Chapter 3: Existing Connections

Human landscape features like roads, rails, trails, and sidewalks create human connections. Natural landscape features like waterways, forests, and meadows create connections for the animals, birds, and fish living in our shared world.

Roads
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Roadsides
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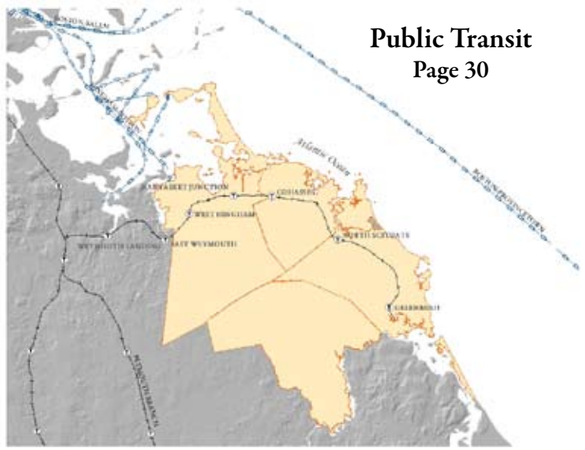

Public Transit
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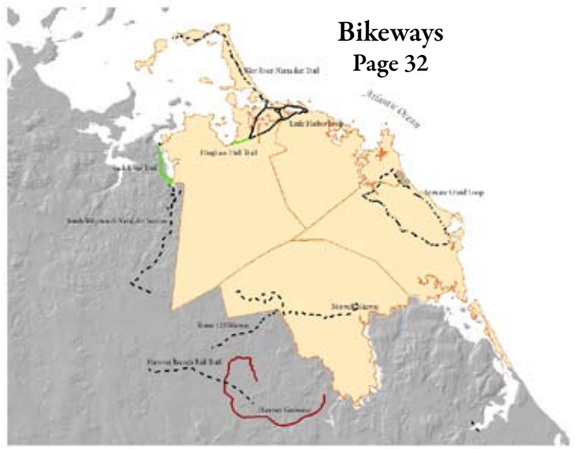

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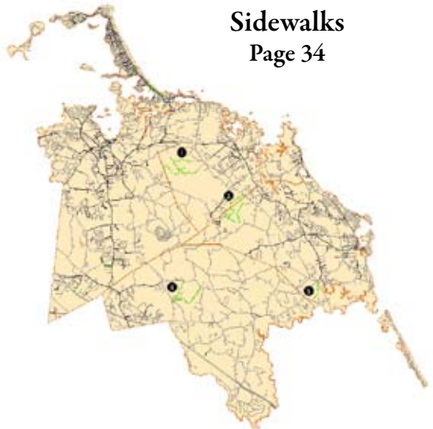

Sidewalks
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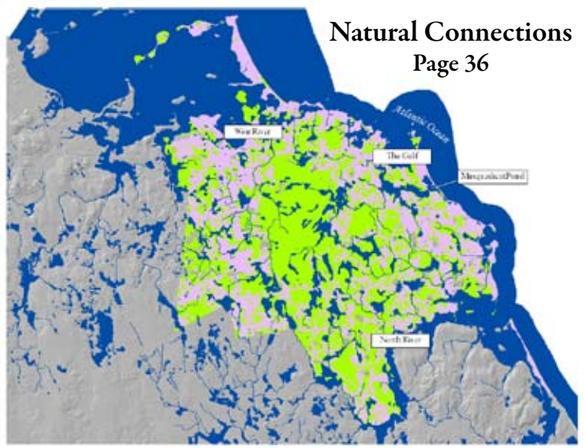

Natural Connections
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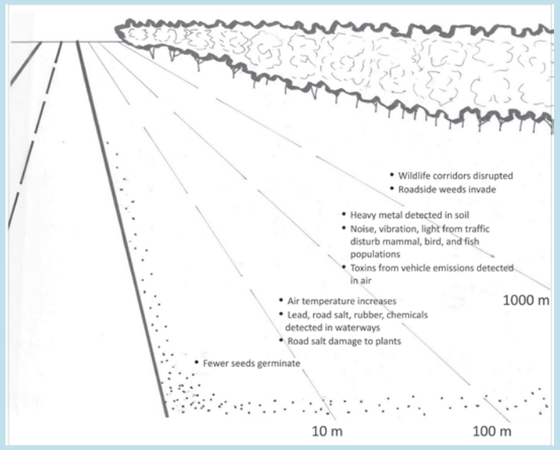
Road Ecology

The nearly five million-mile American road network slices across the land, moving humans, food, and goods, but fragmenting the landscape and disrupting natural processes.

Take a walk along a busy highway if you dare. If you can ignore the noisy roar, stinking exhaust, and hot air blasts from the rushing traffic, you may notice that almost nothing grows or lives along the edge of the road. As you turn towards the woods, you may cross a drainage ditch full of sediment and contaminants which will end up clouding the nearest stream. As you walk, you feel tough grasses beneath your feet, the only plants to survive the road salt and the harsh chemicals spewing from racing cars and trucks. It quiets as you walk towards the woods, but still you won't hear many birds singing or see many different plant types until you are far from the road.

Roads splinter wildlife habitats, spread pollutants into the air, soil, and water, and change the migration patterns of fish, birds, and mammals. The result is a monotonous environment lacking in the diversity and richness of a healthy ecosystem.



Roadside Zones of Impact
Roads have long range effects on many environmental quality.
Adapted from Forman et al, 2006

Roads

The South Shore is rich in roads. Nearly 600 miles of roads connect people and places in the 136-square mile South Shore study area. Road density (~8 miles of road/square mile) is twice as high as the state average (4 miles/square mile). Of the five towns Hull has the highest road density (23 miles/square mile) and Norwell the lowest (6 miles/square mile).

Forty-four miles of heavily used roads ring the region's green heart, Wompatuck State Park, separating it from the coastline and population centers. State highways (routes 3, 3A, 53, 228) are the most heavily used roads with more than 10,000 vehicles per day.

