Trail Design Toolkit

Part 3 of a Starter Guide for the US Great Lakes Waterfront Trail (US GLWT)

Prepared for:
Council of State Governments Midwest
National Parks Service - Rivers Trails and Conservation

By:
Emily Carra: Writing - Original & Draft, Conceptualization, Formal analysis, Investigation, Resources, Data Curation, Visualization
Xiao Chen: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Writing - Original Draft, Visualization
Xingyan Chen: Formal analysis, Visualization, Writing - Review & Editing
Roberto Carriedo Ostos: Conceptualization, Formal analysis, Resources
Christine Sit: Writing - Review & Editing, Project administration

Advisors:
Lisa Du Russel (Professor of Practice)
Isabella Shehab (Doctoral Candidate)
University of Michigan
School for Environment and Sustainability (UM-SEAS)

In Collaboration with:
Pennsylvania Department of Environmental Protection, Coastal Resources Management Program
Pennsylvania Department of Conservation and Natural Resources
Erie County Department of Planning and Community Development

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Part 3 of the Starter Guide for the US Great Lakes Waterfront Trail

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US Great Lakes Waterfront Trail

Jessica Lienhardt, Council of State Governments Midwest Office
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Christina Luporini Council of State Governments Midwest Office

Pennsylvania

PA DEP Coastal Resources Management Program

Shelby Clark, Coastal Resources Coordinator, Lake Erie Coastal Zone
Stacey Box, Environmental Group Manager, Coastal Resources Management Program

Department of Conservation and Natural Resources

Leslie Sarvis, Greenways and Trails Program Specialist

Erie County Department of Planning and Community Development

Emerson Bannon, Parks, Trails, & Recreation Coordinator
Alexandra (Ally) Royal, Coastal Resources Management and Agricultural Preservation Program Administrator

Trail Design Toolkit

The GLWT partners cover a wide breadth of geographic space and federal, state, and local agencies. Partners hold monthly roundtable meetings with 40+ participants. A collaboration of this scale must overcome potential challenges like large-scale coordination, preserving individual state identities, and possible funding disruptions. To handle these challenges, the SEAS-GLWT Trail Design Toolkit aims to help GLWT stakeholders navigate trail design decisions.

The SEAS-GLWT Trail Design Toolkit guides the user through different trail types for the US GLWT proposed trail in an easy-to-understand way, walks through various considerations in trail design, and provides examples with test sites in the GLWT region.

Toolkit Goals

Users of the SEAS-GLWT Trail Design Toolkit should be able to:

- Identify relevant trail types for trails of interest
- Be prepared to approach local planning, environmental, and governmental bodies with trail design options and ideas to further local trail improvement
- Understand how to use the accompanying resources to further the trail planning process

Toolkit Sections

To achieve these goals, the SEAS-GLWT Trail Design Toolkit provides the following deliverables:

- **US GLWT Design Guide**: A decision tree that guides the user through various trail design decisions to pick relevant trail types for trails of interest
- **Trail Type Information Cards**: A set of visuals and relevant information for eight trail types
- **Test Site**: A sample walkthrough of the decision guide using a test site in Erie County, Pennsylvania
- **Resources**: A section containing recommendations and best practices for trail design as well as a resources guide for trail plants

Great Lakes Waterfront Trail Design Guide

The Great Lakes Waterfront Trail Design Guide (also referred to as Trail Design Guide) is the core focus of the Toolkit and takes the form of a decision tree, commonly known as a flowchart.

Working through the steps of the Trail Design Guide (see Trail Design Guide Directions on page 3) allows the user to 1) consider various aspects of the proposed site and 2) determine the most appropriate trail type among eight choices.

Each of the eight trail types is described in its own individual Trail Type Information Cards (page 7-10). In addition, three test sites serve as examples for using the Trail Design Guide within the Great Lakes region (page 11-14).

Trail Design Guide Directions

Start at the top of the decision tree and follow the highlighted questions based on your chosen site. As seen under the Legend, the user is first prompted with a decision question, such as “Is the roadway high-speed or limited access?” Next is a conditional response:” High-speed” Continue following the question and answer prompts until reaching a Trail Type at the end of the decision tree.

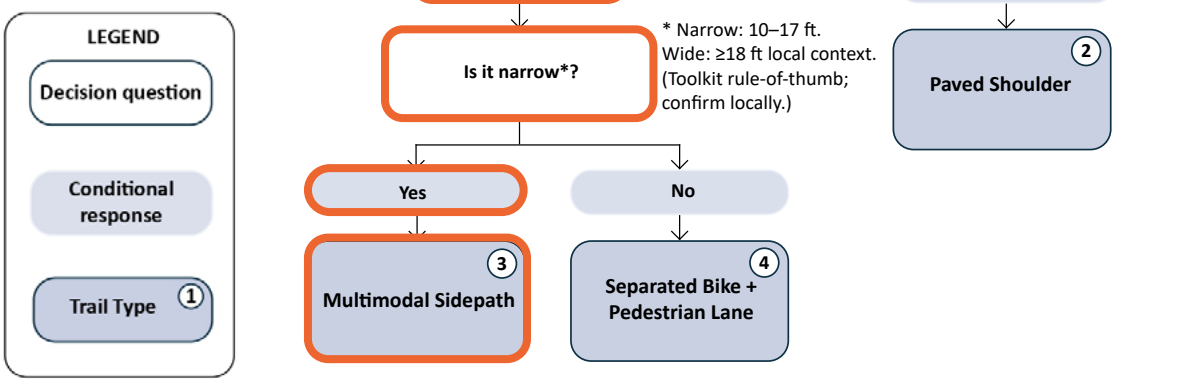
Once the Trail Type has been identified, (e.g., Separated Bike Lane), the user can flip to the relevant information card listed on the Trail Type. These information cards (page 7-10) provide additional information on each Trail Type.

Example Scenario for the Trail Design Guide

Below is an example showing how the Great Lakes Waterfront Trail Design Guide helps users identify a Trail Type based on site conditions such as trail context, traffic speed, and road right-of-way. These site conditions can vary depending on local context and are often identified through local resources, such as PennDot for Erie County, PA.

START
↓
Stand alone trail
↓
High speed (55mph)
↓
Spacious ROW (80feet)
↓
Funds + resources to separate users
↓
Separated Bike Lane

Next: Go to the Trail Type Information Cards



Trail Type Information Cards

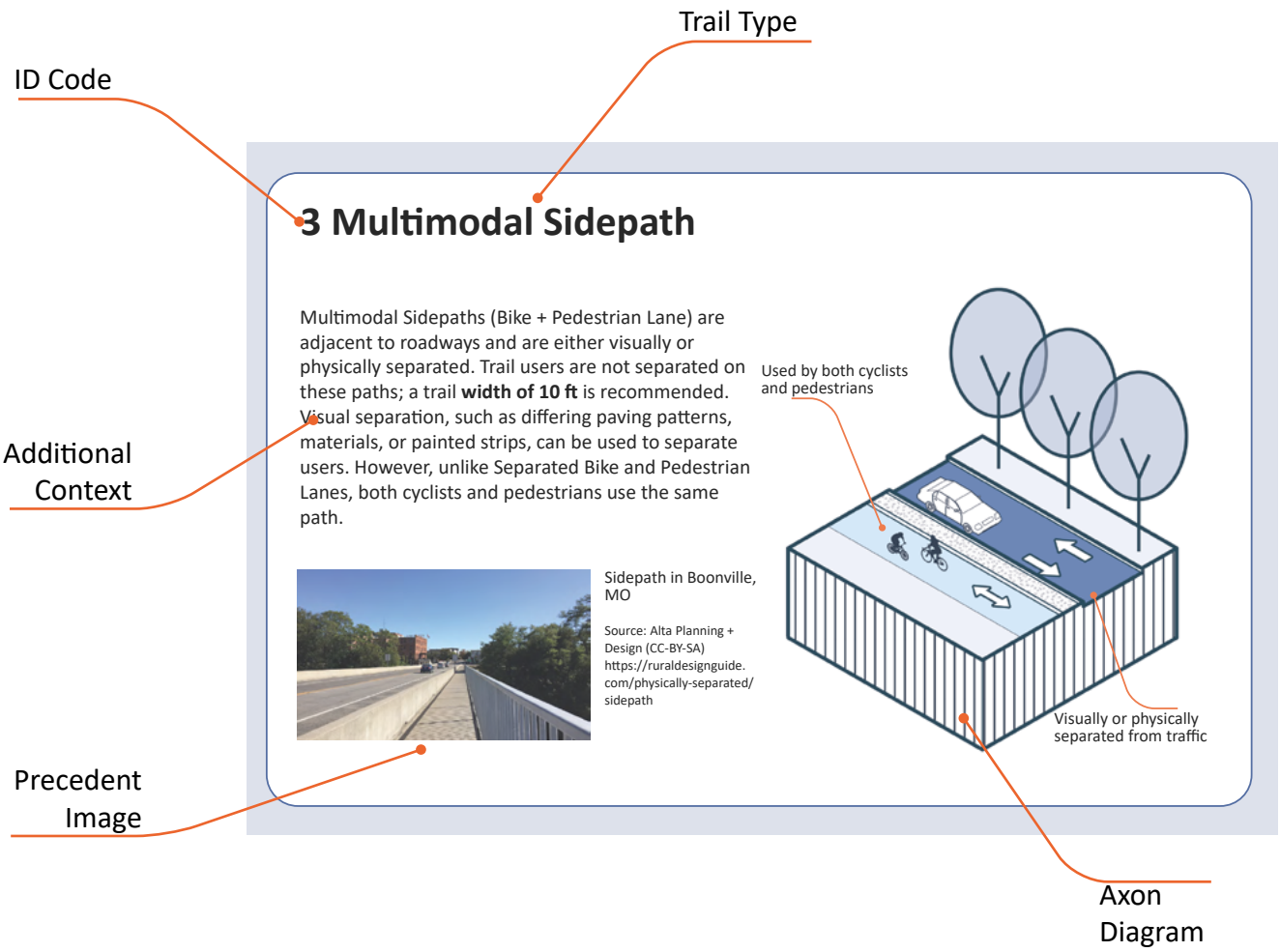
Each Trail Type has its own information card that describes: trail specifications, most appropriate situation for the trail, and the trail's advantages and disadvantages. The information cards include real world examples, relevant considerations, and a diagram that highlights key features for each Trail Type.

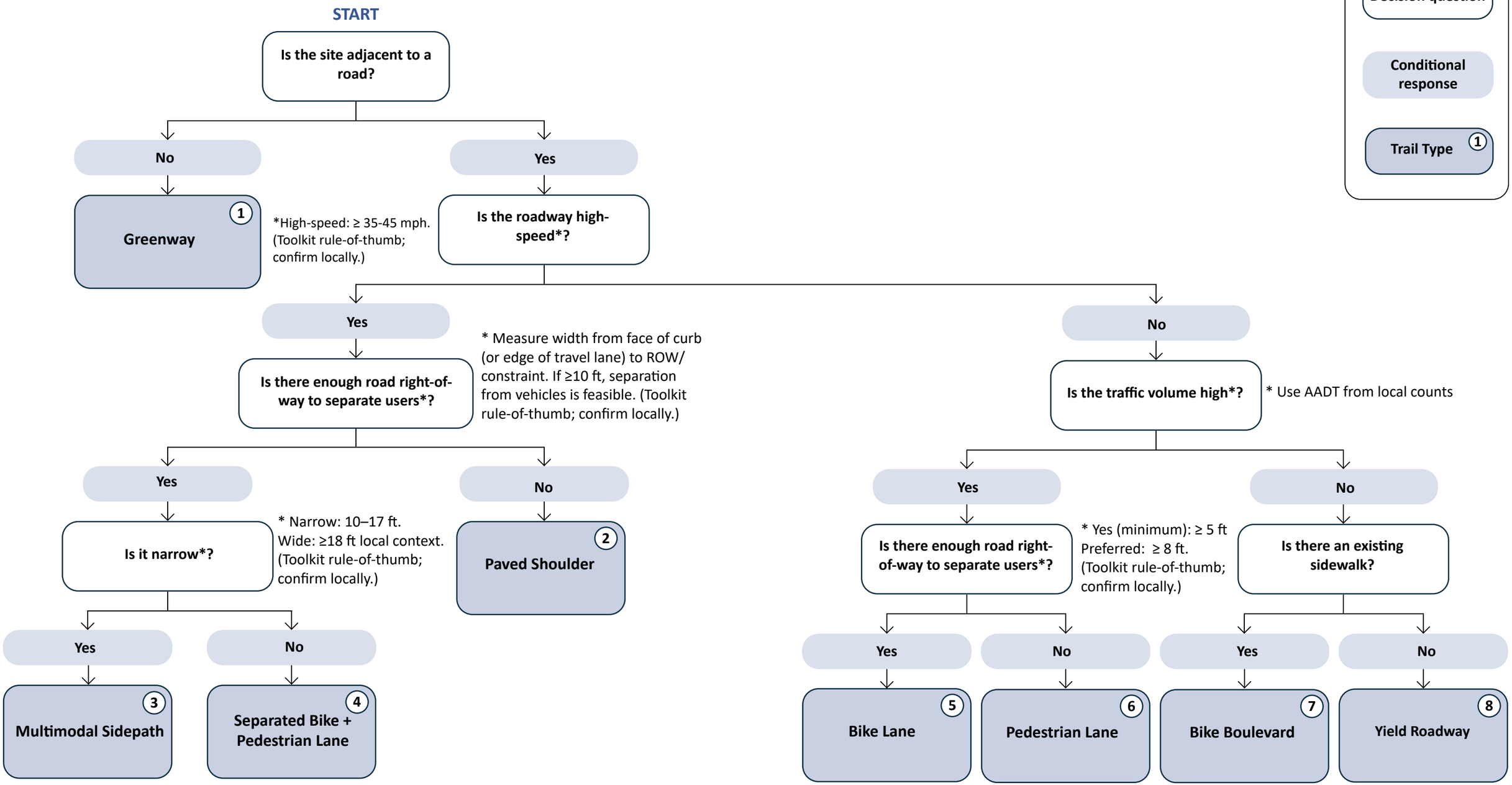
The Trail Types are further identified through numbers (ex: 1, 2, 3…) at the top left of each card. The numbers are also found on the Trail Design Guide (pages 5-6) and are used to differentiate between trail types.

