Evironmental Quality in Connecticut

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STATE OF CONNECTICUT

COUNCIL ON ENVIRONMENTAL QUALITY

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April 20, 2022

The Honorable Ned Lamont
Governor of Connecticut
State Capitol
Hartford, CT 06106

Governor Lamont:

The Council is pleased to submit *Environmental Quality in Connecticut* for 2021, as authorized by Connecticut General Statutes (CGS), Section 22a-12. The Council was established on June 25, 1971 by Public Act 872 making 2021 the Council's 50th year. This report uses over fifty indicators of environmental health and human activity to illustrate environmental trends, both positive and negative, for the 2021 calendar year. In 2021, the Covid-19 virus continued to have had an impact on certain indicators, skewing the data trends for some of the indicators, such as patterns of energy consumption and transportation.

Though this report can be printed, it is designed to be read as an online document on the Council's website. Online, the values on its charts will appear under the reader's cursor and the reader can access the many supplemental documents which are hyperlinked within it. "Quick Summary" boxes above most of the charts show the data trends for the past year and past decade.

In sending this report, the Council wishes, also, to acknowledge your efforts through the Governor's Council on Climate Change and Executive Order 21-3 to address the State's serious climate challenge. Indeed, decarbonization of electric grid, increased use of renewable resources for heating and cooling and the expanded use of electric drive vehicles is critical to reducing greenhouse gases generated by the combustion of fossil fuels.

As always, the Council looks forward to providing you with any additional information you might request.

Respectfully submitted,

Keith R. Ainsworth

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Index

The Status of Connecticut's Environment After 50 Years

2021 marked fifty years since the Council on Environmental Quality (Council) was established by Public Act 872. On June 25, 1971, the legislature bestowed the Council with three primary responsibilities: to submit an annual report to the governor on the status of Connecticut's natural environment, and advise other state agencies on the environmental impacts of proposed construction projects. The Council now posts most of its advisories to its website. The Council, which commenced its activities in October of 1971, operated for the first year with only the nine members performing all the required functions. Late in 1972, pursuant to legislative authorization, an Executive Director was secured. In 1973, the Council was tasked with the responsibility to produce and distribute the Environmental Monitor, a summary of proposed land transfers by state agencies and of all state actions that are subject to a review under the Connecticut Environmental Policy Act.

Since the Council's creation, its annual reports have succinctly documented the many changes to Connecticut's environment. In the first annual report, published in 1973, the Council focused on air quality, water quality, land use, and noise abatement. There was even some discussion of Connecticut's offshore oil potential and a cautionary statement regarding "the risks associated with offshore drilling."

Generally, Connecticut's environment is better than it was ten years ago and significantly better than the environmental conditions from when the Council was created in 1971. The greatest improvement has been to the state's air quality. Despite, the recovery of bald eagles, the state's wildlife has been changing and many species are in decline. Some recent negative trends in flora and fauna are the consequence of climate warming that is affecting the species that are found in Long Island Sound and in the state's woodlands. Indeed, many of the indicators identified in this report are individually affected by climate change, but most are affected through their connections to one or more other indicators.

As stated in the annual report published in 1973, "W*e, the people, have created our pollution problems, and we can solve them. Much has been done, but much remains to be done.*"

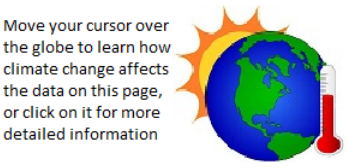
Introduction – Understanding "Environmental Quality in Connecticut"

The Annual Report of the Council on Environmental Quality for 2021

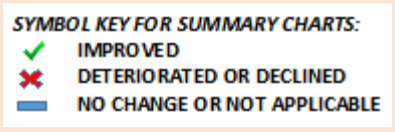
published April 20, 2022

Welcome to *Environmental Quality in Connecticut*. This edition documents the condition of Connecticut's environment during the 2021 calendar year. This annual report is designed to be read online to allow use of the navigation buttons to move from section to section within it or to find the topics of interest in the Index. Online, the values on the charts will appear under your cursor.

The majority of Connecticut's key environmental indicators are strongly affected -- almost always negatively -- by a changing climate. The symbol at right (example) will identify indicators that are so affected or those that affect the climate. For the online edition, running your cursor over the symbol will reveal a brief statement of the indicator's connection to climate that is also linked to more information. For the printed version, please refer to "Climate Notes" at the end of this Annual Report.



