PITTSBURGH REGIONAL TRANSIT

LANDSCAPE DESIGN GUIDELINES

JUNE 2025

Pittsburgh Regional Transit

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Fig. 0-02

ACKNOWLEDGMENTS

Pittsburgh Regional Transit

Pittsburgh Regional Transit (PRT) provides public transportation throughout the City of Pittsburgh and Allegheny County in Western Pennsylvania.

PRT's 2,600 employees operate, maintain, and support bus, light rail, incline, and paratransit services for approximately 200,000 daily riders.

Governed by an 11-member board appointed by the Allegheny County executive, leaders from both parties in the Pennsylvania House of Representatives and Senate, and the governor of Pennsylvania, the board and its committees hold regularly scheduled public meetings.

PRT's budget is funded by fare and advertising revenue, along with money from county, state, and federal sources. PRT's finances and operations are audited on a regular basis, both internally and by external agencies.

PRT began serving the community as the Port Authority of Allegheny County in March 1964. In early 2015, PRT began investing in a Transit-Oriented Development (TOD) program. This document is the result of investment to date, overseen by Transit-Oriented Communities (TOC) staff and an interdisciplinary working group. The Port Authority of Allegheny County re-branded as Pittsburgh Regional Transit in 2022.

Participants

This report received input and feedback internally from the PRT's Transit-Oriented Communities (TOC) advisory committee, an inter-departmental body established to support the TOD program. These guidelines were developed by PRT's Planning and Service Development Department, led by Moira Egler, Manager of Transit-Oriented Communities, and supported by Ryann McMahon, Senior Planner, and Derek Dauphin, Director of Planning.

Consultant Team

The guidelines were developed in collaboration with a team that included HDR Inc. and evolve environment::architecture.

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Fig. 0-03

CHAPTER 1

INTRODUCTION

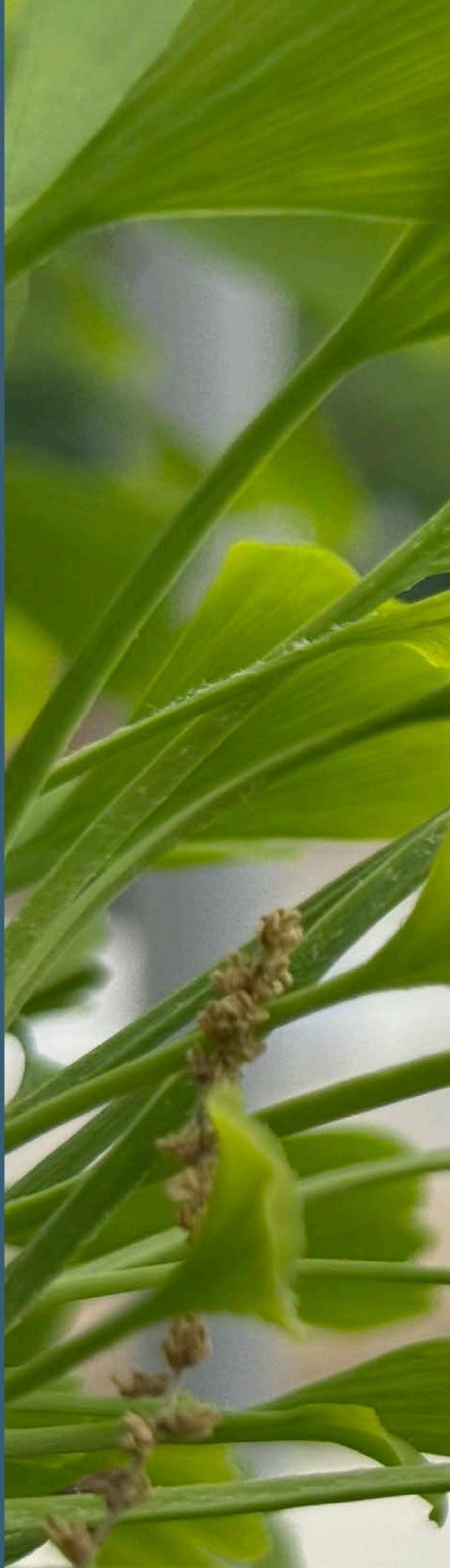


Fig. 1-01

1. INTRODUCTION

WHAT ARE THE LANDSCAPE DESIGN GUIDELINES?

The *Landscape Design Guidelines* are a strategic, comprehensive resource developed to improve the quality, consistency, and sustainability of landscapes across Pittsburgh Regional Transit (PRT)'s system. Additionally, these guidelines aim to help to improve the effectiveness of the agency's maintenance efforts. Intended for planning and design consultants, PRT planning and engineering project managers, and maintenance teams, this document provides design considerations, encourages alternative maintenance practices, and identifies realistic implementation strategies. The guidelines establish a clear framework for understanding current landscape conditions and implementing sustainable improvements that enhance the passenger experience while reducing long-term maintenance demands. They also serve as a source of inspiration, encouraging thoughtful and impactful improvements to the transit environment.

The guidelines are aligned with **PRT's Climate Action Plan (CAP)**, supporting the agency's efforts to achieve **net zero carbon emissions by 2045**, and more broadly, in creating a sustainable and equitable transit network. When considered across the scale of PRT's properties, these landscape strategies of low-maintenance native plant palettes can have profound impacts in reducing PRT's maintenance costs, as well as offsetting greenhouse gas emissions, sequestering carbon, mitigating urban heat island effects, improving air quality, and improving the ability of the landscape to respond to frequent flood events.

The *Landscape Design Guidelines* also supports goals identified in **PRT's Strategic Plan** (2024-2028), and marks progress towards the following goals:

Accountability
- A4: Establish social responsibility by being an active and consistent community partner
- A5: Achieve recognition as a national leader in implementing innovative environmental solutions and climate initiatives

Resiliency
- R5: Develop the infrastructure needed to deploy a zero-emission fleet by 2045

Customer Experience
- CE2: Operate an equitable transit system that supports thriving communities

The following pages outline a detailed assessment of existing landscape conditions across PRT's properties—including park and rides, fixed guideway stations, and operations facilities—and identifies 12 common landscape typologies. Many sites contain multiple overlapping typologies.

For each condition, targeted strategies are provided to improve landscape performance, appearance, and functionality. Strategies include increasing tree canopy coverage, diversifying native plantings, rehabilitating degraded forest areas, managing stormwater, controlling erosion, stabilizing slopes, depaving and reducing impervious surface areas, incorporating traffic calming measures, and adding public amenities and art to enhance the rider experience.

By establishing consistent standards across the system, these guidelines will help to create a unified landscape identity that reflects PRT's values, strengthens the brand's image, increases ridership, and enhances operational efficiency. Ultimately, these guidelines provide a long-term vision for land stewardship that balances aesthetics and maintenance—supporting a healthier, more resilient region for generations to come.

PROJECT BACKGROUND

This document addresses actions identified in PRT's Climate Action Plan:

- **Action S.5.e** called for the development of a sustainable landscape design and maintenance guidebook and training program.
- **Action 3.1.g** recommends a transition to zero-emission small maintenance equipment and notes that transitioning PRT's portfolio to sustainable landscapes would reduce some of the need for small maintenance equipment at all.
- **Action S.5.c** notes that staff discussions in the past have suggested converting landscaped areas to low/no mow native habitats..

The need for a consistent approach to landscape was also previously identified through PRT's Station Improvement Program. Before developing these guidelines, PRT station area planning projects did not have a consistent set of expectations or standards regarding landscape strategies. All of PRT's major capital projects have a site or landscape component, and the lack of standards led to unique conditions on a site-by-site basis or resulted in the reversion of non-hardscaped areas to either mowed grass or overgrowth.

For station area plans in the Station Improvement Program, one of the goals is to enhance the station experience through good design and quality stewardship. While unique landscape conditions can embody good design, they must be maintained by teams who possess the necessary training, capacity, and resources to provide appropriate stewardship.

While each station area plan identified unique recommendations for landscaping strategies, there lacked deliberate coordination between plans.

The *Landscape Design Guidelines* were initiated in response to this need—providing a consistent foundation for design, planning, and maintenance that positions landscape as a core element of transit infrastructure from the earliest stages of project planning. The guidelines aim to ensure that landscape considerations are integrated into project scopes and budgets, and that designs reflect both the realities of PRT's maintenance capabilities and the agency's broader goals for climate resilience, and creating welcoming and environmentally responsible public transit spaces that enhance the passenger experience.

The *Landscape Design Guidelines* provide landscape strategies that can be applied consistently throughout PRT's portfolio and offer a pathway to changing PRT's overall landscape maintenance demands, enabling a higher standard of care for the same level of capacity and resources.

METHODOLOGY

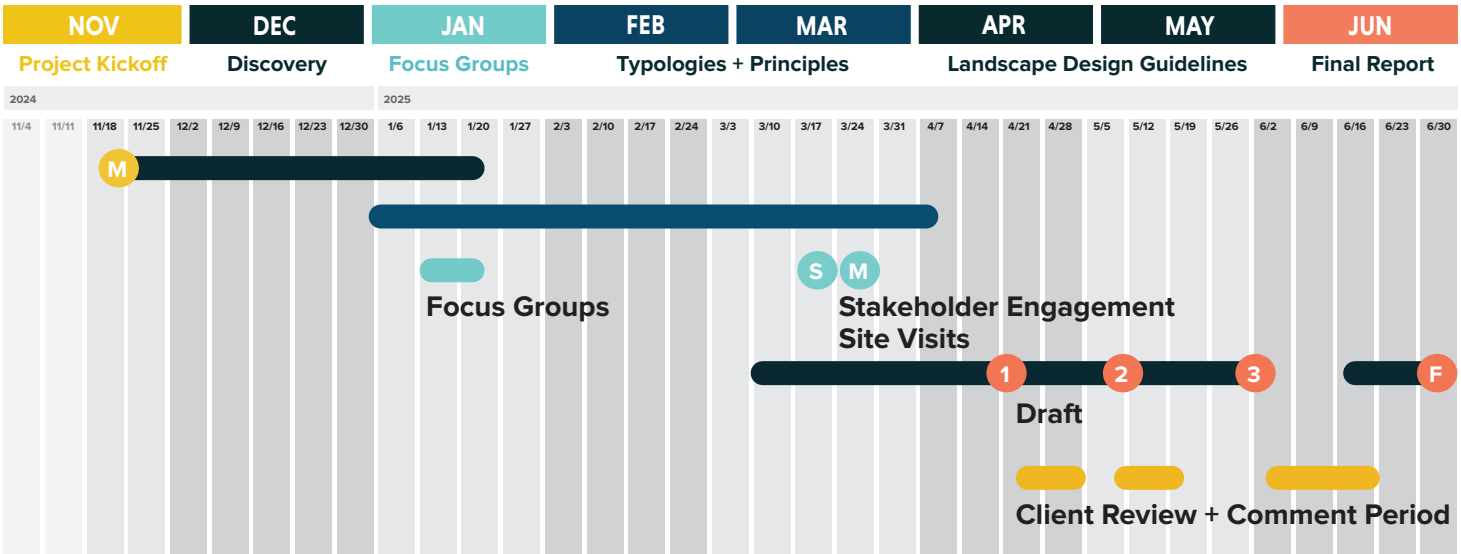
The development of the *Landscape Design Guidelines* began with first aligning goals and identifying the project's **guiding principles**, followed by a comprehensive **discovery** phase to establish a clear understanding of existing conditions, past planning efforts, and current operational capacity. As a first step, the project team reviewed past planning documents to identify prior strategies related to landscape design and sustainability practices. This review helped to contextualize the current effort within PRT's broader goals, particularly those aligned with the agency's Climate Action Plan, Transit Oriented Development (TOD) Guidelines, and Light Rail Transit (LRT) Design Guidelines.

To assess the range of landscape conditions across the transit system, the project team conducted a detailed desktop analysis. This included the use of GIS data, land cover layers, and a manual review of satellite imagery, photographs, and maps. A total of 105 properties were evaluated: 44 park and rides, 68 fixed guideway stations (including busway and LRT), and 8 operations facilities. For each property, the team documented the type, quality, and approximate size (in acres) of landscape conditions.

To supplement the data analysis and develop a deeper understanding of current practices, the team facilitated two 90-minute **focus groups** with PRT staff and leadership. These sessions provided critical insight into how properties are currently managed, the capacity of maintenance teams, and key challenges and goals for future landscape improvements. Participants were grouped by department—Operations, Maintenance + Safety, and Planning + Engineering—to ensure relevant, focused discussions. These conversations were instrumental in shaping strategies and recommendations that are both practical and feasible under current operational constraints. More detailed summaries of these discussions can be found in the Appendix.

In-person site visits were also conducted to confirm desktop findings and directly observe landscape conditions. Key site visits included Herron, Washington Junction, Negley, Steel Plaza, and East Liberty Stations. Further engagement included PRT's Transit-Oriented Communities (TOC) advisory committee.

PROJECT TIMELINE



The **Typologies + Principles** phase involved analyzing the existing landscape conditions in greater detail, identifying opportunities for enhancement, and developing a framework of strategies that could be applied across the system. The final phase focused on organizing the guidelines into a clear, actionable document. After internal review and several rounds of feedback, the *Landscape Design Guidelines* were finalized and issued in June 2025.

Data Sources

PRT obtained metric data from Pennsylvania Spatial Data Access (PASDA), internal data, staff observation and site visits, focus group interviews, and satellite imagery, photographs, and maps.

Image Sources

Images are from a range of sources, including Google Earth and Google Street View. All maps and graphics were created by PRT and the consultant team unless otherwise noted. Case study images are credited to the photographer or design team where applicable. For a full list of image sources used in this document, refer to the Appendix.

PRT engaged leadership and staff to understand how properties are currently managed and maintained, as well as to gain insight into the goals, challenges, and opportunities in developing site landscape improvements.

Key takeaways included:

Limited capacity for maintenance tasks presents significant challenges, requiring a balance between conceptual landscape planning and the realities of maintaining such landscapes.

Successful implementation of site improvements will require **internal training, capacity-building, and a cultural shift** toward sustainable maintenance practices.

Given internal limitations, **external contractors** may be necessary, particularly during the plant establishment phase, though union considerations must be addressed.

Existing precedents for stakeholder involvement and **partnerships** suggest opportunities to collaborate on landscape implementation and maintenance efforts.

Durable materials and standardized designs are essential for long-term maintenance efficiency.

GUIDING PRINCIPLES

The guiding principles for the *Landscape Design Guidelines* are informed by previous planning documents such as LRT Design Guidelines, TOD Guidelines, and Station Area Plans. The following principles were established collectively at the project onset, and should be referenced throughout future planning efforts to inform decision-making.

Environment + Ecology

The *Landscape Design Guidelines* prioritize ecological health and climate resilience through:

- Habitat management + protection
- Ecological restoration
- Stormwater management
- Decarbonization
- Heat island mitigation
- Climate resilience
- Stormwater management strategies
- Environmental awareness

Care + Maintenance

All strategies are rooted in a realistic understanding of operational capacity:

- Native plants selected for their unique condition + environment
- Replicable, adaptable + low maintenance
- Litter reduction strategies
- Maintenance strategies + requirements
- Equipment + vehicles
- Ease of replacement

Experience

Designs must enhance rider comfort, safety, and the overall perception of transit environments:

- Clear sight lines
- Accessible walkways
- Public safety
- Amenities + seasonal considerations - creating welcoming experience year-round
- Cohesive design language reinforcing PRT's brand identity

Community-Minded

Landscapes should reflect the needs of all communities served by PRT, with attention to fairness, accessibility, and public health. Priorities include:

- Promote belonging
- Align with neighborhood context, while providing system-wide consistency
- Inclusive and accessible for all
- Support green jobs
- Staff considerations (include maintenance staff in decision making)
- Address public health disparities
- Improve air quality + access to nature

Fig. 1-02

LANDSCAPE GOALS

Based on the guiding principles, the following landscape-specific goals were identified:

Improve Passenger Experience

- Create comforting and welcoming station areas
- Maintain visibility for rider convenience and safety
- Focus landscape improvements in high visibility or high use areas

Increase Tree Canopy Coverage

- Provide shade for enhanced rider comfort
- Mitigate urban heat island impacts
- Support improved biodiversity and resilience

Create More Durable Landscapes

- Incorporate low maintenance planting strategies that evolve over time
- Consider life cycle processes and cost benefit analyses: for example, long-term benefits of GSI to offset hard costs
- Create landscapes that are prepared for a changing climate, including flooding and increasing temperatures.

Align with Climate Action Plan

- Identify landscape strategies that support carbon reduction and greenhouse gas offsets

Simplify Planning Process

- Build consensus around feasible, achievable landscape solutions
- Ensure landscape is considered a core element of transit infrastructure and is embedded in project scopes, budgets, and design decisions from the beginning of a project

Align Maintenance + Land Management Strategies

- Create a system-wide approach to landscape maintenance to streamline maintenance activities and efforts.
- Offer actionable strategies that are aligned with PRT's resources and long-term vision for land stewardship.

Fig. 1-03 - Itea virginica, Virginia Sweetspire

PLANNING DOCUMENT SUMMARY

The project team reviewed several documents for aligning principles, strategies, and resources. Summaries of the documents are provided below.

Station Evaluation (2024)

This report utilizes a quantitative analysis to identify which stations should be prioritized for conceptual planning and station area improvements. PRT comprehensively evaluated stations under six main categories: **Existing Conditions** (amount of amenities, tree canopy coverage, facility condition / age, etc.), **People** (population, ridership, job flow, etc.), **Equity, Development Opportunity** (underutilized land, developable land, population change, etc.), **Connectivity** (pedestrian connections, bike lanes, intersection density, etc.), and **Displacement** (areas of persistent poverty, minority populations, average income, cost burden, etc). Many of the stations identified in the Station Evaluation report will be subject to future landscape improvements as outlined in the *Landscape Design Guidelines.* As such, design consultants should review both documents in parallel when evaluating existing station and landscape conditions.

Station Area Plans (various years)

Since 2018, PRT has produced seven (7) station area plans that identify opportunities and potential improvements for the following stations, in chronological order:

- Negley
- Station Square
- Dormont Junction
- Carnegie
- South Hills Junction
- Wilkinsburg and Brushton
- Herron

The station area plans analyze each of the stations at three different scales:

- the **station area scale,** which looks at the physical condition, assets, liabilities, customer use patterns, connectivity and accessibility;
- the **community context scale**, which considers transformations in the surrounding area that could support TOD, alongside regulatory context, infrastructure conditions, economic trends, cultural identity and context, community use patterns and perceptions, and stormwater conveyance;
- the **transit corridor scale**, which considers improving connectivity, regional economic forces, and timing of station area initiatives.

These reports were evaluated for any landscape recommendations, plant lists, and approaches to landscape design.

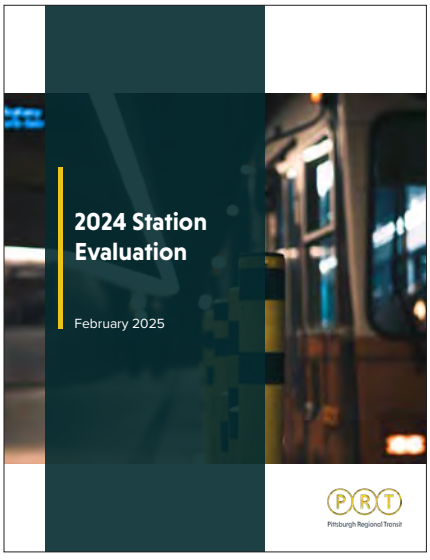


Fig. 1-04

Fig. 1-05

Fig. 1-06

Climate Action Plan (2024)

Recognizing that climate change is one of the most important challenges facing us today, PRT set a goal to reach net zero carbon emission by 2045. This plan establishes targets, goals, strategies, and actions to reduce carbon emissions, ensuring the plan is not only aspirational but achievable.

The *Landscape Design Guidelines* are intended to serve as a resource for efficient, sustainable, and low-emission maintenance practices specifically related to the landscape. These guidelines build on a number of the goals, strategies, and targets set forth in the CAP, including:

- Reducing facility and infrastructure emissions by 40% by 2030.
- Establishing an operations and maintenance best practices guidebook for all stations, buildings, and sites, and to provide energy-efficient operations.
- Transition to zero emission small maintenance equipment as new purchases are made
- Develop emissions reduction strategies and incentives in contracts, especially those for ongoing maintenance and operations.

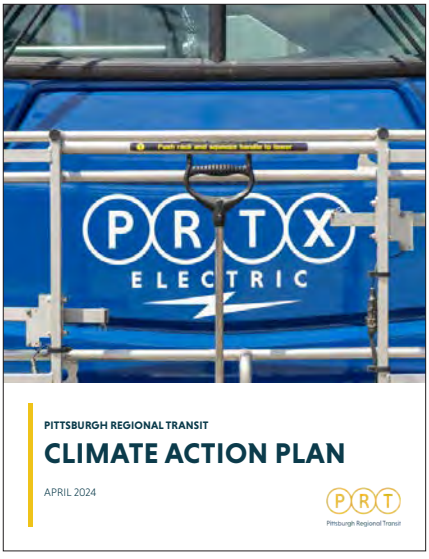


Fig. 1-07

Equity Index of Mobility Need (2019)

PRT's goal is to provide quality service in an effective, efficient, and equitable manner. Decisions on how, where, and in what order to make improvements is a balance of competing priorities and demand.

In order to aid in this decision-making process, and to provide transparency and consistency throughout ongoing decision-making, PRT produced the Equity Index of Mobility Need as a guideline for how to evaluate equity. This evaluation serves to identify areas that have a higher portion of disadvantaged populations (low income households, minority race or ethnicity populations) or those who have greater mobility needs (households with older adults, persons with disabilities, or households without access to a vehicle). The analysis overlays these different factors to create an index score ranging from 0-1, where 1 equals greater mobility need.

The original report was produced in 2019, and identified 10 municipalities with the greatest mobility need: 1) Braddock Borough, 2) Rankin Borough, 3) Homestead Borough, 4) Mount Oliver Borough, 5) North Braddock Borough, 6) City of Duquesne, 7) West Homestead Borough, 8) East Pittsburgh Borough, 9) Wilkinsburg Borough, 10) City of McKeesport.

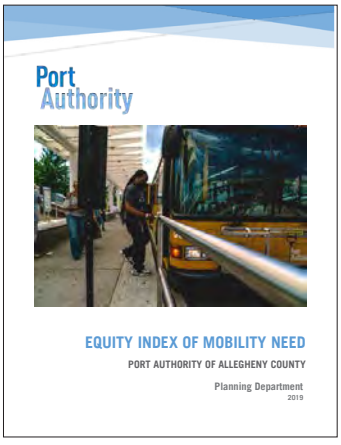


Fig. 1-08

Light Rail Transit Station Design Guidelines (2018)

The Light Rail Transit (LRT) Design Guidelines serve as a foundational reference for shaping the physical character and performance standards of stations along the Authority's fixed guideway network. Developed in coordination with the Station Improvement Program (SIP), the guidelines aim to enhance the agency's image, drive ridership and revenue, and support TOD. They promote a cohesive and flexible design approach—standardizing core elements while allowing for contextual adaptation—ensuring that each station contributes to a unified yet responsive transit environment.

The guidelines emphasize key principles such as customer and staff comfort, visual consistency, coherent site design, and long-term durability and maintenance. Station typologies and categorizations structure the guidance and are critical for defining scalable design strategies across various station types.

Although focused on architecture and infrastructure—providing detailed direction on station canopies, materials, colors, branding, and platforms—the LRT Design Guidelines include limited but relevant landscape recommendations. These include maintaining sidewalks with grades under 5% where feasible, ADA-compliant access features, and incorporating pervious landscaped areas. The document acknowledges the challenges of maintaining landscape elements and recommends standardization of planting types, species, and placement to improve maintenance efficiency. Considerations for erosion control on steep sites and seasonal variability in landscape management are also addressed.

The *Landscape Design Guidelines* build upon this framework, adopting its structure and principles while expanding the landscape-specific strategies to create consistent, high-quality, and maintainable station environments across the network.

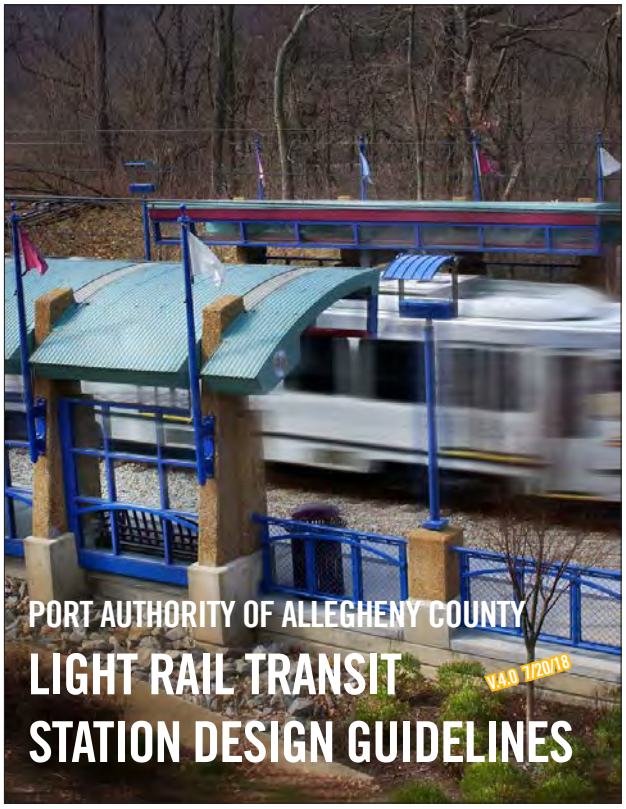


Fig. 1-09

Transit Oriented Development Guidelines (2016)

The Port Authority of Allegheny County TOD Guidelines is a comprehensive document outlining best practices for integrating transit infrastructure with surrounding land use to create vibrant, walkable, and sustainable communities. It provides a framework for stakeholders, including transit agencies, local governments, developers, and community groups, to implement TOD projects that enhance transit ridership, economic development, and quality of life. TOD, defined as higher-density, mixed-use development located within walking distance of transit stations, has several key benefits, including: reduced automobile dependency, improved air quality, expanded access to affordable housing, and a more efficient use of land. The guidelines classify TOD into six station typologies—Downtown, Urban Mixed Use, Urban Neighborhood, Transit Neighborhood, Suburban Neighborhood, and Suburban Employment—each with tailored recommendations for density, land use, connectivity, and parking strategies.

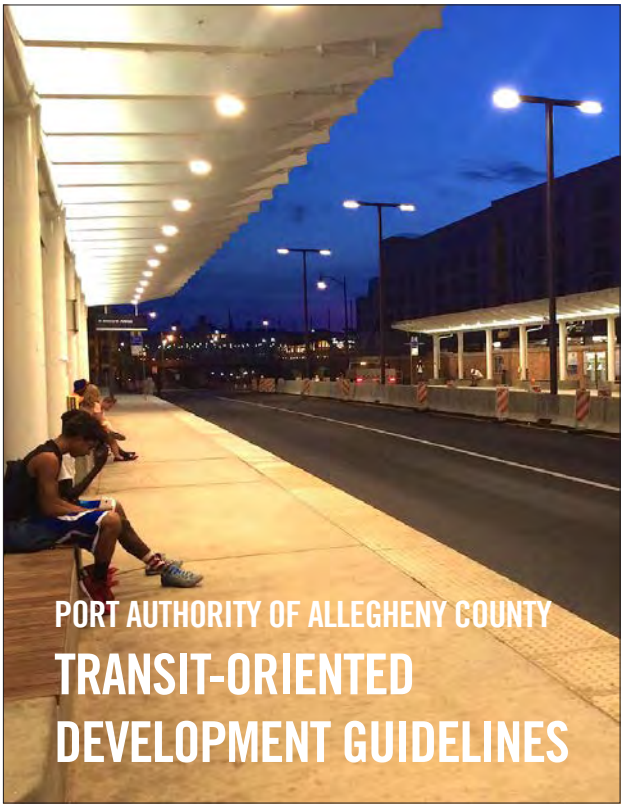


Fig. 1-10

The document outlines critical design principles such as multimodal connectivity, pedestrian-friendly environments, and active streetscapes. It emphasizes the importance of integrating public art and open spaces to foster community identity, while advocating for development patterns that minimize parking demand and promote sustainable design.

Recognizing Pittsburgh's legacy transit infrastructure and urban context, the guidelines underscore the need for coordinated regional planning. By leveraging TOD as a tool for smart growth, Allegheny County can create equitable, transit-oriented communities that align with long-term sustainability and livability goals.

Facilities Master Plan (ongoing)

PRT's NEXTransit Long Range Plan (2021) recommended the development of a Facilities Master Plan to help PRT address current inadequacies and to position the agency to be more adaptable, effective and efficient, supporting future needs and potential expansion. The Facilities Master Plan was identified as Project Zero, because its completion is critical to the successful implementation of other recommendations outlined in the NEXTransit plan.

Currently still in development, this plan has identified that PRT is spatially constrained at its bus garages and maintenance facilities. Additionally, park and rides are underutilized in many locations and could be monitored for future right-sizing to reduce maintenance costs. The spatial constraints at maintenance facilities indicate that PRT has limited ability to adapt its maintenance practices due, in part, to insufficient space. The preferred course of action will identify opportunities to address these spatial constrains so that PRT can invest in purpose-built maintenance and support facilities that meet the agency's current and future needs.

HOW TO USE THIS RESOURCE

The *Landscape Design Guidelines* provide a comprehensive resource for a range of stakeholders including design consultants, project managers, and PRT maintenance teams, creating a shared understanding of the existing landscape conditions across PRT properties, and identifying the steps for implementing sustainable improvements.

Different portions of the guidelines will be more relevant for certain groups. For example, design and engineering consultants might most utilize the **Proposed Landscape Conditions** (Chapter 2) and **Landscape Strategies** (Chapter 3), while maintenance teams might review the **Recommendations** (Chapter 5). The steps for how to best use this resource include:

1. Identify the Existing Landscape Condition

The first step is to identify the existing landscape conditions that comprise a particular station area, park and ride, or operations facility, as illustrated in the **Example Station Area diagrams** on pages 22-26. Chapter 2 identifies the ten most typical landscape conditions found across PRT's system, and, for each, describes its role within the transit system, strategies for improving the quality of landscape, and the type and level of maintenance expected.

2. Review the Proposed Landscape Condition

Next, the hypothetical landscape scenarios or applications provide examples of the types of landscape design interventions that might apply for the particular landscape condition. These illustrations will be most useful during planning, design, and engineering of future station area improvements.

3. Reference and Apply Landscape Strategies

The strategies used to achieve the proposed conditions are outlined in Chapter 3, which provides additional details, plant lists, maintenance implications, and data. The **Landscape Suitability Matrix** on page 26 provides an overview of where different landscape strategies are recommended, and where they are not recommended or not applicable.

4. Utilize Resources: Implementation + Design Considerations

Chapter 4 provides supplementary resources such as a basic overview on how to select the right plants and landscape materials, and finding the right partners. By providing easy access to considerations such as ridership, PRT's Index of Mobility Need, canopy coverage, or access to parks and open spaces, and public health indicators like air quality – consultants can start from the same foundation and understanding of landscape priorities and potential.

5. Confirm Designs are Maintainable by PRT: Review Maintenance Needs + Recommendations

When making landscape recommendations, Consultant teams should have a base understanding of the level of landscape care realistically achievable by PRT's resources. While the *Landscape Design Guidelines* are intended to reduce PRT's landscape maintenance demands—and support transitioning to alternative maintenance practices—Chapter 5 outlines the ways in which PRT might feasibly implement some of these landscape improvements: through building internal capacity of maintenance teams, increasing administrative efficiency and data-tracking, and/or relying on external contracts where necessary. This chapter provides seasonal maintenance checklists to support PRT's maintenance efforts, and also outlines the steps for implementing a series of pilot projects in order to test the landscape strategies identified in this document, and to develop a better understanding of their maintenance requirements and PRT's ability to manage them.

PLANNING AND DESIGN CONSULTANTS

PRT PLANNING AND ENGINEERING PROJECT MANAGERS

MAINTENANCE STAFF

1. Identify the Existing Landscape Condition

2. Review Proposed Landscape Conditions

3. Reference and Apply Landscape Strategies

4. Utilize Resources: Implementation + Design Considerations

- Plant Selection Criteria
- Finding the Right Partners
- Designing for Impact

5. Review Maintenance Needs + Recommendations

- Landscape Maintenance Recommendations
- Building Internal Capacity
- Administrative Recommendations
- Pilot Project

Utilize the appropriate resource to implement the project


Fig.1-11

Public Entry Plaza


Fig. 1-12

Parking Lot


Fig.1-13

Landscape Buffer - Mown Lawn

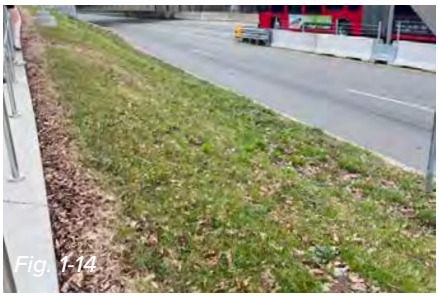


Fig. 1-14

Steep Slope - Mown Lawn


Fig. 1-15

Landscape Buffer - Planted


Fig. 1-16

Steep Slope - Planted


Fig. 1-17

Steep Slope - Wooded


Fig. 1-18

Walls


Fig. 1-19

Creek Adjacent


Fig. 1-20

Space Constrained

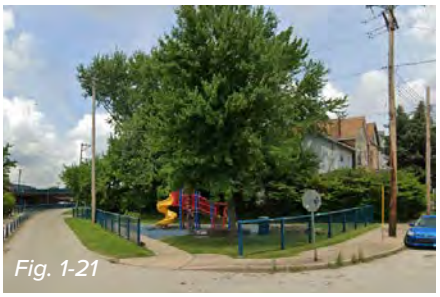


Fig. 1-21

Public Amenity


Fig. 1-22

Roadway

Trees


Fig. 1-23

Native Plant Diversity


Fig. 1-24

Manage Invasive Species


Fig. 1-25

Stormwater Management


Fig. 1-26

Slope Stabilization


Fig. 1-27

Forest Rehabilitation


Fig. 1-28

Depaving

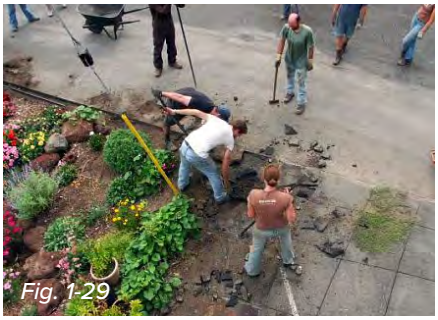


Fig. 1-29

Traffic Calming

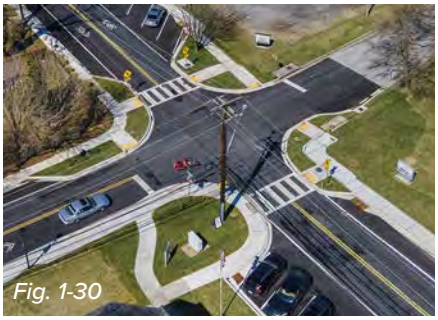


Fig. 1-30

Amenities


Fig. 1-31

Public Art

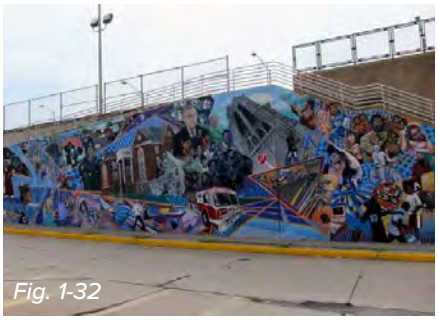


Fig. 1-32

Examples: Station Planning + Understanding the Landscape

The fist step of using this resource is to identify the existing landscape conditions present within the station or study area. The following pages provide an example of what this assessment might look like. Consultants should undertake a similar exercise as part of station area planning. Note that a variety of landscape conditions make up a station area. Identifying areas with higher visibility and maintenance intensity will help to identify where to focus landscape improvements.

MAINTENANCE INTENSITY:

HIGH - High maintenance landscapes require regular and ongoing maintenance, according to a specific schedule, with very little flexibility.

LOW - The lowest maintenance landscapes are those with little to no maintenance. These often include unmanaged natural areas that are not directly part of the station experience.

VISIBILITY:

There is a corresponding relationship between the intensity of maintenance efforts how visible or accessible a landscape condition is to passengers, impacting passenger experience and perceptions of safety and comfort.

HIGH - High visibility areas include the most public facing landscapes—areas along pathways, entrances, near shelters, and parking lots.

LOW - Low visibility areas include areas that are not adjacent to passenger facilities, such as inaccessible wooded areas, along fixed guideways, or at maintenance facilities and garages.

DESIGN CONSIDERATIONS

The design considerations will vary based on the station's context, neighborhood demographics, access, and mobility need and should also be identified by consultant teams as part of the station area planning process. In general, landscape improvements should always prioritize the visual or sensory benefit of landscapes in creating a more positive passenger and employee experience; rely on durable, low-maintenance plants and materials; consider the ecological value and ability to improve native habitat; and bolster landscape's ability to create a more resilient, adaptable region. Within some station areas, the agency and consultants might prioritize reducing impervious surfaces or increasing tree canopy coverage, while in others might want to consider access to regional trail systems or parks. Some stations might benefit from partnerships with regional or public authorities that share similar goals, such as non-profit organizations, neighborhood groups, or watershed conservancy groups.

The considerations listed on the following example stations are for illustrative purposes only, and should be identified early in planning processes with PRT and consultant teams.

EXAMPLE STATION: HERRON

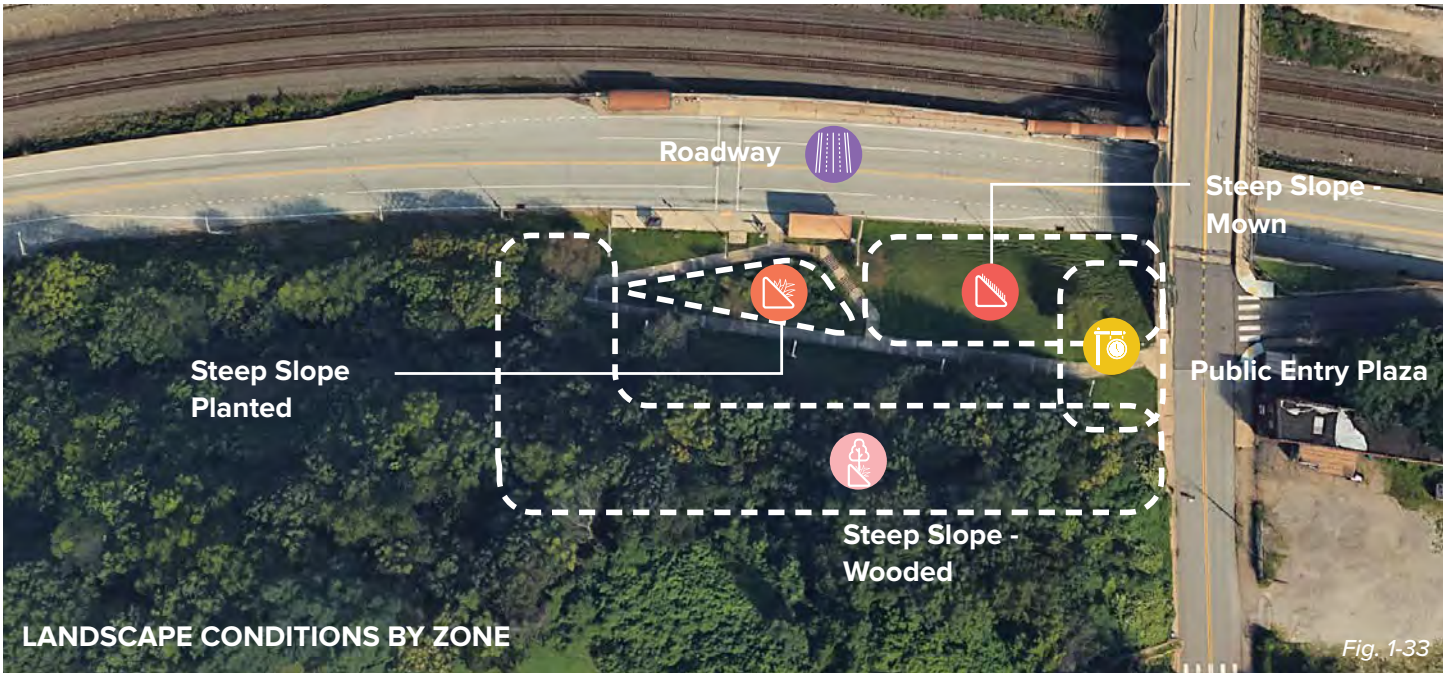


Fig. 1-33

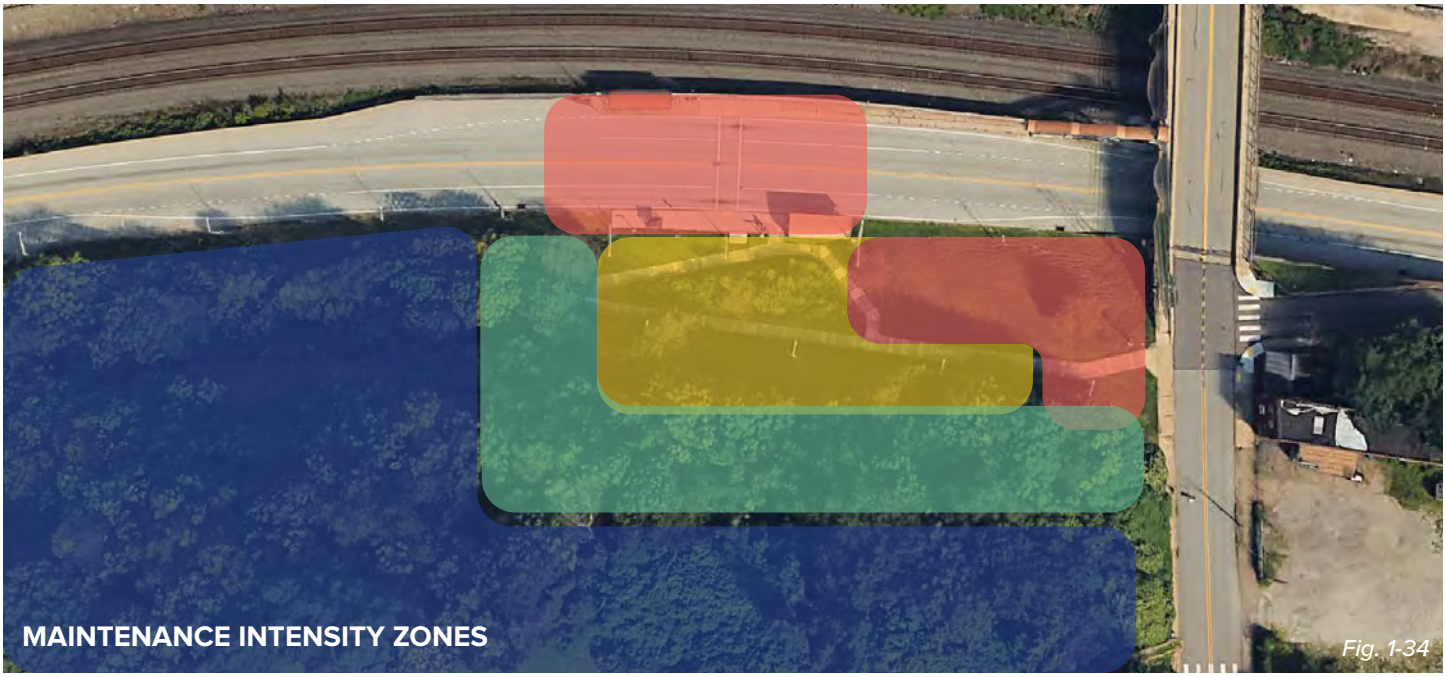


Fig. 1-34

MAINTENANCE INTENSITY

HIGH

LOW

VISIBILITY

HIGH

LOW

CONSIDERATIONS

- VISUAL / SENSORY APPEAL
- DURABILITY
- RESILIENCE
- LOW MAINTENANCE
- ECOLOGICAL VALUE

EXAMPLE STATION: MEMORIAL HALL

Fig. 1-35

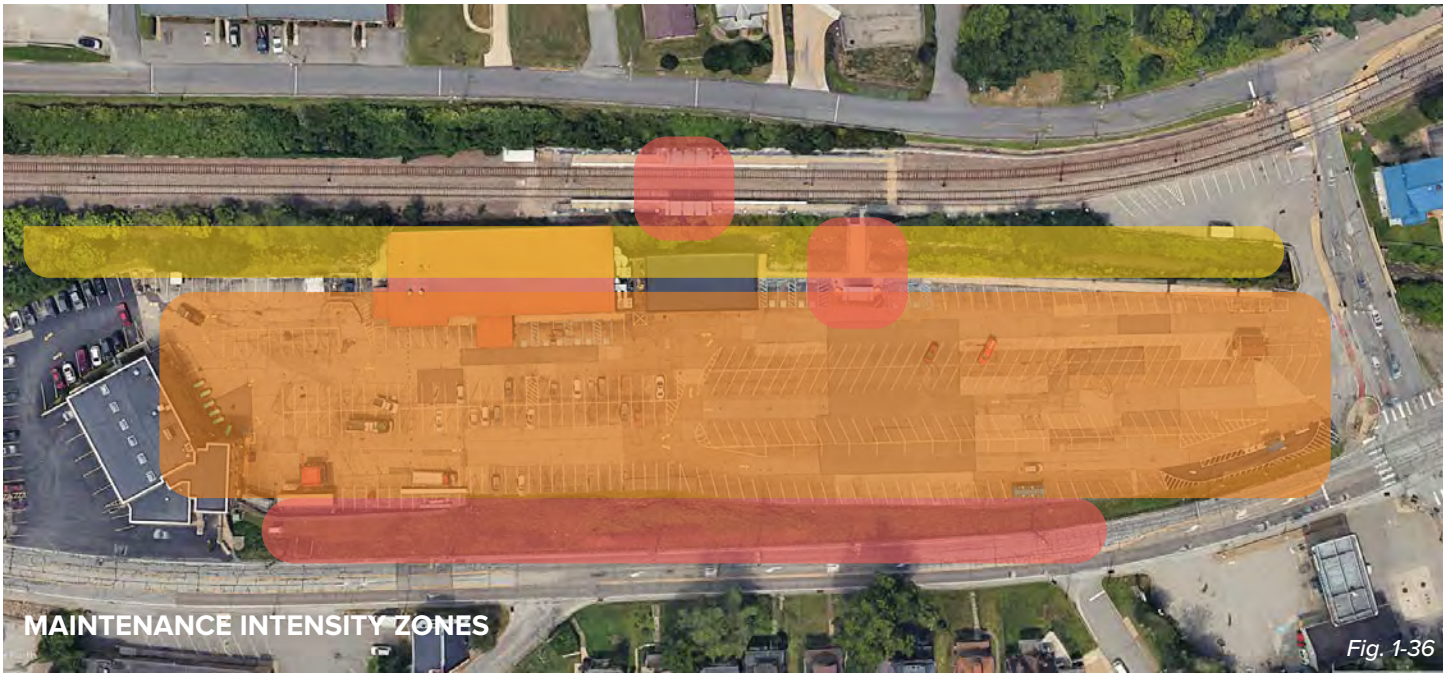


Fig. 1-36

MAINTENANCE INTENSITY

HIGH

LOW

VISIBILITY

HIGH

LOW

CONSIDERATIONS

- VISUAL / SENSORY APPEAL
- DURABILITY
- RESILIENCE
- LOW MAINTENANCE
- IMPERVIOUS SURFACES
- WATERSHED PARTNERS
- CANOPY COVERAGE

EXAMPLE STATION: WILLOW

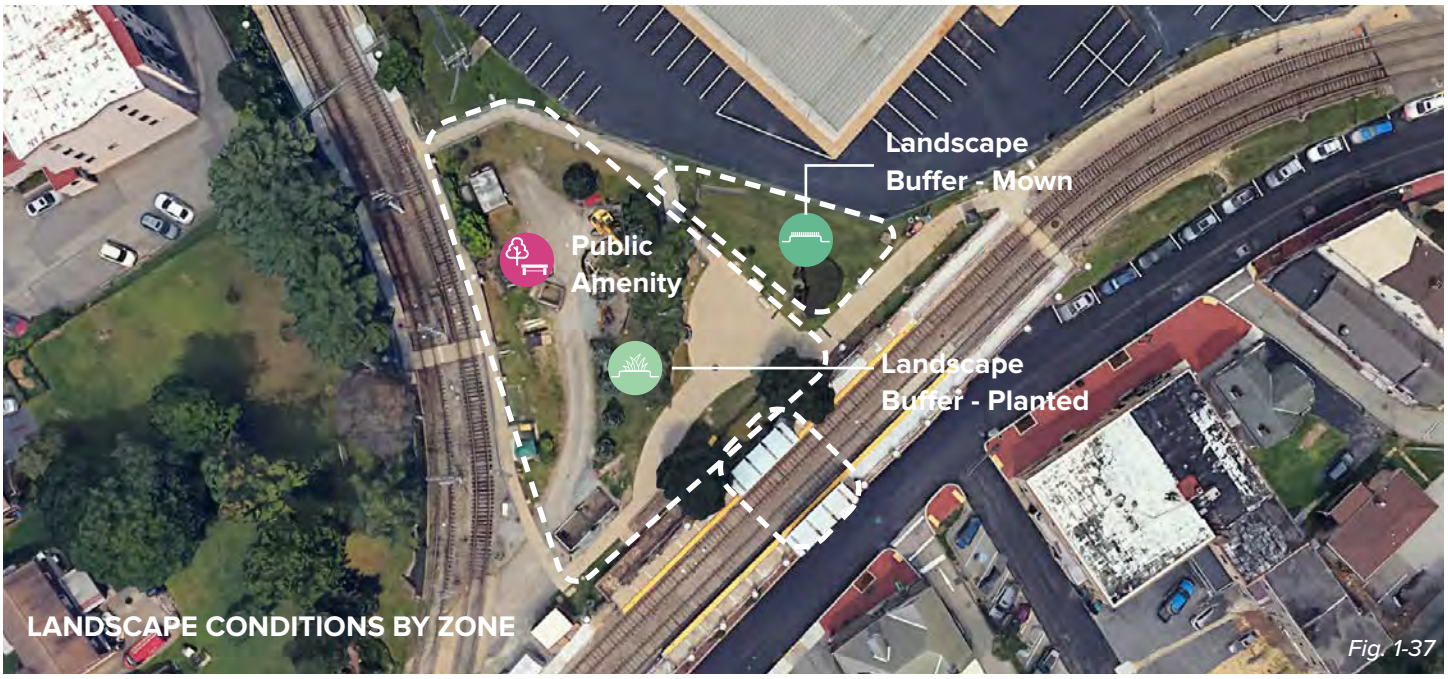


Fig. 1-37

Fig. 1-38

MAINTENANCE INTENSITY

HIGH

LOW

VISIBILITY

HIGH

LOW

CONSIDERATIONS

- VISUAL / SENSORY APPEAL
- DURABILITY
- PROGRAM
- PARTNERS
- ECOLOGICAL VALUE
- PARKS & TRAIL ACCESS

Landscape Suitability

While increasing the amount of trees, improving native plant diversity, and managing stormwater are generally appropriate and recommended at every station area, some landscape strategies are either not applicable or not appropriate for different landscape conditions. For example, public art would not appropriate in wooded landscape conditions, nor would trees be appropriate within the roadway. The chart below helps to illustrate where the different landscape strategies are most applicable.