SEAS-GLWT Trail Design Standards pull from a variety of trail design guides both national and international. A generalizable set of standards were compiled from multiple trail guides into the eight Trail Types below.

Guides used:

- National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide, 3rd Edition
- American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities, 5th Edition
- Federal Highway Administration (FHWA) Small Town and Rural Multimodal Networks
- Small Town and Rural Design Guide: Facilities for Walking and Biking



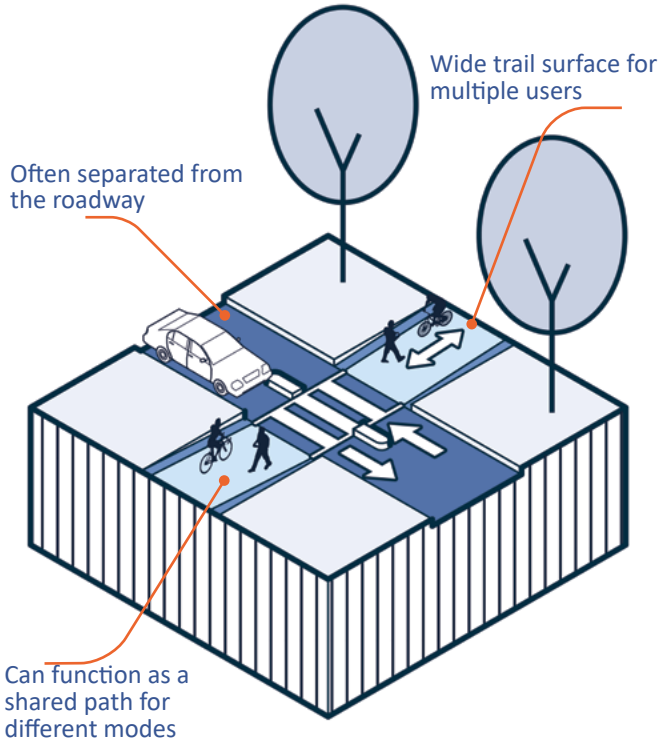

LEGEND
Decision question
Conditional response
Trail Type 1
START
Is the site adjacent to a road?
No
Yes
1
Greenway
*High-speed: ≥ 35-45 mph. (Toolkit rule-of-thumb; confirm locally.)
Is the roadway high-speed*?
Yes
Is there enough road right-of-way to separate users*?
* Measure width from face of curb (or edge of travel lane) to ROW/ constraint. If ≥10 ft, separation from vehicles is feasible. (Toolkit rule-of-thumb; confirm locally.)
Yes
Is it narrow*?
* Narrow: 10–17 ft. Wide: ≥18 ft local context. (Toolkit rule-of-thumb; confirm locally.)
No
2
Paved Shoulder
Yes
3
Multimodal Sidepath
No
4
Separated Bike + Pedestrian Lane
No
Is the traffic volume high*?
* Use AADT from local counts
Yes
Is there enough road right-of-way to separate users*?
* Yes (minimum): ≥ 5 ft Preferred: ≥ 8 ft. (Toolkit rule-of-thumb; confirm locally.)
No
Is there an existing sidewalk?
Yes
5
Bike Lane
No
6
Pedestrian Lane
Yes
7
Bike Boulevard
No
8
Yield Roadway

1 Greenway

Greenways are recreational trails, often found within a natural, ecological corridor serving as linear parks with an emphasis on mobility. Recommended trail paths are wide to accommodate multiple trail users, often range **from 8 ft to 14 ft in width**. Greenways are found most often away from existing roadways and can be a single path for multiple modalities or multiple paths separated by modality.

Gitchi-Gami State Trail

Source: Minnesota Department of Transportation, North Star Route About https://www.dot.state.mn.us/bike/north-star-route-about.html

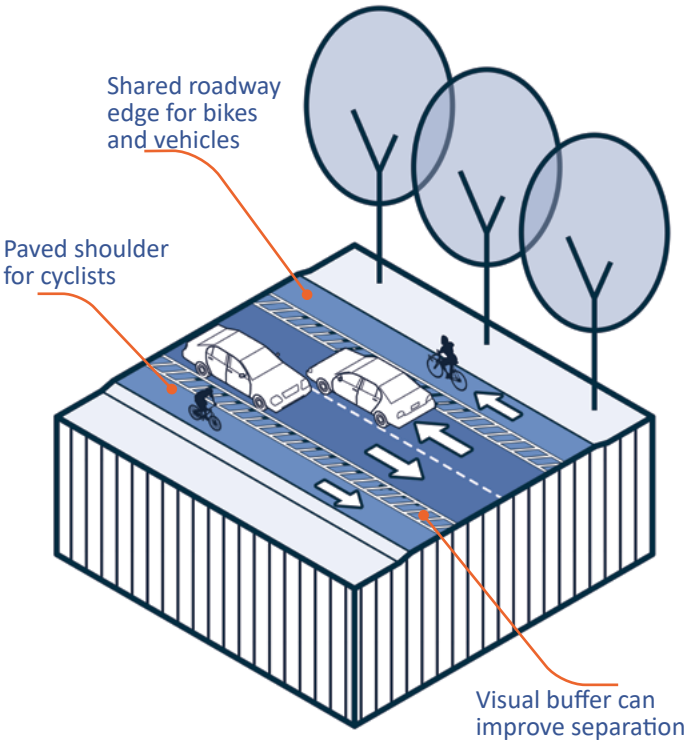


2 Paved Shoulder

Paved Shoulders are **4 ft wide** strips of paved road, often separated by a solid white line. They can be used by both vehicles and cyclists, providing improved sight distance for drivers. It is recommended that either visual separation (painted strips) or physical separation (rumble strip) be included in the design. Paved Shoulders are recommended for highly confident cyclists.

Paved Shoulder north of D'Iberville, MS

Source: Alta Planning + Design (CC-BY-SA) https://ruraldesignguide.com/visually-separated/paved-shoulder

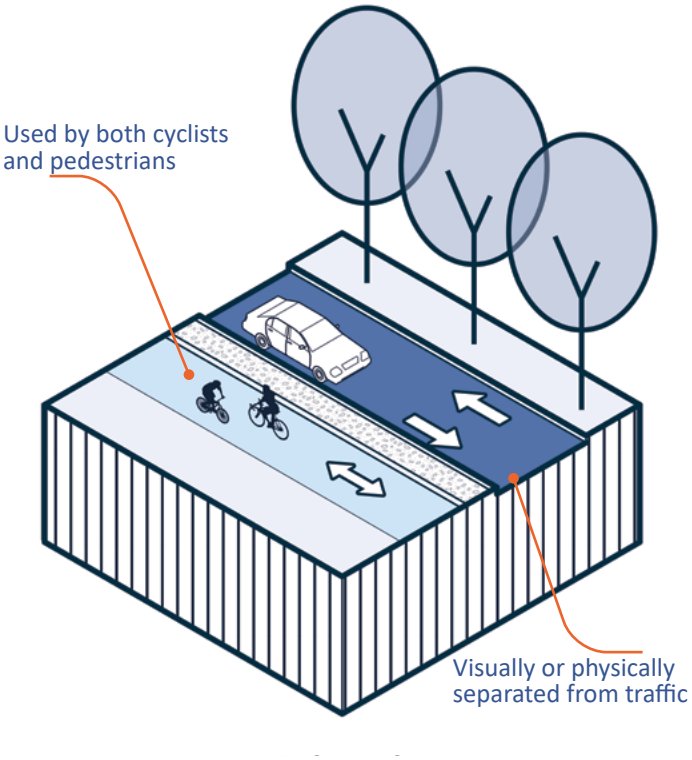


3 Multimodal Sidepath

Multimodal Sidepaths (Bike + Pedestrian Lane) are adjacent to roadways and are either visually or physically separated. Trail users are not separated on these paths; a trail **width of 10 ft** is recommended. Visual separation, such as differing paving patterns, materials, or painted strips, can be used to separate users. However, unlike Separated Bike and Pedestrian Lanes, both cyclists and pedestrians use the same path.

Sidepath in Boonville, MO

Source: Alta Planning + Design (CC-BY-SA) https://ruraldesignguide.com/physically-separated/sidepath

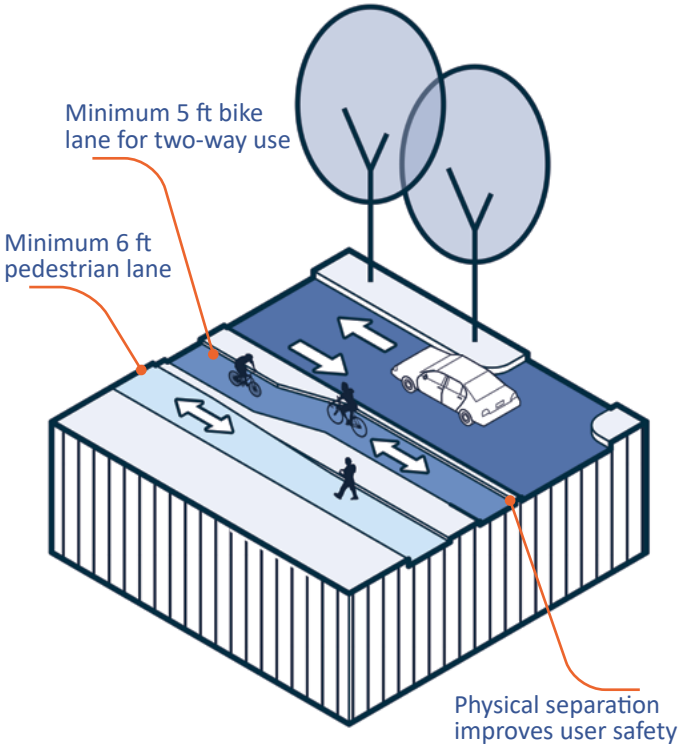


4 Separated Bike + Pedestrian Lane

Separated bike and pedestrian lanes provide dedicated trails for each user type. Pedestrians and cyclists are physically separated from each other to increase user safety and experience. Trail widths are determined by buildable space at a minimum, **5 ft wide** bike lanes are recommended for multidirectional use, and a **6 ft width** for pedestrians. Separated Bike and Pedestrian Lanes can be adjacent.