Nearly 400 miles of moderately used roads (101 to 1000 vehicles per day) form a continuous network across the region, becoming more dense at the periphery where residential and commercial development are most concentrated.

About 150 miles of very lightly used roads are scattered throughout the region in tiny dead-end fragments (less than a mile in length) except in Wompatuck State Park and Bare Cove Park where they form a continuous network.

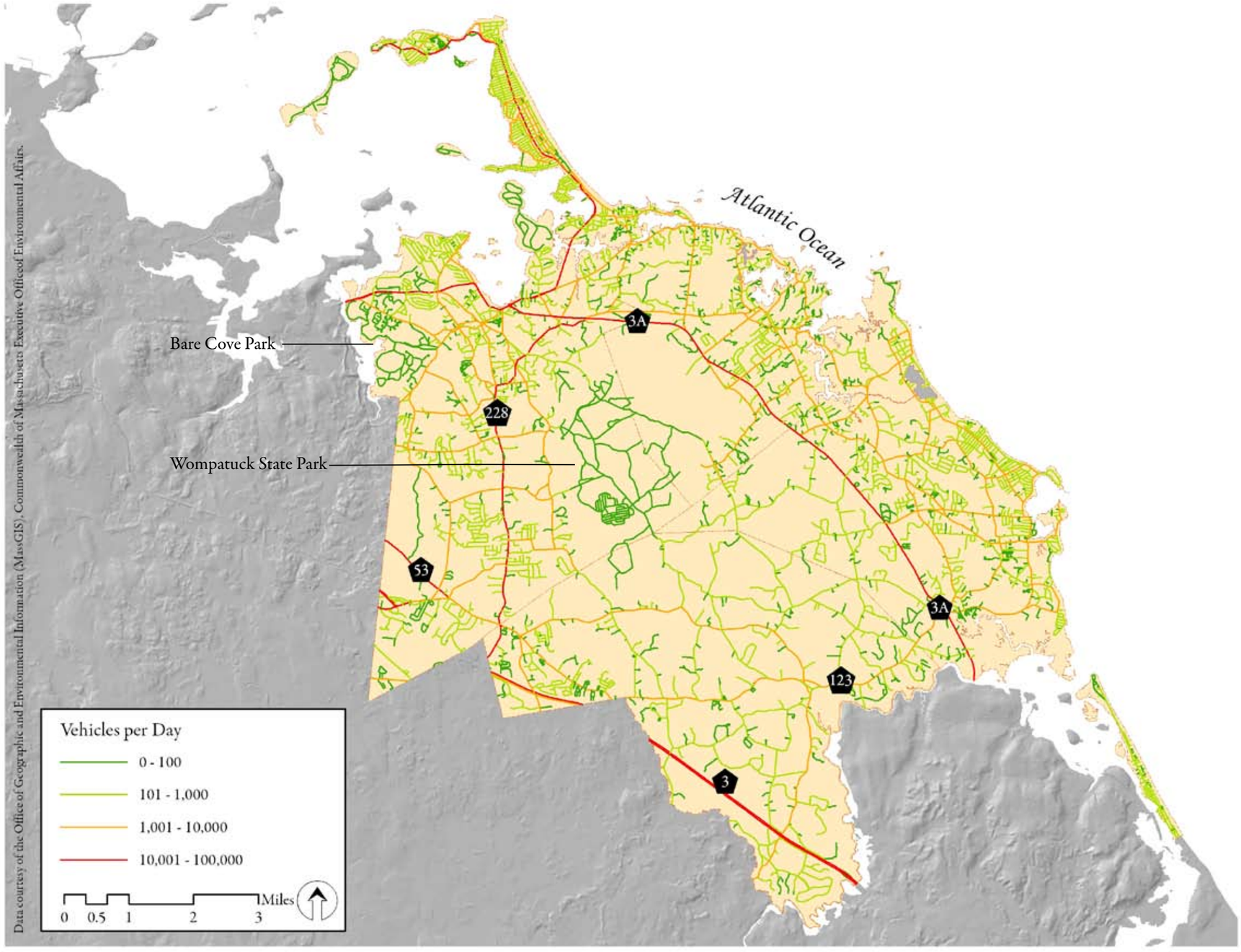
The lightly trafficked roads are the most desirable (and heavily trafficked the least desirable) to muscle-powered users, but less busy roads may be too few and discontinuous to effectively serve the alternative transportation function of a greenway network. The abundance and continuity of moderately used roads provides greater opportunity for making alternative transportation connections on the South Shore.

Roads Affect Ecological and Human Health

Roads have important implications for human and ecological health on the South Shore. With roads comes traffic and the air, water, and noise pollution it produces. Studies have shown that humans living near major roadways are at increased risk for death from heart and lung disease. Children living near busy roads are at greater risk for developing asthma.

Roads also have adverse affects on plants and animals. For example, large mammals thrive only where road density is less than 1 mile/square mile. Higher densities are associated with significant loss of habitat and mortality from collisions with vehicles. Wetland species seem to be particularly sensitive to the adverse effects of roads. Plant, amphibian, reptile, and bird populations tend to be reduced in wetlands within a mile of a road. Woodland birds are especially to sensitive to traffic noise during their breeding season. Their numbers were found to be reduced in woodlands within 1.7 miles of a busy highway (Forman et al., 2003).

The adverse effects of roads are reflected in the increased prevalence of heart and lung disease in humans, and reduced populations of mammals, amphibians, and birds where road density and/or traffic volume is high. A well designed greenway has the potential to help prevent some of the environmental ills caused by roads. Providing humans with alternatives to driving may reduce vehicle use. Less traffic means less air, water, and noise pollution and a healthier environment for all species.

