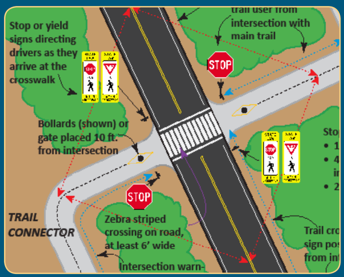
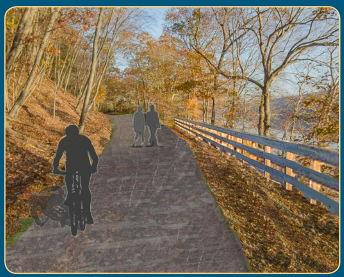
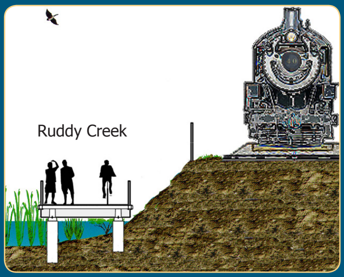
Valley Railroad State Park Scenic Corridor Study







Prepared for the
Lower Connecticut River Valley Council of Governments (RiverCOG)

Trevor R. Buckley and Christian Johnson • The Conway School
May 2014 • Conway, Massachusetts

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Scenic Corridor Study

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Photo by Trevor Buckley

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Valley Railroad Company assisted throughout the study; its representatives provided insights into the corridor's history and the company's current operations. Thank you to Bob Bell, President of Valley Railroad, Board Member Kevin Dodd, and Vice President and engineer Rob Bradway, as well as Paul Scarbrough, President of the Friends of the Valley Railroad, a non-profit supporting the Company's upkeep of the rail.

Thank you to everyone who graciously shared photos: Liz Bazazi, The Blue Oar, David Nelson, Emily Davis, Craig Della Penna, Jake Lynch at Rails-to-Trails Conservancy, Stuart Macdonald, Nine Town Transit, RiverQuest (Mark and Mindy Yuknat), Barrie Robbins-Pianka, Valley Railroad Company, and Walt Zilahy.

Photo by Christian Johnson

These mill ruins near River Road in Maromas are visible along the South Scovill Loop Trail, one of the potential connections to a possible multiuse trail along the corridor.

The area at Goodspeed Station and Eagle Landing State Park might provide the southern terminus for a multiuse trail along the corridor.

Contents

All images and graphics in the report are by the authors unless otherwise noted.

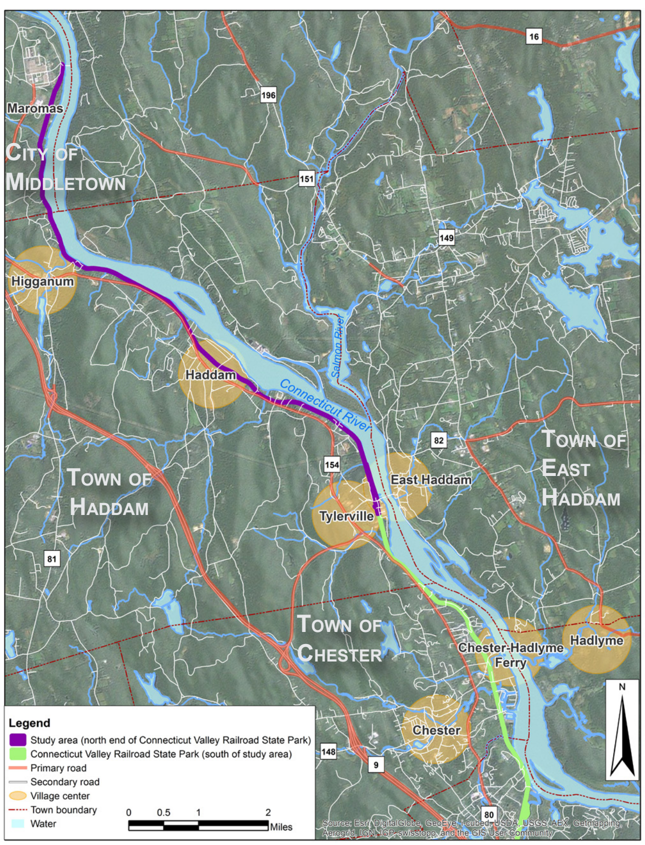
Executive Summary

Project Scope

The Valley Railroad State Park Scenic Corridor Study, commissioned by the Lower Connecticut River Valley Council of Governments (RiverGOG), analyses the regional and local context of the northern nine miles of the Valley Railroad corridor and the existing conditions along the corridor between Tylerville and Maromas (see map below). Approximately eight miles of this rail has not been used for train travel since 1968. This report provides conceptual designs and design guidelines for development of a multiuse trail along the corridor. The study is one of several commissioned by the RiverCOG to examine the role that this asset should play in regional planning efforts related to transportation, conservation, and economic development.

Analysis

The study area is situated along the Connecticut River in the Town of Haddam and City of Middletown. The setting is suburban (small village centers) to rural. Local economic activity is geared towards the service sector, and recreation related to the Connecticut River and area parks and greenways is important to the region's economic development. Scenic viewsheds along the river are a draw for tourists and recreationalists. A multiuse trail along the rail corridor would, for the most part, complement current regional planning work in these areas.



Data sources: CT DEEP, ESRI, Trevor Buckley, USDA Geospatial Gateway

Environmental conditions within the study area that present design challenges include steep slopes, soils susceptible to erosion, designated areas that are home to federal and state listed species and critical habitats, and potential soil contamination from historic rail use and industrial operations. Trail development could affect local hydrology, sensitive habitats, wildlife, and vegetation.

Trail Design Options

Multiuse trail design that allows for universal accessibility requires a 2% or less cross-sectional slope, and a 5% or less longitudinal slope. Historic rail corridors like the Valley Railroad corridor typically meet these general criteria, so are well-suited in that regard for locating a trail.

Three trail types are considered in the report: burying the rails and ties to build the trail over the existing infrastructure; removing the rails and ties and building the trail on the railbed; and building the trail parallel to the tracks, which would allow for the possibility of extending active rail through the corridor. As there is no precedent for the first type and other factors could complicate such trail construction, this type is not considered in the conceptual designs.

Trail replacing rail is by far the most common type of rail-trail constructed in the United States. A trail with rail has many precedents, but the Valley Railroad property's right-of-way, safety concerns, and environmental and physical constraints would affect the alignment and construction of this type of trail. Valley Railroad Company conducts steam train excursions up to Ruddy Creek, north of Goodspeed Station (see map on next page). This operation overlaps with the project study area for one mile; therefore, a trail with rail would be necessary for that stretch of the corridor.

The anticipated use of a potential trail would determine the appropriate surface material, as would environmental conditions that affect its durability.

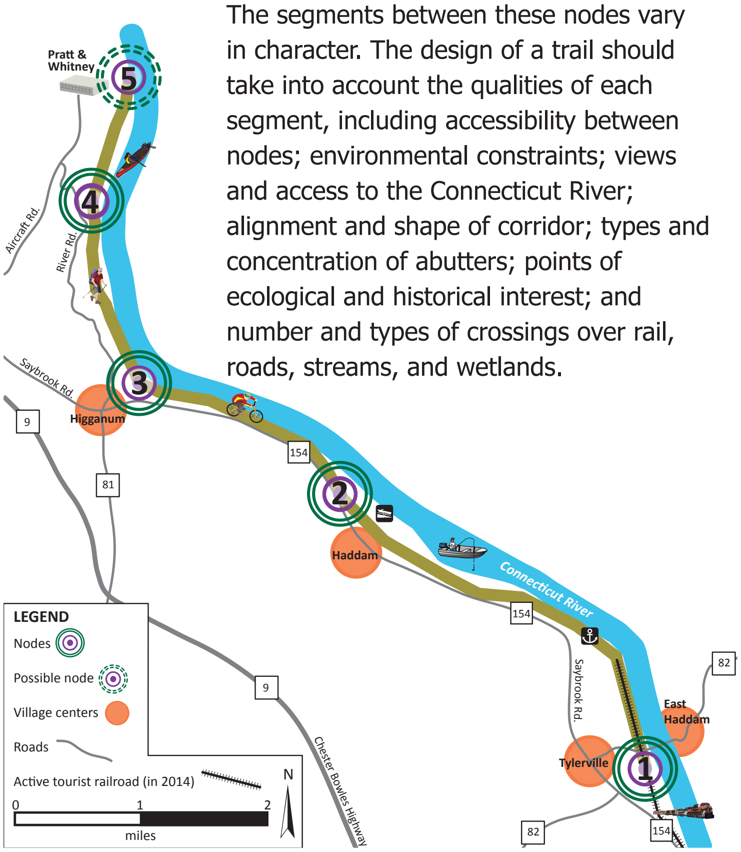
Surface material can also impact environmental quality, so selection of sustainable materials is emphasized in this report. Multiple treads of different surface materials could suit different activities, and might enhance safety for all users where activities conflict. The trail could potentially be divided into zones along its length with different surface materials to suit different uses.

The Trail Structure

A potential trail can be understood as a system of segments and nodes. Nodes act as focal points of activity along the trail, including trailhead facilities, destination points for recreational opportunities, and connections to village centers and area attractions. The following locations, shown in the map below, are recommended for trail nodes:

1. Eagle Landing State Park and Goodspeed Station
2. Haddam Meadows State Park
3. Higganum Cove
4. North Scovill Loop Trail at Hubbard Brook
5. Pratt & Whitney pier behind the Engine Center

The segments between these nodes vary in character. The design of a trail should take into account the qualities of each segment, including accessibility between nodes; environmental constraints; views and access to the Connecticut River; alignment and shape of corridor; types and concentration of abutters; points of ecological and historical interest; and number and types of crossings over rail, roads, streams, and wetlands.



Conceptual Designs & Guidelines

The main elements of trail design explored in this report are trailheads, trailside amenities, safe crossings at rail and road intersections, and stream and wetland crossings.

Trailheads are primary access points with facilities such as parking and restrooms; this report recommends trailheads at each node, Trailside amenities include signs (informational, directional, regulatory, warning, educational), seating, access to the Connecticut River, and views of the river.

Safe crossings for a trail are needed at intersections with active rail, highways, residential roads, driveways and utility roads, and paths. Features of safe crossings include signs, striping or pavement markings, and signals such as active warning beacons for motorists, as well as bollards or gates that block vehicular access to the trail.

The corridor crosses over approximately twenty streams and passes close by several wetlands. A trail might require retrofitting existing bridge structures, constructing new spans, or placing elevated boardwalks over wetlands or on the side of the railbed's causeways.

This report includes rough estimates of potential costs associated with nine miles of trail development. Depending on the options adopted, the estimated costs range from approximately $5.38 million to $30.73 million. These totals do not include some costs, such as those related to retrofitting bridges and permitting, which could not be determined given the scope of the project.

Visions for the Corridor

The report concludes with three visions of what the corridor might look like in the future:

- An informal trail along the corridor (the no-action alternative).
- A multiuse trail in place of the rail.
- A multiuse trail-with-rail development.

The River & the Rail: A Brief History

THE LOWER CONNECTICUT RIVER

Long before the first European settlements, Quinetucket—"the long tidal river"—was home to the Pequot Indians. Their lives and culture were intimately entwined with the river, a source of sustenance and a primary means of transportation and trade. European settlement brought tremendous change over the late-sixteenth to mid-eighteenth centuries. Conflicts over the river's resources fueled competing interests between native communities and settlers, and rapid European settlement, disease, and ensuing warfare ultimately decimated Native American communities throughout the watershed.

The river served as an avenue by which the colonial settlers spread from the sea inland. In time, the tidal waters gave birth to several centers of shipbuilding, sea trade, and fishing, including the wharves at Haddam Meadows and Higganum Cove. Mills developed along the river and its tributaries for the processing of grain, timber, and stone. Sites such as Higganum Cove saw a succession of industrial operations, which reached their heyday in the latter half of the nineteenth century. Mills and factories spurred railroad expansion, which arrived along the Lower Connecticut River in the 1860s.

THE VALLEY RAILROAD

In 1868, the Valley Railroad Company was chartered to build a railroad that would connect Old Saybrook to Hartford, a distance of forty-four miles. Construction began with groundbreaking at Walkley Hill in Higganum in April 1870, and, in a little over a year's time, the company laid the tracks and constructed seventeen stations, including those at Tylerville/Goodspeed (also called East Haddam/Moodus), Arnolds, Haddam Meadows, Higganum Cove, and Maromas. On July 29, 1871, the first passenger train rolled down the tracks.

The Valley Railroad, situated along the scenic but rural valley quickly became fated to branch-line status. Industry never developed as much along this stretch of the valley as it did elsewhere. In an effort to make the line profitable, the company rented other lines to extend its network (Turner and Jacobus 162). Financially strained, the company experienced bankruptcy, reorganization, and finally a sale to the New Haven Railroad.

Opposite: A photograph taken in 2014; in many places, this landscape feels timeless.

Photos by Trevor Buckley

Above: Small stations once lined the corridor at nearly every village; some depot structures still stand today.

With little manufacturing and, eventually, the growing popularity of the automobile, train travel along the Valley Railroad declined significantly in the first half of the twentieth century. The last passenger train traveled the line in 1933, and 1968 saw the last of the freight business. In the late 1960s, Penn Central (the owner of the line at that time) was planning to tear up the tracks and decommission the railroad. Staving off this demolition, the State of Connecticut stepped in and in August 1969 purchased the right-of-way for what became Connecticut Valley Railroad State Park.

Around the same time, promoters of a scenic tourist rail venture led the way to the establishment of the modern incarnation of the Valley Railroad Company. Exactly one century after the first train ran down the line—July 29, 1971—the Essex Steam Train pulled out of its namesake station to travel north along the river to Deep River. Today, the Valley Railroad Company leases the 136-acre, 22.67-mile-long rail corridor and continues to operate vintage train excursions up and down the Lower Connecticut River Valley.

Photo courtesy of Valley Railroad Company, CVRM Collection

The 1892 station in Essex as it appeared in 1960, unused and overgrown.

Photo by Andrew Paclucik, courtesy of Valley Railroad Company

The inaugural steam train trip arrives at Deep River on July 29, 1971.

Locomotive #97 stands at the entrance of Valley Railroad's Essex train yard.

Photo by Christian Johnson

Higganum Cove in a nineteenth-century photograph; mills took advantage of the falls at Higganum Creek, which empty into a meandering stream that flows through wetlands to the Connecticut River.

Photo courtesy of Liz Bizazi

Photo by Chase Smith, courtesy of Valley Railroad Company

Locomotive #3025 pulling out of the station.

1. Client Profile & Project Scope

THE LOWER CONNECTICUT RIVER COUNCIL OF GOVERNMENTS (RIVERCOG)

The Lower Connecticut River Valley Council of Governments, known as RiverCOG, is a regional planning organization that serves as the state sanctioned planning body—including roles as the regional planning commission (RPC) and metropolitan transportation organization (MPO)—for seventeen towns in south-central Connecticut (see map below). The district formed from the merger of two smaller and adjoining regional planning agencies (RPAs) in 2012. It includes the small city of Middletown and small towns on the east and west side of the Connecticut River, from Portland, northeast of Middletown, to Old Saybrook and Old Lyme at the mouth of the River at the Long Island Sound. Middletown's population is about 47,500, while the populations of the towns range from 2,300 (Lyme) to 14,000 (Cromwell); some have suburban development, while others are much more rural (Connecticut Economic Resource Center). Altogether, there are approximately 170,000 people living in the district. The Connecticut River lies at the center of the district geographically, and its water quality, scenic value, and other attributes place it at the center of the region's planning efforts. Twelve of the seventeen RiverCOG municipalities are directly adjacent to the river, and much of their economic activity is related to recreation and tourism along the river.

RiverCOG District & Project Study Area

Data sources: Connecticut Department of Energy and Environmental Protection (DEEP), Trevor Buckley

PROJECT CONTEXT & SCOPE

Valley Railroad: A Regional Asset

In 2012, RiverCOG began an inventory of regional assets and turned to the task of studying the Connecticut Valley Railroad State Park. This property is a 136-acre and 22.67-mile-long rail corridor stretching from Old Saybrook to Middletown (see map), paralleling the river for much of its length. The property has been owned by the State of Connecticut since 1969, and while technically a state park (owned by the Department of Energy and Environmental Protection [DEEP]), the entire property has been leased to Valley Railroad Company since 1971. Valley Railroad operates a tourist rail operation on the lower approximately thirteen miles of track, from Tylerville to Old Saybrook. The company, with the help of the non-profit Friends of the Valley Railroad, maintains the remainder of the corridor—about nine miles—though the section north of Ruddy Creek has not been used for active rail service since 1968. (Two of the company's excursions do travel as far north as Ruddy Creek.) Following an unsuccessful TIGER grant application to refurbish the tracks for freight use along the entirety of the corridor, Connecticut's Department of Transportation (DOT) removed freight from its plans for the corridor in the 2010 State Rail Plan.

DOT, however, tasked RiverCOG with studying the corridor as a regional asset, looking at options for the future of the property. To that end, RiverCOG initiated studies in 2013 and 2014, including a freight and passenger rail feasibility study (currently in the bidding stage), and the Valley Railroad State Park Scenic Corridor Study (this report) looking at the feasibility of a multiuse trail along the northern nine miles, from Eagle Landing State Park to Maromas. In each of these studies, RiverCOG is interested in studying the Valley Railroad corridor's potential to contribute to planning in three areas:

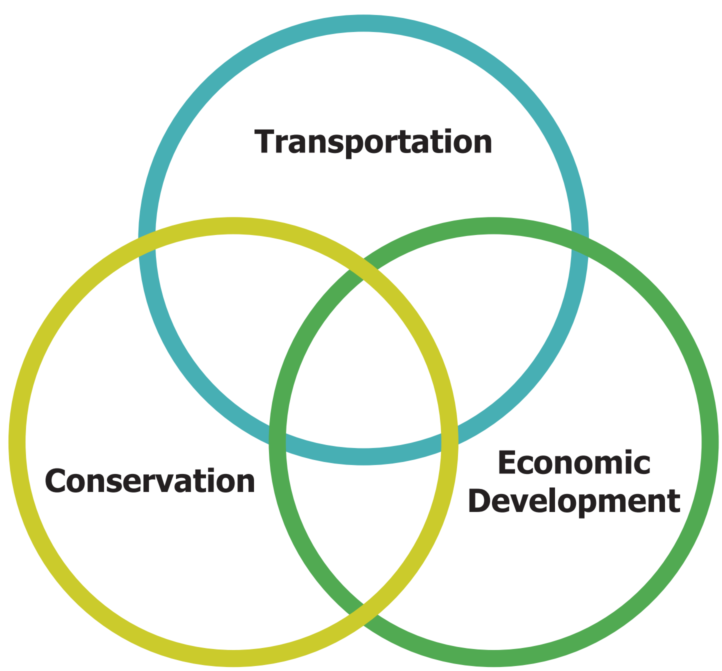
- **Transportation** that utilizes the whole Valley Railroad corridor, including the northern nine-mile section along the river, and looks increasingly to public transit, and bike and pedestrian infrastructure.
- **Conservation**, including planning that treats the Connecticut River as a critical resource and emphasizes the protection of open space and creation of greenways, which includes regional trail systems through public and other conservation lands.
- **Economic development** that is largely river-centric and based on tourist attractions and recreational activities, and strives to create a stronger, more integrated tourist economy.

RiverCOG, through the studies it is conducting, is asking how the Valley Railroad corridor currently relates and could potentially relate to planning efforts in these areas; with the northern nine miles studied in this project, the agency is particularly interested in how its use as a multiuse trail could contribute to economic development. Economic development and integration informed the approach to a trail taken in this project; the specific value of the corridor will be examined in a separate study (see "Regional Economy," page 11).

Project Components

RiverCOG asked that this study consider three trail types for possible implementation along the corridor. These types are trail replacing rail, trail on top of existing rail, and trail with rail, each examined in Chapter 4, "Trail Options." In addition, RiverCOG requested that the study include the following:

- Identify appropriate connections from the potential multiuse trail to the four village centers of Higganum, Haddam, East Haddam, and Chester/Hadlyme (including Gillette Castle across the river and the Valley Railroad tourist line).
- Develop conceptual designs for potential trail nodes, intersections, and gathering places for tourists and residents.
- Develop design guidelines for construction of the trail on the existing railbed and for bridges and/or other means of crossing at wetlands and waterways.



- Identify environmental constraints.
- Assess rail-trail/road intersections and develop designs to provide safe crossings.
- Identify locations for trailheads and parking areas.
- Map locations of existing trail facilities and make recommendations for locations of future facilities (restrooms, bike repair shops, provisions).
- Link the trail to other open and green spaces and existing trail systems.
- Develop approximate cost estimates for construction of a proposed trail along the existing railbed, including trail nodes, intersections and crossings, gathering places, and facilities.

All of these components are addressed in this report.

COMMUNITY NEEDS: INFORMATION GATHERING & ASSESSMENT

Community feedback provided important findings that shaped the project's conceptual designs and guidelines, and other recommendations. Two community meetings were held. A stakeholder meeting in early February 2014 brought together a dozen or more entities representing state and local government, local business and industry interests, community advocacy groups, and non-profits working on conservation and development issues, among others. Approximately thirty attendees, through a series of guided exercises, were asked to consider the positive and negative characteristics of the study area currently and as it would be if used as a multiuse trail. These comments were written, marked on maps, and reported back to the group. Collectively, feedback from attendees included issues related to local-regional conservation efforts and opportunities for economic activity, public education, public river access, and recreation that a trail might generate. There was lively discussion over what form a trail might take—trail replacing rail, trail with rail, etc.—and how Valley Railroad Company's operation would relate to a trail project. This meeting is described in more detail in Appendix A.

The second community meeting, in early March, presented analysis and initial design recommendations, and solicited public feedback. About sixty attendees participated in a voting exercise on suggested trail nodes, trail design options, and trail uses. Forty-two individuals completed a survey about their relationship to the river, including recreational activity and ability to access the river, and their preferred design options and uses for a multiuse trail. The results of these exercises informed the proceeding work on the project, and the feedback has been incorporated throughout this report. This meeting is described in more detail in Appendix B.

PROJECT PROCESS

The following flowchart depicts the design process for the project, beginning with research and evaluation of trail types and application of several analyses to make assessments of trail design options, followed by conceptualization of trail structure and design elements. In addition to community feedback, information gathering and research included:

- Background research on multiuse and rail-trails.
- Case study investigation.

Photo by Trevor Buckley

A small breakout group at the early February stakeholder meeting shares their thoughts on the positive and negative characteristics of the corridor and the potential for a multiuse trail.

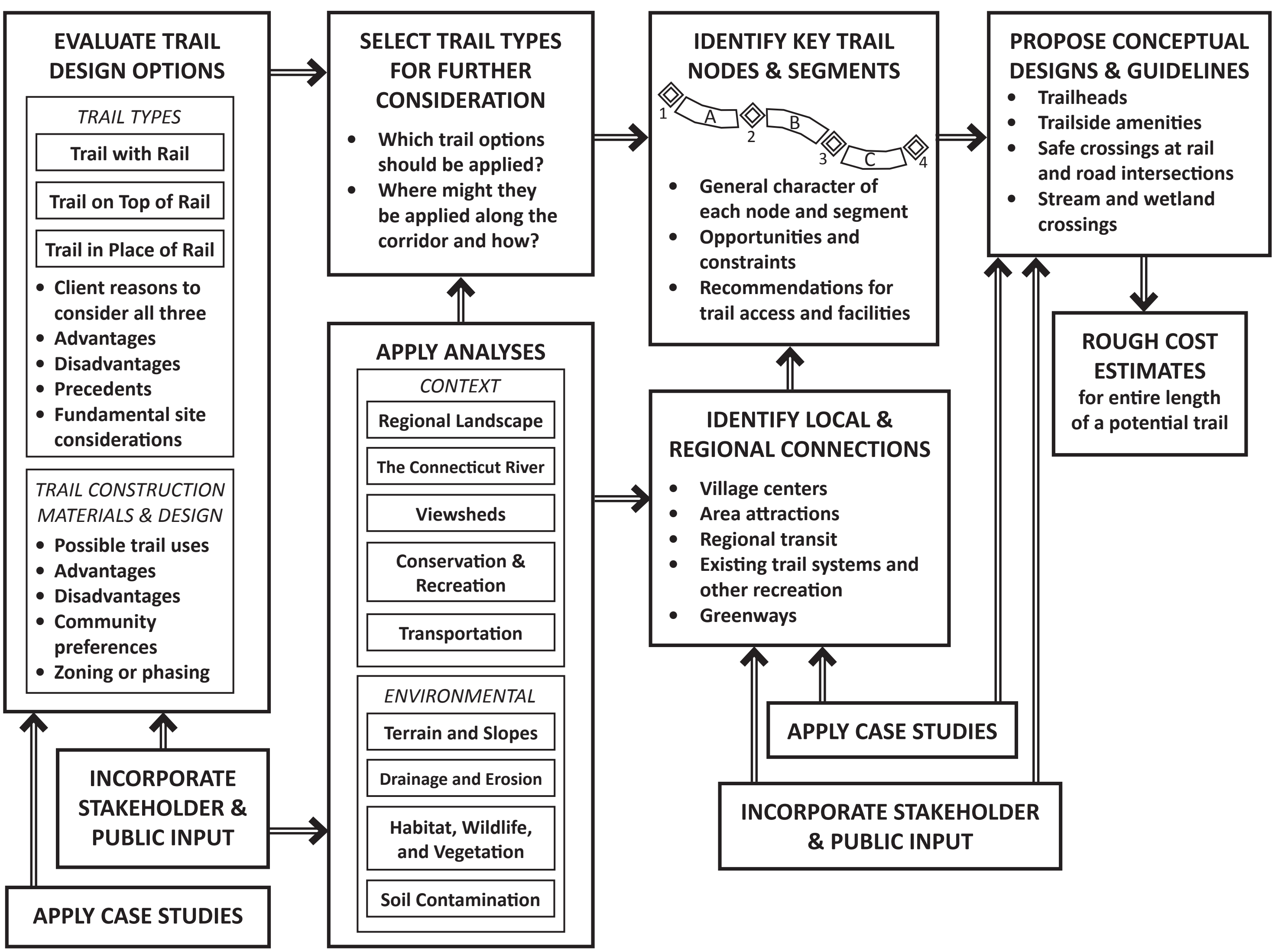
- Field observations and data collection from the study area.
- GIS analysis of the study area (data sources are detailed in Appendix C).
- Interviews with professionals in various fields related to multiuse trails.
- Interviews with professionals familiar with aspects of the project and study area.
- Follow-up conversations with community members.

PRECEDENTS FOR MULTIUSE TRAILS

Over 21,400 miles of rail-trail currently exist in the United States (Connecticut has 173 miles), and there are nearly 8,000 more currently in development nationwide (Rails-to-Trails Conservancy [RTC] "Rail-Trail Statistics"). While most of these trails have replaced rail, 1,397 of the existing miles are formed by trails with rails (or what are commonly called rail-with-trails), that is, multiuse trails placed within rail right-of-ways or other property alongside rail lines (RTC "Rail-Trail Statistics"). Thirty-nine

Design Process for Multiuse Trail Feasibility

Valley Railroad State Park Scenic Corridor Study



percent of these trail miles are located next to active rail (RTC). Case studies of both trails that have replaced rails and trails with rails are relevant to this study, in consideration of the trail types that RiverCOG has requested be explored in this report.

Existing rail-trails are the most obvious type of multiuse trails to look at for precedent, but trails along rivers and historic canal corridors share common characteristics with this project too, including longitundinal grade and hydrographic setting. Case studies abound, and snapshots of several of these have been woven into relevant sections of this report, given their similarity in geographical, ecological, and cultural context to this project.

Photo by Trevor Buckley

The Norwottuck Rail Trail runs 10.6 miles from Northampton to Belchertown, Massachusetts, roughly paralleling state Route 9 and then Route 116 on its eastern end. The path passes by village and town centers and provides ramps and connectors to local roads and neighborhoods. There are also several area hiking trails that intersect the trail and there are opportunities to explore conservation areas, which include wetlands and beaver ponds with boardwalks in some places. The trail is pictured here at a ramp leading to Route 116 and Amherst Center.

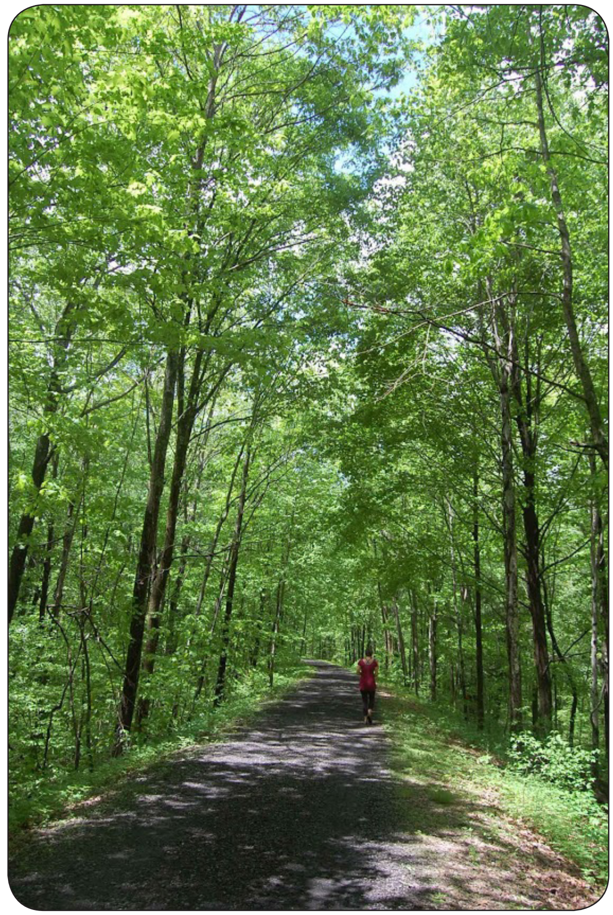


Photo courtesy of Emily Davis

The Walkill Trail Rail Trail, a 12.2-mile multiuse trail that replaced rail, links downtown New Paltz and Gardiner, New York, and is part of the larger Hudson River Valley Greenway Trail System.

Photo courtesy of the Blue Oar

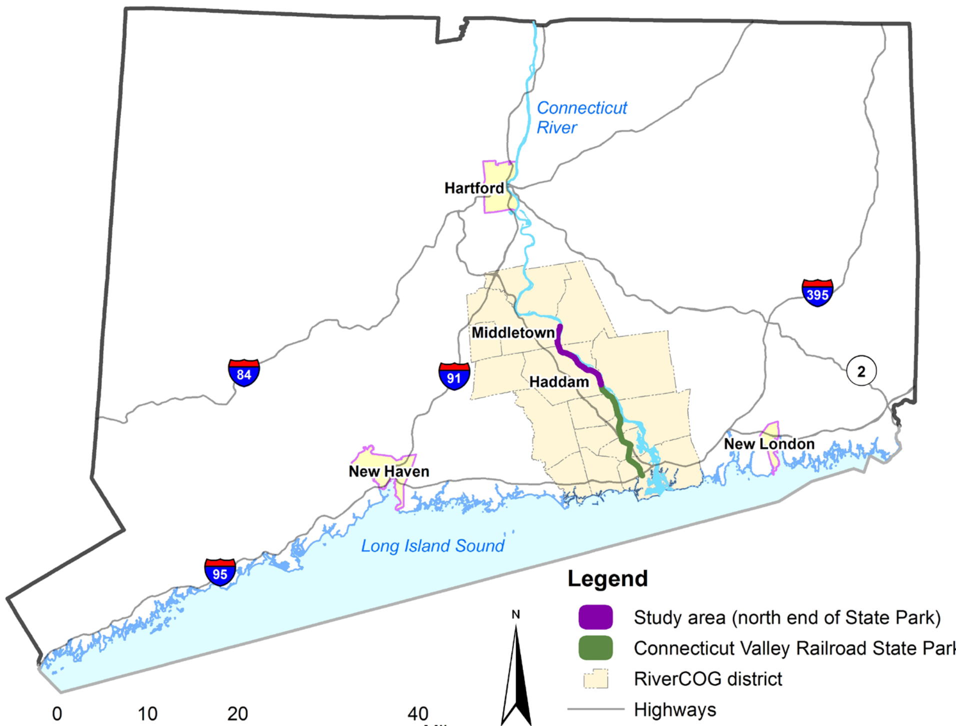
2. Analysis I:
Regional & Local Context

Location, Landscape & Economy

Relative Location

The study area is equidistant—about ninety miles—from New York City and Boston, and is situated between three metropolitan areas in Connecticut: Hartford, New Haven, and the smaller New London (see map at right). The Valley Railroad corridor runs through seven of the RiverCOG's seventeen member municipalities, from Old Saybrook to Middletown. The study area of this project is located in two of those: Haddam (population 8,300) and in the sparsely populated Maromas area of Middletown (both in Middlesex County).

Relative Location



Data sources: CT DEEP, Trevor Buckley

Regional Landscape

The regional landscape, shown in the bird's eye view image and map on pages 12 and 13, is largely forested and defined topographically and hydrographically by the Connecticut River Valley. In the study area, the railbed roughly parallels the river's course and is mostly located within the riparian corridor—50 to 100 feet from the river's edge in many places—with some diversions away from it, such as at Mill Creek and Haddam Meadows. The riparian corridor includes tidal freshwater wetlands, as well as floodplain forests and some upland habitat.

Several village centers punctuate the landscape, and the rail corridor lies about one-half mile or less from those labeled on the bird's eye view image. The portion of the corridor running through Haddam abuts residential neighborhoods, two marinas, two state parks, and conservation land, while the portion that runs through Middletown passes by some homes (on a bluff above the railbed), before entering ruggedly scenic Maromas, crossing through a large expanse of conservation land owned by Northeast Utilities and then a property belonging to aerospace manufacturer Pratt & Whitney.

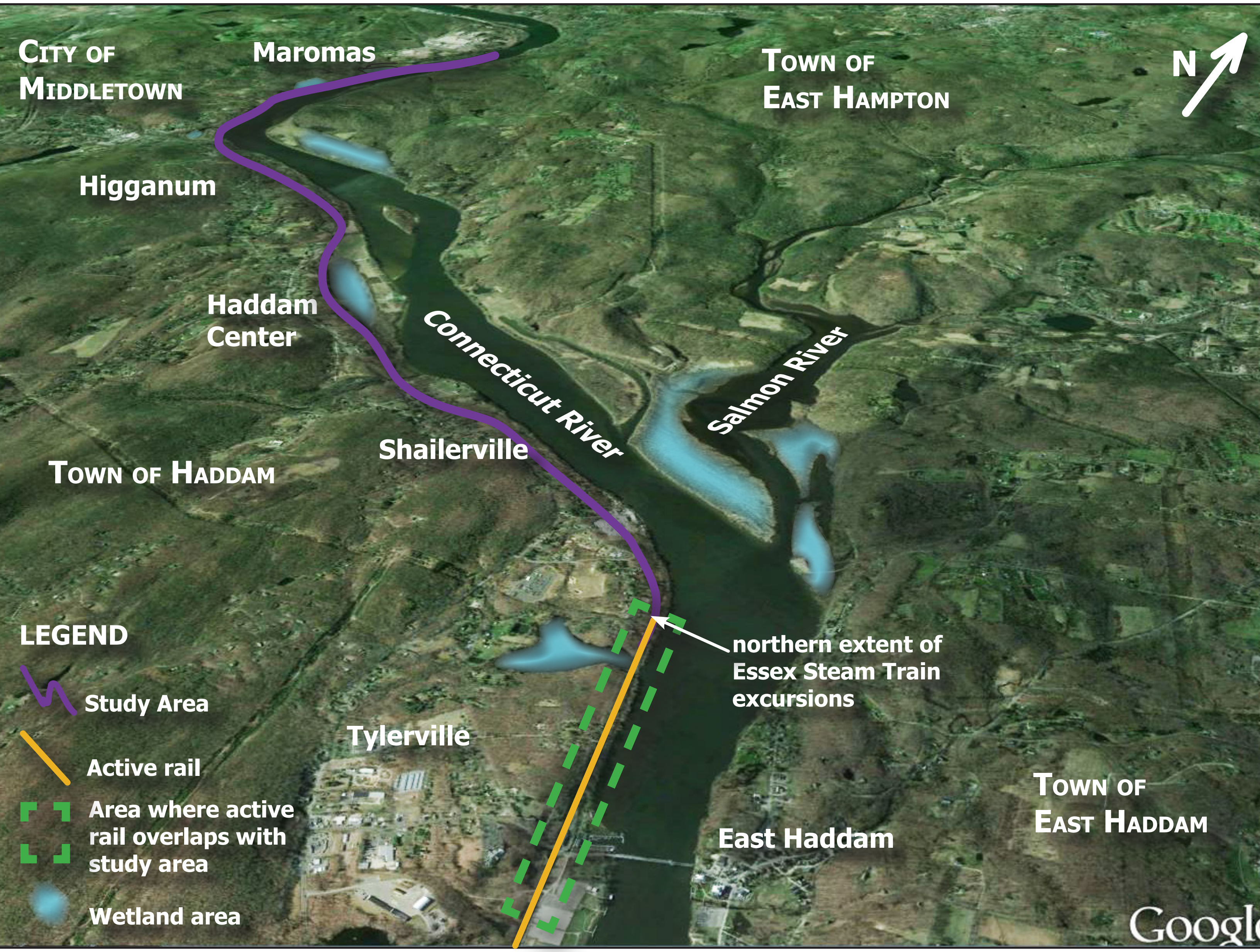
The Key West vibe at the Blue Oar restaurant, by the Midway Marina in Tylerville, draws guests in to dine and unwind by the Connecticut River. The Blue Oar is one of several businesses in the area that caters to a seasonal influx of visitors.

About one mile of the rail within the study area at the south end is actively used by trains. The Valley Railroad Company operates its Essex Steam Train from here south to Old Saybrook on the Long Island Sound. Connections to the east side of the river, including to the villages of East Haddam and Hadlyme (Town of East Haddam), shown in the map on page 13, are discussed in the analysis of "Transportation" (pages 22-25).

Regional Economy

The service sector is an important component of the regional economy, including businesses that serve seasonal tourist- and weekender-populations that frequent state parks, recreate on the river, and visit local cultural attractions, including the Valley Railroad's stream trains. No current reports or data are available

Bird's Eye View of the Regional Landscape



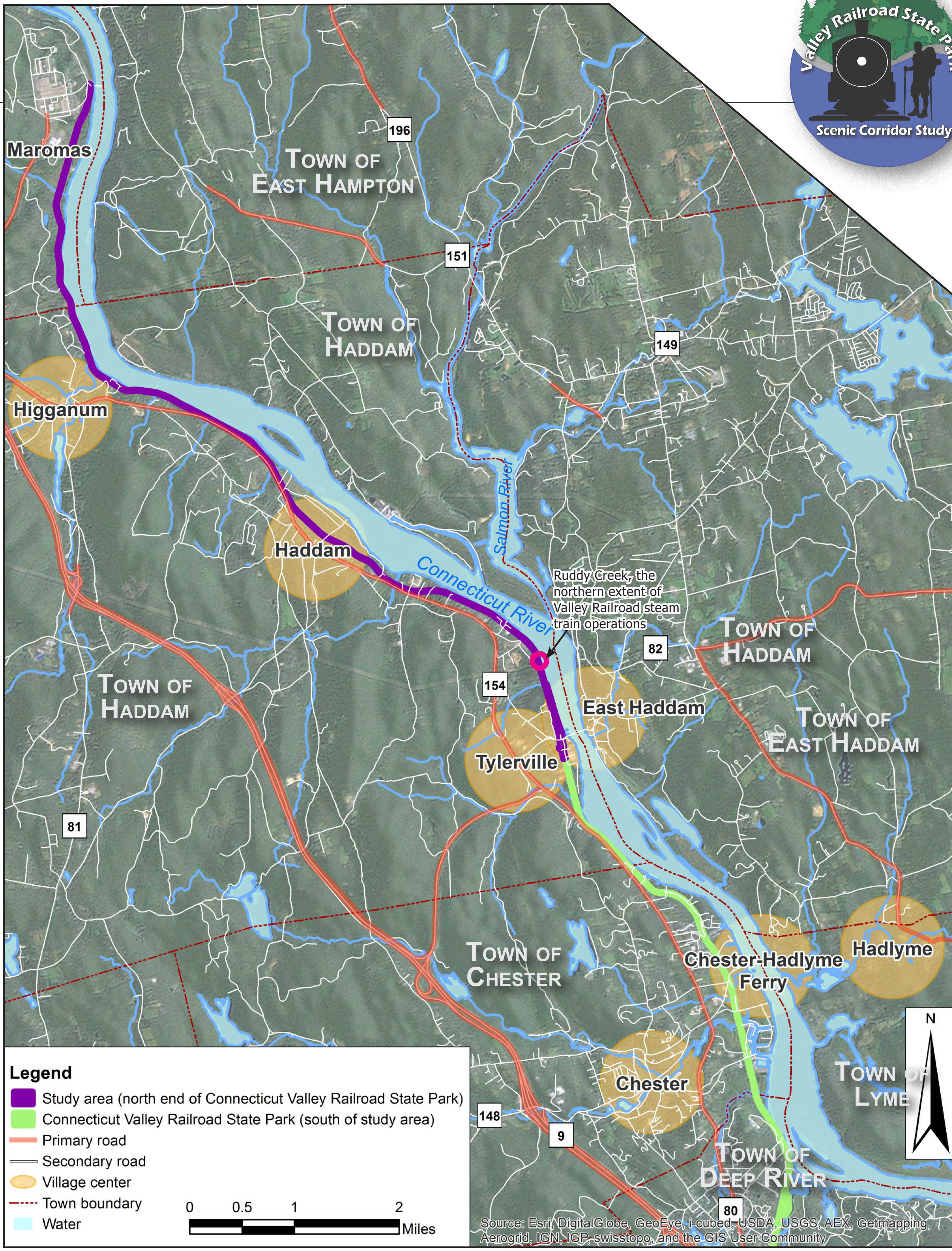
Imagery by Google Earth

for the size of the recreation and tourism economy in the RiverCOG district, but the agency has hired the University of Connecticut's Center for Economic Analysis to conduct an Economic Evaluation of Amenity (Non-Market) Assets to examine the combined value of regional assets that fuel the economy. RiverCOG planners have discussed with local businesses how to build a more integrated tourist economy, providing links between attractions, both in terms of physical infrastructure and customer incentives (e.g., a uni-ticket for multiple attractions).

IMPLICATIONS

- A potential trail development would be accessible to several major population centers and could become a draw for visitors from both central Connecticut and along the I-95 corridor.
- A trail would have some level of environmental impact on Connecticut River's riparian corridor (for nearly nine miles), as well as several small tributaries and wetlands, during construction and potentially into its future use.
- A trail could provide a physical link between several area villages and local attractions.
- A trail might build on and contribute to the local economy, by supporting existing attractions and businesses and perhaps by spurring new business development.
- A successful trail project could increase road traffic from trail visitors driving to the area and bring more air pollution to this rural region.

Project Study Area: Roads, Rail Corridor, and Village Centers



Data sources: CT DEEP, ESRI, Trevor Buckley

The River: A Last Great Place

Scenic views, active river recreation, and abundant wildlife are all signs that conservation measures have regulated development and improved the Lower Connecticut River's water quality, and thus the local economy and quality of life. In recognition of its unique place in the American landscape as a "world-class ecosystem," the Nature Conservancy, in 1994, named the Lower Connecticut River one of North America's Last Great Places.

The Connecticut River, in its entirety or as a specific segment, has received the following distinctive designations:

- It is the only federally designated **National Blueway** (2012) and one of **14 American Heritage Rivers** (1998).
- The river is designated in this region by the Environmental Protection Agency (EPA) as **Class SB**, safe for recreation, which comes after decades of reforms that transformed "New England's best-landscaped sewer" (so-named for the assorted waste dumped into and flowing downstream) into a river fit for human use (Stinton, Farnsworth, and Stinton 30).
- The entire watershed is designated as the **Silvio D. Conte National Wildlife Refuge**, the only such watershed-wide refuge (1991).
- The Lower Connecticut River's uncommon tidal wetland complex (from Old Saybrook at the Long Island Sound inland to Hartford) is internationally designated as a **Wetland Complex of Significance under the Ramsar Convention** (1993).
- The Lower Connecticut River Valley from Old Saybrook to Haddam lies within the state designated **Gateway Conservation Zone** (from the river to the first ridgeline) (1974); the Connecticut River Gateway Commission dictates zoning-related ordinances to localities that aim to protect the "natural or traditional riverway scene." (See page 16 for more information on the Gateway Commission.)

A view of the river from the beach at Cove Wharf (by Higganum Cove) looks east to George Dudley Seymour State Park. Both sides of the river at this location are undeveloped and protected under state designation or conservation easements.