South Lake Tahoe, CA

Source: Tahoe Regional Planning Agency https://ruraldesignguide.com/physically-separated/sidepath

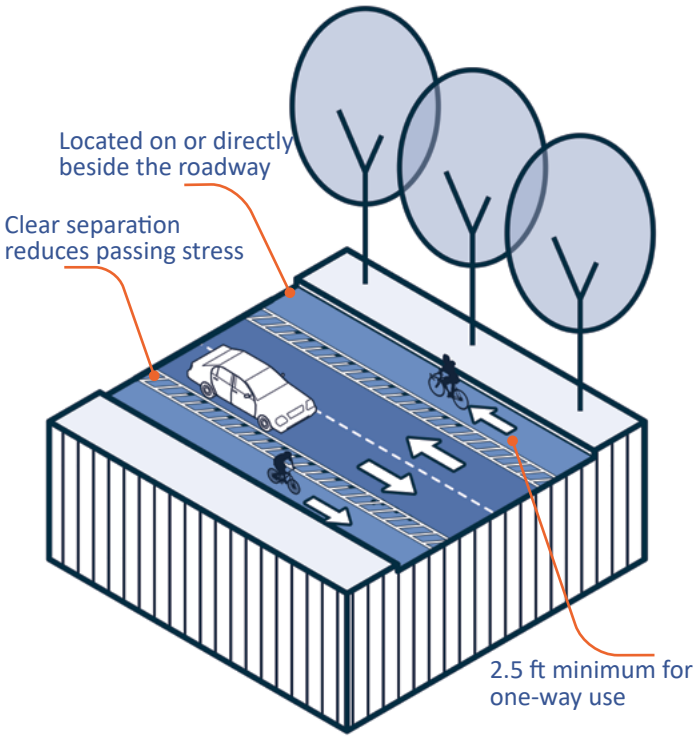


5 Bike Lane

Bike lanes are located on or directly adjacent to roadways. Clear separation from motor vehicles is necessary to reduce passing stress and improve the comfort of trail users. A preferred minimum width of 5 ft is recommended for multidirectional bike lanes, and **2.5 ft is recommended** for single directional use.

Bike Lane in Willow Creek, CA

Source: https://ruraldesignguide.com/visually-separated/bike-lane

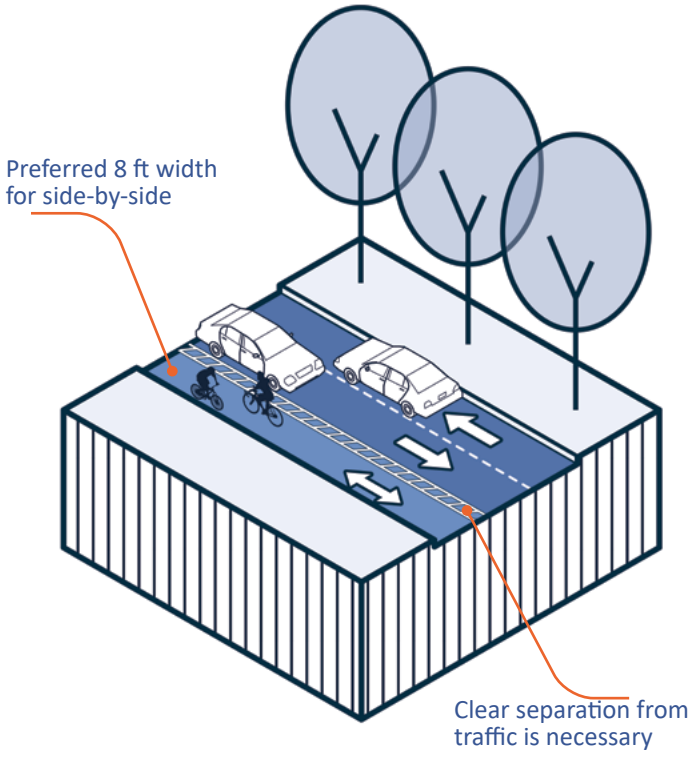


6 Pedestrian Lane

Pedestrian lanes are located on roadways when a sidewalk is not feasible. Clear visual or physical separation from vehicular traffic is necessary. Pedestrian lanes should be wide enough to allow comfortable, side-by-side walking; **8 ft is preferred, with a minimum of 5 ft** for accessibility and maneuverability. When physical separation is not an option, extra lane width enhances user comfort and usability.

Pedestrian Lane in Detroit, OR

Source: https://ruraldesignguide.com/visually-separated/pedestrian-lane

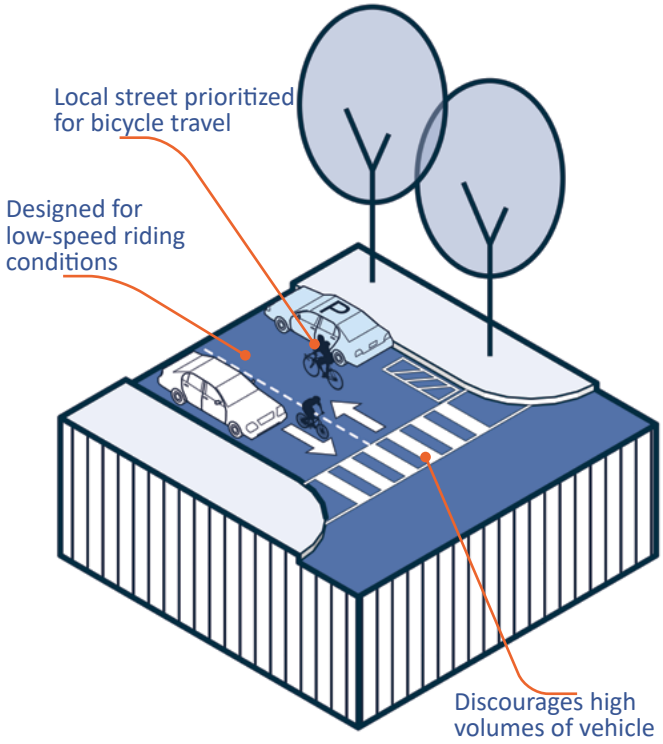


7 Bike Boulevard

Bicycle boulevards are local streets adapted to prioritize bicycle travel while discouraging high volumes of vehicle traffic. Low-speed, low-volume streets can serve as effective bike boulevards. On narrow streets, target speeds should be 10–20 mph, and alternative routes should be provided if safe passing or contraflow travel isn't possible.

Bicycle Boulevard in Arcata, CA

Source: https://ruraldesignguide.com/mixed-traffic/bicycle-boulevard



8 Yield Roadway

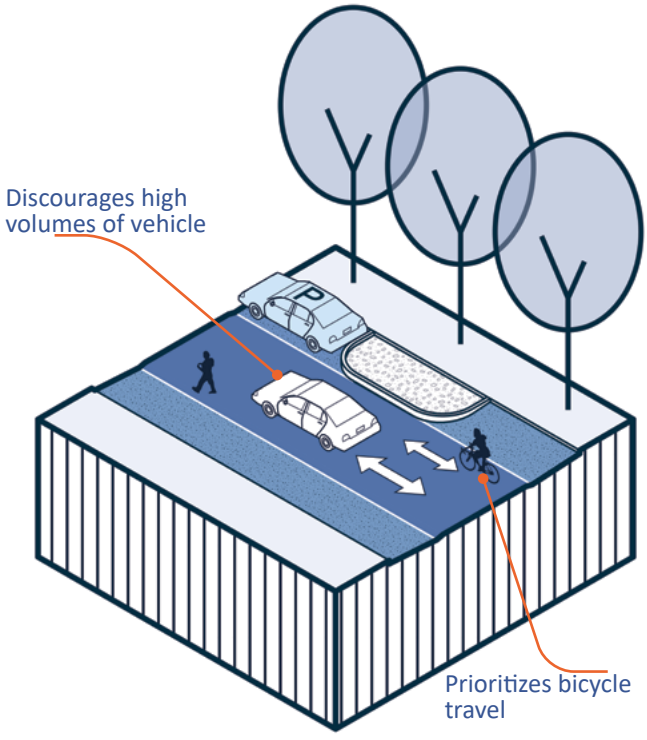
Yield roadways are local (often residential) streets adapted to prioritize bicycle travel while discouraging high volumes of motor vehicle traffic. Low-speed, low-volume, two-way streets can serve as effective Yield Roadways and should follow AASHTO Low Volume Roads guidance.

Pull-out areas for passing or meeting vehicles should be provided every 200–300 ft, using parking lanes or roadside areas when lane width is ≤15 ft.

Yield Roadway in Sisters, OR

Source: Alta Planning + Design (CC-BY-SA)

https://ruraldesignguide.com/mixed-traffic/yield-roadway



Test Sites - Erie County, Pennsylvania

Erie County, Pennsylvania is a strong test site because it reflects the multi-jurisdictional nature and physical conditions common across other Great Lake communities. By piloting this toolkit in Erie County, Pennsylvania, the project demonstrates how locally grounded priorities can scale to shape a multi-state trail system.

Within Erie County, two test sites were chosen in collaboration with Erie County stakeholders: 1) 6th St in Millcreek Township and 2) the Tom Ridge Environmental Center (TREC) at Presque Isle Park.

6th Street is a residential road with frequent vehicle and pedestrian use, a common sight to see in many communities. The frequent pedestrian use highlights the importance of considering pedestrian safety in design decisions.

TREC is an education center that serves visitors to the 3,200 acres of Presque Isle and offers research, education, and visitor services in one place.[1] The multi-purpose aspect of the site highlights the importance of considering safety and clear markings for curbs and buffers.

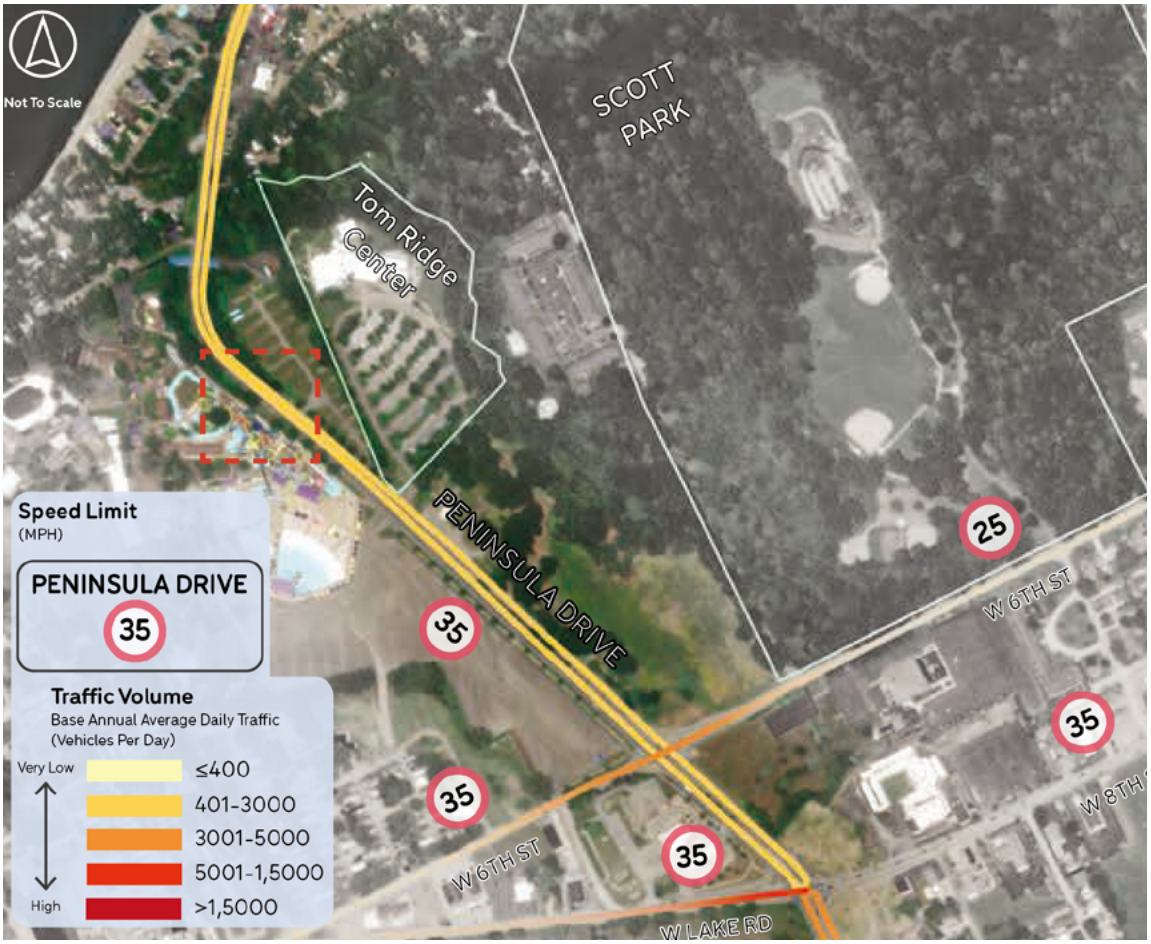
Street View of the TREC test site in Erie, Pennsylvania.
Source: Google Street View, June 2024.

