RUTGERS–NEW BRUNSWICK
Center for Urban Environmental Sustainability
School of Environmental and Biological Sciences

Middlesex County Cultural Landscape and Ecosystems Service Plan

Part III

Integrated Ecosystem Services and Cultural Landscape Action Plan

Prepared by: CUES Rutgers University
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PREFACE

The Middlesex County Department of Planning supported the development of a comprehensive Cultural Landscape and Ecosystems Service Plan as part of the Destination 2040 planning process, County's strategic vision.
Although the political and administrative process is still ongoing, we publish the underlying research to disseminate relevant information to the general public and interested members of the environmental community. Further we believe that the developed methodology is a contribution to the ongoing discussion on the role of environmental planning in a home rule state.

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Center for Urban Environmental Sustainability (CUES) Team:

- Wolfram Hoefer Dr.-Ing, AK NW, Director,
- Nina Cron MLA, Project Coordinator
- Jean Epiphan MS, Ecologist, Licensed Tree Expert, ISA Cert. Arborist
- Steven Handel PhD, Senior Ecologist, Hon. MLA
- Vincent Javit MLA, Designer
- Daniel Ilkow MLA, Technical Support
- Student Interns: Tyler Holden, James Lee, William Magnanini, Jacob Oberwanowicz

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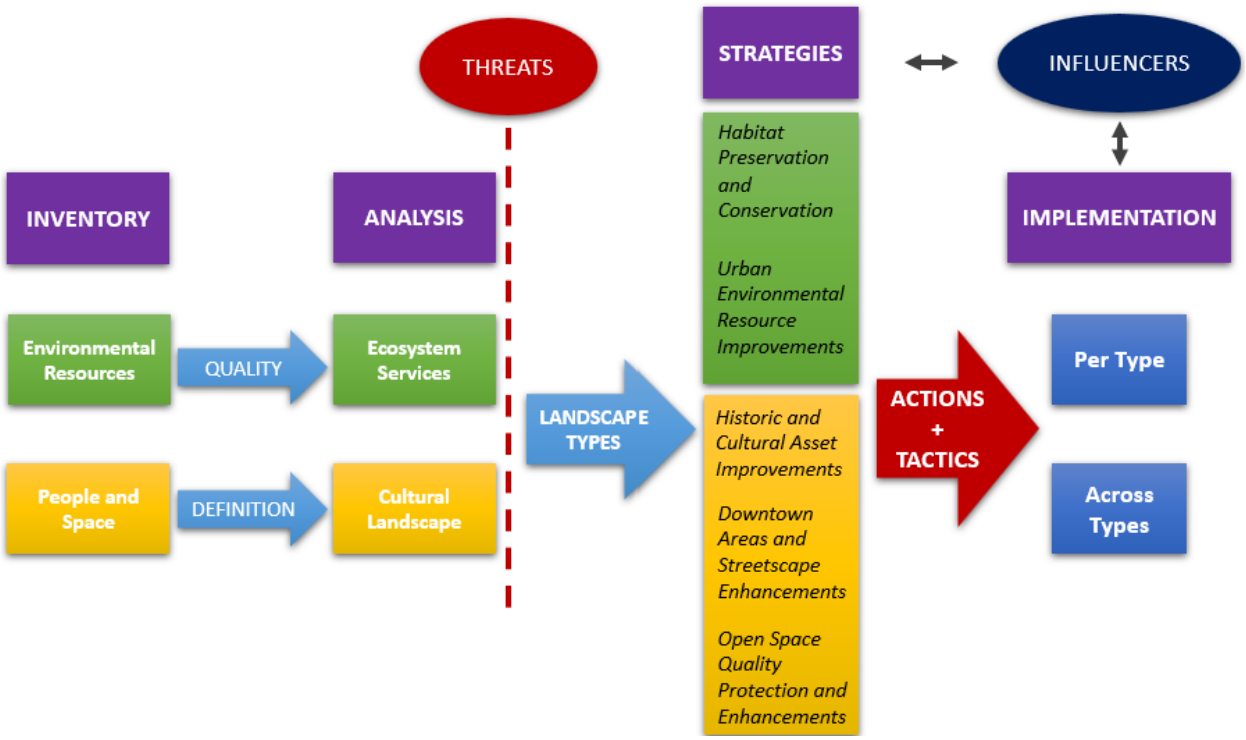
INTRODUCTION

Middlesex County's *Integrated Ecosystem Services and Cultural Landscape Action Plan* stems from the inventory and analysis of Middlesex County's landscapes revealing existing environmental conditions related to people and the County's ecological fabric. The inventory informed the selection of components for the *Analysis* chapter, concluding that the County holds significant potential to enhance the ecological value and support culturally significant areas County-wide. This document outlines Middlesex County's landscape *Vision* and *Action Plan* to attain sustainable, resilient, and accessible landscapes throughout the County.

The project process diagram in ***Figure 3.1*** outlines the stages from inventory to action implementation. *Inventory* (chapter 1) examined the County's existing environmental conditions concerning the demographic situation. The inventory examined the needs and wishes of residents to inform the quality of the County's environmental resources and develop an understanding of cultural landscapes. The *Analysis* (chapter 2) further assessed these conditions as ecosystem services and cultural landscapes resulting in landscape types specific to Middlesex County and strategies for landscape improvements. The landscape types and strategies derived from the *Analysis* (chapter 2) informed this *Action Plan.* The following chapter proposes a County-wide implementation framework with actions and tactics for landscape specific tactics across all landscape types. See ***Figure 3.2*** for action and tactic structure.

Figure 3.1: Project Process Diagram



Vision

The *Vision* for Middlesex County's landscape is that all land, including improvements, will support an integrated, culturally significant, and ecologically thriving environment through ecological habitat enhancements and quality outdoor places for people to foster identity, memory, and cultural meaning.

The County will lead efforts to enhance ecological habitat and ecosystem services across the diverse urban, suburban, and rural conditions, including urban environment enhancements, natural habitat quality protection, and improvements to reduce urban heat island effects, flood risk, and habitat degradation.

These enhancements will support a positive landscape perception expanding the spectrum of the County's cultural landscape to include all landscapes experienced by people. Enhancements will still expand on traditional cultural landscapes to bolster diverse historical events County-wide and protect the County's viewsheds. The County-wide *Greenway Opportunities* network will connect people of diverse groups and fragmented wildlife habitats.

The implementation strategies, actions, and tactics will consider the important role of the County as a lead for direct implementation and as a moderator to steer other landscape influencers, including municipalities, State and Federal government, private landowners, and non-profit organizations. This landscape action plan must consider the entirety of the County's landscape because all acres have the potential to detract from or enhance the County's landscape quality and resident experience.

Action Plan

The goal of the ***Nature & Place.*** Functional Plan is to support and foster the higher landscape expectation that residents have expressed by providing tactics to achieve the integrated cultural landscape and ecosystem services-centered vision. The *Analysis* chapter concluded that environmental assessment could no longer only focus on pristine quality habitats, separate places for people, and natural spaces. Assessments must consider the role of every acre and each specific land use, contributing to the holistic system and quality of Middlesex County's landscape experience.

The extensive *Environmental Conditions Inventory* and *Ecosystem Services and Cultural Landscape Analysis* shows that Middlesex County's landscapes display wide diversity from north to south and east to west. The 28 identified landscape types reflect this variety (*Analysis* chapter) associated with various land uses and cover, which result from economic, social, and cultural preferences of the County's population historically and today.

To enhance Middlesex County's landscape's function, aesthetics, and accessibility, implementation efforts must extend to the regional scale and include site scale-specific interventions. The individual landscape types function cohesively to form corridors and natural connections supporting people through ecosystem services and wildlife through quality, uninterrupted habitats. These types further form the contiguous cultural landscape, fostering emotional responses that evoke memory, identity, or spiritual connection to a place.

This plan provides flexible and dynamic decision-making tools to strengthen existing efforts and enable municipalities to make environmentally and culturally conscious additions to their planning regimes, supporting the unity of the County's landscape. The landscape actions respect, support, and aim to facilitate conversation among the landscape's leading influencers, such as private landowners, municipal decision-makers, County leaders, state and federal regulators, and non-profit organizations acting as primary resources and support systems for landscape action.

Action Plan Structure

The Action Plan includes the *Ecosystem Services* and *Cultural Landscape* strategy sections, which outline strategies, actions, and tactics to achieve the Destination 2040 strategic initiatives centered on ecological and cultural landscape enhancements.

The *Analysis* chapter categories informed the actions, ***Figure 3.2***. The strategies include *Habitat Preservation and Conservation, Urban Environmental Resource Improvements, Historic and Cultural Asset Improvements, Viewshed Management, Downtown Areas and Streetscape Enhancements,* and *Open Space Quality Protection and Enhancements.* A collection of actions follows each strategy and includes multiple tactics to achieve the overall integrated vision.

Figure 3.2: Action Plan Organization

	STRATEGIES	ACTIONS	TACTICS *PER TYPE AND ACROSS TYPES*
ECOSYSTEM SERVICES	***Habitat Preservation and Conservation***	**Land Use**	Acquisition / Conservation Zoning / Cluster Zoning for Conservation / Easements / Partnership Agreements / Farmland Preservation / Alternative Use: Land for Agriculture
		Restoration And Habitat Enhancements	Biodiverse Planting / Shade Trees / Lawn Alternatives / Invasive Species Management / Wetland, Buffer, and Waterbody Protection / Deer Management and Fencing
		Stewardship	Ecological Stewardship Programs and Incentives / Habitat Value and Legal Requirement Education / Community Stewardship Groups
	Urban Environmental Resource Improvements	**Green Infrastructure**	Green Facades / Bioswales / Rain Garden and Bioretention Basin / Street and Parking Lot Trees / Green Roofs / Stream Daylighting / Permeable Parking Surfaces
		Energy Efficiency	Cool Roof / Solar Panels on Building Rooftops / Solar Panel Canopies in Parking Lots / Solar Fields / Electric Vehicle Charging Stations (EV)
CULTURAL LANDSCAPE	***Historic and Cultural Asset Improvements***	**Historic Landscapes**	Historical Signage / Historic Landscapes and Features Representing Diverse Groups
		Viewshed Management	Viewshed Inventory and Analysis / Vegetation Management / Development Standards / Viewshed Access
	Downtown Areas and Streetscape Enhancements	**Pedestrian Space Enhancements**	Street and Plaza Activation / Signage and Wayfinding / Community Arts Advocate / Art Installations / Digital Technologies to Celebrate the Local Character / Streetscape Amenity Enhancements
		Pedestrian And Cyclist Safety	Pedestrian and Bicycle Accessibility / Dedicated Bicycle Lanes
	Open Space Quality Protection and Enhancements	**Parks And Recreation Management**	Park Management Regimes / Permeable Pavement in County Park Parking Lots / Sustainable Park Amenity Enhancements

Tactic Organization

The tactics tables contain a description, environmental and cultural benefits, and a projected timeframe for tangible implementation, including short-term (1-2 years), medium-term (3-5 years), and long-term (5+ years).

The tactics include recommended County-leads, influencers who may be responsible for implementation, priority locations identified through the *Inventory* or *Analysis*, suitable landscape types, and resources such as design guides or funding opportunities.

Table 3.1 provides a sample tactic table detailing the contents found under each tactic. The actions and tactic tables utilize Roman numerals to classify the action category and by letter to mark the individual tactic (#).

Table 3.1: Sample Tactic Chart

(#): Tactic Title		
Tactic statement		
Benefits	**Environmental:** Potential positive ecological or human environmental impacts resulting from the action	**Cultural:** Potential positive cultural landscape impacts resulting from the action
Timeframe	Short-term (1-2 years), Medium-term (3-5 years), Long-term (5+ years)	
Priority Location	*Inventory* or *Analysis* categories or maps identifying priority locations for intervention.	
County Lead	Middlesex County Office(s) recommended leading or guiding action implementation.	
Landscape Types	Cultural landscape types the action applies to; for full type descriptions, see the *Analysis* Chapter *Landscape Types* section.	
Influencers	Influencers impact the landscape through ownership, management, or enforcement. Influencers include: Municipality, County, State, Federal, Private Landowner, and Non-Profit Organizations.	
Resources	Funding Resources, Programs, or Design Manuals	

Implementation

The *Action Implementation* section applies the appropriate tactics to each *Cultural Landscape Type* for recommendations to achieve the *Integrated Ecosystem Services and Cultural Landscape Action Plan* vision. The generalized types offer site-scale components acting in unison to meet the regional vision of a resilient, sustainable, and culturally preferred Middlesex County through landscape enhancements and protection.

The final section, *Tactics Across Types,* lists the tactics across all landscape types and the proposed County-wide *Greenway Opportunities* concept. The *Greenway Opportunities* outline spaces and places for ecological connections, preservation potential, and valuable cultural spaces for a connected and thriving County landscape.

This plan produces tangible outcomes within the existing context of home rule through a process-oriented, flexible environmental decision-making framework. Landscape urbanism principles inspire this approach "which landscape replaces architecture as the basic building block of contemporary urbanism" and a "landscape thinking" that values a dynamic process producing flexible outcomes. [(1)] We consider this approach suitable in the home rule context because it is "uncritical of capitalist urbanization and suspicious of governmental intervention."[(2)] The landscape urbanist's respect for property ownership values the role of private investment paired with the goal of planning for a more resilient future. The following action plan centers on outdoor spaces as driving facilities to support the cultural significance and ecological quality of Middlesex County to promote the County as a prime place people want to live, work, and play.

3.1 ECOSYSTEM SERVICES

Introduction

Ecosystem services are essential to the human quality of life through flood mitigation, air quality improvement, water pollution filtration, urban heat island reduction, and more. Ecosystem services result from healthy ecological habitats and human-impacted environments throughout the rural to urban gradient. Middlesex County's landscape, although 60 percent urban, holds significant potential for environmental improvements supplying beneficial ecosystem services for humans while enhancing habitat quality for native wildlife.

The Ecosystem Services topics proposed through this Landscape Action Plan include two strategies with the following "Actions" categories shown in Figure 3.2:

1. *Habitat Conservation*
    a. Land Use (I)
    b. Restoration and Habitat Enhancement (II)
    c. Stewardship (III)
2. *Restoration* and *Urban Environmental Resource Improvements*
    a. Green Infrastructure (IV)
    b. Energy Efficiency (V)

Habitat Conservation and Restoration proposes actions to conserve and preserve the County's natural landscapes and restorative tactics striving for the best quality wetland function. *Urban Environmental Resource Improvements* focus on tactics for the County's human-impacted landscapes promoting green infrastructure and energy efficiency.

Figure 3.3: Restoration Site, Woodbridge

Source: CUES, Rutgers University. Photograph. 2021.

HABITAT PRESERVATION AND CONSERVATION

Middlesex County's preserved habitats support the County's wildlife and offer recreational opportunities. Nature Parks throughout the County support an ecologically focused identity and desire for continued conservation. While unpreserved habitats occupying the landscape beyond preservation borders offer the same ecosystem services and habitat quality, they hold only limited protection and guidance for sustainability. Three strategic initiatives lead the call for action to preserve the County's natural landscapes, promote stewardship, and encourage municipal land use sustainability include:

- *Enhance the capacity of municipalities to advance sustainable and resilient land use and development.*
- *Preserve wildlife habitats and natural resources.*
- *Improve the stewardship of environmental resources.*

The analysis of Middlesex County's ecological habitats of concern and preserved open space revealed that roughly 16 percent of the County's landscape holds open space preservation status. ***However, 23 percent (approximately 47,000 acres) of the County's total landscape contains the highest priority ecological habitats of concern, while 65 percent (approximately 30,000 acres) of these upland forest and wetland habitats are not within preserved open space or preserved farmland (compare with Analysis Chapter (2) Table 2.2)***

Wetland habitats and wetland buffers encompass nearly half of the County's landscape. Although NJDEP regulates wetlands, there are still potential development threats and resident alterations due to a lack of land management awareness needed to protect wetland habitats. ***The Wetland, Wetland Buffer, and Waterbodies comparison with impervious surfaces (2015) analysis revealed that impervious surfaces cover 18 percent of the County's wetlands and buffers (mainly the extent between the 150-300 feet buffers).*** Landscape actions aim to protect and enhance wetlands and buffers by reducing impervious surfaces within these areas and improving resident education on land management strategies.

The following collection of tactics identifies methods to conserve land and monitor management, protect habitat quality, habitat education, and community-led initiatives to attain the three guiding strategic initiatives***.***

This section concludes with Map 3.1, which illustrates priority locations for tactic intervention based on the analysis findings.

Land Use (I)

I.a: Acquisition		
Acquire suitable land through voluntary purchase, donation, and requests for open space use and permanent land protection, as identified in the ***Open Spaces.*** Functional Plan		
Benefits	**Environmental:** Protects sensitive land from disruption and future development.	**Cultural:** Reduces long-term costs for landowners from potential flood insurance and rebuild costs
Timeframe	Short-term (1-2 years)	
Priority Location	Priority Acquisition Undeveloped land at development risk Ecological Habitats of Concern Priority Flood Mitigation Zones	
County Lead	Office of Parks and Recreation Office of Planning	
Landscape Types	Across Types	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	New Jersey Department of Environmental Protection (NJDEP) Green Acres and Blue Acres Programs [3,4]	

Figure 3.4: NJDEP Blue Acres Buyout Program, Woodbridge

Source: CUES, Rutgers University. Photograph. 2021.

ACROSS TYPES

I.b: Conservation Zoning		
Rezone undeveloped land at development risk as Conservation Districts.		
Benefits	**Environmental:** Reduces fragmentation of and limits development on large parcels [5]	**Cultural:** Tax benefits from lowered market value, charitable donation tax exemption, estate tax benefits, agreement based on property needs to continue operations
Timeframe	Short-term (1-2 years)	
Priority Location	Undeveloped land at development risk Ecological Habitats of Concern Priority Flood Mitigation Zones	
County Lead	Office of Planning	
Landscape Types	Across Types	
Influencers	Municipality	
Resources	Sustainable Jersey: Habitat Conservation [6]	

Figure 3.5: No Mow Conservation Area on Industrial Warehouse land in Cranbury

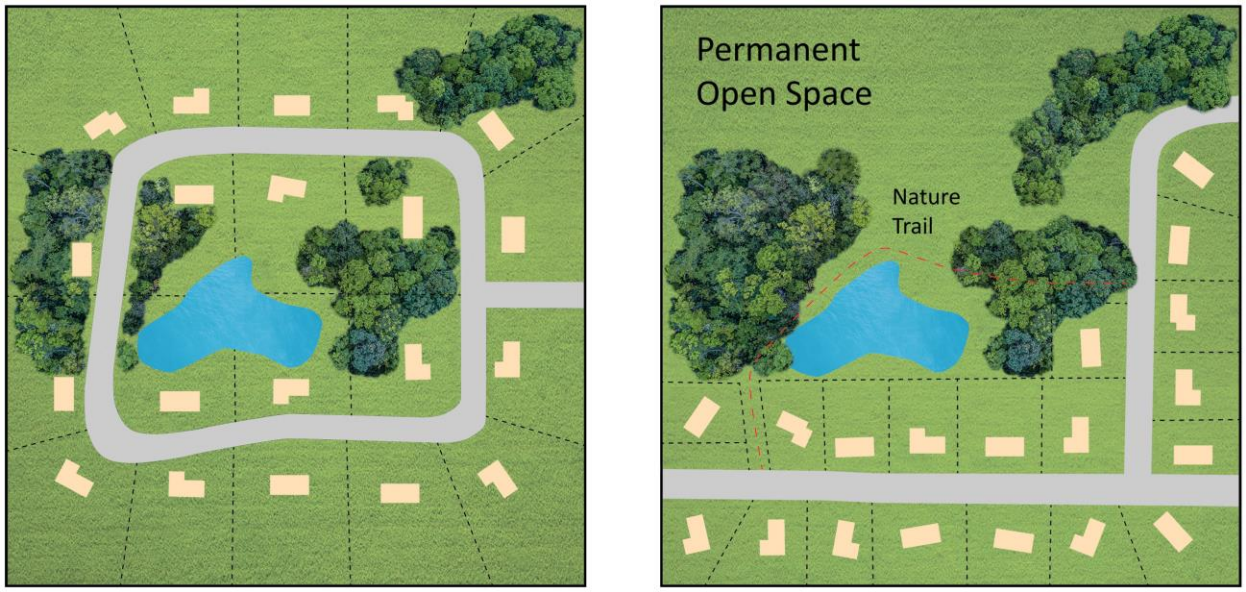
Source: CUES, Rutgers University. Photograph. 2021.

I.c: Cluster Zoning for Conservation

Require cluster zoning and subdivision limitations for land development based on a site-specific ecological and viewshed assessment to retain contiguous natural land or farmland.

Benefits	**Environmental:** Retain habitat corridors and permanently preserve open space and farmland	**Cultural:** Provides contiguous open space and enhances landscape experience.
Timeframe	Short-term (1-2 years)	
Priority Location	Undeveloped land at development risk Ecological Habitats of Concern Priority Flood Mitigation Zones ***Invest Smart*** Priority Investment Areas for focused development outside of natural areas	
County Lead	Office of Planning	
Landscape Types	Across Types	
Influencers	Municipality	
Resources	New Jersey Future Non-Contiguous Cluster Zoning [7]	

Figure 3.6: Conservation Zoning Diagram



Source: Diagram created by CUES, Rutgers University, adapted from an original diagram developed by the New Jersey Department of Transportation. (n.d.). Conservation Zoning. *NJDOT*. https://www.state.nj.us/transportation/works/studies/rt57/pdf/ConservationZoning.pdf

I.d: Easements

Utilize conservation easements to protect undeveloped land at development risk maintaining private operations with conservation agreements.

Benefits	**Environmental:** Permanently protected natural habitats	**Cultural:** Tax benefits from lowered market value, charitable donation tax exemption, estate tax benefits, agreement based on property needs to continue operations
Timeframe	Short-term (1-2 years)	
Priority Location	Undeveloped land at development risk Ecological Habitats of Concern Priority Flood Mitigation Zones	
County Lead	Office of Parks and Recreation Office of Planning	
Landscape Types	Across Types	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	Sustainable Jersey: Conservation Easement Action [8]	

I.e: Partnership Agreements

Target public properties for conservation in undeveloped land at development risk areas through contractual agreements.

Benefits	**Environmental:** Preserves habitat and natural land	**Cultural:** Fosters collaborative stewardship
Timeframe	Short-term (1-2 years)	
Priority Location	Publicly owned property Undeveloped land at development risk Ecological Habitats of Concern Priority Flood Mitigation Zones	
County Lead	Office of Planning Office of Facilities Management	
Landscape Types	Across Types	
Influencers	Municipality, County, State, Federal	
Resources	Middlesex County Conservation Management Agreement with Metuchen [9]	

I.f
FARMLAND PRESERVATION

I.f: Farmland Preservation		
Preserve eligible farmland through the New Jersey Farmland Preservation Program based on ***Strong Farming.*** Functional Plan.		
Benefits	**Environmental:** Retain cultural significance and protect the land from future development.	**Cultural:** Preservation of characteristic farming landscape, tax benefits from lowered market value, charitable donation tax exemption, estate tax benefits, continued farm operations
Timeframe	Short-term (1-2 years)	
Priority Location	Non-preserved agricultural land ***Strong Farming.*** Functional Plan	
County Lead	Office of Planning	
Landscape Types	RURAL FARMLAND 6.1	
Influencers	Municipality, County, State, Private Landowner	
Resources	New Jersey Farmland Preservation Program: County Planning Incentive Grant (10)	

Figure 3.7: Preserved Story Farm

Source: CUES, Rutgers University. Photographs. 2020.

I.g: Alternative Use, Land for Agriculture		
Utilize lawns, brownfield sites, vacant lots, and parking lots for agricultural production approved through municipal zoning and ordinances.		
Benefits	**Environmental:** Increases potential habitat for pollinators and chance for site remediation	**Cultural:** Urban agriculture supports community interaction
Timeframe	Medium-term (3-5 years)	
Priority Location	Urban Land Use and Land Cover areas	
County Lead	Office of Planning	
Landscape Types	OFFICE PARK 3.5, CAMPUS 3.6, WAREHOUSE 4.2, VACANT 5.3	
Influencers	Municipality, County, Private Landowner, Non-Profit Organizations	
Resources	Sustainable Jersey: Community Garden Action [11]	

Figure 3.8: Urban Agriculture, New Brunswick

Source: CUES, Rutgers University. Photographs. 2020.

Restoration and Habitat Enhancements (II)

II.a: Biodiverse Planting		
Include native plant species and diverse combinations in planting plans.		
Benefits	**Environmental:** Strengthens species richness, supports pollinating insects	**Cultural:** Attractive native plants selection improves visual quality; lower maintenance costs through more resilient vegetation
Timeframe	Short-term (1-2 years)	
Priority Location	County-wide	
County Lead	Rutgers Cooperative Extension Office of Planning	
Landscape Types	SINGLE, LOW-DENSITY RURAL 1.1, SINGLE, LOWER-DENSITY SUBURBAN 1.2, SINGLE, MEDIUM-DENSITY SUBURBAN 1.3, SINGLE, HIGH-DENSITY SUBURBAN 1.4, MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, SINGLE NEIGHBORHOOD BUILDING 3.1, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, INDOOR MALL 3.4, OFFICE PARK 3.5, CAMPUS 3.6, BURIAL GROUND 3.7, HEAVY INDUSTRY 4.1, WAREHOUSE 4.2, SMALL YARD OR OTHER LIGHT INDUSTRY 4.3, ACTIVE LANDFILL 5.1, CLOSED LANDFILL 5.2, VACANT 5.3, RURAL FARMLAND 6.1, URBAN AGRICULTURE 6.2, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	The Native Plant Society [12] New Jersey Division of Fish and Wildlife's Wildlife Habitat Incentives Program [13] The National Audubon Society Plant for Birds by location [14]	

Figure 3.9: Native and Native Cultivars suitable for Landscape Plantings

Source: CUES, Rutgers University. Photographs. 2021.

Left: *Asclepias syriaca,* Common Milkweed; *Echinacea purpurea*, Purple Coneflower; *Agastache foeniculum,* Anise Hyssop

II.b

SHADE TREES

II.b: Shade Trees		
Monitor existing shade trees to protect them from damage and plant additional native shade trees throughout the County, focusing on open spaces and natural areas		
Benefits	**Environmental:** Decreases soil erosion and increases species richness, reducing heat island effects.	**Cultural:** Improvement of open space quality, increases shade, and decreases stormwater runoff.
Timeframe	Short-term (1-2 years)	
Priority Location	Ecological Habitats of Concern ranks 1-3 Open Space	
Landscape Types	SINGLE, LOW-DENSITY RURAL 1.1, SINGLE, LOWER-DENSITY SUBURBAN 1.2, SINGLE, MEDIUM-DENSITY SUBURBAN 1.3, SINGLE, HIGH-DENSITY SUBURBAN 1.4, MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, OFFICE PARK 3.5, CAMPUS 3.6, BURIAL GROUND 3.7, WAREHOUSE 4.2, ACTIVE LANDFILL 5.1, CLOSED LANDFILL 5.2, VACANT 5.3, RURAL FARMLAND 6.1, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
County Lead	Office of Planning	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	Sustainable Jersey Tree Maintenance Programs [15] See ***Appendix 1*** for CUES recommended tree species	

Figure 3.10: Shade Trees in County-Owned Fords Park, Woodbridge.

Source: CUES, Rutgers University. Photographs. 2021.

II.c: Lawn Alternatives		
Replace lawn cover with biodiverse plants, meadows, reforestation, and shrub plantings		
Benefits	**Environmental:** Less fertilizers needed, decreases soil erosion, stormwater runoff, and emissions [16]	**Cultural:** Decreases lawn maintenance costs, flowering meadows and selecting attractive native perennials and shrubs enhances the visual appearance
Timeframe	Short-term (1-2 years)	
Priority Location	Ecological Habitats of Concern ranks 1-3 Priority Flood Mitigation Zones	
County Lead	Office of Planning	
Landscape Types	SINGLE, LOWER-DENSITY SUBURBAN 1.2, SINGLE, MEDIUM-DENSITY SUBURBAN 1.3, SINGLE, HIGH-DENSITY SUBURBAN 1.4, MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, SINGLE NEIGHBORHOOD BUILDING 3.1, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, OFFICE PARK 3.5, CAMPUS 3.6, WAREHOUSE 4.2, CLOSED LANDFILL 5.2, VACANT 5.3, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, GOLF COURSES 7.5	
Influencers	Municipality, Private Landowner	
Resources	Duke Farms: Perennial Meadow [17] Tapestry Lawn [18]	

Figure 3.11: Clover Lawn Cover

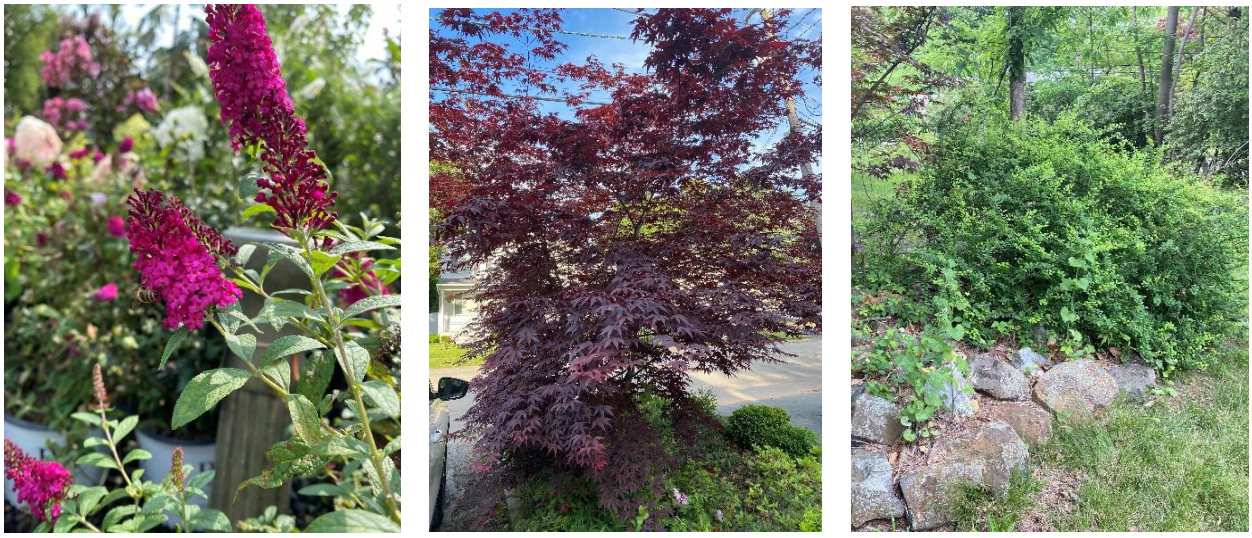
Source: CUES, Rutgers University. Photograph. 2022.

II.d: Invasive Species Management

Monitor and manage invasive species in highly valued ecological habitats of concern through selective plant choices and invasive species removal.

Benefits	**Environmental:** Allows native plant species to flourish and understory regeneration.	**Cultural:** Reduces long-term cost to remediate degraded sites
Timeframe	Short-term (1-2 years)	
Priority Location	Ecological Habitats of Concern ranks 1-3	
County Lead	Office of Parks and Recreation	
Landscape Types	SINGLE, LOW-DENSITY RURAL 1.1, SINGLE, LOWER-DENSITY SUBURBAN 1.2, CLOSED LANDFILL 5.2, VACANT 5.3, RURAL FARMLAND 6.1, URBAN AGRICULTURE 6.2, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	The New Jersey Invasive Species Strike Team – 2021 Do Not Plant List [19]	

Figure 3.12: Commonly Available Landscape Plants on the Do Not Plant List



Source: CUES, Rutgers University. Photographs. 2021, 2022.
Left: *Buddleia davidii,* Butterfly Bush; *Acer palmatum*, Japanese Maple; *Berberis thunbergii,* Japanese Barberry

ACROSS TYPES

II.e: Wetland, Buffer, and Waterbody Protection		
Establish priority wetland and wetland buffer restoration projects with focused efforts on impervious surface reduction and habitat replenishment		
Benefits	**Environmental:** Stabilize soils, filter pollutants, store water, and provide essential habitat for wildlife and native plant species [20]	**Cultural:** Improves waterway experience, reduces property flood damages in the adjacent areas and to upstream properties by storing stormwater and suppressing storm surges along the coast [21]
Timeframe	Medium-term (3-5 years)	
Priority Location	Wetlands, Wetland Buffers, Waterbodies, and Impervious Surfaces	
County Lead	Office of Planning	
Landscape Types	Across Types	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	Division of Fish and Wildlife: Wetland Reserve Program (WRP) [22]	

Figure 3.13: Ernest L. Oros Wildlife Preserve- marsh restoration project in Woodbridge

Source: CUES, Rutgers University. Photographs. 2020.

II.g

DEER MANAGEMENT FENCING

II.f: Deer Management and Fencing

Develop a deer management tool to aid municipalities and individual land owners in protecting vegetation, forests, and agricultural land from deer damage through fencing, hunting, and other appropriate methods

Benefits	**Environmental:** Allows for regeneration of herbaceous and understory layers	**Cultural:** Reduce damage to residential gardens, reduce collision danger, reduce exposure to deer-borne diseases
Timeframe	Medium-term (3-5 years)	
Priority Location	Ecological Habitats of Concern ranks 1-3 Open Space Preserved Farmland Forested Land Cover	
County Lead	Rutgers Cooperative Extension Office of Planning Office of Park and Recreation	
Landscape Types	SINGLE, LOW-DENSITY RURAL 1.1, SINGLE, LOWER-DENSITY SUBURBAN 1.2, RURAL FARMLAND 6.1, URBAN AGRICULTURE 6.2, SOCIAL PARKS 7.1, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County	
Resources	Middlesex County Deer Management Program [23]	

Figure 3.14: Deer Hunting Signage in Matchaponix Forest, Monroe

Source: CUES, Rutgers University. Photographs. 2020.

Stewardship (III)

III.a: Ecological Stewardship Programs and Incentives		
Encourage the community to lead ecological stewardship programs through incentives.		
Benefits	**Environmental:** Decreases ecological threats and promotes landscape conservation [24]	**Cultural:** Residence participating in stewardship programs have more interaction with other community members
Timeframe	Short-term (1-2 years)	
Priority Location	County-wide	
County Lead	Rutgers Cooperative Extension	
Landscape Types	Across Types	
Influencers	Municipality, County, Non-Profit Organizations	
Resources	Sustainable Jersey: Community Education and Outreach [25]	

III.b: Habitat Value and Legal Requirement Education

Develop informational brochures to inform landowners of habitat value and legal requirements related to the natural land cover associated with their property.