Photo by Walt Zilahy, courtesy of Liz Bazazi

IMPLICATIONS

- A trail along the Valley Railroad corridor is tied by its location to a river whose ecological and cultural importance is recognized nationally and internationally; this significance should have a bearing on the conceptualization of the entire trail.
- Trail developers should incorporate the river's various designations into the construction, design and use of the trail, looking to the reports of each monitoring or governing body (e.g., Conte Refuge, Gateway Commission, etc. for guidance).
- A trail development might draw on the designations to promote the region and the trail as a destination, and educate the public on its significance in the American landscape.

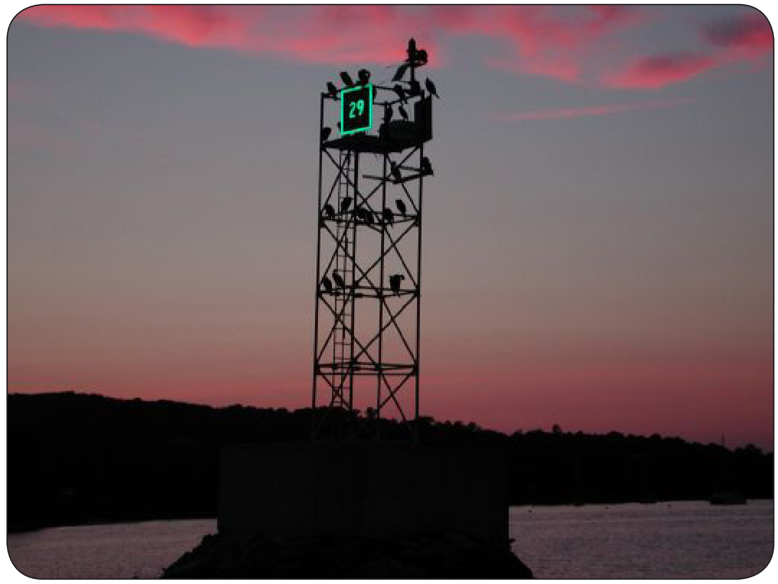


Photo courtesy of RiverQuest

Comorants roosting on a navigational beacon on the river.

Photo courtesy of RiverQuest

Looking upriver towards the Haddam Swing Bridge, a historic and primary crossing across the Connecticut River between Tylerville and East Haddam (see page 24).

Viewsheds

State and regional planning efforts have ensured that the Connecticut River Valley maintains its large scenic viewsheds, that is, large natural expanses of the river visible up and down the river. This is due in part to the Connecticut River Gateway Commission, which mandates local zoning ordinances dictating building standards within the Gateway Zone. Gateway statutes include a 100-foot non-construction buffer from the river and a 50-foot no-disturbance vegetative buffer, as well as construction and architectural standards.

These standards are supported by viewshed priorities among RiverCOG commissioners. A 2012 survey of commissioners found that they "overwhelmingly favored Town and Regional [sic] viewsheds composed of natural environmental features primarily containing water elements and most importantly viewsheds containing the Connecticut River." They also ranked natural resource protection "highest in planning objectives at both the municipal and regional level" (RiverCOG). Conservation efforts (see next section) to maintain open and green space may very well

Views along the Valley Railroad corridor from late January 2014 (Photos by Trevor Buckley)

A view from the railbed below Camp Bethel's campus in Tylerville. Goodspeed Opera House is across the river in the center background.

Landings on several private properties offer glimpses of the river, but fall outside of the rail right-of-way, so access is not permitted at this time. The scale of vegetative removal in some such spots appears to conflict with Gateway statues.

A typical woodland scene along the corridor, here as the tracks approach Haddam Meadows State Park from southeast.

On a long straightaway in the rail corridor that hugs the river, between the Haddam Transfer Station and Higganum, views of the river are plentiful and there is little private property that blocks access to the river.

complement the viewshed protection that the communities of the Lower Connecticut River Valley hope to preserve.

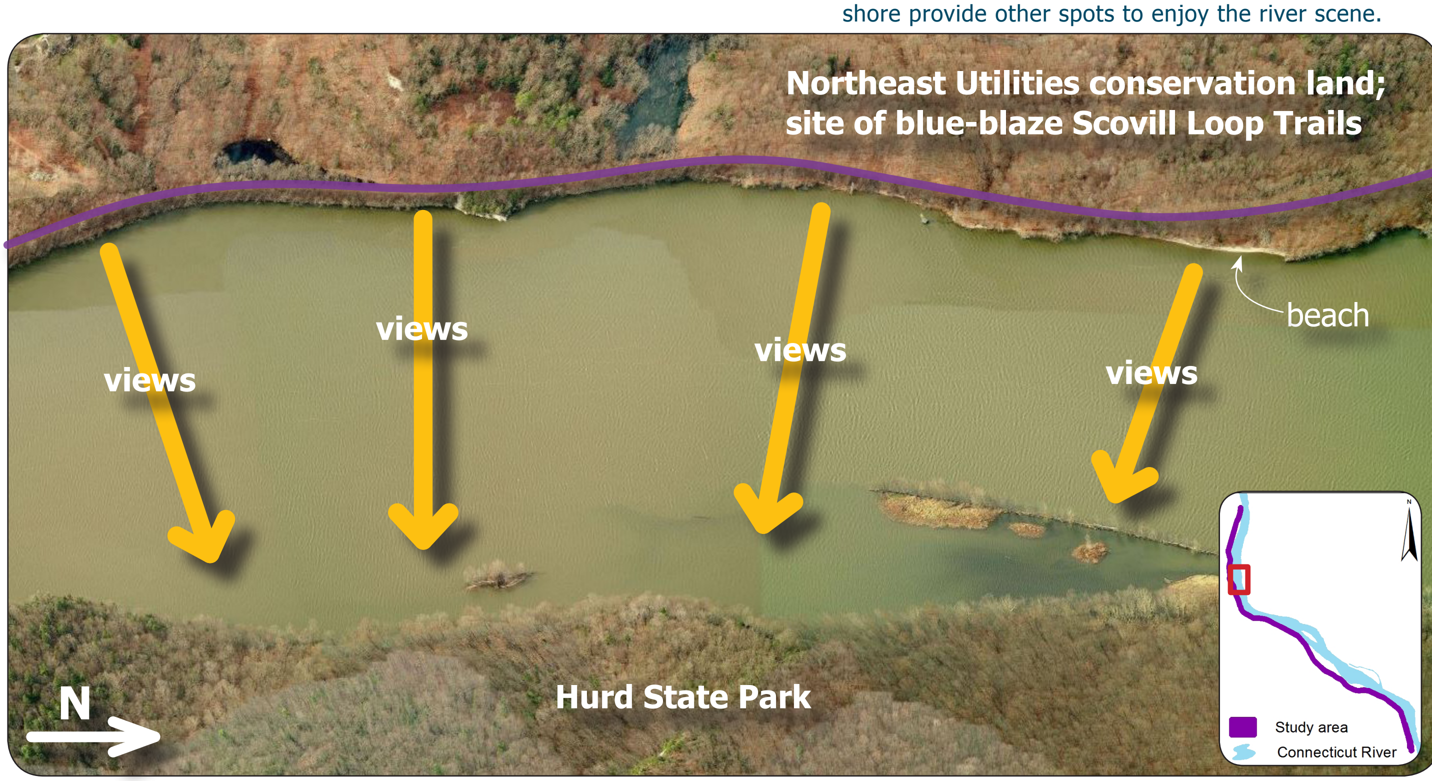
The Valley Railroad corridor roughly parallels the river, and in many places is directly upslope from the water's edge. Views include vegetated areas of the corridor with glimpses of the river, residential neighborhoods near or overlooking the river, and, in some places, sweeping vistas of the river—especially at trestles, causeways, beaches, and trails leading down to the river. There are views to the east of bucolic scenery, including several state parks and forests and other tracts of conservation land (see images below).

IMPLICATIONS

- A potential trail may provide access to scenic views for local residents and visitors.
- Trail developers should consider how trail alignment and design can frame vistas along the corridor.
- Selective framing of views can heighten excitement and anticipation of views through design elements that conceal and reveal views in different places.
- Techniques for framing views might include selective thinning and small access trails to beaches and the river's edge.
- CGC statutes will limit vegetative disturbance within 50 feet of the shoreline, which may prohibit placement of small access trails from the corridor to the river.

Photo by Barrie Robbins-Pianka

The railbed (outlined in purple) winds along the river's edge in Maromas, affording great views (gold arrows), in places, east across the river to Hurd State Park in East Hampton. Vegetation does obscure some of these views, but beaches (see photo at left) that dot the shore provide other spots to enjoy the river scene.



Imagery by Bing Maps

Conservation & Recreation

CONSERVATION & RECREATION: AN ECONOMIC FORCE

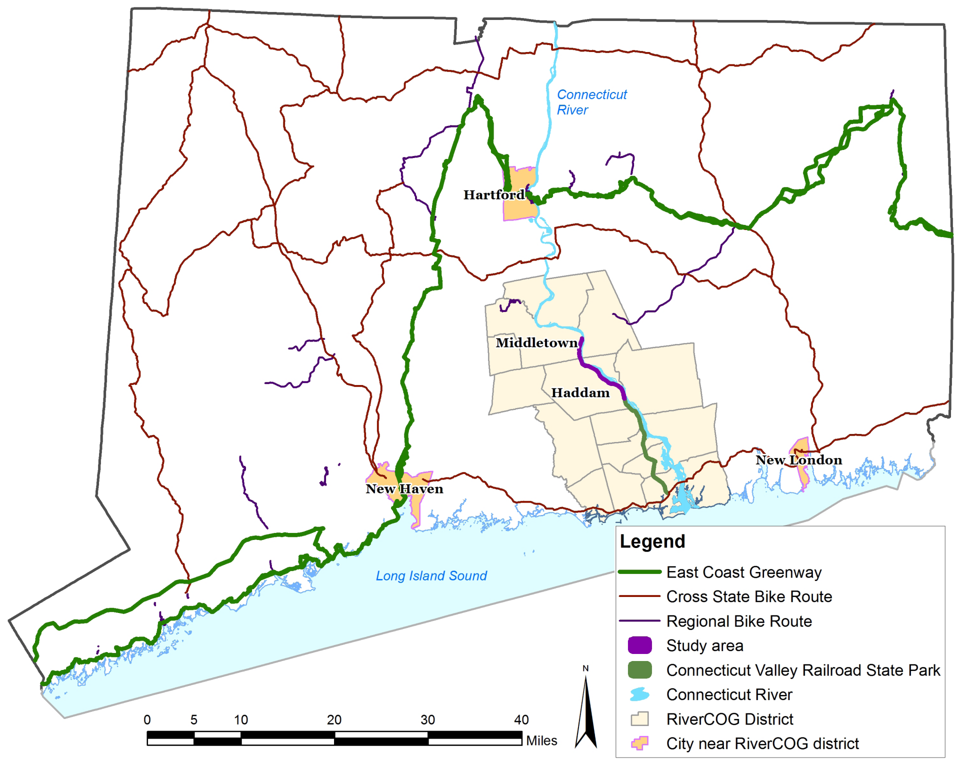
A 2011 study from the Connecticut Center for Economic Analysis (CCEA) found that, by "very conservative estimates," state parks and forests (owned by the Department of Energy and Environmental Protection [DEEP]) generate more than $1 billion a year in revenues (Gunter et al. 31) and 8,800 jobs. (Gunther et al. 53). According to Christine Woodside writing in *Connecticut Woodlands*, the study, which was prepared for DEEP, "marks the first time in recent years that state officials have acknowledged 'the elephant in the room,' that is, the value of natural lands in the very image, and economic health, of Connecticut" (Woodside 6).Conservation and recreation are clearly a large economic generator.

In the RiverCOG district, the anecdotal evidence indicates that this is the case, and community surveys conducted in Haddam by the Higganum Vision Group point toward community interest in developing a tourist-based economy in the region (Bizazi). While there are no current reports available with similar statistics for the RiverCOG region, the UCONN study on non-market assets that RiverCOG has commissioned is currently underway. Once completed, this study should shed light on the impact that parks and cultural attractions have on the regional economy.

BIKING

Connecticut has a state bike route network (see map at upper right), which includes a portion of the East Coast Greenway (ECG), a bike route in development that will run from Maine to Florida. Currently, there are no sections of this designated

Connecticut State Bike Network



Data sources: CT DEEP, CT DOT, Trevor Buckley

Photo courtesy of The Blue Oar

Boats docked at Midway Marina near Tylerville in Haddam, a few hundred feet downhill from the Valley Railroad corridor.

network near the study area. Data on bike lanes and locally designated routes are limited, but current data along with field observation show few bike lanes along roads near the corridor. RiverCOG is currently conducting a regional Bike-Pedestrian Study, so more information on infrastructure needs will be available in the not-too-distant future.

RIVER RECREATION

The economy in several towns of the RiverCOG district are geared towards the service sector, with many businesses serving a seasonal tourist population that frequents key attractions. These include marinas, river cruise operations (e.g., Valley Railroad Company's riverboat, the *Becky Thatcher*), paddling rentals, ecotourist ventures (e.g., *RiverQuest*), and riverside restaurants along the designated blueway.

While several towns south of the study area have public docks, both public boat access and public access in general along the study area are limited. There are two public places near the study area to put in a boat: a "car-top" boat launch for canoes and kayaks at Eagle Landing State Park and a general purpose boat launch at Haddam Meadows State Park, both along the river and rail corridor (see map on page 21). The river can be legally accessed by the public—to put a canoe or kayak in and enjoy the beaches—via the Scovill Loop Hiking Trails on Northeast Utilities' conservation land in Maromas. There is also a DEEP-owned car-top launch below Godspeed Opera House in East Haddam. Community members have reported that additional access is needed along the corridor studied in this report (see sidebar at right).

According to a 2011 CCEA study, Connecticut state parks and forests generate more than $1 billion a year in revenues and 8,800 jobs.

Photo by Christopher Hennesey, Courtesy of Valley Railroad Company

Valley Railroad Company operates the *Becky Thatcher* out of Deep River Landing; the riverboat carries steam train passengers up to East Haddam to take in the sights.

PUBLIC MEETING SURVEY RESULTS

Thirty-six of the forty-two survey respondents stated that more public river access is needed near the project study area. Fourteen respondents stated that access was needed at Higganum Cove (the most responses for any one place).

(Results from survey of attendees of the Public Information Workshop in early March 2014)

Photo courtesy of RiverQuest

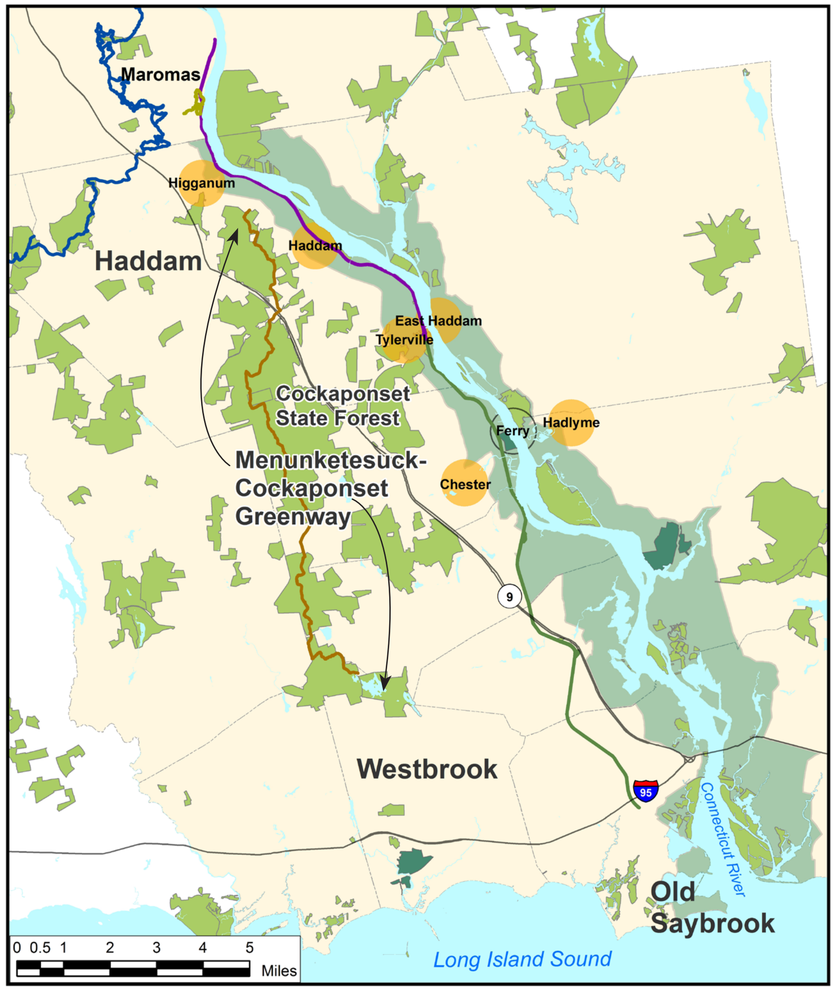
RiverQuest provides a variety of excursions onto the river, including wildlife viewing opportunities, and trips through freshwater tidal wetlands at Selden Creek in Lyme.

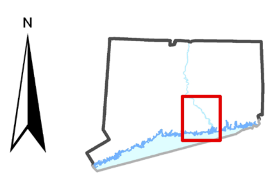
HIKING

The regional landscape contains tens of thousands of acres of open space, many of which constitute state-designated greenways. These include the Gateway Conservation Zone and the Menunketesuck–Cockaponset Greenway (named for the two state forests from which it is formed) (see map at right). The latter is the product of regional efforts, of which RiverCOG takes part, to create a greenway from Haddam to the Sound, putting land in conservation and providing recreational opportunities across the region. Two large regional hiking trails wind their way through the region (see map at right and on page 21). The Mattabesset spur of the New England Scenic Trail extends eastwardly into Middletown, including Maromas. This trail, as well as the Scovill Loop Trails near the rail corridor, are managed by the

Northeast Utilities (Connecticut Light & Power) owns over 1,400 acres of land in Maromas that they cooperatively manage with DEEP, including the Scovill Loop Trails right along the Valley Railroad corridor.

Regional Greenways and Hiking Trails





Data sources: CT DEEP, Connecticut Forest & Parks Association (CFSA), RiverCOG, Trevor Buckley

Legend

- Mattabesett Trail (New England Scenic Trail)
- Quinimay Trail
- Scovill Loop Trail
- Highways
- Study area
- Connecticut Valley Railroad State Park
- State Parks and Forests
- Federal Public Lands
- Gateway Conservation Zone
- Village Centers
- Chester-Hadlyme Ferry
- RiverCOG District

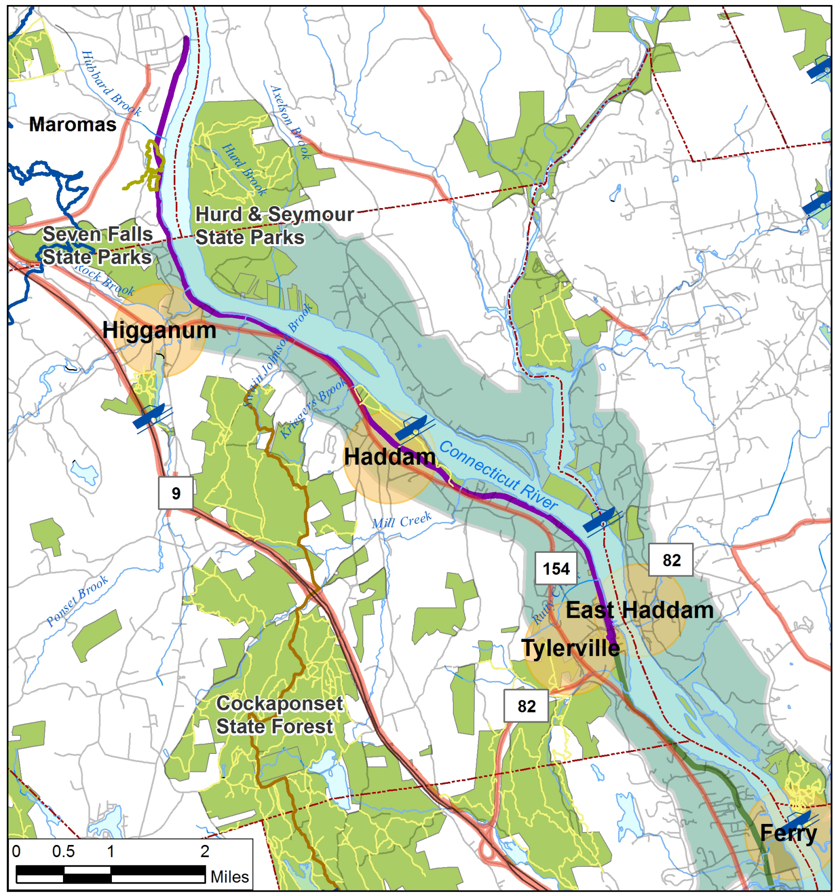
Connecticut Forest and Park Association (CFPA) and are part of its well-known statewide Blue Blaze Trail System. The newly created Quinimay Trail extends north-to-south across the length of the Menunketesuck–Cockaponset Greenway (see map on page 20). Close to the study area, several state park properties have hiking trails (see local recreation map at right).

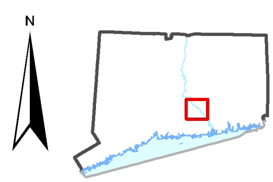
IMPLICATIONS

A new trail could:

- Link into the statewide bike network, including the East Coast Greenway (however, more information is needed on bike traffic and where there is a need for connectivity).
- Provide more public river access (e.g., to beaches, for paddling).
- Link river recreation to inshore greenways, including hiking trails.
- Serve to connect the New England Scenic Trail to the Long Island Sound by way of the Quinimay Trail (more information is needed on potential trail demand).

Local State Parks, Boat Launches, and Hiking Trails





Legend

- Mattabesett Trail
- Quinimay Trail
- Scovill Loop Trail
- Trail
- DEEP Boat Launch
- Study area
- CVRR State Park - south of study area
- State Parks and Forests
- Gateway Conservation Zone
- Primary road
- Secondary Roads
- Town boundary
- Village center

Data sources: CT DEEP, Connecticut Forest & Parks Association (CFSA), RiverCOG, Trevor Buckley

Gillette Castle State Park, near Hadlyme south of the study area, has several hiking trails leading up to the mansion and a bluff overlooking the Connecticut River.

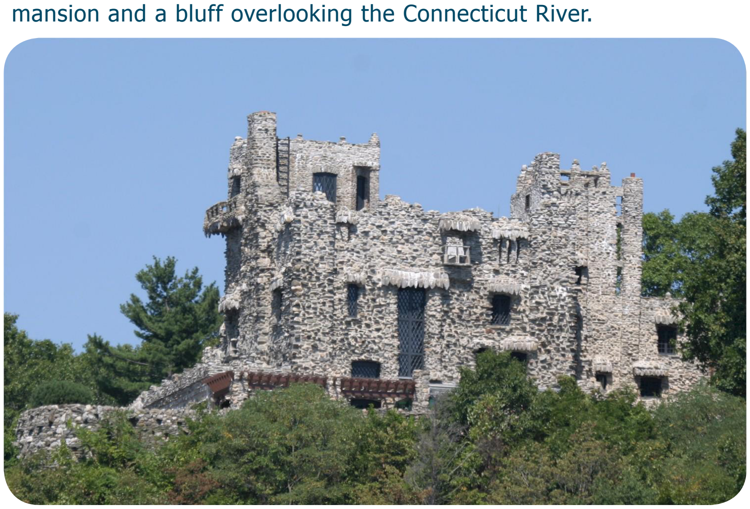


Photo by RiverQuest

Transportation

TRAVELING ALONG THE CONNECTICUT RIVER

Area Highways

The corridor roughly parallels state Route 154, or Saybrook Road, between Tylerville and Higganum. The main thoroughfare from Middletown to Old Saybrook is state Route 9, or Chester Bowles Highway (a limited access highway), which has three exits that service the towns near the study area: two near Higganum Village and one at Route 82, which leads to Tylerville.

9 Town Transit

9 Town Transit buses serve the Lower Connecticut River Valley region. With routes that run from Middletown to the coast (see map on opposite page), and along the Long Island Sound, it is the only public transit service in the study area. The Mid-Shore Express Line runs up Route 154; the only bus stop on the line that is near the corridor is in Higganum Village (see burgundy dot on map), but the bus will stop for users flagging it down, and make pre-scheduled stops, deviating as far as three-quarters mile off its fixed route. Dial-A-Ride service is available for East Haddam on the east side of the river. The Mid-Shore Express line which runs to the Middletown Bus Terminal allows riders to transfer to the Middletown Area Transit (MAT) buses and to CT Transit buses that can carry riders all the way to Hartford. At the south end of the Mid-Shore Line, the bus links to an Amtrak station in Old Saybrook (see purple dot on map), which provides access to New York City and Boston by train.

Photo courtesy of 9 Town Transit

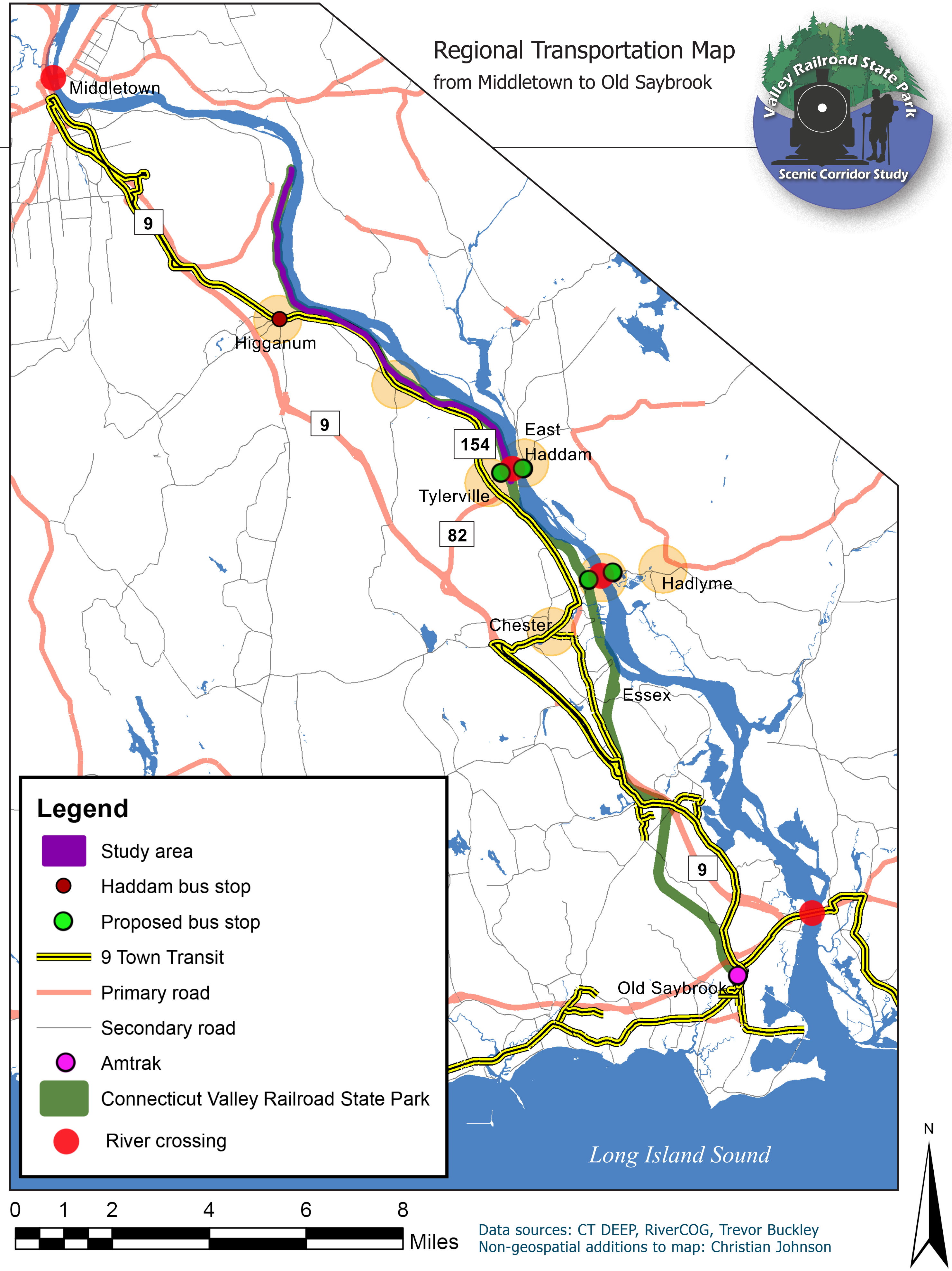
A 9 Town Transit bus stopped at the Connecticut River Museum on the waterfront in Essex.

Photo by Jody Dole, courtesy of Valley Railroad company

The Essex Steam Train traveling alongside the river.

Photo courtesy of 9 Town Transit

The bus and steam train routes intersect in Chester.



Data sources: CT DEEP, RiverCOG, Trevor Buckley
Non-geospatial additions to map: Christian Johnson

Essex Steam Train & Riverboat

The Valley Railroad Company runs vintage steam trains for tourist excursions from its primary station in Essex, north to Tylerville, and south to Old Saybrook (by the Amtrak station). Most excursions run as far north as Chester, but the wintertime Eagle Flyer and Dinner Service Train travel up to the causeway over Ruddy Creek in Tylerville. The Valley Railroad Company holds a long-term lease on the entire corridor through the Connecticut Valley Railroad State Park, until at least 2027. Valley Railroad has invested substantial time and money into restoring the tracks and acting as stewards of the park, by clearing vegetation and routinely completing maintenance and improvements along the corridor (Valley Railroad Company staff and board members). The company also operates a tourist riverboat operation; the *Becky Thatcher* carries train passengers up the river from Deep River Landing to East Haddam and back, and the train returns them to Essex.

Photo by Christopher Hennesey, courtesy of Valley Railroad Company

The Essex Steam Train at Deep River.

CROSSING THE RIVER

East Haddam Swing Bridge

First opened in 1913, this 881-foot span over the river connects East Haddam and Tylerville. A 456-foot section of the bridge can swing open to allow for large vessels to pass. The bridge was designed by famed bridge engineer Alfred P. Boller, and is a part of the East Haddam Historic District. The deck supports two lanes for vehicles, and sees an average flow of 9,600 vehicles per day (Google Earth Pro); there is no lane and essentially no shoulder for pedestrian or bike travel across the bridge, making it relatively dangerous for crossing on foot or by bike.


Photo by user "Anne/altopower," sourced from Flickr

The Haddam Swing Bridge open to allow boats through.

Chester-Hadlyme Ferry

Located three miles south of the study area, the ferry has been an established crossing point on the river since 1769. The ferry connects Chester on the west side to Hadlyme on the east bank. The current vessel is the *Sheldon III*. The ferry can accommodate eight or nine cars and forty passengers. The service operates seasonally, from April 1 to November 30, and ferries an average of 100 vehicles per day. The Valley Railroad Company offers a Gillette Castle State Park excursion, where passengers disembark at the Hadlyme Flagstop (west side of the Connecticut River) and take the ferry across the river to the State Park.

Photo sourced from Connecticut DOT

The Chester-Hadlyme Ferry, the *Selden III*.

IMPLICATIONS

- With nearby area highways, an Amtrak connection fifteen to twenty-five miles away, and nearby access to a bus network that spans the River Valley from the Sound to Hartford, the corridor is well-situated for visitors from outside the immediate area.
- Potential trail users could make use of the current 9 Town Transit route along Route 154 to loop back to trailheads where they parked, or travel on to other destinations.
- Valley Railroad could add a stop at Eagle Landing State Park and Goodspeed Station to link into the trail, as well as provide visitors from the south a stop to disembark and visit East Haddam, on the east side of the river—if a safe route to get there is provided.
- There are few ways for pedestrians and cyclists to access the east side of the river without using a car.
- Due to its historic character, it may not be likely that a pedestrian/bike lane or designated structure (e.g., cantilevered span) could be added to the Swing Bridge.
- 9 Town Transit could provide a link to the east side of the river by establishing a regular route across the Swing Bridge and possibly a stop at the Chester-Hadlyme ferry docks on both sides of the river (see green dots on map on page 23). This could create the opportunity for trail users to access Hurd and Seymour State Parks, Gillette Castle, and many other attractions.
- A trail could produce increased demand for parking and larger traffic volumes on local roads.

Photo by Walt Zilahy

3. Analysis II: Environmental Conditions Along the Corridor

Four main areas of environmental conditions were found along the Valley Railroad corridor, which could most affect the feasibility of multiuse trail construction and the experience of potential trail users. These include:

- **Terrain and slopes:** affect design options, trail user accessibility, and drainage.
- **Drainage, flood hazard, and soil erosion susceptibility:** affect durability of the trail, including the surface materials.
- **Habitat, wildlife, and vegetation:** will be affected by trail construction, and also constitute a significant interest/draw for trail visitors.
- **Possible soil contamination:** affects the health and safety of trail users.

The information used in this analysis of environmental conditions is a combination of background research, field observations, Geographic Information Systems (GIS) analysis, input from professionals in various fields, and interviews with stakeholders and community members.

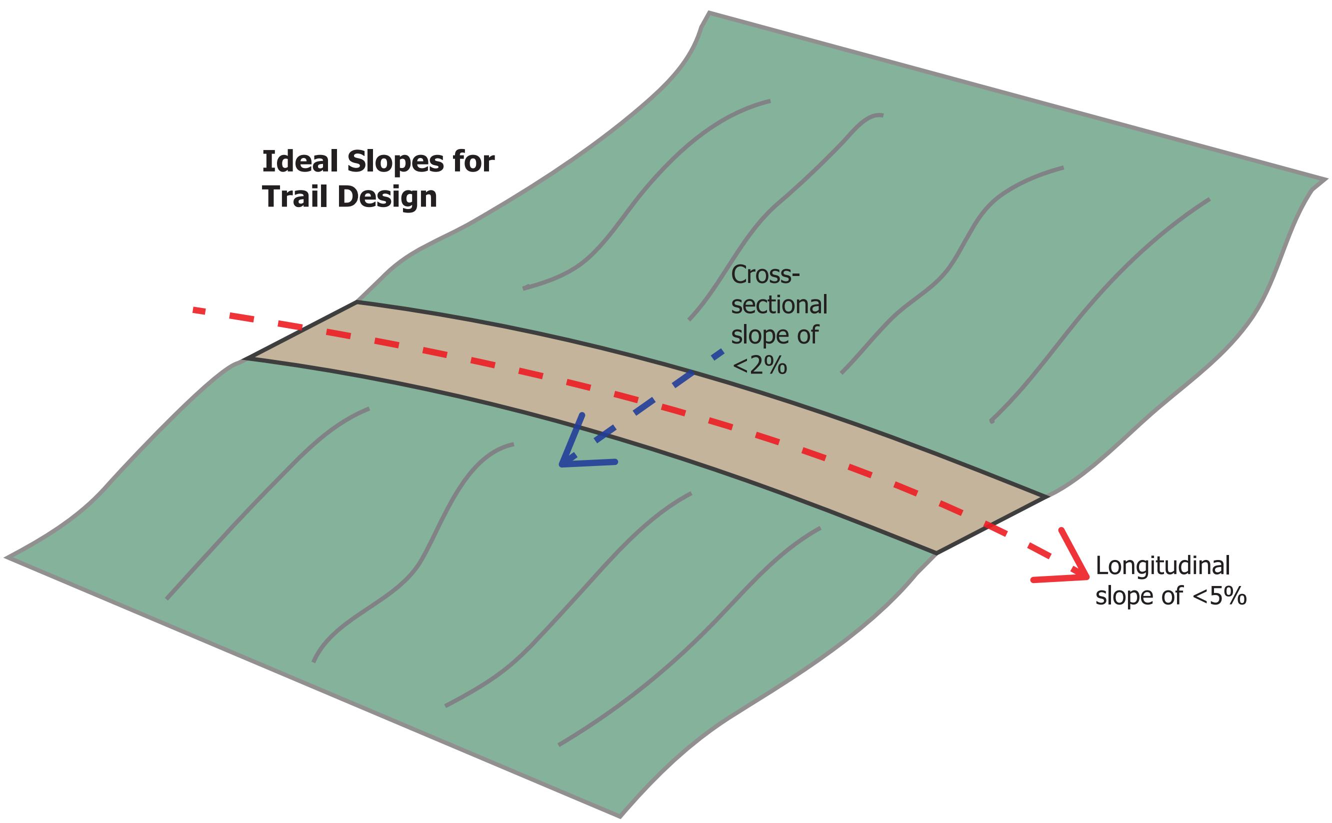
Terrain & Slopes

Terrain is a critical factor in determining feasibility of trail development, determining the site's readiness for trail preparation, and potentially affecting accessibility for trail users. The amount of grading needed to level terrain for accessibility, including creating access points on the trail corridor, could greatly affect construction costs.

The ideal slope criteria for a multiuse trail are:

- Longitudinal slope of 5% for universal accessibility to trail users, including those in wheelchairs or with other disabilities; and,
- Cross-sectional slope of 2% for accessibility and proper drainage of water off of the trail.

The longitudinal slope of the Valley Railroad corridor, like many historic rail corridors, is gently sloping (about 3% or less). Rail corridors are well-suited for multiuse trail development for this very reason; a gentle slope makes a trail universally accessible and conducive for easy walking and cycling. While the cross-sectional



slope of the railbed (the slope across its width) is relatively flat, the adjacent slopes vary across the corridor. There are four types of cross-sectional slope found in the study area, as depicted in the photographs below:

- **Convex/Raised:** the railbed rises above the surrounding terrain, including wetlands and several streams, where the bed forms a causeway to cross waterbodies.
- **Flat:** the railbed is flush with the surrounding terrain, such as at old train depots (e.g., Goodspeed Station and Depot Road at Higganum Cove).
- **Concave/Carved Out:** the railbed lies in a depression between slopes, or between bedrock outcrops where rock was blasted to make way for the corridor.
- **Terraced:** the relatively flat railbed is located on the side of a slope, which in many places is quite steep.

In much of the study area, the railbed is terraced into the slope; a GIS analysis shows that slopes along the Valley Railroad corridor average a steep 23%. See map on the page 29 for a representative sample from north of Haddam Center.

Convex/Raised

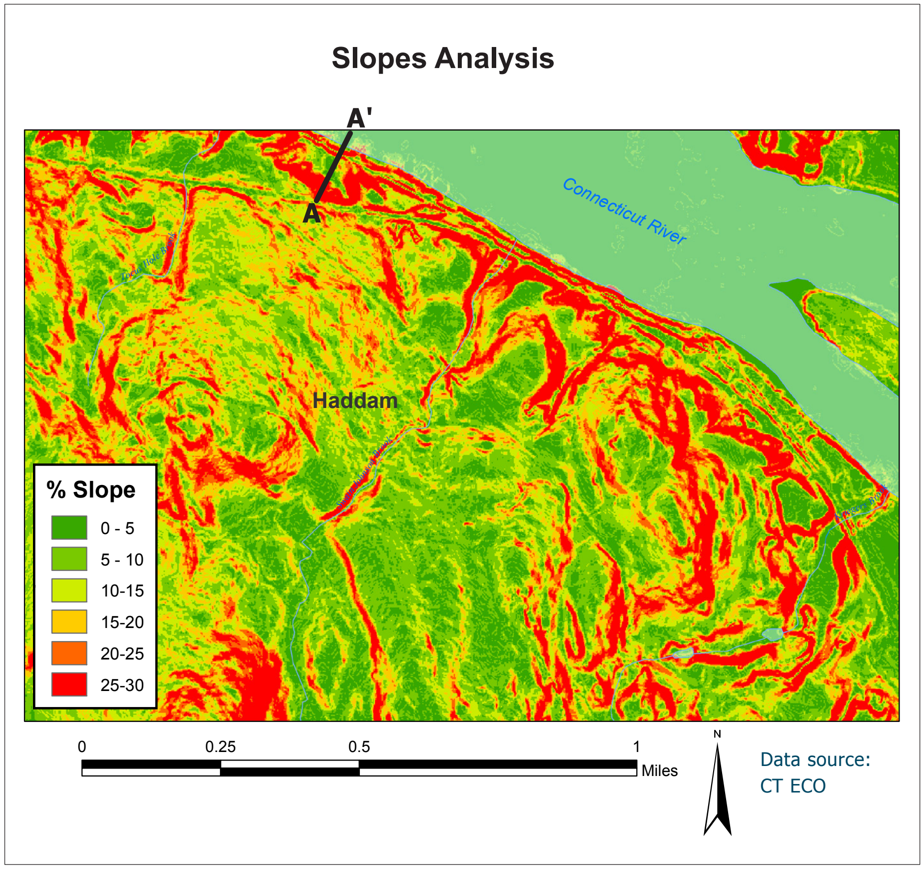
Convex/Carved Out

Flat

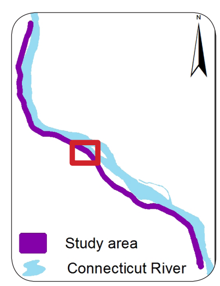
Terraced/Along the Slope

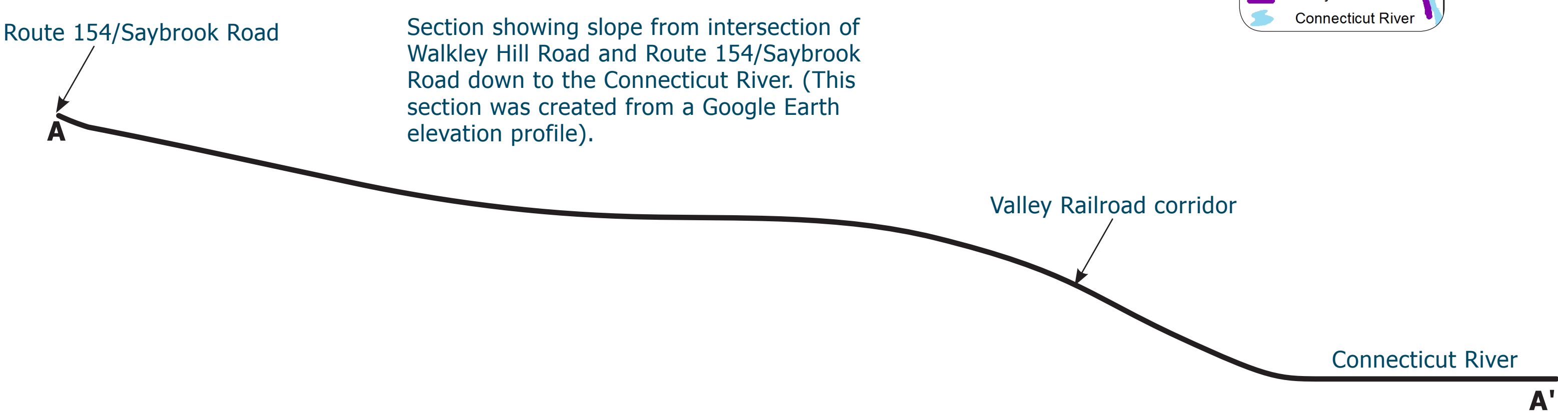
IMPLICATIONS

- The erosive potential of steep slopes would pose a challenge during construction of a rail-trail and in the future maintenance of the corridor. This is discussed in more detail in the next section ("Drainage, Flood Hazard, & Soil Erosion Susceptibility," page 30).
- Achieving proper drainage on a steep slope so it doesn't contribute to erosion poses a challenge. The trail surface would need a cross-section graded at 2% to drain runoff into some type of swale or a permeable surface to help infiltrate stormwater.
- Accessibility would require grading slopes wherever trail access is needed and the cross-sectional slope is above or below the grade of the railbed. (See "Trail Design Requirements," page 41.)



This snapshot of the GIS slope analysis map was taken between Haddam Center and Higganum Village. (See locator map at right.) Section A-A' on the map is shown below.





Section showing slope from intersection of Walkley Hill Road and Route 154/Saybrook Road down to the Connecticut River. (This section was created from a Google Earth elevation profile).

Drainage, Flood Hazard, & Soil Erosion Susceptibility

The corridor crosses over at least seventeen streams that drain into the Connecticut River (see map on page 31). Four trestles provide crossings over larger streams, including Mill Creek, Higganum Creek, Hubbard Brook, and one unnamed stream. Smaller streams and wetlands drain through culverts under the railbed (there are at least thirteen of these in the study area, based on field observation). In some places, the railbed is built on a causeway over wetlands or small ravines and gullies. Twenty percent of the study area lies within the FEMA Special Flood Hazard Zone (known as the 100-year flood zone) (as determined by GIS analysis).