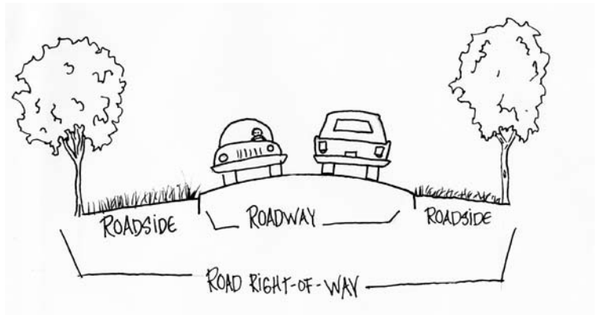

Atlantic Ocean
Bare Cove Park
Wompatuck State Park
3A
228
53
123
3
Vehicles per Day
0 - 100
101 - 1,000
1,001 - 10,000
10,001 - 100,000
Miles
0 0.5 1 2 3
Data courtesy of the Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.

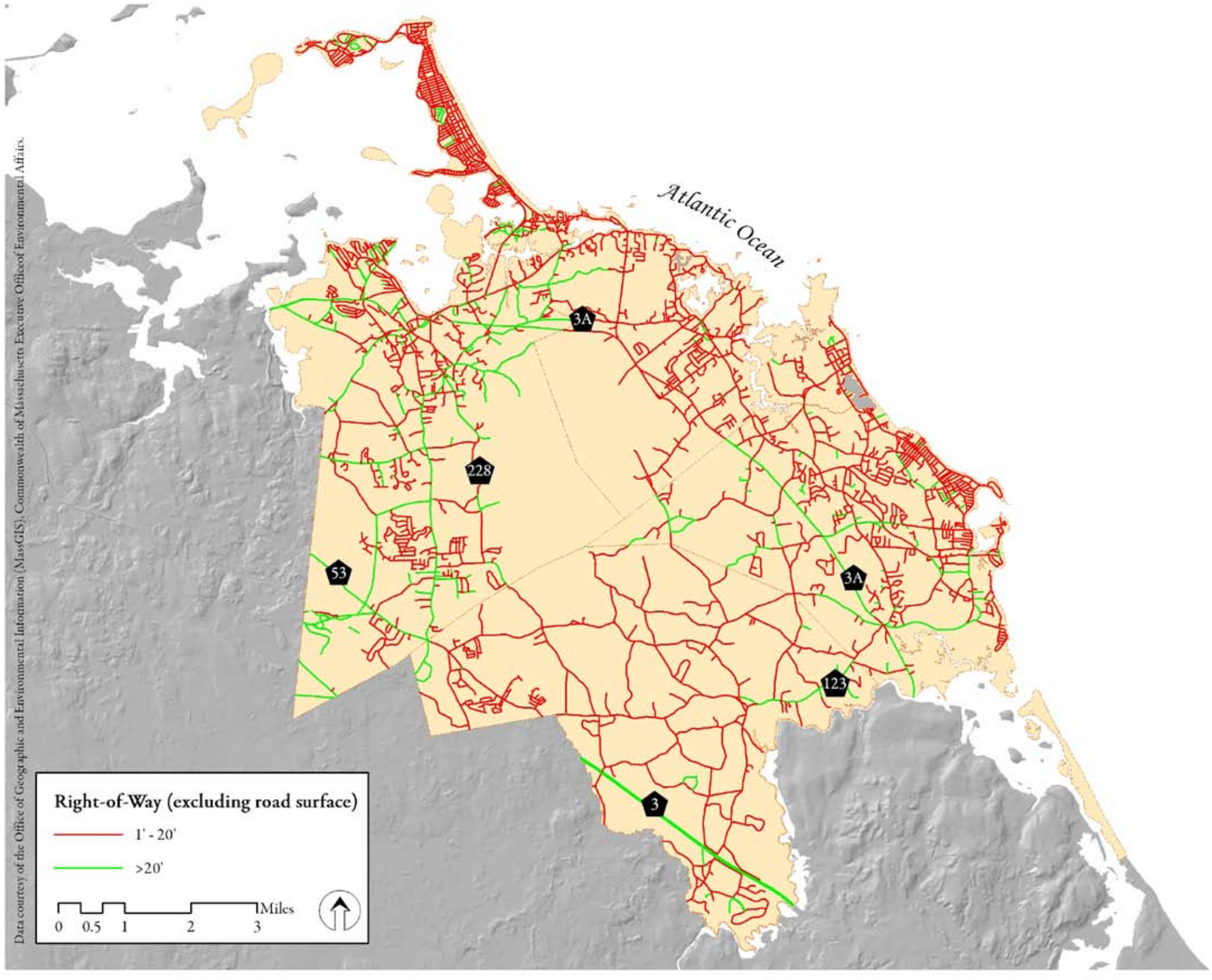
Roadsides

Rarely do a road's travel lanes completely fill the road right-of-way. The remaining roadside area between the travel lanes and the edge of the right-of-way is an untapped public resource. Forty-four miles of South Shore roads have roadside areas more than twenty feet wide. The roads with the widest roadsides tend to be the heavily trafficked highways at the periphery of the region. These are also the roads which are the most detrimental to the environment.

Transforming the roadside into a greenway can help counteract some of the adverse effects of roads. For example, a greenway which supports alternative transportation function may help reduce traffic and the resulting air, water, and noise pollution. In addition, a roadside greenway can help protect water quality by capturing stormwater runoff before it reaches waterways.

Most South Shore roads with wide right-of-ways are state highways and under the jurisdiction of the Massachusetts Highway Department. Gaining the Department's support and cooperation is essential if this underutilized resource is to be integrated into a greenway network.




Atlantic Ocean
3A
228
53
3A
123
3
Right-of-Way (excluding road surface)
1' - 20'
>20'
Miles
0 0.5 1 2 3
Data courtesy of the Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.

Car-Free Homes in Freiberg, Germany

A free, year-long public transit pass is only one of the incentives given to participants in a recent experiment in sustainable urban design. The experiment is occurring in the 5000-resident Vauban district in Freiberg, Germany, where the city is taking an aggressive approach to wresting the streets away from cars and returning them to pedestrians and bicyclists.