Benefits	**Environmental:** Promotes awareness of natural habitats and plant communities. Enables residents to adapt maintenance accordingly.	**Cultural:** Enables residents to act through more informed investment decisions.
Timeframe	Short-term (1-2 years)	
Priority Location	County-wide	
County Lead	Rutgers Cooperative Extension	
Landscape Types	Across Types	
Influencers	Municipality, County, Non-Profit Organizations	
Resources	NJDEP Before you Buy, Before you Build [26] Homeowners' Guide to Wetlands & Buffers [27]	

ACROSS TYPES

III.c: Community Stewardship Groups		
Introduce a County-led green team initiative to support municipal community groups acting to protect and enhance the landscape.		
Benefits	**Environmental:** Reduces the spread of invasive species and increases native plantings.	**Cultural**: Residence participating in stewardship programs have more interaction with other community members
Timeframe	Medium-term (3-5 years)	
Priority Location	County-wide	
County Lead	Office of Planning	
Landscape Types	Across Types	
Influencers	Municipality, County, Non-Profit Organizations	
Resources	Sustainable Jersey Green Team [28] Middlesex County Conservation Corps [29]	

Figure 3.15: Ecosystem Services Strategies in a Residential Landscape

Source: CUES, Rutgers University. Photographic Rendering. 2022.

Habitat Preservation and Conservation Priority Locations

Map 3.1 illustrates priority locations for *Habitat Preservation and Conservation* action and tactic areas.

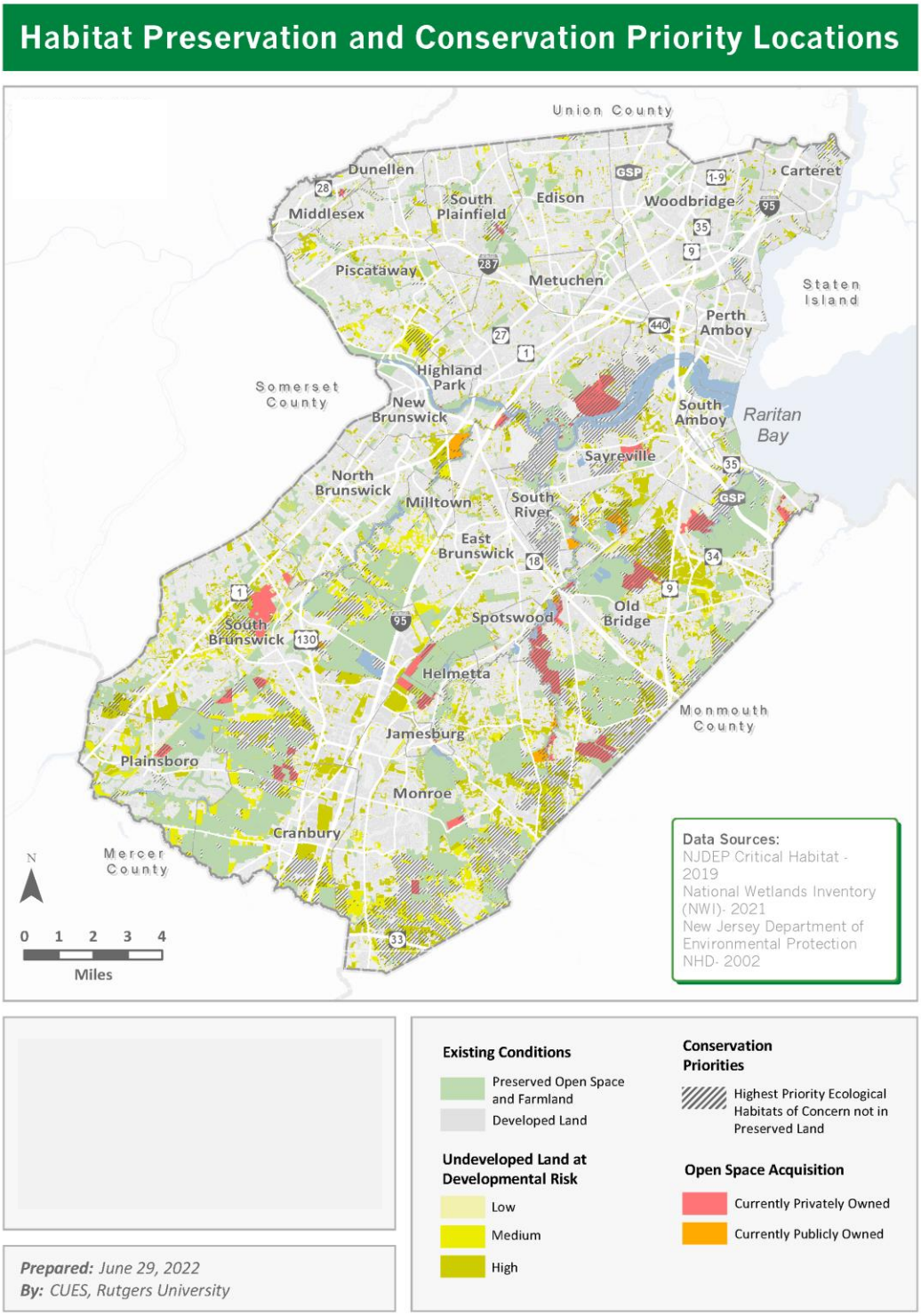
Open spaces and preserved farmland protection exhibit the County's protected landscapes in need of no further preservation designations. These protected spaces contain the highest level of protection through Green and Blue Acres and the New Jersey Farmland Preservation Program funding. Ecological habitats of concern, identified in the *Analysis* chapter, do not require different preservation statuses in already protected areas.

Lands at development risk, including upland forests with no protection and wetlands with NJDEP protection status, identify areas where natural and vacant land development risk occurs County-wide. The highest priority ecological habitats of concern represent development risk locations with valuable ecological habitats. These lands include ideal places to consider acquisitions or conservation zoning.

Urban areas with the highest priority ecological habitats of concern provide optimal locations to support stewardship tactics, partnership agreements, conservation zoning, conservation easements, and wetland protection and enhancement to ensure habitat protection while land use remains operational.

The priority open space, identified through ***Open Spaces.***, locates the top priority acquisitions throughout the County's landscape. Privately owned land should consider Green and Blue Acres funding for acquisition, while the publicly owned parcels should consider partnership agreements to ensure continued conservation on publicly owned property.

Map 3.1 Habitat Preservation and Conservation Priority Locations



URBAN ENVIRONMENTAL RESOURCE IMPROVEMENTS

People in urban environments suffer from the negative impacts of high impervious surfaces and built-out landscapes. Flooding and urban heat islands are two negative environmental results of historic planning patterns. Urban environment enhancements such as green infrastructure provide a proven method to reduce flooding impacts and urban heat islands while increasing the cultural value of a space through visually appealing landscapes.

Middlesex County's D 2040 strategic initiatives state the need to manage water and reduce negative heat impacts throughout the County. The guiding strategic initiatives informing the *Urban Environmental Recourse Improvements* actions and tactics include:

- *Expand the use of green infrastructure approaches for water management.*
- *Expand the use of "green infrastructure" to reduce the heat and stormwater impacts of transportation facilities (expanded to encompass the entire County).*

Middlesex County's *Ecosystem Services* analysis revealed that ***30,000 acres of County land lie within the 100-year FEMA flood risk zone, with 8 percent of the total area covered by impervious surfaces. The Impervious Surface inventory revealed that impervious surfaces cover nearly 64,000 acres of the County's entire landscape (roughly 32 percent).*** Stormwater runoff from all impervious surfaces feeds into the County's four watershed management areas adding more water volume and subsequent velocity to the 30,000 acres within the 100-year FEMA flood zone during rainfall events (compare with *Analysis* Chapter (2) ***Tables 2.5 and 2.6***).

Green infrastructure captures stormwater on-site and reduces surface temperatures through evapotranspiration and shade. Mature trees can absorb between 10 and 150 gallons of water daily (dependent on the species) to reduce the amount of water and non-point source pollution in surrounding waterways resulting from urban runoff. [30] Permeable pavement works to reduce surface temperatures through evapotranspiration and stormwater absorption, while lighter materials reduce surface temperatures. [31, 32]

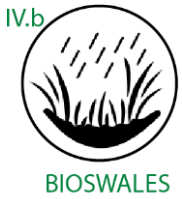
The following tactics include green infrastructure solutions to reduce stormwater runoff and urban heat islands. Further, energy-efficient interventions, such as cool roofs and solar panels, reduce energy consumption and lower urban heat island effects. NJDEP has an extensive list of green infrastructure solutions available on the State website in accordance with the NJAC 7:8 Stormwater Rules. [33] This section concludes with ***Map 3.2*** illustrating priority locations for tactic intervention based on the *Analysis* chapter findings.

Green Infrastructure (IV)

IV.a: Green Facades		
Encourage climbing vegetation growth on the building façade, on the building, or a trellis.		
Benefits	**Environmental:** Decreases stormwater runoff	**Cultural:** Improves the visual appearance of large building volumes.
Timeframe	Short-term (1-2 years)	
Priority Location	Priority Flood Mitigation Zones Areas subject to urban heat island effects	
County Lead	Office of Planning	
Landscape Types	RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, WAREHOUSE 4.2	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	**Lady Bird Johnson Wildlife Center Species Recommended for Climbing:** *Parthenocissus quinquefolia*- Virginia Creeper [34] *Lonicera sempervirens L.*- Trumpet Honeysuckle [35] *Campsis radicans*- Trumpet Creeper [36]	

Figure 3.16: Virginia Creeper Green Façade

Source: Tasja. (2008). Wilde Wingerd, gefotografeerd in Haarlem Virginia Creeper, Haarlem, Netherlands. *Wikimedia Commons*. photograph. https://commons.wikimedia.org/wiki/File:Klimop_rond_luik.JPG

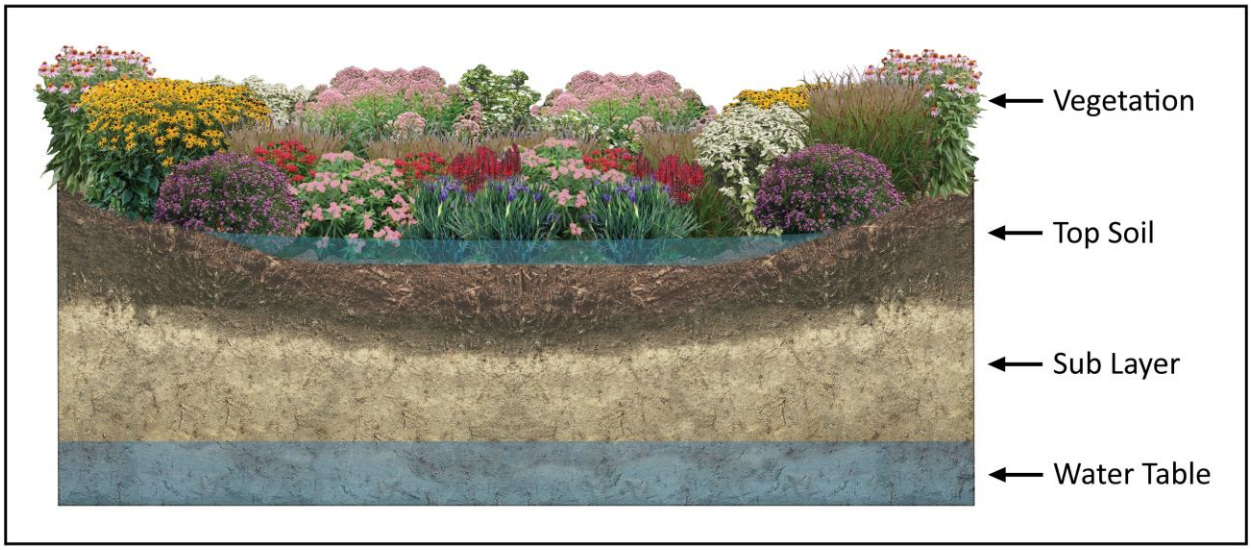


IV.b: Bioswales

Implement vegetated channels to convey and slow the movement of stormwater in areas with limited space for rain gardens.

Benefits	**Environmental:** Decreases impervious surfaces and erosion and enhances plant diversity.	**Cultural:** Slows speed and reduces the volume of stormwater runoff resulting in flood damages.
Timeframe	Short-term (1-2 years)	
Priority Location	Priority Flood Mitigation Zones Areas subject to urban heat island effects	
County Lead	Office of Planning	
Landscape Types	URBAN CITY CENTER 2.3, HEAVY INDUSTRY 4.1	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	NJDEP Grass Swale [37]	

Figure 3.17: Bioswale Layer Diagram



Source: Diagram created by CUES, Rutgers University, adapted from an original diagram developed by the New Jersey Department of Environmental Protection.

IV.c

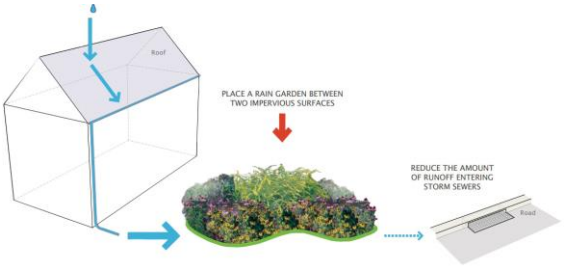
RAIN GARDENS/ BIORETENTION

IV.c: Rain Garden and Bioretention Basin

Install rain gardens or bioretention basins on underutilized lawns and parking lots to capture stormwater

Benefits	**Environmental:** Increases biodiversity and decreases pollutants in the ecosystem [38]	**Cultural:** Reduces stormwater runoff; increases ecosystem services and aesthetic value.
Timeframe	Short-term (1-2 years)	
Priority Location	Priority Flood Mitigation Zones Areas subject to urban heat island effects	
County Lead	Office of Planning	
Landscape Types	SINGLE, LOWER-DENSITY SUBURBAN 1.2, SINGLE, MEDIUM-DENSITY SUBURBAN 1.3, SINGLE, HIGH-DENSITY SUBURBAN 1.4, MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, SINGLE NEIGHBORHOOD BUILDING 3.1, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, OFFICE PARK 3.5, CAMPUS 3.6, WAREHOUSE 4.2, URBAN AGRICULTURE 6.2, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	Rutgers University Water Resource Program Rain Garden Manual [39] Rutgers Water Resource Program: Keep the Rain from the Drain, Impervious Surface Reduction Plans per Municipality [40]	

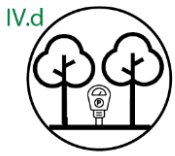
Figure 3.18: Rutgers Rain Garden Placement Diagram



Resources Program. (n.d.) Rain Garden Manual of New Jersey Chapter 2: Planning Your Rain Garden. *Rutgers University*. Pg 19. http://water.rutgers.edu/Rain_Gardens/RGWebsite/RainGardenManualofNJ.html

Figure 3.19: Rain Garden Installation at Tremley Point in Union County, NJ

Source: CUES, Rutgers University. Photographs. 2019.
Linden Rain Garden designed by Rutgers Engineering Students as part of a $2.7 Million grant to reduce flooding and restore ecosystems in Linden, NJ. [41]



STREET TREES/
PARKING LOT TREES

IV.d: Street and Parking Lot Trees

Add, protect, and upgrade street trees and tree pits throughout the County based on industry-standard tree pit guidelines and approved plant species listed in ***Appendix 3.1***.

Benefits	**Environmental:** Reduce urban heat island effects, and capture stormwater runoff.	**Cultural:** Aesthetically pleasing and reduces heating and cooling costs, increases property values, and protects asphalt from heat damage over time. (42)
Timeframe	Short-term (1-2 years)	
Priority Location	Priority Flood Mitigation Zones Downtowns and Parking Lots Areas subject to urban heat island effects	
County Lead	Office of Planning	
Landscape Types	SINGLE, LOWER-DENSITY SUBURBAN 1.2, SINGLE, MEDIUM-DENSITY SUBURBAN 1.3, SINGLE, HIGH-DENSITY SUBURBAN 1.4, MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, SINGLE NEIGHBORHOOD BUILDING 3.1, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, INDOOR MALL 3.4, OFFICE PARK 3.5, CAMPUS 3.6, BURIAL GROUND 3.7, WAREHOUSE 4.2, ACTIVE LANDFILL 5.1, URBAN AGRICULTURE 6.2, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	Rutgers Water Resources Program Tree Pit Guidance (43) Rutgers Water Resources Program Tree Pit Details (44) See ***Appendix 3.1*** for CUES recommended tree species	

Figure 3.20: Tree Planting Zone Diagram

Source: Diagram created by CUES, Rutgers University, adapted from an original diagram developed by the Arbor Day Foundation.

Figure 3.21: Street and Parking Lot Trees

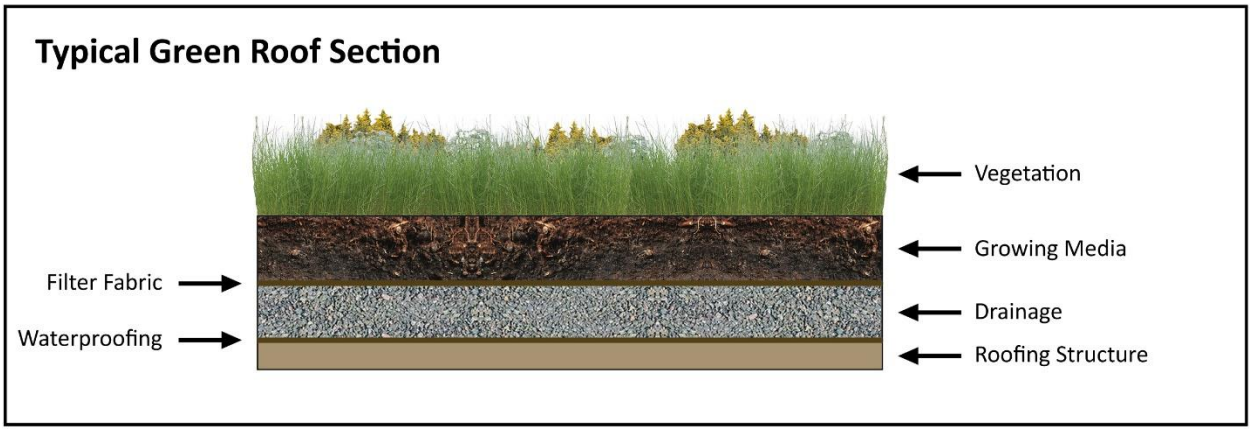
Source: CUES, Rutgers University. Photographs. 2022.

IV.e

GREEN ROOFS

IV.e: Green Roofs		
Install green roofs on appropriate structures in accordance with NJDEP stormwater rules		
Benefits	**Environmental:** Reduce stormwater runoff, reduce urban heat island effects	**Cultural:** Reduce building cooling costs
Timeframe	Medium-term (3-5 years)	
Priority Location	Priority Flood Mitigation Zones Areas subject to urban heat island effects	
County Lead	Office of Planning	
Landscape Types	RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, PLAZA SHOPPING CENTER 3.3, INDOOR MALL 3.4, OFFICE PARK 3.5, CAMPUS 3.6, WAREHOUSE 4.2, SOCIAL PARKS 7.1	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	NJDEP Stormwater Best Management Practices Manual: Green Roof [45] EPA Reducing Urban Heat Island: Green Roofs [46]	

Figure 3.22: Green Roof Diagram



Source: Diagram created by CUES, Rutgers University, adapted from an original diagram developed by Endah Lestari et al. [47]

IV.f: Stream Daylighting

Restore above-ground water flow to streams historically diverted underground

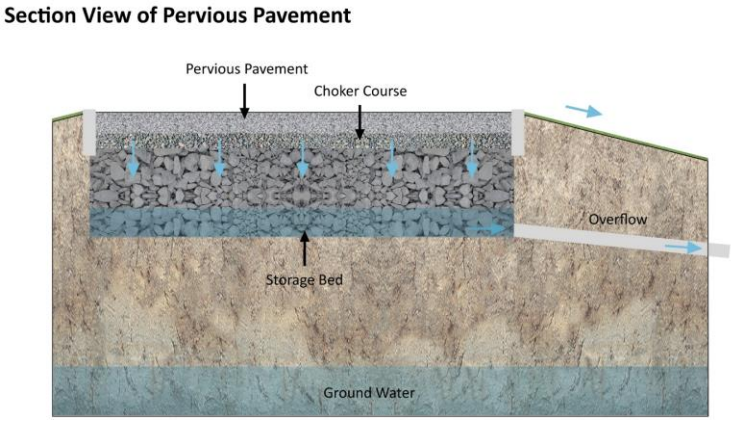
Benefits	**Environmental:** Restore ecological function and wildlife habitat, nutrient, and pollution removal	**Cultural:** Reduces flood risk and flood mitigation costs
Timeframe	Medium-term (3-5 years)	
Priority Location	Priority Flood Mitigation Zones	
County Lead	Office of Planning	
Landscape Types	Across Types	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	NJDEP Water Quality Restoration Grants [48]	

IV.g: Permeable Parking Surfaces

Upgrade or install parking lots with permeable materials in accordance with NJDEP Pervious Paving System guidelines

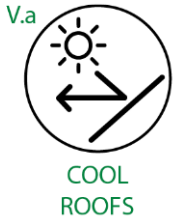
Benefits	**Environmental:** Allows stormwater absorption into the soil and reduces runoff. Reduces heat island effect.	**Cultural:** Increased visual variety through reduction of asphalt surfaces.
Timeframe	Medium-term (3-5 years)	
Priority Location	Priority Flood Mitigation Zones Parking lots	
County Lead	Office of Planning	
Landscape Types	SINGLE, LOW-DENSITY RURAL 1.1, SINGLE, LOWER-DENSITY SUBURBAN 1.2, SINGLE, MEDIUM-DENSITY SUBURBAN 1.3, SINGLE, HIGH-DENSITY SUBURBAN 1.4, MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, SINGLE NEIGHBORHOOD BUILDING 3.1, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, INDOOR MALL 3.4, OFFICE PARK 3.5, CAMPUS 3.6, BURIAL GROUND 3.7, WAREHOUSE 4.2, RURAL FARMLAND 6.1, URBAN AGRICULTURE 6.2, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	NJDEP Pervious Paving Systems [49]	

Figure 3.23: Pervious Pavement Diagram

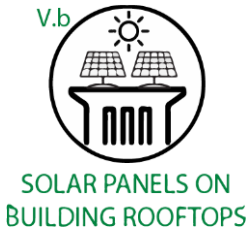


Source: Diagram created by CUES, Rutgers University, adapted from an original diagram developed by NJDEP [50]

Energy Efficiency (V)



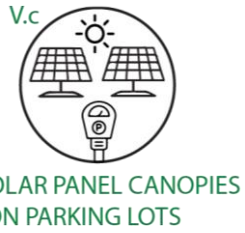
V.a: Cool Roof		
Utilize light-white colors and reflecting materials for roof installations and replacements		
Benefits	**Environmental:** Reduce urban heat island effects	**Cultural:** Reduce energy consumption and cooling costs [51]
Timeframe	Short-term (1-2 years)	
Priority Location	Areas subject to urban heat island effects	
County Lead	Office of Planning	
Landscape Types	MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, SINGLE NEIGHBORHOOD BUILDING 3.1, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, INDOOR MALL 3.4, OFFICE PARK 3.5, CAMPUS 3.6, WAREHOUSE 4.2, SMALL YARD OR OTHER LIGHT INDUSTRY 4.3	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	Rutgers University: NJ Green Building Manual, Cool Roofs [52]	



V.b: Solar Panels on Building Rooftops

Install rooftop solar panels on appropriate buildings

Benefits	**Environmental:** Reduces emissions from generating electricity and reduces surface temperatures [53]	**Cultural:** Reduces electrical costs
Timeframe	Short-term (1-2 years)	
Priority Location	All buildings County-wide Areas subject to urban heat island effects	
County Lead	Office of Planning	
Landscape Types	SINGLE, LOW-DENSITY RURAL 1.1, SINGLE, LOWER-DENSITY SUBURBAN 1.2, SINGLE, MEDIUM-DENSITY SUBURBAN 1.3, SINGLE, HIGH-DENSITY SUBURBAN 1.4, MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, SINGLE NEIGHBORHOOD BUILDING 3.1, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, INDOOR MALL 3.4, OFFICE PARK 3.5, CAMPUS 3.6, WAREHOUSE 4.2, SMALL YARD OR OTHER LIGHT INDUSTRY 4.3, ACTIVE LANDFILL 5.1	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	New Jersey Successor Solar Incentive Program (SuSI) [54]	



V.c: Solar Panel Canopies in Parking Lots

Add solar panel canopies over large parking lots.

Benefits	**Environmental:** Reduces urban heat island effect and emissions from generating electricity.	**Cultural:** Reduces electrical costs and increases shade
Timeframe	Medium-term (3-5 years)	
Priority Location	Parking lots County-wide Areas subject to urban heat island effects	
County Lead	Office of Planning	
Landscape Types	MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, INDOOR MALL 3.4, OFFICE PARK 3.5, CAMPUS 3.6, SMALL YARD OR OTHER LIGHT INDUSTRY 4.3, ACTIVE LANDFILL 5.1, CLOSED LANDFILL 5.2, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	New Jersey Successor Solar Incentive Program (SuSI) [55]	

V.d: Solar Fields

Construct solar fields on underutilized lands such as closed landfills, vacant lots, and barren landscapes due to human intervention

Benefits	**Environmental:** Reduces emissions from generating electricity [56]	**Cultural:** Reduces electrical costs
Timeframe	Medium-term (3-5 years)	
Priority Location	Vacant and barren land Areas subject to urban heat island effects	
County Lead	Office of Planning	
Landscape Types	OFFICE PARK 3.5, CAMPUS 3.6, CLOSED LANDFILL 5.2, VACANT 5.3	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	New Jersey Successor Solar Incentive Program (SuSI) [57]	

V.e: Electric Vehicle Charging Stations (EV)

Install electric vehicle charging stations in multi-dwelling residential parking areas, commercial areas, parks, and in public on-street parking and parking lots

Benefits	**Environmental:** Supports electric vehicle use and reduced carbon emissions.	**Cultural:** Decreases need for fossil fuels
Timeframe	Medium-term (3-5 years)	
Priority Location	High-density residential, mixed-use, and commercial areas County-wide public parking lots	
County Lead	Office of Planning	
Landscape Types	MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, INDOOR MALL 3.4, OFFICE PARK 3.5, CAMPUS 3.6, WAREHOUSE 4.2, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	New Jersey Charge Up: Residential Incentive Program [58] New Jersey Drive Green Grants for Charging Station Projects [59]	

Figure 3.24: EV Charging Station on Cook Campus, New Brunswick

Source: CUES, Rutgers University. Photographs. 2022.

Urban Environmental Resource Improvements Priority Locations

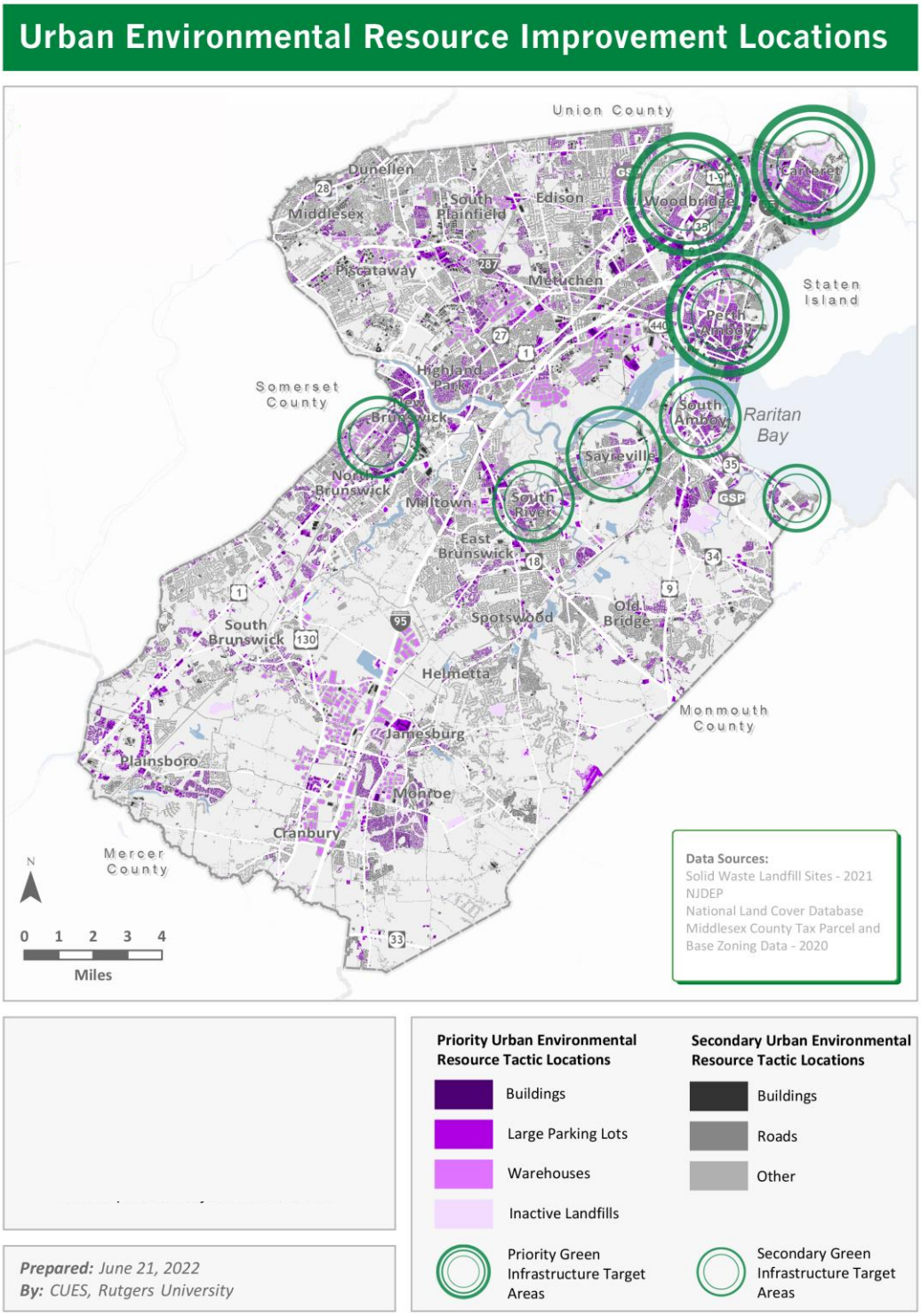
Map 3.2 locates priority locations for the *Urban Environmental Resource Improvement* action and tactics to reduce urban heat islands, capture stormwater runoff, and produce clean energy.

Middlesex County's impervious surfaces provide target locations for urban environmental resource improvements. Priority locations for all urban environmental resource tactics include high-density residential, commercial, and mixed-use buildings, warehouses, large parking lots, and closed or inactive landfills. Larger buildings and parking lots provide more surface area for intervention establishing the most significant impact. Therefore, larger areas become the priority for solar installations, cool roofs, and various green infrastructure tactics.

At the same time, all impervious materials County-wide contributes to the surrounding waterway quality and water volume providing secondary urban resource tactic priority locations. Impervious surfaces across the County include ideal places for permeable asphalt, pavers, and impervious surface reductions. These secondary priority areas deliver smaller surfaces at the individual scale but add to the County's overall ability to capture more stormwater onsite and reduce hotter surface temperatures due to impervious materials.

Priority green infrastructure target areas include generalized locations identified with the highest urban heat islands (surface temperatures 149-170 degrees Fahrenheit) and tree canopy cover densities below 10 percent. Secondary priority green infrastructure target areas include generalized locations in the second tier of urban heat island surface temperatures (130-149 degrees Fahrenheit) and tree canopy cover densities below 10 percent. These more urbanized areas would benefit from the community supporting green infrastructure improvements to reduce the city's overall urban heat island effects and stormwater runoff. Interventions focus on all aspects of the landscape, such as buildings, streets, lawn cover, parking areas, and more.

Map 3.2 Urban Environmental Resource Improvement Priority Locations



3.2 CULTURAL LANDSCAPE

Introduction

The *Inventory* of the County's people and spaces and the *Analysis* of cultural landscapes revealed a new and all-encompassing definition for the cultural landscape ***to include historic properties, natural features, and living ornaments, along with indicators of everyday human interaction of a diverse population:***

> *As defined in this plan, a cultural landscape is an outdoor space of any scale experienced by people. The value of a cultural landscape develops from a historically significant event or era, religious correlation, or emotional response that evokes memory, identity, or spiritual connection to a place. The cultural landscape can be natural in form or entirely built. Still, it is always an outdoor space directly or indirectly experienced by people tied to a perceived intangible and subjective value based on cultural preference.*

This definition captures traditionally understood cultural landscapes as historic places connected to nature, and the modern suburban context expanded to represent heritage in everyday places. Cultural landscape features such as historic landmarks represent the County's people, while outdoor enhancements support a growing desire for people to identify with specific places.

Middlesex County is a cultural hub for diverse groups, arts, and historical events. The Office of Arts and History works extensively to incorporate the entire County into arts and culturally related programs. [60] This section focuses on the supporting cultural landscapes and proposed actions to connect people with everyday outdoor places, historic landscapes, and the County's plentiful viewsheds.

The Cultural Landscape topics proposed through this Landscape Action Plan include three strategies followed by actions shown in Figure 3.2:

1. *Historic and Cultural Asset Improvements*
    a. Historic Landscapes (VI)
    b. Viewshed Management (VII)
2. Downtown Areas and Streetscape Enhancements
    a. Pedestrian Space Enhancements (VIII)
    b. Pedestrian and Cyclist Safety (IX)
3. Open Space Quality Protection and Enhancements
    a. Parks and Recreation (X)

Figure 3.25: Perth Amboy Waterfront Viewshed

Source: ***Nature & Place.*** (L-Plan) Photo Survey Submission. Photograph. Submitted 2021.

HISTORIC AND CULTURAL ASSET IMPROVEMENTS

Middlesex County's rich history and viewsheds reflect American colonization, industry, military, collegiate ties, diverse immigration waves, beaches, waterfronts, and natural landscapes. Recent population growth leads to more residents not identifying with this heritage, producing an even more important mission for all newcomers and longtime residents to develop a personal relationship with the County's cultural identity through history and viewsheds. This includes cultural expressions of diverse ethnic groups.

The Office of Arts and History (the Arts Institute) plays a significant role in connecting the County's residents to arts and history through programming, grant support, and studies to assess the County's arts and history needs seen in the Osgood report. [61] The Osgood draft report concluded that County residents need broadened access to arts and cultural events. D 2040 outreach revealed that residents sometimes lack access to outdoor spaces. The D 2040 Strategic Initiative guiding the need to celebrate historic events focuses on the role of the County's Arts Institute.

- *Develop the Arts Institute of Middlesex County into a hub for all arts, cultural, and historical programming.*
- *Provide safe, innovative, inclusive, and sustainable parks and recreation services.*

The *Inventory* and *Analysis* revealed that the County has many historic districts and viewsheds, adding to the character of neighborhoods and downtown areas such as the Clara Barton neighborhood in Edison or downtown Cranbury. In addition to historic districts, historic properties, and historic markers represent the County's historical events. At the same time, viewsheds connect people to the County's agricultural heritage and natural landscapes.

Historic districts, properties, and viewsheds often contain clear markers, such as the East Jersey Old Town Village at Johnson Park in Piscataway. In other circumstances, the significance becomes less obvious such as linear historic districts, properties, and inaccessible viewpoints. Adding inclusive signage and celebrating the County's diversity provides an opportunity to enhance the representation of the County's celebrated heritage.

The following action section provides tactics to enhance access and representation of historical events in the landscape and viewshed management techniques to support the County's outdoor network.