Soils in the study area include sandy or silty loams and gravels (according to the USDA Web Soil Survey). Using GIS data on soil erosion susceptibility, it was found that thirty percent of both surface and subsurface soils within the study area are highly susceptible to erosion (see map on page 32). Twelve percent of the study area is characterized by both high erosion susceptibility and the Special Flood Hazard Zone. One location where these conditions are combined is the washout at Tocus Hole Brook, west of Swain Johnson Brook (see photo below and brown dot on maps, pages 31 and 32).

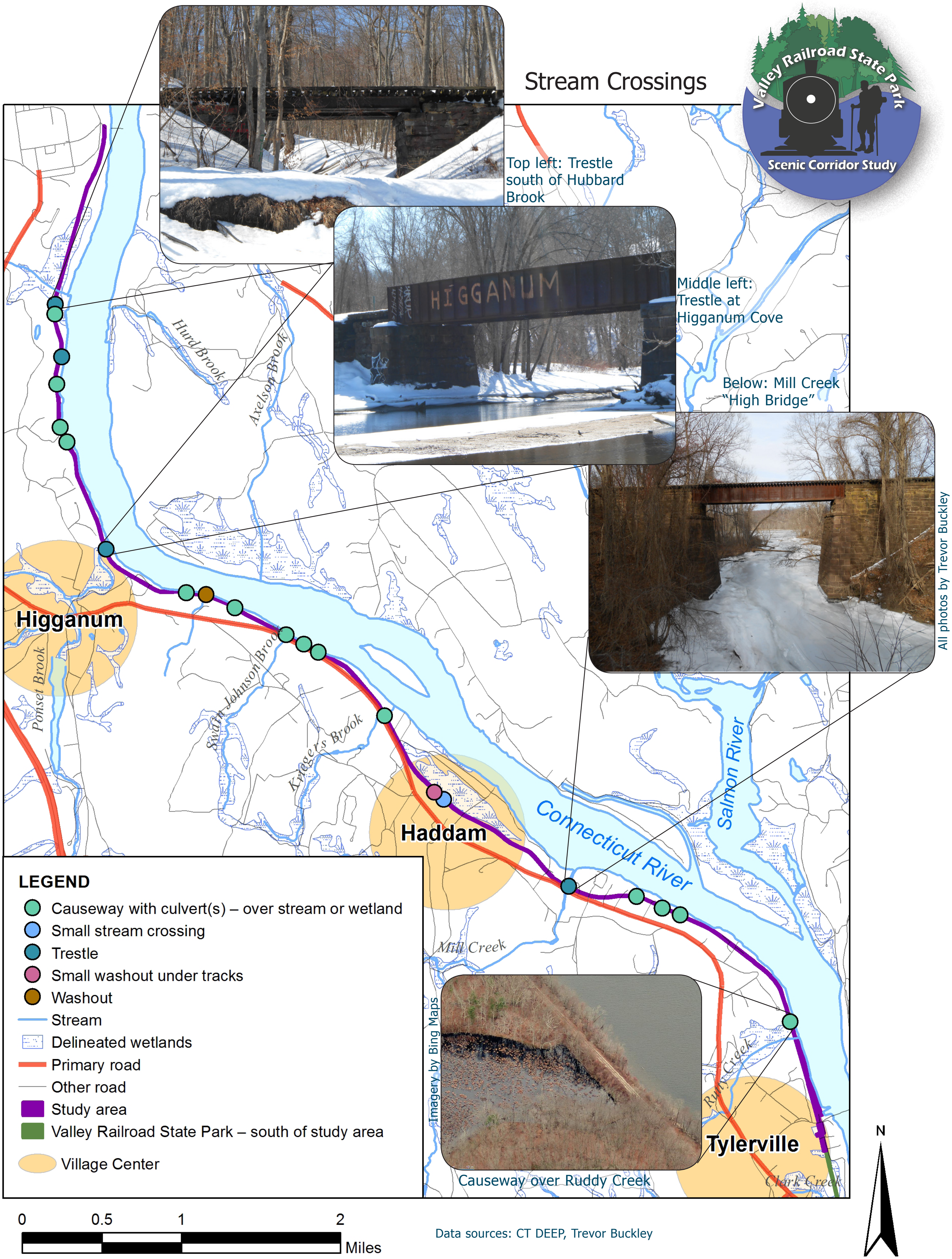
Imagery by Trevor Buckley

A washout over a culverted stream occurred in the 1980s after a large flood event. Valley Railroad partially dismantled the rail left hanging over the chasm, but has not refilled the railbed here. (See brown dot on maps.)

IMPLICATIONS

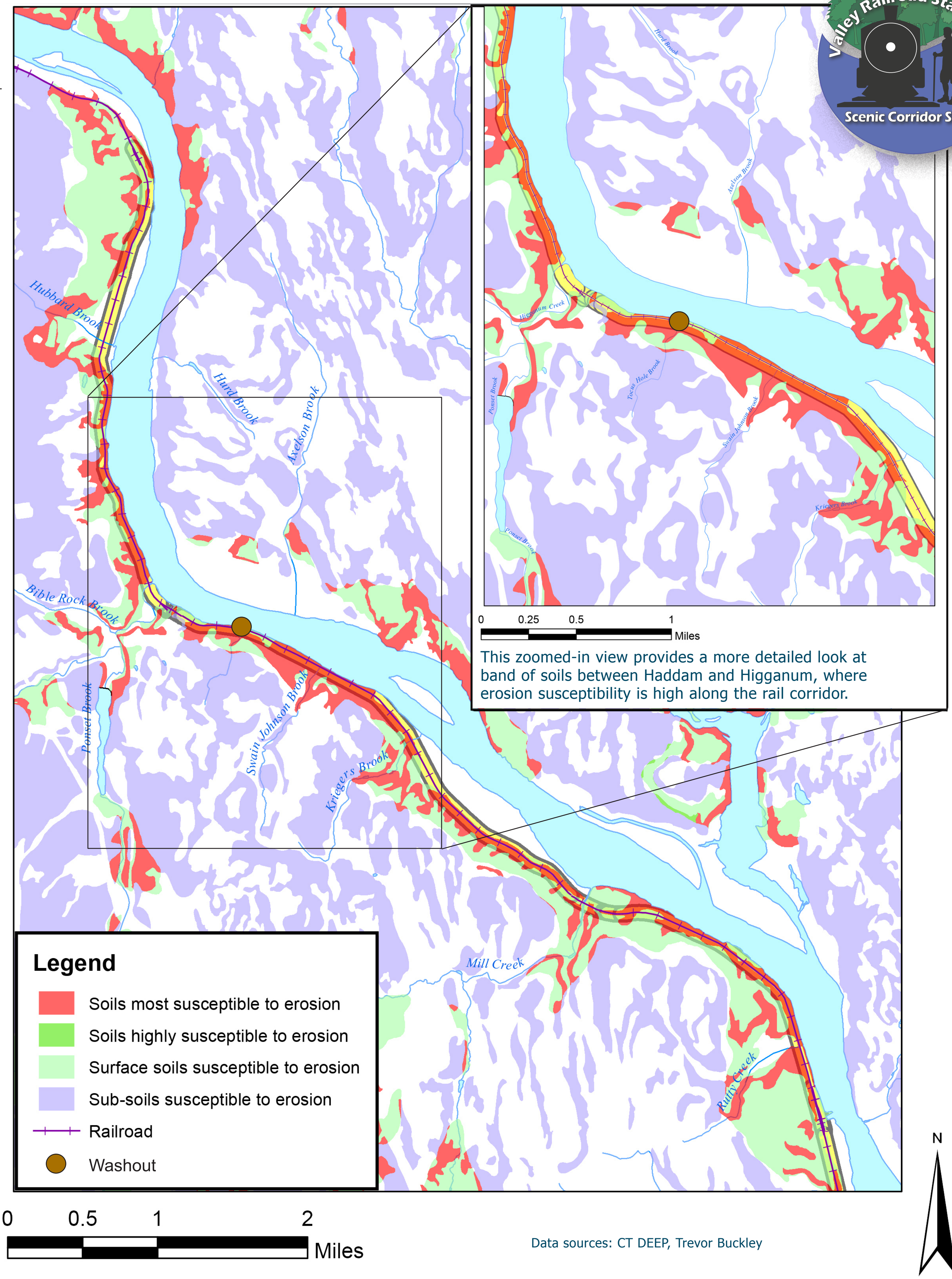
- Flooding hazard must be taken into account for design choices for a trail, including surface material (see page 51), especially in areas within the 100-year flood zone.
- Areas of soil erosion and flood hazard, combined with steep slopes, present challenges to preventing soil erosion during construction and to ensuring durability of the trail in places affected by these conditions. Selection of trail building materials should be guided by all of these considerations.
- Vegetated drainage swales might help to infiltrate water and thereby reduce erosion and stormwater runoff into the Connecticut River.
- The existing culvert system needs to be assessed, restored, and integrated into a comprehensive drainage plan; a well-designed drainage plan will help reduce erosion and on-going maintenance costs.
- Slope stabilization methods (for example, fiber mats or bioengineering) should be employed both during construction and over the long-term to reduce erosion.
- Plants used in bioengineering might help remediate soil contamination on the rail corridor (see "Soil Contamination" on page 36).

Stream Crossings



Data sources: CT DEEP, Trevor Buckley

Soil Erosion Susceptibility



Data sources: CT DEEP, Trevor Buckley

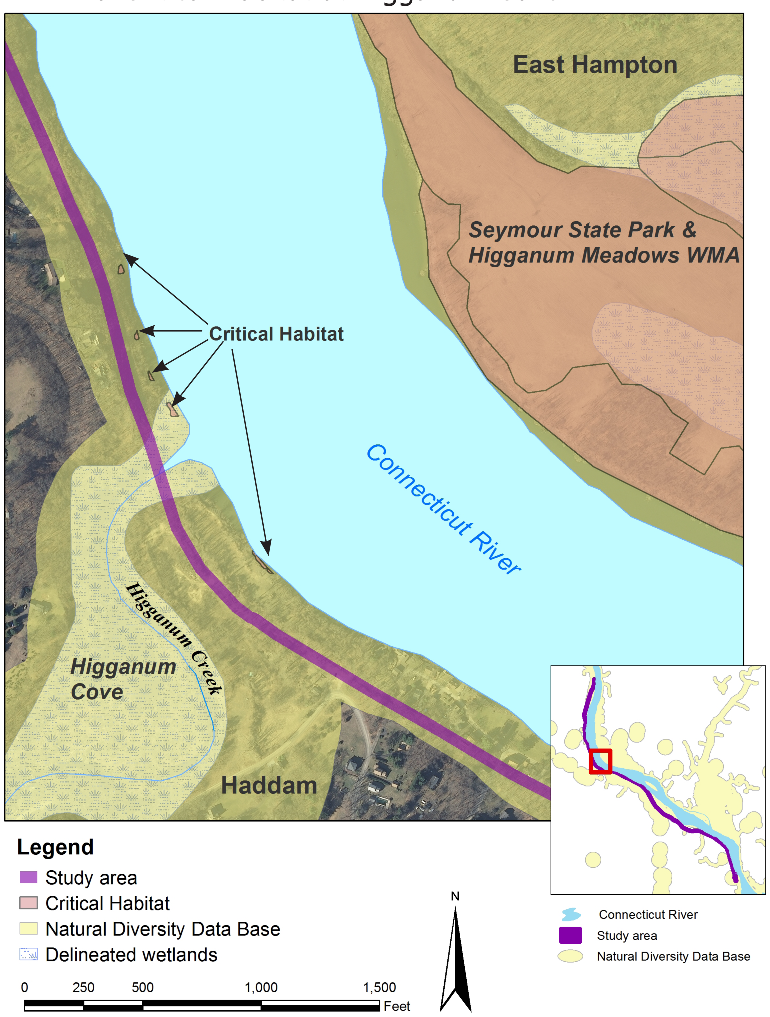
Habitat, Wildlife, & Vegetation

HABITAT

For most of its length, the study area runs along the Connecticut River, close to or crossing through the riparian corridor, which includes habitats ranging from different tidal freshwater wetland types to floodplain forests to beaches to upland forests. Given this range of habitats and the general health of the river, biodiversity along the river is rich, particularly in wetland areas.

Nearly the entirety of the project study area lies within the portion of Connecticut's Natural Diversity Data Base (NDDB) GIS layer bordering the Connecticut River (see inset map below). The NDDB is a Department of Energy and Environmental Protection (DEEP) designation for land that is home to wildlife and vegetation that is federally or state-listed as endangered, threatened, or a species of concern. While DEEP does not provide information about the specific species located in the NDDB layer—a request for information is available when a specific plan for development is submitted—cross-checking the NDDB layer with a state inventory of listed species in Middlesex County can suggests which listed species are within the corridor and surrounding areas. These include winter-nesting bald eagles (threatened) and migratory shortnose sturgeon (endangered). Any development effort in areas with the NDDB designation, including a trail project, should follow the formal information request process to receive specific information about which species live and breed in these delineated areas.

NDDB & Critical Habitat at Higganum Cove



Data sources: CT DEEP, ESRI, Trevor Buckley

There are several spots adjacent to the corridor that are delineated as Critical Habitat (see map), that is habitat of critical importance to conservation efforts. Critical Habitat is identified by Connecticut DEEP and is identifiable with GIS data. Within the project study area, these habitats include riparian beachshore and floodplain forest. Higganum Cove and vicinity is shown in the map (left) as a sample representation of how the rail corridor lies within the NDDB and adjacent to Critical Habitat along the river. The map also shows how larger swaths of wetlands and floodplain forests in the vicinity of the corridor are demarcated as Critical Habitat, such as areas at Seymour State Park on the east side of the Connecticut River.

Photo by Walt Zilahy

One of the several beaches along the river's edge north of Higganum Cove, delineated as Critical Habitat.

There are also several wetland areas adjacent to the study area that are not listed as Critical Habitat (see photo of beaver pond in Maromas at right). All wetlands—whether classified a Critical Habitat or not—receive legal protection through the Connecticut Wetlands Act, which requires a 50-foot buffer around delineated wetlands for any development. State and federal permitting may be required for any development that will affect wetlands.

Photo courtesy of RiverQuest

Osprey nests near the study area, on navigational beacons and on top of the Haddam Swing Bridge.

WILDLIFE

Among the wildlife in the study area are dozens of bird species, including migratory waterfowl (e.g., American black duck) and raptors (e.g., osprey, especially at Eagle Landing State Park), fish—including anadromous (e.g., Atlantic salmon and the endangered shortnose sturgeon) and catadromous species (e.g., American eel)—as well as amphibians and reptiles. There is a seasonal dimension to much of the wildlife activity. For example, bald eagles typically nest near the study area at Eagle Landing State Park and in Maromas during January and February. Higganum Creek at Higganum Cove is one the Connecticut River tributaries where the anadromous sea lamprey spawns in the spring (Vanderboom).

Photo courtesy of RiverQuest

Bald eagles come to Tylerville and Maromas in winter to nest along the river.

VEGETATION

The forest across the region and along the rail corridor is part of the maple-ash-hickory-oak complex. The species composition varies as one moves downslope to the river. The river's freshwater tidal wetland complex is home to hundreds of plants; these environments are very diverse as they house both common wetland plants and those specialized for the tidal freshwater conditions. Wild rice (*Zizania palustris*) is the emblematic species of these freshwater wetlands and a "critical food source for ducks, rails, blackbirds, and other species, and once was a staple grain for Native Americans" (Stinton, Farnsworth, and Stinton 201).

The presence of invasive plant species in the Lower Connecticut River Valley has increased in recent years, and efforts are being made to combat Asiatic water chestnut, common reed, and purple loosestrife, among others, that are invading marshes and other wetlands. These species crowd out native plants, and may negatively impact overall biodiversity in these areas of significant habitat. During the project study, invasive plants, including barberry and Oriental bittersweet, were visible in upland areas along the railbed. Soil disturbance, human traffic, and dispersal via birds and other wildlife are all factors that, in general, might contribute to the spread of invasive species.

IMPLICATIONS

- Before initiating a trail project, a request for information from the Natural Diversity Data Base (NDDB) should be made to determine which species are recorded in the area and when they are present. This inventory of species and their locations should inform the trail design process.
- Precautions would need to be taken in the trail design, during the construction phase, and in trail use post-construction to avoid sensitive habitat and disturbance of wildlife wherever possible.
- Native plants should be used in landscaping along a trail, including those plants used in slope stabilization efforts.
- The presence of invasive plants in the study area could increase with a trail development due to soil excavation, construction, and an overall increase in human activity along the corridor (e.g., hikers or paddlers in wetlands). Strategies should be considered for preventing the spread of invasives and controlling them once they have arrived.
- By providing visual and physical access to the river and through the use of signs and programming, a trail can expose local residents and tourists to the natural and cultural ecology and conservation of the Lower Connecticut River Valley.


Photo by Barrie Robbins-Pianka

One of several beaver ponds along the rail corridor in Maromas. The streams forming these ponds are culverted through the railbed.


Photo courtesy of RiverQuest

A sward of wild rice (*Zizania palustris*).

Soil Contamination

CONTAMINATION CONCERNS

Soil contamination is a significant environmental concern along old rail corridors. Areas to be used by pedestrians and other trail users should be remediated to a level safe for recreational use. Before remediation can take place, trail developers must identify high risk locations along the corridor using the conventional two-phase Environmental Site Assessment (ESA) process:

- Phase I consists of research on existing and historic land use, and contamination events or violations, plus a visual examination of the corridor, also called an All-Appropriate Inquiry (AAI).
- Phase II consists of soil and groundwater sampling of suspected areas identified by the Phase I ESA.

Photo by Trevor Buckley

The entire rail corridor would need to be examined for potential soil contamination. Ties and soil may contain chemical pollutants, and former rail facilities such as the area around the old Higganum Depot, shown here, would need to be considered in a Phase I AAI.

Phase I AAI and Phase II ESAs are conducted by an ASTM (American Society for Testing Materials) certified expert. Along a historic rail corridor, inspectors would locate potentially contaminated areas, which include:

- Fueling points
- Platforms/stations
- Industrial sites

Within the study area corridor, there are at least three former station sites and one former industrial site. See sidebar on page 37 for more information on the industrial site at Higganum Cove. The specifics of the rail infrastructure were not researched for this study so it is unknown where and if fueling points were located along the corridor. Such information could be sourced from Valley Railroad Company or historic archival data, including Sanborn Maps (historic land use maps used to estimate fire insurance policies).

The contaminants present depend on when the rail was used and how long it has been out of service, but could include:

- Creosote and chromated copper arsenate found in railroad ties.
- Heavy Metals, including lead and mercury.
- Spilled or leaked liquids such as oil, gasoline, and cleaning solvents.
- Herbicides and defoliants, including arsenic, used to keep the tracks clear of vegetation.
- Polycyclic aromatic hydrocarbons (PAHs), produced from fossil fuel combustion.
- Abestos from industrial sites and station shingling (Massachusetts Department of Environmental Protection [MA DEP] 2; RTC, *Understanding Environmental Contaminants* 5-6, 9).

Passenger service along the Valley Railroad study area ended in the 1930s and freight service ended in the 1960s; thus, contamination would date to historic rail use. Some contaminants can persists along historic rail corridors years after entering the environment (MA DEP 2). Rail use restarted in the 1990s in the area around

CONTAMINATION AT HIGGANUM COVE

Higganum Cove, a half-mile northeast of Higganum Village, lies at the confluence of Higganum Creek and the Connecticut River. The area includes an abandoned twelve-acre industrial site that is also called the Frismar property. The site remained in industrial use, off and on, for nearly two hundred years. The last industrial operations there produced mimeograph paper and circuit boards, leaving behind polychlorinated biphenyl (PCBs), volatile organic compounds (VOCs), and asbestos (Glidden; Higganum Cove Committee 2; Vanderboom 2). In the mid-1980s, a management company purchased the site, and during that time municipal solid waste was dumped on site. After a fire on the site in 1989, the owners vanished leaving behind a heavily contaminated site (Glidden). Today, the Cove provides important habitat for fish and other wildlife, and could serve as an outlet for paddlers to access the river (Higganum Cove Committee 2).

DEEP and EPA conducted assessments in the 1990s, estimating cleanup costs at $2 million (Higganum Cove Committee 2). The area was also listed as a Superfund site. The Town of Haddam is interested in owning the property, as well as purchasing the adjacent nine-acre collection of parcels that is for sale (the McCain "property"), with the hopes of developing the area into a park with public river access. Local advocates hope that this could link to a potential multiuse trail. The Town's tentative plan would be to create a passive recreational facility on the industrial site, while building active recreational facilities (e.g., multipurpose space and sports facilities) on the nine-acre tract across Higganum Creek (Glidden).

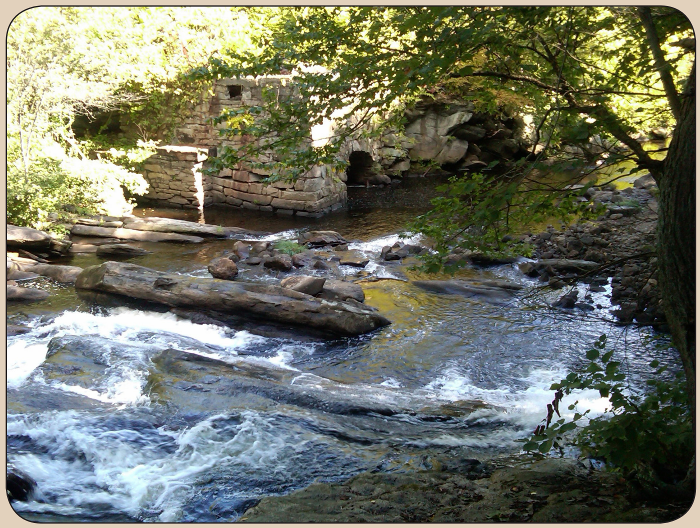


Photo by Janet Verney, courtesy of Liz Bazazi

The falls along Higganum Creek that powered the mills now run past the industrial ruins on the site.


Photo by Christian Johnson

The water tower that looms over Higganum Cove has become a local marker of the village's industrial past.

the historic Goodspeed Station and Ruddy Creek, near Eagle Landing State Park, when Valley Railroad Company improved the tracks and extended the tourist steam train operation northward to that point. Soil in that area could contain some contamination from infrequent but contemporary rail use.

Railroad operators use herbicides and defoliants to maintain clear sightlines and keep the tracks clear of vegetation. The Valley Railroad Company applies herbicide annually, voluntarily requesting supervision by a DEEP officer. Valley Railroad reports that it has conducted extensive testing of soil and adjacent wells to ensure that toxins are not entering the groundwater and that levels comply with state and federal standards (Valley Railroad Company staff and board members).

CLEAN-UP PROCESS

The ESA will determine whether remediation is required at the site, and, if so, recommend that a remediation plan (Phase III ESA) be developed. Clean-up can include the removal of contaminated soil and ties and tracks; the ties and tracks might be salvaged to recycle or repurpose, or they may be disposed of. Another option may be to leave some contaminated soil and ties in place and burying them in a process called "capping," which could include a paved or crushed aggregate trail surface (MA DEP 8; RTC *Understanding Environmental Contaminants* 15).

Phytoremediation may provide a viable and more environmentally friendly alternative to removing contaminated soils along the corridor. Phytoremediation is a method of remediation that makes use of certain plants and their associated microorganisms to process toxic substances (see sidebar on page 39). This remediation method may be used in concert with more conventional practices. In the context of a Valley Railroad corridor project, planting for phytoremediation can be paired with bioengineering efforts to stabilize slopes and prevent soil erosion.

IMPLICATIONS

- A Phase I (and potentially Phase II) ESA should be conducted to determine potential areas and levels of contamination.
- Contaminated soils must be remediated or capped to levels acceptable for recreational use.
- Innovative remediation techniques could potentially include phytoremediation.

PHYTOREMEDIATIVE PROCESSES

Phytoremediation makes use of plants that have a high tolerance for and can process heavy metals and other contaminants. With management, plants can be used to remove pollutants from contaminated soil. Plant species are selected based on local soil conditions, native flora, contaminants present, and the selected plants' tolerance for the contaminants. There are several forms of phytoremediation that could potentially help remediate the Valley Railroad Corridor for use as a multiuse trail. The following are four types, as defined in the design firm youarethecity's *Field Guide to Phytoremediation* (Kühl; youarethecity 14).

Degradation

Plants absorb and "break downs contaminants through enzymatic and metabolic processes through processs such as photosynthetic oxidation/reduction....Pollutants are degraded and incorporated into the plant or are broken down in the soil" as simpler, non-toxic substances.

Extraction

The root systems of plants absorb contaminants and accumulate them in stems and leaves. These plants need to be harvested and disposed of as hazardous material.

Stabilization

Plants "sequester or immobilize contaminants by absorbing them into its roots," rendering contaminants insoluble in the ground. This reduces the spread of pollutants through leaching into groundwater, or erosion and other mechanisms of soil dispersion.

Volatilization

The plant converts volatile contaminants into less toxic forms before releasing them into the air through transpiration.

Photo courtesy of Emily Davis

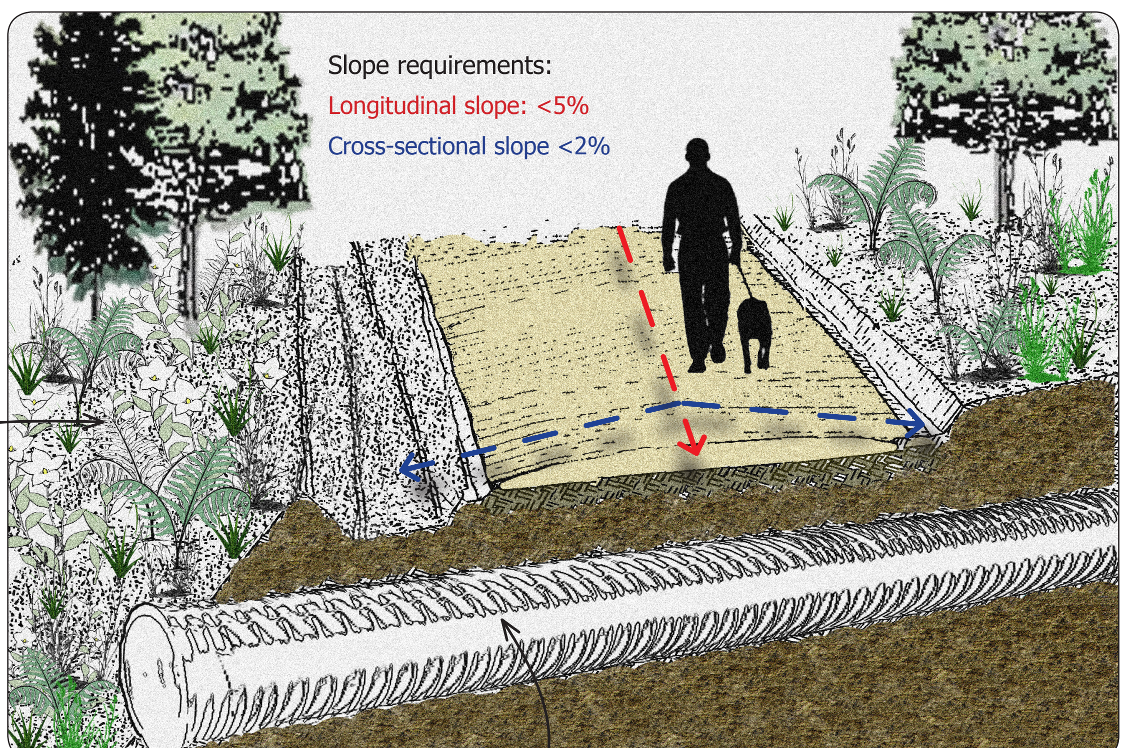
4. Trail Design Options & Assessment

TRAIL DESIGN REQUIREMENTS

There are no comprehensive federal or state standard guidelines for multiuse trail development, except in regards to road-trail intersections and universal accessibility (discussed below). Multiple publications produced by federal and state agencies and several organizations working on trail development (see "Works Cited and "Additional Key Resources" on pages 114-115) were reviewed in development of this study; trail professionals were also consulted. Generally accepted standards for the trail design are as follows:

- The American Association of Safety Highway and Transportation Officials (AASHTO) recommends a twelve- to fourteen-foot width for a shared-use (pedestrian and cycling) trail with a two-foot graded shoulder; the minimum recommended width, with bicycling, is ten feet with two-foot shoulders.
- A trail should be universally accessible and barrier-free for trail users, including those in wheelchairs or with other disabilities. For accessibility, the maximum longitudinal slope of a trail and access ramp is 5%, or 8.3% for no more than five hundred feet, as long as a railing and properly placed landings and edge protection are provided.
- A cross-slope of 2% or less is needed for wheelchair accessibility, and to drain water off of the trail.
- Railing beside the trail is necessary where the adjoining slope is 30% or greater and the slope is less than five feet from the edge of the trail.
- Parking areas and facilities at trailheads must be similarly accessible, including meeting statues of the American with Disabilities Act (ADA) and state and local building codes. If recreational opportunities are created along the trail (e.g., fishing access or access to a canoe launch), barrier-free recreational opportunities should be included as well.

This sketch shows a trail replacing rail



Landscaping for slope stabilization and phytoremediation

Culverts carry streams under railbed

Trail Design Types

RiverCOG requested that this study consider three rail-trail types for development of a multiuse trail along nine miles of the Valley Railroad corridor:

- Trail replacing the existing rail
- Trail on top of the existing rail
- Trail with (alongside) the existing rail

These trail types are assessed below and general recommendations are given for development of each type along the Valley Railroad corridor. Legal issues which may affect the trail design and feasibility of any of these options are discussed very briefly. More research into legal specificities of the rail corridor's right-of-way (ROW) and other considerations are needed.

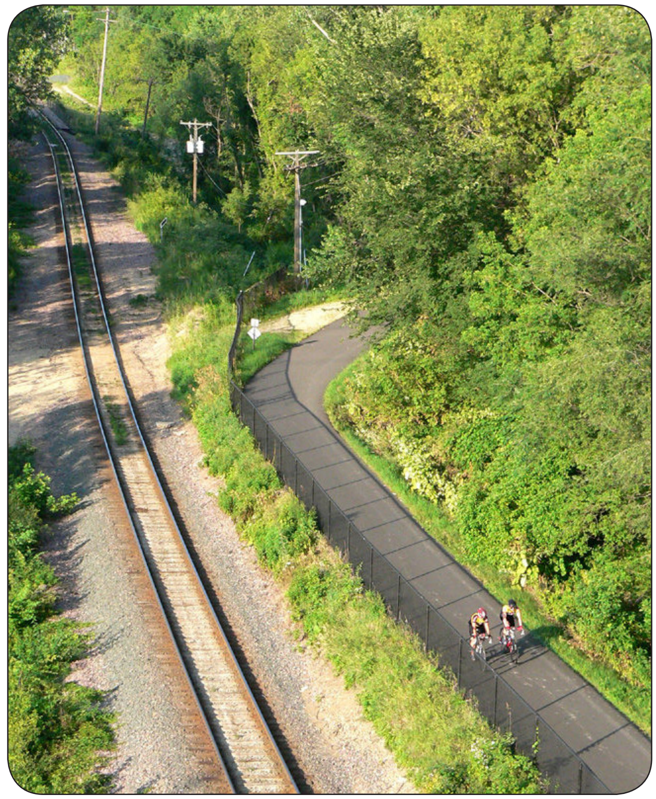


Photo by Stuart Macdonald

This rail-with-trail in St. Paul, Minnesota, is one of over 160 in 41 states. Trail users are separated from the active rail by a chain-length fence.

Type 1: Trail Replacing Rail

This is the most common method of adapting a railroad corridor to a multiuse recreational trail, where rail access is no longer desired or deemed viable. Removing the rail infrastructure creates a corridor that is already suitable, in terms of slope, for public access. Removal simplifies the process dramatically compared to the trail with rails option, because there is much less need to route around terrain restrictions (such as slopes and bedrock outcrops in the case of the Valley Railroad corridor), or to design for safety where the trail and active rail come in close contact. There is at least one non-profit group in the northeast, Iron Horse Preservation Society, that will remove rails and ties at no cost.

The Valley Railroad Company, however, plans to continue to extend their operations northward and the company, along with the Friends of the Valley Railroad, have done extensive work to repair and improve the conditions of the tracks to further this process (Friends of Valley Railroad; Valley Railroad Company staff and board members). When the Valley Railroad extended their operations from Chester to Goodspeed Station, they were able to restore the 3.5 miles in four years. Over the last two years, another quarter mile of track has been restored. This pace may be accelerated in the future as the Valley Railroad has established its fleet and can now devote more funds to restoring tracks than procuring and restoring locomotives and rail cars (Valley Railroad staff and board members).

Furthermore, the tracks are owned by the State of Connecticut, which considers the tracks a valuable transportation asset. While removal of the tracks to use the corridor solely as a potential trail might be a lower-cost and lower-impact alternative, the likelihood of doing so seems uncertain given this context.

Type 2: Trail on Top of Existing Rail

The RiverCOG suggested a method of creating a trail that would keep the railroad infrastructure in place to allow for the corridor to easily revert to rail use in the future. Could a trail be placed on top of the existing rails and ties? It was suggested that this might be a more cost-effective trail design option than trail replacing rail or trail with rail.

This method of trail construction would require burying the tracks and ties (see figures at right). In addition, it could pose possible hazards to trail users. For example, spikes and rails might eventually surface, causing accidents, and leaving railroad ties beneath the surface may cause the trail surface to develop a "wash-board" texture with use and time. No precedent for this type of trail was identified; therefore, comparison for cost-effectiveness with other trail types wasn't feasible in this study.

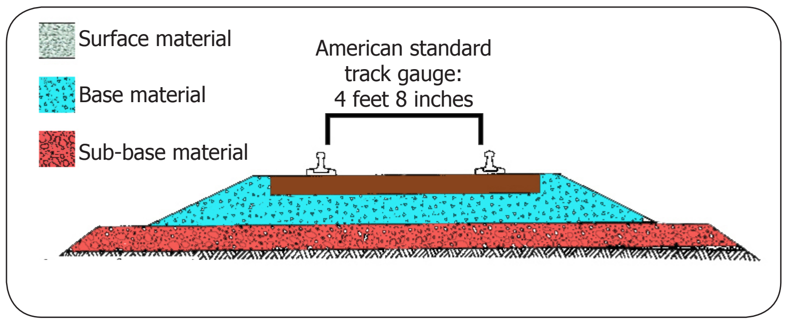
In regards to maintaining a corridor for future rail use, a strategy known as railbanking can be employed. In other locations where a trail was desired, but rail companies or planners wanted to reserve the right to restore rail, railbanking has often been used (see below).

RAILBANKING

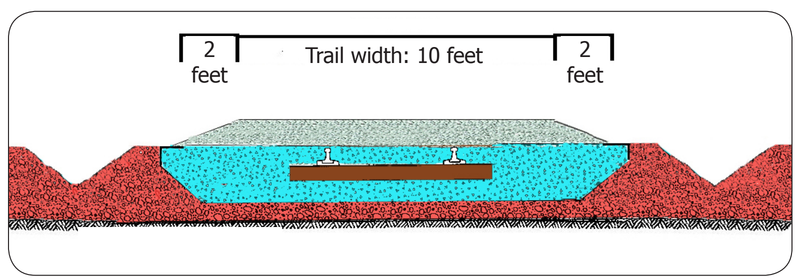
Railbanking is a method by which corridors that would otherwise be abandoned can be preserved for future rail use through interim conversion to a trail. Established in 1983 as an amendment to Section 8(d) of the National Trails System Act, the railbanking statute allows a railroad to remove all of its equipment, with the exception of bridges, tunnels, and culverts, from a corridor, and to turn the corridor over to any qualified private organization or public agency that has agreed to maintain it for future rail use. This property transfer precludes abandonment.

In 1990, the U.S. Supreme Court unanimously ruled, in the case of Preseault v. United States, that preserving a corridor for future rail use through railbanking is a legitimate exercise of governmental power. This decision protects a railroad's legal right to transfer all forms of its ownership, including easements, to a trail group. (According to the Rails-to-Trails Conservancy, this strategy is not impacted by the Supreme Court decision on rail ROW and property rights, handed down in Marvin M. Brandt Revocable Trust et al. v. United States in March 2014 [RTC "What the Marvin M. Brandt Case Means for America's Rail-Trails"].)

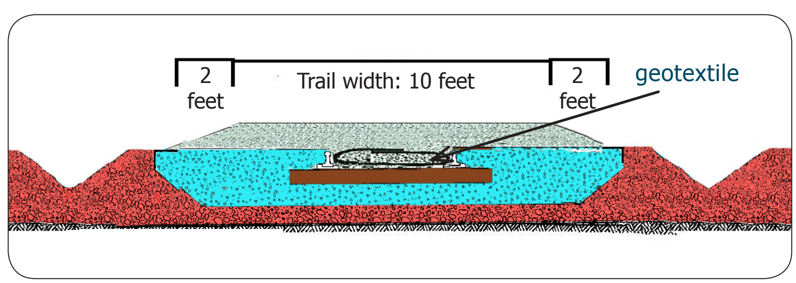
CONCEPTUAL SECTIONS FOR TRAIL ON TOP OF THE EXISTING RAIL



Typical railbed prior to trail construction.



Fill added on sides and over railbed, then surfaced.



Geotextile added to prevent washboarding of surface material over ties.

Cross-sections are not to scale.

Type III: Trail with Rail

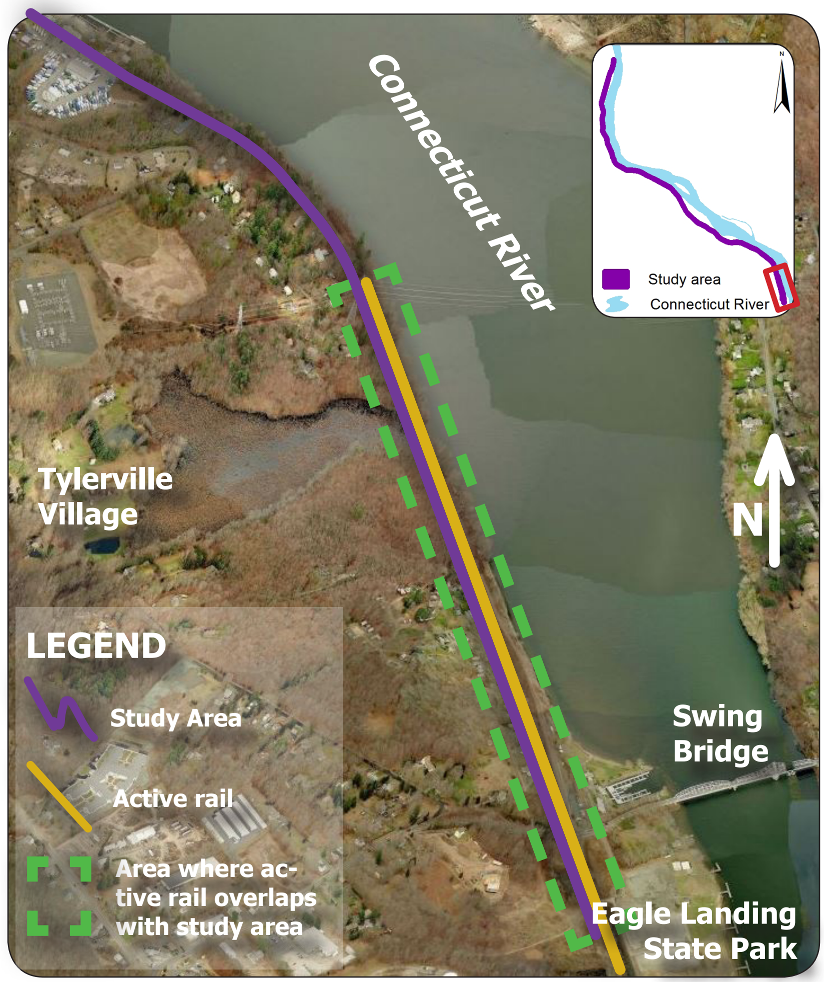
KEY FACTORS TO CONSIDER

If the proposed trail were to extend as far south as Goodspeed Station at Tylerville, then a trail running beside the rails would be the only option for at least the southernmost mile of the corridor. This is because the Valley Railroad operations currently use that stretch of track (see aerial photo). (The company does operate its high-rail maintenance vehicles along the corridor north of this area.) If Valley Railroad continues to extend operations northward, then a trail with rail would be required for an even greater portion of the study area. There are three main factors affecting the design of a trail with rail along this corridor: rail right-of-way width, general safety concerns, and physical constraints (environmental and others).

The right-of-way along the Valley Railroad corridor varies, but in the study area, the typical right-of-way is 99 feet—49.5 feet from either side of the centerline of the railbed (Valley Railroad Company staff and board members). (The basis for the ROW is the 1917 valuation map, which can be found at the Thomas J. Dodd Research Center at the University of Connecticut.) Generally, the trail would need to be

Photo by Kim Tyler, courtesy of Valley Railroad Company

Valley Railroad's Eagle Flyer excursion at Goodspeed Station; the train travels about a mile further, overlapping with the study area.



Aerial imagery by Bing Maps

Aerial imagery showing where tourist trains operate in the study area for this project, near Tylerville.

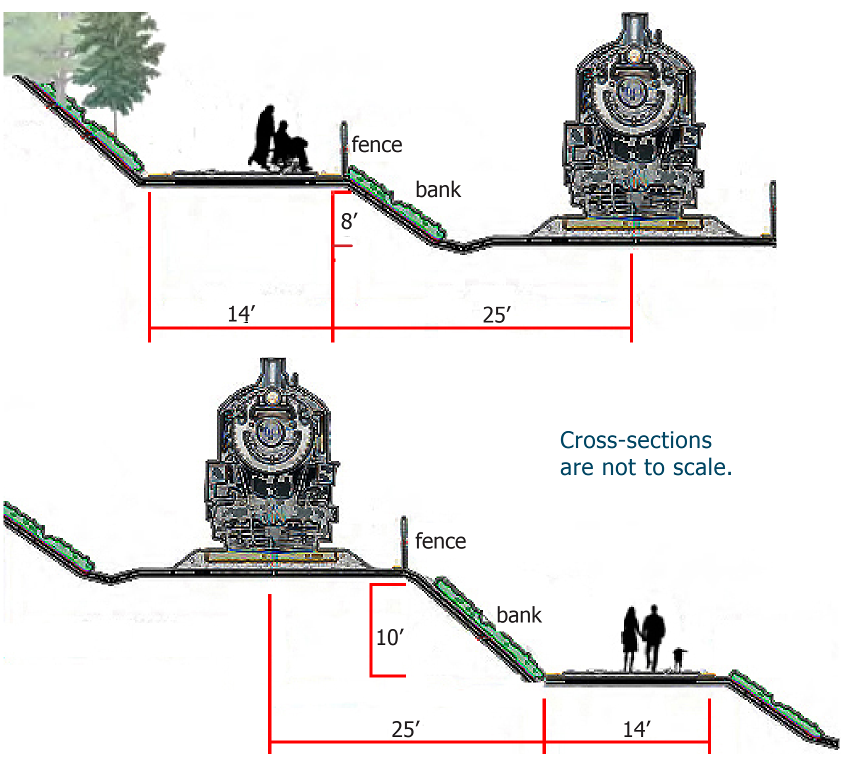
RAILS-WITH-TRAILS SAFETY

Out of the tens of thousands of fatalities that have occurred on railroad corridors in the U.S. since 1992, as of September 2013, only one was a trail user of a rail-with-trail (on the South Bay Trail in Bellingham, Washington in 2008) (Rails-to-Trails Conservancy, *America's Rail-Trails* 12).

placed alongside the rail, staying within the ROW and property boundaries of the Connecticut Valley Railroad State Park. Additional right-of-way may need to be secured, in order to design for safety requirements (e.g., separation between rail and trail, safe trail-rail crossings) and physical constraints (e.g., bedrock outcrops) along the corridor.

SAFETY CONCERNS

In designing a trail with rail, the maintenance and safety requirements for railroad operations and the safety of trail users must be taken into consideration. The Valley Railroad operates its vintage engines at maximum speeds of twenty miles per hour; the tracks are maintained to allow for up to thirty miles per hour. While these trains are generally slow-moving, there are still safety and liability concerns in allowing public access so close to their operations. Railroad companies have borne the burden of litigation for many incidents on their property, even for crashes with at-fault trespassers or drivers who have blatantly ignored



These cross-sections are adapted for this project from "Chelatchie Prairie: Rail with Trail Corridor Study" (Alta Planning + Design 31).

obvious warning systems (U.S. Department of Transportation 1-2). The trail, for its part, should not restrict access for rail maintenance equipment or personnel. Representatives from the railroad's operations and maintenance departments should be consulted for technical advice about establishing proper separation between rails and trail.