The Vauban district is designed to discourage car ownership. Cars are not allowed in the district's residential area except to drop-off and pick-up passengers and goods. All parking areas are at the periphery. The land which would normally be used for parking contains playgrounds, gardens, and parks instead. Although it is discouraged, residents are allowed to own cars, but it is very expensive. The cost of a because they must buy a parking space in the community parking lot for approximately $27,000. The need for a car is reduced because schools, a farmers' market, shops, a food coop, recreation areas, and approximately 600 jobs are all within walking distance of one another. Residents who do occasionally need a car can participate in a low cost community car-sharing program

The experiment has been very successful. The car ownership rate in Vauban is only 150 per 1000 residents compared to 430 per 1000 residents in Freiberg as a whole.

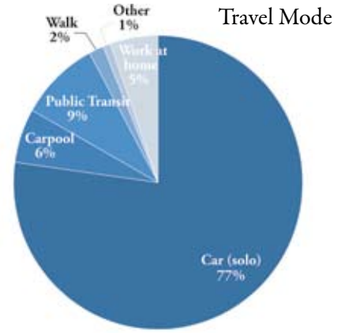
Wikimedia Commons

Residents walk through an urban park in the car-free Vauban district.

See http://www.vauban.de/info/abstract.html for more information

Public Transit

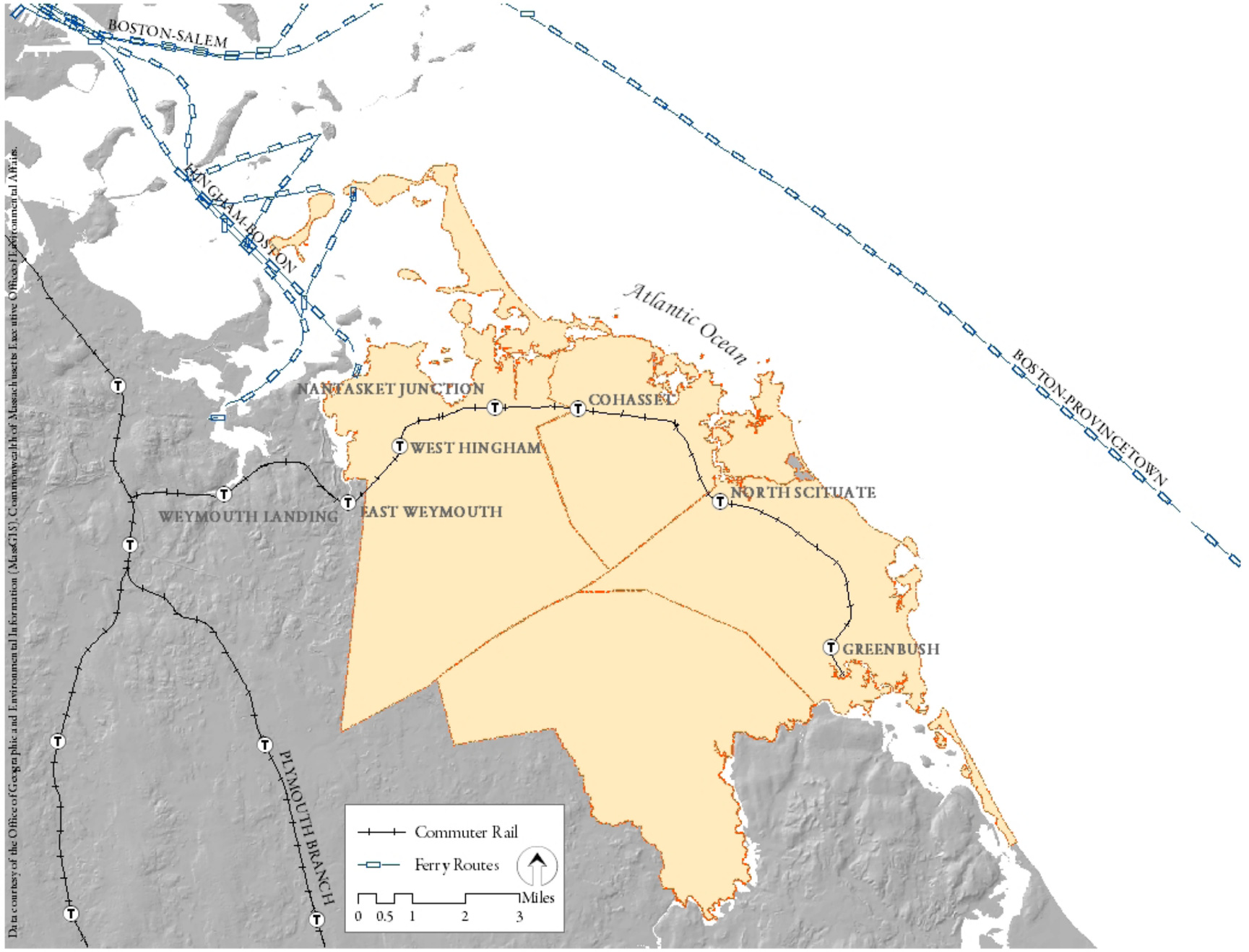
Nearly eighty percent (25,052 workers) of employed residents leave their South Shore town for work (United States Census, 2000). The average commute time ranges from 35 to 40 minutes. The vast majority of commuters drive, either alone (77 percent) or in a carpool (6 percent) while 12 percent use public transportation, walk, or bike.



Public transit use may increase with the recent opening of the Massachusetts Bay Transit Authority (MBTA) Greenbush commuter rail line. The 18-mile-long line, skirting the coast from the South Shore to Boston, restores a connection which was broken in 1959. It takes about one hour to travel between the Greenbush Station in Scituate and South Station in the heart of Boston.

Ferries offer another way to get to Boston from the South Shore. Ferries run between Hingham, Hull, downtown Boston, and Logan Airport multiple times each day. There is no charge to bring a bicycle on the ferry.

Since commuter rail lines and ferries connect the South Shore with the heart of Boston, linking the greenway network and the public transit system will increase people's transporation options. As gas prices continue to climb and people look for alternatives to their cars, these connections may become even more important. Communities with a good public transit system will feel increasing development pressure. A greenway network can help guide future development and conserve natural landscapes.

