



2020-2030 REGIONAL PLAN OF CONSERVATION AND DEVELOPMENT

WESTERN CONNECTICUT COUNCIL OF GOVERNMENTS



Western Connecticut COUNCIL OF GOVERNMENTS



RESOLUTION OF THE WESTERN CONNECTICUT COUNCIL OF GOVERNMENTS TO ADOPT THE 2020-2030 WESTERN CONNECTICUT REGIONAL PLAN OF CONSERVATION AND DEVELOPMENT

WHEREAS,

pursuant of Section 8-35a of the Connecticut General Statutes the Western Connecticut Council of Governments developed the 2020-2030 Western Connecticut Regional Plan of Conservation and Development (“the Plan”) for its area of operation; and

WHEREAS,

the Plan was developed based on studies of physical, social, economic and governmental conditions and trends. It is designed to promote abatement of the pollution of the waters and air of the region, including reducing hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound. The Plan also identifies areas to have (1) compact, transit accessible, pedestrian-oriented mixed-use development patterns and land reuse, and (2) promotes such development patterns and land reuse.

WHEREAS,

the 2020-2030 Western Connecticut Regional Plan of Conservation and Development replaces the previous Plans of Conservation and Development developed by the Housatonic Valley Council of Elected Officials and South Western Regional Planning Agency.

WHEREAS,

in accordance with 8-35a (b), WestCOG provided a sixty-five-day public comment period; and

WHEREAS,

WestCOG held at least one public hearing on January 16, 2020, at which notice of the meeting was sent in writing to each member municipality’s Chief Elected Official, planning commission and provided legal notice in a newspaper having a substantial circulation in the region.

WHEREAS,

the State of Connecticut Office of Policy and Management reviewed the Plan and determined, in accordance with Section 8-35a (b) of the Connecticut General Statutes, that it is not inconsistent with the *Conservation and Development Policies: The Plan for Connecticut 2013-2018*;

NOW THEREFORE BE IT RESOLVED THAT WESTCOG:

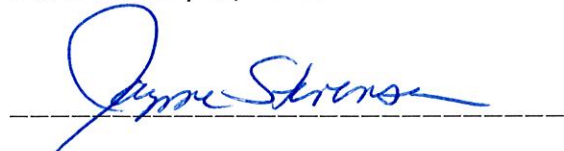
Adopts the 2020-2030 Western Connecticut Regional Plan of Conservation and Development.

CERTIFICATE

The undersigned duly qualified and acting Chairman of WestCOG certifies that the foregoing is a true and correct copy of a resolution adopted at a legally convened meeting of WestCOG on January 16, 2020.

This resolution is effective **January 16, 2020.**

Date: January 16, 2020.



Jayme Stevenson, Chairman
First Selectman, Darien



2020-2030 Regional Plan of Conservation and Development

Western Connecticut Council of Governments

January 2020

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Executive Summary

The Western Connecticut Plan of Conservation and Development (POCD) was prepared in compliance with Section 8-35a of the Connecticut General Statutes which requires each Council of Governments to prepare and maintain a plan every ten years. The plan must show “its recommendations for the general use of the area” including land use, housing, transportation, public utilities and “such other matters as, in the opinion of the council, will be beneficial to the area.” The plan furthermore “shall be designed to promote with the greatest efficiency and economy the coordinated development of its area of operation and the general welfare and prosperity of its people.” This Plan replaces previous regional plans issued by HVCEO (1971, 1981, 1997 and 2009) and those of SWRPA (1974, 1983 and 2006).

The Regional Plan of Conservation and Development has numerous functions including: providing leading advice on Responsible Growth strategies; setting development priorities as required by CGS §8-35a(a); coordinating water and sewer utilities between towns; promotes preservation of inter-town water supplies required under CGS §25-33g; marketing the region as a coordinated jurisdiction; assisting private investment studies and municipal bond sales; meeting the mandate for land use/transportation coordination (23 USC 134(h)(1)); integrating regional level policies in state and local level plans; addressing regional input to municipal plans (CGS §22a-102d); addressing regional input to state plan (CGS §16a-28); addressing coordination along boundaries (CGS §8-3b); coordinating various aspects of municipal land use regulation; and establishing the fiscal basis for regional management of collectively shared infrastructure. The Regional Plan of Conservation and Development is intended to be an advisory document for regional-level decision making and could be incorporated at both the state and local level planning process.

This Plan presents a series of specific challenges facing the region in the coming decade. The specific goals

and objectives of this plan can be found within each section and are compiled into a complete set of policies in Appendix D.

The Region

The Western Connecticut Region (the Region) encompasses the eighteen municipalities in southwestern Connecticut, including Bethel, Bridgewater, Brookfield, Danbury, Darien, Greenwich, New Canaan, New Fairfield, New Milford, Newtown, Norwalk, Redding, Ridgefield, Sherman, Stamford, Weston, Westport and Wilton. It falls within the greater metropolitan area of New York City, the most populous city in the United States of America. The Region has a highly-skilled and educated workforce, world-class healthcare, beautiful coastlines and numerous historic villages, all nestled in the beautiful four-season landscape of New England.

Trends and Conditions

The Region experienced its fastest rate of growth immediately following World War II when automobile ownership in America became common and was further accelerated by the creation of the Interstate Highway System in the following decades. Between 1950 and 1970, the region’s population increased by 79%. However, since 1970 the region has grown by an additional 142,473 persons, amounting to a 30% increase in population. The population is projected to grow by 115,234 by 2050.

During the last thirty years the average American household has declined in size. However, within the Region ten municipalities have experienced increases in the size of the average household. In contrast, seven municipalities – all which are in rural or suburban in character – have experienced declines. Bethel, Bridgewater, Brookfield, New Fairfield, New Milford, Newtown and Redding all experienced a decline in the size of the average household reflecting their aging population and decline in school age population.

Eleven of the Region's municipalities have lost public school enrollment during the period 2010 to 2018. Four municipalities (Bethel, Brookfield, Greenwich and New Canaan) had modest increases in public school enrollment. In contrast, Danbury, Norwalk and Stamford combined experienced an increase of 2,408 public school students reflecting the greater availability of affordable housing in these cities. Declining public-school enrollment trends in most of the region's suburban and rural municipalities will require affected municipalities to assess their long-term capital investment plans for public schools.

Seniors are expected to become an increasing share of the region's population over the next thirty years as the baby boom generation retires and chooses to stay living in their current dwelling units.

Infrastructure

Thinking of infrastructure as encompassing natural infrastructure systems, as well as those that are manmade, becomes increasingly important as climate change considerations influence the way we plan for warmer temperatures, more intense rainfall events, more severe storms and more catastrophic flooding events. For this reason, natural infrastructure, when properly managed, functions as an ecosystem service providing important benefits to municipalities in western Connecticut.

Land development can have a significant impact on the quality and quantity of stormwater and floodwaters that impact our region. Increasing the density of development increases stormwater runoff, especially from impervious surfaces. While impervious cover by itself does not create pollution, paved and compacted surfaces prevent infiltration of water into the ground, amplifying and accelerating stormwater runoff, mobilizing contaminants that otherwise would be decomposed in situ. With a changing climate, runoff controls are unlikely to be adequate. Zoning commissions should require the installation and upkeep of detention or retention basins, maintenance of catch basins to slow stormwater discharge velocities

and encourage pervious pavement to increase the percolation rate of high intensity rainfall events.

Municipalities should proactively establish climate change adaptation strategies to manage the safety, health, economic, and fiscal risks associated with the increase in the frequency and/or severity of weather conditions. Weather events can have a direct impact on the public water supplies and food production of the region. Several recommended strategies include expanding the protection of riparian corridors, increasing tree canopy coverage along major rivers and streams within urbanized areas adversely affected by the urban heat island effect and adopting impervious cover standards that directly and positively influence the rate of stormwater runoff.

Telecommunications

Telecommunications systems are a major component of the land use of Western Connecticut. Antenna towers used for cellular service, radio, television, cable and satellite have become ubiquitous elements of our environment. Wireless services and their attendant towers are regulated by the Connecticut Siting Council; radio, television, cable and satellite service towers are regulated by the Federal Communications Commission. Recent amendments to FCC regulations adopted in 2018 will require zoning commissions to update their procedures for the review and approval of FCC regulated towers. The potential for adverse visual impacts of telecommunication towers remains an important issue for municipalities. On the positive side, expansion of broadband communications is a major component of the high-tech industries of the 21st century and for this reason, a lack of broadband access is a critical deficiency in attracting new industry to the region.

Roads

The maintenance of public investments in local roads is an important long-term responsibility of local governments. There are 2,638 miles of local roads in Western Connecticut, all of which require routine maintenance and need to be evaluated periodically to develop capital investment strategies to ensure these critical assets remain intact. Using the FHWA

annualized cost calculator and the Connecticut Department of Transportation Pavement reconstruction treatment costs calculator, annualized costs to maintain the region's 2,638 miles of local roads is estimated at \$31.6 million. However, if maintenance costs are deferred road reconstruction costs can pose significant financial burden on local government.

Sewer Avoidance Strategies

Sewers should not be extended into rural areas designated for agricultural, open space or residential lots of one acre or greater. Sewer extension would be an inefficient investment of federal, state and local funds since there are financially more cost-effective ways to correct wastewater violations caused by failing septic systems. These systems must be properly installed and maintained to ensure compliance with public health code requirements. In Western Connecticut several municipalities have established inspection requirements for septic systems to ensure regular cleaning and maintenance and to avoid the eutrophication of the region's water bodies.

Sewer Service

There are ten major water pollution control facilities located in ten of the region's municipalities with design flows totaling 77.7 million of gallons per day (MGD). Actual flows currently are 48.4 MGD leaving an available capacity of 29.2 MGD for future development. While the region has an adequate capacity for future residential, commercial and industrial development, there are clear limitations on the sewage treatment plants build out capacity without capital investments in expanded water pollution controls and proactive approaches to reducing non-point sources for nitrogen and phosphorous. For example, under conservative wastewater generation rates, the current 29.2 MGD available capacity can accommodate a population of about 390,000 additional people in those served by sewers.

Renewable Energy

A goal of the Regional Plan of Conservation and Development is to increase the use of renewable forms of energy in conjunction with implementing energy

conservation strategies. Since 1978 Connecticut land use commissions have been expected to encourage the use of solar energy and to plan for more energy-efficient patterns of development with the aim of reducing vehicle miles traveled and fossil fuel use. Efforts to promote renewable energy for electricity and other power needs have taken on greater urgency with increasing evidence of the long-term effects of carbon dioxide emissions as a global warming gas. A transition to a renewable energy economy will also require a greater investment in energy conservation and energy efficiency. Municipalities in Western Connecticut can support this goal by encouraging the installation of solar energy systems and passive solar design principles for residential, commercial, and industrial properties.

Infrastructure and Climate Resiliency

As society has become more complex, with increasing dependence on centralized systems of energy production and distribution, communication, and water and sewer service, the potential for system failures increases the risk of significant adverse consequences to the quality of life. Superstorm Sandy was a wake-up call for municipalities in Connecticut – both along Long Island Sound and inland. Resilience entails a commitment to 1) adapting communities to be less vulnerable to flooding, severe storms and rising sea levels, 2) increasing the redundancy of critical infrastructure systems and 3) mitigating the weaknesses of existing building systems to weather changing climate impacts.

Housing

Perhaps more than any single issue, the lack of affordable housing has become a limiting factor for the region's growth. Access to affordable housing is influenced by the lack of multi-family housing; limited availability of two-family housing, excessive restrictions on the creation of accessory apartments in single family dwellings and definitions of family within zoning regulations that often prohibit non-traditional families from living together. Western Connecticut, along with municipalities in the Greater New York and Greater Boston areas, are experiencing a housing affordability

crisis that affects residents regardless of their income or wealth.

Western Connecticut is one of the state's difficult housing markets for those with low to moderate incomes. Yet western Connecticut is not unique; the housing affordability crisis affects most of the fastest growing metropolitan regions of the United States where job creation outpaces housing creation. The state legislature has responded to the housing crisis by imposing housing affordability goals for each municipality to ensure future generations are able to live and work in the places they call home. In 2018, the Connecticut Department of Housing released its Affordable Housing Appeals List indicating, with the exceptions of Danbury, Norwalk and Stamford, the remaining municipalities in the region fell short of the ten percent affordable housing goal established by Public Act 88- 230. Apart from Bridgewater, Sherman and Weston, fifteen of the region's municipalities have adopted affordable housing concepts.

Economy

In 2017 the five major industries in the region were educational services and health care (21 percent of estimated employment); professional, scientific and management and administrative services (17 percent); finance, insurance and real estate (14 percent); retail trade (10 percent) and arts, entertainment, recreation and accommodation and food services (8 percent). Together these sectors of the economy accounted for seventy percent of the region's employment. These five sectors also accounted for an estimated 24,253 new employment opportunities during the period 2010 to 2017. The region's strength rests with a highly educated workforce and this is an important marketing priority.

There are twenty-nine industrial zones in the region, with eighteen of these zones located in Danbury, Newtown, Norwalk and Stamford – all of which share proximity to the interstate highway system. The region also provides over 4,154 acres of industrially zoned land, with about thirty percent of it within these four municipalities. Municipalities that have established

industrial zones in areas less accessible to sewer, water and interstate highways are generally at a disadvantage when marketing the business advantages of their community and may need to reassess their long-term land use plans.

During the last ten years, only three municipalities have seen an appreciable increase in their labor force (Danbury, Norwalk and Stamford) with the remaining fifteen municipalities experiencing declines or only marginal increases since the Great Recession. The region's major employers remain concentrated in the urban centers and this trend is likely to continue based on the range of public services, transportation systems and access these urban centers offer to the region's labor market.

Community Character

Municipalities in Western Connecticut are leaders in maintaining the character and sense of place of their cities, towns and villages. Community character is a difficult concept to define. However, character depends upon the physical, cultural, natural, historic and demographic features of each town. The region provides a rich historic and architectural legacy reflected in the existence of over 5,000 historic buildings in 85 historic districts - one of the most extensive historic preservation programs anywhere in New England. This rich historic legacy not only adds to community character it also promotes tourism and the local economy.

Another aspect of community character are local scenic roads. Local governments are authorized to protect the unique historic features of local roads –many of which date back to the early 17th century. There are 81 locally designated scenic roads offering eighty-five miles of aesthetically valuable vistas protected by municipal ordinances that preserve unique historic, aesthetic and physical features within the region.

The results of the region's long running experiment with zoning have led to some remarkable improvements in the protection of community character – especially open space, stream belt zoning, watershed protections and village district regulations. A

shared sense of place is one of the reasons the more dynamic Village District concept, enabled by Public Act 98-116, has been so strongly embraced within Western Connecticut. Development of village clusters – rather than single family enclaves without services – is the region’s next challenge. To achieve this goal will require a revision of traditional zoning that segregates – rather than integrating – land uses.

Water Supplies and Water Resources

One of the most important challenges facing the region is the development of new water supplies to supplement existing sources. Water supplies are provided by a wide range of surface water reservoirs, community water systems, groundwater aquifers and more recently by a growing use of interconnections between water supplies to ensure reliability during droughts and other emergencies. Water supplies in Western Connecticut are parochial in nature with most of the municipalities relying on their own aquifers, reservoirs, or community water systems to meet their critical water needs. The region has twelve protected aquifers currently used for public water supply, all of which have been delineated to ensure watershed management controls minimize pollutants from entering the drawdown zones of aquifers. While these efforts are a necessary step in protecting these vital water resources, more needs to be accomplished for other aquifers that have yet to be used for public water supply purposes. Currently, only Ridgefield has established zoning regulations that consider the need to protect both existing and potential aquifers to meet future water supplies.

Public Water Suppliers

The region is well served by public water suppliers with over eighty separate water companies providing service connections to sixty seven percent of the population. Aquarion Water Company serves 408,631 persons in Western Connecticut with the greatest level of service offered in the urbanized areas of Danbury (77% have public water service); Darien (86%); Greenwich (85%); Norwalk (92%) and Westport (89%).

As of 2017, fifty nine percent of the region’s population served by public water suppliers are served by one or more of Aquarion Water Company’s forty-three subsidiary organizations.

Protecting Long Island Sound

Municipalities along the Long Island coast must avoid investments in the coastal zone anticipated to be impacted by rising sea levels in the next one hundred years. Where infrastructure upgrades for roads, water and sewer service are under consideration in the coastal zone management zone, municipal investments should not be considered until a lifecycle cost analysis is completed that considers the full range of costs and benefits, positive and negative externalities, and the degree of long-term structural integrity that can be achieved by such investments. The second issue of concern are the hypoxia levels found in the western most portion of Long Island Sound. Stormwater and sewage treatment plant discharges –including systems with combined stormwater and sewage – contribute to hypoxia levels. Implementation of the Municipal Separate Storm Sewer System (MS4) promulgated by the U.S. Environmental Protection Agency will have a long-term positive impact on reducing hypoxia levels in the Sound.

Protected Open Space

The State of Connecticut has established a collective goal of protecting 21% of all lands as open space by the year 2023. The state, municipalities and land trusts in Western Connecticut have made commendable efforts to achieve this state goal, with an estimated 57,862 acres of land protected for open space, which is equivalent to 16.4% of all lands within Western Connecticut. To collectively meet the state’s open space acquisition goal - using the fiscal effort formula of 48% State and 52% partner – Western Connecticut municipalities, land trusts and other conservation organizations will need to identify and protect about 8,373 additional acres.

Protecting Urban and Rural Forests

The regional plan emphasizes the protection of forests and the many ecological, economic and social values

they provide to residents. Connecticut lost over 150,000 acres of forest lands between 1985 and 2006 and this trend will continue unless efforts are made to protect these lands. Forest management is not only important in rural areas - urban areas also benefit from forest management practices focused on the needs of the urban environment. Street tree management programs ensure proper care and protection is provided.

Agricultural Resources

While it might seem improbable that Fairfield County's agricultural sector, including aquaculture, has a greater economic impact on Connecticut's economy than any other county in the state, that is the finding from a 2010 University of Connecticut study. Despite the economic, community character and food security benefits of agriculture, there is only a limited amount of preserved farmland in Western Connecticut - less than 800 acres. Protecting farmland is not the only impediment to agriculture in Connecticut; federal, state and local public policy must also consider the benefits of establishing preferential markets for locally grown agriculture.

Each section presented in the Executive Summary can be found in more detail in the following chapters.

An Introduction to Regionalism

No man is an island, and this also holds true for the 532 square mile Western Connecticut region. The future of Western Connecticut depends on a range of global developments that impinge on use of land, housing, employment, transportation and natural resources. At least seven global-scale developments are expected to influence life in Western Connecticut by 2050. These include:

- ▶ climatological changes induced by combustion of fossil fuels;
- ▶ rapid growth of renewable energy resources to power homes and vehicles;
- ▶ replacement of low-skilled work through mechanization, automation, robotics, and artificial intelligence;
- ▶ concentration of the world's people in mega-cities of over 10 million persons;
- ▶ intensified competition for scarce resources including petroleum, rare earth metals, timber, pulpwood, and water;
- ▶ shortfalls in affordable housing for low- and moderate-income households in the developed world; and
- ▶ continued expansion of the world's population requiring unprecedented levels of demand for food, clothing and shelter.

The consequences of these developments will affect our region's employment opportunities, housing choices, transportation options, where we choose to live and how we protect our natural resources. We live in an interdependent world where food supplies, consumer goods, energy resources, and communication systems link this region to virtually every corner of the globe. However, supply chain interruptions due to war, droughts, political instability, or decline in natural resources can impinge on the economic stability of our local economy. Our region's future depends upon its relationship to other regions in Connecticut, the United States, and across the world. In developing the Regional Plan of Conservation and

Development, we have been mindful of these global scale trends that influence the decisions of Chief Elected Officials in our 18 municipalities.

Let's start by reviewing the consequences of these global scale trends on our region.

1. Employment Growth of Service Sector

The region has lost its manufacturing base as these jobs have been moved to lower-cost regions. Instead, we have witnessed significant growth in the service sector including employment in the health care services, educational, financial, professional, and scientific fields. One consequence of this development is that many of these jobs are more flexible in their workhours, enabling telecommuting options that would not have been possible in the pre-internet era. Low skilled work opportunities will be increasingly impacted by automation and artificial intelligence developments in a variety of fields – underscoring the importance of offering relevant training, skills and education for the next generation.

2. Climate Change in Connecticut

While much of the media coverage of climate change focuses on its impacts to the most vulnerable regions of the world, including the Arctic and sub-Saharan Africa, Connecticut can expect substantial impacts from rising sea levels along its coast and increases in seasonal rainfall and the intensity of storm events. As the frequency, duration, and intensity of rainfall increases, the region will need to address flooding, stormwater management, adverse impacts to surface water quality, erosion and sedimentation, and other issues. Temperature increases in the summer are expected to lead to more severe rainfall intensities like those found in the tropics. Flood protection measures will become more challenging; flood insurance rate maps are already obsolete because

floodplain boundaries no longer reflect the local climate.

3. Concentration of Population in Urban Core Cities

The region's growth is constrained by the availability of water and sewer services both of which focus development to the cities of Danbury, Greenwich, Norwalk, and Stamford, which account for 50% of the region's population and nearly 90% of the region's available sewer capacity. These cities can expect to see increasing demands for housing reflecting their role in providing services and employment opportunities for the entire region. As cities grow in the region and the United States, intra-city travel by road will be adversely impacted thereby increasing the need for investments in alternative modes of travel and communication and the adoption of transportation demand management strategies.

4. Scarce Resources Affect the Region

While the region no longer locally produces minerals and timber, other local natural resources continue to be important to the region's current and future economy. These include drinking water, land, and renewable energy resources. Unlike major cities such as Boston and New York, none of the region's cities own major watersheds capable of sustaining populations found in mega-cities like New York or Washington DC. The region's growth will inevitably be constrained by access to water, even with efforts to establish interconnections between existing water utility services aimed at reducing single point of service vulnerabilities during droughts. The State of Connecticut has developed a state Water Supply Plan that incorporates a Margin of Safety (MOS) concept into its requirement for determining long term water supply needs.

For many reasons, water supply issues will remain one of the most important long-term resource constraints in Western Connecticut. In contrast to water resources, we rely almost entirely on regions outside of Connecticut to meet our dietary requirements. Only two percent of all food

consumed by Connecticut residents is grown in the state. This raises significant long-term concerns as California and Florida provide an inordinate amount of the region's food supply. Both states are extremely vulnerable to the vicissitudes of climate change including droughts, hurricanes, and sea level rise; and the long-distances involved in transport of foodstuffs from those areas raises the potential for supply (and thus food) chain disruptions. As discussed in later sections of this plan, Connecticut has lost most of its farmland over the last one hundred years, but this loss need not be irreparable if efforts are made to develop sustainable "greenhouse based" agricultural and aquaculture production strategies.

5. Tempered Population Growth

The United Nations predicts that the world's population will increase from 7.3 billion today to 9.7 billion by 2050, with most of this increase occurring in the developing nations of the world. In contrast, Western Connecticut is only expecting modest population growth due to a low birth rate and limited net migration to the region. Given a low birth rate, population growth is a function of employment opportunities, a suitable economic climate for business and industry, and adequate labor skills to attract industry. The region's economic future will depend upon diversifying its economic base by maintaining a favorable business climate. A high cost of doing business, limited availability of workers, traffic congestion, and water supply constraints are obstacles to be overcome to stimulate continued growth.

6. Growth of the Renewable Energy Sector

In the last ten years, solar and wind energy systems have become competitive with traditional sources of electricity in Connecticut, reflecting the fact that the state has the second highest costs for electricity in the nation. Availability of wind and access to sunlight are necessary for these renewable energy sources to function. While Western Connecticut does not have the same number of uninterrupted days of sunshine as, say, New Mexico, its high electricity costs make solar energy 'cost

competitive.’ Historically solar energy has been supported by the state by giving incentives to homeowners to install photovoltaic systems and passive solar design into their housing. The climate crisis as documented by the Intergovernmental Panel on Climate Change (IPCC) has accelerated state investment in solar farms as an alternative to piecemeal investment of solar energy through subsidy of homeowner solar installations. This has significant ramifications for Western Connecticut since, absent land use policies and guidance from Connecticut’s municipalities, solar farms are typically constructed on idle farmland, forest or open space. The future of the renewable energy sector will largely depend on the region’s implementation of strategies that promote solar and wind power and are compatible with the need to protect soil, water, habitat, and ecosystem services and to provide adequate land for agriculture, forestry, recreation, and other important land uses.

7. Shortfalls in Affordable Housing

Lack of affordable housing affects millions of Americans as income levels fail to keep pace with rising real estate costs. Rising costs reflect a tightening supply of land available for development and the consumption expectations of homeowners and renters. Housing is not merely a means of providing shelter; for homeowners it is often the most important financial investment/asset they will ever own. Lack of affordable housing prompted the Connecticut General Assembly to intervene in municipal land use planning to establish minimum levels of affordable housing so that our children might be able to live in the communities in which they grew up and workers providing essential services could afford to live and work in town.

The Case for Regionalism

The advent of the automobile has transformed the traditional notion of a home town as few residents of Western Connecticut live and work in their place of residence. Stamford, with thirty-nine percent of its residents living and working in Stamford represents the

best example of a ‘local’ society – local in the sense that work and home fall in proximity, thereby reducing reliance on the automobile. In thirteen of the region’s eighteen municipalities, fewer than 20% of the residents worked in the same municipality as they lived in (in 2015). These commuting patterns underscore the dramatic changes that have occurred over the course of the last century, altering how we address housing, employment, transportation and economic development in the region.

In simple terms, roads do not end at town lines, nor do employment or housing opportunities. While we all live within municipal boundaries, the daily commute for most residents of Western Connecticut takes them to other places in the region, in Connecticut, or in New York. Moreover, the case for a regional perspective does not end with commuting patterns. Most notably, water, air, and climate do not stop at the town line. This realization has been one of the reasons that the General Assembly has consistently expanded the importance of regional approaches to transportation, economic development, housing, land use, natural resources, and service delivery.

Legal Framework for Regionalism

Connecticut’s original 1947 regional planning statute recognized that the growth of a municipality influences, and is influenced by, the surrounding region, that no town is an isolated entity. That law required each regional planning authority to make a plan of development for the region within its jurisdiction. The authority of this Regional Plan of Conservation and Development on the members of the region is advisory. The reason for this is simple: the choice as to who makes local land use decisions should be those who live closest to the results. Yet the traditional deference to local planning and zoning commissions now must take into consideration regional strategies for transportation, water supply, sewer services, employment, housing, public health and emergency preparedness, to mention the most salient issues.

In 2013, the Connecticut State Legislature granted the state’s regional Councils of Governments (COGs) a

broad range of authorities to address the fundamental decision-making constraints posed by local governments attempting to solve regional challenges on their own. This new law enables COGs to assume most of the responsibilities that have previously been

assigned to single purpose district, commission, or authority. The magnitude of this change can be understood by a review of the range of regional authorities that have been enabled by state legislation over the last seventy years (Table 1).

Table 1: Regional Services Established by Connecticut Law: 1947 to 2013

Regional Services	Year	Western CT	State	CT General Statutes /Federal Law Reference
<i>Regional Planning Authorities</i>	1947	0	0	Repealed in 2013
<i>Regional School Districts</i>	1951	2	19	Sections 10-39 to 10-63t
<i>Municipal Districts</i>	1955	0	1	Sections 7-330 to 7-332
<i>Health Districts</i>	1959	3	20	Sections 19a-240 to 19a-246
<i>Transit Districts</i>	1961	2	12	Sections 7-273b to 7-273n
<i>Multi-Town Lake Authorities</i>	1967	3	8	Sections 7-151a
<i>Council of Governments</i>	1971	1	9	Sections 4-124i to 4-124p
<i>Air Pollution Control Districts</i>	1971	0	0	Section 22a-185
<i>Regional Sewer Authority/Agreements</i>	1971	4	35	Section 7-246
<i>Metropolitan Planning Organizations</i>	1973	2	8	Federal-Aid Hwy Act of 1973
<i>River Protection Commissions</i>	1973	4	8	Sections 25-102a - 25-102l
<i>Soil & Water Conservation Districts</i>	1974	2	8	Sections 22a-315 to 22a-317
<i>Emergency Medical Service Councils</i>	1974	2	5	Sections 19a-182 to 19a-184
<i>Regional Resource Recovery Authorities</i>	1982	2	5	Sections 7-273aa to 7-273oo
<i>Area Agencies on Aging</i>	1983	2	5	Section 17a-304
<i>Water Utility Coordinating Committees</i>	1985	2	7	Sections 25-33c to 25-33j
<i>Greenways Commissions</i>	1995	10	47	Public Act 95-335
<i>Water Pollution Control Districts</i>	1995	3	35	Inter-municipal agreements
<i>Emergency Preparedness Districts</i>	2007	2	5	Section 28-1 to 28-22
<i>Regional Economic Development Commissions</i>	2010	2	12	Section 32-741
Total		44	214	

Under state law, a regional Council of Governments may, if desired, provide "any service, activity or undertaking that [any] political subdivision [of the state] is authorized by law to perform." In other words, a COG may provide the functions of a municipality or any other political subdivision of the state. These functions "may include, without limitation... (1) engineering; (2) inspectional and planning; (3) economic development; (4) public safety; (5) emergency management; (6) animal control; (7) land use management; (8) tourism promotion; (9) social; (10) health; (11) education; (12) data management; (13) regional sewerage; (14) housing; (15) computerized

mapping; (16) household hazardous waste collection; (17) recycling; (18) public facility siting; (19) coordination of master planning; (20) vocational training and development; (21) solid waste disposal; (22) fire protection; (23) regional resource protection; (24) regional impact studies; and (25) transportation" (CGS §8-31b(b)).

The Western Connecticut Council of Governments (WestCOG) has assumed responsibility for the two Metropolitan Planning Organizations (MPOs) and the Economic Development District (EDD) in its region. The remainder of the regional services given in the table

and list above represent future opportunities for more effective and coordinated delivery of regional services.

Regional Planning in Western Connecticut: Its History and Purpose

The Western Connecticut Council of Governments opened January 1, 2015. WestCOG was created from the merger of the former Housatonic Valley Council of Chief Elected Officials (HVCEO) and the South Western Regional Planning Agency (SWRPA). It includes the eighteen municipalities of Bethel, Bridgewater, Brookfield, Danbury, Darien, Greenwich, New Canaan, New Fairfield, New Milford, Newtown, Norwalk, Redding, Ridgefield, Sherman, Stamford, Weston, Westport and Wilton (**WestCOG Location map**). By state law, each COG must create and maintain “a plan of development for its area of operation, showing its recommendations for the general use of the area” including land use, housing, transportation, public utilities and “such other matters as, in the opinion of the agency, will be beneficial to the area.” The plan furthermore “shall be designed to promote with the greatest efficiency and economy the coordinated development of its area of operation and the general welfare and prosperity of its people” (CGS §8-35a(a)). This Plan replaces previous regional plans issued by HVCEO (1971, 1981, 1997 and 2009) as well as those of SWRPA (1974, 1983 and 2006).

This Plan of Conservation and Development fulfills the statutory responsibility to prepare a regional plan. More importantly this Plan enunciates the vision for the Region to enable municipal plans to consider regional scale policies in their own decision-making and for the State Plan of Conservation and Development to be mindful of the unique land use and natural resource and infrastructure issues that affect Western Connecticut.

The Regional Plan of Conservation and Development has the following uses:

- Provides leading advice on Responsible Growth strategies

- Sets development priorities as required by CGS §8-35a(a)
- Coordinates water and sewer utilities between towns
- Promotes preservation of inter-town water supplies required under CGS §25-33g
- Markets the region as a coordinated jurisdiction
- Assists private investment studies and municipal bond sales
- Meets mandate for land use/transportation coordination (23 USC 134(h)(1))
- Integrates regional level policies in state and local level plans
- Addresses regional input to municipal plans (CGS §22a-102d)
- Addresses regional input to state plan (CGS §16a-28)
- Addresses coordination along boundaries (CGS §8-3b)
- Coordinates various aspects of municipal land use regulation
- Establishes the fiscal basis for regional management of collectively shared infrastructure

Public and Stakeholder Involvement

Stakeholder Involvement

Throughout the development of this draft Plan, stakeholders from each municipality were engaged through a variety of forums, including the meetings of municipal planners, the Western Connecticut Comprehensive Economic Development District group, the Technical Advisory Group and the Council of Governments. At the July 17, 2019 Planners’ Lunch, staff from the region’s municipal planning and zoning departments participated in a discussion and provided feedback on the data and findings collected and analyzed in the prior months. A working draft was then dispersed to municipal planners, economic development members, and public works staff for comments starting on August 8, 2019.

After incorporating comments from municipal staff, the working draft was then sent out for comments from

the COG on September 5, 2019 and discussed at the September 19th COG Meeting.

Public Outreach

The public comment period started on November 1, 2019 and ended on January 4, 2020. WestCOG will post comments and responses at the website below.

Newsletters

Every month a WestCOG newsletter is distributed to the mailing list of interested parties and is posted on the WestCOG website. The Plan of Conservation and Development was featured in the July, August, September, November and December 2019 and January 2020 editions of the newsletter.

Website

The draft Plan of Conservation and Development is hosted on the WestCOG website at both plan.westcog.org and westcog.org/pocd/.

Information about what a Plan of Conservation and Development is, public meetings and presentations can also be found at these web addresses.

Social Media

WestCOG also dispersed information about how to get involved through Twitter, Facebook and LinkedIn.

Newspapers

Press releases were distributed to several English and Spanish newspapers in the region regarding the public information meetings, public comment period and the public hearing.

The statutory legal notice of public hearing was published on December 27th, 2019 in the Stamford Advocate

Public Information Meetings

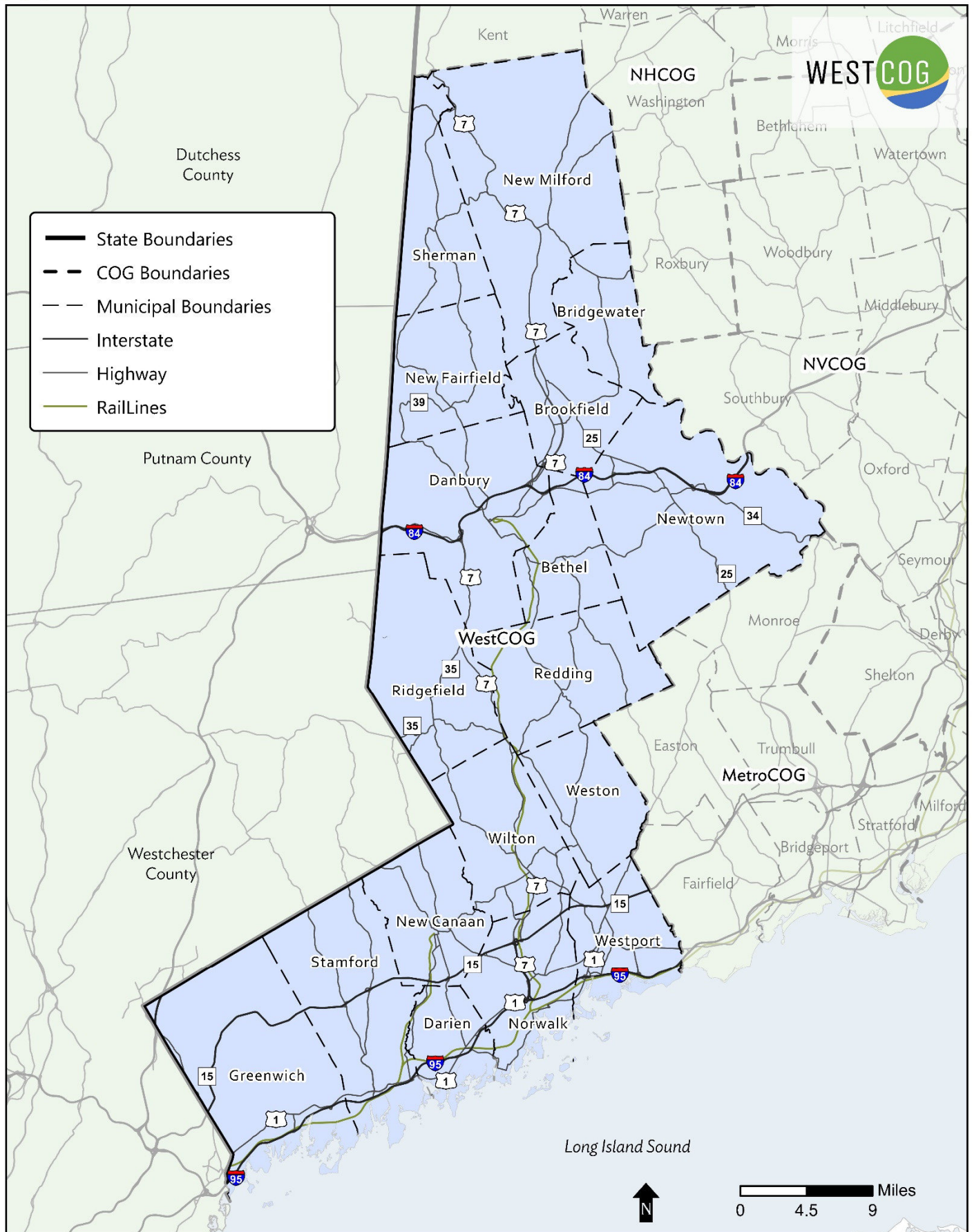
Public information meetings were held on December 4, 2019 at the Greenwich Audubon Center and on December 5, 2019 at Highstead in Redding, both from 7pm to 8pm. The purpose of these sessions was to

share the draft Plan and allow for members of the public to share comments verbally.

Public Hearing

The statutory public hearing was held on January 16, 2020 at 12:30PM at the Ridgefield Visiting Nurse Association.



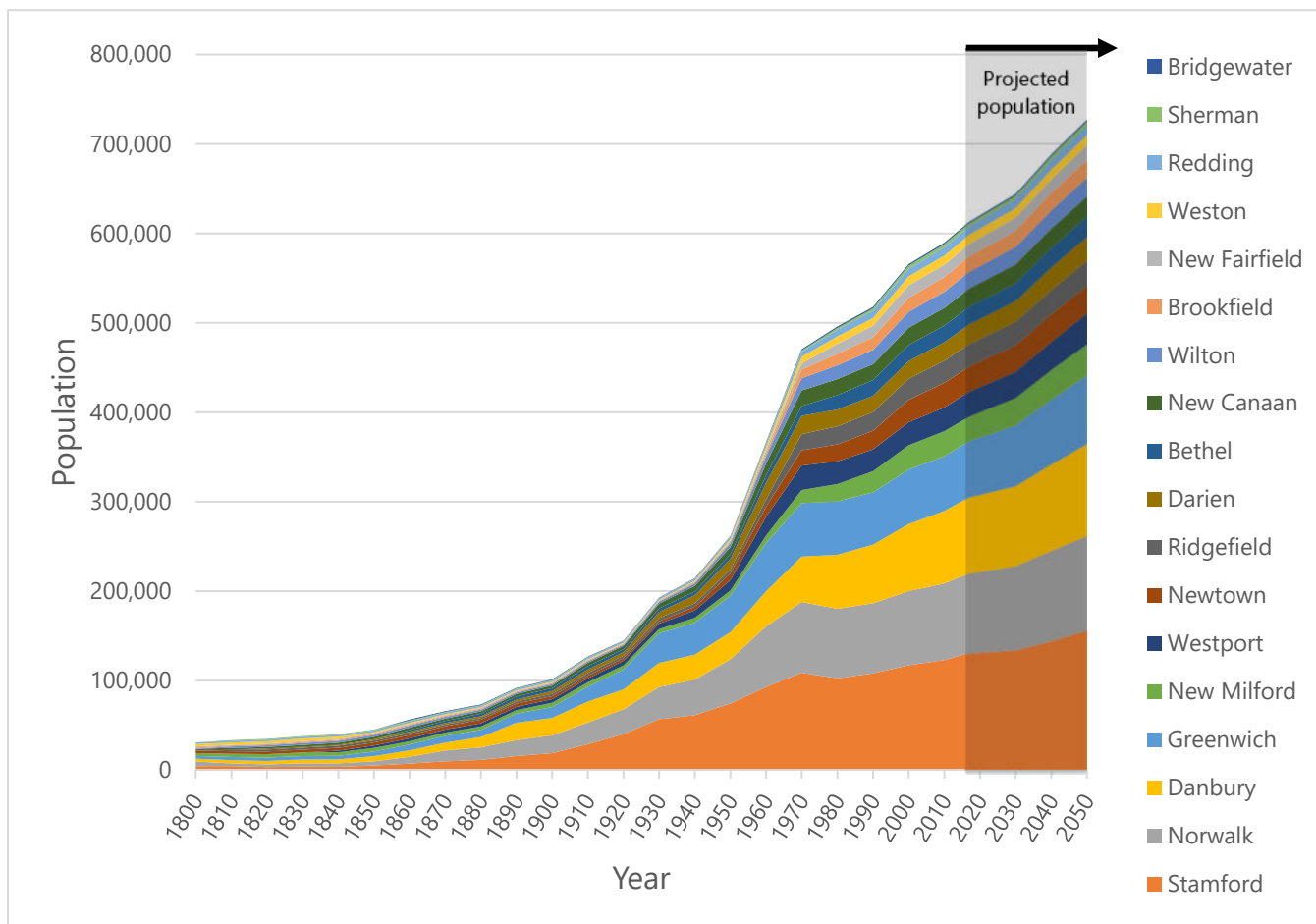


Demographic Trends

In 2017, an estimated 612,870 persons lived in the eighteen municipalities of Western Connecticut, with 50% of the population living in the region's three largest municipalities (Danbury, Norwalk and Stamford). While these cities have long been central locations for employment in the region, their share of the region's population declined with the advent of the automobile in the post-World War I era. In 1920, these three municipalities accounted for 62% of the region's population; by 2010 it had dropped to 49%. In 2017, for the first time in one hundred years, these cities grew faster than suburban and rural municipalities in the region.

As can be seen in **Figure 1** below, the region experienced its fastest rate of growth immediately after World War II when automobile ownership in America became common and was accelerated by the creation of the interstate highway system in 1955. Between 1950 and 1970, the region's population increased by 79%. However, since 1970 the region has grown by an additional 142,473 persons, amounting to a 30% increase in population. The region's population is projected to increase by 115,234 persons between 2017 and 2050 with 50% of that growth occurring in Danbury, Norwalk and Stamford.