Test Site 1

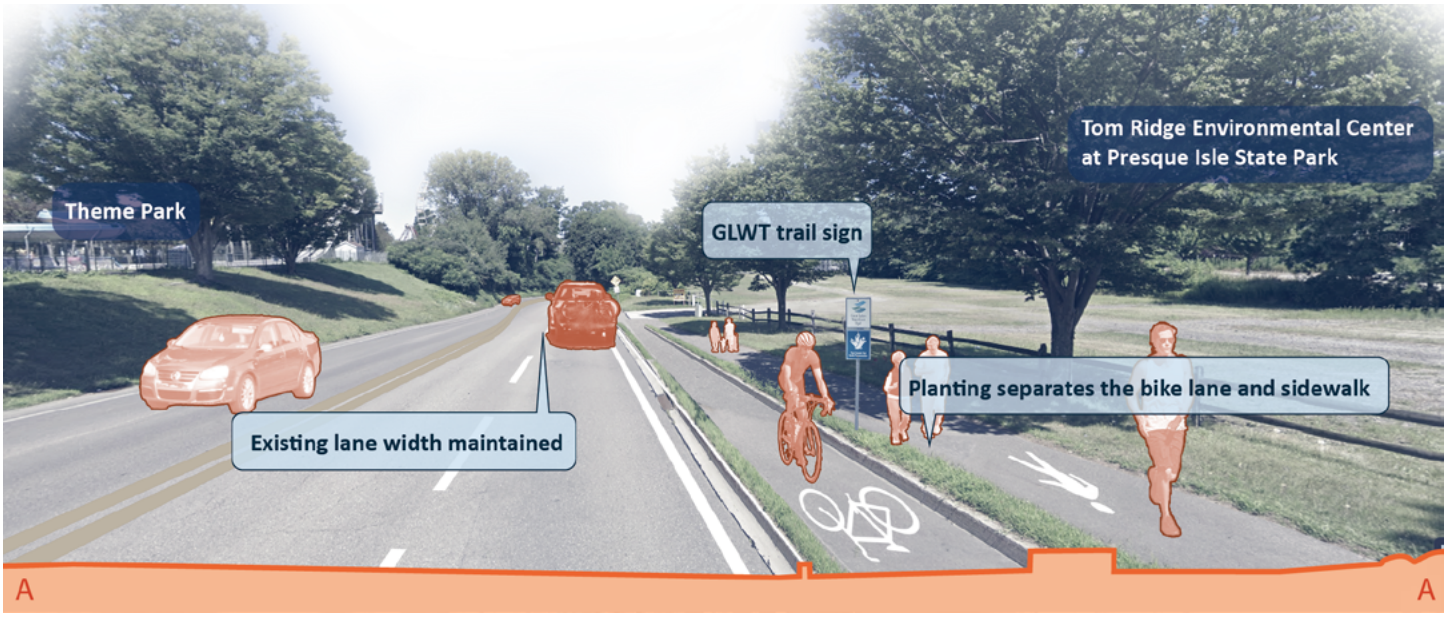
TREC is a site that serves multiple types of trail users. Safety and clear markings for curbs and buffers are especially important to consider in design decisions.

A separated bike lane provides a dedicated, physically protected space for cyclists. The one-way lane width is 7ft. Curbs, buffers, or distinct surfaces, are essential for safety and clarity.

TREC test site location. (right)
Created by
Xingyan Chen.



Rendering of the TREC test site.(below)
Created by Xiao Chen.



Test Site 2

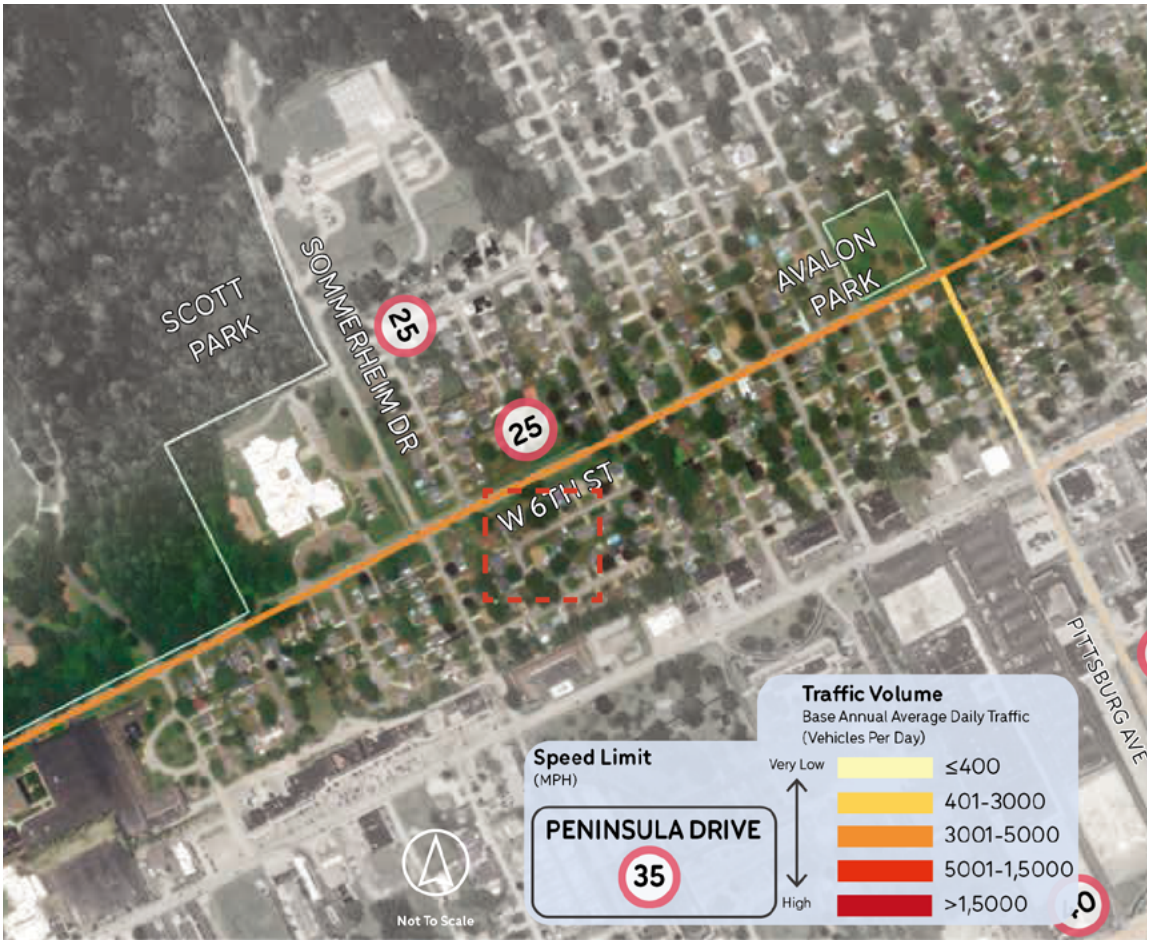
6th Street is a residential road with frequent vehicle and pedestrian use. Pedestrian safety is especially important to consider in design decisions.

Pedestrian lanes should be wide enough to allow comfortable, side-by-side walking; 8ft is preferred, with a minimum of 5ft for accessibility and maneuverability.
Because they lack physical separation, extra width enhances comfort and usability
Lanes must meet accessibility standards, including a maximum 2% cross slope (the transverse tilt or angle of a road surface), a grade consistent with adjacent streets, and a firm, stable, slip-resistant surface.

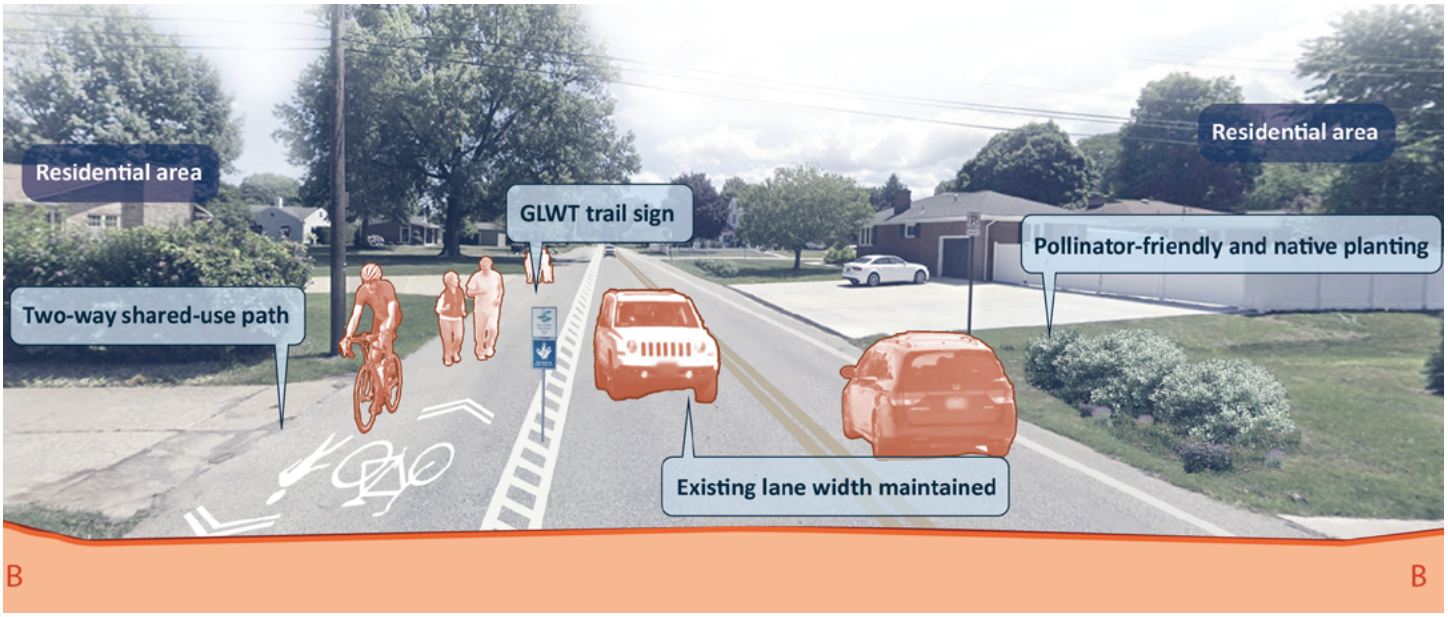
Street View of the 6th Street site in Erie, Pennsylvania.
Source: Google Street View, May 2024.

Street View of the 6th Street site in Erie, Pennsylvania.
Source: Google Street View, May 2024.

6th Street test site location
Created by Xingyan Chen.



Rendering of the 6th Street test site.
Created by Xiao Chen.



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Appendices

A. Trail Type Definitions and Standards

1. Best Practices and Recommendations: Trail Design

1.1 Climate Change and Trails

Climate change is a main contributor to the increasing frequency of extreme weather events such as storms, floods, and droughts. These weather events can cause major damage to trails and greenways. "Extreme weather can cause erosion, washouts, landslides and flooding, making these trails and greenways unusable. In addition, rising temperatures and drier seasons can lead to increased wildfires that can damage trails and greenways and create unsafe air-quality conditions" (Rails to Trails Conservancy, n.d.). According to Rails to Trails Conservancy (n.d.), While climate change can have a negative impact on trails, these same trails can be used to help mitigate the effects of climate change, limit the damage from extreme weather events, and even be useful in increasing community resilience.

Water

Trails and greenways can help communities build resilience to extreme weather. Whether from rain, flood, snow, or storms, a trail's physical features (like slopes and valleys) and native plantings can act as passive, natural methods to control water. Planning raised trails and greenways around riparian edges can create a natural buffer zone between communities and flood zones acting like a giant rain garden. Rails to Trails Conservancy (n.d.) found that through native plantings, trails can improve water drainage, reduce risk of flash flooding, and improve water quality. Greenways and trails can provide resilience and green infrastructure benefits, particularly stormwater management and flood mitigation as well as preserve vegetation while also serving as a source of wildlife connectivity and habitat (Davis et al., 2023, p. 13).

Trails and greenways also have the potential to regenerate native landscapes, restore floodplain function, dissipate floodwaters, and reduce inundation and erosion hazards to downstream communities and infrastructure. Trails and greenways could help to reduce pollutant discharges from impervious surfaces (Davis et al., 2023, p. 14). By designing trails with stormwater management in mind, communities can become more climate resilient.

For examples of how existing trails were designed to mitigate water crises, read water- and trail-related case studies in the Landscape Performance Series.

The SEAS-GLWT Starter Guide includes a Native Plant Resources Guide to help find native plants suited for different regions around the Great Lakes.

Wildfire

Trails and greenways can function in two crucial ways to mitigate wildfire, 1) act as firestops by providing a buffer of fire-adapted native plants and 2) provide corridors for emergency response vehicles and evacuation.

Firestops - To support resilience against wildfires, trails and greenways can act as firestops for less severe ground fires. Impervious surface paths or wide, vegetation-free paths (cleared of flammable material) can stop fire from spreading (American

Trails Staff, 2023, section 3). In addition, applying prescribed burns to fire-adapted landscapes can help limit the amount of accumulated fuel load on the ground.
Emergency Response - Designing with emergency vehicles or community evacuation in mind can improve a community's ability to respond to fires, floods, and other emergencies. Leveraging interconnected trail paths can provide emergency responders access to a multitude of areas and help facilitate evacuation. Trails and greenways can also act as secondary corridors for emergency vehicles when main roadways are no longer accessible.