Historic Landscapes (VI)

VI.a: Historical Signage		
Explore opportunities for improved informational and wayfinding signage in historical districts and historical properties.		
Benefits	**Environmental:** Informs residents of the value of the land	**Cultural:** Brings attention to the area, increasing local revenue through local tourism
Timeframe	Short-term (1-2 years)	
Priority Location	Historic designations districts and properties Historic Property Ranks from ***Open Spaces.*** Functional Plan	
County Lead	Office of Arts and History	
Landscape Types	SINGLE, LOW-DENSITY RURAL 1.1, MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, CAMPUS 3.6, BURIAL GROUND 3.7, RURAL FARMLAND 6.1, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	Historic Preservation Certified Local Government Grants [62] Middlesex County Division of History and Historic Preservation Historic Marker Program [63]	

Figure 3.26: Historic Signage at John A. Phillips Preserve, Old Bridge

Source: CUES, Rutgers University. Photograph. 2020.

ACROSS TYPES

VI.b: Historic Landscapes and Features Representing Diverse Groups		
Highlight and preserve historical landscapes relevant to diverse groups throughout the County		
Benefits	**Environmental:** Reflects the historic and environmental value of the land and represents the County's diversity.	**Cultural:** Brings attention to area, increasing local revenue through local tourism
Timeframe	Short-term (1-2 years)	
Priority Location	County-wide	
County Lead	Office of Arts and History	
Landscape Types	Across Types	
Influencers	County, State, Federal	
Resources	Historic Preservation Certified Local Government Grants [64] Middlesex County Division of History and Historic Preservation Historic Marker Program [65]	

Figure 3.27: Marie Curie Monument in Roosevelt Park, Edison

Source: CUES, Rutgers University. Photograph. 2020.

Viewshed Management (VII)

VII.a: Viewshed Inventory and Analysis		
Conduct an in-depth County-wide viewshed inventory and analysis at the local level identifying more viewsheds culturally valued for preservation.		
Benefits	**Environmental:** Highlights and draws attention to natural environmental features	**Cultural:** Enhances quality of landscape experience and increases the potential to draw in tourism.
Timeframe	Short-term (1-2 years)	
Priority Location	Countywide	
County Lead	Office of Planning	
Landscape Types	Across Types	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	Scenic Corridor Overlay Zoning [66] New Jersey Future Non-Contiguous Cluster Zoning [67]	

VII.b: Vegetation Management

Maintain and direct sight lines through vegetation removal, cutting, and additions.

Benefits	**Environmental:** Increases landscape preservation and invasive reduction	**Cultural:** Maintains aesthetics and value
Timeframe	Short-term (1-2 years)	
Priority Location	Identified viewsheds	
County Lead	Office of Parks and Recreation	
Landscape Types	SINGLE, LOW-DENSITY RURAL 1.1, CLOSED LANDFILL 5.2, VACANT 5.3, RURAL FARMLAND 6.1, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	Scenic Corridor Overlay Zoning [68]	

ACROSS TYPES

VII.c: Development Standards		
Restrict zoning to minimize viewshed inhibitors within sight lines.		
Benefits	**Environmental:** Preserves landscape integrity and limits fragmentation	**Cultural:** Maintains aesthetics and value
Timeframe	Medium-term (3-5 years)	
Priority Location	Countywide	
County Lead	Office of Planning	
Landscape Types	Across Types	
Influencers	Municipality, Private Landowner	
Resources	Scenic Corridor Overlay Zoning [69] New Jersey Future Non-Contiguous Cluster Zoning [70]	

Figure 3.28: Waterfront Views, Carteret

Source: CUES, Rutgers University. Photograph. 2021.

VII.d

VIEWSHED ACCESS

VII.d: Viewshed Access		
Incorporate viewshed access points along the greenway opportunity routes and in parks.		
Benefits	**Environmental:** Increases maintenance to preserve natural integrity	**Cultural:** Increases importance of landscape to people and pedestrian use
Timeframe	Long-term (5+ years)	
Priority Location	Greenway Opportunities and Viewshed Analysis Open Space	
County Lead	Office of Parks and Recreation	
Landscape Types	CLOSED LANDFILL 5.2, VACANT 5.3, RURAL FARMLAND 6.1, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal, Private Landowner, Non-Profit Organizations	
Resources	Green Acres [71]	

Figure 3.29: Forest Fire Lookout Tower in Thompson Park, Jamesburg

Source: CUES, Rutgers University. Photographs. 2020.

DOWNTOWN AREAS AND STREETSCAPE ENHANCEMENTS

The *Inventory* and *Analysis* revealed the overall quality of the County's municipal downtown areas and an overabundant amount of parking. The downtown quality matrix revealed that each municipal downtown has clear strengths and opportunities for improvement. The D 2040 Public Outreach revealed that people desire better quality downtowns, increased access, and safer pedestrian streetscapes.

Each urban, suburban, or rural downtown is unique to its municipality and exemplifies varied needs such as amenity enhancements, pedestrian spaces, bicycle paths, or open space connections and awareness. The D 2040 strategic initiative guiding the following set of actions and tactics includes:

- *Revitalize walkable town centers, downtowns, and commercial corridors.*

Landscape enhancements play an integral role in the overall revitalization of downtown areas. Outdoor spaces and landscape amenities increase awareness of environmental qualities and challenges while enhancing the quality and access of downtown areas through positive visual experiences and increased user comfort.

Temporary pedestrian spaces provide flexible alternatives for often car-centric areas like roads and parking lots to increase outdoor access with limited intervention. Temporary spaces offer more outdoor space for people, whether for one day or the whole summer season. Permanent pedestrian spaces are the base for long-term landscape enhancements as they indefinitely convert outdoor space for pedestrian use. Permanent pedestrian spaces further add visual stimulation and functionality while reducing stormwater runoff and urban heat islands and increasing plants for pollinators through added vegetation and impervious surface removal. The following tactics focus on downtown and streetscape enhancements for the best user experience in downtown areas through creating high-quality, flexible spaces for pedestrians and supporting placemaking initiatives.

Pedestrian Space Enhancements (VIII)

VIII.a

STREET AND PLAZA ACTIVATION

VIII.a: Street and Plaza Activation		
Utilize parking lots, side-roads, and vacant lots in urban areas for temporary or permanent pedestrian spaces such as parklets and pedestrian plazas by establishing tools for quick conversion in temporary spaces and analysis for suitable permanent pedestrian spaces.		
Benefits	**Environmental:** Can permanently or temporarily increase vegetation and decrease urban heat island effects	**Cultural:** Supports residents' interaction and thus enhances local cultural identity.
Timeframe	Short-term (1-2 years)	
Priority Location	Publicly owned parking lots Vacant lots Downtowns	
County Lead	Office of Planning	
Landscape Types	RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3	
Influencers	Municipality, Private Landowner, Non-Profit Organizations	
Resources	Projects for Public Spaces [72]	

Figure 3.30: Temporary Pedestrian Spaces in Middlesex County

Source: CUES, Rutgers University. Photograph. 2021. (Left) COVID-19 Street Closure Highland Park; (Right) Rutgers Landscape Architecture Club Parking Day, New Brunswick.

Figure 3.31: Permanent Pedestrian Plaza, Metuchen

Source: CUES, Rutgers University. Photograph. 2020.

VIII.b: Signage and Wayfinding

Implement town-wide wayfinding signage connecting pedestrians and cyclists to downtown areas, historic properties, historic trails, and local parks.

Benefits	**Environmental:** Increases importance and access to the landscape	**Cultural:** Increases general knowledge about local attractions, contributing to local identity.
Timeframe	Medium-term (3-5 years)	
Priority location	Downtowns	
County Lead	Office of Planning	
Landscape Types	RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3	
Influencers	Municipality	
Resources	Projects for Public Spaces [73]	

VIII.c: Community Arts Advocate		
Establish a municipal arts advocate.		
Benefits	**Environmental: -**	**Cultural:** An arts advocate can work to enhance local conversations about arts and support culture-forming interactions.
Timeframe	Short-term (1-2 years)	
Priority Location	County-wide	
County Lead	Office of Arts and History	
Landscape Types	Across Types	
Influencers	Municipality, Non-Profit Organizations	
Resources	Sustainable Jersey: Municipal Commitments to Support Arts and Creative Culture [74]	

VIII.d

ART INSTALLATIONS

VIII.d: Art Installations		
Incorporate murals, statues, performative, interactive, or temporary art installations into the municipal streetscape.		
Benefits	**Environmental: -**	**Cultural:** Increase aesthetics and attention to the area
Timeframe	Short-term (1-2 years)	
Priority Location	Downtowns County Parks	
County Lead	Office of Arts and History	
Landscape Types	RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3	
Influencers	Municipality, County, Private Landowner, Non-Profit Organizations	
Resources	Middlesex County Office of Arts & History Regional Cultural Plan and Grant Support [75]	

Figure 3.32: Art Installations in Downtown Areas

Source: CUES, Rutgers University. Photograph. 2021, 2020.
(Left) Mural, Highland Park; (Right) Memorial Artwork, Woodbridge.

VIII.e: Digital Technologies to Celebrate the Local Character

Develop a County-wide digital and interactive phone application promoting all municipal downtown areas.

Benefits	**Environmental:** Potentially decreases the need for physical marketing and potential litter	**Cultural:** Linking local character with social media allows to engage with broader sections of the population.
Timeframe	Short-term (1-2 years)	
Priority Location	County-wide	
County Lead	Office of Planning	
Landscape Types	Across Types	
Influencers	County	
Resources	Sustainable Jersey: Municipal Communication Strategies [76]	

VIII.f

STREETSCAPE AMENITY ENHANCEMENTS

VIII.f: Streetscape Amenity Enhancements		
Upgrade and add streetscape amenities in downtown areas, including benches, tables, planters, garbage and recycling cans, bicycle racks, lighting fixtures, flags, etc.		
Benefits	**Environmental:**	**Cultural:** Supports local identity and provides opportunities for social interaction to foster cultural processes.
Timeframe	Short-term (1-2 years)	
Priority Location	Downtowns	
County Lead	Office of Planning	
Landscape Types	RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3	
Influencers	Municipality, County, Non-Profit Organizations	
Resources	Municipal Main Street Committees Main Street New Jersey Program Guide Handbook [77] Downtown New Jersey [78]	

Figure 3.33: Downtown Enhancements

Source: CUES, Rutgers University. Photograph. 2021, 2022. (Left) Pop-up Park, Dunellen; (Right) Street Planter, Dunellen.

Pedestrian And Cyclist Safety (IX)

IX.a: Pedestrian and Bicycle Accessibility		
Connect pedestrian sidewalks and paths between residential neighborhoods, open spaces, and commercial areas **supporting the Bike Easy. Walk Safely** Functional Plan.		
Benefits	**Environmental:** Supports human health and well-being and reduces carbon emissions.	**Cultural:** Reduces car traffic in the commercial core.
Timeframe	Medium-term (3-5 years)	
Priority Location	Greenway Opportunities On-Road Connections ***Bike Easy. Walk Safely.*** Functional Plan	
County Lead	Office of Planning	
Landscape Types	SINGLE, LOW-DENSITY RURAL 1.1, SINGLE, LOWER-DENSITY SUBURBAN 1.2, SINGLE, MEDIUM-DENSITY SUBURBAN 1.3, SINGLE, HIGH-DENSITY SUBURBAN 1.4, MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, SINGLE NEIGHBORHOOD BUILDING 3.1, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, INDOOR MALL 3.4, OFFICE PARK 3.5, CAMPUS 3.6, BURIAL GROUND 3.7, HEAVY INDUSTRY 4.1, WAREHOUSE 4.2, SMALL YARD OR OTHER LIGHT INDUSTRY 4.3, ACTIVE LANDFILL 5.1, CLOSED LANDFILL 5.2, VACANT 5.3, RURAL FARMLAND 6.1, URBAN AGRICULTURE 6.2, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Non-Profit Organizations	
Resources	***Bike Easy. Walk Safely.*** Functional Plan	

Figure 3.34: Unmarked Shoulder, South Brunswick

Source: CUES, Rutgers University. Photograph. 2021.

IX.b: Dedicated Bicycle Lanes

Implement dedicated bicycle lanes on roadways based on the ***Bike Easy. Walk Safely.*** functional plan's design standards and recommended locations.

Benefits	**Environmental:** Decreases vehicle emissions and increases bicyclist safety.	**Cultural:** Reduces car dependency for local travel and reduces local traffic.
Timeframe	Medium-term (3-5 years)	
Priority Location	Greenway Opportunities On-Road Connections ***Bike Easy. Walk Safely.*** Functional Plan	
County Lead	Office of Planning	
Landscape Types	SINGLE, LOW-DENSITY RURAL 1.1, SINGLE, LOWER-DENSITY SUBURBAN 1.2, SINGLE, MEDIUM-DENSITY SUBURBAN 1.3, SINGLE, HIGH-DENSITY SUBURBAN 1.4, MULTI-DWELLING, HIGH-DENSITY SUBURBAN 1.5, RURAL VILLAGE CENTER 2.1, SUBURBAN TOWN CENTER 2.2, URBAN CITY CENTER 2.3, SINGLE NEIGHBORHOOD BUILDING 3.1, STRIP MALL 3.2, PLAZA SHOPPING CENTER 3.3, INDOOR MALL 3.4, OFFICE PARK 3.5, CAMPUS 3.6, BURIAL GROUND 3.7, HEAVY INDUSTRY 4.1, WAREHOUSE 4.2, SMALL YARD OR OTHER LIGHT INDUSTRY 4.3, ACTIVE LANDFILL 5.1, CLOSED LANDFILL 5.2, VACANT 5.3, RURAL FARMLAND 6.1, URBAN AGRICULTURE 6.2, SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Non-Profit Organizations	
Resources	***Bike Easy. Walk Safely.*** Functional Plan	

Figure 3.35: Dedicated Bike Route, Old Bridge

Source: CUES, Rutgers University. Photograph. 2022.

Downtown Areas and Streetscape Enhancement Areas

Map 3.3 illustrates all downtown areas in Middlesex County. Downtown and streetscape enhancement priority intervention locations exist throughout the County's existing downtown areas.

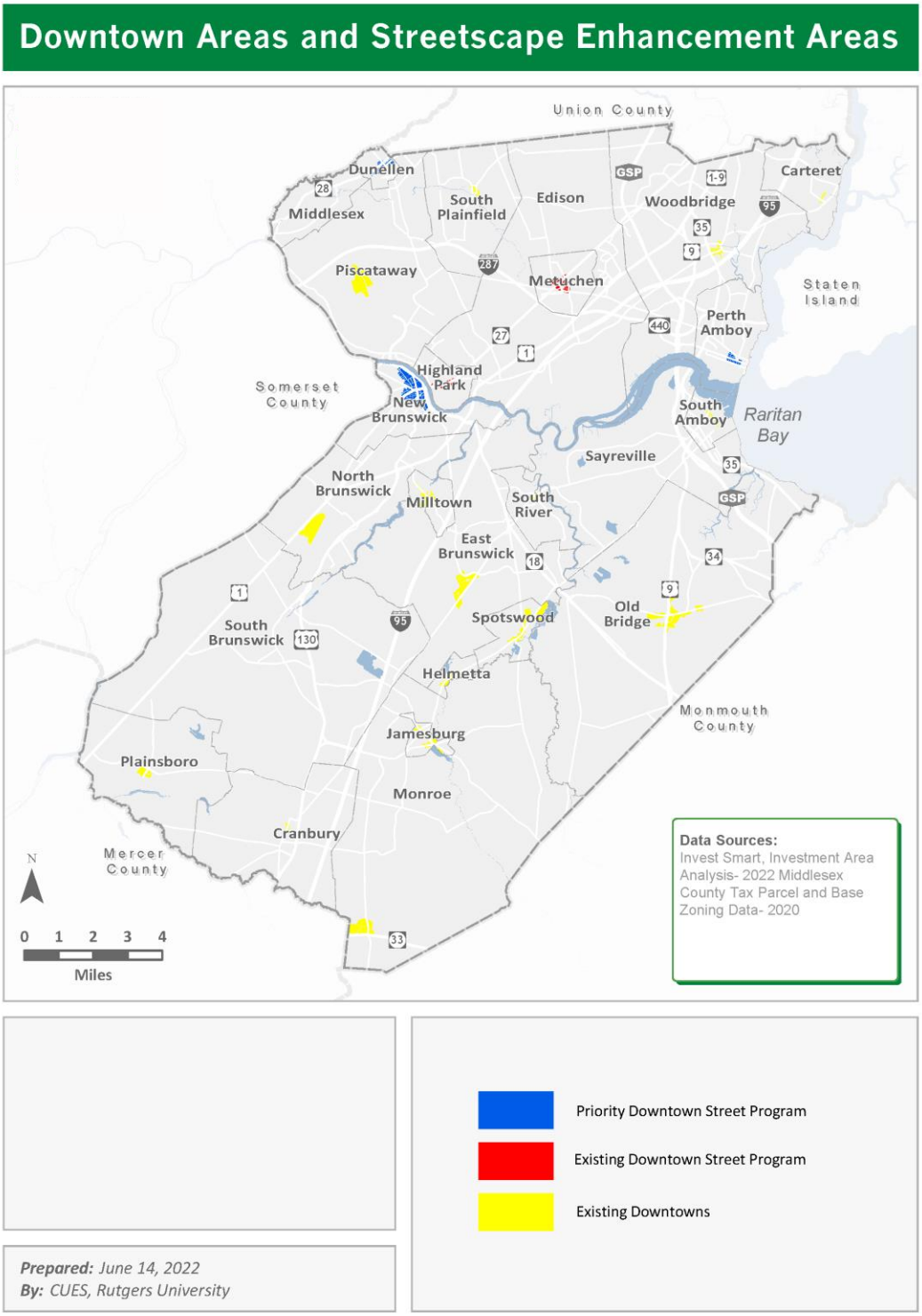
The inventory and analysis chapters revealed downtown locations and state street programs associated with each downtown area. ***Map 3.3*** represents priority downtown street program areas (blue), including downtowns with the Downtown New Jersey designation. Main Street NJ program qualifications require participation in the Downtown NJ program. Programs aid non-profit organizations in providing steady and consistent improvement support for downtown areas.

Existing Downtown Street Programs (red) include Highland Park and Metuchen, which already contain the Main Street NJ program designation.

Existing downtowns (yellow) include all areas without Main Street NJ or Downtown New Jersey Program status. The existing downtowns may consist of a special improvement district (refer to the *Analysis* chapter downtown quality matrix).

Differentiating the downtown areas by these main programs identifies funding support and resources accompanying downtown improvements. Each municipal downtown County-wide would benefit from the Downtown Areas and Streetscape Enhancement action and tactics to increase art representation, pedestrian safety, bicyclist accessibility, and overall outdoor experience in the County's commercial centers.

Map 3.3: Downtown Areas and Streetscape Enhancement Areas



OPEN SPACE QUALITY PROTECTION AND ENHANCEMENT

Middlesex County offers 19 County parks and 14 County-owned conservation areas for recreational activity. The parks in Middlesex County include County-owned open spaces and municipally, state, federally, and privately owned parks. Green Acres or Farmland Preservation funding protects over 30,000 acres of Middlesex County's landscapes. Maintaining and enhancing Middlesex County's parks for recreational and habitat use is essential. The D 2040 strategic initiative guiding tactics for open space quality includes:

- *Provide safe, innovative, inclusive, and sustainable parks and recreation services.*

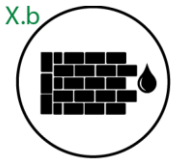
The ***Open Spaces.*** Functional plan (OSRP) contains an in-depth analysis of the County parks providing opportunities for park enhancements through resilient infrastructure, permeable pavement, enhanced amenities, and more. The original guiding actions from the OSRP enhance maintenance regimes, plan for sea-level rise, and incorporate sustainable amenities into park designs. The tactics in this section include and expand on the original actions from the OSRP and identify priority parking lots for permeable paving and flood risk structures within parks. ***Map 3.4*** illustrates priority locations for action intervention.

Figure 3.36: Davidson's Mill Pond Park Native Plant Garden

Source: CUES, Rutgers University. Photograph. 2020.

Parks and Recreation Management (X)

X.a: Park Management Regimes		
Review and update park maintenance regimes.		
Benefits	**Environmental:** Increases landscape integrity and invasive removal.	**Cultural:** Increases park aesthetics and pedestrian use.
Timeframe	Short-term (1-2 years)	
Priority Location	Open space	
County Lead	Office of Parks and Recreation	
Landscape Types	SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	County	
Resources	***Open Spaces.*** Functional Plan	



PERMEABLE PAVEMENT IN COUNTY PARKING LOTS

X.b: Permeable Pavement in County Park Parking Lots		
Review the overall organization and amount of parking in County Parks, focusing on implementing porous pavement and permeable parking in County Park parking lots and paths in areas with less traffic.		
Benefits	**Environmental:** Can reduce urban heat island effect and decreases stormwater runoff.	**Cultural:** Increases overall aesthetics.
Timeframe	Medium-term (3-5 years)	
Priority Location	County-owned open space and parking lots	
County Lead	Office of Parks and Recreation	
Landscape Types	SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	County	
Resources	NJDEP Pervious Paving Systems [79]	

Figure 3.37: Permeable Parking Installation in Mercer County Parks at Baldpate Mountain.

Source: CUES, Rutgers University. Photograph. 2021.

X.c: Sustainable Park Amenity Enhancements		
Assess and upgrade park amenities to include sustainable alternatives such as compost bathrooms, solar lighting, pervious paths, etc.		
Benefits	**Environmental:** Decreases waste and pollution	**Cultural:** Increases aesthetics, safety, and overall park usability.
Timeframe	Medium-term (3-5 years)	
Priority Location	Open space	
County Lead	Office of Parks and Recreation	
Landscape Types	SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal	
Resources	Sample Initiative: National Park Service *Green Park Plan* [80]	

Figure 3.38: Permeable Walking Path at John A. Phillips Open Space Preserve, Old Bridge

Source: CUES, Rutgers University. Photograph. 2022.

X.d: Sea-Level Rise Strategies in Parks

Construct County Park facilities outside sea-level rise areas and include wetland restoration and construction to provide a waterbody buffer.

Benefits	**Environmental:** Reduces pollution and increases the potential for storm buffer. Reduces the need for flood mitigation efforts	**Cultural:** Supports awareness of climate change and highlights possible solutions.
Timeframe	Long-term (5+ years)	
Priority Location	***Middlesex County All-Hazard Mitigation Plan**** identified facilities in flood zones Open Space Priority Flood Mitigation Zones	
County Lead	Office of Planning	
Landscape Types	SOCIAL PARKS 7.1, NEIGHBORHOOD PARKS 7.2, SPORTS PARKS 7.3, NATURE PARKS 7.4, GOLF COURSES 7.5	
Influencers	Municipality, County, State, Federal	
Resources	***Middlesex County All-Hazard Mitigation Plan**** ***Open Spaces.*** Functional Plan	

*Draft analysis of all County facilities within flood zones

Open Space Quality Protection and Enhancement Priority Locations

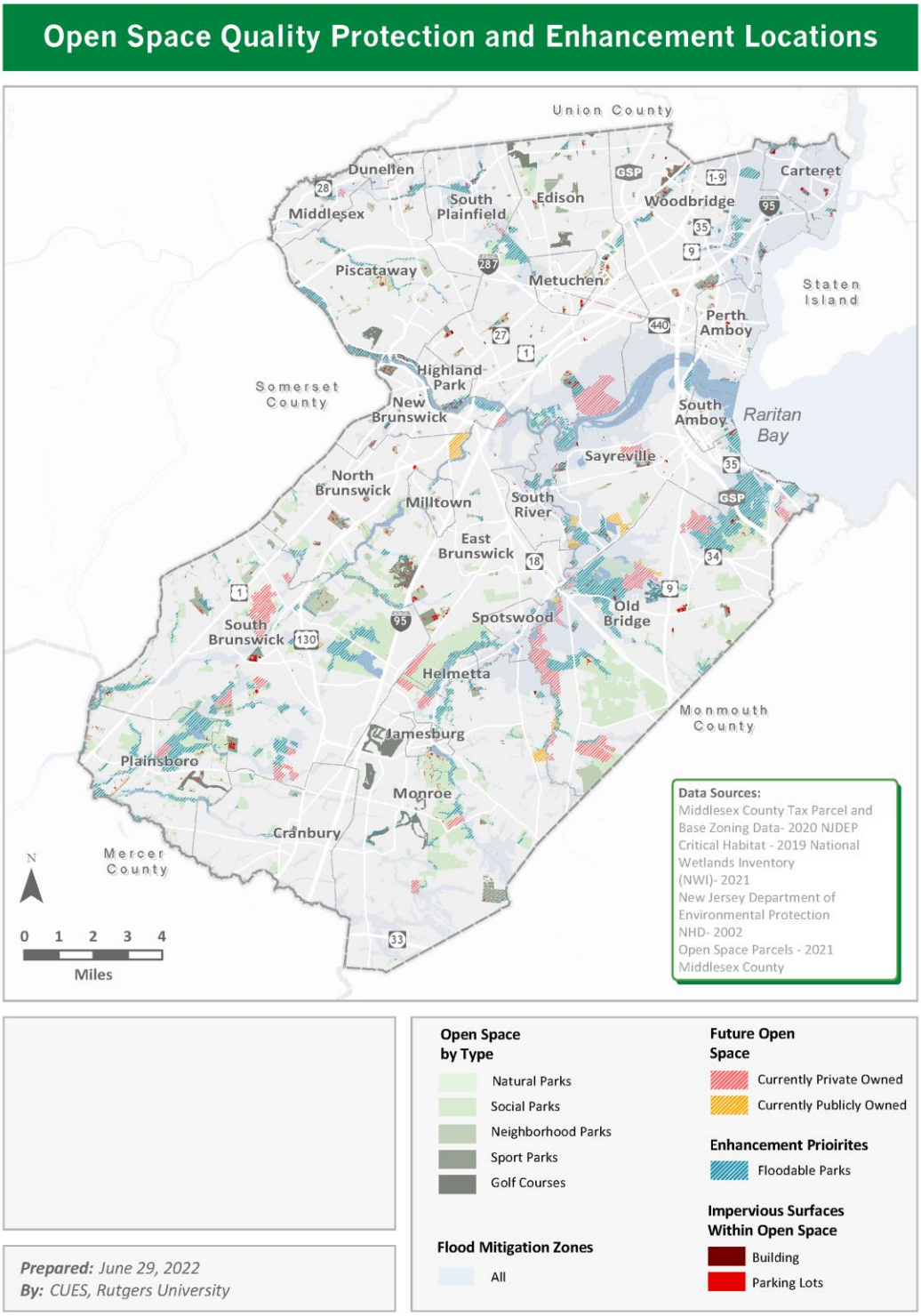
Map 3.4 illustrates priority open space quality protection and enhancement priority locations related to open space landscape types.

The open space landscape types identify areas where park management regimes may differ. A natural park requires more varied maintenance tactics and goals than a social or sports park.

However, all park types will require sea-level rise and water management tactics with climate change pressure. Floodable parks differentiate park areas within priority flood mitigation zones. These areas note potential floodable park tactics to combat sea-level rise and flood risks for existing open space and future planned open space based on the acquisition recommendations from ***Map 3.1***. Floodable parks can support wetland restoration projects, store significant stormwater, and provide recreational areas connecting people with wetland landscapes.

Impervious surface reduction can occur in all park parking lots and potentially unneeded structures. The park impervious surfaces, marked in red, highlight all impervious surfaces to consider for an impervious surface reduction in parks. The Middlesex County *All-Hazard Mitigation draft plan* locates all County park buildings in flood risk zones while ***Open Spaces.*** identified County park facilities and amenities in threat of sea-level rise.

Map 3.4: Open Space Quality Protection and Enhancement Priority Locations

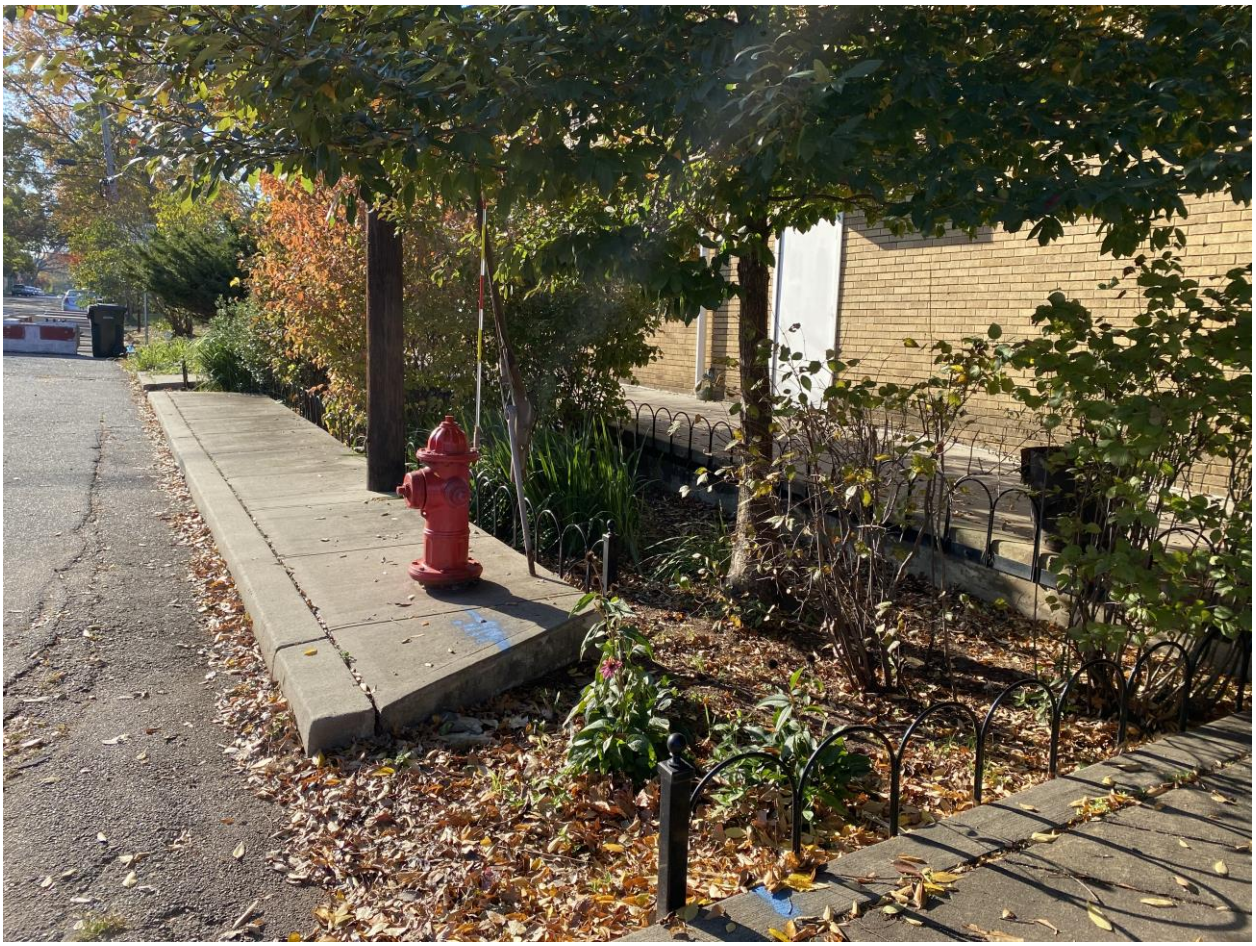


3.3 ACTION IMPLEMENTATION

The *Integrated Ecosystem Services and Cultural Landscape Action Plan* outlines two approaches for regional-scale action implementation. The first approach applies environmental actions (section 3.1) and cultural actions (section 3.2) to the landscape types developed in the *Analysis* chapter. The landscape types combine multilevel NJDEP land use data and the research team's definitions based on the cultural understanding of Middlesex County's spaces and associated landscapes.

The second approach recommends actions across the entire landscape that transect all types. These actions include preservation opportunities and ecological stewardship. In addition to the type-specific and across type actions, the proposed Middlesex County *Greenway Opportunities* network provides an implementation framework supporting ecosystem services and cultural landscapes.

Figure 3.39: Rain Garden in Suburban Downtown, Highland Park



Source: CUES, Rutgers University. Photograph. 2021.

TYPE-SPECIFIC TACTICS

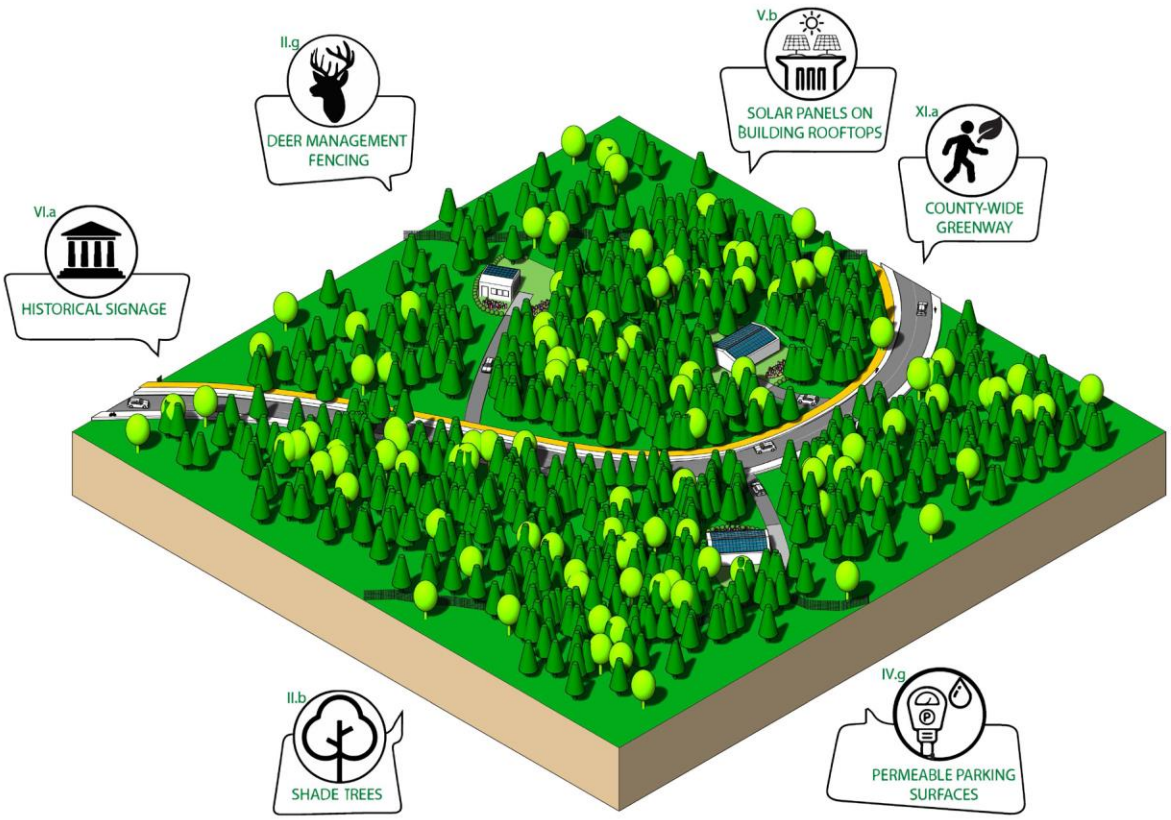
Type-specific Tactics contain physical implementations that vary based on the landscape type, listed in ***Table 3.2***. The following section pairs cultural landscape types identified in the *Ecosystem Services and Cultural Landscape Analysis* with *Type-Specific Actions* from sections 3.1 and 3.2 into individual fact sheets. Tactic icons and a brief quick fact accompany each landscape type. Quick facts state the impacts of the potential tactics per type. The *Type-Specific Tactics* fact sheets begin on page 87.