Figure 1: Population Trends and Projections for Western Connecticut: 1800 to 2050



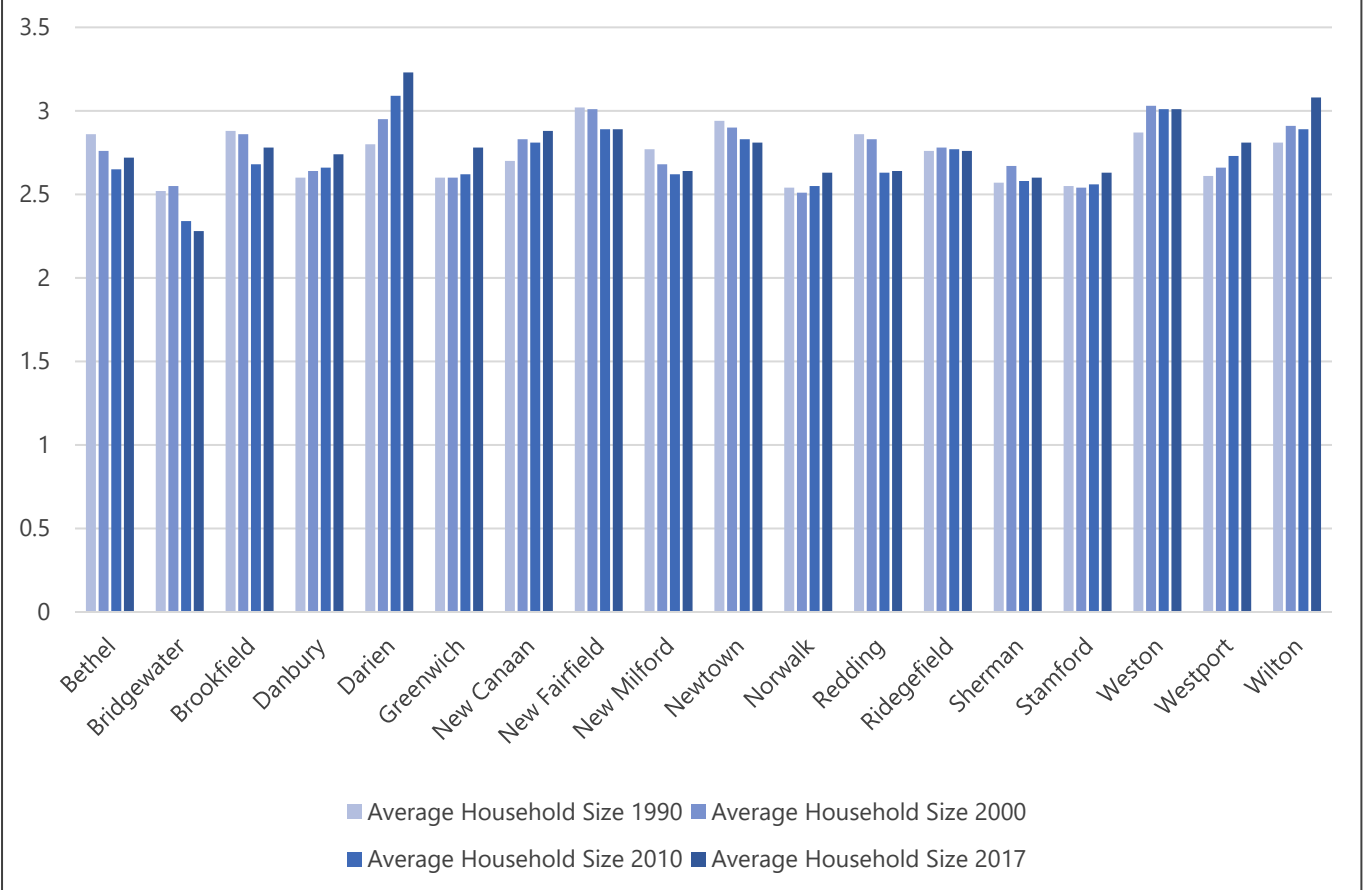
Source: State of Connecticut Register & Manuals, 1904 & 1970; U.S. Bureau of the Census; Connecticut Department of Public Health 2017 population estimates, 2018; NYMTC Projections, WestCOG Analysis, 2019.

Average Household Size

During the last thirty years the average American household has declined in size. However, within Western Connecticut ten municipalities have experienced increases in the size of the average household. In contrast, seven municipalities – all

which are in rural or suburban in character – have experienced declines. Bethel, Bridgewater, Brookfield, New Fairfield, New Milford, Newtown and Redding all experienced a decline in the size of the average household reflecting their aging population and decline in school age population (Figure 2).

Figure 2: Trends in Average Household Size in Western Connecticut Municipalities: 1990 to 2017



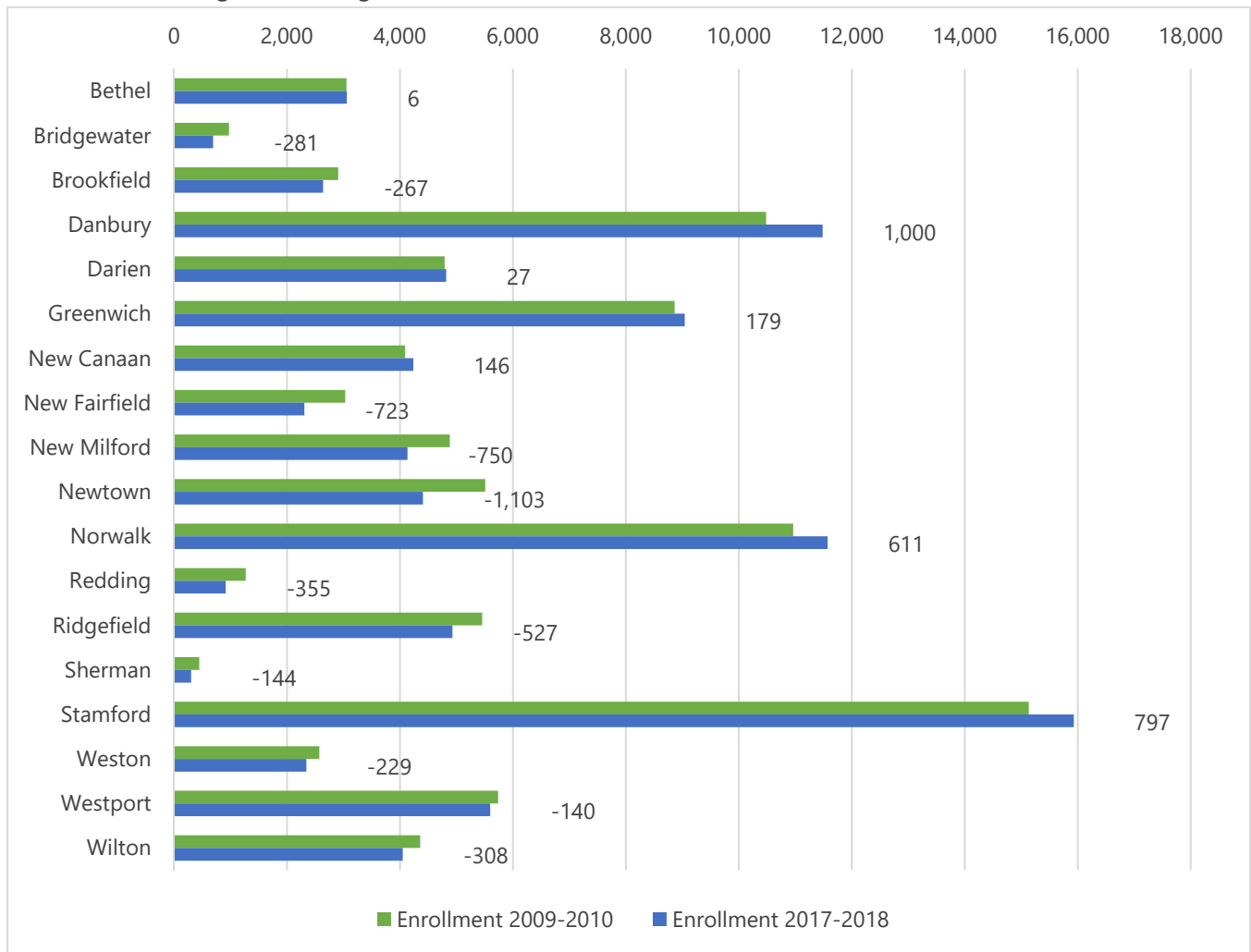
Education

School Enrollment

Ten of the region's municipalities have lost public school enrollment during the period 2009 to 2018. Four municipalities (Bethel, Darien, Greenwich, and New Canaan) had modest increases in public school enrollment. In contrast, Danbury, Norwalk and Stamford combined experienced an increase of 2,408 public school students reflecting the greater availability of affordable housing in these cities (**Figure 3**). Declining public-school enrollment trends in most of the region's suburban and rural municipalities will require affected municipalities to assess their long-term capital investment plans for public schools.

An analysis of the school enrollment trends in the region's one hundred and twenty-five elementary and middle schools revealed a decline of 1,615 students between October 2010 and October 2017. The municipalities with the greatest declines in pre-high school age students were Newtown (955 fewer students between Kindergarten and eighth grade); New Fairfield (466); Ridgefield (453); Wilton (353); Redding (330); Bridgewater Region 12 District (320); Westport (282); Weston (223); New Milford (221); Sherman (107); Brookfield (106); and Darien (95). In contrast to these suburban and rural municipalities, pre-high school age students increased in Danbury (1,017); Stamford (639); Norwalk (191); Greenwich (151); Bethel (153) and New Canaan (121).

Figure 3: Change in Public School Enrollment from SY 2009/2010 - SY 2017/2018



Note: Data excludes Stamford Academy and Stamford Charter School Districts. These 2 districts had 131 students in 2009-2010 and 453 in 2017-2018.

Enrollment in the region's high schools varies substantially from that found in elementary and middle schools. Stamford had the greatest decline in high school students during the period 2010 to 2017 with 399 fewer students in 2017 compared to 2010. Other high schools affected by significant declines over this same period were New Fairfield (182); New Milford (157); Brookfield (136); Ridgefield (99) and Bethel (63). Changing enrollment patterns in some cases may enable municipalities to repurpose underutilized high schools for elementary school use (e.g., the case for Norwalk and Stamford) or to repurpose underutilized elementary schools for high school use (e.g., the case for Weston, Westport, Wilton, and Bridgewater's Region 12 School District). However, where high school and pre-high school enrollments are both falling (e.g., New Fairfield, New Milford, Newtown and Ridgefield), serious consideration should be given to school consolidation strategies. In the case of Danbury and Norwalk where school enrollment has increased in the pre-high school and high school age groups, expansion of the existing school systems may be appropriate if the current occupancy levels are at capacity. Where growing districts are in proximity to shrinking districts, inter-district busing of students and/or sharing of facilities and services may be considered.

Education Expenditures

During school year 2017-18, the region's public-school systems spent \$1.7 billion for salaries and other administrative expenditures, in addition to \$101 million for land, building and debt services. On average, it cost \$18,403 for each pupil's education (i.e., Pre-Kindergarten to grade 12) exclusive of land, building and debt services in the eighteen municipalities in Western Connecticut. Annual cost per pupil ranged from as low as \$13,032 in Danbury to \$30,081 in the Bridgewater Region 12 school system (Table 2). Bridgewater's Region 12 school system had the lowest student/teacher ratio for general education (7.8 students per Full Time Equivalent Teachers) whereas Danbury had the highest student/teacher ratio (14.4 students per Full Time Equivalent Teachers). There were 9,470.9 full time equivalent (FTE) general and special

education teachers and teacher's assistants working in the region's public-school system in 2017-18, with 72% of the teachers working in general education and the remainder working in special education. Because of the unique challenges of educating children with disabilities, student/teacher ratios are nearly one-third that of the general student population. On average, there are 4.3 FTE special education teachers and assistants for each student with a disability in the region, with per-student values ranging between 2.3 FTE special education teachers and assistants in Redding and 7.1 FTE special education teachers and assistants in Norwalk.

One opportunity for improving the cost-effective delivery of public education may be to consider inter-municipal or regional solutions for the functions provided by support staff such as instructional

Table 2: Per Pupil Cost for Public Education in Municipalities in Western Connecticut: 2017 to 2018

Municipality	Total School Expenditures	Student Enrollment	Reported Per Pupil Cost
<i>Bethel</i>	\$48,301,790	3,059	\$16,252
<i>Bridgewater Region 12</i>	\$20,455,203	692	\$30,081
<i>Brookfield</i>	\$41,748,200	2,639	\$15,377
<i>Danbury</i>	\$147,024,456	11,483	\$13,032
<i>Darien</i>	\$98,907,463	4,818	\$20,576
<i>Greenwich</i>	\$191,602,623	9,042	\$21,502
<i>New Canaan</i>	\$90,224,976	4,237	\$21,135
<i>New Fairfield</i>	\$39,159,777	2,308	\$16,551
<i>New Milford</i>	\$64,264,118	4,133	\$15,272
<i>Newtown</i>	\$78,209,578	4,407	\$17,372
<i>Norwalk</i>	\$204,635,894	11,573	\$17,466
<i>Redding</i>	\$21,100,370	914	\$23,238
<i>Ridgefield</i>	\$92,945,729	4,929	\$18,634
<i>Sherman</i>	\$7,078,079	302	\$22,399
<i>Stamford</i>	\$302,248,240	15,931	\$18,756
<i>Weston</i>	\$50,476,590	2,343	\$21,379
<i>Westport</i>	\$118,984,359	5,598	\$21,175
<i>Wilton</i>	\$84,155,429	4,050	\$20,667
Total	\$1,701,522,874	92,458	\$18,403

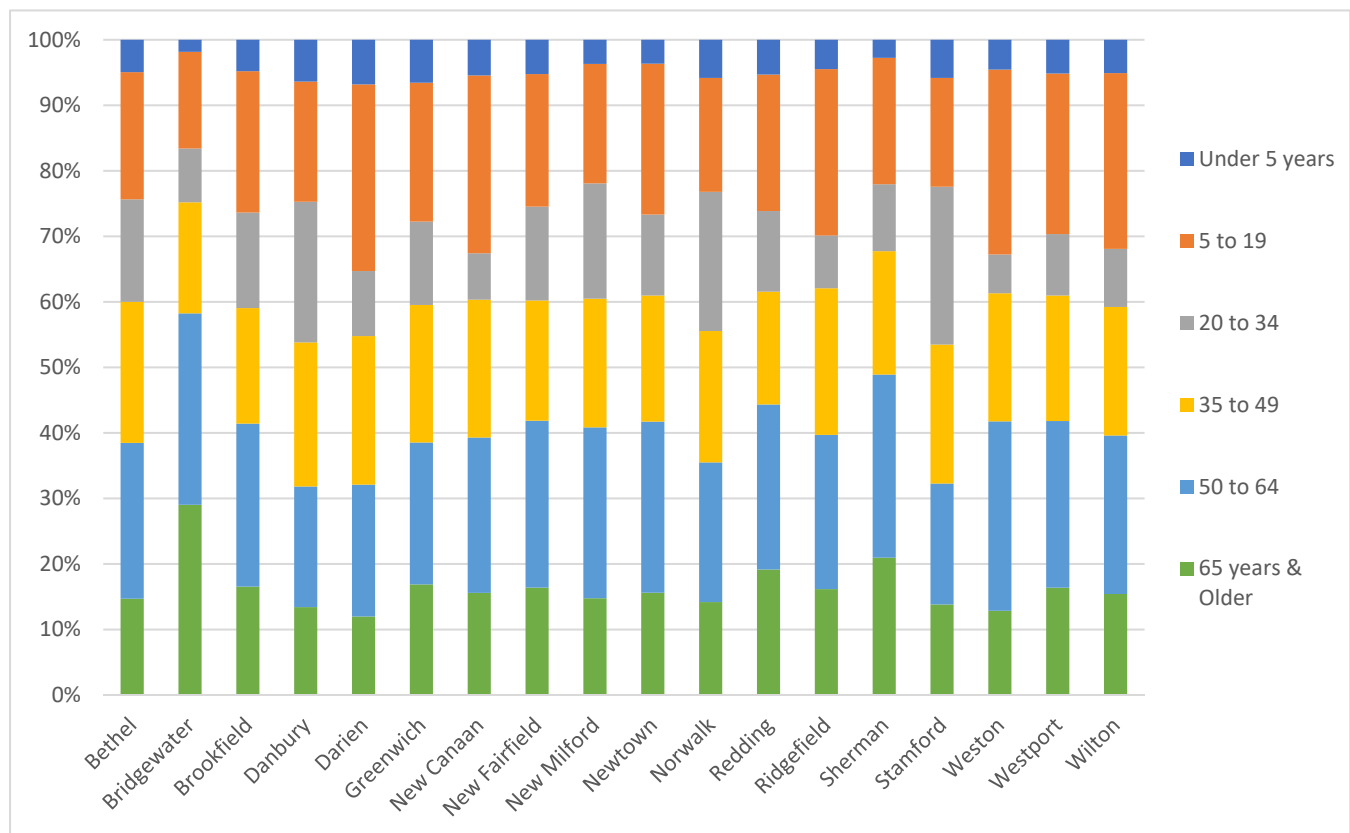
Source: CT State Department of Education

specialists, counselors, social workers, psychologists, school nurses, and other staff providing non-instructional services and support. On average, for each 18.5 public school students there was one FTE staff person working in a non-instructional role within the region's school districts. The ratio of students to non-instructional staff ranged from a low of 8.2 students to FTE non-instructional staff in Bridgewater's Region 12 school district to a high of 22.7 students to non-instructional staff in Danbury. While seeking efficiencies in the cost of providing public education is a complex challenge, it is appropriate to identify opportunities to improve the efficiency of services provided by non-instructional staff – especially when regional or sub-regional coordination strategies could improve the management and delivery of public education without affecting the quality of the work performed by the region's teachers.

Senior Population

In 2017, The U.S. Bureau of the Census estimated there were 90,363 persons 65 years of age or older living in Western Connecticut. The senior population ranges from 12% of those living in Darien to 29% of those living in Bridgewater (**Figure 4**). Seniors benefit from convenient access to shopping, social opportunities, and medical care. This is especially important for households solely comprising seniors, who may no longer be willing or able to drive. Seniors are expected to become an increasing share of the region's population over the next thirty years as the baby boom generation retires and chooses to stay living in their current dwelling unit.

Figure 4: Population Breakdown in Western Connecticut in 2017



Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates.

Infrastructure

Settlement patterns are influenced by natural landscapes and manmade infrastructure. While the natural environment may not normally be considered infrastructure, it has decisively shaped travel and settlement patterns in the region. Waterways and their associated riparian corridors have influenced municipal flood control measures, determined the location of sewage treatment facilities, and informed the techniques for managing stormwater. Similarly, the region's northern waterways have been a source of hydropower, while traditional New England settlement patterns have taken advantage of the solar heat gains of south-facing buildings and clustered development in village centers to minimize the costs of long-distance travel.

This chapter not only addresses some of the natural infrastructure systems with which we must co-exist, but it also reviews our responsibilities for the maintenance of manmade systems such as highways, bridges, communication towers, electric generation facilities, and flood control and stormwater management systems. Thinking of infrastructure as encompassing natural infrastructure systems, as well as those that are manmade, becomes increasingly important as climate change considerations influence the way we plan for warmer temperatures, more intense rainfall events, more severe wind storms and more catastrophic flooding events. For this reason, natural infrastructure, when properly managed, functions as an ecosystem service providing important benefits to municipalities in western Connecticut.

Stormwater and Flood Waters

Land development can have a significant impact on the quality and quantity of stormwater and floodwaters that impact our region. Increasing the density of

development increases stormwater runoff, especially from impervious surfaces such as parking lots; compacted soils; extensive roof drainage systems; and denuded or disturbed forests, farmland, or open space. Studies conducted by the Connecticut Nonpoint Education for Municipal Officials (NEMO) program have shown impervious cover as an important environmental indicator of the health of riparian corridors. While impervious cover by itself does not create pollution, paved and compacted surfaces prevent infiltration of water into the ground, amplifying and accelerating storm runoff, mobilizing contaminants that otherwise would have remained and potentially decomposed in situ. Urban infrastructure, in the form of stormwater catch basins, detention and retention basins, and engineering controls, such as dikes, levees and culverts focus and concentrate runoff, further increasing the volume and speed of stormwater and flood water discharges and decreasing water quality. For the past fifty years, development practices have largely relied on concrete and asphalt, transforming urban environments into stormwater/floodwater chutes, sending as much water as quickly as possible downstream, without adequate consideration of impacts on surface and groundwater quantity and quality, or ecosystems and receiving areas downstream. Here we assess the impacts of infrastructure designed to address stormwater and floodwater management.

Stormwater Management

Because of the adverse consequences of excessively high impervious cover in urbanized areas, the Environmental Protection Agency requires municipalities that own and operate a storm sewer system in an Urbanized Area (UA) to comply with the Municipal Separate Storm Sewer Systems (MS4) General Permit. Urbanized Areas are defined by the

U.S. Census Bureau and consist of densely populated areas surrounding urban centers. In Connecticut, 113 municipalities are subject to MS4, including all municipalities in the region but Bridgewater and Sherman. Except for Stamford, which is governed by an earlier MS4 permit, fifteen other municipalities in the region are governed by the MS4 five-year General Permit effective July 1, 2017.

Traditionally, zoning regulations have placed few meaningful limitations on impervious cover standards. Instead, they have primarily relied on lot coverage standards to control the density of development on residential, commercial, and industrially zoned land. Most of the region's municipalities still maintain lenient lot coverage and building coverage standards that will require significant revisions to comply with the MS4 General Permit. Zoning commissions that permit basin-wide impervious surface coverages of 11% or more, a level which would result in significant, adverse impacts to drinking water, recreational facilities, shellfish areas and/or violate surface water quality standards, will find it advantageous to reassess acceptable lot and building coverage standards in every residential, commercial and industrial zone.

Drainage basins that exceed 11% impervious surface will become priority areas for improved stormwater management. There are no easy solutions for addressing stormwater in urbanized areas where impervious coverage already exceeds this threshold. Improving stormwater quality is compounded by the existence of combined stormwater and sewer systems in urban areas that fail to disaggregate the collection of these waste water streams. Eliminating stormwater inflow and infiltration (I&I) problems in Stamford, Norwalk and Danbury will be a slow and tedious effort that represents a long-term fix – not something that can be achieved within the ten-year planning horizon of this document. Fortunately, EPA's MS4 program does not require a complete solution, only proof that

each municipality has implemented to "the *Maximum Extent Practicable* practices which will prevent the discharge of the water quality volume to a surface water body or other practices necessary to protect and maintain designated uses and meet standards and criteria contained in the Water Quality Standards."

With the emergence of low impact development concepts and the EPA's MS4 general permit program, there has been a shift toward evidence-based stormwater management controls in municipal zoning regulations. At the local level, the challenges of reducing stormwater pollution will be one of the greatest land use challenges we face over the next twenty-five years. EPA requires all directly connected impervious areas (DCIA), governed by an MS4 general permit, that discharge to watercourses to develop a long-term plan to reduce impervious cover and to achieve a two percent reduction in DCIA by the year 2022 and one percent reductions each year thereafter. This mandate represents a significant responsibility for a variety of land use related agencies including planning and zoning commissions, conservation commissions, and public works departments as well as zoning and wetland enforcement officers

While it will be impossible to eliminate all impervious cover in the urbanized areas of Western Connecticut – or for that matter anywhere in the United States –there are many strategies that can play a significant role in reducing their contributions to elevated phosphorous, nitrogen, E. coli and other bacterial contaminants. EPA has established strict requirements for the control of stormwater discharges in municipalities subject to the MS4 requirements including on-site retention of stormwater for developments that have less than a forty percent impervious coverage. The consequences of these regulations will dramatically change the stormwater controls developed within Western Connecticut and throughout the entire state.

Floodplain Management

In 1968 Congress established the National Flood Insurance Program (NFIP) to provide flood insurance for Americans in areas vulnerable to flooding, provided that local governments enact flood ordinances to reduce the risks of future flooding to new construction. However, because of increasing intensity of flooding – caused in part by climate change and in part by lenient implementation of flood mitigation measures – the Federal Emergency Management Agency has lost billions of dollars through this program. The fundamental premises of the program are in question as climate scientists have documented an increasing intensity of storm rainfall events that have made FEMA's Flood Insurance Rate Maps obsolete. The one-hundred-year storm – rather than being a one in one hundred chance of occurring in any year – has in many locations become a one in ten-year frequency. The result is that the government is subsidizing development in areas of high flood prone risk without appropriate cost controls or oversight over the land use controls that were intended to avoid flooding.

Poor actuarial decisions by FEMA are only part of the problem. Poorly managed stormwater management systems imposed on new development have contributed to increased downstream flooding. For example, runoff controls are likely to be inadequate or non-existent, if zoning commissions fail to require the installation and upkeep of detention or retention basins; catch basins and settling basins to slow stormwater discharge velocities or pervious pavement to increase the percolation rate of high intensity rainfall events. Since FEMA flood insurance rate maps are essentially obsolete, municipalities need to place a higher priority on the expansion of floodplain boundaries and reassess the floodplain restrictions established by local ordinance. Rather wait for FEMA to revise its floodplain boundaries, municipalities should proactively establish climate change adaptation strategies to manage the safety, health, economic, and

fiscal risks associated with the potential increased frequency and/or severity of flooding and drought conditions. Such an approach would be consistent with state investment policies and could have a positive impact on protecting public water supplies, agriculture and aquaculture production.

One of the most relevant initiatives adopted by thirty-five Connecticut municipalities is the creation of stream belt zones that establish minimum setbacks from watercourses to provide greater protections for the water quality of Connecticut streams. These regulations also serve to improve riparian corridors for other purposes as well, including establishing migratory pathways for a range of species, improved thermal protection of watercourses by the maintenance of tree canopies and the maintenance of an undisturbed floodplain free of structures and impediments to the free flow of floodwaters.

Riparian Corridors

In 1972 the U.S. Department of Agriculture published a landmark study, *A Guide for Streambelts, A System of Natural Environmental Corridors in Connecticut*. The report influenced many Connecticut municipalities to adopt streambelt zoning concepts, including several municipalities in Western Connecticut. Streambelt zoning supports more than a dozen ecological principles including; 1) promoting land uses that are not likely to adversely impacts streams; 2) to promote the public health, safety and general welfare of residents living near streams to avoid flooding; 3) to maintain natural drainage to ensure natural flow of floodwaters in periods of heavy precipitation; 4) to ensure public access to high quality natural riparian corridors in proximity to population centers; 5) to stabilize stream flow; 6) to protect water quality including through protection of tree canopies; 7) to retain corridors beneficial for water supply, wildlife habitat and recreation; 8) to protect areas of significant ecological importance; 9) to improve recreational

opportunities that are valued for their aesthetic, scenic and natural values; 10) to preserve unique areas of historic scientific and sacred importance for conservation, nature education, scientific study and personal enjoyment; 11) to establish buffer zones between incompatible land uses and riparian corridors to ensure the “edge effect” flexibility for the dynamics of fluvial morphology including fluvial erosion hazards; 12) to protect and improve fish and wildlife habitats; and 13) to help protect groundwater supplies that are hydraulically connected to the state’s watercourses.

Establishing riparian corridors is one of the most effective means of achieving the state’s policy of protecting, maintaining and restoring the chemical, physical, and biological integrity of ground and surface waters consistent with the region’s existing land uses. Riparian corridors require minimum buffers of at least fifty to one hundred feet of undisturbed land on either side of a watercourse to filter and attenuate the

nutrient and sediment discharges into surface waters (**Figure 5**). Moreover, to the extent that “soft buffers” – zones where only limited disturbances are allowed – supplement the “hard buffers” immediately adjacent to the watercourse, surface water runoff can percolate into the ground rather than discharging into surface waters, thereby improving water quality. Similarly, well-constructed riparian corridors can create multiple barriers for protecting watercourses tributary to public water supplies. For example, numerous Connecticut municipalities have adopted zoning regulations that 1) increase the percolation efficiency of stormwater sheet flow, 2) reduce erosion and sedimentation by protection of tree canopies along stream corridors and 3) prohibit tree cutting within three hundred feet of watercourses. Streambelt zoning not only provides a multi-barrier protection system for critical public water supplies; it safeguards the biological integrity of watercourses upon which other forms of life depend.



Figure 5: Riparian Corridor, Housatonic River

A recent study conducted by the Western Connecticut Council of Governments found a wide range of tree canopy coverage within 50 feet of either side of thirty-one major watercourses. **Figure 6** shows an example for a small area in the region. As might be expected, watercourses within the urbanized portions of the region had less tree canopy coverage than the more rural municipalities. From a water quality perspective, increased tree canopy coverage immediately adjacent to watercourses plays an important role in reducing erosion and sedimentation, maintaining lower stream water temperatures for aquatic life, maintaining

migratory pathways for terrestrial creatures, and complying with federal and state water quality standards. Municipalities in which tree canopy coverage falls below 70% in the fifty-foot streambelt buffer zones are likely to have greater water pollution and flooding issues than those municipalities that have protected these buffer zones (**Table 3**).

Figure 6: Example Area of Riparian Corridor Study



Table 3: Tree Canopy Coverage on 50-foot buffer zones along Watercourses in Municipalities of Western Connecticut: 2019

Municipality	Canopy Area %	Municipality	Canopy Area %
Bethel	68	Newtown	80
Bridgewater	82	Norwalk	49
Brookfield	73	Redding	81
Danbury	56	Ridgefield	70
Darien	59	Sherman	71
Greenwich	63	Stamford	69
New Canaan	75	Weston	84
New Fairfield	70	Westport	51
New Milford	66	Wilton	80

There are thirty-five Connecticut municipalities that have adopted streambelt zoning including Sherman – the only municipality in Western Connecticut to have done so. Nonetheless, there is interest in this concept in Redding as well, a municipality whose land area is nearly entirely within a public water supply watershed. What benefits would a streambelt zone have over the controls provided by wetland and floodplain regulations? This question has sometimes been raised by those who are not familiar with the limitations of wetland and floodplain regulations. Floodplain regulations have a primary focus on maintaining channel integrity to ensure the proper discharge of floodwaters through the floodway and to eliminate obstructions during 100-year storm events in the designated floodplain. Similarly, wetland regulations are primarily concerned with protecting the ecological values of wetland resources, which are of enormous consequence for natural systems and mankind, but do not address the range of impacts that occur to non-regulated lands along streambelt corridors. For example, the New Hampshire Department of Environmental Services has emphasized the importance of expanding the role of local zoning commissions to address broader issues of fluvial geomorphology. Rivers and streams are constantly undergoing change due to various natural and human induced causes:¹

- ▶ Accelerated land development in susceptible areas.
- ▶ Increased stormwater discharges due to growth and development.
- ▶ Alteration of natural drainage systems and hydrologic processes. Regional patterns of precipitation due to potential global climate shifts.

- ▶ Traditional river management practices that do not support natural hydrologic processes

Floodplain Corridors

A reassessment of traditional approaches to floodplain and stormwater management have become increasingly evident as the intensity and duration of rainfall events has changed over the last fifty years. Since 1954, the state of Connecticut has had thirty-one disaster declarations including 10 hurricanes, 8 severe storms, 8 snow storms, 3 floods, and 2 tornadoes. The 10 hurricanes, 8 snow storms, 3 floods and 4 of the state's severe storms impacted the 18 municipalities in Western Connecticut. Snow storms and severe storms are classified separately from floods but also cause significant flooding. Since 1996, FEMA has expensed \$351 million on losses from its national flood insurance program in Connecticut. These losses include damage to properties within Western Connecticut from 237 flood events affecting municipalities in the Fairfield and Litchfield county portions of the region (Table 4).

Table 4: Number of Flooding Episodes in Western Connecticut: 1996 to 2016

<i>Affected County Areas</i>	<i>Years of Flooding Events</i>	<i>Total Reported Floods</i>
<i>Northern Fairfield</i>	1996, 2005	3
<i>Southern Fairfield</i>	1996, 1997, 2006, 2007, 2009-2013, 2016	19
<i>Fairfield</i>	1996-2014	77
<i>Southern Litchfield</i>	2003-2006	17
<i>Litchfield</i>	1996-2011, 2013	44
<i>Total</i>	1996-2016	237

Source: Federal Emergency Management Agency, March 2019

¹ New Hampshire Department of Environmental Services, Innovative Land Use Planning Techniques: A Handbook for sustainable Development, Chapter 2.9, Fluvial Erosion Hazard Area Zoning, 2008

Within Western Connecticut, FEMA reports \$172 million in flood insurance losses between 1978 and March 31, 2019. These enormous flood insurance payments underscore the need for much greater controls over development in floodplain zones. The sheer number of floods underscores the importance of undertaking a complete reassessment of flood control measures within the region and adopting impervious cover standards for new development.

In 2017, the Fourth National Climate Assessment issued a Climate Science Special Report indicating extreme precipitation events are expected to occur more frequently with increasing ambient temperatures. Extreme precipitation events occur when the air is nearly completely saturated and under these conditions rainfall intensity generally increases by about 6% to 7% for each degree Celsius of temperature increase.² These extreme precipitation events are not merely a future concern – we have been experiencing their consequences over the last fifty years (Figure 7).

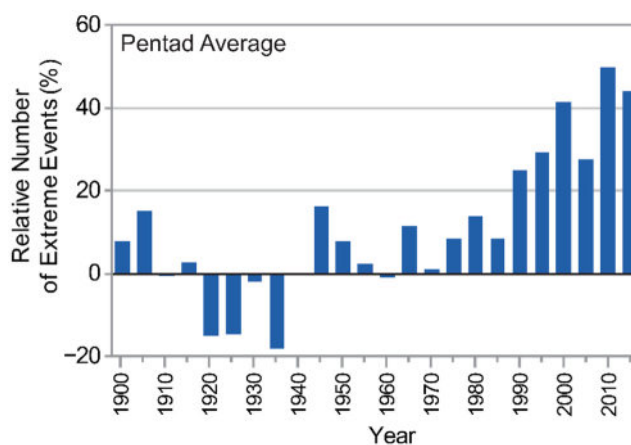
This study also found substantial increases in twenty-year precipitation levels in the Northeast with a 23% increase in the fall, a 25% increase in the spring, an 8% increase in the winter and a 16% increase in the summer months. The consequences for floodplain, stormwater and disaster management are significant and augur well for a more robust approach to the protection of riparian corridors.

Impervious Cover Regulations

With the emergence of the MS4 general permit program, public awareness of municipal stormwater management issues has increased. Currently, nine of the region's municipalities have adopted impervious cover or lot coverage standards that establish maximum coverage standards for a wide range of land

use. Apart from New Canaan and Ridgefield, which have linked impervious coverage to lot size, the traditional approach adopted by nine of the region's municipalities has been to assign a maximum lot coverage devoted to buildings, accessory structures, parking and sidewalk areas, and other impermeable surfaces. This approach is beginning to shift with greater awareness of the adverse consequences of hardscape and surface runoff. Yet urban areas are hard pressed to change lot cover or impervious cover standards since the existing built environment militates against such an approach.

Figure 7: 2-day Precipitation Events Exceeding 5-Year Recurrence Interval

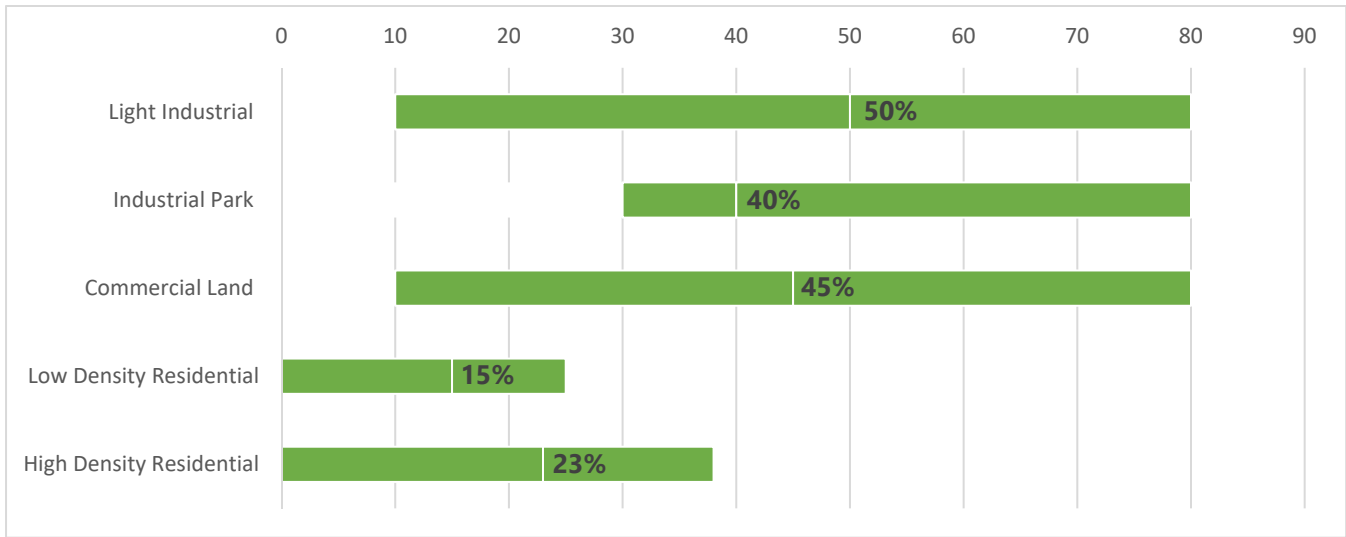


One of the greatest concerns with traditional approaches to lot coverage is that they impose the least restrictions on those land uses that have the greatest potential for generating the most impacts to stormwater quality. As can be seen from Figure 8, the highest lot coverage standards in the region's municipalities are found for manufacturing, commercial and industrial parks.

² U.S. Global Change Research Program (USGCRP), 2017: *Climate Science Special Report: Fourth National Climate Assessment, Volume I* [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart,

and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp, Chapter 7. doi: [10.7930/J0J964J6](https://doi.org/10.7930/J0J964J6).

**Figure 8: Range and Average of Lot Coverage Standards
(Based on 2019 Zoning of Western CT Municipalities)**



The region's municipalities are shifting from building cover to lot cover and even further to impermeable cover and, as at the vanguard, to Green Area standards. This transition reflects a realization that the availability of light and air are not the only important public health factors influencing the livability and safety of the built environment. Other ecological considerations, including, rainfall percolation rates, vegetative cover, and direct solar access for passive solar developments are now being considered within the concept of lot coverage. Lot coverage standards were originally designed to establish a less congested appearance to residential development, while ensuring developable land for commercial and industrial development. These assumptions have lost some of their appeal as municipalities wrestle with the increasing intensity of stormwater and floodwater events.

Impervious cover standards are expected to become much more common in Connecticut over the next five years as two thirds of all municipalities develop stormwater management plans that establish strategies to reduce the amount of directly connected impervious areas within municipal stormwater systems. **Table 5** shows the four types of land cover

Table 5: Comparison of Zoning Standards for the Control of Land Cover in Western Connecticut

Types of Cover Controls	Factors Generally Included	Factors Generally Excluded
<i>Building Cover</i>	Building footprints, Accessory Structures	Parking, Sidewalks
<i>Lot Cover</i>	Building Cover Standards plus parking, sidewalks, tennis courts, patio terraces, driveways, plastic turf	Landscaped areas, pervious and porous pavers
<i>Impermeable Cover</i>	Lot Cover Standards plus stormwater Mgt and low impact development using permeable cover	Lawns, fields, gravel surfaces
<i>Green Area Cover</i>	The amount of landscaping and vegetation provided as a percent of total lot area	Buildings, parking, sidewalks & impermeable areas

regulations that exist within the region including the factors that are generally included in their application.

Impermeable Cover- A Status Report

An analysis of current levels of development, as measured by the percent impervious land cover in each municipality, reveals that 163,758 acres of the region's land – as measured within each drainage basin - has impermeable surfaces, such as buildings, parking lots, swimming pools, garages, driveways, roads, and sidewalks, covering eleven percent or more of the land (**Impervious Cover** map). Impervious surface cover of at least 11% in a drainage basin which is directly connected to a municipal stormwater system is the regulatory threshold that forces local compliance with the MS4 permit. Given that impervious cover can increase with development, WestCOG evaluated each of the eighteen municipalities within its region to determine the amount of land that might fall under the MS4 program in the future. We identified an additional 34,211 acres (i.e., ten percent of the region's land area) that falls just below the threshold where impervious cover (i.e., between nine to less than eleven percent, see **Table 6**) poses a threat to surface water quality. These areas will become subject to MS4, with required municipal involvement, should development in these areas yield impervious cover of 11% or higher and be directly connected to a municipal stormwater system.

At the other extreme, nine municipalities have impervious land cover exceeding forty percent (**Table 6**). When development or redevelopment occurs in such areas, the MS4 General Permit requires retention of stormwater onsite unless it is not technically feasible, in which case the developer must retain runoff to the maximum extent achievable using control measures that are technologically available, economically practicable, and consistent with best industry practice. Onsite retention of stormwater, while not an absolute requirement of the MS4 program, clearly becomes the default for future high-density development in the

region municipal stormwater discharges into impaired waters or into catch basin systems discharging to watercourses. The MS4 program does not address stormwater discharges that are not directly connected to municipal stormwater systems – even if those discharges contribute to water pollution. On a regional scale, only twelve percent of the 163,758 acres identified by drainage basin as exceeding the threshold of eleven percent impervious can be classified as Directly Connected Impervious Areas as part of a municipal stormwater system (**Figure 9**). This is not to suggest that unregulated impervious cover is a benign phenomenon. Nor should one forget that even stormwater discharges from lawns, forests and other pervious surfaces can contribute to erosion, sedimentation, and contaminant transport, but at much lower levels of intensity compared to stormwater discharges into impervious areas that are directly connected to municipal stormwater systems or directly into impaired watercourses.