Urban Heat Island Effect

Trails, particularly in urban areas, can help mitigate Urban Heat Island (UHI) effects. Strategic planting of wide, canopied trees near impervious surfaces can reduce temperatures by a couple of degrees; some studies even found a 16% to 40% temperature decrease in shaded vs exposed areas (Ziter et al., 2019). Greenways in dense urban areas can help disperse UHI and increase temperature regulation. Planting shade trees at constant intervals helps extend the surface area protected from intense sun exposure, preventing heat-related illnesses like heatstroke. Tree planting density also matters: more trees means more layers of canopy means denser shade, all of which further reduces surface temperature (Marando, 2022).

For examples of how existing trails were designed to mitigate Urban Heat Island effect, read UHI- and trail-related case studies in the Landscape Performance Series.

1.2 Equity, Accessibility, and Inclusivity

For examples of how existing trails were designed to include equity, accessibility, and inclusivity, read equity- and trail-related case studies in the Landscape Performance Series.

Equity and Accessibility

A history of environmental and racial injustices has created unequal access to green spaces like parks, greenways, and gardens (Lewartows, 2024). Demographics typically left out of the planning processes for parks and trails include: low-income neighborhoods, communities of color, people with physical or intellectual disabilities, older adults, and people with limited English proficiency (Rails to Trails Conservancy, n.d.).

Communities of color are three times more likely than white communities to live in areas with limited nature access (Bergeron, 2024). The greenspaces that are accessible usually offer lower quality parks, trails, and recreational facilities (Rails to Trails Conservancy, n.d.). Equity-based regional planning can use trails and greenways to increase the quality and number of public greenspaces within disenfranchised neighborhoods. Collaborating with local environmental justice groups, community leaders, and non-profits in the trail design process can ensure equitable trails with wider accessibility.

Inclusivity

Inclusive trail design means designing for the broadest audience in mind. Universal Design practices, healthy city planning, trauma-informed design, mental health-based design, and aging-based design are just a few ways to integrate inclusivity in trail design (Botchwey et al., 2022; Ezell et al., 2018; Schroeder, 2023). Designing a trail for agency and choice allows for more options in use. The more options there are, the more inclusive the design is. Ultimately, trails should offer a wide range of experiences to be

truly inclusive.
Designing with accessibility can often benefit multiple kinds of trail users. For example, a sidewalk ramp is beneficial for wheelchair users, but it can also help families with strollers, people with mobility issues, and cyclists. By including the ramp, the sidewalk is much more accessible, allowing for a wider range of users.

Three essential questions key (Ezell, 2022) to designing with inclusion in mind are:

- **Who is helped?** – identifies the readily apparent users or beneficiaries of a planning proposal and commences the essential question-asking process.

- **Who is harmed?** – use the answers to this question to improve a planning idea by mitigating any negative impacts to people we identify when considering who may be harmed by that idea.

    - **Financially harmed**. Will someone's livelihood be affected by an incompatible land-use decision, or will an infrastructure proposal negatively impact someone's property?
    - **Physically harmed**. Will someone suffer from unsafe or unhealthy physical or environmental conditions caused by the outcomes of a planning proposal?
    - **Culturally harmed**. Will someone's ties to the built environment such as important buildings, sites, or landmarks, be negatively impacted?
    - **Psychologically harmed**. Will someone's state of mind be impacted, such as having one's home demolished against one's will? Or will someone be subjected to potentially overwhelming new sensory inputs (e.g., blinking lights, loud noises) caused by changes in land uses?
    - **Harmed by neglect**. Will groups containing many loud voices be harmed by being ignored? Will people with quieter voices suffer by not being loud enough?

- **Who is missing?** - takes time to ask who is unable to participate due to barriers, lack of knowledge, or lack of consideration (pp. 1-4).

1.3 Ecology-based Design

Trails and Greenways, as explored above, can provide a wide range of support both for socio-cultural purposes and ecological ones. Grounding design work with ecological design principles in mind will help facilitate a robust use of ecosystem services and expand intrinsic natural value and aesthetic value. Guiding theories like Cues to Care help reduce management efforts, increase safety, and regenerate native landscapes (Li & Nassauer, 2020). Borrowing from everyday landscape aesthetic theories provides rich ground to further design trails in a way that is both beneficial to the environment and the communities around them.

Safety

Increasing user safety is a priority for trail and greenway design. Design targets can vary by context but generally include:

- Ensuring visibility by: keeping plants near paths a low height, keeping planting density low near pathways, not blocking sightlines with tall plantings or structures.
- Keeping trails and greenways well lit
- Showing visual cues that the trails are being maintained: mown edges, clean trails, keeping trails fixed and free of excessive damage.

Ecological Sensitive Areas

For more information, read the Rails to Trails Developing Trails in Sensitive Areas page.

For examples of how existing trails were designed with habitats and safety in mind, read habitat- and trail-related case studies in the Landscape Performance Series.

2. SEAS-GLWT Trail Design Standards

SEAS-GLWT Trail Design Standards pull from a variety of trail design guides both national and international. A generalizable set of standards were compiled from multiple trail guides into the eight Trail Types below.

Guides used:

- National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide, 3rd Edition
- American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities, 5th Edition
- Federal Highway Administration (FHWA) Small Town and Rural Multimodal Networks
- Small Town and Rural Design Guide: Facilities for Walking and Biking

2.1 Greenway

Trail Type Definition

Greenways are recreational trails, often found within a natural, ecological corridor serving as linear parks with an emphasis on mobility. Recommended trail paths are wide to accommodate multiple trail users, often range from 8 ft to 14 ft in width. Greenways are found most often away from existing roadways and can be a single path for multiple modalities or multiple paths separated by modality.

Standard Dimensions

Greenway dimensions follow AASHTO's guidelines for shared use paths (AASHTO, 2024, ch. 6):

> **6.4.3 Recommended Shared Use Path Width**
> Table 6-3 provides a range of recommended shared use path widths to serve desired volumes and operational lane configurations for the path. It is designed to achieve a Federal Highway Administration (FHWA) Shared Use Path Level of Service Calculator (SUP LOS) of "C" for the stated volume of users (from Table 6-2) for typical mode split conditions. Where the mode split differs from the typical proportions, Table 6-2 should not be used, and Table 6-3 should be used with caution. It is recommended the designer recalculate the recommended width based on the mode split and desired SUP LOS for the project using the FHWA SUP LOS calculator available from FHWA. (pp. 5 - 8)

Table 1
Shared Use Path Level of Service Look-Up Table, Typical Mode Split
(AASHTO, 2024, ch. 6, p. 7, Table 6-2)

Shared Use Path Level of Service Look-Up Table, Typical Mode Split*										
Shared Use Path Peak Hour Volume	Shared Use Path Width (ft)									
	8	10	11	12	14	15	16	18	20	≤ 25
50	B	B	B	B	B	A	A	A	A	A
100	D	C	B	B	B	A	A	A	A	A
150	D	C	B	B	B	A	B	A	A	A
200	D	D	C	B	B	A	B	A	A	A
300	E	D	C	C	C	B	B	B	B	A
400	F	E	D	D	C	C	C	B	B	A
500	F	F	D	D	D	C	C	C	C	A
600	F	F	E	E	E	D	D	C	C	A
800	F	F	F	F	F	E	E	E	E	A
1,000	F	F	F	F	F	E	F	F	F	A
≥ 1,200	F	F	F	F	F	F	F	F	F	A

**Assumptions:*
1. Mode split is 55 percent adult bicyclists, 20 percent pedestrians, 10 percent runners, 10 percent in-line skaters, and 5 percent child bicyclists.
2. An equal number of trail users travel in each direction (the model uses a 50 percent–50 percent directional split).
3. Trail volume represents the actual number of users counted in the field (the model adjusts this volume based on a peak hour factor of 0.85).
4. Trail has a centerline.

Table 2
Recommended Shared Use Path Widths to Achieve SUP LOS "C"
(AASHTO, 2024, ch. 6, p. 8, Table 6-3)

Table 6-3: Recommended Shared Use Path Widths* to Achieve SUP LOS "C"

Shared Use Path Operating Widths and Operational Lanes*					
SUPLOS "C" Peak Hour Volumes	Recommended Operational Lanes	Practical Minimum	Recommended Lower Limit	Recommended Upper Limit	Practical Maximum
150 to 300	2	8 ft	10 ft	12 ft	13 ft
300 to 500	3	11 ft	12 ft	15 ft	16 ft
500 to >600	4	15 ft	16 ft	20 ft	None

** Typical Mode Split is 55 percent adult bicyclists, 20 percent pedestrians, 10 percent runners, 10 percent in-line skaters, and 5 percent child bicyclists.*

In general, a two-directional shared use path should be at least 10 ft in width. This allows for a person traveling single file to pass another person approaching from the opposite direction in single file comfortably…However, this width does not allow for socialization without increasing conflicts…The FHWA SUP LOS research found 11 ft to be the minimum width required for a path to function with 3 operational lanes (p. 8).

Paths wider than 12 ft are recommended where one or more of the following conditions prevail:

- Where it is desired to allow bicyclists and pedestrians to travel side-by-side throughout a corridor (for example, 3-lane operation) and still accommodate passing from the other direction.
- Where it is desired to allow bicyclists to operate at speeds of 20 to 30 mph to minimize conflicts with other users.
- The path is a regionally significant bicycle travel corridor.
- Where pedestrians, golf carts, skaters, adult tricycles, children, or other users…that need more operating width are likely to exceed 30 percent of the path traffic.
- Where the shared use path is used by larger maintenance vehicles.
- On steep grades to provide additional passing area and shy distances to faster downhill bicyclists.
- Through curves and tunnels to provide more operating space where it would otherwise feel constrained.
- The path has more than 200 users in peak hours (LOS “C”) (pp. 8-9).

12 ft- to 16-ft-wide paths can operate as 3 lanes of travel up to a volume of approximately 400–500 people in a peak hour. Where path volumes begin to exceed 300 users in peak periods, consideration should be given to separating them…to maximize safety and comfort for all users (p. 9).

Path widths less than 10 ft operate best on lower volume shared use paths (below 150 users per peak hour).These paths are most appropriate in rural areas with low volumes of use.

In areas with higher volumes of use, path widths below the recommended lower limit should only be used for a short distance where a wider path is not practical or where negative environmental impacts associated with a recommended path widths cannot otherwise be mitigated to accommodate a physical constraint, such as:

- an environmental feature (such as a wetland or rock outcropping),
- co-location of a path within a narrow right-of-way bounded by railroad tracks,
- a bridge abutment or pier,
- a utility structure,
- a property fence, or
- a building (p. 9).

In very rare circumstances, a reduced width of 8 ft (2.4 m) may be used where the following conditions prevail:

- Bicycle traffic is expected to be low, even on peak days or during peak hours.
- Pedestrian use of the facility is not expected to be more than occasional or to exceed 30 percent of total volume.
- Horizontal and vertical alignments provide frequent, well-designed passing and resting opportunities.
- The path will not be regularly subjected to maintenance vehicle loading conditions that would cause pavement damage (pp. 9 - 10).

2.2 Paved Shoulder

Trail Type Definition

This trail type is recommended for use in Rural and Suburban conditions on low to moderate volume and/or speed conditions.

Paved Shoulders are 4 ft wide strips of paved road, often separated by a solid white line. They can be used by both vehicles and cyclists, providing improved sight distance for drivers. It is recommended that either visual separation (like painted strips) or physical separation (like rumble strips) be included in the design. Paved Shoulders are recommended for highly confident cyclists (AASHTO, 2024; Goodman & FHWA, 2016).

Standard Dimensions

Paved Shoulder dimensions follow the Small Towns and Rural Multimodal Networks guidelines for paved shoulders (Goodman & FHWA, 2016, ch. 3):

Any amount of clear paved shoulder width can benefit pedestrians and bicyclists, however, to be fully functional for their use, the paved shoulder area should be wide enough to accommodate the horizontal operating envelope of these users.

- To accommodate bicyclists and pedestrian use of the shoulder, provide a minimum width of 4 ft (1.2 m) adjacent to a road edge or curb, exclusive of any buffer or rumble strip (p. 5, Geometric Design).