Table 3.2: Type-Specific Tactics

Tactic ID	Title
I.f	FARMLAND PRESERVATION
I.g	ALTERNATIVE USE, LAND FOR AGRICULTURE
II.a	BIODIVERSE PLANTINGS
II.b	SHADE TREES
II.c	LAWN ALTERNATIVES (MEADOWS, REFORESTATION, SHRUBS)
II.d	INVASIVE SPECIES MANAGEMENT
II.g	DEER MANAGEMENT- FENCING
IV.a	GREEN FACADES
IV.b	BIOSWALES
IV.c	RAIN GARDENS/BIORETENTION
IV.d	STREET AND PARKING LOT TREES
IV.e	GREEN ROOFS
IV.g	PERMEABLE PARKING SURFACES
V.a	COOL ROOFS
V.b	SOLAR PANELS ON BUILDING ROOFTOPS
V.c	SOLAR PANEL CANOPIES ON PARKING LOTS
V.d	SOLAR FIELD
V.e	ELECTRIC VEHICLE CHARGING STATIONS (EV)
VI.a	HISTORICAL SIGNAGE (INFORMATIONAL AND WAYFINDING)
VII.b	VEGETATION MANAGEMENT
VII.c	VIEWSHED ACCESS
VIII.a	STREET AND PLAZA ACTIVATION
VIII.b	SIGNAGE AND WAYFINDING
VIII.d	ART INSTALLATIONS
VIII.f	STREETSCAPE AMENITY ENHANCEMENTS
IX.a	PEDESTRIAN ACCESSIBILITY
IX.b	DEDICATED BICYCLE LANES
X.a	PARK MANAGEMENT REGIME
X.b	PERMEABLE PAVEMENT IN COUNTY PARK PARKING LOTS
X.c	SUSTAINABLE PARK AMENITY ENHANCEMENTS
X.e	SEA-LEVEL RISE STRATEGIES IN PARKS

1.1 Single, Low-Density Rural

Residential



Quick Facts:

5,000 acres of single low and lower-density properties contain pervious surfaces. Ensuring that 75% of this land provides ecological habitat through meadows, forest, and wetland protection can support 3,750 acres of pristine ecological habitat.

1.2 Single, Lower-Density Suburban

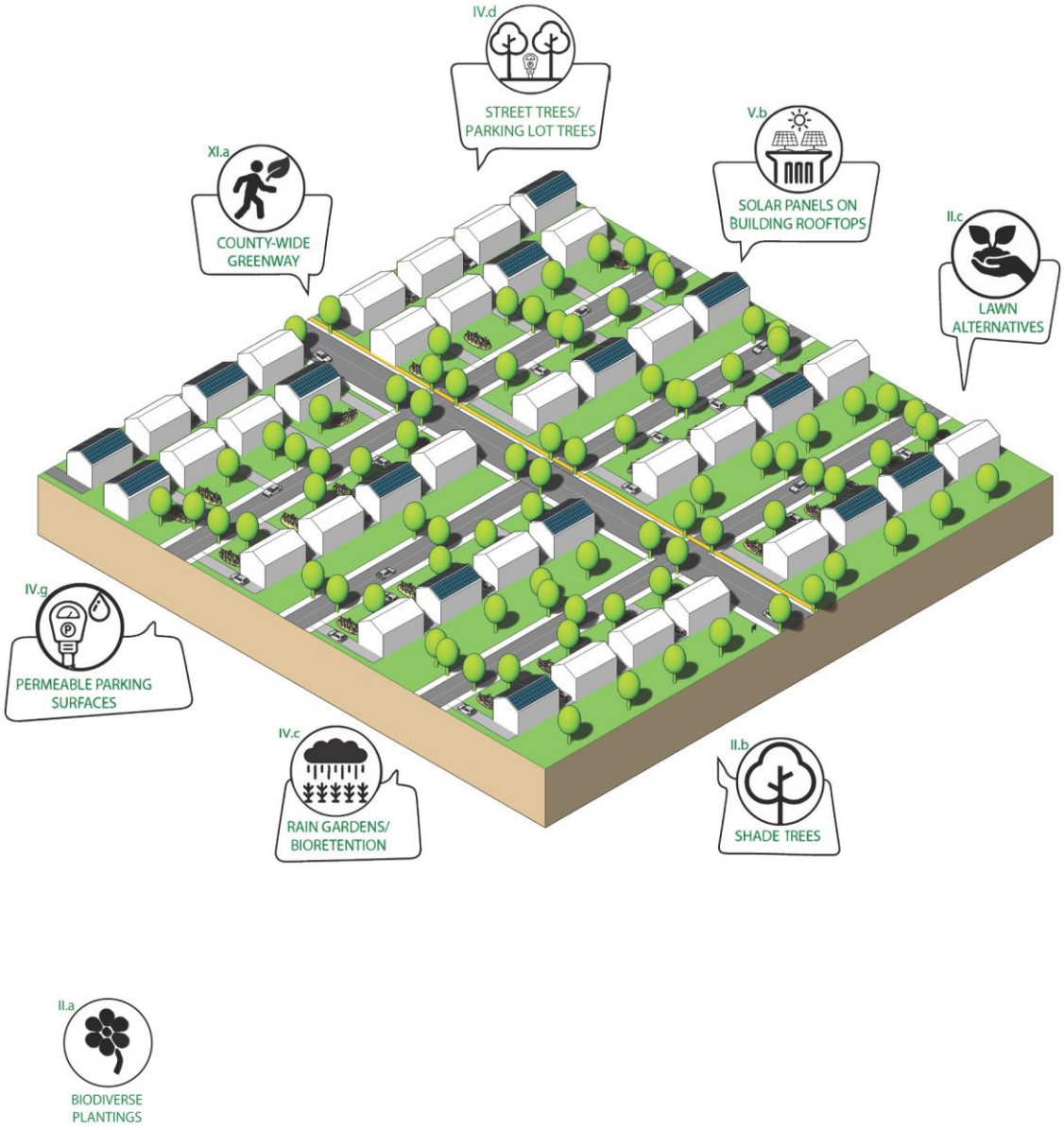
Residential

Quick Facts:

Reducing parking, patio, and other paved surfaces by 5% on the County's single low and lower-density properties can eliminate 35 acres of impervious surfaces, reducing stormwater runoff entering the surrounding natural habitats and waterways.

1.3 Single, Medium-Density Suburban

Residential

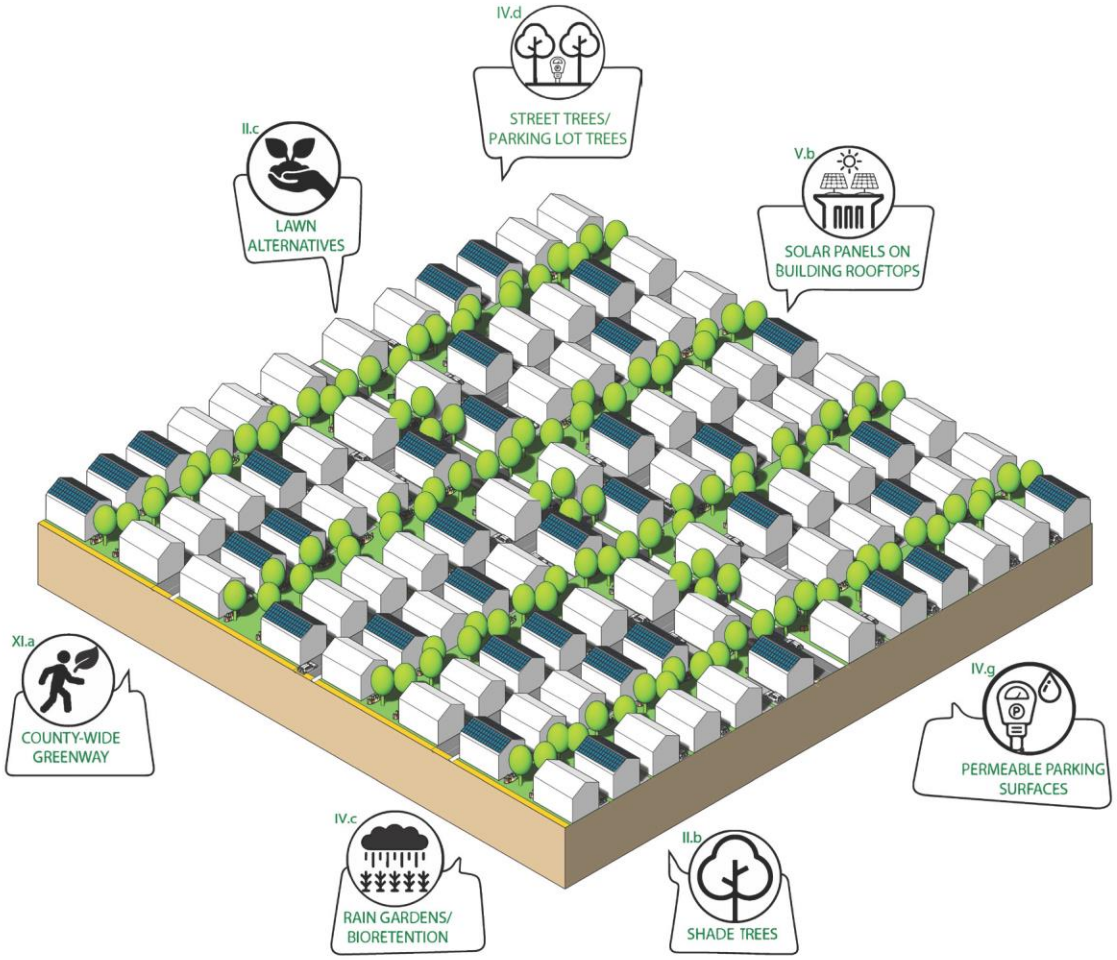


Quick Facts:

Replacing impervious parking, patio, and sidewalk materials on medium-density residential properties by 5% can reduce 300 acres of impervious surfaces covering the County's landscape.

1.4 Single, High-Density Suburban

Residential

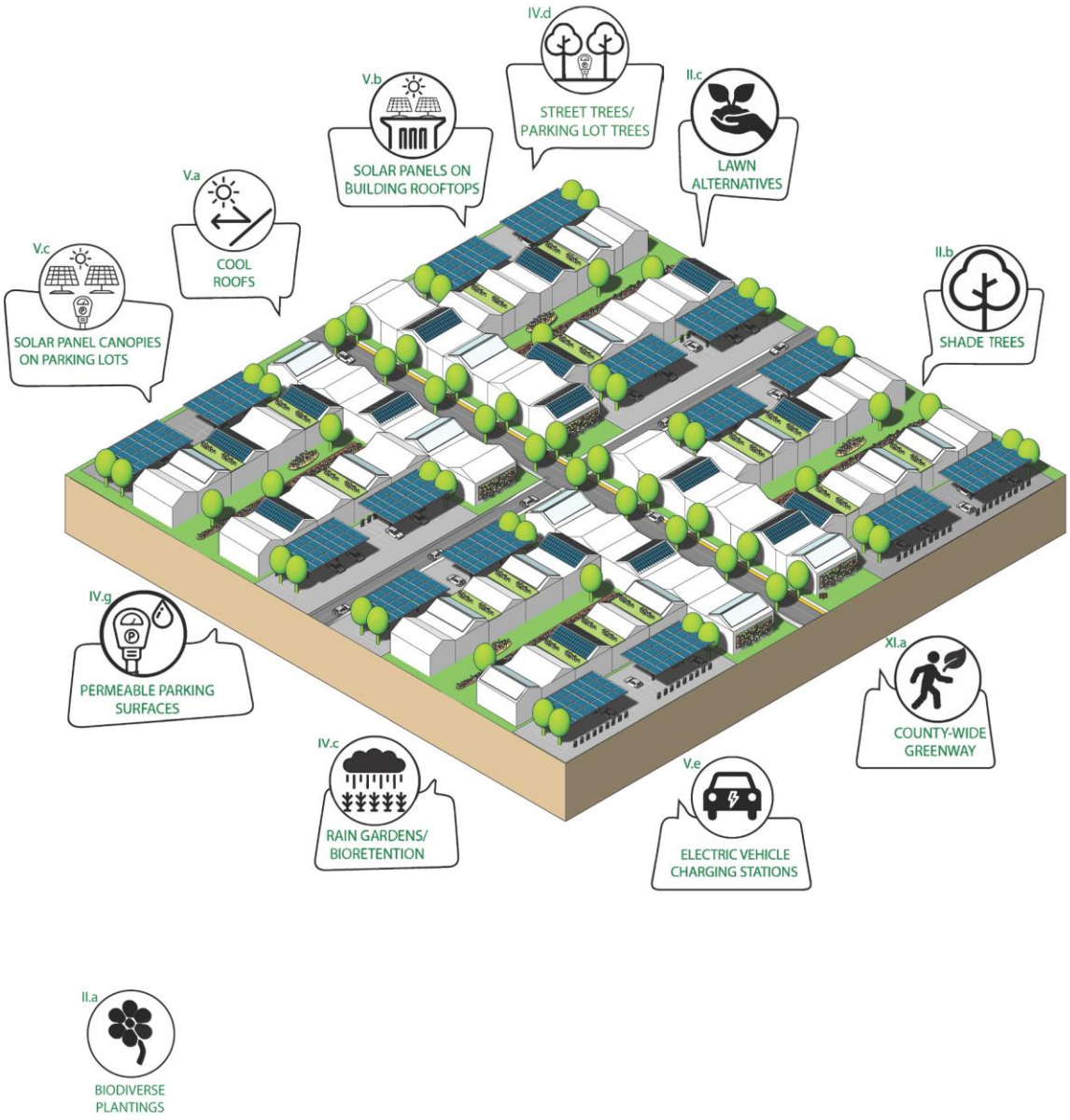


Quick Facts:

Collecting stormwater for 25% of all impervious parking, patio, and sidewalk surfaces in high-density single and multi-dwelling residential properties can divert 23 million gallons of water for every 1-inch of rain away from local waterways.

1.5 Multi-Dwelling, High-Density Suburban

Residential

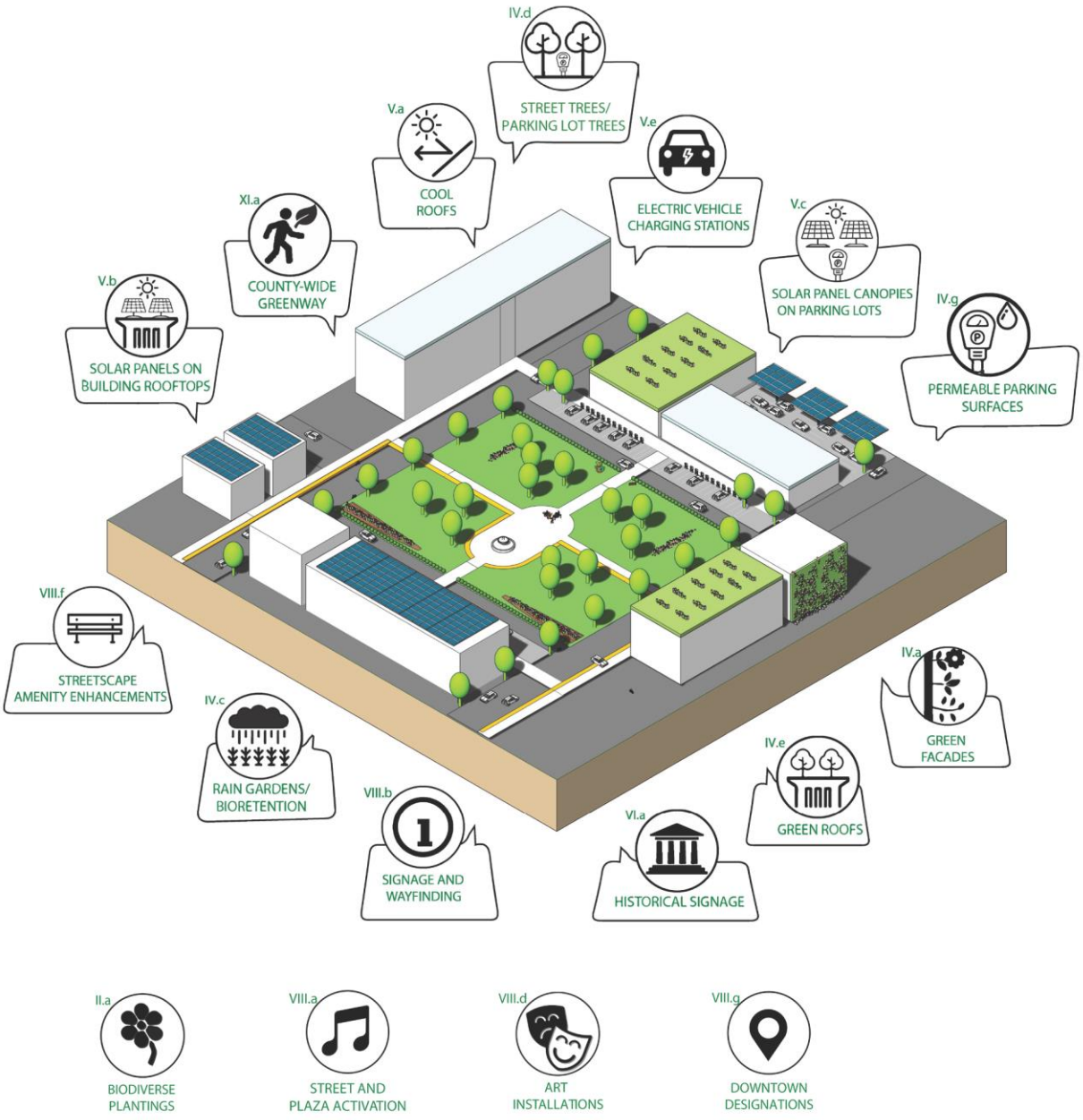


Quick Facts:

Reducing parking lots, patios, and impervious path materials by 5% on high-density single and multi-dwelling residential properties can replace 350 acres of impervious materials with porous asphalt, pavers, or vegetation.

2.1 Rural Village Center

Mixed-Use

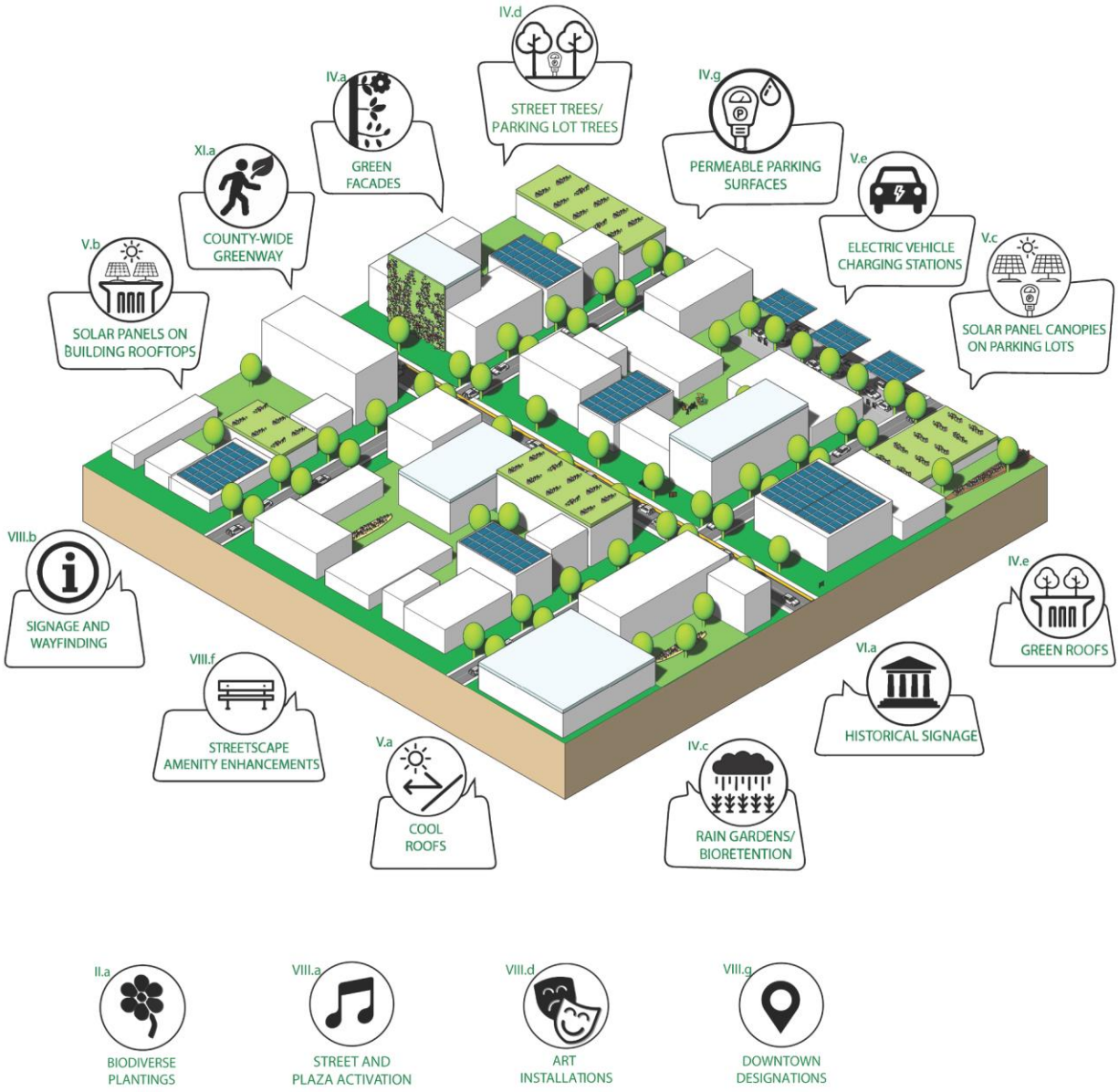


Quick Facts:

Replacing impervious parking surfaces with permeable asphalt filters 80-85% more total suspended solids (TSS) from stormwater runoff before entering local waterways and the surrounding natural areas.

2.2 Suburban Town Center

Mixed-Use

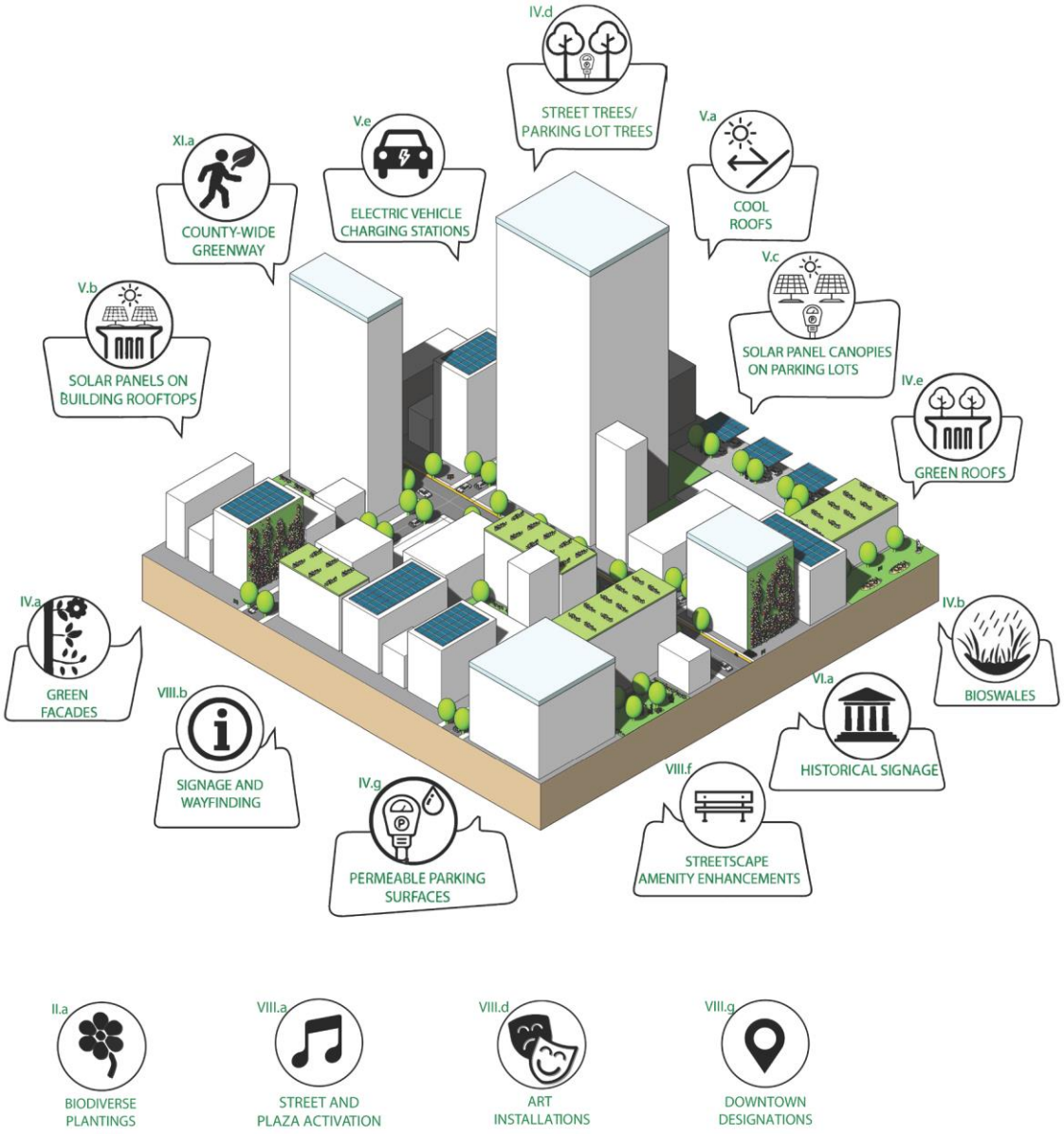


Quick Facts:

Parking surfaces account for 516 acres in suburban downtown areas. Covering all parking lots with 25% shade tree canopy cover can add 130 acres of shaded surfaces (about 40°F cooler than unshaded surfaces), helping to reduce urban heat islands.

2.3 Urban City Center

Mixed-Use

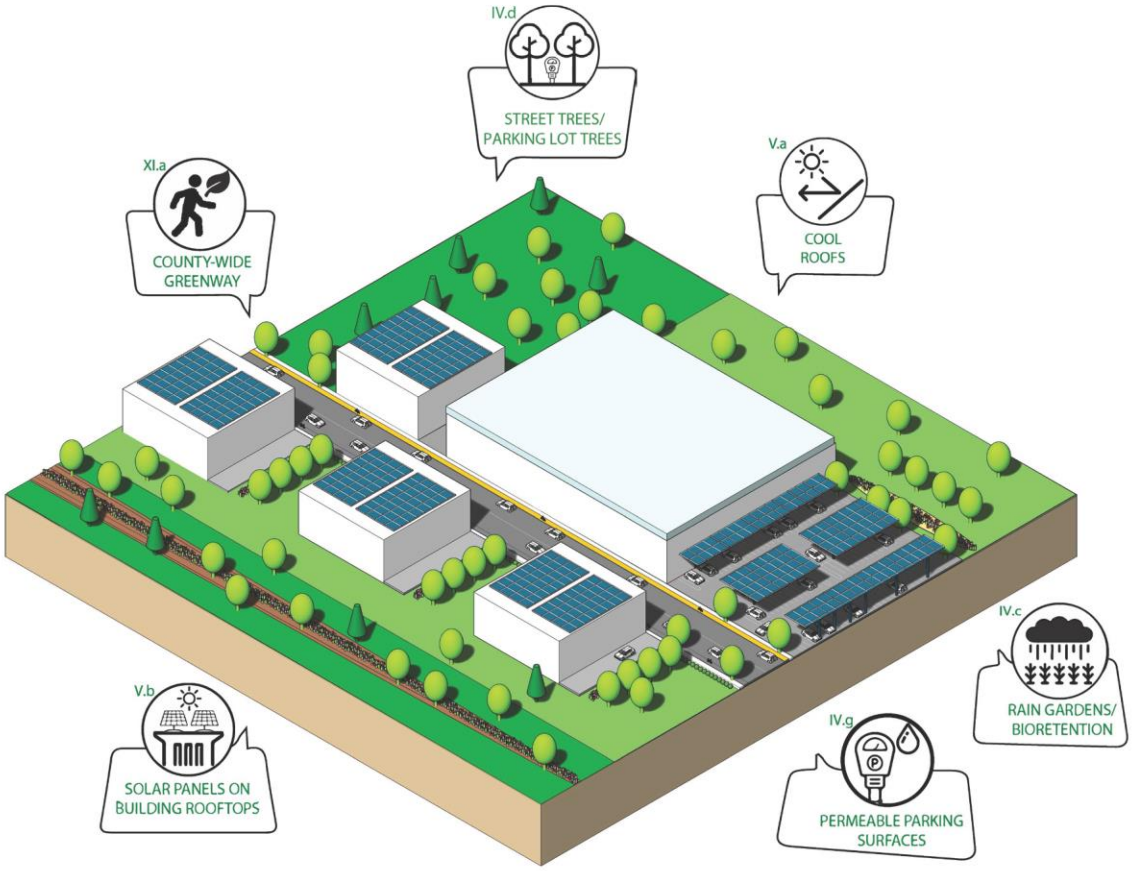


Quick Facts:

Introducing green roofs, cool roofs, and green facades can lower the city's ambient air temperature by 5°F.

3.1 Single Neighborhood Building

Commercial



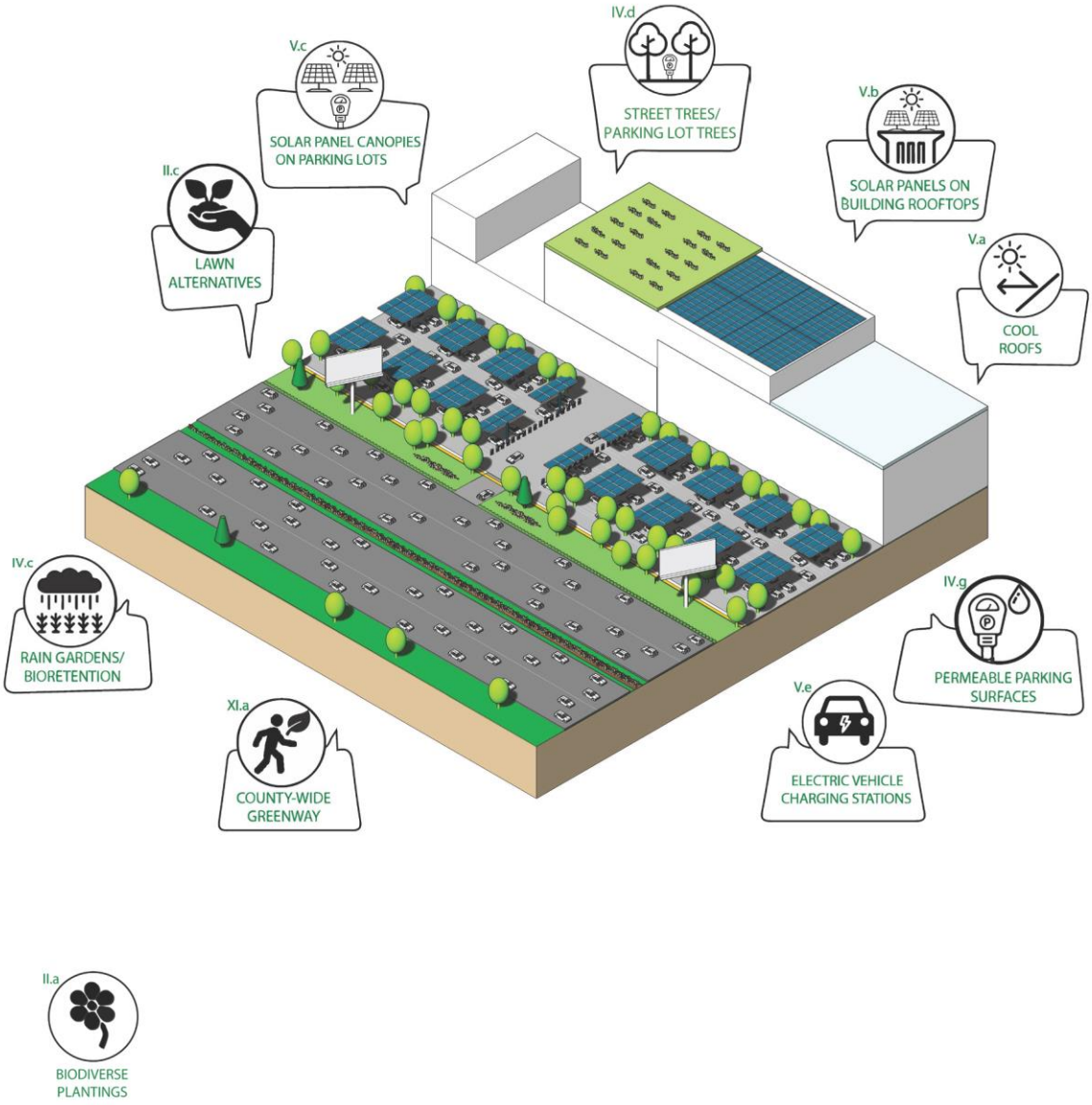
II.a
BIODIVERSE
PLANTINGS

Quick Facts:

Single neighborhood commercial building parking lots account for nearly 3,000 acres of the County's impervious surfaces. Replacing these materials by even 10% can eliminate 300 acres of impervious materials.