Summary Key for Indicators: Each page in the report has an environmental theme. Where an indicator shows change over time, there will usually be a summary key to allow for a quick evaluation of the status of that indicator. The top line is the indicator's status for the most recent year; the second line shows the current year's status compared to the 10-year trend; and the third line shows whether the indicator is on track to meet its goal.



The asterisks in the body of the text refer to clarifying information found in the "Technical Notes" section on most pages. The endnotes identify the primary source of the information.

In 2021, as was the case in 2020, the 2019 novel coronavirus (COVID-19) imposed some practical challenges to the monitoring of environmental conditions and enforcement of environmental regulations. Data for some indicators were affected by measures to reduce exposure of State employees to COVID-19 and by residents' personal behaviors in response to the virus. For example, there were no surveys for bat populations at the monitoring site due to Covid-19. In addition, several of the indicators increased or decreased, more than would be normally expected, due to the public's response to the COVID 19 virus. Residential electricity consumption increased significantly in 2021, in part, because people were spending more time at home, while bus ridership declined.

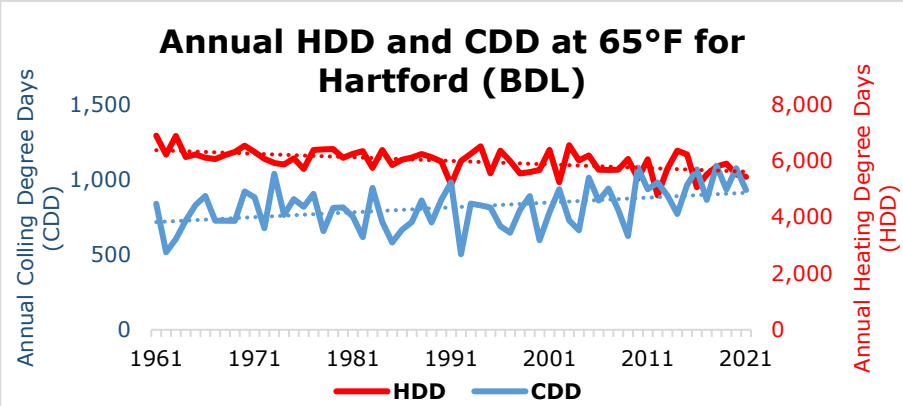
There may be updates to the 2021 Annual Report if data become available that were not available at publication. Sign up for e-alerts to receive a notice when updates are published. The Council welcomes your comments and questions.

The Climate Challenge

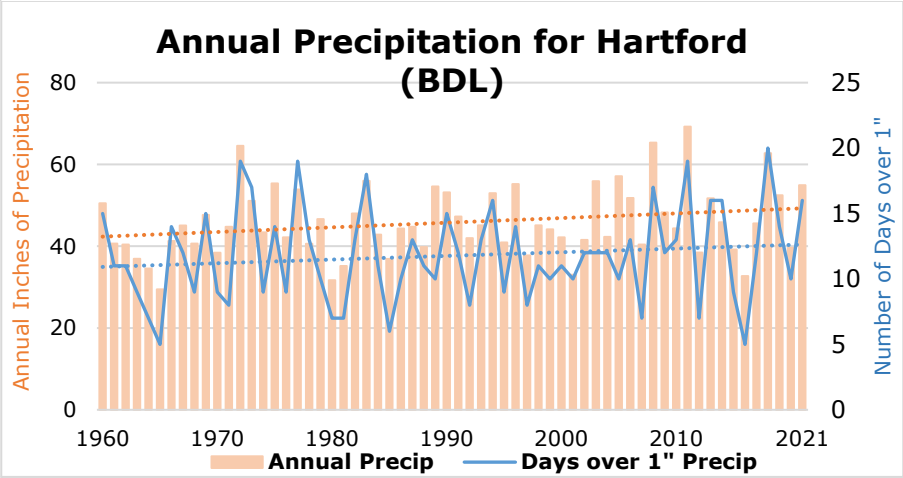
The warming of Connecticut's climate threatens to undo much of the environmental progress of past decades that is illustrated in these pages. Nearly every environmental indicator in the 2021 annual report has a tie to global warming. As depicted in the charts below, the trend over the last sixty years suggests that Connecticut's climate is getting warmer and there's more precipitation.[1]

The state's warming climate is evidenced by increased annual average temperature, precipitation, cooling degree days (CDD) and decreasing heating degree days (HDD) since 1960.