Figure 9: Region's Land Area Compared to Impervious and Directly Connected Impervious Land Areas

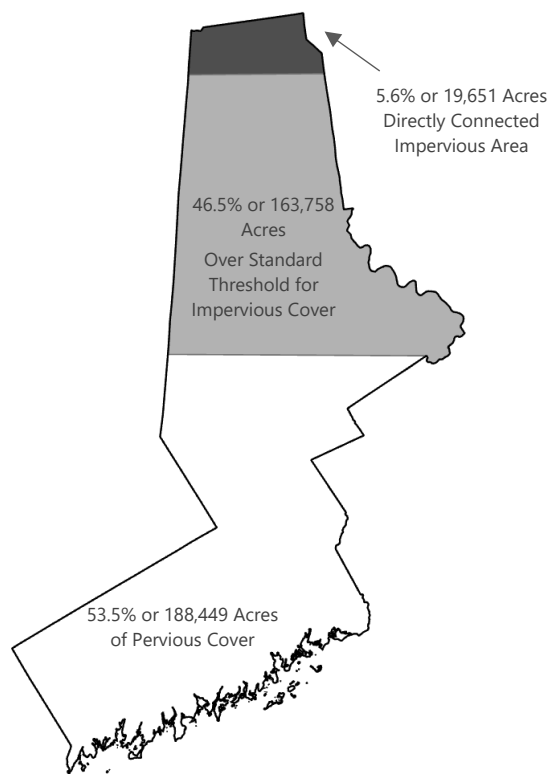


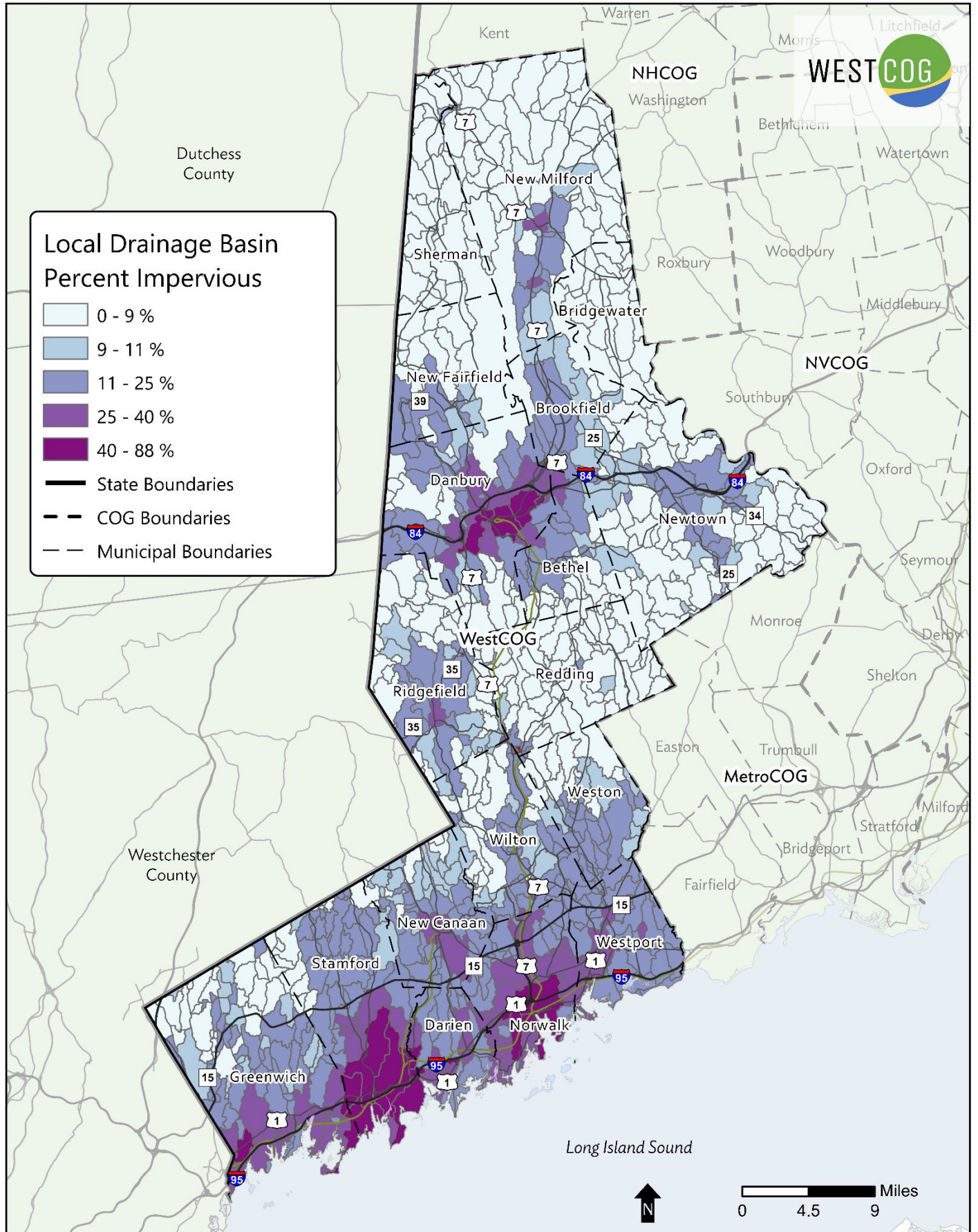
Table 6: Distribution of Watershed Lands by Percent Impermeable Cover (Acres): 2019

Municipality	Impervious cover under 9%	Impervious Cover from 9 to 11%	Impervious Cover from 11.1 to 25%	Impervious Cover of 25.1 % to 40%	Impervious Cover of 40.1% or more	Total Municipal Land Area
<i>Bethel</i>	3,700.7	1,439.0	5,076.2	628.0		10,843.9
<i>Bridgewater</i>	11,110.3					11,110.4
<i>Brookfield</i>	3,409.3	2,583.9	6,719.4	324.1		13,036.7
<i>Danbury</i>	8,611.8	1,240.7	10,830.3	4,803.1	2,631.7	28,117.8
<i>Darien</i>			4,715.3	3,104.0	309.8	8,139.9
<i>Greenwich</i>	5,522.3	4,888.4	11,749.0	7,139.7	1,078.9	31,089.3
<i>New Canaan</i>	1,049.5	2,640.6	8,703.0	2,031.0		14,424.3
<i>New Fairfield</i>	11,195.2	1,092.6	3,814.8			16,102.7
<i>New Milford</i>	30,370.0	4,441.0	5,491.0	577.7		40,881.9
<i>Newtown</i>	23,976.3	4,770.9	8,949.9			37,697.6
<i>Norwalk</i>	5.0		4,898.8	6,543.0	3,066.1	14,753.6
<i>Redding</i>	18,636.8	1,019.4	794.8	5.4	40.0	20,496.5
<i>Ridgefield</i>	7,843.4	3,992.8	9,997.8	464.6	11.7	22,310.3
<i>Sherman</i>	14,851.9	75.9	43.7			14,971.4
<i>Stamford</i>	2,711.9	1,224.1	10,969.3	2,788.9	6,839.6	24,590.9
<i>Weston</i>	4,873.2	2,019.0	6,332.3			13,224.6
<i>Westport</i>			10,643.4	2,067.4	136.3	12,916.9
<i>Wilton</i>	5,277.4	2,782.5	9,149.3	259.4	29.3	17,498.0
Total	153,145.0	34,210.9	118,878.2	30,736.4	14,143.3	352,206.7
% of Total	43%	10%	34%	9%	4%	100%

Note: WestCOG, 2019.; total land area is calculated from the area of watershed basins in the region. Islands are not included in calculations. Projection: NAD_1983_HARN_StatePlane_Connecticut_FIPS_0600_Feet

Impervious Cover

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Urban Infrastructure

We live in a world defined by urban infrastructure that establishes the physical conditions that support our economy and quality of life. The concept of urban infrastructure has taken on new meaning as our society has become more technologically inclined and dependent on modern systems of communication and data management for business, residential, and personal needs. Fifty years ago, urban infrastructure plans focused on highways, public buildings, utilities (e.g., sewer and water services), and parks as investment priorities. Today infrastructure planning includes a wide range of new concepts including the need for broadband communication; the Internet of Things; renewable energy installations; stormwater management equipment; dedicated bicycle and walking corridors; and more sophisticated assessments of transportation as multimodal systems and as regional and state asset management responsibilities.

Because the built environment shapes our personal, social and work worlds, decisions on where and when infrastructure investments should be made require a coordinated approach involving local, regional, state and sometimes federal government entities, each of which has a stake in the process. Western Connecticut municipalities are not merely concerned with the types of infrastructure investments considered by state and federal agencies, they also are seeking greater involvement in the timing, intensity and duration of these investments. The state Plan of Conservation and Development has made a commitment to coordinating the timing of any planned expansion of existing infrastructure to meet regional growth objectives. It is critical that state government be held accountable to meet this important policy commitment.

In this section we review the critical components of the region's infrastructure including communication systems, road systems, renewable energy systems and

sewer avoidance strategies to minimize inappropriate impacts on the region's sewage treatment plants.

Communications Infrastructure

During the last thirty years, telecommunications systems have become a major component of the land use of Western Connecticut. Antenna towers used for cellular service, radio, television, cable and satellite have become ubiquitous elements of our environment. Wireless services and their attendant towers are regulated by the Connecticut Siting Council; radio, television, cable and satellite service towers are regulated by the Federal Communications Commission. Municipal governments have no jurisdiction over the siting of these towers even though they may have significant visual impacts on municipalities in the Region. On the positive side, expansion of broadband communications is a major component of the high-tech industries of the 21st century and for this reason, a lack of broadband access can serve as a critical deficiency in attracting new industry to the region. Many rural residents in Western Connecticut still rely on substandard DSL service for their internet connection. According to a U.S. Census Bureau survey of Western Connecticut municipalities conducted over the five-year period ending in 2017, ninety two percent of the households had computer broadband internet subscriptions. That survey revealed that only four percent of all households were without computers, and that about seventy of those households lived in Danbury, Norwalk and Stamford. Internet access, rather than being merely a rural problem, also reveals the income and educational disparities found in the region's urbanized areas where online service subscriptions, computer purchases, and related costs may try the budgets of lower-income households. Only 78 percent of those sixty-five years old and older had a subscription to a broadband service. Similarly, only seventy percent of the household populations 25 years or over with less than a high school education had broadband internet service even though they had a

computer. Age, income, and education influence the uptake and use of internet services and the opportunities they offer for socioeconomic development.

Communications Towers

Communication towers represent a blot on the visual landscape – much like telephone poles did at the turn of the 20th century when Alexander Graham Bell was vigorously promoting the benefits of telephones as a tool to modernize American life and improve social and business connectivity for the affluent. There are nearly three hundred radio, television and cell towers in Western Connecticut ranging in height from as low as 24 feet tall for one tower in Westport to a 499-foot FCC regulated tower in Brookfield. The Federal Aviation Administration limits towers to less than 500 feet due to their potential obstruction with commercial aircraft including low flying planes used for agricultural and other surveillance monitoring functions. While tall towers are the exception rather than the rule, these structures pose the most environmental and public safety concerns since they not only impact aviation but also pose falling hazards during extreme weather events and detract from the visual character of municipalities in the northern tier of the region. Overall, towers are far more common in the region's urban centers, with over fifty percent found in Danbury, Greenwich, Norwalk and Stamford where we have the greatest concentration of population and economic activity.

Local governments are authorized to review FCC-regulated tower siting locations for conformity with zoning and other land use regulations but must do so consistent with FCC regulations that specify the time limits for approval of applications. Local zoning and land use regulations must not unreasonably delay or prevent the installation of FCC communication towers

nor may they impose regulations that differentially discriminate against such installations.³ In contrast, local zoning and land use commissions have a more limited advisory role over tower installations governed by the Connecticut Siting Council.

Municipal Plans of Conservation and Development should consider reviewing land use guidance to facilitate decisions that better address local safety, aesthetics, emergency preparedness and communication needs associated with communication towers. One concern is the need for viewshed regulations that establish a rational basis for the regulation of FCC communication towers consistent with the requirements imposed by FCC regulations. While eleven of the region's municipalities have adopted viewshed regulations to remedy the aesthetic and visual impacts of FCC or Connecticut Siting Council regulated towers, many of these regulations need to be updated to be consistent with federal nondiscrimination standards for viewshed analysis. FCC has mandated that local governments cannot establish viewshed regulations unique to FCC regulated towers when other tall structures are not subject to a viewshed review process. Perhaps, more importantly, the FCC regulations issued on October 15, 2018 also establish a "shot clock" rule that imposes strict time tables for planning and zoning commissions to accept, review and approve FCC regulated communication towers. Because of the potential adverse impacts of the "shot clock" rule on local land use, planning and zoning commissions should avail themselves of legal counsel to ensure current time tables do not run afoul of FCC regulations.

Fifth Generation Cellular Network Technology

The next generation of cellular network is expected to deploy in early 2020. While new generations have been released approximately once every ten years, the

³ Federal Register, Volume 83, No. 199 October 15, 2018, pp. 51867-51886

speeds offered over this time have been exponential. The fifth generation of broadband deployment will increase connection speeds from one hundred megabits per second to ten gigabits per second, or in other words, one hundred times faster than the fourth generation and five million times faster than the service offered in 1981.

Improvements to the cellular network are expected to enable innovations in every industry sector. A 2016 PSB survey of 3,588 business decision makers, found that fully autonomous vehicles, smart homes, enhanced communications, artificial intelligence/machine learning and remote healthcare are among the top six capabilities that the fifth generation can enable. Advanced telecommunication is a part of an essential infrastructure system that attracts and retains businesses in the region. A faster, more reliable connection can give businesses a significant advantage over their competitors.

While the 5G network increases productivity and connection speeds, there will be a significant impact on the urban environment. A network of Small Wireless Facilities, or small cells, will need to be mounted on structures, such as utility poles and light fixtures, fifty feet in height or less. They each will need an antenna no more than 3 cubic feet paired with auxiliary equipment limited to 28 cubic feet or about the size of a residential refrigerator. However, one of the biggest differences from previous generations is that small cells only cover a few hundred feet, while macrocells cover miles. Because of this, there will be a considerable amount more cells than seen in the past.

In October of 2018, the FCC released regulations that reduce the time and cost of implementing the new network, limit the land use controls local and state governments have, and call for reasonable and transparent design standards. Municipalities will have to amend their zoning and permitting regulations to not conflict with these new regulations.

A consistent approach for zoning and permitting across the municipalities in Western Connecticut can facilitate a speedy rollout of the new network, while ensuring they do not conflict with the existing character of the neighborhoods in the region.

Road and Related Infrastructure

The maintenance of public investments in local roads is an important long-term responsibility of local governments. There are 2,638 miles of local roads in Western Connecticut, all of which require routine maintenance and need to be evaluated periodically to develop capital investment strategies to ensure these critical assets remain intact. In addition, there are 426 miles of state roads that provide critical intermunicipal and regional access to housing and employment opportunities in Western Connecticut and beyond. One aspect of the regional plan that is often inadequately accounted for are the long-term costs for capital investment, operations, and maintenance to ensure the integrity and performance of the transportation system over time. The Federal Highway Administration has enumerated eighteen major elements of any transportation asset management strategy. These are: 1) Pavement preservation and maintenance by road type (e.g., interstate system, priority system, urban, rural); 2) Pavement rehabilitation and replacement; 3) Bridge preservation and maintenance; 4) Major bridge construction; 5) New capital program (construction/expansion); 6) Traffic engineering and maintenance; 7) Drainage maintenance; 8) Rest areas; 9) Operations and maintenance (winter operations, ditching, pothole patching); 10) Safety/guardrail, cable barriers, signs, intelligent transportation systems; 11) Noise walls; 12) Slides, slip remediation; 13) Tunnels; 14) Program delivery/administration; 15) Payroll and other administrative expenses; 16) Pass through funds; 17) Debt service and bond payments; and 18) Emergencies and contingencies to cover unplanned expenditures. While two or three of these elements may be low priorities for local road systems in Western

Connecticut, the remainder should be considered as part of the planning and budgeting process in each municipality.

FHWA guidance on the use of lifecycle costs for transportation infrastructure has shown that these costs are a significant budgetary responsibility for local governments (Table 7). Using the FHWA annualized cost calculator and the Connecticut Department of Transportation Pavement reconstruction treatment costs calculator, annualized costs to maintain the region's 2,638 miles of local roads is estimated at \$31.6 million. However, if maintenance costs are deferred road reconstruction costs can pose significant financial burden on local governments. On a per mile basis, complete reconstruction of local roads ranges from \$1.7 million to \$2.7 million. A complete reconstruction of the region's local roads would be disastrous if such costs were to occur in any given year. Costs for a complete reconstruction of the local road system range from \$4.5 to \$7.1 billion reflecting its total asset value. These costs underscore the importance of developing

local transportation asset management plans consistent with FHWA guidance.

Other Road Infrastructure

Catch basins, traffic signals, road intersections and locally maintained bridges – all of which impose significant long-term maintenance responsibilities on local governments – are also important components of the road system. Based on an analysis of the region's infrastructure, we have identified 17,710 intersections, 816 signalized intersections, 111,124 catch basins and 740 bridges that are the responsibility of the local governments in Western Connecticut. Maintaining the integrity of these assets is not only a fiscal burden on local taxpayers; it has broader negative externalities for the public at large. For example, failure to keep these road infrastructure elements in working order may pose highway safety hazards, adversely affect traffic congestion, and impact the quality of stormwater discharges from roadways.

The components of local road infrastructure are a significant municipal asset that need to be managed to reduce their lifecycle costs to residents of the region. As can be seen in Table 8, the region's local roads represent the most significant sunk costs for local governments. Although the value of region's local road infrastructure falls far short of the \$118 billion asset value of its land and real estate, it is important to remember that it does not generate revenue from taxes and requires municipal outlays or the largess of the state of Connecticut to be properly maintained.

Table 7: Highway System Asset Management Considerations

Transportation Asset	Life Cycle Cost as Percent of Initial Investment	Average Annualized Cost
<i>Pavements</i>	142%	\$12,000/Lane Mile
<i>Bridges</i>	142%	\$16,000/Bridge
<i>Large Culverts</i>	139%	\$1,300/Year
<i>Culverts</i>	443%	\$150/Year
<i>Overhead Signs</i>	129%	\$900/Year
<i>Deep Stormwater Tunnels</i>	252%	\$30,000/Tunnel Mile

Source: Financial Planning for Transportation Asset Management, February 2015, pp. 40-41

Table 8: Estimated Replacement Value of the Region's Locally Owned Road Infrastructure: 2019

Road Infrastructure Feature	Unit	Cost/Unit	Unit Area	Total Units	Total Replacement Cost
<i>Intersection Replacement</i>	SY	\$165.98	400	17710	\$1,175,802,320
<i>Catch Basin Replacement</i>	SF	\$235.00	12	111124	\$313,369,680
<i>Bridges Reconstruction</i>	SF	\$545.00	16785	740	\$6,769,390,500
<i>Road Reconstruction</i>	SY	\$165.98	27,878,400	46,433,024	\$7,706,953,324
<i>Traffic Signal Replacement</i>	number	\$200,000.00	1	816	\$163,200,000
Total					\$16,128,715,824

Source: Connecticut Transportation Asset Management Plan, 2018 & WestCOG, 2019.

Bicycle and Pedestrian Friendly Development

The state of Connecticut encourages a network of pedestrian and bicycle paths and greenways that provide convenient inter- and intra-town access, including access to the regional public transportation network. This state policy objective is consistent with the municipal and regional efforts to create pedestrian and bicycle friendly development patterns that support the region's thirty-five village districts and its wide range of natural resources. Multi-modal transportation options are especially important for youth and the senior population who do not have access or no longer can use the automobile as their primary means of travel. Human scale transportation options strengthen the appeal of visiting and living in village and urban scale communities – especially when the pedestrian and bicycle walkway/bikeways are coupled with other traffic calming strategies. Increasing the network of bikeways/walkways needs to be based on a systematic analysis of the costs and benefits these transportation modes provide to 1) public health, 2) access to retail services and recreation opportunities, 3) opportunities for local and/or intra-town journey to work, 4) considerations of public safety for bikers and walkers, and 5) opportunities to reduce air pollution and fossil fuel consumption.

Sewer Avoidance Strategies

Sewers should not be extended into rural areas designated for agricultural, open space or residential

lots of one acre or greater. Sewer extension would be an inefficient investment of federal, state and local funds since there are financially more cost-effective ways to correct wastewater violations caused by failing septic systems. Septic systems are the traditional means of treating wastewater discharges from rural residential development. These systems must be properly installed and maintained to ensure compliance with public health code requirements. In Western Connecticut several municipalities have established inspection requirements for septic systems to ensure regular cleaning and maintenance. Failing septic systems have contributed to the eutrophication of Candlewood Lake and other waters in the region.

Before sewers are considered in areas of failing septic systems, efforts should first focus on bringing these systems into compliance with public health codes. The basic decision matrix should first 1) identify the locations of failing septic systems; 2) determine if existing systems can be upgraded and/or properly maintained to current standards; 3) where soil conditions, lot size, well location, proximity to waterbodies or watercourses precludes system upgrades, community sewer systems should be considered and 4) when none of these options is feasible then and only then should sewer services be extended. Brookfield, Danbury, New Fairfield, Sherman and New Milford abut Candlewood Lake and will benefit from Brookfield's study to determine the best

means to address the wastewater management issues in the areas of concern adjacent to Candlewood Lake.

Because the State Department of Health and the CT DEEP do not require septic systems to be pumped out on a regular basis – they only recommend this practice – numerous municipalities have chosen to mandate inspections and pump outs on a three to five-year cycle. New Fairfield requires the inspection and cleaning of septic systems for residences located adjacent to Candlewood Lake. Similarly, Sherman has established a municipal inspection of all septic tanks to ensure they are properly functioning – unless the homeowner undertakes this work and provides documentation that the work has been properly completed. Brookfield has not mandated a specific pumping schedule but recommends it be done every two years with an inspection conducted every four years. More importantly, Brookfield has established an online database that will eventually enable the town to track the frequency of septic system inspections and pump outs using the website www.septicsearch.com. This website is a cooperative venture that currently has over eight participating Connecticut municipalities and serves as model of an effective regional approach to the management of septic systems within Western Connecticut.

Maintaining buildable lot standards is also a critical component of Western Connecticut’s effort to avoid the extension of sewer services to sparsely populated rural areas. Ten of the region’s eighteen municipalities have established town-wide minimum buildable lot standards that exclude a variety of regulated land uses (i.e., wetlands, watercourses, floodplains), lands with development or legal constraints (i.e., steep slopes, naturally occurring soils close to groundwater, bedrock or ledge, land burdened by easements or lot configurations incapable of siting a septic system leaching field). The remaining eight municipalities have buildable lot regulations that vary by zone with less stringent requirements generally allowed for existing

urban centers, village districts and multi-family development. **Table 9** reveals that the most common factors considered are the presence of wetlands and watercourses with fewer constraints imposed on land in floodplains, with steep slopes, or burdened by easements. The benefit of adopting a zoning regulation for buildable lots is that septic system leaching fields can be installed with space for primary and reserve leaching fields without requiring destruction of wetlands, impingement of floodplains, or other environmentally sensitive lands.

Table 9: Summary of Criteria Used to Define Buildable Lots in Western Connecticut 2019

<i>Buildable Lot Criteria</i>	<i>Municipalities with Buildable Lot Criteria</i>
<i>Wetlands</i>	15
<i>Watercourses</i>	15
<i>Easements</i>	9
<i>Steep Slopes</i>	8
<i>Floodplains</i>	7
<i>Narrow Strips of Land</i>	2

Source: WestCOG, April, 2019

The “buildable square” is another tool used to ensure septic systems are placed on lots with few environmental constraints. Municipalities that have adopted this approach require a minimum buildable square to fit within the minimum buildable lot and to be free of all environmental and legal encumbrances. For example, if a minimum buildable lot is set at two acres (i.e., a 400-foot-deep lot with a frontage of 218 feet), a minimum buildable square might be set at 150 feet wide by 300 feet deep and must be free of all regulated wetlands, floodplains, watercourses and steep slopes). While this zoning tool is not commonly found in most Western Connecticut zoning regulations it should be considered by any municipality that wishes

to improve the effectiveness of its rural sewer avoidance strategy.

Alternative Technologies

There are a range of alternatives to sewer line extensions that should be considered when septic systems fail and soil conditions, lot size, and other environmental factors prohibit the adoption of rehabilitation strategies. Community sewage treatment plants serving two or more households may be a feasible alternative when enough land is available in proximity of the affected residents. The Connecticut Department of Energy and Environmental Protection (DEEP) regulates community sewer systems that generate more than 7,500 gallons of wastewater per day, and such systems may be appropriate for small lot areas near lakes or watercourses which pose a threat to surface and groundwater quality. Such systems may be owned cooperatively by those impacted by failing septic systems or by local governments under the auspices of a Water Pollution Control Authority. Community sewage treatment plants have the virtue of being far more cost-effective for the abatement of wastewater violations than extending sewer lines into rural areas. Sewer extensions encourage leapfrog development, trigger sewer assessment fees and raise property values which in turn increase property taxes on those whose property abuts a sewer line. Investment in sewer line extensions should only be considered when such actions are consistent with creating transit-supporting densities in the urbanized portion of the region.

The Bill and Melinda Gates Foundation is 'reinventing the toilet' as part of a global effort to improve drinking water quality and reduce the global burden of disease in the undeveloped world. While their initiative focuses on India and China, the technologies that are being developed could revolutionize the practice of using watercourses as the public sewers for human waste. According to the Gates Foundation, since 2011, its "Reinvent the Toilet Challenge has worked with leading

engineers and scientists to design low-cost toilets that do not require connections to the electrical grid, water supply, or sewers." Just as many developing nations have leapfrogged landline straight to the cellular telephones, Americans may soon be able to benefit from technological innovations that, while conceived of for the developing countries, could revolutionize the treatment and disposal of human waste also in the developed world. Sewage treatment, even when tertiary treatment standards are achieved, still contributes substantial pollution to the state's waters.

Water Pollution Control Facilities

There are ten major water pollution control facilities located in ten of the region's municipalities with design flows of 77.7 million of gallons per day (MGD). Actual flows currently are 48.4 MGD leaving an available capacity of 29.2 MGD for future development (**Table 10**). While the region has an adequate capacity for future residential, commercial and industrial development, there are clear limitations on the region's buildout capacity without capital investments in expanded water pollution controls. For example, under conservative wastewater generation rates, the current 29.2 MGD available capacity can accommodate approximately 390,000 additional persons in those areas served by sewers. However, with the adoption of water conservation strategies such as low flow faucet aerators and showerheads, low flush toilets, time interval landscape irrigation systems, xeriscaping, and greywater reuse, the region can substantially extend the capacity of existing sewage treatment plants.

Design flow limitations are also a function of the wastewater diluting capacity of the receiving waters for the region's ten sewage treatment plants. DEEP has established limits on the maximum amount of nitrogen that may be discharged at each water pollution control facility, impacting the capacity for wastewater treatment in the region. In addition, the state of Connecticut and U.S. Environmental Protection Agency

have adopted phosphorus removal limits for waste water discharges into the state's waters that also affect wastewater treatment plant capacity. Phosphorus is a naturally occurring element that is essential to support plant growth. However, when present in excessive amounts, it results in "eutrophication" of water bodies thereby impairing both aquatic life and recreational use of water resources. Public Act 12-155, An Act Concerning Phosphorus reduction in state waters, requires a phosphorus reduction strategy to address point and non-point sources of phosphorus discharges into watercourses. While DEEP's efforts focus on discharge limits at wastewater treatment plants, PA 12-155 also prohibits the use of fertilizers, soil amendments, or compost that contains phosphate to lawns within fifteen feet or less from any brook, stream, river, lake, pond, or sound. Reduction of phosphorus in

the region's watercourses will require improved public education of homeowners and farmers concerning the proper use of fertilizers and state financial support for wastewater treatment plant upgrades. Adoption of low impact development strategies and improved stormwater management for new development can play a critical role in reducing non-point sources of phosphorus. However, In the coming years, as DEEP updates the discharge permits for wastewater treatment plants, the state should give high priority to continuing its Clean Water Funding to implement measures to achieve the phosphorus effluent performance levels assigned to each facility. Furthermore, other considerations, including protection of open space, riparian corridors, agricultural and forest preservation must also be factored into any buildout analysis.

Table 10: Waste Water Design Flows and Available Capacity for Water Pollution Control Facilities in Western Connecticut

Facility	Watershed	Receiving Water	Design Flow (MGD)	Actual Flow (MGD)	Available Capacity (MGD)	Worst Case Population Serviceable by Available Capacity
<i>Danbury WPCF</i>	N/A	Limekiln Brook	15.5	8.34	7.16	95,467
<i>Greenwich WPCF</i>	Greenwich Harbor	Long Island Sound	12.0	8.09	3.91	52,133
<i>New Canaan WPCF</i>	Five Mile River	Five Mile River	1.7	0.881	0.819	10,920
<i>New Milford WPCF</i>	N/A	Housatonic River	1.02	0.56	0.46	6,133
<i>Newtown WPCF</i>	N/A	Pootatuck River	0.932	0.466	0.466	6,213
<i>Norwalk WPCF</i>	Norwalk Harbor	Norwalk River	18	12.525	5.475	73,000
<i>Redding WPCF</i>	Norwalk River	Norwalk River	0.245	0.06	0.185	2,467
<i>Ridgefield WPCF</i>	N/A	Great Swamp	1	0.726	0.274	3,653
<i>Stamford WPCF</i>	Stamford Harbor	Stamford Harbor	24	15.416	8.584	114,453
<i>Westport WPCF</i>	Saugatuck River	Saugatuck River	3.25	1.351	1.899	25,320
Total			77.647	48.415	29.232	389,760

Source: U.S. Environmental Protection Agency, *Establishing Nitrogen Endpoints for Three Long Island Sound Watershed Groupings*, March 27, 2018, pp. B-8 to B-10, Redding WPCF NPDES Permit & West COG analysis.

Sewer Service Areas

A recent WestCOG analysis found that 13.9% of the region's land area, or about 49,114 acres, is served by sewers (**Sewer Service Area** map). In 2010, 68% of the region's population lived in areas served by sewers, reflecting the higher density development found in the urbanized areas of Danbury, Greenwich, Norwalk, Stamford, and Westport. These five municipalities accounted for 86% of the combined population served by sewers in Western Connecticut. As can be seen in **Table 11**, three municipalities have avoided the installation of sewers (Bridgewater, New Fairfield, and Sherman), consistent with municipal objectives of

protecting open space, forests and farmland and limiting urban development. As discussed earlier in this section, sewer avoidance strategies are not only consistent with the region's long-term goals of protecting open space but of restricting development in areas with valuable ecological resources such as riparian corridors and avoiding development on land that is unsuitable for development due to constraints posed by steep slopes, shallow to bedrock, unsuitable soil conditions, or a high groundwater table.

Table 11: Areas Served by Public Sewer Systems in Western Connecticut: 2017

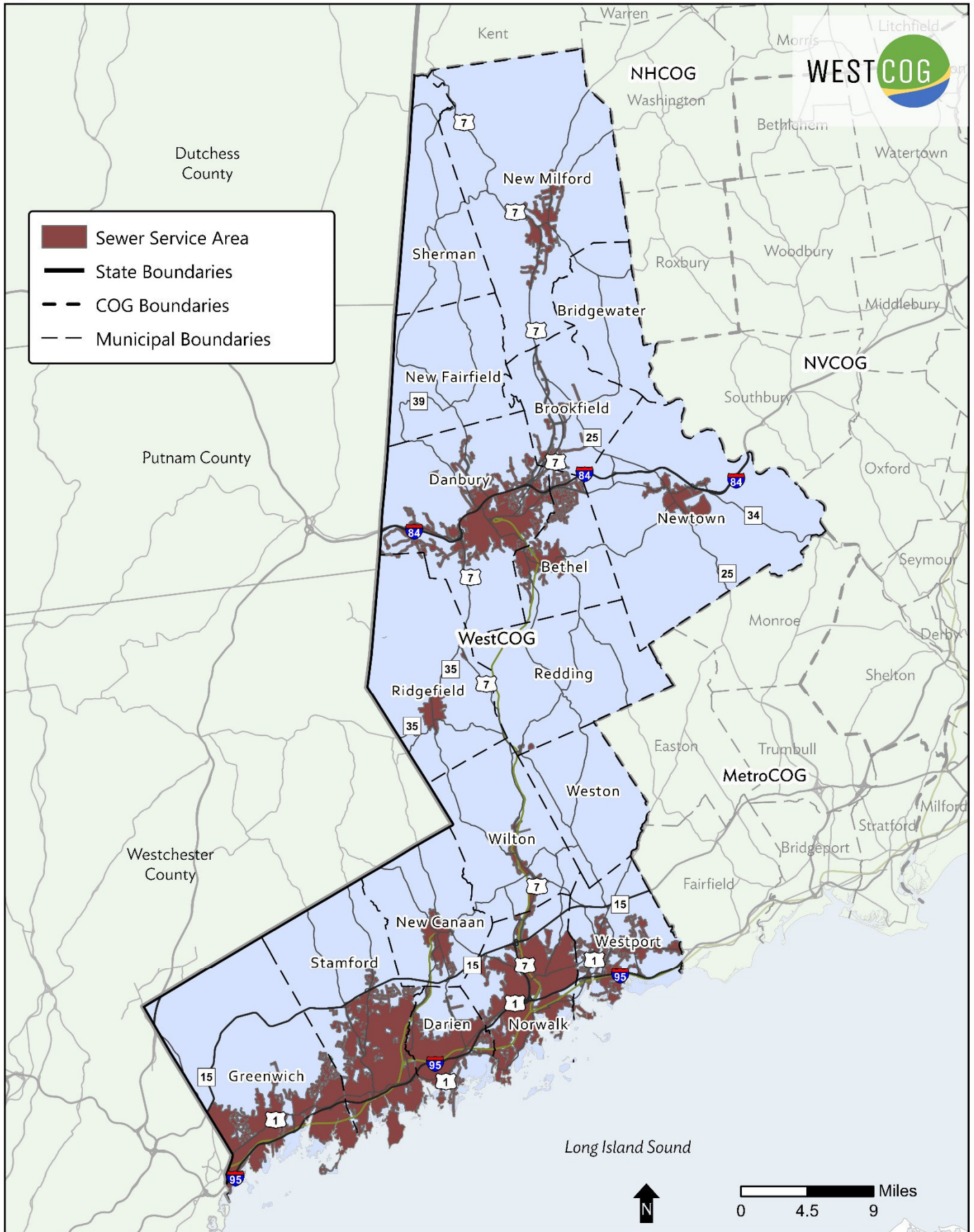
Town	Land Area without Sewers (Acres)	Land Area with Sewers (Acres)	Grand Total (Acres)	Land Area with Sewer Service (%)	Population Served by Sewers in 2010	Total Population in 2010	Percent of Population Served by Sewers
<i>Bethel</i>	8,400.4	2,443.4	10,843.8	22.5%	14,284	18,600	77
<i>Bridgewater</i>	11,110.3	0.0	11,110.3	0.0%	0	1,725	0
<i>Brookfield</i>	12,152.7	884.0	13,036.7	6.8%	5,668	16,470	34
<i>Danbury</i>	21,112.1	7,005.7	28,117.7	24.9%	67,733	81,056	84
<i>Darien</i>	3,767.0	4,372.8	8,139.9	53.7%	19,672	20,750	95
<i>Greenwich</i>	23,397.4	7,691.9	31,089.2	24.7%	49,938	61,119	82
<i>New Canaan</i>	13,201.5	1,222.7	14,424.3	8.5%	9,621	19,732	49
<i>New Fairfield</i>	16,102.6	0.0	16,102.6	0.0%	0	13,871	00
<i>New Milford</i>	39,188.5	1,693.4	40,881.8	4.1%	11,185	28,145	40
<i>Newtown</i>	36,291.3	1,406.1	37,697.4	3.7%	4,511	27,605	16
<i>Norwalk</i>	6,373.8	8,379.8	14,753.6	56.8%	79,973	85,653	93
<i>Redding</i>	20,436.7	59.7	20,496.4	0.3%	983	9,174	11
<i>Ridgefield</i>	21,445.9	864.3	22,310.3	3.9%	6,541	24,652	27
<i>Sherman</i>	14,971.4	0.0	14,971.4	0.0%	0	3,574	0
<i>Stamford</i>	15,364.3	9,226.5	24,590.8	37.5%	109,050	122,867	89
<i>Weston</i>	13,223.0	1.5	13,224.6	0.0%	72	10,179	1
<i>Westport</i>	9,801.5	3,115.3	12,916.8	24.1%	18,240	26,393	69
<i>Wilton</i>	16,751.1	746.8	17,497.9	4.3%	4,589	18,053	25
Total	303,092	49,114	352,206	13.9%	402,060	589,618	68

Based on DEEP 2017 Sewer Service Area Data. Analysis assumes a 200-foot buffer from sewer service. Acres were calculated from square feet derived from NAD 2011 HARN CT Stateplane.

Source: WestCOG, May 20, 2019

Sewer Service Area

Western Connecticut Council of Governments
westcog.org | 475.323.2060



Renewable and Electricity Infrastructure

A goal of the Regional Plan of Conservation and Development is to increase the use of solar and other renewable forms of energy and energy conservation. Since 1978, Connecticut land use commissions have been expected to encourage the use of solar energy and to plan for more energy-efficient patterns of development with the aim of reducing vehicle miles traveled and fossil fuel use. Efforts to promote renewable energy for electricity and other power needs have taken on greater urgency with increasing evidence of the long-term effects of carbon dioxide emissions as a global warming gas.

Western Connecticut municipalities have made substantial efforts to diversify the sources used to generate electrical power. Based on a recent Public Utility Regulatory Authority study, Western Connecticut municipalities currently have plants with name plate capacity of 82.6 megawatts of power from renewable energy sources including 23.8 megawatts from solar and 45.2 megawatts from combined heat and power installations (Table 12). The total megawatt capacity of

solar energy systems in Western Connecticut represents 1,144 residential and commercial installations with the greatest number found in the urbanized municipalities of Danbury (163), Norwalk (197) and Stamford (125). While these installations are helping to reduce our reliance on fossil fuels, they represent less than one percent of residential and business establishments in Western Connecticut. Overall, less than 13% of the region's locally generated electrical energy is derived from renewable energy sources including solar, fuel cells methane and hydro power (Figure 10, Figure 11).

Western Connecticut still relies on fossil fuels, nuclear and natural gas to meet 88% of its electricity needs. There are four power plants in the region fueled by fossil fuels – Connecticut Jet Power LLC in Greenwich; Danbury Hospital in Danbury; Third Taxing District of Norwalk in Norwalk and Waterside Power LLC in Stamford with a combined capacity of 194.9 megawatts of electricity. The remainder of the region's electrical needs are imported from nearby regions within Connecticut supplied by United Illuminating or Eversource.



Figure 10: Bulls Bridge Hydro-Electric Facility, New Milford, CT

Table 12: Renewable Energy Rated Capacity in Western Connecticut by Source: 2019 (Megawatts)

Municipality	Combined Heat & Power	Fuel Cell	Hydro	Landfill Methane Gas	Low Emission Advanced Renewable Energy	Solar	Grand Total
<i>Bethel</i>						1.7	1.7
<i>Bridgewater</i>						0.1	0.1
<i>Brookfield</i>						0.7	0.7
<i>Danbury</i>	4.3	1.6				4.6	10.5
<i>Darien</i>	0.1					0.6	0.7
<i>Greenwich</i>	0.1	0.5				1.4	2.0
<i>New Canaan</i>						0.5	0.5
<i>New Fairfield</i>						0.8	0.8
<i>New Milford</i>	34.3	0.2	7.2	3.3		1.1	46.2
<i>Newtown</i>	1.5		0.1			3.7	5.3
<i>Norwalk</i>	3.0	0.2				1.9	5.1
<i>Redding</i>						0.3	0.3
<i>Ridgefield</i>						0.5	0.5
<i>Sherman</i>						0.1	0.1
<i>Stamford</i>					0.4	3.8	4.2
<i>Weston</i>						0.2	0.2
<i>Westport</i>	0.1					0.8	0.9
<i>Wilton</i>	1.9					0.9	2.8
Grand Total	45.2	2.5	7.3	3.3	0.4	23.8	82.6

Source: Public Utility Regulatory Authority, April 2019

The need to transition from fossil fuels to a renewable based form of electricity takes on greater urgency when we consider the findings of the Intergovernmental Panel on Climate Change (IPCC). The IPCC estimates that if we collectively wish to reduce world temperature increases to less than two degrees centigrade then we must reduce our fossil fuel use by ninety percent in the next thirty years. A simple back of the envelope calculation means we need to reduce fossil fuel use by three percent each year for the next thirty years. To achieve this goal an enormous amount of institutional, behavioral, and financial inertia must be overcome over the next ten years to establish a sense of urgency about the adverse consequences associated with the 'do nothing' scenario.

A transition to a renewable energy economy will also require a greater investment in energy conservation and energy efficiency. In 2018, the average household in Western Connecticut consumed 11.53 megawatt hours of electricity annually for residential use, whereas the average Connecticut household consumed 9.26 megawatt hours or 20% less electricity. As can be seen in **Table 13**, in 2018 total annual electricity demand in Western Connecticut was 4.8 million megawatt hours or about 22.6 megawatt hours for all residential and

business electricity used when normalized to the number of households in the region. In contrast, total electricity demand in Connecticut was 26.6 million megawatt hours or the equivalent of 20.6 megawatt hours of residential and business electricity used when normalized to all Connecticut households or about 9 percent less than that used by those living in Western Connecticut.

In response to concerns about energy efficiency, seventeen of the region's municipalities have pledged to join the Clean Energy Communities Program established by the State of Connecticut in cooperation with electric utilities, the Connecticut Energy Efficiency Fund, and the Connecticut Green Bank. The pledge is a commitment to reduce municipal building energy consumption by 20% by 2018. As of April 2019, nine of the municipalities completed a renewable energy campaign aimed to increase the use of solar and other renewable forms of energy. More significantly, one municipality – Wilton – achieved its goal of a 20% energy reduction for its municipal buildings, thereby becoming one of nine Connecticut municipalities to reach this goal on time.



Figure 11: Hydro-electric facility, Newtown and Southbury, CT

Reductions in the consumption of electricity is a necessary first step before solar and other renewable energy initiatives are contemplated. The dollar saved through energy conservation is the cheapest energy investment we can make. By implementing energy efficiency campaigns – including the Energize Connecticut renewable energy campaign – Western Connecticut can facilitate a more cost-effective

adoption of solar energy systems for residential and business applications.

Environmental Considerations with Renewable Energy

While renewable energy from solar and wind play an important role in reducing the state's carbon emissions, they also pose a significant threat to forest, farm, and

Table 13: Electricity Demand in Western Connecticut in 2018 (Megawatt Hours)

Municipality	Households	Residential (MWh)	Business (MWh)	Total Electricity (MWh)	Residential Electricity Per Household (MWh)	Total Municipal Electricity Normalized Per Household (MWh)
<i>Bethel</i>	6,595	75,528	65,218	140,746	11.45	21.34
<i>Bridgewater</i>	738	11,519	1,104	12,623	15.61	17.11
<i>Brookfield</i>	5,941	77,498	61,988	139,486	13.04	23.48
<i>Danbury</i>	28,070	280,351	377,410	657,761	9.99	23.43
<i>Darien</i>	6,616	116,303	61,226	177,529	17.58	26.83
<i>Greenwich</i>	22,804	269,099	180,679	449,778	11.80	19.72
<i>New Canaan</i>	6,792	132,253	43,428	175,681	19.47	25.87
<i>New Fairfield</i>	4,675	59,509	8,052	67,561	12.73	14.45
<i>New Milford</i>	10,585	121,679	85,043	206,722	11.50	19.53
<i>Newtown</i>	8,704	100,431	62,024	162,455	11.54	18.66
<i>Norwalk</i>	32,503	218,680	264,948	483,628	6.73	14.88
<i>Redding</i>	3,294	47,328	16,245	63,573	14.37	19.30
<i>Ridgefield</i>	8,342	117,422	97,231	214,653	14.08	25.73
<i>Sherman</i>	1,429	21,844	2,259	24,103	15.29	16.87
<i>Stamford</i>	46,469	473,598	789,603	1,263,201	10.19	27.18
<i>Weston</i>	3,289	64,674	8,987	73,661	19.66	22.40
<i>Westport</i>	9,459	166,943	112,901	279,844	17.65	29.58
<i>Wilton</i>	6,058	94,085	102,763	196,848	15.53	32.49
Region	212,363	2,448,744	2,341,109	4,789,853	11.53	22.56
Connecticut	1,294,866	11,986,144	14,651,858	26,638,001	9.26	20.57

Source: Clean Energy Communities Dashboard, April 2019

open space lands – especially when the approach taken relies on mega-installations of solar panels for utility grid interconnections. These are not only a concern in Western Connecticut; the state Plan of Conservation and Development has placed a heavy emphasis on making renewable power generation compatible with state goals for environmental protection, minimizing potential impacts to rural character and environmental, agricultural, and scenic resources when siting new power generation facilities and/or transmission infrastructure. However, the state’s current emphasis on megawatt scale “solar farms” in lieu of more effective incentives for residential and commercial building applications (**Figure 13**) will inevitably lead to continued conflicts between forest, farm, and open space protection and the expansion of solar energy.