3.2 Strip Mall

Commercial

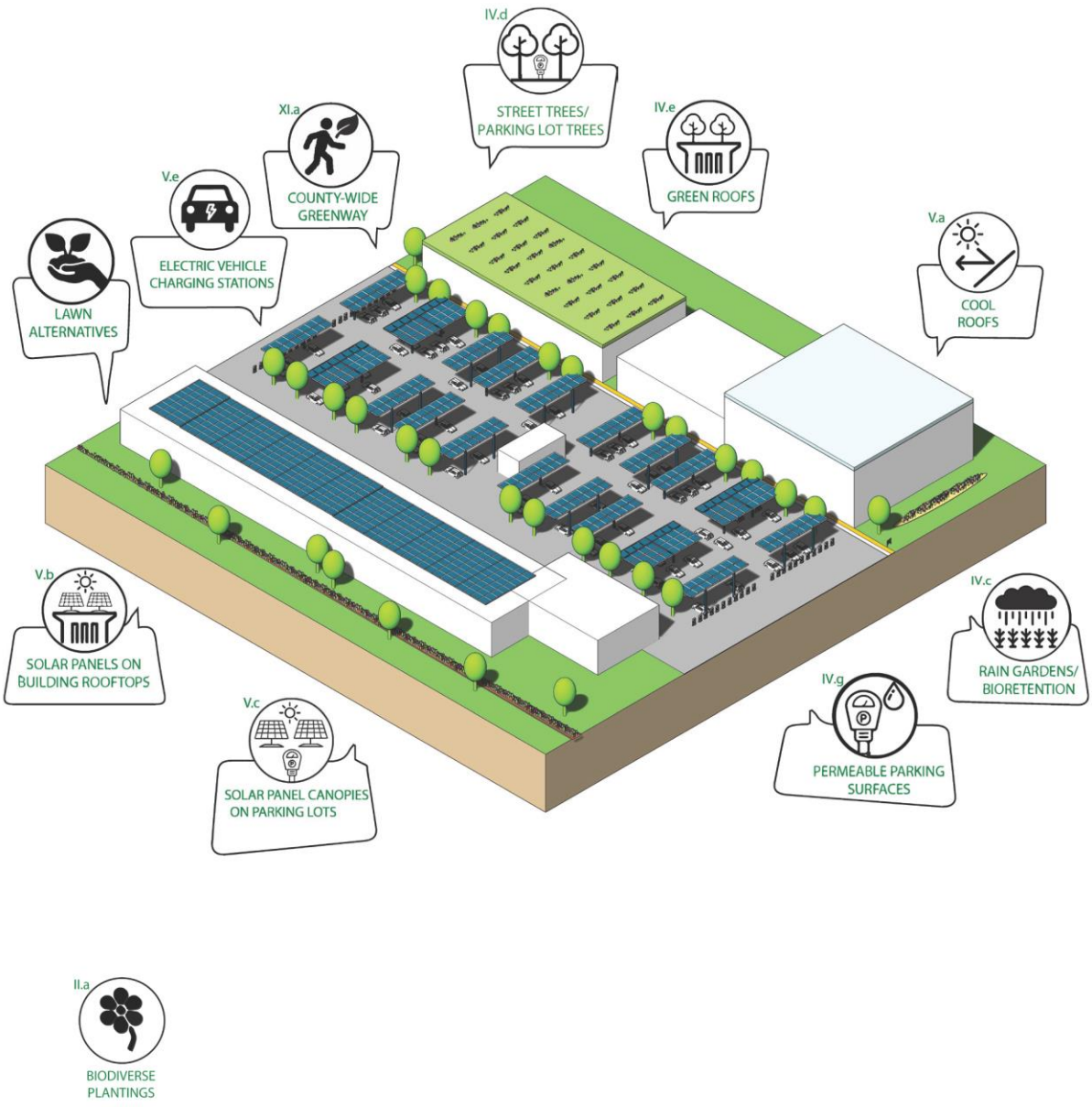


Quick Facts:

Strip malls and shopping plazas' building footprints cover over 300 acres of the County's landscape. Utilizing even a quarter of the total roof area for green roofs can add 75 acres for biodiverse plants, reduce roof temperatures, and store stormwater.

3.3 Plaza Shopping Center

Commercial

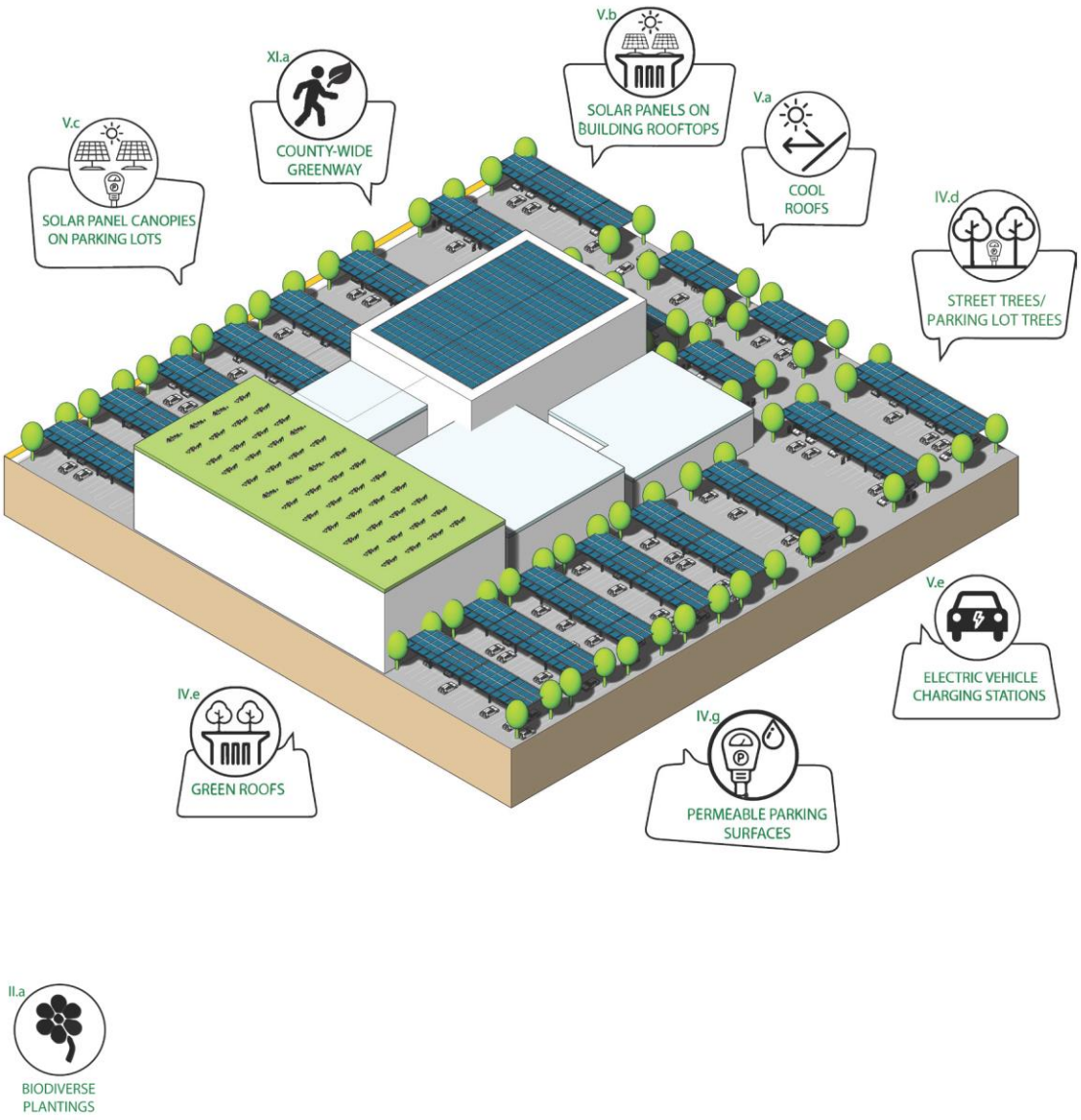


Quick Facts:

Replacing 10% of a strip mall and shopping plaza's parking surfaces with permeable materials can reduce the County's total impervious surface acreage by 75 acres.

3.4 Indoor Mall

Commercial



Quick Facts:

Incorporating cool roofs and lighter parking lot treatments on these commercial properties can reduce surface temperatures by 30°F on high heat days affecting over 180 acres of the County's landscape.

3.5 Office Park

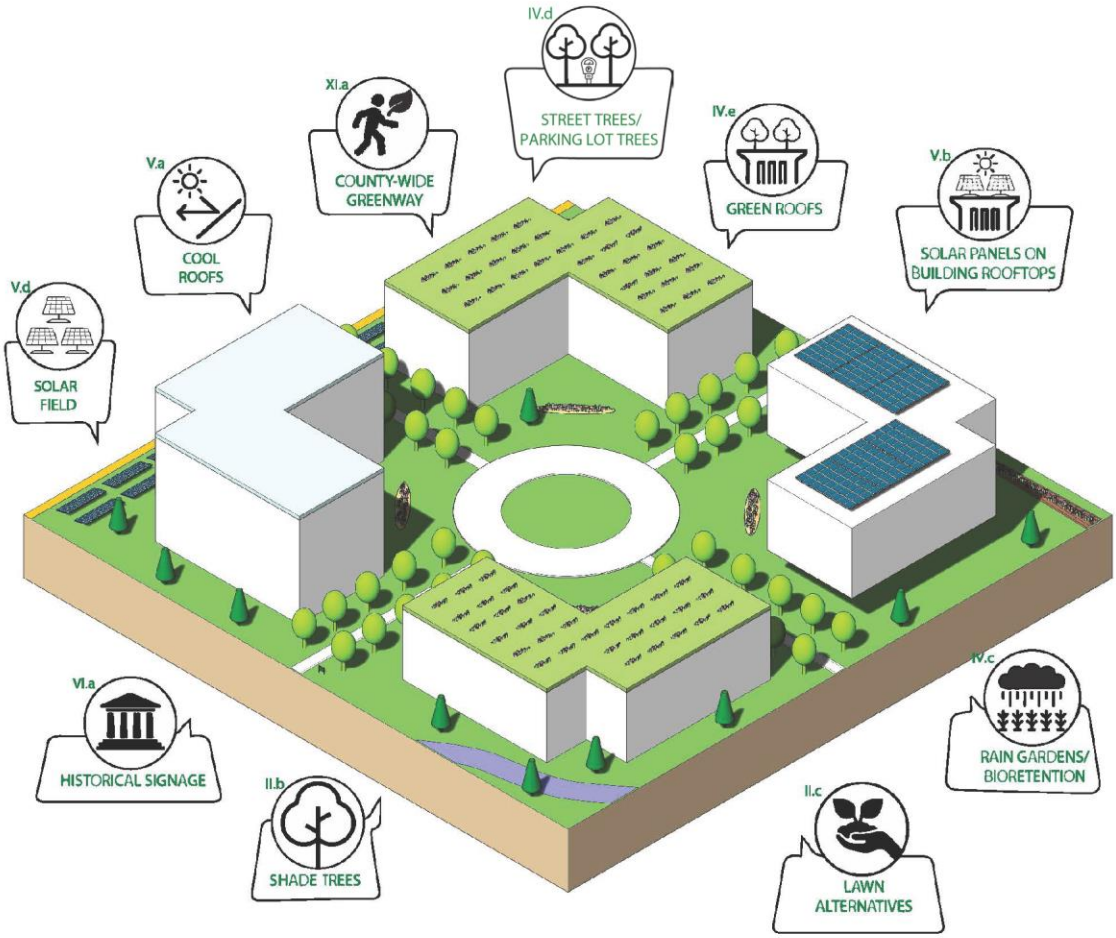
Residential

Quick Facts:

Office parkland without impervious surfaces or buildings accounts for 762 acres. Encouraging lawn alternatives can support an additional 762 acres of natural land with reduced maintenance needs and increased ecosystem services potential.

3.6 Campus

Commercial

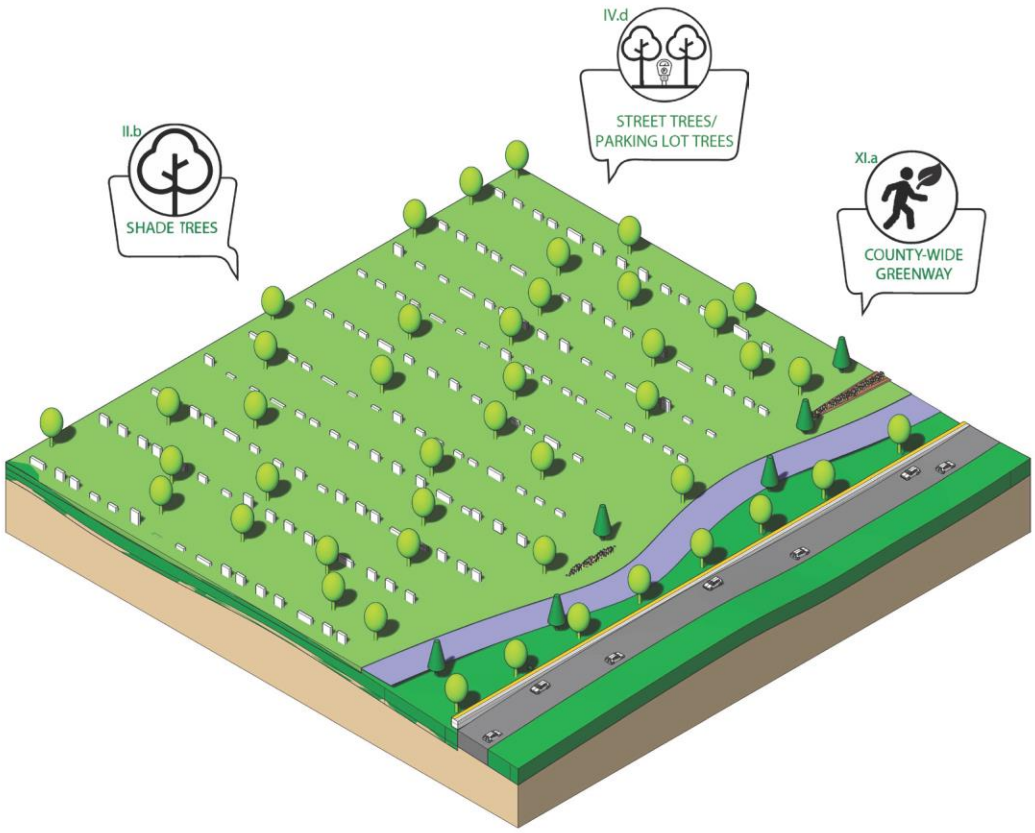


Quick Facts:

Adding green roofs to even half of the County's campus building acres can potentially supply 375 acres for biodiverse plantings and water storage.

3.7 Burial Ground

Commercial

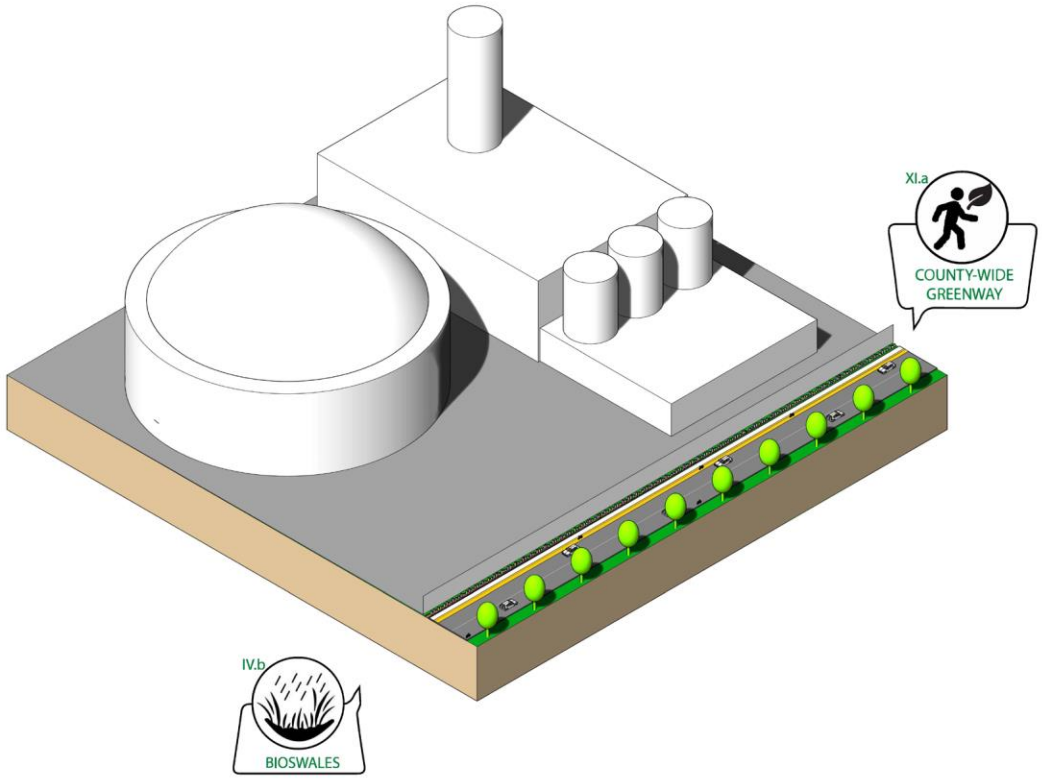


Quick Facts:

Utilizing 10% (133 acres) of the County's total burial grounds (1,332 acres) to plant trees can account for an additional 5,300 shade trees, averaging 40 per acre.

4.1 Heavy Industry

Industrial

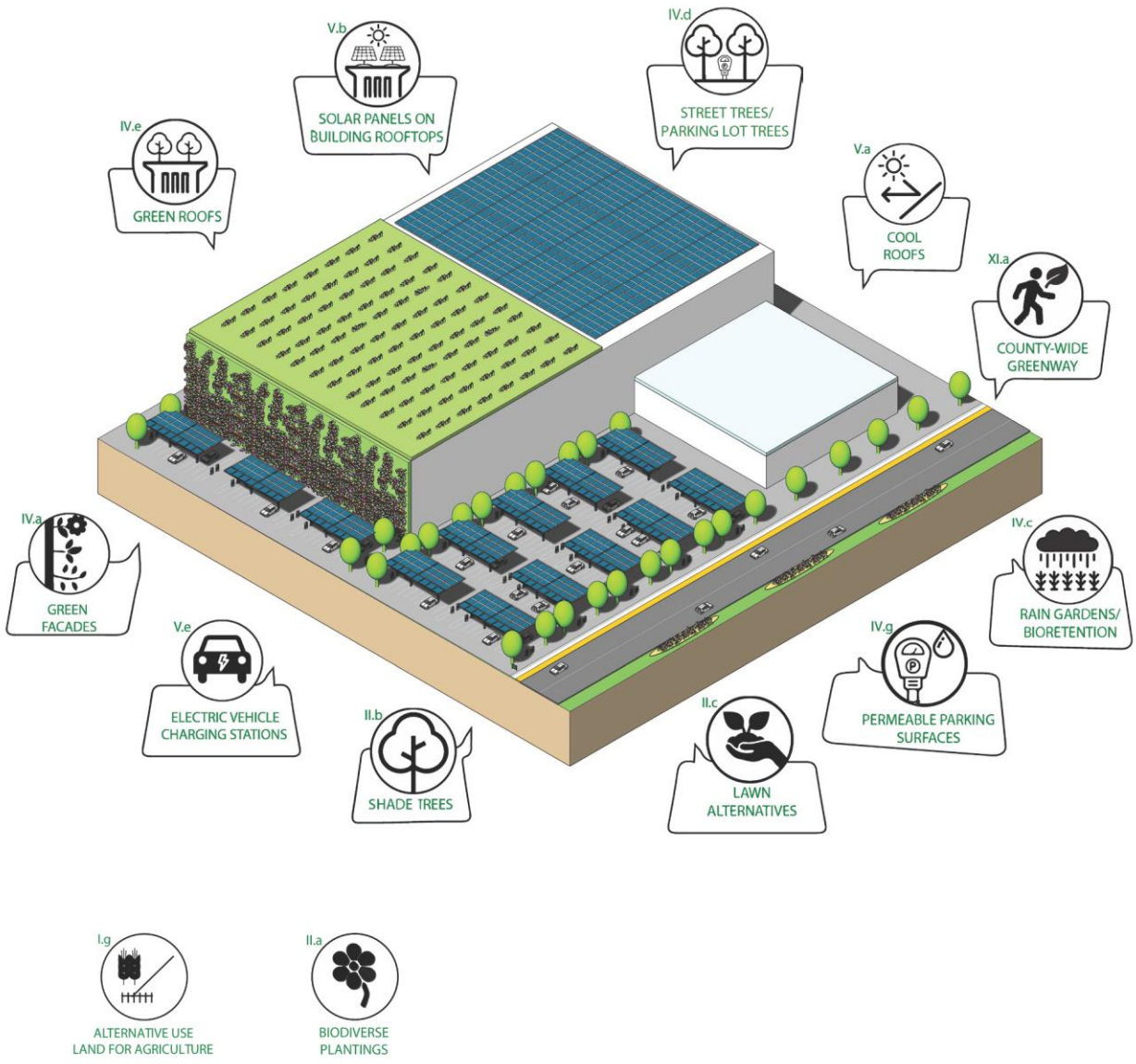


Quick Facts:

Supporting biodiverse plant growth on roadway strips can add about 10 acres of pollinator plant species (if averaging 1% of the property's land accounting for the road right-of-way).

4.2 Warehouse

Industrial

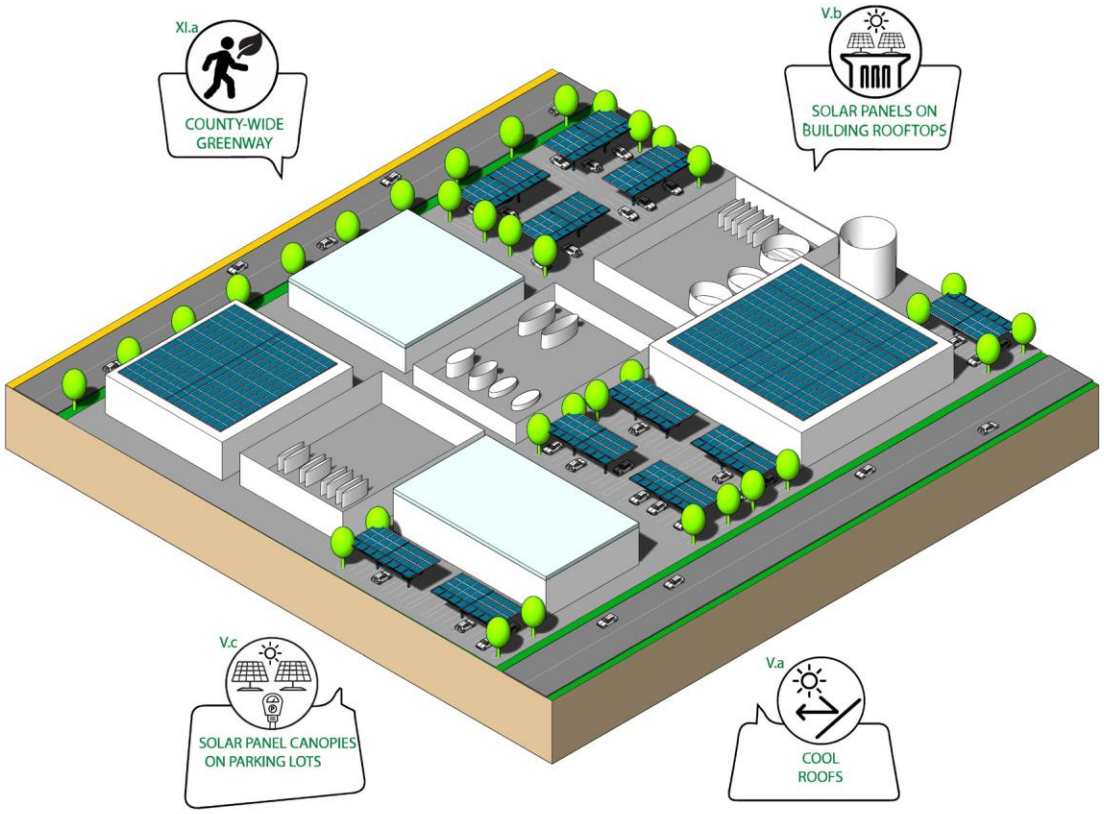


Quick Facts:

Warehouse buildings account for over 4,000 acres of the County's landscape (2%) and over 3,000 parking lot acres (1.5%). Reducing impervious surfaces by 5% (350 acres) can reduce 9.5 million gallons of water runoff for 1-inch of rain!

4.3 Small Yard and Other Light Industry

Industrial

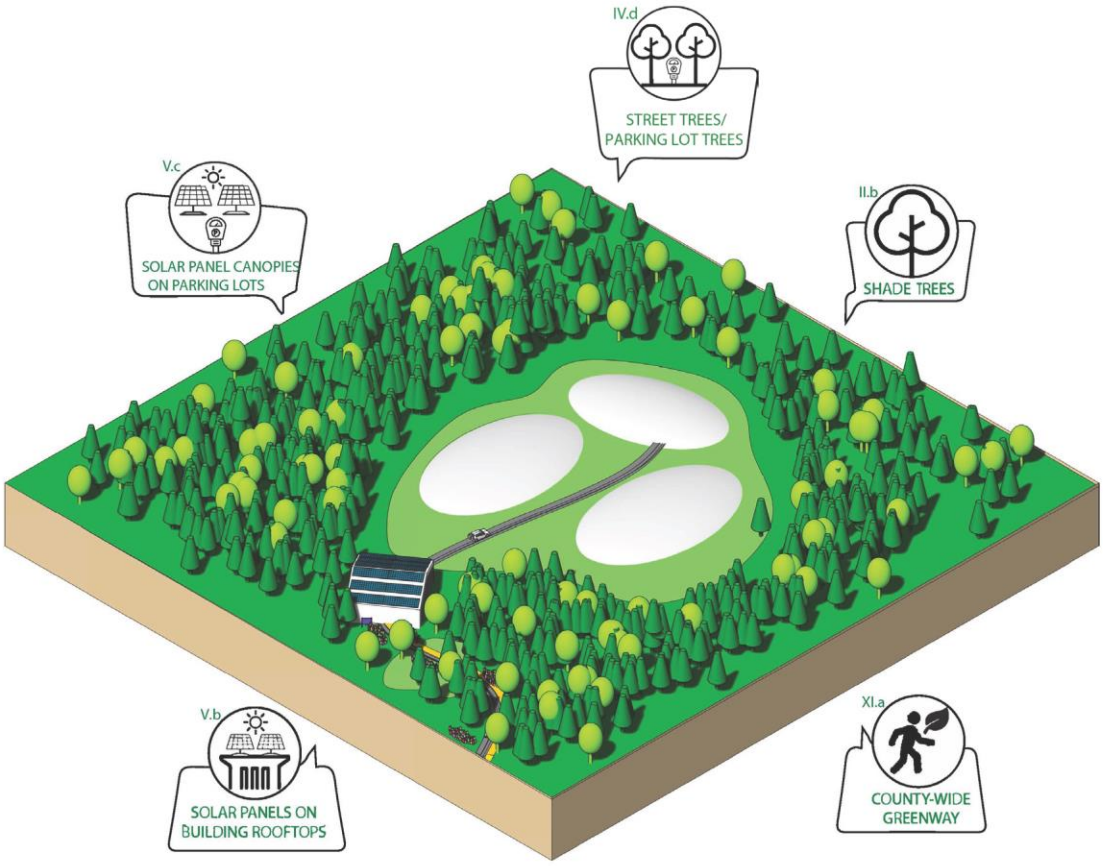


Quick Facts:

Reducing parking lot sizes by 10% can eliminate 210 acres of impervious surfaces.

5.1 Active Landfill

Barren

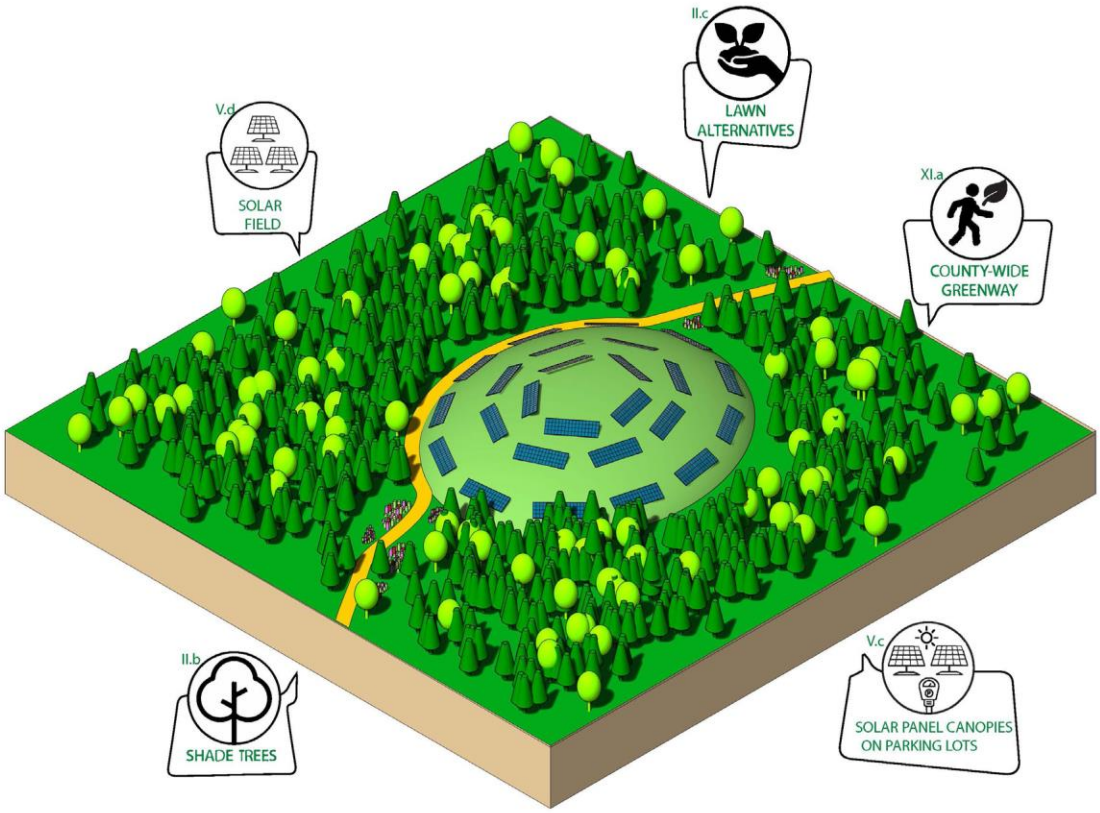


Quick Facts:

Adding solar panels to the active landfills 20 acres of parking lots can add 41,480 commercial cells (72 cell size) to the solar network. That's roughly 14.5 million kilowatts of energy!

5.2 Closed Landfill

Barren

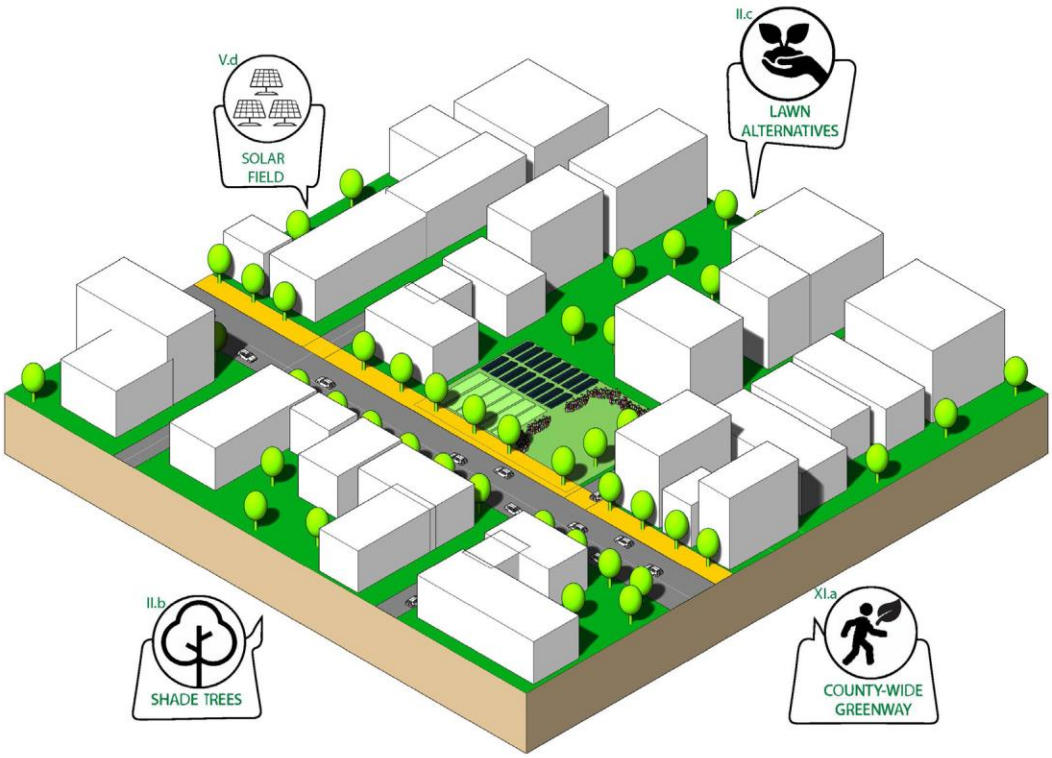


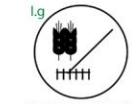
Quick Facts:

Closed landfill remaining parking lots (225 acres) alone can house up to 466,650 (72-cell size) commercial solar cells producing 350 kilowatts per cell. That's about 163 million kilowatts of energy!

5.3 Vacant

Barren



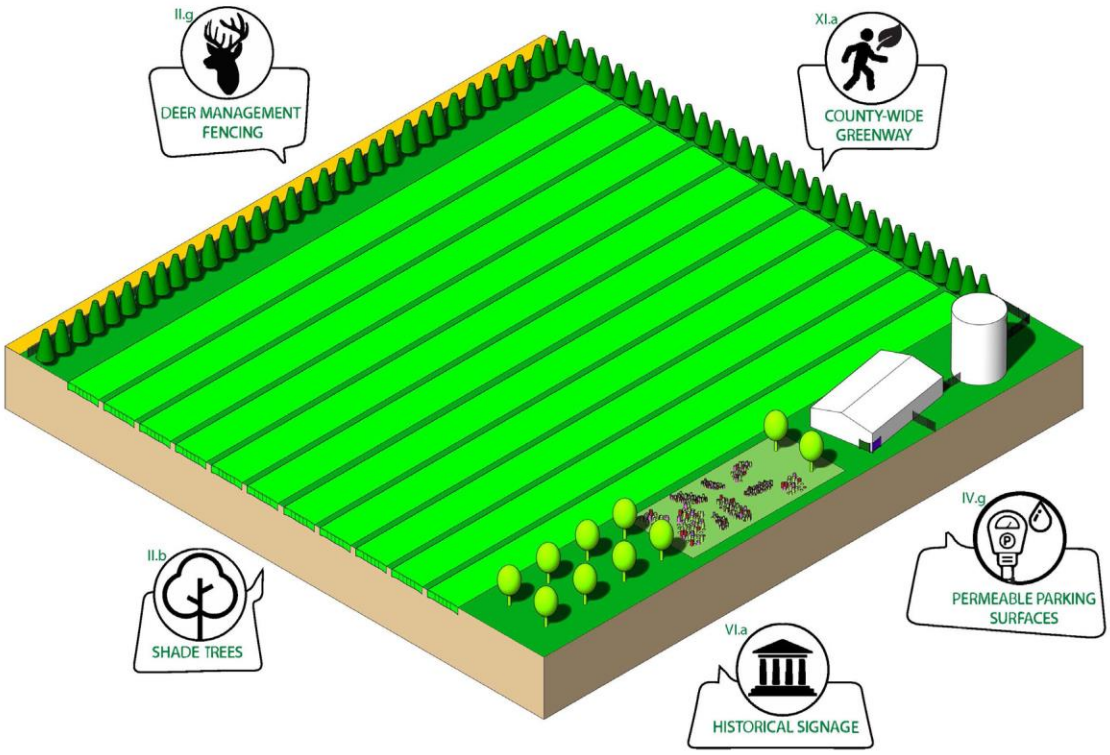


Quick Facts:

The County's vacant land encompasses 2,250 acres of impervious materials. Removing all impervious surfaces on vacant land can reduce the County's total impervious surface cover by 3.5%.