LANDSCAPE SUITABILITY MATRIX

LANDSCAPE TYPOLOGY	LANDSCAPE STRATEGY									
	TREES	NATIVE PLANT DIVERSITY	MANAGE INVASIVE SPECIES	STORMWATER MANAGEMENT	SLOPE STABILIZATION	FOREST REHAB	DEPAVING	AMENITIES	TRAFFIC CALMING	PUBLIC ART
PUBLIC ENTRY PLAZA	○	■	N/A	■	○	N/A	■	■	■	■
PARKING LOT	■	■	N/A	■	○	○	■	■	■	○
SPACE CONSTRAINED	○	○	○	○	N/A	✕	○	○	■	○
LANDSCAPE BUFFER - MOWN LAWN	■	■	■	■	N/A	○	N/A	N/A	N/A	○
STEEP SLOPE - MOWN LAWN	■	■	■	○	■	○	N/A	N/A	N/A	✕
LANDSCAPE BUFFER - PLANTED	■	■	■	■	N/A	○	N/A	N/A	N/A	N/A
STEEP SLOPE - PLANTED	■	■	■	○	■	○	N/A	N/A	N/A	✕
STEEP SLOPE - WOODED	■	■	■	○	■	■	N/A	N/A	N/A	✕
CREEK ADJACENT	■	■	■	○	■	■	○	N/A	✕	N/A
WALLS	○	○	○	✕	N/A	N/A	N/A	N/A	N/A	■
PUBLIC AMENITY	■	■	■	○	N/A	N/A	○	■	■	■
ROADWAY	✕	■	■	■	N/A	N/A	○	✕	■	○

LEGEND

■ RECOMMENDED
○ CONSIDER IF RELEVANT
✕ NOT APPROPRIATE
N/A NOT APPLICABLE

Fig 1-39 - Rudbeckia hirta, Black Eyed Susan

CHAPTER 2

LANDSCAPE TYPOLOGIES

Fig. 2-01

2. LANDSCAPE TYPOLOGIES

EXISTING LANDSCAPE CONDITIONS OVERVIEW

In the following pages, the **existing landscape conditions** are described in detail, including its role within the transit system, a list of sites where the condition is found, photographic examples of the condition, and how frequently this condition appears across PRT sites (shown as percentage of total sites evaluated).

To help envision the types of landscape improvements possible for each condition, this section includes an annotated view of an existing condition, and identifies the **recommended landscape strategies**, as well as outlines the **current maintenance needs** (to establish a baseline for understanding whether improvements will increase, decrease, or remain the same in maintenance intensity).

This section also provides examples of important **design considerations** for project teams to prioritize during planning and design of future station area improvements.

The **application** sections sets targets for landscape improvements, illustrating how the landscape strategies can be applied through a conceptual site.

Lastly, each landscape typology is also accompanied by a **case study**, illustrating how similar landscapes have been addressed across different municipalities or peer transit agencies ranging from Minneapolis Metro to cities like Cincinnati or the DC metro area. The case studies are meant to provide inspiration and alternative ways of thinking about specific areas of the transit system.

GRAPHIC KEY: MAINTENANCE REQUIREMENTS

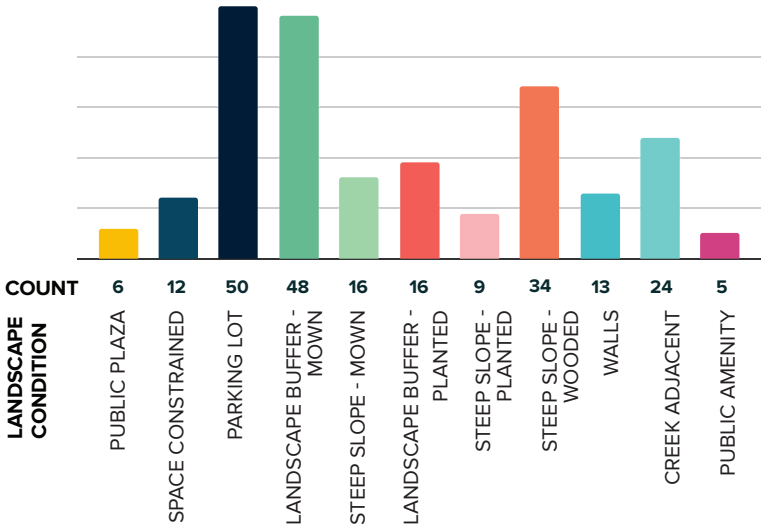
Indicates High, Medium, or Low Existing Maintenance Requirements

Indicates an increase in maintenance

Indicates maintenance needs will remain the same or similar, though tasks may shift

Indicates a decrease in maintenance

NUMBER OF LANDSCAPE CONDITIONS ACROSS ALL EVALUATED PROPERTIES



Public Plaza

Public Plazas were identified at long platform stations where there is a large area of hardscape marking the entry to the station, or providing space for amenities such as trash receptacles, bicycle parking, signage and lighting. This is where passengers typically purchase transit passes and wait for transit. Public plazas are also used for rider drop-off or pick-up.

Parking Lot

Any site that has a parking lot as part of its station or facility area is included in this category. It also includes park and rides.

Landscape Buffer - Mown Lawn

This category refers to areas of short grass, generally bordered by a curb, that act as a separation between roadways and station areas. There may or may not also be trees as part of mown lawn areas.

Steep Slope - Mown Lawn

Steep slopes are defined generally as grades greater than 33% slope, or 3:1. This category identifies steep slopes that are typically maintained as lawn.

Landscape Buffer - Planted

This category refers to areas planted with a variety of understory shrub or grass species, generally bordered by a curb, that act as a separation between roadways and station areas.

Steep Slope - Wooded

Steep slopes are defined generally as grades greater than 33% slope, or 3:1. Heavily wooded conditions are found along roadways, creeks, or more suburban station areas.

Steep Slope - Planted

Steep slopes are defined generally as grades greater than 33% slope, or 3:1. This category identifies steep slopes that are planted with understory shrub or grass species.

Space Constrained

Space constrained sites were found in urban conditions such as downtown stations like Gateway or First Avenue, or where the station is along active roadways, such as the Red Line stations in Beechview, or some of the Silver Line stations in Bethel Park.

Walls

Due to the region's topography of steep slopes and varying terrain, walls are an inevitable component of the landscape. Across PRT properties, walls vary in height and condition.

Creek Adjacent

A number of transit lines run parallel to existing hydrology networks or creeks. These areas are most likely to suffer from impacts of flooding.

Public Amenity

A few sites provide public amenity in the form of public park, memorial, or playground.

Roadways

This category was not calculated as part of the analysis, as the condition is present across PRT's system. However, roads and busways are a significant part of the landscape that impacts rider experience.

PUBLIC ENTRY PLAZAS

As the most visible and public landscape condition, the entry plaza should be welcoming, comfortable, and provide clear instructions for accessing and navigating transit. While the more formal condition found at stations with platforms and canopies is described here, the arrival and entry experience at each and every station should be a priority—accessible and legible arrival is crucial for a positive passenger experience—ensuring safety, reducing stress, and promoting efficient transit use.

The use of wayfinding, defined pathways, and enhanced green space will help to empower riders to navigate stations and boost their confidence in using public transportation, making their experience as positive as possible. Studies show that enhancing green space and green infrastructure improves passengers' experience, increases comfort, improves aesthetic appearance, and reduces perceived wait times by as much as 30%[1].

Amenities such as seating, trash receptacles, and lighting are an important aspect of station plazas, particularly in areas where passengers wait for transit. Additional amenities like bicycle parking and adequate drop off zones are imperative to meet a diverse range of customer needs.

1 Lagune-Reutler, M., Guthrie, A., Fan, Y., & Levinson, D. (2016). Transit Stop Environments and Waiting Time Perception: Impacts of Trees, Traffic Exposure, and Polluted Air. Transportation Research Record, 2543(1), 82-90. https://doi.org/10.3141/2543-09

CASTLE SHANNON

Fig. 2-02

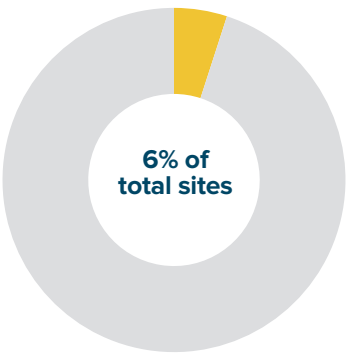
NEGLEY

Fig. 2-03

Stations with this condition:

- Castle Shannon
- East Liberty
- Gateway
- Negley
- Roslyn
- Washington Junction

Trees and green space in transit areas improves passenger experience, **reducing perceived wait times by as much as 30%.**



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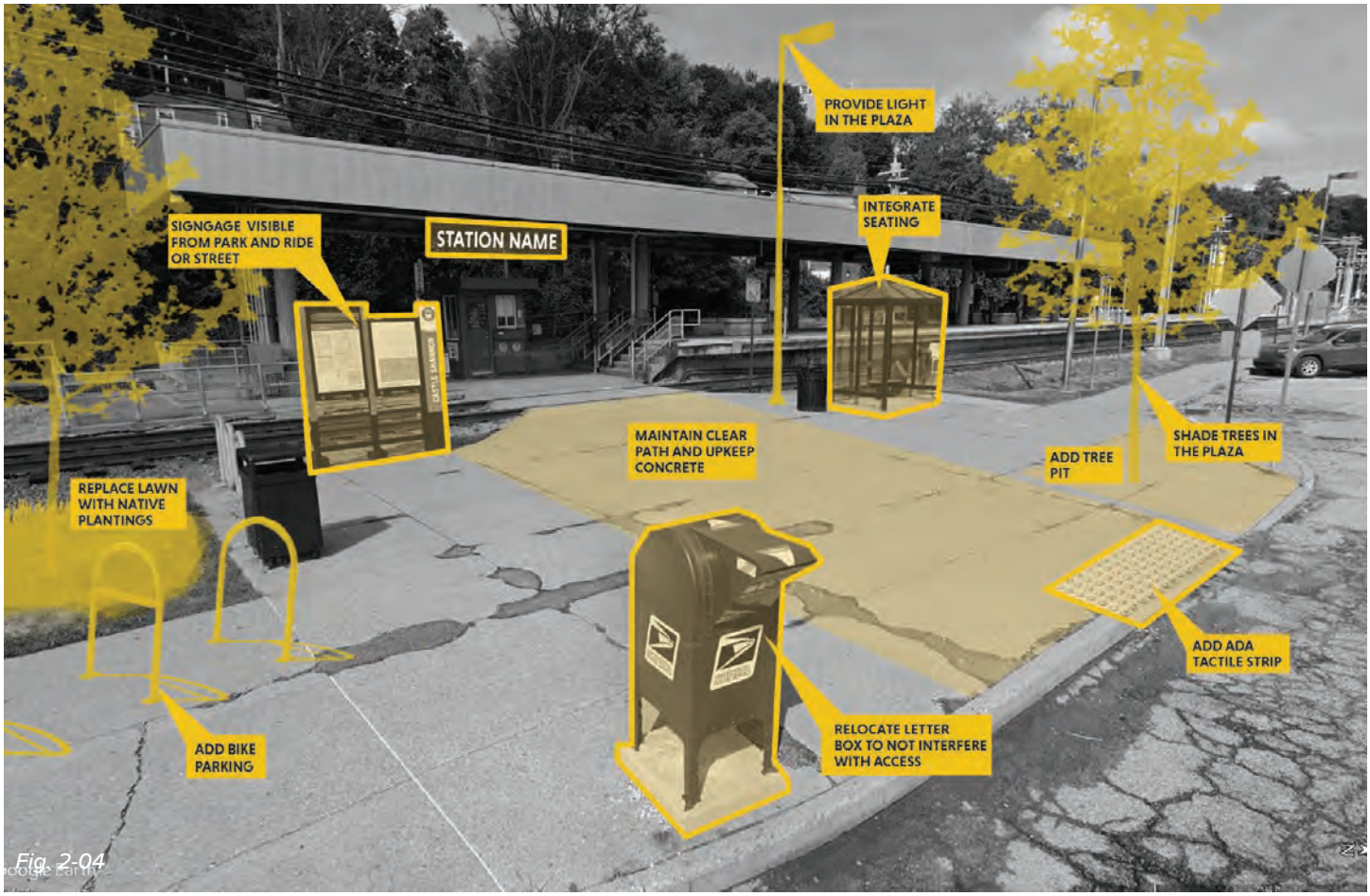


Fig. 2-04

Current Maintenance Requirements

The most common maintenance requirements within public entry plazas include removal of trash, cleanup of vandalism or graffiti, and repair of amenities such as seating, shelters, and signage. Additional needs include concrete or asphalt surface repair and coordination with maintenance teams to keep adjacent track infrastructure and roadways safe, clean, and operational.

Maintenance Intensity

HIGH

Considerations

Desire Lines / Clear Path
ADA Accessibility
Lighting
Appropriate Amenities
Canopy Coverage

Recommended Landscape Strategies

See Chapter 3 for more information on each of the different landscape strategies.

APPLICATION

1. Target **15-30% of arrival area to green space** (trees, planters, stormwater management).
2. Maintain legible, accessible entrance that is **ADA compliant**.
3. Provide buffers between pedestrian crossings and oncoming traffic to **limit potential conflict.**
4. Provide **zones for amenities** such as trash receptacles, bicycle parking, and community amenities such as mailbox drop boxes, newspaper dispensers.
5. Provide **seating in covered areas**, either with structure or **tree canopy,** to provide riders with shade and comfort.
6. Plants should have **high ecological value**, support stormwater management, and provide habitat for insects, birds, and other habitat.

Fig. 2-05

MAINTENANCE INTENSITY

HIGH

With the use of durable plants and hardscape material, improvements near station arrival plazas will likely require the same amount of attention and maintenance.

CASE STUDY

TARGET FIELD STATION

Minneapolis, MN - MetroTransit

Target Field Station in downtown Minneapolis is a key multi-modal transit hub and public gathering space adjacent to the Minnesota Twins Stadium. It was designed to spur neighborhood revitalization and connect light rail and commuter trains, bus lines, and an extensive network of bike and pedestrian trails across the Twin Cities. The site combines transportation infrastructure with sustainable landscape design, with stormwater systems designed to capture, filter, and reuse stormwater on site, removing an estimated 97% of sediment from runoff. The project also utilizes a no-shovel snowmelt system—where an antifreeze mixture is pumped through plastic tubing embedded in the concrete, melting snow without the use of salt or deicing chemicals.

The transit station entry plaza design utilizes a simple combination of trees in linear grates that both direct foot-traffic, while softening the hardscape, providing shade and canopy coverage and below-grade stormwater management.

KEY FIGURES

Landscape Elements: Trees, Native Plantings, Stormwater Infrastructure (Underground Cisterns), Public Amenity

Landscape Area (% of Total Station Area): 17%

Owner: Hennepin County

Year Completed: 2014

Funding: Mix of local, federal, and state sources. Included grants from Mississippi Watershed Management Organization.

Project Team: OLIN (Landscape Architect), Perkins Eastman, Knutson Construction

Fig. 2-06

Fig. 2-07

(Left) Aerial view of the Target Field Station public entry plaza. Illuminated poles provide signage and lighting, and can be programmed for special events. Photo by Morgan Sheff via Hennepin County.

(Top) Ground-level view of the entry sequence. Photo via Knutson Construction.

PARKING LOT

The most frequently found landscape condition is parking lots - which make up approximately 117 acres of PRT parcels - and include commuter park and rides and staff parking at operational sites. They range in size, from 10-15 spaces at sites like Muldowney, and over 700 spaces at Wilkinsburg. Since most lots are surfaced with asphalt, they greatly contribute to stormwater runoff and may carry pollutants like heavy metals, oil, grease and gas, as well as increased sediment, into Pittsburgh's waterways. Parking lots also greatly contribute to urban heat island, creating uncomfortable and unfriendly environments, especially during summer months.

WASHINGTON JUNCTION

Fig. 2-08

MCCANDLESS

Fig. 2-09

Stations with this condition:

- Bell
- Carnegie
- Castle Shannon
- Crafton
- Dormont Junction
- Hamnett
- Harmar Garage
- Idlewood
- Killarney
- Library
- Lytle
- Memorial Hall
- Mount Lebanon
- Palm Garden
- Potomac
- Sheraden
- South Hills Junction
- South Hills Village
- Swissvale
- Washington Junction
- West Library
- Wilkinsburg

Park and Rides:

- Alpine Village
- Amridge
- Beulah Church
- Covenant / Presbyterian Church
- Duquesne
- Elizabeth
- Forest Hills
- Glenfield
- Harmar
- Large
- McCandless
- McKeesport Transportation Center
- Monroeville Mall
- Muldowney
- North Park Pool
- Plum
- Ross
- Spring Garden
- Tarentum
- Thorn Run
- University Boulevard
- Wabash
- Woodville

Operational Facilities:

- Collier Garage
- East Liberty Garage
- Harmar
- Manchester Main Complex
- Ross Garage
- South Hills Junction
- West Mifflin Garage

Parking lots make up approximately **117 acres of primarily impervious cover**, equivalent to 88 football fields.

FREQUENCY OF CONDITION

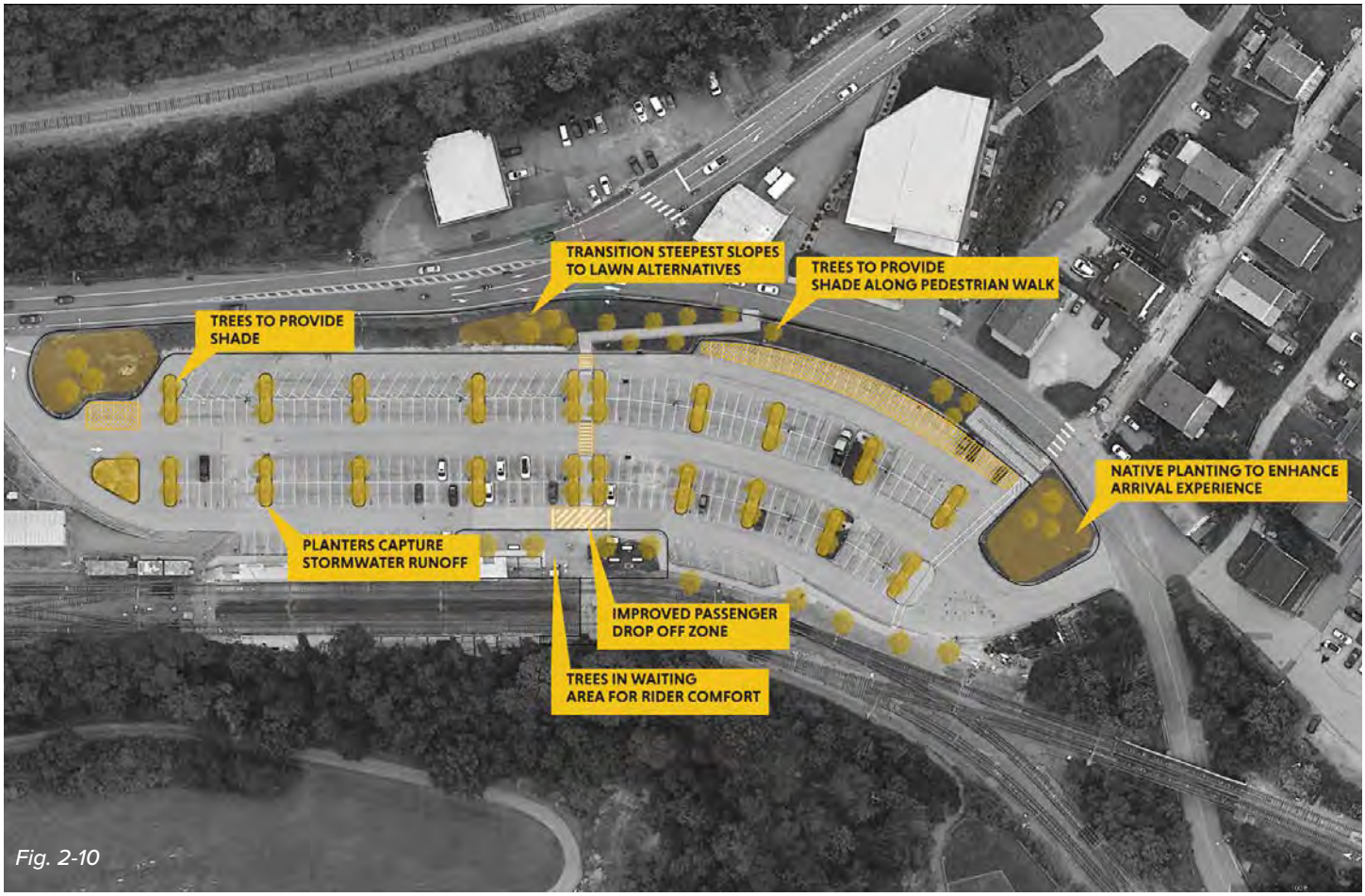


Fig. 2-10

Current Maintenance Requirements

Maintenance of parking lots is fairly minimal, repairing asphalt as needed. However, many of the parking lots across the system are in poor condition and will need to be repaved in the near future. At that time, PRT should consider integrating more landscape features.

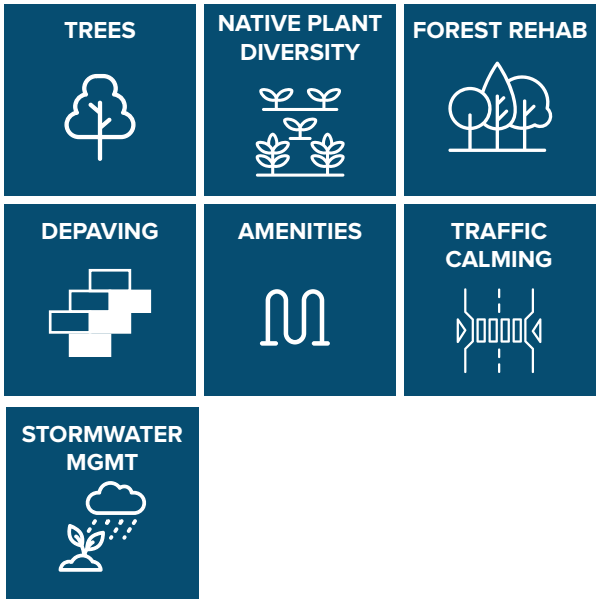
Maintenance Intensity

LOW

Considerations

Canopy Coverage
Utilization Rates
Neighborhood Walk Access to Public Parks
Manage Stormwater + Capture Runoff

Recommended Landscape Strategies



See Chapter 3 for more information on each of the different landscape strategies.

APPLICATION

1. Provide **1 tree for every 5 parking spaces**
2. Provide **min 7' width landscaped islands** or stormwater planters every 20 spaces, and at bottom and top of parking rows.
3. Provide landscape that equals at least **10% of total area.**
4. Target capturing **80% of stormwater** on site.
5. Evaluate utilization rate in order to right size parking lots. Leftover space should consider **depaving, reforestation, or transition to public amenity,** or other public usage.
6. Utilize traffic calming measures to ensure safe pedestrian access to station areas.

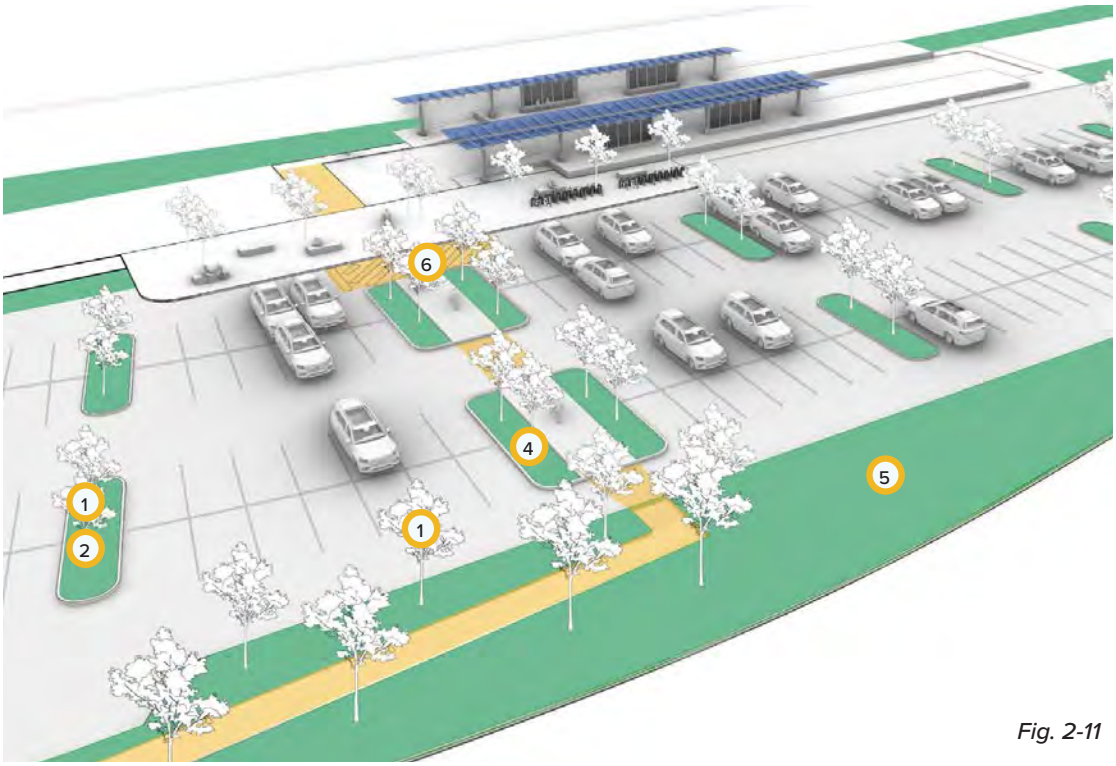


Fig. 2-11

MAINTENANCE INTENSITY

HIGH

Managing this type of landscape will require maintenance beyond current practices. However, the environmental benefits and improvements to the passenger experience should be prioritized.

ZONING CODE COMPARISON

This table highlights codes governing Pittsburgh and other peer cities regarding landscape requirements for parking lots. These metrics provide PRT with realistic targets for improving conditions for both the environment and riders, and comply with zoning code on capital projects as they move into implementation.

	Interior Landscaping Requirements			Perimeter Landscape Planting	
City	Trees	Islands	Landscape General	Land Use Buffering	Public Streets Screening
Pittsburgh, PA	1 Tree per 5 Spaces	Min 5' Width	25SF per space for up to 100 spaces -or- 30SF for over 100 spaces	Screening between adjacent property and ROW Width: 5' Min Height: 42" Min	(1) Tree per 30LF
Philadelphia, PA	1 Tree per 5 Spaces	Required in Lots with > 50 spaces. Every 20 spaces.	10% of Total Area	Fence or Landscape Buffer Required Width: 8' Min - 1 Tree + 3 Shrubs per 20LF	Fence or Landscape Buffer Required Width: 5-10' (1) Tree per 35LF
Milwaukee, WI	1 Tree per 4 spaces	Min 8' Width	100 SF per 4 parking spaces	Fence or Landscape Buffer Required 5-10' Width with Evergreen Shrubs	Fence or Landscape Buffer Required Width: 5-10' (4) shrubs or (8) perennials per 10LF (1) Tree per 20 LF
Minneapolis, MN	1 Tree per 50' for parking lots over 10 spaces	Required in Lots over 10 spaces Min 7' Width	300SF per 50 spaces	7'-9' Wide Buffer 95% Opaque	7' - 9' Wide Buffer (1) Tree per 25LF

CASE STUDY

SANTA CLARA STATION

Eugene, OR - Lane Transit District

Santa Clara Station in Eugene, OR is a busy transit corridor that serves as a hub for Lane Transit District fixed bus routes and bus rapid transit lines. The parking lot provides 55 spaces, electric vehicle charging stations, clearly designated drop-off zones, and public amenities like secured bike parking and a comfort station with restroom facilities. While typical parking lots generally contribute to greater stormwater runoff, this thoughtfully designed landscape manages and treats 100% of stormwater runoff through the use of permeable pavers, a large retention basin, native plantings and bioswales. The site's landscaping not only supports ecological function but also greatly contributes to the overall aesthetic of the transit station, reflecting on the transit authority's broader goals of sustainability, community integration, and multi-modal transit access.

KEY FIGURES

Landscape Elements: Native Plantings, Landscape Buffer, Stormwater Infrastructure (Retention Basin). 100% of stormwater is treated and retained onsite.

Park and Ride: 60 Parking Spaces

Landscape Area (% of Total Station): 26%

Costs / Funding: $10.3M / Federal Transit Administration 5307 Funds, Connect Oregon Grant, Surface Transportation Block Grant (STBG) and Local Funds

Year Completed: 2021

Design Partners: Rowell Brokaw

Fig. 2-12

(Left) The Santa Clara Transit Station in Eugene Oregon, developed as part of the Lane Transit District, follows more stringent parking lot requirements than other major cities, and the improvement to the rider experience is measurable.

Image by Rowell Brokaw.

LANDSCAPE BUFFER - MOWN LAWN

The second most common landscape type is mown lawn, which is found on relatively flat or slightly sloped surfaces, often bordered by a curb to act as a separation between roadways and station areas (mown lawn on steep slopes is described as a separate landscape condition). These areas of turf are typically a monoculture, where one dominant species of grass provides little value to wildlife or pollinators, and may be vulnerable to pests and diseases. Similar to asphalt parking lots, lawn areas also contribute to stormwater runoff, as typical lawns can only infiltrate one inch of rainwater per hour. When compared to a forest, which can infiltrate 16 inches,[1] lawns provide little value in stormwater management.

1 https://library.weconservepa.org/guides/151-from-lawn-to-meadow

CASTLE SHANNON

Fig. 2-13

WASHINGTON JUNCTION

Fig. 2-14

Stations with this condition:

- Carnegie
- Casswell
- Castle Shannon
- Dawn
- Dorchester
- Edgebrook
- Harmar Garage
- Herron
- Ingram
- Kings School Road
- Mount Lebanon
- Negley
- Overbrook Junction
- Palm Garden
- Pioneer
- Poplar
- Potomac
- Sarah
- Sheraden
- South Bank
- South Hills Junction
- South Hills Village
- St. Anne's
- Stevenson
- Washington Junction
- Westfield
- Whited
- Wilkinsburg

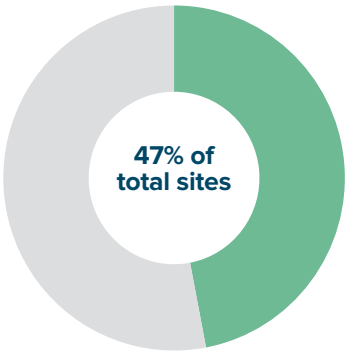
Park and Rides:

- Alpine Village
- Amridge
- Beulah Church
- Covenant / Presbyterian Church
- Duquesne
- Elizabeth
- Forest Hills
- Harmar
- Large
- McCandless
- McKeesport Transportation Center
- Muldowney
- Plum
- Spring Garden
- Tarentum
- Thorn Run
- University Boulevard

Operational Facilities:

- East Liberty Garage
- Ross Garage
- Manchester Main Complex

47% of PRT's stations have some form of lawn, requiring regular maintenance. With **shallow root systems** and often in **compacted soil**, lawn areas can contribute to stormwater runoff.



FREQUENCY OF CONDITION

Fig. 2-15

Current Maintenance Requirements

Current maintenance practices involve mowing lawn on a 5-week rotation, which is significantly longer than typically recommended mowing frequency of once per week during peak growing season. If maintenance crews miss a week, stations may look uncared for. Maintenance equipment runs on gasoline, with lawn mower exhaust contributing to air pollution.

Maintenance Intensity

HIGH

Considerations

Increase Ecological Value
Manage Stormwater + Capture Runoff
Programmatic Use (recreation areas or high-foot traffic zones might remain lawn)

Recommended Landscape Strategies

See Chapter 3 for more information on each of the different landscape strategies.

APPLICATION

1. **Reduce lawn areas by 50%**
2. Utilize a **mix of meadow planting, no-mow grasses**, or trees and shrubs, as suitable for the condition
3. Planting strategies near high-use areas should incorporate durable and hardy species
4. Consider pedestrian desire lines and avoid planting in these areas.
5. Plants should have **high ecological value**, support stormwater management, and provide habitat for insects, birds, and other habitat.
6. Consider deep-rooted grasses and long-lived, fast-growing trees for **carbon sequestration** potential.

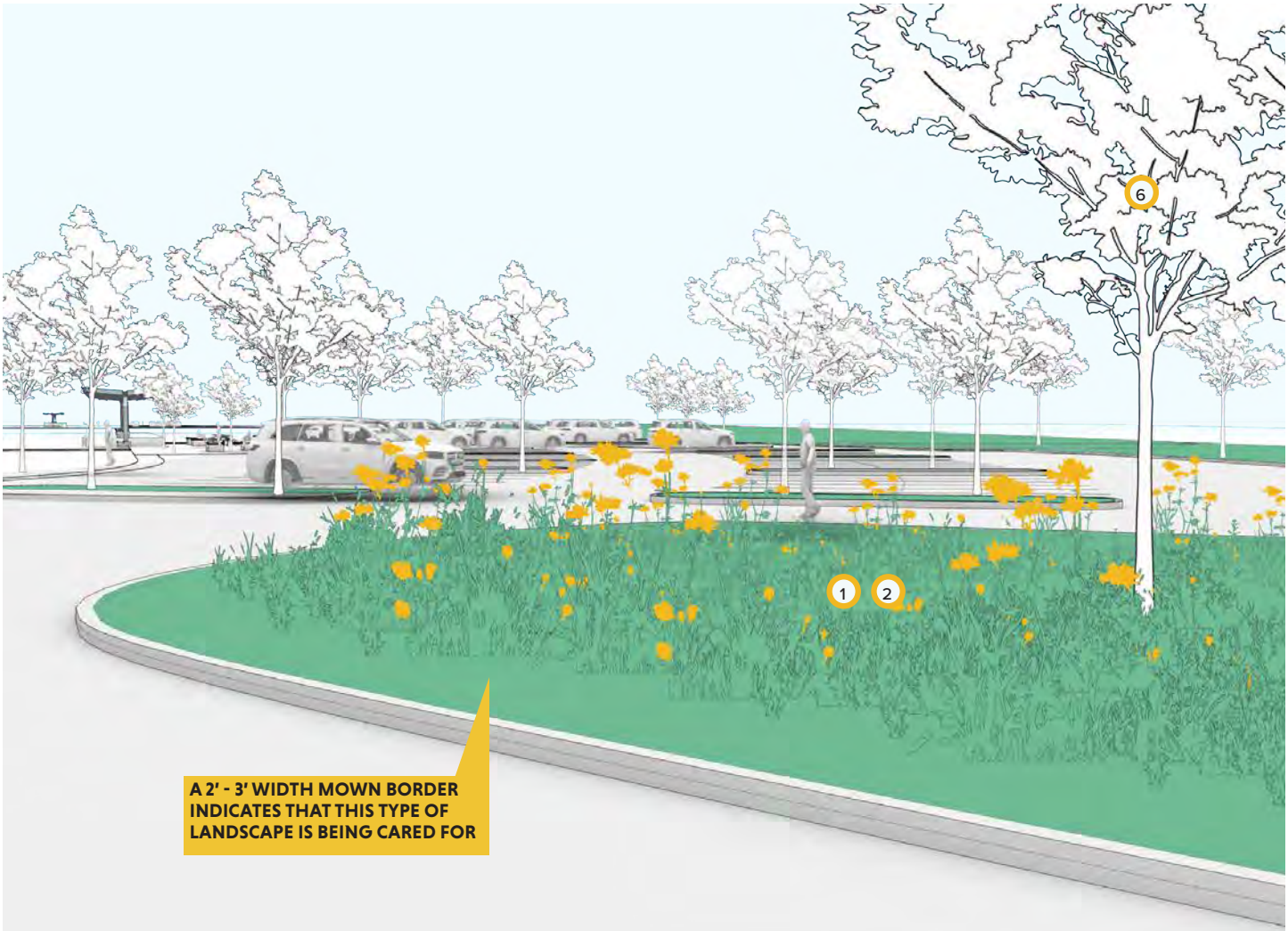


Fig. 2-16

MAINTENANCE INTENSITY

MEDIUM

Reducing the area of lawn and transitioning to native meadow will require less maintenance after establishment, requiring mowing only once per year at the most.

CASE STUDY

NATIVE POLLINATOR CONVERSION PROJECT

Caln Township Parks and Recreation, Chester County, Pennsylvania

The first phase of Caln Township Native Pollinator Conversion Project successfully transformed 1 acre of township-owned land from turf grass into a native pollinator meadow. The project began in 2022, with site prep including applying post-emergent herbicide, while continuing mowing practices throughout spring, summer, and fall. Volunteers who attended a seeding workshop helped to apply a mixture of PA Native Wildflower seeds, native grasses, and cover crop of annual rye to provide erosion and weed control through establishment. By 2024, the meadow had established and Caln Township Parks and Recreation department provided tours to other municipalities and groups interested in implementing similar projects.

The project was so successful that a second phase, converting an additional acre of land, began construction in October 2024.

KEY FIGURES

Landscape Elements: Native Plantings, Landscape Buffer

Size: 1 acre

Funding: Pennsylvania American Water Grant, PA DEP Environmental Education Grant

Year Completed: Phase I began April 2022, Phase II began October 2024

Partners: Caln Township Parks and Recreation Department, PennState Extension Master Watershed Stewards and Master Gardeners, PADCNR, Chester County Conservation District

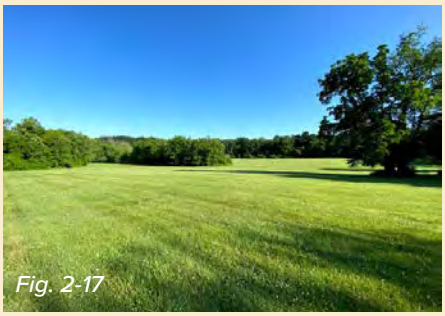


Fig. 2-17

Fig. 2-18

Fig. 2-19

Images show the transition from lawn to meadow. All images via Caln Township.

(Top) The site consisted primarily of turf grass
(Middle) Immediately after an herbicide application to remove the turf grass and expose soil prior to seeding.
(Right) The meadow in Year 2.

LANDSCAPE BUFFER - PLANTED

This condition refers to green landscape buffers that are planted, either purposely or naturally emergent, with a variety of understory shrub or grass species. Emergent or naturally occurring plant material is likely to contain invasive species. While these areas of grasses and shrubs are better than lawn in managing stormwater, slowing runoff, and preventing erosion, this landscape type lacks consistency and language within existing conditions, often appearing unkempt or poorly managed.

In some instances, such as South Park Station, the planting and maintenance is spearheaded and managed by local neighborhood groups or organizations. While these types of partnerships are beneficial, they should be formalized with binding agreements that include long-term care and maintenance plans. Future partnerships should utilize these guidelines for plant recommendations that provide consistent aesthetic quality, and ecological and environmental value.

Where increasing tree canopy is feasible, trees with columnar, upright growth habits should be considered so as to not encroach on rail lines or roadways, and limit the amount of additional pruning maintenance required.

WASHINGTON JUNCTION

Fig. 2-20

ARLINGTON

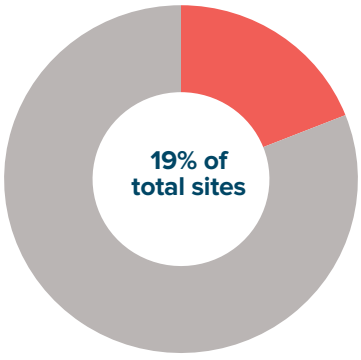
Fig. 2-21

Stations with this condition:

- Allegheny
- Arlington
- Bethel Village
- Carnegie
- Castle Shannon
- Crafton
- Dorchester
- East Liberty
- Idlewood
- Lytle
- Munroe
- Negley
- South Park Road
- Washington Junction
- Willow

Park and Rides with this condition:

- Amridge
- Duquesne
- Woodville



FREQUENCY OF CONDITION

Fig. 2-22

Current Maintenance Requirements

Maintenance needs include monitoring for invasive species and weeds, as well as pruning and trash cleanup.

Recommended Landscape Strategies

See Chapter 3 for more information on each of the different landscape strategies.

Current Maintenance Intensity

MEDIUM

Design Considerations

Increase Ecological Value
Manage Stormwater + Capture Runoff
Manage Invasive Species
Proximity to Transit Infrastructure
Overhead Infrastructure (Power lines)
Pedestrian Desire Lines

APPLICATION

1. Maintain **sight lines** for safety by utilizing low shrubs and grasses (2-3' max height at maturity).
2. Refrain from planting within pedestrian desire lines so plants are not trampled. The use of **dense evergreen shrubs** can be considered where pedestrian movement should be discouraged.
3. Utilize a limited palette of perennial shrubs and grasses (2-3 species per bed) for **visual consistency.** Prioritize plant species that require very little maintenance to maintain their form or structure.
4. Planting palette should consider **year-round interest**, providing a mix of evergreen, flowering, and grass species.
5. Maintain desired offset (6' min.) from rail tracks
6. Plants should have **high ecological value**, support stormwater management, and provide habitat for insects, birds, and other habitat.
7. Consider deep-rooted plant species and fast growing, long-lived trees for **carbon sequestration** potential.

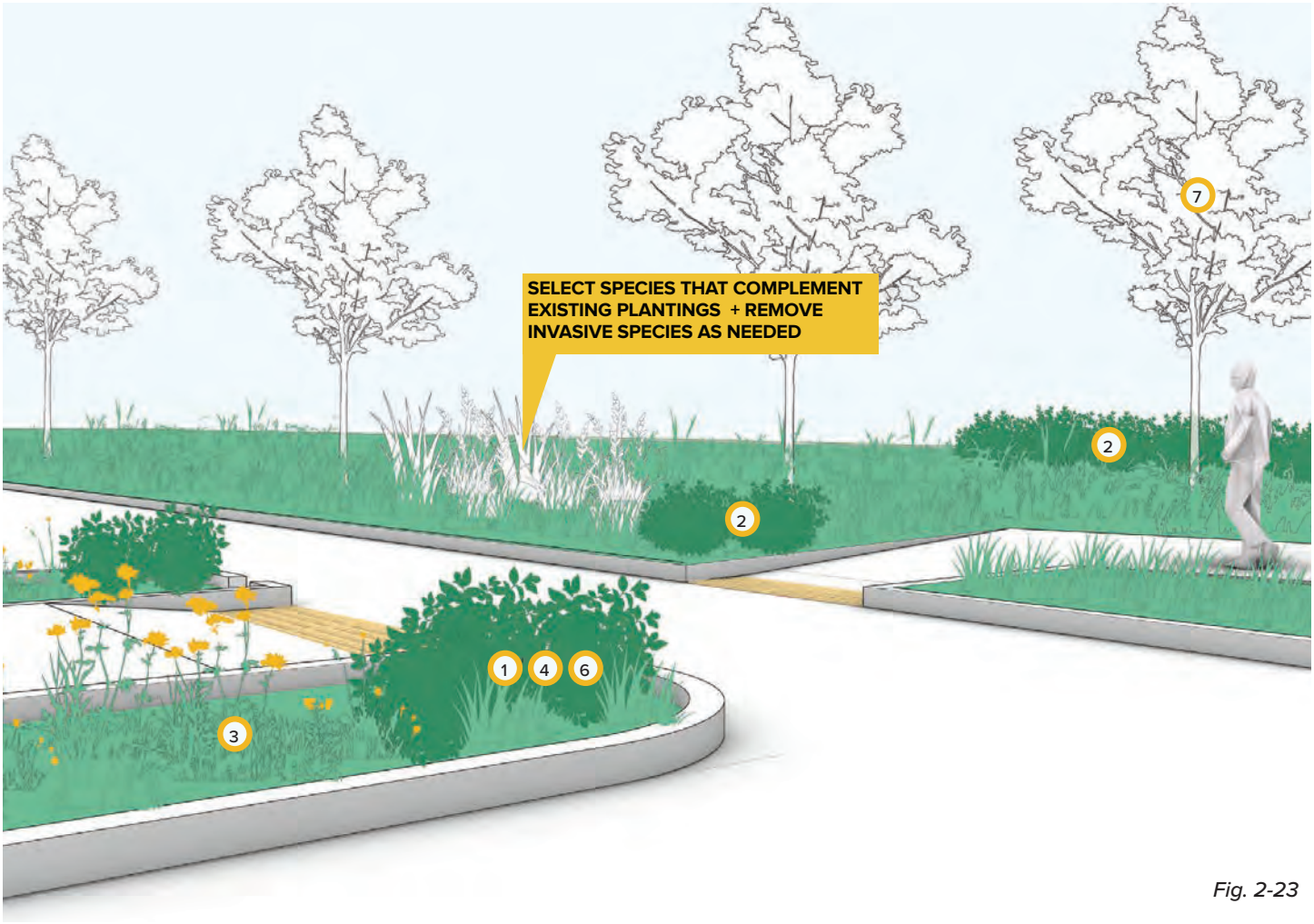


Fig. 2-23

MAINTENANCE INTENSITY

MEDIUM

As the proposed condition is primarily additional plantings that complement the existing shrub or grass layer, maintenance needs will be similar, including weeding and light seasonal pruning.

CASE STUDY

NORTHSIDE TRANSIT CENTER

Cincinnati, OH - SORTA / Metro

The Northside Transit Center, one of the busiest transit hubs in Cincinnati, transforms a neglected and underutilized urban site into a vibrant urban transit hub and park. Landscape buffers, with native groundcover, shrubs, and trees, strategically divide and soften the hardscape elements--which accommodate nine bus platforms as well as connections to the surrounding urban fabric. The landscape provides much-needed relief from the urban context, and support a park-like feel of the transit center. Community art and branded graphics are also woven through the design, celebrating the history and "reflecting the eclectic and diverse culture of the Northside community." [1]

1 MSA Design. Metro Northside Transit Center. Retrieved from https://www.msaarch.com/projects/metro-northside-transit-center-graphics

KEY FIGURES

Landscape Elements: Native Plantings, Landscape Buffer, Public Art

Landscape Area (% of Total Station): 15%

Costs / Funding: $3.7M / 80% Federal Funded, 20% Local Match

Year Completed: 2020

Design Partners: MSA Design, Vivian Lambi + Associates (Landscape Architect)

Fig. 2-24

Fig. 2-25

Planted buffer with mix of native shrubs, groundcovers, and trees soften the hardscape area around the bus station. Images via MSA Design.

STEEP SLOPE - LAWN

PRT's transit systems span a diverse range of topographic conditions: including approximately 117 acres of steep slopes across all properties, including station areas and facilities, and along PRT's ROW and fixed guideways. For the purposes of this assessment, steep slopes are defined as grades greater than 25%, equivalent to 1 foot of vertical rise for every 4 feet of horizontal distance.

Maintaining these slopes as lawn presents significant maintenance and safety challenges, particularly for crews responsible for mowing. Beyond the operational difficulty and dangers, steep slopes are also highly prone to erosion, especially during heavy rainfall. Turf grass, with its shallow root systems, are poorly suited for erosion control, as it is not sufficient to slow runoff, stabilize slopes or prevent gullies from forming.

While these areas are not typically navigated by passengers, they are highly visible, making them well-suited for conversion to alternative landscape cover types that require less maintenance, while still providing aesthetic value.

PIONEER

Fig. 2-26

CASTLE SHANNON

Fig. 2-27

Stations with this condition:

- Bethel Village
- Castle Shannon
- Denise
- Edgebrook
- Herron
- Homewood
- Mount Lebanon
- Negley
- Pioneer
- Sheraden
- South Hills Junction
- West Library
- Willow

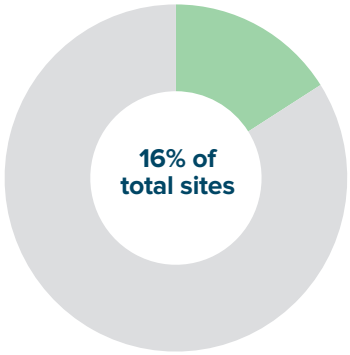
Operational Facilities with this condition:

- Collier Garage
- West Mifflin Garage
- South Hills Junction

Park and Rides with this condition:

- Beulah Church
- Large

Roughly 117 acres of PRT parcels is on steep slopes. The **steepest slopes** (greater than 40% grade) make up approximately **33 acres**.



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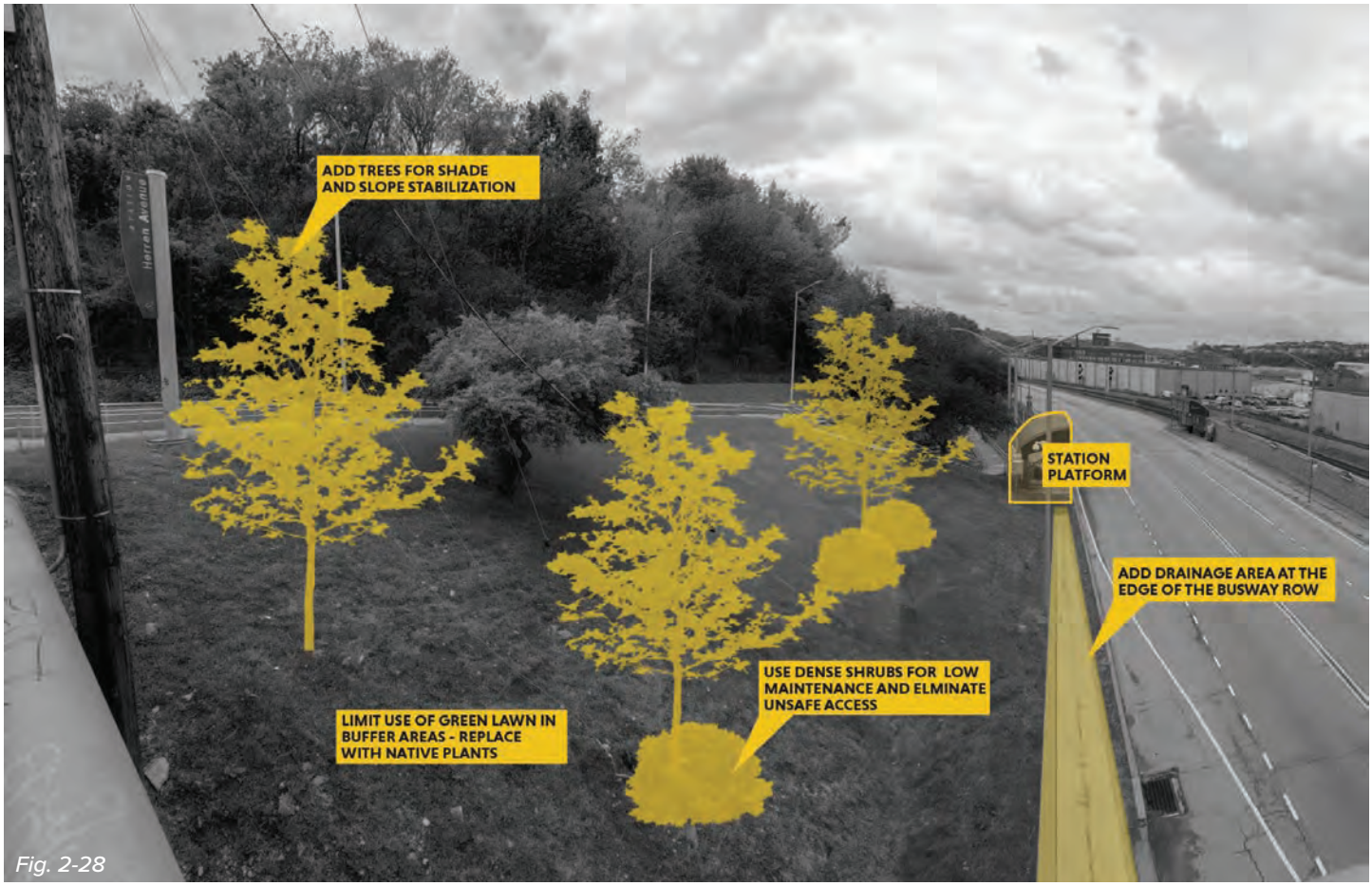


Fig. 2-28

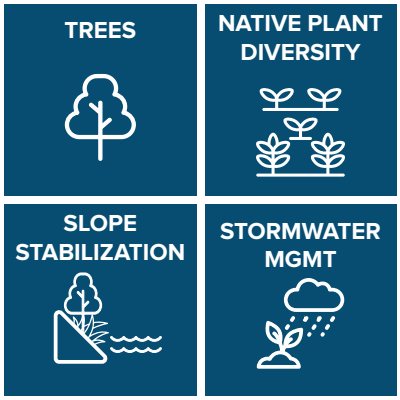
Current Maintenance Requirements

Current maintenance practices involve mowing lawn on a 5-week rotation. Maintenance equipment runs on gasoline, with lawn mower exhaust contributing to air pollution. PennDOT advises against mowing with regular equipment on slopes greater than 40%, instead a side-mounted mower or a boom mower should be used.