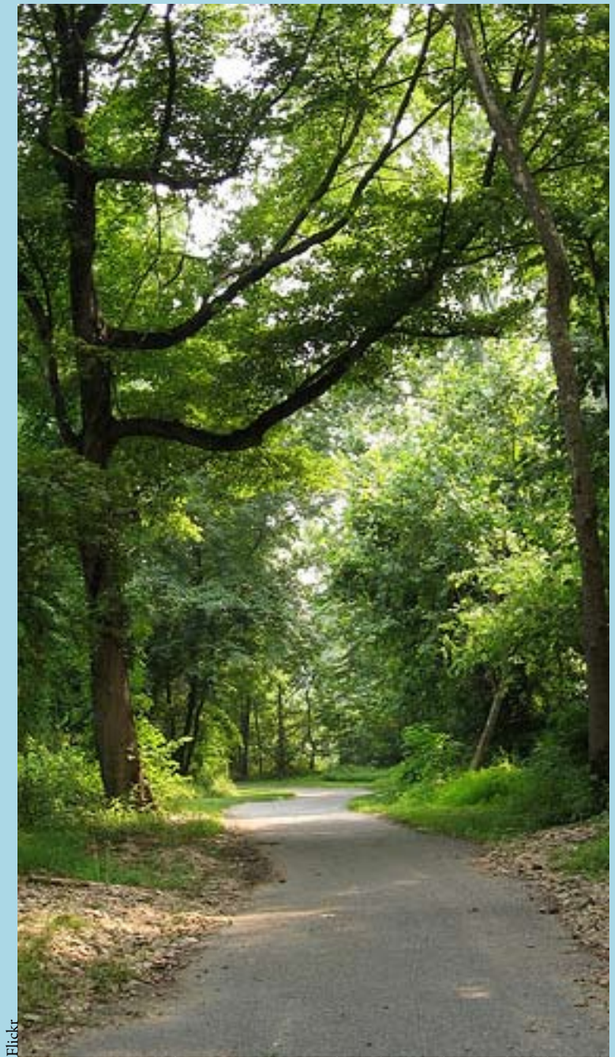

BOSTON-SALEM
HAN-GHAM-BOSTON
Atlantic Ocean
BOSTON-PROVINCETOWN
NANTASKET JUNCTION
COHASSET
WEST HINGHAM
NORTH SCITUATE
WEYMOUTH LANDING
EAST WEYMOUTH
GREENBUSH
PLYMOUTH BRANCH
Commuter Rail
Ferry Routes
Miles
0 0.5 1 2 3
Data courtesy of the Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.

Anacostia Tributary Trail System

The Anacostia Tributary Trail System meanders for miles along the tributaries of the Anacostia River in Prince George's County, Maryland. Prince George's County is part of the Baltimore-Washington DC metropolitan area. The trail system links residential areas, parks, and commuter train stations. Much of the system lies within the "Beltway" (Interstate 495), one of Washington, DC's busiest roads, but it travels through a variety of natural environments including woodlands, open fields, and wetlands. As part of the Anacostia Headwaters Greenways, the trial system serves as model for metropolitan greenways that maximize ecological function while supporting alternative transportation.

The Anacostia Headwaters Greenways are part of Maryland's state-wide 1500-mile long greenway network. Maryland has designed a multipurpose greenway system. They recognize that greenways can be multipurpose. Many Maryland greenways are primarily recreational, but all provide some level of ecological function such as preserving natural landscapes, providing flood control, and protecting wildlife corridors. In urban and suburban areas, ecological function is maximized by routing the greenway along river and stream corridors.

See:http://www.dnr.state.md.us/greenways/ for more information.



Flickr

The Anacostia Tributary Trail meanders along tributaries of the Anacostia River watershed in suburban Prince George's County, Maryland.