6.1 Rural Farmland

Agriculture

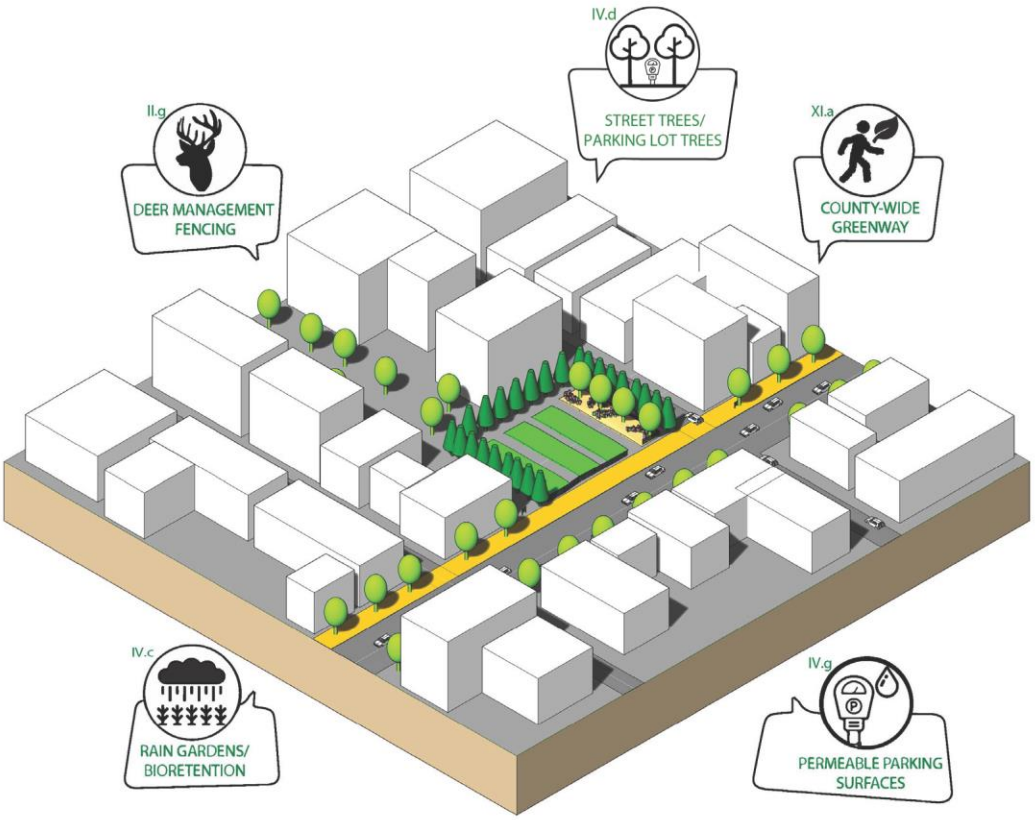


Quick Facts:

The County contains 5,448 acres of unprotected agricultural land across Middlesex County. Through continued preservation, these remaining acres can help maintain the County's viewsheds and agrarian heritage.

6.2 Urban Agriculture

Agriculture



Quick Facts:

Parcels used for urban agriculture can replace underutilized parking lots, connect urban communities to the County's agricultural heritage, and supply more people with fresh food in potential food deserts.

7.1 Social Parks

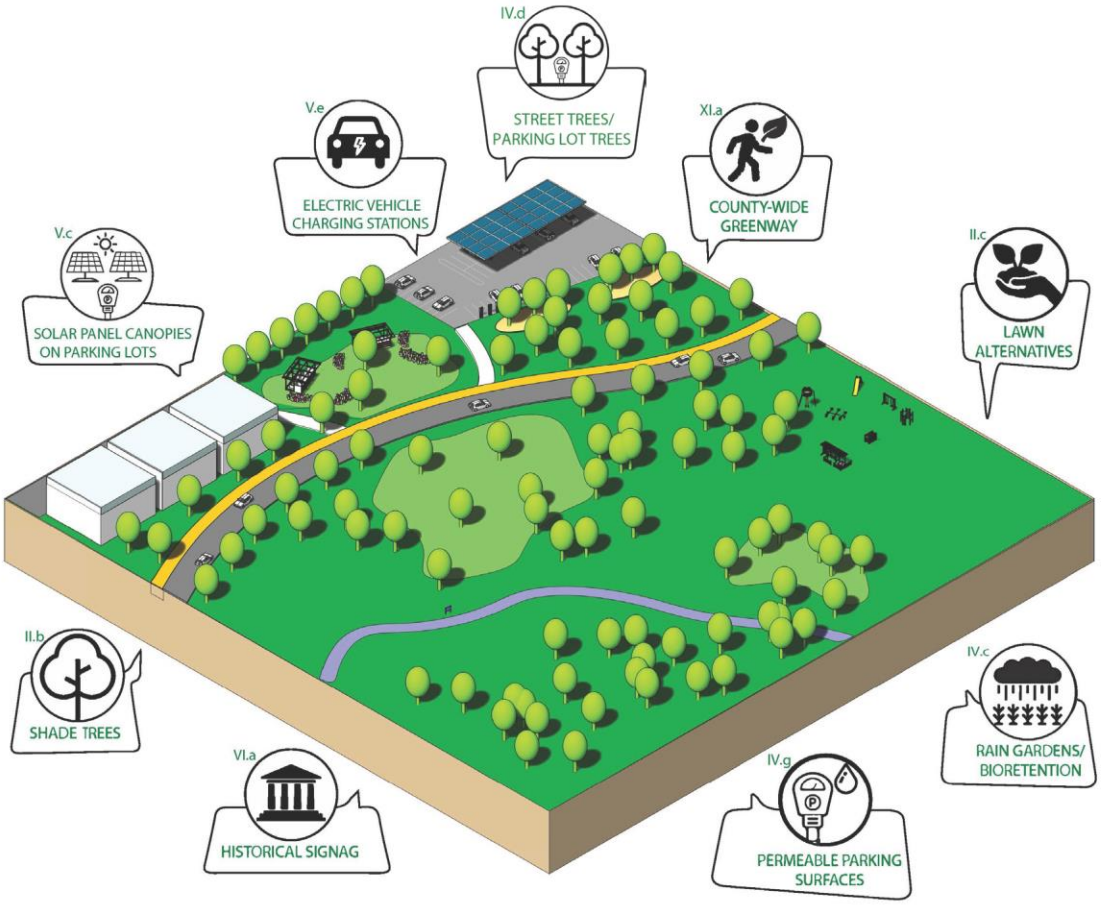
Open Space

Quick Facts:

Capturing stormwater from all building roofs can potentially catch 542,756 gallons of water per 1-inch of rain.

7.2 Neighborhood Parks

Open Space

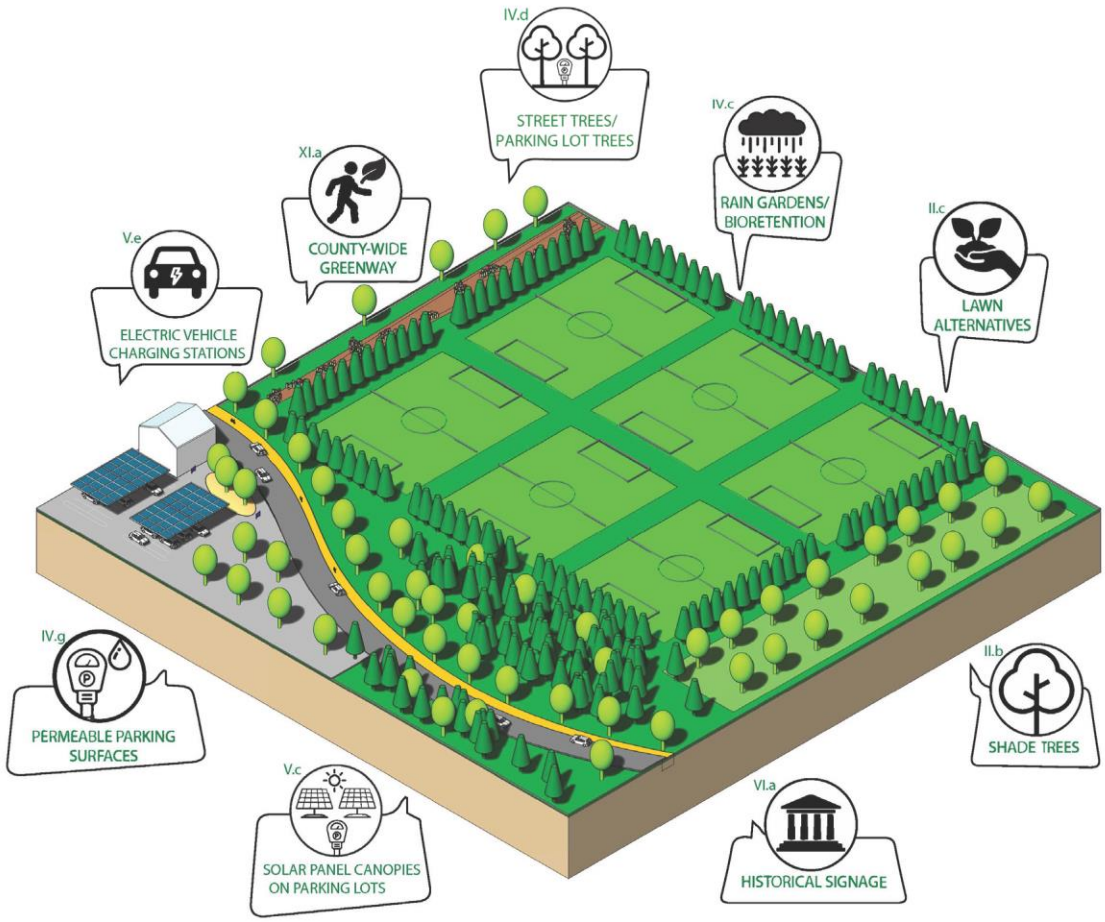


Quick Facts:

Neighborhood parks account for over 3,000 acres of the County's open space network. Ensuring at least 25% shade tree cover of the total property can provide at least 750 acres of shade access throughout neighborhood areas County-wide.

7.3 Sports Parks

Open Space

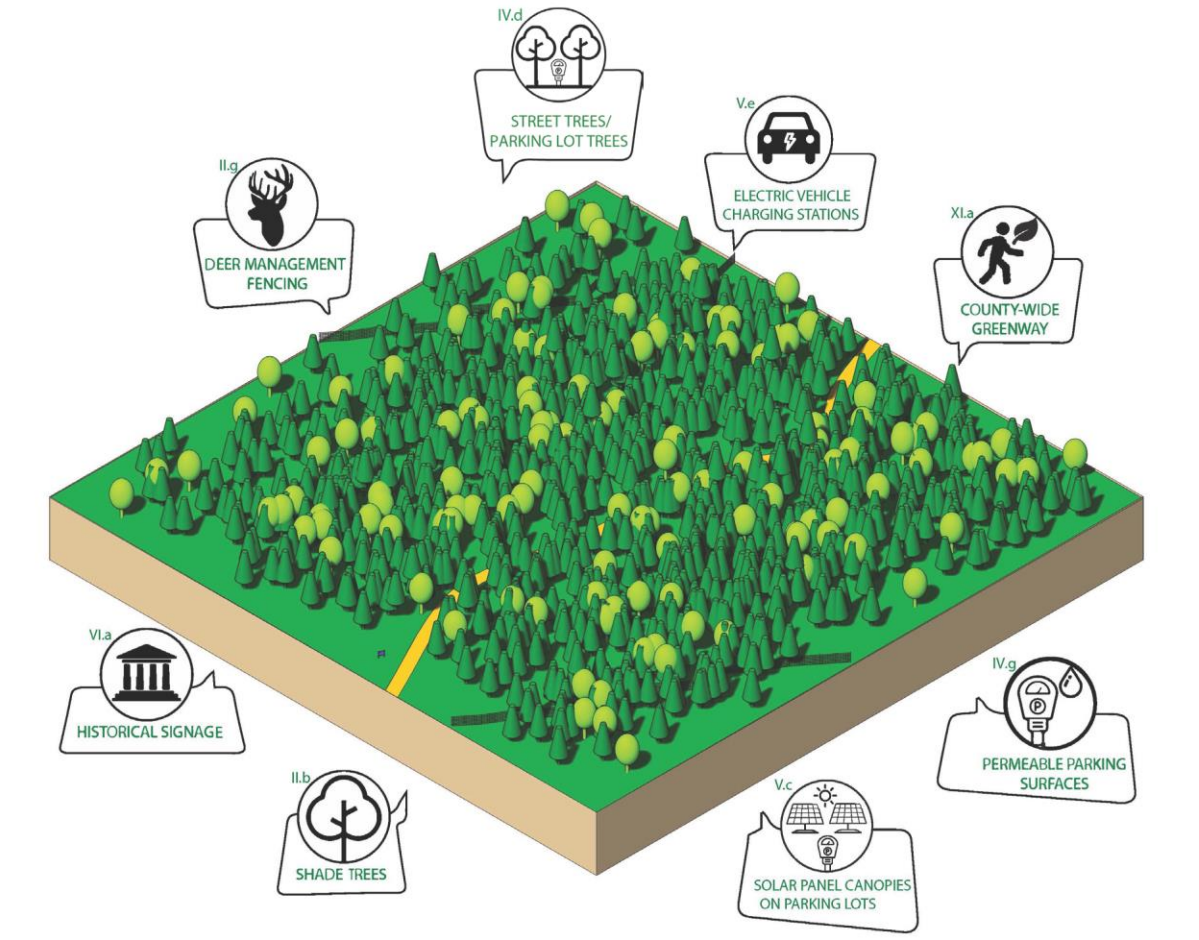


Quick Facts:

Replacing 50% of sports park parking lots with permeable materials can reduce the County's impervious cover by 55 acres.

7.4 Nature Parks

Open Space

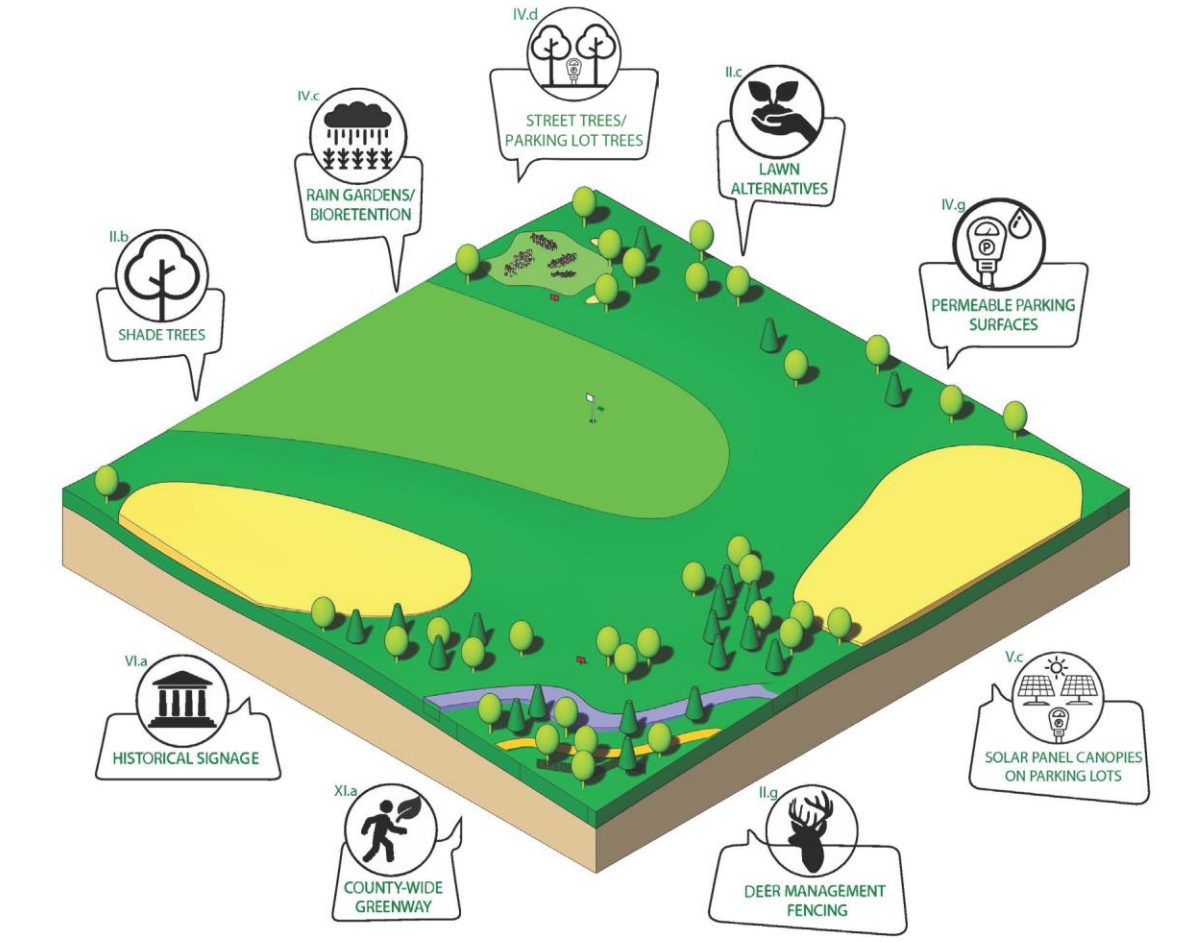


Quick Facts:

Reducing and replacing impervious parking lots by 50% in nature parks with vegetation or permeable asphalt can remove 186 acres of impervious materials reducing nonpoint source pollution entering natural habitats.

7.5 Golf Courses

Open Space



Quick Facts:

Golf courses cover 1,588 acres of the County's landscape. Utilizing even 10% of golf course land for biodiverse native meadows will cover nearly 160 acres of added pollinator patches throughout the County.

TACTICS ACROSS LANDSCAPE TYPES

Tactics across landscape types apply to all landscape types. In most scenarios, the across-type actions do not contain physical interventions but develop specific processes to enable desired outcomes. These actions include plan establishment, community groups, and tools for conservation, awareness, and education. ***Table 3.3*** lists all tactics across types that include programming opportunities, land ownership for protection, education, and raising ecological awareness. These tactics work with landscape urbanist ideals to plan for cities with the environment at the core decision-making framework. The following section concludes the tactics across landscape types with the *Greenway Opportunities* network linking cultural significance and ecological goals through natural and human-made corridors.

Table 3.3: Programming, Educational, and Planning Tactics

Tactic ID	Title
I.a	ACQUISITION
I.b	CONSERVATION ZONING
I.c	CLUSTER ZONING FOR CONSERVATION
I.d	EASEMENTS (CONSERVATION AGREEMENT)
I.e	PARTNERSHIP AGREEMENTS
II.e	WETLAND (AND BUFFER) AND WATERBODY PROTECTION
III.a	ECOLOGICAL STEWARDSHIP PROGRAMS AND INCENTIVES
III.b	EDUCATION OF HABITAT VALUE AND LEGAL REQUIREMENTS
III.c	COMMUNITY STEWARDSHIP GROUPS
IV.g	STREAM DAYLIGHTING
VI.b	HISTORICAL LANDSCAPES AND FEATURES REPRESENTING DIVERSE GROUPS
VII.a	VIEWSHED ANALYSIS
VIII.c	ARTS ADVOCATE
VIII.e	DIGITAL TECHNOLOGIES TO CELEBRATE THE LOCAL CHARACTER

GREENWAY OPPORTUNITIES

The County-wide greenway network is the third implementation element, providing solutions to permanently preserve the County's natural corridors and connect humans with nature. The concept follows essential needs expressed throughout the D 2040 outreach process. This ***Nature & Place.*** plan defines a greenway as a linear natural or human-made corridor for recreation, active transportation (bike trails), or habitat conservation. Greenways enhance recreation and open space access, create, and conserve wildlife habitat connections, and reduce the need for local car travel.

Greenway implementation supports the County's strategic initiative to:

- Provide safe, innovative, inclusive, and sustainable parks and recreation services.

The analysis of aerial imagery, existing pedestrian and bike routes, preserved land, and a land use inventory informed the development of the County-wide *Greenway Opportunities* network. The ***Open Spaces.*** functional plan includes the Greenway Opportunities assessment's first phase with conceptual routes connecting open spaces along riparian corridors, ecological habitats of concern, continuous forested and wetland landscapes, vegetated transmission lines, and rail corridors. Development of the greenway network continues in ***Nature & Place.*** With ongoing collaboration with the ***Bike Easy. Walk Safely.*** functional plan.

Municipal engagement feedback and project team site visits informed the further specification of the greenway system. The municipal meetings (discussed in the *Inventory* and *Analysis* chapters) provided greenway feedback from Plainsboro, Perth Amboy, Old Bridge, Piscataway, East Brunswick, New Brunswick, Metuchen, Woodbridge, and Highland Park professional representatives.

The accumulation of the above efforts results in the *Greenway Opportunities* tactics outlining a greenway network throughout Middlesex County across all landscape types. The *Greenway Opportunities* suggest natural land, farmland, open space (park), and downtown area connections through existing and proposed corridors. Where necessary, potential on-road connections fill gaps between greenway corridors where physical barriers prevent paths in natural areas. The route implementation requires further site-specific feasibility studies to confirm constructability and appropriate means to obtain access beyond the scope of this action plan. It will be essential for Middlesex County to champion the *Greenway Network*.

Greenway Tactics

The following tactics propose a greenway concept, greenway marker, dedicated greenway working group, and a greenway identity centered around the associated landscape. These actions recommend needed steps for the success of the greenway implementation County-wide.

XI.a: County-wide Greenway	
Strengthen and further develop in detail a County-wide greenway network concept. Develop priority sections for implementation.	
Timeframe	Short-term (1-2 years)
Priority Location	Greenway Opportunities
County Lead	Office of Parks and Recreation Office of Planning
Influencers	County

XI.b: Greenway Working Group	
Establish a County greenway working group.	
Timeframe	Short-term (1-2 years)
County Lead	Office of Parks and Recreation
Influencers	County

XI.c: Greenway Marker	
Design a County greenway marker (signage) that will be utilized on the entire greenway network.	
Timeframe	Medium-term (3-5 years)
County Lead	Office of Parks and Recreation
Influencers	County

XI.d: Greenway Character	
Promote the greenway tied to the surrounding landscape feature such as a river walk linking natural landscapes and commercial establishments supporting a neighborhood identity.	
Timeframe	Long-term (5+ years)
County Lead	Office of Parks and Recreation
Influencers	County

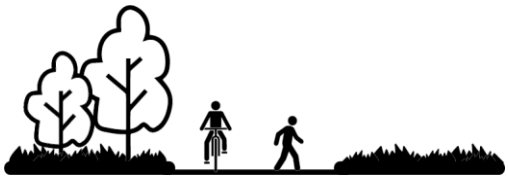
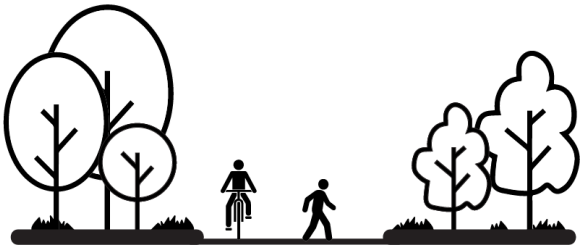
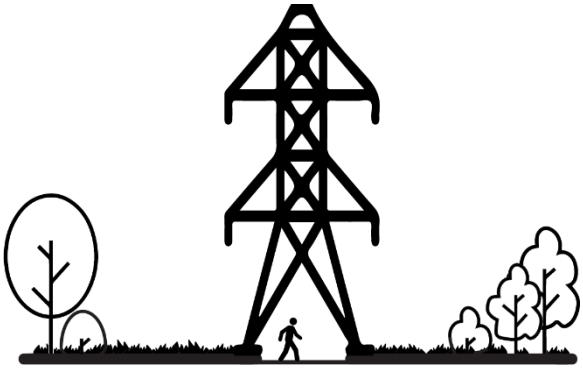
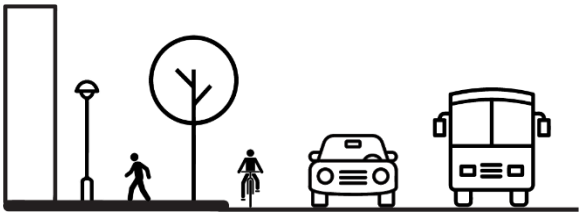
Greenway Types

Greenway Types reflect the diverse County landscape identified through site visitation. These types, ***Figure 3.40,*** helped the research team decipher physical challenges, opportunities, and the implementation effort associated with each segment. The six primary *Greenway Types*, ***Table 3.4***, include open paths, forest paths, right-of-ways, on-road connections, wetland boardwalks, and levee trails. The greenway types apply to Greenway Opportunity segments.

Figure 3.40: Greenway Challenges and Opportunities throughout Middlesex County

Source: CUES, Rutgers University. Photographs. 2021. All photographs were taken during the CUES greenway-focused site visits. Top left to bottom right: (1-3) South Brunswick, (4,6) Monroe, (5,7) Cranbury, (8) Woodbridge, (9) Perth Amboy.

Table 3.4: Greenway Types

Type Diagram	Description	Segment
1. Open Path 	Utilize existing or build new paths through open landscapes, such as agricultural areas, meadows, or lawns. The open character of the landscape allows for wide views and areas for shade tree considerations.	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 30, 31, 32, 33, 34, 35, 37, 38, 39, 40, 41
2. Forest Trail 	Utilize existing or build new paths through forested areas. The enclosed character of the landscape allows for a nature-oriented experience.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 16, 18, 19, 20, 21, 22, 23, 25, 27, 28, 29, 30, 31, 32, 34, 35, 38, 39, 41
3. Right-of-way 	Maintained right-of-way access trail for pedestrians and cyclists on stone dust, gravel, or asphalt	7, 15, 18, 19, 21, 22, 30, 33, 37
4. On-Road Connection 	Bike routes and pedestrian paths on roadways as separate lanes, painted strips, or sidewalks. Requires considerations of bike/pedestrian crossings.	3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 18, 20, 23, 24, 25, 26, 27, 29, 31, 35, 36, 37, 38, 39, 40
5. Wetland Boardwalk 	A boardwalk constructed in a wetland area.	4, 7, 16, 18, 19, 23, 24, 25, 29, 38
6. Levee Trail 	Constructed trails on existing or proposed levees.	4, 7*, 15* *Levee proposed in Resilient New Jersey: Resilient Raritan River and Bay Communities Project [81]

Greenway Opportunities

41 Greenway Opportunities sections guide the implementation process. The descriptions, beginning on page 109, detail how the segments use existing routes across the County and develop connections to fill the gaps, see ***Map 3.5***. The opportunity routes highlight ideal pathways (not exact coordinates ready for site plan approval) and include four categories described in ***Table 3.5***. The descriptions identify roadways and corridors appropriate for the route. The segment narratives include a route description, key features along the route, physical challenges, and the route length in miles calculated in ArcGIS. The *Greenway Opportunities* align with the identified viewsheds in the viewshed analysis showing the greenway's potential to support viewshed protection and accessibility (tactics VII.b-d), ***Figure 3.41***.

Table 3.5: Greenway Opportunities Map 3.5 Key Descriptions

Greenway Opportunities	Description
Greenway Opportunities	Proposed greenway paths representing potential natural corridors for recreational use
On-Street Connections	Paths on roadways utilized to connect natural corridors and open spaces
Existing Greenway	Existing trails and greenways mapped by NJDEP Land Use Trails [82]
Existing but Needs Improvement	Existing trails utilized as transportation networks (bike paths) that may need signage or sidewalk improvements

Table 3.5 correlates to ***Map 3.5*** Greenway Opportunities.

Map 3.5: Greenway Opportunities

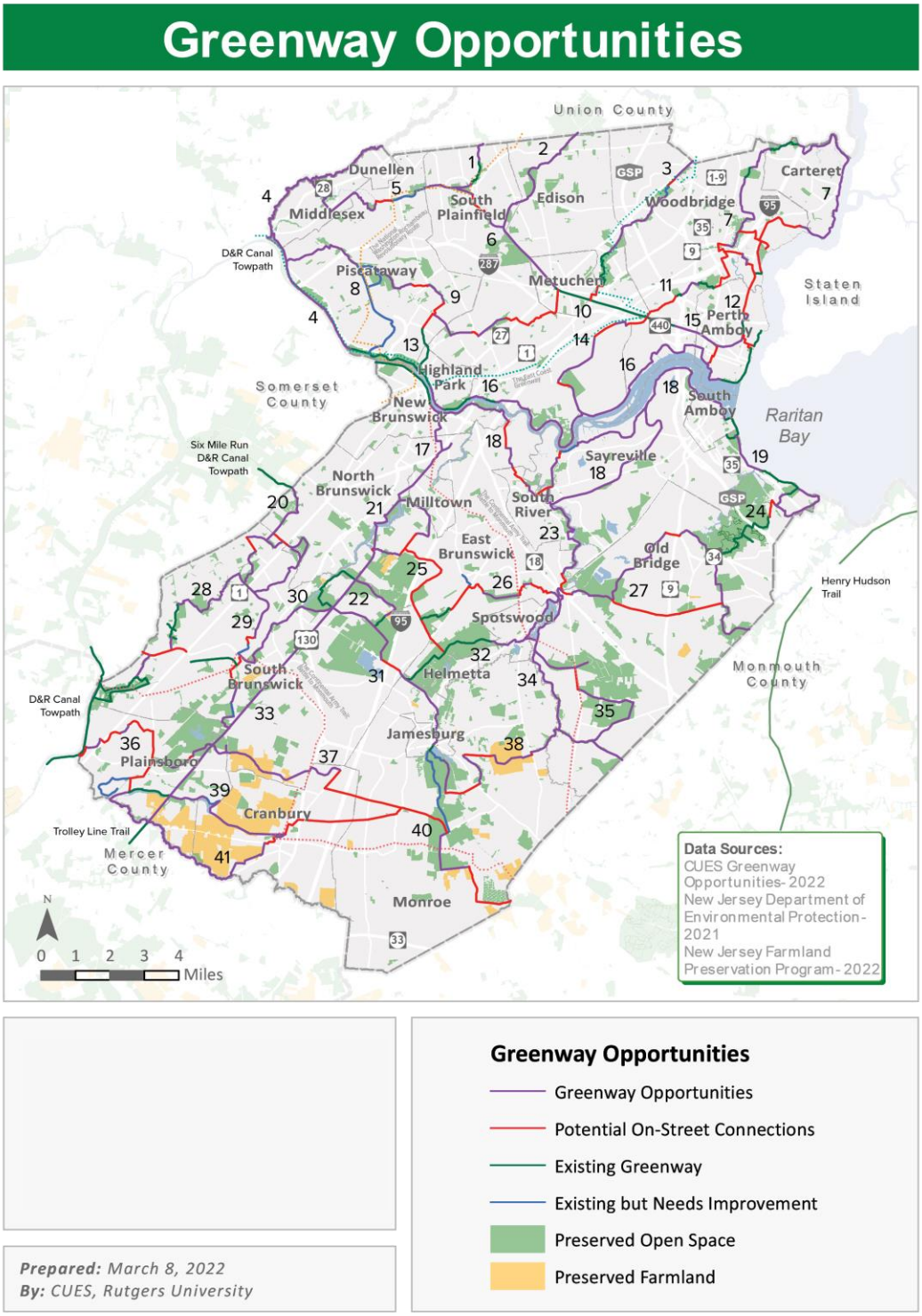
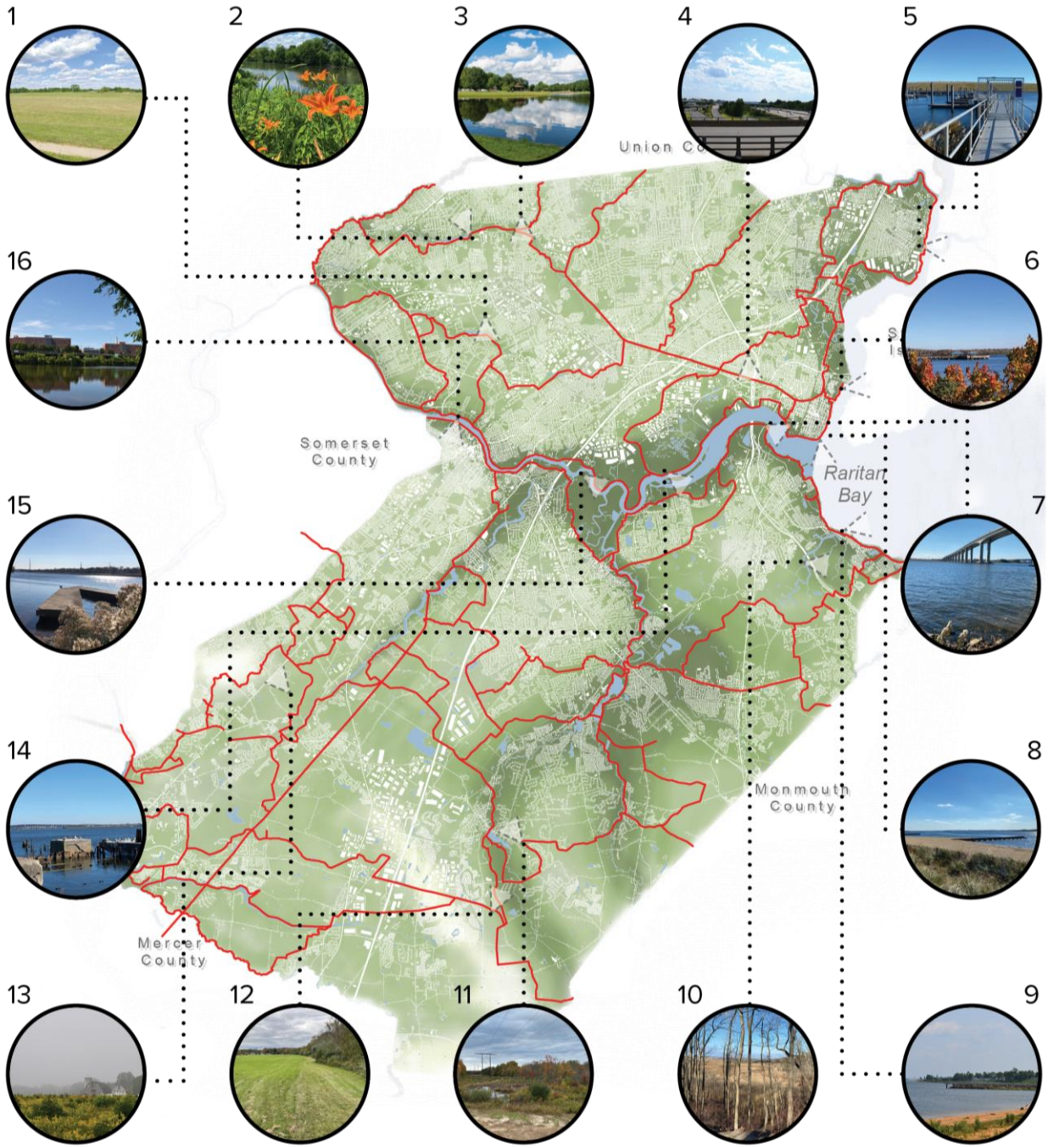


Figure 3.41: Greenway Opportunities and County Viewsheds



All *Greenway Opportunities* in red.
Refer to the *Analysis* Chapter *Viewshed Analysis* page x for full viewshed descriptions.
Items: (1) Farmstead, Piscataway (2) New Market Pond, Piscataway (3) Spring Lake County Park, South Plainfield (4) 440 Bridge, Woodbridge (5) Arthur Kill Waterfront, Carteret (6) Perth Amboy Waterfront (7) Victory Bridge, Perth Amboy (8) Perth Amboy Waterfront (9) Old Bridge Waterfront (10) Cheesequake State Park, Old Bridge (11) Wetland, Monroe (12) Field, Monroe (13) Heathcote Farms, South Brunswick (14) Raritan River, Woodbridge (15) Raritan River, Edison (16) Raritan River, New Brunswick.