Current Maintenance Intensity

VERY HIGH

Recommended Landscape Strategies



See Chapter 3 for more information on each of the different landscape strategies.

Considerations

Increase Ecological Value
Manage Stormwater + Capture Runoff
Drought Tolerance
Pedestrian Desire Lines
Slope Stabilization
Erosion Control
Soil Characteristics

APPLICATION

1. **Reduce lawn areas by 90%**
2. Utilize a **mix of meadow planting, no-mow grasses**, or **trees and shrubs**, as suitable for the condition to aid in stabilizing slopes.
3. Dense evergreen shrubs can deter riders from running down hillsides.
4. Utilize **erosion control** or **drainage methods** described in Chapter 3 as needed for the specific condition.
5. Plants should have **high ecological value**, support stormwater management, and provide habitat for insects, birds, and other habitat. Select plant species suited to upland slope conditions.
6. Consider deep-rooted plant species both for **slope stabilization** and **carbon sequestration** potential.

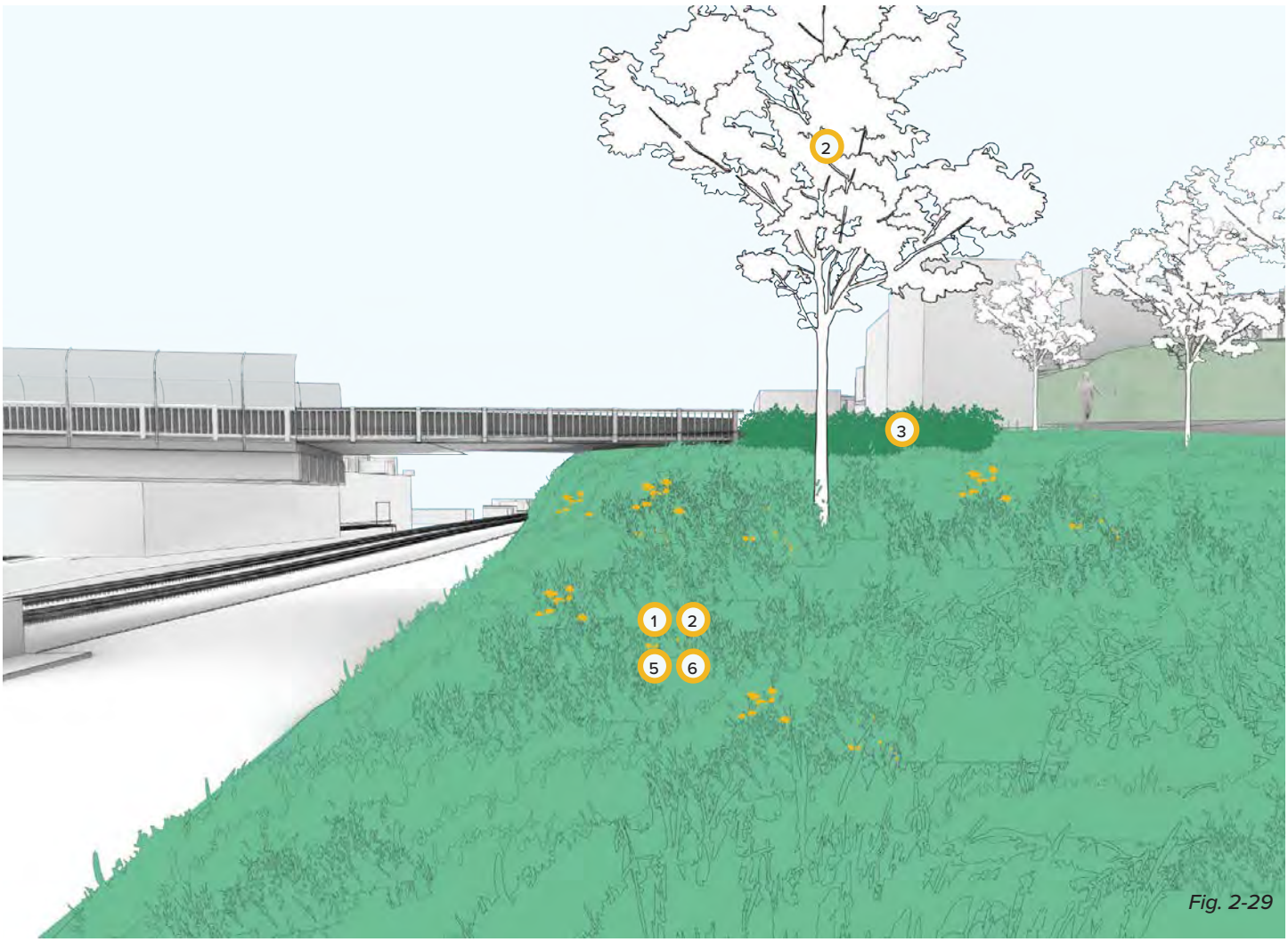


Fig. 2-29

MAINTENANCE INTENSITY

LOW

Due to safety concerns, steep slopes should not be mown, and instead planted with low-maintenance grasses, meadow, and native shrubs suitable for sloped conditions - cover types that require very little maintenance once established.

CASE STUDY

CENTER FOR SUSTAINABLE LANDSCAPES

Phipps Conservancy and Botanical Garden

The Center for Sustainable Landscapes is an extension of the public gardens at the historic Phipps Conservatory. One of the greatest challenges for the design team was working with the site's existing conditions, including exposed rock cliffs, steep topography, and degraded slopes on a former brownfield site. The team aimed to stabilize steep slopes while integrating accessible circulation and stormwater management features.

To restore the site and enrich the visitor experience, the design utilizes native plant species that are adapted to such challenging conditions. Upland and drought-tolerant plant communities were used in higher elevations, while lowland and wetland species were planted in lower-lying areas. Due to budget constraints, the team relied heavily on seed mixes to establish vegetation.

The landscape manages all stormwater on site for 99.7% of rainfall events.[1]

1 Pevzner, Nicholas, and Sean McKay. "Phipps Conservatory Center for Sustainable Landscapes." Landscape Performance Series. Landscape Architecture Foundation, 2016. https://doi.org/10.31353/cs1110

KEY FIGURES

Landscape Elements: Steep Slope Stabilization, Slope Restoration, Native Plantings, Landscape Buffer

Maintenance Costs: The native plants cost $0.80/sf to maintain, a 20% savings from other non-native plantings.

Costs / Funding: $11.8M

Year Completed: 2012

Design Partners: Andropogon Associates (Landscape Architect), The Design Alliance (Architect), Civil and Environmental Consultants, Inc (Civil)

Site Before (above), and After (below). Images by Andropogon.

Fig. 2-31

Fig. 2-30

Fig. 2-32

STEEP SLOPE - PLANTED

This landscape condition refers to steep slopes (greater than 33%, or 3:1) that are planted, either purposely or naturally emergent, with a variety of understory shrub or grass species. Many of these conditions contain invasive species, though care should be taken when attempting to manage invasive species so as to minimize disturbance to slopes and prevent further erosion or slope degradation. Strategies for improving this landscape condition include re-vegetation, introducing drought tolerant native groundcovers and shrubs adapted to sloped conditions, increasing tree canopy, and managing stormwater runoff through the use of planting strategies, rain gardens, diversion and infiltration beams, or terracing.

Where steep slopes are adjacent to pedestrian right-of-way or accessible pathways, curb or other edging should be utilized alongside stormwater management strategies to prevent sedimentation and provide a clear path of travel.

Additionally, designers should consider pedestrian desire lines, and either incorporate the use of accessible pathways, or, if pedestrian movement is unsafe, deter circulation through the use of dense evergreen shrubs.

BETHEL VILLAGE

Fig. 2-33

IDLEWOOD

Fig. 2-34

Stations with this condition:

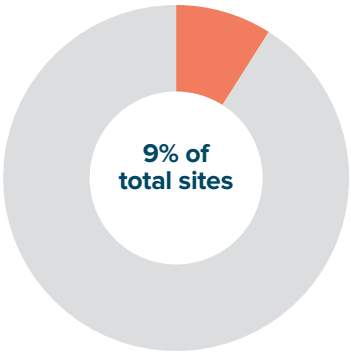
- Bethel Village
- Dormont Junction
- Hamnett
- Homewood
- Idlewood
- Swissvale
- Whited

Operational Facilities with this condition:

- West Mifflin Garage

Park and Rides with this condition:

- Large
- Ross



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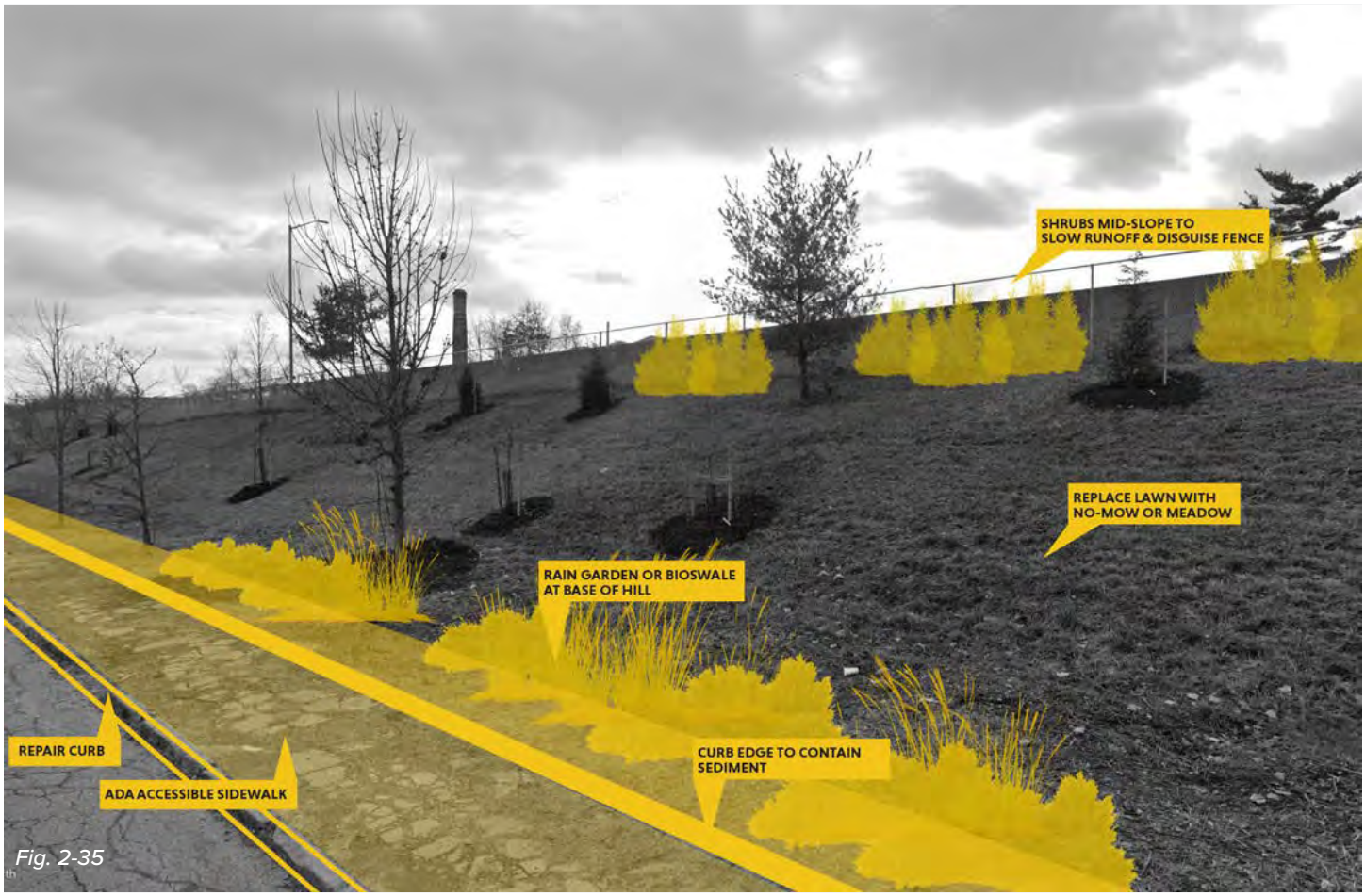


Fig. 2-35

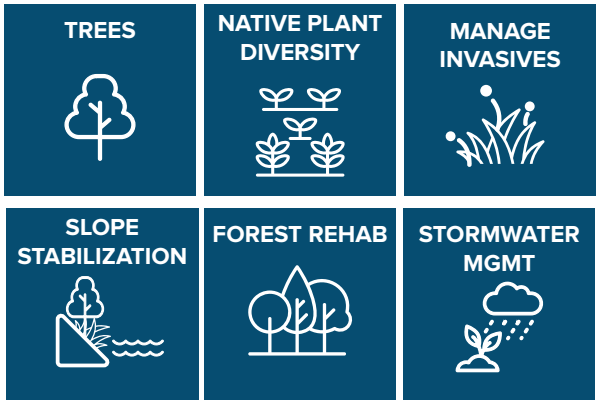
Current Maintenance Requirements

Maintenance needs include monitoring for invasive species and weeds, as well as seasonal pruning, trash cleanup.

Current Maintenance Intensity

MEDIUM

Recommended Landscape Strategies



See Chapter 3 for more information on each of the different landscape strategies.

Design Considerations

Increase Ecological Value
Manage Stormwater + Capture Runoff
Drought Tolerance
Pedestrian Desire Lines
Erosion Control
Soil Characteristics

STEEP SLOPE - WOODED

This landscape conditions refers to heavily wooded or tree-covered areas, often found in the steep slopes or undevelopable land along roadways, creeks, and in more suburban station areas. Steep slopes, grades greater than 33% slope, or 3:1, comprise approximately 19.5% of all PRT properties. Managing stormwater runoff and maintaining tree canopy, while managing invasive species and restoring degraded slopes to prevent future landslides or further erosion, are the greatest priorities for this landscape condition.

While not always highly visible to riders, care should be taken where pathways are adjacent to wooded areas to prioritize public safety, incorporate lighting, providing a positive passenger experience at the woodland's edge.

HERRON

Fig. 2-36

LIBRARY

Fig. 2-37

Stations with this condition:

- Bell
- Boggs
- Bon Air
- Central
- Dawn
- Edgebrook
- Fallowfield
- Glenbury
- Herron
- Highland
- Hillcrest
- Inglewood
- Library
- Logan Road
- McNeilly
- Memorial Hall
- Mon Incline Lower
- Mon Incline Upper
- Palm Garden
- Pioneer
- Roslyn
- Sarah
- South Bank
- South Hills Junction
- South Hills Village
- West Library

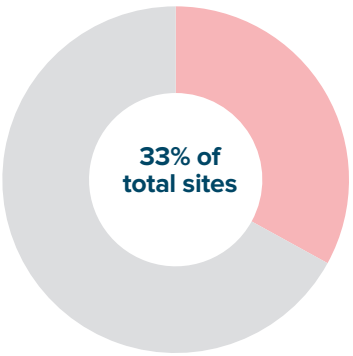
Park and Rides with this condition:

- Alpine Village
- Forest Hills
- Muldowney
- Thorn Run
- University Boulevard
- Woodville

Operational Facilities with this condition:

- Collier Garage

Tree canopy coverage across PRT's properties **is 31%**. Pittsburgh's Climate Action Plan identifies a goal of 60% tree canopy cover by the year 2030.



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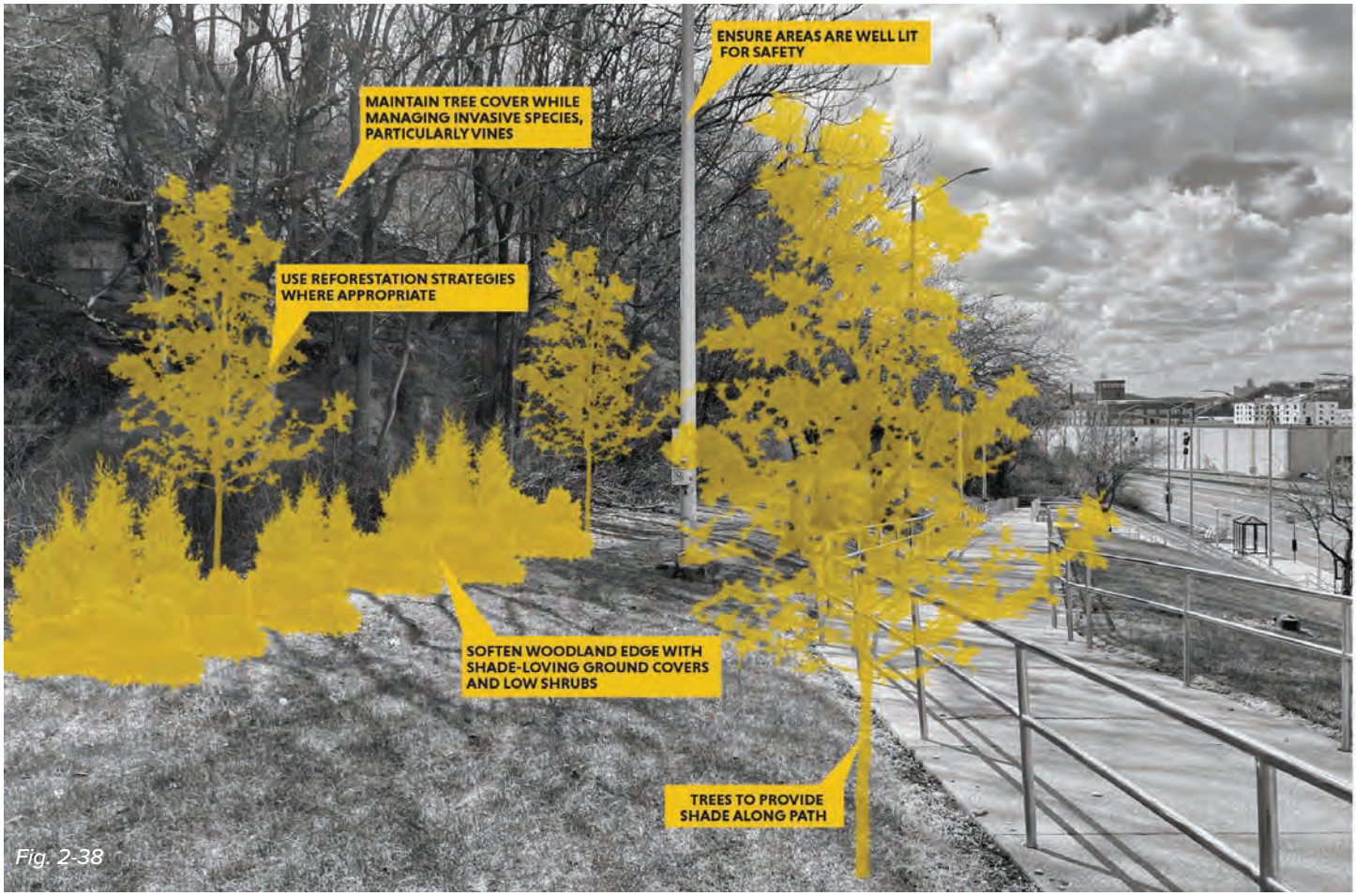


Fig. 2-38

Current Maintenance Requirements

Maintenance in this condition is primarily as-needed and reactionary, addressing safety concerns or implementing erosion control methods only after challenges present themselves, for example, following a landslide occurrence.

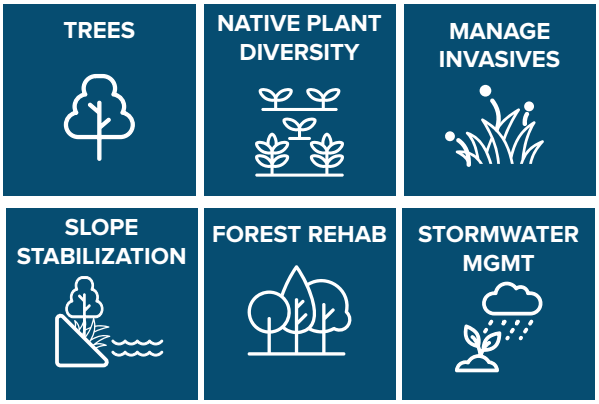
Current Maintenance Intensity

MEDIUM

Design Considerations

Preserve Existing Tree Canopy
Erosion Control
Soil Characteristics

Recommended Landscape Strategies



See Chapter 3 for more information on each of the different landscape strategies.

STEEP SLOPE - PLANTED APPLICATION

1. For existing grass and shrubs, **identify invasive species to remove** and select plant species that complementing the existing or established groundcover.
2. Utilize **erosion control methods** that support management of stormwater runoff through both upland (at the top of the slope) and lowland (base of slope) areas.
3. Utilize a **mix of drought tolerant meadow planting, no-mow grasses**, or **trees and shrubs**, as suitable for the condition.
4. Dense evergreen shrubs can deter riders from running down hillsides. Aim for 30% evergreen to provide **winter structure and interest**.
5. Plants should have **high ecological value**, support stormwater management, and provide habitat for insects, birds, and other animals. Selections should complement existing plant communities and be suited to
6. Consider deep-rooted and long-lived plant species both for **slope stabilization** and **carbon sequestration.**

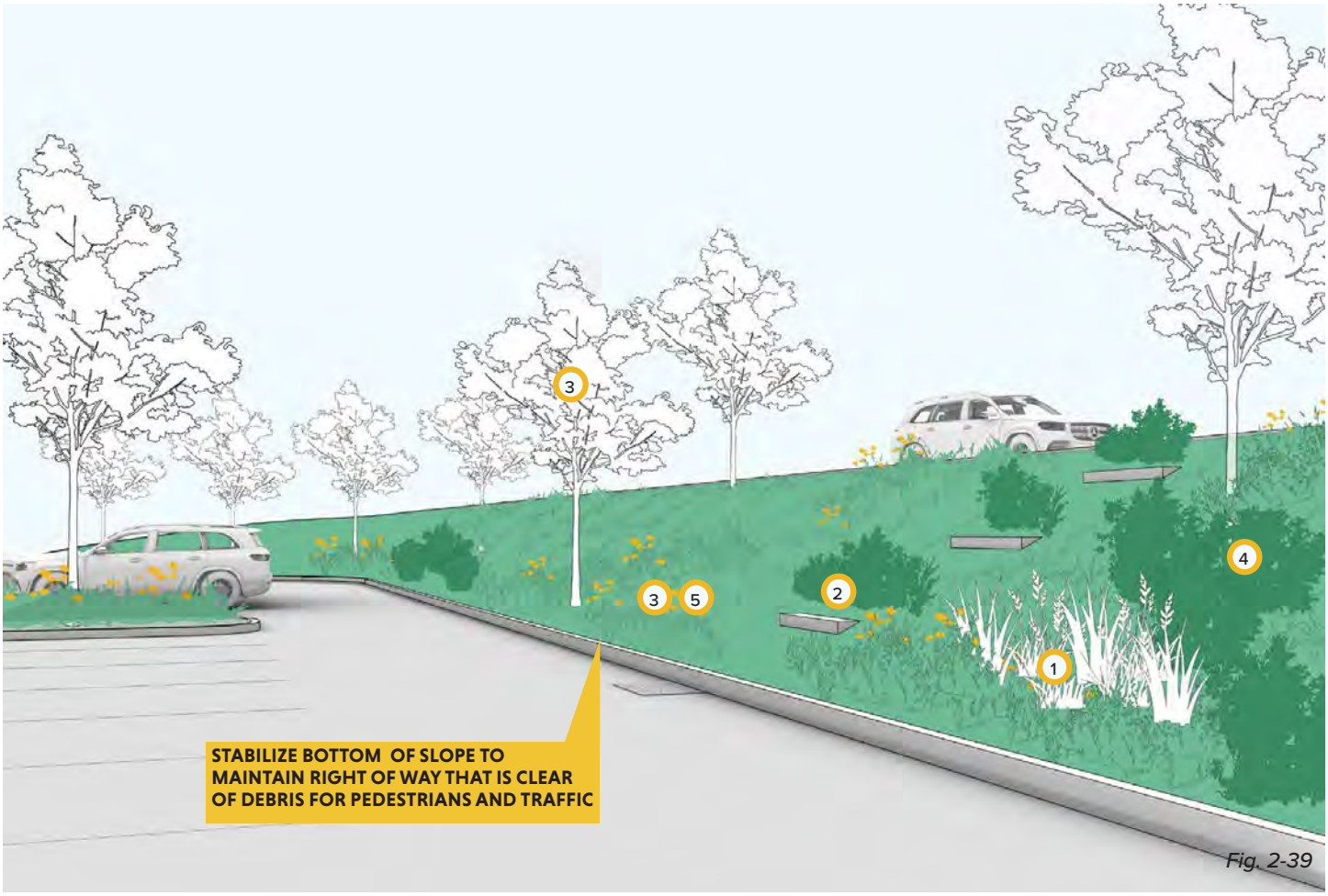


Fig. 2-39

MAINTENANCE INTENSITY

MEDIUM

Similar to wooded areas, maintenance of these landscapes should continue to be low.

STEEP SLOPE - WOODED APPLICATION

1. **Maintain existing canopy** coverage. Do not remove trees, regardless of species, unless absolutely necessary**.**
2. **Fallen trees can be left in situ** within wooded areas and strategically positioned perpendicular to the flow of water to slow the velocity and volume of runoff.
3. If a **retaining wall** is required, consider low cost gabion walls in less visible areas. Higher visibility areas should consider **stone block that can also function as seating**.
4. **Manage invasive vines and weeds** such as knotweed and poison ivy, particularly in higher visibility areas.
5. Soften the woodland's edge by creating a **transition zone** between wooded and open area. Plants should be selected for their ability to thrive in partial shade conditions.
6. Plants should have **high ecological value**, support stormwater management, and provide habitat for insects, birds, and other animals.
7. Consider deep-rooted and long-lived plant species both for **slope stabilization** and **carbon sequestration**.

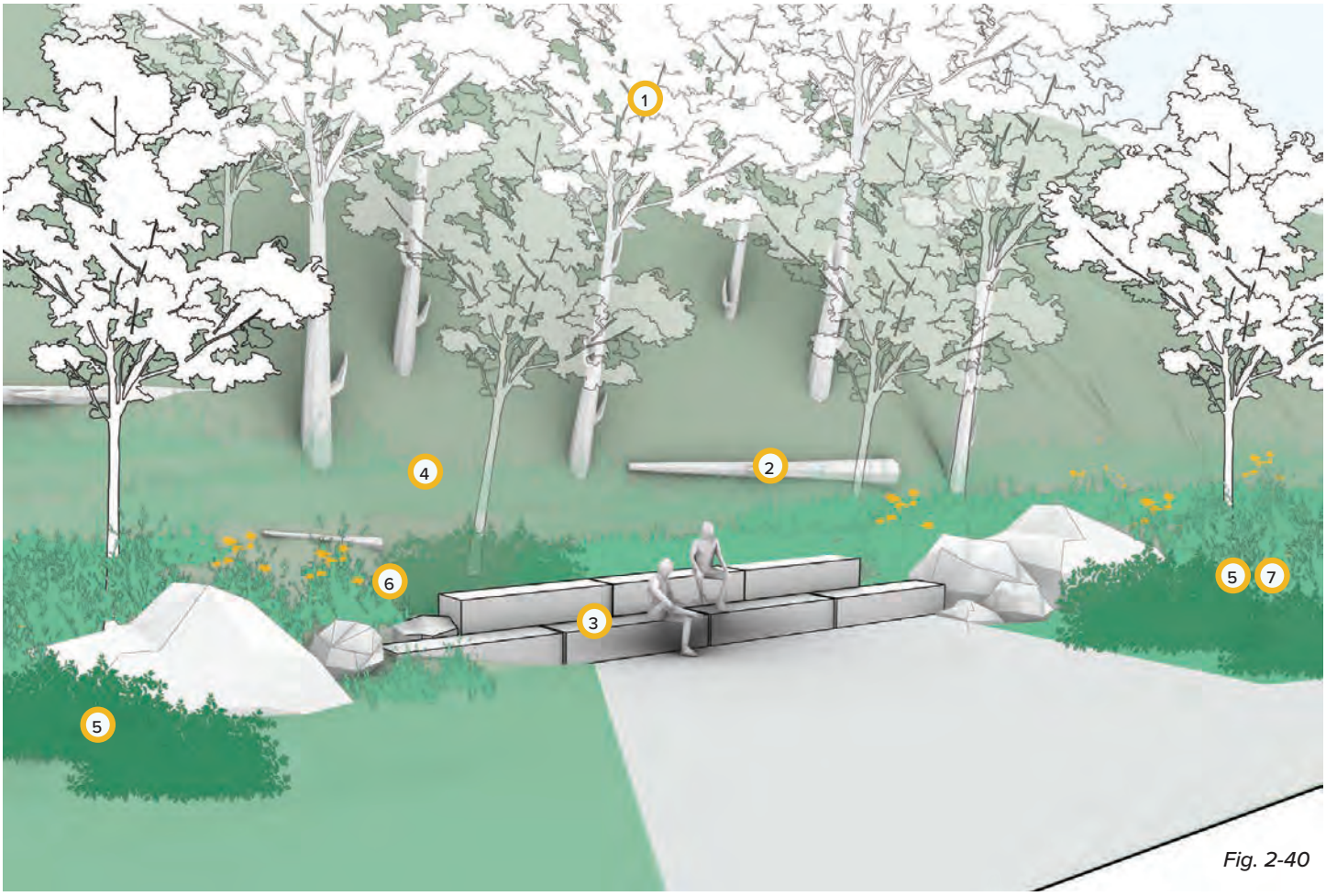


Fig. 2-40

MAINTENANCE INTENSITY

MEDIUM

As one of the least visible landscape conditions, maintenance needs are intended to remain low, though managing invasive species is beyond current maintenance practices, therefore considered an increase in maintenance.

SPACE CONSTRAINED

Space constrained sites are typically found in more urban environments where the amount of exterior space available for landscape is limited, or where transit stations must fit within limited or irregular footprints. Examples include downtown locations like Gateway or First Avenue, where stations are integrated into existing buildings or office complexes, as well as sites along active roadways such as the Red Line stations at Hampshire, Fallowfield, and Shiras.

These locations present unique design challenges related to accessibility, visibility, pedestrian flow, and safety. Limited space often restricts the inclusion of typical amenities like shelters, seating, or landscape buffers. However, well-executed design solutions can still enhance user experience through creative use of vertical elements, efficient circulation patterns, and strategic lighting or signage.

Where possible, partnerships with adjacent property owners or corporate partners can help expand the usable landscape footprint, improving functionality without major land acquisition. Future improvements should prioritize maximizing the spatial efficiency of these sites while ensuring safe, legible, and welcoming environments for all transit users.

FIRST AVENUE

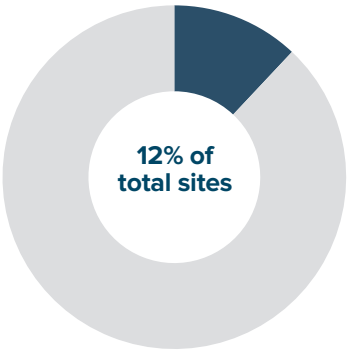
Fig. 2-41

FALLOWFIELD

Fig. 2-42

Stations with this condition:

- Belasco
- Bethel Village
- Crafton
- First Avenue
- Gateway
- Hampshire
- Mesta
- North Side
- Penn Station
- Shiras
- Station Square
- St Anne
- Steel Plaza
- Westfield
- Wood Street



FREQUENCY OF CONDITION

Fig. 2-43

Current Maintenance Requirements

Maintenance needs include pavement repair, trash cleanup, or painting. At some stations, particularly downtown stations like Gateway and First Avenue, maintenance might be handled by a corporate partner.

Current Maintenance Intensity

LOW

Design Considerations

Canopy Coverage
Utilization Rates
Neighborhood Walk Access to Public Parks
Stormwater Runoff

Recommended Landscape Strategies

See Chapter 3 for more information on each of the different landscape strategies.

APPLICATION

1. Target **10% of station area** to dedicate to **landscape / green space.**
2. Provide **safe pedestrian access** to station platforms through marked crosswalks, tactile strips, and traffic calming measures such as curb bump outs or signalized intersections.
3. Utilize **trees with columnar, upright growth habit,** so as to not encroach on transit infrastructure or rail lines.
4. Trees in planting beds or in-ground with tree grates allow pedestrian movement but provide the benefit of **added tree canopy and shade,** enhancing rider experience.
5. **Large planters** may be applicable in more urban conditions, though drought tolerant species should be selected if irrigation is not to be provided.
6. **Maintain site lines** through low-growing (12-24") groundcovers, grasses, and shrubs. Native plants should be chosen for their **high ecological value** and ability to support stormwater management.

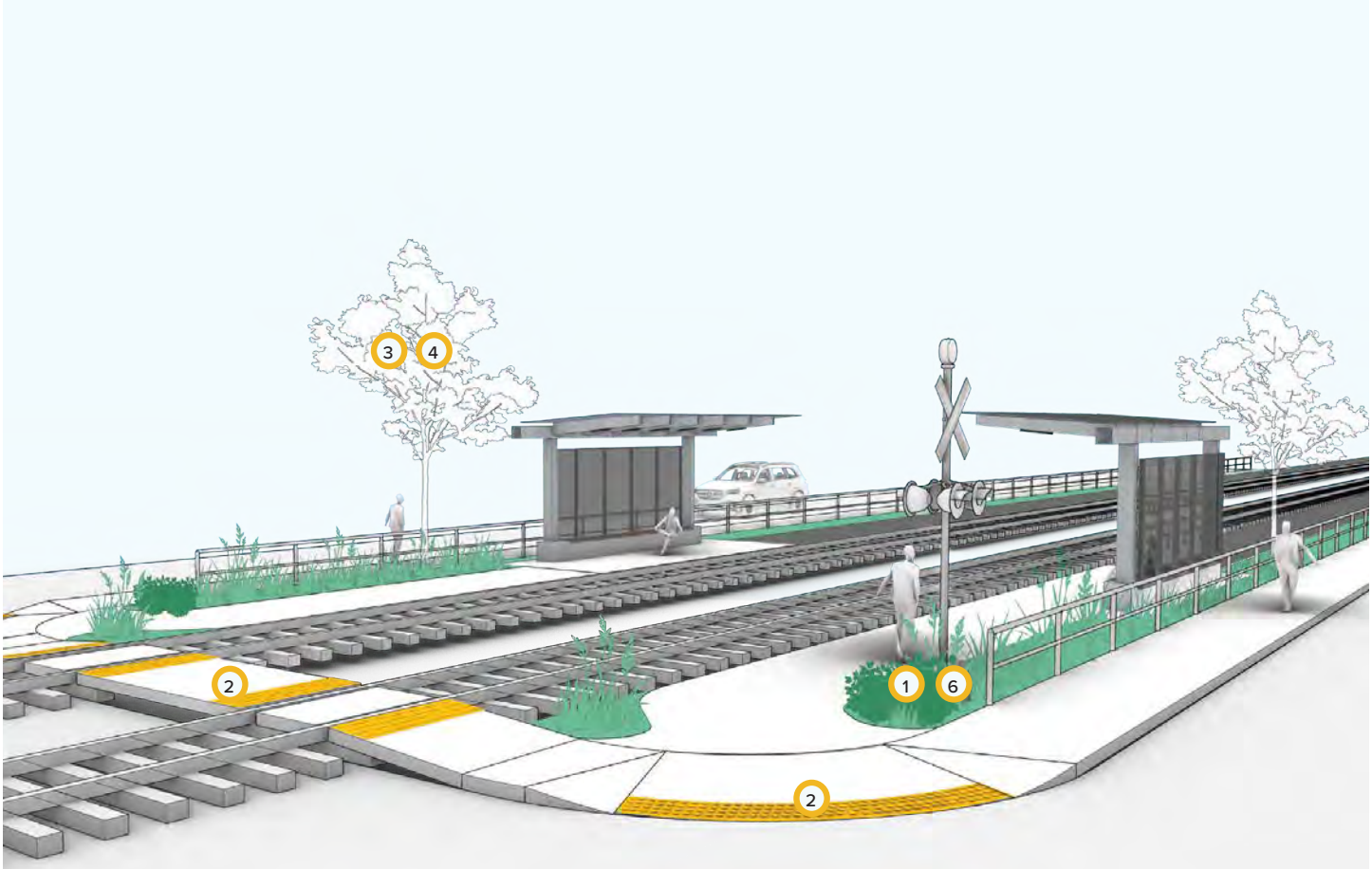


Fig. 2-44

MAINTENANCE INTENSITY

MEDIUM

The introduction of landscape elements within space constrained sites will likely require more maintenance than the existing condition. However, the improvements to rider experience should be prioritized.

CASE STUDY

BUS RAPID TRANSIT STATION

Montgomery County Department of Transportation, US 29 BRT Station Design, Silver Spring, MD

When Montgomery County, MD set out to develop the region's first Bus Rapid Transit (BRT) system, they required stations that could be branded, accessible, safe, comfortable, while also offering a positive life cycle investment. They focused on "shaping station areas that were accessible, adaptable, and sustainable"[1] by developing a modular "kit of parts" that could adapt to the unique site conditions and evolving ridership demands. Community input emphasized the integration of sustainable landscape and materials, including in the ability to support future PV panels to achieve net zero emissions. The project also used renewable and locally sourced natural materials, and employed low-impact development strategies such as bioswales, tree pits, and native groundcovers surrounding the platforms.

KEY FIGURES

Landscape Elements: Native Plantings, Stormwater Infrastructure

Landscape Area (% of Total Station): 25%

Costs / Funding: The 14-Mile project is estimated to cost $31M / Federal TIGER funds

Year Completed: 2020

Design Partners: ZGF, Landscape Forms Studio 431, RK&K (Engineering) Concrete General (Contractors)

1 ZGF Architects. (2020). Montgomery County Department of Transportation, US 29 BRT Station Design. ZGF. https://www.zgf.com/work/693-montgomery-county-department-of-transportation-us-29-brt-station-design

Fig. 2-45

Fig. 2-46

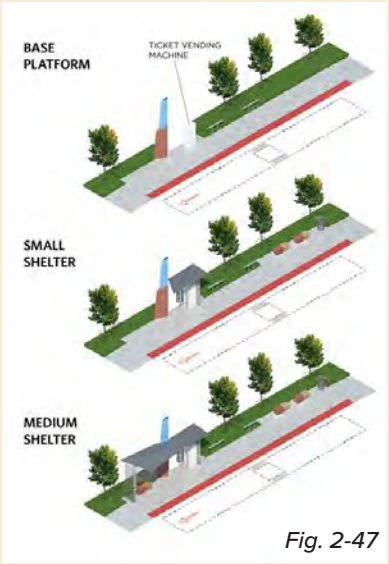


Fig. 2-47

(Top) The diagrams illustrate the conceptual framework for implementing a cohesive station appearance across sites of different sizes. Each station, regardless of the available area, incorporates landscape in the form of trees, stormwater planters, or other green space.

(Left) Images © Halkin Mason Photography via ZGF Architects.

WALLS

Given the region's steep topography, walls are a necessary and prevalent feature across PRT's properties. These walls vary in height, construction, and condition—from low retaining walls that can also function as seating, to 20-foot or taller cinder block, stone or concrete structures that navigate extreme grade changes. Rather than being seen as visual intrusions, this landscape type presents an opportunity to enhance community identity.

Incorporating public art, such as murals, can transform walls into community assets. Studies consistently show that public art improves perceptions of safety, enhances well-being, and fosters a sense of social belonging.[1] Public art can also stimulate economic development by attracting visitors, increasing foot traffic and reinforcing residents' connection to place, by centering community voices and co-designing shared public spaces. During focus group interviews with maintenance staff, it was noted that walls featuring murals or artwork were less prone to vandalism. Project teams should reference PRT's Public Art Strategic Plan for further guidance on procurement, public art engagement, and implementation.

Where space permits, additional strategies such as planting vegetation in front of walls can help to soften the visual impact of taller walls, and integrate them more naturally into the surrounding landscape.

DUQUESNE

Fig. 2-48

CRAFTON

Fig. 2-49

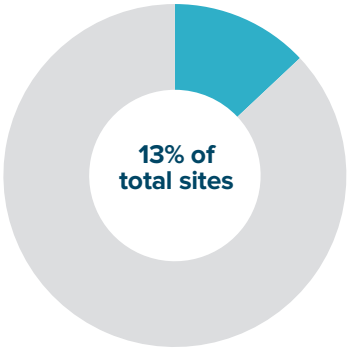
1 Young, Caitlin. "How Public Art Can Improve Quality of Life and Advance Equity." Housing Matters, Urban Institute, 16 Nov. 2022, https://housingmatters.urban.org/articles/how-public-art-can-improve-quality-life-and-advance-equity.

Stations with this condition:

- Bell
- Crafton
- Hamnett
- Homewood
- Idlewood
- McNeilly
- Roslyn
- South Bank
- Station Square
- Swissvale
- Westfield
- Willow

Park and Rides with this condition:

- Duquesne



FREQUENCY OF CONDITION

Fig. 2-50

Current Maintenance Requirements

Walls require periodic inspection and, depending on the material, may require repair such as patching or repointing. Many walls should also be cleaned periodically, requiring power washing as needed.

Recommended Landscape Strategies

TREES

PUBLIC ART

See Chapter 3 for more information on each of the different landscape strategies.

Maintenance Intensity

LOW

Considerations

Visibility
Neighborhood Partners
Accessibility

APPLICATION

1. Consider partnerships with **local artists** to beautify larger walls with **public murals**.
2. Where walls align with station entrances, consider employing **PRT branding and signage.**
3. Utilize **PRT's Public Art Strategic Plan** for guidance on procurement and community engagement.
4. Conduct **structural assessment** every 5 years and repair as needed. Walls should also be cleaned or pressure washed as needed.
5. If space allows, plant a min 4’ wide buffer (either at grade, or with 24-30" high planter walls) with a **mix of trees, shrubs**, and grasses to **minimize wall height and soften hard material**s.
6. Plants should have **high ecological value**, support stormwater management, and provide habitat for insects, birds, and other habitat.
7. Consider deep-rooted plant species, and long-lived tree species for their **carbon sequestration** potential.

Fig. 2-51

MAINTENANCE INTENSITY

MEDIUM

While introducing vegetation would be an increase in maintenance requirements, the use of public art would require the same, or less, maintenance over the long term. Agreements could be put in place with community members or local artists to maintain the murals.

CASE STUDY

MURAL ARTS

Philadelphia, PA

Mural Arts Philadelphia began in the 1980s as an anti-graffiti initiative, and now is the nation's largest public art program, creating 50-100 projects annually. The initiative's objective is to use art as a catalyst for urban transformation. With a history spanning three decades, Mural Arts serves as a compelling case study in how public art can strengthen community identity, instill a sense of pride and drive positive change. Studies show that public art can boost perceptions of the neighborhood, and expand empathy and social trust.[1]

Founded and led by Jane Golden, the project fosters partnerships between established artists and local communities to reimagine and revitalize public spaces. Reflecting on the transformative power of empowering youth to leave their mark on their communities, Golden has said, "Young people started to make their mark on the city in big, bold, beautiful, inspiring ways."

KEY FIGURES

Landscape Elements: Public Art

Operating Budget: $2.8M (2024 Fiscal Budget)

Design Partners: Various Local Artists

1 Tebes, Jacob Kraemer, et al. Porch Light Program: Final Evaluation Report. Philadelphia Department of Behavioral Health and Intellectual disability Services, June 2015, https://dbhids.org/wp-content/uploads/2016/01/Community_Mural-Arts_Porch-Light-Evaluation.pdf

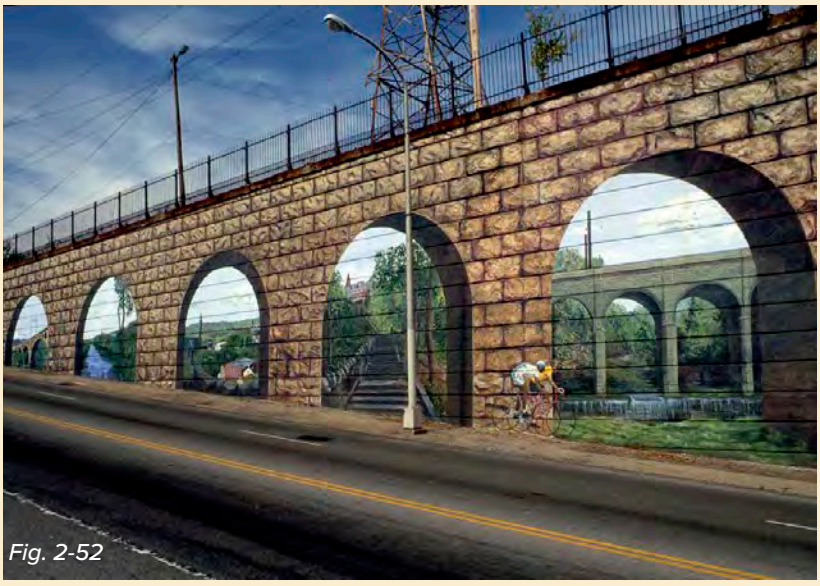


Fig. 2-52

Fig. 2-53

(Right) "Manayunk Textile" by artist Henry Morales. Photo by Conrad Benner.
(Left) "Manayunk Views" by Tish Ingersoll, 1997, restored in 2016. Photo via the artist.

CREEK ADJACENT

A number of transit lines run parallel to existing hydrology networks of streams or creeks, including portions of the Red and Silver Lines and South Busway, which follow Sawmill Run—a stream corridor that experiences frequent flooding. Southern portions of the Red and Blue Lines follow Graeser's Run, a small tributary of Chartiers Creek. The station areas adjacent to these open or channelized streams are most likely to suffer from impacts of flooding, and consideration should be given to increasing pervious land cover, planting additional trees, and restoring or repairing riverine corridors to more naturalized settings where feasible.

In order to align goals and funding sources, improvements of this landscape condition should be undertaken in conjunction with local watershed organizations such as Watersheds of South Pittsburgh, Upstream, or others, as well as municipal agencies such as Pittsburgh Water and Sewer Authority (PWSA). An assessment of the areas most frequently experiencing flooding would help to prioritize sections of the streams that are most in need of stabilization and repair. It is important to note that any work within waterways potentially falls under the regulatory jurisdiction of the United States Army Corps of Engineers (USACE) and/or Pennsylvania Department of Environmental Protection and can require a land use permit to authorize the activity. Careful consideration should be taken when working creek adjacent to ensure regulatory compliance prior to implementation of any actions and/or activities.

BEAGLE

Fig. 2-54

ST ANNE

Fig. 2-55

Stations with this condition:

- Beagle
- Castle Shannon
- Central
- Dorchester
- Glenbury
- Inglewood
- Killarney
- Kings School Road
- Library
- Logan Road
- McNeilly
- Memorial Hall
- Munroe
- Overbrook
- Sandy Creek
- Sarah
- Smith Road
- St. Anne's
- Washington Junction
- West Library

Park and Rides with this condition:

- Glenfield
- Large
- McCandless
- Plum
- Woodville

Streams or creeks run alongside a number of PRT's station areas and facilities, totaling **24% of properties evaluated.**

Fig. 2-56

Current Maintenance Requirements

Current maintenance requirements include periodic litter removal, cleaning out culverts, and stream bank stabilization on an as-needed, or emergency basis.

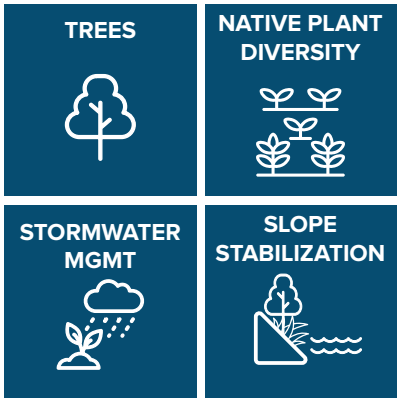
Maintenance Intensity

MEDIUM

Considerations

Visibility
Neighborhood Partners
Accessibility

Recommended Landscape Strategies



See Chapter 3 for more information on each of the different landscape strategies.

APPLICATION

1. Where feasible, **increase riparian buffer zone** to a minimum of 35', or up to 100'. **Regrade slope** as needed, and r**evegetate with native plants** to support slope stabilization.
2. Utilize **erosion control, slope stabilization, and energy dissipation** methods such as coir logs planted with wetland plugs, flood benches, rip rap, stone block walls, or cross vanes that slow and redirect velocity of water flow.
3. Conduct **structural assessment of embankments** every 5 years and repair as needed.
4. Plant **native trees along river corridors** to provide shade and improve habitat for fish & wildlife.
5. Manage invasive vines or wetland species. Do not remove trees unless absolutely necessary. Tree stumps can be left in place to stabilize stream bank.
6. Plants should have **high ecological value**, filter pollutants and runoff, improve soil health, and provide habitat for insects, birds, fish and other wildlife.

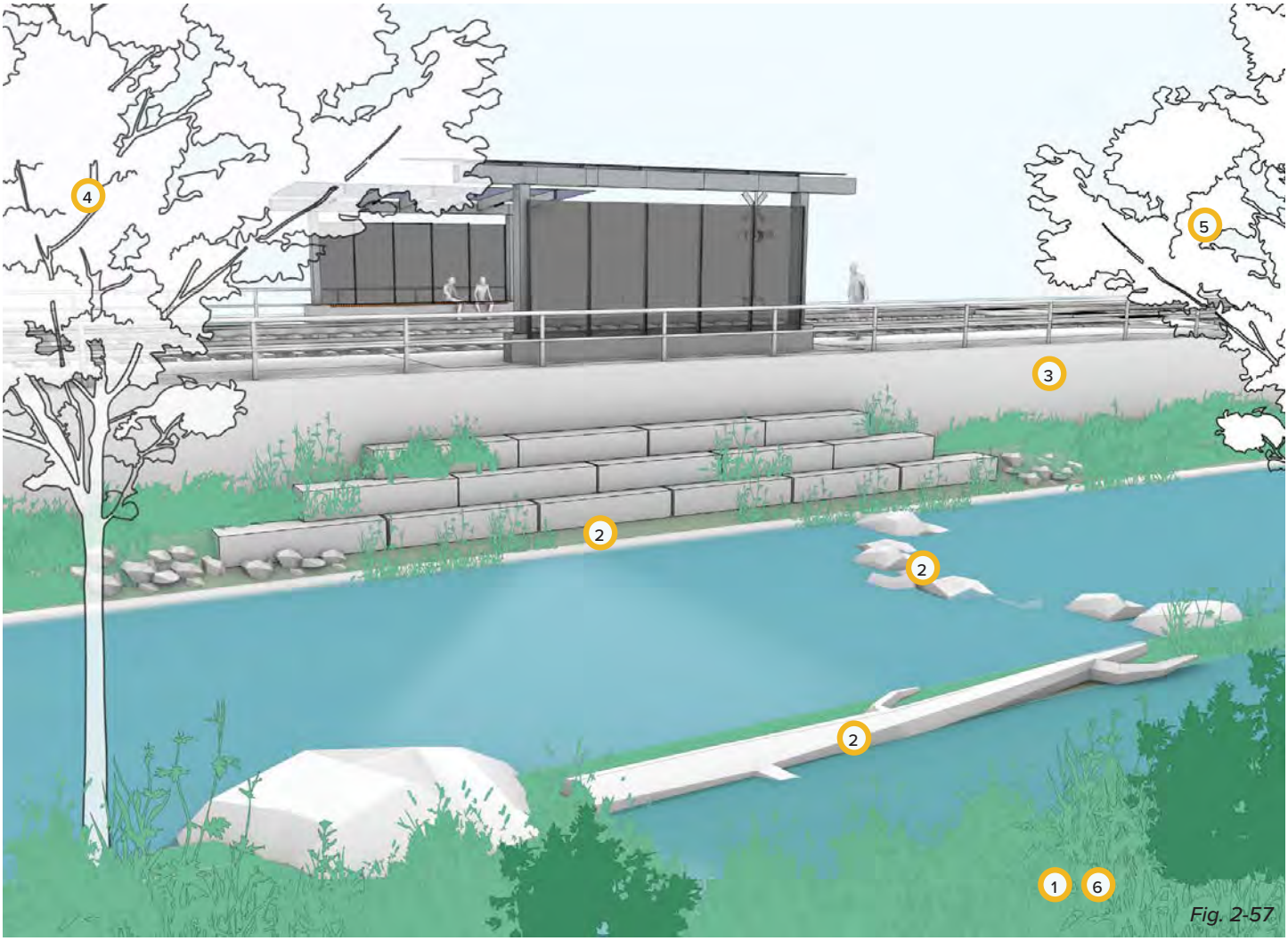


Fig. 2-57

MAINTENANCE INTENSITY

MEDIUM

Once stream restoration projects are completed, maintenance needs should remain similar to pre-construction conditions. However, we propose more attention be given to managing invasive species and proactive stabilization and restoration.