Bike Trails

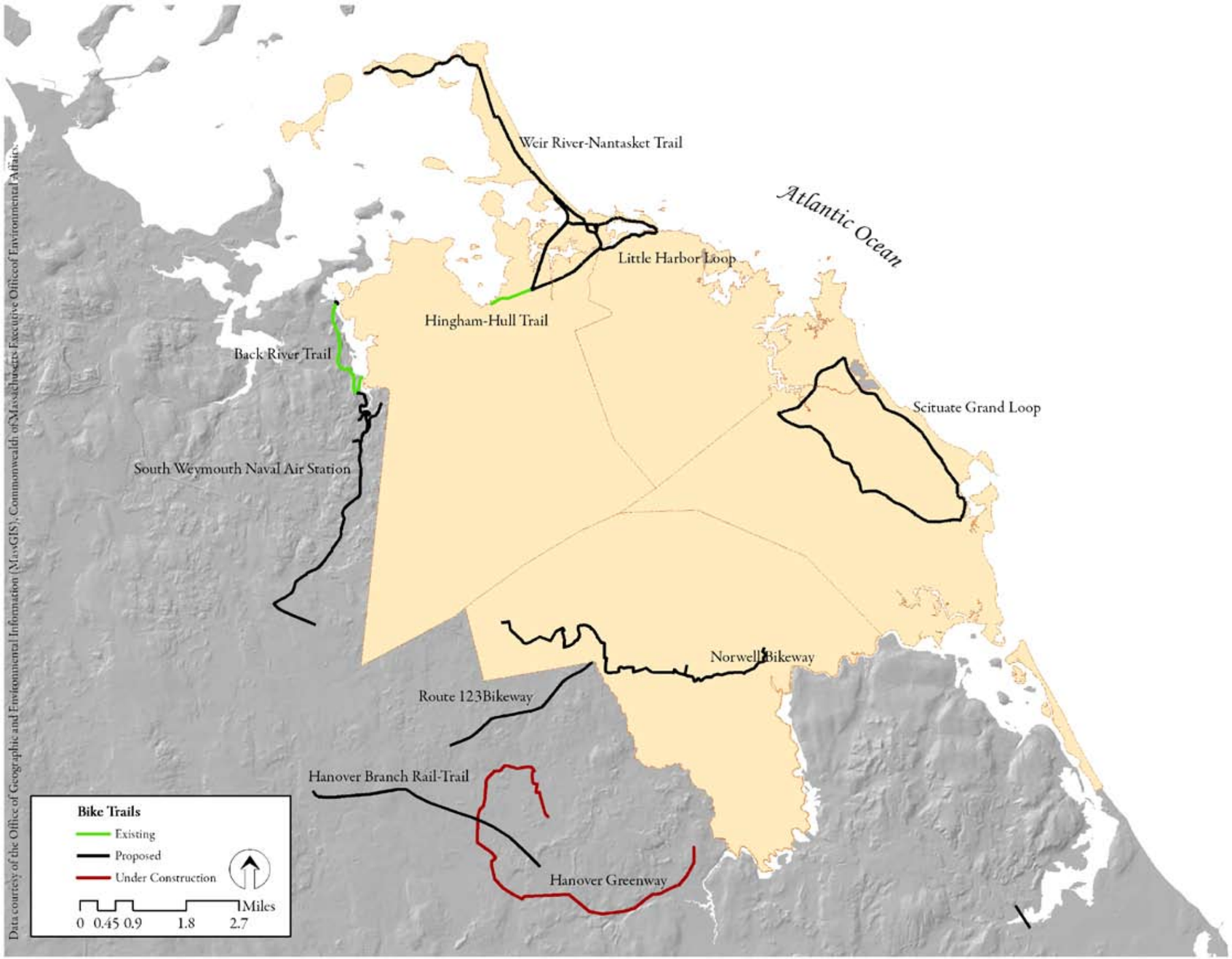
The South Shore has only one existing bike trail, the 0.75-mile Hingham to Hull Trail, running along Rockland Avenue between George Washington Boulvevard and the Route 3A rotary. At its east end, the trail connects to the proposed Weir River-Nantasket Trail running from the tip of the Hull peninsula to the Weir River and around Little Harbor in Cohassett. At its west end, there is potential to connect with the existing Back River Trail and proposed South Weymouth Naval Air Station Trail in Weymouth.

A 10-mile loop trail connecting commuter rail stations, commercial districts, high density residential neighborhoods, and beaches in Scituate is proposed.

A proposed 7.6-mile bike trail in Norwell connects neighborhoods, schools, commercial districts and a bus stop, the only public transit option available. The project was recently funded. There is potential to link the Norwell Bikeway with proposed trials in the adjacent town of Hanover.

The Metropolitan Area Planning Council's (MAPC) Regional Bicycle Plan (March 2007) has a conceptual plan for a 16-mile rail-with-trail along the right-of-way of the newly completed Greenbush commuter rail line. The MAPC's plan notes that additional study will be needed because of the Massachusetts Bay Transit Authority's reluctance to participate in rail-to-trail projects.

The most recent Massachusetts Bicycle Transportation Plan (2007) proposes a statewide bicycle network called the Bay State Greenway. The proposed Greenway would have seven primary corridors. The proposed corridor that is closest to the South Shore, the 150-mile Boston-Cape Cod corridor, connects Boston to Provincetown through towns east of the South Shore (Milton, Canton, Randolf, Avon, and Brockton).


Weir River-Nantasket Trail
Atlantic Ocean
Little Harbor Loop
Hingham-Hull Trail
Back River Trail
Scituate Grand Loop
South Weymouth Naval Air Station
Norwell Bikeway
Route 123Bikeway
Hanover Branch Rail-Trail
Hanover Greenway
Bike Trails
Existing
Proposed
Under Construction
Miles
0 0.45 0.9 1.8 2.7
Data courtesy of the Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Sidewalks

Pedestrian-friendly towns have continuous sidewalks on both sides of most streets. With only 100 miles of sidewalk for 600 miles of roads, none of the South Shore towns can be considered pedestrian-friendly except Hull which has almost 25 miles of sidewalks. Sidewalks are lacking in Norwell. Cohasset, Hingham, and Scituate have some sidewalks, mostly in commercial districts and along heavily trafficked highways. Most sidewalks (83 percent) are only on one side of the road and discontinuous, forcing users to cross busy streets to stay on them.

The opportunities for pedestrians and bicyclists to share sidewalks on the South Shore is limited. Although there are some sidewalks wide enough to accommodate both pedestrians and bicyclists (greater than 10-feet wide), the majority are 3-feet wide, making them too narrow for safe shared use (Hummer, 2006). Telephones and signposts are found in many of the widest sidewalks, reducing the space available to pedestrian and bicyclists. Keeping sidewalks clear of obstacles will improve their travel utility.

Andrew Weir

Telephone poles in the sidewalk on George Washington Boulevard are obstacles to pedestrians and bicyclists.

Some towns and cities prohibit bicyclists on sidewalks, especially in busy commercial districts, to ensure pedestrian safety. The most progressive towns provide bicycle parking throughout their commercial districts so encourage bicyclists to park and walk to their destinations. South Shore towns should be encouraged to adopt zoning ordinances which mandate bicycle parking facilities in their commercial centers as a first step towards building a greenway network that supports all types of alternative transportation.