An unfortunate side-effect of establishing grid-connected solar energy farms is that there are no built-in incentives to reduce electricity consumption by end users. In contrast, the state’s residential solar energy incentive program requires energy audits as a condition of any solar energy system installation supported by state funds. Homeowners have a direct interest in reducing their electric usage to conform to the capacity of their solar panels. The energy audit concept is not a component of the Public Utility Regulatory Authority’s (PURA) approval process for grid-connected solar farms approved, with the result that conversion to solar energy to electricity does not necessarily have any impact on base electric loads for electricity generators.

While municipal and regional governments have limited oversight over the installation of grid-connected solar farms, it is imperative that efforts be made to work closely with PURA and prospective solar farm developers to identify locations in each municipality that have the least impact on protected forest, farmland, open space, sensitive environmental lands including steep slopes, and land falling within riparian corridors that sustain marine and terrestrial

forms of life and serve as migratory pathways for wildlife, and viewsheds. Special design guidelines need to be developed to steer large scale solar and wind energy systems away from 1) fragile eco-systems and 2) land needed to achieve the region’s food security and open space goals. Five broad criteria must be developed for statewide application to future solar farms and wind energy conversion systems including 1) viewshed considerations, 2) ridgeline protections, 3) riparian corridor setbacks, 4) avoidance of development on regulated and/or fragile lands (i.e., steep slopes, highly erodible soils, wetlands), and 5) avoidance of forest clear cutting where sustainable forest management programs have been adopted.

Land Use Considerations with Solar Energy

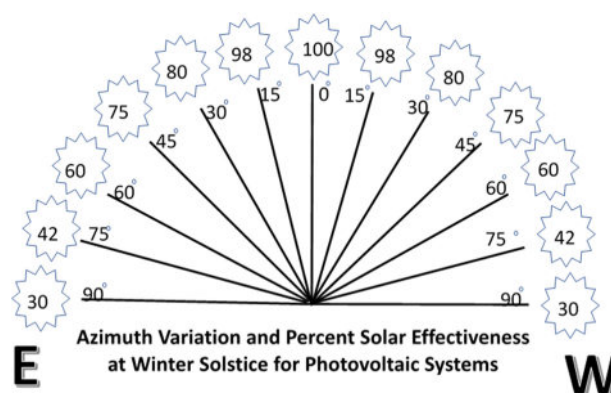
A goal of the state of Connecticut is to reduce our long-term dependence on fossil fuels and become more energy independent. Municipalities in Western Connecticut can support this goal by encouraging the installation of solar energy systems on residential, commercial, and industrial properties. Zoning and subdivision regulation can play a critical role in enabling greater use of solar energy by encouraging land use patterns that facilitate greater solar access for new development. Examples of land use strategies that promote solar energy include using the municipal authority granted under subdivision regulations to align street systems along east-west axes, where feasible, so that houses are oriented to take advantage of south facing exposures; encouraging cluster subdivisions that incorporate solar access and solar orientation considerations into the design of new developments; orienting houses to face within 30 degrees of true south regardless of street orientation; and enabling planned developments that provide incentives for the installation of solar and other renewable energy systems including super-insulated and zero net-energy houses.

A principal consideration in the installation of solar and other renewable energy systems is energy efficiency. Super-insulated dwelling units that are oriented to within 30 degrees of true south require far less energy for heating and cooling than other dwelling units that fail to consider building orientation or are built to minimum building code standards (**Figure 12**). It is not uncommon for developers to provide the minimum required insulation reduce the sales price of a home. Such strategies fail to address the lifecycle costs of residential homeownership, whether the evaluation is done for the life of the dwelling or for ten or twenty years into the future. The long-term cost of purchasing heating oil, natural gas, or electricity to heat a home in Western Connecticut can be sharply reduced if municipalities encourage developers to disclose the differences in long-term heating and cooling costs between various super-insulation packages and the minimum building code insulation standards. As can be seen in the graph below, house orientation, by itself, plays a critical role in increasing the effectiveness of rooftop-mounted photovoltaic panels and reducing heat loads for passive solar energy homes. By increasing the amount of south-facing fenestration, providing thermal mass within the building to store the passive solar energy, and super-insulating the building, it is possible to make dramatic reductions in our dependence on fossil fuels for home heating. Similarly, south facing building orientations are also best for minimizing summer heat gains provided that appropriate overhangs are provided to shade south facing window walls. The classic study by Victor Olgay, *Design for Climate*,⁴ emphasized the importance of a south facing building orientation as the best means to gain heat in the winter and reduce cooling loads in the summer. On a broader scale, cities are significantly affected by the urban heat island effect which occurs when buildings with low albedo surfaces (e.g., black

roofs) and large mass absorb solar energy during the daytime and release that energy at night. Reducing thermal pollution will require a comprehensive reassessment of urban design principles with the aim of minimizing building heat retention in the summer months. Design for climate must be considered at all scales – the site, the subdivision level and at city scale (see the tree canopy section of the plan for more details).

The advantages of solar energy heat gains in the winter can be considerable for those living in Western Connecticut. For example, a one square foot of south facing double glazed window under clear skies receives 21,148 more BTUs during the heating season than if that same window was facing 30 degrees to the east or west; it receives 42,677 more BTUs than one facing southeast or southwest; 117,344 more BTUs than one facing east or west and over 6 times more BTUs than the same window facing north (**Table 14**). The lessons of solar architecture are 1) minimize north facing windows, 2) orient the long side of the house within 30 degrees of true south, 3) install double glazed windows with a high u-value (e.g., to reduce heat loss), and 4) minimize the building's heat requirements through energy conservation and super-insulation.

Figure 12: Azimuth Variation and Percent Solar Effectiveness at Winter Solstice for Photovoltaic Systems



⁴ Design with Climate: Bioclimatic Approach to Architectural Regionalism, 1963, Princeton University Press.

Table 14: Energy Benefits of Building Orientation and South Facing Windows in Sandy Hook, Connecticut, 41.41 Degrees North Latitude

Building Orientation	Solar Gain with 100% Clear Sky			Solar Gain with Typical Cloud Cover		
	Clear Sky Solar Energy Gain during Heating Season (Btu/Sq. ft.)	Energy Benefit of South Facing Window Over Other Orientations (BTU/Sq. ft.)	Percent Energy Decline over a south-facing one square foot window over other orientations	Cloudy Sky Solar Energy Gain during Heating Season (BTU/Sq. ft.)	Energy Benefit of South-Facing Window Over Other Orientations (BTU/Sq. ft.)	Percent Energy Decline over a south-facing one square foot window over other orientations
<i>Due South</i>	241,638			133,768		
<i>10 Degrees West of South</i>	239,005	2,633	99	132,326	1,442	99
<i>30 Degrees West of South</i>	220,490	21,148	91	122,653	11,115	92
<i>45 Degrees West of South</i>	198,961	42,677	82	110,218	23,550	82
<i>60 Degrees West of South</i>	173,245	68,393	72	96,700	37,068	72
<i>80 Degrees West of South</i>	136,405	105,233	56	76,177	57,591	57
<i>East/West</i>	117,344	124,294	49	65,843	67,925	49
<i>North</i>	32,624	209,014	14	18,294	115,474	14

Note 1: Assumes green grass on southside of window equal to a .25 reflectance

Note 2: Cloudy Sky data based on cloud cover data for Connecticut

Note 3: Calculations derived from website Sustainable by Design Window Heat Gain Calculator, May 2019

Solar Access – The Right to Light

The long-term energy benefits of solar orientation are not dependable unless there is also an equal level of commitment to a right to light for those relying on solar energy for passive home heating or for the generation of electricity with photovoltaic panels (Figure 13). Typically, solar access can be impeded by the inappropriate placement of trees near south facing window walls or by locating new buildings without adequate shadow clearance from trees and other natural or manmade features of the environment. Since there is no legal right to light under American law, the only way that homeowners can be assured of sufficient sunlight to power their solar panels or heat their home is by planning the location of new homes to minimize potential solar access interference from shadow casting objects. Studies done by the Central Naugatuck Valley Regional Planning Agency in 1980s found that solar

access is affected by lot size, the slope of the land, maximum allowable building heights, and landscaping considerations.⁵

Planning and zoning commissions can play a key role in facilitating the protection of solar access in new developments not only by encouraging east west streets for new developments but by considering solar access issues in the siting of new homes. Six Connecticut municipalities (Beacon Falls, East Hartford, Hartford, New London, Stonington and Wolcott) require solar access to be evaluated and/or protected in the siting of solar energy systems. In addition, municipalities may also wish to consider requiring solar easements to be placed on properties developed as residential subdivisions or planned developments to ensure long term solar access in areas where potential



Figure 13: Solar Panels on Accessory Structure, Ridgefield, CT

⁵ Central Naugatuck Valley Regional Planning Agency, *Overcoming Land Use Barriers to Solar Access: Solar Planning Recommendations for Local Communities*, February 1980.

future development or tree growth could threaten solar access.

Pollution Prevention and Resource Conservation

Under Public Act 14-94 enacted by the General Assembly in 2014, the state of Connecticut has made a commitment to increase the amount of recycling and reduce the amount of solid waste generated in Connecticut to achieve a 60% diversion of solid waste from disposal by 2024. DEEP has indicated that the state's recycling rate must reach 45% if the 60% diversion goal is to be achieved. This is a formidable challenge for Connecticut residents since a 2015 DEEP commissioned study indicated that many residents are not aware of what is recyclable and what is not. According to DEEP, as much as 16% of the solid waste disposed in Connecticut is readily recyclable.⁶

Resource conservation requires a focus on three basic elements; waste reduction, reuse and recycling. The highest priority is pollution prevention (i.e., waste reduction) by designing products, processes and services that minimize the generation of waste in the first place. Once that step has been achieved. The next step is to assess strategies for reusing or recycling so-called waste materials. An emerging resource conservation strategy adopted by many leading-edge manufacturing companies is lean six sigma management as a tool to achieve zero waste. Lean Six Sigma is used to systematically reduce and/or remove waste from production processes and has also been used by many government agencies to improve the efficient delivery of services (i.e., reducing the waste of time and labor from the inefficient management of municipal services).

In order to achieve the state's diversion goals, residents of the region, aided by local governments, must be made aware of the impacts of their purchasing decisions since the need to recycle is often predicated

on the selection of products and its attendant packaging that is either not reusable or excessively packaged. Reducing waste through procurement planning must be considered in any effort to reach the state's waste diversion goal. Municipal governments can facilitate the achievement of the state's goal by clearly, consistently and repeatedly communicating recycling policies and goals to town residents. Studies of past recycling marketing strategies conducted by the National Recycling Coalition found the most effective way to engage residents in waste diversion and recycling is to communicate municipal goals through messaging that appeals to both rational and emotive reasoning. Recycling does not happen by the stroke of a pen signed by the Governor or the chief elected official of the municipality. It requires a heartfelt and ongoing effort to establish recycling habits amongst all residents – especially the younger generation since they are the ones who will have the future stewardship and protection of our natural resources.

Infrastructure and Climate Resiliency

As society has become more complex, with increasing dependence on centralized systems of energy production and distribution, communication, and water and sewer service, the potential for system failures increases the risk of significant adverse consequences to the quality of life in the region. These concerns have become more salient as residents of Western Connecticut have experienced the consequences of natural and manmade disasters that have disrupted business activities, resulted in significant property damage and adversely affected their health and wellbeing. Superstorm Sandy was a wake-up call for municipalities in Connecticut – both along Long Island Sound and inland.

⁶ Connecticut Department of Energy and Environmental Protection, 2015 Statewide Waste Characterization Study, March 15, 2016.

What does resilience mean? While this term has been overused, it is defined as “the capacity to recover quickly from difficulties; toughness.”⁷ In the context of the region’s infrastructure, resilience entails three basic assumptions:

Redundancy: manmade infrastructure must be designed with redundancy to ensure the long-term functioning of major systems such as electricity, heating, water, sewer, and communications;

Mitigation: manmade systems must be designed to minimize exposure to climate-induced impacts such as flooding, temperature extremes, sea level rise, wind storms, hurricanes and tornados. FEMA defines mitigation as “sustained actions taken to reduce or eliminate long term risk to life and property from hazards.”⁸

Adaptation: historic investments in public and private urban infrastructure along riparian corridors, Long Island Sound, and in older energy inefficient buildings cannot adapt to changing climate conditions overnight. However, municipalities should consider long-term investment strategies that 1) make public buildings more energy efficient and make greater use of renewable energy sources; 2) eliminate funding for projects in areas vulnerable to sea level rise and/or falling within newly designated floodplain zones; and 3) establish sustainable development patterns that create more energy-efficient patterns of development.

Several of the region’s municipalities have already initiated projects to increase the resilience of municipal infrastructure in the face of climate change. An important resource for municipalities concerned with the impact of climate change on urban infrastructure is the Connecticut Institute for Climate Resilience and Adaptation (CIRCA). CIRCA provides a range of policy

papers and resources that can be used by municipal land use commissions to address the challenges of climate change.

The region’s municipal agencies are required by Public Act 13-179 to “consider sea level rise when making critical plans for land use, hazard mitigation and civil preparedness.”⁹ Planning for sea level rise is not an academic topic; the National Oceanic and Atmospheric Administration (NOAA) estimates that sea levels will rise between one and eight feet by the year 2100. These estimates, while imprecise, are clear indications that public investments must be avoided in areas that are projected to be inundated. All future state and federal investments will have to be consistent with the state Plan of Conservation and Development and its policies as they impact sea level rise.

⁷ Google online Dictionary

⁸ FEMA, Local Mitigation Planning Handbook, March 2013, p. I-1.

⁹ William Rath, UCONN School of Law, Center for Energy and Environmental Law, Statutory Adoption of Updates Sea-Level Rise Scenarios, May 1, 2018, p.2.

Hazard Mitigation Strategies

In the ten-year planning horizon of this plan, one of the most important first steps for the region is development of hazard mitigation plans to address long term concerns with business continuity issues affecting local governments, business, and providers of public services (e.g., electricity and communications). The Natural Hazard Mitigation Plan for the South Western Region: 2016-2021 and the Municipal Hazard Mitigation Plan (Northern Region) covering the former Housatonic region, represent progress in a coordinated regional strategy to mitigate natural and manmade hazards.

The hazard mitigation plan for South Western Region set broad goals for each municipality, all of which share a common goal to reduce loss of life and property from natural hazards such as floods, sea level rise, storm events, high winds, dam failures and winter storms. While each municipality's hazard mitigation strategies, as set forth in the Natural Hazard Mitigation Plan, are customized to local needs, common priorities unite the region in a consistent approach to hazard mitigation (Figure 14).

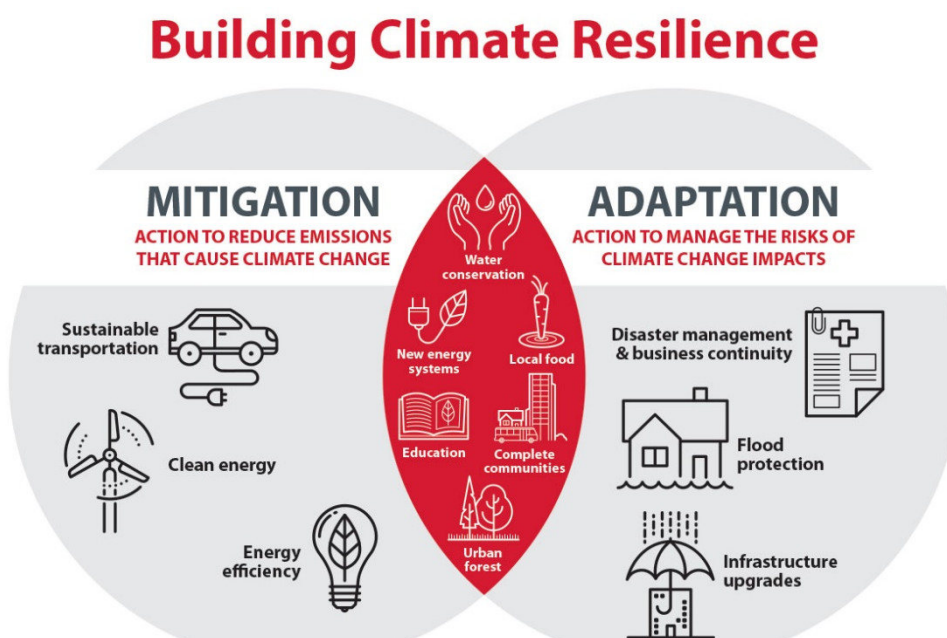


Figure 14: Building Climate Resilience; Source: City of Calgary, Canada

Summary of Goals and Policies - Infrastructure

Stormwater Management

1. Minimize the installation of impervious surfaces in new developments
2. Avoid the installation of impervious surfaces within at least 100 feet of watercourses or the creation of new, directly-connected impervious areas.
3. Revise zoning regulation standards for building cover to address impermeable cover standards and Green Area cover standards.
4. Develop long-term strategies to reduce infiltration of stormwater into municipal sewage treatment plant systems.

Floodplain Management

5. Redefine the boundaries of the 100-year floodplain based on post-2001 meteorological data for Western Connecticut.
6. Revise floodplain management provisions of municipal zoning regulations to reflect revised floodplain boundaries.
7. Request FEMA to update its flood insurance rate map program to align with current meteorological data.
8. Request FEMA to incorporate anticipated climate trends into its meteorological assessments of future flood stage forecasting to address anticipated precipitation levels for thirty-year planning scenarios.

Riparian Corridors

9. Encourage the adoption of streambelt zoning as a means to protect ecology and riparian values provided by the major watercourses in Western Connecticut.
10. Develop model streambelt zoning regulations for adoption by municipalities in Western Connecticut.
11. Increase the protection of tree canopies and maintain core forests along major riparian corridors in Western Connecticut.

Communication Infrastructure

12. Establish view-shed regulations to guide the installation of towers consistent with the regulations of the Federal Communications Commission and the State of Connecticut Siting Council.
13. Identify appropriate locations for towers and small wireless facilities consistent with communication requirements and the aesthetic and view-shed concerns of citizens of Western Connecticut.
14. Encourage the co-location of communication towers to minimize the visual clutter of wireless communication systems in the region.
15. Assess the consistency of local land use decision making timetables with the Federal Communication Commission's "shot clock" timetable that establishes strict deadlines for acceptance, review, and approval of telecommunication tower applications.
16. Assemble a Task Force of appointed municipal staff, industry leaders, and WestCOG staff to create a coordinated development strategy for fifth generation cellular network implementation.

Transportation Infrastructure

17. Develop municipal and regional Transportation Asset Management Plans to guide municipal and state investments in the maintenance and rehabilitation of municipally owned transportation infrastructure.
18. Conduct detailed inventories of transportation infrastructure to determine fiscal priorities for maintenance and rehabilitation of key transportation assets.

Sewer Avoidance

19. Employ sewer avoidance strategies in areas where failing septic systems pose a clear and present danger to public water supplies, public recreational water bodies, and public groundwater supplies.
20. Identify appropriate community sewer systems for areas with failing septic systems where such systems cannot be cost effectively repaired.
21. Adopt more sophisticated buildable lot standards within zoning regulations for those municipalities where septic system failures have been endemic.

Renewable Energy Infrastructure

22. Adopt zoning regulations that facilitate the installation of renewable energy systems including photovoltaic systems, super-insulated and net zero energy dwellings, earth sheltered housing, and ground source and air source heat pump technologies.
23. Consider the creation of renewable energy zones like that established in Bethel, as a means to direct the locations where the Connecticut Siting Council places grid-connected solar energy systems within the region.
24. Adopt subdivision regulations that give greater consideration to solar access and solar orientation of buildings in new residential developments.
25. Participate in the Clean Energy Communities Program to facilitate adoption of long-term sustainable approaches to the installation and use of renewable energy sources.
26. Avoid the placement of grid-connected solar energy systems in areas that will destroy core forests, adversely affect riparian corridors, or destroy critical agricultural lands.

Housing

Perhaps more than any single issue, the lack of affordable housing in the region has become a limiting factor for its growth. Access to affordable housing is influenced by the lack of multi-family housing; limited availability of two-family housing, excessive restrictions on the creation of accessory apartments in single family dwellings and definitions of family within zoning regulations that often prohibit non-traditional families from living together. Western Connecticut, along with municipalities in the Greater New York and Greater Boston areas, are facing a housing affordability crisis that affects residents regardless of their income or wealth. For example, in 2018 the median sales price for a single-family home ranged from \$287,500 in New Milford to \$1,604,500 in Greenwich. Significantly, in 2018 four of the region's municipalities (Darien, Greenwich, New Canaan, and Westport) had median sales prices that exceeded \$1 million. In 2018, the median sales price of single-family dwelling units in Western Connecticut was \$709,814 or nearly three times that of the entire state of Connecticut (i.e., \$258,000).¹⁰

Home Values and Affordability

According to the 2017 U.S. Census five-year American Community Survey less than 40% of all homes in the region are valued at less than \$500,000; 41% at \$500,000 to less than \$1 million; and 21% at \$1 million or more.¹¹ With these home values, it is not surprising that Western Connecticut is one of the state's difficult housing markets for those with low to moderate incomes. Yet western Connecticut is not unique; the housing affordability crisis affects most of the fastest

growing metropolitan regions of the United States where job creation outpaces housing creation. Because this is a highly affluent region of Connecticut the most revealing indicators of housing affordability are median gross rent as a percentage of household income and median selected owner costs as a percentage of income for those with and without mortgages. While there is no absolute indicator of affordability, the most traditional rule of thumb is that households should not spend more than 30% of their income on housing to ensure income remains for food, clothing, credit card debt and other lifestyle needs. Based on this formula, in 2017 the U.S. Bureau of the Census reported that renters in fifteen of the region's municipalities are spending more on housing than they can afford. Only Bridgewater, Brookfield, and Wilton fell within traditional affordability guidelines.¹²

In contrast, homeowners appear to be less impacted by the region's expensive housing, a reflection of their higher income levels than other residents of Connecticut. Even when accounting for the margin of error attributable to the U.S. Census Bureau's American Community Survey sampling size, none of the eighteen municipalities had median homeownership costs that exceeded 30%. This is not to imply the region's is affordable to the broader population – merely that those who own housing here have been self-selected for their ability to afford the region's housing costs.

The state legislature has responded to the housing crisis by imposing housing affordability goals for each municipality to ensure that future generations are able to live and work in the places they call home. Under

¹⁰ Warren Group, January 2019.

¹¹ U.S. Census Bureau, five-year American Community Survey, 2012-2017, Table B25075.

¹² This definition of affordability reflects income levels of a community and therefore may not be indicative of the affordability challenges facing the younger generation and those with low paying jobs

Connecticut law, affordable housing is defined as housing that is affordable to those at 80% of the Area Median Income (AMI) and that costs them no more than thirty percent of their income. The state of Connecticut further limits affordable housing to that which either has deed restrictions to control costs or qualifies as affordable due to government subsidies. In 2018, the Connecticut Department of Housing released its Affordable Housing Appeals List indicating, with the exceptions of Danbury, Norwalk and Stamford, the remaining municipalities fell short of the ten percent affordable housing goal established by Public Act 88-230.

As can be seen from **Table 15**, Western Connecticut has 19,880 housing units that meet the state's affordable housing goals. If affordable housing supply were evaluated as a regional issue, Western Connecticut would be just shy of the ten percent goal – with 8.45% of its housing meeting Department of Housing

affordability standards. However, when housing choice is evaluated at municipal level, twelve of the region's municipalities have less than five percent of their housing units meeting affordability standards. Under the provisions of Connecticut's housing laws, each municipality is required to meet the ten percent threshold or face the potential for appeals of their zoning decisions through the Affordable Housing Land Use Appeals procedure.

A case could be made that housing is a regional problem and should be evaluated at that scale. If that approach should gain favor, it would also suggest that regional tax base sharing strategies might also gain favor so that the fiscal burdens associated with various land use classifications could be equitably shared across municipal boundaries – analogous to the approach taken in the Minneapolis/St. Paul Metropolitan Area.

Table 15: Affordable Housing: A Status Report for Western Connecticut

2018 Affordable Housing Appeals List - Exempt Municipalities							
Town	Housing Units 2010 Census	Governmentally Assisted	Tenant Rental Assistance	Single Family CHFA/USDA Mortgages	Deed Restricted Units	Totally Assisted Units	Percent Affordable
Danbury	31,154	1,590	943	544	296	3,373	10.83%
Norwalk	35,415	2,215	1,331	363	607	4,516	12.75%
Stamford	50,573	4,112	1,879	385	1272	7,648	15.12%
2018 Affordable Housing Appeals List - Non-Exempt Municipalities							
Bethel	7,310	192	28	134	74	428	5.85%
Bridgewater	881	0	0	1	0	1	0.11%
Brookfield	6,562	155	24	96	77	352	5.36%
Darien	7,074	136	10	2	104	252	3.56%
Greenwich	25,631	865	392	13	27	1,297	5.06%
New Canaan	7,551	215	21	3	21	260	3.44%
New Fairfield	5,593	0	2	60	18	80	1.43%
New Milford	11,731	307	35	150	17	509	4.34%
Newtown	10,061	134	8	88	18	248	2.46%
Redding	3,811	0	1	13	0	14	0.37%
Ridgefield	9,420	175	6	29	69	279	2.96%
Sherman	1,831	0	1	6	0	7	0.38%
Weston	3,674	0	2	5	0	7	0.19%
Westport	10,399	265	55	3	27	350	3.37%
Wilton	6,475	158	5	14	82	259	4.00%
Total	235,146	10,519	4,743	1,909	2,709	19,880	8.45%

Source: Connecticut Department of Housing, March 2019

This table does not address the universe of affordable housing not governed by state housing policies.

National Housing Trends

One significant contributor to current housing costs is the ongoing escalation of house size as Americans continue to buy more expansive houses with greater amenities than the generation before. In the space of less than fifty years the average size new single-family house in the United States has increased by nearly sixty percent and this trend closely parallels the increase in the average cost of a new single-family house (**Figure 15**).

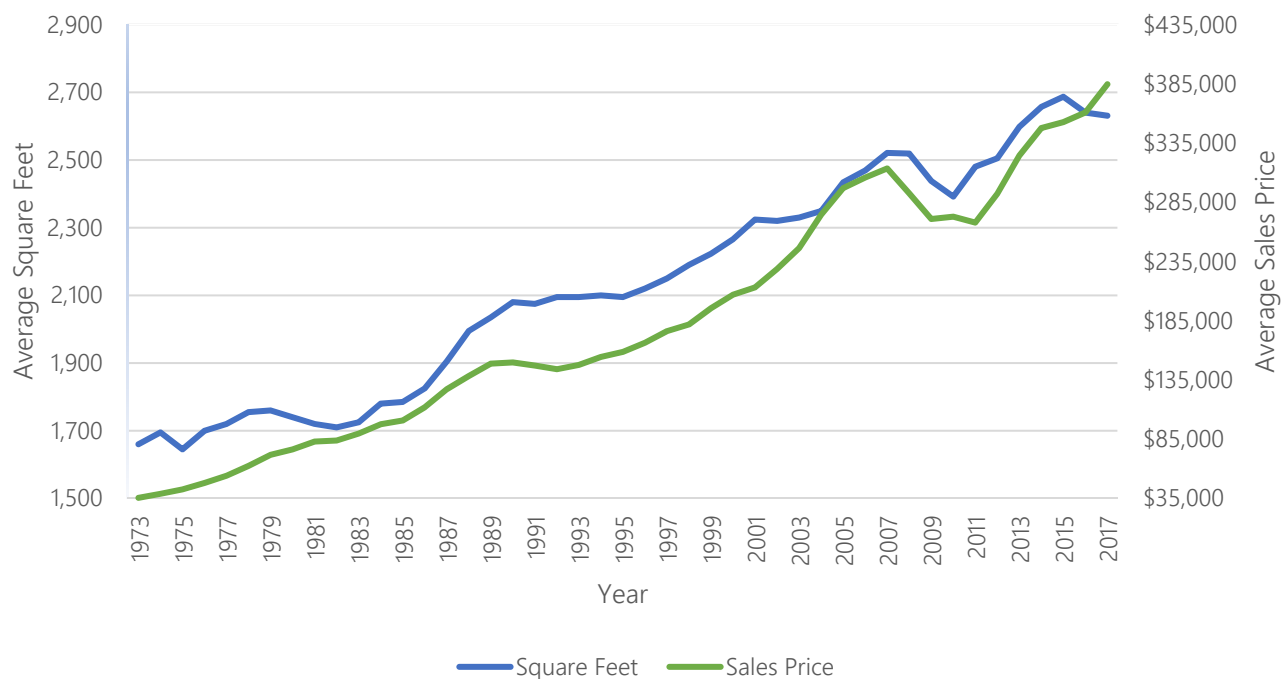
Paradoxically, while houses have grown, households have shrunk. Instead of large families, the modern single family house is an artifact of rising expectations for modern amenities such as the American flush toilet (1857), the telephone (1880 onward), electricity (1882 onward), home refrigerators (1913), modern air conditioning (1925), wall furnaces (1935), home dehumidifiers (1950s), dedicated home cinemas, tool rooms (1960s), expansive living room style kitchens (1990s), internet services (1992 onwards) and the Internet of Things that ties electrical devices wirelessly

or through wires to central command systems (1999 onwards). These amenities have added to the quality of modern life but also have bumped-up the cost of housing. A typical house built in the 1944 was 837 square feet whereas by 2017 the average new house was 2,631 square feet – even though far fewer people live in that house compared to the family living in the house built in 1944. These trends reflect our lifestyles, but to the extent that the entire housing stock within Western Connecticut is oversized for the typical household, efforts need to focus on repurposing some single-family homes for multi-tenant or multi-family use to reflect the different realities and needs of today's smaller households.

Zoning Incentives for Affordable Housing

In 1988 the Connecticut State Legislature passed Public Act 88-338, "An Act Promoting the Development of Affordable Housing through the use of Municipal Planning and Zoning Authority." This law enabled zoning commissions to offer density bonuses for affordable housing. In that same year the Connecticut

Figure 15: Average New Single-Family House Size and Sales Price in the United States



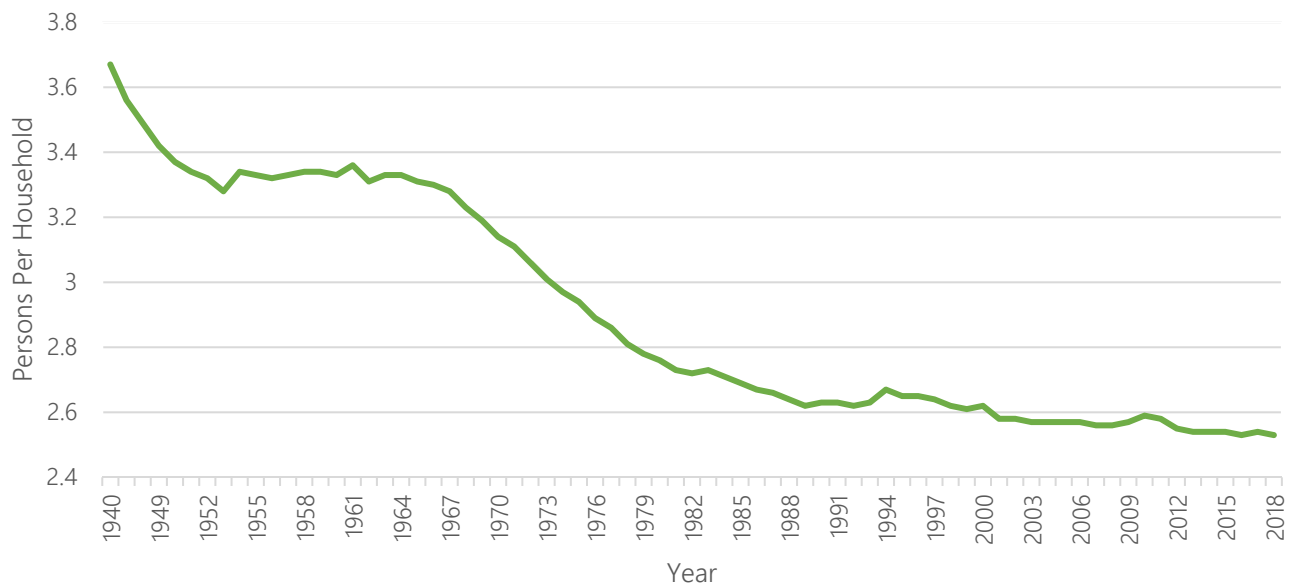
Supreme Court also held that zoning regulations encourage the development of housing opportunities – not just for some citizens in some zones – but for all citizens in all zones.¹³ These legislative and judicial developments have prompted some important changes in traditional zoning in the region. Apart from Bridgewater, Sherman and Weston, fifteen of the region’s municipalities have adopted affordable housing concepts. Twelve of these municipalities offer density bonuses, and the remaining three (New Canaan, New Fairfield, and Wilton) provide for affordable housing without any specified density bonuses. Density bonuses adopted by the twelve municipalities generally range from 20 to 35% over existing multi-family dwelling unit standards. In exchange for these density bonuses, the percentage of affordable housing units that must be affordable varies from 20 to 100% – with the most stringent standards found in a senior residential zone and a municipal housing zone both located in Westport.

Decline in the Traditional ‘Family’ Household

The housing market cannot be understood without an assessment of the changes to family size and structure over the last fifty years. The average household size in the United States has declined from 3.67 persons per household just prior to the start of World War II to 2.53 persons per household in 2018 (**Figure 16**).

Similarly, the percent of Connecticut household population living alone has jumped from 6% in 1940 to 26.4% in 2000. In Western Connecticut 30% of households were living alone in 2000, but by 2017 the U.S. Census estimates only 24% of householders were living alone. Essentially one out of every four residents must cope with life’s challenges without support from others. Some of the factors contributing to the decline in traditional families and household sizes include greater financial independence for women, delayed marriage and domestic partnering, lower birth rates, divorce, spouses outliving their partners, out-migration of children to regions with better job opportunities,

Figure 16: Average Household Size in the United States: 1940-2018



¹³ Builders Service Corp. v. Planning and Zoning Commission of East Hampton, 208 Conn. 367, 545A2nd, 530 (1988)

and the instability of modern employment opportunities that scatter extended families all over the nation. One consequence of these many factors is that the elderly often live alone in large houses with little financial cushion to weather the costs of home ownership.

Housing Tenure: Bedroom Communities

According to the 2017 American Community Survey, 69% of all occupied housing units in the region are owner occupied. The availability of rentals largely correlates with the supply of multifamily housing, which itself is a product of the availability of infrastructure necessary to support density (e.g., public water and sewer) and regulation (zoning).

Municipalities with the greatest percentage of owner-occupied units include Weston (96%); Wilton (86%); Westport (83%); Sherman (92%); Newtown (86%); New Fairfield (94%); Bridgewater (89%); Darien (85%); Ridgefield (84%) and Brookfield (82%). In contrast the urban municipalities of Danbury (60%); Norwalk (60%) and Stamford (54%) have the highest rate of rentals.

Limited availability of rental properties coupled with high housing costs have not been lost on municipal planners and chief elected officials in the region.

Virtually every municipality has taken substantial steps to increase the amount of affordable housing through expanded housing opportunities in the single-family dwelling and offering density bonuses to developers that offer affordable housing.

Affordable Housing – Zoning Strategies

During the 1980s many municipalities recognized the housing crisis faced by single family homeowners and began making accessory apartments available as a permitted use. The need for this zoning innovation

reflected the ever-increasing size of American homes coupled with the declining size of the American family. In effect, Americans in general, and residents of Western Connecticut in particular, were living in houses that were too expensive to maintain, with too many rooms to heat for too few inhabitants.

Housing, of course, was not merely providing shelter from the heat and cold it was becoming one of the most important financial investments a family would ever make as well as being a status symbol of one's rank within society. The result is that Americans are now living in houses that far exceed their minimum requirements for shelter as determined by public health standards developed during the 20th century. For many Americans, home buying is equivalent to a financial investment in the stock market – a safe place to store one's capital with shelter as a bonus.¹⁴ What happens when heating oil prices sky-rocket, property taxes rise, and the children graduate from high school leaving the parents as empty nesters? Will large single-family houses be an attractive option for the next generation? These concerns are influencing the region's future housing supply and zoning regulations play an important role in that process.

The cost of housing is one of the most significant land use issues affecting municipalities in Western Connecticut. Lack of available land, limited multi-family zoning options, lack of sewer services in the suburbs and the high cost of land and housing in the region have contributed to a significant shortfall in housing choice for many low- and moderate-income families. The net result is that fewer and fewer people are living in large houses which are costly to maintain with ever rising heating oil costs, property taxes, lawn care, building maintenance and mortgage payments. In many cases, residents of the region are living in over-

¹⁴ While the investment value of real estate is not necessarily as profitable as the stock market, it is often the only investment many Americans make.

sized houses that far exceed their living requirements and capture more of their disposable income than they find desirable.

While multi-family housing options are primarily best offered in municipalities with sewer and water services, the region's suburban municipalities can minimize the fiscal impacts of single-family home ownership – especially on the elderly and single parents – by offering shared housing arrangements such as accessory apartments, two family housing and other shared uses of traditional single-family dwelling units. Expanding housing opportunities within the single-family dwelling unit not only can reduce the carrying costs of homeownership, it also can provide housing opportunities for low and moderate income persons – especially when zoning regulations allow for the letting of rooms, the creation of two dwelling units in large single family homes, more flexible definitions of family and opportunities for repurposing large dwelling units for more flexible space sharing arrangements – including multi-generational families that benefit financially and socially from support systems available from kith and kin. While most of the region's municipalities have recognized the important role of accessory apartments, there has not been an equal level of acceptance of the important housing benefits offered by the two-family dwelling unit or for the advantages of expanding the letting of rooms. Zoning regulations have been a significant constraint on the availability of affordable housing simply by minimizing the income producing options available to the single-family homeowner.

An increasing number of American workers are taking jobs that offer far less stability than in the post-World War II era. One result of employment instability, the need for long term housing has been replaced by a need for short term shared housing arrangements, and for smaller more affordable housing. The nation is facing a dilemma: the cost of housing continues to rise and yet the average American's income levels are not

keeping pace with housing inflation. In contrast, Connecticut has not seen a rise in housing costs or income levels over the period 2005 to 2017 – reflecting its relatively slow rebound from the great recession of 2009. The solutions include undertaking long commutes from low cost rural areas to urban employment centers, seeking family financial assistance to subsidize the initial cost of homeownership, adopting house sharing arrangements to distribute housing costs amongst multiple wage earners or spending an ever-increasing share of one's income on housing costs.

Some have argued that different housing needs are found at each stages of life with those in the family formation stage requiring more housing than college students or empty nesters in their retirement years. In principle families – whether traditional or non-traditional – require more living space than single persons. However, the existing housing stock is excessively large and new housing continues that renders: single-family dwelling units exceeding minimum floor area requirements necessary to meet public health and building code standards. The result is that there is a significant mis-match between the housing needs of the non-traditional families and the available supply of affordable housing meeting their actual space requirements.

Smaller Sized Dwelling Units

Affordability is not only merely a question of income – it is also a matter of right sized housing reflecting the life style, income and mobility needs of non-traditional families. Municipalities can influence housing costs by offering a variety of housing choices at varying income levels reflecting the needs of their citizens. Zoning requirements for multi-family and single-family housing serve as policy gatekeepers on housing affordability and supply. Municipalities in Western Connecticut have been leaders in the provision of affordable housing – even when market forces conspire

to short circuit their efforts. However, more should be done to address the shortage of right sized housing especially the removal of minimum floor area requirements from zoning regulations consistent with the 1988 ruling of the Connecticut Supreme Court.¹⁵ The availability of starter homes, whether detached or attached, is an essential element of any long-term plan to promote the economic wellbeing of municipalities in Western Connecticut.

As mentioned above, there are other means to expand housing options within the single-family dwelling including encouraging accessory apartments, two family dwelling units, and the letting of rooms in single family dwelling units. Given the vast oversupply of space within the inventory of single-family dwelling units in the region, these options offer constructive reuse strategies for the existing housing supply that must be considered alongside efforts to expand multi-family housing choices.

Accessory Apartments

Some homeowners may be interested in renting out rooms or subdivide their homes if such measures will help defray the cost of housing. Unfortunately, access to accessory apartments has done little to expand housing options for lower income residents since there have been far too few accessory apartments to meet the region-wide need for affordable housing. Three municipalities prohibit accessory apartments, and ten allow them but require an annual approval for the continuation of such housing – a mechanism that creates an unnecessarily obtrusive oversight process for those seeking to reduce the costs of homeownership.

Two Family Housing

Another option offered by some municipalities is the provision of two-family housing. Two family housing is

an effective way to create more affordable housing that can easily be integrated into existing single-family neighborhoods (**Figure 17**) – especially in those municipalities with large lot zoning where existing houses can be subdivided to create two units or new houses can be built to be compatible with the existing area. Six of the region’s municipalities do not allow for two family dwelling units, and five of those that do offer this option require a special permit, site plan review, or zone change depending on the location in which the housing is proposed. These regulatory barriers for two family housing create disincentives for their development at a time when affordable housing is needed.



Letting of Rooms: A Shared Housing Strategy

For single persons starting out in life, or on academic exchanges, business trips, or deployments, room rentals are often a very convenient and affordable way to enter the housing market. This option is popular with individuals who have limited housing needs and

¹⁵ Builders Service Corp. v. Planning and Zoning Commission of East Hampton, 208 Conn. 367, 545 A2nd, 530 (1988)

prefer not to have to furnish a home. For homeowners living in an oversized home with high costs and maintenance responsibilities, having a roomer may offer socioeconomic benefits. This option is particularly popular with single, divorced, and senior persons, who may be seeking ways to defray the costs of their mortgage, utilities, and taxes; assistance in home and yard maintenance; or just company and somebody to look after the property. Thirteen of the region's municipalities expressly allow the letting of rooms in single family dwellings or the creation of a boarding house operated by the owner. Most of the region's municipalities that offer this housing option allow up to three tenants in one single family dwelling.

While most municipalities treat the letting of rooms and boarding houses as interchangeable terms, this is not the case in the urban centers of Danbury, Greenwich, Norwalk, and Stamford. In these four municipalities boarding houses constitute a distinctly different housing option than the letting of rooms in single family dwellings. Traditionally boarding houses offered shared meals (i.e., board) and private rooms for guests similar to the services offered by today's hotel industry. Not surprisingly, boarding houses offer higher occupancy limits than those found in single family homes offering rooms for let. Stamford allows up to ten boarders, Norwalk allows up to twenty boarders and Danbury and Greenwich do not specify occupancy limits.

Definitions of Family

The concept of family has undergone significant change in the twentieth century with the decline of extended family relationships, the growth of single person households and an increasing number of non-traditional families associated with people living together to reduce housing costs. Excluding Darien, the region's municipalities have placed limits on the

maximum number of unrelated persons who may live together as a single housekeeping unit. The limits range from only one person unrelated to the household (Greenwich) to five persons (Brookfield, New Milford, New Fairfield, Ridgefield, Redding and Westport). In 2005, the Connecticut Legislature legalized civil unions, giving them the same benefits and protections under Connecticut law as those given to spouses in a marriage. Despite the legalization of civil unions, only one municipality in Western Connecticut – Bethel – has incorporated this concept into its zoning definition of family.