CASE STUDY

LOWER WALLER CREEK RESTORATION

Austin, TX

The Lower Wall Creek restoration in Austin, Texas transforms approximately 13 acres along a neglected urban stream into a vibrant ecological and public space. One of two original waterways traversing through the city, Waller Creek had been heavily developed—over 60% of the areas surrounding the waterway are impervious—leading to increased pollutants, erosion, low water quality and reduced habitat, as well as flooding. The restoration focused on eliminating invasive plants, rehabilitating existing structures, and introducing bank-armoring and erosion control methods aimed at dissipating and redirecting the velocity of water flow during peak storm events. Plantings were chosen for their ability to provide stabilization through their root systems, filter pollutants, and improve shade, habitat, and enhanced visual appeal. The restoration is part of a larger corridor framework project that links residents to a system of public spaces and continuous trails throughout Austin.

KEY FIGURES

Landscape Elements: Native Plantings, Tree Canopy Cover, Urban Stream Restoration

Costs / Funding: Funded by a combination of Waterloo Green Conservancy, City of Austin Tax Increment Financing Zone funds, and federal funding from the US Army Corps of Engineers.

Status: Plan began in 2012, construction took place between 2019 and 2021. Phase II construction began in 2023, and is expected completed in 2026.

Partners: Michael Van Valkenburgh Associates (MVVA), Thomas Phifer and Partners, Waterloo Greenway Conservancy, City of Austin Technical Advisory Group

Fig. 2-58

Fig. 2-59

Photos of Waller Creek before restoration (left), and after (right). Images by Susan Kenzie via ASLA The Field.

PUBLIC AMENITY

Public amenities, in the form of parks, playgrounds, and memorials, play a critical role in shaping vibrant, inclusive communities. They contribute to physical and mental well being and present opportunities for enhanced environmental resilience through tree canopy coverage and green infrastructure. These can reduce urban heat island and mitigate the impacts of flooding. Across PRT's system, a few sites provide public amenities and, though somewhat unique, this is a landscape condition that should be expanded upon—particularly in future TOD improvements.

Studies show that when there is a park, people are more likely to walk or take public transit to access a transit station, and a transit station that has a park may provide a more pleasant first-mile / last-mile experience.[1]

Future developments should prioritize the integration of public realm amenities. A system-wide study—looking at existing institutional and commercial anchors, ridership, and available or underutilized open space—such as parking lots—would indicate potential sites with the greatest opportunity for incorporating enhanced public amenities near transit stations.

1 Park, Kyoung, Dong-Ah Choi, Guang Tian, and Reid Ewing. "Not Parking Lots but Parks: A Joint Association of Parks and Transit Stations with Travel Behavior." International Journal of Environmental Research and Public Health, vol. 16, no. 4, 2019, article 547. MDPI, https://doi.org/10.3390/ijerph16040547.

WILLOW

Fig. 2-60

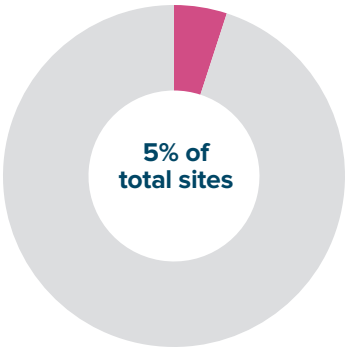
ROSLYN

Fig. 2-61

Stations with this condition:

- Library
- Overbrook Junction
- Roslyn
- Steel Plaza
- Willow

Studies show that **when there is a park people are more likely to take public transit** or walk to access a transit station.



FREQUENCY OF CONDITION

Fig. 2-62

Current Maintenance Requirements

Though these conditions are unique, maintenance demands are not that atypical from other highly visible station areas. Ideally, maintenance is managed by a nearby neighborhood group or institutional partner. These areas should be monitored closely to make sure amenities like seating and lighting remain functional and present no public safety hazards.

Maintenance Intensity

MEDIUM

Considerations

Visibility
Neighborhood Partners
Accessibility

Recommended Landscape Strategies

TREES | **PUBLIC ART** | **AMENITIES**

See Chapter 3 for more information on each of the different landscape strategies.

APPLICATION

1. Public spaces should rely on existing **institutional anchors, community amenity, or commercial partners** to support programming and maintenance, and support an **active public space**.
2. Provide safe pedestrian and public access through **accessible surfaces, pathways** and **multi-modal connectivity.**
3. Public space may be permanent or temporary, such as a **pop-up.** Program might range from park, playground, memorial, flexible open area, or **plaza and pavilion** with food and beverage offerings.
4. Program and public amenity function should be dependent upon the existing community needs and desires.
5. Planting palette should consider **year-round interest**, providing a mix of evergreen, flowering, and grass species.
6. Plants should have **high ecological value**, support stormwater management, and provide habitat for insects, birds, and other habitat.
7. Consider deep-rooted plant species for **carbon sequestration** potential.

Fig. 2-63

MAINTENANCE INTENSITY

MEDIUM

Maintenance demands should remain the same, as these types of public spaces are best managed by a nearby or on-site partner, such as a community group or commercial vendor.

CASE STUDY

PULASKI PARK AND ACADEMY OF MUSIC BUS STATION

Northampton, MA, Pioneer Valley Transit Authority (PVTA)
Western Massachusetts

The Academy of Music bus stop was a high ridership transit station that had fallen into disrepair. The revitalization of this station, and the integration of public space improvements exemplifies how thoughtful public realm design can enhance transit experiences. Improvements included fully accessible pathways navigating steep slopes, incorporating bike-share facilities, and an open plaza and lawn to host a range of events, transforming this transit stop into a vibrant community gathering space.

KEY FIGURES

Landscape Elements: Public Amenity, Native Plantings

Size: 2.5 Acres

Costs / Funding: $2.5M / Combination of Community Preservation Act and Parkland Acquisitions and Renovations for Communities (PARC) grants.

Year Completed: 2017

Design Partners: Stimson Studio (Landscape Architect)


Fig. 2-64


Fig. 2-65


Fig. 2-66

Fig. 2-67

Pulaski Park and Academy of Music Bus Station - Northampton, MA - (Top) Photographs by Ngoc Doan (Bottom left) Photograph by Charles Mayer Photography (Right) Plan drawing by Stimson Studio

ROADWAY

The roads and busways that make up PRT transit routes are a significant part of the rider experience, where trips can range from average of 15-30 minutes, depending on the rider's route. These roadside landscapes present opportunities for implementing greenhouse reduction strategies, reforestation or ecological restoration, as well as considering roadway sizing, canopy coverage, and areas for potentially increasing landscape buffers that would improve the visual quality along roadways and provide habitat for native pollinators.

As a necessary component of the transit system, consideration should be given to ways of mitigating and offsetting the impervious cover and heat island effects generated by this landscape condition. As future and ongoing roadway construction projects are evaluated, PRT should prioritize right-sizing right-of-ways to allow for the incorporation of landscape and stormwater management elements.

SOUTH BUSWAY

Fig. 2-68

EAST BUSWAY

Fig. 2-69

This condition is present across the system.

Roads, including Busway routes, make up approximately 71 acres, about **8.5% of total PRT properties**.

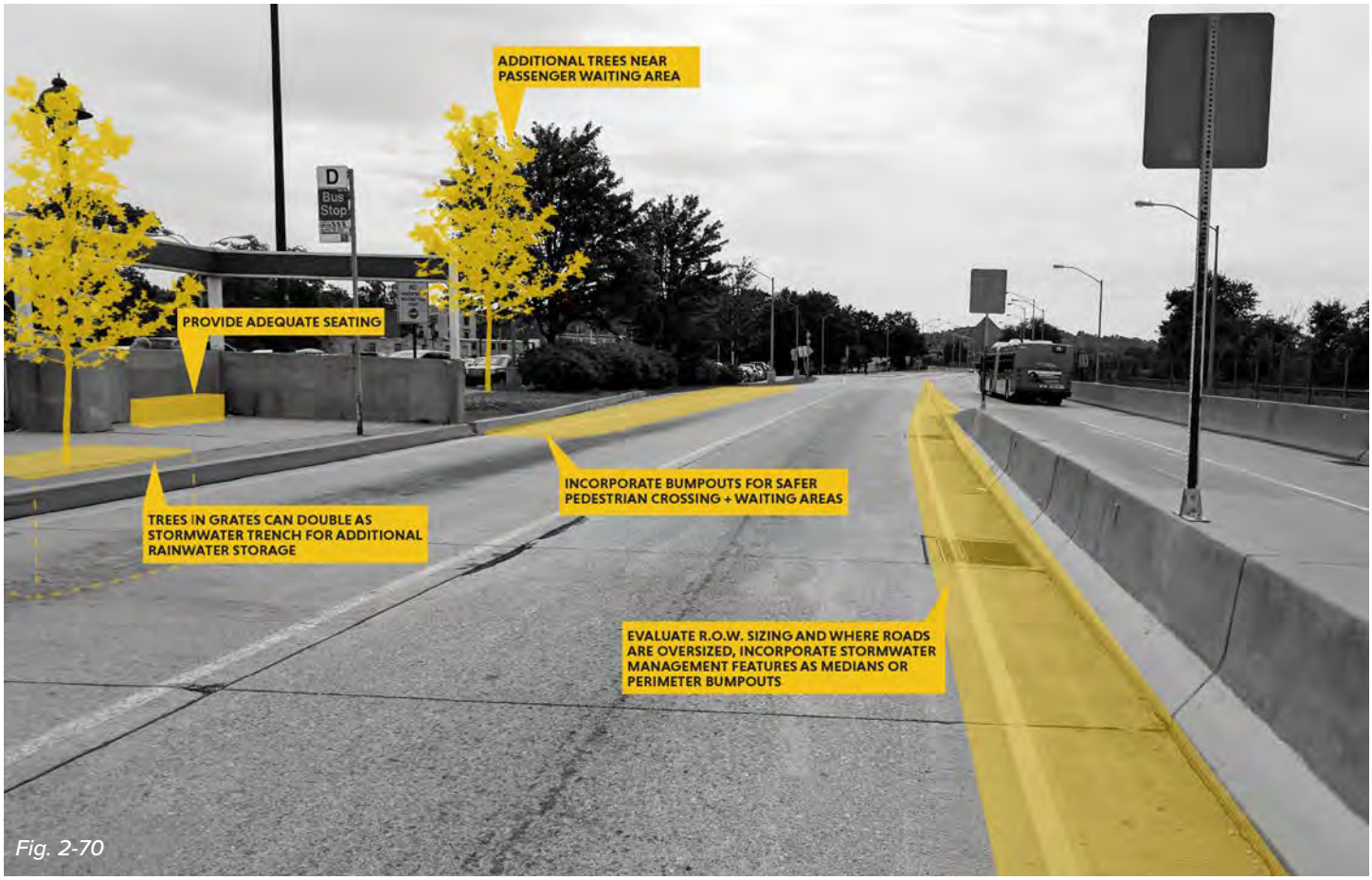


Fig. 2-70

Current Maintenance Requirements

Maintenance along roadways and in the right-of-way can present safety hazards for maintenance teams. Tasks include asphalt or concrete repair, striping, and clearing debris or fallen trees.

Recommended Landscape Strategies

See Chapter 3 for more information on each of the different landscape strategies.

Maintenance Intensity

MEDIUM

Considerations

Visibility
Neighborhood Partners
Accessibility

APPLICATION

1. Evaluate road sizing for possible road diet.
2. Where road lanes or shoulders are currently oversized, reclaim area for pedestrian ROW and **stormwater management strategies such as tree pits, permeable pavers, rain gardens**, or **bioswales**.
3. Utilize curb bump-outs for **safe pedestrian crossings.**
4. Target a **30% increase in tree canopy** along busways and roadways. Maintain 6'-0" offset from roadways.
5. Utilize **trees with columnar, upright growth habit,** so as to not encroach on transit infrastructure or rail lines.
6. Plants should have **high ecological value**, support stormwater management, and provide habitat for insects, birds, and other habitat.

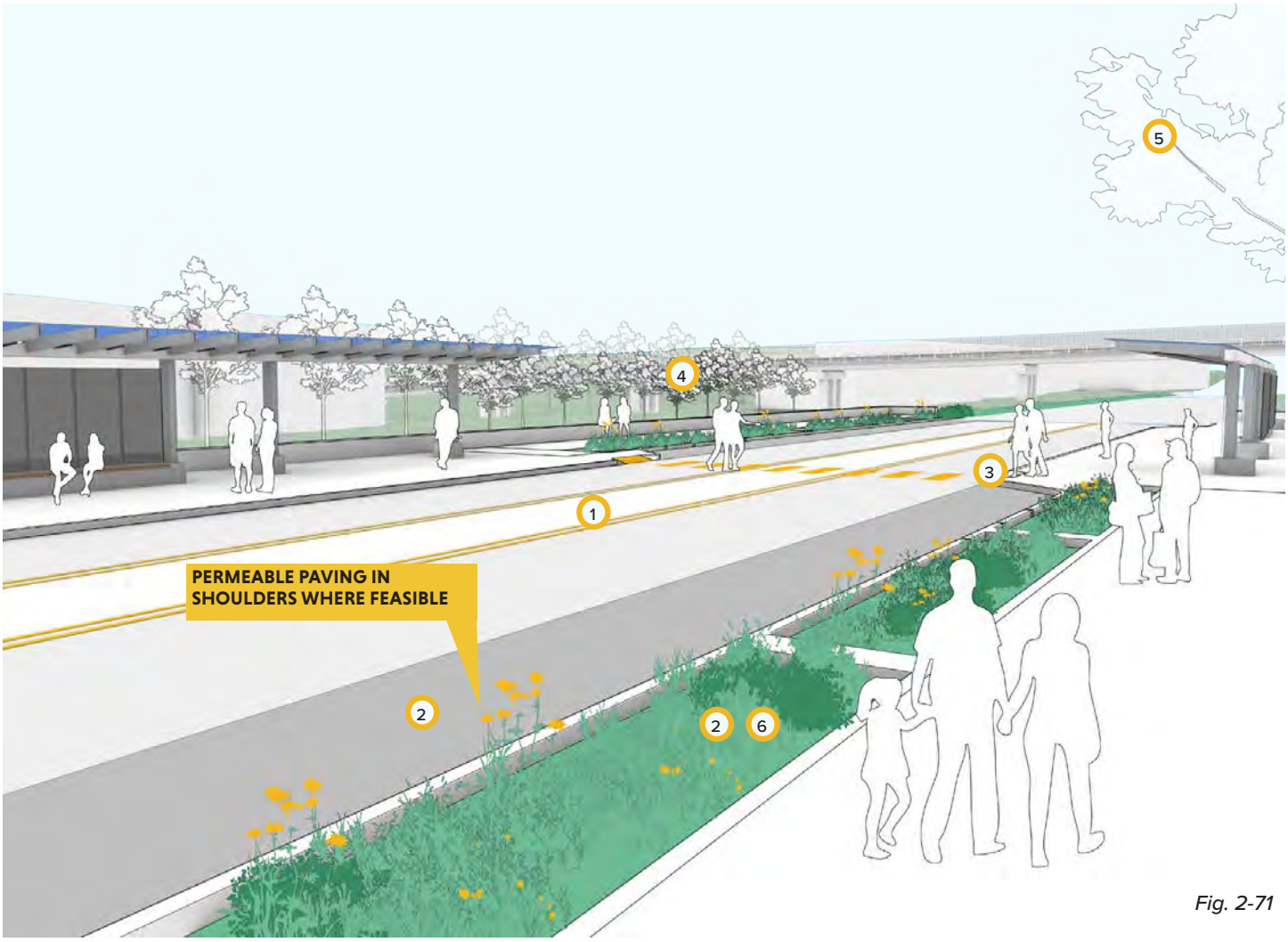


Fig. 2-71

MAINTENANCE INTENSITY

MEDIUM

It is recommended that roadway improvements are considered during station area improvements, and during routine roadway repairs. The incorporation of stormwater management within these zones will be an increase in maintenance, though it could be part of a specialized Green Stormwater Infrastructure external contract.

CASE STUDIES

STREETS GREEN INFRASTRUCTURE POLICY

City of Boston, Office of Green Infrastructure

Cities across the United States are implementing innovative strategies for enhancing visual appeal of roadways, while also creating landscapes that can help to reduce flooding, enhance vital ecosystems and habitat for pollinators, mitigate urban heat island effect, and improve air quality.

For example, the City of Boston has established a policy that requires incorporation of green stormwater infrastructure in all streets and right-of-way (ROW) projects. The policy aims to create stormwater infrastructure out of oversized streets, or when curbs, alleys, and roads are repaired.

KEY FIGURES

Landscape Elements: Native Plantings, Landscape Buffer, Stormwater Management

Year Established: 2022

POLLINATOR HABITAT INITIATIVES

Pennsylvania Department of Transportation, PA Turnpike

Both PennDOT and the PA Turnpike Commission have established native pollinator habitat initiatives aimed at supporting declining pollinator populations of bees, butterflies, and other insects vital to our ecosystem and agriculture production, by converting roadside areas into native wildflower habitats. These programs not only provide essential habitat for pollinators, but also provide educational opportunities, improved visual quality along roadsides, and reduced maintenance costs due to decreased mowing requirements. To date, over 16 acres of pilot plots have been installed along the PA Turnpike.

KEY FIGURES

Landscape Elements: Native Plantings, Landscape Buffer, Stormwater Management

Year Established: 2022

Awards: 2024 Diamond Award, ACEC/PA

Fig. 2-72

A vegetated swale installed in Boston as part of the Green Infrastructure policy collects runoff from adjacent sidewalks cycle tracks, and roadways.

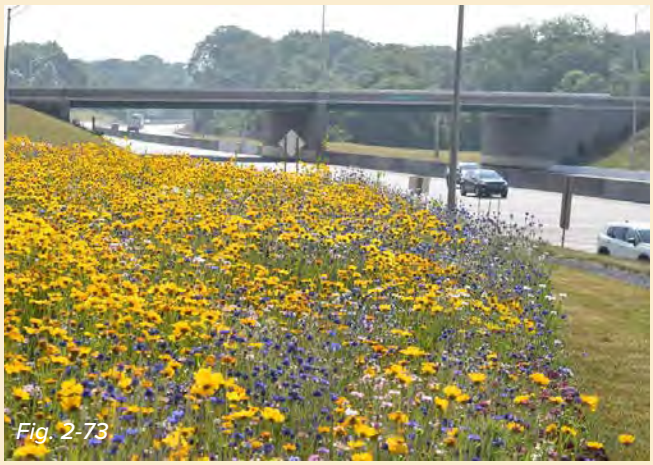


Fig. 2-73

A roadside landscape along the Pennsylvania Turnpike that has been converted to native pollinator habitat. Image by McCormick Taylor.

CHAPTER 3

LANDSCAPE STRATEGIES

Fig. 3-01

Negley Station - Photo by PRT

3. LANDSCAPE STRATEGIES

LANDSCAPE STRATEGIES OVERVIEW

The landscape strategies developed as part of these guidelines provide PRT with a system-wide approach to respond to critical landscape areas or conditions, which have been identified for improvement and/or intervention.

Strategies include:

	Trees	pg. 82
	Native Plant Diversity	pg. 86
	Manage Invasives	pg. 100
	Forest Rehabilitation	pg. 104
	Slope Stabilization	pg. 108
	Green Stormwater Infrastructure	pg. 114
	Depaving	pg. 120
	Traffic Calming	pg. 124
	Public Art	pg. 128
	Amenities	pg. 130

The goal of these strategies is to improve rider and employee experience and engagement throughout the PRT system by enhancing community connectivity, aligning landscape management with PRT's Climate Action Plan and carbon reduction goals, promoting landscape resilience through implementation of durable landscapes, and reducing the burden of landscape management by decreasing maintenance requirements and expanding operational efficiency.

The landscape strategies discussed in the subsequent sections will highlight key aspects and benefits of each design approach and provide an overview of how the strategy can respond to landscape conditions and lead to positive outcomes through goal attainment.

Fig. 3-02

Native plant diversity landscape strategy implemented at PRT's Negley Station along the MLK Jr. East Busway.

GOALS

ALIGN MAINTENANCE & LAND MANAGEMENT STRATEGIES

- convert high maintenance landscapes to low maintenance native alternatives

CREATE MORE DURABLE LANDSCAPES

- consider life cycles and how landscapes will evolve over time

IMPROVED RESILIENCE & BIODIVERSITY

- select diverse native species for planting designs
- manage invasive species
- reduce soil erosion and bare soil areas

ALIGN WITH CLIMATE ACTION PLAN & CARBON REDUCTION GOALS

- minimize the use of traditional concrete
- reduce the use of hardscape
- preference plant species with high carbon sequestration and storage potential

IMPROVE PASSENGER EXPERIENCE

- create comfortable, shaded, welcoming entry plazas and station areas
- maintain visibility for rider convenience and safety

INCREASE TREE CANOPY COVERAGE

- identify opportunities for tree planting

OUTCOMES

Increased ridership & revenue

Landscapes that PRT can maintain

Mitigate climate impacts

Net zero carbon emissions by 2045

TREES

Benefits

Establishing trees within the urban environment provides many important benefits including **traffic calming, stormwater management, improved air quality, shielding winds, cooling local heat island effects, energy efficiency, and enhanced mental health**. Tree planting also contributes to the design of **more attractive entry plazas and gathering spaces** that contribute to positive rider and employee experience and increased public engagement.

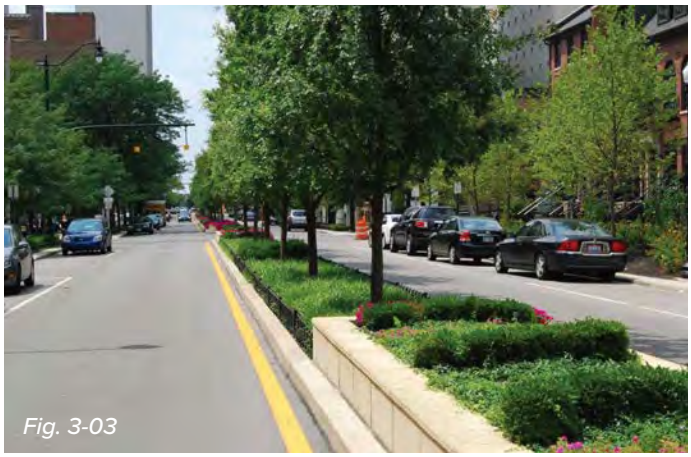
Applicability

Tree planting is most appropriate where each individual tree is provided a minimum volume of accessible soil for rooting (200 cubic feet). The location of new trees should also be selected to maintain all required offsets from right-of-way intersections and utilities.

Tree species selection should also consider the site specific context to avoid potential conflicts with utilities or other adjacent conditions. For example, designers should choose trees with less aggressive root systems to avoid upturned pavement surrounding tree pits and avoid locating trees that are expected to reach over 15 ft height at maturity beneath overhead wires where those conditions are present. Only certain tree species are appropriate for planting on steep slopes, exceeding (3:1), to avoid the risk of overturning. Further information about appropriate tree species for steep slopes is provided in the Slope Stabilization Landscape Strategy section.

STREET TREES

- Pittsburgh Code (§918.02) dictates at least one (1) street tree for every 30 LF of public street. Additionally it states that street trees have a minimum non-paved planting area of 30 sq ft, with a minimum depth of 3'. Where feasible a minimum planting area of 50 sf and 3ft depth should be provided.
- Maintain intersection site lines by implementing a minimum distance of 40' from stop signs and in the absence of a stop sign maintaining the same distance from intersecting rights-of-way.
- Tree pit/trench soil shall have an acidity range of pH 6.0 to 7.0 and a clay content of no more than 30%, contain not less than 3% organic material, and will be free of subsoil, slag, stones, and other forms of refuse/debris.
- Minimum street tree size is 2" caliper ball-burlapped. In the absence of overhead wires, select shade trees and if present select utility-compatible trees.
- Minimum spacing for large shade trees is 30' off-center and 25' off-center for utility compatible trees.
- Maintain a minimum distance of 5' from water and/or gas utility boxes and a minimum distance of 3' from edge of sidewalks, maintain ADA compliance.
- Stormwater tree pits and trenches should be considered where feasible.



Street trees provide other benefits besides shade such as traffic calming, improved aesthetic, and reduced stormwater impacts.

London Plane (Platanus acerifolia), a common street tree known for their rapid growth, large canopy, and tolerance within an urban setting.

CANOPY TREES

- Utilize shade/canopy trees within plazas and parking areas to improve aesthetics, provide cooling, and manage stormwater. Aim for a goal of 1 tree per 5 spaces, vegetated islands in lots with more than 50 spaces, and maintain 10% of the total parking area as vegetated landscape.
- Plant shade trees near gathering spaces and entry plazas to make these spaces more inviting. Place seating and/or resting areas within shaded zones.
- Utilize trees to create traffic calming within parking areas, create areas of refuge for pedestrians, and direct circulation to and from stations and/or platforms.

URBAN TREE CANOPY CONSERVATION

Pittsburgh's zero net loss canopy policy, which was adopted under the City's Climate Action Plan, aims to increase canopy from 42% to 60% by 2030. To achieve this goal requires thoughtful planting strategies and conservation of existing wooded areas and shade trees.

- Preserve existing shade/canopy trees. During construction, do not disturb/impact more than 10% of an existing tree's root base. To estimate size of the root base, imagine a wine glass on a dinner plate.
- If a canopy tree is required to be removed, include replacement trees to mitigate its loss. The minimum replacement shall equal the combined caliper of the removed tree, which often results in a ratio of 2:1 or 3:1.

White Oak (Quercus alba), a common landscaping tree known for its longevity and hardiness, shade/cooling effects, and environmental benefits.

Entry plazas landscaped with trees create shade and make for an inviting gathering space, leading to an improved experience.

TYPES OF STREET TREES

COMMON NAME / CULTIVARS	SCIENTIFIC NAME	MATURE HEIGHT	BLOOM PERIOD	FLOWER/ FRUIT COLOR	SALT TOLERANCE	SUNLIGHT/ MOISTURE
STREET TREES: RECOMMENDED FOR PLANTING IN SIDEWALKS, MEDIANS, AND PARKING LOTS						
American Hornbeam	*Carpinus caroliniana*	20-35’	Apr-May	Yellow-green	-	
Ginkgo / ‘Magyar’ (Male Only)	*Ginkgo biloba*	40-50’	Apr-May	-		
Hackberry / ‘Chicagoland’ ‘Prairie Pride’	*Celtis occidentalis*	50-70’	Apr-May	Greenish		
Honeylocust	*Gleditsia triacanthos*	40-70’	May-Jun	Green-yellow		
Kentucky Coffee / Fruitless Cultivars Only	*Gymnocladus dioicus*	60-75’	May-Jun	Green-white		
London Plain / ‘Exclamation’ ‘Columbia’ (not ‘Bloodgood’)	*Platanus x acerifolia*	60-80’	Apr	Yellow-green	-	
Silver Linden	*Tilia tomentossa*	50-70’	Jun-Jul	Creamy-yellow	-	
Zelkova	*Zelkova serrata*	50-70’	Apr-May	Yellow-green	-	
SHADE TREES: RECOMMENDED FOR PLANTING IN PLAZAS AND OTHER PUBLIC SPACES TO ENHANCE THE URBAN TREE CANOPY AND INTEREST						
Bald Cypress	*Taxodium distichum*	50-70’	Apr-May	Greenish	-	
Bur Oak	*Quercus macrocarpa*	60-80’	Apr-May	Yellow-green		
Carolina Silverbell	*Halesia tetraptera*	20-40’	Apr-May	White	-	
Chinkapin Oak	*Quercus muehlenbergii*	40-60’	Apr-May	Yellow-green		
Downy Serviceberry	*Amalanchier arborea*	15-25’	Mar-Apr	White	-	
Flowering Cherry	*Prunus, spp.*	20-30’	Mar-Apr	Pink/white	-	
Hophornbeam	*Ostrya virginiana*	30-50’	Apr-May	Yellow-green	-	
Overcup Oak	*Quercus lyra*	40-60’	Apr-May	Yellow-green	-	
Smoke Tree	*Cotinus coggygria*	10-15’	May-Jun	Pink/purple	-	
Swamp White Oak	*Quercus bicolor*	50-60’	Apr-May	Yellow-green	-	

= Salt Tolerant [1] *= Full Sun* *= Part-Shade* *= Full Shade*

= Dry *= Moist* *= Wet* *= Well Drained [2]* *= Drought Tolerant [3]*

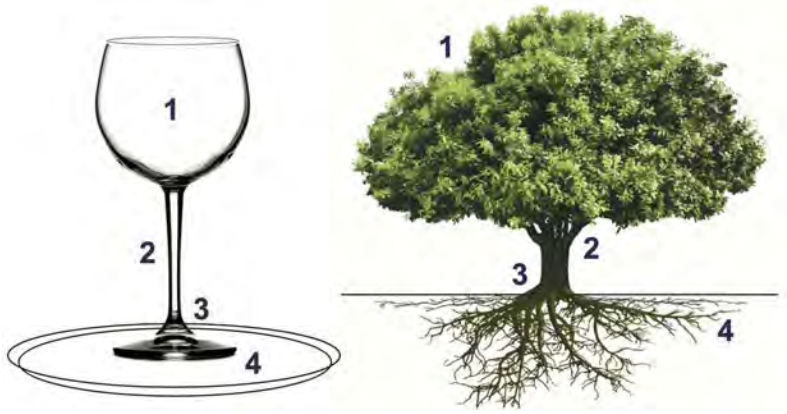


Fig. 3-07

1. Tolerant of road salts.
2. Allows water to infiltrate and move through the soil profile at a moderate rate, preventing prolonged saturation, and ensuring plant roots receive enough oxygen and avoid root rot and other water-related stresses.
3. Prolonged period of little to no rainfall that leads to excessively dry soil conditions, lower water table, and can cause significant stress or damage to plants not adapted to drought conditions.

A tree is like a wine glass sitting on a dinner plate. The top of the glass represents (1) leaves and branches, (2) tree stem, and (3) the structural root plate. A dinner plate (4) represents the feeder root system. Limit impacts to no more than 10% of the tree’s root system.

KEY COMPLIANCE STANDARDS

Pittsburgh Specific Standards/Guidelines

CITY OF PITTSBURGH LANDSCAPING AND SCREENING STANDARDS; CHAPTER 918 OF THE ZONING CODE

Encourages the planting of appropriate new vegetation and the preservation of existing vegetation and reduces potential nuisances by requiring a visual screen between different uses. Applies to all developments that are subject to Site Plan Review provisions.

URBAN FORESTRY STANDARDS

Guidelines for the planting, maintenance, and protection of trees within urban areas.

- ANSI A-300 Tree Maintenance Standards
- Pittsburgh Shade Tree Commission declaration of tree protection measures and standards[1]

TREE PITTSBURGH "ZERO NET LOSS" POLICY

Principle adopted by the City of Pittsburgh to maintain and grow its urban tree canopy by ensuring no net loss of trees occurs due to development or infrastructure projects. While Tree Pittsburgh itself is a nonprofit advocacy and education organization, the policy is embedded in city government practices and is supported by planning and permitting requirements.

- The goal is to replace every public tree removed with a new tree, at a 1:1 ratio at minimum—and often more if the removed tree was mature or had high ecological value.
- Replacement trees must be appropriate for the site, non-invasive, and approved species listed in the city's Street Tree List or relevant urban forestry standards.
- Projects must submit a tree replacement plan as part of their permit process if public trees are impacted.
- Public Tree Removal Permits are required for any work that may remove or damage trees within the public right-of-way.
- For projects unable to plant trees on-site, off-site planting or in-lieu fees may be required to maintain canopy goals.

Pennsylvania Standards/Guidelines

VEGETATION AND LANDSCAPING

PADEP encourages the use of native vegetation in landscaping to promote biodiversity and reduce maintenance needs. This includes guidelines for re-vegetating disturbed areas and using plants that are well-suited to local conditions.

Organization Standards/Guidelines

ISI Envision Standards

CLIMATE AND RESILIENCE

This category addresses climate impacts and ensures resilience to future challenges. Credits might focus on reducing greenhouse gas emissions, improving resilience to climate change, and preparing for natural disasters.

1. http://pittsburgh-pa.elaws.us/code/coor_titlefour_artxiii_ch487_sec487.02

NATIVE PLANT DIVERSITY

Benefits

Native plant diversity is a strategy to improve the aesthetic value of PRT landscapes while also reducing maintenance burdens throughout its system. Additionally, native landscapes will improve stormwater management outcomes, introduce cost and energy efficiencies, and benefit human and environmental health, all while increasing biodiversity that is vital to support native fauna and the local ecosystems in which we live and rely on.

Applicability

Allegheny County, Pennsylvania is mapped within the North American Ecoregion identified as Appalachian Mixed Mesophytic Forest. This ecoregion is globally recognized for its high level of biodiversity, species richness, and vital habitat warranting protection and conservation.[1] The region's unique topography and varied geology significantly contributes to the level of biodiversity observed and makes it a "hot spot" for many neotropical migratory bird species and other wildlife.[2]

While the above ecoregion represents large forest systems, the species makeup within these vegetative communities is essential for development of landscaping guidelines and identification of native plants suitable for the PRT system. By selecting local ecotype native species deemed suitable for the ecoregion, the result will be plants that are well adapted to the local climate regime, soil, and are resistant to pests reducing the need for extensive fertilization, watering, and/or pest control. This natural adaptation directly correlates to lower maintenance costs over time.

NATIVE PLANT COMMUNITY REFERENCES

The landscape untouched, within this ecoregion, would ultimately revert to a successional forest typology. However, wooded areas may not always be appropriate throughout the PRT system. This presents an opportunity for PRT to create, enhance, and/or restore critical microhabitats throughout its system, supporting a wide array of flora and fauna, while also reducing its maintenance burdens. Many forbs (i.e., flowering herbaceous plants), grasses, sedges, rushes, and shrubs thrive in areas of forest disturbance, which result in canopy gaps such as fallen trees, wildfire, and storm damage. Therefore, maintaining an herbaceous (i.e., meadow) and/or thicket/shrub landscape in strategic areas throughout the system will maintain an elevated level of diverse microhabitats critical to specialized species while also serving PRT's landscape needs.

Using local native ecosystems as a reference, the suggested appropriate native planting strategies for PRT include:

1. Tall grass meadow
2. Woody ground cover
3. Shrub thicket
4. Layered woodland
5. Native turf grass alternatives

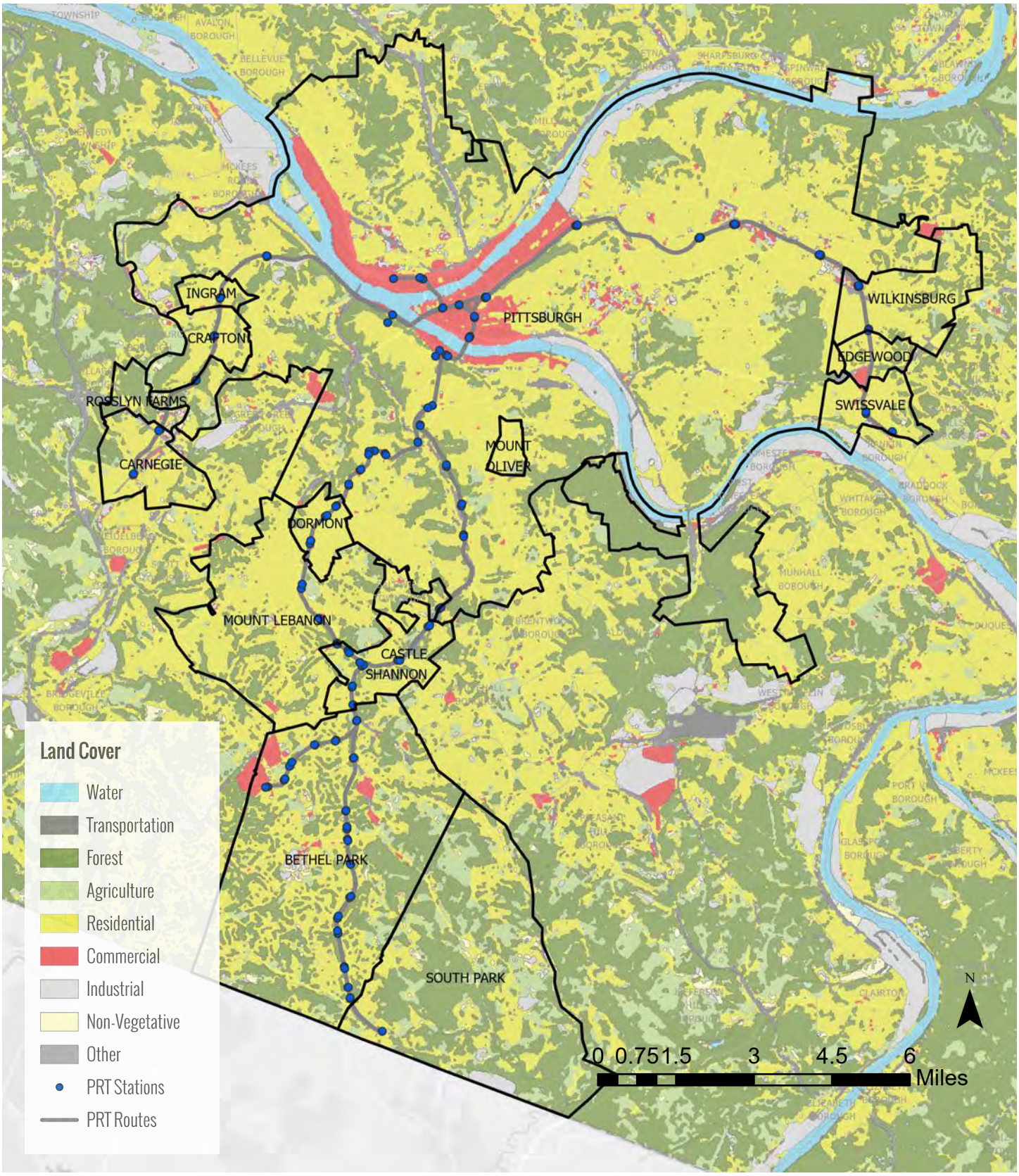
The following subsections identify strategies for implementation of these native landscape typologies throughout the PRT system and provide PRT staff with general guidance on species composition, function, and design/maintenance considerations for each landscape type through the establishment phase to long-term management.

The map featured to the right utilizes Allegheny County land cover data, last updated May 14, 2023, to identify land cover types (e.g., water, grassland, wooded, urban) present throughout the City of Pittsburgh and in relation to the PRT system (i.e., PRT owned parcels and routes).

As depicted, much of the developed space within the City of Pittsburgh consists of residential areas and commercial space. The dominant vegetative community consists of woodlands with small patches of grasslands. Implementation of these guidelines can help to improve regional habitat connectivity.

1. Ricketts et al. 1999
2. Collins et al. 2006

LAND COVER MAP



TALL GRASS MEADOW

A meadow landscape is a structure comprised of grasses and forbs (i.e., wildflowers). Meadows are cost-effective landscaping options that are relatively easy to install, require less frequent mowing, do not require irrigation, and provide ecological uplift. Other benefits include the natural aesthetic and beauty, increased access to nature and community engagement, urban cooling, reduction of stormwater/flood impacts, and climate resilience.

Design Considerations

- Soil characteristics such as texture (e.g., sand/loam/clay), pH (i.e., are soils acidic), and amount of organic matter;
- Assess sun exposure at the site and select species suited for the condition (i.e., full sun to shade);
- Evaluate moisture levels and drainage patterns within the site;
- Maintain site triangles, height of some species can impact site lines (Indian grass can grow to a height of 2.5-8');
- Generate seasonal interest (e.g., bloom period, winter seed pod retention and structure);
- Native grasses have deep growing roots (i.e., root systems extend up to 16' below ground surface), providing improved soil and slope stability.

Maintenance Considerations

- Low maintenance landscape that requires infrequent mowing (every 3 to 5 years; can be cut annually if desired);
- Leaf litter can largely be left in place, with a maximum thickness of 2-4" of leaves (excess may require removal);
- Climate adapted landscape, does not require irrigation;
- Annual inspection of landscape during growing season to identify invasive species for removal;
- Native seeding performed in early spring and/or fall (prior to frost) for best performance;
- Native seed typically applied at a rate of 20 lbs/ac and with a cover crop at a rate of 40 lbs/ac.

Mixed meadow grasses in this meadow including Little Bluestem (foreground) and Big Bluestem (background).

Establishment Phase

Typically ranges from 2-3 years and requires increased levels of maintenance and care for controlling invasive vegetation, implementation of adaptive management strategies, and length of time for species to establish (e.g., grasses spend the first 1-2 years growing their roots). Aim to maintain less than 10% total vegetative cover for invasive species within the landscape to reduce competition with selected species. Cover crops should be cut before they go to seed to further reduce competition. Once native grasses and forbs have established (i.e., have a total vegetative cover greater than 85%), pressure from invasive vegetation will be significantly reduced within the landscape. Meadow landscapes often appear flashy with vibrant dense wildflower blooms in year 1 (yellows) and 2 (yellows, purples, and whites). Once grasses have established, bloom density is expected to significantly decrease unless the landscape is artificial disturbed (i.e., mowing and/or herbicide).

Long-Term

Meadows enter the long-term management phase from 3-5 years after establishment. Once in this phase, management needs for the landscape are significantly reduced, requiring less frequent removal of invasive vegetation, mowing, and/or adaptive management.

1. https://www.naturalheritage.state.pa.us/factsheets/16079.pdf

TYPICAL TALL GRASS MEADOW SPECIES

Plant palette design should include 10 species at minimum, including 3-4 grass species, 5-6 herbaceous perennials, and 1-2 herbaceous biennials.

COMMON NAME	SCIENTIFIC NAME	MATURE HEIGHT	BLOOM PERIOD	FLOWER/ FRUIT COLOR	SALT TOLERANCE	SUNLIGHT/ MOISTURE
Allegheny Pachysandra	*Pachysandra procumbens*	0.5-1'	Apr-May	Pinkish-white		
Beardstongue	*Penstemon digitalis*	2-5'	May-Jul	White		
Big Bluestem	*Andropogon gerardii*	2-6.5'	Jun-Sep	-		
Black-Eyed Susan	*Rudbeckia fulgida*	2-3'	May-Sep	Yellow		
Butterfly Weed	*Asclepias tuberosa*	1-3'	May-Sep	Orange		
Clustered Mountain Mint	*Pycnanthemum muticum*	1-3'	Jul-Aug	White-purple		
Common Milkweed	*Asclepias syriaca*	2-6'	Jun-Aug	Purple		
False Sunflower	*Heliopsis helianthoides*	2-4'	Jun-Aug	Yellow		
Hollow Joe-Pye-Weed	*Eutrochium fistulosum*	6-10'	Jul-Sep	Purple		
Indian Grass	*Sorghastrum nutans*	2.5-8'	Aug-Sep	-		
Late-Flowering Thoroughwort	*Eupatorium serotinum*	3-6'	Aug-Oct	White		
Little Bluestem	*Schizachyrium scoparium*	1-5.5'	Aug-Oct	-		
New England Aster	*Symphyotrichum novae-angliae*	4-6'	Aug-Sep	Purple		
Partridge Pea	*Chamaecrista fasciculata*	1.5-2'	Jul-Aug	Yellow		
Pennsylvania Sedge	*Carex pensylvanica*	0.5-1'	-	-		
Plains Coreopsis	*Coreopsis tinctoria*	2-3'	Jun-Oct	Yellow		
Purple Coneflower	*Echinacea purpurea*	2-4'	Jun-Aug	Purple		
Purpletop Grass	*Tridens flavus*	3-5'	Aug-Oct	Purple		
Rough-Stemmed Goldenrod	*Solidago rugosa*	1-3'	Sep-Oct	Yellow		
Swamp Milkweed	*Asclepias incarnata*	3-5'	Jul-Aug	Purple		
Switch Grass	*Panicum virgatum*	3-6'	Jul-Oct	-		
White Snakeroot	*Ageratina altissima*	2-3'	Jul-Oct	White		
White Wood Aster	*Eurybia divaricata*	1-3'	Jul-Oct	White		
Wild Bergamot	*Monarda fistulosa*	2-5'	Jul-Aug	Purple		
Wild Columbine	*Aquilegia canadensis*	1-3'	Apr-Jun	Red		
Wild Geranium	*Geranium maculatum*	1-2'	Apr-Jul	Lavender-pink		

= Salt Tolerant *= Full Sun* *= Part-Shade* *= Full Shade*

= Dry *= Moist* *= Wet* *= Well Drained* *= Drought Tolerant*

Common Milkweed
(Asclepias syriaca)

New England Aster
(Symphyotrichum novae-angliae)

Little Bluestem
(Schizachyrium scoparium)

Wild Bergamot
(Monarda fistulosa)

Black-Eyed Susan
(Rudbeckia fulgida)

Clustered Mountain Mint
(Pycnanthemum muticum)

Pennsylvania is home to many native and naturalized plant suppliers. Many of these suppliers are incredibly knowledgeable on the establishment of native plants and can be a valuable resource to PRT staff. They can provide guidance on seed mixes, plant availability, recommended growing conditions, and can assist in the creation of customized seed mixes appropriate for PRT's needs.[1]

1. https://www.pa.gov/agencies/dcnr/conservation/wild-plants/landscaping-with-native-plants/buy-native-plants.html

WOODY GROUND COVER

Many native straight species of wooded shrubs can grow to heights of 12-25', which can create landscaping challenges within the urban or constructed landscape where plant massing is not desired, for example, when it is necessary to maintain vehicular and pedestrian sight lines. The use of low-growing woody ground cover presents a landscaping option that not only allows maintaining these important sight lines, but also provides other benefits such as reducing soil erosion, weed suppression, low maintenance, and provides a natural aesthetic. This planting design often relies on the use of short form native species cultivars; however there are native straight species that also have a naturally compact growth habit.

Design Considerations

- Low growing woody ground cover cultivars are a low maintenance strategy appropriate within urban, constructed, or highly altered landscapes;
- Maintain vehicular and pedestrian sight lines. Plant height within vehicular triangles should not exceed 30";
- Many of the species identified in the table on the following page are highly tolerant of a wide array of growing conditions and are well suited to more harsh environments;
- Well suited for garden beds, with defined boundaries. Although not invasive, some species tend to be aggressive colonizers such as Virginia creeper;
- Well suited to tree pits and/or trenches located along roadways, paths, and in parking areas;
- Used to control circulation by restricting desire lines and/or unintended pathways.

Maintenance Considerations

- Low maintenance landscape that requires occasional pruning and/or removal of deadwood (i.e., pruning is generally not required more than once per year and also does not need to be performed every year);
- Leaf litter can largely be left in place, with a maximum thickness of 2-4" of leaves (excess may require removal to prevent smothering);
- Climate adapted landscape, does not require irrigation except during periods of severe drought;
- Annual inspection of landscape during growing season to identify invasive species for removal.

Establishment Phase

Ranges from 3-5 years, depending on species composition, and requires increased levels of maintenance and care for controlling invasive vegetation, pruning of deadwood, repair/replacement of damaged shrubs, and implementation of adaptive management strategies. Optimal spacing for shrub plantings is 6-8' on center using triangular spacing (more dense spacing will result in quicker colonization). For a more naturalized aesthetic plants shrubs in diverse clusters. If including woody vines, in the planting, vine training or pruning may be required to prevent impacting other plants within the landscape. Leave duff (i.e., leaf litter) in place as it is critical to the health of the planting, reduces risk of erosion, and provides vital habitat for fauna. Irrigation of shrubs may be required if severe drought is encountered, especially in the first year of establishment.

Long-Term

After approximately 5 years, woody ground covers enter the long-term maintenance phase and require little intervention beyond performing annual inspections to help keep the plantings free of invasive species, pruning of deadwood, and to document overall health of the plantings. If over colonizing, cutback or periodical removal of some shrubs may be necessary.

Canby's Mountain Lover (Paxistima canbyi) ground cover provides a touch of color to the winter landscape and can help maintain the visual structure outside of the growing season.

TYPICAL WOODY GROUND COVER SPECIES

COMMON NAME	SCIENTIFIC NAME	MATURE HEIGHT	BLOOM PERIOD	FLOWER/ FRUIT COLOR	SALT TOLERANCE	SUNLIGHT/ MOISTURE
Black Chokeberry	*Aronia melanocarpa 'UCONNAM165' LOW SCAPE MOUND*	3-4'	May	White		
Canby's Mountain-lover	*Paxistima canbyi*	0.5-1'	May	Green		
Dwarf Bush-Honeysuckle	*Diervilla 'Copper'*	2-3'	Jun	Yellow		
Fragrant Sumac	*Rhus aromatica 'Gro-Low'*	1.5-2'	Apr-May	Yellowish		
Juniper	*Juniper horizontalis*	0.5-1.5'		Blue		
New Jersey Tea, Redroot	*Ceanothus americanus*					
Sweet Pepperbush	*Clethra alnifolia 'Hummingbird'*	2-4'	Jul-Aug	Creamy White		
Virginia Creeper*	*Parthenocissus quinquefolia*	Ground/ Climbing	Apr-May	Greenish		
Virginia Sweetspire	*Itea virginica 'Sprich' LITTLE HENRY*	2-2.5'	Jun-Jul	White		
Yellowroot	*Xanthorhiza simplicissima*	0.5-2.5'	Apr-May	Dark Purple		

= Salt Tolerant *= Full Sun* *= Part-Shade* *= Full Shade*

= Dry *= Moist* *= Wet* *= Well Drained* *= Drought Tolerant*

**Can be an aggressive colonizer and should be planted with careful consideration (e.g., not appropriate in small garden beds)*

Fig. 3-16

Dwarf Bush-Honeysuckle (Diervilla 'Copper'), is a hardy plant that is easily grown in average, medium moisture, and well drained soils in areas of full sun or part-shade. This plant is highly tolerant of a wide array of growing conditions and spreads with the use of runners or stolens. The plant can be propagated by transplanting suckers. The plant is naturally deer resistant and is viable in areas with high deer traffic. Its low height makes it a beneficial ground cover within the urban/ constructed landscape. It produces a yellow sweet smelling flower in the early summer (i.e., June).

Fig. 3-17

An example of Fragrant Sumac (Rhus aromatica 'Gro-Low') being utilized as a ground cover within a tree pit installed in the urban landscape. This cultivar is often referred to as a workhorse within constructed landscapes due to its hardy nature and wide tolerance for soil conditions. This species is relatively easily grown in average soil conditions and provides many benefits within a designed space such as maintaining of sight lines, weed suppression, and texture.

SHRUB THICKET

A shrub hedge thicket is a relatively quick landscape to establish that offers several design benefits such as reduced maintenance, landscape screening, define circulation, increased aesthetics, and stormwater management through erosion control, evapotranspiration, and infiltration. Additional benefits include increased access to nature, community engagement opportunity, and improved biodiversity.

Design Considerations

- Utilize as landscaping screening to mask undesirable sight lines, utilities, and/or areas where foot traffic is unwanted or unsafe;
- Evaluate soil characteristics, sun exposure, moisture levels, and drainage patterns;
- Consider establishment period of different species such as the fast-growing serviceberry, chokeberry, and/or sumac;
- Recommend 8’ on center for shrubs when planting;
- Provides high level of soil and slope stability and is well suited for this purpose;
- Mind height restrictions within the design site, some species can reach heights of 30’;
- Without appropriate deer protection/mitigation measures, shrubs can be susceptible to herbivory.