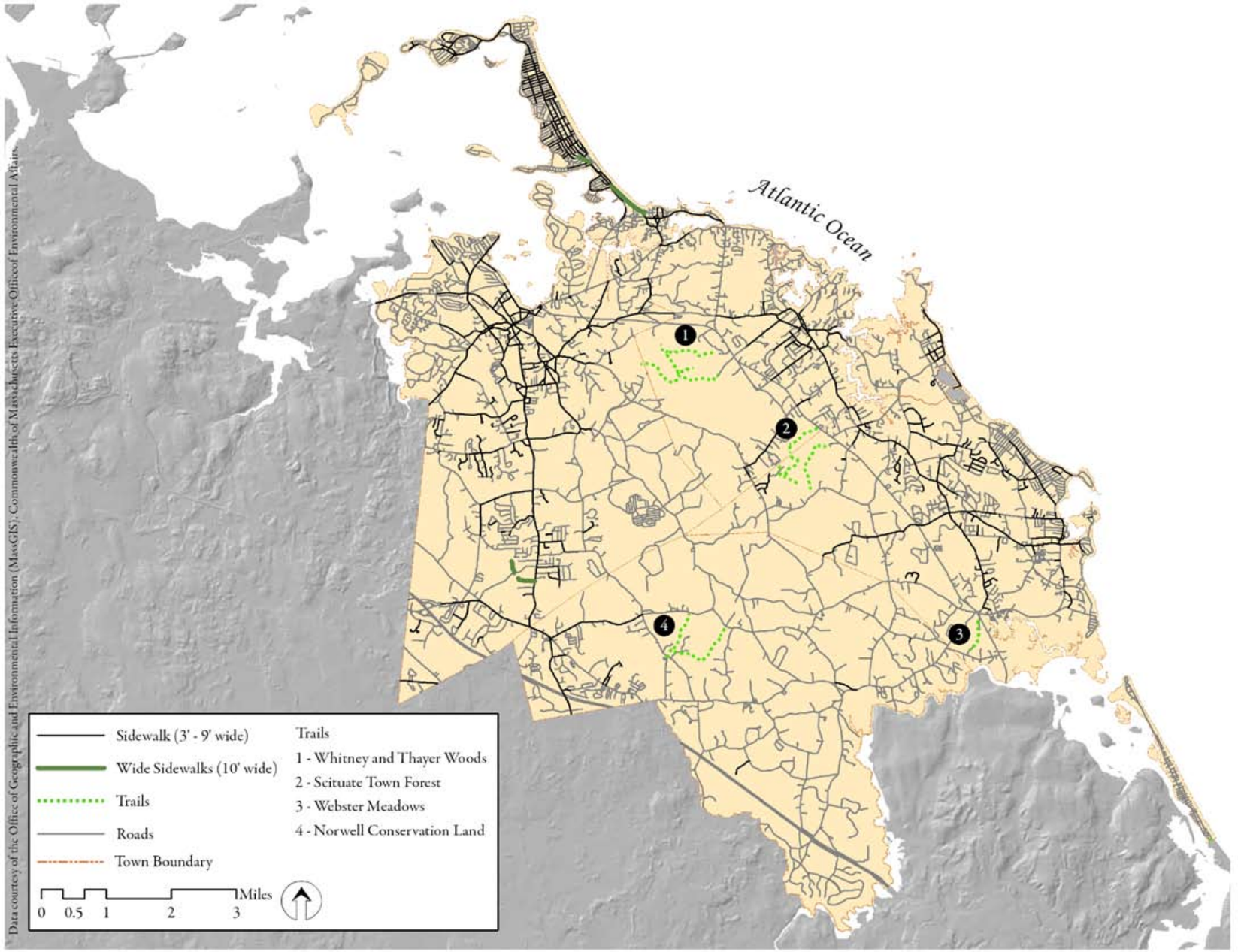
There are isolated walking trails in several of the conservation areas. These trails through scenic landscapes can be the seeds for a greenway network on the South Shore.

Bicycle Parking Guidelines – Madison, Wisconsin

Land Use	Bike Space
Dwellings/Lodging rooms	1 per dwelling unit or 3 lodging rooms
Clubs/lodges	1 per lodging room plus 3% of person capacity
Fraternities/sororities	1 per 3 rooms
Hotels/lodging houses	1 per 20 employees
Galleries/museums/libraries	1 per 10 auto spaces
Colleges/universities/junior and high schools	1 per 4 employees plus 1 per 4 students
Nursery/elementary schools	1 per 10 employees and students above second grade
Convalescent and nursing homes	1 per 20 employees
Commercial/manufacturing	1 per 10 auto spaces
Places of assembly, recreation, entertainment, amusement	1 per 10 auto spaces

Zoning for Bicycles

With over 60,000 students attending the University of Wisconsin, and very limited campus parking, Madison, Wisconsin has long been a leader in accommodating bicycle commuters. The Madison Common Council passed a zoning ordinance requiring developers to provide off-street parking for new and expanded development, and for changes in use that would require additional vehicle parking. This ordinance, passed on March 1, 1988, has been a model for towns and cities around the county.


Atlantic Ocean
1
2
3
4
Sidewalk (3' - 9' wide)
Wide Sidewalks (10' wide)
Trails
Roads
Town Boundary
Trails
1 - Whitney and Thayer Woods
2 - Scituate Town Forest
3 - Webster Meadows
4 - Norwell Conservation Land
0 0.5 1 2 3 Miles
Data courtesy of the Office of Geographic and Environmental Information (MassGIS); Commonwealth of Massachusetts Executive Office of Environmental Affairs

Kathleen McCormick

The North River Estuary

Natural Connections

Thirty-eight square miles of undeveloped lands grace the South Shore. These conservation and recreation lands are scattered across the region in a patchwork of land areas ranging in size from a thousandth of a square mile to almost five square miles. The patchwork has been created by development.

To animals, each of these patches represent habitat. Development increases the number of habitat patches, but makes them smaller and more isolated. With continued development, habitat patches can become too small and isolated to support certain sensitive species. If there is no way for individuals of that species to move to a larger habitat patch, the long term survival of the species can be threatened (Hellmund and Smith, 2006).

A patchwork of habitats presents other threats to some species. Many species travel to find food and mates. If travel is blocked, starvation threatens as does the risk of genetic defects because of inbreeding. Extinction threatens all species if they can't flee natural disasters such as floods and fires, or re-colonize areas after disturbance, disease, or natural disaster (Hellmund and Smith, 2006).