SEPARATION BETWEEN TRACKS AND TRAIL

Safety is the primary concern when creating a public way near active tracks. The greater the setback the better, but constraints may require a relatively narrow set-back. In the case of a corridor with low speed and infrequent train traffic, such as Valley Railroad's operation, a minimum set-back of 10 to 25 feet from the centerline of the track may be acceptable (U.S. Department of Transportation 65). There are several techniques for separating the active rails from the trail. A physical barrier such as a fence discourages trail users from crossing into areas of railroad operations. Vegetation or a vertical separation, with a small steep slope or retaining wall, can also be used as barriers. Planting trees and shrubs in addition to fencing, or using fencing with a vertical separation, can help to reinforce the separation (see figures at left).

An option for the Valley Railroad corridor: fence combined with vertical separation (bank)

Given the slopes throughout the corridor, a vertical separation between trail and rail may be required.

In the top figure, the trail is eight feet above the railbed and twenty-five feet away from the centerline of the railbed. A fence reinforces the separation, adding safety and deterring trespassing onto the railbed.

In the bottom figure, the trail is ten feet below the railbed. The fence serves an additional purpose of keeping debris from falling downslope onto the trail.

The width of the railroad ROW will determine the distance that a trail can be setback from the rails. As stated, several lengths of the corridor have a ROW of 99 feet. Assuming a minimum of a 10-foot wide trail with 2-foot wide shoulders, and taking into account the width of the locomotive on the rail, a 99-foot ROW would allow for the trail to be separated from the active rails by as much as 35.5 feet. The figures on this page illustrate this scenario, as well as two scenarios for where the right-of-way narrows. These figures also illustrate how physical constrictions, discussed below, might narrow the setback.

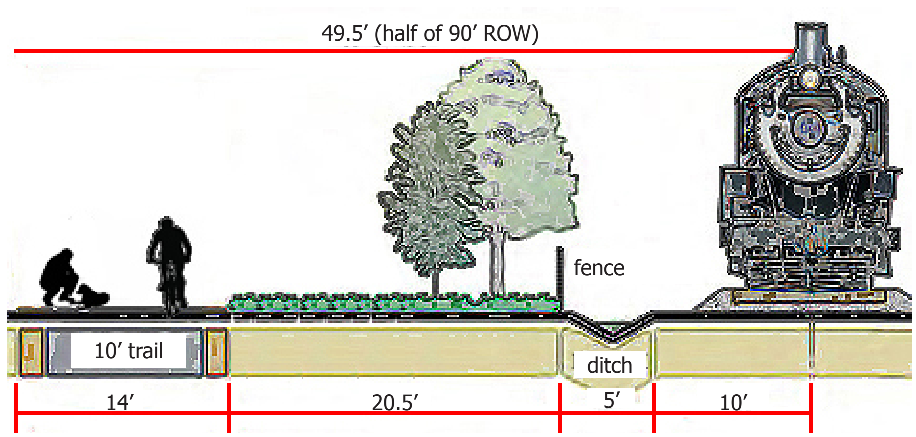
CONSTRAINTS ALONG THE CORRIDOR

There are several places in the study area where physical restrictions would put constraints on placing the trail next to the tracks. The main constraints (pictured on page 47) are:

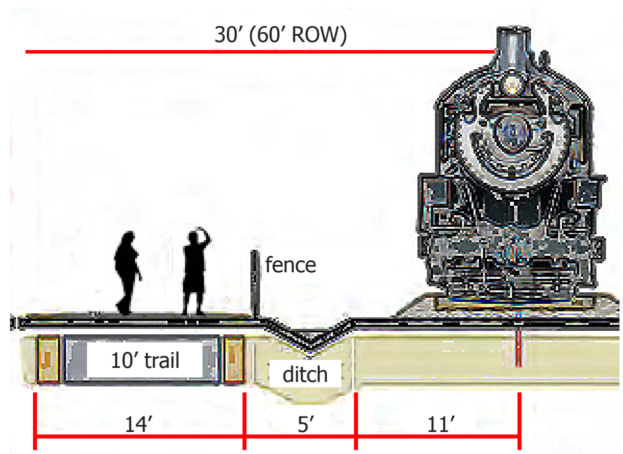
- Terrain restrictions
- Wetland crossings
- Residential areas

All of the constraints identified on the Valley Rail corridor are shown on the map on page 49. Where the minimal safe separation distance cannot be met, or there is simply no room for the trail next to the rail, there are two options for trail placement:

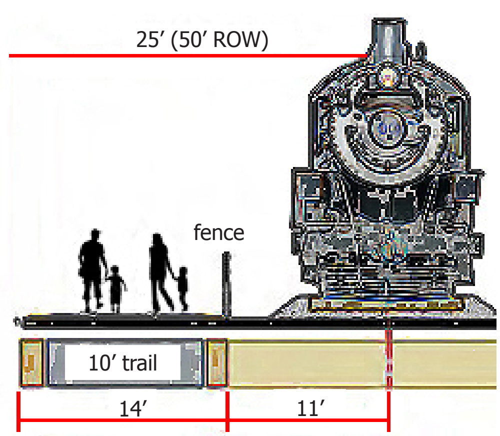
Three Scenarios for Setbacks with a Varying Right-of-Way along the Valley Railroad corridor



The right-of-way is an average of 99-feet wide; the maximum possible setback for a 10-foot wide trail with shoulders is 35.5 feet.



The right-of-way narrows to 60 feet, creating a maximum setback of 16 feet.



The right-of-way narrows to 50 feet, creating a maximum setback of 11 feet.

These cross-sections are adapted for this project from “Chelatchie Prairie: Rail with Trail Corridor Study” (Alta Planning + Design 30).

- Altering the landscape to contend with the constraint
- Re-routing around the area of constraint

Either of these possibilities could cause the trail to be aligned out of the rail ROW, in which case the trail could either be placed on a new right-of-way or easement secured from adjoining property owners or re-routed onto nearby streets.

Terrain Restrictions

Terrain features such as steep slopes and bedrock outcrops limit the trail's alignment options. For areas with steep slopes on both sides of the tracks (not uncommon in the study area), significant excavation and re-grading may be required. Three bedrock outcrops along the corridor that were blasted to create a channel for the tracks would need to be blasted again to widen the channel, or the trail would need to be built over the bedrock. This latter option could make universal access more difficult. Alternatively, the trail could potentially be directed around these sections via local roadways.

Causeways and Wetland Crossings

As discussed in the analysis of drainage, the railbed crosses several streams and wetlands via causeways. In some cases, these are so narrow such that a trail would have to be built onto the side of the causeway or through the adjoining wetland. An option for a trail crossing over a wetland is to build a boardwalk. Boardwalk construction must be carefully managed to minimize environmental impact; executed correctly, boardwalks can have a low impact and allow trail users to experience these habitats (e.g., observing wildlife). Boardwalks in the study area would need to be sturdily constructed to withstand seasonal flooding and, where placed along the river, large blocks of ice that flow downstream during the winter and spring. Areas where boardwalks or other types of crossings for the trail would be required include (from south to north) the causeways at Ruddy Creek and Hubbard Brook wetlands, the wetlands in Haddam Meadows State Park, and over several smaller streams, beaver ponds, and wetlands (see map on page 31 and 103).

Photo by Trevor Buckley

Three bedrock outcrops along the corridor, such as this one near Depot Road in Higganum may require re-routing the trail out of the railroad right-of-way.

Photo by Trevor Buckley

New trail bridges or additions to existing trestles would be required for a trail, which could affect riparian and wetland habitats.

Photo by Trevor Buckley

There are a few residential neighborhoods that closely abut the tracks, such as here at Landing Road in Higganum.

Residential and Commercial Properties

There are two locations where the railroad passes close to residential structures: on either side of Gates Drive in Shailerville and the intersection of the rail and Landing Road in Higganum. A trail might need to be re-routed at the two residential areas, given the narrow constriction of the corridor between homes (see bottom photo on page 47 for a look at Landing Road). The railbed is also buried under pavement at the intersection with Synder Road at Midway Marina, including the marina's expansive boat yard. At the marina, a wider ROW could solve the issue. (Valley Railroad Company is already working with the marina on establishing an agreeable ROW between the rail corridor and the marina's operations.) Safety for trail users passing through the marina yard could be a concern, in which case the trail could travel along a fenced-in corridor next to the rail, through the boat yard, or the trail could potentially be re-routed around the yard.

A Trail with Rail through the Entire Study Area

It is beyond the scope of this study to develop trail-with-rail options for the entire length of the corridor. This option would require further study due to the technical engineering necessary to evaluate and design for constraints along the rail line, including routing the trail onto local streets, construction of wetland-crossing boardwalks, and possible additions to existing bridge trestles to include bike and pedestrian lanes. A professional engineer's assessment would be required for bridges, terrain restrictions, and drainage systems to generate specific design options, and a traffic engineer's assessment would be needed for options re-routing the trail onto streets.

RAIL-WITH-TRAIL PRECEDENTS

Lehigh River Gorge Trail
Jim Thorpe, Pennsylvania
6 miles (of a 25.7-mile trail) • Opened 1972

A tourist train and freight operation uses the tracks. No fencing has been used; instead, a vertical separation with a dense barrier of vegetation is employed. A 2012 study indicated that the trail has brought an additional $6 million to the region that year (RTC, *America's Rail-with-Trails* 29).

Schuylkill River Trail
Philadelphia, Pennsylvania
4 miles (of a 22-mile trail) • Opened 1993

Trail promoters involved railroad representatives in both the feasibility and design phases of the project. Part of the easement agreement included that the railroad had final approval of trail design, specifically with fencing and setbacks ("Rails with trails: case studies from across America").

Winnipesaukee, Opechee and Winnisquam (WOW) Trail • Laconia, New Hampshire
1.3 miles opened, 9 miles planned • Opened 1993

The average distance between the trail and the centerline of the tracks is fifteen feet. The tracks are separated from the trail by a four-foot-high chain-link fence (seen in the photo below). This type of fence has not been well received by trail users and a more aesthetically-pleasing fencing is planned for future segments (RTC, *America's Rail-with-Trails* 39).

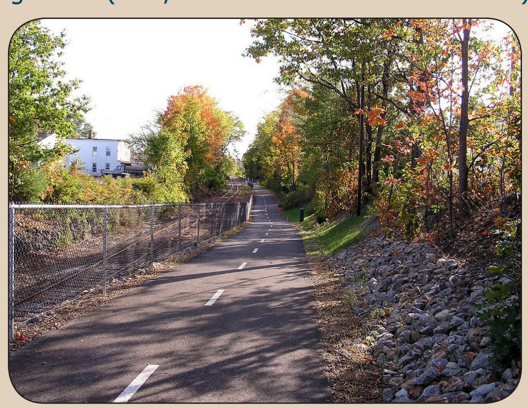
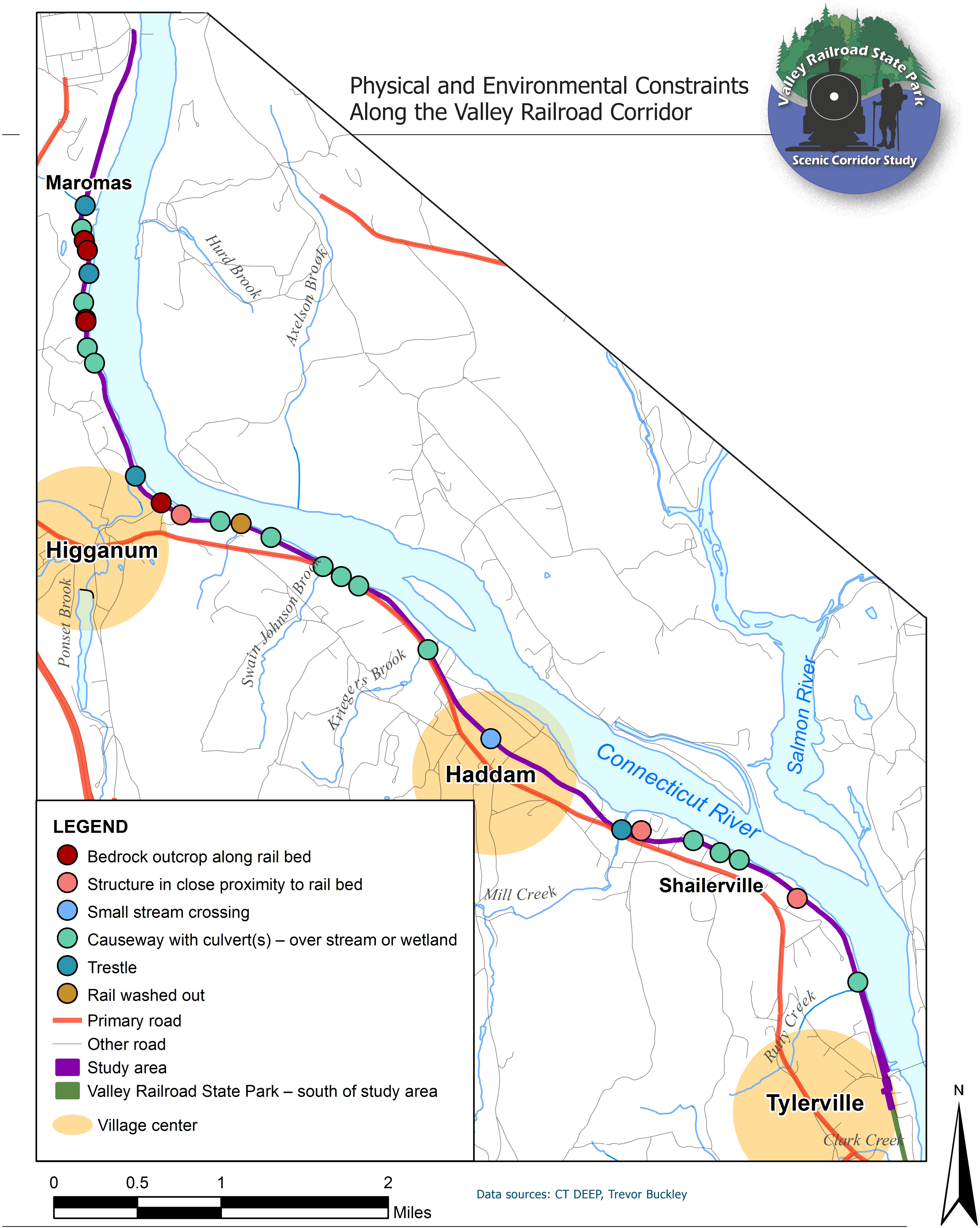


Photo by Rails-to-Trails Conservancy, sourced from Flickr

Physical and Environmental Constraints Along the Valley Railroad Corridor



Data sources: CT DEEP, Trevor Buckley

Trail Construction Materials

A SUSTAINABLE APPROACH TO CONSTRUCTION MATERIALS

Many factors go into material selection, including the anticipated/intended trail uses and the environmental conditions of a site. Given the array of options available, rail developers should strive to use materials that are sustainable, taking into consideration the environmental impact that materials produce over their entire life cycle, including production, transport, installation, use and maintenance, and ultimate disposal and or repurposing. Specific life cycle assessments (LCAs) of materials, if available, can be a valuable tool in making these decisions.

According to Meg Calkins, in *Materials for Sustainable Sites*, "materials and products for sustainable sites are those that minimize resource use, have low ecological impacts, pose no or low human and environmental health risks, and assist with sustainable site strategies" (Calkins 3). Generally, the less a material pollutes the environment, depletes resources, and alters habitat through its life cycle, the better. Most materials on the market today are not, by this definition, sustainable. Whenever possible thn, it is simply best to use the least amount of materials possible.

PRINCIPLES TO GUIDE THE USE OF MATERIALS FOR SUSTAINABLE SITES

The following recommendations are drawn from and summarize the characteristics that landscape architect and author Meg Calkins uses to define materials for sustainable sites (Calkins 3-8).

- Choose materials and products that use fewer resources overall.
- Practice the three Rs: reduce overall use of materials wherever possible, employ reused materials or materials that have a potential for reuse, and employ materials that are recycled products or contain constituents that are recycled products.
- Use materials with high durability that require infrequent replacement and maintenance.
- Consider the embodied energy (the energy consumed to produce and install material) of both the constituents of the material and the overall product.
- Reduce embodied carbon, by sourcing materials locally (cuts down on the fuel required for transport), and using materials that produce lower amounts of carbon dioxide during production and installation.
- Avoid materials and products than can harm human environmental health at any phase of their life cycle.
- Select materials that are overall low-emitters of pollutants.
- Select materials that do not contain toxic chemicals or contain minimal levels.
- Select materials that will not adversely affect hydrologic health, by using permeable and/or porous materials that will infiltrate water and reduce stormwater run-off, as well as products that will not leach pollutants or toxins into soil or groundwater.
- Select materials that do not retain solar energy or that have a high albedo or reflectivity value, so that the project does not create a heat sink (commonly referred to as the "urban heat island effect").
- "As with any materials used, [project developers should] support companies with sustainable social, environmental, and corporate practices" (Calkins 8).

SURFACE MATERIALS

Surface materials for multiuse trails range from native soils to crushed stone aggregates to asphalt or concrete paving. Considerations in selecting a surface material include:

- Type of trail use, intended and/or anticipated
- Anticipated volume of traffic
- Cost and budgetary restrictions
- Detrimental environmental effects of a material's constituents (e.g., toxic chemicals in asphalt sealing resins)
- Aesthetics, especially as it relates to the surrounding landscape.

Trail uses and the appropriate materials for those uses would need to be determined in part with community involvement through public workshops and surveys. A public information workshop held for this project produced feedback on trail use and design options; results are included in the "Community Feedback" section on page 54. The preferences of trail users from outside of the community who may visit the trail might also be taken into account. Such a broader survey was not conducted during this project, but is recommended in future studies of trail development for the corridor.

Environmental conditions of the site would affect the durability of a trail's surface material. Due to the erosive nature of many soils within the study area and the potential for flooding in places—given the corridor's proximity to the Connecticut River, streams, and wetlands—selected materials should either have a hard surface or a stabilized soft surface that would hold up through typical storm events.

There are several options for a multiuse trail surface for visitors in wheelchairs or with other disabilities. Three common trail surface materials were chosen for further consideration:

- Crushed aggregate and stone dust
- Asphalt
- Concrete

Advantages and disadvantages for each are described below and summarized in the table on the next page. Given the scope of this study, no recommendations are offered as to which surface is "best." A decision should be guided by the sustainability principles discussed earlier and a cost-benefit analysis of available options at the projected time of trail construction.

Crushed Aggregate and Stone Dust

Compacted crushed aggregate or granular stone with stone dust (as a binding agent) can accommodate most trail users; a stone diameter of 3/8-inch or less is needed to make the trail accessible for wheelchair use (Flink, Olka, and Searns 69). The cost is moderate compared to asphalt and concrete; however, there is typically more on-going maintenance required (e.g., annual replacement of material lost to erosion and pitting/rutting).

While providing a smooth and firm surface, granular stone can be difficult for road cyclists to use. If not properly compacted and stabilized, it can also be inaccessible to trail visitors using wheelchairs. Eroded sediment from these materials—especially, if not properly compacted—can pollute streams with increased sediment load and potentially with chemicals used in the materials (Calkins 241). There may be local quarries where stone could be sourced, cutting down on transport costs. Geotextiles would be required between the surface and base material to act as a barrier to vegetation, as water infiltration and granular stone's porosity might otherwise allow plants to grow up through the surface.

Photo by Stuart Macdonald

The High Line Trail in Cherry Village, Colorado, is surfaced in crushed aggregate.

Comparison of Trail Surface Materials*

Material	Lifespan	Advantages	Disadvantages	Approximate costs**	Public feedback***
Crushed aggregate with stone dust	7 to 15 years	▪ Accommodates most trail users, except road cyclists ▪ "Natural" aesthetic ▪ Can usually be locally sourced	▪ Soil that erodes off surface can pollute nearby water bodies ▪ Poorly compacted material not accessible to trail users in wheelchairs ▪ Annual regrading may be needed	$425,000 per mile – $749,120 per mile	62% in favor "'aesthetic matches natural setting"
Asphalt	7 to 20 years	▪ Smooth surface, enjoyed by cyclists ▪ Holds up well to heavy use ▪ 80% of asphalt used in new projects comes from recycled asphalt ▪ Recycled material can be used in aggregate ▪ Porous options	▪ Typically impervious ▪ Maintenance issues: rutting in heat, freeze-thaw cracking ▪ More prone to flood damage than concrete ▪ Petroleum-based ▪ Chemical pollutants in several of constituents ▪ Dark color retains heat	Conventional: $750,000 per mile – $1.2 million per mile Porous asphalt: $1.5 million per mile $2.2 million per mile	33% in favor "road-like"
Concrete	20+ years	▪ Highly durable (holds up in floods, freeze-thaw resistance) ▪ Longevity ▪ Light color reflects heat ▪ Commonly found locally ▪ Porous options	▪ Typically impervious ▪ High embodied energy and carbon ▪ Textured surface required to avoid slipperiness ▪ Jointing required to prevent cracking	Conventional: $1.2 million per mile – $1.8 million per mile Porous concrete: $1.8 million per mile – $2.4 million per mile	4% in favor

*Most of the information on surface materials came from Flink, Olka, and Searns' *Trails for the Twenty-first Century* and Flink and Searns' *Greenways*.

**Approximate costs: per mile costs based on subtotals by surface material from Cost Estimates table on page 107.

***Public feedback: these figures are from the poster activity from the public information workshop held for this project in early March 2014 (see page 54 and Appendix B, page 21).

Asphalt (Asphaltic Concrete)

Asphalt Cement + Aggregate

Asphalt can provide a smooth surface for cyclists and it holds up well to high levels of use. In fact, asphalt's plasticity requires regular use to "remain pliable and resilient;" thus, it lasts longer with heavier use (Flink, Olka, and Searns 72). Recycled materials can be used in both the petroleum-based binding agents and aggregate (such as glass cullet). And nearly 80% of all asphalt on the market is itself recycled from old asphalt (Calkins 208). Porous asphalt options are available.

Asphalt softens in heat, which can cause rutting, and is susceptible to freeze-thaw cracking—both potential problems with south-central Connecticut's climate—creating on-going maintenance issues and costs. Asphalt is more prone to flood-damage than concrete, though measures can be taken to reduce such damage, including using a deeper than conventional amount of base material (Rails-to-Trails Conservancy, "Developing Trails in Sensitive Areas"). The components of asphalt, including its binding agents and the resins used in surface sealants, are all potential sources of environmental pollutants and toxins, including polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs) that can leach into the soil and groundwater (the former of which has been linked to reproductive defects in wildlife [Calkins 223]).

In addition, the aesthetics of asphalt—its "road-like" look—may not be in keeping with the feel of the Valley Railroad corridor, and the dark surface retains heat energy, making it and the surrounding area hotter and increasing the rate at which the asphalt degrades. Along the Valley Railroad corridor, heat retention and degradation might be mitigated by the widespread tree cover and shade. General strategies for reducing asphalt's negative effects include using a lower mixing temperature, less binder, and more recycled aggregates in production (Calkins 208). Using the least amount of asphalt possible—perhaps by designing for the ten-foot minimum width required for a multiuse trail and not anything wider—would reduce all of the material's negative effects, as well as the project costs.

Photo by Craig Della Penna

The Shining Sea Trail on Cape Cod in Massachusetts is paved in asphalt, which allows for painted lane designation.

Concrete

Cement (typically Portland) + Aggregate

Concrete is considered the most durable of the options presented here. Its ability to hold up well in flood-prone areas, its freeze-thaw resistance, and its general longevity may make it a more cost-effective material when weighed against the maintenance and replacement costs of other materials. (Though concrete repair costs, when required, can be quite costly). The light, reflective surface color does not retain heat as asphalt does, and no finishes are needed as it is generally resistant to weathering. It must be textured to avoid slipperiness when wet, and jointed to absorb cracking. (The jointing can be an annoyance to cyclists by creating a bumpy ride.) Porous options are available which, like porous asphalts aid in infiltration and reducing runoff. Like asphalt, there are also recycled cement products, though some mixes have an alkaline content, which, if leached out, could upset the pH in streams and wetlands in the study area (Calkins 256).

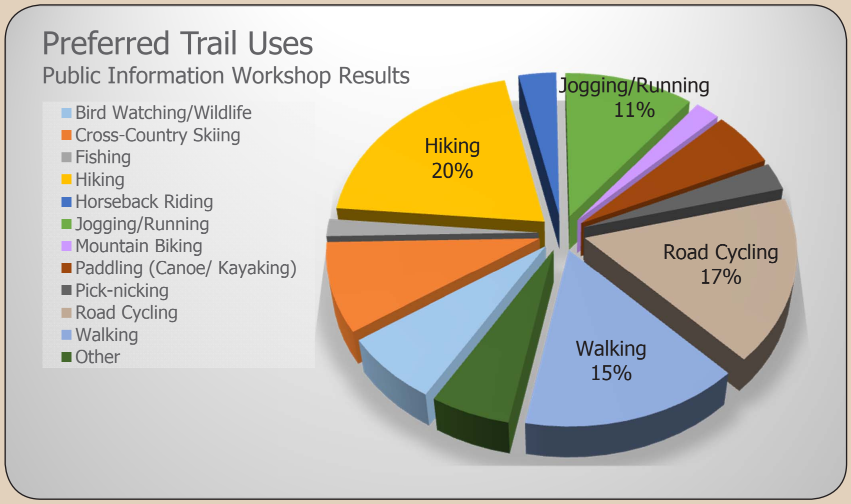
"Surfacing—If the trail is paved, I would be unlikely to use it. It is that natural beauty [of the corridor] that attracts me and pavement would detract from that."

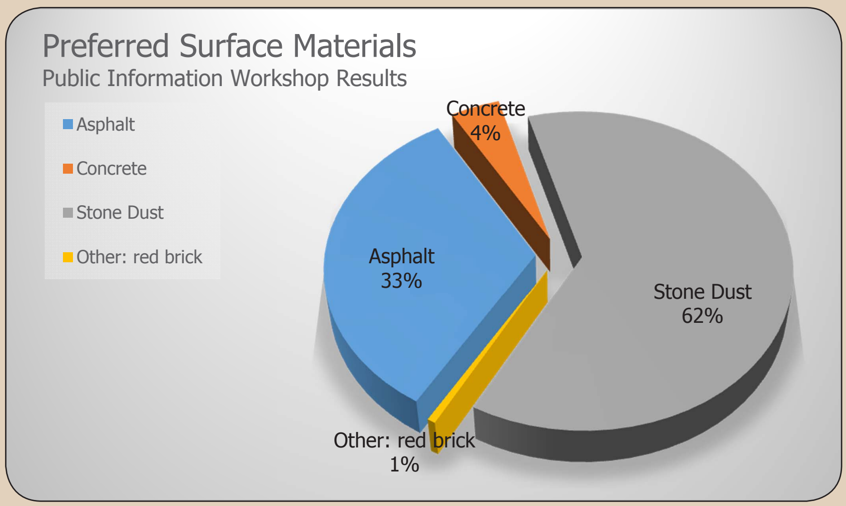
– Community member comment on the survey from the public information workshop

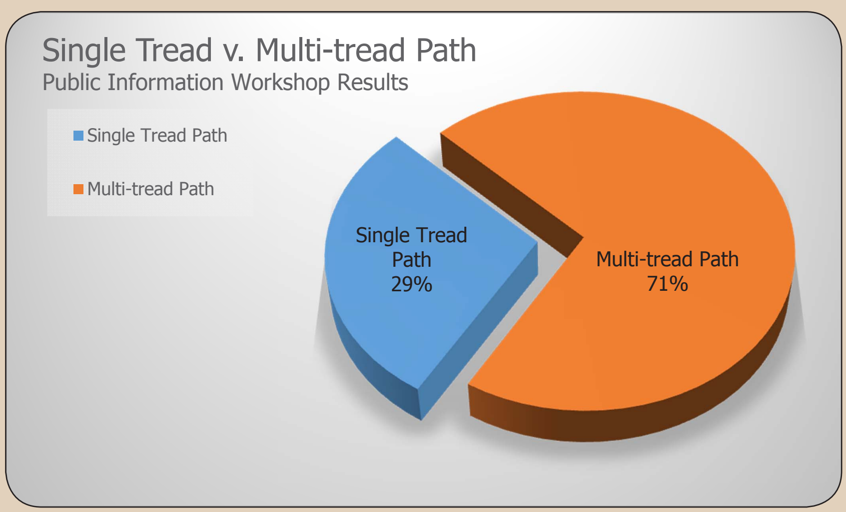
TRAIL DESIGN PREFERENCES: RESULTS OF PUBLIC INFORMATION WORKSHOP

Community members who attended the March 2014 public information workshop expressed preferences for trail design and uses of a potential multiuse trail. Participants were also surveyed about what they currently do when they visit the Connecticut River, as a secondary means of anticipating what preferred uses of the trail might be (see Appendix B for the details of this workshop). The following is a summary of the results of the workshop activity (approximately 46 participants) and survey (42 respondents):

- The top four (of eleven) uses for a potential trail were hiking, road cycling, walking, and running/jogging.
- Participants favored crushed aggregate ("stone dust") and some participants commented in their surveys that they preferred it for its aesthetic qualities ("blending in with the natural environment").
- Asphalt received about half as many votes as aggregate with stone dust, and concrete received just a handful. Several people commented that they would be less likely to use a trail with an asphalt or concrete surface: "It would feel too much like a street."
- The level of preference expressed for road cycling does not dovetail with the level of preference expressed for a stone path, given road cycling's requirement for a hard, smooth surface. This might be solved, however, by incorporating multiple treads of different materials, as participants favored a multi-tread trail by two to one.







Concrete can commonly be found locally; however, it is typically the most expensive of the three options presented in this section (by linear unit installed cost) and it has a high embodied energy, that is, it requires a large energy input in its creation and installation, giving it a significant carbon footprint relative to the other two options. This can be largely attributed to Portland cement, the binding agent used to harden aggregates into concrete.

Zoning of Surface Material and the Multi-tread Option

Different surface materials could be used at different points along a trail, effectively creating zones suitable for different uses. Trail material could switch at a node in the trail, for example, where a trailhead and parking lot would provide a break in the trail and a logical place to transition between materials. One segment of a trail could be surfaced in asphalt, while another segment could be surfaced in a stone aggregate material, discouraging some kinds of users from certain sections of the trail.

Some trails include two or more separate treads, or trail surfaces, into the trail design. This might be done to separate trail users where conflicts can be anticipated (e.g., between equestrians and trail visitors in wheelchairs [McCarthy]). More often, multiple treads are used to offer different surface materials for different uses, for example, asphalt for cyclists and crushed aggregate materials for jogging or equestrian use. A trail can be opened with a single tread and be upgraded later with the additional treads, as trail demand increases, finances become available or conflicts arise between trail users.

Preparation for Surfacing: Sub-base and Base Materials

Beneath the trail surface, a series of layers prepares the site for proper weight transfer from surface to sub-grade, good sub-surface and surficial drainage, and an even and relatively level surface across the width of the trail. Trail construction, for the Valley Railroad corridor, would require soil excavation and grading, followed by either regrading and recompacting rail ballast in the case of a trail replacing rail, or adding sub-base material for a trail with rail. In the former case, some rail ballast may need to be removed if soils are to be remediated. The amount (thickness) of sub-base material needed would be determined by the sub-grade soil conditions and the surface material being used.

Rail ballast can be effectively used as sub-base material. (While it could also serve as a surface material, several characteristics complicate this option, including potential contamination and the diameter of the stone [Flink, Olka, and Searns 66-67].) Tracks can leave an imprint on the railbed, known as track tie memory, so the ballast has be to reconstituted at the surface or additional gravel added to reduce an uneven surface. Geotextiles can also be employed to reduce the effect of any persistent track tie memory affecting the trail surface.

In general, trails require a sub-base course of compacted aggregate, typically four to eight inches thick (depending on the surface material used), to be placed immediately below the surface material to aid in proper sub-surface drainage (Flink, Olka, and Searns 66). Both the sub-base and base layers must be graded properly to establish the minimum 2% cross-sectional slope needed for drainage off the trail surface. In addition to aggregates, the sub-base layer can also be formed with two recycled pavement products: recycled asphalt pavement (RAP) and recycled concrete asphalt (RCA); the use of RCA for sub-base material is particularly common (Calkins 244).

A Note on Bridge and Boardwalk Surface Options

Bridges and boardwalks are described in more detail in the section "Stream and Wetland Crossings." It should be briefly mentioned here that these crossings would require retrofitting old rail crossings or building new bridges, either of which would require surface materials, such as:

- Traditional wood decking
- Engineered wood or composite wood products
- Concrete

Photo by Trevor Buckley

5. The Trail Structure: Nodes & Segments

A potential trail would consists of a system of segments and nodes. Nodes are the focal points of activity along trails and points of primary trail access. Segments are the lengths of trail connecting nodes. The following sections explain the general functions of nodes and segments for this project, and describe the nodes and segments possible for a trail along the Valley Railroad corridor, including their respective opportunities and constraints, and design recommendations.

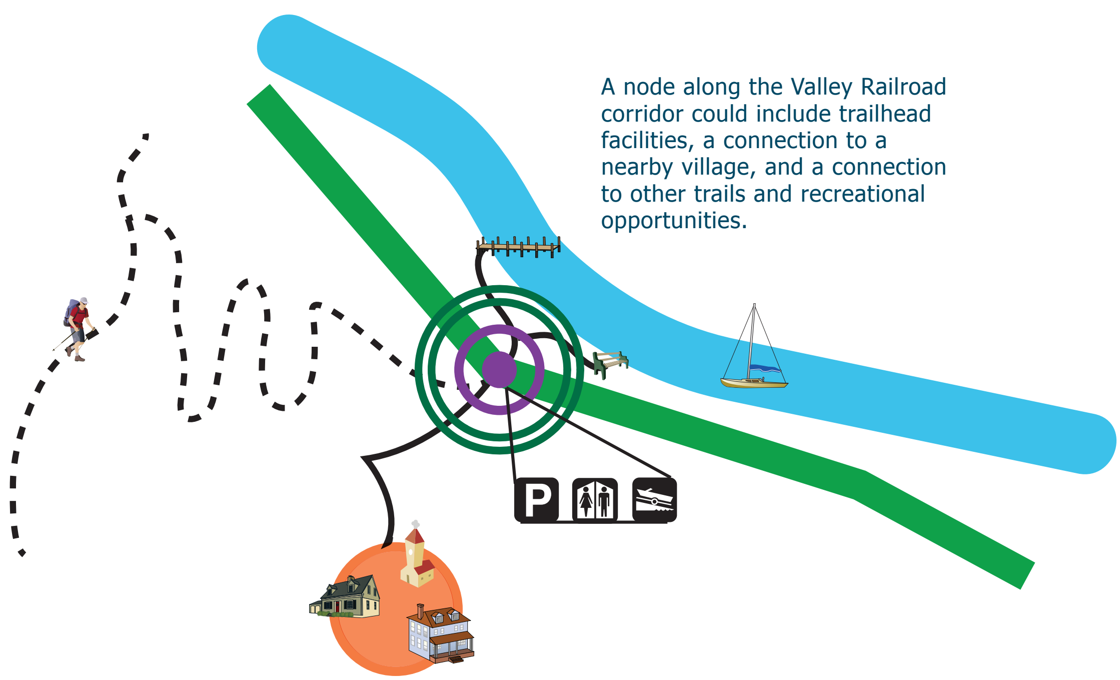
WHAT IS A NODE?

In general, nodes lie at the juncture between distinct segments of the trail, providing a transition between different types of trail experiences, for example, zones of different trail use or surface material. They also serve as nexus points linking trails and local communities via trailheads or trail connectors (secondary paths) to neighborhoods, other trails, and recreational opportunities. In this capacity, nodes may include a trailhead, but not necessarily; a node may be situated at the intersection of trails without providing access from the road. In the case of the linear and narrow Valley Railroad corridor, each proposed node in this project includes trailhead facilities.

Traveling along a trail, a visitor should find nodes logical places to pause, rest, and reorient themselves, including disembarking from the trail or diverting onto another route. Visitors to a trail along the Valley Railroad Corridor may choose to avail themselves of the facilities and river access at these nodes without using the trail itself—perhaps, enjoying a picnic on the beach or putting in their canoes and kayaks for a paddle through wetlands. Each of these nodes, once developed, should invite the user in, provide ease of trail access and necessary facilities, and connect trail users with the local and regional landscape.

Potential locations for nodes were assessed for their characteristics and potential in regards to:

- Connectivity to village centers, local attractions, recreational opportunities, nearby provisions, and accommodations.
- Safe and convenient accessibility to a trail.
- Facilities and amenities.



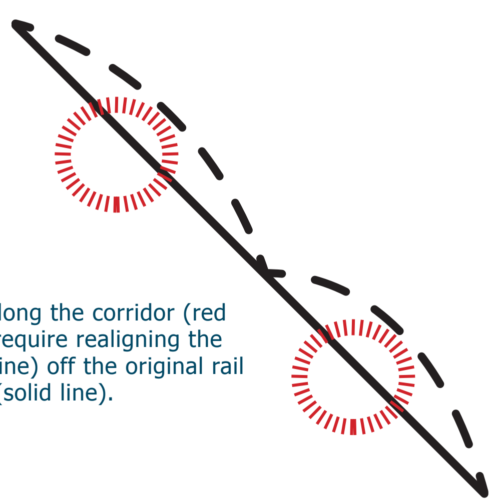
A node along the Valley Railroad corridor could include trailhead facilities, a connection to a nearby village, and a connection to other trails and recreational opportunities.

Photo left: The recreational hub at Haddam Meadows State Park could serve as a trail node with trailhead facilities and connections to Haddam Center and local attractions, with the development of sidewalks and bike paths.

WHAT SHOULD DEFINE THE SEGMENTS?

Segments are the lengths of trail between the nodes, each of which should be designed according to its distinguishing characteristics and potential user experience. For the Valley Railroad corridor, these characteristics include:

- Length (distance between nodes).
- Level of accessibility for trail users and emergency and maintenance vehicles.
- Environmental constraints, such as susceptibility to soil erosion and sensitive habitats.
- Views and access to the Connecticut River.
- Alignment (e.g., within confines of railroad ROW) and shape (straightness or curvature).
- Type and proximity of abutting property owners and land uses.
- Type of points of interests (e.g., historic sites or natural habitat).
- Number and types of rail and road crossings.
- Number and type of stream and wetland crossings.



Constraints along the corridor (red circles) may require realigning the trail (dotted line) off the original rail right-of-way (solid line).

Given their unique characteristics, each segment may provide a different experience for trail users. Those different experiences can also be designed to create zones of use along the trail, by changing surface material to signify different uses or by creating a schedule of uses that prevents conflicting activities from taking place at the same time. For example, equestrian use, which is considered unsafe for trail visitors using wheelchairs, might be limited to specific days of the week.

Depending on the distance between nodes, segments should be accessible at certain points outside of trailheads, for ease of access to users, maintenance crews, and emergency vehicles. Each segment should also offer some amenities for the trail users. These could include benches for resting, picnic tables for gathering, small trails to access the river for put-ins and take-outs for paddling, and directional and educational signs to lead the visitor along the trail and share historically and ecologically significant stories along the way.

Given the narrow right-of-way and physical constraints along the Valley Railroad corridor discussed earlier, adjustments may be needed and/or additional right-of-way may be necessary for a trail in the following situations:

- Trail with rail where constraints necessitate the trail departing from the rail corridor (as discussed in the section "Type 3: Trail with Rail").
- Trail-rail crossings, where the trail needs to be curved and thus moved out of the ROW in order to achieve a 45 to 90 degree intersection between trail and rail (See section on "Safe Crossings" on page 95).
- Seasonal and/or permanent re-routing to avoid sensitive habitat, such as wetlands where migratory birds are feeding, or place where birds are nesting.
- Locations of extreme soil erosion susceptibility, where washouts may be expected (see "Drainage, Flood Hazard, & Erosion Susceptibility" in Analysis I).

The alignment of the corridor shapes the experience of trail visitors. The gentle curves in the corridor offer suitable visibility for a multiuse trail (i.e., 150-foot sightlines at any given point for safe cycling) (Flink, Olka, and Searns 24); they also add interest and comfort to trail users as they proceed across an otherwise linear path. Long straightaways can be monotonous, particularly for walkers or runners (but see informational box at bottom right). There are three nearly one-mile-long straight sections along the study corridor:

- A section beginning at Goodspeed Station and continuing until the corridor turns from the river and approaches Midway Marina.
- A section beginning just west of the Town of Haddam Transfer Station and extending west towards Swain Johnson Brook, where Route 154 veers away from the rail corridor (see photo spread on pages 60 to 61).
- A section of causeway, beginning at Hubbard Brook and extending north towards the Pratt & Whitney property (see photo on this page).

These sections of track have a striking visual quality: they appear to extend as far as the eye can see, and, at sections near Goodspeed and west of Haddam Meadows, they parallel the river closely and offer great views. These could be designed into promenades or esplanades running along the river with seating, overlooks, and picnic spots, and possibly user access points from nearby Route 154.

Photo by Trevor Buckley

The straight-away on the railbed in Maromas, north of the Hubbard Brook trestle.

METAPHORIC TRAVEL

Long straightaways may be monotonous, or could they offer something special to those traversing them? Left unadorned and simply designed, straight trails of this length can create an affecting visual and psychological experience—what designer Randolph Hester describes in *Design for Ecological Democracy* as “metamorphic travel” or “a walk without measure” that can engender places for meditative outings without much distraction along the way (407). Hester encourages designers “to be disciplined and restrained [with these places] to create a stoic landscape,” and he specifically mentions historic rail corridors among potential sites.

The nearly mile-long straight-away, adjacent to Saybrook Road and the Connecticut River, could serve as a pedestrian esplanade with overlooks and access to small beaches.

Photo by Trevor Buckley

Proposed Nodes

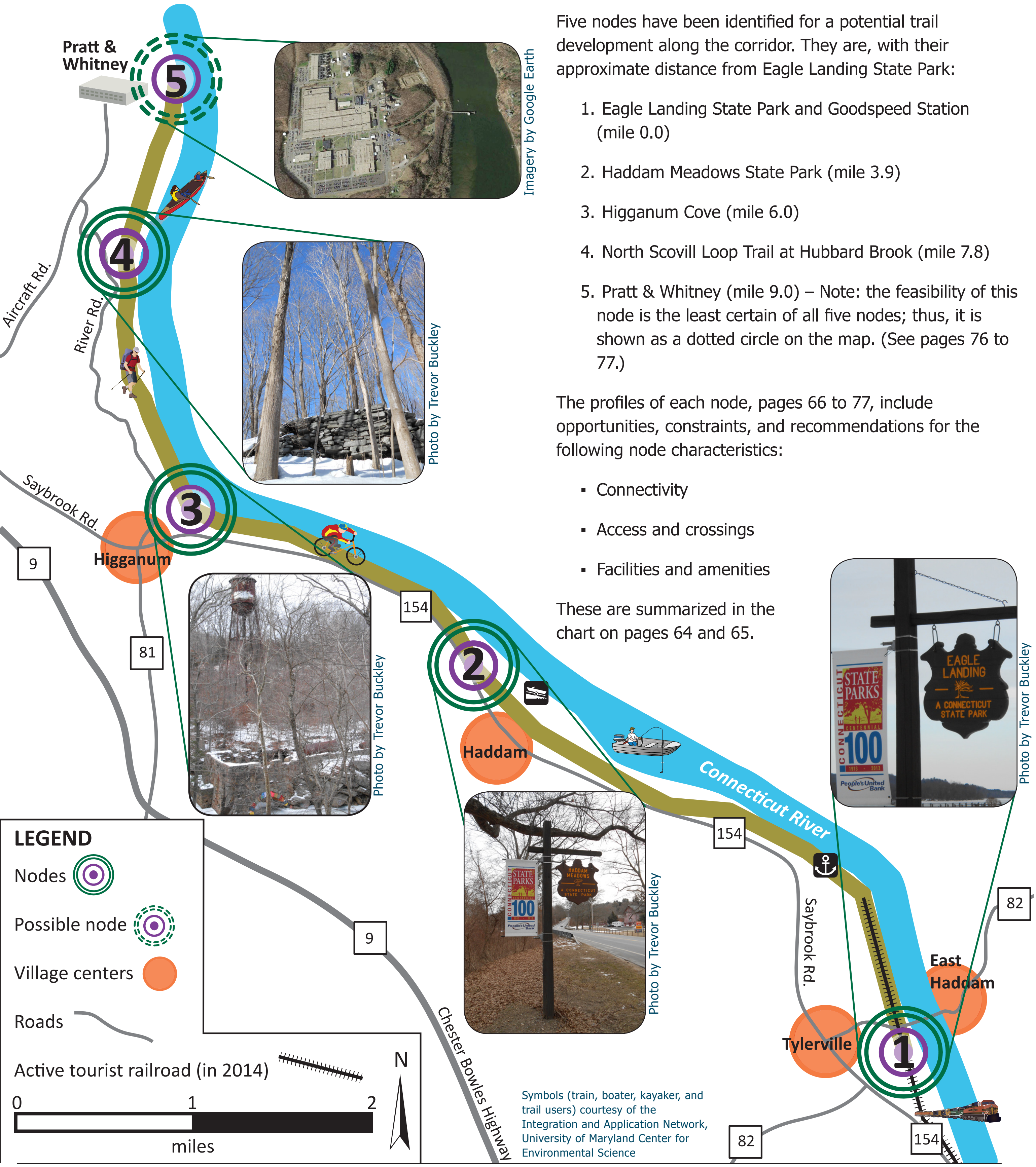
Five nodes have been identified for a potential trail development along the corridor. They are, with their approximate distance from Eagle Landing State Park:

1. Eagle Landing State Park and Goodspeed Station (mile 0.0)
2. Haddam Meadows State Park (mile 3.9)
3. Higganum Cove (mile 6.0)
4. North Scovill Loop Trail at Hubbard Brook (mile 7.8)
5. Pratt & Whitney (mile 9.0) – Note: the feasibility of this node is the least certain of all five nodes; thus, it is shown as a dotted circle on the map. (See pages 76 to 77.)

