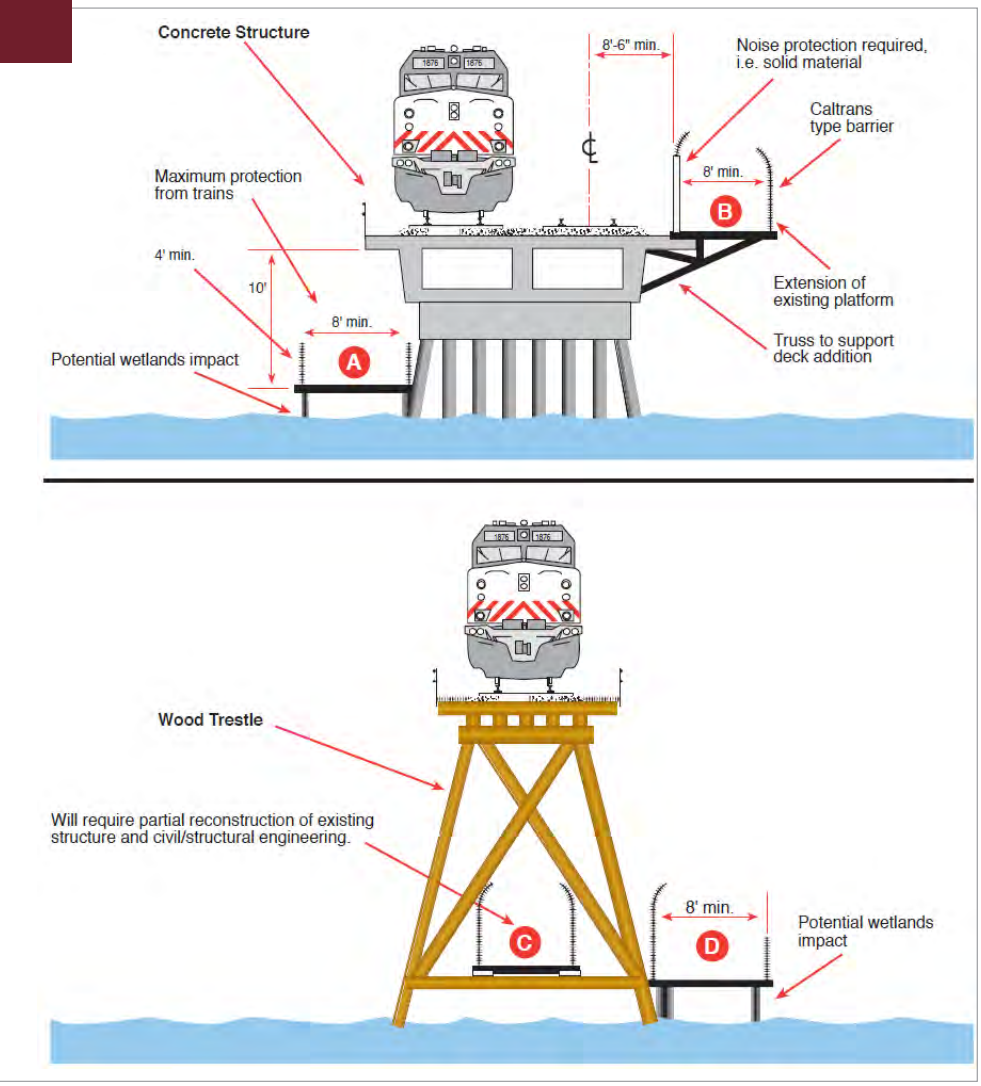


Figure 41: Trestle Options

Meanwhile, a new bridge over a road or canyon may have high costs, and may, in some cases, represent the single greatest cost on the project. There will be additional permits to secure, and for bridges over roads, construction hours will likely be limited to nighttime or other non-commuting hours, potentially adding time and expense to the project.

Rail-with-trail bridges constructed over existing roads, trails, or bikeways pose a special problem. Neighboring residents and trail users may want access to the new rail-with-trail from the roadway, requiring construction of ramps that must meet accessible gradient standards. These access points can add considerable expense to any project.

If the railroad will allow a rail-with-trail to be incorporated into an existing rail bridge, the rail-with-trail must not impede bridge maintenance and inspection access. Engineers should be consulted during the planning and design phases to ensure load allowances will not be exceeded when the new trail opens. The trail planner must also be prepared to assume maintenance and liability protection for the new combined structure. In some cases, accessible ramps may also need to be constructed to route the trail onto the existing bridge.

Some of the potential solutions for rails-with-trails on corridors with bridges include:

- **Abutments:** In some cases, unused abutments on an existing structure that once carried a parallel track may be available to repurpose for trail use.
- **Unused Bridge Space:** Using space on the bridge and trestle that is not used for planned for use by rail traffic or operations may be an option. However, securing the desired trail width and railroad permission for such an arrangement may prove difficult.
- **Cantilever:** Adding a cantilever that is attached in some fashion to the existing bridge may be less expensive than constructing a completely new bridge, but the rail-with-trail developer may be required to make structural integrity improvements to the existing bridge.
- **New Structure:** Constructing a new structure may be very expensive and may have negative environmental impacts if it requires construction in a riparian or other habitat. Safety benefits may be most apparent from construction of a new bridge, rather than using an existing structure or installing an at-grade road crossing.

A trail bridge was built parallel to the rail bridge on the White River Greenway in Indiana. (Photo courtesy of the Rails-to-Trails Conservancy).

Tunnels

Like bridges, rail tunnels can be one of the most significant physical challenges to overcome for successful rail-with-trail development. Tunnels were generally built by railroads only if the topography necessitated it; these same topographical extremes can make rerouting an otherwise parallel trail around a railroad tunnel nearly impossible.

Single-track tunnels shared by both trains and trail users should be avoided, although in rare cases, excursion lines or other rail carriers with very limited service may be willing to consider it.

Where a single-track tunnel exists along a proposed rail-with-trail, lengthy detours may be the only option. Nearby roads can be signed as an on-road detour, or where wide enough, road right-of-way could be redesignated for bicycle and pedestrian use. Occasionally, nearby out-of-use railroad corridors may be available. Rarer still is finding an alternate route around the tunnel not currently used as a transportation corridor that meets gentle grade requirements. A waterway near the rail line, such as a stream or river, may be one such option.

Heritage Rail Trail County Park

There is a shared rail-with-trail single-track tunnel is along Heritage Rail Trail County Park in Pennsylvania, where the trail narrows significantly along the track used by steam-powered excursion trains. Trail users must use caution and yield when trains are approaching the historic Howard Tunnel, as there are no passive or active warning devices present.