Greenway Opportunities by Segment
The following segment numbers correlate with ***Map 3.5*** *Greenway Opportunities*.

Segment (1) Cedar Brook North: Spring Lake County Park to Union County along the Cedar Brook corridor. Currently, the County Park has a trail along the brook.

- **Key Features:** Spring Lake Park, Cedar Brook Lake, Connection to Union County, Cedar Brook Park and Cricket Field, Willow Park, Veterans Park, Tappen-Faulks House
- **Physical Challenges:** Major Road Crossing (CR529 Plainfield Avenue), Road Crossing (Cedar Brook Avenue)
- **Length:** 1.5 miles

Segment (2) National Heritage Trail through South Plainfield: Part of the Revolutionary War National Heritage Trail. This segment connects Spring Lake County Park in South Plainfield, Edith Stevens Memorial Wildlife Preserve in Edison, The Oak Ridge Reservation in Clark, Union County, and Oak Tree Avenue to Putnam Park in South Plainfield. The forested area along the railroad provides a potential route to the Oak Ridge Reservation in Union County.

- **Key Features:** County Parks- Spring Lake Park. National Park Service Designation- National Heritage Historic Trail (not actively managed), Municipal Parks- Putnam Park, Edith Stevens Memorial Wildlife Preserve, Ashbrook Swamp, Ashbrook Golf Course, Homestead Farm at Oak Ridge, Shamrock Park, North Edison Park. Private Lands- Plainfield Country Club
- **Physical Challenges:** Connection along CR604 Oak Tree Avenue, space along the Conrail railroad line north of Edith Stevens Memorial Wildlife Preserve in Edison, Major Road crossing at CR602 Inman Avenue in Edison, Conrail railroad crossing at Tingley Lane in Edison, Private golf course adjacent-Plainfield Country Club in Edison, road crossing at CR604 Oak Tree Road in Edison.
- **Length:** 4.2 miles

Segment (3) Rahway River's South Branch to the Middlesex Greenway: The County-owned Middlesex Greenway extends to the Rahway River in Union County using the South Branch riparian corridor by several existing open space parcels (the Middlesex County Open Space and Recreation Plan Update (2022) *Appendix 1* list open space parcel ownership). Potential on-road connections act as alternative routes with limited river access. This connection links Roosevelt Park to the Middlesex Greenway along Pierson Avenue.

- **Key Features:** State-owned Sailors & Soldiers Memorial. County-owned Merrill Park, Roosevelt Park, Middlesex Greenway. Municipally-owned South Branch of the Rahway River and the privately-owned Woodbridge Country Club. The East Coast Greenway traverses a mix of open space parcels and State Route 27 adjacent to Segment 3.
- **Physical Challenges:** Garden State Parkway crossing. Conrail railroad crossing between Soldiers & Sailors Monument and Roosevelt Park in Edison. On-road connections exist on South Middlesex Avenue between County-owned Merrill County Park properties in Woodbridge. The potential on-road connections between Roosevelt Park and the Middlesex Greenway in Edison along Grandview Avenue, Maplewood Avenue, Amboy Avenue, and Pierson Avenue.
- **Length:** 6 miles

Figure 3.42: Civilian Conservation Corps Monument at Roosevelt Park, Edison

Source: CUES, Rutgers University. Photograph. 2020.

Segment (4) Green Brook to D & R Canal: The Green Brook defines Dunellen and Middlesex's northern borders. A greenway exists along the Green Brook in Union County, ending in Dunellen. Segment 4 links the Green Brook greenway to Johnson Park in Piscataway, following the Green Brook to the D&R Canal.

- **Key Features:** Municipal-owned Parks Green Brook Park, Second Street Park, McCoy Park, Victor Crowell Memorial Park, Runyon Ballfield, Day Park, Riverside Park, County-owned Johnson Park, and Mountain View Park. The Green Brook Flood Control Project. Historic property Edward Maurer House.
- **Physical Challenges:** CR607 Lincoln Boulevard crossing. New Jersey Transit Raritan Valley Line and Conrail railroad crossings near CR607 Lincoln Boulevard and passage under these railroad lines at East Main Street in Middlesex. Tight spaces along the Green Brook in Middlesex (Green Brook Auto Recycling and Scrap). Navigating Interstate 287 at CR622 River Road in Piscataway.
- **Length:** 10 miles

Figure 3.43: The Green Brook Riparian Corridor Dividing Somerset and Middlesex Counties

Source: CUES, Rutgers University. Photograph. 2020.

Segment (5) The Bound Brook to Spring Lake Park: The Bound Brook corridor extends southeast from the Green Brook, beginning in Middlesex Borough. Significant open space along this stretch of the Brook links Middlesex Township and Dunellen Borough to Spring Lake Park in South Plainfield. This section features the National Washington-Rochambeau Revolutionary Route and associated markers. The trail enters South Plainfield's industrial areas adjacent to the train line.

- **Key Features:** County-owned Mountain View Park, Spring Lake Park. Municipal-owned Columbus Park, New Market Pond, Veterans Memorial Park, Cap Lake Park. Public properties- Middlesex High School, Middlesex Public Library, South Plainfield Public Library. Historic Simcoe's raid location (Revolutionary War), the National Parks Service's designated historic National Washington-Rochambeau Revolutionary Route.
- **Physical Challenges:** The Bound Brook riparian edge is narrow in industrial land use areas. The Conrail railroad line is right along the brook with Conrail and New Jersey Transit Raritan Valley Line crossing in Middlesex. Residential neighborhoods occupy Bound Brook's edge from New Market Road in Piscataway to South Avenue in Middlesex with potential on-road connection along William Street in Piscataway.
- **Length:** 6.4 miles

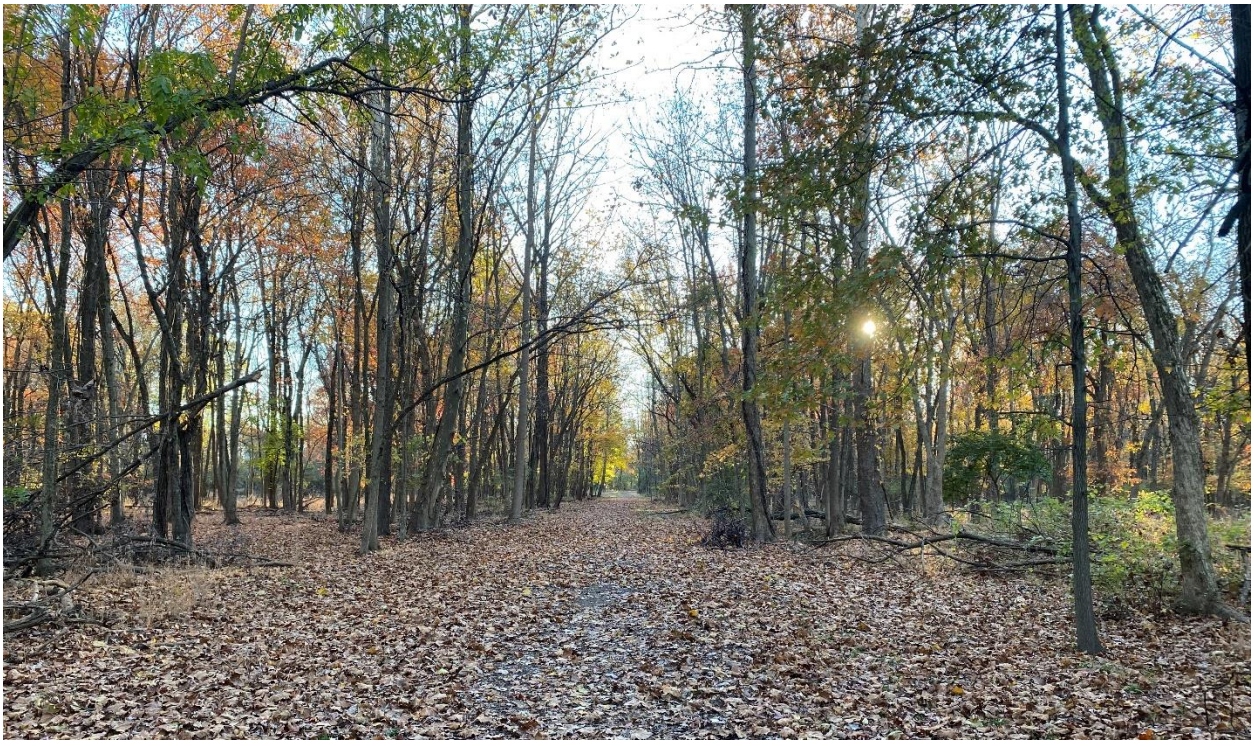
Figure 3.44: Existing Trail at New Market Pond, Piscataway

Source: CUES, Rutgers University. Photograph. 2022.

Segment (6) Middlesex Greenway Extension to Spring Lake Park: This path begins at the Middlesex Greenway in Metuchen, extending northwest towards Spring Lake Park in South Plainfield. It enters the Peter J. Barnes III Wildlife Preserve in Edison, traveling along the Bound Brook to Memorial Park in South Plainfield. Potential on-road connections through an industrial area along Spicer Avenue, New Market Avenue, and Lakeview Avenue in South Plainfield extend to Spring Lake Park near Veterans Park.

- **Key Features:** The Bound Brook. Connection to County-owned Middlesex Greenway, Peter J. Barnes III Wildlife Preserve, Spring Lake Park. Municipal-owned Memorial Park, Veterans Park, South Plainfield Junior Basketball Club, Soccer Club, and Pop Warner Football field.
- **Physical Challenges:** Conrail railroad crossing in downtown South Plainfield and Metuchen; right-of-way access, wetland terrain along the Bound Brook, and Talmadge Road crossing.
- **Length:** 4.5 miles

Figure 3.45: Trail Entrance at Peter J. Barnes III Wildlife Preserve, Edison



Source: CUES, Rutgers University. Photograph. 2021.

Segment (7) Woodbridge and Carteret Waterfront Loop: Segment 7 creates a loop beginning in Woodbridge at Boynton Beach and traveling adjacent to the Carteret and Woodbridge Arthur Kill waterfront to Joseph Medwick Memorial County Park in Carteret. Joseph Medwick Memorial County Park trails leave the park and extend south to Ernest L. Oros Wildlife Preserve and Pin Oak Forest County properties in Woodbridge by following the Caseys and Woodbridge Creeks.

The County Pin Oak Forest is a beautiful wetland landscape that is difficult to access. Heading south from Pin Oak Forest, the PSE&G powerline right-of-way along Woodbridge Creek is a corridor to Boynton Park in Woodbridge. Woodbridge Creek crosses under the Conrail railroad line, but the trail extends east to cross Blair Road, continuing into Boynton and Woodbridge River Parks. Potential on-road connections branch to the east coast at Port Reading Avenue, or the greenway path continues south.

The Greenway Opportunity continues south to CR514 Main Street in Woodbridge via the Woodbridge Creek corridor passing through Woodbridge Blue Acres properties (the Middlesex County Open Space and Recreation Plan Update (2022) Appendix 1 lists open space parcel ownership). The trail crosses Interstate 95 via Woodbridge Avenue. Potential on-road connections on Green Street, Pearl Street, CR514 Main Street, and Woodbridge Avenue navigate the New Jersey Transit North Jersey Coast rail line. Here, the segment links with Segment 11 (south) or continues to Boynton Beach at the Woodbridge waterfront meeting with Segment 12.

- **Key Features:** Woodbridge Creek, The Rahway River. State-owned Woodbridge Blue Acres sites. County-owned Ernest L. Oros Wildlife Preserve, Pin Oak Forest, Joseph Medwick Memorial Park, Municipally-owned Woodbridge River Park, Alvin P. Williams Memorial Park, Sewaren Marina Park, Heards Brook Park, Bowtie Pool, Arthur Kill Waterfront Park, and Boynton Park. Privately-owned NJ Transit Station Woodbridge, Woodbridge United Methodist Church
- **Physical Challenges:** PSE&G right-of-way, Turnpike barrier
- **Length:** 15.7 miles

Segment (8) The D & R Canal and Ambrose Brook Piscataway loop: The Ambrose Brook corridor connects to the State D&R Canal through Rutgers Busch Campus in Piscataway. Segment 8 begins at the connection with Segment 4 at CR622 River Road. The trail continues northeast through forested areas to Ambrose Brook. Open space along the Ambrose Brook provides land for a trail leading to Possumtown Park in Piscataway (Veterans Park). The path continues east to Ambrose, and Doty's Park in Piscataway, connecting to the existing bike trail on Hoes Lane. The trail crosses a pedestrian bridge over Hoes Lane, leads to Piscataway High School, or continues south to the County's Johnson Park. The east loop utilizes Behmer Road to connect with Segment 9 or travels southwest through Raritan Landing Golf Club. The existing Hoes Lane (south) path links Johnson Park in Piscataway through the Rutgers Busch Campus.

- **Key Features:** The Raritan River. County-owned Johnson Park, Raritan Landing Golf Course. Municipal-owned Possumtown Park, Ambrose and Doty's Brook Park and Natural Area, Veterans Park, Piscataway Little League Inc., and The Piscataway Community Center (YMCA) on Hoes Lane, Piscataway Municipal Pool, Piscataway Highschool.
- **Physical Challenges:** Crossing Interstate 287 in Piscataway at Possumtown Road.
- **Length:** 7.4 miles

Figure 3.46: Existing Bike Trail on Hoes Lane, Piscataway

Source: CUES, Rutgers University. Photograph. 2022.

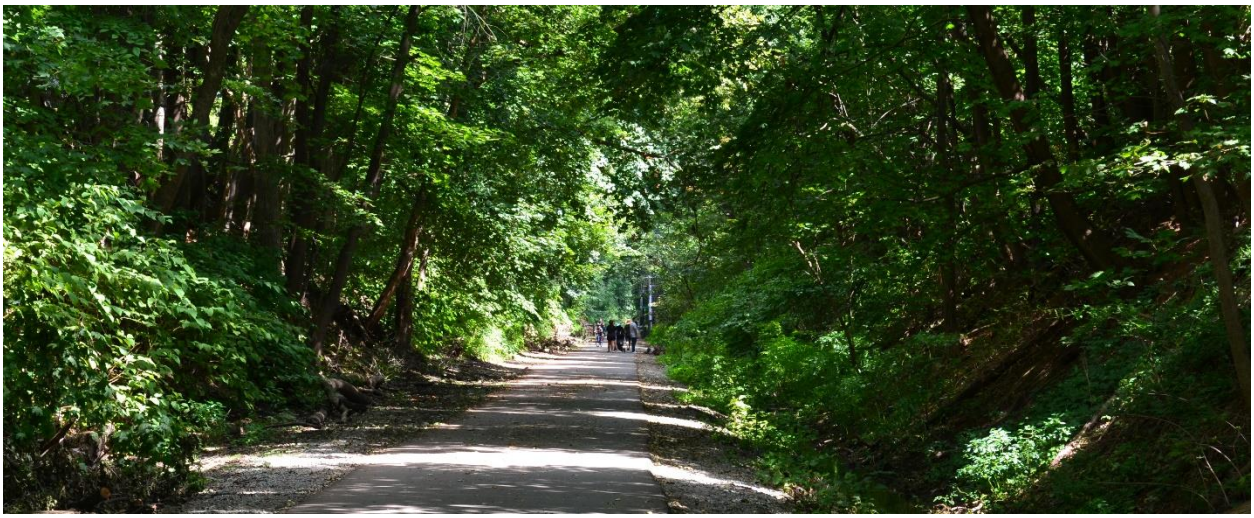
Segment (9) Raritan Landing to the Middlesex Greenway: Raritan Landing Golf Course in Piscataway to the Middlesex Greenway using potential on-road connections and the Ambrose Brook natural corridor. The trail leads from the County-owned Raritan Landing Golf Club through the Randolphville section of Piscataway adjacent to Lake Nelson. A potential on-road connection along Lakeside Drive in Piscataway navigates the narrow Lake edge. Potential on-road connections on Kilmer Road in Piscataway cross the East Coast Greenway Route to CR529 Plainfield Avenue northwest of the New Jersey Transit Edison Station. The New Jersey Transit Northeast train corridor's natural habitat leads to open space at Pow-Mia Boulevard in Edison. The path continues under Interstate 287 via Whitman Avenue to Rose Street. Rose Street connects with the Middlesex Greenway at the Memorial Parkway crossing.

- **Key Features:** County-owned Raritan Landing Golf Course, Middlesex Greenway, Papainni Park, Camp Kilmer Fields, Central Avenue Park, Privately-owned New Jersey Transit Edison Station, Rutgers Campus, Historic Ephraim-Fitz Randolph House
- **Physical Challenges:** Crossing CR630 Route 27 at Talmadge Road in Edison, On-road connections through neighborhoods, and residential areas close to Lake Nelson, crossing the New Jersey Transit Northeast corridor line at CR529 Plainfield Avenue, on-road connections at School Street, Rockafellar Road, Kilmer Road, Whitman Avenue, and Rose Street to Memorial Parkway.
- **Length:** 8.2 miles

Segment (10) The Middlesex Greenway: The Middlesex Greenway is an existing 3.5-mile trail on the former Conrail right-of-way. The asphalt path begins in Metuchen at Middlesex Avenue and ends in Woodbridge at the Garden State Parkway.

- **Key Features:** Municipal-owned Michael Dudash Park, Myrtle-Charles Park, Memorial Park. Downtown Metuchen, U.S. Route 1 Pedestrian Bridge (viewshed of historic Menlo Park)
- **Length:** 3.5 miles

Figure 3.47: The Middlesex Greenway



Source: CUES, Rutgers University. Photograph. 2020.

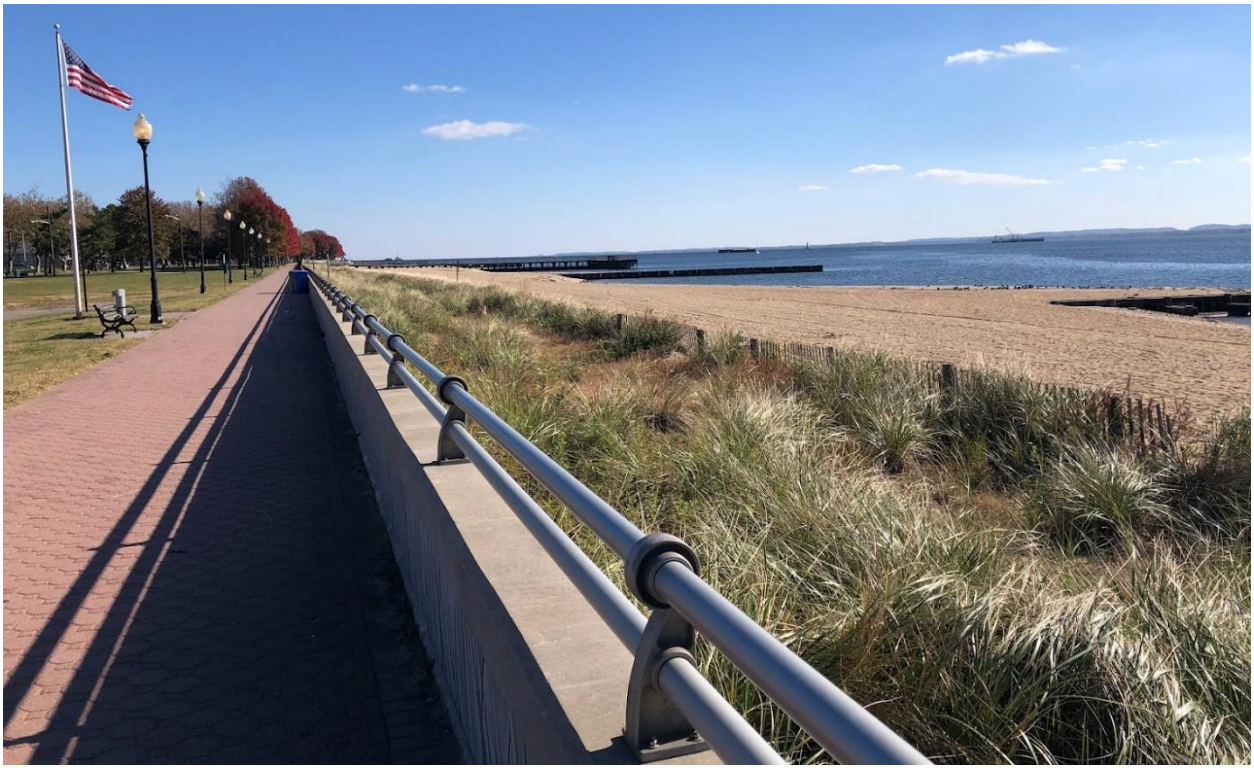
Segment (11) Middlesex Greenway to William Warren County Park: This route contains potential on-road connections from the Middlesex Greenway to Fords Park in Woodbridge. The Garden State Parkway pedestrian bridge provides access to Fords Park from the west. This Greenway Opportunity connects to William Warren Park in Woodbridge, while traffic lights offer a safe pedestrian crossing over U.S. Route 9 into the park. The trail is a potential on-road connection from William Warren Park to the Arthur Kill waterfront. The trail crosses under Interstate 95 via the existing sidewalk on South Fulton Street, leading to the Greenway Opportunity at Woodbridge Avenue (Segment 7).

- **Key Features:** County-owned Middlesex Greenway, William Warren County Park. Municipal-owned Fords Park, Truxton Drive Playground
- **Physical Challenges:** U.S. Route 9 crossing, potential on-road connections on CR529 King Georges Post Road, and potential on-road connections from William Warren County Park along South Fulton Street to link with Segment 7.
- **Length:** 4.2 miles

Segment (12) Perth Amboy to Sewaren, Woodbridge: Segment 12 links the Perth Amboy Waterfront leading to Carteret through potential on-road connections and urban parks. This segment begins at Perth Amboy's Bicycle trail at Hall Avenue to Pulaski Avenue adjacent to CR611 State Street, connecting to Rudyk Park in Perth Amboy. The potential greenway links back to CR611 State Street via the pipeline right-of-way under State Route 440, meeting with the existing trail at Captain Carlson Park (east) at the Woodbridge waterfront. The trail follows the waterfront via the Cliff Road potential on-road connection to Alvin Williams County Park and the Woodbridge Dog Park.

- **Key Features:** Arthur Kill Waterfront, County-owned Captain Carlson Park, Alvin P Williams County Park. Municipal-owned Rudyk Park, Bayview Park, Perth Amboy Ferry Slip, Perth Amboy Waterfront, Boynton Beach, Sadowski Waterfront Park, Neal J. Lucy Park. Privately-owned Raritan Copper Works, Raritan Yacht Club, St. Stephen's Church Complex.
- **Physical Challenges:** Potential on-road connections at CR611 State Street and Cliff Road. Conrail line crossing. Refineries, heavy industrial area navigation, pipeline right-of-way access at Pulaski Avenue, crossing CR611 State Street at Rudyk Park, and trucking yards.
- **Length:** 3.8 miles

Figure 3.48: Perth Amboy Waterfront



Source: CUES, Rutgers University. Photograph. 2021.

Segment (13) Ambrose Brook to Johnson Park: Ambrose Brook connects to Johnson Park through Rutgers University Livingston Campus. This connection includes potential on-road routes from the forested Rutgers Ecological Preserve to Johnson Park in Piscataway. The path travels from Ambrose Brook (meeting Segment 9) in Piscataway to Avenue E from School Road and Rockafellar Road; it includes existing trails on Livingston Campus and paths along the Buell Brook in the Ecological Preserve ending at Johnson Park.

- **Key Features:** Scenic Ambrose Brook, County-owned Johnson Park, East Jersey Old Town Village. Municipal-owned Riverside Park, School Street Park, and The East Coast Greenway on CR622 River Road. Privately-owned Rutgers Eco Preserve, Rutgers Livingston Campus, Merriewold (The Castle), Goldman House.
- **Physical Challenges:** CR622 River Road crossing, potential on-road connections at Rockafellar Road, and Avenue E crossing in Piscataway.
- **Length:** 2 miles

Figure 3.49: East Jersey Old Town Village at Johnson Park

Source: CUES, Rutgers University. Photograph. 2020.

Segment (14) Middlesex Greenway to Thomas Edison Park: The Middlesex Greenway connects to Thomas Edison County Park through natural land patches in Edison Township's industrial area. The trail begins at the Middlesex Greenway connecting with King Georges Road, then heads south over State Route 440 along the King Georges Post Road sidewalk. Once over State Route 440, the path leads through the industrial area along CR515 Woodbridge Avenue in Edison to Middlesex College and Thomas Edison County Park. The trail leads south through the wetlands to the Raritan River from the County Park.

- **Key Features:** County-owned Thomas Edison Park, the forested area between Thomas Edison Park and Fieldcrest Avenue, Middlesex College, the Raritan River, the Raritan Center
- **Physical Challenges:** Narrow along Fieldcrest Ave, heavy industry, highways by the intersection at the Middlesex Greenway, industrial parkways such as CR514 Woodbridge Avenue leading to the Thomas Edison County Park lack sidewalks but have lawn cover along the edge.
- **Length:** 5 miles

Figure 3.50: Edison Industrial Area, Physical Challenge

Source: CUES, Rutgers University. Photograph. 2021.

Segment (15) Middlesex Greenway Extension through Perth Amboy: The Middlesex Greenway extends into Perth Amboy via Woodbridge's abandoned Conrail railroad line. Currently, the Middlesex Greenway ends at the Garden State Parkway (GSP). The inactive rail bridge over the GSP acts as a pedestrian overpass. The northeast trail links with Perth Amboy's existing bicycle trail at Hall Avenue. Potential on-road connections link to the Perth Amboy Waterfront and the existing beachfront walk via CR611 State Street. The Perth Amboy waterfront walk extends south to Sadowski Parkway, ending at 2nd Street at the Raritan Bay. The Greenway Opportunity continues west from 2nd Street to Sandy Point, then Riverview Drive. A potential on-road connection on Sheridan Street to Goodwin Street loops the Greenway Opportunity back to the abandoned Conrail rail trail.

- **Key Features:** County-owned Middlesex Greenway. Municipal-owned Perth Amboy Waterfront, Perth Amboy bicycle trail at Hall Avenue, Sadowski Parkway, 2nd Street Park. Privately-owned Industrial waterfront. State Route 35 Victory Bridge.
- **Physical Challenges:** Right-of-way across the Parkway, State Route 9, and State Route 440. Gaining access to the abandoned Conrail rail line. Potential on-road connection on Sheridan Street and CR624 Goodwin Street, navigating the New Jersey Transit Northeast Coast Line rail right-of-way.
- **Length:** 6.7 miles

Figure 3.51: Abandoned Conrail Bridge over the Garden State Parkway

Source: CUES, Rutgers University. Photograph. 2020.

Segment (16) Raritan River North Walk Piscataway to Perth Amboy: The northern part of the Raritan River begins at Johnson Park leading to Perth Amboy and the State Route 35 Victory Bridge connecting Perth and South Amboy. Starting west is a patchwork of open space along the Raritan River in Highland Park. The trail travels along the river connecting Johnson Park and Donaldson Park under the State Route 27 bridge.

Due to the tidal marsh, little development exists in Edison along the Raritan River. The trail travels under U.S. Route 1, passing the Raritan River Boat Club. The Silver Lake Tributary crossing is located at the existing pedestrian bridge in Edison at the Edison Boat Basin and River Walk. The trail continues along the river under Interstate 95. A right-of-way path currently goes under the Interstate. The trail follows the wetland area along the Raritan River in Edison, leading to the Woodbridge waterfront at the Raritan River to the Keasbey area. From the Keasbey area, the trail continues to the Perth Amboy Waterfront and State Route 35 Victory Bridge.

- **Key Features:** The Raritan River and Marsh Habitat. County-owned Johnson Park, Donaldson Park. Municipally-owned Highland Park Ravine, Highland Park Meadows. Privately-owned Raritan Boat Club, Raritan Boat Launch, Rice Estate, Red's Marina, Raritan River Ravine, Edison Boat Basin, Meadow Road South, Kents Neck, Keasbey waterfront, Perth Amboy Waterfront. State Route 35 Victory Bridge.
- **Physical Challenges:** Highland Park residential land and steep topography along the Raritan River, wetland trail connections through the tidal marsh along the Raritan River, and links along the industrial waterfront.
- **Length:** 15.2 miles

Figure 3.52: Keasbey Waterfront

Source: CUES, Rutgers University. Photograph. 2020.

Segment (17) The D&R Canal at the Raritan River to Farrington Lake: The State-owned Delaware & Raritan Canal State Park towpath ends at Boyd Park in New Brunswick. From Boyd Park, the path continues along the Raritan River's edge, linking to Rutgers School of Environmental and Biological Sciences (SEBS) on Cook-Douglas Campus, crossing State Route 18 at one of the several pedestrian bridges into New Brunswick. The path navigates through Cook-Douglas Campus to College Farm Road, then under U.S. Route 1 at the agricultural cow path underpass (northeast from College Farm Road). The trail continues south into North Brunswick, passing through Milltown and CR606 North Main Street along the PSE&G right-of-way. The trail travels through David Crabiel Memorial Park in North Brunswick and further south to Farrington Lake, where it meets the Segment 21 loop at the Farrington Lake Spillway in North Brunswick.

- **Key Features:** The Lawrence Brook, The Sucker Brook, Farrington Lake, Downtown Milltown. State-owned D&R Canal Towpath, County-owned David Crabiel Memorial Park. Municipal-owned Boyd Park, Milltown Partum Avenue Tennis Courts, North Brunswick Conservation Area, Raritan River Conservation Area, Varga Park, Popowski Avenue Park, and East Lawrence Pocket Park. Privately-owned Cook-Douglas Campus, Rutgers Gardens.
- **Physical Challenges:** River mudflat terrain adjacent to the Raritan River, Conrail rail line crossing near Lawrence Brook in North Brunswick, PSE&G right-of-way access through Milltown to Farrington Boulevard in North Brunswick.
- **Length:** 6 miles

Figure 3.53: Right-of-way path crossing Milltown Main Street

Source: CUES, Rutgers University. Photograph. 2021.

Segment (18) Raritan River South Riverwalk, New Brunswick to South Amboy: The trail begins at Boyd Park in New Brunswick along the outskirts of Rutgers campus toward U.S. Route 1. The path goes under U.S. Route 1 through a forested area, passing the River Conservation Area along the Raritan River, where existing access paths lead under Interstate 95. Once under Interstate 95, crossing the Raritan River branch poses a significant physical challenge. The route crosses the Raritan River tributary connecting with Schoolhouse Lane in East Brunswick. From Schoolhouse Lane, the trail passes through a forested patch adjacent to Weston Place and Edgeboro Road.

The path cuts southeast through the industrial area adjacent to the Middlesex County utility property toward the South River. A potential on-road connection from Brick Road (which will need a pedestrian lane) to William Street leads to Pacers Field Varga Park in South River along the marsh to the South River Veterans Memorial Grounds (VFW). The trail connects with Reid Avenue utilizing the CR535 Main Street bridge (Veterans Memorial Bridge) and sidewalk to cross the South River leading into Sayreville. The trail splits north and south.

The north sector follows an access road abutting the Blue Acres parcels at the marsh's edge to Hinton Avenue in Sayreville and the Raritan River. It continues to the existing trail leading to Ken Buchanan Riverfront Park in Sayreville. From Sayreville Boulevard, the trail follows a current access path to the Crossman section in Sayreville through various potential on-road connections. The final stretch of Segment 18 along the Raritan River passes under the Garden State Parkway leading to State Route 35 Victory Bridge into Perth Amboy or continues to Marsh Point towards the South Amboy waterfront and Raritan Bay.

The South sector creates the Sayreville loop utilizing the Conrail Line corridor connecting with the northern sector at the Raritan River.

- **Key Features:** Raritan River views and access, marsh, and estuary view across the river, CR535 South River Main Street, South Amboy Waterfront, Raritan Bay, State Route 35 Victory Bridge. County-owned Marsh Point, CR535 Veterans Memorial Bridge. Municipal-owned River Road Park, Boehmhurst Park, Pacer's Field Varga Park, Raritan River Conservation Area. Privately-owned South River Community Garden, Veterans Memorial Grounds (VFW), Rutgers University Campuses.
- **Physical Challenges:**
    - **North Sector:** River mudflat terrain, trail close to and in the floodplain, South River and other Raritan River tributary crossings, industrial areas in East Brunswick, South River, and Sayreville, passing under Interstate-95, passing under Conrail bridge in South Amboy, potential on-road connections along Williams Street and CR535 at Veterans Memorial Bridge.
    - **South Sector:** Conrail Line (active or inactive status).
- **Length:** 19.5 miles

Figure 3.54: Victory Bridge over the Raritan River

Source: CUES, Rutgers University. Photograph. 2021.

Segment (19) South Amboy Raritan Waterfront to Old Bridge Waterfront: This path links existing trails within Raritan Waterfront Park and the Old Bridge Waterfront Park. The Conrail line travels along the waterfront between the railroad and Raritan Bay. The biggest physical challenge is crossing Cheesequake Creek, especially near State Route 35. Navigating the path at Cheesequake Creek to State Route 35's sidewalks create a passage leading to Old Bridge Waterfront Park.

- **Key Features:** Cheesequake Creek. County-owned Old Bridge Waterfront Park. Municipal-owned Colucci Eppineer Fields, South Amboy Marina Area, Morgan Park, South Amboy Waterfront Walkway.
- **Physical Challenges:** Crossing Cheesequake Creek, navigating the State Route 35 sidewalk network, Raritan Bay Slag Superfund Site (in progress).
- **Length:** 4.4 miles

Figure 3.55: Raritan Bay Waterfront

Source: CUES, Rutgers University. Photograph. 2020.

Segment (20) Finnegan's Lane Natural Area Loop: This loop extends from Somerset County's Six Mile Run open space area, linking to the State D&R Canal towpath. The trail extends from Six Mile Run into Middlesex County in North Brunswick to Hidden Lake Park, heading south to Luke Park onto the PSE&G right-of-way toward Finnegan's Lane in North Brunswick. The loop splits east and west at the potential Finnegan's Lane connection on-road.

To the east, the path passes over U.S. Route 1 at the traffic light and pedestrian crossing into the Finnegan's Lane Natural area forested sub-loop. The sub-loop heads south along Oakley's Brook, crossing Deans Lane following the Cow Yard Brook to Beekman Road, where the trail loops back, meeting with Segment 29 to Beech Woods Park in North Brunswick.

To the west, the trail follows Oakley's Brook to Henderson Road into an open space area and Beech Woods Park in South Brunswick, meeting with Segments 28 and 29.

- **Key Features:** Six Mile Run in Somerset County to the State D&R Canal towpath. County-owned Finnegan's Lane Natural Area. Municipally-owned Luke Park, Veterans Park, Beech Woods Park, Dobin Park, and Hidden Lake Park.
- **Physical Challenges:** Finnegan's Lane, Henderson Road, U.S. Route 1 crossing, residential neighborhoods near Finnegan's Lane, PSE&G right-of-way access.
- **Length:** 10.4 miles

Figure 3.56: Finnegan's Lane Conservation Area

Source: CUES, Rutgers University. Photograph. 2020.