Maintenance Considerations

- Once established, is a low maintenance landscape requiring little intervention;
- Leaf litter (no more than 2-4" thick) and deadwood (e.g., small snags and branches) can be left in place;
- Climate adapted landscape, does not require irrigation except for periods of severe drought;
- Annual inspection of landscape during growing season to identify invasive species for removal;
- Planting performed in early spring and/or fall (prior to frost) for best performance.

The Mixed Hardwood Floodplain Thicket occurs in all major river basins of Pennsylvania.

Establishment Phase

Ranges from 3 to 5 years depending on the species composition and requires routine maintenance to manage invasive species, prune deadwood, repair/replace damaged shrubs, and implement adaptive management strategies. Optimal spacing for shrub plantings is 8’ on center using triangular spacing. Shrub species should be planted in diverse clusters, limiting groupings of the same species, for improved establishment. Install temporary deer fencing or individual cages around planted specimens until resistant to deer herbivory. Leave duff (i.e., leaf litter) in place as it is critical to the health of the stand, reduces risk of erosion, and provides vital habitat for fauna.

Long-Term

Shrub or hedge thickets enter the long-term management phase after a period of 5 years, requiring little intervention. Perform annual inspections to help keep the thicket free of invasive species, that deadwood and/or snags are not endangering the public or PRT resources, and document overall health of the thicket. Recommend deadwood and/or snags be left in place if not identified as a risk given they are vital habitat for many native species.

TYPICAL SHRUB THICKET SPECIES

COMMON NAME	SCIENTIFIC NAME	MATURE HEIGHT	BLOOM PERIOD	FLOWER/ FRUIT COLOR	SALT TOLERANCE	SUNLIGHT/ MOISTURE
Allegheny Foamflower	*Tiarella cordifolia*	< 1'	Apr-Jul	White		
Allegheny Pachysandra	*Pachysandra procumbens*	0.5-1'	Apr-May	Pinkish-white		
Black Chokeberry	*Aronia melanocarpa*	3-6'	Apr-May	Blue/black berry	✓	
Blackhaw	*Viburnum prunifolium*	8-15’	Apr-May	Blue/black berry		
Flowering Dogwood	*Cornus florida*	15-30'	Apr-May	White		
Golden Ragwort	*Packera aurea*	1-2’	Apr-May	Yellow		
Mountain Laurel	*Kalmia latifolia*	12-20’	May-Jul	White/pink		
Northern Spicebush	*Lindera benzoin*	6-12'	Mar-Apr	Yellow & red berry		
Pennsylvania Sedge	*Carex pensylvanica*	0.5-1'	-	-		
Red Chokeberry	*Photinia pyrifolia*	5-10’	Mar-May	Red berries	✓	
Serviceberry	*Amelanchier canadensis*	10-25'	Apr-May	White		
Southern Arrow-Wood	*Vibrunum dentatum*	6-12’	May-Jun	Red berries	✓	
Staghorn Sumac	*Rhus typhina*	15-25'	May-Jul	Green-Yellow	✓	
White Snakeroot	*Ageratina altissima*	2-3'	Jul-Oct	White		
White Wood Aster	*Eurybia divaricata*	1-3'	Jul-Oct	White		
Wild Columbine	*Aquilegia canadensis*	1-3'	Apr-Jun	Red		
Wild Geranium	*Geranium maculatum*	1-2'	Apr-Jul	Lavender-pink		
Witch-Hazel	*Hamamelis virginiana*	8-20’	Sep-Nov	Gold		

= Salt Tolerant *= Full Sun* *= Part-Shade* *= Full Shade*

= Dry *= Moist* *= Wet* *= Well Drained* *= Drought Tolerant*


Fig. 3-19

Serviceberry (Amelanchier canadensis)


Fig. 3-20

Black Chokeberry (Aronia melanocarpa)


Fig. 3-21

Flowering Dogwood (Cornus florida)


Fig. 3-22

Northern Spicebush (Lindera benzoin)


Fig. 3-23

Red Chokeberry (Photinia pyrifolia)


Fig. 3-24

Witch Hazel (Hamamelis virginiana)


Fig. 3-25

Southern Arrowwood (Vibrunum dentatum)


Fig. 3-26

Pennsylvania Sedge (Carex pensylvanica)


Fig. 3-27

White Wood Aster (Eurybia divaricata)


Fig. 3-28

Allegheny Pachysandra (Pachysandra procumbens)

LAYERED WOODLAND

References local forest ecosystems and microhabitats to create stratified woodland environments consisting of herbaceous groundcover, shrub/sapling, and canopy strata. This planting approach requires increased upfront investment, but it is often more cost-effective over time compared to other strategies, and reduces long-term maintenance or irrigation. Other benefits include ecological uplift, natural aesthetics, increased access to nature and community engagement, urban cooling, reduction of stormwater/flood impacts, and climate resilience.

Design Considerations

- Layered Woodland plantings should include a diverse selection of recommended species, comprised of a minimum of 2 species within the canopy layer, 2 species within the shrub layer, and 3 species in the ground cover;
- Long-term strategy that can be phased (e.g., tall grass meadow > shrubland > woodland);
- Evaluate soil characteristics, sun exposure, moisture levels, and drainage patterns;
- Consider establishment period of different species such as the fast-growing tulip poplar vs the slow growing oak tree (i.e., early vs late successional species);
- Recommend 10’ on center for trees and 8’ on center for shrubs when planting;
- Provides the highest level of soil and slope stability and is well suited for this purpose;
- Mind height restrictions within the design site, some species can reach heights of 90’; and
- Without appropriate deer protection/mitigation measures understory plants can be susceptible to over browsing.

Maintenance Considerations

- Once established, is a low maintenance landscape requiring little intervention;
- Leaf litter (no more than 2-4" thick) and deadwood (e.g., small snags and branches) can be left in place;
- Climate adapted landscape, does not require irrigation except for periods of severe drought;
- Annual inspection of landscape during growing season to identify invasive species for removal; and
- Planting performed in early spring and/or fall (prior to frost) for best performance.

Establishment Phase

Ranges from 5-10 years depending on species composition and requires routine maintenance to manage invasive species, prune deadwood, repair/replace damaged tree shelters, and implement adaptive management strategies. Remove excess herbaceous material from the base of shelters annually as this can negatively impact planted trees. Remove shelters after a period of 2-4 years or once the sapling has matured (e.g., the specimen reaches 3-5” above the top of the shelter, can stand without the shelter, and can withstand deer rubbing and/or rodent damage). The use of shelters can be reduced if utilizing larger container sizes, but this will increase the costs for planting materials for the project. As the stand matures, transition the herbaceous stratum to a shade tolerant plant mix using plugs. For quicker establishment of herbaceous material plan for 12-18” spacing using triangular spacing and/or a staggered grid pattern. Leave duff (i.e., leaf litter) in place as it is critical to the health of the stand, reduces risk of erosion, naturally suppresses weeds, and provides vital habitat for fauna.

Long-Term

Woodlands enter the long-term management phase after a period of 10-15 years, requiring little intervention. Perform annual inspections to confirm that the understory contains less than 20% invasive species, that deadwood and/or snags are not endangering the public or PRT resources, and document overall health of the stand. Recommend deadwood and/or snags be left in place if not identified as a risk given they are vital habitat for many native species.

TYPICAL LAYERED WOODLAND SPECIES [1]

COMMON NAME	SCIENTIFIC NAME	MATURE HEIGHT	BLOOM PERIOD	FLOWER/ FRUIT COLOR	SALT TOLERANCE	SUNLIGHT/ MOISTURE
TREES						
American Hornbeam	*Carpinus caroliniana*	20-35'	Apr-May	White		
Bitternut Hickory	*Carya cordiformis*	50-80'	Apr-May	Green		
Black Oak	*Quercus velutina*	50-60'	Apr-May	Yellow-green		
Box Elder	*Acer negundo*	30-50'	Mar-Apr	Green-yellow		
Burr Oak	*Quercus macrocarpa*	70-80'	Apr-May	Yellow-green		
Chestnut Oak	*Quercus prinus*	60-70'	Apr-May	Yellow-green		
Green Ash	*Fraxinus pennsylvanica*	50-60'	Apr-May	Green		
Mockernut Hickory	*Carya tomentosa*	60-80'	Apr-May	Yellow-green		
Red Maple	*Acer rubrum*	40-70'	Mar-Apr	Red		
Red Oak	*Quercus rubra*	60-75'	Apr-May	Yellow-green		
Red Pine	*Pinus resionsa*	50-80'	May-Jun	Yellow		
Shagbark Hickory	*Carya ovata*	70-90'	Apr-May	Green-yellow		
Silver Maple	*Acer saccharinum*	50-80'	Mar-Apr	Green-yellow		
Sugar Maple	*Acer saccharum*	40-80'	Apr	Green-yellow		
Sweet Birch	*Betula lenta*	40-75'	Apr-May	Green-yellow		
Tulip Poplar	*Liriodendron tulipifera*	70-90'	May-Jun	Yellow-green		
White Oak	*Quercus alba*	50-80'	Apr-May	Yellow-green		
White Pine	*Pinus strobus*	50-80'	May-Jun	Yellow		
Yelow Birch	*Betula allegheniensis*	60-75'	Apr-May	Purple-yellow		
SHRUBS						
Black Chokeberry	*Aronia melanocarpa*	3-6'	Apr-May	Blue/black berry		
Blackhaw	*Viburnum prunifolium*	8-15’	Apr-May	Blue/black berry		
Mountain Laurel	*Kalmia latifolia*	12-20’	May-Jul	White/pink		
Northern Spicebush	*Lindera benzoin*	6-12'	Mar-Apr	Yellow & red berry		
Red Chokeberry	*Photinia pyrifolia*	5-10’	Mar-May	Red berries		
Serviceberry	*Amelanchier canadensis*	10-25'	Apr-May	White		
Southern Arrow-Wood	*Vibrunum dentatum*	6-12’	May-Jun	Red berries		
Witch-Hazel	*Hamamelis virginiana*	8-20’	Sep-Nov	Gold		
GROUNDCOVER						
Allegheny Foamflower	*Tiarella cordifolia*	< 1'	Apr-Jul	White		
Allegheny Pachysandra	*Pachysandra procumbens*	0.5-1'	Apr-May	Pinkish-white		
Pennsylvania Sedge	*Carex pensylvanica*	0.5-1'	-	-		
White Snakeroot	*Ageratina altissima*	2-3'	Jul-Oct	White		
White Wood Aster	*Eurybia divaricata*	1-3'	Jul-Oct	White		
Wild Columbine	*Aquilegia canadensis*	1-3'	Apr-Jun	Red		
Wild Geranium	*Geranium maculatum*	1-2'	Apr-Jul	Lavender-pink		

= Salt Tolerant *= Full Sun* *= Part-Shade* *= Full Shade*

= Dry *= Moist* *= Wet* *= Well Drained* *= Drought Tolerant*

TURF GRASS

Turf grass is widely used as a landscape cover type within PRT properties. The benefits of turf grass include low installation costs, a relatively short establishment period, and the stabilization of site soils compared to an unvegetated condition. However, these benefits must be weighed against the more frequent maintenance requirements, limited aesthetic value, and reduced environmental benefits. Wherever possible, designers should consider alternatives to turf grass cover that may reduce maintenance requirements and provide additional benefits.

Design Considerations

- Avoid planning for turf grass along steep slopes or extremely constrained areas that will be challenging to mow;
- Minimize turf grass in areas where informal pedestrian traffic (people taking shortcuts across the grass) may cause “desire lines” to be formed;
- Consider the best species mix for site specific conditions, note that most turf grass species prefer full sun. PennDOT Formula B is a recommended general purpose seed mix;
- Eco-lawns should be prioritized where feasible. Eco lawns are comprised of species, such as “no mow” sedges and clovers, that reduce maintenance efforts and enhance biodiversity;
- Consider adjacent uses around turf grass areas to cleary define extents of maintenance activities and avoid potential conflict, for example, string trimnmning can damage adjacent site furnishings as well as other plants like trees and shrubs; and
- Ensure turf grass areas are well graded to prevent isolated ponding conditions during wet weather.

Large turf grass lawn at the entrance to Washington Junction Station.

Maintenance Considerations

- Turf grass areas are to be mowed to a height of 3 - 4” at least every 4 weeks during the growing season (May - October);
- Re-seed as needed during the appropriate season (March 1 - June 1 and August 1 - October 15. If utilizing a pre-emergent herbicide in the spring to suppress common lawn weeds, seeding must be performed at the end of the season (i.e., fall);
- Dethatch turf grass periodically (~3 years) to encourage a more dense and healthier lawn area;
- Aerate turf grass plantings in highly compacted areas as needed.

Establishment Phase

Turf grass establishment occurs primarily within the first growing season. Newly seeded turf grass areas should be protected from wind and erosion with a layer of straw mulch. Straw mulch is typically applied at a rate of 3 tons/acre for turf grass seed and secured with a tackifer. The straw mulch should be maintained until successful germination is achieved. Any bare areas where grass is not growing after germination should be immediately reseeded and mulched. Watering newly seeded areas during dry periods is critical to successful turf establishment.

Long-Term

Long-term management of turf grass is, at minimum, comprised of regular mowing during the growing season. Designing for eco-lawn species mixes can reduce the required mowing effort and include species that will more easily spread and fill in following disturbances. Existing traditional turf grass plantings can be transitioned over the long-term maintenance period to include eco-lawn species that will provide added benefits to those areas.

TYPICAL ECO-LAWN SPECIES

COMMON NAME	SCIENTIFIC NAME	SUNLIGHT/MOISTURE
SEDGES		
Appalachian Sedge	*Carex appalachia*	
Common Wood Sedge	*Carex blanda*	
Pennsylvania Sedge	*Carex pensylvanica*	
Texas Sedge	*Carex texensis*	
Wood Sedge	*Carex woodii*	
FINE FESCUES		
Chewings Fescue	*Festuca rubra ssp. commutata*	
Creeping Red Fescue	*Festuca rubra*	
Hard Fescue	*Festuca trachyphylla*	
Sheep Fescue	*Festuca ovina*	
CLOVERS		
Crimson clover	*Trifolium incarnatum*	
Microclover	*Trifolium repens var. Pipolina*	
White clover	*Trifolium repens*	

= Salt Tolerant *= Full Sun* *= Part-Shade* *= Full Shade*

= Dry *= Moist* *= Wet* *= Well Drained* *= Drought Tolerant*

PENNDOT FORMULA B MIX

SPECIES	% BY WEIGHT	MINIMUM % PURITY	MINIMUM % GERMINATION	MAXIMUM % WEED SEED	SEEDING RATE LB./1,000 YD2
Perennial Rygrass Mixture *(Lolium perenne).* A combination of improved certified varieties with no one variety exceeding 50% of the total ryegrass component.	20	97	90	0.10	8.5
Creeping Red Fescue or Chewings Fescue *(Festuca rubra or ssp commutate)* (Improved and certified)	30	97	85	0.10	12.5
Kentucky Bluegrass Mixture *(Poa pratensis).* A combination of improved certified varieties with no one variety exeeding 50% of the total bluegrass componant.	45	97	80	0.15	21.0
Annual Ryegrass *(Lolium multiflorum)*	5	95	90	0.10	2.0

KEY COMPLIANCE STANDARDS

Pittsburgh Specific Standards/Guidelines

CITY OF PITTSBURGH LANDSCAPING AND SCREENING STANDARDS; CHAPTER 918 OF THE ZONING CODE

Encourages the planting of appropriate new vegetation and the preservation of existing vegetation and reduces potential nuisances by requiring a visual screen between different uses. Applies to all developments that are subject to Site Plan Review provisions.

URBAN FORESTRY STANDARDS

Guidelines for the planting, maintenance, and protection of trees within urban areas.

- ANSI A-300 Tree Maintenance Standards
- Pittsburgh Shade Tree Commission declaration of tree protection measures and standards[1]

Pennsylvania Standards/Guidelines

VEGETATION AND LANDSCAPING

PADEP encourages the use of native vegetation in landscaping to promote biodiversity and reduce maintenance needs. This includes guidelines for re-vegetating disturbed areas and using plants that are well-suited to local conditions.

Organization Standards/Guidelines

ISI Envision Standards

NATURAL WORLD

This category focuses on protecting and restoring ecosystems and biodiversity. Credits might include siting projects to minimize environmental impact, conserving natural habitats, and enhancing ecological functions.

CLIMATE AND RESILIENCE

This category addresses climate impacts and ensures resilience to future challenges. Credits might focus on reducing greenhouse gas emissions, improving resilience to climate change, and preparing for natural disasters.

1. http://pittsburgh-pa.elaws.us/code/coor_titlefour_artxiii_ch487_sec487.02

INVASIVE SPECIES MANAGEMENT

Benefits

Invasive species management is a critical ongoing effort to help maintain the integrity of planted landscapes. An Integrated Species Management (ISM) approach combines several control and treatment strategies in order to achieve an appropriate level of management in response to site specific conditions and the long terms goals for each management area.

Applicability

Invasive species management will apply in different ways across the PRT system. Public facing landscapes are subject to more intensive maintenance strategies than interstitial landscapes that are less visible to riders and employees, and therefore better suited to incorporating invasive species management with routine maintenance efforts to achieve both short and long-term goals. Less public facing areas should be evaluated to determine the highest needs for responsible stewardship of the natural resources within the PRT system and may be managed to achieve long term goals.

The primary management strategies for use on PRT property include:

- Prevention
- Mechanical control
- Chemical control

PREVENTION

Prevention of invasive vegetation is one of the most critical steps in establishment of a native landscapes and also has the benefit of being much easier and more cost effective that reactive management. Prevention can be achieved through implementation of the following best management practices:

- Site Preparation - Remove existing vegetation (e.g., lawn) through smothering or herbicide application to eliminate existing vegetation and reduce weed seed bank. Minimize tilling and/or soil disturbance;
- Specify that native seed mixes are free of weed seed and that seed is purchased from reputable suppliers;
- Avoid importing topsoil if feasible, but if required, specify that imported fill material is free of weed seed. Note, many native species are not only tolerant, but can thrive in subsoil (i.e., nutrient-poor), which can also suppress weeds;
- When mulching after seed application, specify that mulch is free of weed seed. Example, specify that straw be used and not hay, which contains weed seed;
- Seed application in the fall is preferable and mix with a cover crop to out compete weeds.

MECHANICAL

Mechanical control includes the physical removal of invasive vegetation from the landscape through pulling, cutting, or mowing. The benefit of this method is it avoids the use of chemicals such as herbicides and is highly effective. However, mechanical control is labor intensive, expensive, and is only viable in small or accessible areas.

Mugwort plant growing in a wild field.

HERBICIDES

Chemical control of invasive vegetation is another tool in the toolbox and is often necessary for successful management of native landscapes. However, it needs to be used thoughtfully and selectively to minimize impacts to non-target vegetation, soil, and water.

The two most common herbicides utilized for management of invasive vegetation are Glyphosate (e.g., Roundup Pro and Rodeo) and Triclopyr (e.g., Garlon 3A and Garlon 4). Glyphosate is a non-selective, systemic, foliar herbicide used to control a broad spectrum of vegetation. Triclopyr is an herbicide designed to control woody and broadleaf plants and can be applied without significant damage to grasses.

Application methods include foliar spray, spot treatment, or cut-stump/basal bark treatment. Typical spray practices consist of backpack or boom sprayers. Boom sprayers can be effective in treatment of large areas of invasive vegetation (i.e., during site prep), but use should be limited as there is a high risk of over-spray. Spot treatments with backpack sprayers are the most effective treatment option in that it protects non-target species and limits environmental exposure. Cut-stump or basal bark treatment consists of herbicide application directly to cut woody stems or to the base of trees, which is also effective at treating only undesired plants and avoiding impact to non-target species.

TIMING IS EVERYTHING

- Apply herbicide when target plants are growing and before seeds set, generally mid-to-late summer/early fall;
- Avoid spraying just before rain or in windy conditions (i.e., prevent over-spray);
- One treatment may not be enough, check treated plants approximately two (2) weeks after treatment and if still green, perform a followup treatment;
- Understand the treatment site (e.g., soil type, slope, proximity to water, and surrounding vegetation.

HERBICIDE APPLICATOR LICENSE

All businesses both non-profit and for-profit and government agencies are required to have a commercial or public applicators license if applying herbicide.[1]

- Have at least one (1) certified applicator;
- Meet financial responsibility and insurance requirements;
- Maintain annual application ($35/year as of 2025).

If PRT does not maintain an herbicide applicators business license, one alternative is to contract a reputable firm who specializes in invasive species management, establishment of native landscapes, and maintains an herbicide applicators business license.

1. https://www.pa.gov/agencies/pda/plants-land-water/plant-industry/pesticide-programs.html

COMMON INVASIVE SPECIES


Fig. 3-31

Common mugwort
(Artemisia vulgaris)


Fig. 3-32

Japanese knotweed
(Polygonum cuspidatum)


Fig. 3-33

Oriental bittersweet
(Celastrus orbiculatus)


Fig. 3-34

Crown vetch
(Coronilla varia L.)


Fig. 3-35

Japanese barberry
(Berberis thunbergii)

PARTNERSHIPS

Engage with local community stakeholders. Many community groups, non-profits, or extension services have vested interest in reduction of lawn space and establishment of native landscapes and can be a valuable resource through guidance, volunteer work, and/or assistance in maintaining of these spaces. Additionally, forming partnerships is a way of increasing connectivity and engagement with the PRT system.

The Pennsylvania Department of Agriculture and **Penn State Extension** offer several resources to guide the management of non-weed biological pests such as spotted lanternflies, beech leaf disease, western conifer seed bug, and spongy moth and eastern tent caterpillars.


Fig. 3-36

Public facing landscapes are subject to more intensive maintenance strategies than interstitial landscapes that are less visible to riders and employees.

KEY COMPLIANCE STANDARDS

Pittsburgh Specific Standards/Guidelines

URBAN FORESTRY STANDARDS

Guidelines for the planting, maintenance, and protection of trees within urban areas.

- ANSI A-300 Tree Maintenance Standards
- Pittsburgh Shade Tree Commission declaration of tree protection measures and standards[1]

TREE PITTSBURGH "ZERO NET LOSS" POLICY

Principle adopted by the City of Pittsburgh to maintain and grow its urban tree canopy by ensuring no net loss of trees occurs due to development or infrastructure projects. While Tree Pittsburgh itself is a nonprofit advocacy and education organization, the policy is embedded in city government practices and is supported by planning and permitting requirements.

- The goal is to replace every public tree removed with a new tree, at a 1:1 ratio at minimum—and often more if the removed tree was mature or had high ecological value.
- Replacement trees must be appropriate for the site, non-invasive, and approved species listed in the city's Street Tree List or relevant urban forestry standards.
- Projects must submit a tree replacement plan as part of their permit process if public trees are impacted.
- Public Tree Removal Permits are required for any work that may remove or damage trees within the public right-of-way.
- For projects unable to plant trees on-site, off-site planting or in-lieu fees may be required to maintain canopy goals.

Pennsylvania Standards/Guidelines

PENNSYLVANIA PESTICIDE CONTROL ACT OF 1973

This law governs the use of herbicides in Pennsylvania. In addition to defining the specific requirements for herbicide procurement, application and disposal, the law promotes the use of Integrated Pest Management (IPM) techniques, including cultural practices and biological controls.

VEGETATION AND LANDSCAPING

PADEP encourages the use of native vegetation in landscaping to promote biodiversity and reduce maintenance needs. This includes guidelines for re-vegetating disturbed areas and using plants that are well-suited to local conditions.

1. http://pittsburgh-pa.elaws.us/code/coor_titlefour_artxiii_ch487_sec487.02

FOREST REHABILITATION

Benefits

Forest Rehabilitation isn't just about trees, it's about transit resilience. Opportunities to restore and enhance woodlands reduces stormwater runoff, protects native biodiversity, improves air quality and nutrient cycling, reduces atmospheric carbon, and contributes to the urban tree canopy. When applied to naturalized areas that are currently maintained as periphery landscapes (i.e. mowed lawn or edge conditions), forest rehabilitation can also significantly reduce long term maintenance needs. Restoring lost or existing degraded woodlands is a smart investment in safer, more efficient, and more sustainable public infrastructure.

Applicability

Priorities for forest rehabilitation should center on the selection of problem areas that have the potential to increase future maintenance needs, such as increased stormwater runoff, sediment and soil erosion, and tree fall risks. Rewilding is most relevant at locations where lawn area can be reduced by reforesting edges adjacent to existing woodlands.

WOODLAND RESTORATION

Woodland restoration within PRT's system could involve replacing invasive, unstable vegetation on steep slopes with deep-rooted native trees, shrubs, and groundcovers that stabilize soil, reduce erosion, and prevent treefalls onto transit infrastructure. This process may include selective removal of hazardous trees, controlling aggressive non-native species, and replanting with low-maintenance, site-adapted natives that support biodiversity. Restoration would enhance slope stability, reduce maintenance costs, and manage stormwater more effectively, all while improving the appearance and ecological function of wooded areas along transit corridors. Ultimately, it would protect infrastructure, improve safety, and align PRT with broader regional sustainability and resilience goals.

Refer to strategies covered within the following sections: Native Biodiversity; Invasive Species Management; and/or Slope Stabilization and Riparian Restoration.

Restoring native woodlands with deep-rooted trees and shrubs strengthens slopes, protects transit infrastructure, and boosts regional biodiversity.

A cutting site in a pine forest prepared for new plantings to create safer, low-maintenance landscapes that support biodiversity, manage stormwater, and showcase environmental leadership

REWILDING

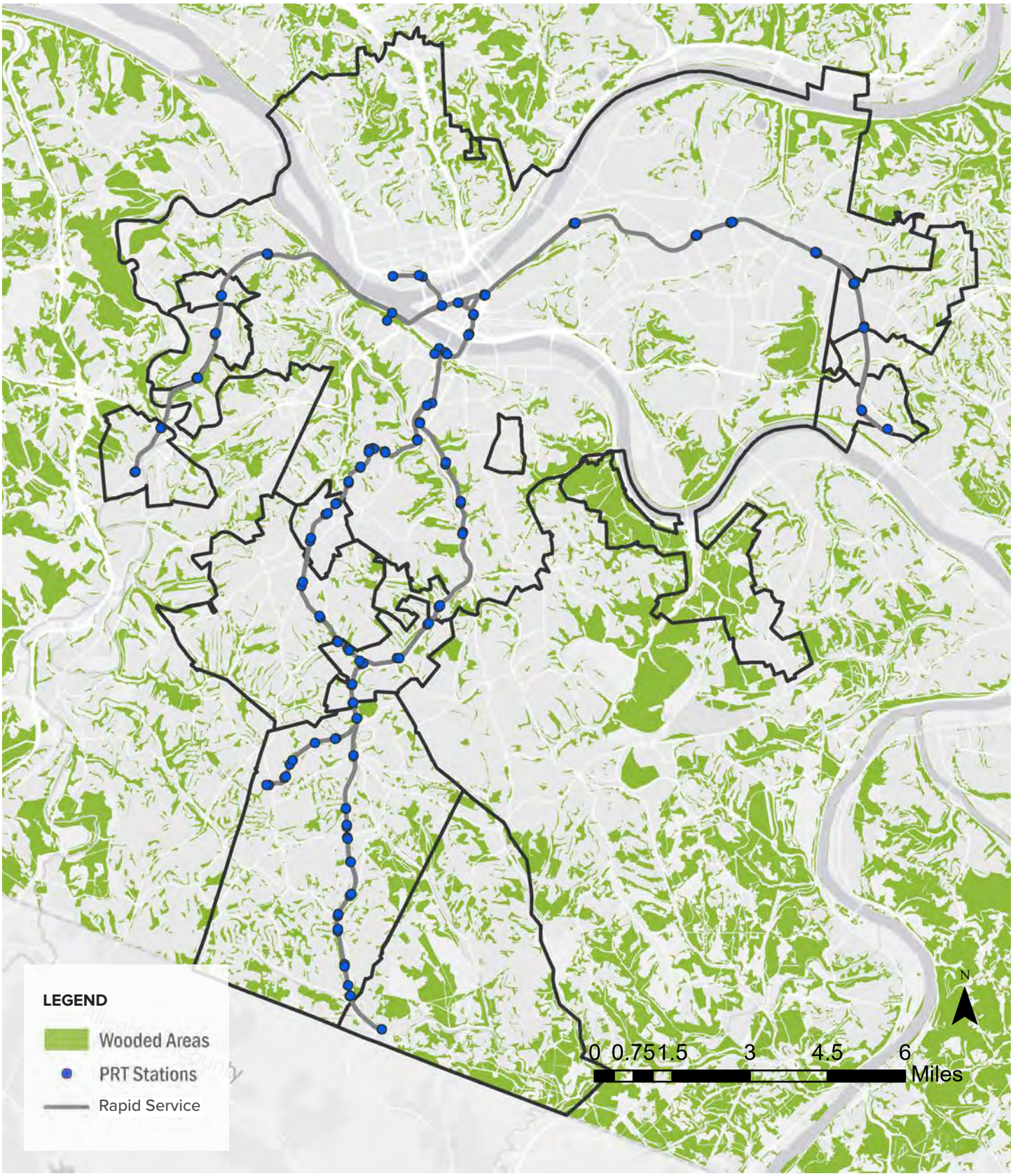
Rewilding existing landscapes benefits PRT by reducing maintenance costs, lessens risks of falling trees, improves stormwater management and climate resiliency, and enhances public perception through environmental leadership.

- A well-designed native plant community is self-sustaining over time and outcompetes invasives, reducing long-term maintenance costs. Passive rewilding or managed succession can reduce labor needs.
- Transitioning to shorter native trees or shrubby woodland (e.g., serviceberry, viburnum, Gro-Low) in critical zones limits the height and weight of vegetation near transit lines, reducing the risk of treefalls.
- Healthy, biodiverse woodland soils improve infiltration and act like a sponge, reducing stormwater surges and helping reduce stormwater impacts on the system.
- Visibly managed wild spaces using native plants create a more appealing, natural environment for riders. It also positions PRT as a leader in sustainability and ecological stewardship, aligning with regional climate goals.

Public GIS Datasets such as the **Urban Tree Canopy Cover layers** (featured on the following page) provide insights into the PRT system and can help PRT strategically **manage its lands and identify priority areas for wooland rehabilitation and/or rewilding**.

- **Identifying degraded or vulnerable areas** - Areas with low tree canopy and high impervious surface near slopes, tracks, or stations can be flagged as vulnerable to stormwater runoff, erosion, and heat island effects.
- **Prioratize Invasive-Dominated Sites** - Where canopy exists but is patchy or dominated by early-successional or invasive vegetation, restoration may focus on understory replanting or invasive removal.
- **Data Analysis to Assess Slope Stability Risks** - By combining canopy cover with elevation and slope data, PRT can identify steep, sparsely vegetated slopes at risk of landslides or treefall. These areas may benefit from native woody plantings to anchor soil and prevent infrastructure damage.
- **Opportunities for Passive Rewilding** - Vacant lots, unpaved rights-of-way, or low-traffic zones with existing herbaceous green space but no canopy could be passively rewilded by allowing natural succession or through minimal intervention.

URBAN TREE CANOPY COVER



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1. http://pittsburgh-pa.elaws.us/code/coor_titlefour_artxiii_ch487_sec487.02

Pennsylvania Standards/Guidelines

VEGETATION AND LANDSCAPING

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Federal Standards/Guidelines

NEPA

National Environmental Policy Act (NEPA) compliance is required when a project involves federal funding, permits, or approvals

- Federal permits or approvals: If the project impacts wetlands, navigable waters, endangered species habitat, or cultural resources, triggering involvement from agencies like the U.S. Army Corps of Engineers or the U.S. Fish and Wildlife Service.

Organization Standards/Guidelines

ISI Envision Standards

NATURAL WORLD

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CLIMATE AND RESILIENCE

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SLOPE STABILIZATION + RIPARIAN RESTORATION

Benefits

Slope stabilization is essential for protecting both nearby communities and critical transit infrastructure. Beyond mitigating landslide hazards, stabilization strategies also play a key role in reinforcing stream channels, embankments, and riparian zones. These strategies reduce erosion, enhance stormwater management, and contribute to improved water quality, creating both ecological and infrastructure resilience.

Applicability

Approximately 25-30% of land area near PRT routes features a slope greater than 25%, placing these areas at elevated risk for erosion, landslides and problematic runoff. Strategies for stabilizing steep and eroding slopes should be determined by the potential for layering benefits and meeting additional long term goals when possible, including reduced maintenance requirements, enhancing native biodiversity, and improving rider experience.

SLOPE MAINTENANCE CHALLENGES

Mowing native landscapes, such as meadows, is an important maintenance practice to suppress woody encroachment, recycle nutrients, and promote desirable herbaceous species. However, when these landscapes occur on steep slopes, mowing to the required height of 6–12” becomes logistically and ecologically complex. Challenges include equipment limitations, soil erosion risks, operator safety, and the potential for habitat disturbance. The table to the right summarizes these challenges and identifies practical strategies to mitigate them, helping to ensure both ecological integrity and maintenance safety.

ENGINEERED SOLUTIONS

A variety of engineering and bioengineering controls are available to stabilize steep slopes and reduce erosion. These methods range from natural solutions like living stems and coir logs that encourage vegetation growth and soil binding, to structural approaches like gabion walls and rip rap that provide immediate and long-lasting reinforcement. Intermediate techniques such as fiber-reinforced soils blend natural and engineered materials to improve slope strength without the visual or ecological impact of hard infrastructure. Selecting the appropriate strategy depends on site conditions, budget, long-term goals, and the desired balance between ecological value and structural stability.

Fig. 3-39

Fascines provide both structural and biological slope stabilization and can provide quicker vegetation establishment as the fascines contain living plants.

CHALLENGE	DESCRIPTION	MITIGATION STRATEGIES
Difficulty Maintaining Mowing Height	Maintaining a consistent 6–12" cut is hard with standard rotary mowers, especially on uneven ground.	Use adjustable-height flail or sickle-bar mowers; perform test passes to calibrate cutting height.
Equipment Limitations on Steep Slopes	Conventional mowers are unsafe or ineffective on slopes due to rollover risks and traction loss.	Use slope-rated equipment (e.g., remote-controlled, walk-behind, or track-mounted mowers).
Habitat Disruption	Mowing may disturb overwintering insects or nesting birds, reducing biodiversity.	Time mowing after bird fledging and before insect emergence; rotate mowing zones each year; leave some uncut refuge patches to support habitat continuity.
Limited Seasonal Access	Slopes may be inaccessible during key mowing windows due two wet or frozen soil conditions.	Schedule mowing during late-winter freezes or dry early spring windows; choose low-impact equipment suitable for marginal conditions.
Obstruction and Visibility Issues	Tall vegetation can hide hazards such as rocks or holes, posing risks to equipment and operators.	Conduct pre-mow hazard inspections; flag obstacles; use high-clearance or manual trimming tools for tricky areas.
Operator Safety Risks	Increased risk of injury from equipment rollover or slips when operating on slopes.	Train staff in steep-slope operation; use PPE and ROPS-equipped machinery; restrict mowing to safe weather conditions.
Soil Disturbance and Erosion Risk	Mowing equipment can compact or disturb soil, leading to erosion on steep slopes.	Mow in dry conditions; use low-ground-pressure equipment; mow along contours; stabilize slopes with deep-rooted native grasses.

Living Stems

Fascines are bundles of dormant woody cuttings installed along contour lines on slopes to control erosion and promote vegetation establishment. The cuttings root into the soil, forming a living barrier that reinforces the slope, reduces runoff velocity, and traps sediment. Ideal for moderate slopes and cost-effective stabilization in areas where heavy equipment access is limited.

- Dormant cuttings from native species with strong rooting capacity, that are 1.5-2” in diameter and 3-6’ in length;
- Install fascines along contours of slope, spaced 3–5’ vertically, depending on slope steepness. Trenches should be 4–6” deep and wide enough to hold the bundle. Place bundles in trenches and secure with wooden stakes every 2–3';
- Effective on slopes up to 2:1 (50%); ideal on low- to moderate-energy slopes. Combine with erosion control blankets or coir logs for added stability if needed;
- Monitor through first growing season for moisture and rooting; replant failed sections as needed.

Gabion Walls

Gabion walls are structures composed of rock-filled wire mesh baskets, stacked and tied together to form retaining walls or toe-of-slope reinforcements. They are especially effective in areas with active erosion, high runoff, or the need for immediate structural stabilization. Gabions provide excellent drainage, long lifespan, and strength, but have limited aesthetic and ecological benefits.

- Galvanized or PVC-coated steel mesh baskets, typically 3–6’ in length and filled with angular, well-graded stone (6–12” size); must be durable and frost-resistant;
- Ideal for toe-of-slop stabilization, streambanks, or cut/fill slopes and in areas readily accessible by heavy equipment;
- Inspect annually for corrosion or displacement, remove vegetation/debris that could damage the mesh, replace mesh is signs of structural failure.

TYPICAL SLOPE STABILIZATION + RIPARIAN SPECIES

Riparian sites are highly specialized and the designer should carefully consider conditions such as erosion potential, moisture levels, slope, etc.

COMMON NAME	SCIENTIFIC NAME	SLOPE STABILIZATION POTENTIAL	BLOWDOWN POTENTIAL	SALT TOLERANCE	SUNLIGHT/ MOISTURE
TREES					
American Hornbeam	*Carpinus caroliniana*	Excellent; dense roots, small stature	Very Low		
Bitternut Hickory	*Carya cordiformis*	Good; deep roots	Low		
Black Oak	*Quercus velutina*	Excellent; deep-rooted, stabilize slopes	Low		
Burr Oak	*Quercus macrocarpa*	Excellent; deep-rooted, stabilize slopes	Low		
Chestnut Oak	*Quercus prinus*	Excellent; deep-rooted, stabilize slopes	Low		
Gray Dogwood	*Cornus racemosa*	Excellent; suckering growth creates dense thickets	Low		
Green Hawthorn	*Crataegus viridis*	Moderate; Deep root system	Moderate		
Mockernut Hickory	*Carya tomentosa*	Good; deep roots	Low		
Red Oak	*Quercus rubra*	Excellent; deep-rooted, stabilize slopes	Low		
Redbud	*Cercis canadensis*	Moderate; Spreading shallow roots	Low		
Shagbark Hickory	*Carya ovata*	Good; deep roots	Low		
White Oak	*Quercus alba*	Excellent; deep-rooted, stabilize slopes	Low		
SHRUBS / WOODY GROUND COVER					
Black Chokeberry	*Aronia melanocarpa 'UCONNAM165' LOW SCAPE MOUND*	Good; compact form, good root mass	Low		
Blackhaw	*Viburnum prunifolium*	Good	Low		
Common Snowberry	*Symphoricarpos albus*	Excellent; Suckering shrub that forms dense colonies	Low		
Dwarf Bush-Honeysuckle	*Diervilla 'Copper'*	Good; dense, suckering roots	Very Low		
Fragrant Sumac	*Rhus aromatica 'Gro-Low'*	Excellent for erosion control due to dense root system and spreading habit	Very Low		
Mountain Laurel	*Kalmia latifolia*	Excellent; evergreen, dense roots	Very Low		
New Jersey Tea, Redroot	*Ceanothus americanus*	Moderate; deep taproot but not a vigorous spreader	Low		
Northern Spicebush	*Lindera benzoin*	Moderate; spreads by suckers	Low		

TYPICAL SLOPE STABILIZATION + RIPARIAN SPECIES (CONTINUED)

COMMON NAME	SCIENTIFIC NAME	SLOPE STABILIZATION POTENTIAL	BLOWDOWN POTENTIAL	SALT TOLERANCE	SUNLIGHT/ MOISTURE
Red Chokeberry	*Photinia pyrifolia*	Good	Low		
SHRUBS / WOODY GROUND COVER (CONTINUED)					
Running Serviceberry	*Amelanchier stolonifera*	Excellent; Spreads by stolons to form dense colonies	Low		
Serviceberry	*Amelanchier canadensis*	Moderate	Low		
Smooth Rose	*Rosa blanda*	Excellent; Spreads by suckers, forms dense thickets	Low		
Southern Arrowwood	*Viburnum dentatum*	Good; suckering habit	Low		
Virginia Sweetspire	*Itea virginica 'Sprich' LITTLE HENRY*	Good; suckering habit, spreads well	Low		
Witch-Hazel	*Hamamelis virginiana*	Moderate; multi-stemmed	Low		
Yellowroot	*Xanthorhiza simplicissima*	Excellent; suckering, dense roots	Very Low		
WOODY VINES					
Virginia creeper*	*Parthenocissus quinquefolia*	Excellent; vigorous climber and ground cover	Low		
HERBACEOUS GROUND COVER					
Big Bluestem	*Andropogon gerardii*	Excellent; Deep, dense root system	N/A		
Blue Mistflower	*Conoclinium coelestinum*	Good; Spreading rhizomes offer soil stabilization in moist, well-drained areas	N/A		
Bride's Feathers	*Aruncus dioicus*	Okay-Good; Low-growing mat-forming; shallow soil coverage	N/A		
Butterflyweed	*Asclepias tuberosa*	Good; Tall perennial with fibrous root system	N/A		
Indiangrass	*Sorghastrum nutans*	Excellent; Deep roots	N/A		
Lanceleaf Tickseed	*Coreopsis lanceolata*	Okay-Good; Fibrous roots help stabilize shallow soils	N/A		
Little Bluestem	*Schizachyrium scoparium*	Excellent; Dense, fibrous root system	N/A		
Texas Sedge	*Carex texensis*	Excellent; Dense root mass	N/A		
Wild Bergamot	*Monarda fistulosa*	Good; Fibrous root system	N/A		

= Salt Tolerant *= Full Sun* *= Part-Shade* *= Full Shade*

= Dry *= Moist* *= Wet* *= Well Drained* *= Drought Tolerant*

**May climb trees and structures, which could exacerbate blowdown risks*

Fiber Reinforcement

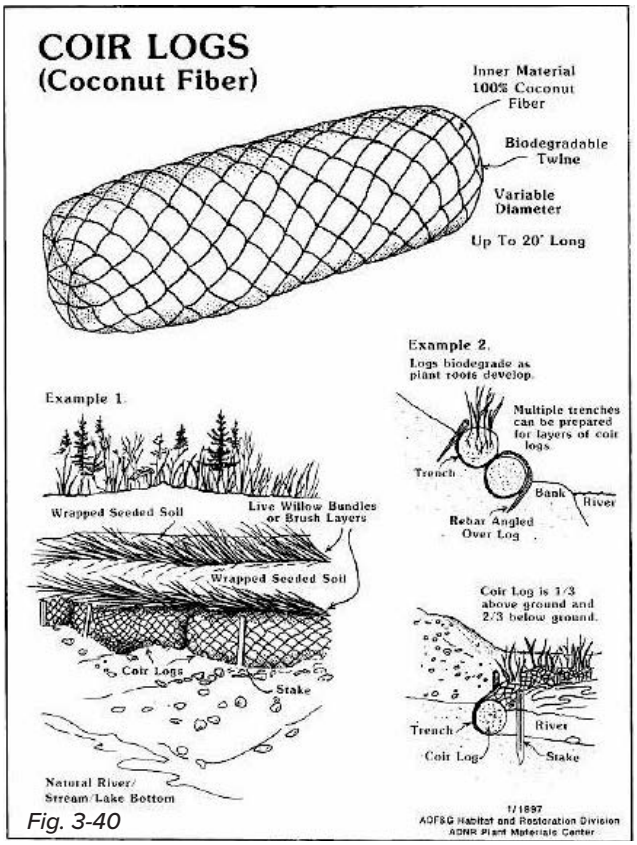
Fiber-reinforced soils integrate short synthetic or natural fibers into soil to enhance shear strength, reduce deformation, and stabilize shallow slope failures. Used for increasing slope resistance in revegetation projects or when structural reinforcement is needed below the surface without visible hard infrastructure.

- Common fiber types: polypropylene, coir, or jute; lengths range from 1-3”; typically 0.5–2.0% by soil volume;
- Ideal for revegetated slopes, cut slopes, or under erosion control blankets. Effective on slopes up to 1.5:1 (66%);
- Monitor vegetative cover and surface erosion as vegetation establishes.

Rip Rap

Placement of large, angular stone along slopes or streambanks to absorb water energy, control erosion, and prevent slope failure. Used for immediate, high-energy erosion control in areas with concentrated stormwater or flooding risk. While highly durable, rip rap has limited ecological or aesthetic value.

- Angular, non-friable stone sized for energy conditions: 6–12” for low to moderate flow and 18–36” for high-energy sites;
- Ideal for streambanks, culvert outfalls, slope toes, and drainage channels;
- Inspect after major storm events for displaced rock. Replace missing or undercut stones to maintain slope toe integrity.



Coir logs provide immediate structural stabilization of steep slopes and allows for vegetation to establish as they biodegrade.

Coir Logs

Coir logs are biodegradable coconut fiber rolls installed along contours or water edges to provide temporary erosion control, sediment capture, and a base for vegetation establishment. Best suited for low to moderate slope gradients or riparian edge stabilization, coir logs slowly degrade over time as native plants root through and stabilize the area.

- Logs range from 12–20” diameter, 10–20’ in length. Select density and size based on flow velocity and slope steepness;
- Excavate shallow trench (~⅓ log depth), seat log firmly, anchor with hardwood stakes (every 2–3’) and secure with biodegradable twine;
- Ideal for slope breaks, streambanks, and riparian zones and best on slopes up to 3:1 (33%), not suitable for high-velocity flows alone;
- Inspect after storms for displacement or loosening, re-anchor as needed until vegetation becomes dominant.

KEY COMPLIANCE STANDARDS

Pennsylvania Standards/Guidelines

ENVIRONMENTAL PROTECTION STANDARDS

Ensuring that landscape designs comply with local, state, and federal environmental regulations.

- Clean Water permits/allocations/Stormwater/Sewer/WQM: PADEP water quality permits, compliance measures, and reporting requirements[1]
- Air Quality permits and reporting documentation[2]
- PA DEP Applicable Rules and Regulations[3]

EROSION AND SEDIMENT CONTROL

PADEP requires erosion and sediment control plans for construction activities. These plans must include measures to prevent soil erosion and manage sediment during and after construction

VEGETATION AND LANDSCAPING:

PADEP encourages the use of native vegetation in landscaping to promote biodiversity and reduce maintenance needs. This includes guidelines for re-vegetating disturbed areas and using plants that are well-suited to local conditions.

Federal Standards/Guidelines

NEPA

National Environmental Policy Act (NEPA) compliance is required when a project involves federal funding, permits, or approvals

ENVIRONMENTAL PROTECTION STANDARDS

The U.S. Army Corps of Engineers (USACE) regulates wetlands under Section 404 of the Clean Water Act. This regulation ensures that discharges of dredged or fill material into all waters of the United States, including wetlands, are authorized. USACE determines wetland boundaries using three main characteristics: vegetation, soil, and hydrology.

Organization Standards/Guidelines

ISI Envision Standards

NATURAL WORLD

This category focuses on protecting and restoring ecosystems and biodiversity. Credits might include siting projects to minimize environmental impact, conserving natural habitats, and enhancing ecological functions.

CLIMATE AND RESILIENCE

This category addresses climate impacts and ensures resilience to future challenges. Credits might focus on reducing greenhouse gas emissions, improving resilience to climate change, and preparing for natural disasters.

1. https://greenport.pa.gov/elibrary/GetFolder?FolderID=3664
2. https://greenport.pa.gov/elibrary/GetFolder?FolderID=3623
3. https://www.pa.gov/agencies/dep/programs-and-services.html

GREEN STORMWATER INFRASTRUCTURE

Benefits

Green Stormwater Infrastructure (GSI) features within the landscape are defined as nature-based best management practices (BMPs) that manage stormwater runoff and improve water quality. Potential co-benefits include improved air quality, mitigation of urban heat island effect, enhanced ecological function, and social and economic benefits. GSI provides the greatest benefits when integrated with other intentionally designed site elements such as parking islands and entry plazas.

Applicability

Relevant technical guidance for the design of green stormwater infrastructure practices is provided by the Allegheny County Model Stormwater Management Ordinance, the City of Pittsburgh Stormwater Design Manual, and local municipal and town standards and regulations. This includes a description of the requirements under the applicable codes as well as the planning and design standards and considerations for different individual practice types.

GENERAL REQUIREMENTS

Stormwater management requirements for new and redeveloped PRT Facilities within city limits are defined by Title's 13, 9 and 14 of the City of Pittsburgh Code. Under Title 13, development projects must submit a Stormwater Management (SWM) Site Plan for review and approval. Any SWM Site Plan that does not include green infrastructure or a low impact design practices, must demonstrate that they are infeasible in accordance with the City of Pittsburgh Stormwater Design Manual.

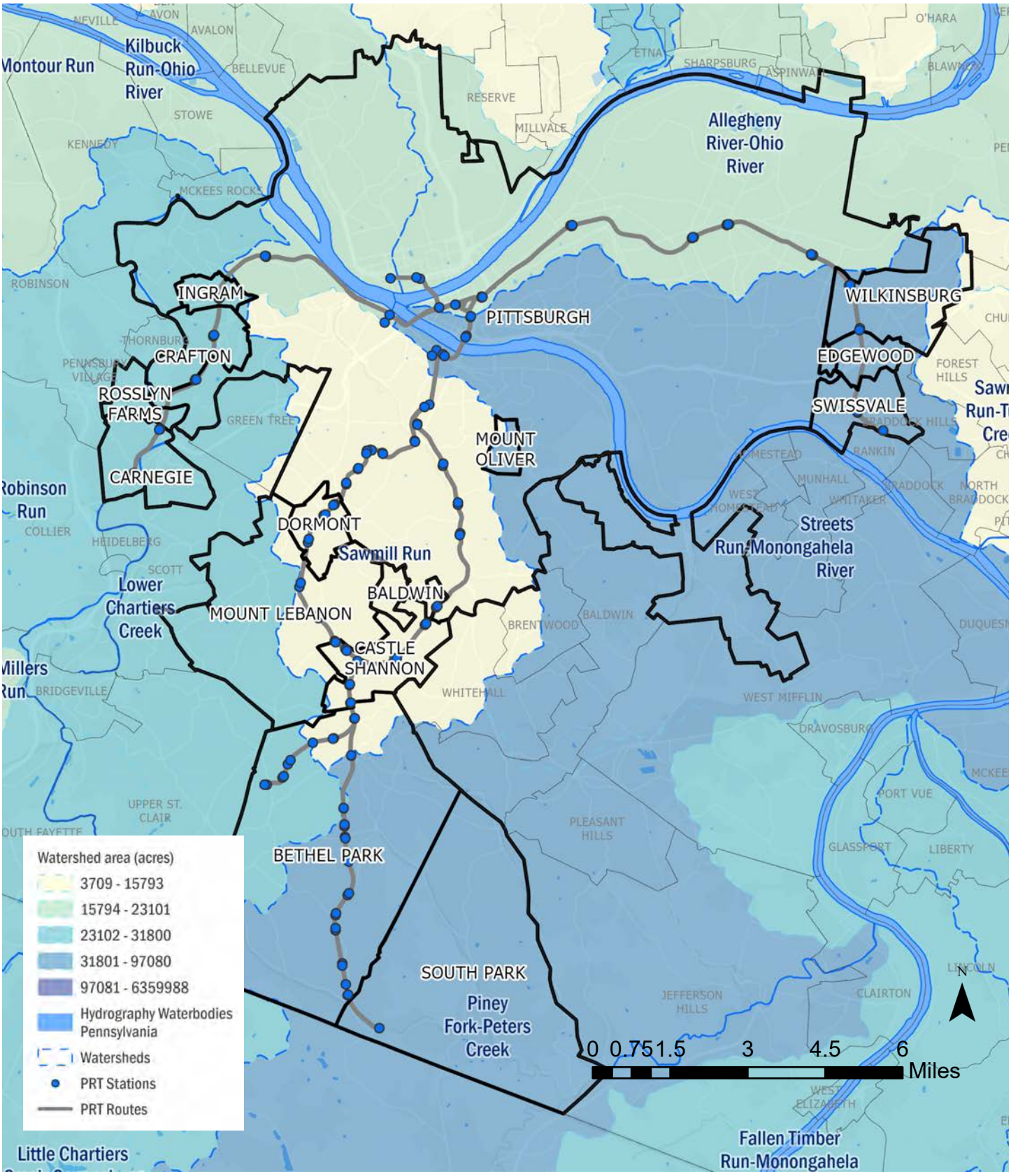
Outside of city limits, stormwater and GSI requirements are defined by the municipality in which the project/facility is located. As a goal, PRT should aim to implement stormwater management BMPs consistently throughout the system, while confirming the minimum standards set by the municipality are met. Designing above the minimum specification and standard can help PRT future proof its stormwater infrastructure and potentially avoid the need for costly retrofits and/or replacement of substandard infrastructure.