The Howard Tunnel on the Heritage Rail Trail County Park, Pennsylvania (Photo courtesy of Wikimedia Commons/Onore Baka Sama)

In select cases, the topography may be gentle enough to allow for the trail to ascend and descend over the mouth of the tunnel. Rail-with-trail planners must ensure the trail's ascent and descent meet accessible grade requirements, and the trail should be wider, particularly around curves, to help counter the effects of cyclists gaining speed on their descent.

Metropolitan Branch Trail

The next planned phase of the Metropolitan Branch Trail in Washington, DC, will ascend and descend over a Washington Metro rail tunnel at Fort Totten station. Paralleling the transit system's Red Line heading north, the trail will ascend the mouth of the perpendicular Metro tunnel, then descend to a non-rail-with-trail route on the other side. On the trail's descent, a retaining wall will be constructed to hold the hill in place.

The Metropolitan Branch Train will cross the Green/Yellow line Metro tunnel on the west side of the Metro station and then parrellels the Red Line Metro tracks (Image courtesy of the District Department of Transportation)

Multitrack tunnels where one or more of the tracks are out of service or there is ample space adjacent to the tracks may be able to accommodate dual trail and rail uses, although such an arrangement is rare. Similar rail-with-trail tunnel co-use would need to consider and budget for appropriate separation and ventilation techniques as well as lighting and other features standard in more traditional trail tunnels.

Cal Park Hill Tunnel

In Marin County, California, the Cal Park Hill Tunnel was designed to accommodate both the future Sonoma-Marin Area Rail Transit commuter line and the SMART Pathway in a former freight rail tunnel. Because the trail is so close to the rail line through the tunnel, a floor-to-ceiling concrete wall separates the two, while the trail portion is also ventilated separately from the rail half to protect trail users from the train's diesel emissions.

Where a new rail-with-trail is constructed in tandem with a new rail line, tunnel co-use is easier to accomplish, as adequate width, ventilation, and safety measures can be factored into the tunnel design. Most commonly, these shared tunnels are developed for transit (more specifically, light rail) use.

The shared-use Cal Park Hill Tunnel along the SMART commuter rail line in California (Photo courtesy of the Marin Independent Journal)

Capital Crescent Trail

One such example is a future tunnel in downtown Bethesda, Maryland, that will accommodate both the planned Purple Line light rail and a future extension of the Capital Crescent Trail. An existing rail-trail tunnel under a commercial building was deemed to be too narrow to accommodate both the transit line and upgraded trail, so an agreement was reached with the property owner to vacate and rebuild with a wider tunnel underneath (in exchange for higher density and other benefits). Design and construction of the new building and wider tunnel are being coordinated with the Maryland Transit Administration, the trail and transit project manager.

The Capital Crescent Trail passes under the road above and alongside disused tracks. The trail extension will parallel active tracks in a tunnel such as this. (Photo courtesy of trailink.com/barry ladwig)

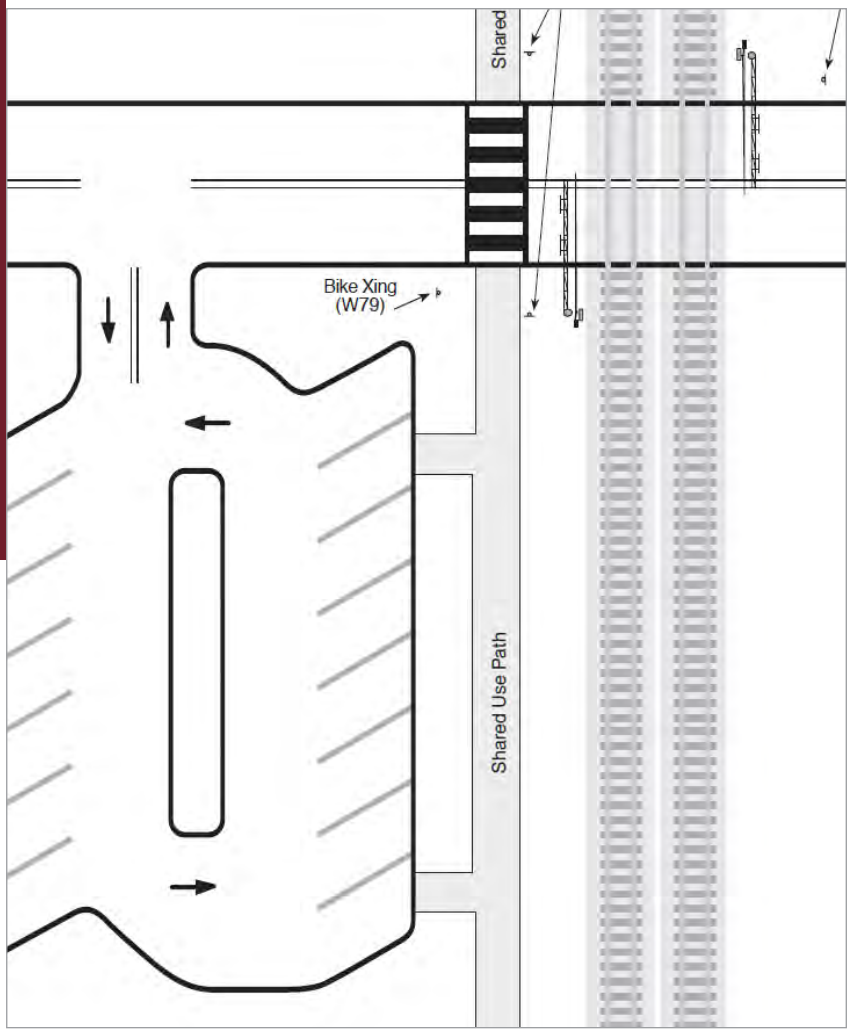


Figure 42: Trailhead and Parking Design

Trailheads and Parking Areas

As with any trail, a new rail-with-trail will attract locals and visitors alike to drive and park near the facility, potentially impacting local neighborhoods. To avoid additional crossings over the active rail line, rail-with-trail design should locate trailheads, parking areas, restrooms, and other facilities on the same side of the tracks as the trail.

Drainage

Railroad corridors are constructed with both lateral and cross roadbed drainage to keep water away from the tracks and ballast structure. Lateral drainage consists of the ditches seen parallel to most tracks and ballast, which helps direct water into natural or built waterways. Cross-roadbed drainage pipes are used to connect lateral drainage ditches via a connection under the tracks.

Maintaining the integrity of the railroad drainage system is of paramount importance for any rail-with-trail design.[83] If a rail-with-trail is planned for construction where there is an existing lateral drainage ditch or swale, a new drainage system must be designed. Rail-with-trail planners should coordinate with the railroad or rail corridor owner throughout the planning and design process, even if the proposed trail is adjacent to railroad property.