The profiles of each node, pages 66 to 77, include opportunities, constraints, and recommendations for the following node characteristics:

- Connectivity
- Access and crossings
- Facilities and amenities

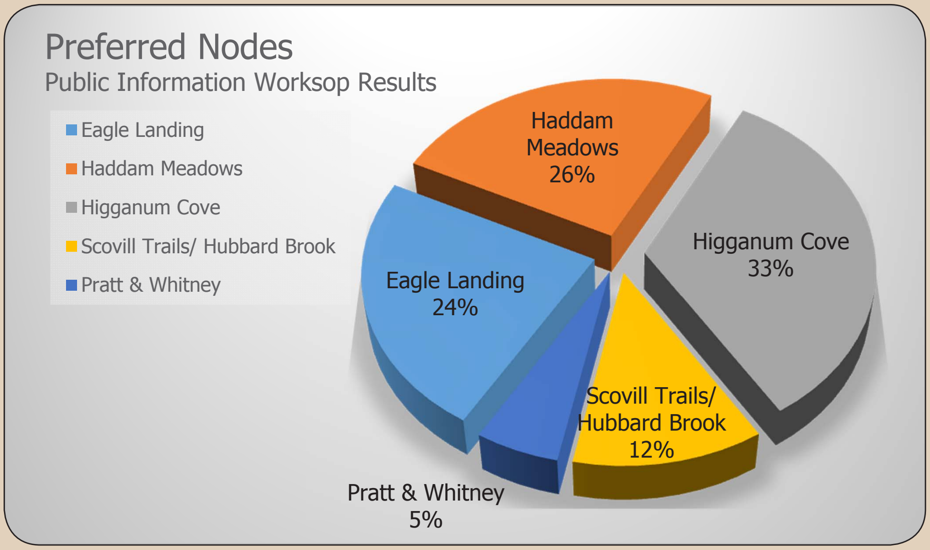
These are summarized in the chart on pages 64 and 65.



Symbols (train, boater, kayaker, and trail users) courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science

PUBLIC FEEDBACK

Participants at the public information workshop for this study were asked to vote on their preferences for potential nodes. The pie chart displays the results, with Higganum Cove leading with about a third of votes, and Haddam Meadows and Eagle Landing trailing not far behind, with about a quarter of the votes each. The northern two proposed nodes received far fewer votes.



VILLAGE CONNECTIONS

Three of the proposed nodes can provide village connections within a half-mile or less, contributing to the integration of a potential trail into existing regional assets.

A Regional Tourist Hub

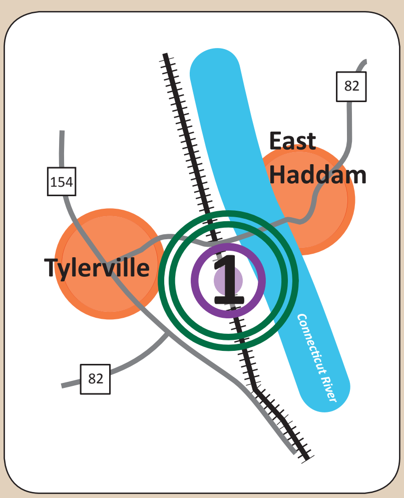
A node at Eagle Landing State Park/Goodspeed Station would be 0.5 mile from Tylerville and East Haddam across the river.

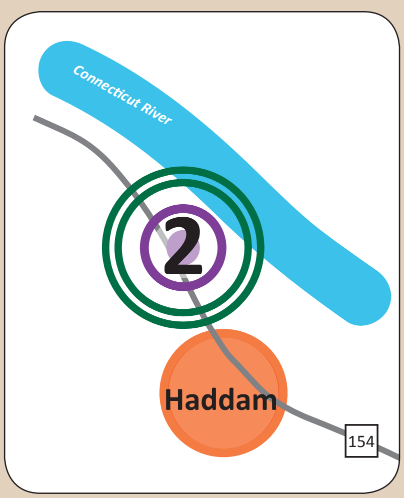
A Recreational Destination

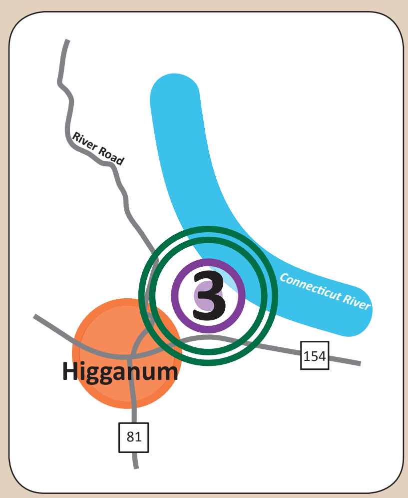
A node at the entrance of Haddam Meadows State Park would be 0.4 miles from Haddam Center.

A Focal Point of Community Interest in Public River Access

A node at Higganum Cove would be 0.5 miles from the center of Higganum village.







SUMMARY OF PROPOSED NODES

Node	Opportunities	Constraints	Recommendations
Eagle Landing State Park and Goodspeed Station At Route 82/Bridge Road near the Haddam Swing Bridge	▪ Located at a regional crossroads for traffic and tourist activity, because of the bridge. ▪ Ample parking available at Eagle Landing. ▪ Two village connections possible: Tylerville and East Haddam across the river, which have businesses to serve trail users.	▪ Heavy car traffic, particularly in warmer months with increased recreational use near the river. ▪ Visibility at crossing obscured by vegetation near bridge and curved downhill approach from Tylerville.	▪ Use parking at Eagle Landing State Park. ▪ Begin trail access next to parking at Eagle Landing with road crossing. ▪ Install active warning beacon and crosswalk at Route 82/Bridge Road.
Haddam Meadows State Park At entrance road off Route 154/Saybrook Road	▪ Local recreational hub and special events/ festival site. ▪ This site has the only public general boat launch in study area. ▪ Village connection to Haddam Center possible.	▪ Corridor crosses over park road at entrance, just yards from Route 154, creating safety issues. ▪ Current parking at park entrance is limited.	▪ Add parking and amenities to establish a trailhead. ▪ Install at-grade crossing(s) over Route 154 to connect to trails or residential road routes to Haddam Center.
Higganum Cove At both Norsal Road/ Cove Wharf Road and Depot Road	▪ Town is already interested in developing site, with public access to river and recreation. ▪ History of industrial and commercial use of site offers intrigue and educational appeal. ▪ Village connection to Higganum Center possible, which has businesses to serve trail users.	▪ Remediation is needed to use former industrial portion of the site. ▪ Narrow and curvy roads require new bike and pedestrian infrastructure to create a connection to the center of Higganum village.	▪ Develop some parking at trail corridor, but encourage trail connection to Higganum with bike and pedestrian infrastructure. ▪ Include historical education component with interpretative signs.

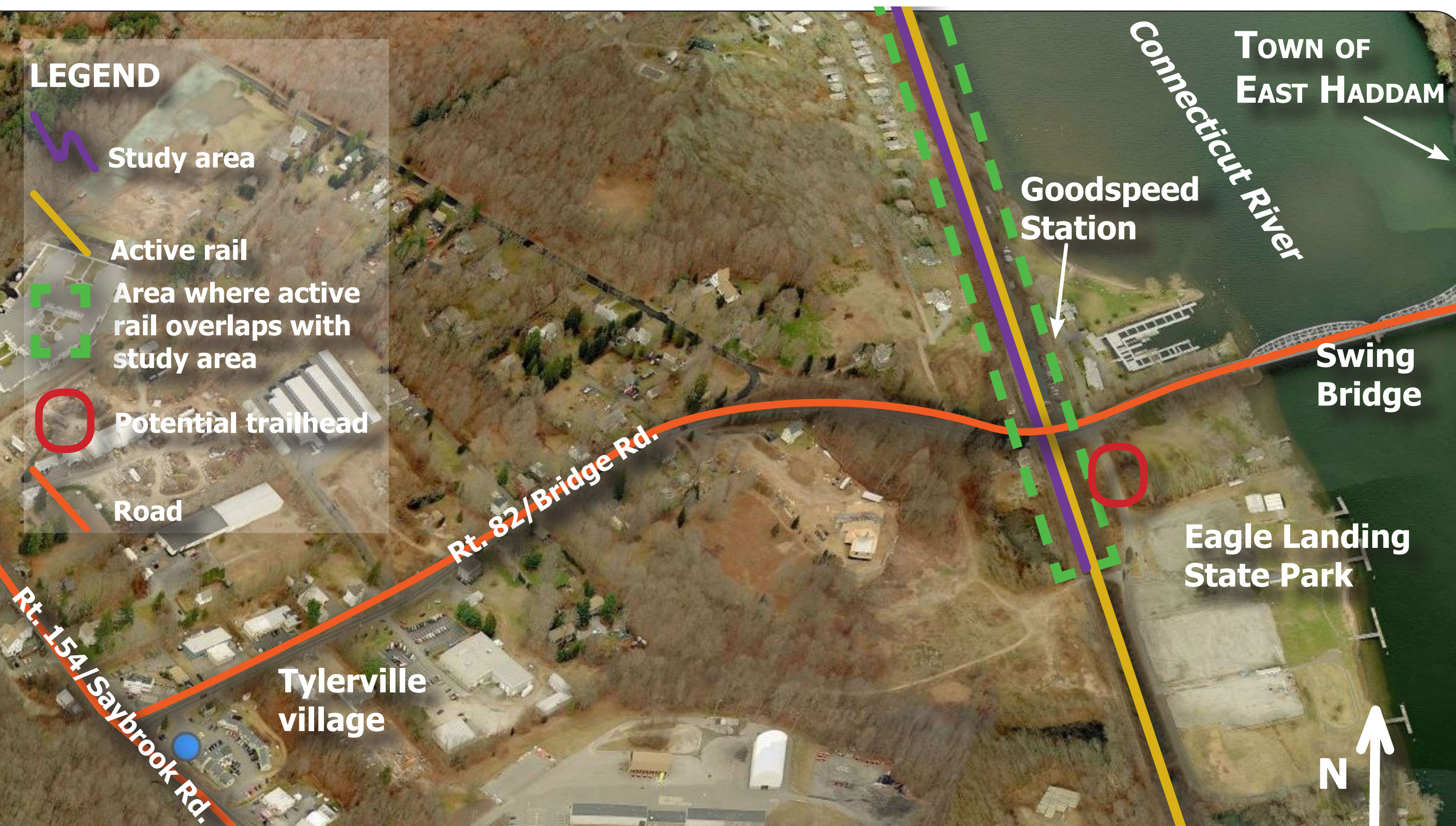
Node	Opportunities	Constraints	Recommendations
North Scovill Loop Trail at Hubbard Brook At parking for Scovill Trails on River Road and at bottom of utility road that intersects with the rail corridor.	▪ Location of existing hiking trails and conservation land open to the public. ▪ Hubbard Brook and wetlands are popular with paddlers. ▪ Small parking lot on River Road and Scovill Trails and utility roads could provide access to corridor downslope.	▪ Road access at River Road is half a mile upslope; rail corridor is currently accessible only by hiking trail or unimproved utility road. ▪ There are sensitive habitats in the vicinity of the node, including beach shores delineated by DEEP as Critical Habitat.	▪ Consider additional parking and trailhead facilities at River Road. ▪ Grade and improve utility road for wheelchair accessibility and for paddlers to carry canoes and kayaks to the river; consider allowing limited car access to utility road for these types of trail users. ▪ Designate river access points for visitors and put-ins for paddlers.
Pratt & Whitney At pier access road, downslope and east of the Engine Center complex	▪ Would provide a node at the north end of corridor. ▪ Potential trail access exists at road to Pratt & Whitney's pier. ▪ Possibility exists for trail node to offer a spot for employee recreation and trail access, and potentially commuting. ▪ Pier/jetty could provide a connection between the trail and boating on the river.	▪ Current access to the corridor is limited; there is no access from north of a potential trail; the only road access is through Pratt & Whitney's property. ▪ Pratt & Whitney has security and safety concerns with trail access.	▪ Work with Pratt & Whitney to ascertain suitable levels of access. ▪ Develop parking at Pratt & Whitney dock for trailhead.

Node: Eagle Landing State Park & Goodspeed Station *in Tylerville*

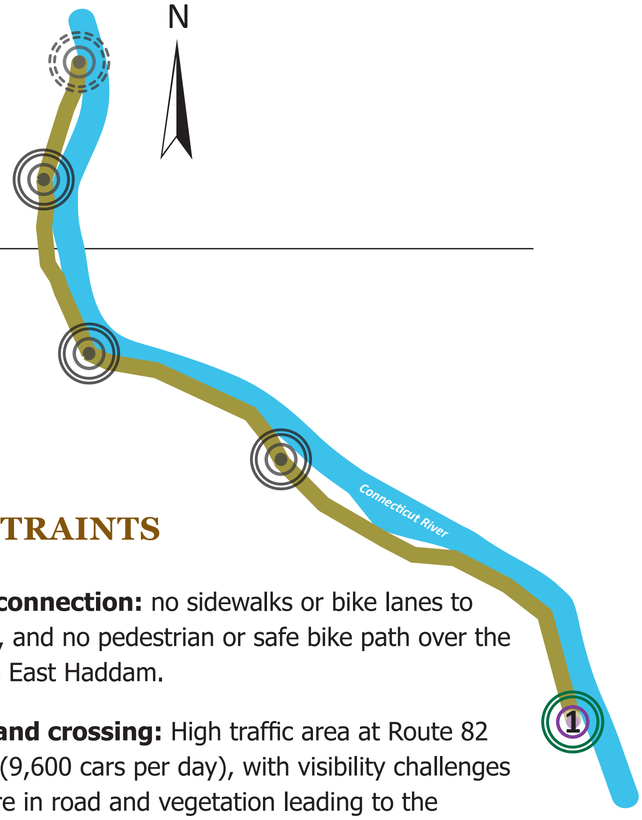
A node at the waterfront Eagle Landing State Park and Goodspeed Station provides a gateway to two villages popular with tourists and the only bridge in the area linking the east and west sides of the Connecticut River. An agricultural area until the 1960s, Eagle Landing has since served as a seasonal tourist and recreation hub providing access to river cruise excursions, a paddling put-in/take-out, and wildlife viewing. The recently created state park is known for winter eagle nesting. Goodspeed Station is a site upslope from Eagle Landing that historically was home to a Valley Railroad train depot; the station structure no longer exists, though a gift shop is located in an old warehouse building. The Valley Railroad Company operates its Eagle Flyer and Dinner Service tourist steam train excursions as far north as Ruddy Creek, about one mile past Goodspeed Station. This area is located on busy Route 82/Bridge Road leading to the Swing Bridge, with a daily car count of 9,600 (Google Earth Pro).

Photo by Christian Johnson

The depot at Goodspeed Station no longer stands, but an old warehouse is home to a gift shop, and there is a piece of rolling stock next to a section of active rail.



Imagery by Bing Maps



OPPORTUNITIES

Village connections: Tylerville (0.5 mile) and East Haddam (0.3 mile)

Local attractions: Goodspeed Opera House, historic homes and sites in East Haddam (across the river).

Recreational opportunities: a paddling launch at Eagle Landing, two tourist boat excursions depart from Eagle Landing (*RiverQuest* and the *Lady Katherine*), eagle watching at Eagle Landing, and a link to Essex steam train at Goodspeed Station.

Provisions: food establishments in both villages and fuel in Tylerville.

Accommodations: Gelton House Inn in East Haddam.

Access and crossing: at-grade crossing potential at Route 82/Bridge Road to access trail corridor.

Facilities and amenities: ample parking at Eagle Landing south of Route 82 (legacy of a former cruise ship operation), porta-johns, gazebo shelter, docks, and gift shop.

CONSTRAINTS

Village connection: no sidewalks or bike lanes to Tylerville, and no pedestrian or safe bike path over the bridge to East Haddam.

Access and crossing: High traffic area at Route 82 crossing (9,600 cars per day), with visibility challenges (curvature in road and vegetation leading to the bridge)

Trail-with-rail necessary for about a mile north of Route 82 where the rail is in active use.

Facilities: there is little room for parking on the north side of Route 82, nearest the potential trail corridor, which necessitates a crossing from Eagle Landing State Park at Route 82.

Photo by Trevor Buckley

The view to East Haddam from the docks at Eagle Landing State Park.

Photo by David Nelson

The sign and traffic signal on the approach to the Swing Bridge from Tylerville.

RECOMMENDATIONS

Village connection:

- Install sidewalks or footpaths and bicycle lanes or cycle track (off-road bike path) to Tylerville.
- Add 9 Town Transit bus service from Tylerville and East Haddam.
- Investigate a pedestrian bridge or boat link (such as a water taxi or small ferry) to East Haddam.

Access and crossings:

- Begin trail next to parking at Eagle Landing, with trailhead facilities.
- Install a crossing that has safety features, including an active warning beacon and possibly median refuge island to slow down vehicular traffic on Route 82 (see page 96).

CONNECTIONS: ACROSS THE RIVER TO EAST HADDAM

East Haddam is a quaint village on the east bank of the Connecticut River, settled in 1622. Lying directly opposite the proposed node at Eagle Landing and Goodspeed Station, East Haddam can only be directly reached from the study area using the narrow century-old Swing Bridge—which has no lanes or shoulder for cyclists and/or pedestrians—or by canoe and kayak. (There is a DEEP-owned car-top boat launch below Goodspeed Opera House). For those with a motorized boat, there is no public river access or dock to moor at East Haddam. (Goodspeed Opera House has a private pier). Potential trail users would, at the present time, have little means to cross to East Haddam, except in a car. With narrow streets and limited parking, the village is not set up for increased visitation that a trail could bring. Without an improved link, trail users might miss out on the many cultural and historic attractions and small businesses, and proprietors could thrive on this economic opportunity.

Recommendation: Given the unlikelihood of altering the architecturally significant (and cherished) Swing Bridge, the most sensible alternatives would be to add bus or boat service from Eagle Landing to East Haddam. The Town of East Haddam could sign a contract with Nine Town Transit, as the Town of Haddam has, in order to extend service across the river at the Bridge. (There is currently Dial-a-Ride service available in East Haddam.) This service could be initiated with a trial period to test ridership, and could be scheduled on a seasonal basis to reflect increased summer traffic.

Photo courtesy of RiverQuest

The stately Goodspeed Opera House, perched on a bank next to the Swing Bridge, is a defining feature of the riverscape at East Haddam village.

Trail facilities and amenities

- Use the parking at Eagle Landing State Park to avoid new paving.
- Develop a trail center that will draw on the tourist traffic, perhaps including a small environmental education center that could link with RiverQuest, the ecotourist boat excursion out of Eagle Landing.
- Employ a concessionaire or seasonal food cart to sell food and beverages.
- Replace the portable toilets with a permanent composting toilet facility (as there is no public sewer in Haddam and this would avoid installing a septic system).
- Explore installing a self-service bike service station (see page 87).

CONNECTIONS: VALLEY RAILROAD COMPANY AT GOODSPEED STATION

There are multiple opportunities for Valley Railroad's current operations to link into a trail node at Eagle Landing and Goodspeed Station. The Company already runs its Eagle Flyer during the winter months north to Ruddy Creek and the Dinner Service excursions run regularly from May to October. The Company's riverboat, the *Becky Thatcher*, sails from Deep River to the Swing Bridge, and there are some historic buildings and sample rolling stock (historic train cars) at the site, with a gift shop currently occupying an old freight warehouse.

Photo courtesy of Valley Railroad Company

A more informal version of the current Dining Service excursion could supply trail users with a meal option after a long walk down the corridor, perhaps while the train transports them down to their origination point at the train station in Essex.

Photo by L.B. Carlson, courtesy of Valley Railroad Company

Valley Railroad could offer educational opportunities at a new multifunctional educational center at Eagle Landing or Goodspeed Station, leading field trips such as the company does at the Essex train yard.

Photo courtesy of Valley Railroad Company

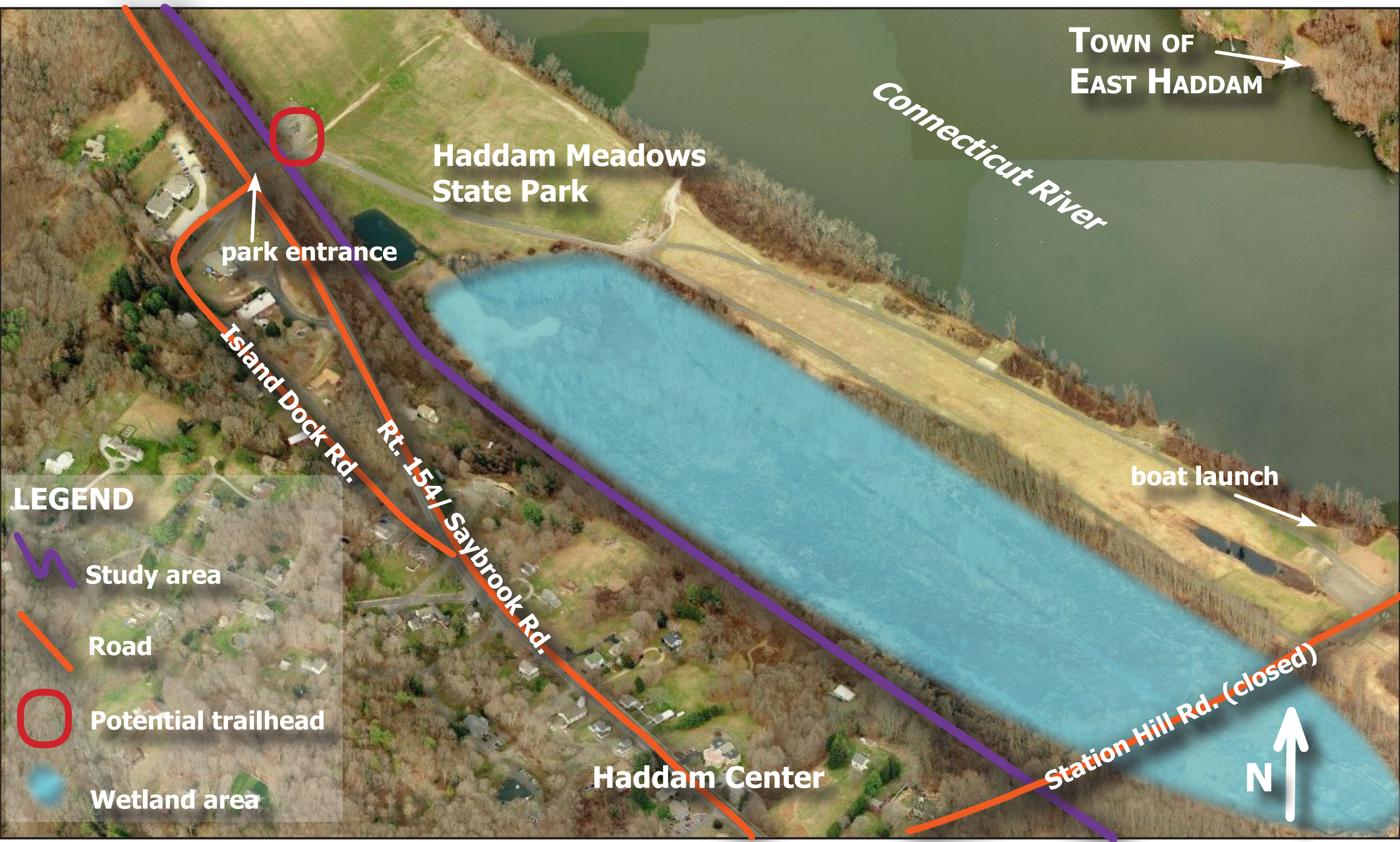
The *Becky Thatcher* could add a stop in at the Eagle Landing dock to pick up trail visitors and transport them downstream to Gillette Castle State Park or the villages of Chester, Essex, and Deep River.

Node: Haddam Meadows State Park
in Haddam Center

Haddam Meadows is a historic site of community agriculture and regional shipping. Today it is a popular state park with the only public boat launch along the corridor and extensive wetlands and floodplain forest known for birding and other wildlife viewing. Close to Haddam Center, right off Route 154/Saybrook Road, and along the current 9 Town Transit bus line, Haddam Meadows provides a central and well-known location for a potential trail node.

Photo by Trevor Buckley

A view across the Meadows from the entrance to the park.



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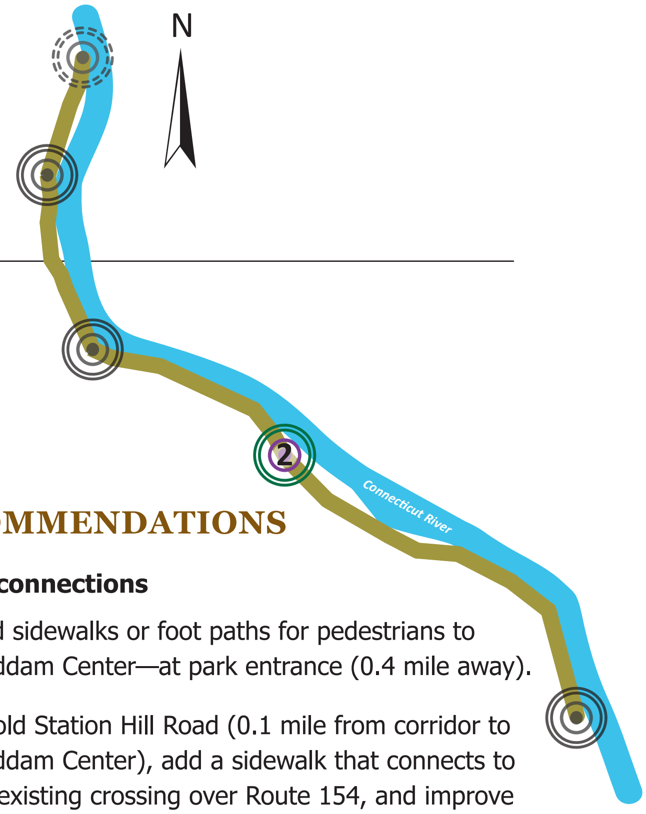


OPPORTUNITIES

Village connections

- Located 0.4 mile from Haddam Center.
- Located roughly midway between Tylerville and Higganum village centers, along Route 154.
- 9 Town Transit bus will stop along Route 154 if flagged down and will drop off at other locations as requested.

Local attractions: Haddam Historical Society (Haddam Center) housed in the Thankful Arnold House, Brainerd Memorial Library, Town Hall, Field Park, and the former jail building.

Accommodations: Nehemiah Brainerd House B&B near Haddam Center.

Access and crossings: at-grade and near-grade access for a trailhead.

Facilities and amenities

- Popular boat launch, fishing, picnicking spot, and trails for hiking and cross-country skiing.
- Hotspot for wildlife viewing, along river and wetlands.

CONSTRAINTS

Village connection: few provisions in Haddam Center.

Access and crossings

- Corridor crosses over park road at entrance, just yards from Route 154, presenting safety issues.
- No safe crossing or access to Haddam Center at present; car count of about 4,900 cars per day on Route 154 (Google Earth Pro).

Facilities and amenities

- Limited parking at entrance where potential trail would be located.
- Few existing facilities near potential trailhead (e.g., restrooms, picnic tables)

RECOMMENDATIONS

Village connections

- Add sidewalks or foot paths for pedestrians to Haddam Center—at park entrance (0.4 mile away).
- At old Station Hill Road (0.1 mile from corridor to Haddam Center), add a sidewalk that connects to an existing crossing over Route 154, and improve and lengthen sidewalks along Route 154 (there are some sections of sidewalk from the post office to Walkley Hill Road).
- Add bike sharrows (pavement stenciling that alerts drivers to share the road with bike traffic), bike lanes, or cycle tracks along Route 154 or residential streets to provide village connections.
- Add 9 Town Transit bus stop, perhaps on a seasonal basis.

Access and crossings

- Direct traffic to Island Dock Road, a residential road near park entrance leading to Haddam Center (takes pedestrian/bike traffic off Route 154).
- Provide safe crossing over Route 154 to Island Dock Road (see conceptual diagram in "Safe Crossings" page 97), with pedestrian and bike right-of-way.

Facilities and amenities

- Place trailhead close to existing parking or locate alongside new parking lot.
- Install an educational exhibit related to wetlands and wildlife viewing at the park.
- Employ seasonal concessionaires, perhaps on weekends to begin with (for a trial run).
- Explore installing a self-service bike service station.

Node: Higganum Cove *in Higganum Village*

Lying at the confluence of Higganum Creek and the Connecticut River, Higganum Cove was the site of mills and factories from the 1700s to the 1980s, as well as shipbuilding in the nineteenth century. Valley Railroad trains stopped at a depot on the southeast side of the cove. Today, the area is a focal point of community interest in public access to open space and the river. Given this interest and location close to the village of Higganum, Higganum Cove provides a logical node. The Town of Haddam, as discussed earlier (page 37), plans to purchase two sites to develop into recreational facilities near the rail corridor and river, and connect these facilities to the village center. These include the twelve-acre former industrial site at the Cove (the Frismar property) and an adjoining nine acres—the McCain property—across the creek from the industrial site. This hub could link well with a potential trail development, providing a trailhead and connection between the trail and other recreational opportunities.

OPPORTUNITIES

Village connections: Situated 0.5 miles downslope and northeast of the center of Higganum.

Local attractions: industrial ruins and cove with wetlands and wildlife.

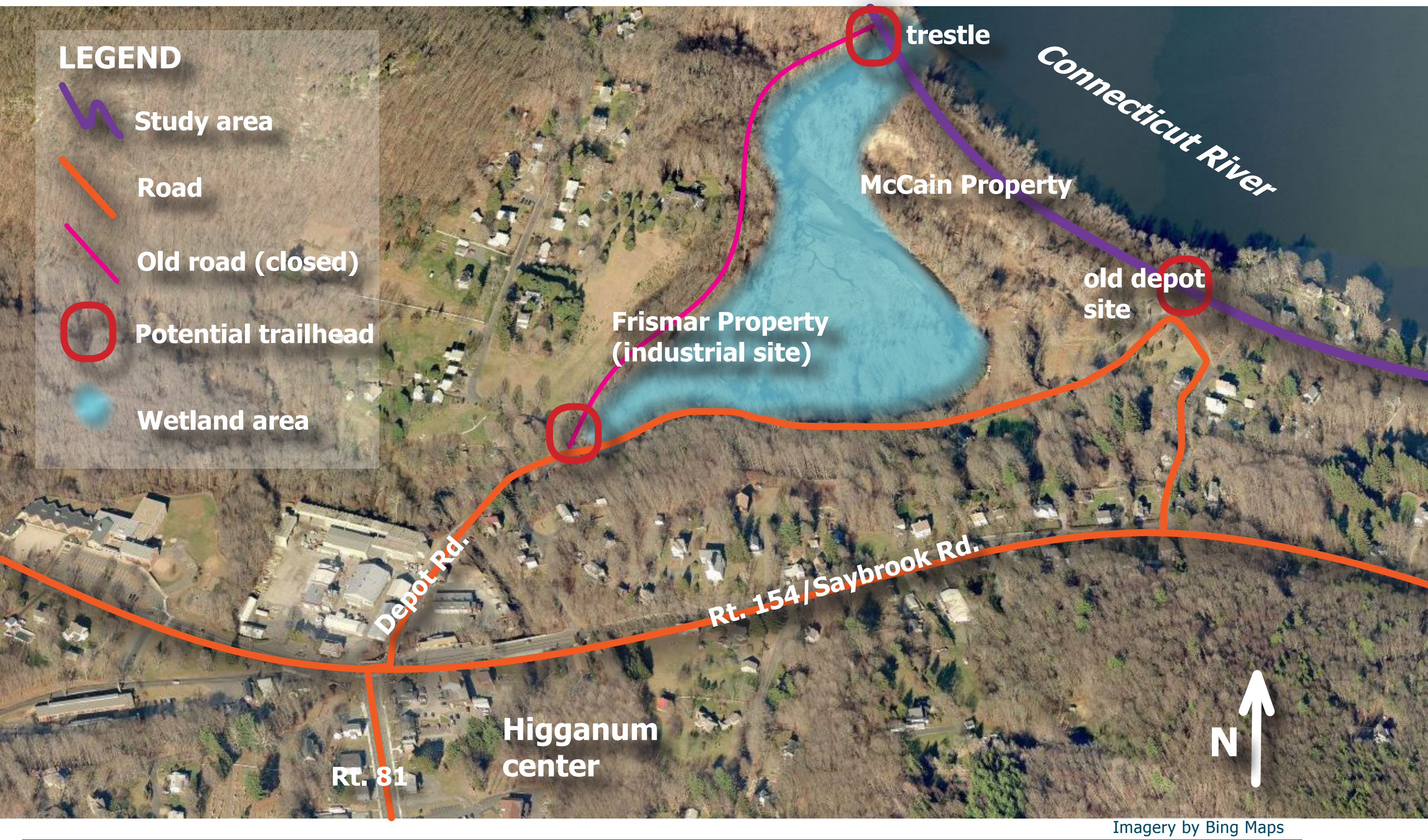
Recreational opportunities: The Town envisions future facilities for Higganum Cove site.

Provisions: grocery, drug store, food establishments, bank, and gas in Higganum.

Access and crossings

- The nine-acre tract that the Town hopes to buy is located directly adjacent to the corridor, which presents potential access.
- There is an old road (pink line in aerial photo) that crosses through the twelve-acre industrial site and leads down to the rail corridor.

Facilities and amenities: There appears to be cleared land available for parking near the site of the former train depot.



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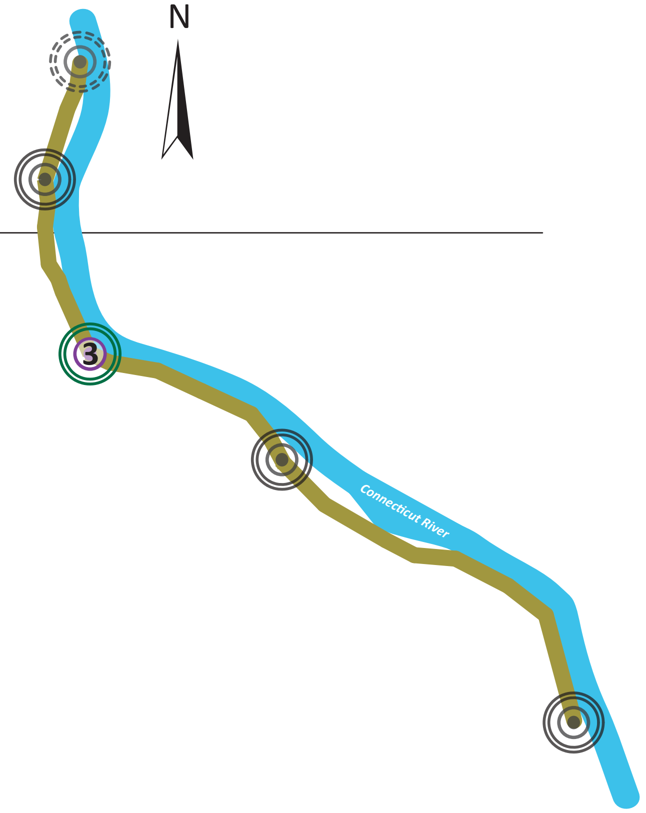


CONSTRAINTS

Village connections: bike and pedestrian connection to village center requires infrastructure along narrow and/or winding streets (Depot Road and nearby residential streets, such as Landing Road).

Facilities and amenities:

- Environmental contamination issues at the industrial site require remediation to a level safe for passive recreation.
- No facilities exist at this time.

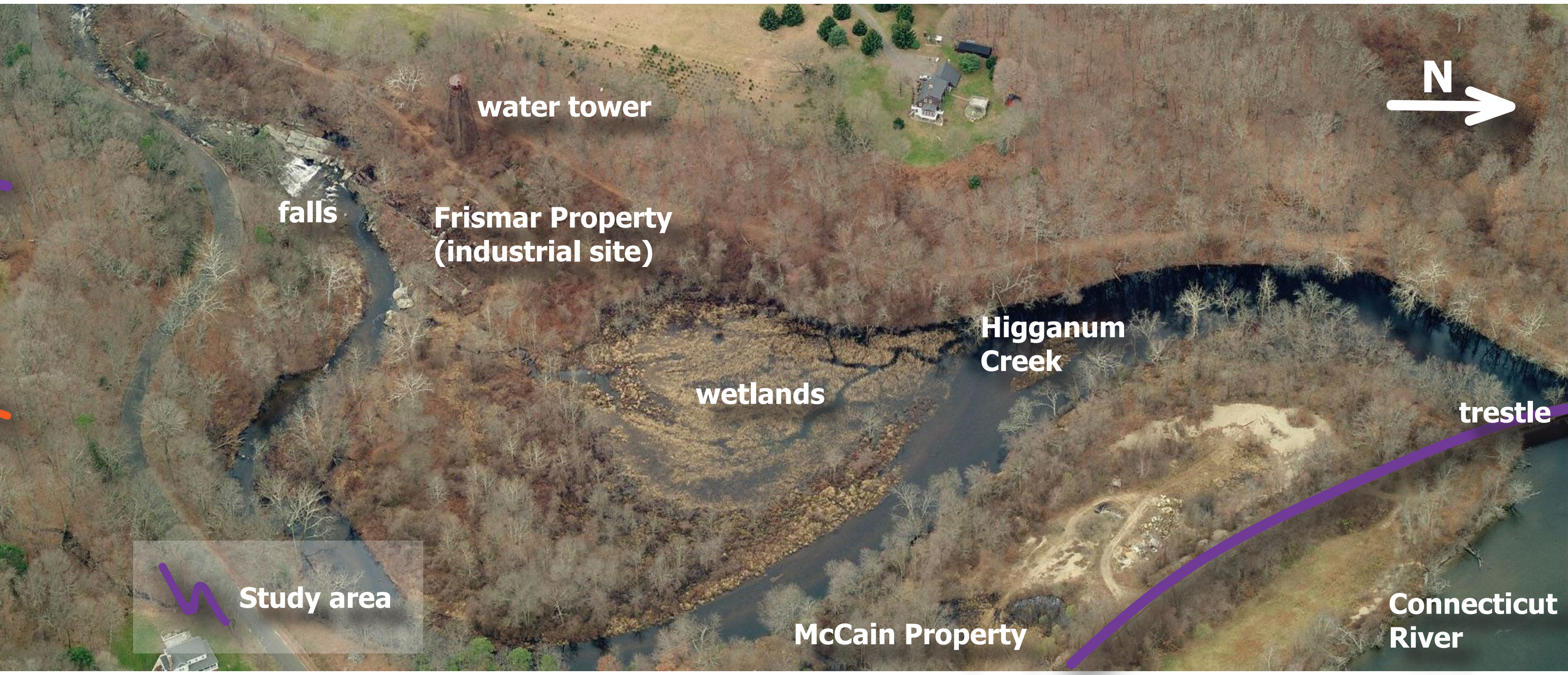
RECOMMENDATIONS

Village connections

- Add sidewalks and sharrows (pavements stenciling indicated shared bike-car lane) or bicycle lanes to Higganum Center.
- Add a 9 Town Transit bus stop, perhaps on a seasonal basis.

Facilities and amenities

- Develop a system of signs for historical, cultural, and environmental interpretation of the Cove—including the industrial ruins and wetlands.
- Employ seasonal concessionaires to serve trail users.
- Integrate trailhead(s) with future municipal recreational facilities on east side of creek.



Imagery by Bing Maps

Node: North Scovill Loop Trail at Hubbard Brook
in Maromas

The intersection of the north Scovill Loop Trail, a utility road, Hubbard Brook, and the Valley Railroad corridor near the Connecticut River in Maromas creates a logical recreational hub along a potential trail. This conservation land, owned by Northeast Utilities (Connecticut Light and Power) and co-managed with DEEP as Cooperative Wildlife Management Area (WMA), includes a portion of the 74-acre conservation easement that Connecticut Forest and Park Association (CFSA) holds in the area. (While this CFSA easement is known as the Hubbard Brook Preserve, it is owned by Northeast Utilities [Cain].) The WMA is currently open to the public for passive recreation. Some activities, such as camping, are restricted.

OPPORTUNITIES

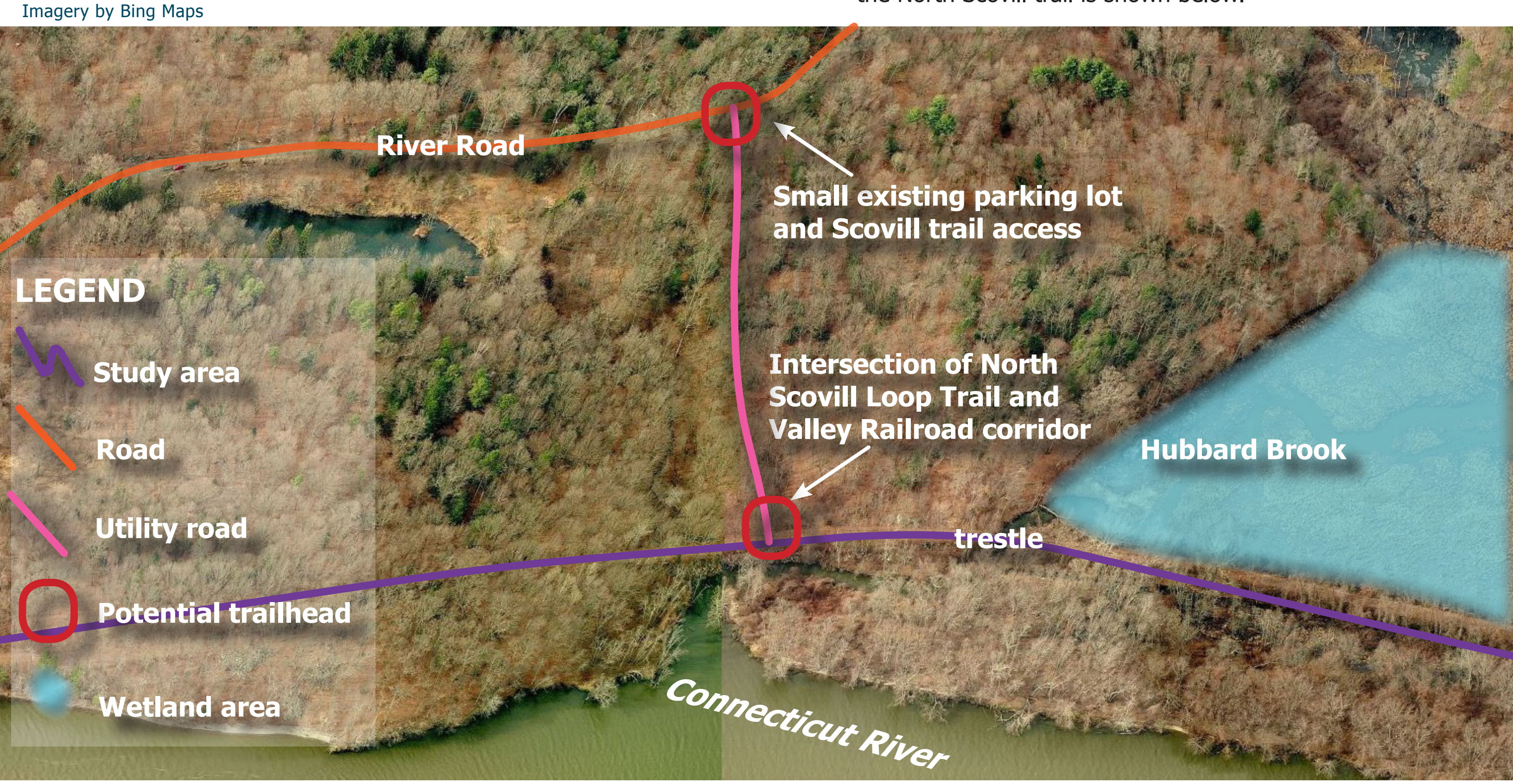
Recreational opportunities

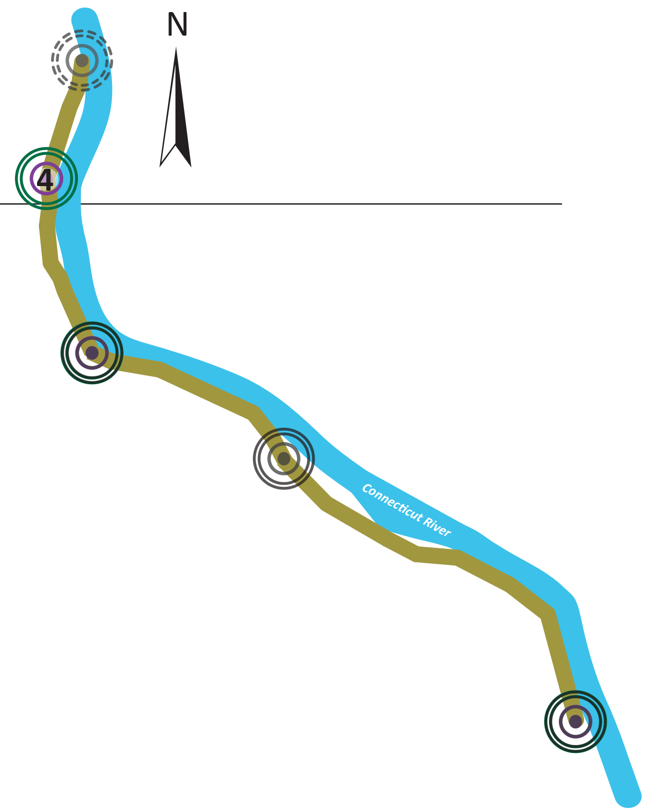
- Scovill hiking trails provide additional recreational opportunities.
- Hubbard Brook and its outlet into the Connecticut River could provide paddling access.
- Could serve as a nexus between the corridor and river recreation and regional hiking trails (Scovill Loop Trails and possibly New England Scenic Trail one mile upslope).
- Distance from residential neighborhoods and villages could provide a suitable place for camping, especially for paddlers traveling down the Connecticut River.