Many of the habitat patches on the South Shore are linked by rivers and streams. Waterways form a *natural* transportation system. The South Shore's natural transportation system is almost as extensive as its human-built roadway system. Five hundred miles of waterways connect the area's lakes and ponds to the Atlantic Ocean in three estuaries, the Weir, the Gulf, and the North. Estuaries are one of the most sensitive and ecologically important habitats on earth. They provide preferred habitat for many species of waterfowl and nurseries for many species of marine life (United State Environmental Protection Agency, 2008). The natural transportation system serves people, animals, and aquatic creatures.

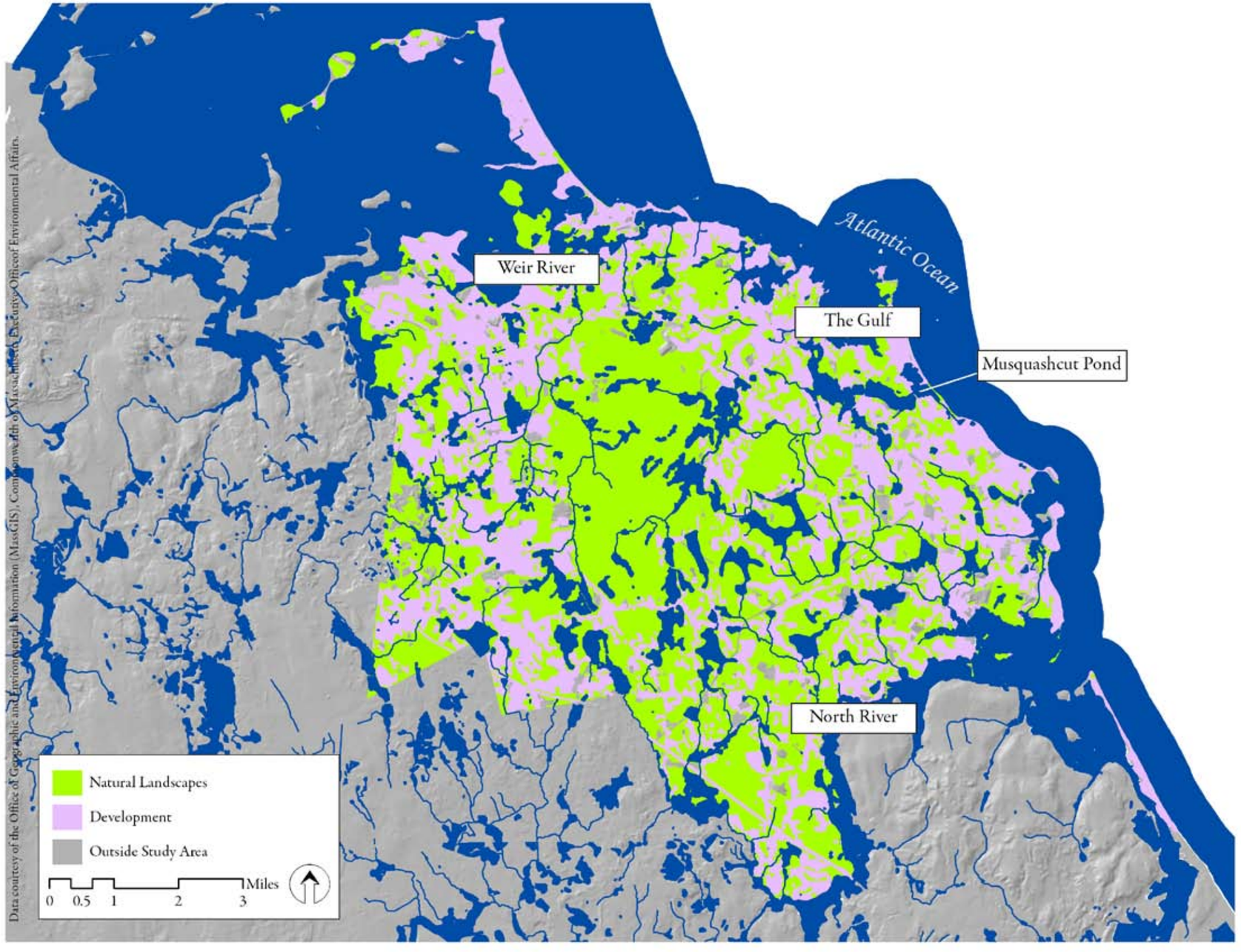
The banks along waterways, known as the riparian corridor, are an extremely important ecosystem in and of itself because this is where so many species find food and shelter. Species frequenting riparian corridors include birds, bats, deer, mice, otters, raccoons, minks, and beavers. Riparian corridors have extraordinary value to humans too, not only for their beauty and the recreational opportunities they provide, but also for their role in protecting water quality. Riparian corridors help regulate water quality and quantity by filtering sediment, removing pollutants, and controlling flood waters.

Unfortunately humans' auto-domainated lifestyle and love of waterfront living have diminished the South Shore's natural transportation system. Roads bisect many streams. Homes encroach on shorelines and riparian corridors. The result is reduced aquatic ecosystem health.

The effects of human development on aquatic ecosystem health are evident throughout the South Shore. Musquashcut Pond in Cohasset and Old Oaken Bucket Pond in Scituate, both surrounded by roads and residential development, are just one example. The water is clouded with algae because of excessive phosphorous (found in fertilizer) and low oxygen levels (Coastal Watersheds Water Quality Assessment Report, 2006). Water quality has been too poor for human swimming in many ponds and river segments including North River, Weir River, Aaron River, Herring Brook, Bound Brook, or in Musquashcut Pond, Jacobs Pond, Old Oaken Bucket Pond, and Lily Pond (Coastal Watersheds Water Quality Assessment Report, 2006, 2002).

A well-designed greenway can restore broken connections in the South Shore's natural transportation system and create new ones.

What we do on the land is written on the water.
-Mary Wahl, Oregon Bureau of Environmental Services


Atlantic Ocean
Weir River
The Gulf
Musquashcut Pond
North River
Natural Landscapes
Development
Outside Study Area
0 0.5 1 2 3 Miles
Data courtesy of the Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Environmental Affairs.