Maintenance practices of the railroad can also negatively affect drainage along the trail, especially in areas where the existing railroad drainage system has deteriorated or is otherwise in poor shape. Examining the existing railroad drainage system and observing railroad maintenance practices during the rail-with-trail planning phase could significantly benefit the trail long after it opens.

Failure to adequately address drainage can be costly for a trail manager. In addition, rail-with-trail developers must also consider the impact the trail's surface will have on local water runoff; the impact will be higher with a paved trail. Additionally, if any action is conducted within the base floodplain, FHWA's floodplain regulation (23 CFR Part 650 Subpart A) will also apply.

H.U.M. Trail

The H.U.M. Trail in McHenry County, Illinois, was constructed without adequate improvements to an existing railroad drainage ditch. As a result, recurrent flooding on the trail is a headache for both trail management and users. In 2007, heavy rainfall caused severe damage to the trail that required it to be closed for several months for reconstruction.

[83] FRA's regulation on drainage is found at 49 CFR § 213.33.

Lighting

As with all trails, lighting a rail-with-trail is dependent on a variety of factors, including cost to install, maintain, and operate; whether the trail will be used in the winter and low-light hours; and potential impact on neighbors. Many trail managers elect to only illuminate their trail at grade crossings and undercrossings, where lighting is a matter of safety and visibility, particularly if the rail-with-trail is closed at night.

Schuylkill River Trail

Along the Schuylkill River Trail in Berks County, Pennsylvania, the trail manager notes that the grade on the track has increased over time, leading to large flows of water inundating the trail during rain.

Trail developers should take into account lighting impacts on train operation and visibility for any crossing of railroad tracks. One innovative pathway lighting concept that may be considered is to have lighting activated by motion detectors, so that the trail is illuminated while people approach and a few minutes after they pass, but not for the entire night.

Signage and Markings

Prominent signing at trailheads and along the trail aimed at deterring users away from the railroad tracks may be desired or required. In many cases, existing "No Trespassing" signage posted by the railroad prior to rail-with-trail development may be sufficient. Where such signage does not already exist, railroads may require its installation at a set spacing, such as 500 feet. Adequate signage is a necessity at trail-rail crossings—see Chapter 8D of the MUTCD for more information.

Equestrian Considerations

Due to horses' lack of experience near railroads, instinctual flight behavior, and general wariness of new and potentially challenging situations, specific design considerations should be made when planning for equestrian use on rails-with-trails.

Trail width is an overriding design issue when considering equestrian use on rails-with-trails. Separate pathway treads dedicated solely or primarily for equestrian use are a common feature of many trails that allow horses. Narrow railroad rights-of-way that afford width for only a single paved trail, or that provide inadequate shy distance for horses frightened by nearby or oncoming trains, are not appropriate candidates for accommodation of equestrian use.

Some equestrian users advocate fences of sufficient height to prevent horses jumping them when startled or frightened; however, this concern should be balanced with the need for visibility of trains for both horses and riders. Horses that cannot see an oncoming or approaching train will experience greater fear and confusion than if they are able to see and identify the source of noise.

Lighting on the Cedar Lake Trail in Minnesota. (Photo courtesy of the Rails-to-Trails Conservancy)

Bridges require additional considerations. Many horses are frightened by bridges and other elevated environments, particularly lattice or perforated bridges that allow the animal a view of the ground substantially below the bridge deck. Most horses are not accustomed to this environment and will respond unpredictably with potentially negative consequences. One possible solution where a bridge low to the ground crosses a c onsistently shallow waterway is to bypass the bridge altogether and allow equestrian users to cross the water itself. For such crossings, rail-with-trail planners would need to secure approval from any agency that owns, manages, or regulates the waterway, as well as perform a careful analysis of the risks and benefits to equestrian users. Signage clearly indicating the crossing type in advance of the crossing and at trailheads also should be developed and installed.

A sign on the Thun Trail in Pennsylvania explaining that bicycles should yield to pedestrians and horses, and pedestrians should also yield to horses. (Photo courtesy of traillink/jmcginnis12)

Denton Branch Rail Trail in Texas. (Photo courtesy of Jake King/Denton Record-Chronicle)

Section VII: Construction, Operations, and Maintenance

Close coordination among stakeholders during the construction, maintenance, and operation of rails-with-trails is important to ensure that the trail continues to meet the needs of its users while addressing the safety and security requirements of the railroads. Once open, a rail-with-trail should minimize impacts on the adjacent railroad while offering a safe experience for both trail users and railroad operators.

This section describes effective practices related to the construction, operation, and maintenance of rail-with-trail facilities.

Overview of Construction, Operations, and Maintenance Effective Practices

Effective strategies for constructing, operating, and maintaining rails-with-trails include:

- **Construction Coordination:** Because of the trail's proximity to active rail lines, planning for the construction of a rail-with-trail should be done in coordination with the railroad owner and operator(s). Trail developers should engage railroads as early as possible so that their feedback can be incorporated into a detailed plan for the trail construction phasing and overall construction schedule.
- **Railroad Requirements:** When engaging in construction activities, the trail developer will need to coordinate with the adjacent railroads to address issues related to public safety, potential impact on operations, and protection of rail facilities.
- **Trail Maintenance:** The trail manager should have a comprehensive operations and management plan that details the procedures and responsibilities for both the railroad and trail manager. The plan should include:
  - » Trail closure procedures and details for removing and reinstalling fences or other barriers, including identification of the entity responsible (and any compensation to be provided), if the trail is damaged or destroyed during rail maintenance activities, and
  - » Defined roles for maintaining vegetation, including how often it is maintained and any shared responsibilities.
- **Education:** The trail manager should consult the railroad to determine whether trail user education related to the adjacent railroad activities is necessary. In many cases, railroads and trail developers may agree that signage, adequate setback, and

separation between the trail and tracks is sufficient. If more active education is desired or required, the trail developer could conduct online or in-person safety trainings, safety briefings in advance of organized walks, runs, or rides, or direct outreach to schools and workplaces.

- **Security, Crime, and Vandalism:** In many cases, the presence of a rail-with-trail channelizes would-be trespassers onto the trail, reducing trespassing and vandalism. In locations where security remains a concern, the trail manager, in coordination with local police, could establish organized activities and trail patrols. Strategies such as the clearing of vegetation or installation of lighting or damage-resistant fencing can also be effective to help address security concerns along a rail-with-trail, provided regular maintenance is also performed.

Construction Management

Planning for the construction of a rail-with-trail should be done in close coordination with the railroad owner and operator(s). Throughout the construction of a rail-with-trail, the trail developer will need to coordinate with the adjacent railroads to address issues with respect to public safety, potential impact on operations, and protection of rail facilities. Early in the rail-with-trail planning and design process, trail developers should consider how the rail-with-trail will be staged and constructed, as well as how much room is needed for construction activities around the active railroad corridor.