Table 3
Recommended Minimum Paved Shoulder Widths by Roadway Conditions (Goodman & FHWA, 2016, ch.3, p. 5, Table 3-1)

Functional classification	Volume (AADT)	Speed (Mi/h)	Recommended Minimum Paved Shoulder Width
Minor Collector	up to 1,100	35 (55 km/h)	5 ft (1.5 m)
Major Collector	up to 2,600	45 (70 km/h)	6.5 ft (2.0 m)
Minor Arterial	up to 6,000	55 (90 km/h)	7 ft (2.1 m)
Principal Arterial	up to 8,500	65 (100 km/h)	8 ft (2.4 m)

On shoulders designed for bicycle and pedestrian accessibility, the edge should be clearly delineated and defined to discourage unnecessary encroachment by motor vehicles. Options beyond a normal white line include:

- A wide 8 in (200 mm) white line.
- A narrow buffer space–two normal 4 in (100 mm) solid white lines separated by an 18 in (0.45 m) or greater space.
- A wide buffer space–two normal solid white lines, separated by a 4 ft (1.2 m) or greater space and optional crosshatch markings.

Discontinue the edge line at intersections and major driveways. On a bicycle accessible shoulder, additional definition of the shoulder alignment may be desired. In these conditions, consider:

- A dotted white line to extend the edge line through intersections and major driveways.
- A second normal width dotted white line may be used to define the outside edge of the shoulder, defining both sides of the bicycle travel area.
- Where possible, provide greater width for added comfort, user passing, and side-by-side riding (p. 7, Markings).

2.3 Separated Bike and Pedestrian Lanes

Trail Type Definition

Separated bike and pedestrian lanes provide dedicated trails for each kind of user. Lanes physically separate pedestrians and cyclists from each other to increase user safety and improve overall experience. Trail widths are determined by buildable space: at a minimum, 5 ft wide bike lanes are recommended for multidirectional use, and 6 ft width for pedestrians. Separated Bike and Pedestrian Lanes can be adjacent to roadways with either visual or physical separation.

Standard Dimensions

Separated bike and pedestrian lanes dimensions follow AASHTO's guidelines for separated bike lanes (AASHTO, 2024, ch.7):

7.3.4. Bike Lane Width

The recommended width of the bike lane will vary depending on the adjacent vertical features, the accommodation of side-by-side bicycling or passing, and the volume of users. There is more flexibility with respect to the width of the bike lane when it is not separated from adjacent zones with vertical curbs. When the bike lane is located at the same elevation as the adjacent street buffer or sidewalk buffer zones, or where sloping or mountable curbs are provided, the bicyclist can operate more closely to the edges of the bike lane during passing movements (p. 14).

One-way separated bike lanes with low volumes of bicyclists (less than 150 per peak hour), the lowest recommended widths in Table 7-3 (6.5 ft, 6 ft, and 5.5 ft respectively) provide the minimum widths that will accommodate occasional passing; the higher recommended widths (8.5 ft, 8 ft, and 7.5 ft respectively) provide the minimum widths that will accommodate side-by-side riding or frequent passing (p. 15).

Table 4
One-Way Separated Bike Lane Widths Based on Existing or Anticipated Volumes Note.
(AASHTO, 2024, ch. 7, p. 16, Table 6-3)

Table 7-3: One-Way Separated Bike Lane Widths Based on Existing or Anticipated Volumes

Peak Hour Directional Bicyclist Volume	One-Way Separated Bike Lane Width (ft) Recommended Values		
	Between Vertical Curbs without Gutter	Adjacent to One Vertical Curb	Between Sloped Curb, at Sidewalk Level, or Adjacent to Curb with Gutter
<150	6.5–8.5	6–8	5.5–7.5
150–750	8.5–10	8–9.5	7.5–9
>750	≥10	≥9.5	≥9
Practical Minimum*	4.5	4	4

** Peak Hour Directional Bicyclist Volume not applicable*

Two-way separated bike lanes and side paths are wider than one-way separated bike lanes to reduce the risk of collisions between opposing directions of travel. The widths of side paths should follow the guidance in Section 6.4.3 based on the expected volume of path users. For two-way separated bike lanes with low volumes of bicyclists (less than 150 per peak hour), the lowest recommended widths in Table 7-4 (10 ft, 9.5 ft, and 9 ft respectively) provide the minimum widths that will accommodate two-way bicycle traffic with occasional passing; the higher recommended widths (12 ft, 11.5 ft, and 11 ft respectively) provide the minimum widths to accommodate some side-by-side riding in one direction while still accommodating passing. In locations with higher volumes of bicyclists, wider two-way bike lanes should be provided to accommodate more side-by-side riding and passing in the same and opposing directions of travel. In constrained conditions where the recommended width cannot be achieved, the minimum width for a two-way separated bike lane is 8.5 ft between two vertical curbs and 7.5 ft between sloped curbs or when at sidewalk level (p. 17).

Table 5
Two-Way Separated Bike Lane Widths Based on Existing or Anticipated Volumes
(AASHTO, 2024, ch. 7, p. 17, Table 7-4)

Table 7-4: Two-Way Separated Bike Lane Widths Based on Existing or Anticipated Volumes

Peak Hour Directional Bicyclist Volume	Two-Way Separated Bike Lane Width (ft) Recommended Values		
	Between Vertical Curbs without Gutter	Adjacent to One Vertical Curb	Between Sloped Curb, at Sidewalk Level, or Adjacent to Curb with Gutter
<150	10–12	9.5–11.5	9–11
150–350	12–16	11.5–15.5	11–15
>350	≥16	≥15.5	≥15
Practical Minimum*	8.5	8	7.5

** Peak Hour Directional Bicyclist Volume not applicable*

For additional information about separation elements, read NACTO's Separating Protected Bike Lanes (NACTO, 2025).

2.4 Multimodal Sidepath

Trail Type Definition

Multimodal Sidepaths are adjacent to roadways and are either visually or physically separated. Trail users are not separated on these paths; a trail width of 10 ft is recommended. Visual separation, such as differing paving patterns, materials, or painted strips, can be used to separate users. However, unlike Separated Bike and Pedestrian Lanes, both cyclists and pedestrians use the same path.

Standard Dimensions

In addition to AASHTO's guidelines (see section 2.1), multimodal sidepath dimensions also includes more specifications from NACTO (NACTO, 2025, Designing for All Ages and Abilities, Paths):

Design Guidance

Overall path width includes both the rideable space (the paved path) and the lateral clearance on either side of a path.

Paths should be wide enough for people on bikes to comfortably ride side-by-side while other users pass in the opposite direction. Design for the future, considering the existing and potential land use and transportation needs along the path. Paths designed to current volumes will likely reach capacity in the future, resulting in crowding and increasing crash potential among users. Paths narrower than 11 ft (3.3 m) do not provide adequate dimensions for expected use patterns. Use constrained or minimum dimensions only intermittently along a path corridor.

Beyond these dimensions, lateral clearance of at least 2 ft (0.6 m) is necessary for each side of a path. The clearance area should be flush or nearly flush with the path. Signs, light poles, utility poles, and other intermittent vertical objects should be outside this clearance; in constrained conditions, these elements may be a minimum of 1 ft (0.3 m) from the path. Fencing, railings, or other linear barriers may be 1 ft (0.3 m) from the path,2 but additional clearance is desirable where possible (paras. 1 - 3, Dimensions).

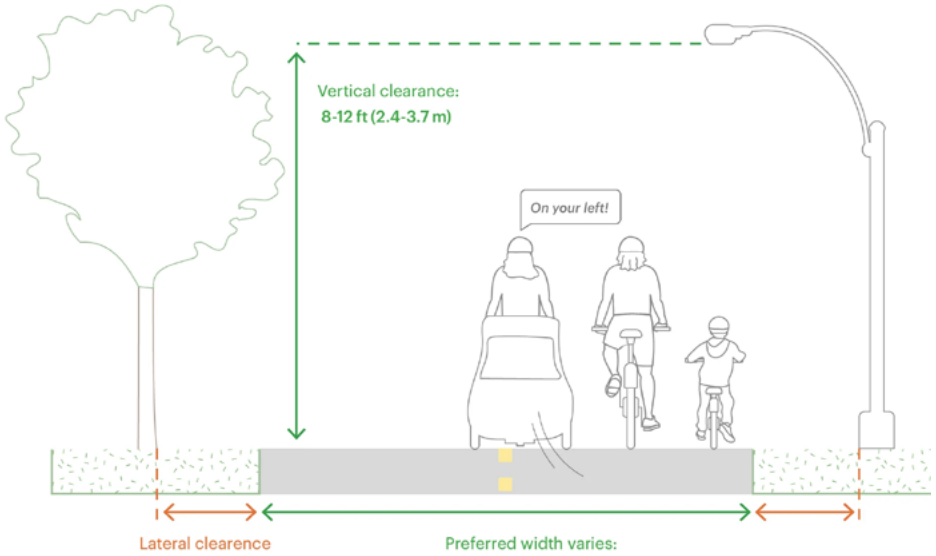


Figure 1
Recommended Path Dimensions
Dimensions are recommended from NACTO's guideline but actual dimensions may be set on a case-by-case basis.
(NACTO, 2025, Designing for All Ages and Abilities, Paths, Figure 3).

2.5 Bike Lane

Trail Type Definition

Bike lanes are located on or directly adjacent to roadways. Clear separation from motor vehicles is necessary to reduce passing stress and improve the comfort of trail users. A preferred minimum width of 5 ft is recommended for multidirectional bike lanes, and 2.5 ft is recommended for single directional use.

Standard Dimensions

Bike Lane dimensions follow NACTO's guidelines for advisory and constrained bike lanes (NACTO, 2025, Designing for All Ages and Abilities, Bikeways on Low-Speed, Low-Volume Streets):

Advisory Bike Lanes

Advisory bikeways are typically implemented on streets narrower than 28 ft (8.5 m) wide, excluding any space dedicated to on-street parking.

The advisory bike lane space should be 5-6.5 ft (1.5-2 m) wide. Avoid advisory bike lanes that are 7 ft (2.1 m) or wider, especially when adjacent to the curb, to limit the likelihood that people will use them as parking or travel lanes.
The central motor vehicle space should be 10-15 ft (3-4.5 m) wide, which allows for motor vehicle travel in one direction at a time between the advisory bike lanes. The total combined width of the central motor vehicle space and the bike lanes will provide an effective width of at least 20 ft (6 m) for two-way motor vehicle travel.

The maximum width for the central motor vehicle operating space is 18 ft (5.4 m), providing an effective width of 28 ft (8.4 m) for a motor vehicle to pass another from the opposing direction.

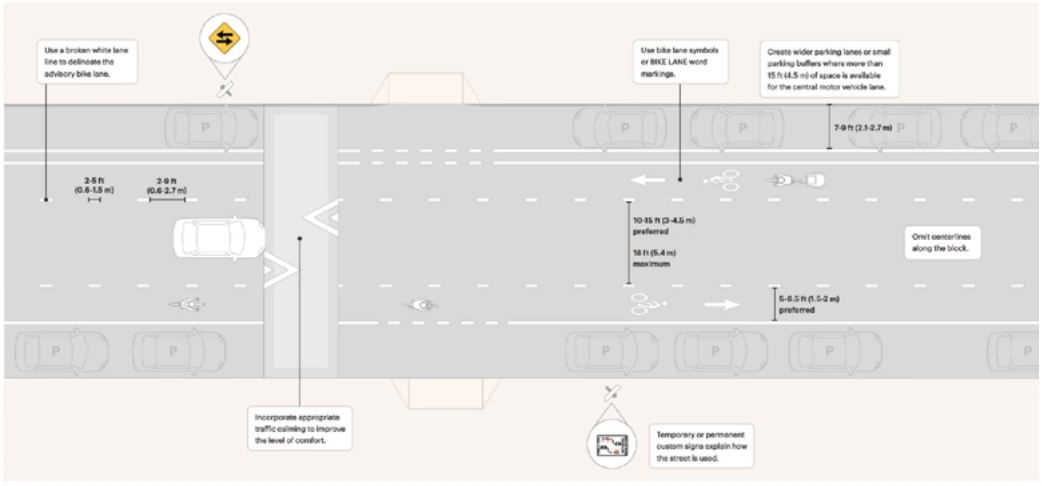
Where more than 15 ft (4.5 m) of space is available for the central motor vehicle lane and the advisory bike lanes are at least 5 ft (1.5 m) wide, additional right-of-way can be allocated to the parking lane. Cities can add a buffer alongside the parking lane or mark the parking lane up to 9 ft (2.7 m) off the curb. Wider parking lanes may be preferable for streets with frequent delivery activity or unique curbside access needs, such as accessible loading.

Where the central motor vehicle lane is larger than 18 ft (5.4 m), constrained bike lanes with buffers may create a more comfortable and predictable biking environment.

Mid-block pinch points (also known as chokers or hugs) can be used to discourage motor vehicles from driving regularly within the advisory bike lanes. These pinch points include short segments of protected bike lane conditions and are wide enough for only a single motor vehicle. Drivers are forced into a yield condition.

Advisory bike lanes adjacent to parking lanes are not recommended where on-street parking demand and use is low. Users may be confused by the mostly empty curbside lane. In these cases, parking lanes should be reallocated to other uses, such as protected or buffered bike lanes (paras. 1 - 8, Dimensions).