Segment (21) Farrington Lake Heights Loop: This segment begins at the Farrington Lake Spillway in North Brunswick, looping around Farrington Lake to Riva Avenue (on the west) and the Fresh Ponds Road Conservation Area (east), closing the loop at Riva Avenue (south).

The western sector moves south to Segment 22, crossing Farrington Lake at the Hardenburg Lane bridge. After crossing the bridge, this segment utilizes the PSE&G right-of-way through the residential area. The path continues southeast to Beaverdam Brook, connecting with Segment 22 or continuing northeast. The return loop circles back to the Farrington Lake Spillway via the Fresh Ponds Road potential on-road connection through East Brunswick's conservation area.

- **Key Features:** Farrington Lake. Municipally-owned Farrington Lake Park, Farrington Lake Natural Area, Elks Open Space, Bicentennial Park, North Brunswick Township Park. County-owned Mill Pond Park.
- **Physical Challenges:** Fresh Ponds Road potential on-road connection, PSE&G right-of-way access.
- **Length:** 5.8 miles

Figure 3.57: Davidson's Millpond Park

Source: CUES, Rutgers University. Photograph. 2020.

Segment (22) Cottageville and Fresh Ponds Loop: This looped segment begins at the Riva Avenue potential on-road connection utilizing the PSE&G right-of-way to extend south into Ireland Brook County Park, Davidsons Mill Pond County Park, and the Pigeon Preserve, all in South Brunswick. This path utilizes the natural corridor between Riva Avenue and Farrington Lake to Davidsons Mill Pond through the park (existing path west loop) to the PSE&G right-of-way. The path crosses the right-of-way continuing east along the Lawrence Brook into the Pigeon Preserve, looping north through the Ireland Brook County Park to the PSE&G right-of-way. A straight path utilizes the PSE&G right-of-way connecting with Segment 33 at Davidsons Mill Pond Park.

- **Key Features:** Farrington Lake. State-owned Pigeon Swamp. County-owned Davidson's Mill Pond Park, Ireland Brook Conservation Area, Tamarack Hollow. Municipal-owned Albert Avenue Park, Farrington Park, Tamarack Hollow Conservation Area, Lawrence Brook.
- **Physical Challenges:** Lawrence Brook crossing
- **Length:** 8 miles

Figure 3.58: PSE&G Right-of-way at Tamarack Hollow Conservation Area

Source: CUES, Rutgers University. Photograph. 2020

Segment (23) The South River Trail from South River to Spotswood: South River connects to Spotswood along the South River. Auto yards and industrial uses at the river's edge pose physical challenges to the northern South River sector. Further south, open space parcels create a pearl-like trail extending south through East Brunswick to Keystone Park in Old Bridge. Matawan Road's potential on-road connection guides trail users over the South River, meeting Segments 27 and 34 in Spotswood's east area. Existing ATV or horseback paths provide additional trail opportunities in the southern sector.

- **Key Features:** The South River, existing ATV and horse paths, State-owned Blue Acres sites. County-owned South River Waterfront and Bissett's Recreation Area. Municipally-owned Veterans Drive Athletic Fields, Keystone Park, Lenape Park East Brunswick.
- **Physical Challenges:** Privately-owned auto yards and industrial uses adjacent to the river.
- **Length:** 4.6 miles

Segment (24) Old Bridge Waterfront to Cheesequake State Park: This trail follows two waterbodies from the Old Bridge Waterfront to Cheesequake State Park (Whale Creek and Marquis Creek). The loop travels west, crossing State Route 35 at two locations continuing south through wetland terrain and open space. The Whale Creek and Marquis Creek intersect with the New Jersey Transit North Jersey Coast Line rail corridor creating a significant physical barrier. The Whale Creek trail travels northeast adjacent to the rail line connecting to the Marquis Creek section at Woodland Avenue to combat the rail barrier. The potential on-road connection crosses the CR626 Matawan Road Bridge to Cheesequake State Park.

- **Key Features:** State-owned Cheesequake State Park and existing greenways. County-owned Cliffwood Beach, Cliffwood Recreation Area, Old Bridge Waterfront Park.
- **Physical Challenges:** State Route 35 Crossing, New Jersey Transit North Jersey Coast Line, wetland terrain along Whale Creek, CR626 Matawan Road potential on-road connection
- **Length:** 5.9 miles

Segment (25) Farrington Lake to Jamesburg Park: Farrington Lake connects to Jamesburg Park through multiple potential on-road connections. The trail branches westward from Segment 21 along Hardenburg Lane in North Brunswick. Hardenburg Lane passes under Interstate 95 to Durham's Corner Road, passing East Brunswick Community Lake traveling southeast, and passing Heavenly Farms into Jamesburg County Park in East Brunswick.

- **Key Features:** Farrington Lake. County-owned Jamesburg Park, Ireland Brook Conservation Area, Tamarack County Golf Course. Municipally-owned East Brunswick Community Lake Park, Heavenly Farms.
- **Physical Challenges:** Potential on-road connection, CR535 Cranbury Road crossing, Durham's Corner Road pedestrian path.
- **Length:** 4.4 miles

Segment (26) East Brunswick to Duhernal Lake in Spotswood: This trail begins at Heavenly Farms in East Brunswick and travels along CR535 Cranbury Road to Henley Drive, extending east to Frost Woods Park in East Brunswick from New Brunswick Avenue. The trail continues to Welsh Park from potential on-road connections to St. Georges Road, crossing CR615 Main Street in Spotswood to the South River and Duhernal Lake in Spotswood.

- **Key Features:** CR615 Spotswood Main Street, the South River, Duhernal Lake. Municipally-owned Heavenly Farms, Dideriksen Park and Fair Grounds, The Fields Sports Complex, Great Oak Park, Frost Woods, Welsh Park, and East Spotswood Park.
- **Physical Challenges:** Crossing major roads CR535 Cranbury Road and CR615 Main Street, and connections through residential areas.
- **Length:** 5.5 miles

Segment (27) Deep Run Preserve to Cheesequake State Park and Monmouth County: This segment begins at the Matawan Bridge crossing the South River near the Old Bridge and East Brunswick border. The trail starts as a potential on-road connection along Old Matawan Road and then cuts north into the County's Runyon Preserve in Old Bridge. The trail continues east through the preserve and then splits north and south, making a loop. The trail continues north through the preserve to Perrine Road, crossing U.S. Route 9 at the intersection and State Route 34, entering Cheesequake State Park. This trail continues south into Old Bridge, where it passes various open spaces like Geick Park, Athletic Fields, and Cedar Ridge Woodland Trails, where the path leads into Monmouth County.

To the south, a potential on-road connection guides travelers into Old Bridge's commercial area on CR516 Matawan Old Bridge Road. However, this south on-road connection currently lacks sidewalks in areas.

- **Key Features:** Old Bridge Commercial District, Monmouth County. State-owned Cheesequake State Park. County-owned Deep Run Preserve. Municipally-owned Geick Park, Athletic Fields, Cedar Ridge Woodland Trails.
- **Physical Challenges:** Crossing U.S. Routes 9 and State Route 34, CR516 Matawan Old Bridge Road pedestrian lanes, tributary crossing in Old Bridge at Geick Park and Cedar Ridge Woodland Trails.
- **Length:** 13 miles

Figure 3.59: Access Road at Deep Run Preserve

Source: CUES, Rutgers University. Photograph. 2020

Segment (28) South Brunswick Greenway to the D&R Canal: This segment begins at Beech Woods Park in South Brunswick and connects to the State D&R Canal in South Brunswick, leading to Plainsboro and the southwest Middlesex and Mercer County borders. The path starts as a potential on-road connection from Beech Woods Park at Beekman Road and connects various open spaces and forested areas in South Brunswick. The trail passes through the Sand Hills, West New Road Park, along the Heathcote Brook to an existing path on Promenade Boulevard, through designated open space to Heathcote Park in Plainsboro to the D&R Canal State Park, passing through the Cook Natural Area. Segment 28 continues as the State D&R Canal towpath into Mercer County.

- **Key Features:** Carnegie Lake. State-owned Cook Natural Area, D&R Canal State Park. Municipally-owned Woodlot Park, Heathcote Park, and Extension, John W. Flemer Preserve, Beech Woods Park, Silver Birch Park, Kendall Woods Park, College Park, South Brunswick Environmental Center
- **Physical Challenges:** Crossing through residential neighborhoods between open spaces, street crossings (Sand Hill Road), and connections along Promenade Boulevard with existing sidewalks.
- **Length:** 15.4 miles

Segment (29) Finnegan's Lane Natural Area to Ridge Road South Brunswick: This segment starts at the connecting point with segments 20 and 28 at Beech Woods Park in South Brunswick. Segment 29 extends east through a heavily forested area crossing the Cow Yard Brook and Lawrence Brook Tributary to Major Road. A potential on-road connection from Major Road links to an existing trail southwest of Northumberland Way. The current trail ends at CR522 Ridge Road in South Brunswick, connecting to Segment 30.

- **Key Features:** Existing trails and forested terrain. Municipally-owned forested open spaces.
- **Physical Challenges:** Crossing CR522 Ridge Road, crossing through residential neighborhoods.
- **Length:** 3 miles

Segment (30) Davidsons Mill Pond County Park to Plainsboro Preserve: Segment 30 is a north-to-south trail beginning at Davidsons Mill Pond County Park in South Brunswick and ending at the Plainsboro Preserve, where it links to the north-south PSE&G right-of-way (Segment 33). The north sector travels along Lawrence Brook through the Deans area of South Brunswick to Reichler Park on CR522 Ridge Road. The path travels south into Monmouth Junction from Ridge Road, linking with the existing Freedom Trail leading to Fresh Impressions Park in South Brunswick. The potential on-street connection utilizes E New Road to cross the New Jersey Transit Northeast Corridor Line, heading south to the naturalized area and the Lawrence Brook Tributary to Sondek Park in South Brunswick along Friendship Road into the Plainsboro Preserve.

- **Key Features:** The Freedom Trail, The Lawrence Brook. Municipally-owned Dean's Pond, Reichler Park, Sondek Park. County-owned Davidson's Millpond, Davidson's Mill Pond County Park, Plainsboro Preserve.
- **Physical Challenges:** Crossing U.S. Highway 130, Georges Road, Major Road, and CR522 Ridge Road.
- **Length:** 8 miles

Figure 3.60: Existing Freedom Trail, South Brunswick

Source: CUES, Rutgers University. Photograph. 2020.

Segment (31) Pigeon Swamp to Thompson Park: State-owned Pigeon Swamp in South Brunswick connects to Thompson Park through Jamesburg Park and the Manalapan Greenway. CR610 Deans Rhode Hall Road passes over Interstate 95 to Jamesburg Park in East Brunswick, where the trail continues southeast, crossing Bordentown Turnpike and CR615 Helmetta Road to the Manalapan Brook Greenway. This greenway extends down into Thompson Park in Monroe Township at Lake Manalapan.

- **Key Features:** State-owned Pigeon Swamp State Park. County-owned Jamesburg Park Conservation Area, Manalapan Brook Greenway, Thompson Park, and Lake Manalapan.
- **Physical Challenges:** Bordentown Turnpike and CR615 Helmetta Road crossing and agricultural areas.
- **Length:** 4.7 miles

Segment (32) Jamesburg Park to the South River: The potential greenway path connects with Segment 26 at Spotswood's western side of the South River. This path travels southwest along Duhernal Lake and the South River and continues along Cedar Brook Creek to Jamesburg Park (east corner) in Spotswood through the Park (west) to Monroe Township.

- **Key Features:** Duhernal Lake, existing greenways, CR615 Spotswood Main Street. County-owned Jamesburg Park Conservation Area, Helmetta Pond. Municipally-owned DeVoe Lake.
- **Physical Challenges:** CR615 Manalapan Road and CR 613 Devoe Avenue crossing, South River and Matchaponix Brook crossing to Industrial Road.
- **Length:** 6.7 miles

Segment (33) Right-of-way Trail from Davidsons Mill Pond County Park to Mercer County's Trolley Line Trail: This trail occupies the PSE&G right-of-way at the transmission line from South Brunswick to Plainsboro, connecting with the Trolley Line Trail in West Windsor, Mercer County.

- **Key Features:** The Lawrence Brook, Mercer County's Trolley Line Trail. County-owned Plainsboro Preserve. Municipally-owned Tall Timbers Park, Gordon Pond, Walker Gordon Soccer Field, Reichler Park, Sondek Park, Friendship Park, Harvest Woods Park, Lenape Trail, Plainsboro Pond. Privately-owned with County Easement preserved farmland.
- **Physical Challenges:** PSE&G right-of-way access, crossing U.S. Highway 130, CR522 East Garden Way, paths through residential neighborhoods, CR614 Plainsboro Road, the Cranbury Brook, and the Millstone River into Mercer County.
- **Length:** 9 miles

Figure 3.61: Trolley Line Trail in Mercer County Ending at Middlesex County Border

Source: CUES, Rutgers University. Photograph. 2020.

Segment (34) South River to Matchaponix, Monroe: Duhernal Lake in Spotswood connects to the Matchaponix area in Monroe through naturalized land. The path begins at Duhernal Lake (east side), following the Matchaponix Brook into the Matchaponix Presidential Open Space area in Old Bridge. The trail continues south and branches west or east (Segment 35 is to the east). Segment 34 continues southwest along the Matchaponix Brook, linking with Segment 38 at Spotswood Englishtown Road in Monroe Township.

- **Key Features:** Duhernal Lake. Municipally-owned Matchaponix Presidential Open Space, the Matchaponix Brook.
- **Physical Challenges:** residential neighborhoods along tributaries, Matchaponix Brook and tributary crossing, floodplain terrain, CR520 Texas Road.
- **Length:** 6.2 miles

Segment (35) John A. Phillip's Preserve Loop: This loop provides access to trailheads along John A. Phillips Preserve in Old Bridge. Segment 35 links to segment 34 in two locations. The first goes through Woodhaven open space (south); the second, at the South River off West Greystone Road (north).

Segment 35 begins (north) at West Greystone Road and continues east into the preserve. The path utilizes CR527 Englishtown Road's potential on-road connection to the East Greystone Road corridor to enter the preserve's southern areas, then heads south to cross CR520 Texas Road along the Barclay Brook to Woodhaven open space in Old Bridge.

- **Key Features:** Barclays Brook, Matchaponix Brook. County-owned John A. Philips Preserve, Municipally-owned Woodhaven Park
- **Physical Challenges:** Crossing CR520 Texas Road and CR527 Old Bridge-Englishtown Road, tributary crossing
- **Length:** 8 miles

Segment (36) D&R Canal to Plainsboro Preserve: This segment begins at the D&R Canal State Park towpath at the Carnegie Lake parking lot. The potential on-road connection on Mapleton Road travels north to an existing trail south of the Forrestal Village neighborhood in Plainsboro. The trail continues east to a potential on-road link at Forrestal Road, providing passage under U.S. Route 1. The trail follows Stellarator Road northeast around Princeton University Forrestal Campus to the Johnson Foundation fire lane east of the parking garage, then cuts across a natural area to College Road E. The sidewalk on College Road E connects with a forested path leading to Research Way. Research Way extends east to CR683 Schalks Crossing Road, crosses the New Jersey Transit line (a pedestrian bridge project is in the planning phase), and continues through the Plainsboro Preserve into Plainsboro Center.

The potential on-road connection from Plainsboro Road to Maple Avenue leads to the entrance at Mill Pond Park and the Lenape Trail in Plainsboro. At this connection, the trail splits east and west. The Lenape Trail meets with the PSE&G right-of-way (Segment 33) to the east. The trail connects with Segment 41 to the west, forming a loop trail along the Middlesex and Mercer County border.

- **Key Features:** Plainsboro Center, Forrestal Village, existing paths, Carnegie Lake. County-owned Plainsboro Preserve. Municipally-owned Plainsboro Community Park, Lenape Trail, Mill Pond Park, Plainsboro Pond. Privately-owned Princeton University Forrestal Campus and natural open spaces
- **Physical Challenges:** Mapleton Road crossing to Forrestal Village trails, on-road connections, movement along CR683 Schalks Crossing Road, existing paths that need improvement, residential areas, the planned but not yet installed pedestrian bridge over New Jersey Transit rail line.
- **Length:** 8.7 miles

Segment (37) Plainsboro Preserve to Thompson Park: Segment 37 connects the Plainsboro Preserve to Thompson Park through preserved farmland and potential on-road connections. The trail begins (west) at the PSE&G right-of-way (Segment 33). The trail continues east along the Shallow Brook and County-owned Boyco Farm, passing through preserved farmland and agricultural land utilizing existing access paths. The path continues east, crossing U.S. Highway 130 to a potential on-road connection at Cranbury-South River Road, then heads south to CR614 Prospect Plains Road. At CR614 Prospect Plains Road, there is an existing path over Interstate 95 (in need of sidewalk improvements). Prospect Plains Road's potential on-road connection continues into Thompson Park in Monroe.

- **Key Features:** State-owned Monmouth Battlefield State Park. County-owned Plainsboro Preserve, Boyco Fark, Thompson Park. Municipally-owned Rowland Park.
- **Physical Challenges:** Sidewalks need improvements through warehouse areas on CR614 Prospect Plains Road, crossing Interstate 95.
- **Length:** 7.7 miles

Segment (38) Thompson Park to Matchaponix: Segment 38 connects Thompson Park in Monroe with Matchaponix Brook linking fragmented open spaces. The trail begins at Lake Manalapan in northern Thompson Park and moves south to the end of the park. The potential on-road connection at Schoolhouse Road avoids additional rail line crossing in the park continuing east. The trail crosses CR522 Buckelew Avenue on Schoolhouse Road, then turns north into the Manalapan Brook Tributary open space area. The trail follows the brook north to the potential on-road connection at Grace Hill Road. It moves east to a forested stretch between agricultural fields (State protected farmland) and the New Jersey Training School (Juvenile Detention Center), following the field perimeter and tree rows to CR613 Spotswood Englishtown Road. The trail connects with Segment 34 at the Matchaponix Brook in Monroe.

- **Key Features:** Preserved Farmland, Matchaponix Brook, Manalapan Brook, Monroe High School. County-owned Thompson Park, Lake Manalapan.
- **Physical Challenges:** Crossing CR522 Buckelew Avenue, tributary crossing in forested areas, navigating between the training center and agricultural fields, and small forested stretches between residential parcels.
- **Length:** 4 miles

Segment (39) Cranbury Brook and Cranbury Preserve: Cranbury Brook offers an opportunity to make an east-west connection from Plainsboro to Downtown Cranbury. The path travels along Cranbury Brook to the Cranbury Preserve linking to CR535 North Main Street at Brainerd Lake in Cranbury.

- **Key Features:** Downtown Cranbury, Cranbury Brook. Municipally-owned Cranbury Preserve, Brainerd Lake, Village Park, Cranbury Fire House, West Property Soccer Fields, Unami Woods.
- **Challenges:** Navigating agricultural land and residential areas.
- **Length:** 6 miles

Figure 3.62: Public Access Connecting Open Space to Downtown Cranbury

Source: CUES, Rutgers University. Photograph. 2021.

Segment (40) Downtown Cranbury to Monroe Crossroads: The Cranbury Brook connects to Downtown Cranbury through this potential on-road connection extending to Thompson Park in Monroe Township. The possible on-road link heads north at Brainerd Lake in Cranbury along CR535 North Main Street to Westminster Place, then northeast on Maplewood Avenue. Half Acre Road crosses U.S. Highway 130 and guides pedestrians over Interstate 95 (with needed sidewalk enhancements). Half Acre Road extends east to CR615 Union-Valley Half Acre Road. The road connects with CR614 Prospect Plains Road leading the trail into the Crossroads section of Thompson Park in Monroe.

- **Key Features:** Cranbury Brook, Brainerd Lake, Downtown Cranbury. State-owned Monmouth Battlefield State Park. County-owned Thompson Park Conservation Area, James Monroe Memorial Park. Municipally-owned Village Park, Historical Village. Privately-owned Concordia Golf Club.
- **Physical Challenges:** An on-road segment, crossing Interstate-95 and U.S. Highway 130, and navigating CR614 Prospect Plains Road and CR615 Union-Valley Half Acre Road, Cranbury industrial area on Half Acre Road.
- **Length:** 12 miles

Figure 3.63: Downtown Cranbury Potential On-Road Connection

Source: CUES, Rutgers University. Photograph. 2021.

Segment (41) Millstone River: The Millstone River defines Middlesex County's southern border. The river offers opportunities to connect to Mercer County and provides an east-west connection. This segment begins at Maple Avenue in Plainsboro. It follows the Millstone River east through the Conservation area crossing the Trolley Line Trail connector at the PSE&G right-of-way, over CR615 Cranbury Neck Road to the Upper Millstone River Greenway in Cranbury. West of Old Trenton Road, the trail heads northeast along the Millstone River Tributary, continuing north to downtown Cranbury. Segments 39 and 41 create a Cranbury and Plainsboro Loop.

- **Key Features:** The Millstone River, West Windsor Plainsboro High School North, Rural landscapes.
- **Physical Challenges:** Connection through neighborhood areas and agricultural land heading north to Downtown Cranbury.
- **Length:** 8.6 miles

Greenway Opportunities Conclusion

The *Greenway Opportunities* identified throughout Middlesex County connect existing open spaces through opportunity routes and existing trails. Each of the 41 *Greenway Opportunity* segments traversers a portion of the County tying to a designated open space. Implementing a County-wide greenway network encompassing over 300 miles is no small task but it will establish Middlesex County with a Green identity and recreational center and increase the residents' quality of life by fostering public health. Each segment presents opportunities to enhance the overall open space network by connecting preserved open space of all scales. Physical challenges such as highway, railroad, and river crossing occur across many greenway segments.

The greenway types, ***Table 3.6***, show that certain segments require less intensive implementation, such as maintained open paths or forest trails, while others require more effort, such as a levee trail. Establishing a county-led Greenway Working Group will help support greenway feasibility studies, secure funding, and implement strategies across multiple municipalities. The *Greenway Opportunities* present a chance to define Middlesex County as the greenway capital of New Jersey, providing broader access to open space, healthy wildlife corridors, and reducing car dependency.

CONCLUSION

Middlesex County's landscape encompasses nearly 200,000 acres of New Jersey. Every acre has the potential to enhance the ecological fabric and cultural representation of the County. Not every landscape is suitable for every recommended tactic in this action plan, but every landscape—categorized by type—can contribute to the landscape's ecological function and cultural value.

The *Integrated Ecosystem Services and Cultural Landscape Vision* supports the County's landscape to operate at its full potential for all people, wildlife, and outdoor spaces. The methods to achieve a thriving landscape exist through programs such as Sustainable Jersey, Resilient NJ, Green and Blue Acres, Farmland Preservation, and many more. These programs support resilient actions at the municipal and private landowner scales, even though all influencers have the power to impact the landscape positively.

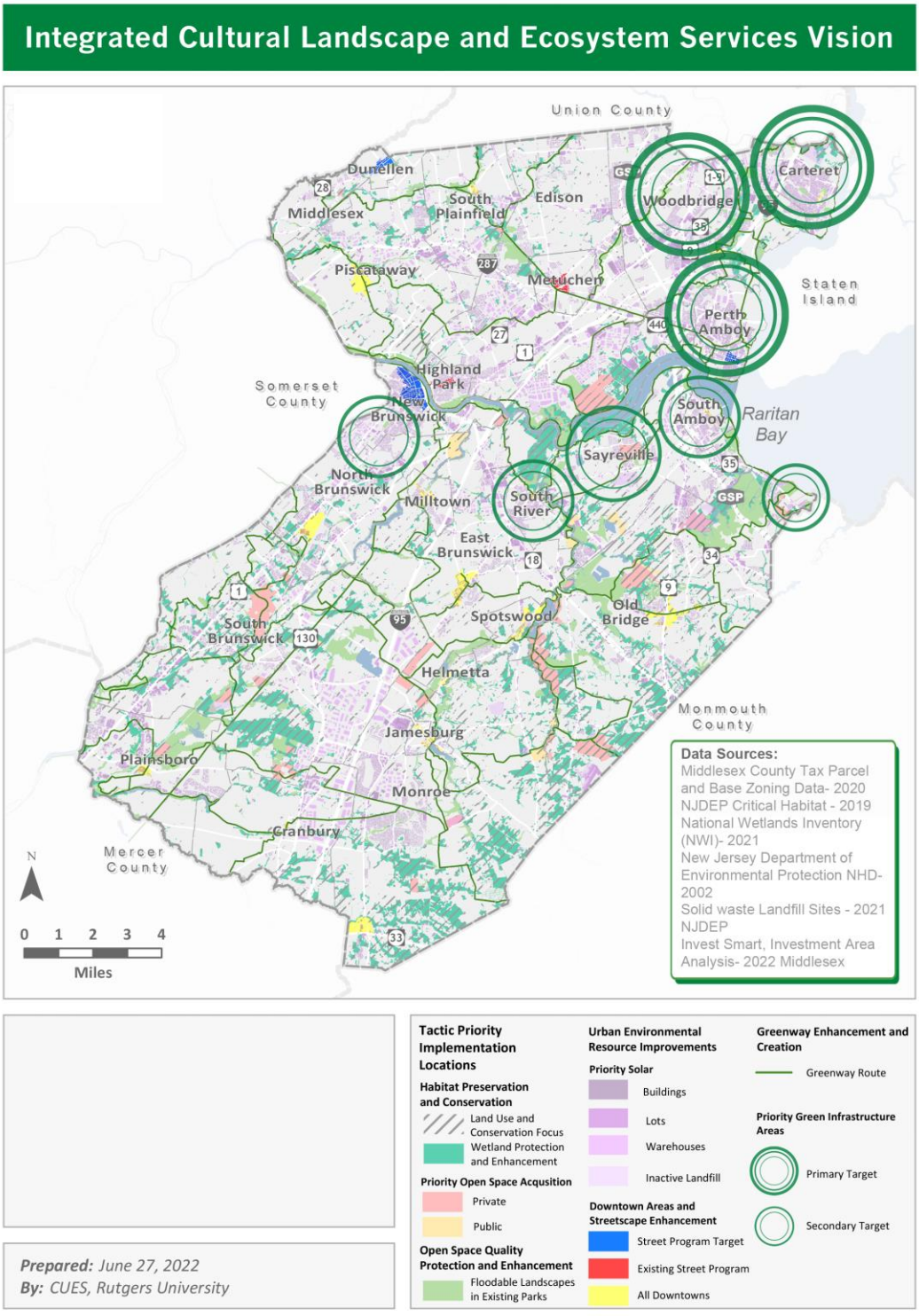
The proposed actions and tactics in sections 3.1 and 3.2 centers on conservation, urban environment improvements, stormwater management, urban heat island reduction, history and diversity represented in the landscapes, downtowns as ideal outdoor spaces, and open space quality to strive for a resilient future. As each landscape type functions to its highest expectation, natural and human-made corridors connect again to provide places for people and wildlife.

Actions across types include environmental stewardship, conservation zoning, digital technologies connecting with the public, and wetland protection. These actions call on all levels of influencers to make a change for the environment through various methods such as impervious surface removal in wetlands or lot restrictions when zoning developable land. All these interventions begin with the importance of connecting people to spaces solidifying an essential need to protect them.

Middlesex County's *Greenway Opportunities* are a base for action implementation, genuinely supporting the integrated ecosystem services and cultural landscape vision. The *Greenway Opportunities* become preservation priorities, natural corridors, recreational and transportation routes, places for viewshed protection and access, and a better-connected open space network supported by influencer-driven stewardship. The *Greenway Opportunities* support Middlesex County as a connected landscape exemplifying the County's heritage as part of the Garden State and the County's sustainable future while supporting public health by increasing residents' quality of life.

Map 3.6 locates the County's integrated vision for ecosystem services and cultural landscapes. The collection of actions and tactics proposed in this plan supports a collaboration across all landscapes and influencers to strive for a unified and integrated cultural and ecological landscape vision. Middlesex County's vision aims for a landscape encompassing all outdoor spaces to support an integrated, culturally significant, and ecologically thriving environment through ecological habitat enhancements and quality outdoor places for people to foster identity, memory, and cultural meaning. Supporting a high-quality environment begins with the County's residents, leaders, and landscape influencers demanding a higher expectation from all outdoor places. Through education, environmentally conscious planning, and swift action Middlesex County holds the potential to lead environmental advocacy for ecological and cultural landscapes.

Map 3.6: Integrated Cultural Landscape and Ecosystem Services Vision



APPENDIX

3.1: Tree and Large Tree-like Shrub Species

Table 3.7: Tree and Large Shrub Species Recommendations for Urban Planting Areas [83, 84]

Tree Species		Moderate Tolerance		Appropriate Location			
Common Name	**Scientific Name**	**Flood**	**Drought**	**Lawn and yard**	**Street edge**	**Street underwires**	**Parking lot**
Box elder*	*Acer negundo**	x	x	x	x	x	x
Red maple	*Acer rubrum*	x	x	x	x		x
Sugar maple	*Acer saccharum*		x	x	x		
Downy serviceberry*	*Amelanchier arborea**	x		x		x	x
Shadblow serviceberry*	*Amelanchier canadensis**	x	x	x		x	
Allegheny serviceberry*	*Amelanchier laevis**	x		x		x	
Pawpaw*	*Asimina triloba**	x		x		x	
Black birch	*Betula lenta*	x	x	x			
River birch	*Betula nigra*	x	x	x	x		x
Grey birch*	*Betula populifolia**	x	x	x		x	x
Hornbeam*	*Carpinus caroliniana**	x		x		x	
Bitternut hickory	*Carya cordiformis*	x		x	x		
Pignut hickory	*Carya glabra*		x	x	x		
Shagbark hickory	*Carya ovata*		x	x			
Mockernut hickory	*Carya tomentosa*		x	x			
Hackberry	*Celtic occidentalis*	x	x	x	x		
Flowering dogwood*	*Cornus florida**			x		x	
Washington hawthorn*	*Crataegus phaenopyrum**		x	x		x	
Persimmon	*Diospyros virginiana*	x	x	x	x		
Witch hazel*	*Hamamelis virginiana**		x	x		x	
American holly	*Ilex opaca*		x	x		x	x
Black walnut	*Juglans nigra*	x	x	x			
Eastern red cedar	*Juniperus virginiana*		x	x			x
Sweetgum	*Liquidambar styraciflua*	x	x	x	x		
Tuliptree	*Liriodendron tulipifera*		x	x	x		
Northern bayberry**	*Morella pensylvanica***		x	x		x	x
Black gum	*Nyssa sylvatica*	x	x	x	x		
Hophornbeam*	*Ostrya virginiana**		x	x		x	

White pine	*Pinus strobus*		x	x			
Pitch pine	*Pinus rigida*		x	x			x
Sycamore	*Platanus occidentalis*	x	x	x	x		
Black cherry	*Prunus serotina*		x	x			x
Hoptree*	*Ptelea trifoliata**		x	x		x	x
White oak	*Quercus alba*		x	x			
Swamp white oak	*Quercus bicolor*	x	x	x	x		
Scarlet oak[1]	*Quercus coccinea[1]*		x	x			
Bear oak*	*Quercus ilicifolia**		x	x		x	x
Burr oak	*Quercus macrophyllum*	x	x	x			
Swamp chestnut oak	*Quercus michauxii*	x	x	x	x		x
Chinkapin oak	*Quercus muehlenbergii*		x	x	x		x
Chestnut oak	*Quercus montana*		x	x	x		
Pin oak [1]	*Quercus palustris [1]*	x	x	x	x		x
Willow oak	*Quercus phellos*	x	x	x	x		x
Dwarf chestnut oak*	*Quercus prinoides**		x	x		x	x
Northern red oak [1]	*Quercus rubra [1]*		x	x	x		x
Post oak	*Quercus stellata*		x	x	x		x
Black oak [1]	*Quercus veluntina [1]*		x	x	x		
Shining sumac*	*Rhus copallinum**		x	x		x	x
Smooth sumac*	*Rhus glabra**		x	x		x	x
Staghorn sumac*	*Rhus typhina**		x	x		x	x
Elderberry**	*Sambucus canadensis***	x	x	x		x	x
Pussy willow**	*Salix discolor***	x		x		x	x
Sassafras	*Sassafras albidum*		x	x			x
Bald cypress	*Taxodium distichum*	x	x	x	x		x
Northern white cedar	*Thuja occidentalis*	x	x	x			
InBasswood	*Tilia americana*		x	x			
Princeton elm	*Ulmus americana 'Princeton'*	x	x	x	x		x

*Remains in the understory or small tree at maturity

**Tree-like shrubs, especially when properly pruned

[1] Species of oak most susceptible to bacterial leaf scorch (BLS); do not plant in areas near BLS outbreaks.

Table 3.7 Key:

- **Flood Tolerance:** Species adapted to withstand flooding or regular water inundation
- **Drought Tolerance:** Species adapted to withstand drought conditions
- **Lawn and yard:** Lawns, yards, gardens, and woodland edges
- **Street Edges:** Street edges (4-6 feet wide) and highway medians (>6 feet wide)
- **Street underwires:** Street edges specifically under powerlines
- **Parking Lot:** Parking lot islands (100-200 square feet or >200 square feet) and edges

GLOSSARY

Arts Advocate: An appointed individual responsible for arts leadership and resource discovery at the municipal level.

Bacterial Leaf Scorch (BLS): a shade tree disease caused by Xylella fastidiosa, a xylem-inhabiting bacterium with particular nutritional requirements and causes tree death. [85]

Cluster Zoning: cluster development sets aside a portion of a single development site as open space and concentrates all of the development on the remaining. [86]

Conservation Zoning: development occurs on a portion of a land parcel, with the remainder of the land in conservation. [87]

Easement: a restriction placed on a piece of property that limits the land uses to protect natural resources and open space. [88]

Ecosystem Services: The broad definition of ecosystem services includes the benefits people obtain from the ecosystem. [89]

Environmental Stewardship: Environmental stewardship is the shared responsibility to sustain a high environmental quality by all whose actions affect the landscape.

Green Infrastructure and Green Stormwater Infrastructure: methods of stormwater management that reduce stormwater volume, flow, or flow characteristics by allowing the stormwater to infiltrate into the soil and treated by vegetation. [90]

Green Roof: A green roof, also known as a vegetated roof, is a roof covered with a growing medium and vegetation. A green roof consists of vegetation planted in growing media on top of a drainage layer that intercepts stormwater and reduces the total volume of runoff through evapotranspiration. [91]

Non-Contiguous Cluster Zoning: Unlike basic cluster development, which sets aside a portion of a single development site as open space and concentrates all of the development on the remaining land, non-contiguous clustering allows a municipality to extend this concept to multiple tracts of land. As the name describes, the properties need not be contiguous, and they need not be in common ownership. [92]

Rain Gardens and Bioretention Basins: Landscaped, shallow depressions capture rainwater allowing it to percolate slowly into the ground. Bioretention basins constitute large rain gardens. (93)

Small Tree: On average, a tree reaches 20-30 feet at mature height (80-100 years in age).

Shade Tree: A tall tree that provides shade at ground level due to its large canopy. (94)

Understory: A layer of vegetation (such as saplings in a forest) below the canopy but cleared the ground-level vegetation. (95)

Viewshed: A cultural landscape characteristic defined as a linear lookout from a particular vantage point that highlights the natural landscape.

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