Whether the rail-with-trail is located on or adjacent to railroad property, access to the railroad property may be required during construction. Most railroads have a detailed process for allowing activities on their property. Prior to construction, the trail developer will need to coordinate with the railroad and other authorities to obtain all the necessary permits and permissions to access the site. Written permission from the railroad will usually be required for any railroad site access, even if only for preliminary activities such as surveying. Insurance will also likely be required before a railroad grants access to a site.

In some cases, construction might involve the temporary use of railroad property or temporary permission to cross railroad tracks. Temporary easements may be needed for construction activities, including staging, grading, and the installation of stormwater infrastructure. Further, any construction activity that will impact rail operations, such as a new undercrossing or changes to bridges, will require extensive review and approval by the railroad's engineering and operations departments. Hiring engineering and construction firms that have experience working with the railroad could be helpful.

Trail developers should coordinate with the railroad owner and operator(s) early in the planning process to understand these requirements so that they can appropriately account for them in the construction plans and schedule. Construction budgets and schedules should also account for any unanticipated issues that may arise during construction, including those related to geology, undocumented utilities, encroachment, and flagging services, as these issues can disrupt the project timeline and add considerable expense.

Flagging

Flaggers are typically railroad employees (though they can be contractors officially trained by the railroad) who direct or restrict rail traffic for the duration of a project's construction period to keep workers, railroad employees, and customers safe. Railroads require flagging services when project activities are conducted near active tracks or when they could otherwise impact rail operations. For example, flaggers are required when tunneling under or building a bridge over active tracks. Arrangements for flagging services must be made well in advance to ensure that flagging staff are available according to the project schedule. Failure to make adequate arrangements might delay construction. Depending on the level of work to be performed, the railroad will likely provide right-of-way worker protection training to non-railroad employees working on or near active railroad tracks.

Trail developers are typically responsible for the cost of flagging services required during trail construction. These costs can be substantial, and typically depend on the number of days the flaggers are needed, rather than the number of hours per day. If flaggers are needed outside of regular work hours, an overtime rate will likely apply. Strategies to minimize the costs for flagging services include having the flaggers only work during regular business hours or providing incentives to the project contractor to complete certain tasks early. It is important to note that trail developers should not enter railroad property without prior coordination or permission from the railroad; otherwise, they are considered trespassers.

Flagging Examples

Along an upcoming extension of the Border-to-Border Trail in Washtenaw County, Michigan, two flaggers are required to be present during construction at a rate of approximately $1,200 per person per day. Where fencing separation and safety signage exists, however, construction proceeded without the use of flaggers. Even then, flaggers were mandated during construction of the fence itself.

Along the Denton Branch Rail Trail in Denton County, Texas, both the rail line and rail-with-trail were being constructed simultaneously, eliminating the need for flaggers. However, because design of a bicycle and pedestrian bridge was delayed, it was installed after the adjacent transit tracks were already active. This ended up costing the project manager $100,000 solely for flagging services; money that would have been saved had design and construction of the new bridge proceeded as planned.

Education

Few rail-with-trail managers report conducting formal safety education related to the adjacent active rail line; rather, most education efforts along rails-with-trails appear to comprise the same safety and etiquette guidelines common to all shared use paths. Still, trail developers and managers should explore potential education efforts with the railroad, as they may help allay safety concerns.

The safety education associated with existing rails-with-trails is primarily passive, such as signing, online resources, or print materials. In many cases, the existing "No Trespassing" signage installed by the railroad prior to trail development may be sufficient. Where fences are constructed along with the trail, similar signing may be required or desired at a regular interval, such as every 500 feet. Active safety education efforts, which are used less often, consist of online or in-person trail safety training, safety briefings in advance of organized walks, runs, or rides, or direct outreach to schools and workplaces. Ongoing education can prove to be an important tool to encourage safe behavior among trail users and potentially reduce liability exposure to both trail managers and railroads.

For many rails-with-trails, especially where the trail is constructed within the railroad right-of-way, design strategies negotiated with the railroad may reduce the need for safety education for trail users. High fences, safe crossings, adequate setback, and other solutions are all effective at minimizing trail user interaction with active tracks, often making additional signage or formal safety education unnecessary.

Many railroads participate in safety outreach, including posting signs at trailheads and crossings, attending community events, regular monitoring of tracks, and enacting and enforcing penalties for trespassers. In some cases, railroads often work with trail managers to promote rail-with-trail safety. UTA, for example, holds training programs about rail safety along trails intended specifically for children.[84]

SEPTA Customer Safety Day educates children and adults. (Photo courtesy of SEPTA)

[84] Operation Lifesaver, in partnership with Utah Transit Authority produced a video PSA about bike safety around tracks and trains: **https://oli.org/video/view/bike-safety-tips-around-tracks-and-trains**.

Education Examples

Along the Schuylkill River Trail and Five Star Trail, both in Pennsylvania, signs display an advisory warning to stay on the path. Trail managers need to ensure that warning signs explaining the importance of staying on authorized trails and directing trail users away from active tracks, where required or deemed necessary, are prominently displayed and regularly maintained.

Managers of the Traverse Area Recreation and Transportation Trail in Grand Traverse County, Michigan, organize approximately 10 events per year on trail safety education, in addition to regularly hosting both online and in-person safety trainings.

Traverse Area Recreation and Transportation Trail in Grand Traverse County, Michigan. (Photo of courtesy trailink.com)

Operation Lifesaver, Inc.

Most railroads also support and participate in Operation Lifesaver,[85] which is a nationally recognized nonprofit organization sponsored cooperatively by a wide variety of partners, including Federal, State, and local government agencies, highway safety and transportation organizations, and railroads. The organization is dedicated to educating the public about the dangers associated with highway-rail grade crossings and railroad rights-of-way, with the aim of ultimately ending collisions, deaths, and injuries at these locations.

The program specifically seeks to improve driver, bicyclist, and pedestrian behavior at highway-rail grade crossings by encouraging compliance with crossing signs and signals. Another focus is educating the public that trespassing on railroad rights-of-way, tunnels, trestles, and other railroad property is both illegal and dangerous.

Operation Lifesaver can be a valuable resource for both rail-with-trail managers and public and private railroad companies. As part of the safety education for a new or existing rail-with-trail, trail managers and railroad companies should encourage their State's Operation Lifesaver coordinator to discuss the possibility of arranging safety presentations and other education events for trail users. Additionally, they can help identify where safety information materials might be made available on a regular basis (e.g., at a trailhead information kiosk). Also, consider whether local bicycle sales or rental shops would be willing to distribute safety information.