Access

- Scovill hiking trails link the rail corridor to River Road and parking there.
- Utility roads provide access from River Road to the rail corridor. The road from the trailhead for the North Scovill trail is shown below.

Imagery by Bing Maps





CONSTRAINTS

Village connections: no villages nearby, but Higganum Center is about two miles south.

Access

- The rail corridor is 0.5 miles downslope from road access and parking, so a trail connector would be needed to River Road.
- Grading of the utility road would be needed to make it accessible for visitors in wheelchairs arriving at a trailhead on River Road, or the road would need to be improved for vehicular access so that these visitors can drive down to the trail.

RECOMMENDATIONS

- Improve utility road for emergency and maintenance vehicles.
- Grade the utility road to make it accessible for visitors in wheelchairs arriving at a trailhead on River Road, or improve the road for vehicular access so that these visitors can drive down to the trail.
- Add designated paths to the river from the trail to provide paddling access and to prevent foot traffic off corridor into woods and wetland areas.
- Consider adding a small boardwalk system or overlooks to Hubbard Brook wetland areas.
- Study efficacy of camping near the node and on the adjoining conservation land.

Photo by Trevor Buckley

Trestle over Hubbard Brook, looking north towards Pratt & Whitney's property (see next node, pages 76 to 77).

Node: Pratt & Whitney *in Maromas*

Further study needed to determine efficacy of this site

The dock at Pratt & Whitney's Engine Center in Maromas is near the northern terminus of the Valley Railroad property and thus would provide a logical end point and access point for a potential trail. Pratt & Whitney's employees and customers have convenient access to the corridor and could take advantage of the trail. More information is needed, however, on whether Pratt & Whitney is amenable to this idea.

Courtesy of Valley Railroad Company

The access road from Pratt & Whitney's Engine Center to the pier, currently gated off (picture taken in 2013). This might serve as an access road to a trail node at the rail corridor.

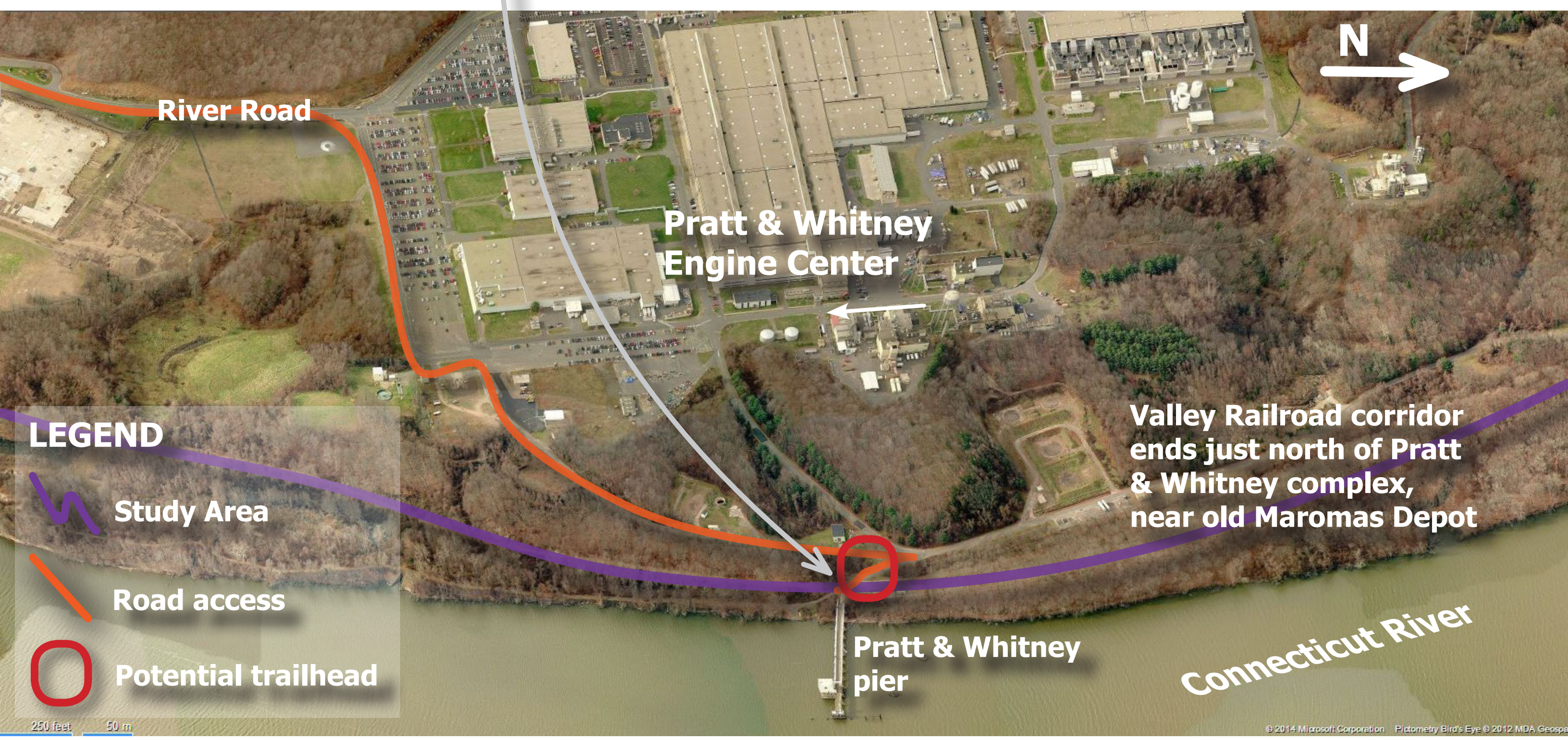
OPPORTUNITIES

Village connection: no village nearby, but corridor is adjacent to a large industrial facility, Pratt & Whitney's Middletown Engine Center.

Regional connection: Development of the trail to this point could encourage a link through Maromas to downtown Middletown and its riverfront, as suggested by several community members—perhaps along River Road to the north or Maromas Road to the west (see "Constraints" for status of River Road to the north).

Recreational facilities: Scovill Loop Trails at Hubbard Brook a little over a mile to the south.

Facilities and amenities: pier/jetty at Pratt & Whitney could provide a connection to river boating.



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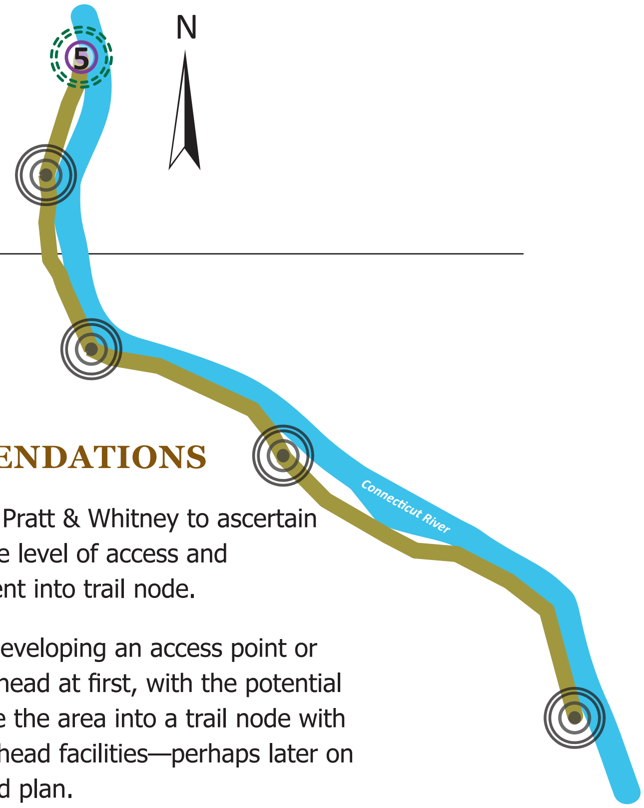


CONSTRAINTS

Access:

- Pratt & Whitney has closed River Road on its north end, cutting off all access from that direction; access to the site would have to be from the south, from River Road via Pratt & Whitney's campus.
- Pratt & Whitney has security/privacy concerns.

Few provisions nearby.

RECOMMENDATIONS

- Work with Pratt & Whitney to ascertain appropriate level of access and development into trail node.
- Consider developing an access point or minor trailhead at first, with the potential to enhance the area into a trail node with major trailhead facilities—perhaps later on in a phased plan.

RECLAIMING THE TRACK IN MAROMAS

Valley Railroad Company has worked over the last seven years to remove vegetation from the tracks in Maromas near Pratt & Whitney. Valley Railroad can now operate its high-rail maintenance vehicles on this stretch of track. The company reports that Pratt & Whitney's security at the gate near the pier is active.

Photo by Tom Krulikowski, courtesy of Valley Railroad Company

The railbed, north of Pratt & Whitney, as it appeared before rehabilitation.

Courtesy of Valley Railroad Company

Clearing vegetation with a bush hog in 2006.

Courtesy of Valley Railroad Company

The track and ties, once cleared.

Courtesy of Valley Railroad Company

Laying down new track.

Defining Trail Segments

The Trail Segments

Four segments would connect the five proposed nodes:

1. Eagle Landing State Park/Goodspeed Station to Haddam Meadows State Park – 3.9 miles long

2. Haddam Meadows State Park to Higganum Cove – 2.1 miles long

3. Higganum Cove to Scovill Loop Trails/Hubbard Brook – 1.8 miles long

4. Scovill Loop Trails/Hubbard Brook to Pratt & Whitney – 1.2 miles long

One of several beaver ponds in Maromas.

Photo by Walter Zilahy

Photo by Trevor Buckley

Looking east towards Midway Marina.

Symbols (train, boater, kayaker, and trail users) courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science

The segments between the nodes each have their own character, including opportunities and constraints. These characteristics, along with recommendations, have been summarized in the table on pages 80 to 81.

Possible uses along the entire length of the trail could include walking, hiking, cycling (with hybrid and mountain bikes, if not with road bikes), cross-country skiing, and access to paddling. All sections should be designed for universal accessibility.

Secondary access points between trailheads may be considered in a trail design. These might be necessary where it is determined that such access will connect the trail to local businesses or attractions, and where there is close road access or residences, so that the access point might encourage trail use. Generally, these should be designed specifically for use by trail visitors (e.g., trail connector with the same dimensions as trail, stairs and sections of ramp from nearby roads upslope), and not for maintenance and emergency vehicles, which can enter the trail at trailheads and or road crossings, and travel along the trail to their destination. However, exceptions may be considered wherever a convenient access point coincides with an area of particular concern to maintenance. There are no sections of the trail longer than two miles that do not have some sort of crossing, so vehicular access between nodes is not a particularly pressing concern for a potential trail.

Photo by Barrie Robbins-Pianka

One opportunity that exists along the corridor is the chance to view wildlife. Local residents report that there is a lot of wildlife activity along the northern part of the corridor, including beavers building dams, birds roosting, and reptiles traversing the corridor alongside the tracks.

Photo courtesy of Valley Railroad Company

Constraints along the corridor include abutters' homes and property that are directly adjacent to the tracks. This would prove especially challenging in places with a trail with rail design.

SUMMARY OF TRAIL SEGMENTS

Node	Opportunities	Constraints	Recommendations
Eagle Landing State Park/Goodspeed Station to Haddam Meadows State Park 3.9 miles long Abutters: two state parks, Camp Bethel, residential properties, Midway Marina	▪ Most potential access points, with its proximity to Route 154 and local roads. ▪ Most population along corridor of all segments, which may bode well for visitation levels. ▪ Haddam Meadows State Park is known for wildlife viewing.	▪ Most residential abutters. ▪ Fewest river views. ▪ Midway Marina operating on rail corridor at Synder Road—traffic and safety concerns.	▪ Consider offering privacy screening to residential abutters. ▪ Look for locations and additional right-of-way or easement to provide river views; could include trails down to river. ▪ Install signs to encourage respect for privacy and safety at Midway Marina.
Haddam Meadows State Park to Higganum Cove 2.1 miles long Abutters: Transfer Station, Haddam Land Trust conservation property, homeowners	▪ Good road access to Route 154. ▪ Plentiful river views.	▪ Long straightaway west of Haddam Transfer Station.	▪ Consider access points along Route 154. ▪ Install seating and overlooks on straight-away to add interest and take advantage of views.

Node	Opportunities	Constraints	Recommendations
Higganum Cove to Scovill Loop Trails/ Hubbard Brook 1.8 miles long Abutters: residential abutters; Northeast Utilities' Cooperative Wilidlife Management Area (WMA), Pratt & Whitney	▪ Plentiful river views. ▪ Several beaches. ▪ Known for wildlife viewing. ▪ Access points to Scovill Loop Trails ▪ Possible area for equestrian use ▪ Trust for Public Land mapping project identified two suitable camping areas along corridor for paddlers stopping overnight.	▪ Removed from River Road and other road access. ▪ Several areas of wetland and beach shore habitat along the corridor (the latter designated by DEEP as Critical Habitat).	▪ Study whether some beaches could be opened for public access, perhaps with seasonal limitations. ▪ Select specific links to Scovill Loop Trails to direct trail traffic and access to River Road. ▪ Ensure at least one location for authorized vehicular access, perhaps at utility road at Hubbard Brook. ▪ Locate possible camping opportunities.
Scovill Loop Trails/ Hubbard Brook to Pratt & Whitney 1.2 miles long Abutters: Northeast Utilities (WMA), Pratt & Whitney; no residential abutters	▪ Plentiful river views. ▪ Known for wildlife viewing. ▪ Possible area for equestrian use	▪ Least road access of the segments. ▪ Security and privacy concerns/limitations along property line with Pratt & Whitney.	▪ Discuss with Pratt & Whitney the appropriate level of trail access from its property. ▪ Add hiking trail(s) from corridor up to River Road or Pratt & Whitney property.

Eagle Landing State Park/Goodspeed Station to Haddam Meadows State Park

3.9 miles long

This segment begins at Goodspeed Station, and it passes close to the river, especially where it crosses over Ruddy Creek about 0.6 mile north of the station, affording terrific views. It passes through the most populated section of the study area, with residential abutters from Tylerville to Shailerville, as well as Camp Bethel in Tylerville. The corridor turns away from the river near Midway Marina and crosses right through the marina yard, where the railbed is buried beneath pavement in the boat yard. The rail corridor begins a long woodland stretch at Haddam Dock Road, crossing a succession of driveways and small roads, as well as Mill Creek with a high trestle, before entering Haddam Meadows State Park. At Haddam Meadows, the corridor passes close by (on the south side of) wetland areas before arriving at the park entrance.

Photo by Trevor Buckley

This segment of a trail would wind through low-density residential areas, but come in close contact with Midway Marina and some individual homes. There are several intersections with small roads and driveways, before the corridor reaches Haddam Meadows State Park.

Haddam Meadows State Park to Higganum Cove

2.1 miles long

This segment begins at the park entrance, close to Route 154, and then passes the Town of Haddam Transfer Station before running along a straightaway wedged between Route 154 and the Connecticut River that offers views to the river, and crosses over several small culverted streams emptying into the river. At Tocus Hole Brook, there is a washout in the railbed that has not been repaired since it occurred in the 1980s. Beyond that point, the corridor enters into a more residential area on the approach to Higganum Center. Near Landing Road, the rail passes within a couple dozen feet of some homes, then passes through a cut in the bedrock and the old Higganum depot site before arriving at the trestle spanning Higganum Creek's outlet into the Connecticut River.

Photo by Trevor Buckley

There are several places along this potential trail segment that could be developed into wayside rest areas, or points at which to view or access the river.

Higganum Cove to North Scovill Loop Trails/Hubbard Brook

1.8 miles long

This segment begins at Higganum Cove and follows the river as it bends to the north. The corridor closely follows the river, running along the bottom of a hill bluff below residential abutters and under power lines span the river. Causeways cross over several streams or small ponds. About a mile up the segment, the Scovill Loop Trails intersect the corridor and, at points, cross over the corridor and lead down to riverside beaches. The segment passes by two utility roads, over a small trestle, and through two bedrock outcrops before arriving at the trestle at Hubbard Brook.

Photo by Trevor Buckley

This segment of trail would have little close road access north of Higganum Cove. In this section pictured, just north of the cove, the trail is located at the bottom of a hill with homes above. Past this residential area, the corridor runs adjacent to the Northeast Utilities wildlife management area in Maromas.

North Scovill Loop Trail/Hubbard Brook to Pratt & Whitney

1.2 miles long

This segment begins at the Hubbard Brook trestle, and forms a long causeway (about 0.85 mile long) that separates the Hubbard Brook wetland from the Connecticut River's floodplain forest. Entering Pratt & Whitney's property, the corridor bends towards the river and arrives at the Pratt & Whitney pier/jetty.

Photo courtesy of Valley Railroad Company

A straightaway north of Hubbard Brook's outlet into the Connecticut River.

Photo by Trevor Buckley

6. Conceptual Designs & Guidelines for Trail Construction

Four elements of trail construction are included in this section:

- Trailhead design
- Trailside amenities
- Provisions and connections to local businesses
- Safe crossings at rail and road intersections
- Stream and wetland crossings: bridges and boardwalks

These discussions are followed by cost estimates for construction of a trail along the length of the corridor.

Photo by Craig Della Penna

A trailhead should create an inviting entrance to the trail, with facilities that serve the needs of trail users.

Trailhead Design

Trailheads are primary access points for a trail that, at a minimum, have parking and directional signage, but often have seating (i.e., benches and picnic tables), restrooms, water, trash and recycling receptacles, bike racks and other facilities needed for trail uses specific to particular segments of the trail (e.g., posts for hitching horses, lighting, and call boxes). Trailheads are designed with consideration of existing facilities and environmental constraints, anticipated level of trail use, anticipated level of servicing or maintenance of facilities, and the available utilities or infrastructural needs (Flink, Olka, and Searns 93).

The trail nodes envisioned for the Valley Railroad corridor would each include a trailhead. Eagle Landing/ Goodspeed Station, Haddam Meadows, Higganum Cove, and North Scovill Loop Trail/Hubbard Brook would have most of the typical trailhead facilities. The Pratt & Whitney node would (at least to start) serve as a minor trailhead with parking, signage, and seating, but no restrooms or water.

The trailhead design guidelines on the following pages include these common components:

- Parking
- Informational kiosk
- Signs
- Restrooms
- Drinking water
- Seating
- Lighting and call boxes
- Bicycle facilities
- Waste and recycling receptacles
- Landscaping
- Structures, such as shade pavilions

A trail along the Valley Railroad corridor would include intersections at several lightly traveled roads. Enhancements, such as signs indicating right-of-way and removable bollards to block vehicular traffic, would be necessary to create safe crossings. A simple system of signs, pavement markings, and physical barriers, plus adequate sightlines, can achieve the necessary safety requirements. An example from the Norwottuck Rail Trail in Amherst, Massachusetts is shown here, where the trail intersects a service road on the campus of Amherst College.

TRAIL DESIGN GUIDELINES

In keeping with the environmental awareness of trail design for this project, trailheads should be constructed with sustainability in mind. The following are some principles to keep in mind.

- Incorporate water and energy savings, including low-energy facilities and use of renewable energy sources.
- Install water catchment features, to collect water for hand washing and toilets or for landscape irrigation.
- Employ low-maintenance landscaping, using native plants, greywater, and water catchment.
- Practice waste reduction, including composting and recycling.
- Practice sustainable construction, including the use of natural building materials, and recycled and permeable or porous pavements for parking and trail surface materials.

The section below details the common components of trailhead facilities. Parking, a kiosk, and signs are a must; the other features increase the level of services provided to trail users. As Flink, Olka, and Searns suggest in *Trails for the Twenty-First Century*, facilities can be enhanced, so "when designing for either major or minor trailheads, allow flexibility for change over time" (94). Start with the basics, but keep in mind that trail visitation may increase along the use of the trailhead facilities.

Parking

Parking should be placed on the outside edge of the trailhead facilities (where the most pedestrian traffic is to be expected), with the trail entrance oriented perpendicularly to the lot. There should be at least one accessible space per lot (minimum of one per twenty-five spaces) (Flink, Olka, Searns 95). Priority parking areas could be designated for cyclists and or low-emission/ energy-efficient vehicles. Equestrian trailers, if horseback-riding is allowed on the trail, will require properly sized spaces and picket posts placed nearby for hitching horses. The parking lot surface material should be designed for accessibility, but also for stormwater infiltration, making use of porous pavements, modular pavers, or compacted aggregate or granular stone.

Of the prosed nodes with trailheads in this project, extensive parking is already available at Eagle Landing State Park, and there is a small gravel lot at Haddam Meadows State Park and at the North Scovill Loop Trail.

Kiosk

A kiosk provides a central place for trail visitors to gather information. Visitors can study a trail map and take in a small educational exhibit as well as pick up copies of maps and brochures. A bulletin board on the kiosk structure can be used to post fliers for educational programs and special events such as festivals and concerts.

Signs

Signs should be clear and consistent in design, forming continuous systems throughout a trail corridor; this system should reinforce the unique identity of a trail. These systems begin at trailheads and emanate out along the trail. Wayfinding signage is particularly important at a trailhead, orienting trail users entering or exiting the trail. (See pages 88 and 89 for more on signs.)

Restrooms

Conventional restrooms will require running water and septic systems (there is no sewer in Haddam or the Maromas section of Middletown). More sustainable, low-impact facilities should be encouraged, including low-flow toilets, composting toilets, water catchment systems to collect water for use in sinks and toilets, and graywater systems for recycling or reusing water for landscaping. The structure housing restrooms should be designed for compliance with ADA and state and local building codes.

The only proposed node that currently has any restrooms is Eagle Landing State Park, and the facilities there are just portable toilets.

Water

Drinking water might include hand pumps or solar-powered fountains. They should be centrally located, perhaps adjacent to the restrooms or kiosk, and designed for ADA compliance.

Seating

Seating should include benches and picnic tables, situated for comfort (both in sunny and shady spots) and views, with some near the other facilities and others in quieter spots. Picnic areas with seating might also include grills or firepits for cooking.

Safety features

Lighting and call boxes provide safety and security and emergencies.

Bicycle facilities

Bike racks, for parking and locking up bikes, should be no more than 50 feet from a path, or they risk not being used (Flink, Olka, and Searns 100). A service station will statisfy trail users in need of an air pump and some basic tools to fix flat tires and make other repairs without exiting the trail. See photo at right for an example of a self-service bike station.

Shelters

Shelters, such as gazebos and pavillions, can provide temporary protection from the elements or inclement weather; another place to picnic; and a venue for special events or gatherings at trailheads, such as educational programming.

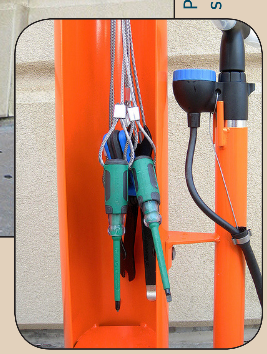
Structures should be constructed with natural building materials and employ elements such as green roofs, water catchment, and solar or wind energy for electricity. (Wind turbines or solar panels be constructed as free-standing elements apart from the shelters.)

Waste and recycling

Receptacles should include containers for trash, and recycling, and ideally composting facilities too. A simple compost operation, maintained by parks staff or volunteers, could be used to generate compost for the gardens and other landscaping at the trailhead.

Landscaping

Sustainable landscape design and maintenance includes reducing turf grass to only specified areas, emphasizing native plants, making use of water catchment and greywater, and reducing stormwater runoff. Stormwater reduction structures could include: water infiltration and retention structures (such as bioretention tree planters and bioswales, especially near the parking lot) and rain gardens around the trailhead facilities.



Photos by user 'dickdavid', sourced from Flickr

An example of a bike repair station with a toolset and air pump.

Trailside Amenities

A comfortable trail experience will require at least some basic facilities along the various segments, including signs, education, seating, river views, and river access. Some recommendations are provided for each with graphics below.

SIGNS

Informational and directional signs should point out secondary access points (between the trailheads), stream crossings and other significant geographic features, river access points (e.g., overlooks, beaches, paddling put-ins/take-out), and connections to provisions, accommodations, and points of interests. The following photos demonstrate some examples of trail signs.

Regulatory signs include all of the traffic control signs and notifications of what trail uses are allowed.

Warning signs caution trail visitors to specific hazards, including temporary conditions.

Temporary signs might be placed in frames that are permanent or on a dedicated board at the kiosk. These might be used to announce festivals, upcoming educational programs, or seasonal wildlife sightings.

Photo by Stuart Macdonald

A regulatory sign reminding dog owners of their responsibilities.

Photo by Stuart Macdonald

A cluster of warning signs at a crossing.

Photo by Stuart Macdonald

Mile marker for White River Greenway in Indianapolis, Indiana.

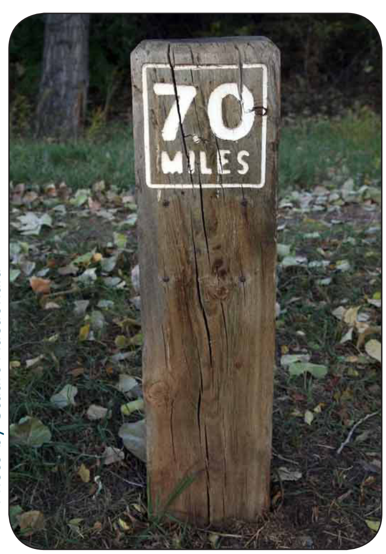


Photo by Stuart Macdonald

Mile marker for High Line Canal trail in Cherry Hills, Colorado.

Photo by Stuart Macdonald

Mile marker for Aurora Reservoir Trail in Colorado.

EDUCATION

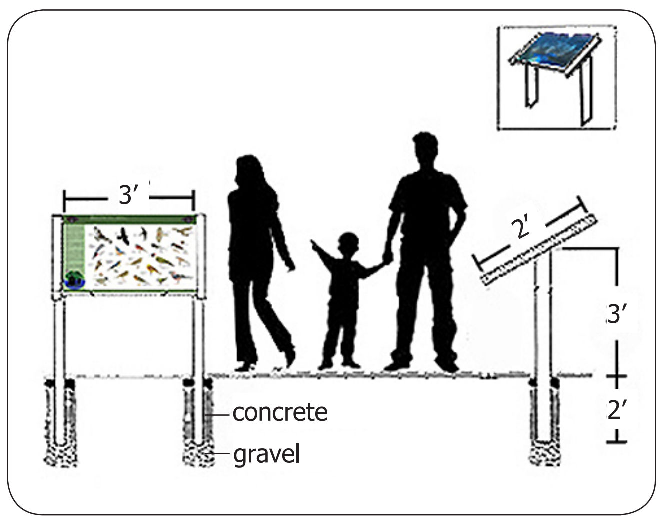
A recreational trail provides the opportunity to educate users about historical places and events, as well as environmental systems, concerns, and features. A system of signs can provide information at key locations and as a whole the signs can create a narrative for the landscape that the trail users are experiencing. Subjects for educational signs within the Valley Railroad State Park could include:

- Native American history in the Lower Connecticut River Valley
- Valley Railroad
- Agricultural and industrial past
- Shipbuilding and sea trade
- The Lower Connecticut River, including flood plain dynamics and tidal freshwater wetland and flood plain dynamics
- Wildlife and plant identification guides, including birds, fish, and native and invasive flora
- Fisheries of the Connecticut River

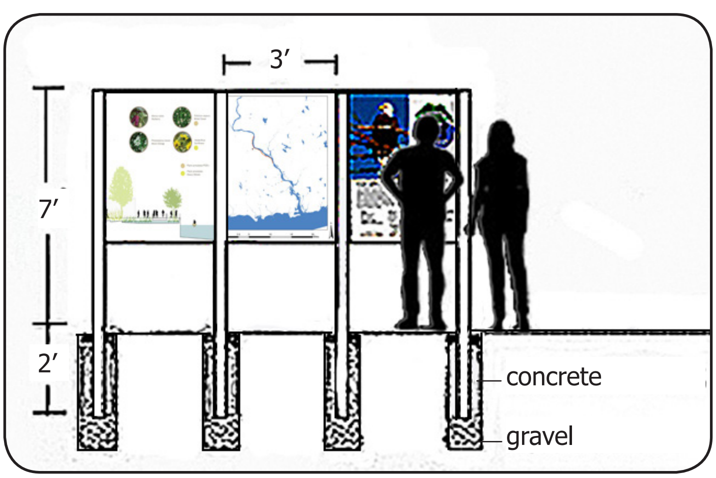
Educational approaches can take a topical approach, with each sign displaying discrete packages of information that stand alone, or a narrative approach, weaving a story through a series of connected signs (e.g., chronological history, life cycle of an animal). See conceptual graphics for examples of sign structures.

Photo by Trevor Buckley

This informational kiosk at a trailhead for the Norwottuck Rail Trail provides historical context for visitors before they embark on the trail.



These placard-style educational signs can be placed at relevant sites along the trail (e.g., feeding grounds for waterfowl), and together, form a system of thematic signs.



A triptych of panes with educational posters can draw together several different subjects or illustrate the chronology of an important historical event. This size sign is most appropriate at a trailhead.

SEATING

Benches seating four to six people are recommended every half-mile for suburban trails and every two miles for rural trails (Flink and Searns 270); those rules can be applied to the appropriate segments (e.g., Eagle Landing to Higganum Cove is suburban, while Higganum Cove to Pratt & Whitney is rural). There are numerous styles to choose from, though a consistent style and natural materials (e.g., locally sourced stone or locally, sustainably harvested wood) should be employed across the entire corridor. (See photos below for examples.)

RIVER VIEWS

River views could be indicated with subtle signs wherever they are currently available or are framed with minimal vegetative thinning (in accordance with the Gateway Conservation Zone and local statues). Seating could be provided at these points, and/or overlooks such as wooden decks or belvederes could be installed to provide a place to rest and linger while taking in the river, scenic landscape, boats on the river, and wildlife.

RIVER ACCESS

Small paths to beaches and coves should be included to provide a place to recreate by and on the river, including picnicking, kayaking, and bird-watching, to name a few activities. Wherever possible, these paths should be designed to be barrier-free for all trail users; this goal will have to be reconciled with environmental constraints such as steep slopes.

Photo by Trevor Buckley

Photo by Trevor Buckley

Two different stone benches are used along the Norwottuck Rail Trail in Massachusetts. The style in the upper photo is used for memorial (enscribed) benches, closer to the developed area around the town of Amherst. The rougher hewn design, in the lower photo, is used along the numerous beaver ponds and wetlands in the rural stretch of the trail between Amherst and Belchertown.

Photo by Emily Davis

Wooden benches are more comfortable for long periods of sitting than stone benches. This simple bench along the Wallkill Valley Rail Train sits on a bridge over the trail's namesake river, in upstate New York.

Provisions & Connections to Local Businesses

A trail along the Valley Railroad corridor would benefit from connections to businesses, new and existing, that can provide provisions to trail visitors. There are several stores and food service establishments in the nearby villages, as well as some overnight accommodations, but essentially there is nothing right along the potential trail corridor and currently no bike repair or outdoor equipment rental shops that might serve trail users. There are many examples of rail-trails and multiuse trails that incited economic development. Along the Valley Railroad corridor, businesses might develop in existing commercial areas within village centers, or space and facilities could be established at the nodes for seasonal concessionaires and other businesses. These might include snack shacks and food carts, bike repair shops or self-service stations, and rental shops for kayaking and canoeing.

Two examples of places where successful business development has occurred along a trail corridor are the Virginia Creeper Trail in Southwest Virginia and the Great Allegheny Passage in Maryland and Pennsylvania. In the small town of Damascus, Virginia (population of about 900), there are now six bike shops, several of which offer shuttles for trail visitors to carry them to points along the 34 mile trail—often to the topographic high point at Whitetop, where they can bike back downhill. There are also trailside businesses serving visitors, such as Old Alvarado Station, pictured above, the site of a former rail depot.

Along the Great Allegheny Passage (GAP) Trail, nine small Rust Belt towns have joined together to form the Trail Town Program (www.trailtowns.org), a resource for business development intended to capitalize on the popularity of the 120-mile-long trail between Cumberland, Maryland and Pittsburgh, Pennsylvania. The organization reports that between 2002 and 2008 annual direct spending attributable to GAP trail users increased from $7.26 million to $40.8 million. (The Progress Fund, "Trail Impact Fact Sheet"). In 2012, 30% of trail businesses surveyed stated plans to expand (The Progress Fund, "Expand your Business").

Photo by user "DM," sourced from Flickr

Old Alvarado Station is a landmark along the Virginia Creeper Trail in Southwest Virginia, and a popular place to take a break and grab refreshments.

Photo courtesy of Rails-to-Trails Conservancy

The Lucky Dog Cafe and Riversport, right off the Great Allegheny Passage, in Confluence, Pennsylvania, provide provisions and additional recreational opportunities for trail visitors.

Photo by Craig Della Penna

Touring cyclists can stay over at the Sugar Maple Trailside Inn in Florence, Massachusetts. The casual guest can take a bike for a day trip down the Northampton Bikeway, a rail-trail.

Safe Crossings at Rail and Road Intersections

In the study area, the Valley Railroad corridor intersects with several small residential roads, residential driveways, and a few utility roads. These quiet, low-traffic roads that meet the corridor at-grade—combined with the gentle grade and curvature of the corridor—bode well for safe crossings. General improvements for a trail include signage to indicate whether motorists or trail users have the right-of-way, and clear sightlines for visibility, especially given the vegetated landscape throughout the corridor. There are also two highway crossings to consider for the Eagle Landing and Haddam Meadows nodes. Valley Railroad currently operates trains at the proposed Eagle Landing node, so a trail-rail crossing would be necessary. Trail-rail crossings may be required at other points along the corridor if a trail with rail is decided on. Village connections at Eagle Landing, Haddam Center, and Higganum Cove may require additional road crossings off the corridor, leading to trail connectors, sidewalks, bike lanes, etc.

CONSISTENT RIGHT-OF-WAY POLICIES AT INTERSECTIONS

Safe crossings require a consistent hierarchy of intersection types across the trail corridor to clearly communicate the right-of-away at each type of intersection; drivers will have the right-of-way at some intersections and trail users will have the right-of-way at other intersections (Flink, Olka, and Searns 84). This hierarchy is determined by an analysis of when vehicle traffic is lowest and highest on each road. Traffic engineers conducting this analysis will take into account the factors affecting vehicle-trail user intersection, including:

- Traffic volume
- Peak travel time
- Speed of travel
- Sightlines
- Anticipated number of trail users
- Other factors unique to specific sites.

A traffic engineer's assessment is needed to determine how each crossing should be designed. Based on initial observations of these characteristics across the corridor, however, three main types of road crossings have been identified for a potential trail development in this study. They are:

- Highway crossings at Routes 82 and 154
- Road crossings
- Driveway and utility road crossings

These three types are shown in the map on page 94 and are discussed in the conceptual diagrams that follow, as well as rail crossings, and other situations along the corridor.

CONSIDERATIONS AND DESIGN FEATURES FOR SAFE CROSSINGS

Federal or state regulations include design requirements for bicycle and pedestrian crossings at roads. These include three major elements:

- Signs, including stop, yield, and regulatory signs. Generally signs should be clustered where possible, and must be visible from 125 to 150 feet away and groupings of signs set 75 feet apart from one another (specific distances are included in the conceptual diagrams that follow).

TRAIL PRECEDENT: Camp Chase Rail-Trail • Madison County, Ohio • 5 miles

This partially constructed 11.5-mile rail-trail project has presented challenges such as tight parameters of land available, an eight-lane highway crossing, and several at-grade rail crossings. The project manager, Steve Brown, advises that it is "important to do your homework up front and on the ground when it comes to prevailing grades, drainage and utilities to avoid expensive redesigns and change orders" ("Rails with trails: case studies from across America").

- Striping, stenciling, or other pavement markings. These cannot be used to communicate messages exclusively; rather, they should be used sparingly and to complement signage.

- Signals, including traffic lights and active warning beacons.

Federal and state law, as well as professional convention in traffic engineering dictate the form of these elements. Regulation and resources include the Federal Highway Administration's Manual Uniform Traffic Control Devices (MUTCD), among others. (See "Key Resources" for a list of codes and manuals.)

Two main issues need to be considered at all intersections. One is controlling/limiting access to trail users and specified motor vehicles. Features that can be used to allow trail users through and, if needed, removed for maintenance and emergency vehicles include:

- Signs indicating that no motorized traffic is allowed.

- Bollards that are drop-down or removable (a single bollard or sets of three).

- Gates, such as a barrier rail, swinging, or counterweight construction

The second issue is ensuring that trail users, especially bicyclists, slow down and stop at intersections where vehicles have the right-of-way. Design elements that can help achieve this include:

- Appropriate regulatory signs, properly placed for visibility along the trail.

- A change in material in the final stretch of a trail or leading to a crossing that serves as a secondary alert to slow down.

- Clear sightlines to exits and intersections.

- A distinct curve in the trail alignment on the approach to the intersection.

EXAMPLES OF BOLLARDS AT INTERSECTIONS & TRAILHEADS

Photo by Stuart MacDonald

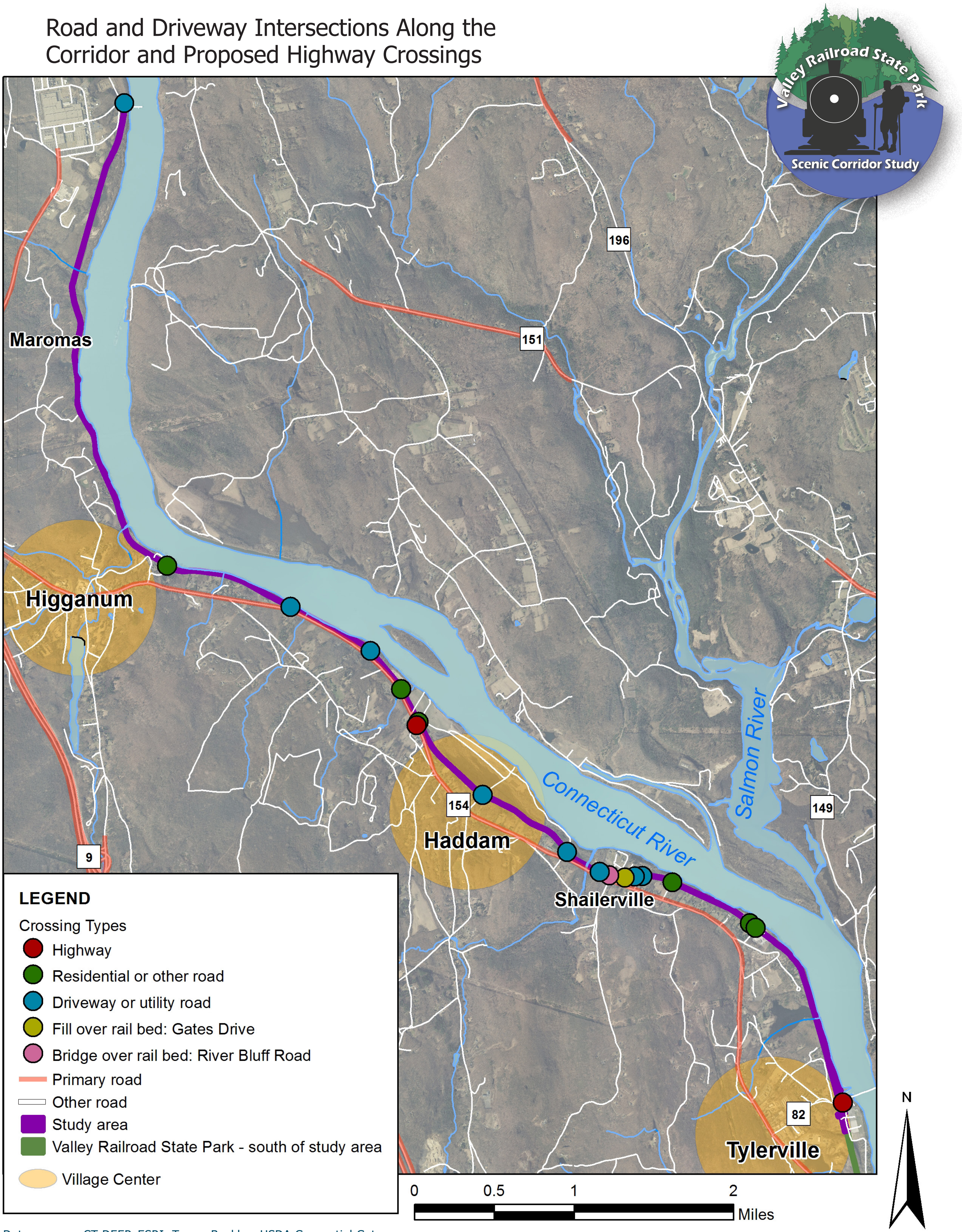
An example of a residential street crossing using a single wooden bollard.

Photo by Trevor Buckley

Photo by Trevor Buckley

Two examples from the Norwottuck Rail Trail in Massachusetts. The top example, at a trailhead, uses boulders with a bollard. The bottom example, is improperly designed with two bollards; this can funnel traffic into the center of the path, and cause collisions.

Road and Driveway Intersections Along the Corridor and Proposed Highway Crossings



Data sources: CT DEEP, ESRI, Trevor Buckley, USDA Geospatial Gateway

All of these elements are explored in the "Conceptual Diagrams" below.

Intersections/road crossings may provide suitable secondary entry/exit points onto the trail for trail users, but this should not be encouraged (except for trail users who live near such intersections). Rather, trail users should be directed and encouraged to use trailheads and other access points, through signs and by not placing parking at intersections/crossings. Trail users should definitely be prohibited (and discouraged with appropriate signage) from making use of private roads and driveways, unless there is a formal agreement with property owners to allow trail users to access the trail via their drive or other path.

SAFE CROSSINGS: CONCEPTUAL DIAGRAMS

The following conceptual diagrams, pages 96 to 101, are not based on legal surveys and are not to scale (including the diagrams for the two specific highway crossings at Route 154 and Route 82). Further consultation with both a traffic and a civil engineer would be needed to specify the proper design for each intersection along the corridor.

Most of these diagrams illustrate a trail replacing the rail infrastructure. Given the specific requirements that would be required for trail with rail at each intersection (e.g., grading embankments, close residential proximity), diagrams for those situations have not been included for all situations.

With the exception of the bridge crossing over the trail (at River Bluff Drive), only at-grade crossings are considered here. For road crossings, there were no locations where tunnels or bridges were deemed preferable. Construction of those types of crossings add significant costs over an at-grade crossing. Given the available tools for safe at-grade crossings and level of vehicular traffic anticipated at most crossings on a potential trail along this corridor, at-grade intersections should suffice.

A below- or above-grade crossing is preferable for trail over rail crossings, given safety concerns. The constraints of this corridor—physical, environmental, and legal as discussed earlier—may limit the possibility for a bridge or tunnel to be employed with a trail with rail. At-grade crossings should be limited to the minimum number needed.