More flexible zoning definitions for family have been a controversial and legally problematic issue for municipalities in light of evolving family structures. These concerns can run afoul of efforts to expand housing opportunities in single family zones – especially when housing costs force unrelated persons to live together to reduce their costs of living. One approach upheld by the Connecticut Supreme Court in the case of *Home Builders Service Corporation v. Planning and Zoning Commission*, is the use of occupancy limits to control public health – instead of limitations on the number of unrelated persons living together. Occupancy based limits tie the number of persons living together to the amount of space available within the housing unit and to the public health requirements for septic system leaching fields when such housing is not connected to a municipal sewage treatment plant.

Affordable Housing Plans

The Connecticut Department of Housing has taken the position that every municipality is required to develop an Affordable Housing Plan whether or not the municipality has achieved its affordable housing goals.¹⁶ Public Act 17-170 An Act Concerning the Affordable Housing Land Use Appeals Procedure,

¹⁶ Interview with Michael Santoro, Connecticut Department of Housing, January 6, 2020

indicates the plan must be updated every five years and every municipality must show how it intends to increase the number of affordable housing developments. The Connecticut Department of Housing is currently working on guidance to assist municipalities with the implementation process. Plan elements should include but not be limited to; a housing needs assessment, a review of zoning incentives and disincentives to the creation of affordable housing, an analysis of legal and regulatory barriers to the creation of affordable housing, the availability of infrastructure to support affordable housing (e.g., sewers, water service, and transit accessible locations), the availability of appropriately zoned land for multi-family and congregate housing, and the adoption of administrative mechanisms to finance, implement and monitor the plan.

Transit Accessible Housing

When higher-density housing (whether condominium or rental property) is developed near areas with transit services, we can make significant steps toward the reduction of automobile dependency within the region. The railroad lines serving municipalities along the coastline provides essential transportation to New Haven to the east and New York City to the west. Many people who work in New York City rely on train service for their daily commute, and this has enormous benefits in reducing traffic congestion along the I-95 corridor. Improving transit service and linkages through

better integration of all transportation options coupled with advances in transit technology is a state policy objective. This objective is also consistent with providing convenience, reliability, safety and competitive modal choices within the region.

Similarly, transit supporting development – with densities of at least twenty dwelling units per acre – have been identified as necessary to sustainable, long-term transit services in the region. Municipalities with train stations should identify infill development opportunities consistent with the creation of transit supporting housing corridors near rail service stations. Similarly, infill housing should also be considered in the thirty-five designated village districts within the region since these locations already offer a variety of retail services that facilitate pedestrian and bicycle forms of travel in lieu of the automobile. Infill development is a well-accepted planning tool to make the most efficient use of urban infrastructure and minimize the transportation burdens of those living in mixed use, village style neighborhoods. Non-traditional families are the target market for housing opportunities developed within or abutting the region's thirty-five villages and for this reason, a coordinated approach to promoting the beauty, charm and transit accessible features of these villages should be given high priority as part of the region's economic development strategy.

Summary of Goals and Policies – Housing

Affordable Housing

1. Provide greater zoning flexibility in the development of accessory apartments and two-family dwelling units in single family residential zones.
2. Consider the adoption of regional strategies to address housing affordability where municipalities within a region develop a coordinated housing strategy with mutually beneficial outcomes. This concept will require state enabling legislation but could offer significant benefits to the participants.
3. Expand zoning strategies that enable seniors to remain in their homes through more flexible approaches to the letting of rooms, more flexible definitions of family, and less burdensome permitting procedures.

Transit Oriented Housing

4. Encourage a mix of housing and commercial development in the region's thirty-five village centers as well as within the urbanized centers in the region.
5. Focus higher density development along major transit routes to support high-quality mass transit services.

Economy

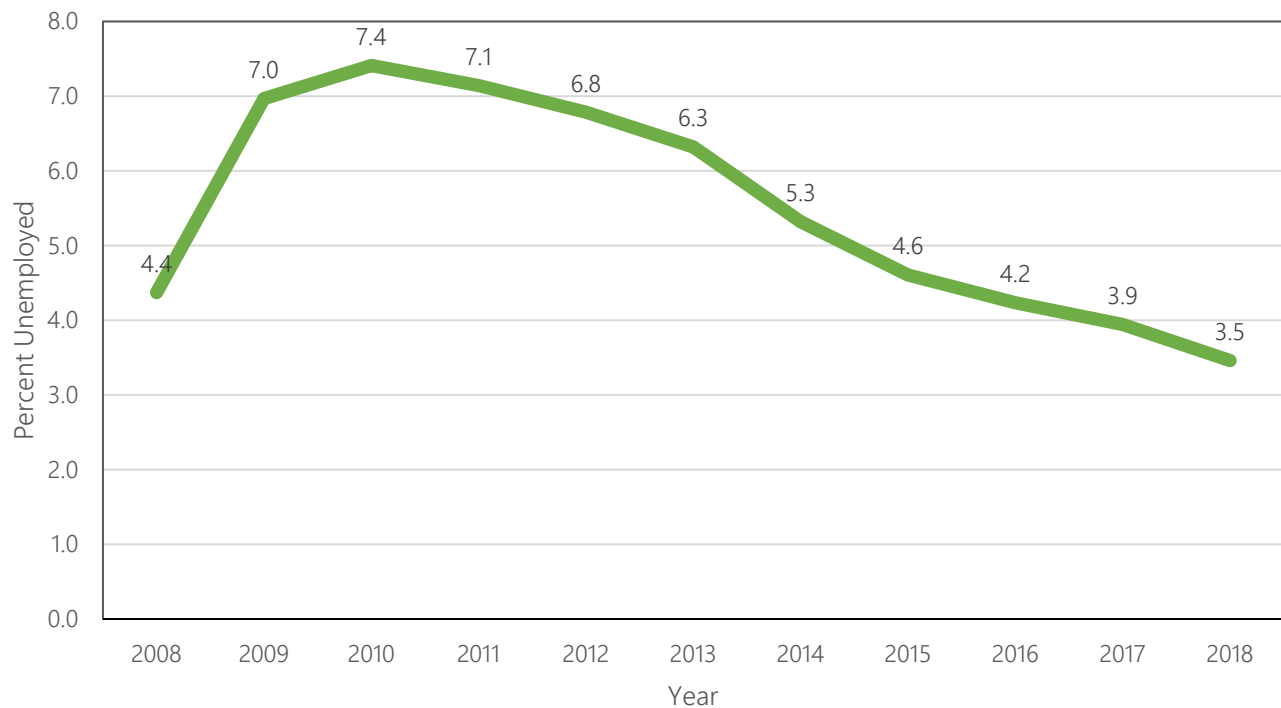
The economy of Western Connecticut has been recovering from the adverse impacts of the Great Recession with an unemployment rate of 3.5% in 2018 (Figure 18). The Connecticut Department of Labor reports that employment in the region reached 305,198 workers in 2018 – a modest two percent increase compared to employment in 2008 but less than the five percent increase in population experienced in that period.¹⁷ In 2017 the five major industries in the region were educational services and health care (21 percent of estimated employment); professional, scientific and management and administrative services (17%); finance, insurance and real estate (14 %); retail trade (10%) and arts, entertainment, recreation and accommodation and food services (8%). Together these sectors of the economy accounted for seventy

percent of the region's employment. These five sectors also accounted for an estimated 24,253 new employment opportunities during the period 2010 to 2017. The region's strength rests with highly educated workforce.

Development Constraints

While the region has rebounded from the Great Recession, its future growth must contend with a variety of constraints including a limited amount of affordable housing; journey to work traffic congestion along Interstates 84 and 95; limited sewer and water services in many of the region's suburban municipalities, inappropriately located land for business development in many municipalities and ecological constraints imposed by public water supply

Figure 18: Unemployment Trends in Western Connecticut: 2008-2018



¹⁷ Connecticut State Department of Public Health Population estimates for WESTCOG municipalities 2008 to 2017.

watershed lands, wetlands and steep slopes. None of these constraints should adversely affect the long-term health of the economy as long as local, state and federal investment decisions properly address these issues during the planning and development process. The region's growth will inevitably be closely linked to its major interstate highway systems as shown in the **Potential Growth** map depicting regional and local growth centers. However, a key to transit planning is to encourage land use changes near public transit stations that will be supportive of transit use. This concept, known as 'transit- oriented development' focuses housing and commercial activities within walking distance, of public transportation facilities. Zoning that enables transit supporting densities of at least twenty dwelling units per acre and human scaled urban design along transit corridors (i.e., public bus and rail lines) will also play a critical role in facilitating improved public transportation and minimize our inordinate dependence upon the automobile to reach the place of work. The greatest concentration of employment density aligns with I-84 and I-95 both of which are the most appropriate locations for transit supporting densities and mixed-use development (see **Employment Concentration** map).

Land Use

There are twenty-nine industrial zones in the eighteen municipalities, with eighteen of these zones located in Danbury, Newtown, Norwalk and Stamford – all of which share proximity to the interstate highway system. The region provides over 4,154 acres of industrially zoned land, with about thirty percent of it within these four municipalities. At the other extreme, six municipalities have not provided any land for industrial development (Darien, New Canaan, Redding, Ridgefield, Sherman, Weston) although Darien and Redding have provided for Designed Office and Research and Office and Research Parks respectively. Zoning has played a significant role in focusing development toward the urbanized portions of the

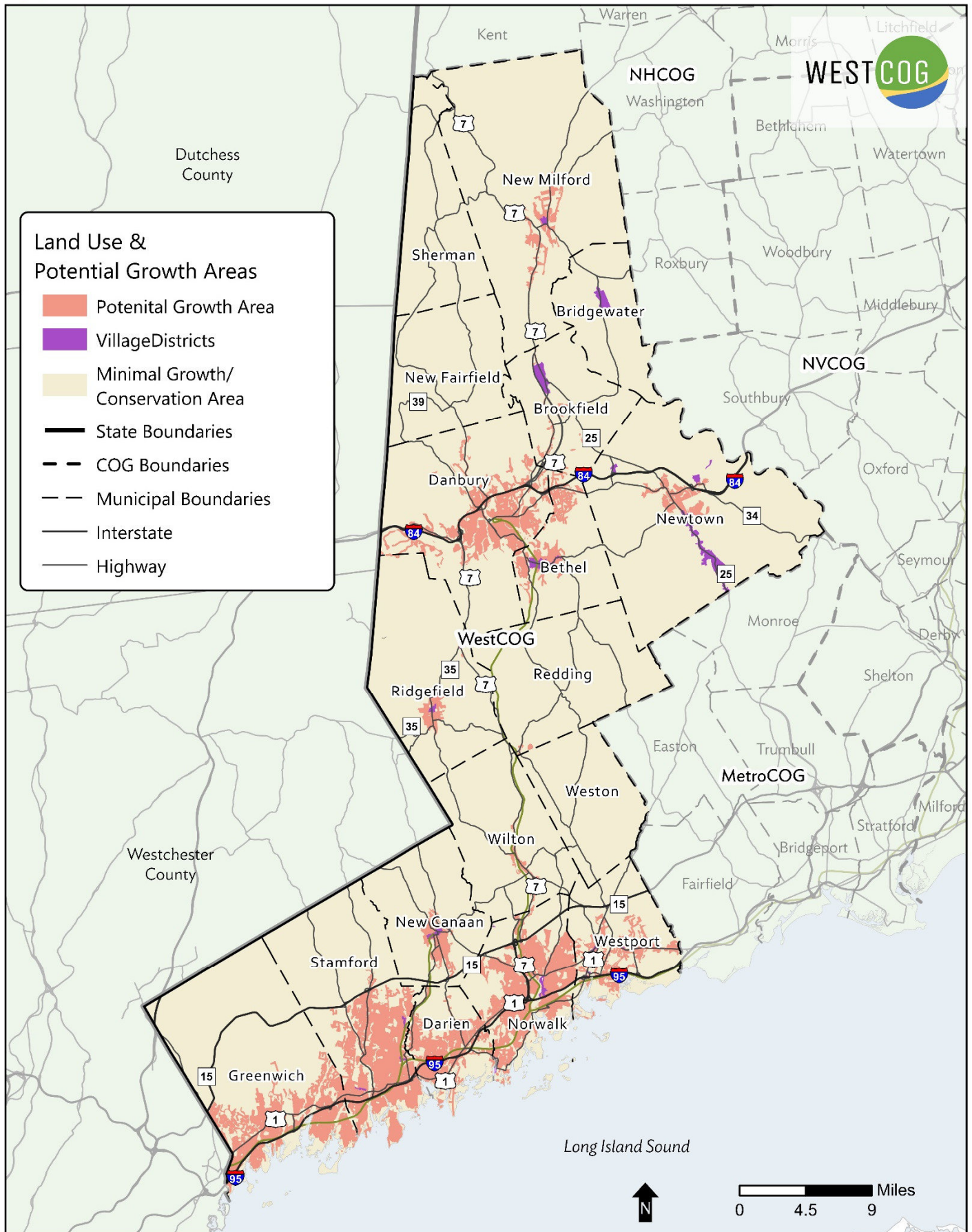
region where urban infrastructure (e.g., sewer, water, limited access highways and support services) is available. However, zoning is not the only locational advantage factor considered by captains of industry when siting their new facilities. Municipalities that have established industrial zones in areas less accessible to sewer, water and interstate highways are generally at a disadvantage when marketing the business advantages of their community. The region's employment is heavily weighted toward white-collar professions, which has been reinforced by municipal zoning regulations that promote corporate parks which are also sometimes referred to as Campus Research Parks, Executive Office Parks, and Designed Office and Research Zones. Zoning, as one of the region's economic development tools, has attracted high technology industries and professional and management services. What remains one of the region's greatest challenges is the provision of affordable housing in proximity to employment opportunities.

Major Employers

There are twenty-three employers that employ over 1,000 employees in the region including Pitney Bowes, Gartner Inc., Deloitte, Stamford Hospital, Boehringer Ingelheim, Norwalk Hospital, Greenwich Hospital, and Danbury Hospital. At the next tier, there are thirty industries that employ from 500 to 999 employees including Western Connecticut State University, UTC Aerospace Systems, Kimberly Clark, New Milford Hospital, Synchrony Financial, Norwalk Community College, Poland Springs Water, Questcon Technologies, NBC Sports Group, and PricewaterhouseCoopers. The sixty-three largest employers account for an estimated 85,000 jobs, or nearly a third of all employment opportunities in the region. Health care, higher education, entertainment services, and professional services are critical elements of the region's economy.

Potential Growth Area

Western Connecticut Council of Governments
westcog.org | 475.323.2060



Western Connecticut Council of Governments
westcog.org | 475.323.2060



Work Force

Employment Growth Expectations

The Connecticut Department of Labor forecasts 111,164 new jobs will be created between 2016 and 2026 across Connecticut, amounting to a 5.9% increase in employment. The twenty fastest growing occupational groups are expected to be found in architectural and engineering services, building and construction, computer services, finance and business, food service, health care, management, personal care services, social services and transportation. These industries are expected to account for nearly 46% of the total employment growth by 2026. These forecasts are consistent with the aging of the region's population, our continued reliance on interstate transportation systems to provide our food and consumer goods, and ongoing efforts to expand building construction opportunities within region.

Industrial and Commercial Grand List

Commerce and industry not only contribute employment opportunities, they heavily support local government services, enabling municipalities to reduce the burden of property taxes on homeowners. In 2017, commercial and industrial landowners accounted for fifteen percent of the region's net grand list, but in the cities of Danbury (25%), Norwalk (20%) and Stamford (25%) these landowner's tax responsibilities provided a greater proportion of local property tax revenues than other municipalities, reflecting the greater level of employment and retail services in these three municipalities. Multifamily housing also contributes to the region's economy directly by providing affordable housing and indirectly by providing local property tax revenues. In 2017 multifamily housing only contributed three percent of the net grand list value revealing the degree to which the region is heavily funded by tax

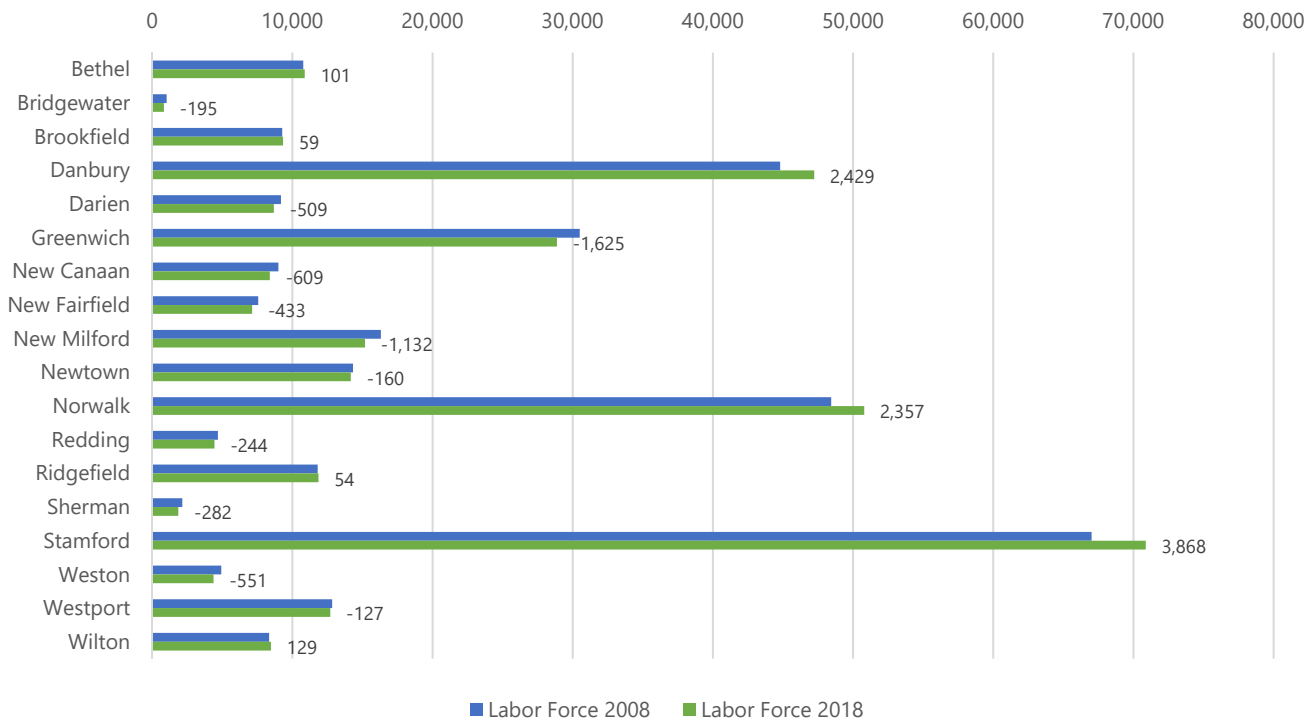
revenues from single family dwelling units. Virtually all the region's multifamily housing value, as measured by the 2017 grand list, is found in Danbury, Greenwich, Norwalk, and Stamford. Together, these municipalities account for 93% of the region's multifamily housing grand list by value. Within these four municipalities, only Stamford's multifamily housing made a significant contribution to its overall net grand list with \$2.2 billion in value accounting for nearly ten percent of its net grand list which, represents the highest grand list contribution in all of Connecticut. Hartford may be the capital of the Connecticut, but Stamford is its most vital city with the greatest commitment to a diverse asset mix of housing and economic development opportunities.¹⁸

Workplace Commuting Patterns

Lack of commercial and industrial land in many municipalities may influence long-distance commuting even if it is not the only factor at work. The further away residents need to travel to work the more likely they may eventually move to other locations closer to their place of work. As can be seen in **Figure 19**, excluding residents of Bridgewater and Redding, the remaining municipalities experienced a decline in the percentage residents staying in their community for employment. At the regional level 67% of residents of Western Connecticut stayed within the region for employment in 2002. By 2015 the percentage living and working within the region dropped to 61% - resulting in longer commuting patterns for residents. In 2015 26% of the region's residents traveled 25 or more miles to reach work. In contrast only 22% traveled that far in 2002. The growing specialization of occupational skills coupled with the limited availability of affordable housing has resulted in some segments of the labor force choosing long distance commuting to reach their workplace.

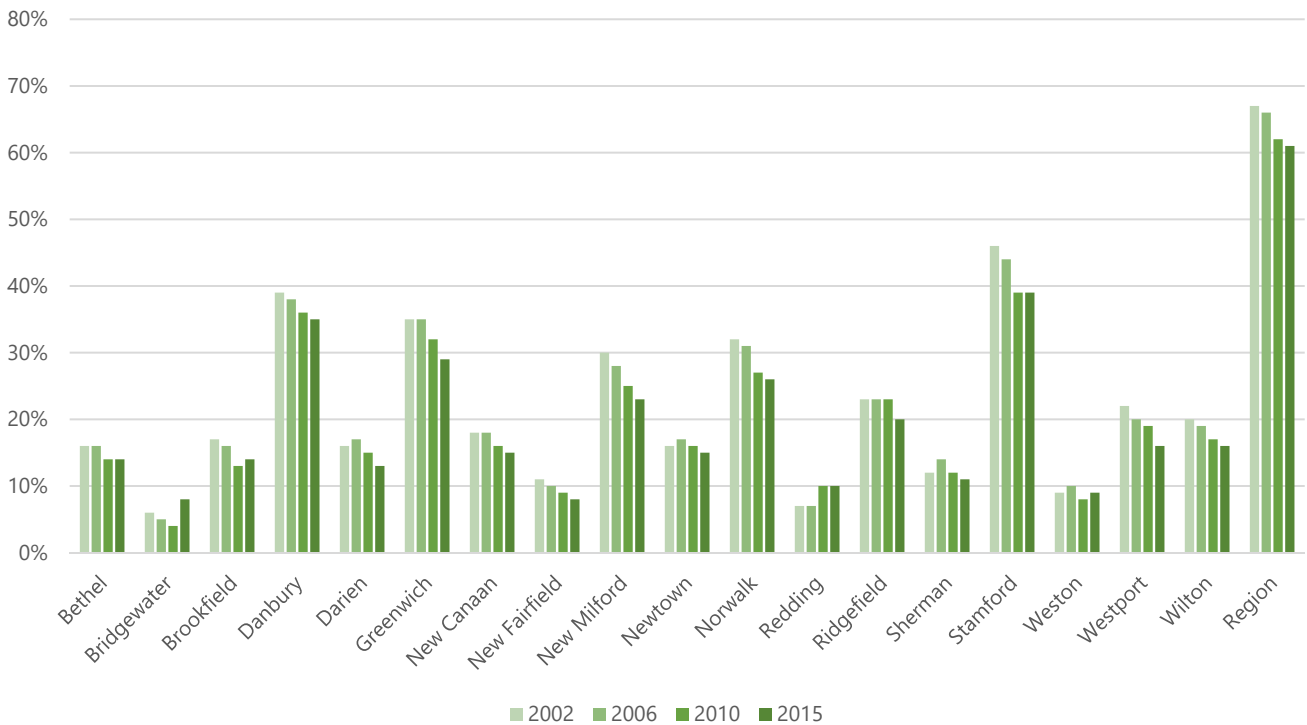
¹⁸ Stamford's vitality is measured here as the grand list value of its multi-family housing stock compared to other Connecticut cities – not the mix or type of multi-family housing it offers.

Figure 20: Labor Force Participation



Source: Connecticut Department of Labor, 2019

Figure 19: Percent of Residents Working and Living in the Same Community



Source: U.S. Census Bureau, Longitudinal Employer-Household Dynamics, 2019

The Employment-Transportation Nexus

During the last ten years, only three municipalities have seen an appreciable increase in their labor force (Danbury, Norwalk and Stamford) with the remaining fifteen municipalities experiencing declines or only marginal increases since the Great Recession (**Figure 20**). The region's major employers remain concentrated in the urban centers and this trend is likely to continue based on the range of public services, transportation systems and access these urban centers offer to the region's labor market.

Generating local employment opportunities within each municipality can be conceived as a means, not to change the rural character of much of the region, but to enhance the economic stability of its residents and of local governments that overly depend upon residential property for most of its tax revenues. There are several other ways the adverse impacts of long distance commuting on the economy can be mitigated; 1) staggered workhours for employees can reduce peak hour congestion – especially for large industries with single drive entrances; 2) work from home policies have proven to be extremely popular for professional and management services organizations where home offices can replicate the computer resources and communication systems normally found in professional offices; 3) shared ride services on a community or companywide scale have also been important means of relieving the burdens of long distance commuting in towns without public transportation.

Economic Development Plans

Not all residents benefit equally in the employment opportunities within the region. Lack of education, limited access to public transportation, lack of affordable housing, and a mismatch between employment opportunities and labor force skills can all contribute to structural unemployment within the region. Structural unemployment occurs when there is a mismatch between the jobs available and the skills of the labor force. However, it can also be influenced by underlying factors such as transportation and housing constraints that make it impractical for a person to access employment opportunities. In response to these

concerns the Western Connecticut Council of Governments has developed a Comprehensive Economic Development Strategy (CEDS) that provides a full range of goals and objectives to remedy some of these structural unemployment challenges and to foster a vital business climate. The CEDS identifies six major goals to promote the region's economic development as follows:

1. Regional Planning and Coordination

Build a stronger regional economic development program that achieves closer coordination among municipalities and between Western CT COG and state and surrounding regions.

2. Improved Business Climate

Foster an environment that encourages creativity, innovation and entrepreneurship and strengthens existing clusters.

3. An Inclusive Work Force

Attract, retain and develop a multi-faceted workforce that meets the needs of existing employers and is attractive to new firms providing high quality careers.

4. An Improved and Maintained Transportation and Public Infrastructure

Maintain, improve and develop the region's infrastructure so that it meets the needs of the workforce as well as existing and growing industries.

5. A More Sustainable and Resilient Region

Promote responsible strategies that contribute both to environmental sustainability and economic development

6. A Positive Regional Identity

Forge a regional identity that is well known globally and inspires pride in residents.

The region's Comprehensive Economic Development Strategy identifies priority projects that invest in the region's economic future with selections made based on their ability to create/retain jobs, protect the environment, have a positive regional economic impact and other "readiness" criteria concerning the "shovel ready" nature of each proposed project. Regional

approaches to economic development are essential in a world in which employment, housing, environmental protection and cultural resources are regional in scope and depend on inter-municipal and even inter-regional solutions.

Growth Opportunities

The region's strength is its proximity to the New York and Boston metropolitan areas which are sufficiently close to make many of the professional and medical services offered competitive within the larger Northeast economy. Greenwich is thirty-five miles from New York and Danbury is sixty-eight miles away. Western Connecticut is an attractive location for many New Yorkers and Bostonians seeking a 'easier' lifestyle in one of the most attractive and charming settings in New England. These factors have made hospitality, food service, and tourism important components of the region's economy. As the population continues to age, medical, hospital, and eldercare facilities will continue to expand and be competitive within the larger New York metropolitan region. While the region's limited

affordable housing will constrain opportunities in some lower-paying service-related industries, this issue should not adversely affect the prospect for continued growth of professional and managerial services that have broad market penetration at the regional and national levels. The region's nine corporate office parks – located in Brookfield, Danbury, Darien, Greenwich, Newtown, Redding, Westport, and Wilton – should continue to focus on professional and managerial services and corporate headquarters that benefit by access to the region's existing suite of services. While the corporate office park concept needs to be revamped to attract incubator firms based on emerging business trends, their physical locations within the region continue to offer locational advantage with strong links to the Greater New York metropolitan area. In addition, improved rail commuter service to New York, with interconnections to other locations in Connecticut, must also be a high priority for state investment in the region's transportation infrastructure.

Summary of Goals and Policies - Economy

Economic Development

1. Encourage economic development along the region's two major interstate systems and within industrial parks that have direct access to these highways.
2. Amend zoning to allow agricultural industries including greenhouses, nurseries, and climate-controlled food processing industries in industrial zones in the region.
3. Employ strategies including telecommuting to reduce commuting and total vehicle miles traveled at the region's largest employers.
4. Expand the supply of multi-family housing to ensure affordable housing for the region's workforce.
5. Encourage greater employment growth in the region's thirty- five villages consistent with local community character, arts and cultural resources, and sewer and water services.
6. Encourage the state to make investments in rail services within the region.
7. Ensure that the region's workforce receives the appropriate level of training and skills development to compete in the marketplace.

Community Character

The municipalities in Western Connecticut are leaders in maintaining the character and sense of place of their cities, towns and villages. Community character is a difficult concept to define. However, character depends upon the physical, cultural, historic and demographic features of each town. Cultural assets including arts and entertainment are not only essential elements of community character but contribute to the economic and public well-being of the region. A discussion of the physical character of the region is discussed in the Natural Resources section of the plan. However, open space, parks and recreation are also integral elements of community character and complement the region's physical infrastructure built to support our needs for services, employment and a sense of community identity.

Historic Districts

The eighteen municipalities in Western Connecticut provide a rich historic and architectural legacy reflected in the existence of over 5,000 historic buildings in the region's 85 historic districts. The region has one of the most extensive historic preservation programs of anywhere in New England with 774 historic properties located outside of local, state or national historic districts and 4,610 properties located within such districts. While these properties represent about one percent of the housing stock of the region their importance is not determined by their number but by their contribution to the history and character of the region. The region's historic districts include many important New England villages that played important roles in the birth of the nation and its battles against the British during the Revolutionary War. Four of the region's municipalities have existed for nearly four hundred years (Danbury, Greenwich, Stamford and Norwalk); the remainder were settled in the 18th century, with six of the municipalities incorporated after dividing off from adjoining municipalities. The interconnectedness of the region's municipalities is not

only found in its shared history, it is revealed by the interconnected roads and villages.

Scenic Roads

Since 1981, local governments have been authorized to protect the unique historic features of local roads – many of which date back to the early 17th century. Today there are 81 locally designated scenic roads offering eighty-five miles of aesthetically valuable vistas protected by municipal ordinances that preserve unique historic, aesthetic and physical features within the region. This represents nearly thirty percent of the locally designated scenic road miles in Connecticut, reflecting the region's commitment to maintaining its New England character.

For designation as a local Scenic Road the road must, by law, be free of intensive commercial development and must meet at least one of the following criteria: it is unpaved; it offers scenic views; it is bordered by mature trees or stone walls; the traveled portion is no more than twenty feet wide in width; it blends naturally into the surrounding terrain; or it parallels or crosses over brooks, streams, lakes or ponds (**Figure 21**). In addition, for designation to occur the owners of majority of land fronting the designated roadway must agree to the classification by filing a written statement of approval with the town. Usually this takes the form of a petition signed by abutting owners, which will then be verified by the municipal assessor to assure that more than fifty per cent of the road frontage concurs with the designation. By adopting a scenic road ordinance and designating a certain road as a scenic road, a municipality may regulate improvements or changes to the roadway which would alter its character. Such alterations include widening, paving, straightening, changes in grade, and removal of mature trees or stone walls, whether proposed by municipal departments, utilities or abutting property owners. While these restrictions accompany any road so designated, a scenic road ordinance does not interfere

with normal maintenance activities, nor prevent essential safety improvements or the construction of new roads or private driveways which intersect with the designated scenic road.

In addition to local scenic roads, there are four state designated scenic roads including the Merritt Parkway,

Route 53 in Redding, Route 136 in Westport and Route 33 in Wilton offering 28.5 miles of scenic vistas. The Merritt Parkway passes through Greenwich, Stamford, Darien, Westport and Norwalk connecting the region to New York in the south and Hartford in the north. State scenic road designations are managed by the Connecticut Department of Transportation.



Figure 21: Scenic Road near a Burial Ground in Greenwich, CT

Historic Villages

While many important historic resources have been protected by local, state and national historic district designations, there are also many unique villages with special charms that may not qualify under the restrictive requirements of historic district regulations. Since 1998, Connecticut municipalities can establish village districts under the more flexible village district zoning enabling laws of Connecticut General Statutes Section 8-2j. Ten of the region's municipalities have explicitly adopted village district regulations for thirty-five villages. In addition, five municipalities have adopted traditional zoning regulations to protect

historic villages within their jurisdiction. The zoning protections offered under the Village District Act improve architectural design and continuity of village form that would otherwise not be possible under the more limited authorities of conventional zoning. Municipalities in Western Connecticut have been leaders in statewide efforts to protect and improve community character with many villages dating back to the pre-Revolutionary War era. The rich historic New England legacy found in Western Connecticut makes the region a destination hub for thousands of genealogists seeking to find their roots, for weekenders

seeking respite from urban life, and for millions of tourists fascinated by its New England charm.

Maintaining the integrity of our historic villages also requires an ability to adjust to the needs of present and future generations. Villages, towns and cities undergo continuous change and one of the key roles of the regional plan is to integrate new development into the fabric of the community without compromising the sense of place and character that currently exists. The adoption of architectural review boards, as required by the 1998 Village District Act, has proven to be an excellent means of negotiating the design challenges of maintaining village character in a changing world.

Consideration should be given to adopting community design guidelines to integrate growth and enhance community appearance. Consider models such as Simsbury, Connecticut's award-winning Guidelines for Community Design. In addition, several municipalities

have developed regulations to protect viewsheds and important ridgelines from inappropriate development. Examples of such approaches can be found in Kent, Woodbury, and Winsted, Connecticut subdivision regulations and in the Meriden and Suffield, Connecticut zoning regulations.

To further protect character, municipalities that have yet to adopt strategies for protecting their existing villages should consider adopting the additional design controls available under the Village District Act. Bridgewater, Darien, Greenwich, New Fairfield, Redding, Sherman, and Weston may wish to consider some of the design review authorities offered by the Village District Act.

Community Character and Natural Resources

An important feature of the region is its wide range of protected lands and lands that remain undeveloped. As of 2015, three percent of the region's land area consisted of agricultural fields; forty eight percent of deciduous and coniferous forests, three percent of forested and non-forested wetlands and tidal wetlands, fifteen percent of turf and grass and utility corridors and four percent of water bodies. The balance of the region is consumed by a range of developed land that constitutes twenty six percent of the region's land mass. There is a great deal of variation in the amount of undeveloped land within the eighteen municipalities, ranging from Bridgewater and Redding with ninety-two and eighty-eight percent respectively of their land being undeveloped. Bridgewater's total land and water comprises 11,110 acres and is exceptionally hilly.¹⁹ High ridges in the central, northwestern and eastern sections descend abruptly to Lake Lillinonah (formed by a hydroelectric dam on the Housatonic River) along the town's southwest and southeast borders, to the Clatter Valley on the northwest, and tower above the Shepaug Valley along the eastern border. Redding faces similar development constraints for its 20,497-acre land area with the greatest development limitations posed by the fact that eighty five percent of the town falls within a public water supply watershed.



Figure 22: Uncle Sam still lives in Danbury, CT

¹⁹ UCONN Center Land Use Education and Research, 2015.

In contrast, in 2015 only thirty nine percent of Norwalk, fifty five percent of Stamford and fifty five percent of Westport remained undeveloped – reflecting the more urbanized condition of municipalities located along the coastline.

Zoning and Land Use

The region's character is also strongly influenced by the types of development that have been allowed over the last one hundred years. Municipalities along the coast were amongst the first to adopt zoning regulations in Connecticut reflecting the early development pressures from the outmigration of New Yorkers during the dawn of the automobile age. Five municipalities adopted zoning regulations in the nineteen twenties [Danbury (1929) Darien (1925), Greenwich (1926), Norwalk (1929) and Stamford (1926)] of which all but Danbury are located along the coast.

In contrast, most municipalities in the northern tier of the region [(e.g., Bethel (1959); Brookfield (1961); Bridgewater (1962), New Milford (1971), Redding (1950), and Ridgefield (1946)] adopted zoning after World War II as road systems improved and commuting patterns made many of these municipalities more easily accessible by automobile. The construction of the Connecticut Turnpike (I-95) and the Interstate Highway System, resulted in a shift away from the historical emphasis on centralized development and ushered in the dawn of the suburb.

Zoning regulations have significantly influenced the region's pattern of development by creating zones that separate so-called incompatible land uses to protect property values and minimize conflicts between commercial and residential development. The results of the region's long running experiment with zoning have led to some remarkable improvements in the protection of community character – especially open

space, stream belt zoning, watershed protections and village district regulations.

On the flip side, traditional zoning has often led to poorly orchestrated compositions of residential, commercial, and industrial development that has contributed to long commuting distances connecting bedroom communities to the region's employment centers. The notion of bedroom communities is an artifact of the automobile era. Those that could afford to leave the cities to raise their children increased their commuting times for the sake of life in the country. While the automobile inspired dreams of life in rural America, it also created fragmented land use patterns that have increased the amount of energy, and pollution associated with the journey to work. As Jane Jacobs has pointed out, municipalities that have integrated residential and commercial development are often the most vital neighborhoods since they meet a wide range of human needs while increasing the sense of community for its inhabitants.²⁰ A shared sense of place is one of the reasons the more dynamic Village District concept, enabled by Public Act 98-116, has been so strongly embraced within Western Connecticut. Development of village clusters – rather than single family enclaves without services – is the region's next challenge. To achieve this goal will require a revision of traditional zoning that segregates – rather than integrating – land uses. Limiting residential development in rural sections of the region and increasing development in urban centers accessible to public transportation and sewer and water services is a critical priority for the region if we wish to reduce the energy, pollution, and time associated with the journey to work.

²⁰ Jane Jacobs, *The Death and Life of Great American Cities*, 1961, pp. 152-177.

Summary of Goals and Policies – Community Character

Historic Preservation and Tourism

1. Promote the tourism value of the region's unique historic, cultural, arts, and natural resources as one of its greatest economic development assets.
2. Market and raise awareness of the unique historic legacy found in western Connecticut.
3. Identify additional local scenic roads that should be preserved to create more livable communities that offer biking, walking, and access to nature.
4. Adopt the special zoning authorities for village districts enabled by Section 8-2j of the Connecticut General Statutes as amended, where it has not yet been established.

Water Supplies and Natural Resources

One of the most important challenges facing the region is the development of new water supplies to supplement existing sources. Municipal boundaries often do not conform to watersheds, and access to water resources is not evenly distributed across all eighteen municipalities in the region. During the last five years the state of Connecticut has inventoried the water supply resources and needs of all 169 municipalities. This effort has identified regional solutions that will be required to maintain a viable long-term water supply. Water supplies are provided by a wide range of surface water reservoirs, community water systems, groundwater aquifers and more recently by a growing use of interconnections between water supplies to ensure reliability during droughts and other emergencies. Water supplies in Western Connecticut are parochial in nature with most of the municipalities relying on their own aquifers, reservoirs, or community water systems to meet their critical water needs.

Recently, due to the drought that impacted Stamford several years ago, municipalities have become more aware of the need for interconnections within the region's water supply system to minimize the loss of water resources during high demand periods coinciding with drought conditions. To understand the scope of the region's long-term water supply challenges this section reviews the current sources of water, watershed management policies, stormwater management, and land use controls that influence the quantity and quality of the water supply.

Aquifer Protection Strategies

The region has twelve protected aquifers currently used for public water supply, all of which have been delineated to ensure watershed management controls minimize water pollutants from entering the drawdown zones of aquifers serving one thousand or more people (**Table 16, Aquifer Protection Areas Map**). While these efforts are a necessary step in protecting these vital water resources, more needs to be accomplished for other aquifers that have yet to be used for public water supply purposes. The state Department of Health has not required similar documentation of potential aquifers supplies within Connecticut even though this initiative has been authorized by Connecticut Zoning enabling legislation in 1989. Currently, only Ridgefield has established zoning regulations that consider the need to protect both existing and potential aquifers to meet future water supplies. Previous work conducted by the former Housatonic Valley Council of Chief Elected Officials identified forty potential aquifers that could be tapped for future water supplies.²¹ These aquifers should be given priority consideration for land acquisition and/or the purchase of development rights to ensure their availability for future use. Both existing and potential supply sources should be given equal weight for protection on the Future Growth Map, as Conservation Areas. Until a future supply area's final water supply status is determined, it must receive protection as if it were to become such a supply, lest its runoff be degraded beneath drinking water standards. Both state and regional plans share identical concerns for the protection of these resources. Inclusion of potential aquifers as a priority for protection is not an

²¹ Housatonic Valley Council of Elected Officials, Housatonic Valley Regional Plan of Conservation and Development, Chapter 3, Water Supplies and Water Resource, Adopted July 1, 2009.

endorsement of the water supply proposal by its potential water receiving or water donating member municipality. Rather, this action defines the agenda for upcoming water supply studies and policy formulation.