Security, Crime, and Vandalism

While stakeholders and community members may raise fears of crime and other security concerns during the rail-with-trail planning process, in general, trails are unlikely to experience security and safety issues significantly different from the surrounding area. Strategies to reduce or prevent crime that are commonly used for many shared use paths can be applied effectively to rails-with-trails. These include regular patrols, frequent trail programming, clear sight lines, and lighting.

[85] https://oli.org/

However, with rails-with-trails, the trail manager has the added responsibility of ensuring that trail users stay away from railroad operations and only cross tracks at designated locations. While no formal study has evaluated the effect of rails-with-trails on trespassing and vandalism along parallel rail lines, there is anecdotal evidence that some rails-with-trails have demonstrated a positive impact on crime along adjacent tracks. In many cases, simply the presence of an alternate and designated route for pedestrians can reduce trespassing on tracks and other off-limits railroad property. In addition, design strategies can also reduce or prevent crime along rails-with-trails (see Section VI for more information). Strong, secure, and damage-resistant construction materials and landscaping should be used, particularly where it serves as separation between the trail and tracks. Secured access areas (e.g., parking lots, storage areas), barrier systems (e.g., gates, fences, access control), lighting, and video monitoring can also be installed to address security concerns.

Most railroads rely on local police departments to enforce trespassing and vandalism laws along their corridors. However, most police departments respond as needed, rather than having regular patrols. While some railroads conduct their own monitoring, railroad monitoring typically does not extend to the trail issues unless activities on the trail impact the railroad property.

Unless specifically required in the acquisition or development agreement with the railroad, rail-with-trail managers should use their discretion as to whether trail patrols are necessary and how frequently they should occur. While some law enforcement agencies may be willing to conduct patrols, volunteers can also be used to patrol a rail-with-trail. When using volunteers, rail-with-trail managers should be sure to inform and empower participants in any such program with whom to call and what intervention to take if they witness trespassing or other crime on active railroad tracks.

The railroad and trail managers should cooperate to develop protocols for notifying each other of scheduled activities or events that could affect co-located uses or of any observed instances of trespassing or unauthorized activity, or of the occurrence of accidents or injuries, so that appropriate responsive action can be taken.

Security, Crime, and Vandalism Examples

The Frisco Trail in Fayetteville, Arkansas is located on a site that once saw frequent pedestrian use of an active Arkansas & Missouri Railroad line that ran through the city's downtown area. Now, city residents and visitors instead use the rail-with-trail to access nightlife and other amenities. Similarly, along the Camp Chase Trail in Columbus, Ohio, a new rail-with-trail bridge provides a safe way for pedestrians to cross Interstate 270 in the same location where trespassing was once a frequent occurrence on the railroad bridge itself.

Local officials familiar with the County Line Trail in Wayne County, Ohio, report seeing a reduced frequency of illegal dumping, trespassing on railroad property, and illegal all-terrain vehicle activity since the trail opened, despite not having any formal patrolling program.

Cafe along the Frisco Trail in Fayetteville, Arkansas. (Photo courtesy of the City of Fayetteville)

The manager of the Thun Trail section of Pennsylvania's Schuylkill River Trail runs a grant-funded, dedicated volunteer patrol program called the Schuylkill River Trail Ambassadors. Each ambassador commits to eight-hour shifts of traveling the trail and filing incident reports when appropriate. The Washington, DC, section of the Metropolitan Branch Trail features a similar program called the DC Trail Rangers. The program, funded by the DC DOT and run by the Washington Area Bicyclist Association, also equips Trail Rangers with the tools and skills necessary to perform simple maintenance tasks. The Frisco Trail in Fayetteville, Arkansas has a similar program.

Trail Maintenance

As with any shared use path, maintenance is important to mitigate or eliminate safety issues, extend the life of a trail, and provide trail users with a quality experience. Maintenance activities may include sweeping, mowing or cutting debris, patching holes in fences, replacing signs, and resurfacing. The majority of existing rails-with-trails are maintained by government agencies; less common are trail groups and volunteers who take a primary or secondary role in maintenance activities. Railroad owners are rarely involved in conducting regular trail maintenance activities.

An important aspect of maintenance for a rail-with-trail is related to the railroad's own maintenance activities along the adjacent tracks. Railroads require access to their tracks for routine and emergency maintenance and other activities, including tie and track replacement; drainage culvert cleaning; bridge and tunnel inspection and repairs; switching and communications equipment access and maintenance; and crossing equipment servicing and repairs. While railroads often service their tracks, drainage systems, bridges, and other structures on or from the tracks, many prefer to have landside access as well, with enough space to allow ample room for truck access, turning, and tie replacement.

Maintenance activities performed off-track are most commonly accomplished by having trucks drive alongside the tracks on maintenance roads or, in some cases, on the side of the ballast near the rails themselves. Even situations where work is performed primarily from the tracks can impact an adjacent trail. For example, tie replacement machines, which are track-mounted, release old ties out on one side while installing new ties from the other side.

If a rail-with-trail is located near an active track, the trail manager should assume that the trail itself may well become the maintenance road for the railroad. Several possible methods are available to address shared trail-railroad maintenance roads. For example, the trail can be constructed to accommodate heavy railroad trucks and equipment. Fencing can be designed for easy removal and reinstallation or constructed with sliding gates. Entrance signs should include a warning that, "Trail May Be Closed at Any Time Without Notice." The trail should also include a gate or other barrier to quickly close the facility to public access.

Whether rail maintenance activities are performed directly from the rail-with-trail or immediately adjacent to it, they can significantly impact the trail's surface, vegetation, separation techniques, and trailside amenities. Debris and other objects left on the trail by railroad personnel during maintenance activities might become the responsibility of the trail manager. Such debris should be removed promptly. Typically, a rail-with-trail manager will be responsible for closing the trail when the railroad requires access that may impact the public's safety.

Camp Chase Trail

Along Ohio's Camp Chase Trail, the trail manager is required to notify the railroad in advance of any type of work being done on the trail, as well as inform them of how close maintenance workers will be to the tracks. Maintenance staff were also required to attend railroad safety classes to adequately prepare them for the responsibilities and limitations of working within an active rail corridor.