The following intersections and crossings types are shown on the map on page 94 and examined in the following pages:

1. General rail crossings for trail with rail
2. Highway crossings at Routes 82 and 154
3. Road crossings
4. Driveway and utility road crossings
5. Fill on the railbed to create a crossing at Gates Drive
6. Bridge over bed at River Bluff Drive
7. Path crossings

1. RAIL CROSSINGS

With at-grade trail-rail crossings, it is important to include safety features, including warning and stop signs, and the alignment of the trail should intersect the tracks at an angle between 45 (minimum) and 90 (preferred) degrees. The curve in the trail on the approach to the railbed is used to angle the intersection properly, and it also helps to slow trail users down trail users as they reach the crossing. The recommended perpendicular intersection makes it so that bicyclists can cross the tracks without their tires getting caught in a flangeway (the gap between the rails and trail surface material). This latter problem can be addressed with compressible flangeway fillers (made of rubber or other materials).

A specific example of a ninety degree intersection is shown in the crossing conceptual diagram for Route 82 on page 96.

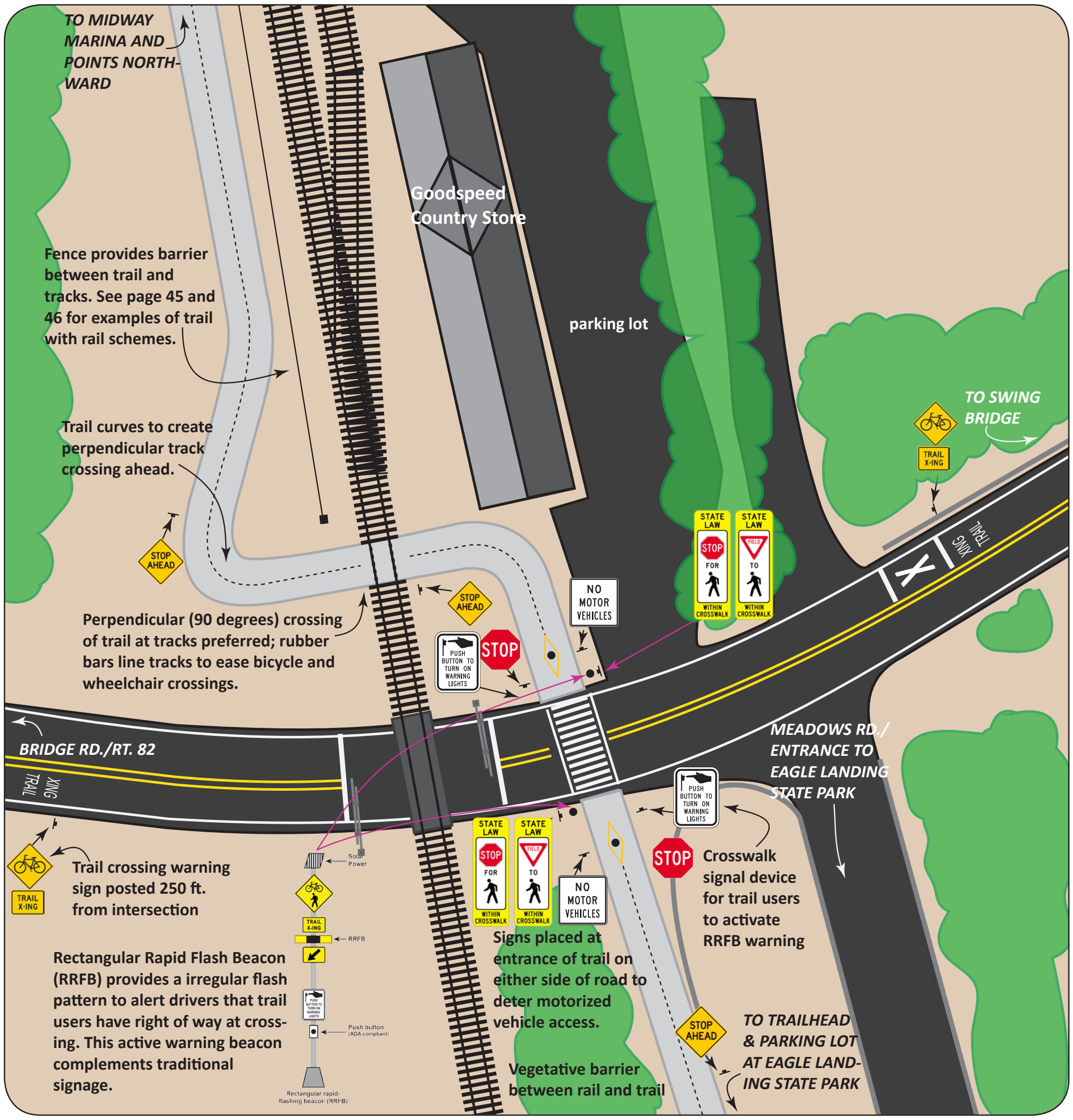
2. HIGHWAY CROSSINGS

Route 82: Bridge Road

There is ample parking available at Eagle Landing State Park for a trail node, which could serve as the southern trailhead. To take advantage of this parking, trail users would have to cross Bridge Road/Route 82 in order to continue north along the corridor.

Given the daily traffic count of nearly 9,600 cars per day on this stretch of Route 82, a number of safety features would be necessary. These include signage and an active warning beacon—a rectangular rapid flash beacon (RRFB) is suggested here—that directs traffic to stop for pedestrians (cyclists should dismount while proceeding over the crossing). Given the traffic signals nearby at the Swing Bridge—stopping vehicles when the bridge is open—an additional traffic light is not recommended here.

The diagram for the Route 82 crossing at the Eagle Landing/ Goodspeed Station trail node shows an example of a trail-with-rail highway crossing, and a trail-rail crossing with a ninety degree intersection.



Traffic sign images are from the Manual of Traffic Signs, by Richard C. Moeur (http://www.trafficsign.us/)
Rectangular Rapid Flash Beacon (RRFB) image sourced from Boston Region Metropolitan Planning Organization (MPO) (http://www.ctps.org/Drupal/data/transreport/html/trpt0113.html)

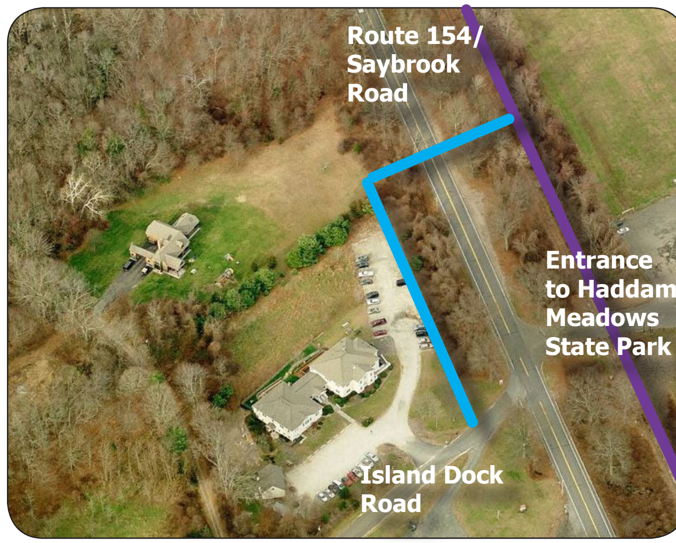
Below: The current intersection of the Valley Railroad line and Route 82/ Bridge Road at the entrance to Eagle Landing State Park (looking east).

Photo by Trevor Buckley

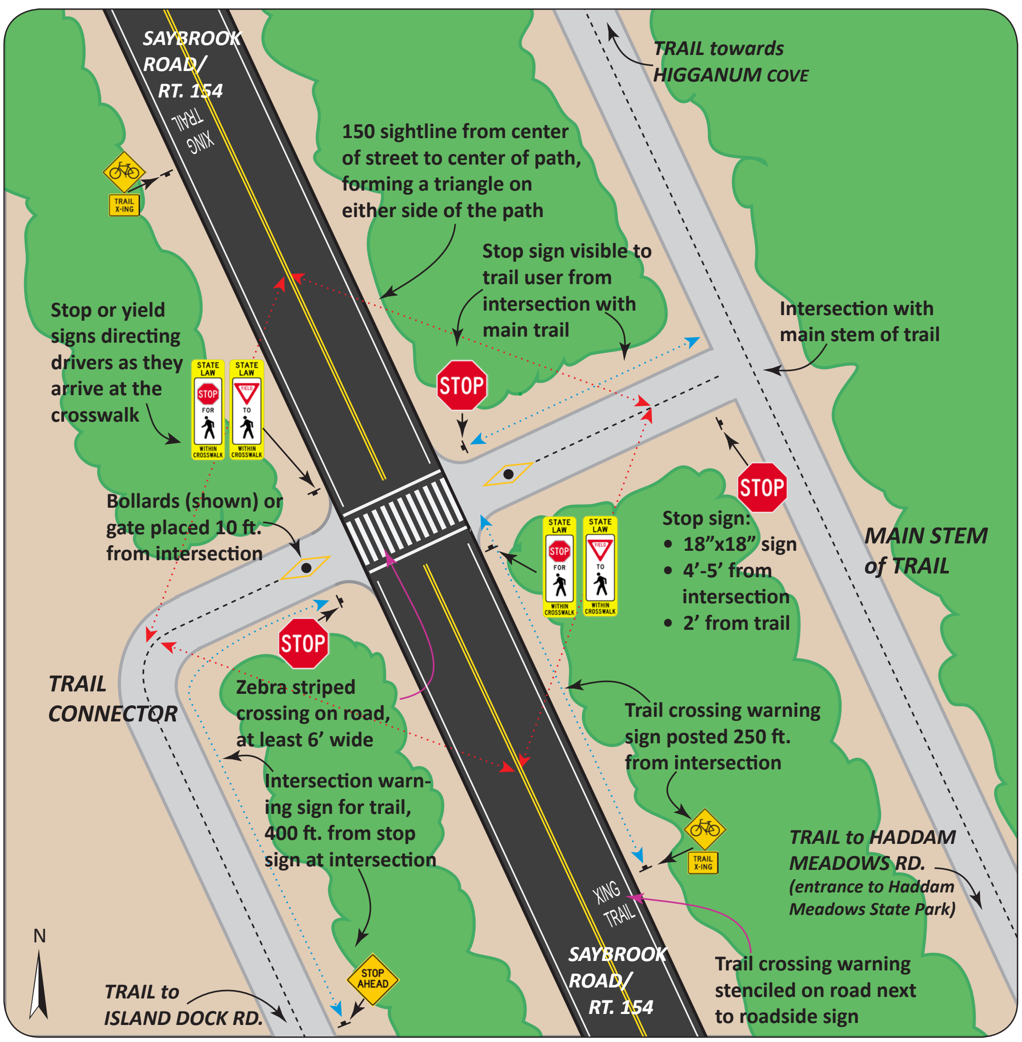
Route 154: Saybrook Road

A highway crossing from Haddam Meadows State Park across Route 154 could provide a connection between a node at the park and Haddam Center. This could be situated close to the state park entrance and Island Dock Road, shown in the photograph and diagram here, or at Station Hill Road to the southeast (which enters the park and crosses the rail corridor, but is closed off to vehicular traffic at Route 154).

The average traffic count for Route 154 in this area is about 4,900 cars per day and the speed limit is 45 mph (Google Earth Pro). A crosswalk with a pedestrian right-of-way is recommended. No active warning beacon is included here, but it could be added later if pedestrian traffic across Route 154 warrants the enhancement.



In this bird's eye view, the study area is shown in purple, while a potential spot for the crossing and trail connector is shown in blue.



Traffic sign images are from the Manual of Traffic Signs, by Richard C. Moeur (http://www.trafficsign.us/)

3. ROAD CROSSINGS

Due to a combination of factors, including high traffic, close proximity to Route 154, and low visibility, safe crossings at the following locations may require a vehicular right-of-way to maintain vehicular traffic flow, and signs to stop trail users before crossing.

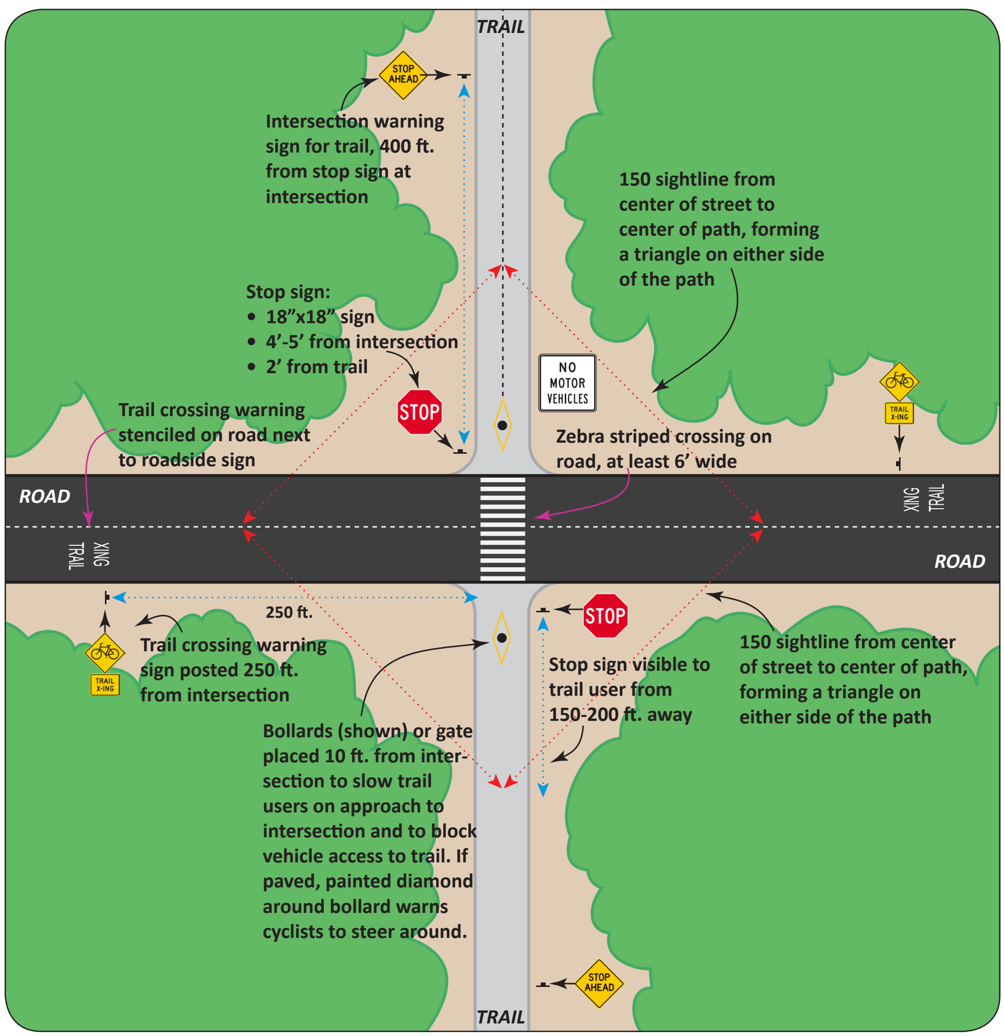
- Synder Road, at Midway Marina
- Haddam Dock Road (private on the north side of the rail), near Midway Marina
- Haddam Meadows Road, at the entrance to Haddam Meadows State Park
- Entrance road to the Town of Haddam Transfer Station
- Landing Road in Higganum Center

Photo by Trevor Buckley

The intersection with Landing Road in Higganum, close to several houses.

The rail crossing with Synder Road is currently buried under pavement at Midway Marina. Safety for a trail intersection would be crucial around this busy boatyard.

Photo by Trevor Buckley

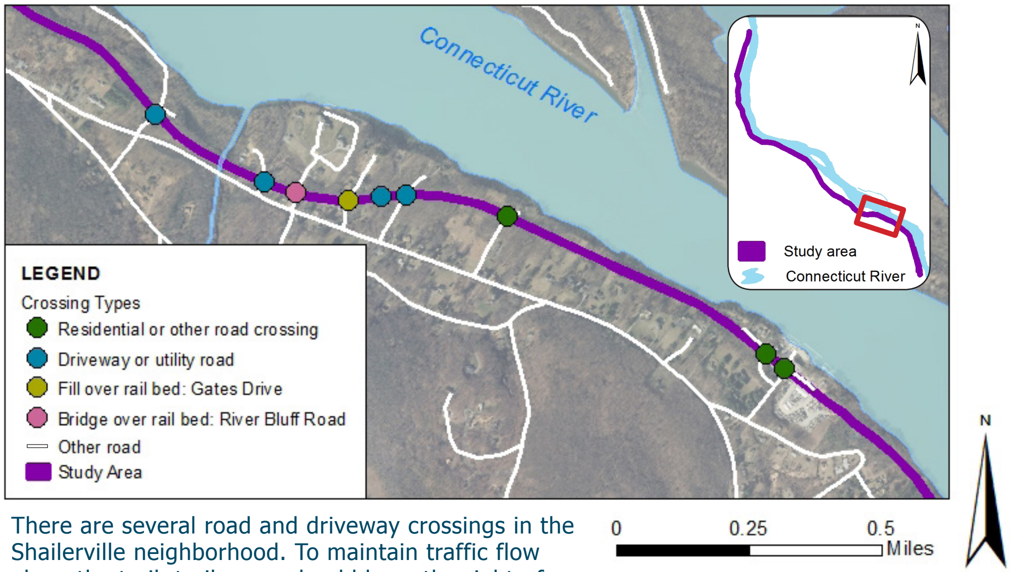


Traffic sign images are from the Manual of Traffic Signs, by Richard C. Moeur (http://www.trafficsign.us/)

4. DRIVEWAY AND UTILITY ROAD CROSSINGS

At intersections with these lightly traveled roads, trail traffic is anticipated to be higher than vehicular traffic. Thus, trail users will maintain the right-of-way, with yield signs installed to instruct drivers to slow down.

- Horton Road (private on the north side of the rail), between Midway Marina and Mill Creek
- Three residential driveways in Shailerville (near Gates Drive and River Bluff Road)
- Coast Guard access road (closed), west of Mill Creek
- Station Hill Road (closed at Route 154) in Haddam Meadows State Park
- Utility road to fiber optic cable crossing railbed, west of Transfer Station
- Private drive off Route 154 near Swain Johnson Creek (closed)
- Pratt & Whitney dock access road

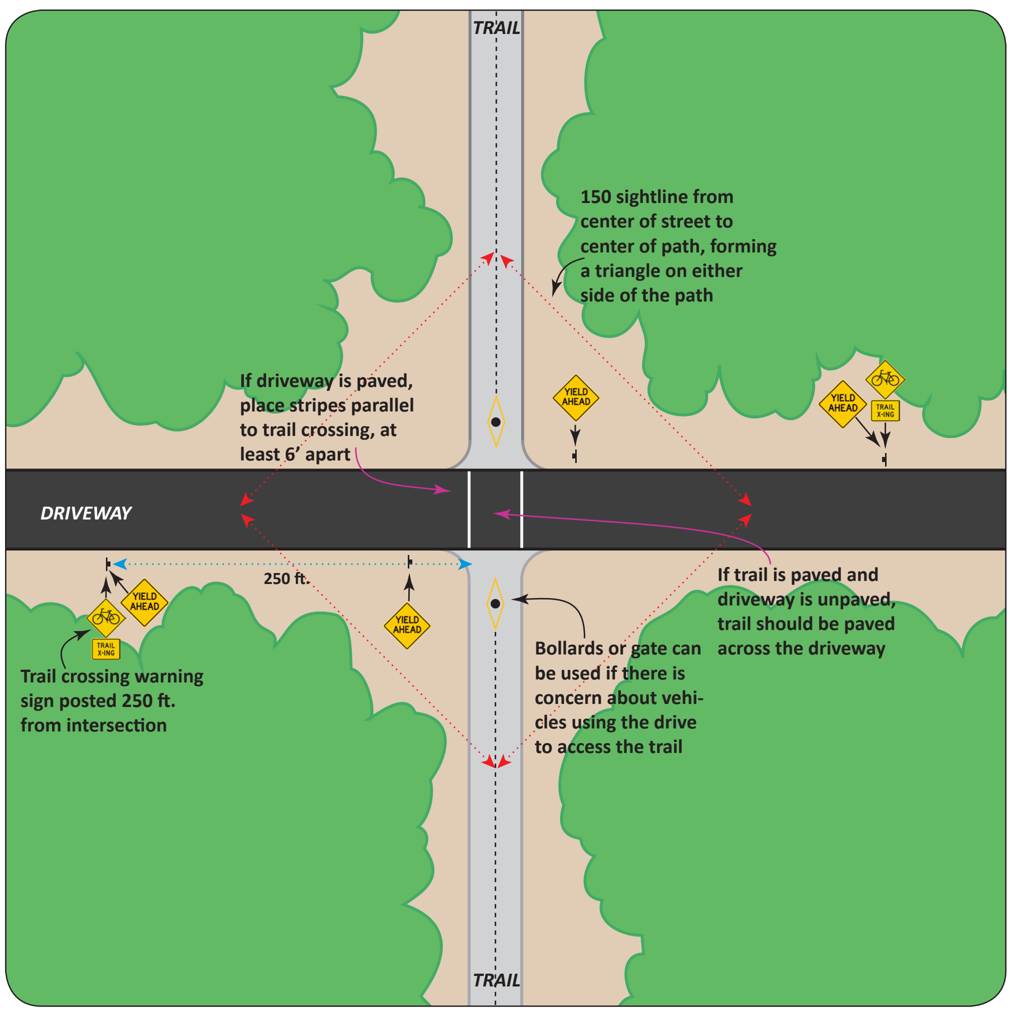


There are several road and driveway crossings in the Shailerville neighborhood. To maintain traffic flow along the trail, trail users should have the right-of-way at driveway.

Data sources: CT DEEP, ESRI, Trevor Buckley, USDA Geospatial Gateway

Photo by Trevor Buckley

A crossing at Horton Road in Shailerville.



Traffic sign images are from the Manual of Traffic Signs, by Richard C. Moeur (http://www.trafficsign.us/)

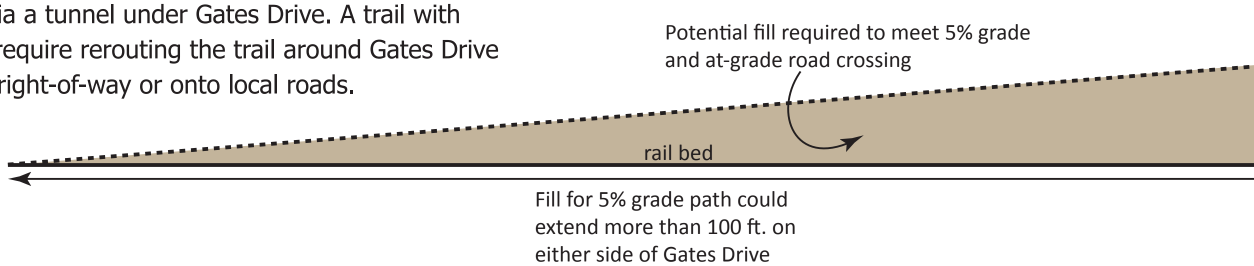
5. FILL ON RAILBED AT GATES DRIVE

Gates Drive is a residential road located on top of fill over the existing railbed (see photos at right). An at-grade crossing will require fill longitudinally along the railbed to achieve a grade sufficient for general accessibility along this stretch of the trail. This could include a straight-away section of trail ramping up towards Gates Drive, or a curved ramp. The conceptual section below demonstrates the potential maximum fill required to create an at-grade crossing with a straight 5% grade trail built along the alignment of the rail corridor. (This scheme would require 25,000 cubic feet of fill [1,250 tons], at a cost of $12,500-$25,000 [see "Cost Estimates" section on page 106 to 107]). An 8.3% grade is accessible if equipped with handrails, landings every 200 feet, and guards along the edge of the path. The alignment and curvature of the trail leading up to Gates Drive may vary based on the width of ROW and constraints of the slopes of the surrounding embankments and abutters' homes.

Photo by Trevor Buckley

The view of Gates Drive on the approach from the east.

A much more expensive, so less likely option, is a below-grade crossing via a tunnel under Gates Drive. A trail with rail would likely require rerouting the trail around Gates Drive onto a separate right-of-way or onto local roads.



6. BRIDGE OVER BED AT RIVER BLUFF DRIVE

This bridge provides adequate clearance (greater than ten feet) over the railbed for a potential trail. Improvements may be needed, though, on the underside of the bridge to protect trail users from falling debris, or vehicular residue. Fencing may be added as well to deter trail users from accessing the road via the slopes around bridge. A rail with trail may require re-routing of trail over this road.

Photo by Trevor Buckley

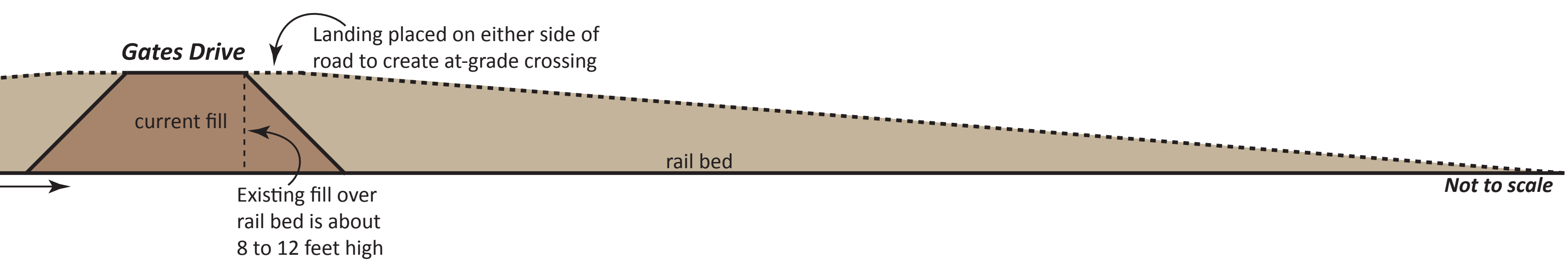
The River Bluff Drive bridge may need improvements for trail user safety, including fencing to keep people from climbing the embankment to exit the trail.

Photo by Trevor Buckley

The view looking down from Gates Drive onto the railbed.

Photo by Trevor Buckley

The view of Gates Drive on the approach from the west.



7. PATH CROSSINGS

Several small paths cross the corridor, often from backyards to overlooks along the river. No formal crossings are needed here, but these paths may persist after trail developments, so a design may incorporate signs where appropriate to warn trail users, cyclists in particular, to watch for traffic at these crossings. Perhaps, property owners can be consulted as to whether they would prefer signs to be located on the trail property near their homes.

Photo by Trevor Buckley

An example of one of the small paths or drives that crosses the corridor to connect homes with the portion of owners' property that lies on the other side of the tracks and abuts the Connecticut River.

Stream & Wetland Crossings: Bridges & Boardwalks

BRIDGES

If a trail replacing rail is planned, the existing bridges and trestles along the corridor might be converted for trail use until such time as the railroad extends its operation to that point. Another possibility would be to attach a cantilevered pedestrian/bikeway to the existing structures. An engineer's assessment will be required of all structures prior to any incorporation to the trail. The live load for trail use is likely to be significantly lower than its original design for supporting locomotives.

If the existing infrastructure cannot be used, then either building a designated pedestrian and bike bridge or using a prefabricated bridge (see photo below left) to span the gap could solve the problem. If these options are not feasible, then rerouting to local roadways around the obstacle may provide the solution.

Bridge decking should be of a non-slip surface, either texturized wood/engineered wood or concrete over sheet metal. Railings should be at least 42 inches in height and extend 15 feet beyond the entry of the bridge, oriented outward at a 45 degree angle. Gaps in decking that allow for drainage should be perpendicular to the flow of traffic to prevent wheels from catching edges and loss of control. Further more a kick-rail or runner should be incorporated into the design to keep wheels within the deck.

If equestrians will use the trail, heights should be at least 54 inches and there should be appropriate signs directing users to dismount and walk their horses across all bridges.

Photo by Stuart Macdonald

A prefabricated steel pedestrian truss bridge used on a trail in Austin, Texas.

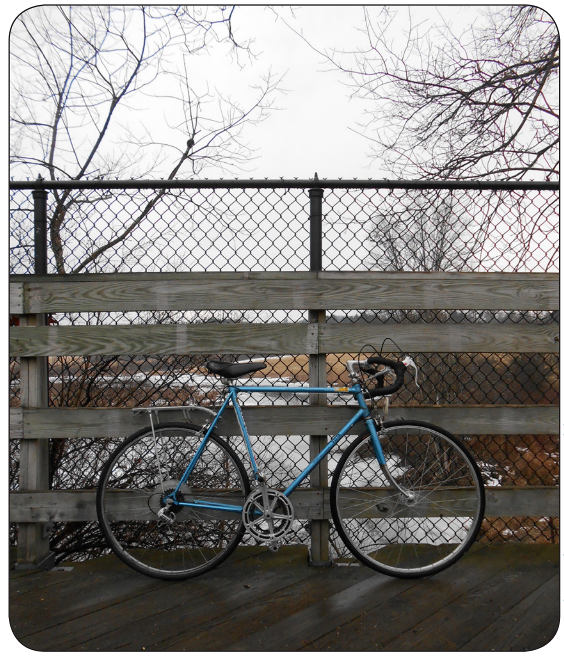


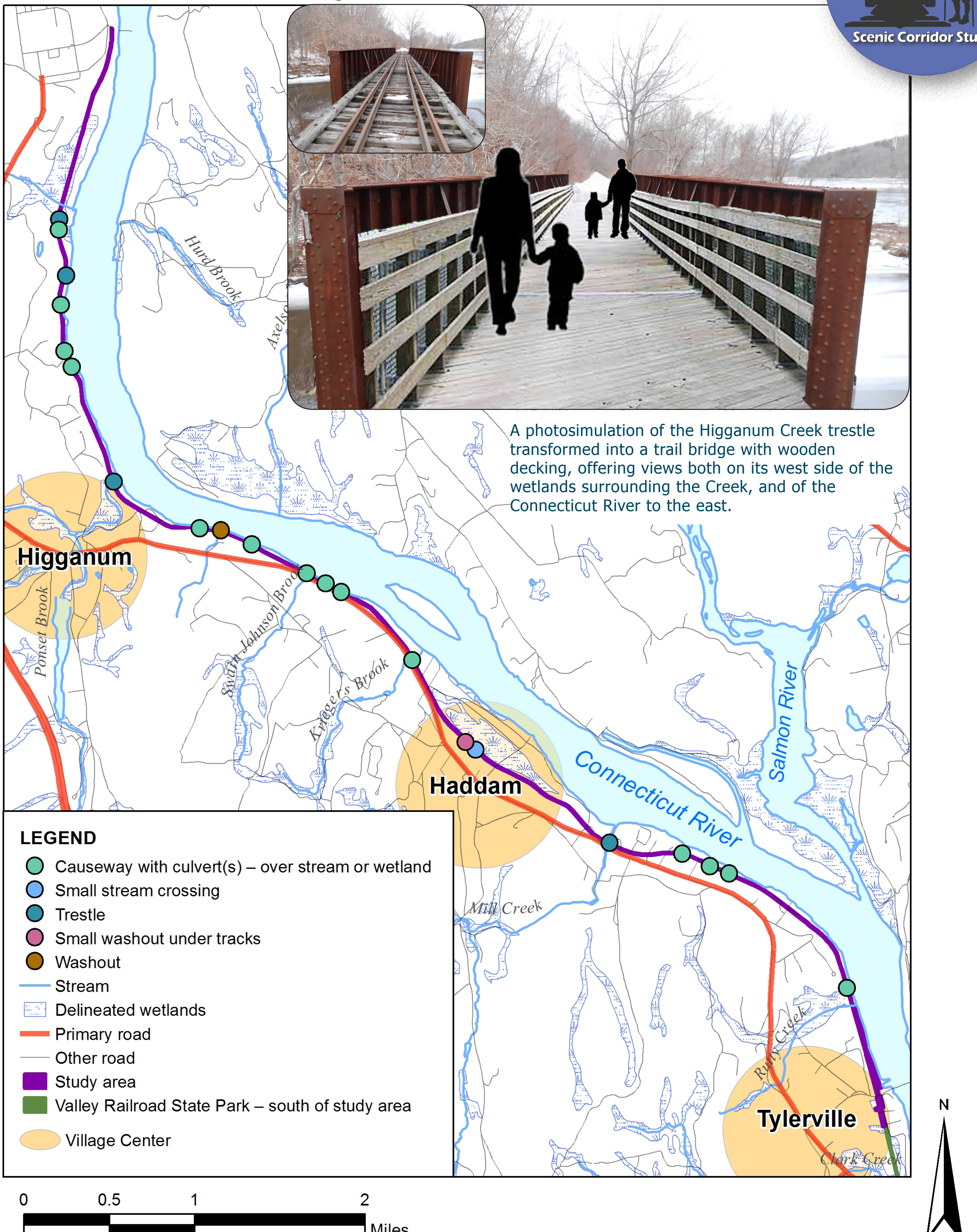
Photo by Trevor Buckley

A 42-inch tall railing is necessary on bridges. (Shown here is a bridge along the Norwottuck Rail Trail in Amherst, Massachusetts.)

Photo by Trevor Buckley

Railing needs to continue off of the bridge to keep trail users from veering into streams, and should turn at an angle to keep cyclists from running head-on into the end of the railing. (Same bridge as shown above.)

Stream and Wetland Crossings



A photosimulation of the Higganum Creek trestle transformed into a trail bridge with wooden decking, offering views both on its west side of the wetlands surrounding the Creek, and of the Connecticut River to the east.

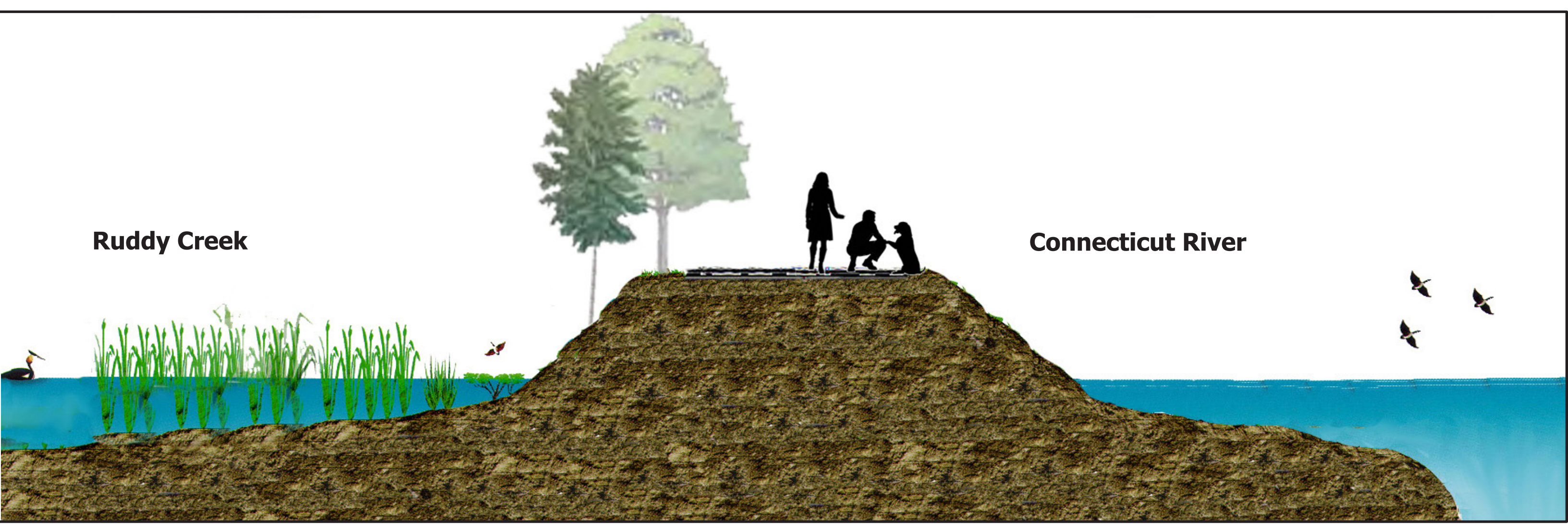
BOARDWALKS

In a trail-replacing-rail scheme, trails on top of the Valley Railroad's causeways at Ruddy Creek and next to wetlands and beaver ponds in Maromas could offer dynamic stretches for wildlife viewing and river access.

Decking for boardwalks in the study area must be elevated well above the tidal high water line and take into account seasonal changes in water levels. Designs should also consider that the effects of climate change may bring these levels higher than historical norms. Boardwalks can provide observation decks with seating.

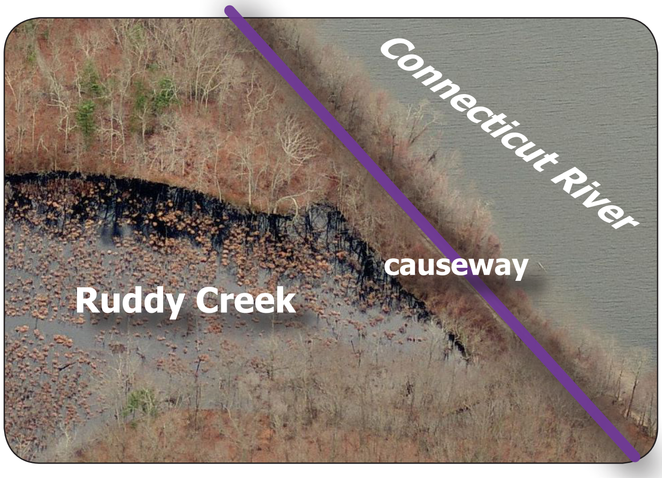
As discussed in the analysis of habitat, wildlife, and vegetation, precaution will be necessary in construction of a trail along the corridor, given its location in the riparian corridor and next to wetlands. According to Jon Kunstler of the Association of State Wetland Managers, Inc., "Care should be taken to maintain natural wetland hydrology including fluctuations of water levels important to wildlife" (Kunstler 9). One possibility for reducing the impact of a potential trail project on wetland and riparian areas would be to schedule construction in winter, "...which reduces impacts on nesting or feeding wildlife" (Kunstler 9). In order to plan for the least amount of impact, a wetland ecologist should be consulted for any sections of the trail through wetlands.

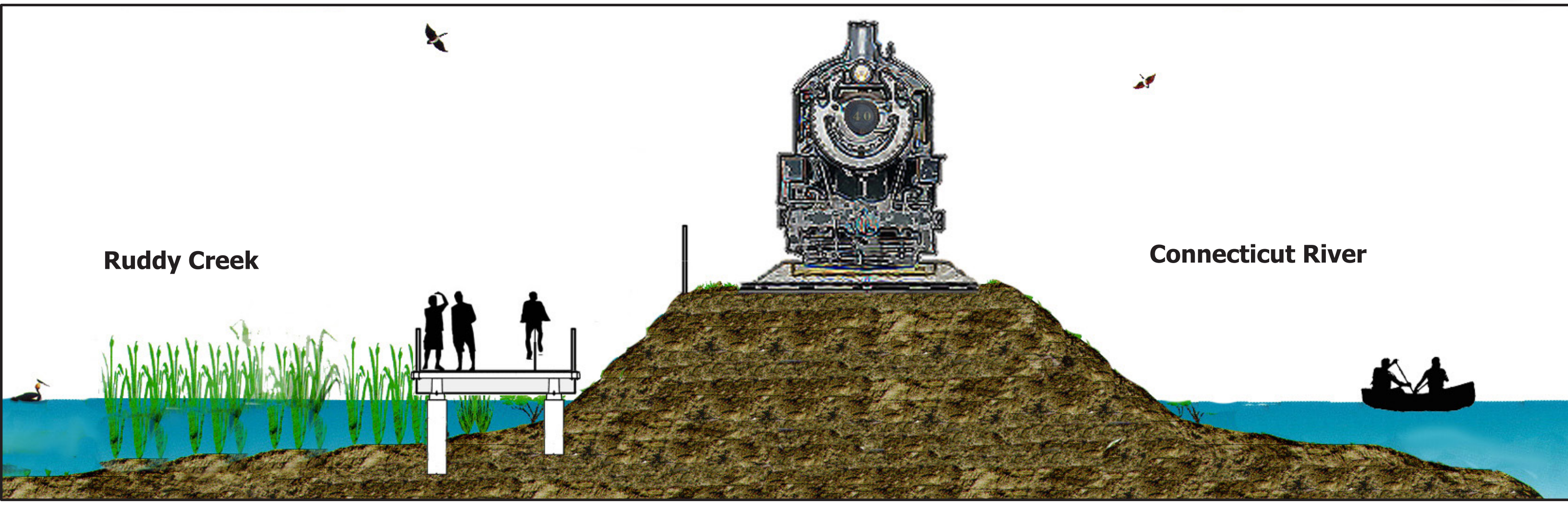
In a trail-replacing-rail scheme, trails on top of the Valley Railroad's causeways at Ruddy Creek and next to wetlands and beaver ponds in Maromas could offer opportunities for wildlife viewing and river access.



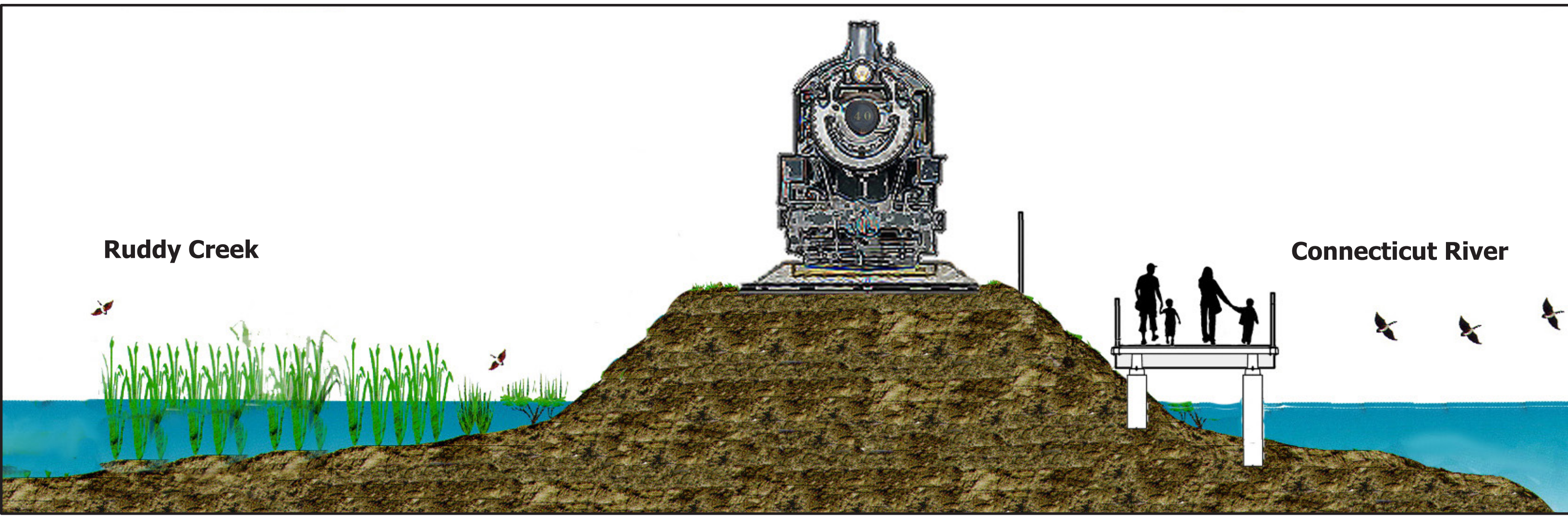
THE CAUSEWAY AT RUDDY CREEK

The following conceptual cross-sections depict a trail along the causeway over Ruddy Creek (culverted) and next to the Connecticut River (pictured in photograph at right). A trail with rail would be necessary along this narrow corridor, as it is the northern terminus for two of Valley Railroad's steam train excursions. A boardwalk would need to be added on either the wetland Ruddy Creek side (first section below) or the causeway or the Connecticut River side (second section below).





A boardwalk on the Ruddy Creek side of the causeway. This would provide trail users with an intimate experience with wetland habitat and wildlife there, including views of nesting osprey.



A boardwalk on the Connecticut River side of the causeway would provide spectacular views up and down the river.

Cost Estimates

The following table includes rough estimates of the likely costs of constructing a ten-foot wide trail along nine miles of rail corridor. Most of these costs include installation. As this project provides general guidelines for trail development and not a specific design, all costs are approximate and there are many elements that, at this time, cannot be accurately priced (e.g., engineering assessments, surveyor fees, contamination clean up, permitting, tree removal), given the scope of the project.