Table 16: Aquifer Protection Areas in Western Connecticut: 2019

Municipality	Aquifer Protection Area
<i>Darien</i>	Rewak
<i>Stamford</i>	Rewak*
<i>Norwalk</i>	Kellog-Deering*
<i>Westport</i>	Coleytown*
<i>Westport</i>	Canal Street*
<i>Wilton</i>	Coleytown
<i>Weston</i>	Coleytown
<i>Ridgefield</i>	Oscaleta*
<i>Danbury</i>	Lake Kenosia*
<i>Bethel</i>	Chimney Heights*
<i>Bethel</i>	Maple Avenue*
<i>Newtown</i>	Fairfield Hills*
<i>Newtown</i>	South Main Street*
<i>Brookfield</i>	Meadowbrook*
<i>New Milford</i>	Indian Field*

(*) Indicates Primary Municipality Aquifer Location

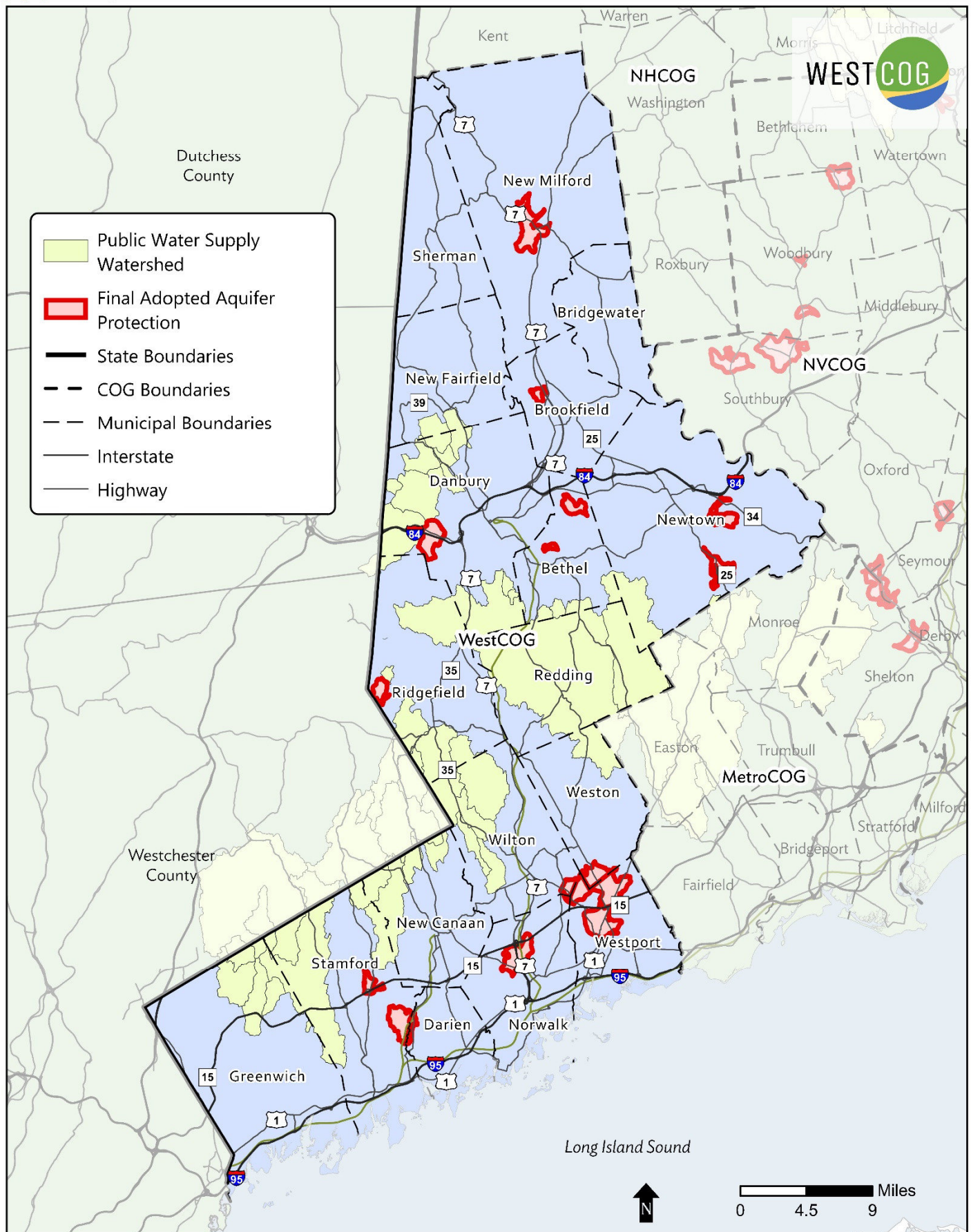
Water Diversion Registrations and Permits

Connecticut regulates water suppliers that extract more than 50,000 gallons of water per day under the state's Water Diversion Law. Those water suppliers that established wells prior to July 1, 1982 when the state's water diversion law was enacted had their existing well capacities grandfathered as long as they registered with the state. In contrast, those seeking to develop water supplies since 1982 fall under a more rigorous permit program that evaluates the potential impacts of each well including its consequences on adjoining properties, the environment, public water supply needs and other factors. Thirty-nine diversion permits have been issued within Western Connecticut since 1982, enabling the withdrawal of up to 53.18 million gallons per day (MGD) from one hundred and twenty-eight permit holders. Danbury's permit accounts for 37 MGD of that total, followed 3.6 MGD for the Ridgefield water system.

In contrast, the water supply systems pre-dating the state's diversion law account for 506 MGD, with the major authorized withdrawals associated with New Canaan (125 MGD), Greenwich (121 MGD), Wilton (107 MGD), and Stamford (86.9 MGD). Not all withdrawals are for public water supply purposes. Golf clubs, large industries, universities, country clubs, and recreational organizations account for 16.8 MGD of the total consumptive water use under the water registration program, and these uses account for 11.7 MGD of total consumptive use under the water permit program. The state has yet to establish capacity limits for the pre-existing diversions which means that it is not clear if these drawdowns are sustainable under the Department of Health's margin of safety standards that accounts for water availability in the worst year over a one-hundred-year planning horizon. The region's water supplies are not merely impacted by uncontrolled drawdowns from grandfathered water supplies, they are also adversely impacted by the limited interconnectedness of the entire region's water supply system.

Aquifer Protection Areas

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Interconnected Systems

The challenges posed by limited water supplies may be addressed by establishing interconnections between adjoining water companies. This approach is useful especially when the same water utility company has the right to serve both municipalities and/or the interconnection is mutually beneficial. For example, thirteen of the seventeen major community water suppliers in Western Connecticut have already established interconnections to address the need for backup water supplies in the event of emergencies. Additional efforts are underway to improve the interconnectedness of the region's water supply. There are eighteen planned interconnections within the region's water suppliers with most of these initiatives being undertaken by Aquarion Water Company in the towns of Brookfield, Newtown, New Fairfield, New Milford, and Ridgefield. Even when interconnections represent an internal company planning process, there can still be significant obstacles to overcome. The 2016 Western Public Water Supply Management Area (WPWSMA) report has identified numerous challenges in establishing an interconnected system including "water quality differences, pressure gradients, the challenges associated with diversion permitting, and/or lack of agreements for the movement of water."

As mentioned above, the movement of large volumes of water triggers the state's water diversion regulations, including when more than 50,000 gallons of water is exported from one watershed into another. The decision to export water is a highly controversial one and requires considerable regulatory oversight due to the environmental and economic consequences of such decisions. Exporting water from one watershed into another can adversely affect stream habitats, future water supplies of adjoining municipalities, and even the wastewater diluting capacities of watercourses that serve as the discharge points for wastewater treatment plants. In an ideal world, land development patterns should be consistent with the water carrying capacity of the underlying watershed boundaries. Of

course, this has little resemblance to past water development practices in Connecticut where many municipalities rely on water exported from distant rural areas to meet their burgeoning population needs. Interconnected water supply systems are especially relevant today as we no longer have land to annex to address water shortfalls. Regional solutions to water supply will inevitably become more important as Western Connecticut's population expands despite its land and water resources remaining stagnant.

Responding to a water crisis affecting several regions, in 2014 the Connecticut General Assembly mandated the development of the state's first modern Water Supply Plan to provide a coherent approach to the generation and distribution of surface and groundwater supplies. The final plan, which was issued in 2017, adopted in 2019, has not yet been implemented but identifies significant actions required to sustain long term water supplies in Western Connecticut. One component of that plan is the development of interconnections between major water supply service areas to provide a margin of safety for affected municipalities.

The most urgent and least controversial need is to develop interconnections for emergency purposes. This strategy is most likely to garner state and regional support, especially when it offers an opportunity to provide critical supply redundancy with minimal long-term impact. Five of the region's community water systems have emergency interconnections that enable Aquarion's various divisions to better equilibrate unexpected demands on its overall water supply systems.

Public Water Suppliers

The region is well served by public water suppliers with over eighty separate water companies providing service connections to seventy-two percent of the population. Based on data supplied by the Connecticut State Department of Health and Aquarion Water Company for 2018, 440,264 persons in Western

Connecticut have public water service with the greatest level of service offered in the urbanized areas of Darien (97% have public water service); Greenwich (97%); Norwalk (93%); Stamford (92%) and Westport (98%). As of 2017, fifty nine percent of the region's population served by public water suppliers are served by one or more of Aquarion Water Company's forty-three subsidiary organizations.

The Connecticut State Department of Health requires five-year updates to water supply plans to ensure water companies have sufficient water to accommodate changing water consumption trends and the development plans of local governments. With the state's emphasis on protecting groundwater and surface water quality and quantity for recreation, aesthetic and ecological reasons, water suppliers must not only consider safe yields under authorized water diversion permits but should consider the adverse consequences of over-pumping from groundwater supplies exempted under the water diversion registration program.

Small Water Systems

There are sixteen privately owned public water utilities that own and operate small systems serving one thousand or more people. In addition, there are thirty-seven community water suppliers with fewer than 1,000 customers. These smaller systems, which do not have the resources of a larger system, often face administrative and financial challenges in regulatory permitting, technical assessment, system maintenance, infrastructure replacement, and water supply. These smaller systems pose a long-term planning challenge due to limited resources to address asset management and insufficient staff to provide a safe and reliable supply of drinking water. To some extent, these hurdles are overcome by ownership strategies that enable the centralization of administrative functions for multiple small systems under one management umbrella. This approach works well and, in part, explains why Aquarion Water Company has been an important

provider of Community Water System services in the region. It also suggests that the development of exclusive service areas within the region can facilitate a more efficient delivery of future water supplies under more efficient management structures.

Water Conservation Strategies

The Connecticut Department of Public Health requires any new development to plan for a minimum of seventy-five gallons of water consumption per capita when a new water supply is needed. While this rule of thumb is a valuable tool for planning the worst-case impacts created by new residential development, it is imperative that planning and zoning commissions and the Western Connecticut Council of Governments offer incentives such as the adoption of water conserving fixtures, the installation of water conservation measures for urban and suburban landscaping, and other stormwater collection devices that can make beneficial reuse of rainfall. The gallon saved through conservation is far cheaper than the gallon derived from a new well, from an expanded reservoir, or through an interconnection to an adjoining municipal water supplier.

Land Use Protection Strategies

Apart from Ridgefield, Redding, Norwalk, Weston, Wilton and Greenwich, municipalities in the region have not developed local strategies to protect potential sources of groundwater that could meet future drinking water needs. Ridgefield has established aquifer protection requirements for potential drinking water resources, Redding has committed to maintaining the integrity of its extensive aquifer system in view of 85% of its land area falling within public water supply watersheds, Norwalk has emphasized the importance of protecting four potential aquifers for long term water supply uses, Weston has adopted recommendations to reduce the potential contaminant burdens of septic tanks and pesticides on local aquifers and private wells, Wilton has identified impaired aquifers that require additional groundwater and

stormwater protections to protect long term supplies, and Greenwich has made commitments to the purchase of open space to support the continued supply of surface and groundwater. Since 40 percent of Greenwich's residents rely on private wells, its Plan of Conservation and Development has emphasized the importance of protecting groundwater recharge through land use strategies such as large lot zoning and more stringent pervious cover standards.

Drinking Water Protection

In addition to efforts to protect drinking water through land use controls governing aquifers, efforts must also be focused on the types of chemicals used, stored and applied in municipal, commercial, industrial and warehouse operations within the region.

Over the last several years, there has been increasing number of private and public wells with elevated levels of sodium chloride in the water. While high levels of sodium chloride have minimal health effects for healthy individuals, those with high blood pressure or other medical conditions requiring a low sodium diet can unknowingly be consuming excess sodium chloride. Another cause for concern is that chloride can cause

pipes and other fixtures to corrode, possibly depositing lead or other harmful metals into the drinking water. Therefore, it is imperative to use only the amount of sodium chloride that is necessary during winter maintenance procedures. In 2018 the Western Connecticut Council of Governments undertook a study to understand the various Winter Maintenance practices of the region. It outlines best practices used to limit the amount of road salt or sodium chloride that is being applied to

the roadway, many of which are already being used by municipalities in the region. It is also important for municipalities to have training on the current best practices in winter maintenance. Trainings were held in both 2017 (**Figure 23**) and 2018 through WestCOG and continue to be offered through programs such as Green Snow Pro at the UCONN Technology Transfer Center. Both private winter maintenance professionals and homeowners also need to be aware of the quantity and location they are applying road salt. Snow should not be plowed close to the cone of influence for on-site wells.

There are also other contaminants that need to be properly managed to ensure safe drinking water in the region. The Emergency Planning and Community Right to Know Act (EPCRA) enacted by Congress in 1986 established requirements for industries to report the chemicals used on site so that emergency responders can be prepared to address chemical releases, fires and other emergencies that might expose a community to toxic chemicals. Unfortunately, while this law improved emergency response capabilities across the region and the United States, it did not authorize federal, state or



Figure 23: Winter Maintenance Training on 11/1/2017

local governments to restrict the use toxic chemicals that might be released to the environment. Several municipalities in Western Connecticut have experienced contamination of groundwater resources that will remain polluted for generations to come after a toxic chemical, known by its acronym PFAS, was released from a nearby airport that used it for fire protection purposes.²² The drinking water crisis posed by PFAS triggered the creation of a statewide PFAS Task Force that developed strategies to protect the health and welfare of Connecticut's residents and the environment.²³ The PFAS Task Force identified 38 recommendations to address PFAS contamination. While it is expected that PFAS cleanups will be costly, the state has yet develop maximum contaminant levels (MCL) to guide the cleanup process. The costly nature of PFAS cleanups and their threat to public health, underscores the importance of developing pollution prevention strategies that eliminate the use of these chemicals in the commercial, industrial and consumer product arenas.²⁴

Simply testing for PFAS and other toxic substances that may exist in our groundwater is not enough to prevent similar releases from happening again. Land use agencies should consider reviewing the types of businesses and industries allowed in commercial, warehouse and industrial zones to determine if any of these uses may pose potential threats to groundwater resources. Disclosure of chemicals is required by EPCRA and this information can aid planning and zoning commissions in making more informed land use decisions

Protection of Long Island Sound

In April 2018, the Connecticut Department of Energy and Environmental Protection (DEEP) released its comprehensive study titled *Long Island Sound Resource and Use Inventory*. The study was mandated by the

Connecticut State Legislature to protect natural resources in the face of ever-changing land use and development patterns along the Connecticut coastline. The regional plan of conservation and development is particularly focused on development activities that contribute to hypoxia, pathogens, toxic contaminants, and floatable debris in Long Island Sound. From this perspective, stormwater management, sewage treatment operating parameters, coastal wetland and riparian corridor protection strategies are essential elements of any Long Island Sound protection strategy.

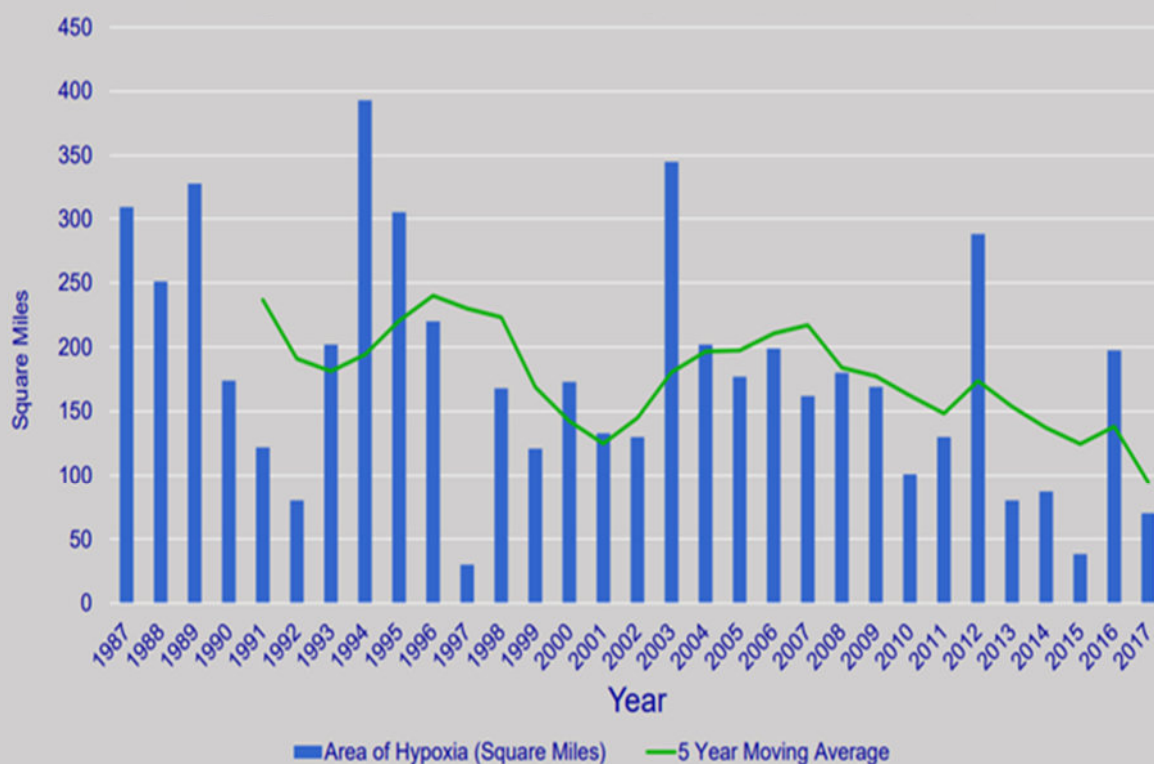
In addition, municipalities along the Long Island coast must avoid investments in the coastal zone anticipated to be impacted by rising sea levels in the next one hundred years. Where infrastructure upgrades for roads, water and sewer service are under consideration in the coastal zone management zone, no municipal investments should be considered until a lifecycle cost analysis is completed that considers the full range of costs and benefits, positive and negative externalities, and the degree of long-term structural integrity that can be achieved by such investments. DEEP has found hypoxia levels to be the most severe in the westernmost portion of Long Island Sound where stormwater and sewage treatment plant discharges – including systems with combined stormwater and sewage – have been most common. To some extent, the national effort to improve stormwater through the Municipal Separate Storm Sewer System (MS4) promulgated by the U.S. Environmental Protection Agency will have a long-term positive impact on reducing hypoxia levels in the Sound. However, point source discharges from industries and sewage treatment plants are also contributors to hypoxia conditions in Long Island Sound.

²² PFAS = Per- and Polyfluorinated Alkyl Substances

²³ PFAS Action Plan by the Connecticut Interagency PFAS Task Force, November 1, 2019

²⁴ Connecticut Interagency PFAS Task Force, July 30, 2019

Figure 24: Long Island Sound Area of Hypoxia (Square Miles)



Source: Long Island Sound Nitrogen Reduction Strategy, Public Webinar, November 29, 2019

As can be seen in **Figure 24**, hypoxia levels in Long Island Sound have generally declined over the last thirty years from nearly four hundred square miles of oxygen depleted Sound area in 1994 to less than seventy-five square miles in 2017. According to the 2017 DEEP Long Island Sound Water Quality Monitoring Program, hypoxic levels existing along the Greenwich to Darien corridor exceeded acceptable levels more than 90% of the time between 1991 and 2012 (**Figure 25**).

However, by 2018 conditions along the westernmost sector of Connecticut's Long Island Sound had made significant improvement based on a revised analysis using dissolved oxygen as the parameter of choice (**Figure 26**).

According to DEEP, the state's nitrogen trading program has played an important role in reducing nitrogen levels – the primary cause of hypoxia in Long Island Sound. This program has also facilitated a more cost-effective approach to reaching the established Total Maximum Daily Loads (TMDL) established for nitrogen levels in the Sound.²⁵ While these efforts are laudable much work remains to be done to disconnect stormwater systems from Long Island Sound and to enhance the performance of sewage treatment plants. Moreover, nitrogen pollution is a multi-state regional challenge since as much as 54% of the estimated nitrogen pollution found in Long Island originates in headwaters north of Connecticut's border with Massachusetts.²⁶

²⁵ Connecticut Department of Energy and Environmental Protection, Report of the Nitrogen Credit Advisory Board for Calendar Year 2017 To the Joint Standing Environment Committee of the General Assembly, 2017, p. 4.

²⁶ John R. Mullaney and Gregory E. Schwarz, U.S. Geological Survey, Estimated Nitrogen Loads from Selected Tributaries in Connecticut Draining to Long Island Sound, 1999–2009, 2013, p. 27.

Figure 25: The Frequency of Hypoxia in Long Island Sound Bottom Waters

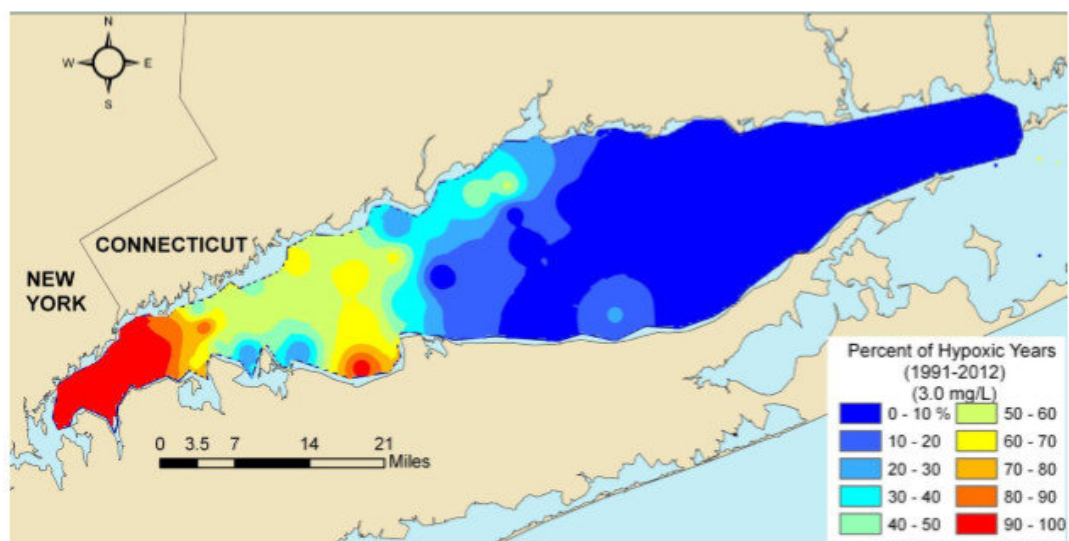


Figure 11-1: *Frequency of Hypoxia in Long Island Sound over 21-Year Span*. This map was developed from CT DEEP Long Island Sound Water Quality Monitoring Program data (CT DEEP, 2017).

Figure 26: Dissolved Oxygen in Long Island Sound Bottom Waters

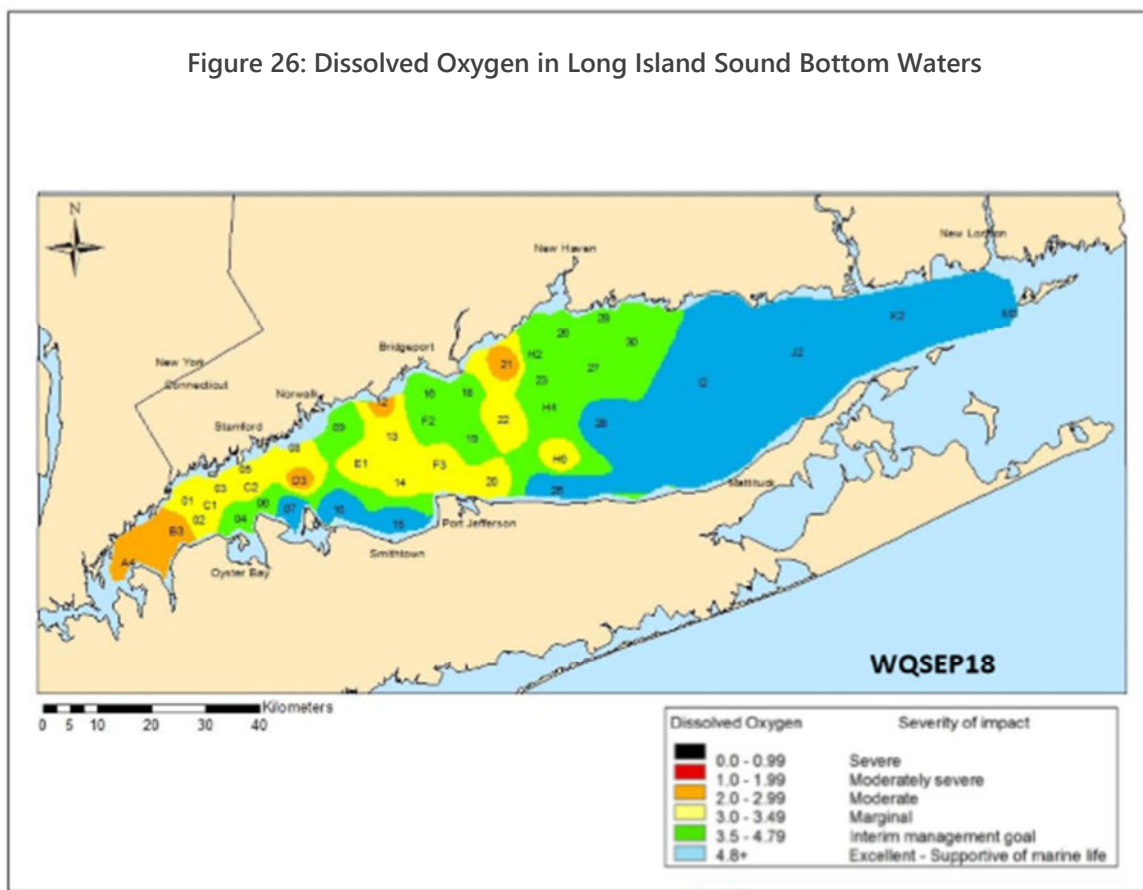


Table 1. Minimum Dissolved Oxygen Concentrations and Areal Estimates for WQSEP Cruises Conducted from 1998-2018 by CT DEEP.

In addition, farming practices and homeowner overuse of chemical fertilizers within the watersheds of Western Connecticut also contribute to high nitrogen levels that cause hypoxia within the Sound. The Long Island Sound Study identified 235 point-source dischargers accounting for 19.2 million kilograms of Nitrogen per year and 340 regulated MS4 discharges into Long Island Sound (including 202 located in Connecticut) that discharge over 1.3 million kilograms of Nitrogen annually. Ten water pollution control facilities (WPCF) in Western Connecticut generate 297,821 kilograms of Nitrogen annually that directly impacts Long Island Sound (Table 17).

The findings from the wide range of studies conducted to date underscore the importance of regional and interstate solutions to managing the denitrification of Long Island Sound. Municipalities in northern Connecticut as well as those located in Massachusetts, Vermont, and New Hampshire may not recognize their role in protecting the health of Long Island Sound. To remedy this deficiency, state and federal legislative/regulatory remedies may be required to address the nitrogen contributions of out of state point and non-point sources impacting hypoxia conditions in the Sound.

According to the Blue Plan, more than 4 million people live in the Sound's adjoining communities, and the Sound's watershed includes nearly 9 million people on both sides of the Sound.²⁷ A wide range of maritime transport relies on the Sound to transport people and goods into deep water harbors. It also provides a livelihood to commercial and recreational fishers and shell fishers as well as passive recreation to boaters, birdwatchers and many other use sectors. The Blue Plan estimates that human activities in the Sound generate about \$9.4 billion annually (in 2015 dollars)

for the regional economy. All told Long Island Sound is among the most important and valuable estuaries in the nation which explains why Congress, in 1987, designated Long Island Sound an Estuary of National Significance.

Aquaculture in the Sound – Good for the Economy and the Environment

One of the strongest motivations for protecting the water quality of the Sound is to protect aquaculture including shellfish. Deterioration of water quality along the Connecticut coastline has led to numerous closures of shellfish grounds – both those controlled by the state and by local governments and natural beds that are not licensed to specific individuals. The Connecticut DEEP has defined shellfish beds using a six-tier classification system that provides for; 1) approval of beds where it is safe to harvest for direct consumption; 2) two categories of conditional approvals that depend upon the season, the water quality and whether the bed is near a sewage treatment plant; 3) two categories of restrictions on shellfish operations reflecting poor water quality associated with sewage treatment locations or a lack of survey data to validate a public health determination concerning the safety of shellfish.

Historically, combined stormwater and sewage systems have been one of the chief concerns for aquaculture along the Connecticut shoreline. Upgrades of sewage treatment plants to tertiary treatment levels, reduction in the direct discharge of stormwater into Long Island Sound, and the enforcement of floodplain management through zoning have reduced some of the adverse water quality impacts on coastal waters. Yet these efforts have not been enough.

One promising approach to improving the aquaculture economy and removing nutrients from Long Island Sound is the adoption of nutrient bio-extraction

²⁷ Long Island Sound Inventory and Science Subcommittee of the Blue Plan Advisory Committee. "Long Island Sound Resource and Use Inventory." 331. Groton, CT: University of Connecticut, 2018.

strategies relying on mussels and seaweed to remove nitrogen from the aquatic environment. A demonstration study conducted in the Bronx has shown some promising results where a 20 by 20-foot mussel raft was shown to filter more than 3 million gallons of water a day. The Long Island Sound Study, conducted as a joint venture of the U.S. Environmental

Protection Agency and the states of Connecticut, New York and Rhode Island, has established a long-range plan for protection of the Sound. Its objectives, including the reduction of hypoxia in the Sound, are supported by WestCOG.

Table 17: Municipal and Industrial Point Sources in Western Connecticut Discharging into Long Island Sound

Facility	NPDES ID	Watershed	Receiving Water	Design Flow (MGD)	Actual Flow (MGD)	Load (kg N/Yr.)	Concentration (mg/L)
<i>Danbury WPCF</i>	CT0100145	N/A	Seth Williams Brook	15.5	8.34	56,164	4.86
<i>Greenwich WPCF</i>	CT0100234	Greenwich Harbor	Long Island Sound	12.0	8.09	73,063	6.52
<i>Kimberly Clark Corp.</i>	CT0003212	N/A	Housatonic River	N/A	2.955	7,234	1.79
<i>New Canaan WPCF</i>	CT0101273	Five Mile River	Five Mile River	1.7	.881	2,816	2.31
<i>New Milford WPCF</i>	CT0100291	N/A	Housatonic River	1.02	.56	3,976	5.13
<i>Newtown WPCF</i>	CT0101788	N/A	Pootatuck River	.932	.466	2,485	3.85
<i>Norwalk WPCF</i>	CT0101249	Norwalk Harbor	Norwalk River	18.0	12.525	96,588	5.57
<i>Redding WPCF</i>	CT0101770	Norwalk River	Norwalk River	.245	.06	NA	NA
<i>Ridgefield WPCF</i>	CT0100854	N/A	Great Swamp	1.0	.726	7,124	7.09
<i>Stamford WPCF</i>	CT0101087	Stamford Harbor	Stamford Harbor	24.0	15.416	45,058	2.16
<i>Westport WPCF</i>	CT0200684	Saugatuck River	Saugatuck River	3.25	1.351	3,313	1.77
Total				77.65	51.37	297,821	

Source: U.S. Environmental Protection Agency, *Establishing Nitrogen Endpoints for Three Long Island Sound Watershed Groupings*, March 27, 2018, pp. B-8 to B-10, & Redding WPCF NPDES Permit.

Protected Open Space

The State of Connecticut has established a collective goal of protecting 21% of all lands as open space by the year 2023. This goal is set forth in the state's Comprehensive Open Space Acquisition Strategy, known as the 2016-2020 Green Plan. That plan holds the state responsible for acquiring 62,960 acres and for its partners (e.g., municipalities, land trusts and other organizations) to acquire the remaining 108,920 acres of open space needed to reach its goal of 673,210 acres of protected open space by the year 2023. The state, municipalities and land trusts in western Connecticut have made commendable efforts to achieve this goal, with an estimated 57,862 acres of land protected for open space. This is equivalent to 16.4% of all lands within western Connecticut (**Protected Open Space in Western CT map, Table 18**).

For the region to collectively meet the state's open space acquisition goal - using the fiscal effort formula of 48% State and 52% partner - western Connecticut municipalities, land trusts and other conservation organizations will need to identify and protect about 8,373 additional acres. Not all the region's municipalities will be able to equally acquire their fair share of protected open space called for by the state's Comprehensive Open Space Acquisition Strategy. For example, Norwalk, Stamford, and Danbury have less available open space land and therefore it is incumbent on suburban and rural municipalities to play a more proactive role in meeting the overall state open space goal.

To reduce the financial burden of protecting open space, consideration should be given to leveraging state and federal funds allocated for farmland protection and open space protection including the Connecticut Farmland Preservation Program, the Connecticut Recreation and Natural Heritage Trust Program, the U.S. Department of the Interior Land and Water Conservation Fund Grant Program, and the U.S. Department of Agriculture's Healthy Forest Reserve

Program. In addition, purchase/transfer of development rights, permanent open space easements, payment in lieu of open space, and innovative municipal land banking strategies that authorize limited development in exchange for long term open space protections for large parcels of land can be important tools in meeting the region's long-term open space needs. Similarly, municipalities that have established robust open space subdivision standards that protect special properties with unique ecological and cultural resources, can also expand open space resources - especially when these parcels are sited as a part of an integrated municipal open space management plan.

One of the most important means to reach the goal is to establish a coordinated and accurate open space data base that can be used by all parties to track performance. The Connecticut Department of Environmental Protection has created the Connecticut Land Registry Pilot which is intended to meet the database requirements of state agencies, municipalities, and land conservation organizations. When it is fully operational the land registry will facilitate municipal and regional efforts to identify priority lands suitable for open space acquisition based on regional goals of reducing forest fragmentation, improving wildlife corridors, protecting riparian corridors, creating more accessible park and recreational facilities and improving the interconnectedness of open space, forest and wildlife habitats. Appendix E contains recommended criteria for designating protected open space to assist municipalities with the standardization of the data collection efforts and to enable a consistent approach to tracking open space at the regional and state levels.

Greenways

An additional method used to designate open space is through the creation of greenways. The Connecticut General Statutes defines a greenway as "a corridor of open space that (1) may protect natural resources,

preserve scenic landscapes and historical resources or offer opportunities for recreation or nonmotorized transportation, (2) may connect existing protected areas and provide access to the outdoors, (3) may be located along a defining natural feature, such as a waterway, along a man-made corridor, including unused right-of-way, traditional trail routes or historic barge canals or (4) may be greenspace along a highway or around a village.” Greenways serve the important purpose of increasing the connectivity of open space throughout the state, critical for wildlife and pollinator protection, in addition to, more connected recreational spaces.

Since 2001, nine greenways have been designated by the Connecticut Greenways Council (CT DEEP) in western Connecticut, including:

- Housatonic Riverbelt Greenway
- Ives Trail
- Mianus River Greenway
- Mill River Greenway
- New Milford River Trail Greenway
- Newtown Greenway System
- Norwalk Heritage Greenway
- Norwalk River Valley Linear Trail
- Still River Greenway

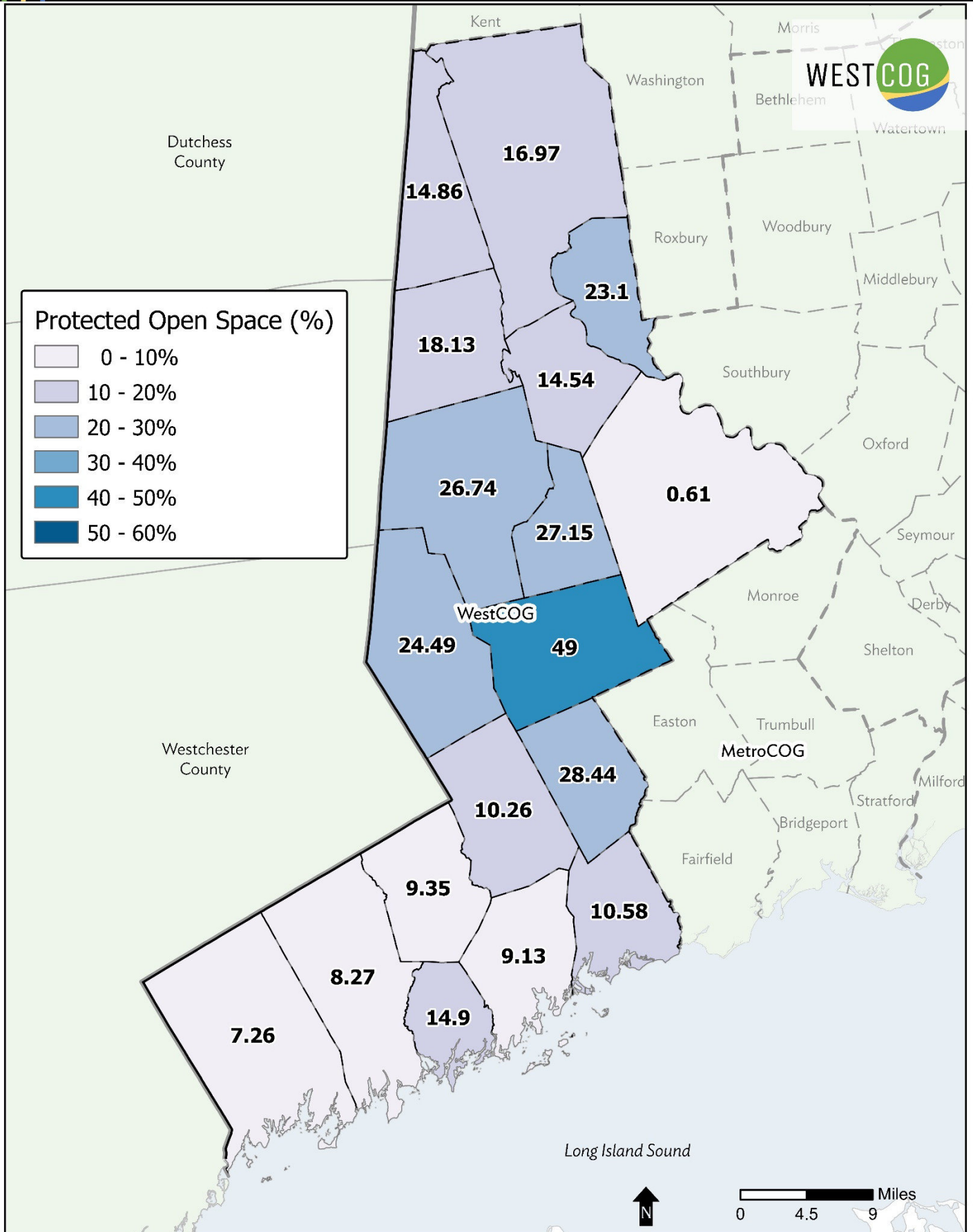
Table 18: Protected Open Space in Western Connecticut: 2019

<i>Municipality</i>	Deeded Open Space Acres	Total Municipal Acres	Percent of Total Land Area
<i>Bethel</i>	2,943.6	10,843.9	27.1
<i>Bridgewater</i>	2,567.0	11,110.4	23.1
<i>Brookfield</i>	1,895.3	13,036.7	14.5
<i>Danbury</i>	7,517.7	28,117.8	26.7
<i>Darien</i>	1,209.7	8,139.9	14.9
<i>Greenwich</i>	2,258.5	31,089.3	7.3
<i>New Canaan</i>	1,348.3	14,424.3	9.3
<i>New Fairfield</i>	2,920.2	16,102.7	18.1
<i>New Milford</i>	6,936.1	40,881.9	17.0
<i>Newtown</i>	229.9	37,697.6	0.6
<i>Norwalk</i>	1,346.9	14,753.6	9.1
<i>Redding</i>	10,044.0	20,496.4	49.0
<i>Ridgefield</i>	5,463.0	22,310.3	24.5
<i>Sherman</i>	2,224.7	14,971.4	14.9
<i>Stamford</i>	2,034.2	24,590.9	8.3
<i>Weston</i>	3,761.0	13,224.6	28.4
<i>Westport</i>	1,366.4	12,916.9	10.6
<i>Wilton</i>	1,795.0	17,497.9	10.3
Total	57,861.5	352,206.6	16.4
<i>Goal for 2023 (acres)</i>	16,101.9		
<i>Region's Share (acres)</i>	8,373.0		

Sources: Connecticut DEEP, April 2019; 2018 Darien Parks & Recreation Master Plan; 2017 Westport Plan of Conservation & Development (POCD); 2018 Norwalk Open Space Plan; 2009 Greenwich POCD; 2014 Stamford POCD.

Protected Open Space In Western CT

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Protecting Urban and Rural Forests

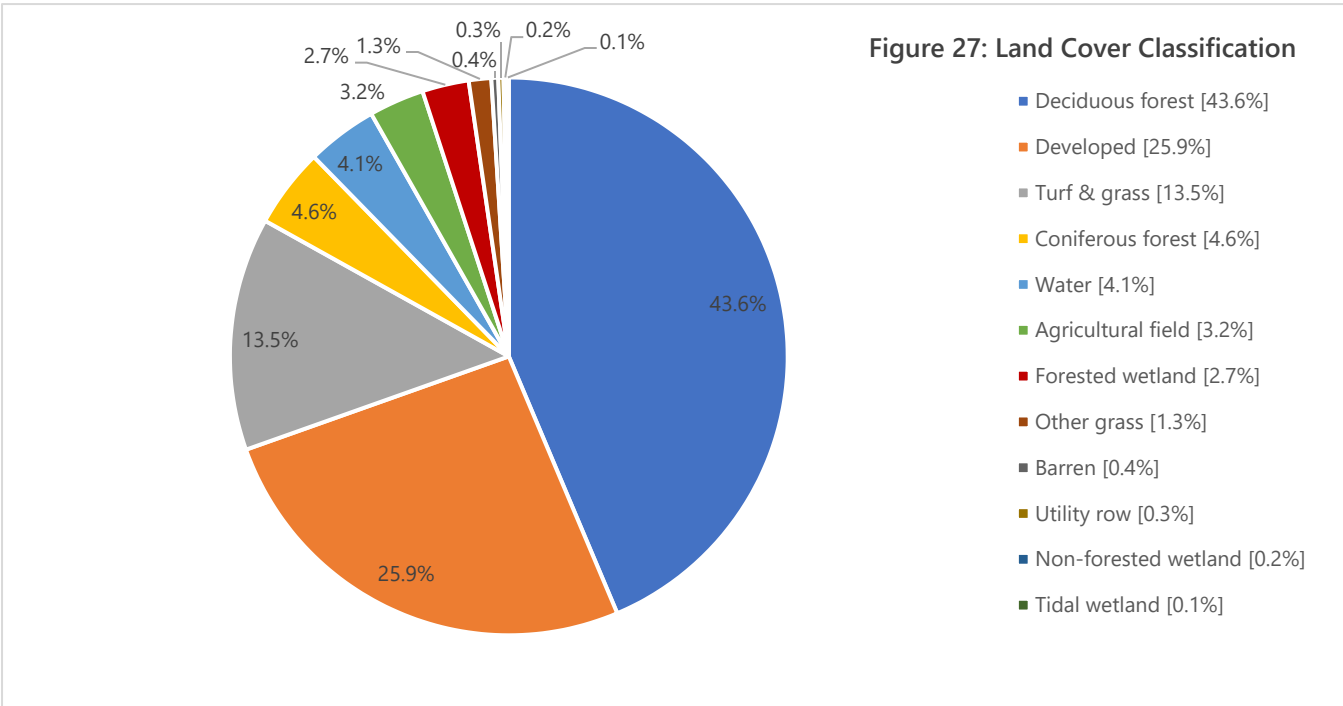
An important element of the regional plan is the protection of forests and the many ecological and social values they provide to residents. Forests are not only an important economic resource they also provide habitat for a wide range of species that find permanent or temporary habitat within the region. Based on data from the University of Connecticut, Connecticut has lost over 150,000 acres of forest lands between 1985 and 2006 and this trend will continue unless efforts are made to protect these lands consistent with the State’s Forest Action Plan.

Connecticut is one of the most heavily forested states in the nation with about 60% of its 3,179,254 acres of land in forest. Western Connecticut, being more urbanized than the rest of the state, has about 51% of its land area in forests as can be seen in **Figure 27**. Forest management overlaps with a wide range of other conservation objectives including open space and public water supply protection, the enhancement of urban environments where impervious cover adversely influences the urban heat island effect, protecting against damaging invasive species and the

restoration of core forests that offer biological diversity and migratory corridors for a wide range of species.

Protection of forest resources is a local, regional, state and federal priority with funding available at the state and federal levels to protect core forests. One program of value is the U.S. Department of Agriculture Forest Legacy Program (FLP) that is intended to conserve environmentally important forests from conversion to non-forest uses. Conservation easements are the principal tool used to protect these important forests, and the Federal government may fund up to 75% of program costs, with at least 25% coming from private, state or local sources. This program protects “working forests”, which are defined as “those that protect water quality, provide habitat, forest products, opportunities for recreation and other public benefits”.