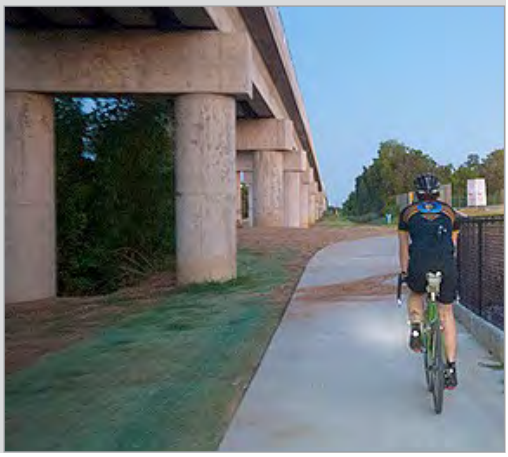
Camp Chase Trail in Georgesville, Ohio.
(Photo courtesy of the Rails-to-Trails Conservancy)

A comprehensive operations and management plan should detail the procedures and responsibilities when the railroad has either a routine or emergency maintenance access need. The plan should specifically lay out trail closure procedures should the railroad or trail manager ever anticipate the possibility. Details on how to remove and reinstall any fence or other barrier, as well as identification of the entity responsible and any compensation to be provided should the trail's surface, fence, landscaping, or other trail amenities be damaged or destroyed by maintenance activities of the railroad, should also be formally included in an operations and management plan and/or the trail acquisition agreement. While occasions where trail maintenance activities impact rail operations or maintenance are rare, an operations and management plan should also outline the procedure and responsibilities associated with any such activities.

Another important issue is responsibility for retaining walls, cut-and-fill areas, drainage culverts, barriers and signs, and bridges. For example, a new rail-with-trail may require extension of an existing cut area or construction of a retaining wall. This area may already have erosion or landslide problems that are handled by the railroad. Rail-with-trail managers may need to assume full responsibility for any structure, culvert, or natural condition within its easement, regardless of whether or not it is a preexisting condition.

Denton Branch Rail Trail

When the Denton Branch Rail Trail was converted back to rail use, a public outreach campaign was conducted to alert trail users that the trail would be temporary closed, relocated within the right-of-way, and reopened adjacent to the new DCTA A-train commuter line. The Department of Parks and Recreation for the city (Parks Department) relied heavily on social media to raise awareness, put articles in the local newspaper as well as in the *Playguide* (the Parks Department's semi-annual mailer that is sent to every household in Denton), and installed signage along the trail corridor. DCTA also conducted an ad campaign and used various forms of outreach to raise awareness of the new transportation route, including both train and trail. These methods by the Parks Department and DCTA were meant to alert residents and trail users of the impending change.



Denton Branch Trail in Texas. (Photo courtesy of the Rails-to-Trails Conservancy)

Vegetation Management

Managing vegetation along any shared use path is important to ensuring safety. Along rails-with-trails, trail managers should take extra care to ensure that trail vegetation does not infringe on the railroad right-of-way or obstruct railroad sight lines.[86] Vegetation management includes tree pruning, tree removal (including fallen trees), and mowing. Such activities can be labor intensive and costly, so trail developers should consider vegetation management as part of a trail's feasibility analysis. Specifically, this should include a delineation of which entity, the trail manager or railroad, is responsible for maintaining vegetation, how often, and any shared responsibility for vegetation management.

[86] FRA's regulation on drainage is found at 49 CFR § 213.33.

Metropolitan Branch Trail

Some of the maintenance on the Washington, D.C., section of the Metropolitan Branch Trail is done by seasonal Trail Rangers employed by the Washington Area Bicyclist Association and funded by the D.C. DOT. The rangers carry tools that allow them to prune vegetation that is encroaching onto the trail or rail corridor and weed such potentially harmful vegetation as poison ivy. For larger tasks, such as tree removal, the rangers file maintenance requests with the city's Department of Public Works.

Vegetation maintenance on the Washington, D.C., section of the Metropolitan Branch Trail is done by a combination of seasonal trail rangers and the city's Department of Public Works (Photo courtesy of Wikimedia Commons)

Section VIII: Next Steps

The purpose of this report is to document the current state of the practice, perspectives, and context for rails-with-trails and identify effective practices for planning, designing, constructing, and maintaining rails-with-trails. Through conducting extensive research into existing and planned rails-with-trails, the research team identified opportunities for additional research and guidance on rails-with-trails. These may include:

- Developing additional specifications, standards, and guidelines for planning, designing, constructing, and maintaining rails-with-trails;
- Conducting research on the effect that rails-with-trails have on trespassing on private property, including railroad rights-of-way;
- Conducting additional research on effective practices for designing and constructing rails-with-trails at common pinch points, including bridges and tunnels; and
- Conducting additional research on rails-with-trails in other countries, including where they are successful and effective processes for developing these facilities.

Appendix A: Definitions

Americans with Disabilities Act: The Americans with Disability Act (ADA) was signed into law on July 26, 1990. It is one of America's most comprehensive pieces of civil rights legislation that prohibits discrimination against people with disabilities.

Architectural Barriers Act: The Architectural Barriers Act of 1968 requires that buildings or facilities that were designed, built, or altered with federal dollars or leased by federal agencies after August 12, 1968 be accessible to people with disabilities.

At-Grade Crossing: An intersection (crossing) where roadways, trails (including rails-with-trails), and railroad tracks cross at the same level.

Centerline: An imaginary line midpoint between the track rails that conforms to the geometry of that track. «Centerline» often is used in reference to the nearest track to a rail-with-trail when discussing such issues as setback and separation.

Class I Railroad: As currently defined by regulations of the Surface Transportation Board (49 CFR Part 1201; General Instructions 1-1), a railroad with annual operating revenue of $447,621,226 or more based on 2017 dollars.

Class II Railroad: As currently defined by regulations of the Surface Transportation Board (49 CFR Part 1201; General Instructions 1-1), a railroad with annual operating revenue of between $35,809,699 and $447,621, 225 based on 2017 dollars.

Class III Railroad: As currently defined by regulations of the Surface Transportation Board (49 CFR Part 1201; General Instructions 1-1), a railroad with annual operating revenue of $35,809,698 or less based on 2017 dollars. These include short-line and light-density railroads.

Code of Federal Regulations (CFR): The codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government.

Commuter Rail: Urban passenger train service for travel generally between a central city and its suburbs, excluding rapid transit (e.g., subways) and light rail service.

Dynamic Envelope: The clearance required for light rail transit traffic or a train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure.

Excursion Trains: Generally, trains used by a private enterprise catering to the leisure or tourism market, such as dinner trains or tourist trains to an historical destination.

Federal Highway Administration: As a modal administration of U.S. DOT, the Federal Highway Administration (FHWA) coordinates highway transportation programs in cooperation with States and other partners to enhance the country's safety, economic vitality, quality of life, and the environment. Major program areas include the Federal-Aid Highway Program, which provides Federal financial assistance to the States to construct and improve the National Highway System, urban and rural roads, bridges, and pedestrian and bicycle facilities.

Federal Railroad Administration: As a modal administration of U.S. DOT, the Federal Railroad Administration (FRA) promotes safe and environmentally sound rail transportation. FRA sets and enforces safety standards for track, signals, motive power and equipment, hazardous materials, operating practices, and highway-rail crossings. The FRA conducts research and development projects to support its safety mission and enhance the railroad system as a national transportation resource. FRA also administers public education campaigns addressing highway-rail grade crossing safety and the danger of trespassing on rail property.