Figure 2
Recommended Advisory Bike Lanes Dimensions
(NACTO, 2025, Designing for All Ages and Abilities, Bikeways on Low-Speed, Low-Volume Streets, Advisory Bike Lanes, Figure 3)



Constrained Bike Lanes
Motor vehicle lanes should be narrowed to support the widest feasible bike lanes. At posted speeds of 35 mph (60 km/h) or less, general-purpose travel lanes can be 10 ft (3 m) wide and still support transit and truck uses. Where transit or heavy trucks are rare, a travel lane of 9 ft (2.7 m) is an acceptable width for general-purpose travel lanes.

Parking lane widths should be minimized, typically to 7 ft (2.1m), in favor of increased bike lane or buffer width. Even if the parking lane will be used occasionally by wide vehicles, marking a narrow parking lane will encourage drivers to park closer to the curb.

Constrained bike lanes and buffered lanes should still accommodate comfortable side-by-side bike riding, platooning, or passing using the bike lane and a portion of the buffer. The preferred width for a constrained bike lane is 6-7 ft (1.8-2.1 m), excluding any gutter pan. Alongside the curb, the minimum width is 4 ft (1.2 m), and when adjacent to parking, the minimum combined width of the bike lane and buffer is 5 ft (1.5 m).

Constrained bike lanes narrower than 6 ft (1.8 m) may not accommodate people riding cargo bikes or larger devices. Avoid 7 ft (2.1 m) or wider curbside constrained bike lanes to limit the likelihood that people will use the bike lane for a parking or travel lane; use a protected bike lane instead.
Constrained bike lanes wider than 7 ft (2.1 m) should have a marked buffer of at least 2 ft (0.6 m).

Parking buffers should be 3 ft (0.9 m) wide to accommodate the full swing of a car door and mitigate the potential for injurious crashes, commonly known as “doorings.” The preferred combined width for buffered bike lanes is 7-9 ft (2.1-2.7 m), including a buffer of 3 ft (0.9 m) and a bike lane that is 4-6 ft (1.2-1.8 m) wide.

With low parking turnover, constrained bike lanes alongside on-street parking may omit the parking buffer. This is a common condition for contraflow bike lanes along bike boulevards with one-way motor vehicle operations. Where additional right-of-way exists but a protected bike lane is not possible, designers may choose a double-buffered bike lane or a buffered curbside bike lane.

A double-buffered bike lane has both a parking buffer and a street buffer. These two buffers guide riders to the safest position within the bikeway, away from both opening car doors and moving vehicular traffic. Where double buffers are used, the bike lane is typically 4-6 ft (1.2-1.8 m) wide, the parking buffer is at least 3 ft (0.9 m) wide, and the street buffer is at least 1 ft (0.3 m) wide.

A buffered curbside bike lane prioritizes the width of the bike lane to accommodate side-by-side riding, platooning, or passing within the bike lane. Street-side buffers are typically 2-4 ft (0.6-1.2 m). This type of bike lane can be easily upgraded to a protected bike lane with the addition of vertical separation in the buffer (paras. 1 - 10, Dimensions).

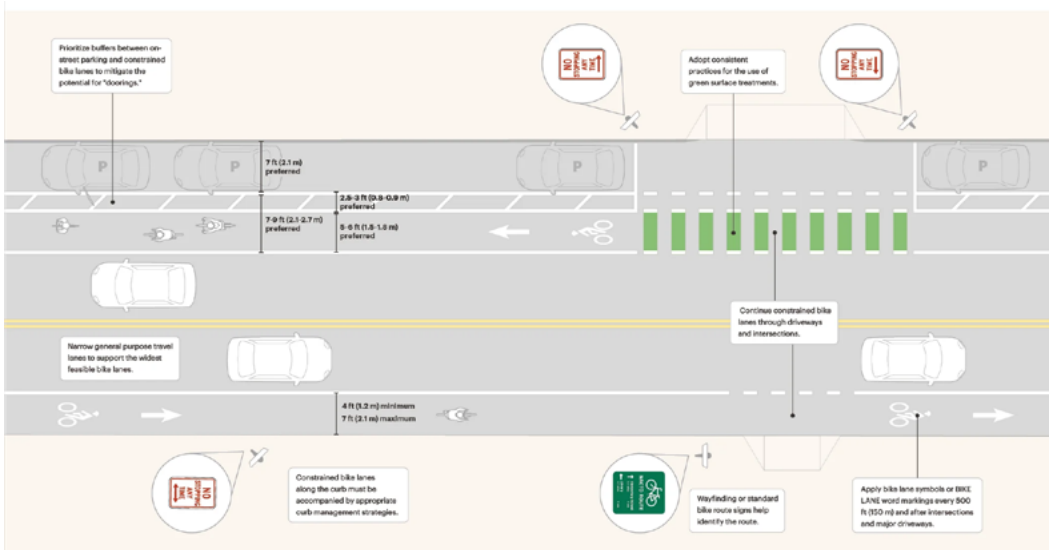


Figure 3
Recommended Constrained Bike Lanes Dimensions
(NACTO, 2025, Designing for All Ages and Abilities, Bikeways on Low-Speed, Low-Volume Streets, Constrained Bike Lanes, Figure 2)

For more information about bicycle lanes general considerations, read the AASHTO Guide for the Development of Bicycle Facilities Chapter 9 section 4 subsection 1.2-3 (AASHTO, 2024, ch.9, pp. 13-15).

2.6 Pedestrian lane

Trail Type Definition

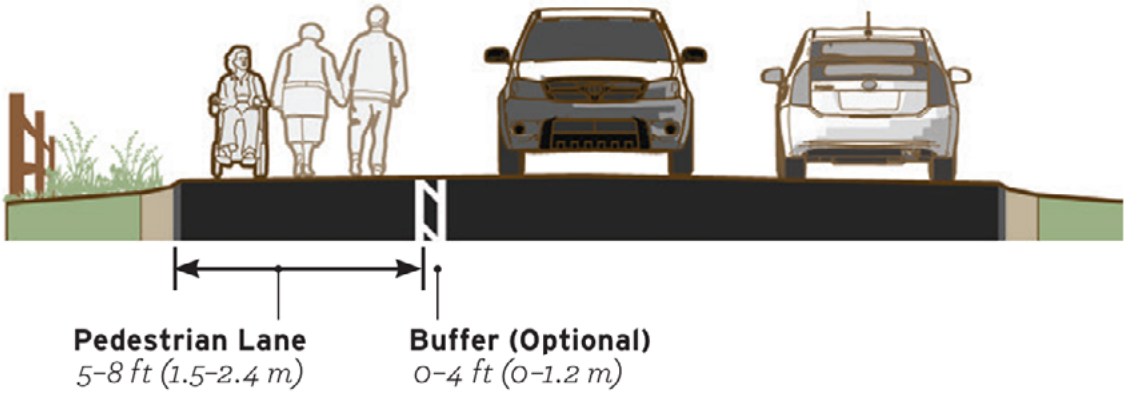
Pedestrian lanes are located on roadways when a sidewalk is not feasible. Clear visual or physical separation from vehicular traffic is necessary. Pedestrian lanes should be wide enough to allow comfortable, side-by-side walking; 8 ft is preferred, with a minimum of 5 ft for accessibility and maneuverability. When physical separation is not an option, extra lane width enhances user comfort and usability.

Standard Dimensions

Pedestrian lane dimensions follow the Small Town and Rural Multimodal Network guidelines (Goodman & FHWA, 2016, ch. 5):

> Pedestrian lanes should be designed to support and promote side-by-side walking within the lane. Because of the lack of physical separation, additional width beyond this should be included for added comfort.
>
> - 8 ft (2.4 m) width is preferred
> - 5 ft (1.5 m) width is the minimum to allow for side-by-side walking and maneuverability by users of mobility devices.
>
> Pedestrian lanes are intended for use by pedestrians and must meet accessibility guidelines for a pedestrian access route. This includes:
>
> - The grade of pedestrian access routes shall not exceed the general grade established for the adjacent street or highway.
> - The cross slope of pedestrian access routes shall be 2 percent maximum.
> - The surface of pedestrian access routes shall be firm, stable, and slip resistant. (p. 7, Geometric Design)

Figure 4
Recommended Dimensions for Pedestrian Lanes (Goodman & FHWA, 2016, ch. 5, p. 7, Figure 5-6)



2.7 Bike Boulevard

Typology Definition

This trail type is recommended for use in Rural and Suburban conditions on low to moderate volume and/or speed conditions.

Bike boulevards are local streets adapted to prioritize bicycle travel while discouraging high volumes of motor vehicle traffic. Low-speed, low-volume streets can serve as effective bike boulevards. On narrow streets, target speeds should be 10–20 mph, and alternative routes should be provided if safe passing or contraflow travel isn't possible (NACTO, 2025).

Standard Dimensions

Bike boulevard's traffic volumes, speed and crossing opportunities criterias follow AASHTO's guidelines (AASHTO, 2024, ch.8):

8.3 Bicycle Boulevard Minimum Design Elements

The design of a bicycle boulevard often involves a collection of different design treatments that may vary significantly depending on the context. At a minimum, a bicycle boulevard should provide route identification and wayfinding to navigate the route. Where traffic volumes or speeds do not meet the criteria specified in Table 8-1, consideration should be given to the provision of traffic calming…Where major street crossings are a barrier and the crossing opportunities meet the criteria specified in Table 8-2, an evaluation of crossing treatments is recommended (p. 5).

Table 6
Bicycle Boulevard Motor Vehicle Traffic Volume and Speed Performance Criteria
(AASHTO, 2024, ch. 8, p. 3, Table 8-1)

Table 8-1: Bicycle Boulevard Motor Vehicle Traffic Volume and Speed Performance Criteria

Minimize Motorized Through Traffic Volumes and Speed Differential			
	Peak Hourly Traffic Volume* (vehicles/hr)	Average Daily Traffic Volume (ADT)	Operating Speed (mph)
Preferred	150	1,000	15
Acceptable	300	2,000	20
Maximum	450	3,000	25

*Assumed to be 15 percent of ADT.

See Chapter 8 References: City of Portland (2015).

**Assumed to be 15 percent of ADT.*

Table 7
Lane Shift Taper Equation for Traffic Calming Treatments
(AASHTO, 2024, ch. 8, p. 9, Table 8-2)

Table 8-2: Lane Shift Taper Equation for Traffic Calming Treatments

Lane Shift Taper Equation for Traffic Calming Treatments		
$L = \frac{WS^2}{120}$		
Where:		
L	=	lane shift (ft), minimum 20 ft
W	=	width of offset (ft)
S	=	target motor vehicle operating speed (mph)

Bike boulevard's dimension follow NACTO's guidelines (NACTO, 2025, Designing for All Ages and Abilities, Bike Boulevards, Design Guidance):