Another important strategy available to municipalities is the creation of a municipal forest under Section 7-131 of the Connecticut General Statutes. When a municipal forest is established a municipality may raise timber, protect water supplies and provide opportunities for outdoor recreation or employment of relief labor. The statute enables municipalities to



appropriate money and purchase land, accept land or money by gift or bequest and allocate any land it owns and is suitable for production of timber. While only a limited number of municipalities have established municipal forests in Connecticut, this law provides important legal resources for forest management and protection not otherwise available at the municipal level.

Unfortunately, invasive species have been introduced into the forests and riparian corridors in the region. They can threaten the native wildlife by introducing disease, over consuming of needed resources and killing of young natives. The Emerald Ash Borer has been particularly pervasive in western Connecticut. The insect kills ash trees by boring their nutrient rich cambium layer. The United States Fish and Wildlife Service provides financial assistance to address invasive species.

Tree Canopy

Forest management is not only important in rural areas of Western Connecticut. Urban areas also benefit from forest management practices focused on the needs of the urban environment. The urban ecology is far different than that found in core forest unblemished by human development. Trees are often the first victims of urban development – cut down to make room for buildings and other human activities. Those that survive are often in a distressed condition unless a municipality has established a street tree management program to ensure proper care and protection is

provided. In 2018, WestCOG completed a leading-edge study titled, *Growing Shade & Enhancing the Urban Canopy: A Tree Canopy Improvement Strategy for the City of Norwalk*. The report established urban forestry guidance pertinent to any municipality concerned with adverse impacts created by a lack of tree canopy in the urbanized portions of their town. Trees and their canopies offer a wide range of environmental and social values including the reduction of stormwater discharges, improved air quality, reduction of the urban heat island and an improved quality of life by integrating the healing qualities of nature into the urban environment.

While the region may only have 51% of its land in a forest classification, the forest canopy covers 61.5% of the region – reflecting a large degree of local commitment to the protection of urban forests. Excluding Danbury (52%), Norwalk (39.2%), Darien (47.7%), Westport (47.1%) and Greenwich (49.4%), the remainder of the region's municipalities have tree canopy cover at or exceeding 60%. A greater street tree canopy is especially important as climate change results in increasing temperatures – especially in urban areas where a lack of trees limits their cooling value. An analysis prepared by WestCOG reveals that 9,948 additional acres could be added on street frontages within the urbanized portions of all eighteen municipalities thereby increasing the overall region's tree canopy by nearly 3%.

Summary of Goals and Policies – Water Supplies and Natural Resources

Water Supplies

1. Adopt aquifer protection area regulations for potential aquifers that will be needed to accommodate future growth and uncertain water supplies.
2. Identify the potential safe yield available from all stratified drift aquifers that have yet to be tapped for public water supply purposes.
3. Encourage continued expansion of the interconnections among the region's public water suppliers to avoid droughts like that experienced in Stamford several years ago.
4. Investigate the feasibility of establishing more coordinated, centralized management of the region's community water systems where limited management services have adversely affected water quality reporting and testing requirements.
5. Reduce the long-term demand for public water through innovative water conservation and xeriscaping techniques.
6. Implement the recommendations of the *Long Island Sound Resource and Use Inventory* study.
7. Determine and implement cost-effective means to reduce the high nitrogen levels discharged into Long Island Sound.
8. Promote the importance of aquaculture in Long Island Sound including its economic and ecological benefits for the marine environment.

Protected Open Space and Forests

9. Identify and protect the most important open space locations within the region, preserving at least 4,354 additional acres, consistent with the State's Green Plan.
10. Ensure that protected open space is located in areas accessible to population centers as well as in areas that serve to protect the region's important ecological resources.
11. Identify federal, state and private sector fiscal resources to protect the region's forest resources.
12. Identify the tree canopy coverage along the region's major riparian corridors as part of a regional effort to protect major watercourses from inappropriate urban development.

Air Quality

Air quality in western Connecticut is a function of its location within the east coast ozone transport region. Tailpipe emissions of nitrous oxides, when exposed to sunlight and warm temperatures become a contaminant known as ozone. Ozone recognizes no municipal, state or regional boundaries and as a result, many municipalities in western Connecticut experience high levels of ozone transported from Washington DC, New Jersey and the New York metropolitan areas simply by being downwind of prevailing wind patterns. In turn, ozone generated by automobile tailpipes in Connecticut contributes to ozone levels further downwind in northeastern Connecticut and the greater Boston area. According the 2018 Annual Report, Connecticut experienced 23 bad air days in 2018 – three more than the previous year – but an improvement over the ten-year average.²⁸ By dint of the region’s proximity to New York City, Connecticut has had the worst ozone pollution in New England.

In 2013, the state of Connecticut, along with nine other Northeast and Mid-Atlantic states have petitioned the U.S. Environmental Protection Agency to expand the geographic size of the Ozone Transport Region since ozone has been found to migrate from many states to the west of Connecticut that are not part of the Ozone Transport Region. States that are designated part of the Ozone Transport Region are required to reduce their emissions to ensure all downwind states can achieve air quality standards. So far the EPA has not responded to the multi-state petition.

As can be seen in **Figure 28**, during the period 2015 to October 2017 Connecticut had the highest levels of ozone pollution in the Northeast. In 2018, ozone levels in Western Connecticut have been highest along the

Connecticut coastline with exceedances of the National Ambient Air Quality Standards (NAAQS) in Greenwich (14 times) and Westport (12 times).²⁹ Transportation management strategies to reduce vehicle miles traveled, expand multi-modal transportation options - including the use of vehicles that reduce or eliminate the use of fossil fuels - and that reduce vehicle congestion must be considered if the region intends to reduce its share of ozone pollution.

NAAQS also exist for five other pollutants; sulfur dioxide, lead, carbon monoxide, fine particulate, nitrogen dioxides. Fortunately, none of these pollutants exceeded regulated pollution thresholds established by the U.S. Environmental Protection Agency (EPA).

While carbon dioxide is a regulated pollutant, according to a 2007 United State Supreme Court decision, it is not one of the six pollutants governed by the National Ambient Air Quality Standards established by EPA.³⁰ Scientists have urged that limits be placed on carbon dioxide levels in the atmosphere since CO₂ is a potent greenhouse gas that contributes to global warming and has significant impacts on a wide range of climate conditions around the world. While no quantitative limits have yet been adopted to curb carbon dioxide, the Supreme Court wisely ruled that some governmental actions are needed to address its impacts; “While it may be true that regulating motor-vehicle emissions will not by itself reverse global warming, it by no means follows that we lack jurisdiction to decide whether EPA has a duty to take steps to slow or reduce it.”³¹

²⁸ Connecticut Council on Environmental Quality, 2018 Annual Report, p. 9.

²⁹ Ibid.

³⁰ Massachusetts, et al, Petitioners v. Environmental Protection Agency et al, U.S. Supreme Court, decided April 2, 2007

³¹ Ibid, p. 22.

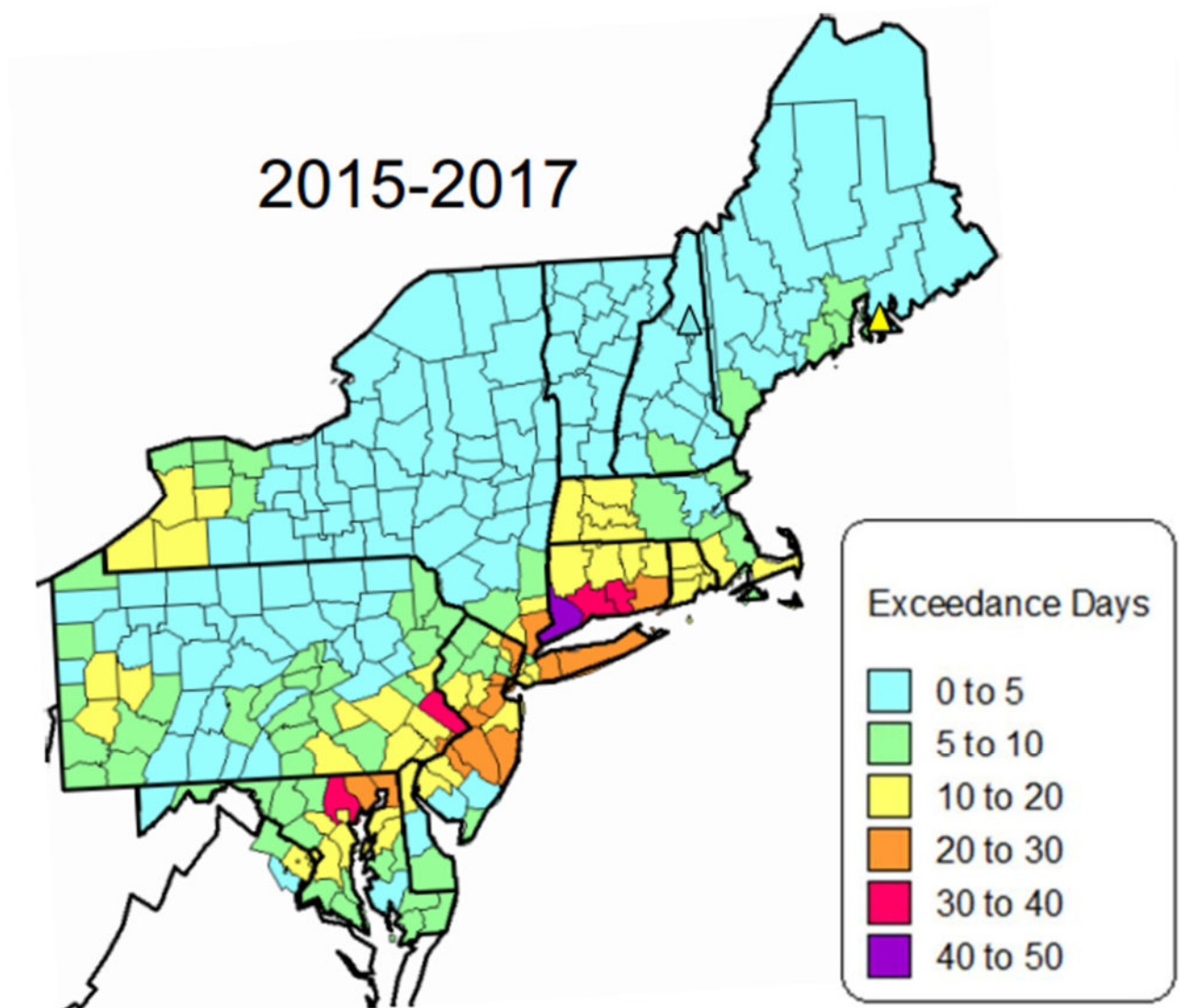
Figure 28:

Bad Air Blows to Connecticut

Connecticut bears the worst burden of smog pollution in the Northeast. Residents on the states' southwestern coast experience 30 or more ozone alert days a year.

OZONE EXPOSURE DAYS

By County 2015-2017



Source: Ozone Transport Commission, November 2017

Summary of Goals and Policies – Air Quality

Air Quality

1. Prioritize infrastructure projects that encourage commuters to choose clean or cleaner modes of transportation such as walking, biking, or transit over driving alone.
2. Support the State of Connecticut in petitioning the U.S. Environmental Protection Agency to expand the geographic size of the Ozone Transport Region.
3. Encourage local employers to offer transportation demand management strategies such as telecommuting, carpooling, vanpooling, etc.

Agricultural Resources

While it might seem improbable that Fairfield County's agricultural sector has a greater economic impact on Connecticut's economy than any other county in the state, that is the finding from a 2010 University of Connecticut study titled, *Economic Impacts of Connecticut's Agricultural Industry*.³² The authors state that "...the agricultural industry purchases goods and services from other industries and hires local labor", thereby having a cascading impact throughout the state's economy. Examples of some of these synergies include the creation of jobs in agriculture support services such as feed suppliers, veterinary services, equipment manufacturers and repair, financial services and short-term contractual jobs such as in engineering, construction, plumbing, electrical work, and inspection. In 2017 the U.S. Department of Agriculture indicated that Fairfield County's agricultural sector generated \$42.1 million in agricultural products. Unlike other

counties in Connecticut, Fairfield County (which covers 16 of the region's 18 municipalities), agriculture is concentrated in the nursery/greenhouse sector, aquaculture, and Christmas tree production, accounting for nearly ninety percent of the market value of its agricultural products. Indeed the 2012 and 2017 USDA Censuses reveal that Fairfield County is ranked as the top producer of Christmas trees and aquaculture products in Connecticut.

In 2010, the University of Connecticut study estimated that Fairfield County agricultural activities generated \$1.1 Billion in economic benefits to the state of Connecticut 1) through direct sales, 2) employment benefits within the county and 3) through value added services induced by the existence of agriculture and the support services it requires. The economic benefits of Fairfield County's agricultural sector exceeded those of all other Connecticut counties. For many residents of

Table 19: Trends in Farms and Specialty Dairy Farms in Fairfield and Litchfield Counties: 1959 to 2017

Year	Fairfield Farms	Fairfield Dairy Farms	Litchfield Farms	Litchfield Dairy Farms	Connecticut Farms	Connecticut Dairy Farms
1959	374	115	1,177	588	8,292	2,407
1964	408	97	925	457	6,068	1,605
1969	347	57	764	303	4,490	1,105
1974	235	33	542	193	3,421	794
1978	279	25	575	182	3,519	717
1982	275	23	640	172	3,754	667
1987	261	10	619	123	3,580	494
1992	241	9	607	99	3,427	384
1997	345	7	689	72	3,687	305
2002	287	6	789	58	4,191	218
2007	310	6	979	87	4,916	261
2012	439	2	1,207	36	5,977	149
2017	402	9	1,217	22	5,521	124

Note: Due to a change in the USDA census definition of dairy farms, the number of dairy farms in 2012 can't be compared to census data for 2007. Previous definitions of dairy farm included all dairy products whereas the current definition is limited to milk products only.

³² Since the U.S. Department of Agriculture does not track agricultural trends below the county level, this element of the plan

necessarily uses county level data to establish agricultural trends within the region.

Western Connecticut these findings may seem counterintuitive as the region has continued to lose its traditional dairy farms to suburban residential developments or to more competitive dairy farms in adjoining states (Table 19). The bright note for Fairfield County and Western Connecticut is the emergence of a strong aquaculture industry along with the growth of the nursery and greenhouse industries that serve Western Connecticut as well as metropolitan New York.

Food Security

Food Security has become an important long-term goal for many areas of the United States as more agricultural resource planners recognize the potential dangers of relying on supply chains vulnerable to international trade sanctions, tariffs, food embargoes and rising transportation costs. Sustainable agriculture posits a greater reliance on locally grown food to support Connecticut's agricultural sector and reduce dependence on distant food supplies. Locally grown produce is likely to be fresher and more nutritious than that imported from distant countries since the latter often requires premature picking, refrigeration, and the application of pesticides to eliminate in-transit losses. Today only two percent of all the food consumed in Connecticut is produced in the state. This reveals the region's significant dependence upon California, Florida, and numerous overseas nations to meet its food and other agricultural needs. Municipalities in the region should consider providing incentives for the establishment and/or expansion of the nursery and greenhouse industries especially as uses compatible within industrial, commercial, and residential zones. Agritourism also has the potential to have synergistic effects on the region's economy especially when nurseries and greenhouses offer collateral services such as community supported agriculture (CSA), hay rides, crop mazes, and other recreational activities that attract urbanites to the countryside.

Another aspect of food security raised by the Food and Agriculture Organization (FAO) of the United Nations is

the increased prevalence of obesity throughout the world, especially in North America. Obesity is another form of malnutrition which reflects an increased reliance on processed foods – rather than fresh locally grown produce (see *The State of Food Security and Nutrition in the World*, 2018, FAO, p. vi). Obesity rates in North America have been increasing over the last decade, and FAO contends that this in part due to the higher cost of nutritious foods, the stress of living with food insecurity, among other reasons. Most residents of western Connecticut may have the resources to afford more nutritious food but access to these resources would be improved by regional efforts to expand locally grown agricultural produce. The FAO study notes that: "food-insecure people are often less likely to have physical access to markets where they can buy nutritious and healthy foods at affordable prices, particularly in high-income countries. The negative effect of food insecurity on diet quality has been documented in low-, middle- and high-income countries alike."³³

Pesticides and Fertilizers

While federal, state, regional and local governments are generally committed to protecting agricultural lands for their economic, ecological and food security benefits, there are opportunities for improving existing practices to minimize the use of pesticides and fertilizers that have the unintended impact of polluting surface and groundwater supplies. The U.S. Department of Agriculture's 2017 Census revealed that 2,269 acres of farm land in Fairfield County received fertilizer applications; 53 acres received chemical insecticides (excluding nematocides); 52 acres received chemical herbicides to control weeds, grass, or brush; and 5 acres received chemicals to treat nematodes. While the number of acres receiving fertilizers and/or pesticides was relatively small compared to the 52,245 acres of farmland in Fairfield County in 2017, these chemicals can produce unhealthy nutrient and contaminant loads in the region's waters.

³³ FAO, IFAD, UNICEF, WFP and WHO. 2018. *The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition*. Rome, FAO

One solution is the adoption of organic farming methods that rely on non-chemical strategies for the control of pests. Organic farming has been one of the fastest growing sectors of the agricultural sector. In 2015 there were 12,818 organic farms in the United States generating \$6.2 billion in sales. Connecticut had 59 organic farms accounting for 2,536 acres most of which was dedicated to vegetables, potatoes and melons grown in the open. In 2017, Fairfield County had nine organic farms – a decline of five organic farms compared to the 2012 USDA Census. Organic farming relies on different agricultural practices to address pest control but result in far less environmental damage to the soil and nearby watercourses than the chemical dependent forms of agriculture. While pesticides may be necessary for certain agricultural practices, farmers need to consider strategies to reduce the runoff of these chemicals into surface and groundwater supplies. This is particularly important in several municipalities such Redding, Greenwich, and New Canaan that have large areas of their municipality falling within public water supply watersheds. Fortunately, these three municipalities have a very limited amount of agricultural activity within their borders.

Another solution to reduce pesticide use is the adoption of integrated pest management strategies that focus on the control of pest food sources and the diversification of agricultural crops to minimize reliance on single crop production methods. Integrated pest management does not eliminate the need for pesticides, but it does provide a more comprehensive approach to pest management than simply relying on chemical treatments to reduce crop loss.

Farmland Protection

There is only a limited amount of land that has been preserved for farmland in Western Connecticut. According to the Connecticut Department of Agriculture, nearly 800 acres of agricultural land have been preserved in Western Connecticut, all of which can be found in Bethel, Bridgewater and New Milford (Table 20). The factors that are considered by the Commissioner of Agriculture in deciding whether or not to acquire the development rights to farmland

include: (1) The probability the land will be sold for nonagricultural purposes; (2) current productivity of such land and the likelihood of continued productivity; (3) the suitability of the land as to soil classification and other criteria for agricultural use; (4) the degree to which such acquisition would contribute to the preservation of the agricultural potential of the state; (5) any encumbrances on such land; (6) cost of acquiring such rights; and (7) the degree to which such acquisition would mitigate damage due to flood hazards. The state’s state acquisition policies are set forth in CGS §22-26cc, State Acquisition of Development Rights. While protecting agricultural land is an important public policy objective, many farmers may be concerned with their long-term liquidity and therefore may not wish to be constrained by development rights imposed on their property, preferring the opportunity to sell their land at market value. This concern reveals the challenge we face in protecting prime farmland when farmers themselves fear the financial instability associated with farm labor in a highly competitive world food market. Clearly, protecting farmland is not the only impediment to agriculture in Connecticut; federal and state public policy must also consider the benefits of establishing preferential markets for locally grown agriculture.

Other initiatives aimed at protecting farmland include the use of Public Act 490 to provide reduced taxation for farmlands, open space and forests. Public Act 490, passed in 1963, does not provide long term protection for farmland since lands receiving a reduced property tax may still be sold if the seller pays a conveyance tax for such a sale if it occurs within ten years of its acceptance into the Public Act 490 program. However, Public Act 490 remains an important aid to Connecticut’s farmers since it reduces the tax burden

Table 20: Land Preserved by the Connecticut Farmland Preservation Program

<i>Municipality</i>	Total Farmland Acreage Preserved
<i>Bethel</i>	119
<i>Bridgewater</i>	239
<i>New Milford</i>	435
<i>Total</i>	789

of holding land by establishing a mill rate based on its use value – not its market value. The Connecticut Farm Bureau has prepared an excellent publication titled, *Connecticut's Land Use Value Assessment Law, Public Act 490: A Practical Guide and overview for Landowners, Assessors and Government Officials*, that serves as an important guidance document for farmers in Western Connecticut seeking to reduce the tax burdens of landownership used for farm, forest or open space.

Municipal zoning regulations can also play an important role in protecting farmland by giving special protections to areas of a municipality where agricultural activities are the predominant land use. The town of Suffield is an excellent example of this strategy. The town established a farmland preservation zone to protect agricultural land. The zone is limited to agricultural lands that have permanent restrictive covenants or easements that preserve these lands for farming. In contrast to Suffield, many municipalities have established rural residential/agricultural zones where single-family residences co-exist with farming under regulations that encourage and support farming activities.

Right to Farm

Finally, municipalities may also consider adopting a "Right to Farm" ordinance modeled on Connecticut's right to farm law (see CGS §19a-341). Within Western Connecticut, New Milford has taken this approach since it contains many working farms and its citizens recognize the many non-farm benefits that are created by the preservation of farmland including; 1) creation of wildlife and pollination corridors, 2) preservation of historic farming architecture, 3) avoidance of sprawl development, 4) generation of greater tax revenues from farming compared to other uses, and 5) linking the younger generation to farming opportunities that remain within their hometown.

Community Supported Agriculture

Local governments are the key stakeholders in enabling the long-term protection and growth of local agriculture. During the last twenty years there has been a resurgence of farmer's markets, community supported agriculture (CSA) and efforts to reduce the climate impacts created by consuming agricultural goods imported from distant lands that rely on fossil fueled transport systems, chemical fertilizers and pesticides. A recent USDA study found that food related energy use accounts for nearly 16% of the nation's energy budget but more significantly it represents the equivalent of 340 million BTU of energy expended annually per person to harvest, process, distribute, transport, refrigerate, clean and dispose of food.³⁴ Indeed, the American food system is a highly energy inefficient system with the total food system consuming more than seven (7) units of energy for every one (1) unit of edible food energy delivered.³⁵ Numerous studies have pointed to the environmental benefits of local agriculture. One study noted:

Local food can be environmentally friendly in many ways, including promoting genetic diversity, preserving open spaces and animal habitats, supporting a clean environment, limiting waste, reducing energy, and preventing overuse of natural resources.³⁶

Community supported agriculture initiatives are designed to integrate suburban and urban dwellers into the agricultural economy by giving homeowners a stake in the food produced by local farmers. According to the Connecticut Department of Agriculture and research conducted by WestCOG, there are eight CSAs in Western Connecticut including three serving New Milford, two in Ridgefield, and one each in Newtown, Sherman, and Wilton. These farms offer a range of membership options and a wide range of produce throughout the growing season. Because of their popularity, it is often necessary to place your name on

³⁴ Patrick Canning, et. Al., Energy Use in the U.S. Food System, Economic Research Service Report Number 94, March 2010, pp. 1, 11.

³⁵ John W. Day, Charles Hall, America's Most Sustainable Cities and Regions, Springer, 2016, p. 235

³⁶ Mia Shirley, Food Ordinances: Encouraging Eating Local, William & Mary Environmental Law & Policy Review, Vol. 37, Issue 2, 2013, p. 518

a waiting list to be eligible for participation in a CSA program. If this should be your predicament then the next best option is to take advantage of the wide assortment of farmer's markets offered within sixteen of the region's eighteen municipalities. Save Sherman and Bridgewater, all of the region's municipalities offer seasonal farmer's markets that serve as an important means to provide residents fresh locally produced produce. Of course, farmer's market are more than simple market places for fresh grown food; they offer a social milieu that attracts a wide range of town residents who might not otherwise mingle with their neighbors. In many ways, the farmer's market has become the secular version of the town church, a place where people of diverse backgrounds can get together, share ideas, enjoy each other's company and help preserve the agricultural heritage of their community.

Summary of Goals and Policies – Agricultural Resources

Agricultural Resources

1. Encourage municipalities to play a more active role in the protection of farmland and agricultural enterprises through farmer's markets, community supported agriculture, and other incentives that reduce the financial burdens of operating private sector managed farms.
2. Promote agri-tourism concepts and adopt such concepts in zoning regulations.
3. Work with Conservation Commissions, the State Department of Agriculture and the Connecticut Department of Energy and Environmental Protection to reduce pesticide use in areas adjacent to public water supply reservoirs and within public water supply watersheds.
4. Develop position papers on integrated pest management strategies applicable to farmers in western Connecticut.
5. Identify all land currently protected under Public Act 490.
6. Encourage the use of industrially zoned land for intensive greenhouse and outdoor agricultural production.

Appendix A: Consistency Determination

The Western Connecticut Council of Governments has determined that its policies and plans for its eighteen municipalities are not inconsistent with those established in the Connecticut State Plan of Conservation and Development 2018-2023 (C&D Plan). A consistency determination is required by Connecticut General Statutes section 8-35b. The Regional Plan of Conservation of Development addresses the state policies contained in the latest draft of the C&D Plan on a policy by policy basis in the table below.

State Policy	Consistency Determination
1.1 Ensure the safety and integrity of existing infrastructure over its useful life through the timely planning and budgeting for maintenance, repairs and necessary upgrades. Undertake a deliberative public process to assess options for the replacement, expansion, or reduction of existing infrastructure as it ages or as circumstances warrant, taking into consideration the potential benefits and costs of any reasonable alternatives, including their potential socio-economic and environmental impacts;	See Urban Infrastructure Analysis for consistency based on an asset management program strategy.
1.2 Focus on infill development and redevelopment opportunities in areas with existing infrastructure, such as in cities or town centers, which are at an appropriate scale and density for the particular area;	See Community character analysis that supports infill development where existing village centers exist using innovative zoning strategies consistent with the scale of local development.
1.3 Promote the continued use or adaptive reuse of existing facilities, particularly those with historical and/or cultural significance, and support the redevelopment of former brownfields and other underutilized or abandoned facilities at a scale and density appropriate for the surrounding area;	See Community character analysis section that addresses preservation of historic districts, historic buildings and cultural resources.
1.4 Encourage multi-disciplinary approaches to infrastructure planning and design. For example, for transportation projects in areas with combined sewers, seek to preserve the functional capacity of wastewater treatment plants by designing projects that enhance the infiltration of storm water generated by the existing street network and other impermeable surfaces through “green infrastructure” measures such as pervious pavement material and the incorporation of urban green spaces;	See Urban Infrastructure analysis that addresses the need to expand impermeable surfaces in new developments to minimize adverse impacts on impaired watercourses and existing sewage treatment plans. Adoption of green infrastructure is also addressed in the open space section of Natural Resources.
1.5 Coordinate the timing of any planned expansion of existing infrastructure to meet state and regional growth objectives;	The plan addresses planned expansions of existing infrastructure in the infrastructure section of the plan.
1.6 Perform a life-cycle cost analysis to identify potential cost burdens beyond the initial capital investment for any proposed action involving the expansion of infrastructure beyond the current limits of	See urban infrastructure element for a discussion of asset management plans which include the need for life cost analysis.

the existing or planned service area for the particular form(s) of infrastructure, except when necessary to address immediate public health or safety concerns;	
1.7 Proactively identify and market available properties that are currently served by infrastructure and that could meet the needs of new or expanding businesses, especially those within close proximity to existing industry clusters;	See the Economic Development Section which addresses the importance of prioritizing development along major transportation corridors.
1.8 Promote land uses around rail stations, airports and sea ports that are complementary to or dependent upon the available infrastructure and other nearby resources;	This is addressed in the transit accessible section of the plan.
1.9 Utilize the state's strategic location and infrastructure to promote expansion of markets for Connecticut grown and manufactured products;	See the Agricultural Resource Section of the plan.
1.10 Encourage local zoning that allows for a mix of uses "as-of-right" to create vibrant central places where residents can live, work, and meet their daily needs without having to rely on automobiles as the sole means of transport;	See the community character and housing elements of the plan where an emphasis is placed on more flexible approaches to zoning to permit mixed use development and a variety and choice of housing.
1.11 Promote urban areas as centers for arts, entertainment and culture, while also supporting community-based agriculture, historic preservation, and access to urban green spaces and waterways;	See community character, natural resources and agricultural elements of the plan for consistency with this policy.
1.12 Capitalize on opportunities to develop and deploy innovative energy technologies, and promote distributed generation and microgrids, where practical, to provide reliable electrical power or energy-dependent community services during outages and peak demand periods; and	See Renewable energy within Infrastructure section for consistency with this policy.
1.13 Minimize the potential risks and impacts from natural hazards, such as flooding, high winds and wildfires, when siting infrastructure and developing property. Consider potential impacts of climate change on existing and future development.	See floodplain, stormwater and infrastructure elements for consistency with this policy.
2.1 Enhance housing mobility and choice across income levels and promote vibrant, mixed-income neighborhoods through both ownership and rental opportunities;	See housing element for consistency with this policy.
2.2 Support adaptive reuse of historic and other existing structures for use as residential housing;	See housing element that addresses two family conversions, accessory apartments and other approaches to use existing buildings.
2.3 Provide favorable loan terms for multifamily housing and mixed-use properties in targeted areas;	This is not addressed in the Regional Plan since it is not one of its authorities.
2.4 Market urban communities to people most likely attracted to working and/or living in urban environments, such as young people and "empty nesters";	This issue has been addressed in the transit accessible housing element of the plan.

2.5 Support local efforts to develop appropriate urban infill housing and neighborhood amenities to make better use of limited urban land;	This is addressed in the housing needs section of the plan.
2.6 Promote housing and/or affordable housing as part of mixed use and transit-oriented developments within walking distance to public transportation facilities;	This is discussed in the housing element of the Regional Plan of Conservation and Development.
2.7 Identify innovative mechanisms, utilizing decentralized or small-scale water and sewage systems, to support increased housing density in village centers and conservation subdivisions that lack supporting infrastructure; and	This is discussed in the sewer avoidance section of the plan
2.8 Encourage and promote access to parks and recreational opportunities, including trails, greenways, community gardens and waterways, for affordable and mixed-income housing.	This is addressed in the open space element of the plan.
3.1 Promote compact, pedestrian-oriented, mixed use development patterns around existing and planned public transportation stations and other viable locations within transportation corridors and village centers;	See the Community character element of the plan.
3.2 Encourage a network of pedestrian and bicycle paths and greenways that provide convenient inter- and intra-town access, including access to the regional public transportation network;	This is addressed in the Community Character section of the plan.
3.3 Ensure that the planning, design, construction, and operation of state and local highways accommodate municipal plans and the needs of all users, to the extent possible;	This is addressed in the roadway infrastructure section of the plan.
3.4 Improve transit service and linkages to attract more customers through better integration of all transportation options and advances in technology, while providing convenience, reliability, safety and competitive modal choices;	This is addressed in the affordable housing section of the plan where transit accessible housing is discussed.
3.5 Coordinate with host municipalities on supportive land use regulations, such as zoning for transit-oriented development and logistics centers, where practical, to make the most effective use of transportation facilities for the movement of people and/or goods;	The plan is consistent with this policy.
3.6 Identify brownfields and other strategic sites that are (1) within one-half mile or walking distance of public transportation facilities and/or (2) near other inter-modal transportation nodes and facilities, and consider them for designation as preapproved development areas;	This is not a regional plan responsibility.
3.7 Restore strategic shipping channels and pier areas to their authorized depths when dredging is recommended in Connecticut's Deep-Water Port Strategy Study; and	This is not a regional plan responsibility.

3.8 Locate government facilities that are likely to be visited by the public in areas served by multiple modes of transportation.	This is not a regional plan responsibility. The regional plan is not inconsistent with this policy
4.1 Protect permanently preserved open space areas, Connecticut Heritage Areas, and archaeological areas of regional and statewide significance;	This policy is addressed in the open space element of the plan.
4.2 Limit improvements to permanently protected open space areas to those that are consistent with the long-term preservation of the natural resource and open space values of the site;	The regional plan is consistent with this policy since no improvements are recommended on protected open space land.
4.3 Expand the state's open space and greenway network through the acquisition and maintenance of important multifunctional land and other priorities identified in the State's Open Space Plan (i.e., Green Plan);	The regional plan is consistent with this policy since it calls for the expansion of protected open space land.
4.4 Avoid activities that could negatively affect rare or unique ecological communities and natural areas, including habitats of endangered, threatened and special concern species, other critical wildlife habitats identified in the Connecticut Wildlife Action Plan, river and stream corridors, aquifers, ridgelines, large or connected forest areas, highland areas, coastal marsh migration areas, and Long Island Sound;	This plan is consistent with this policy since it advocates greater protections of stream corridors using stream belt zoning concepts and the protection of wildlife corridors and Long Island Sound ecological resources.
4.5 Encourage collaborative ventures with municipalities, private non-profit land conservation organizations and other entities to provide a system of appropriately preserved and managed natural areas and resources that allow for a diversity of well-functioning habitats and the sustainable use of resources;	This is consistent with open space element of the Regional Plan.
4.6 Seek to achieve no-net-loss of wetlands through development planning that: 1) avoids wetlands and watercourses, whenever possible; 2) minimizes intrusions into wetlands when impacts are unavoidable; 3) mitigates any resulting impacts through wetland enhancement or creation; and 4) encourages ongoing maintenance of functional wetlands and buffer areas;	The Regional Plan has no authority over wetland resources but it does recommend the protection of all regulated natural resources.
4.7 Revitalize rural villages and main streets by promoting the rehabilitation and appropriate reuse of historic facilities, such as former mills, to allow a concentration of higher density or multiple use development where practical and consistent with historic character;	The regional plan is consistent with this policy. See the community character element.
4.8 Utilize the state's renewable power generation potential to the extent compatible with state goals for environmental protection, and minimize potential impacts to rural character and agricultural and scenic	This issue is addressed in the environmental considerations with renewable energy section of the plan.

resources when siting new power generation facilities and/or transmission infrastructure;	
4.9 Encourage municipalities to build capacity and commitment for protecting the working lands and cultural resources that are important to the community;	This is consistent with the Historic Preservation section of the regional plan.
4.10 Promote agricultural businesses and supportive industries that are vital to the local and regional economy, preserve prime farmland through the acquisition of development rights, and when avoidance of such lands is not practical, minimize the loss or conversion of agricultural lands by state sponsored development actions;	This is consistent with the agricultural element of the regional plan.
4.11 Promote Connecticut's commercial and recreational fishing and aquaculture industries consistent with marine productive capacities and environmental protections;	This is consistent with the agricultural element of the regional plan.
4.12 Utilize the landscape to the extent practical and incorporate sound stormwater management design, such as low impact development techniques, in existing and new development to maintain or restore natural hydrologic processes and to help meet or exceed state and federal water quality standards, so that the state's waters can support their myriad functions and uses;	This is consistent with the stormwater element of the regional plan.
4.13 Manage water resource conflicts by balancing the competing needs of water for human consumption, waste assimilation, habitat sustainability, recreation, power production, agriculture and transporting people and goods;	This is consistent with the water resources element of the regional plan.
4.14 Rely upon the functional capacity of the land, to the extent possible, to provide drinking water and wastewater disposal needs beyond the limits of the existing service area, and comprehensively manage decentralized sewage and water systems to ensure long term viability of sewage disposal and water supply. Support the introduction or expansion of public water and/or sewer services or alternative on-site wastewater treatment systems only when there is a demonstrated environmental, public health, public safety, economic, social, or general welfare concern, and then introduce such services only at a scale which responds to the existing need without serving as an attraction to more extensive development;	This is addressed in the sewer avoidance section of the plan.
4.15 Minimize the siting of new infrastructure and development in coastal areas prone to erosion and inundation from sea level rise or storms, in accordance with the Connecticut Coastal Management Act, and ensure that coastal hazards are accounted for when	This is addressed in the Protection of Long Island Sound section of the plan.

considering options for the replacement, expansion, or reduction of existing infrastructure under Policy 1.1;	
4.16 Protect the ecological, scenic and recreational values of lakes, rivers and streams by promoting compatible land uses and management practices in accordance with adopted plans.	This is consistent with the stream belt protection element of the regional plan.
4.17 Protect, maintain and restore the chemical, physical, and biological integrity of ground and surface waters to ensure that existing and designated uses are maintained; and	This policy is addressed in the riparian corridor section of the plan.
4.18 Promote innovative land conservation and banking practices that further local, regional and state conservation and development objectives, and minimize the need to expand infrastructure to support new development in rural areas.	This is addressed in the Open Space section of the plan.
5.1 Utilize a multiple barrier approach to ensure the availability of safe and adequate public water supplies that meet or exceed state and federal drinking water standards;	This policy is addressed in the riparian corridor section of the plan.
5.2 Identify water supply sources and resources sufficient to meet existing and anticipated needs and to mitigate water shortages during droughts;	This is addressed in the water resources element of the regional plan.
5.3 Ensure that water conservation is a priority consideration in all water planning activities and regulatory decisions, in order to preserve an adequate supply of water and to minimize public and ratepayer costs to expand water system capacity;	This is addressed in the water conservation of the regional plan of conservation and development.
5.4 Utilize an integrated watershed management approach to ensure that high quality existing and potential sources of public drinking water are maintained for human consumption;	This is addressed in the water resources section of the plan.
5.5 Allow redevelopment and rebuilding of coastal areas consistent with coastal area management principles and regulations and prevailing federal rules and requirements;	There is nothing in the regional plan that is inconsistent with this policy.
5.6 Discourage new development activities within areas prone to flooding and coastal erosion, manage any unavoidable activities in such areas in an environmentally sensitive manner and in compliance with applicable laws, and seek to prevent the loss of life and property by maintaining existing dikes, channels, dams, and other barriers, or removing such structures where removal would be a more cost-effective option for reducing threats to downstream property;	There is nothing in the regional plan that is inconsistent with this policy.
5.7 Minimize the impacts of development on existing and identified drinking water sources by utilizing development forms and densities that limit impervious	See stormwater management element of the regional plan.

surface coverage to 10% of the overall area to be developed and which preserves the most amount of land in a natural or undisturbed state;	
5.8 Preserve and maintain traditional working lands for the production of food and fiber, and support niche agricultural operations that enhance community food security throughout Connecticut;	See agricultural element of the regional plan.
5.9 Attain National Ambient Air Quality Standards in accordance with Connecticut's State Implementation Plan, with emphasis on cost-effective strategies and effective enforcement of regulated sources;	This policy is addressed in the air quality section of the plan.
5.10 Reduce carbon dioxide emissions in this state consistent with the recommendations of the Connecticut Climate Change Preparedness Plan;	This policy is addressed in the air quality section of the plan.
5.11 Promote transportation alternatives to the automobile, such as bicycling, walking, and public transportation as a means to reducing energy consumption, air pollution, and obesity-related health care costs;	This is addressed in the Community Character section of the plan.
5.12 Emphasize pollution prevention, the efficient use of energy, and recycling of material resources as the primary means of maintaining a clean and healthful environment; and	This is addressed under the Pollution Prevention and Resource Conservation sub-section of the Infrastructure section of the plan.
5.13 Proactively address climate change adaptation strategies to manage the public health and safety risks associated with the potential increased frequency and/or severity of flooding and drought conditions, including impacts to public water supplies, air quality, and agriculture/aquaculture production.	This policy is addressed in the floodplain management section of the plan.

Appendix B: Reference List

Agriculture

Food and Agricultural Organization of the United Nations. *The State of Food Security and Nutrition in the World: Building climate resilience for food security and nutrition*. Rome: United Nations, 2018.

Lopez, Rigoberto A., Rebecca Boehm, Marcela Pineda, Peter Gunther, and Fred Carstensen. *Economic Impacts of Connecticut's Agricultural Industry: Update 2015*. Mansfield, CT: University of Connecticut, 2017.

Miller, Kristen L. "Right to Farm Ordinances." edited by Office of Legislative Research, 8. Hartford, CT: Office of Legislative Research, Connecticut General Assembly, 2011.

Redfield, Sarah E. *Vanishing Farmland: A Legal Solution for the States*. Lexington, MA: Lexington Books, 1984.

Shirley, Mia. "Food Ordinances: Encouraging Eating Local ". *William & Mary Environmental Law & Policy Review* 37, no. 2 (2013): 28.

U.S. Department of Agriculture. "2015 Certified Organic Survey – Connecticut." edited by National Agricultural Statistics Service, 2. Concord, NH: Northeastern Region – Connecticut Field Office, U.S. Department of Agriculture, 2015.

University of Connecticut College, of Agriculture, Health and Natural Resources. *CSA Toolkit: Starting and Operating a CSA Farm Business*. Mansfield, CT: University of Connecticut, College of Agriculture, Health and Natural Resources, 2015.

Woods, Timothy, Matthew Ernst, and Debra Tropp. "Community Supported Agriculture: New Models for Changing Markets." edited by Agricultural Marketing Service US. Department of Agriculture, 68. Washington DC: US. Department of Agriculture, 2017.

Air Quality

Ozone Transport Commission, OTC Modeling Committee, *Analysis of the Potential Health Impacts of Reducing Ozone Levels in the OTR Using BenMAP* – 2018 Edition, January 3, 2019

Climate Change

Bounoua, Lahouari, Zhang Ping, Georgy Motovoy, Kurtis Thone, Jeffrey Masek, Marc Imhoff, Marshall Shepherd, et al. "Impact of Urbanization on US Surface Climate." *Environmental Research Letters* 10 (August 2015): 9.

Federal Emergency Management Agency. "Financial Losses by State." edited by National Flood Insurance Program, 5. Washington DC: Federal Emergency Management Agency, 2018.

Ghosh, Amitav. *The Great Derangement: Climate Change and the Unthinkable*. Chicago: University of Chicago Press, 2016.

Goodell, Jeff. *The Water Will Come: Rising Seas, Sinking Cities, and the Remaking of the Civilized World*. New York: Bay Bay Books, 2017.

Meillo, Jerry, M, Terese Richmond, and Gary W Yohe. *Climate Change Impacts in the United States*. The Third National Climate Assessment; U.S. Global Change Research Program. Washington DC: USGPO, 2014.

Pachauri, R.K., and L.A. Meyer, eds. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva, Switzerland: Intergovernmental Panel on Climate Change, 2014.

Pachauri, R.K., and A. Reisinger, eds. *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* Geneva, Switzerland: Intergovernmental Panel on Climate Change, 2007.

Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, *et al.*, eds. *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. United Kingdom Cambridge University Press, Cambridge, 2013.

Economic Development

Pinho, Rute, and John Rappa. "Regional Economic Development Corporations." Hartford, CT: Office of Legislative Research, 2008.

Western Connecticut Council of Governments. *Western Connecticut Economic Development Plan: A Comprehensive Economic Development Strategy*. Sandy Hook, CT: Western Connecticut Council of Governments, 2017.