Federal Transit Administration: As a modal administration of U.S. DOT, the Federal Transit Administration (FTA) assists in developing improved mass transportation systems for cities and communities nationwide. Through its grant programs, FTA helps plan, build, and operate transit systems with convenience, cost, and accessibility in mind.

Flangeway: An opening, parallel to a rail, made through platforms, pavements, track structures, etc., to permit passage of wheel flanges. The groove between the rail and the pavement edge.

Grade-Separated Crossing: An intersection of road or trail and railroad tracks where two or more crossing routes are at different elevations such that the flow of traffic is not disrupted. This can be achieved by using an underpass (tunnel) or overpass (bridge). A grade-separated crossing can reduce delay and risk to users and equipment, as compared to an at-grade crossing.

Heavy Rail Transit: Exclusive rights-of- way, multi-car trains, high speed rapid acceleration, sophisticated signaling, and high platform loading characterize heavy rail transit. In general terms, heavy rail transit is also known as subway, elevated railway, or metropolitan railway (metro).

Invitee: A person entering upon the property of another for business purposes or because of a public invitation extended by the property owner.

Licensee: A person who is privileged to enter or remain on land by virtue of the possessor's consent, such as a social guest.

Light Rail Transit: Light rail transit may involve exclusive or shared rights-of-way, high or low platform loading, and multi-car trains or single cars which are automated or manually operated. In general usage, light rail includes trolley cars, streetcars, and tramways.

Manual on Uniform Traffic Control Devices: The Manual on Uniform Traffic Control Devices (MUTCD) provides standards and guidelines for traffic control devices that regulate, warn, and guide road users along the highways and byways in the United States. FHWA published the most recent edition in 2009 with revisions in 2012. Part 8 provides guidelines for signs, signals, markings, and other warning devices at all highway-rail grade crossings. Part 9 provides standards for bicycle facilities including on-road treatments and shared use paths. See https://mutcd.fhwa.dot.gov/ for more information.

National Highway Traffic Safety Administration: As a modal administration of U.S. DOT, the National Highway Traffic Safety Administration (NHTSA) sets and enforces safety and performance standards for motor vehicles and equipment; helps States and local communities reduce the threat of impaired drivers; promotes the use of safety belts, child safety seats, and air bags; provides consumer information on motor vehicle safety topics; conducts research on driver behavior and traffic safety; and promotes traffic safety for pedestrians and bicyclists.

Passenger Rail: Rail transportation that carries passengers rather than freight, such as Amtrak and other intercity carriers, but typically not referring to heavy rail transit or light rail transit.

Railbanking: The use of voluntary agreements between railroads and trail agencies to preserve out-of-service railroad corridors as a trail until a railroad might need the corridor again for rail service.

Railroad Right-of-Way: The private property limits owned by the railroad.

Rail-Side Trail: Alternate term for rail-with-trail commonly used internationally.

Rails-to-Trails Conservancy (RTC): A nonprofit organization dedicated to creating a nationwide network of trails from former rail lines and connecting corridors to build healthier places for healthier people.

Rail-Trail, or Rail-to-Trail: A trail developed on an abandoned or converted railroad line where there is no active rail service.

Rail-with-Trail: A shared-use path or trail open and developed for public use that is located on or directly adjacent to an active railroad or rail transit corridor.

Separation: A barrier, such as fencing, wall, vegetation, body of water, or vertical elevation difference, that separates a railroad track or railroad corridor and a rail-with-trail, in order to prevent or discourage access to an active rail right-of-way by trail users.

Shared-Use Path: A trail (including rails-with-trails and rail-trails) that is physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. Shared-use paths may be used by bicyclists, pedestrians, skaters, wheelchair users, runners and other nonmotorized users.

Short-Line Railroad: See Class III Railroad.

Siding: A track auxiliary to the main track used for meeting, passing, or storing trains.

Trespasser: A person who enters any private property without permission of the owner or without having an official reason to enter that property.

U.S. Department of Transportation: Established by an Act of Congress in 1966, the U.S. Department of Transportation's (U.S. DOT) mission is to *serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future.*

Appendix B: Resources

Rail Safety Information

The Federal Railroad Administration provides information on freight railroad safety statistics nationwide, including rail trespassing. Under 49 CFR Part 225 (Railroad Accidents/Incidents, Reports Classification, and Investigations), freight railroads are required to provide monthly reports to FRA on accidents, incidents, or fatalities that meet certain criteria. Among other information, railroads indicate whether an individual was trespassing at the time of the casualty. Information and data on rail safety is available at the following websites:

- Safety Analysis webpage: **https://safetydata.fra.dot.gov/officeofsafety/default.aspx**.
- Trespasser Casualties Database: **https://safetydata.fra.dot.gov/officeofsafety/publicsite/query/castally4.aspx**.
- Trespassing Prevention webpage: **https://www.fra.dot.gov/Page/P0846**.

Federal Railroad Administration. December 2016. *Rail Safety Fact Sheet.* Available at **https://cms7.fra.dot.gov/newsroom/rail-safety-fact-sheet.**

Federal Railroad Administration. *Train Horn Rule and Quiet Zones*. Available at **https://www.fra.dot.gov/Page/P0889**.

Federal Transit Administration. January 2016. *Rail Safety Statistics Report 2007-2013.* Available at **https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Rail%20Safety%20Statistics%20Report.pdf**.

Federal Railroad Administration. *High-Security Fencing for Rail Right-of-way Applications: Current Use and Best Practices* (October 2015). Available at **www.fra.dot.gov/Elib/Document/15476**.

Federal Transit Administration. *National Transit Database (NTD).* Available at **https://www.transit.dot.gov/ntd**.

Federal Transit Administration. *Safety & Security Major-Only Time Series Data.* Available at **https://www.transit.dot.gov/ntd/data-product/safety-security-major-only-time-series-data**.[87]

Bureau of Transportation Statistics. *National Transportation Statistics.* Available at **https://www.bts.gov/topics/national-transportation-statistics**.[88]

Operation Lifesaver Inc. **https://oli.org/**

Trail Design Resources

American Association of State Highway and Transportation Officials. 2012. *Guide for the Development of Bicycle Facilities, 4TH Edition.*[89]

American Association of State Highway and Transportation Officials. 2004. *Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition*.[90]

Federal Highway Administration. Multiple design resources are available on FHWA's Bicycle and Pedestrian Resources webpage at **https://www.fhwa.dot.gov/environment/bicycle_pedestrian/resources**/. Many documents have concepts applicable to rails-with-trails.

Federal Highway Administration. September 2015. *FHWA Guidance: Bicycle and Pedestrian Provisions of Federal Transportation Legislation.* Available at **https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/guidance_2015.cfm**.