PROJECT SPECIFIC REGULATIONS

Project specific development considerations resulting in different stormwater management requirements include the total area of planned impervious cover and then extents of site disturbance. Projects that propose less than 5,000SF of additional impervious area compared to existing conditions and will result in earth disturbances less than 5,000SF are generally exempt from the city's stormwater management code requirements to submit a SWM site plan.

Additional requirements are defined by project location specific regulations. These requirements should be reviewed and planned for at the outset of the design process.

ALLEGHENY COUNTY WATERSHED MAP



Pittsburgh Location Specific Regulations

- Riverfront District
- Uptown Public Realm
- Combined Sewer System
- Municipal Stormwater System
- Non Special Regulation Watershed
- Allegheny County Act 167 Watersheds
- In Both Allegheny County Act 167 and Public Health and Saftey Watersheds
- Non-Sewered Areas
- Groundwater Seeps and Springs
- Riparian Buffers

STRUCTURAL BMP INTEGRATION

Structural green stormwater BMP's should be implemented where feasible to meet stormwater management requirements. Opportunities for BMP integration may differ within each of the different PRT Landscape Typologies. The subsections below include recommendations for SWM opportunities identified throughout the PRT system, but other approaches may be considered.

Public Entry / Plaza

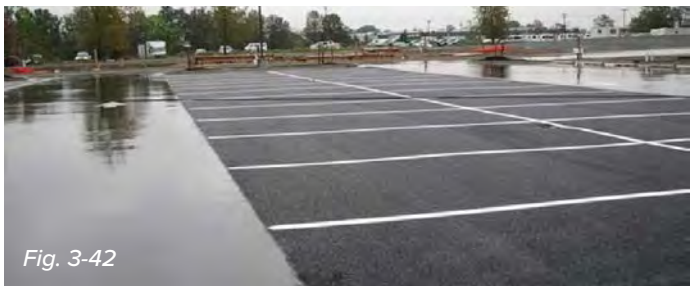
Public entry plazas are designed for high public use and typically include attractive plantings to enhance rider experience. **Bioretention** practices are well suited to address these aesthetic design goals while also meeting stormwater management requirements.

Where there isn't sufficient space available for bioretention, **Porous Pavement** can be used to manage the required stormwater runoff volume or partially reduce stormwater runoff to the extent that it can be managed by a bioretention practice that fits within the available area.

Bioretention

Space Constrained

Space constrained sites provide many design challenges. In these areas **Porous Pavement** is recommended to manage stormwater runoff volume within circulation areas such as roadways and sidewalks.



Porous Pavement

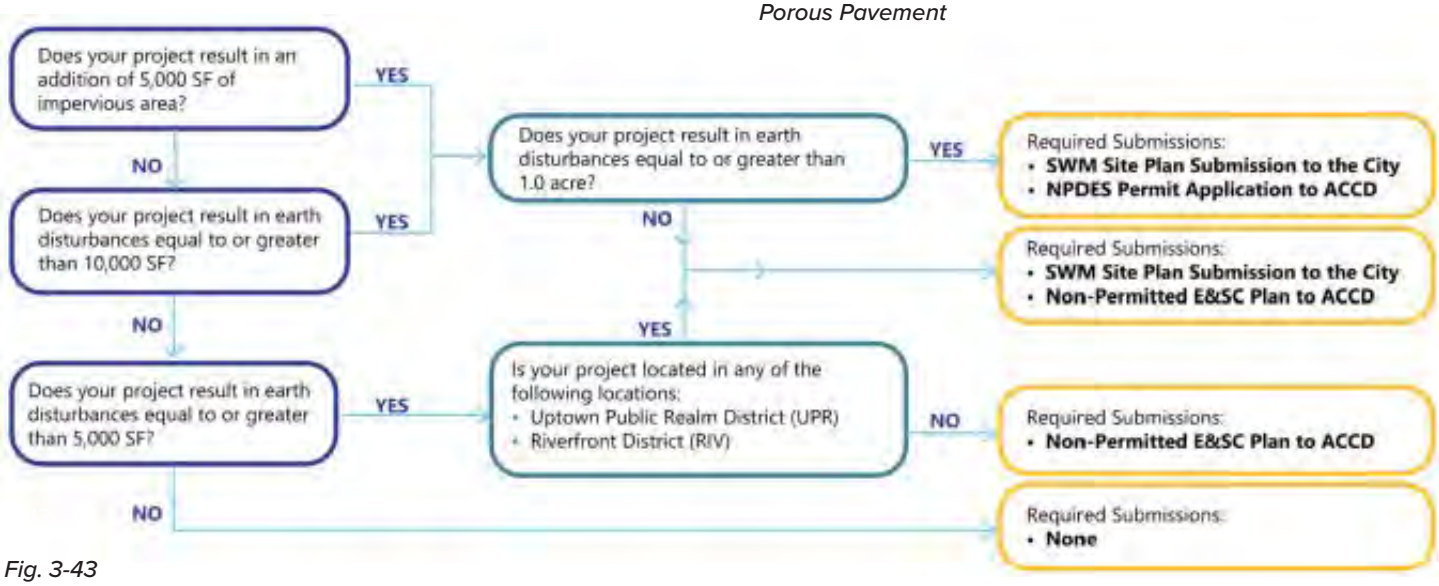


Fig. 3-43

Regulated activities and required submissions flow chart from the City of Pittsburgh Stormwater Design Manual (Figure 2.1)

Parking Lot / Park and Ride

Parking lots provide multiple opportunities for the implementation of stormwater BMPs. **Bioretention** practices can be integrated with parking lot planting requirements. Paving within parking areas can also be specified as **Porous Pavement** without compromising functionality. Finally, parking areas are well suited to **Subsurface** practices which can be installed beneath the paving areas.

Subsurface

Landscape Buffers

Long linear landscape buffers are ideal for the implementaiton of **Bioretention** practices such as bioswales. These are best suited to flatter areas, however steeper grades can be managed through the use of check dams within the practice. Another stormwater management BMP that works well within this landscape typology is **Media Filter** practices, which may be integrated within typical landscape elements such as street tree planting pits.

Media Filter

Steep Slopes

Structural BMP's are not recommended for implementation on very steep slopes. Stormwater green infrastructure practices generally rely on holding water for infiltration or to slowly release back to the grey stormater infrastructure system over time. Holding water on steep slopes may result in increase erosion and will require excessive grading to construct.

Green Roof

Public Amenity

Like public entry/plaza spaces, public amenity areas are highly designed spaces that provide several functions to riders. Several BMP's can be integrated into these spaces. **Porous Pavement** practices can be implemented in place of traditional paving for sidewalks and open spaces. Where structures are provided to house public amenities, **Green Roofs** may be considered. If Green Roofs are not feasible to structural considerations, attractive above ground **Cisterns** may be installed to help manage stormwater runoff from roofs.

Cisterns

Creek Adjacent

Riparian buffers are subject to setback requirements from stream banks to protect sensitive environmental areas. For this reason, stormwater management BMPs are not recommended in the area immediately adjacent to creeks, however there are other beneficial landscape practices that can be applied within these buffers, such as Native Planting, Slope Stabilization and Riprarian Restoration.

Roadway

Opportunities for stormwater management within the busway corridors may be limited by several constraints due to existing utilities and maintenance access. Linear **Bioretention** practices such as bioswales may be considered here where feasible. Additional considerations may include sections of **Porous Pavement** outside of the primary drive lanes to manage stormwater run-on.

PRT LANDSCAPE TYPOLOGIES	RECOMMENDED STRUCTURAL BMP'S					
	Bioretention	Subsurface	Porous Pavement	Green Roof	Media Filters	Cisterns
Public Entry Plaza	✓		✓			
Space Constrained			✓			✓
Parking Lot / Park & Ride	✓	✓	✓			
Landscape Buffer	✓				✓	
Steep Slope*	–	–	–	–	–	–
Creek Adjacent*	–	–	–	–	–	–
Public Amenity		✓	✓	✓		✓
Roadway	✓		✓			

Ponds and basins are also defined as Structural BMP's in the City of Pittsburgh Stormwater Design Manual. These practices are not highly recommended because they generally require large level areas for implementation and cannot be easily integrated with other landscape design features.

** Structural BMP's would not typically be recommended on or under steep slopes or creek adjacent.*

KEY COMPLIANCE STANDARDS

Pittsburgh Specific Standards/Guidelines

THE CITY OF PITTSBURGH STORMWATER DESIGN MANUAL

Provides technical guidance for developers and planners to comply with stormwater management requirements.

Pennsylvania Standards/Guidelines

STORMWATER MANAGEMENT REGULATIONS

Ensuring that landscape designs incorporate features to manage stormwater runoff effectively.

- PADEP SWM requirements and standards[1]
- PADEP's Stormwater Best Management Practices (BMP) Manual provides guidelines for managing stormwater runoff. This includes the design and implementation of BMPs such as infiltration basins, rain gardens, and vegetated swales to manage stormwater on-site[2]
- Managed Release Concept (MRC): This design standard focuses on controlling the release rate of stormwater from BMPs to minimize downstream flooding and erosion. It includes specific design values and standards for BMPs, such as maximum ponding depth, media depth, and infiltration rates[3]

EROSION AND SEDIMENT CONTROL

PADEP requires erosion and sediment control plans for construction activities. These plans must include measures to prevent soil erosion and manage sediment during and after construction

Organization Standards/Guidelines

ISI Envision Standards

NATURAL WORLD

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DEPAVING

Benefits

Reducing impervious cover in the landscape is a low-impact design (LID) principal that has several benefits, including stormwater management, water quality improvement, the mitigation of urban heat island effect, and reduced carbon footprint. Depending on the alternative cover type selection, impervious cover reduction can also reduce construction costs (including the cost of stormwater management systems) and long term maintenance efforts.

Applicability

When planning for the reduction of impervious cover, whether through the design of new landscapes or retrofitting existing facilities, the primary consideration should be to provide pedestrian-friendly spaces while maintaining accessibility.

ALTERNATIVE MATERIALS

Hardscapes are typically comprised of concrete or asphalt. However, there are alternative options for pervious cover types that meet varying degrees of performance standards relative to the traditional options. Alternatives to consider include the following:

- Decomposed granite
- Interlocking pavers
- Permeable concrete
- Permeable asphalt
- Gravel mulch
- Low maintenance planting

Maintenance considerations can be addressed during the design process when these materials are proposed. Decomposed granite should be installed with an appropriate binder to limit maintenance requirements. Geogrids can also be installed to hold gravel and other permeable materials in place when used in walkways and plaza areas that are accessible to pedestrians.

LIMIT CONCRETE AND ASPHALT SURFACING

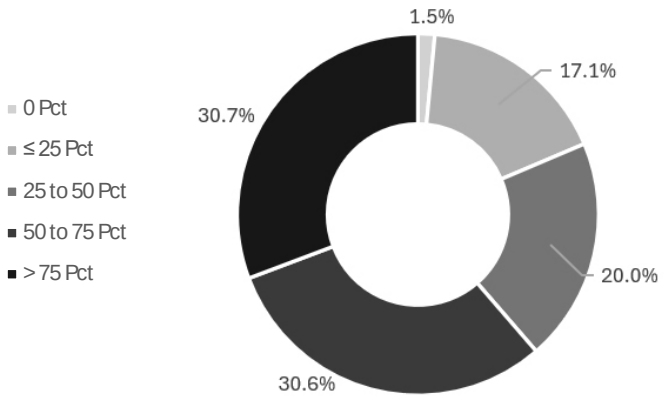
Impervious cover reduction should be prioritized through all design and planning processes. Proposed areas of hardscape cover are often guided by accessible design criteria and the understanding of the numbers of users that a facility expects to serve. It is important to maintain critical performance standards and design for an appropriate level of need.

While some alternatives to impervious surfacing, such as gravel or planting, may not meet accessibility requirements, pedestrian walkways, for example, can be designed to provide the minimum required accessible area for traditional paving while using pervious materials to account for remaining path width, as required to accommodate the total number of expected users.

Permeable pavement options should be considered where alternative cover types for depaving are not feasible. Permeable pavement design options are further described in the Green Stormwater Infrastructure section of these guidelines.

When considering surface alternatives, the designer should take into consideration the life cycles of the proposed materials vs typical concrete and/or asphalt and assess the pros and cons of the material.

PERCENT IMPERVIOUSNESS ACROSS ALL FACILITIES [1]



1. U.S. Geological Survey Annual National Land Cover Database 2023 (based on a 5m x 5m grid)

BEFORE

Fig. 3-48

AFTER

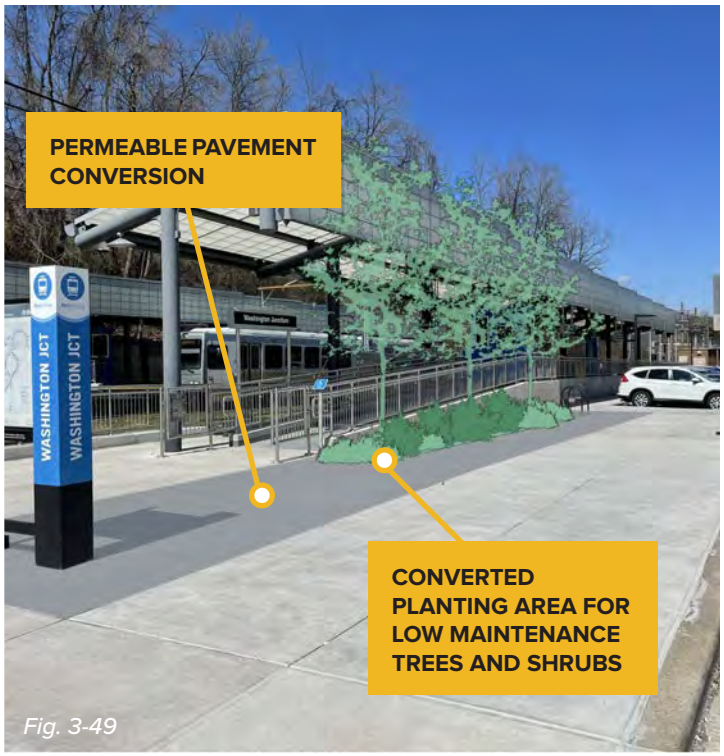
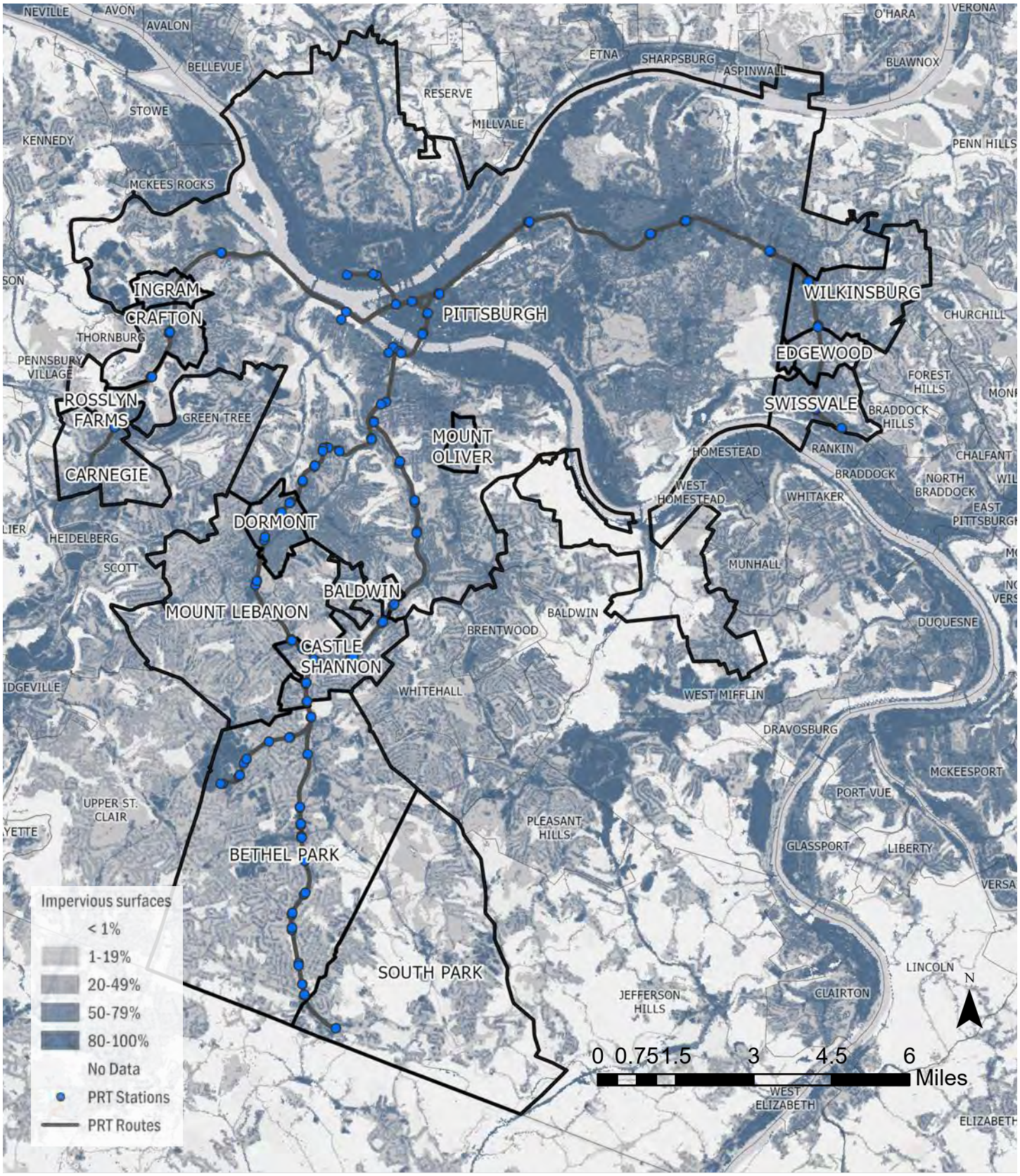


Fig. 3-49

Renderings of the Washington Junction Station before and after conversion to permeable pavement.

IMPERVIOUS COVER MAP



KEY COMPLIANCE STANDARDS

Pittsburgh Specific Standards/Guidelines

CITY OF PITTSBURGH'S DEPARTMENT OF MOBILITY AND INFRASTRUCTURE (DOMI) 2070 MOBILITY VISION PLAN

This document defines the long-term planning efforts and describes the approach to improving mobility justice.

THE CITY OF PITTSBURGH STORMWATER DESIGN MANUAL

Provides technical guidance for developers and planners to comply with stormwater management requirements.

Pennsylvania Standards/Guidelines

RIGHT-OF-WAY PROCEDURES MANUAL

Guidelines for construction and maintenance within public rights-of-way.

STORMWATER MANAGEMENT REGULATIONS

Ensuring that landscape designs incorporate features to manage stormwater runoff effectively.

- PADEP SWM requirements and standards[1]
- PADEP's Stormwater Best Management Practices (BMP) Manual provides guidelines for managing stormwater runoff. This includes the design and implementation of BMPs such as infiltration basins, rain gardens, and vegetated swales to manage stormwater on-site[2]
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EROSION AND SEDIMENT CONTROL

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Federal Standards/Guidelines

ADA STANDARDS FOR ACCESSIBLE DESIGN

Ensuring that all landscape features are accessible to individuals with disabilities.

ACCESSIBLE ROUTES

ADA Standards for Accessible Design be provided within the site, connecting accessible buildings, facilities, elements, and spaces. This includes ensuring that walkways, ramps, and curb cuts are designed to be accessible.

PARKING AND PASSENGER LOADING ZONES

Standards specifying number and design of accessible parking spaces and passenger loading zones. These must be located on the shortest accessible route to the accessible entrance of the building or facility.

OUTDOOR DEVELOPED AREAS

The United States Access Board provides guidelines for outdoor developed areas, including trails, picnic and camping facilities, viewing areas, and beach access routes.[3]

Organization Standards/Guidelines

ISI Envision Standards

RESOURCE ALLOCATION

This category covers the efficient use of resources such as materials, energy, and water. Credits might focus on reducing material waste, improving energy efficiency, and conserving water resources.

CLIMATE AND RESILIENCE

This category addresses climate impacts and ensures resilience to future challenges. Credits might focus on reducing greenhouse gas emissions, improving resilience to climate change, and preparing for natural disasters.

1. https://www.pa.gov/agencies/dep/programs-and-services/water/clean-water/stormwater-management.html
2. https://www.dep.state.pa.us/dep/subject/advcoun/Stormwater/Manual_DraftJan05/Appendix-E-jan-rev.pdf
3. https://files.dep.state.pa.us/water/bpnpsm/StormwaterManagement/ConstructionStormwater/MRC_BMP_Design_Summary_Sheet.pdf

TRAFFIC CALMING

Benefits

Traffic calming measures are defined as localized safety features that slow traffic and/or increase driver awareness. The benefits of traffic calming are an increase in pedestrian and cyclist safety and the creation of more attractive and inviting streetscapes.

Applicability

Traffic calming measures are best applied when designed to be integrated seemlessly with other recommended landscape strategies. The most common opportunites to achieve traffic calming while layering the benefits of other landscape strategies are with the implementation of GSI, Tree Planting, Depaving, Public Art, and Amenities such as shelters, bike racks, and expanded sidewalks. These measures are appropriate for station driveways, entry plazas, parking lots and bus stops.

Traffic calming benefits are greatest in multi-modal streetscapes where there is higher risk to cyclists and pedestrians in close proximity to motorists.

DESIGN OPPORTUNITIES

Many of PRT's sites include access driveways or PRT-owned roadways where traffic calming design features can provide greater safety and comfort for PRT's riders and employees. They are often, but not always, constructed physical improvements within the streetscape, such as:

- Speed humps
- Speed cushions
- Speed tables
- Raised crosswalks and intersections
- Pedestrian islands
- Reduced travel lanes
- Traffic circles
- Chicanes

Examples of not structural saftey features include visual cues such as:

- Signage
- Tactile warning strips
- Textured or reflective paint
- Striping
- Lighting

When planning for traffic calming measures, it is important to consider all of the circulation needs for each site. Accomodations must typically be considered for emergency service vehicles, such as fire trucks and also for larger, non-emergency vehicles such as garbarge trucks, snow plows, and tractor trailers.

Fig. 3-50

St. Anne Park and Ride access driveway on Rockwood Avenue.

Resources

There are several design resources to support the implementation of traffic calming measures within the streetscape.

The U.S. Department of Transportation Federal Highway Administration (FHWA) has published a "**Traffic Calming ePrimer**", which presents an openly available online review of advanced design approaches to traffic calming. It is divided into 8 modules, wherein Module 3 provides a toolbox of individual traffic calming measures.

The Port Authority of Allegheny County **Transit-Oriented Development Guidelines** also includes a discussion of traffic calming and it the relevant local benefits in multi-modal streetscapes.

Additional key compliances include, but are not limited to Pennsylvania Department of Transportation (PennDOT) and National Association of City Transportation Officials (NACTO).

Corner extension with bioswale.

Raised mid-block crosswalk.

KEY COMPLIANCE STANDARDS

Pittsburgh Specific Standards/Guidelines

CITY OF PITTSBURGH'S DEPARTMENT OF MOBILITY AND INFRASTRUCTURE (DOMI) 2070 MOBILITY VISION PLAN

This document defines the long-term planning efforts and describes the approach to improving mobility justice.

- Accessible Design[1]
- Bike Parking Design[2]
- Complete Streets Policy[3]
- Construction[4]
- Curbs[5]
- Electric Vehicle Charging Guidelines[6]
- 2070 Mobility Vision Plan

Pennsylvania Standards/Guidelines

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SIGNAGE

Proper signage required to indicate accessible routes, entrances, and facilities. Signs must be designed to be easily readable and include Braille and raised characters where necessary.

Organization Standards/Guidelines

ISI Envision Standards

QUALITY OF LIFE

This category includes credits related to enhancing community well-being, mobility, and community development. Credits might focus on improving public health, increasing accessibility, and fostering community cohesion.

1. https://www.ada.gov/law-and-regs/design-standards/2010-stds/
2. https://www.pittsburghpa.gov/files/assets/city/v/1/domi/documents/policies-and-standards/23405_domi_bike_guide.pdf
3. https://pittsburgh.legistar.com/LegislationDetail.aspx?ID=2876655&GUID=58D1D58A-BAA3-4C2A-B9A1-E040B0F44D64&Options=ID|Text|&Search=2016-0935
4. https://www.pittsburghpa.gov/files/assets/city/v/1/domi/documents/policies-and-standards/17897_row_procedures_manual_2022_fin.pdf
5. https://www.pittsburghpa.gov/files/assets/city/v/1/domi/documents/policies-and-standards/24453_curb_cut_specifications_for_off_street_parking_-_march_2024_updates.pdf
6. https://www.pittsburghpa.gov/files/assets/city/v/1/domi/documents/policies-and-standards/18958_ev_row_charging_guidelines_final.pdf
7. https://www.access-board.gov/aba/guides/chapter-10-outdoor/

PUBLIC ART

Benefits

Public Art is an expansive landscape design strategy that can be approached in many different ways. However, one unifying goal that PRT can work to achieve through public art is **public engagement**. The benefits of engaging riders, employees, and other users within and around the PRT system may include:

- Community stewardship
- Placemaking
- Beautification
- Shared cultural expression
- Education & communication
- Economic value

Applicability

The landscape typologies that are most likely to create a wide range of opportunities for public art are public entry plazas and walls. However, park and rides, landscape buffers and roadways should all be considered good opportunities for the integration of public art interventions. Through careful planning and design, creative public art interventions ranging from very large to very small scales can be envisioned to enhance the ridership experience throughout the PRT system.

PLANNING AND IMPLEMENTATION

Open calls for public art proposal submissions and working with local artists, in particular, can help build support within the communities where PRT is operating and help foster a community identity within PRT landscapes. The community may also be involved in general artist selection/nomination process and provide comment on the most preferred art experiences.

Partnerships with existing arts and advocacy organizations, such as Pittsburgh Cultural Trust, should also be considered as a way to activate public spaces. Such institutions can leverage large networks of support and publicity and assist with program management and funding opportunities.

Public art in the landscape is commonly provided in the form of a wall mural or a sculpture, however alternative creative formats should be considered as well. Some examples of how public works of art can be integrated with other important landscape design components may include: interpretive signage campaigns, crosswalk and sidewalk painting to support traffic calming, or wayfinding installations to help integrate PRT property with the local community.

Landscape designers can begin to identify opportunities to integrate public art at the earliest stages and work with artists through an iterative process to implement meaningful interventions that will maximize public engagement. If it is necessary to separate the landscape design from the implementation of public art interventions due to schedule or budgetary reasons, landscape designers can help identify key features and locations that may be of interest to artists for further activating the public space.

Fig. 3-53

Interpretive signage at Round Hill Park

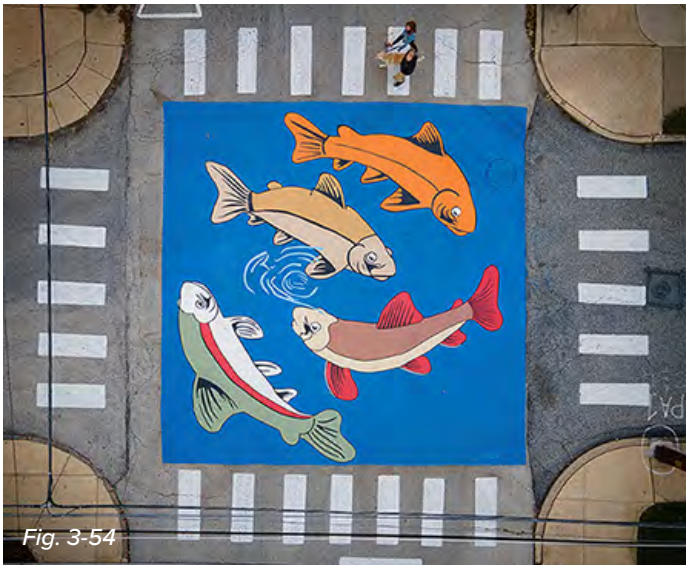
Fig. 3-54

Fig. 3-55

Traffic calming street paintings at intersections in Media, PA produced through a collaboration with the Media Arts Council and the Traffic Calming Project with volunteer support. "Trout at Borough Hall" (top) and "Squirrels at Monroe" (bottom).


Fig. 3-56

Public art bike rack project produced by a collaboration between Pittsburgh Cultural Trust, Bike Pittsburgh, and the City of Pittsburgh

KEY COMPLIANCE STANDARDS

Organization Standards/Guidelines

ISI Envision Standards

QUALITY OF LIFE

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AMENITIES

Benefits

In the context of landscape design, an amenity refers to any feature that enhances the comfort, convenience, and enjoyment of the user. Amenities enhance public spaces and make them more pleasant and inviting. The integration of public amenities into the landscape at PRT facilities presents one of the strongest opportunities to improve rider and employee experience while supporting critical infrastructure needs.

Applicability

Each of the landscape strategies described in these guidelines has the potential to be designed intentionally to provide a public amenity with stacked benefits. For example, **Tree Plantings** can be located to improve seasonal comfort in the form of shade in the summer and wind screen in the winter, and **Traffic Calming** measures can include protected pedestrian waiting areas and bike racks.

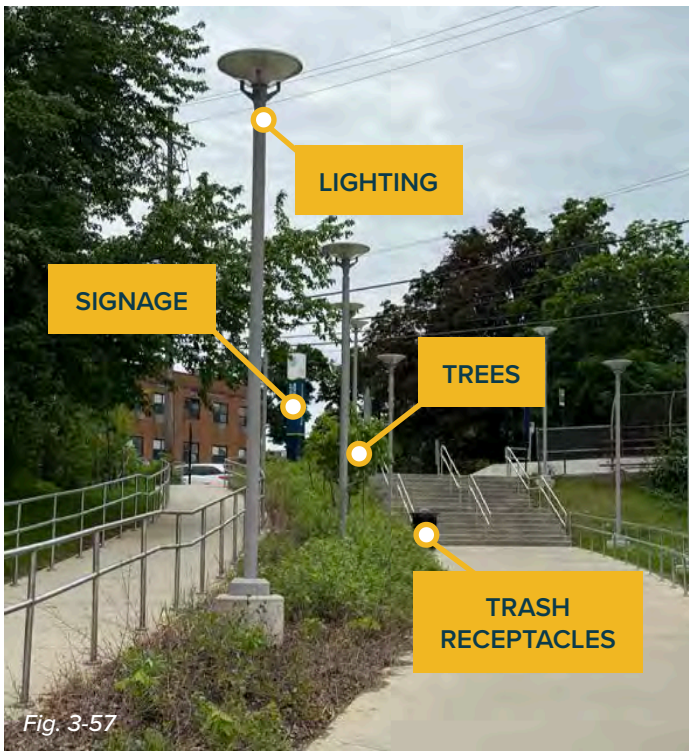
PLANNING AND DESIGN

Planning for amenities such as seating, trash and recycling receptacles, benches, and lighting should be considered at the earliest stages of the design process so that they can be thoughtfully integrated within the overall landscape design for PRT. All public amenities should be composed of durable materials and designed for ease of maintenance and replacement.

Specific siting and design criteria for certain amenity types are provided within both PRT's "**Light Rail Transit Station Design Guidelines**" and the "**Bus Stop and Street Design Guidelines**". This guidance includes:

- Signage (basic and electric)
- Expanded sidewalks
- Benches & leaning bars
- Trash Receptacles
- Shelters
- Lighting
- Bike racks
- Vending machines
- Windscreens
- Call boxes & emergency buttons
- Technology integration

These references provide a basis for including amenities within the landscape.



Layers of public amenities working together at the recently improved Negley Station.

Whenever possible, stakeholders should be engaged during the design process to help inform the decision making and select the specific amenities that are most preferred by local site users. Stakeholder engagement can take many forms ranging from an online survey to in-person community workshops.

Integrated seating design guidance can be found in the Port Authority of Allegheny County Light Rail Transit Station Design Guidelines.

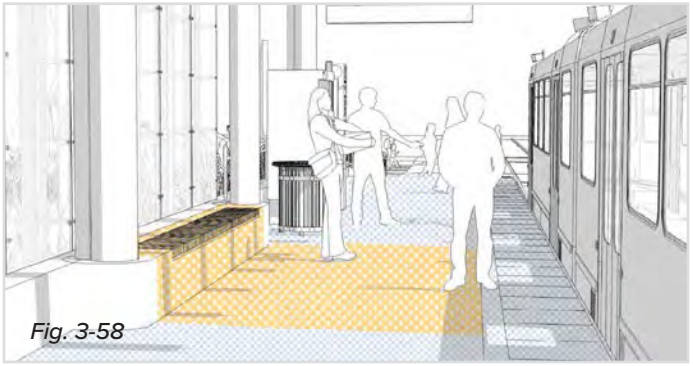


Fig. 3-58

KEY COMPLIANCE STANDARDS

Pittsburgh Specific Standards/Guidelines

CITY OF PITTSBURGH'S DEPARTMENT OF MOBILITY AND INFRASTRUCTURE (DOMI) 2070 MOBILITY VISION PLAN

This document defines the long-term planning efforts and describes the approach to improving mobility justice.

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OUTDOOR DEVELOPED AREAS

The United States Access Board provides guidelines for outdoor developed areas, including trails, picnic and camping facilities, viewing areas, and beach access routes.[5]

SIGNAGE

Proper signage required to indicate accessible routes, entrances, and facilities. Signs must be designed to be easily readable and include Braille and raised characters where necessary.

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1. https://www.ada.gov/law-and-regs/design-standards/2010-stds/
2. https://www.pittsburghpa.gov/files/assets/city/v/1/domi/documents/policies-and-standards/23405_domi_bike_guide.pdf
3. https://pittsburgh.legistar.com/LegislationDetail.aspx?ID=2876655&GUID=58D1D58A-BAA3-4C2A-B9A1-E040B0F44D64&Options=ID|Text|&Search=2016-0935
4. https://www.pittsburghpa.gov/files/assets/city/v/1/domi/documents/policies-and-standards/18958_ev_row_charging_guidelines_final.pdf
5. https://www.access-board.gov/aba/guides/chapter-10-outdoor/

CHAPTER 4

DESIGN CONSIDERATIONS

Fig. 4-01 - Penstemon digitalis, Foxglove Beardtongue

4. DESIGN CONSIDERATIONS

This section is intended to serve as a resource for PRT project managers and planning and design consultants, providing a starting point for future capital improvement projects. Considerations such as how to select the right plants, materials, and finding the right partners are outlined here. Additionally, resources are provided in order to support impactful design, such as PRT's Equity Index, the American Forest Service Tree Equity Score, and public health indicators like air quality, particle matter, canopy coverage, impervious surfaces, and ridership.

GENERAL DESIGN PRINCIPLES

All projects should be designed to compliance with local codes, including IBC, ADA, and local zoning codes. Planning and design consultants should reference the LRT Design Guidelines for general design principles that include:

- Shade
- ADA
- Open Space
- Clear Path
- Visibility
- Lighting

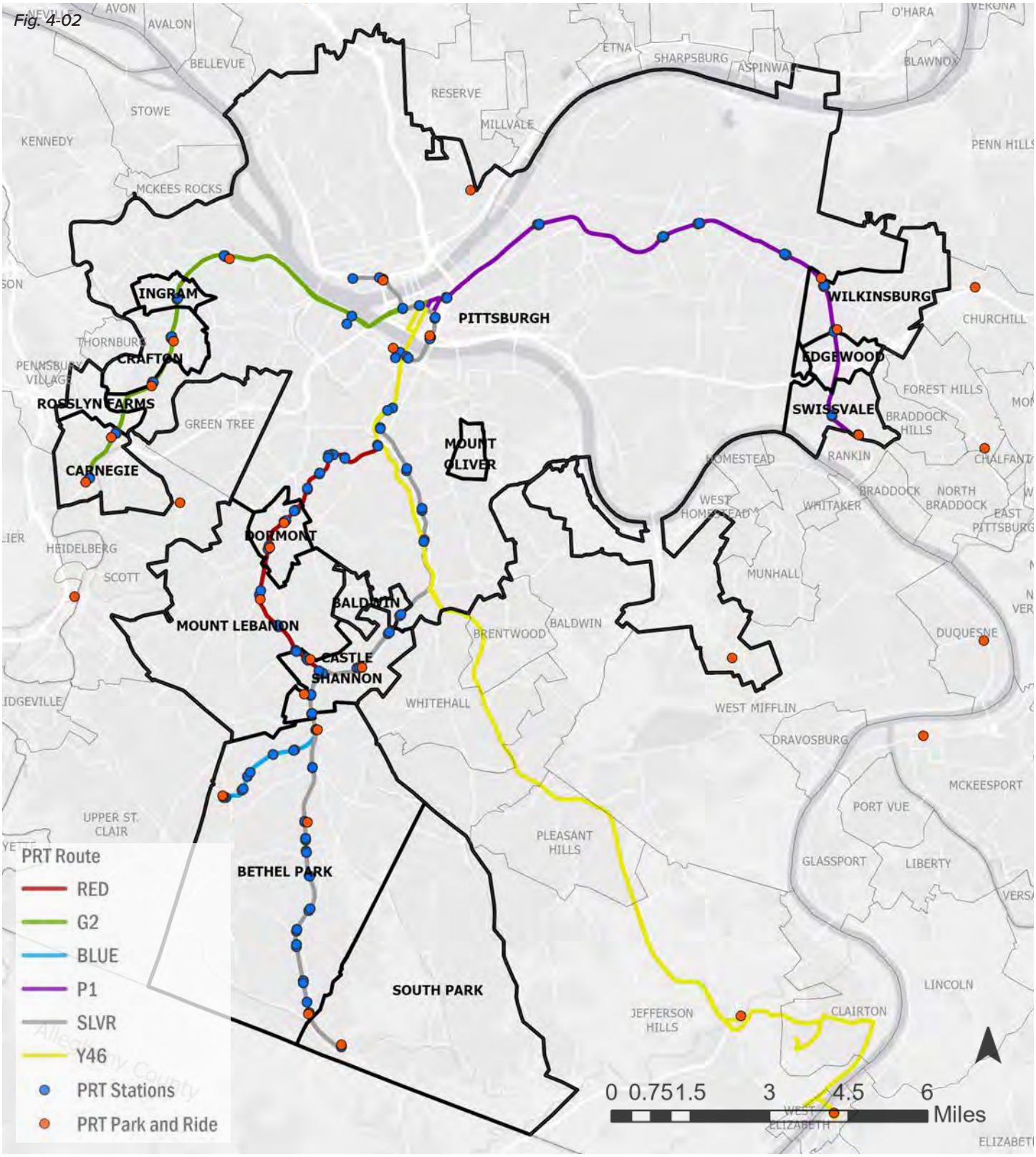
For landscape design, these principles should further emphasize a low impact design approach that uses durable pervious surface and low maintenance native plantings when possible. Adhering to these principles will enhance the environment throughout the PRT system while contributing to a recognizable brand identity for PRT. The specific environmental benefits of these design principles are described within each Landscape Design Strategy in Chapter 3; however, they generally include improvements to air quality, biodiversity, nutrient cycling, stormwater management and flood reduction, and the mitigation of urban heat island effects.

The potential for these principles to contribute the recognizable PRT brand identity are based on the understanding that through promoting transformational landscape design practices, riders, employees, and others within PRT communities will associate their public transit infrastructure with high quality, socially and environmentally responsible design that stands out from typical landscapes that are more commonly seen. These benefits are expected to increase overtime as PRT and their consultants build institutional knowledge about the specific place-based design decisions that perform best.

MUNICIPALITIES

PRT's properties span multiple municipalities. While local codes must guide planning for compliance, adopting a consistent set of zoning standards—modeled after the City of Pittsburgh's more stringent regulations—is recommended county and system-wide. While some codes may not be required outside of Pittsburgh, it should be considered best practice to promote uniformity and reduce risk across jurisdictions.

Fig. 4-02



Data Source: Routes, Park & Rides, Stations & Stops - PRT Open Data; Municipal Boundaries: Allegheny County GIS Open Data

SELECTING THE RIGHT PLANTS

Choosing the right plants is critical to a successful planting design. The “right” plants are the plants that are best suited to the specific local conditions where they will be installed. If plants are provided the conditions that are needed to thrive, they will perform well; however, if these conditions are not met they will perform poorly, exhibit signs of stress, increase maintenance requirements, and be more susceptible to mortality, requiring replacement. Some of the most significant requirements that should be considered first when selecting plants for a landscape design are described below:

Sun Exposure

The amount of sun or shade that a proposed plant is expected to receive is based on surrounding features as well as the solar aspect of the planting location. Generally southern facing plants receive more light than northern facing plants. Orientation to the East or West determines whether a plant will receive morning or afternoon light. Adjacent conditions that impact light availability should be notes such as tall shade trees, buildings, and other structures such as bridges and retaining walls.

Soil

Planting soil is a complex consideration that can significantly affect plant performance. Planting soil characteristics that must be addressed include soil texture, structure, nutrient availability, pH, and percentage of organic matter. It is important to consider both the composition of any planting soil that is being specified to be brought to a project site and the existing soils and subsoils that are present within the planting area. Existing soils can also be amended to meet specified requirements, which reduces the cost associated with offsite disposal and bringing in new material.

Consultants should have a base understanding of soil conditions and identify any erosion prone areas. Maps are provided in this section as reference, but the data should be utilized at the site scale.

Sight Lines

Proposed planting designs must confirm that the mature height of the proposed species will not conflict with vehicular site lines. The vehicular site lines are defined by triangle extending from the drive lines at intersections and must be maintained to allow safe turning. Vegetation within these areas should not exceed 30” at mature height.

Other site lines that need to be maintained include signage and signals as well as site lines required to maintain pedestrian safety (i.e.; avoid plantings that could potentially conceal a person). Local rules and regulations dictate the appropriate planting proximity to various elements in the public streetscape.

Topography / Slope

Topographic position can have a big effect on plant performance. Steep slopes can cause planting soils to become very dry and also risk erosion during rainfalls while isolated low points may not drain causing soils to be very wet and potentially fill with sediment runoff from adjacent areas. It is important to note the topography and choose plant species accordingly. Some plant species are known for having particularly fibrous or rhizomatic root systems which are well adapted to steep slopes; however wherever possible proposed slopes should not be greater than 1H:3V. Slopes steeper than this may also prevent the installation of plant material with large root balls which will need to be heeled in to prevent over-topping.

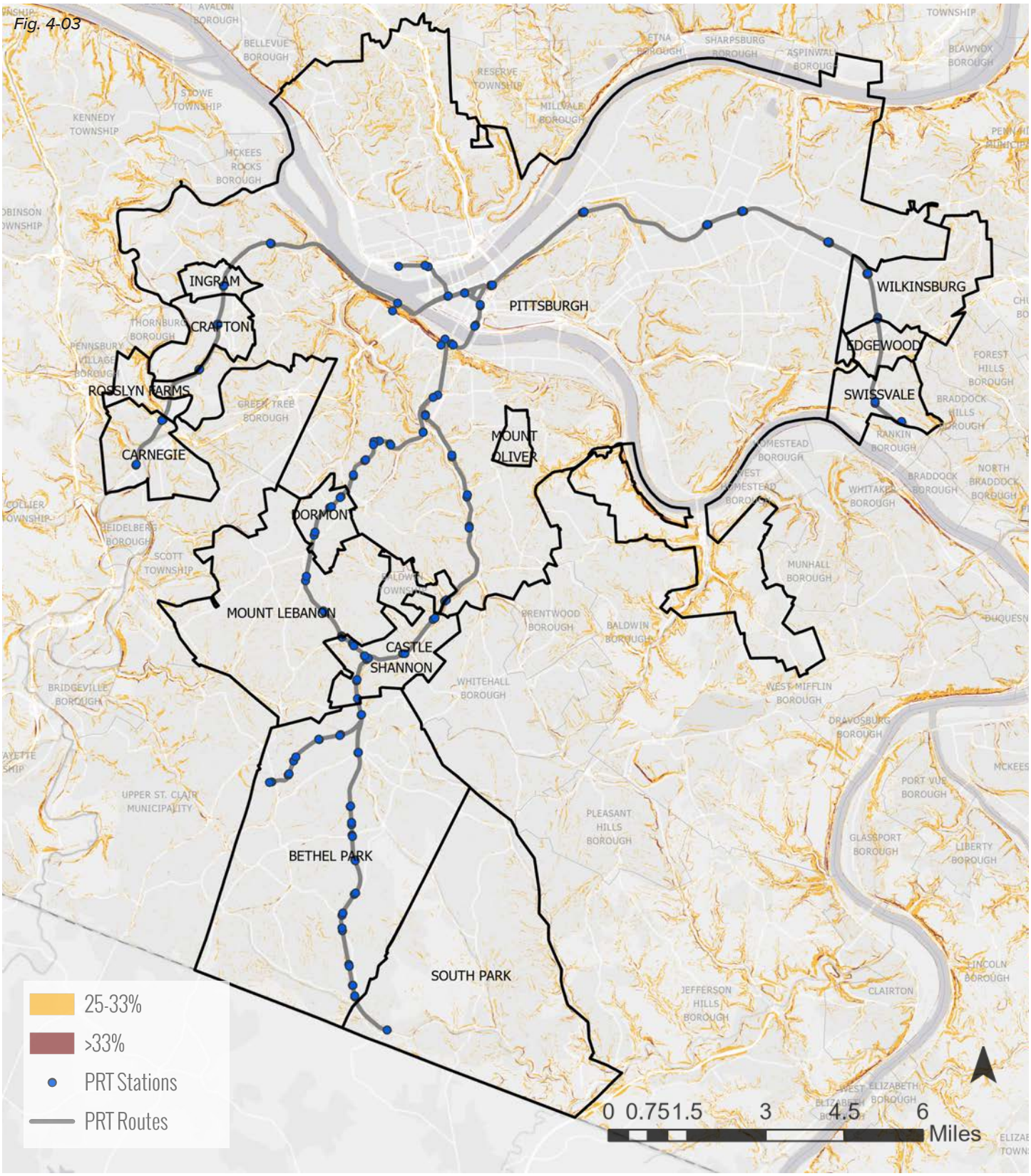
Salt Tolerance

Due to road salt applications, salt tolerance is an important characteristic to consider when developing planting plans for urban conditions. Plant species have varying degrees of salt tolerance and also there is often a distinction between a plant species' tolerance of soil salts (salts that are washed into a planting area with runoff) and aerosol salts (salts that are carried in the air to a plants leaves).

TOPOGRAPHY - STEEP SLOPES

Steep slopes require specific considerations for plant communities, as well as stormwater management, erosion control, and runoff considerations. Many PRT properties include steep slopes, as shown in the map below, which illustrates slopes greater than 25%.

Fig. 4-03

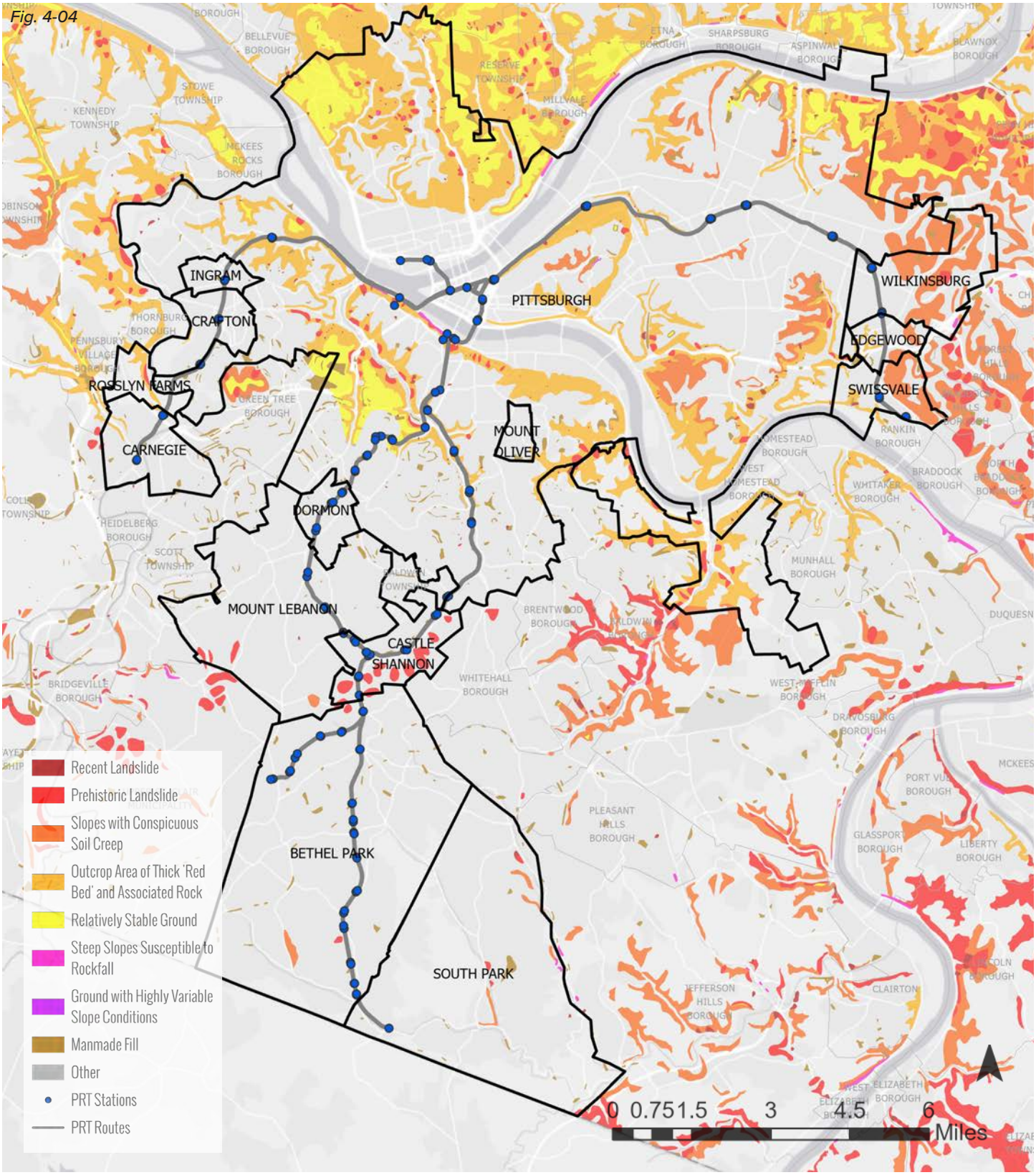


Data Source: City of Pittsburgh GIS Data Hub

LANDSLIDE PRONE AREAS

The regional topography means some areas are susceptible to landslides during heavy rainfall. The map below identifies slopes that have either recently experienced landslides (darkest red), or those at risk from landslide or slope failure (orange).