Western Connecticut Economic Development Alliance. "Western Connecticut Comprehensive Economic Development Strategy." 199. Brookfield. CT: Western Connecticut Economic Development Alliance, 2013.

Western Connecticut Council of Governments. "Western Connecticut Economic Development Plan." 164. Sandy Hook, CT: Western Connecticut Council of Governments, 2017.

Emergency Management

Connecticut Department of Energy and Environmental Protection & Connecticut Department of Emergency Services and Public Protection, Connecticut Natural Hazards Mitigation Plan Update (State of Connecticut 2019).

Federal Emergency Management Agency, Local Mitigation Planning Handbook (USGPO March 2013 ed. 2013).

Federal Emergency Management Agency, Community Recovery Resource Guide: Connecticut (USGPO. 2013).

Federal Emergency Management Agency, Executive Handbook for All-Hazards Preparedness (USGPO 2016).

Federal Emergency Management Agency, Community Planning for Economic Recovery, Participant Guide (USGPO 2018).

Floodplain Building Elevation Standards: Current Requirements & Enhancement Options for Connecticut Shoreline Municipalities. pt. 22 (2018).

Statutory Adoption of Updated Sea-Level Rise Scenarios. pt. 12 (2018).

Natural Hazard Mitigation Plan Update for the South Western Region. pt. 248 (2016).

A.W. Whelchel, et al., The Southern Connecticut Regional Framework for Coastal Resilience Final Report (South Central Regional Council of Governments, The Nature Conservancy, Connecticut Metropolitan Council of Government 2017).

Energy Management

Connecticut Department of Energy and Environmental Protection. *Comprehensive Energy Strategy*. 2018.

DNV-GL. *Oil and Gas Forecast to 2050*. Høvik, Norway: DNV-GL, 2017.

Lang, Reg, and Audrey Armour. "Planning Land to Conserve Energy." Ontario, Canada: Land Directorate, Environment Canada, 1982.

Miller, Richard G., and Steven Sorrell. "The Future of Oil Supply." *Philosophical Transactions of the Royal Society* (2013): 27.

Organization of the Petroleum Exporting Countries. *World Oil Outlook 2040* edited by Ayed S. Al-Qahtani Vienna, Austria: OPEC Secretariat, 2017.

Vidich, Charles. *Overcoming Land Use Barriers to Solar Access: Solar Planning Recommendations for Local Communities* (Central Naugatuck Valley Regional Planning Agency. 1979).

Forest Management

Hochholzer, Helene. "Connecticut's Forest Action Plan (Revised 2015)." 271. Hartford, CT: Connecticut Department of Energy and Environmental Protection, 2015.

Western Connecticut Council of Governments. "Growing Shade and Enhancing the Urban Canopy." 9. Sandy Hook, CT: Western Connecticut Council of Governments, 2018.

———. "Tree Canopy Analysis for the Western Connecticut Region." 31. Sandy Hook, CT: Western Connecticut Council of Governments, 2018.

Housing

Bansal, Julia Singer. "Municipal Affordable Housing Stock (2010-2017)." edited by Office of Legislative Research, 7. Hartford, CT: Office of Legislative Research, Connecticut General Assembly, 2018.

BFJ Planning, and Urbanomics. "Connecticut Affordable Housing Market Inventory Study." 128. Rocky Hill, CT: Connecticut Housing Finance Authority, 2013.

Rappa, John. "Land Use Laws Affecting Affordable Housing Projects." edited by Office of Legislative Research, 8. Hartford, CT: Office of Legislative Research, Connecticut General Assembly, 2001.

Tondro, Terry J. *Connecticut's Affordable Housing Appeals Statute: After Ten Years of Hope, Why only Middling Results?*, 23 WESTERN NEW ENGLAND LAW REVIEW 115(2001).

Vidich, Charles. "Least Cost Housing: Minimizing the Fiscal Impact of Zoning and Subdivision Regulations." 92. Waterbury, CT: Central Naugatuck Valley Regional Planning Agency, 1978.

Infrastructure

Columbia Telecommunications Corporation. *A Brief Overview of Broadband Deficiencies in Connecticut* Kensington, MD2016.

Commission, Federal Communications. "Accelerating Wireless and Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment." 19. Washington DC: Federal Register, 2018.

Connecticut Department of Transportation. "Highway Transportation Asset Management Plan." 191. Newington, CT: Connecticut Department of Transportation, 2018.

Federal Aviation Administration. "FAA Advisory Circular: Obstruction Marking and Lighting ", edited by Federal Aviation Administration, 90. Washington DC: U.S. Department of Transportation, 2015.

Federal Highway Administration. "Financial Planning for Transportation Asset Management: An Overview." edited by Office of Asset Management Pavements and Construction, 88. Washington DC: U.S. Department of Transportation, 2015.

———. "Financial Planning for Transportation Asset Management: Components of a Financial Plan." edited by Office of Asset Management Pavements and Construction, 72. Washington DC: U.S. Department of Transportation, 2015.

———. "Incorporating Asset Valuation into Transportation Asset Management Financial Plans." edited by Office of Asset Management Pavements and Construction, 62. Washington DC: U.S. Department of Transportation, 2016.

Hannon, David. "Sewer Service in the Region." 27: Housatonic Valley Council of Elected Officials, 1993.

Labor Force

Connecticut Department of Labor. "Labor Force Data for Labor Market Areas and Towns." edited by Office of Research, 2. Wethersfield, CT: Connecticut Department of Labor, 2019.

———. "Labor Situation." edited by Office of Research. Wethersfield, CT: Connecticut Department of Labor, 2019.

Land Use

Apostol, Dean, and James Palmer. *The Renewable Energy Landscape: Preserving Scenic Values in our Sustainable Future*. New York: Routledge, 2017.

Elliott, Donald L. *A Better Way to Zone*. Washington DC: Island Press, 2008.

Fischel, William A. *Zoning Rules: The Economics of Land Use Regulation*. Cambridge, MA: Lincoln Institute of Land Policy, 2015.

Hirt, Sonia A. *Zoned in the USA: The Origins and Implications of American Land Use Regulation*. Ithaca, NY: Cornell University Press, 2014.

Housatonic Valley Council of Elected Officials, *Housatonic Valley Regional Plan of Conservation and Development*, 2009.

Office of Policy and Management. "Conservation & Development Policies: The Plan for Connecticut 2018-2023." 47. Hartford, CT: Office of Policy and Management, 2018.

Southwestern Regional Planning Agency, *Regional Plan of Conservation and Development: 2006-2015* Southwestern Regional Planning Agency, 2006.

Long Island Sound

Long Island Sound Inventory and Science Subcommittee of the Blue Plan Advisory Committee. "Long Island Sound Resource and Use Inventory." 331. Groton, CT: University of Connecticut, 2018.

TetraTech Inc. "Establishing Nitrogen Endpoints for Three Long Island Sound Watershed Groupings: Embayments, Large Riverine Systems, and Western Long Island Sound Open Water: Subtask B. Regulated Point Source Discharges." 19. Boston, MA: U.S. Environmental Protection Agency, Region 1, 2018.

Open Space

Connecticut Department of Energy and Environmental Protection. *Comprehensive Open Space Acquisition Strategy: 2016-2020*. 2016.

Connecticut Farm Bureau Association. *Connecticut's Land Use Value Assessment Law: Public Act 490: A Practical Guide and Overview for Landowners, Assessors and Government Officials*. Windsor, CT: Connecticut Farm Bureau Association, 2010.

Stormwater

Arnold, Chester, and James Gibbons. "Impervious Surface Coverage." *American Planning Association* 62, no. 2 (Spring 1996 1996).

Axiomatic LLC. "Baseline Assessment Report: Deicing and Snow Removal Practices." 75. Sandy Hook, CT: Western Connecticut Council of Governments, 2017.

———. "Winter Maintenance Guide." 35. Sandy Hook, CT: Western Connecticut Council of Governments, 2018.

Brabec, Elizabeth, Stacey Schulte, and Paul Richards. "Impervious Surfaces and Water Quality: A Review of Current Literature and its Implications for Watershed Planning." *Journal of Planning Literature* 16, no. 4 (May 2002).

Clausen, John C., Glenn Warner, Dan Civco, and Mark Hood. "Nonpoint Education for Municipal Officials Impervious Surface Research ", edited by Department of Natural Resources Management and Engineering, 18. Mansfield, CT: University of Connecticut, 2003.

Connecticut Department of Energy and Environmental Protection. "Best Management Practices for Disposal of Snow Accumulations from Roadways and Parking Lots." 2. Hartford, CT: Connecticut Department of Energy and Environmental Protection, 2011.

———. "Fact Sheets: Municipal Water Quality and Stormwater Summaries." Hartford, CT: Connecticut Department of Energy and Environmental Protection, 2011.

———. "General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems Reissuance with Modifications: Fact Sheet." 5. Hartford, CT: Connecticut Department of Energy and Environmental Protection, 2016.

———. "MS4 Municipalities with Active Registrations." 1. Hartford, CT: Connecticut Department of Energy and Environmental Protection, 2018.

Gibbons, James. "Addressing Imperviousness in Plans, Site Design and Land Use Regulations." 9. Haddam, CT: Non-Point Source Education for Municipal Officials (NEMO), 1998.

Prisloee, Michael, Emily Hoffhine Wilson, and Chester Arnold. *Final Report: Refinement of Population Calibrated Land-Cover-Specific Impervious Surface Coefficients for Connecticut*. Haddam, CT: University of Connecticut Middlesex County Extension Center 2008.

Sustainable Development

Coyle, Stephen. *Sustainable and Resilient Communities: A Comprehensive Action Plan for Towns, Cities and Regions*. Hoboken NJ: John Wiley & Sons, Inc., 2011.

Day, John W., and Charles Hall. *America's Most Sustainable Cities and Regions*. New York: Springer, 2016.

Hirshberg, Petter, Dale Dougherty, and Marcia Kadanoff. *Maker City: A Practical Guide for Reinventing Cities*. San Francisco, CA: Maake Media Inc., 2017.

Slone, Daniel K., and Goldstein Doris S. *A Legal Guide to Urban and Sustainable Development for Planners, Developers, and Architects*. Hoboken, NJ: John Wiley & Sons, Inc., 2008.

Sustainable Connecticut. *Equity Toolkit*. Willimantic, CT: Sustainable Connecticut, 2019.

Williams, Eric, ed. *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development*. New Hampshire Department of Environmental Services; New Hampshire Association of Regional Planning Commissions; New Hampshire Office of Energy and Planning; New Hampshire Local Government Center, 2008.

Winkless, Laurie. *Science and the City*. New York: Bloomsbury Sigma, 2016.

Transportation

Western Connecticut Council of Governments. "Housatonic Valley Metropolitan Planning Organization: 2015-2045 Long Range Transportation Plan." 121. Sandy Hook, CT: Western Connecticut Council of Governments, 2019.

———. "Southwestern Region Metropolitan Planning Organization: 2015-2045 Long Range Transportation Plan." 122. Sandy Hook, CT: Western Connecticut Council of Governments, 2019.

Trends and Conditions

Connecticut Clean Energy Communities. "Annual Reports For Aggregate Energy Usage." Energize Connecticut, https://ctenergydashboard.com/CEC/CEC_Aggregate_Report.aspx.

Connecticut Data Collaborative. "Median Home Values." Online, <http://ctdata.org/>.

Connecticut Department of Energy and Environmental Protection Water Diversion Program. "Lists of Registered and Permitted Diversions." Connecticut Department of Energy and Environmental Protection, https://www.ct.gov/deep/cwp/view.asp?a=2720&q=404934&deepNav_GID=1654.

Connecticut Department of Public Health. "Annual Town and County Population for Connecticut." Connecticut Department of Public Health, <https://portal.ct.gov/DPH/Health-Information-Systems--Reporting/Population/Annual-Town-and-County-Population-for-Connecticut>.

———. "Water Supplier List." Connecticut Department of Public Health, <https://portal.ct.gov/DPH/Drinking-Water/DWS/Public-Water-System-Lists>.

Office of Policy and Management. "2017 Net Grand List by Town." Office of Policy and Management, <https://data.ct.gov/Local-Government/2017-Net-Grand-List-by-Town/xtsi-wyww>.

U.S. Bureau of the Census. "American Community Survey." <https://www.census.gov/programs-surveys/acs/>.

———. "Characteristics of New Housing." U.S. Department of Commerce, https://www.census.gov/construction/chars/historical_data/.

U.S. Department of Agriculture. "2012 Census of Agriculture: Connecticut State and County Data." edited by USDA National Agricultural Statistics Service, 411. Washington DC, 2014.

———. "2017 Census of Agriculture: Connecticut State and County Data."

https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/Connecticut/.

Waste Water Management

Becker, Mary E. "Interim Phosphorus reduction Strategy for Connecticut Freshwater Non-Tidal Waste Receiving Rivers and Streams Technical Support Document." 70. Hartford, CT: Connecticut Department of Energy and Environmental Protection, 2014.

Waste Management

Connecticut Department of Energy and Environmental Protection, *2015 Statewide Waste Characterization Study*, March 15, 2016.

Water Resources

AKRF Inc. "Five Mile River Watershed Management Plan." 132. Stamford, CT: South Western Regional Planning Agency, 2012.

Axiomatic. "Winter Maintenance Guide." Sandy Hook, CT: Western Connecticut Council of Governments, 2018.

CDM Smith, and Milone & MacBroom. *Connecticut State Water Plan - Draft*. Hartford, CT: Connecticut Water Planning Council, 2017.

Connecticut Department of Energy and Environmental Protection. "2016 Integrated Water Quality Report." edited by Bureau of Water Protection and Land Reuse, 413. Hartford, CT: Connecticut Department of Energy and Environmental Protection, 2017.

Glennon, Robert. *Unquenchable: America's Water Crisis and What to do about it*. Washington DC: Island Press, 2009.

Hust, Robert, and James Murphy. "Protecting Connecticut's Groundwater: A Guide for Local Officials." edited by Connecticut Department of Environmental Protection, 78. Hartford, CT: Connecticut Department of Environmental Protection, 1997.

Milone & MacBroom. *Coordinated Water System Plan Part I: Final Water Supply Assessment Western Connecticut Public Water Supply Management Area*. Hartford, CT: Western Connecticut Regional Water Utility Coordinating Committee, 2016.

Naiman, Robert J., Henri Décamps, and Michael E. McClain. *Riparia: Ecology, Conservation, and Management of Streamside Communities*. Burlington, MA: Elsevier Academic Press, 2005.

Wright, Matthew E. "Saltier Waterways Creating Dangerous 'Chemical Cocktails'." *UConn Today*, no. December 13, 2018 (2018).

Appendix C: List of Acronyms

APA	Aquifer Protection Areas
AMI	Area Median Income
CSA	Community Supported Agriculture
CEQ	Council on Environmental Quality
CHFA	Connecticut Housing Finance Authority
CSC	Connecticut Siting Council
DEEP	Connecticut Department of Environmental Protection
EPA	Environmental Protection Agency
FAA	Federal Aviation Authority
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
I&I	Inflow and Infiltration
IPCC	Intergovernmental Panel on Climate Change
NFIP	National Flood Insurance Program
MGD	Millions of Gallon per Day
MS4	Municipal Separate Storm Sewer System
MG/L	Milligrams per Liter
MWh	Mega Watt hours
N	Nitrogen
POCD	Plan of Conservation and Development
SLR	Sea Level Rise
TOD	Transit Oriented Development
USDA	U.S. Department of Agriculture
UA	Urbanized Area
VMT	Vehicle Miles Traveled
WPCF	Water Pollution Control Facility

Appendix D: Goals and Policies

Implementation of the following 63 goals and policies is the responsibility of the Western Connecticut Council of Governments and will take the form of technical reports, guidance documents, model zoning regulations, and other plans that will create actionable strategies for federal, state and municipal governments with regulatory and/or jurisdictional responsibility for implementing these policies.

In addition, WestCOG will initiate task forces, as needed, when existing forums are not appropriate venues to address critical land use, economic development, environmental or housing issues that do not fall within the jurisdiction of existing organizational structures (e.g. the Western Connecticut Economic Development District (WCEDD), WestCOG Technical Advisory Group, Planners' Luncheons, Council of Governments, etc.).

The plan's goals and policies have secondary implementation responsibilities for other organizations. Each section of the plan identifies WestCOG as the primary organization and recognizes that secondary implementation responsibilities must be verified after the completion any relevant reports.

Stormwater Management

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Public Works Departments, Municipal Planning and Zoning Commissions, Water Pollution Control Facilities

1. Minimize the installation of impervious surfaces in new developments
2. Avoid the installation of impervious surfaces within at least 100 feet of watercourses or the creation of new, directly-connected impervious areas.
3. Revise zoning regulation standards for building cover to address impermeable cover standards and Green Area cover standards.
4. Develop long-term strategies to reduce infiltration of stormwater into municipal sewage treatment plant systems.

Floodplain Management

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions, Federal Emergency Management Agency

5. Redefine the boundaries of the 100-year floodplain based on post-2001 meteorological data for Western Connecticut.
6. Revise floodplain management provisions of municipal zoning regulations to reflect revised floodplain boundaries.
7. Request FEMA to update its flood insurance rate map program to align with current meteorological data.
8. Request FEMA to incorporate anticipated climate trends into its meteorological assessments of future flood stage forecasting to address anticipated precipitation levels for thirty-year planning scenarios.

Riparian Corridors

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions

9. Encourage the adoption of streambelt zoning as a means to protect ecology and riparian values provided by the major watercourses in Western Connecticut.
10. Develop model streambelt zoning regulations for adoption by municipalities in western Connecticut.
11. Increase the protection of tree canopies and maintain core forests along major riparian corridors in western Connecticut.

Communication Infrastructure

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions, Municipal Chief Elected Officials

12. Establish view-shed regulations to guide the installation of towers consistent with the regulations of the Federal Communications Commission and the State of Connecticut Siting Council.
13. Identify appropriate locations for towers and small wireless facilities consistent with communication requirements and the aesthetic and view-shed concerns of citizens of western Connecticut.
14. Encourage the co-location of communication towers to minimize the visual clutter of wireless communication systems in the region.
15. Assess the consistency of local land use decision making timetables with the Federal Communication Commission's "shot clock" timetable that establishes strict deadlines for acceptance, review, and approval of telecommunication tower applications.
16. Assemble a Task Force of appointed municipal staff, industry leaders, and WestCOG staff to create a coordinated development strategy for fifth generation cellular network implementation.

Transportation Infrastructure

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Public Works Departments, Municipal Chief Elected Officials

17. Develop municipal and regional Transportation Asset Management Plans to guide municipal and state investments in the maintenance and rehabilitation of municipally owned transportation infrastructure.
18. Conduct detailed inventories of transportation infrastructure to determine fiscal priorities for maintenance and rehabilitation of key transportation assets.

Sewer Avoidance

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions, CT DEEP, Health Departments

19. Employ sewer avoidance strategies in areas where failing septic systems pose a clear and present danger to public water supplies, public recreational water bodies, and public groundwater supplies.
20. Identify appropriate community sewer systems for areas with failing septic systems where such systems cannot be cost effectively repaired.

21. Adopt more sophisticated buildable lot standards within zoning regulations for those municipalities where septic system failures have been endemic.

Renewable Energy Infrastructure

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions, Municipal Chief Elected Officials

22. Adopt zoning regulations that facilitate the installation of renewable energy systems including photovoltaic systems, super-insulated and net zero energy dwellings, earth sheltered housing, and ground source and air source heat pump technologies.
23. Consider the creation of renewable energy zones like that established in Bethel, as a means to direct the locations where the Connecticut Siting Council places grid-connected solar energy systems within the region.
24. Adopt subdivision regulations that give greater consideration to solar access and solar orientation of buildings in new residential developments.
25. Participate in the Clean Energy Communities Program to facilitate adoption of long-term sustainable approaches to the installation and use of renewable energy sources.
26. Avoid the placement of grid-connected solar energy systems in areas that will destroy core forests, adversely affect riparian corridors, or destroy critical agricultural lands.

Affordable Housing

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions, Municipal Chief Elected Officials

27. Provide greater zoning flexibility in the development of accessory apartments and two-family dwelling units in single family residential zones.
28. Consider the adoption of regional strategies to address housing affordability where municipalities within a region develop a coordinated housing strategy with mutually beneficial outcomes. This concept will require state enabling legislation but could offer significant benefits to the participants.
29. Expand zoning strategies that enable seniors to remain in their homes through more flexible approaches to the letting of rooms, more flexible definitions of family, and less burdensome permitting procedures.

Transit Oriented Housing

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions

30. Encourage a mix of housing and commercial development in the region's thirty-five village centers as well as within the urbanized centers in the region.
31. Focus higher density development along major transit routes to support high-quality mass transit services.

Economic Development

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions, CT DOT, CT DOL, WCEDD

32. Encourage economic development along the region's two major interstate systems and within industrial parks that have direct access to these highways.
33. Amend zoning to allow agricultural industries including greenhouses, nurseries, and climate-controlled food processing industries in industrial zones in the region.
34. Employ strategies including telecommuting to reduce commuting and total vehicle miles traveled at the region's largest employers.
35. Expand the supply of multi-family housing to ensure affordable housing for the region's workforce.
36. Encourage greater employment growth in the region's thirty- five villages consistent with local community character, arts and cultural resources, and sewer and water services.
37. Encourage the state to make investments in rail services within the region.
38. Ensure that the region's workforce receives the appropriate level of training and skills development to compete in the marketplace.

Historic Preservation and Tourism

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions, Municipal Chief Elected Officials, Municipal Economic Development Commissions

39. Promote the tourism value of the region's unique historic, cultural, arts and natural resources as one of its greatest economic development assets.
40. Market and raise awareness of the unique historic legacy found in western Connecticut.
41. Identify additional local scenic roads that should be preserved to create more livable communities that offer biking, walking, and access to nature.
42. Adopt the special zoning authorities for village districts enabled by Section 8-2j of the Connecticut General Statutes as amended, where it has not yet been established.

Water Supplies

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions, Water Pollution Control Facilities, CT DOH

43. Adopt aquifer protection area regulations for potential aquifers that will be needed to accommodate future growth and uncertain water supplies.
44. Identify the potential safe yield available from all stratified drift aquifers that have yet to be tapped for public water supply purposes.
45. Encourage continued expansion of the interconnections among the region's public water suppliers to avoid droughts like that experienced in Stamford several years ago.

46. Investigate the feasibility of establishing more coordinated, centralized management of the region's community water systems where limited management services have adversely affected water quality reporting and testing requirements.
47. Reduce the long-term demand for public water through innovative water conservation and xeriscaping techniques.
48. Implement the recommendations of the *Long Island Sound Resource and Use Inventory* study.
49. Determine and implement cost-effective means to reduce the high nitrogen levels discharged into Long Island Sound.
50. Promote the importance of aquaculture in Long Island Sound including its economic and ecological benefits for the marine environment.

Protected Open Space and Forests

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions, Municipal Conservation Commissions, CT DEEP

51. Identify and protect the most important open space locations within the region, preserving at least 4,354 additional acres, consistent with the State's Green Plan.
52. Ensure that protected open space is located in areas accessible to population centers as well as in areas that serve to protect the region's important ecological resources.
53. Identify federal, state and private sector fiscal resources to protect the region's forest resources.
54. Identify the tree canopy coverage along the region's major riparian corridors as part of a regional effort to protect major watercourses from inappropriate urban development.

Air Quality

Primary Responsibility: WestCOG

Secondary Responsibility: CT DEEP, WCEDD

55. Prioritize infrastructure projects that encourage commuters to choose clean or cleaner modes of transportation such as walking, biking, or transit over driving alone.
56. Support the State of Connecticut in petitioning the U.S. Environmental Protection Agency to expand the geographic size of the Ozone Transport Region.
57. Encourage local employers to offer transportation demand management strategies such as telecommuting, carpooling, vanpooling, etc.

Agricultural Resources

Primary Responsibility: WestCOG

Secondary Responsibility: Municipal Planning and Zoning Commissions, CT DOA, Municipal Conservation Commissions

58. Encourage municipalities to play a more active role in the protection of farmland and agricultural enterprises through farmer's markets, community supported agriculture, and other incentives that reduce the financial burdens of operating private sector managed farms.
59. Promote agri-tourism concepts and adopt such concepts in zoning regulations.

60. Work with Conservation Commissions, the State Department of Agriculture and the Connecticut Department of Energy and Environmental Protection to reduce pesticide use in areas adjacent to public water supply reservoirs and within public water supply watersheds.
61. Develop position papers on integrated pest management strategies applicable to farmers in Western Connecticut.
62. Identify all land currently protected under Public Act 490.
63. Encourage the use of industrially zoned land for intensive greenhouse and outdoor agricultural production.

Appendix E: Recommended Criteria for Designating Protected Open Space

Based on open space designations established by the Housatonic Valley Association and the municipality of Greenwich, the following criteria have been developed to create a uniform system of tracking protected open space in the municipalities of Western Connecticut. By standardizing the categories used for protected open space, it will be possible to determine the levels of protection available for public and privately-owned lands. The intention of these recommendations is not to exclude unprotected open space and recreational areas that are serving important public purposes in many municipalities. Rather, the focus is on determining the degrees of protection afforded to the region's wide range of lands owned in various levels of open space protection.

A property to be legally protected for conservation purposes must meet one of the following four conditions - whether it be owned by governmental or non-governmental organizations - to be included in the Western Connecticut Council of Governments Regional Plan of Conservation and Development.

1. It is **owned in fee** by a conservation entity such as a federal or state conservation agency or a land trust.
2. It is subject to a **perpetual conservation easement** or conservation restriction held by a qualified entity, including those described above and sometimes a municipality
3. It was legally **designated as conservation land**, either in fee simple or subject to a perpetual conservation easement or restriction as a condition of a development permit e.g. a subdivision with conservation land set aside.
4. It was **acquired with restricted funding, or as a donation**, that required it be maintained for conservation and/or recreation purposes only.

Based on these definitions, municipal holdings are considered permanently protected conservation lands if they are subject to condition 2, 3 and/or 4, above. While water company lands have some protections limiting the sale of such lands under statutorily mandated procedures, these are not permanent protections. Similarly, other tax-exempt properties (e.g. schools or churches) that are not held and used for conservation purposes, or lands owned by foundations are not protected open space unless one or more of the above-mentioned conditions apply. While open space benefits are provided by Public Act 490 lands and deed restricted lands, these properties are not perpetually restricted for conservation purposes and are not included under the categories of permanently protected public or private open space listed below. Cemeteries, private hunting / fishing clubs or homeowner's associations also offer unprotected open space benefits and are listed as private unprotected open space in the table below.

Goals for Open Space Inventory

Nevertheless, regardless of the degree of protection provided by public and private open space lands, it is important to establish a uniform collection of all open space lands to determine the amount of open space available to residents of the region. The fact that some open space may be subject to less protections than provided by permanent conservation easements should not limit municipal efforts to inventory all open space lands. Unprotected open space offers many benefits to the region without imposing the fiscal and administrative burdens of acquiring and managing such lands. Such lands also may be potential candidates for open space protection when fiscal resources are available and such lands support broader efforts to expand recreational opportunities in the region, extend wildlife corridors, protect riparian

corridors, enhance hiking and bike trails, expand existing park, preserves and scenic areas.

Public Protected (Either owned by a Conservation entity, subject to perpetual conservation easement, legally designated as conservation land or acquired with funding restrictions requiring it be conserved and/or for recreation purposes)

- ▶ Town Land
- ▶ State Land (CT Dept of Energy & Environmental Protection or CT Dept of Agriculture)
- ▶ Federal Land (U.S. Fish & Wildlife Service, Natural Resources Conservation Service, National Park Service, U.S. Forest Service)

Private Protected (Either owned by a Conservation entity, subject to perpetual conservation easement, legally designated as conservation land or acquired with funding restrictions requiring it be conserved and/or for recreation purposes)

- ▶ Land Trusts
- ▶ Other Non-governmental Organizations
- ▶ Private Associations

Public Unprotected (Land without permanent conservation protections and/or easements)

- ▶ Town Land
- ▶ Public Schools

Private Unprotected (Land without permanent conservation protections and/or easements)

- ▶ Cemeteries, Country Clubs, Private Schools
- ▶ Private Recreation
- ▶ PA 490 Form, Forest or Open Space
- ▶ Water Company Land
- ▶ Utility Rights of Way

▶ Religious Institutions

Types of Open Space Lands Suitable for Protection

An open space technical report prepared for South Western Regional Planning Agency in 1992 provided important guidance concerning the types of open space that should be considered for protection to meet the wide range of cultural, ecological, recreational, historic, and aesthetic factors that contribute to the well-being of residents of western Connecticut.³⁷

Types of Open Space Suitable for Protection:

- ▶ Natural Resources
- ▶ Conservation Lands
- ▶ Recreational Resources
- ▶ Scenic Roads
- ▶ Visual Buffers
- ▶ Historic Resources
- ▶ Cultural Resources
- ▶ Archaeological Resources
- ▶ Scenic Areas
- ▶ Roadside Pullovers

The 1992 SWRPA open space report also provides important clarification on the types of governmental properties that should be considered when inventorying open space lands that are generally considered accessible to the public. Public access to open space is a critical variable when determining whether land should be deemed a public open space resource. The following table provides specificity on the types of federal, state and local government lands that should be considered when inventorying open space.

³⁷ South Western Regional Planning Agency, Technical Report 1 on Open Space, April 8, 1992, p. 2-5.

Federal Land	State Lands	Municipal Lands
U.S. Fish & Wildlife Service Lands	Parks and Arboretums	Conservation easements, Subdivision set Asides
National Park Service Lands	Tidal Flats, Tidal Wetlands, Sedge Flats	Parks, Recreation Facilities, Ball Fields, Playgrounds, Schools, Public Beaches
Historic Sites, Parks	Ponds, Mill Ponds, and Dams	Town Farms, Town Camps,
Wildlife Refuge	Resource Management Areas	Oyster Grounds, Salt Meadows
U.S. Forest Service	River Access Points, Boat Launches and Public Beaches	Historic Sites, Historic Areas, Monuments, Art Centers, Town Government Facilities

Appendix F: Municipal Conservation and Development Policies

Municipal plans of conservation and development provide an important foundation for western Connecticut's regional plan of conservation and development. The goals, policies and strategies adopted by the eighteen municipalities in western Connecticut have been compiled and analyzed to determine the common priorities that bind the region together. Of the 3,270 goals, policies and strategies contained in the eighteen municipal plans, nearly 75% addressed fifteen target areas as follows:

<i>Rank</i>	<i>Policy Topics</i>	<i>Number of Policies</i>
1	Natural resource protection	277
2	Housing	270
3	Economic development	264
4	Open Space	236
5	Central business district enhancements	203
6	Community facility needs	203
7	Highway system improvements	195
8	Historic resources	143
9	Utilities	130
10	Community character	103
11	Pedestrian related facilities	101
12	Coastal zone management	94
13	Village district policies	92
14	Zoning policies	89
15	Mass transit policies	86
<i>Subtotal</i>	Top fifteen policies	2,400
	Other policies*	870
<i>Total</i>	Adopted policies	3,270

Housing Policies

A detailed review of the policies pertinent to housing revealed that affordable housing was the highest

priority identified by the collective wisdom of the eighteen municipalities. The second most cited housing policy was for elderly housing reflecting the aging baby boom generation living in western Connecticut. In rank order the next most frequently cited housing policies are; 1) the need for a diverse housing stock; 2) the need for a housing plan; 3) the need to maintain stable neighborhoods; 4) the need to expand work force housing; 5) the need for mixed income housing; 6) the need for multi-family housing; 7) the need to consider the environmental and energy impacts of housing development; and 8) the need for mixed use development. These ten policy topics accounted for about 75% of all the housing policies adopted in western Connecticut. Collectively, the region's municipalities have identified the most significant housing priorities for the next ten years all of which are consistent with those contained in the Western Connecticut Plan of Conservation and Development.

Natural Resource Protection Policies

An analysis of the region's natural resource protection policies revealed that the ten most frequently cited policies are in rank order; 1) protection of water quality; 2) protection of wetland and watercourses; 3) natural resource protection in general; 4) habitat protection; 5) natural resource awareness programs; 6) stormwater management; 7) invasive species issues; 8) shade tree canopy programs; and tied for ninth place are 9) aquifer protection; hazardous waste issues; riparian corridor protection; and watershed protection. These policy topics accounted for 76% of all the natural resource policies adopted in western Connecticut. While water quality protection and protection of wetlands and watercourses is legally required by federal, state and local laws and regulations, this is not fully the case for stormwater management, invasive species, habitat protection, aquifer protection and riparian corridors. While the federal and state

governments have established stormwater management regulations they do not apply to all cases where stormwater is generated. Similarly, while the state and local governments have established public water supply aquifer protection laws and regulations, these laws and regulations – with few exceptions – have not been extended to potential aquifers that have yet to be tapped for public drinking water purposes. Similarly, riparian corridor protections remain an unregulated natural resource that has profound consequences on the health and vitality of the region's watercourses. As discussed in the plan, state and local legislative remedies will be required to protect riparian corridors since wetland and watercourse regulations do not provide a comprehensive system of protection for this important resource.

Economic Development Policies

In rank order of importance, the following economic development policies account for 74% of all economic development policies adopted by the region's eighteen municipalities; 1) business assistance policies; 2) marketing; 3) zoning; 4) technical assistance; 5) economic development plans; 6) increasing the grand list; 7) parking issues; 8) enhancement of the central business district; 9) highway related policies; and 10) the need for improved economic development networking within the region. These priorities suggest that the region's economic development is caught between strategic planning initiatives aimed at identifying industries and commerce compatible with the existing infrastructure, services and labor force and seeking strategies to better serve the existing commercial, industrial and retail trades.

Enhancing the Central Business District

Virtually all the region's municipalities are concerned with retaining and enhancing their central business districts – whether those districts are village centers or more urban in scale. The top ranking policies for central business districts are as follows: 1) enhancement the central business district; 2) improve pedestrian facilities in the CBD; 3) encourage adaptive reuse of existing facilities; 4) economic development plans; 5) streetscape planning; 6) establishing anchor

retail facilities to attract smaller retail services; 7) ensure architectural character is preserved; 8) the need for improved economic development networking within the region; 9) the need for improved village district design; and 10) the need for mixed use development in the downtown. These ten policies accounted for 56% of all CBD related policies in the region. These policies clearly point to recent concerns with the loss of brick and mortar retail services in the internet era and raise the importance of finding strategies to get people off their computers, out of their cars and walking on main street to fulfill their shopping, entertainment and networking needs.

Open Space Preservation

One of the most important elements of any regional plan is the protection of open space – not only to enrich the lives of the residents of the eighteen municipalities but to preserve natural habitat, maintain core forests, protect wildlife corridors and minimize the adverse stormwater, flooding and climate impacts associated with deforestation and erosion and sedimentation of watercourses. The region's municipal plans of conservation and development have collectively established the following ten priority policies to achieve these objectives; 1) preserve open space; 2) seek funding and grants to obtain additional open space; 3) develop trails to make open space more accessible; 4) acquire property whenever available to expand municipal open space; 5) develop open space management plans; 6) make access improvements to ensure open space is available to a wider public; 7) promote natural resource and open space awareness campaigns; 8) coordinate natural resource and open space protection efforts by networking with other organizations; 9) establish greenways consistent with the state greenway program; and 10) inventory existing open space to establish a baseline of open space resources within each municipality. These ten policy topics account for 77% of all the open space policies in western Connecticut.

Community Facility Needs

Municipal facilities are an essential component of local governments in western Connecticut. Municipal

facilities include town halls, libraries, public schools, public works departments/highway departments, community centers, senior centers and public spaces where community events occur. It is not surprising that the most important community facilities are the public-school systems since public education costs are the single most important component of local government expenditures. Education related policies accounted for about 25% of all community facility needs within the region. The remaining policies in rank order are; 1) facility planning concerns; 2) fire, police and emergency services; 3) accessible public facilities; 4) need for facility maintenance; 5) library preservation and maintenance; 6) public space policies; 7) support for recreational facilities; 8) services for seniors; 9) community facility needs in general; and 10) property acquisition considerations with respect to community land and buildings. Collectively, these ten policy topics accounted for 80% of all the community facility need policies in western Connecticut.

Summary of Other Significant Policies

In addition to the six major policy topics discussed above, it is important to recognize that many emerging policy topics, such as climate change, sustainability, energy management, bicycle and pedestrian friendly streetscapes, flood mitigation measures and flood avoidance plans, farmland protection, transit-oriented development (sometimes closely linked with smart growth development), protection of scenic roads and vistas, resource conservation (also known as reduce, reuse and recycle), and wireless telecommunication systems are critical planning concerns that will become much more important in the next ten years as we face increasing threats from a warming climate, rising sea levels and increased precipitation. Greater emphasis on alternative forms of travel – other than the automobile – will become more important as the cost of petroleum

increases or becomes less available and as the region focuses its development toward those locations which are best supported by the existing sewer, water, mass transit, telecommunications and stormwater management systems.

Livability Index

Finally, it is important to recognize that all of these metrics are merely surrogate measures of what might be called the “happiness index” or the livability index” for the region’s residents. Often, as planners we may get lost in the technical and mundane details of preserving and improving our communities and may not stop to think about the ultimate purpose of municipal and regional planning. Whether we enjoy living in our community, and avail ourselves of its many services and networks, is often determined by the values and personal networks that we establish in life. Communities are not merely physical structures that support our needs, they also create a sense of place and, in the broadest sense, a sense of self. Our lives are not only tied to the physical world that surrounds us but to our personal and emotional connections with friends and neighbors that bind us together as a community. It is this focus on human values that led the nation of Bhutan to replace the concept of a gross national product with that of a gross national happiness index. While the Bhutan vision may be a Pollyanna perspective for some, it underscores the importance of re-emphasizing livability policies such as those adopted in New Canaan, New Fairfield, Sherman and Westport. An index of livability rests on achieving our work, social, community and spiritual goals, strengthening community spirit and creating a sense of community well-being. This regional plan is intended to facilitate a more livable regional community.

Appendix G: Glossary of Terms

Affordable Housing: "...housing for which persons and families pay thirty per cent or less of their annual income, where such income is less than or equal to the area median income for the municipality in which such housing is located, as determined by the United States Department of Housing and Urban Development." (Connecticut General Statutes §8-39a)

Class 1 Renewable Energy Source: "... (A) electricity derived from (i) solar power, (ii) wind power, (iii) a fuel cell, (iv) geothermal, (v) landfill methane gas, anaerobic digestion or other biogas derived from biological sources, (vi) thermal electric direct energy conversion from a certified Class I renewable energy source, (vii) ocean thermal power, (viii) wave or tidal power, (ix) low emission advanced renewable energy conversion technologies, including, but not limited to, zero emission low grade heat power generation systems based on organic oil free rankine, kalina or other similar nonsteam cycles that use waste heat from an industrial or commercial process that does not generate electricity, (x) (I) a run-of-the-river hydropower facility that began operation after July 1, 2003, and has a generating capacity of not more than thirty megawatts, or (II) a run-of-the-river hydropower facility that received a new license after January 1, 2018, under the Federal Energy Regulatory Commission rules pursuant to 18 CFR 16, as amended from time to time, and provided a facility that applies for certification under this clause after January 1, 2013, shall not be based on a new dam or a dam identified by the commissioner as a candidate for removal, and shall meet applicable state and federal requirements, including applicable site-specific standards for water quality and fish passage, or (xi) a biomass facility that uses sustainable biomass fuel and has an average emission rate of equal to or less than .075 pounds of nitrogen oxides per million BTU of heat input for the previous calendar quarter, except that energy derived from a biomass facility with a capacity of less than five hundred kilowatts that began construction before July 1, 2003, may be considered a Class I renewable energy source, or (B) any electrical generation, including distributed generation, generated from a Class I renewable energy source, provided, on and after January 1, 2014, any megawatt hours of electricity from a renewable energy source described under this subparagraph that are claimed or counted by a load-serving entity, province or state toward compliance with renewable portfolio standards or renewable energy policy goals in another province or state, other than the state of Connecticut, shall not be eligible for compliance with the renewable portfolio standards established pursuant to section 16-245a;" (Connecticut General Statutes §16-1(a)(20))

Floodplain: "Any land area susceptible to being inundated by floodwaters from any source." (Federal Emergency Management Agency)

Impervious Cover: "...the sum total of all hard surfaces within a watershed including rooftops, parking lots, streets, sidewalks, driveways, and surfaces that are impermeable to infiltration of rainfall into underlying soils and groundwater." (United States Environmental Protection Agency)

Municipal Separate Storm Sewer System(MS4): "...a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States. (ii) Designed or used for collecting or conveying storm water; (iii) Which is not a combined sewer;

and (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2." (40 Code of Federal Regulations §122.26(b)(8))

National Pollutant Discharge Elimination System: "The Clean Water Act prohibits anybody from discharging "pollutants" through a "point source" into a "water of the United States" unless they have an NPDES permit. The permit will contain limits on what you can discharge, monitoring and reporting requirements, and other provisions to ensure that the discharge does not hurt water quality or people's health. In essence, the permit translates general requirements of the Clean Water Act into specific provisions tailored to the operations of each person discharging pollutants." (United States Environmental Protection Agency)

Protected Open Space: land that has ecological value and is protected through deed restrictions or similar protections, including, but not limited to, wetlands, floodplains, wildlife habitat, coastal and water resources, riparian buffers, agricultural lands, unfragmented forests, lands that augment streamflow protection, recreation, lands containing significant archeological, cultural or historic resources, parcels proximate to urban areas or public transportation that will further environmental justice/ environmental equity goals, and lands that increase the connectivity of trail systems.

Public Water Supply System: "...any water company supplying water to 25 or more persons, daily, at least 60 days of the year. The DWS is responsible for the administration of state and federal drinking water regulations and is dedicated to assuring the quality and adequacy of our State's public drinking water sources." (CT State Department of Public Health)

Riparian Corridor: "...a unique plant community consisting of the vegetation growing near a river, stream, lake, lagoon or other natural body of water. It serves a variety of functions important to people and the environment including preserving water quality by filtering sediment from runoff before it enters rivers and streams; protecting stream banks from erosion; providing a storage area for flood waters; providing food and habitat for fish and wildlife; preserving open space and aesthetic surroundings; creating migratory pathways for a wide range of species; augmenting water resources for underlying stratified drift aquifers and preserving broad corridors to enable the natural mobility of river systems responding to changing climatic and stormwater conditions." (County of Santa Cruz)

Transit Oriented Development: "...the exciting fast-growing trend in creating vibrant, livable, sustainable communities. Also known as TOD, it's the creation of compact, walkable, pedestrian-oriented, mixed-use communities centered around high-quality train systems. This makes it possible to live a lower-stress life without complete dependence on a car for mobility and survival. Transit oriented development is regional planning, city revitalization, suburban renewal, and walkable neighborhoods combined. TOD is rapidly sweeping the nation with the creation of exciting people places in city after city. The public has embraced the concept across the nation as the most desirable places to live, work, and play. Real estate developers have quickly followed to meet the high demand for quality urban places served by rail systems. Transit oriented development is also a major solution to the serious and growing problems of climate change and global energy security by creating dense, walkable communities that greatly reduce the need for driving and energy consumption. This type of living arrangement can reduce driving by up to 85%." (Transit Oriented Development Institute)

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