[87] As of 2008, the NTD no longer reports trespassing as a separate data category.

[88] Provides summaries of rail safety data including for freight, transit, and intercity passenger rail (Amtrak).

[89] At the time of publishing this report, a new version is under development.

[90] At the time of publishing this report, a new version is under development.

Federal Highway Administration. May 2012. *Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition with Revisions Number 1 and 2 incorporated.* Available at **https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.ht**m.

Federal Highway Administration. July 2019. *Railroad-Highway Grade Crossing Handbook, Revised Third Edition.* Available at **https://safety.fhwa.dot.gov/hsip/xings/com_roaduser/fhwasa18040**/.

Federal Highway Administration. November 2002. *Guidance on Traffic Control Devices at Highway-Rail Grade Crossings.*

Federal Transit Administration. 2017. *Manual on Pedestrian and Bicycle Connections to Transit.* Available at **https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/64496/ftareportno0111.pdf.**

Rails-to-Trails Conservancy. 2013. *A Preliminary Assessment of Safety and Grade Crossings*. Available at **http://atfiles.org/files/pdf/rwtgradex05.pdf.**

Rails-to-Trails Conservancy. 2013. *America's Rails-with-Trails: A Resource for Planners, Agencies and Advocates on Trails along Active Railroad Corridors.* Available at **https://www.railstotrails.org/resourcehandler.ashx?id=2982**.

Transportation Research Board. *TCRP Report 175: Guidebook on Pedestrian Crossings of Public Transit Rail Services*. 2015. Available at **http://www.trb.org/Main/Blurbs/172320.aspx**.

U.S. Access Board. *Guide to the ADA Standards.* Available at **https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/guide-to-the-ada-standards**.

U.S. Access Board. *Guidelines and Standards: Streets & Sidewalks*. Available at **https://www.access-board.gov/guidelines-and-standards/streets-sidewalks.**

U.S. Access Board. *Guidelines and Standards: Outdoor Developed Areas*. Available at **https://www.access-board.gov/guidelines-and-standards/recreation-facilities/outdoor-developed-areas.**

Railroad and Public Transportation Agency Rail-with-Trail Policies CSX Transportation. July 2017. *Public Project Information*: *For Construction and Improvement Projects that May Involve the Railroad.* Available at **https://www.csx.com/index.cfm/library/files/about-us/property/public-project-manual/.**

Norfolk Southern Corporation. September 2013. *Public Projects Manual.* Available at **http://www.nscorp.com/nscorphtml/pdf/Customers/public_projects_manual.pdf.**

North Coast Rail Authority. May 13, 2009. *Policy and Procedures Manual.* Available at **http://www.northcoastrailroad.org/Agendas/2009/Item_G.8.pdf.**

SEDA Council of Governments Joint Rail Authority. June 2008. *Rails-with-Trails Standards.* Available at **http://www.sedacograil.org/Documents/Rails%20with%20Trails%20Standards%20with%2008%20amendments.pdf.**

Southern California Regional Rail Authority. May 2010. *Rail-with-Trail Design Guidelines.* Available at **https://www.metrolinktrains.com/globalassets/about/engineering/rail_with_trail_design_guidelines.pdf.**

Union Pacific Railroad and BNSF Railway. January 5, 2016. *Guidelines for Railroad Grade Separation Projects.* Available at https://www.up.com/cs/groups/public/documents/document/pdf_rr_grade_sep_projects.pdf.

Utah Transit Authority. July 2010. *Light Rail Design Criteria Guidelines.* Available at **http://www.rideuta.com/uploads/UTALRTDesignCriteriaRevision5.pdf.**

State Rail-with-Trail Guidelines

California Department of Transportation. July 2005. *Pedestrian and Bicycle Facilities in California. A Technical Reference and Technology Transfer Synthesis for Caltrans Planners and Engineers*. Available at **https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/f0018152-technical-reference-a11y.pdf.**

Delaware Department of Transportation. June 2006. *Statewide Rails-to-Trails/Rail-with-Trail System Master Plan*. Available at **https://deldot.gov/Publications/plans/rails_to_trails/pdfs/MASTER_PLAN_FINAL/MAIN_BODY/REPORT_MAIN_BODY_FINAL.pdf?cache=1574875289064.**

Massachusetts Highway Department. 2006. *Project Development & Design Guide. Chapter 11: Shared Use Paths and Greenways.* Available at **https://www.mass.gov/files/documents/2018/08/08/pddg.pdf.**

Minnesota Department of Natural Resources. 2007. *Trail Planning, Design, and Development Guidelines*.

New Hampshire Department of Transportation Bureau of Rail & Transit. January 2013. *Trail with Rail Design Standards.* Available at **https://www.nh.gov/dot/programs/bikeped/documents/NHDOTTrailwithRailStandards.pdf.**

Parks & Trails New York. *Getting on Track: Working with railroads to build trails in New York State.* Available at **https://parks.ny.gov/recreation/trails/documents/GettingOnTrackWorkingWithRailroads.pdf.**

Oregon Department of Transportation. 2012. *Highway Design Manual. Appendix L: Bicycle and Pedestrian Design Guide.* Available at **https://www.oregon.gov/ODOT/Engineering/Documents_RoadwayEng/HDM_L-Bike-Ped-Guide.pdf**.

Utah Department of Transportation. 2013. UDOT Pedestrian Grade Crossing Manual. Available at **https://www.udot.utah.gov/main/uconowner.gf?n=12635319754536158.**

Vermont Agency of Transportation. December 2002. Vermont Pedestrian and Bicycle Facility Planning and Design Manual. Available at **https://vtrans.vermont.gov/sites/aot/files/highway/documents/publications/PedestrianandBicycleFacilityDesignManual.pdf.**

Virginia Department of Rail and Public Transportation. 2009. Rails with Trails/Pedestrian Crossing Project Initiation, Coordination and Review. Available at **http://www.dcr.virginia.gov/recreational-planning/document/house-bill-2088.pdf.**

Wisconsin Department of Transportation. January 2004 (updated in 2006, 2009, 2015, and 2018). *Wisconsin Bicycle Facility Design Handbook.* Available at **https://wisconsindot.gov/Documents/projects/multimodal/bike/facility.pdf.**

Funding Resources

Federal Highway Administration. *Pedestrian and Bicycle Funding Opportunities.* Available at **https://www.fhwa.dot.gov/environment/bicycle_pedestrian/funding/.**

Federal Transit Administration. *FTA Program & Bicycle Related Funding Opportunities.* Available at **https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/livable-sustainable-communities/fta-program-bicycle.**

U.S. Department of Transportation
Federal Railroad Administration

U.S. Department of Transportation
Federal Highway Administration

DOCUMENT # FHWA-HEP-21-017