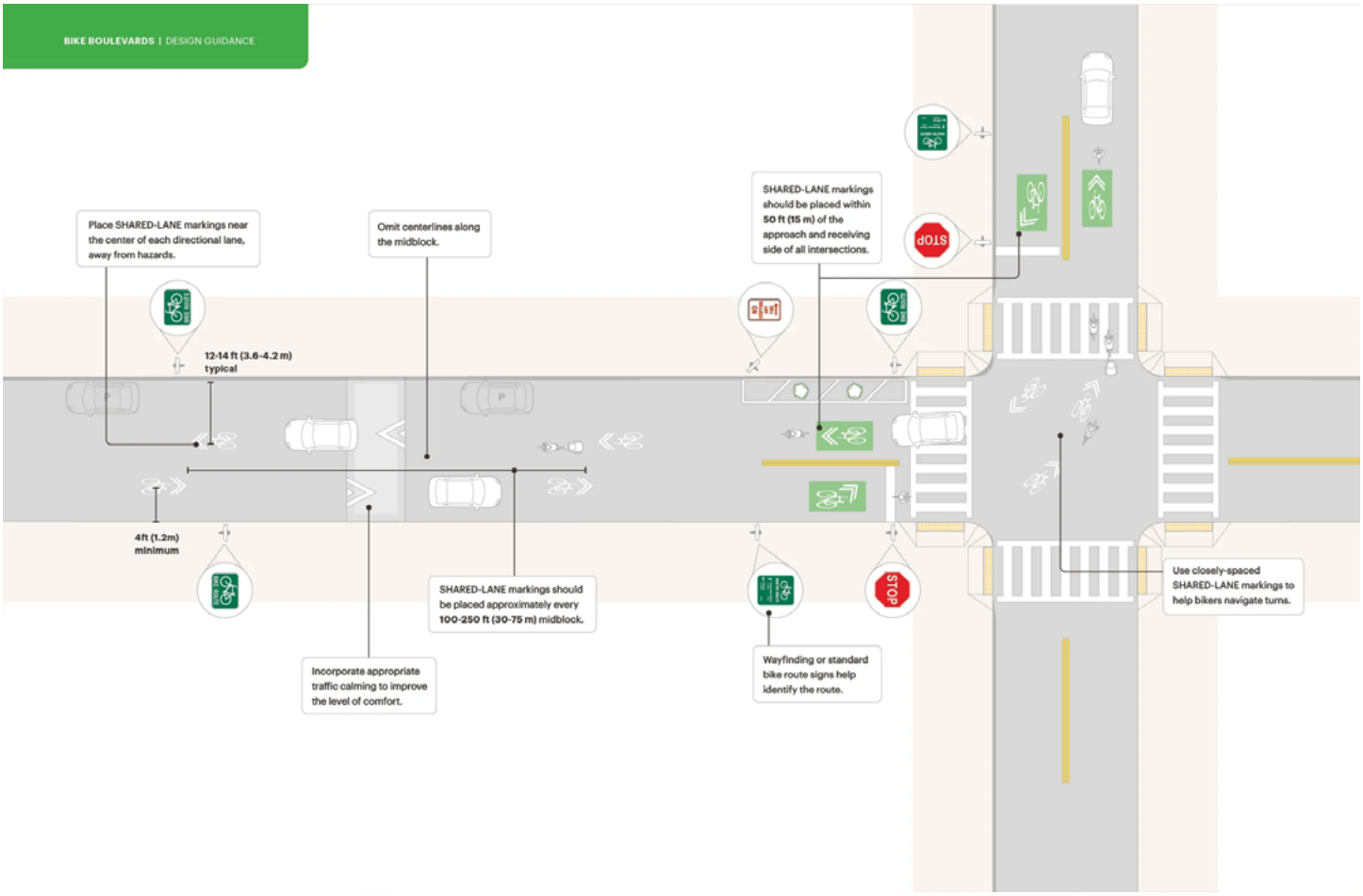
Dimensions

Streets with low motor vehicle speeds and volumes can function as bike boulevards regardless of the width of the street.

For streets with 24 ft (7.2 m) or more of space for two-way motor vehicle traffic, or 15 ft (4.5 m) or more of space for one-way motor vehicle operations, consider additional design treatments. Use design treatments to organize the roadway, maintain narrow motor vehicle lanes, and prioritize two-way biking, including advisory bike lanes, constrained bike lanes, or buffered bike lanes in the with-flow or contraflow direction. Consider opportunities for horizontal deflection through midblock chicanes or midblock hugs (also called chokers).

Along very narrow streets where the shared roadway is so narrow that cars are generally unable to give bikes at least 3 ft (1 m) of space while passing, the target speed should be 10-20 mph (15-30 km/h). Where the shared roadway is so narrow that someone on a bike cannot avoid collision with an oncoming motor vehicle, and where motor vehicle volumes exceed 500 per day, design an alternative route for the contraflow connection (paras. 1-3).

Figure 5
Recommended Bike Boulevards Dimensions (NACTO, 2025, Designing for All Ages and Abilities, Bike Boulevards, Figure 2)



2.8 Yield Roadway

Trail Type Definition

This trail type is recommended for use in Rural and Suburban conditions on low volume and/or speed conditions.

Yield roadways are local (often residential) streets adapted to prioritize bicycle travel while discouraging high volumes of motor vehicle traffic. Low-speed, low-volume, two-way streets can serve as effective Yield Roadways and should follow AASHTO Low Volume Roads guidance. Pull-out areas for passing or meeting vehicles should be provided every 200–300 ft, using parking lanes or roadside areas when lane width is ≤15 ft.

Standard Dimensions

Yield roadway dimensions follow AASHTO's guidelines (AASHTO, 2024, ch.8):

> **8.4.1.2 Narrow (Yield) Streets**
> Yield streets are typically 25–28 ft wide with parking on both sides, or 20 ft wide with parking on one side to limit the effective width of the operating space, which requires motorists to pull into empty parking spaces or driveway openings to allow approaching motorists to pass. For a yield street to function properly, parking density must be relatively high, but motorists must also have regular opportunities to pull to one side. In general, yield streets are most effective where:
>
> - On-street parking utilization does not exceed 40–60 percent of the street, or
> - there are frequent driveways.
>
> Yield streets should also provide enough room for emergency vehicle access as well as the occasional moving van or large delivery truck to navigate safely (p. 7).

Yield roadway dimensions also follow guidelines of the Small Town and Rural Multimodal Network (Goodman & FHWA, 2016, ch. 2, p. 5, Geometric Design):

> **Two-way Travel Lane**
> The paved two-way travel lane should be narrow to encourage slow travel speeds and require courtesy yielding when vehicles traveling in opposite directions meet.
>
> - Total traveled way width may vary from 12 ft (3.6 m)-20 ft (6.0 m).
> - Traveled way width below 15 ft (4.5 m) or below function as a two-way single-lane roadway and should follow the guidance of the AASHTO Low Volume Roads 2001.
>   A: When width is 15 ft (4.5 m) or narrower, provide pull-out areas every 200-300 ft to allow for infrequent meeting and passing events between motor vehicles. Pull-out areas may be established in the parking lane or roadside area.
> - Access for emergency vehicles should be provided. There is no single fire code standard for local roads; however, a range of clear widths for parking and deploying fire department apparatus is between 16-20 ft (5.0-6.0 m). Designers should provide an opening of this width every 200-300 ft (600-91 m).

Roadside

If desired, parking may be located on the paved roadway surface or on gravel or soil shoulders outside of the paved roadway. The parking lane may also serve as a pull-out area while yielding.

- When possible, the parking lane should be constructed with a contrasting material to differentiate the lane from the travel area. Bituminous, crushed stone, gravel, and turf shoulders can be used as contrasting materials to the travel area (AASHTO, 2011, pp. 4-13).
- Trees may be planted within the roadside area at regular intervals to visually and physically narrow the corridor, add to the aesthetic environment, and encourage slow speeds.

Figure 6
Recommended Dimensions for Pedestrian Lanes (Goodman & FHWA, 2016, ch. 2, p. 5, Figure 2-1)

B. Native Plant Resource Guide

The purpose of this guide is to provide guidance on native plant selection for planting along the US Great Lakes Waterfront Trail.

General Midwest Resources

MIdwest Native Plant Nursery DIrectory
Directory of Native Plant Nurseries by state including Iowa, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.

Lady Bird Johnson Wildflower Center
Resources separated by state, ecoregion, and function (stormwater and pollinator friendly).

Pollinator-Friendly Native Plant Lists | Xerces Society
Native plant lists organized by geographic region that support pollinators by providing habitat for resting, nesting, feeding, and breeding.

Native Plants of Great Lakes Region by State

Michigan

Regional Plant Lists - Native Plants and Ecosystem Services
Native plants lists that are divided by Michigan ecoregions (Upper Peninsula, northern Lower Peninsula, and southern Lower Peninsula).

Michigan Native Plants Database Search
Interactive native plant filtered by type (shrub, wildflower, ferns, etc), characteristic (bloom time, height, etc), site context (soil and light), function (pollinator, rain garden, etc), and region..

Find Native Plants - Michigan Natural Shoreline Partnership
Plant lists, external links to resources, guides on nurseries, and native plant educational resources.

Native Plants for Birds
Resources for native plant lists, nurseries, how to design bird friendly landscapes, and state wide flora information.

Wisconsin

Plant native plants to help nature | | Wisconsin Department of Natural Resources
Links to planting basics, native landscape webinars, ecological restoration, and native plant sales.

Plant Species Information | University of Wisconsin-Madison Arboretum
Native plants list by plant type (trees/shrubs, grasses/forbes, ferns) and ecological function (raingarden, savanna garden, hummingbird/butterfly garden).

Native & Naturalized - Selection - Wisconsin Horticulture
Native Wisconsin plants with images and videos featuring gardening tips, tricks, and native plant education.

Illinois

For Your Garden by the Illinois' Department of Natural Resources
Links to native plant resources including species by garden type, sun conditions, and native plant lists.

Illinois - Natural Resources Conservation Service
Invasive species identification, the Illinois Native Plant Guide, and the Plant Materials Garden at the State Office.

CICADA - Conservation Inclusive Development-Residential-Native Plant Seed List
Native plant resources including a native wildflower seed list and maintenance guides.

Indiana

Indiana Native Plant Finder
A database tool to help you choose Indiana native plants specific to your site.

Recommended Indiana-Native Plants for Attracting Pollinators
Curated by Purdue University, this resource focuses on native plants that can enhance and attract pollinator species.

Native Plants Finder - Indiana Wildlife Federation
Native Plants Finder includes Indiana native trees, shrubs, ferns, vines, grasses, and nectar plants found in natural spaces and native gardens.

Plants Native to Indiana's Ecoregions
Indiana ecoregion map to help identify which ecoregion you are in.

Ohio

Native Plants Lists | Ohio Department of Natural Resources
Native plant lists with ecotypes (plains, wetlands, lowlands, wet woods, etc).

Native Plants - Ohio State University
Native Ohio plants with growing tips. Listed plants are sold through Chadwick Arboretum's spring sale.

Ohio Native Perennials
A list of perennial Ohio native plants sold by Rare Roots. Includes cultivars (cultivated varieties) and naturally-occurring hybrids.

Ohio Wildflowers to Find All Year Long | The Nature Conservancy
Native Ohio wildflowers by season.

Pennsylvania

Common Native Plants of Pennsylvania

Per the PAEnflowered website, this "is an easy to use plant resource portal containing species found in the state of PA. We are a non-profit organization devoted to sharing beauty & diversity of the plant world."

Appendix B - Pennsylvania Native Plant List

Per the Pennsylvania Native Plant List "The BMP Plant List contains information about plant species native to Pennsylvania that are suitable for use in BMPs. The list is sorted by plant type and then by scientific name. The table also contains."

Pennsylvania Bureau of ForestryPlanting and Seeding Guidelines

A resource for designing and implementing native planting strategies, with recommended species lists, seed mixes, and guidance.

Bureau of Forestry Native Pollinator Conservation Plan, 2021

Per the Bureau of Forestry Native Pollinator Conservation Plan, this document is meant to "support many of the statewide goals set forth by the Pennsylvania Pollinator Protection Plan..These goals include pro-active management of lawns, rights-of-way, urban areas, and natural landscapes for native pollinators; improving practices for pesticide use; supporting beekeepers; and enhanced emphasis on scientific research to improve understanding of pollinator species ecology and better inform appropriate management."

Common Western Pennsylvania Native Plants

Per the Western Pennsylvania Wild One's webpage "There are more than 2,000 native plant species in Western Pennsylvania. This list includes easy-to-find and easy-to-grow native flowering native plants."

Pennsylvania Native Plant Society

Per the Pennsylvania Native Plant Society webpage their mission is to advocate for the "conservation of native plants and their habitats and promote the increased use of native plants in the landscape."

New York

Native Flowers, Grasses, Shrubs, Trees, and Vine

Department of Environmental Conservation's Native species list for gardening and landscaping.

Creating a Pollinator Garden for Native Specialist Bees of New York and the Northeast

Per the guide, "This guide is focused on providing rich resources for the specialist bees of the northeastern US, New York in particular, and is inspired by Jarrod Fowler's 2016 publication, Specialist bees of the northeast: host plants and habitat conservation."

"Native Plants." Cornell Cooperative Extension Columbia and Greene Counties

Per the Native Plants webpage, "The Finger Lakes Native Plant Society has a list of native plants they consider garden worthy. It includes Native Plants Suitable for Wildflower Gardens & Meadows or Traditional Gardens in the NY Finger Lakes."

A Guide to Native Plants for New York's Great Lakes Shorelines
A guide to selecting and restoring native vegetation along New York's Great Lakes shorelines.

New York Flora Atlas
Native and non-native plants by county in New York state.

Native Plant Guide - Buffalo Niagara Waterkeeper
Per the webpage, "This guide outlines over 90 different plants native to Western New York."

Minnesota

Native Plant List
A Minnesota native plant list that includes information regarding growing zone, sun, type of growth, level of ease to grow, height, wildlife values, and other notes.

Minnesota Plant Lists
Per the webpage, "This page provides sources and lists of plants for stormwater [best management practices], salt tolerance, green roofs, and trees."

Minnesota Wildflowers: A Project for Environmental Justice
Per the webpage, "Here you'll find photos and information about wild plants that grow in Minnesota, both native and non-native. More than just wildflowers, we also include trees, shrubs, vines, ferns and fern allies, grasses, sedges and rushes, and aquatics."

Native plants | UMN Extension
Per the webpage, it includes "resources to get you started on selecting and growing native plants in your yard or garden. Some of these resources recommend both native and non-native plants."

Native Plant Encyclopedia | Minnesota DNR
Native plants by county in Minnesota state.