Fig. 4-04

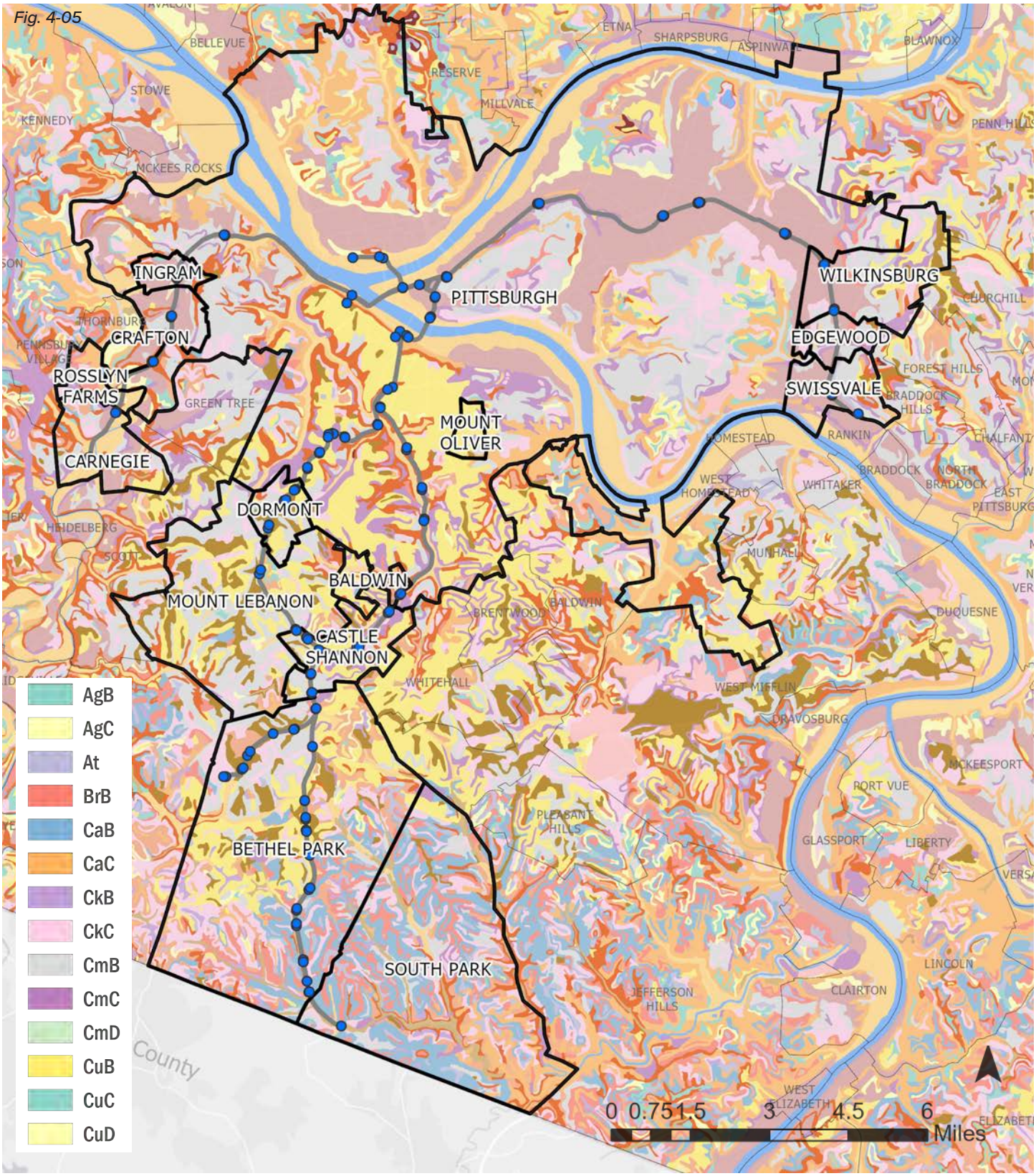


Data Source: Landslide Pomeroy Study - Allegheny County GIS Open Data, Published 2019

SOIL MAP

When designing and planning station areas, consultants should review soil maps at the scale of the site. The map below gives a visual reference of soil data, which provides useful information about landform or surface features, such as slope percentage, as well as physical characteristics like sand / clay / loam, which is important for identifying plants that will thrive in the particular soil conditions.

Fig. 4-05

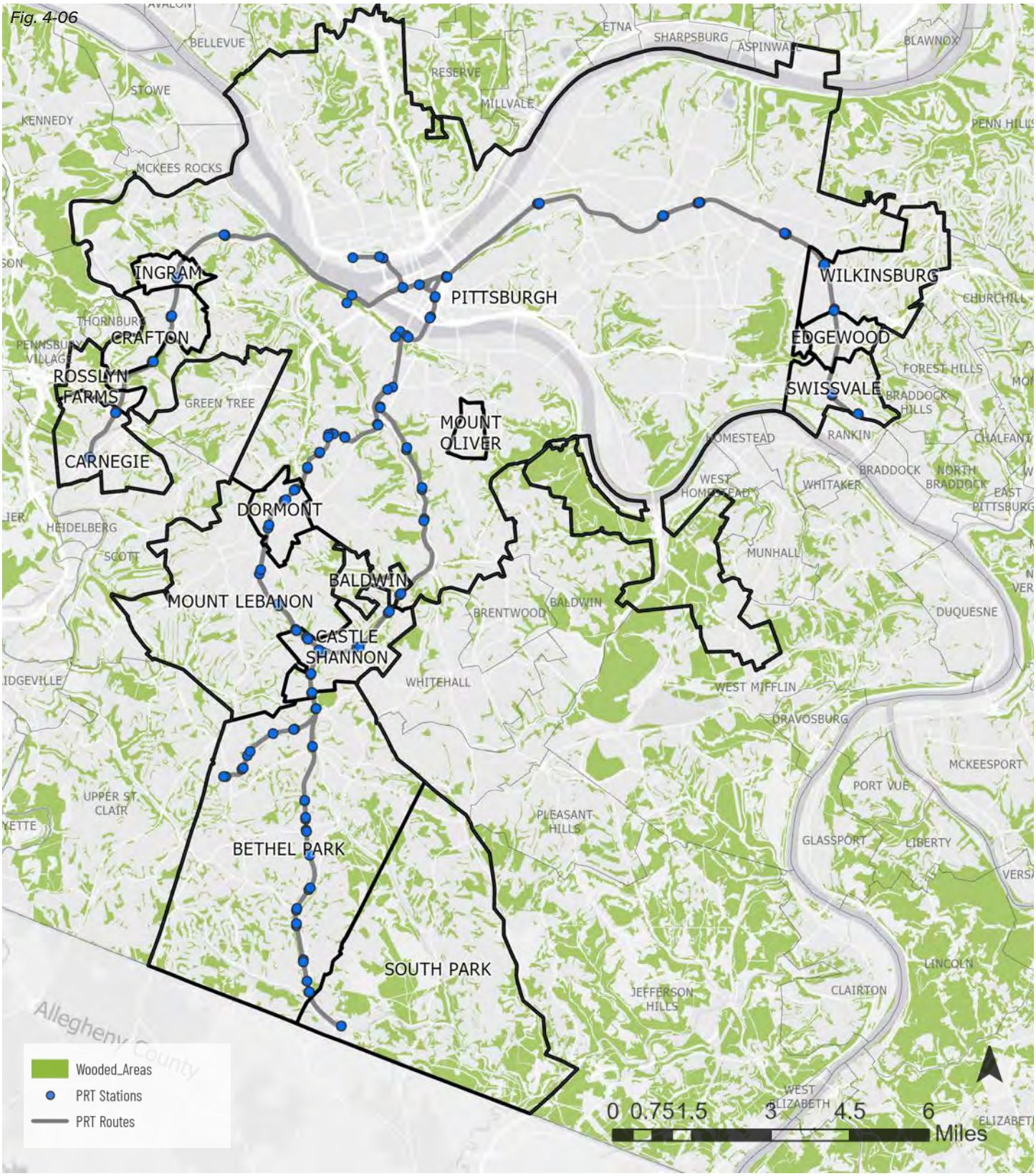


Data Source: Allegheny County Soil Types - Allegheny County GIS Open Data, Published 2015

TREE CANOPY COVERAGE

As of 2020, Allegheny County has a canopy coverage of 51.7%. Across PRT properties, canopy coverage is about 31% - indicating considerable need for an increase in tree canopy to mitigate impacts of heat island and improve air quality. While Allegheny County's Climate Action Plan is currently underway, Pittsburgh's Climate Action Plan set a target of 60% tree canopy coverage by 2030.

Fig. 4-06

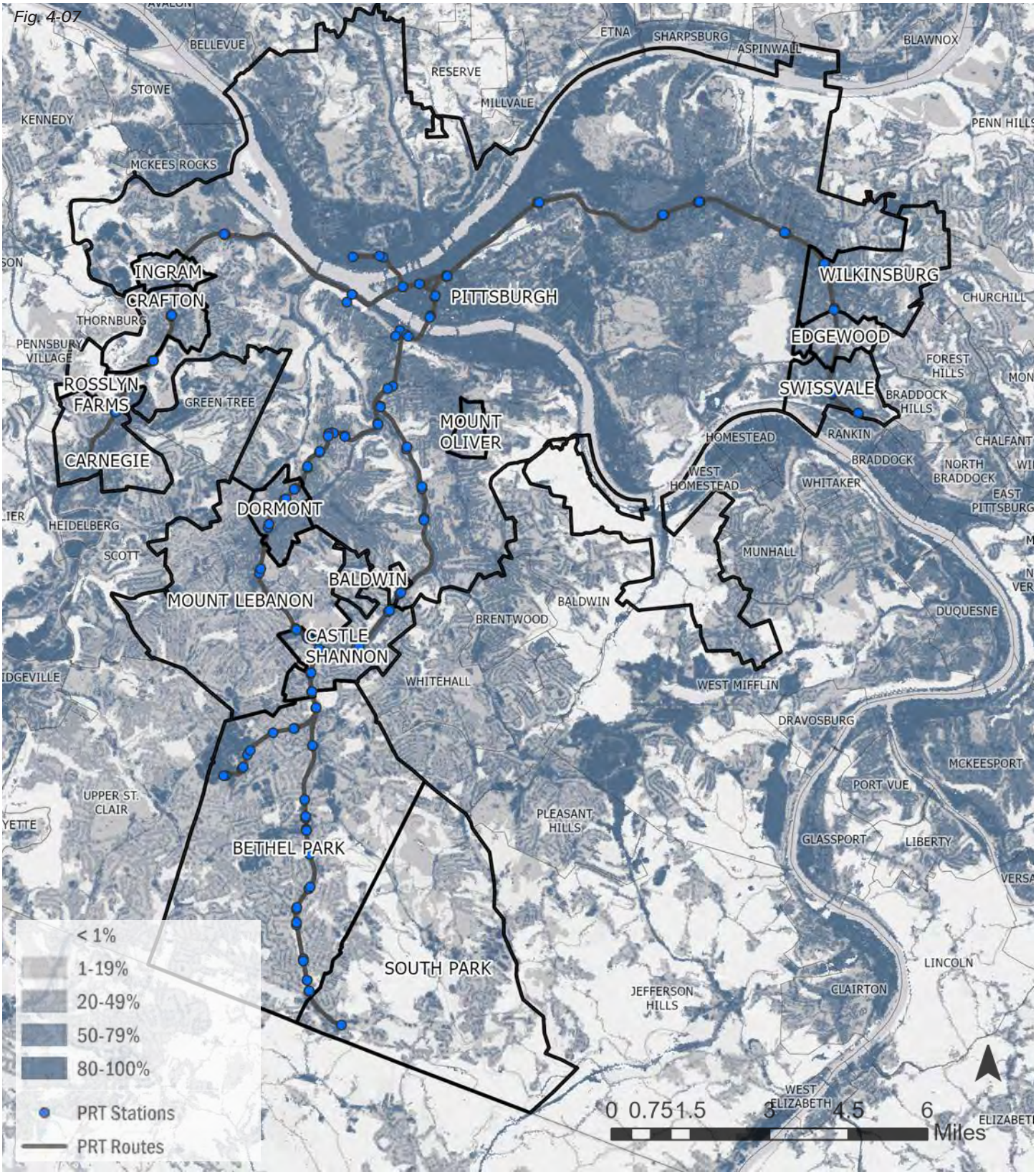


Data Source: Allegheny County Wooded Areas Boundaries - Allegheny County GIS Open Data, Published 2015

IMPERVIOUS SURFACES

Impervious surfaces refer to any man-made material that prevents or limits the infiltration of water into the ground, such as roofs, and asphalt or concrete roadways and parking lots. In the map below, darker blue areas indicate a higher percentage of imperviousness, whereas lighter gray areas indicate some perviousness, or infiltration, despite being a highly built-up, urban area.

Fig. 4-07



Data Source: Impervious Surface Time Series - National Land Cover Database (NLCD) Database, Updated 2025

DESIGNING FOR IMPACT

Transit infrastructure provides more than a means of transportation—it's an opportunity to promote public health, environmental resilience, and social equity. Each PRT station holds the potential to positively shape its context by addressing broader communities needs. In order to determine where landscape improvements can have the greatest impact, designers should reference **PRT's Index of Mobility Need**, alongside external data sources, some of which are highlighted here.

Evaluating a station's connection to parks, trails, and open space, as well as understanding where there are disadvantaged populations with greater mobility needs—such as minority populations, low income households, or cost burdened renters—helps to identify where landscape improvements can be most effective, and direct investments where they can do the most *good*.

Tools like American Forests' **Tree Equity Score** provide actionable insights by revealing where gaps in urban tree canopy coverage align with social vulnerability, identifying communities disproportionately affected by extreme heat, pollution and other environmental hazards.

The Trust for Public Land's **ParkServ** online tool considers regional access to parks and open space, reinforcing the link between quality green space and community health, resilience, and justice. Understanding where there are existing open spaces, trail connections, or institutional anchors will also help to identify where public amenities might be most impactful.

Environmental data further strengthens the case for impactful landscape investments. Many PRT routes experience elevated levels of particulate matter (PM2.5) and poor air quality, underscoring the need for targeted landscape interventions and green infrastructure that not only improves air quality, but also create safer, cooler, and more resilient communities.

These values are further supported through PRT's NEXTransit 2025 Long Range Plan where the general public, community stakeholders, PRT staff, and the PRT Boards identified sustainable transit as a key values of transit.

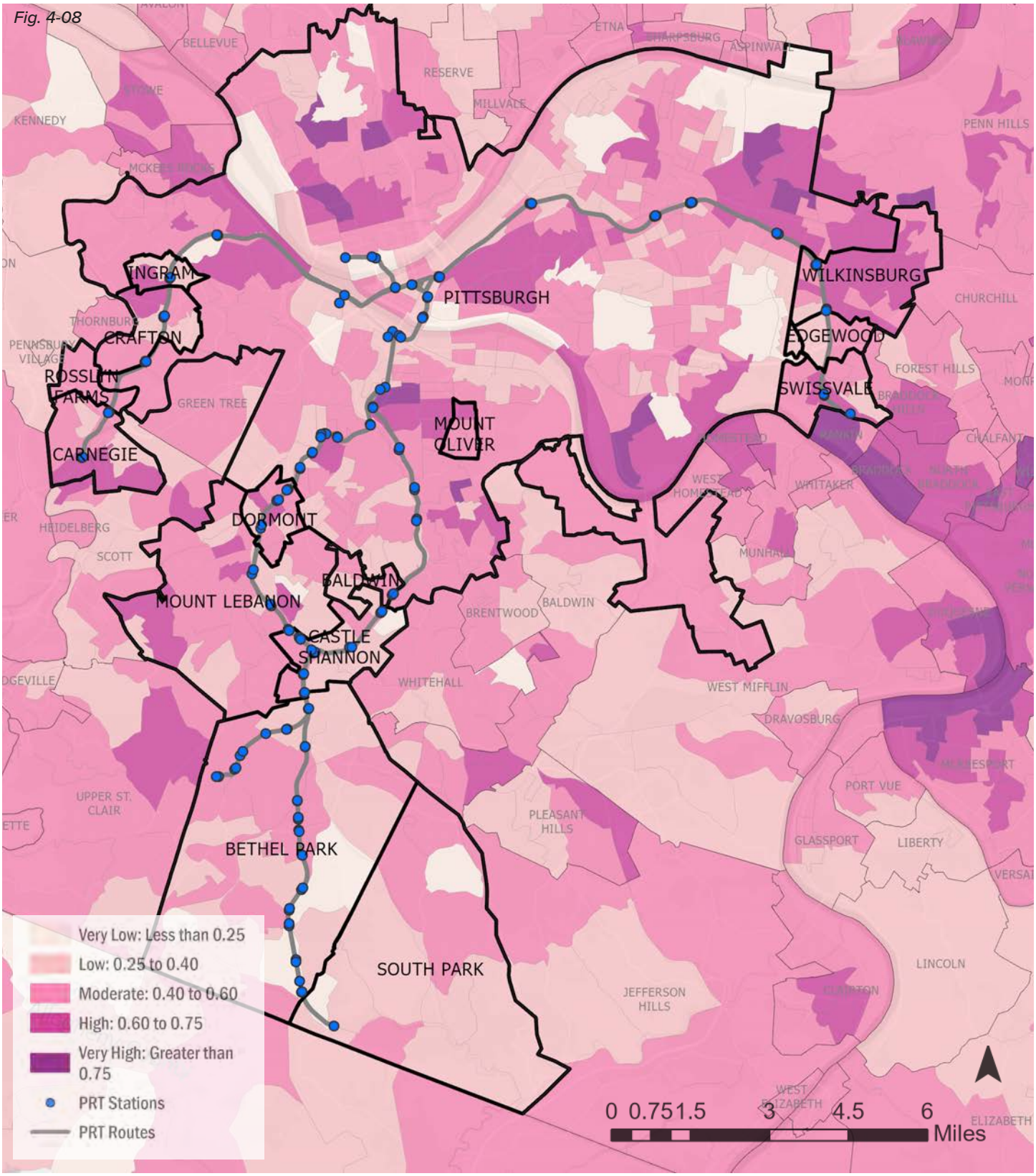
> *"I value a transit system that enhances the health of communities and the natural environment via its operations with regard to energy use, water use, raw material use, land use, and waste production."*[1]

Pittsburgh Regional Transit. (2021, September 16). NEXTransit: Long-range transportation plan [PDF]. Port Authority of Allegheny County. Page 16.

PRT INDEX OF TRANSIT NEED

This evaluation identifies areas with a higher portion of disadvantaged populations (low income households, minority race or ethnicity populations) or those who have greater mobility needs (households with older adults, persons with disabilities, or households without access to a vehicle). The analysis overlays these different factors to create an index score where darker shades indicate greater need.

Fig. 4-08

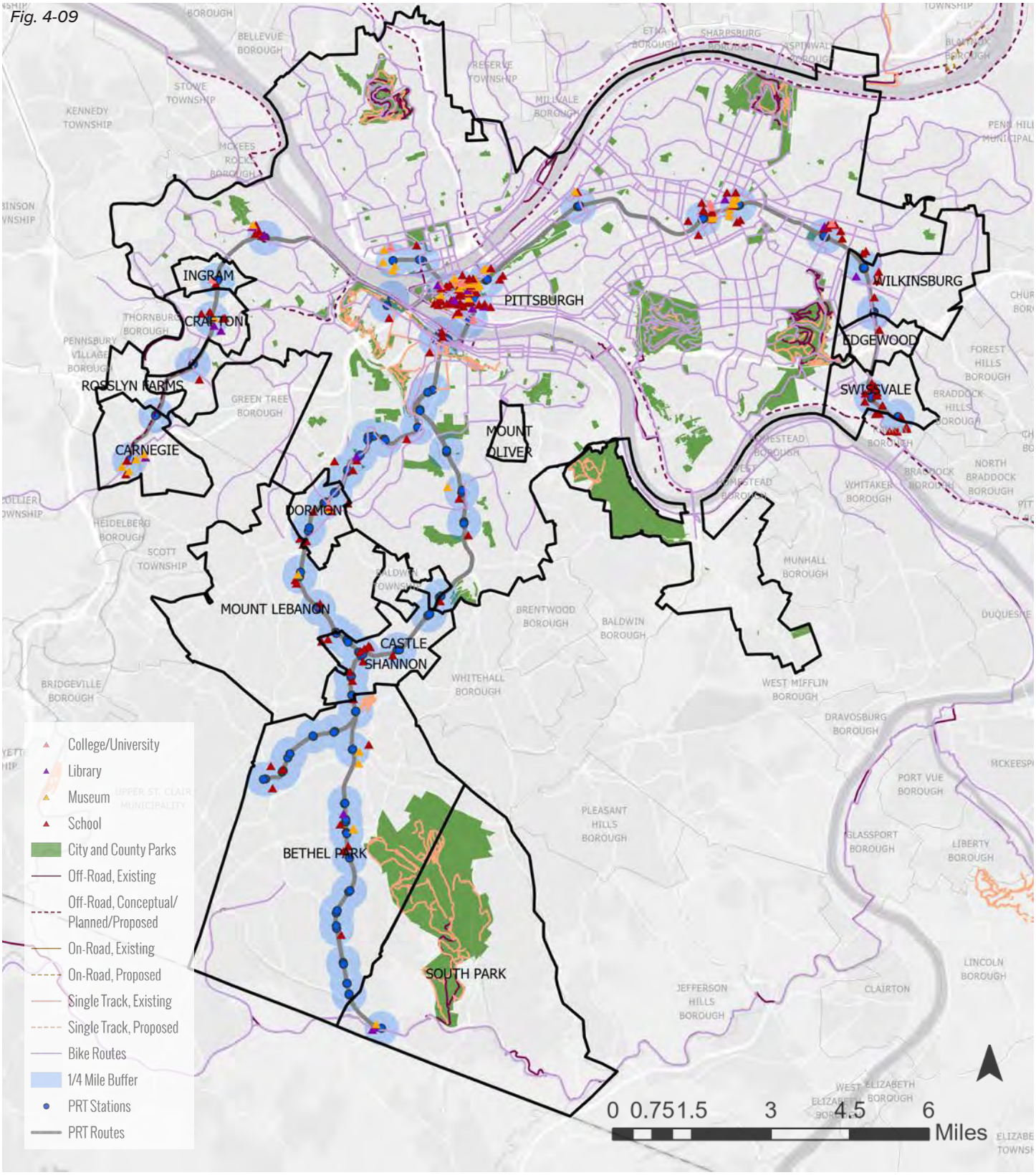


Data Source: PRT Open Data, Updated 2024

INSTITUTIONAL ANCHORS + PARK, NATURE, AND TRAIL ACCESS

Identifying nearby parks, trails, schools, and cultural institutions will help to determine where public landscape amenities might be most impactful. The map highlights these features, and when analyzed at the station level, such context can guide the type of landscape improvements and their programmatic offerings.

Fig. 4-09

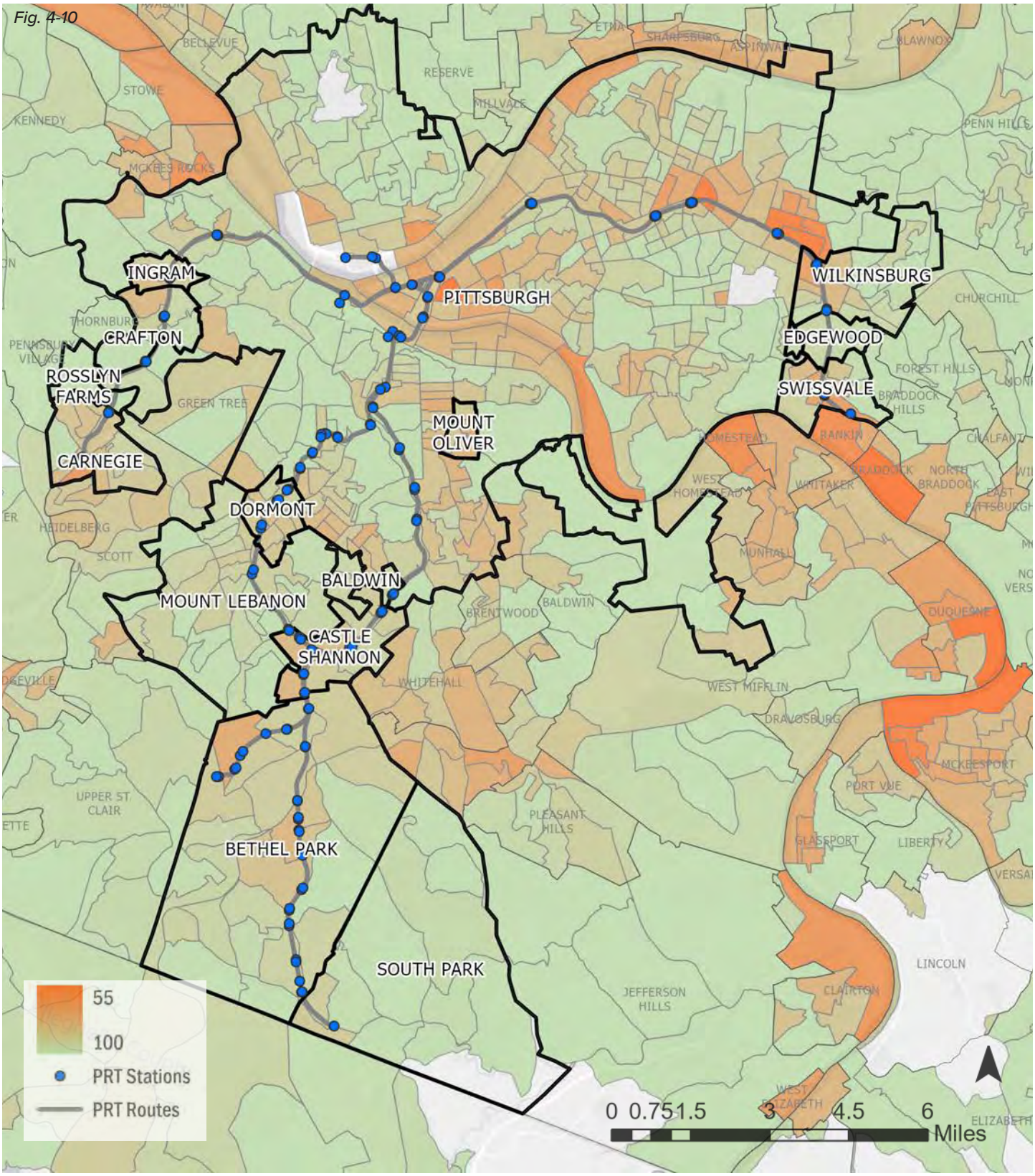


Data Source: Allegheny County Parks - Allegheny County Open Data, Pittsburgh Parks - City of Pittsburgh GIS Data Hub.

AMERICAN FORESTS' TREE EQUITY SCORE

The Tree Equity Score is a useful tool for determining where to plant trees–by integrating data such as tree canopy, building density, income, employment, race, health, and age–giving priority to areas where trees would create the greatest impact. Darker orange indicates a low Tree Equity Score, correlating to a higher need for additional tree canopy coverage.

Fig. 4-10

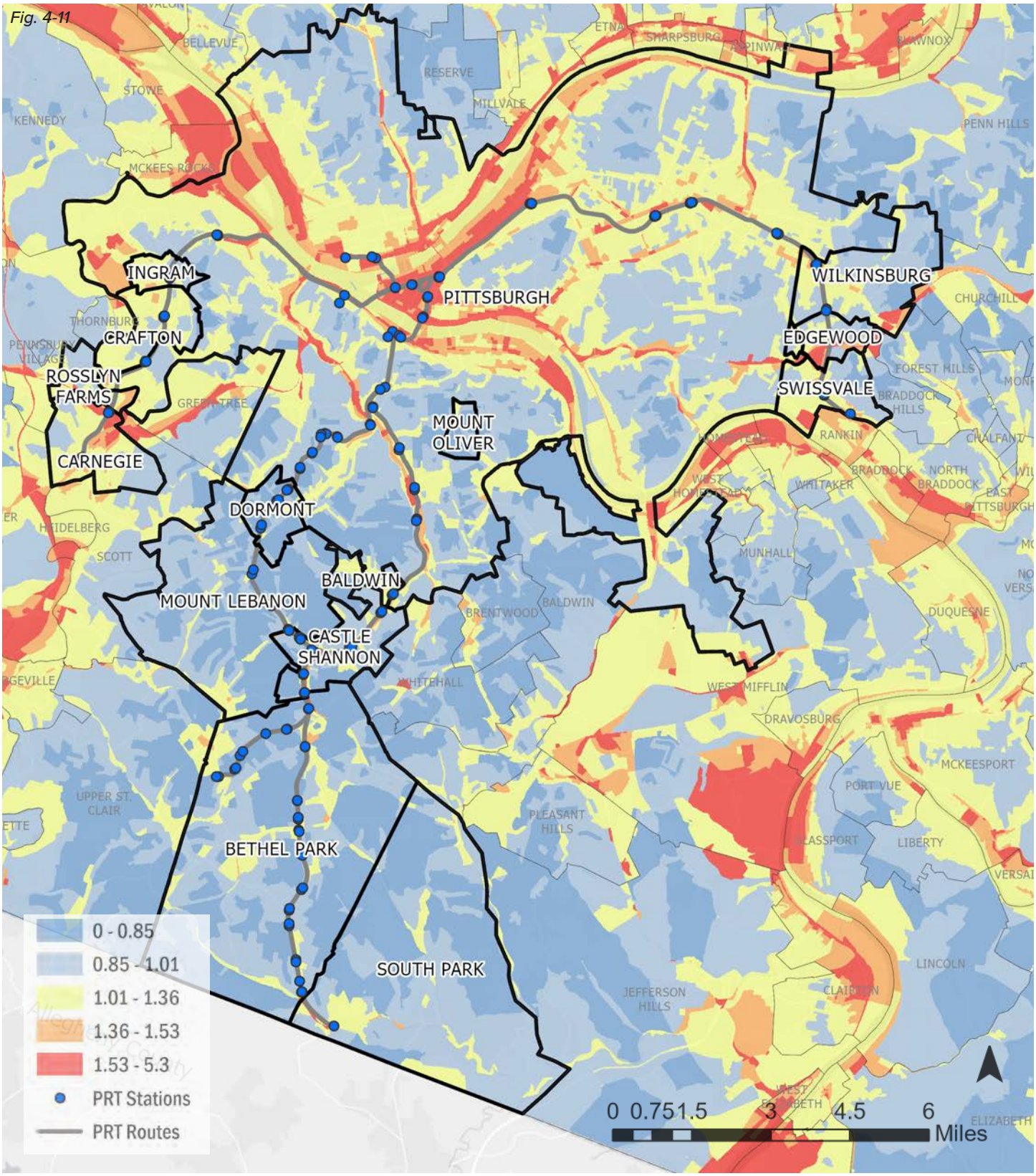


Data Source: www.treeequityscore.org

BLACK CARBON / AIR QUALITY

This analysis focuses on areas that have highest levels of air pollution, which can lead to negative health impacts and increased risk of health conditions like asthma, heart attacks, or lung cancer. Pollutants like black carbon - which is emitted from gasoline and diesel engines are found along many of PRT's transit lines.

Fig. 4-11

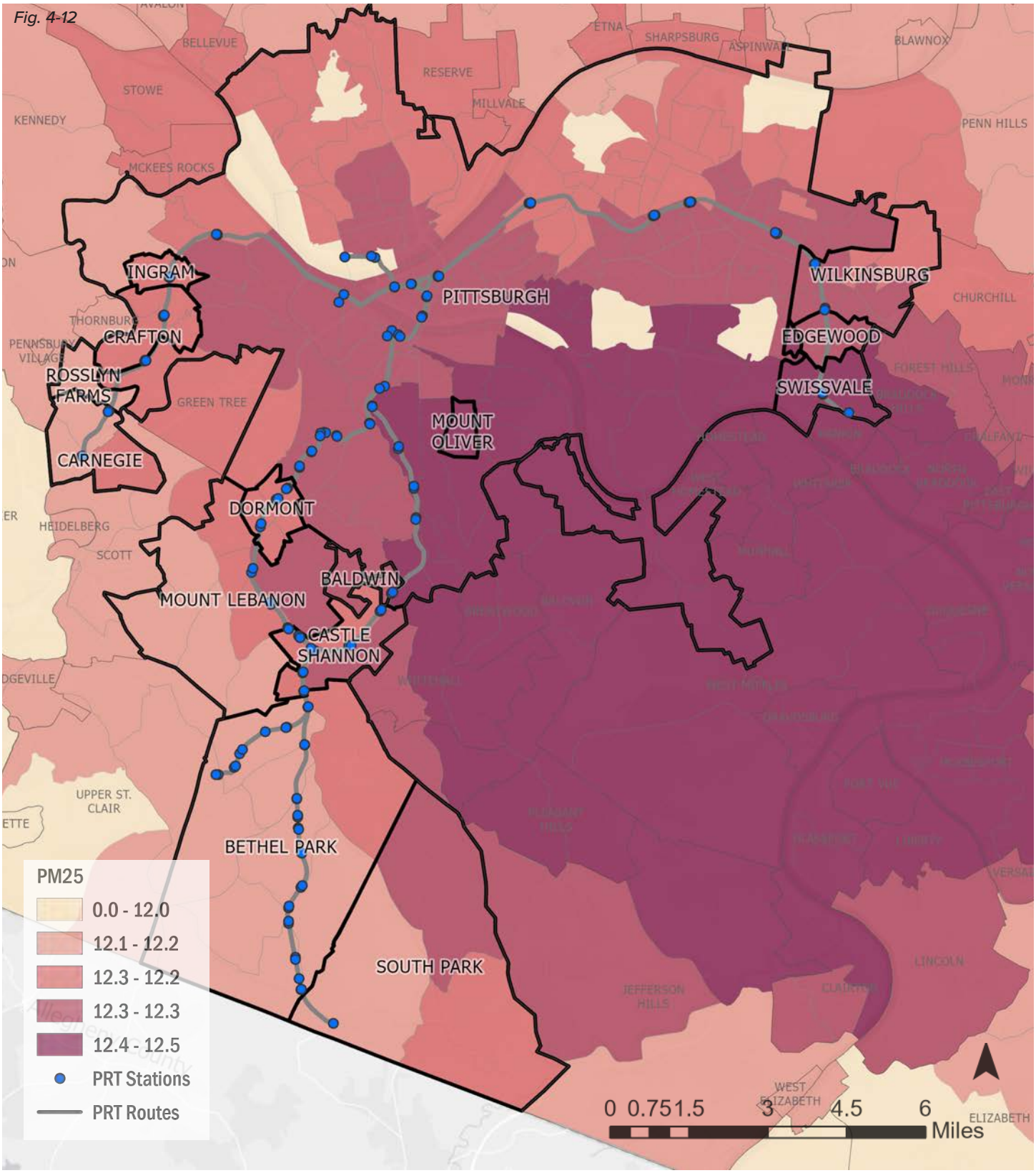


Data Source: Data provided by The Breathe Project, an organization working to improve air quality and eliminate carbon pollution in Pittsburgh, Southwestern PA, and beyond.

PARTICULATE MATTER

Fine particulate matter, or PM2.5 is an air pollutant that can be highly dangerous for animals and humans, as the finer particles can be absorbed into the bloodstream upon inhalation. This pollutant poses the greatest health threat, particularly for people over 65 or children with lung and cardiovascular diseases.

Fig. 4-12



Data Source: Data provided by The Breathe Project, an organization working to improve air quality and eliminate carbon pollution in Pittsburgh, Southwestern PA, and beyond.

FINDING THE RIGHT PARTNERS

PRT need not act alone in transforming its landscape portfolio into sustainable landscapes that are more resilient, more attractive, and easier to maintain at scale. The physical challenges that are present in PRT's portfolio are present throughout the region and have led to the creation of mission-driven non-profits that discretely address specific needs. PRT should actively build relationships with these organizations to understand how their capabilities and missions align with the specific challenges that PRT faces.

Watershed Partners

There are watershed organizations throughout the region with the capacity to either advocate for, implement, or maintain green stormwater infrastructure to improve water quality and reduce flooding impacts. Two of the largest watershed organizations are **Upstream**, which is focused primarily on watersheds in communities served by PRT's Martin Luther King Jr. East Busway, and **Watersheds of South Pittsburgh**, which is focused primarily on watersheds in communities served by PRT's Red and Blue light rail lines.

At a minimum, partnerships with these organizations can enable PRT to better coordinate with institutional and local stakeholders by tapping into their networks. Additionally, watershed organizations can help PRT to identify supporting sources for funding and financing which can enable PRT to implement higher-quality landscaping strategies that support stormwater management goals.

Ecological and Stewardship Partners

Organizations focused on the quality of local ecology or carbon reduction progress, like **Sustainable Pittsburgh,** can support PRT by providing technical assistance or could implement their own projects on PRT-owned land. **Tree Pittsburgh** is a non-profit that has a reforestation program to plant trees in areas impacted by invasive species, illegal dumping, or disruption from development activity. Outside of PRT's station areas, an organization like Tree Pittsburgh could reforest non-occupiable areas that are currently mowed by PRT staff.

Other organizations, such as a neighborhood group, may have an interest in the implementation of pilot projects or providing stewardship of specific sites. In Bethel Park, local organizations have implemented the **Trolley Beautification Project** at sites along PRT's Silver Line. In the future, similar initiatives could consult PRT's *Landscape Design Guidelines* for the appropriate strategies and plant lists.

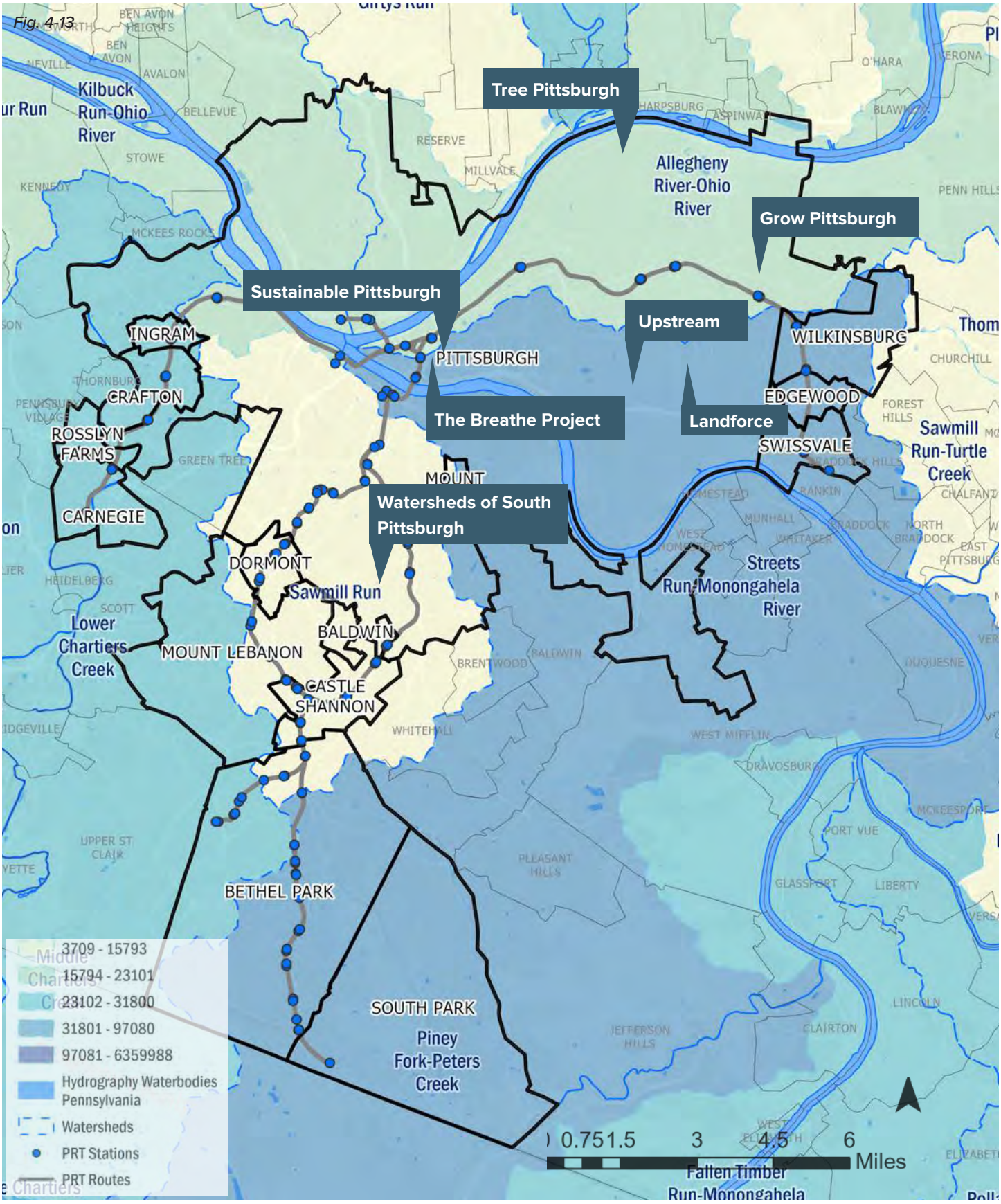
Land-Owning Partners

Throughout PRT's real estate portfolio are parcels on steep slopes, often wooded, that are unlikely to be developed or serve a future transit use. Those sites are exposed to risks such as illegal dumping and ecological disruption due to invasive species. PRT could identify appropriate organizations to divest these parcels to, such as a municipality or land trust. Parcels adjoining a municipal or county park could be appended as part of those parks, transferring the maintenance responsibilities and risks to the park owner. Within the **City of Pittsburgh**, parcels proximal to a city-designated greenway could be transferred to the City and appended to the greenway, similarly transferring maintenance responsibilities and risks to the City and enabling a local neighborhood organization to steward that land through the City's **Greenways for Pittsburgh** program.

An example could be some of the steep slopes that PRT owns near Herron Station, which could be appended to the City of Pittsburgh's Bigelow Greenway. Land trusts such as the **Western Pennsylvania Conservancy**, **Allegheny Land Trust**, and others could be interested in permanently conserving excess land from PRT's portfolio, allowing it to be a regional ecological asset in perpetuity. Land trusts can also assist in the transfer of property from one entity to another, supporting the transaction with their technical assistance and capacity.

WATERSHEDS AND REGIONAL PARTNERS

Fig. 4-13



Data Source: Hydrography Waterbodies, Watersheds - Allegheny County GIS Open Data

CHAPTER 5

RECOMMENDATIONS

Fig. 5-01 *Hydrangea quercifolia, Oakleaf Hydrangea - Photo by evolveEA*

5. RECOMMENDATIONS

ADMINISTRATIVE RECOMMENDATIONS

Many of the landscape strategies and recommendations described in these Landscape Design Guidelines are intended to reduce maintenance tasks that are unsafe for maintenance crews, or those that are harmful to the environment. These are also intended to improve the climate performance of these landscapes from a sustainability perspective. However, transitioning to alternative types of landscapes will not be maintenance free. Thus, it is important to identify ways in which PRT might achieve this new standard of care for its landscapes.

CONSULTANT PROCUREMENT

An **Operations and Maintenance Manual** should be prepared as part of all Design and Engineering Consultant Contracts. The development of these manuals will provide PRT formal opportunities to help guide maintenance and operations assumptions during the design process and provide a roadmap for long term landscape stewardship following construction. This document should be responsive to PRT's standards of practice and address adaptive management needs and routine maintenance and operations requirements and schedules. The preparation of this deliverable document should be clearly requested within scopes of work and the revised language of legal agreements.

A **Qualifications-Based Selection Process** will also enable PRT to select consultant teams that are best suited to fulfill all aspects of the contract requirements. Formal qualifications to consider include State of PA Professional Landscape Architect Licensure, ISI Envision Sustainability Professional Certification, National Green Infrastructure Certification through the Ecological Landscape Alliance, and American Institute of Certified Planners (AICP). Often this will encourage more efficient project delivery and reduce the potential for unforeseen life-cycle costs. Ultimately this procurement approach will afford PRT the greatest control over contracting and allow PRT to develop specific selection criteria that are tailored to each contract to balance project costs with other significant priorities.

ASSET MANAGEMENT SYSTEM

It is recommended that PRT consider the use of an asset management database, that would allow PRT to track time, tasks, and location of maintenance tasks. This would then identify which sites or landscape conditions are requiring highest levels of attention or care and inform decision making for site improvements. These systems are powerful tools that are commonly used by asset managers and there are several trusted products and services available

commercially as well as the potential for PRT to develop a custom system. Further evaluation should be considered to determine if asset management tracking as suggested above can be integrated with the existing FIXX system.

The benefits of an Asset Management System include more efficient scheduling and accounting, generating data and reports that can be used for securing funding opportunities and adaptive management decision making, improved communication with decentralized field staff, and the maintenance of data quality.

Indian-grass River Grassland occurs on sand/gravel deposits and broad cobble/boulder shores along the banks of large rivers.

PILOT PROJECT

A pilot project was suggested as a way to test some of the landscape strategies, both from design and implementation, but also maintenance requirements. Allowing maintenance crews to test and learn about these alternative landscapes and their maintenance requirements in a less-visible location will create momentum and further buy-in for future implementation.

POTENTIAL SITES

Through conversations with PRT staff, we have identified the following locations as candidates for a pilot project:

- **Homewood Station** - The landscape around Homewood Station includes a large area with pathways, stairs, and ramps that are currently mowed grass with a few trees. Railings, light posts, trees, and steep slopes make mowing and maintaining this station challenging. Nearby, along Finance Street, PRT is working in partnership with Tree Pittsburgh to plant trees along the steep slope between Finance Street and the Martin Luther King Jr. East Busway.
- **Negley Station** - As a station that has recently undergone site improvements and still retains areas of lawn, particularly on steep slopes, Negley could be a strong candidate for testing the transition away from mowing on steep slopes.
- **South Hills Junction** - PRT's South Hills Junction complex includes a series of maintenance facilities, parking lots, outdoor storage areas, a segment of the South Busway, a segment of the RED, BLUE, and SILVER light rail lines, layover facilities for buses and light rail vehicles, and stations for buses and light rail vehicles. There are steep slopes, mowed lawns, and other landscapes throughout this property, some of which require substantial effort to maintain. In particular, there is a steep slope between the outdoor rail-tie storage area and the connection to Warrington Avenue.
- **Washington Junction** - This station has many of the landscape conditions identified in these guidelines, including large areas of mown lawn, steep slopes, and parking lot. As a Park and Ride with a high utilization rate, it is a strong candidate for landscape improvements.
- **Glenbury Station** - The hillside behind this station at the start of the South Busway is a good site for testing some of the landscape strategies applicable to steep slopes.

SHORT, MEDIUM, AND LONG TERM INTERVENTIONS

Short Term

Short term interventions should be focused on the implementation of easily achievable strategies that will have the biggest impact on reducing maintenance efforts. These opportunities are primarily related to the conversion of mowed lawn areas, which currently comprise one of the most significant maintenance efforts during the growing season.

Transitioning mowed lawn areas on slopes in particular will help to improve the efficiency and reduce the level of effort for maintenance efforts. **Seeding Meadow Mix**, **No - Mow Grasses**, and **Low Woody Shrub Planting** are all strategies that can be implemented on a short timeline.

Planning efforts for the implementation of mid and long-term strategies should also be considered in the near term. When future project priorities are established early, they can be strategically funded and more effectively delivered.

Medium Term

Medium term goals will include efforts that are identified early on as high priorities but may require some time to initiate. These investments will target opportunities for improvements where the long-term benefits will increase with a shorter implementation timeline. This includes transitioning larger areas at the edges of existing lawn to successional Native Planting areas such as **Layered Woodland** and **Hedge Thicket**. These strategies can be combined with **Invasive Species Management** and **Forest Rehabilitation** at the edge of existing woodlands and along railway corridors. These investments will be well suited to reduce overall area of mowing while also buffering more public facing landscapes from invasive weeds in the future.

Small-scale **Traffic Calming** and **Public Amenity** improvements should also be considered for medium-term investments. These strategies will help support public safety and wellbeing, while also providing opportunities to grow relationships with stakeholders and advocacy organizations.

Long Term

Long term goals include opportunities for transformational projects that implement full scale design guidelines through new station design and large-scale station improvement projects. These efforts will layer several benefits to maximize the performance of the PRT landscape. Through these projects, several strategies can be realized, including **Green Stormwater Infrastructure**, **Slope Stabilization**, and **Riparian Zone Restoration**, which benefit most from being integrated with additional design and planning efforts. Priorities that are addressed in the long term have the greatest potential for advancing several PRT goals and objectives within a single project.

Fig. 5-03

Converting lawn to no-mow or meadow areas reduces maintenance and supports long-term landscape goals.

MAINTENANCE RECOMMENDATIONS

Many of the landscape strategies and recommendations described in these Landscape Design Guidelines are intended to reduce maintenance tasks that are unsafe for maintenance crews, or those that are harmful to the environment. However, transitioning to alternative types of landscapes will not be maintenance free. Thus, it is important to identify ways in which PRT might achieve this new standard of care for its landscapes.

Native landscapes, lawns, and stormwater infrastructure each have distinct maintenance needs that support their function and longevity. Native landscapes require periodic weeding, especially during establishment, to control invasive species and prevent encroachment by aggressive weeds; once mature, they need minimal inputs beyond annual mowing or cutting to simulate natural disturbance. Lawns, by contrast, demand more frequent care, including regular mowing, fertilization, weed control, and often irrigation to maintain a uniform appearance. Stormwater infrastructure such as rain gardens, bioswales, and retention basins must be routinely inspected and maintained to ensure proper flow and infiltration; this includes removing sediment and debris, managing vegetation to prevent clogging, and repairing erosion or structural damage. Together, these practices help maintain ecological function, aesthetic quality, and regulatory compliance.

The following maintenance recommendations may be referred to for guidance on each of the proposed landscaping strategies covered within this document.

STREET TREES

Spring	▪ Remove mulch from trunk flare and refresh mulch rings to a 2–4” depth, keeping clear of bark; ▪ Prune dead, damaged, or structurally weak branches before leaf-out; ▪ Inspect for pest/disease pressure as leaves emerge and treat only if necessary; ▪ Re-stake and adjust ties if still required; remove staking materials after first or second year if tree is stable.
Summer	▪ Deep water trees during extended dry periods (especially trees <5 years post-planting). This can be accomplished with traditional irrigation and/or through passive watering technologies such as Treegator watering bags or hydration rings, which slow releases water over an extended period; ▪ Monitor for signs of stress (e.g., leaf scorch, wilt, early color change); ▪ Control invasive vines and weeds at the base of trees manually or chemically.
Fall	▪ Perform structural pruning after leaf drop; ▪ Plant new/replacement trees during dormancy (October–November). Alternatively, replacement trees can be planted in the spring (April-May), but fall plantings typically have a higher rate of success; ▪ Install deer protection or trunk guards as needed; ▪ Apply slow-release fertilizer in areas with degraded or compromised soil and/or compacted soils.
Annual / As-Needed	▪ Inspect trees for structural hazards or limb failure risk after major storm events; ▪ Remove or replace guards or stakes if damaged.

TALL GRASS MEADOW

Spring

- Mow meadow landscapes to a height of 6–12” in early spring before active growth (March-April);
- Rotate mowing every 3–5 years to prevent woody encroachment and maintain species diversity, avoiding more than 1/3 of the total area per season;
- Remove excess clippings to reduce nutrient buildup and expose soil to sunlight;
- Apply pre-emergent herbicide in March if invasive grasses or annuals are a recurring issue.

Summer

- Monitor for weed pressure, particularly from warm-season invasives like Johnson grass (Sorghum halepense) or Canada thistle (Cirsium arvense);
- Spot-mow or weed-whack patches of invasive vegetation before seed set as this reduces spread and size of the available seed bank for invasive species.

Fall

- Spot treat invasive vegetation with systemic herbicide (e.g., glyphosate or triclopyr) before frost, typically in late October and as plants are heading into their dormant state;
- Seed bare or disturbed areas with appropriate native grasses and forbs; delay seeding at least one week after herbicide application;
- Plant plug replacements or add structural elements like native shrubs if desired.

Annual / As-Needed

- Conduct visual inspection during growing season to identify invasive plants and vegetative dieback;
- Avoid nutrient or irrigation inputs except during establishment;
- Order/restock landscape maintenance supplies as needed;
- Maintain signage or barriers to prevent mowing or trampling by maintenance crews or public.

Fig. 5-04

SHRUB THICKET/WOODY GROUND COVER

Spring	▪ Prune damaged or dead wood from woody plants after winter dieback or after bloom (i.e., once flowers have wilted and/or faded). Lightly shear or shape plants to encourage dense growth and control spread; ▪ Apply pre-emergent herbicide or mulch to reduce early weed competition. Mulch around base of shrubs if establishing new thickets to suppress weeds; ▪ Inspect and repair any protective fencing or deer exclusion measures.
Summer	▪ Deep water trees during extended dry periods (especially trees <5 years post-planting). This can be accomplished with traditional irrigation and/or through passive watering technologies such as Treegator watering bags or hydration rings, which slow releases water over an extended period.
Fall	▪ Replant or gap-fill with additional plugs or divisions to maintain ground cover continuity; leaf mulch is optimal if establishing a planting bed using plugs; ▪ Inspect for and remove invasive species through mechanical or chemical treatment; ▪ Plant replacement shrubs and install deer fencing or cages at time of planting.
Annual / As-Needed	▪ Monitor for die-off or bare spots and address as needed through supplemental planting; ▪ Maintain clearances along paths or structures by trimming growth that extends beyond bounds; ▪ Inspect for erosion on slopes and apply soil stabilization measures if needed; ▪ Remove dead or declining stems to maintain structure and promote vigor.