Most features apply to either a trail replacing the rail or a trail with rail. Boardwalks over wetlands have been included for the one-and-half miles of trail with rail that would be required at Ruddy Creek, where Valley Railroad currently conducts active locomotive operations. Pricing of bridge retrofits and new bridges across the nine-mile corridor would require site engineering assessments beyond the scope of this project; thus, costs are listed as "to be determined."

Estimates herein are based on costs obtained from internet resources, including state department of transportation bid information, professional consultations, and retail vendor prices. Where a range of prices for materials was available, the higher end of the range was used for cost estimation purposes. A qualified engineer would be needed to develop a detailed cost estimate for specific trail design alternatives.

There are many other factors that could have dramatic effects on trail development costs, such as phased implementation, a decision to develop less than nine miles of the corridor into trail, and construction industry trends.

Factors that make these costs highly variable include the costs of building bridges and wetland boardwalks, roadway crossings, permitting fees and other special situations.

The following are notes on specific design elements included in the cost estimate table on page 107:

Trailheads

These following cost estimates are for constructing four major trailheads and one minor trailhead at the northern end of the study area (Pratt & Whitney node). This minor trailhead would not have restroom facilities or drinking fountains. These costs do not include any landscaping associated with the trailhead facilities.

Restrooms

The low cost in the estimate is for a facility with four composting toilets and two sinks, and includes electrical wiring and a well. The high cost is for a structure with a total of four flush toilets and two sinks, and includes electrical wiring, and well and septic facilities.

Erosion control

This includes matting and seeding or plugs of vegetation for bioengineering and phytoremediation of soil.

Boardwalks

The low cost is for a structure constructed of pressure-treated wood, including pilings and 48-inch high railings. The high cost is for a structure with concrete pilings, steel crossbeams, and engineered wood decking with 48-inch high railings.

Grand total

This includes an addition of 40% of the subtotal added in for contingencies, design and administration costs, and mobilization (transport and staging) of construction materials.

Bridges

Retrofitting the existing bridges (for a trail-replacing-rail scheme) requires that a "Bridge Safety and Evaluation Inspection Report" be completed by a qualified professional, and submitted and approved by Connecticut DOT.

Cost Estimate Table for Construction of Nine-mile Multiuse Trail

Item	Quantity	Units	Low unit cost	High unit cost	Low subtotal	High subtotal
Trail construction						
Grading (9 miles/30 feet wide)	1	Lump sum	$ 120,000	$ 180,000	$ 120,000	$ 180,000
Coated chainlink fence along active rail (72 inch high)	5280	Linear foot	$ 30	$ 40	$ 158,400	$ 211,200
Split rail fence along steep slopes (48 inch high)	10560	Linear foot	$ 12	$ 18	$ 126,720	$ 190,080
Sub surface fill (9 miles/6 inch depth)	36300	Per ton	$ 15	$ 20	$ 544,500	$ 726,000
Gates Drive (fill for 5% slope)(needed with a trail that replaces rail)*	1250	Per ton	$ 10	$ 20	$ 12,500	$ 25,000
Road crossing signs	147	Each	$ 200	$ 300	$ 29,400	$ 44,100
Pavement markings	580	Linear foot	$ 3	$ 5	$ 1,740	$ 2,900
Bollards (fixed steel)	28	Each	$ 300	$ 500	$ 8,400	$ 14,000
Bollards (removable)	28	Each	$ 400	$ 700	$ 11,200	$ 19,600
Erosion control	16.5	Per acre	$ 5,000	$ 6,500	$ 82,500	$ 107,250
Educational signs (single panel)	9	Each	$ 500	$ 600	$ 4,500	$ 5,400
Trail signs (1/2 mile markers)	18	Each	$ 25	$ 75	$ 450	$ 1,350
Benches (1 every 1/2 mile)	18	Each	$ 150	$ 400	$ 2,700	$ 7,200
Rapid rectangular flashing beacon	1	Per pair	$ 10,000	$ 15,000	$ 10,000	$ 15,000
Trailheads (x5)						
Parking (gravel/asphalt)	5	10 spaces	$ 10,000	$ 25,000	$ 50,000	$ 125,000
Lighting (trail head security)	18	Each	$ 300	$ 1,500	$ 5,400	$ 27,000
Call boxes (solar-powered and wireless)	5	Each	$ 4,000	$ 5,000	$ 20,000	$ 25,000
Trailhead signs (3 panel kiosk)	5	Each	$ 1,500	$ 2,000	$ 7,500	$ 10,000
Bike Racks (anchored)	4	Each	$ 1,000	$ 2,000	$ 4,000	$ 8,000
Benches (anchored)	34	Each	$ 150	$ 400	$ 5,100	$ 13,600
Tables (anchored)	34	Each	$ 200	$ 500	$ 6,800	$ 17,000
Trash/Recycling station (4 receptacles/anchored)	9	Each	$ 250	$ 1,000	$ 2,250	$ 9,000
Trash Receptacles	18	Each	$ 50	$ 150	$ 900	$ 2,700
Recycling Receptacles	18	Each	$ 50	$ 150	$ 900	$ 2,700
Drinking fountain	4	Each	$ 500	$ 2,500	$ 2,000	$ 10,000
Restrooms	4	Each	$ 90,000	$ 250,000	$ 360,000	$ 1,000,000
		SUBTOTAL (without surface material)			$ 1,577,860	$ 2,799,080
Surface material options						
Crushed stone/stone dust (3/8 inch aggregate)	40000	Per ton	$ 17	$ 20	$ 680,000	$ 800,000
Asphalt (3 inch thick)	1306800	Square foot	$ 2.75	$ 4	$ 3,593,700	$ 5,227,200
Porous asphalt (3 inch thick)	1306800	Square foot	$ 8	$ 10	$ 10,454,400	$ 13,068,000
Concrete (4 inch thick)	1306800	Square foot	$ 6	$ 8	$ 7,840,800	$ 10,454,400
Porous concrete (4 inch thick)	1306800	Square foot	$ 10	$ 12	$ 13,068,000	$ 15,681,600
Filter fabric (needed beneath porus asphalt/concrete)	1	Lump sum	$ 275,000	$ 300,000	$ 275,000	$ 300,000
Boardwalks for wetlands (1.5 miles) (trail with rail)	7920	Linear foot	$ 200	$ 400	$ 1,584,000	$ 3,168,000
Subtotal for trail by surface type (includes boardwalks)					**Low cost**	**High cost**
Crushed stone					$ 3,841,860	$ 6,767,080
Asphalt					$ 6,755,560	$ 11,194,280
Porous asphalt (includes asphalt plus lump sum for filler fabric)					$ 13,891,260	$ 19,335,080
Concrete					$ 11,002,660	$ 16,421,480
Porous concrete (includes concrete plus lump sum for filler fabric)					$ 16,504,860	$ 21,948,680
Additional costs (range of % of subtotal added)	For the purposes of calculating the grand total, a total of 40% of the subtotal will be added to account for additional costs, that is, 15% for contingency, 20% for design/admin., and 5% for mobilization). The grand total is 1.4x the subtotal.					
10%-15% contingency						
15%-20% design/admin.						
3%-5% mobilization						
Grand total					**Low cost**	**High cost**
Crushed stone					$ 5,378,604	$ 9,473,912
Asphalt					$ 9,457,784	$ 15,671,992
Porous asphalt					$ 19,447,764	$ 27,069,112
Concrete					$ 15,403,724	$ 22,990,072
Porous concrete					$ 23,106,804	$ 30,728,152
Costs unknown						
Permitting					TBD	TBD
Surveyor fees					TBD	TBD
Engineer fees					TBD	TBD
Contamination clean up					TBD	TBD
Tree removal					TBD	TBD
Excavation					TBD	TBD
New bridge construction					TBD	TBD
Maintenance					TBD	TBD

*Fill to create an at-grade crossing at Gates Drive would be necessary for a trail replacing rail option. If rail is reestablished at a future point, then the trail would likely be routed around Gates Drive (see page 100-101 for an explanation).

Photo by Walt Zilahy

The corridor at present

A trail replacing rail

7. Visions for the Corridor

This study explores the possibility of developing a multiuse trail along nine miles of the Valley Railroad corridor. It assesses three trail types and various design options, and considers environmental constraints and opportunities for local and regional connectivity. The proposed nodes and segments provide a basic framework for a trail, and the conceptual designs and guidelines offer ideas for trail development as either a dedicated trail corridor ("trail replacing rail") or a corridor with a trail next to the rail ("trail with rail"). Both of these trail design options offer opportunities and have constraints. Given state ownership of the corridor and the long-term lease of the property to Valley Railroad Company, any future trail would be contingent on interest, involvement, and support from both of these entities. Potential options vary in terms of the length of the trail, developing the trail in phases, construction materials, and trail infrastructure. Recognizing the possibilities allows for envisioning what the corridor might look like for future generations. The following portrays three such visions.

One public workshop participant's survey comments captures the excitement and possibilities that a trail project might generate for the communities along the corridor:

"This is the best plan I have heard for this area in a long time. I have lived in Haddam for the last 12 years... My home abuts the railroad line.... [A trail] would support recreation for families, bring more visitors to the region, improve property values, and commercial taxes associated with visitors. It would allow growth of Higganum Center into a destination like downtown Essex. Any connection to other trails, state/conservation land should be supported....I do also support the continued use of the rail line by the Valley RR Co."

Vision I: An Informal Trail Runs Along the Corridor

THE NO-ACTION ALTERNATIVE

The study area remains a stretch of quiet rail corridor, with no train traffic on the northern eight miles, with the exception of high-rail vehicles (trucks modified to run on rails) used for maintenance. Valley Railroad Company maintains the lines for future use, but otherwise the tracks are quiet, with minimal human activity. Soil contaminants from historic rail use and from ongoing maintenance may continue to slowly disperse through the surrounding soil and water, but wildlife in the tidal wetlands and areas of designated critical habitat are largely undisturbed by humans. As climate change unfolds, increasing storm frequency and flooding events along the Connecticut River may exacerbate erosive conditions that exist along the corridor, diminishing further interest in major upgrades to the corridor for future rail or trail use.

The area remains an important riparian corridor along the Connecticut River. Local residents make use of the railbed as an informal pathway for observing wildlife and enjoying scenic views. Local residents and tourists occasionally pass through the corridor to explore coves and beaches or to put in their kayaks and canoes at the river.

Photo by Liz Bazazi

Vision II: The Rail Gives Way To A Trail

A MULTIUSE TRAIL IN PLACE OF RAIL DEVELOPMENT

The Valley Railroad State Park serves as a nine-mile linear greenway on a permeably surfaced, riverside trail using the railbed and existing trestles to serve pedestrians, cyclists, wildlife enthusiasts, cross-country skiers, and other uses throughout the seasons. Along some segments, a single trail transitions to multiple treads to suit different users, such as equestrians and cyclists who prefer different surface materials.

Ecological and cultural narratives unfold on interpretive signs highlighting points of interest from node to node. While trail visitors enjoy exploring the rich history and natural diversity along the corridor, great care is taken to avoid disturbance of sensitive habitats and species of concern. A seasonal schedule based on nesting, feeding, and breeding cycles of birds and other animals determines which portions of the trail are open; alternate routes are devised for these seasonal patterns. A corps of dedicated volunteers and state staff steward the trail, taking part in phytoremediation managing soil contamination and bioengineering efforts to stabilize the steep slopes and reduce soil erosion along the trail.

Photo by Trevor Buckley

Photo of trestle in Maromas at present

Cross-country skiing in Maromas across a former rail trestle. (photosimulation)

A barrier-free path down to the Connecticut River near Higganum Cove. (photosimulation)

Photo by Walt Zilahy

Photo of Cove Wharf beach at present

Vision III: A Trail Runs Along the Rail

A MULTIUSE TRAIL-WITH-RAIL DEVELOPMENT

The Valley Railroad Scenic Corridor serves as a nine-mile linear transportation and recreation corridor consisting of a single-tread, permeably surfaced trail beside the Valley Railroad Company's steam train operations, which have extended all the way to Maromas. The train traverses streams and wetlands on causeways and refurbished trestles, while the trail crosses over water on new spans and pedestrian decks cantilevered off the side of trestles, and on boardwalks through wetlands and floodplain forests. At constraints (bedrock outcrops or steep slopes), the trail diverts from the corridor onto local roads or through a separate right-of-way and rejoins the rail corridor farther on.

Locals and tourists enjoy the trail and use the train to catch rides up and down the corridor, including service to the Chester-Hadlyme Ferry and all the way south to Essex. This trail-rail system builds connectivity between villages and local attractions on both sides of the river. Seasonal restaurants and outdoor outfitters have set up shop at nodes along the trail to sell provisions and rent bike and other equipment to trail visitors. With both trail and rail, a broad spectrum of visitors and residents can enjoy the majesty and beauty of the Connecticut River Valley.

A local steam train operation coexists with trail users.
(photosimulation)

Resources

Works Cited

Alta Planning + Design. "Chelatchie Prairie: Rail with Trail Corridor Study." Clark County, Washington, August 2008. PDF. < http://atfiles.org/files/pdf/080902-final-chelatchie_web.pdf >. 17 April 2014.

Bazazi, Elizabeth. "Re: Thank you and Follow-up." Message to the authors. 11 Feb. 2014. Email.

Burns, Margot. "A Viewshed Model for the Lower CT River and Coastal Region: Abstract." Lower Connecticut River Valley Council of Governments. October 2012. PDF.

Cain, Claire. "(no subject)." Message to the authors. 10 April 2014. Email.

Calkins, Meg. *Materials for Sustainable Sites*. Hoboken, NJ: Wiley, 2008. Print.

Connecticut Economic Resource Center. "Town Profiles." 2013. PDFs. < http://cerc.com/TownProfiles/ >. 17 April 2014.

Flink, Charles, Kristine Olka, and Robert M. Searns. *Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multiuse Trails*. Second edition. Washington, D.C.: Island Press, 2001. Print.

Flink, Charles A. and Robert M. Searns. *Greenways: A Guide to Planning, Design, and Development*. Washington, D.C.: Island Press, 1993. Print.

Friends of Valley Railroad. "Track work map." N.d. PDF. < http://friendsvrr.org/image/FVRR-project-alignment.pdf >. 17 April 2014.

Glidden, Elizabeth. Personal phone interview. 11 Feb. 2014.

Google Earth Pro. Traffic count data. April 2014.

Gunther, Peter, Kathryn Parr, Marcello Graziano, and Fred Carstensen. *The Economic Impact of State Parks, Forests and Natural Resources under the Management of Department of Environmental Protection*. Connecticut Center for Economic Analysis, University of Connecticut. 15 June 2011. PDF. < http://www.ct.gov/deep/lib/deep/outdoor_recreation/2011economicimpactstudy.pdf >. 17 April 2014.

Hester, Randolph T. *Design for Ecological Democracy*. Cambridge, MA: MIT Press, 2006. Print.

Higganum Cove Committee. "Report of Higganum Cove Committee." Town of Haddam, Connecticut, Nov. 2000 PDF. < http://www.haddam.org/documents/higganumcove.pdf >. 9 Feb. 2014.

Hellmund, Paul Cawood and Daniel Somers Smith. *Designing Greenways*. Washington, D.C.: Island Press, 2006.

Kühl, Kaja. "From Brownfields to Greenfields: A Field Guide to Phytoremediation." Urban Omnibus, 10 Nov. 2010. Web. < http://urbanomnibus.net/2010/11/from-brownfields-to-greenfields-a-field-guide-to-phytoremediation/ >. 17 April 2014.

Kunstler, Jon. "Common Questions: Constructing Wetland Boardwalks and Trails." 2006. PDF. < http://aswm.org/pdf_lib/2_boardwalk_6_26_06.pdf >. 17 April 2014.

Massachusetts Department of Environmental Protection. *Best Management Practices for Controlling Exposure to Soil during the Development of Rail Trails*. N.d. *Microsoft Word* file. < www.mass.gov/eea/docs/dep/cleanup/laws/railtrai.doc >. 17 April 2014.

McCarthy, Thomas. Personal interview. 2 Feb. 2014.

Rails-to-Trails Conservancy (RTC). *America's Rail-with-trails*. September 2013. PDF. < http://www.railstotrails.org/resources/flipbooks/2013_rail-with-trail-report/index.html >. 17 April 2014.

- - -. “Developing Trails in Sensitive Areas.” N.d. Web. < http://www.railstotrails.org/ourWork/trailBuilding/toolbox/informationSummaries/sensitiveareas.html >. 17 April 2014.

- - -. “Rail-trail Statistics.” April 2014. Web. < http://www.railstotrails.org/ourWork/trailBasics/trailStats.html >. 17 April 2014.

- - -. *Understanding Environmental Contaminants*. 24 September 2004. PDF. < http://www.railstotrails.org/resources/documents/resource_docs/EPAReport.pdf >. 17 April 2014.

- - -. “What the Marvin M. Brandt Case Means for America’s Rail-Trails.” 17 March 2014. Web. < http://community.railstotrails.org/blogs/trailblog/archive/2014/03/17/what-the-marvin-m-brandt-case-means-for-america-s-rail-trails.aspx >. 17 April 2014.

“Rails with trails: case studies from across America.“ American Trails, March 2007. Web. < http://www.americantrails.org/resources/railtrails/RWTcasestudies.html >. 17 April 2014.

Stinson, John, Elizabeth Farnsworth, and Wendy Stinson. *The Connecticut River Boating Guide: Source to Sea*. Third Edition. Guilford, CT: The Globe Pequot Press, 2007. Print.

The Progress Fund. “Trail Impact Fact Sheet.” N.d. PDF. < http://www.trailtowns.org/Data/Sites/1/trail_impact_fact_sheet.pdf >. 17 April 2014.

Trail Towns Program. “Expand your Business.” N.d. Web. < http://www.trailtowns.org/expand-your-business.aspx >. 17 April 2014.

Turner, Gregg M. and Melancthon W. Jacobus. *Connecticut Railroads...An Illustrated History*. Second Edition. Hartford: The Connecticut Historical Society, 1989. Print.

U.S. Department of Transportation. “Rail-with-Trails: Lessons Learned”. August 2002. PDF. < http://www.fta.dot.gov/documents/RailsWithTrails.pdf >. 17 April 2014.

Valley Railroad Company staff and board members. Personal conversation. 10 March 2014.

Vanderboom, Eric. “Site Investigation Closure Memorandum: Higganum Cove Site.” U.S. Environmental Protection Agency, September 2013. PDF.

Woodside, Christine. “The Elephant in the Room.” *Connecticut Woodlands* 77.1 (March 2012): 6. PDF. < http://www.ctwoodlands.org/sites/default/files/woodlands_2012_spring.pdf >. 17 April 2014.

youarethecity. *Brownfields to Greenfields: A Field Guide to Phytoremediation*. 2011. PDF. < http://www.youarethecity.com/pdf/fieldguide_youarethecity.pdf >. 17 April 2014.

Additional Key Resources

- American Association of Transportation and Highway Officials’ (AATHO) *Guide for the Planning, Design, and Operation of Bicycle Facilities*
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- Uniform Federal Accessibility Standards (UFAS)
- U.S. Federal Highway Administration’s *Designing Sidewalks and Trails for Access, Parts I & II*
- U.S. Federal Highway Administrations’s *Manual Uniform Traffic Control Devices* (MUTCD)

Appendices

Appendix A: Stakeholder Meeting

The Stakeholder Meeting brought together approximately a dozen or more stakeholders from the region. This meeting was facilitated in order to develop a community vision to guide the focus of the project. Supplied with maps of the study area, attendees worked individually to consider the positive and negative characteristics of the rail corridor and a potential rail trail (see copy of handouts on page 117). Attendees were pre-assigned to small groups, in which they discussed their individual reflections. These small groups then reported their top three positive and negative characteristics to share to the larger group. This was followed by an open floor discussion of the topic. Pages 118 to 120 are the summary notes of the small group findings, as well as other notes submitted by attendees of the meeting.

Stakeholder Meeting Exercise Handouts

Valley Railroad State Park Scenic Corridor Study
Stakeholder Meeting – Individual Exercise

Instructions

Working alone, reflect on and brainstorm the following:

- What are the ***positive characteristics*** of the Haddam Section of the rail corridor and what are the ***potential opportunities/assets*** presented by a multimodal trail along the corridor?
  Examples: scenic vistas, access points, parking close to village centers, spots to watch nesting bald eagles, unique or interesting vegetation

- What are the ***negative characteristics*** of the Haddam Section of the rail corridor and what are the ***potential challenges/liabilities*** presented by a multimodal trail along the corridor?
  Examples: road/driveway/path crossings, spots where teens gather to party, areas where homes do have not have much security and privacy from the rail corridor

Use the space below to take notes and mark up your maps as you wish. Towards the end of the time allotted, choose your top two pros and cons to share with your small group.

Group I.D.:
Recorder:
Date: 2.6.2014

Valley Railroad State Park Scenic Corridor Study
Stakeholder Meeting – Small Group Exercise

Instructions

Choose a recorder for the group. Have individuals report their top two pros and cons. As a group, discuss and synthesize the individual responses. Use the space below to take notes and mark up your maps as you wish. Select the group's top two pros and top two cons. Choose a representative to report the small group's thoughts to the larger group.

Valley Railroad State Park Scenic Corridor Study
Summary Notes for Stakeholder Meeting on Feb. 6th, 2014

Prepared by Trevor Buckley & Christian Johnson, The Conway School

The following notes are a distillation of feedback provided by the attendees of the Stakeholder Meeting held by RiverCOG and the Conway School team at the Middlesex County UConn Extension Building on 2/6/2014. The feedback (pros and cons) are categorized under four different areas of analysis (Community, Environmental, Recreation, and Transportation, but there is overlap between these.

I. Positive Characteristics of Corridor & Opportunities/Benefits of a Multi-use Trail:

COMMUNITY

- Opportunity for ecological and cultural education along corridor, including signs.
- Involve Native American groups and include their cultural history in trail design and education.
- Picnic areas and public art venues along the trail.
- Opportunities in Higganum
    - Trail could link to Higganum village via a node near Higganum Cove (sidewalk plan, bus connection, easy bike ride).
    - Town of Haddam is considering acquiring the two properties that make up the cove area.
    - Spur Higganum village and Higganum Cove economic development opportunities.
    - Community surveys have shown great support for developing a tourism-based economy, drawing on the area's natural and historic resources.

ENVIRONMENTAL

- Expansion of existing greenways.
- Selective forest management used to open and maintain views.
- Incorporate community restoration/conservation efforts (e.g., river celebration, outreach/cleanups).
- Preservation and promotion of native vegetation and plant communities, along with removal/control of invasive species.
- The outlet of Hubbard Brook (Maromas) in Hubbard Brook Preserve is an area of interest; there is a trestle there and beautiful fresh water tidal wetland habitat with wildlife.
- Create a connection to Selden Island (Lyme, near the Chester-Hadlyme Ferry).

RECREATION

- General
    - Promote non-vehicular movement and exercise; encourages a healthy lifestyle and improves quality of life.
    - Create riverside parks near village centers for local/visitor recreation.
    - Opportunity to host sporting events (e.g., marathons, triathlons, fund raising walks/runs).
    - Opportunities for kayak, canoe, and cross-country ski rental businesses.
- Specific
    - Parking/Trailhead areas potentially in Tylerville, River Road/Blue Trail, Meadows and Higganum.
    - Connections to Midway Marina and Blue Oar restaurant, Eagle Landing State Park, and tour boats—boat-to-bike opportunities.
    - Parking at Eagle Landing State Park.

1

    - Haddam Meadows offers boating access, space for events, and wildlife viewing area at south end of meadow.
    - Hubbard Brook outlet/beach area near blue-blaze trail has good canoe/kayak access; it already draws people and has good parking (Northeast Utilities conservancy land in Maromas).
    - Hurd and Seymour State Parks across the Connecticut River are very scenic.
    - Could connect and complement other trail systems including Connecticut River Paddlers Trail, New England Scenic Trail, Connecticut Forest & Park Association trails, Appalachian mountain Club camping areas along the Connecticut River.
    - Expanding the popular Airline Trail from East Hampton to Portland and Middletown through Haddam would enable cyclists, hikers, Nordic skiers and potentially equestrians the ability to enjoy extensive treks—this could become a great draw for the entire region.

TRANSPORTATION

- Purpose and design of trail
    - Develop into a multi-use transportation corridor.
    - Safe trail routes for bike and pedestrian commuters, including school children.
    - Removing existing rails would be necessary to proceed with for trail development.
    - Parking will require special attention.
    - Pervious parking areas and storm water management strategies.
- Local and regional connections
    - Tie-ins with Valley Railroad, the Chester-Hadlyme Ferry, and 9 Town Transit.
    - Connection via the Swing Bridge to East Haddam village.
    - A trail head starting at River Street more acceptable to rail interests [due to use of rail north of Goodspeed Station?].

II. Negative Characteristics of the Corridor & Challenges/Obstacles of a Multi-use Trail:

COMMUNITY

- General
    - Private ownership issues and railroad lease.
    - On-going stewardship and maintenance concerns.
    - Trail needs to be more than a through-way; it needs to lift up and provide opportunities for small business.
- Specific
    - Landing Road and Horton Road neighborhoods have homes that are very close to the tracks.
    - Pratt and Whitney has security concerns.

ENVIRONMENTAL

- Need to minimize negative impacts on the river—it is important *how* work is implemented.
- Large waste management facility [Town of Haddam Transfer Station?] along the corridor.

RECREATION

- Inappropriate activities (ATVs, snowmobiles, and 4x4s) present safety and security concerns.
- Boat parking areas needed to encourage private boaters to use trail and patronize businesses.
- Improvements needed for handicap and senior accessibility to river.

TRANSPORTATION

- General
  - Trestles are in poor condition.
  - Lack of adequate parking and access.
  - Pinch points along corridor—very narrow in some places, which would make rail-with-trail difficult.
  - Lack of facilities and infrastructure to support trail.
- Specific
  - Improved connection needed to the East side of the river for pedestrians and cyclists.
  - Rail in operation up to mile marker 13—"Heavy usage line," "Expanding every year" – Bob Bell
  - Midway Marina is a potential obstacle; heavy equipment and vehicles movement across tracks, and safety and right-of-way issues.
  - Middletown Riverfront Planning [Redevelopment Commission?] wants to attract tourism from Old Saybrook and other points along the coast via passenger train directly to Middletown, not via pedestrian/bike trail.

3

Appendix B: Public Information Workshop

Attendees of the Public Information Workshop participated in an activity in which they voted their preferences for proposed nodes, and recommendations for potential trail design options and trail uses. Attendees each received six votes for each of the three categories, and could distribute their votes however they wished. The results for this activity are listed below. Attendees were also provided with a survey, shown on page 122. The results of the survey are on page 123.

Public Information Workshop Activity Results (46 respondents)

STATION #	NODES					TRAIL DESIGN						
	Eagle Landing	Haddam Meadows	Higganum Cove	Scovill Trails/ Hubbard Brook	Pratt & Whitney	Single Tread Path	Multi-tread Path	Asphalt	Concrete	Stone Dust	Other: red brick	Other com-ments
1	15	17	15	2	2	0	19	8	1	28	1	
2	12	22	22	12	6	7	31	13	0	23		
3	8	5	26	6	0	6	7	6	0	12		20
4	16	21	20	8	2	0	2	20	0	20		
5	18	7	11	7	5	12	7	12	6	23		
TOTALS	66	71	93	34	15	25	62	56	7	106	1	20

STATION #	TRAIL USES											
	Bird Watching /Wildlife	Cross-Country Skiing	Fishing	Hiking	Horseback Riding	Jogging/ Running	Mountain Biking	Paddling (Canoe/ Kayaking)	Pick-nicking	Road Cycling	Walking	Other
1	6	6	2	14	3	8	0	1	3	7	7	
2	4	6	0	10	6	10	1	5	1	18	16	
3	6	6	2	21	0	4	2	6	1	5	10	16
4	2	5	1	8	0	7	0	2	1	13	3	
5	5	3	3	9	0	4	3	3	3	6	8	
TOTALS	20	26	5	58	9	31	6	16	8	48	44	16

Valley Railroad Scenic Corridor Study
Public Information Workshop Survey

I. Residence and Regional Perspective

1. Where do you live? (village/town) ______________________________

2. How long have you lived in the Lower Connecticut River Valley region? ______________

3. What do you consider the *most* important draw to the River Valley (from Chester to Middletown)?

Choose one: ☐ Cultural attractions ☐ Natural areas ☐ Recreation

☐ Scenic views ☐ Other: ______________________

II. Relationship to the Connecticut River

1. Do you spend time at/on the Connecticut River? ☐ Yes ☐ No

2. If yes, how often (in season/excluding the coldest months)?

Choose: ☐ Daily ☐ Weekly ☐ Monthly ☐ Occasionally

3. Where do you access the river?

Check and name all that apply:

☐ Public park or boat launch: ______________________

☐ Conservation land/other land open to the public: ______________

☐ Private club or marina: ______________________

☐ Private residential property ☐ Other: ______________

4. What activities do you take part in while at/on the river?

Check all that apply: ☐ Boat ☐ Canoe/kayak ☐ Fish ☐ Picnic

☐ Swim ☐ View wildlife ☐ Other: ______________

5a. Is there a need for more public access to the Connecticut River on the west shoreline, from Tylerville (Haddam) to Maromas (Middletown)? ☐ Yes ☐ No b. If yes, where? __________

____

III. Potential Multi-use Trail

1. Would you anticipate making use of a potential multi-use trail along the River? ☐ Yes ☐ No

2. If yes, how often (in season/excluding the coldest months)?

Choose one: ☐ Daily ☐ Weekly ☐ Monthly ☐ Occasionally

3a. Would you use the trail as an alternative route for local travel (by foot or bicycle)?

(Examples: travel to employment, child's school, shopping) ☐ Yes ☐ No

b. If yes, how often? ☐ Daily ☐ Weekly ☐ Monthly ☐ Occasionally

4. How important would river views from the trail be to you as a potential visitor?

☐ Not Important ☐ Somewhat important ☐ Important ☐ No preference

5. Should a potential trail connect to regional hiking trail networks and bike routes? ☐Yes ☐No

☆ *Please write additional comments on the back side of this sheet. Thank you!*

Public Information Workshop Survey Results (42 respondents)

I. Residence and Regional Perspective										
1.	Where do you live?	Chester 4	Deep River 3	East Haddam 3	Ivorytown 1	Haddam 5	Higganum 20	Maromas 0	Portland 5	Essex 1
2.	How long have you lived in the Lower CT River Valley (years)?		Mean Median Range	27.79 26.00 57.00	Collective	1111.50				
3.	Most important draw to region?			Cultural attractions 0		Natural areas 13	Recreation 4	Scenic views 10	Other: ecotourism 1	
II. Relationship to the Connecticut River										
1.	Do you spend time at the River?			Yes 42	No 0					
2.	If yes, how often?			Daily 14	Weekly 16	Monthly 9	Occasionally 2			
3.	Where do you access the river? (Specific responses in table below)			Public park or boat launch 33	Conservation land/other public access 15	Private club or marina 6	Private residential property 15	Other: rail corridor 2	Other: path by Higganum Cove 1	Other: End of Depot Rd. 1
4.	What activities do you take part in?			Boat 17	Canoe/kayak 23	Fish 8	Picnic 16	Swim 10	View wildlife 28	
			OTHER:	Walk 6	Hiking 3	Run/jog 3	Environmental education 1	Photo-graphy 2	Dog-walking 3	Cross-country skiing 4
				Biking 2	Natural resource data gathering 1			Rowing 1	Camping 1	
5a.	Is there a need for more public access?			Yes 36	No 4	OTHER:	Unsure at this time 2			
5b.	If yes, where?			Higganum Cove 14	All of study area 1	Maromas 4	Areas away from Rt. 154 1	Wherever possible 2	All proposed sites [nodes?] 1	North/south of Haddam Meadows 1
III. Potential Multi-use Trail										
1.	Would you anticipate making use of a potential trail?				Yes 41	No 1				
2.	If yes, how often?				Daily 8	Weekly 25	Monthly 8	Occasionally		
3a.	Would you use as alternative route for local travel?				Yes 7	No 33				
3b.	If yes, how often?				Daily 1	Weekly 3	Monthly 1	Occasionally 3		
4.	How important would river views be on a trail?				Not important 1	Somwhat important 4	Important 34	No preference 3		
5.	Should trail connect to regional hiking, biking routes?				Yes 34	No 3	OTHER:	If/where possible 5		Maybe 1

Free responses to Question II-3b.

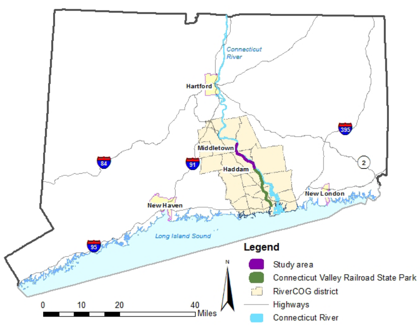
Q-II.3b.	**Where do you access the river?**									
Public park or boat launch:	Haddam Meadows State Park 11	Deep River 4	Eagle Landing 2	Essex 2	East Haddam Boat Launch 1	Chester boat launch 1	Middletown Boat House 1	Essex North Cove 1	Hurd State Park 1	Harbor Park 1
Conservation land:	NE Utilities Land 2	Pratt Cove 1	Clark Creek 1	Parkers Point 1	Chapman Pond 1	Turtle Creek 1				
Private club or marina:	Pettipaug Yacht Club 1	Midway Marina 1	Essex Yacht Club 1	Island Cove 1	Portland Riverside Marina 1	Fireman's Grounds 1				
Other:	End of Depot Rd. (Higganum Cove?) 1									

Appendix C: Geospatial Data Sources for GIS Mapping

RiverCOG District & Project Study Area, page 5

Connecticut Department of Energy and Environmental Protection (DEEP): Connecticut River, Connecticut state boundary, Connecticut Valley Railroad State Park, highways, town boundaries
website: http://www.ct.gov/deep/cwp/view.asp?a=2698&q=322898&depNav_GID=1707&depNav=|

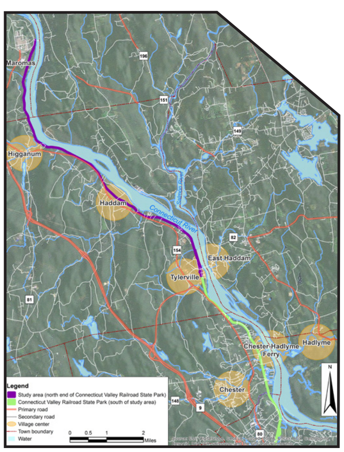
Trevor Buckley: Study area, RiverCOG District



Relative Location, page 11

DEEP: Connecticut River, Connecticut state boundary, Connecticut Valley Railroad State Park, highways, town boundaries

Trevor Buckley: Study area, RiverCOG District



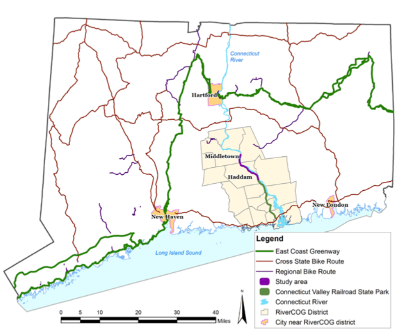
Project Study Area: Roads, Rail Corridor, and Village Centers, pages iv and 13

DEEP: Connecticut Valley Railroad State Park, primary roads, streams, town boundaries

ESRI: Satellite imagery ("?" available in Arc MAP)

Trevor Buckley: Study area, village centers

USDA Geospatial Gateway: Secondary roads
website: http://datagateway.nrcs.usda.gov/GDGHome.aspx



Connecticut Bike Network, page 18

Connecticut Department of Transportation (DOT): Bike routes
website: http://www.ctbikemap.org/cue_sheets.html

DEEP: Connecticut River, Connecticut state boundary, Connecticut Valley Railroad State Park, town boundaries

Trevor Buckley: Study area, RiverCOG district

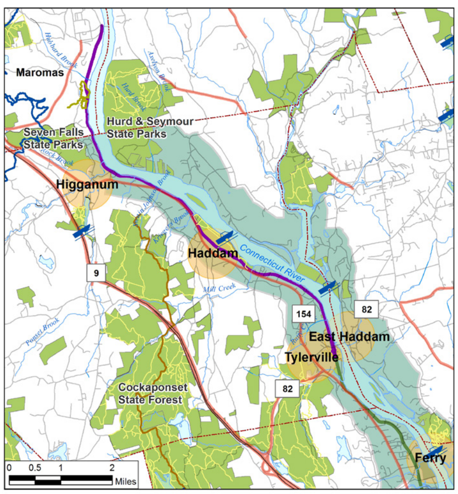
Regional Greenways and Hiking Trails, page 20

Connecticut Forest and Parks Association (CMFA): Mattebessett Trail, Scovill Trails

DEEP: DEEP properties (state forests and parks), federal lands, highways, town boundaries, water bodies

RiverCOG: Connecticut River Gateway Conservation Zone, Quinimay Trail

Trevor Buckley: Chester-Hadlyme ferry, RiverCOG district, study area, village centers



Local State Park, Boat Launches, and Hiking Trails, page 21

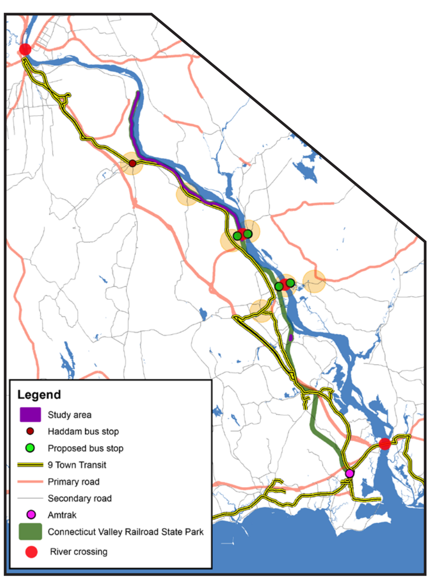
CMFA: Mattebessett Trail, Scovill Trails

DEEP: DEEP properties (boat launches, state forests and parks), primary roads, town boundaries, trails, water bodies

RiverCOG: Connecticut River Gateway Conservation Zone, Quinimay Trail

Trevor Buckley: study area, village centers

USDA Geospatial Gateway: secondary roads



Regional Transportation Map, page 23

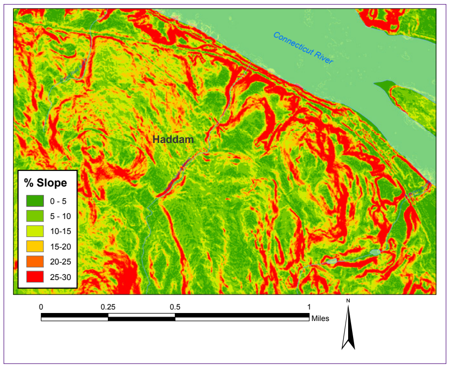
Christian Johnson: Amtrak station, proposed bus stops, river crossings – points added to map/not geospatial data

DEEP: Connecticut Valley Railroad State Park, roads waterbodies

RiverCOG: 9 Town Transit routes

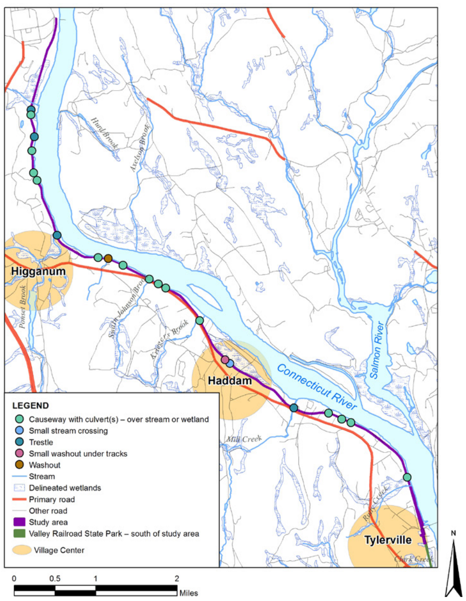
Trevor Buckley: Haddam bus stop, study area, village centers

Appendix C



Slopes Analysis, page 29

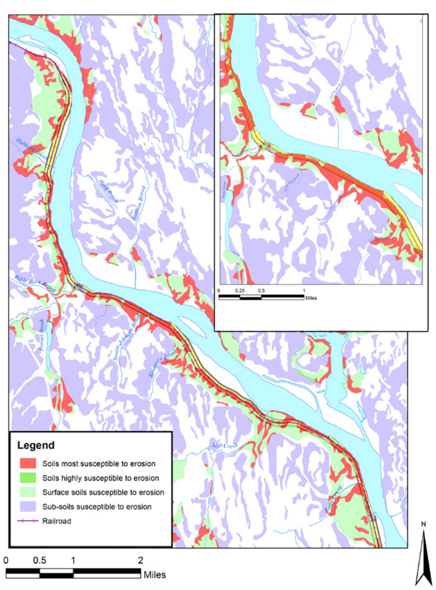
Center for Land Use Education and Research (CLEAR) (at the University of Connecticut): Digital elevation models (DEMs) (used to complete slope analysis)
website: http://clear.uconn.edu/data/CT_DEM/ct_dem_download.asp



Stream and Wetland Crossings, pages 31 and 103

DEEP: Connecticut Valley Railroad Park, delineated wetlands, roads, streams

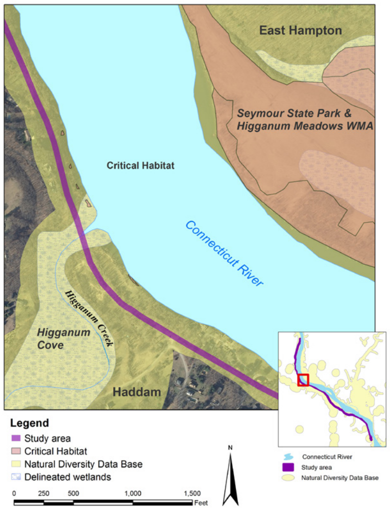
Trevor Buckley: Stream crossing types (created from GPS data), study area, village centers



Soil Erosion Susceptibility, pages 32

DEEP: Soil erosion conditions, railroad

Trevor Buckley: Washout

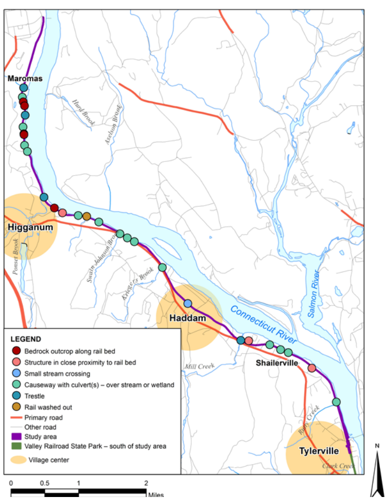


NDDB & Critical Habitat at Higganum Cove, page 33

DEEP: Connecticut River, Critical habitat, delineated wetlands, Higganum Creek, Natural Diversity Data Base

Trevor Buckley: Study area

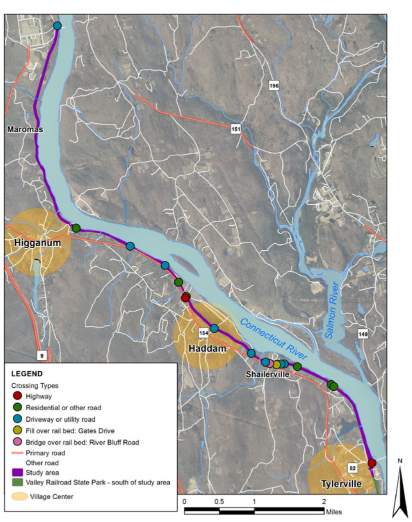
USDA Geospatial Gateway: Orthophotography



Physical and Environmental Constraints Along the Valley Railroad Corridor, page 49

DEEP: Connecticut Valley Railroad State Park, highways, streams

Trevor Buckley: Physical and environmental constraints (created from GPS data), study area, village centers



Road and Driveway Intersections Along the Corridor and Proposed Highway Crossings, page 94, and **Shailerville zoomed in view**, page 99

DEEP: Connecticut Valley Railroad State Park, roads, streams

ESRI: satellite imagery

Trevor Buckley: Intersection types (created from GPS data), study area, village centers

The Valley Railroad State Park Scenic Corridor Study, commissioned by the Lower Connecticut River Valley Council of Governments (RiverCOG), examines the potential for a multiuse trail along the northern nine miles of the Valley Railroad corridor in south-central Connecticut. Approximately eight miles of the corridor between Tylerville and Maromas, Connecticut, have not been used for rail service since 1968. This report analyzes the regional context and existing conditions along the corridor, and provides conceptual designs and design guidelines for developing a trail, including for a trail that could replace the existing rail and also for a trail that could be built along the rail.

This study is one of several to be commissioned by the RiverCOG that will examine the Connecticut Valley Railroad State Park's role as a regional asset, and how it factors into regional planning efforts related to transportation, conservation, and economic development.