LAYERED WOODLAND

Spring	▪ Remove aggressive non-native vines and early sprouting invasives by hand-pulling or spot treating with herbicide (e.g., glyphosate or triclopyr); ▪ Conduct light pruning of shrubs or saplings after they have flowered (i.e., flowers have wilted and/or faded) to promote desired growth forms and allow light to understory; ▪ Refresh mulch only in critical access paths or erosion-prone areas, not across forest floor (i.e., avoid disturbing duff layer once established).
Summer	▪ Deep water trees during extended dry periods (especially trees <5 years post-planting). This can be accomplished with traditional irrigation and/or through passive watering technologies such as Treegator watering bags or hydration rings, which slow releases water over an extended period; ▪ Monitor forest edge and canopy gaps for invasive colonization; ▪ Control aggressive groundcover invasives such as Japanese stiltgrass (Microstegium vimineum) through mowing or herbicide treatment before seed set.
Fall	▪ Spot treat woody invasive vegetation using cut-stump or foliar herbicide; ▪ Install new or replacement native understory plantings and apply deer protection as needed; ▪ Collect and remove trash or debris, especially within urban woodlands.
Annual / As-Needed	▪ Conduct visual inspection for tree hazards (i.e., leaning trunks, hanging limbs) and remove if risk to safety and/or infrastructure. Allow snags and logs to remain where safe to support wildlife habitat.

DEER EXCLUSION MEASURES

Deer exclusion measures are critical to the success of ecological restoration projects, particularly in regions with high deer populations. Overbrowsing by deer can severely limit the survival and growth of native trees, shrubs, and understory plants, leading to delayed site establishment, reduced plant diversity, and increased vulnerability to invasive species. By implementing cost-effective exclusion methods—such as tree shelters, welded wire cages, or temporary fencing—restoration practitioners can protect young vegetation during its most vulnerable stages. These measures help ensure that native plantings reach maturity, enabling the restored landscape to provide long-term ecological benefits such as erosion control, habitat creation, and stormwater management.

Wire cages can be used to protect individual trees from deer damage.

TURF GRASS

Spring	▪ Apply pre-emergent herbicide in early spring to control annual weeds (e.g., crabgrass); ▪ Begin mowing once grass reaches 3–4”, maintaining a mowing height of ~3”; ▪ Test soil pH every 2–3 years and apply lime if needed.
Summer	▪ Mow as needed to maintain consistent height (typically 3-4”); avoid cutting more than 1/3 of grass blade at once; ▪ Water deeply and infrequently, preferably early in the morning; ▪ Monitor for pests, diseases, and drought stress, and address promptly.
Fall	▪ Core aerate compacted turf areas to improve water and nutrient infiltration; ▪ Apply fall fertilizer per soil test recommendations; ▪ Reseed or overseed as needed to increase turf density; ▪ Remove leaf litter and debris to prevent smothering.
Annual / As-Needed	▪ Maintain sharp mower blades and service equipment regularly; ▪ Adjust irrigation schedules based on weather and turf needs; ▪ Apply selective herbicides to control persistent broadleaf weeds; ▪ Inspect for and repair erosion or bare patches due to foot traffic or compaction.

GREEN STORMWATER INFRASTRUCTURE

Applicable GSI operations and maintenance (O&M) standards are outlined in the **City of Pittsburgh Stormwater Design Manual** (March 2022), which serves as the guiding document for design, implementation, and upkeep of GSI systems within the city. Adoption of these standards throughout the entirety of the PRT system provides an opportunity for PRT to "future proof" its stormwater infrastructure, potentially reducing the need for costly retrofitting and or replacement. O&M requirements for GSI are detailed in Appendix F of the City's design manual, including an example maintenance plan checklist, sample O&M plan, and task frequencies for GSI BMPs. This document should be consulted for specific guidance on O&M tasks and the associated frequencies tailored to each specific BMP type.

For GSI systems with a vegetated component (e.g., bioretention basins, green roofs, and bioswales), the following guidance offers both seasonal and as-needed maintenance recommendations that align with the landscaping strategies outlined in these guidelines.

Spring

- Inspect for plant dieback, erosion, or debris accumulation that may have occurred over the winter;
- Replace any damaged vegetation with appropriate native or site-specified species; establish planting beds using 4-6" of leaf mulch, especially if using plugs;
- Cut back dead stems from perennials and grasses to encourage new growth;
- Apply mulch as needed to suppress non-desirable plants (i.e., invasives) and retain moisture; avoid smothering base of plants;
- Inspect for and remove invasive species through mechanical or chemical treatment.

Summer

- Conduct inspections to assess plant health, check for pests/disease, and monitor for signs of drought stress;
- Water young plantings as needed during dry periods to ensure establishment; established plants generally require minimal watering;
- Continue to monitor and remove invasive species regularly, focusing on early removal before they establish and spread;
- Check for signs of erosion or sediment accumulation, especially after storms.

Fall

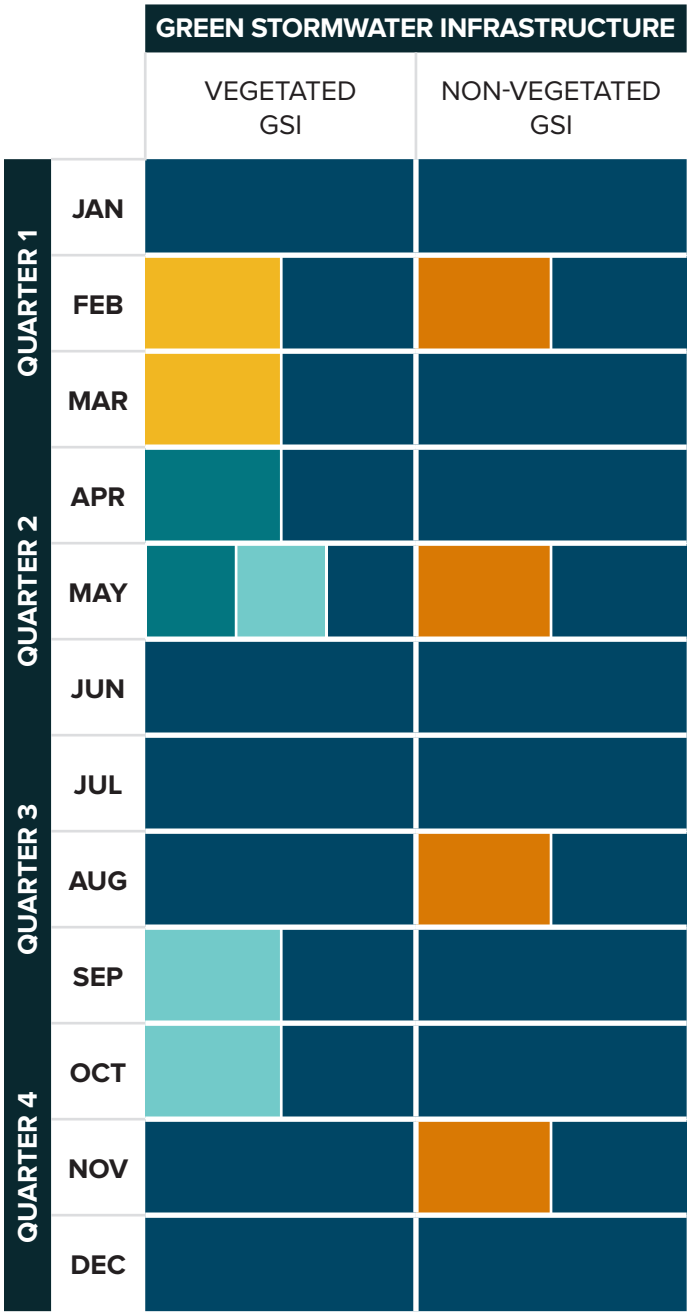
- Spot treat invasive vegetation with systemic herbicide (e.g., glyphosate or triclopyr) before frost, typically in late October and as plants are heading into their dormant state;
- Seed bare or disturbed areas with appropriate native grasses and forbs; delay seeding at least one week after herbicide application; if GSI is flashy (fast moving stormwater/runoff), plug plantings may be more appropriate rather than applying seed mix;
- Plant plug replacements or add structural elements like native shrubs if desired.

Annual / As-Needed

- Remove litter and debris that could block flow or damage vegetation;
- Stabilize any eroded areas immediately to prevent further damage;
- Address bare spots promptly to maintain continuous vegetative cover;
- Monitor for signs of pests or diseases and address with integrated pest management (IPM) approaches;
- If vegetation is impeding water flow or causing system malfunction, trim or adjust as necessary.

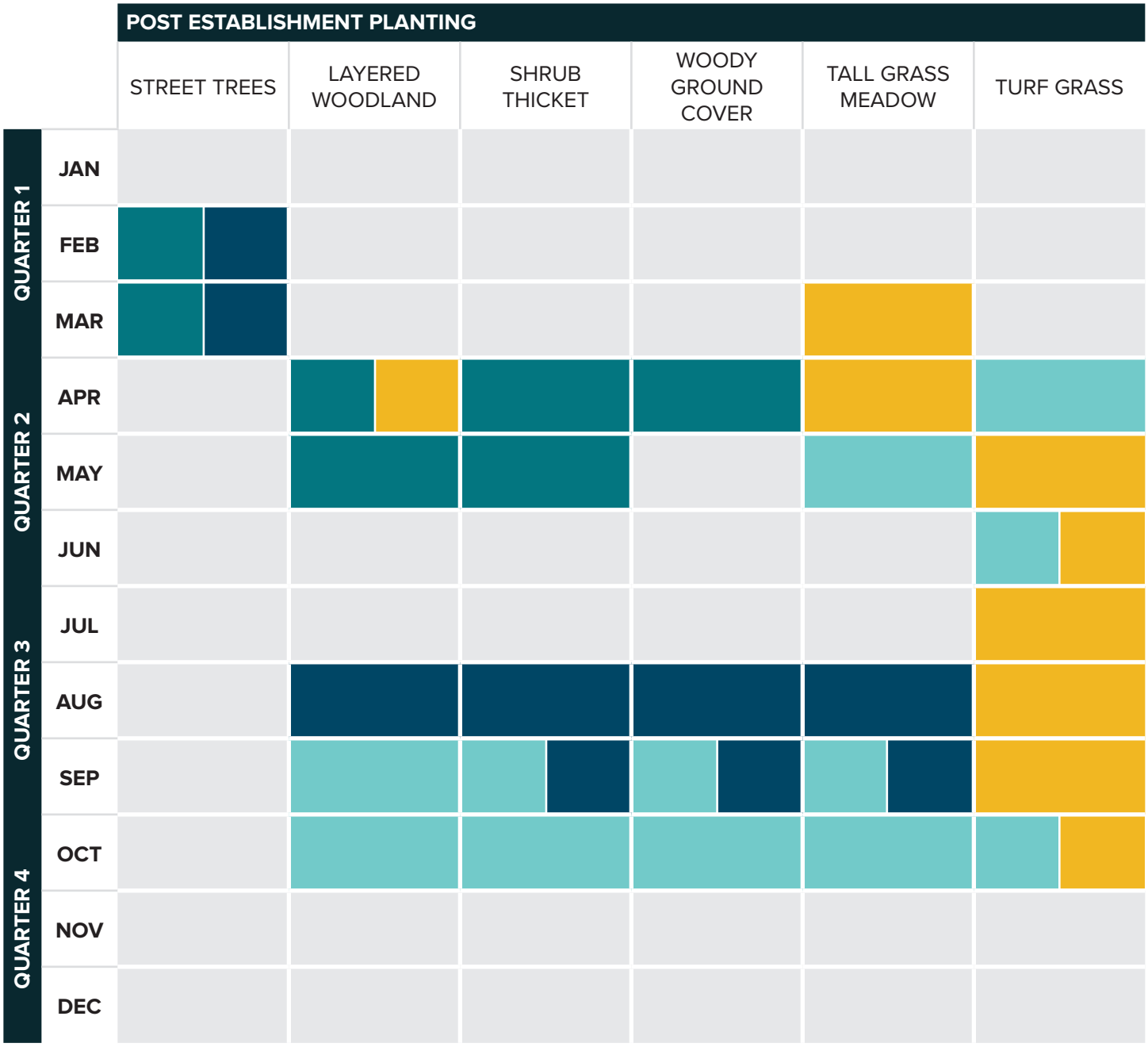
ROUTINE MAINTENANCE ACTIVITY WINDOWS

The table to the right provides a high-level overview of the typical maintenance requirements within a given year, including the general timing of activities, for the landscape strategies and GSI covered within this document. Activities shown include mowing, trimming, pruning, removal of dead wood, invasive species management, inspections, and sediment clean out. This chart not only helps provide an overview of routine maintenance activities but also provides a strategic planning tool for managing landscapes and GSI systemwide. It allows PRT to better anticipate resource needs and to optimize operations workflows. It highlights how different landscape typologies carry varying maintenance burdens, such as turf grass demanding frequent mowing, while native planting strategies offer greater levels of seasonal flexibility and generally lower long-term resource needs. This comparative insight allows PRT to make informed decisions about where to transition from high-maintenance to lower-maintenance plantings, improving ecological value, operational efficiency, and long-term sustainability across its system.



LEGEND

- PRUNING / REMOVE DEAD BRANCHES
- MOWING / TRIMMING
- INVASIVE SPECIES MANAGEMENT
- INSPECTION
- SEDIMENT CLEAN-OUT
- NO ACTIVITY


POST ESTABLISHMENT PLANTING
STREET TREES
LAYERED WOODLAND
SHRUB THICKET
WOODY GROUND COVER
TALL GRASS MEADOW
TURF GRASS
QUARTER 1
QUARTER 2
QUARTER 3
QUARTER 4
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

CAPACITY AND BUDGET

The landscape design guidelines are focused on sustaining, upgrading, and developing high value landscapes that improve the operational life of individual components and materials. They reduce long term maintenance efforts while also promoting higher efficiency climate responsive landscape strategies that align with PRT's Climate Sustainability goals. These goals can be achieved through the design guidelines where opportunities are identified to efficiently and strategically combine the benefits of multiple landscape performance requirements within each proposed intervention.

Designers should be mindful of this approach when considering the functional needs, service life, and maintenance requirements of proposed landscape design deliverables. The most effective projects will incorporate these analyses at the earliest planning stages, as new opportunities for creative implementation of elements that have the potential to address future capacity and budgetary needs will become more limited as the project advances.

BUILDING INTERNAL CAPACITY

Efforts to build internal capacity for landscape improvements and management are intended to create a balance between investment in training and hiring new staff and the implementation of strategic efficiencies to accomplish more with less. Two primary opportunities have been identified to help guide future landscape investment planning.

Planning For Reduced Long-Term Maintenance

Planning for reduced long-term maintenance is an opportunity based in the design guidance for new proposed landscape strategies and includes the potential to transition existing landscapes as well. The native planting strategies proposed in these guidelines are intended to reduce long term maintenance requirements by establishing low maintenance planting areas that are analogous to local native successional communities. The specific plant species associated with these communities have evolved over thousands of years to thrive in the existing soils and climate regime of western Pennsylvania. Once established, these lower maintenance planting strategies are expected to have a better ability to self-sustain within the landscape, requiring fewer maintenance inputs than non-native planting strategies.

Currently, the most common planted landscape cover type within the PRT system is turf grass, which is mowed on a five-week rotation during the growing season. While this planting strategy can provide value within some landscape areas, it is understood to cause a maintenance burden during the growing season, particularly along steep slopes (≥ 10%), within narrow constraints, and other locations that are challenging to mow.

Opportunities to replace turf grass and reduce the amount of turf grass planned for newly designed landscapes by installing lower maintenance native alternatives will reduce overall operations and maintenance costs. The relevant native planting strategies described within this guideline include **tall grass meadow, woody ground cover, hedge thicket, and successional layered woodland**. Each of these strategies will be appropriate in different locations depending on site specific conditions. Tall grass meadow is a particularly good substitution for replacing existing turf grass because the maintenance practice, mowing, is the same for both planting strategies; however the mowing frequency after establishment is less for tall grass meadows. The other recommended planting strategies may require some training and education to establish good pruning and weeding practices; however these planting strategies are also expected to reduce the overall long-term maintenance effort compared to turf grass, which can help offset any necessary short term investments in skill set development.

Contract Requirements

Another opportunity to help support landscape maintenance capacity and budget considerations is to review standard purchasing and construction contract requirements. This includes both the scope of work and the specification of landscape materials.

Contractor maintenance and warranty periods are common for the maintenance of plantings during the initial establishment period, typically 1-2 years. **Extending the construction contractor maintenance requirements** for newly installed landscape through a more complete period of plant establishment according to each planting strategy would help to reduce PRT maintenance efforts and afford PRT staff time to transition to potentially different types of maintenance activities. This approach will further allow for the selection of skilled subcontractors who specialize in the required plant maintenance activities. They can also perform the work more efficiently as well as reduce risk to PRT associated with potential plant failure due to plant nursery quality issues or unforeseen events, beyond what is covered within the plant warranty period.

Contract requirements should also be reviewed to **ensure high quality materials** are purchased and installed on PRT properties. In particular, soil, mulch, and seed products have a high potential to bring invasive weed species into the landscape, increasing maintenance needs. Specifying clean material will ensure that landscape maintenance activities being performed are effective and will reduce future maintenance needs. This consideration applies to construction contract specifications as well as purchasing agreements.

COSTING MODEL

The understanding of potential capacity and budget benefits associated with the recommendations of these deign guidelines is based on the understanding of current landscape maintenance efforts and capacity.

The vast majority of planting within PRT landscapes is turf grass which requires nearly the full capacity of maintenance staff to mow every 5 weeks during the growing season, May - October. This equates to mowing all turf grass areas 4-5 times annually. The recommended lower maintenance planting strategies require 2-3 maintenance activities each year, at most, following the establishment period. The difference represents a **reduction in the annual maintenance requirements of 25% - 60%**. For example, replacing turf grass areas with tall grass meadow plantings (mowing recommended only twice annually) would reduce the frequency of maintenance activities from 4 days per year to 2 days per year.

By refining quality controls during contracting and purchasing, materials costs are expected to rise. This will offset some of the benefits achieved by converting turf grass to alternative lower maintenance native planting strategies.

Extending plant establishment maintenance requirements for construction contractors will provide PRT with greater control over quality and allow for these maintenance costs to be planned in advance as part of a Capitol Improvements program. This allows for **advanced planning and fundraising opportunities while reducing annual operational expenditures**. In this way, the investment in improved landscape performance recommendations (and the resulting lower maintenance landscapes) can be aligned with other strategic financial goals.

Overall the landscape recommendations of these guidelines are not intended to result in increased total costs associated with operations and capital expenditures. The anticipated capacity and budget benefits include:

- Reduced maintenance effort;
- Enhanced rider experience;
- Environmental improvements.

APPENDIX

Fig. 6-01

KEY DEFINITIONS

Biodiversity: Refers to the variety of living species within a specific area, including plants, animals, bacteria and fungi.

Bioretention: Small vegetated landscape areas designed to filter or infiltrate stormwater runoff.

Bioswale: A shallow depression or channel designed to slow and convey runoff, while removing debris and pollutants.

Caliper: The trunk or diameter of a nursery tree.

Carbon Sequestration: In this document, carbon sequestration refers to the process by which carbon in the air is removed from the atmosphere and stored in vegetation such as trees and grasses, and soils.

Drought-tolerant: plants that can survive and thrive with minimal water, or withstand periods of drought.

DBH or Diameter at Breast Height: The measurement of a tree trunk diameter, which is taken at a height of 4.5' above the ground.

Deciduous: A tree that drops its leaves in the fall and winter.

Ecology: The study of the relationships between living organisms, including humans, and their physical environment.

Ecological Value, or **High Ecological Value**: Refers to landscapes or plant species that possess exceptional biological diversity, providing benefits to humans, insects, and other wildlife.

Evergreen: A plant or tree that retains green leaves throughout the year, even in winter.

Forest Rehabilitation: The process of restoring the structure of degraded or damaged forest ecosystems, returning a forest to a healthy state.

Green Stormwater Infrastructure (GSI): Landscape features, ranging in scale from large open spaces to individual plants, that provide functional benefit to human communities through biological and physical processes. GSI takes advantage of the capacities of soil and vegetation to absorb water and filter pollutants.

Invasive Species: A plant or animal that is not native to the region of Allegheny County—or living in areas where they do not naturally exist—and has the potential to cause harm to humans or other native plant communities. Invasive, or non-native species, have the potential to lead to the extinction of native plants and animals, destroy biodiversity, and permanently alter habitat.

Impermeable / Impervious: A surface, such as roofs or asphalt, concrete, brick or stone pavement where rain water flows as runoff over the surface and does not soak into the ground.

Landscaped Area: Area which is planted with purpose and intent.

Low Impact Development (LID): A stormwater management approach that aims to mimic natural runoff patterns and manage runoff as close to its source(s) as possible. It promotes the use of natural systems and processes for infiltration of rainwater.

Reforestation: The process of replanting an area with trees.

Riparian Restoration: the process of restoring the ecological health of the area where land meets a body of water such as creeks, rivers and streams. It involves reestablishing natural processes that naturally occur, improving water quality, reducing flooding, and providing habitat for wildlife.

Pervious / Porous / Permeable Surface: Surfaces which allow water to percolate into the soil, filtering pollutants and recharging underground water table. Turf grass and lawn should be considered only 10% pervious.

Right of Way (ROW): The routes and corridors owned by PRT for use by public transit (light rail and buses). This includes buffer areas such as shoulders that are required for maintenance and operations infrastructure.

Net Zero Canopy Loss: Refers to Pittsburgh City Code that requires any tree 12” or larger diameter that is removed for development be replaced with an equal number of caliper inches. For example, if (1) 20” tree is removed then (10) 2” caliper trees would be needed to replace it. If (2) 10” trees are removed, no replacement is required. Replacements are not required for trees removed for maintenance reasons.

Watershed: All of the land area that drains to a given stream or low point.

KEY COMPLIANCE STANDARDS

Compliance standards at the city, state, federal, and organizational levels shape how landscapes are integrated into the public realm. These regulations address key aspects of transit-related projects, including environmental performance, safety, and accessibility. Beyond mandatory requirements, organizational frameworks such as Envision emphasize sustainability, resilience, and long-term value, encouraging design approaches that extend beyond basic compliance. Together, these layers ensure that landscape strategies align with and enhance the operational, environmental, and community objectives of PRT.

The following subsections identify key city, state, federal, and organizational standards PRT should consider when implementing landscape strategies.

Pittsburgh Specific Standards/ Guidelines

City of Pittsburgh Department of Mobility and Infrastructure (DOMI)

City Specific Standards (City Specific Standards), including but not limited to the following:

- Accessible Design (2010 ADA Standards for Accessible Design)
- Bike Parking Design (Pittsburgh Bicycle Parking Guidelines (11-29-23))
- Complete Streets Policy (Complete Streets Policy (11 22 2016))
- Construction (Right-of-Way Procedures Manual (05 16 2023))
- Curbs (Curb Cut Specification for Off Street Parking)
- Electric Vehicle Charging Guidelines (EV_ROW_ Charging_Guidelines)

Complete Streets Policy

Integrating pedestrian, bicycle, and transit facilities into roadway projects (refer to DOMI).

Urban Forestry Standards

Guidelines for the planting, maintenance, and protection of trees within urban areas.

- ANSI A-300 Tree Maintenance Standards
- Pittsburgh Shade Tree Commission declaration of tree protection measures and standards (§ 487.02. DECLARATION OF POLICY., Chapter 487. PITTSBURGH SHADE TREE COMMISSION, Article XIII. TREES, Title FOUR. PUBLIC PLACES AND PROPERTY, Code of Ordinances, Pittsburgh)

Tree Pittsburgh “Zero Net Loss” Policy

Principle adopted by the City of Pittsburgh to maintain and grow its urban tree canopy by ensuring no net loss of trees occurs due to development or infrastructure projects. While Tree Pittsburgh itself is a nonprofit advocacy and education organization, the policy is embedded in city government practices and is supported by planning and permitting requirements.

- The goal is to replace every public tree removed with a new tree, at a 1:1 ratio at minimum—and often more if the removed tree was mature or had high ecological value.
- Replacement trees must be appropriate for the site, non-invasive, and approved species listed in the city’s Street Tree List or relevant urban forestry standards.
- Projects must submit a tree replacement plan as part of their permit process if public trees are impacted.
- Public Tree Removal Permits are required for any work that may remove or damage trees within the public right-of-way.
- For projects unable to plant trees on-site, off-site planting or in-lieu fees may be required to maintain canopy goals.

Historic Preservation Guidelines

If the project is within a historic district, ensuring compliance with local historic preservation standards.

- **Historic Review Commission (HRC)**: Any exterior work on properties located in City-designated Historic Districts requires approval from the HRC. This includes repairs, restorations, new construction, and demolitions (Historic Preservation - Pittsburgh, PA)
- **PreservePGH**: The Pittsburgh Cultural Heritage Plan guides the city's historic preservation efforts. It emphasizes maintaining the city's distinct character and culture while balancing tradition and innovation (Historic Preservation - Pittsburgh, PA)
- **City of Pittsburgh Code of Ordinances, Title 11**: This section of the code outlines the policies for preserving historic structures, districts, sites, and objects. It includes criteria for designation and guidelines for maintaining the historical integrity of these areas (City of Pittsburgh, PA Historic Preservation)
- **Historic District Design Guidelines**: These guidelines ensure that all locally-designated historic districts are governed by best practices for the treatment of historic structures. They meet the Pennsylvania State Historic Preservation Office's standards and reflect community input (Historic District Design Guidelines | Engage Pittsburgh)

Pennsylvania Standards/Guidelines

Right-of-Way Procedures Manual

Guidelines for construction and maintenance within public rights-of-way.

Environmental Protection Standards

Ensuring that landscape designs comply with local, state, and federal environmental regulations.

- Clean Water permits/allocations/Stormwater/Sewer/WQM: PADEP water quality permits, compliance measures, and reporting requirements (https://greenport.pa.gov/elibrary/GetFolder?FolderID=3664)
- Air Quality permits and reporting documentation (https://greenport.pa.gov/elibrary/GetFolder?FolderID=3623)
- PA DEP Applicable Rules and Regulations (https://www.pa.gov/agencies/dep/programs-and-services.html)

Stormwater Management Regulations

Ensuring that landscape designs incorporate features to manage stormwater runoff effectively.

- PADEP SWM requirements and standards https://www.pa.gov/agencies/dep/programs-and-services/water/clean-water/stormwater-management.html
- PADEP's Stormwater Best Management Practices (BMP) Manual provides guidelines for managing stormwater runoff. This includes the design and implementation of BMPs such as infiltration basins, rain gardens, and vegetated swales to manage stormwater on-site (Appendix-E-MfgProducts)
- Managed Release Concept (MRC): This design standard focuses on controlling the release rate of stormwater from BMPs to minimize downstream flooding and erosion. It includes specific design values and standards for BMPs, such as maximum ponding depth, media depth, and infiltration rates (MRC)

Erosion and Sediment Control

PADEP requires erosion and sediment control plans for construction activities. These plans must include measures to prevent soil erosion and manage sediment during and after construction

Vegetation and Landscaping

PADEP encourages the use of native vegetation in landscaping to promote biodiversity and reduce maintenance needs. This includes guidelines for re-vegetating disturbed areas and using plants that are well-suited to local conditions.

Site-Specific Standards

For projects that require remediation, PADEP's site-specific standards ensure that human health and environmental protection goals are met. This includes establishing background concentrations for contaminants and ensuring compliance with soil and groundwater cleanup standards (Subchapter D. Site-Specific Standard)

Federal Standards/Guidelines

ADA Standards for Accessible Design

Ensuring that all landscape features are accessible to individuals with disabilities.

- **Accessible Routes:** ADA Standards for Accessible Design be provided within the site, connecting accessible buildings, facilities, elements, and spaces. This includes ensuring that walkways, ramps, and curb cuts are designed to be accessible.
- **Parking and Passenger Loading Zones:** Standards specifying number and design of accessible parking spaces and passenger loading zones. These must be located on the shortest accessible route to the accessible entrance of the building or facility.
- **Outdoor Developed Areas:** The United States Access Board provides guidelines for outdoor developed areas, including trails, picnic and camping facilities, viewing areas, and beach access routes. (Chapter 10: Outdoor Developed Areas)
- **Signage:** Proper signage required to indicate accessible routes, entrances, and facilities. Signs must be designed to be easily readable and include Braille and raised characters where necessary.

Environmental Protection Standards

- The U.S. Army Corps of Engineers (USACE) regulates wetlands under Section 404 of the Clean Water Act. This regulation ensures that discharges of dredged or fill material into all waters of the United States, including wetlands, are authorized. USACE determines wetland boundaries using three main characteristics: vegetation, soil, and hydrology.
- The US Environmental Protection Agency (USEPA) regulates drinking water quality, air quality, waste management, and certain chemicals in the environment. Sets national standards with the state Department of Environmental Protection (DEP) to ensure compliance.

NEPA

National Environmental Policy Act (NEPA) compliance required when a project involves federal funding, permits, or approvals.

- FTA funding: If a project is financed in whole or in part by FTA (e.g., Capital Investment Grants, Section 5307 or 5339 funds), NEPA review is mandatory.
- Federal permits or approvals: If the project impacts wetlands, navigable waters, endangered species habitat, or cultural resources, triggering involvement from agencies like the U.S. Army Corps of Engineers or the U.S. Fish and Wildlife Service.
- Major capital projects: Large-scale undertakings such as new transit lines, transit centers, or significant facility upgrades often require Environmental Assessments (EAs) or Environmental Impact Statements (EISs).
- Property acquisition or displacement: If a project results in the relocation of residents or businesses, it often requires NEPA analysis and compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act.
- Categorical Exclusions (CEs): Many smaller projects (e.g., maintenance facilities, safety improvements, landscape upgrades) may still require documentation under NEPA through a CE determination

Organization Standards/Guidelines

Envision Standards

- **Quality of Life:** This category includes credits related to enhancing community well-being, mobility, and community development. Credits might focus on improving public health, increasing accessibility, and fostering community cohesion.
- **Leadership:** This category emphasizes collaboration, planning, and sustainability-focused governance. Credits in this category might include stakeholder engagement, long-term planning, and promoting economic prosperity.
- **Resource Allocation:** This category covers the efficient use of resources such as materials, energy, and water. Credits might focus on reducing material waste, improving energy efficiency, and conserving water resources.
- **Natural World:** This category focuses on protecting and restoring ecosystems and biodiversity. Credits might include siting projects to minimize environmental impact, conserving natural habitats, and enhancing ecological functions.
- **Climate and Resilience:** This category addresses climate impacts and ensures resilience to future challenges. Credits might focus on reducing greenhouse gas emissions, improving resilience to climate change, and preparing for natural disasters.

Performance metrics:

- Improved: Performance above conventional standards, slightly exceeding regulatory requirements.
- Enhanced: Indications that superior performance is within reach.
- Superior: Sustainable performance at a high level.
- Conserving: Performance with essentially zero negative impact.
- Restorative: Performance that restores natural or social systems

RESOURCES

The following resources were either used in the development of this document or may support further study of topics covered in the *Landscape Design Guidelines*. Resources are organized by subject area:

Depaving

- Park, K., Choi, D.-A., Tian, G., & Ewing, R. (2019). Not Parking Lots but Parks: A Joint Association of Parks and Transit Stations with Travel Behavior. International Journal of Environmental Research and Public Health, 16(4), 547. https://doi.org/10.3390/ijerph16040547

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- Climate Positive Design, Climate Positive Design Toolkit. (2023). https://climatepositivedesign.org/wp-content/uploads/2023/09/Climate-Positive-Design_Design-Toolkit.pdf
- City Parks Alliance, Nature Based Solutions for Managing Stormwater in Parks Opportunities to Create a Win-Win for Urban Resilience NATURE-BASED SOLUTIONS FOR MANAGING STORMWATER IN PARKS. (n.d.). https://cityparksalliance.org/wp-content/uploads/2023/05/Parks-and-Green-Stormwater-PolicyBrief-12-10-2024.pdf
- City of Pittsburgh (2022) Stormwater Design Manual, https://hdp-us-prod-app-pgh-engage-files.s3.us-west-2.amazonaws.com/9816/4804/2972/CITY_OF_PITTSBURGH_STORMWATER_DESIGN_MANUAL_v1_MARCH_2022.pdf

Invasive Species

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- Pennsylvania Department of Conservation and Natural Resources: Pesticide Programs. (2023). Pa.gov. https://www.pa.gov/agencies/pda/plants-land-water/plant-industry/pesticide-programs.html

Maintenance

- Pennsylvania Department of Transportation Bureau of Maintenance and Operations MAINTENANCE MANUAL PUB 23 (2025). Retrieved May 1, 2025, from https://www.pa.gov/content/dam/copapwp-pagov/en/penndot/documents/public/pubsforms/publications/pub-23/pub%2023.pdf
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- City of Tucson Storm to Shade Program, Green Stormwater Infrastructure (GSI) Maintenance: A Pocket Guide (2022). Retrieved from: https://drive.google.com/file/d/1Xztgru-RYfnMkYX8baR8zCi7uBEjBfho/view

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- Alliance for the Chesapeake Bay, DIY Lawn to Meadow Guide. (n.d.). Retrieved Mar 1, 2025, from https://www.allianceforthebay.org/wp-content/uploads/2023/09/DIY-Lawn-to-Meadow-Guide-Updated-Aug-2024.pdf
- Pennsylvania Department of Conservation and Natural Resources, (2025) Where to Buy Native Plants. Pa.gov. https://www.pa.gov/agencies/dcnr/conservation/wild-plants/landscaping-with-native-plants/buy-native-plants.html
- Prairie Nursery (n.d.) No Mow Lawn Seeding Instructions, from https://www.prairienursery.com/media/pdf/no-mow-seeding-instructions.pdf?srsltid=AfmBOorB_YuPGvPEf7CE83X7hDl6zZv2VsfvznGjzZWNeQLnQuhCREhf

Public Art

- Tebes, Jacob K. PhD, Matlin, Samantha L. et al, (2015) Porch Light Program: Final Evaluation Report. https://dbhids.org/wp-content/uploads/2016/01/Community_Mural-Arts_Porch-Light-Evaluation.pdf

Public Health

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Chapter 4 - Design Considerations

Fig. 4-01 evolveEA, (2025), Penstemon digitalis, Foxglove Beardtongue, evolveEA
Fig. 4-02 evolveEA, (2025), PRT Properties and Municipalities Map, evolveEA
Fig. 4-03 evolveEA, (2025), Topography and Steep Slopes Map, evolveEA
Fig. 4-04 evolveEA, (2025), Landslide Prone Areas Map, evolveEA
Fig. 4-05 evolveEA, (2025), Soil Map, evolveEA
Fig. 4-06 evolveEA, (2025), Tree Canopy Coverage Map, evolveEA
Fig. 4-07 evolveEA, (2025), Impervious Surfaces Map, evolveEA
Fig. 4-08 Pittsburgh Regional Transit / evolveEA, (2025), PRT Index of Transit Need Map, Pittsburgh Regional Transit
Fig. 4-09 evolveEA, (2025), Institutional Anchors Map, evolveEA
Fig. 4-10 American Forests / evolveEA, (2025), Tree Equity Score Map, evolveEA
Fig. 4-11 The Breathe Project / evolveEA, (2025), Black Carbon Map, evolveEA
Fig. 4-12 The Breathe Project / evolveEA, (2025), Particulate Matter Map, evolveEA
Fig. 4-13 evolveEA, (2025), Watersheds and Regional Partners Map, evolveEA

* All data used for the production of these maps is cited within Chapter 4.

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Appendix

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Maintenance Cards

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ENGAGEMENT SUMMARY

Below are detailed summaries of the focus group interviews.

Operations, Maintenance and Safety Focus Group Interview

The first interview was held January 22, 2025, with Operations, Maintenance and Safety teams.

Participants included:

- Andy Lukaszewicz - Deputy Chief Transportation Officer – Rail Operation
- Jake Cherevka - Director of Facility Systems
- Nate Delaney - Director of Track and Way
- Burt Jennings - Chief Safety Officer
- Shane Copeland - Bus Safety Officer, East Liberty + Ross
- John Taucher - Bus Safety Offer, West Mifflin

The primary goal of the interview was to understand the current operational challenges, maintenance capabilities, and safety considerations related to PRT properties, particularly concerning landscape design and maintenance. The five biggest takeaways from the discussion included: 1) Significant staffing and resource constraints impact current maintenance efforts, 2) The maintenance of new landscaping or beautification projects will require training and capacity-building in alternative maintenance practices, 3) Lack of internal capacity and specialized training may necessitate the need for contracting out landscape maintenance, particularly during the establishment phase, 4) There is precedent for partnerships or stakeholder involvement to share in the responsibilities of implementing and maintaining landscape improvements, and 5) Standardized designs and durable materials are crucial for long-term maintenance efficiency.

There are considerable challenges with current resources allocated to maintain all PRT stations and properties. Currently, an existing staff of eight team members – composed of three crew leaders and five track and facilities service people – are responsible for maintaining the entire system, including grass cutting, trash removal, and maintaining stormwater infrastructure like storm drains, scuppers, and retention ponds. Lawn areas are mown on a 5-week rotation, leaving little flexibility to handle unexpected tasks or additional maintenance burdens. Emergency maintenance requests such as fallen trees, or landslides, broken water mains, downed power lines, or utility leaks happen frequently and can easily disrupt the standing maintenance schedules. Many of the stations have steep slopes that are currently maintained as lawn, making mowing difficult and presenting safety issues, particularly for ride-on equipment.

There is currently no specialized horticultural training for landscape-related tasks such as proper planting, weeding, or plant identification. While staff are trained in safety and heavy equipment operations, they do not have the specific knowledge required for more detail-oriented plant care. There is concern over investing in specialized horticultural training, as long-term staff retention within a specific role can be difficult. Beautification efforts, though seen as important to increasing ridership and improving rider experience, are perceived as difficult to maintain, especially with current capacity. As such, any improvements to the landscape will require a different approach to long-term maintenance.

Currently, PRT holds few external contracts for landscape-related maintenance, including for weed spraying (a 3-year contract), and a contract for Environmental Protection Act (EPA) field sampling. Station Area Improvement contracts are structured so that landscape maintenance is the responsibility of the contractor for the first year, during which plants are guaranteed under warranty. Following the expiration of this contract, PRT is then responsible for maintenance. However, the timeline and transfer of responsibility was not immediately clear, leading to confusion about who is maintaining more recent site improvements such as Negley Station. Enhanced

communication and formalized protocols between project managers and maintenance crews regarding this transfer of responsibility should be made more clear. There is no Operations and Maintenance manual required as part of the contract.

Stakeholder involvement was noted as generally a positive factor in maintaining and beautifying some station areas, where neighbors or community groups have taken initiative to plant flowers or trees. While some are formal legal agreements, such as Tree Pittsburgh's involvement in planting and maintaining trees through establishment at Homewood Station along the East Busway – many are informal agreements, leading to confusion if the original agreeing parties move onto other roles.

Across the system, maintenance teams face a variety of challenges, including vandalism, illegal dumping or property line encroachment, particularly in economically disadvantaged areas or along rail lines running through residential backyards. Landscape maintenance equipment is stored at South Hills Junction Operational Facility – and seasonal equipment is rotated from Harmar Garage to South Hills Junction in spring and winter. All equipment currently runs on gas, and while teams are trying to use battery-operated equipment, they present difficulties in keeping batteries charged enough to complete work in timely manner.

Standardized designs and durable materials were emphasized as essential for long-term maintenance efficiency, as they are more resistant to vandalism and easier to maintain than wooden or less robust alternatives. Consistency in station design across different areas would also simplify maintenance and make it easier to address issues like plant identification and weeding.

Planning and Engineering Focus Group Interview

The second interview was held on January 30, 2025, with Planning and Engineering teams, providing critical insights into the operational, maintenance, and strategic challenges associated with landscape design within the transit system.

Participants included:

- Justin Baghat - Manager of Expansion
- Derek Dauphin - Director of Planning and Service Development
- Greg O'Hare - Chief Engineer
- Ryan Warsing - Director of Sustainability

Key takeaways from the discussion included 1) there is a need to bridge the gap between conceptual landscape planning and the practical realities of maintenance; 2) implementing landscape improvements will require a shift in internal culture and training programs to align with sustainability and operational feasibility; 3) external contractors possess the most potential in addressing maintenance constraints; 4) there is opportunity to integrate landscape design with broader sustainability goals of the Climate Action Plan, particularly carbon reduction.

One of the greatest challenges of designing landscapes that respond to community needs is ensuring they remain maintainable within existing operational constraints, with past experiences showing resistance to landscape features that appear to increase maintenance demands. There was a consensus that empowering teams with knowledge and structured policies could facilitate a culture shift toward more sustainable and manageable landscape solutions. Pragmatic and interim solutions, such as a pocket maintenance manual with plant identification and care guidelines, could serve as a practical tool for maintenance teams.

When asked about priority landscape maintenance needs, this group emphasized that high-traffic areas, such as stations with high ridership and park-and-rides, should be the focus, as they greatly impact rider experience and community perception. Some of the greatest challenges identified include stormwater runoff from PRT properties affecting adjacent neighborhoods and the difficulty of maintaining sloped areas.

While outsourcing maintenance holds potential to solve internal capacity restraints, this would require high-level decision-making and union negotiations. Contract-based solutions present additional complexities, including labor classifications, budget allocations, and broader institutional change.

Currently, specifications are written on a project-by-project basis by engineering consultants during construction documentation. There are no landscape standards to ensure consistency across station area improvements and improve the efficiency of long term planning.

Budget considerations remain a highest priority, and concerns about balancing capital investment with long-term operational costs, emphasizing the need for lifecycle cost analysis and sustainable long-term investment. While engineering teams prioritize essential infrastructure repairs, there was recognition that well-designed landscapes could yield long-term cost savings by reducing maintenance demands. The discussion concluded with a reflection on how landscape design can contribute to broader agency goals, including carbon reduction and resilience planning. There was also interest in fostering partnerships with external organizations, such as Tree Pittsburgh, to leverage additional resources for landscape implementation and stewardship.

Overall, the interviews underscored the need for a structured approach to landscape design that aligns with operational realities, financial constraints, and sustainability objectives. Moving forward, the team will need to navigate the balance between innovation and practicality while ensuring that the proposed guidelines are adaptable, maintainable, and supported at all levels of the organization.

MAINTENANCE CARDS

COMMON INVASIVE WEEDS


Common mugwort


Beggarticks

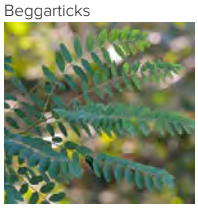

Goosefoot


Yellow nutsedge


Jimsonweed


Smooth crabgrass


Knotweed


Black locust


Common Reed

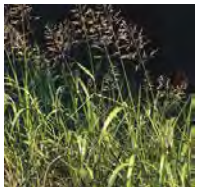

Pennsylvania Smartweed


Common groundsel


Green foxtail

NATIVE PLANT PALETTE


Common milkweed


Purpletop


Little bluestem


Switchgrass


Beardtongue


Goldenrod

FRONT OF CARD

MAINTENANCE CARD
TALL GRASS MEADOW

ANNUAL MOWING

Mow the prior year's residual herbaceous growth to 4-6". Mow any wet areas when the ground is frozen. Use a flail or rotary-style mower that chops dead growth.

String trim areas inaccessible to the mower (around tree trunks, shrubs, rocks, etc.). Take care around trees and shrubs to avoid wounding stems and trunks. Leave cut material as it returns organic matter and nutrients to the soil.

Any thick accumulations that remain to the point where soil cannot be observed should be dispersed evenly over the site or removed.

MONITOR / CONTROL WEEDS

Identify common weed species and note type and location. Beware of pulling weeds as it can disturb meadow seedlings and may lead to germination of weeds seeds.

Report and Conduct follow up treatment as needed.

RAKE / BLOW / MULCH

Rake or blow off thick fall leaf deposits after trees shed their leaves, as needed.

Mulch difficult to remove piles of leaf litter using a mulching mower and leave in place. Remaining thick deposits of mulch should be evenly dispersed.

Equipment Checklist:
- ☐ Flagging / Stakes
- ☐ Herbicide
- ☐ Mower
- ☐ String Trimmer
- ☐ Rake / blower

Activity Checklist:
- ☐ Inspection
- ☐ Mowing
- ☐ Trimming
- ☐ Raking / Blowing

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Regular Activity

"As-needed" Activity

Pittsburgh Regional Transit

BACK OF CARD


Rhus aromatica 'gro-low' at Negly Station

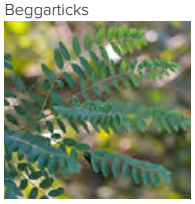
COMMON INVASIVE WEEDS


Common mugwort


Beggarticks


Goosefoot


Knotweed


Black locust


Bittersweet


Tree of heaven


Crown-vetch


Mile-a-minute

FRONT OF CARD

MAINTENANCE CARD
WOODY GROUNDCOVER & SHRUB THICKET

ANNUAL PRUNING

Prune to remove dead branches and encourage healthy growth prior to the start of new seasonal growth. If necessary to prune outside of this window, avoid pruning from late summer to early winter which could encourage new growth at the wrong time of year.

String trim undesireable low woody vegetation that may be encroaching on adjacent areas such as sidewalks and plazas. For larger material that cannot be removed with a string trimmer, use hand pruners, loppers, hedge clippers or a brush cutter as appropriate

INVASIVE SPECIES MANAGEMENT

Handpull invasive weeds, by removing the entire plant from the root and disposing at an approved off-site location.

HERBICDE applications should be considered when weeds are growing in larger continuous areas

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

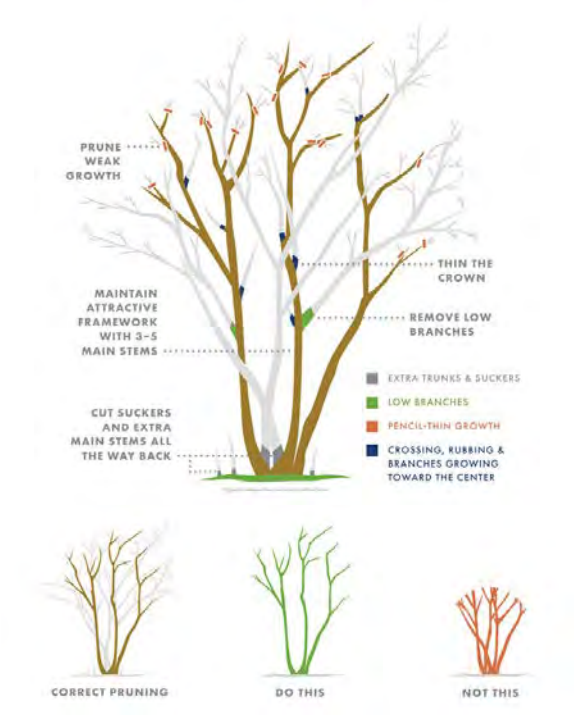
Equipment Checklist:
- ☐ Flagging / Stakes
- ☐ Sheers / Lopper
- ☐ String Trimmer
- ☐ Herbicide

Activity Checklist:
- ☐ Inspection
- ☐ Pruning
- ☐ Trimming
- ☐ Handpulling
- ☐ Herbicide application

Regular Activity
"As-needed" Activity

PRT
Pittsburgh Regional Transit

BACK OF CARD



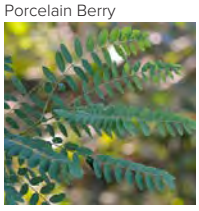
COMMON INVASIVE WEEDS


Stiltgrass


Porcelain Berry


Norway maple


Privet


Black locust


Autumn olive


Tree of heaven


Crown-vetch


Mile-a-minute

Town of Cary, NC “Pruning to Promote Plant Health” (carync.gov)

FRONT OF CARD

MAINTENANCE CARD
LAYERED WOODLAND

SPRING CLEANING

Remove agressive non-native vines and early sprouting invasives by hand pulling or spot treating with herbicide (e.g. glyphosate or triclopyr)

Prune dead branches on trees and tall shrubs or saplings after they have finished flowered to promote desired growth habit and allow light to reach the understory.

Replace Mulch as necessary to cover any exposed soil areas and repair erosion gullies. Avoid disturbing any natural leaf litter and woody debris from the native plantings that has fallen to the gorund over the course of the precedding fall and winter months.

MONITOR FOR WEEDS

Identify common weed species and note type and location.

Report and determine type and timing for follow up treatment as needed.

INVASIVE SPECIES MANAGEMENT

Spot Treat invasive species using cut-stump or foliar herbicide as needed.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Equipment Checklist:
- ☐ Flagging / Stakes
- ☐ Herbicide
- ☐ Mulch
- ☐ Shears / Lopper
- ☐ Saw
- ☐ Pole Pruner

Activity Checklist:
- ☐ Inspection
- ☐ Pruning
- ☐ Handpulling
- ☐ Remove debris
- ☐ Mulch
- ☐ Herbicide application

Regular Activity

“As-needed” Activity

PRT
Pittsburgh Regional Transit

BACK OF CARD

FRONT OF CARD

MAINTENANCE CARD
STREET TREES

Equipment Checklist:
- ☐ Mulch
- ☐ Shears / Lopper
- ☐ Saw
- ☐ Pole Pruner

Activity Checklist:
- ☐ Inspection
- ☐ Pruning
- ☐ Remove litter

INSPECTION AND PRUNING

Inspect trees annually for overall tree health, structural hazards or limb failure risk, and to maintain clearances from utilities and active transit corridors. Visual inspections should be completed by a qualified arborist as required.

Prune dead branches and damaged limbs, including any growth that is interfering with overhead utilities or active transit (adjacent to rail corridors and roadways)

Replace Mulch as necessary to cover any exposed soil areas and repair erosion gullies. Remove mulch from trunk flare if present and reform mulch rings to 2”-4” depth. Remove any litter and trash.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Regular Activity

“As-needed” Activity

Pittsburgh Regional Transit

BACK OF CARD

COMMON INVASIVE WEEDS


Common mugwort


Beggarticks

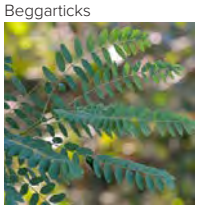

Goosefoot


Yellow nutsedge


Jimsonweed


Smooth crabgrass


Knotweed


Black locust


Common reed


Pennsylvania smartweed


Common groundsel


Green foxtail


Cheatgrass


Bull thistle


Greater celandine


Purple loostrife


Rough bluegrass


Wild chevril

FRONT OF CARD

MAINTENANCE CARD
TURF GRASS

MOW

Mow and String Trim regularly to maintain grass height to 3”-4”. Take care when mowing or string trimming around tree trunks, adjacent plantings, and furnishings to avoid damage and accidental mortality of other landscape plantings. Leave grass clippings in place when mowing regularly; however if grass has grown longer than 5” prior to mowing, remove grass clippings and add to compost. During mowing events, note and report problematic weeds that should be managed seperately.

INVASIVE SPECIES MANAGMENT

Apply pre-emergent pesticides in early spring to control weeds and grubs. Apply selective herbicides as spot treatment to control broadleaf weeds as needed.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Equipment Checklist:
- ☐ Mower
- ☐ String Trimmer
- ☐ Rake

Activity Checklist:
- ☐ Mow
- ☐ Inspect
- ☐ Hand pulling
- ☐ Herbicide application

Regular Activity
“As-needed” Activity

PRT
Pittsburgh Regional Transit

BACK OF CARD

Pittsburgh Regional Transit

PITTSBURGH REGIONAL TRANSIT
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