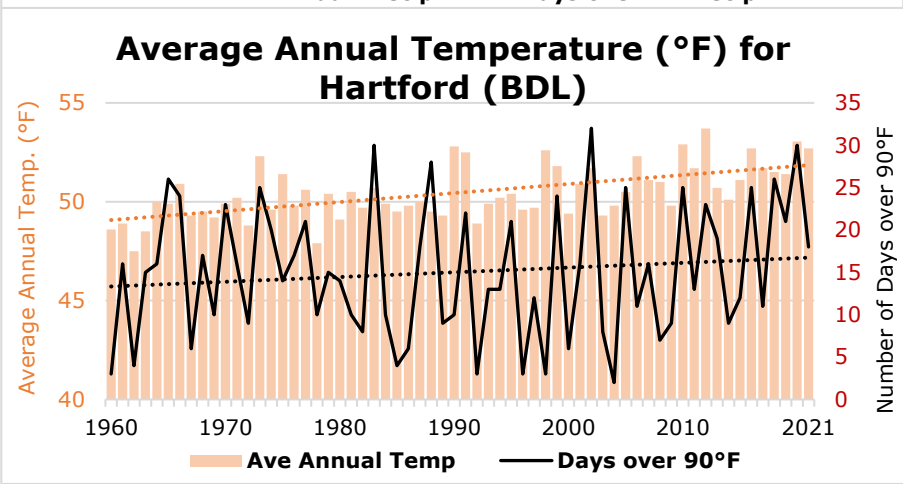
The trend for annual average HDD has decreased while the trend for annual average CDD has increased since 1960. Degree days reflect changes in climate and are a proxy for the energy demand for heating or cooling.



Annual precipitation for 2021 was 20 percent higher (54.94) and the number of days with rainfall greater than one inch (16) was 37 percent higher than the annual average since 1960. It is predicted that as the climate warms, severe weather events like prolonged drought and extreme rainfall will become more frequent.[2]



The average annual temperature for 2021 was 52.7 degrees Fahrenheit (°F). Between 1960 and 2020, the average annual temperature was 50.43°F. The average number of days annually, since 1960, with temperatures greater than 90°F is now 15.2. However, 2021 had 18 days greater than 90°F.



Technical Notes: *All weather and climate data are for the weather station at Bradley International Airport (BDL).

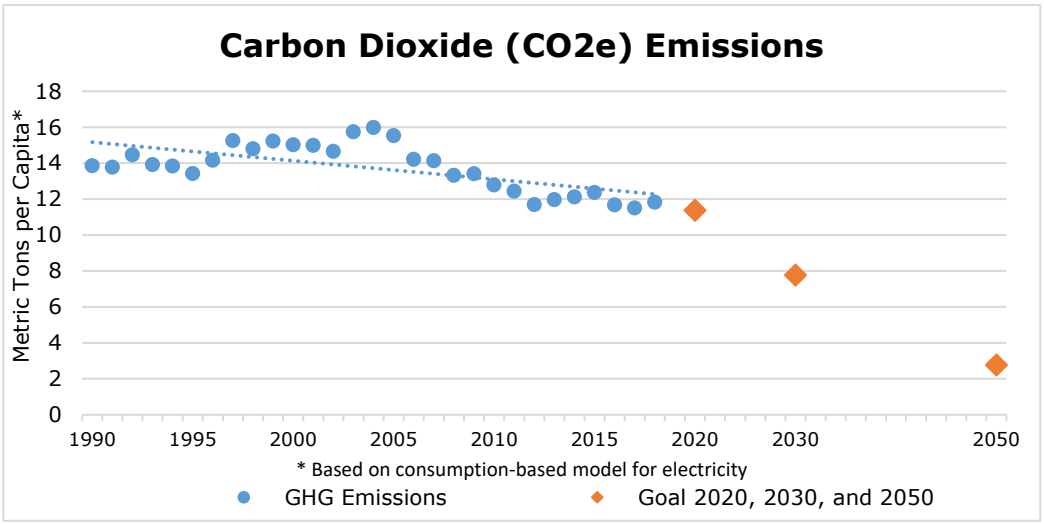
Climate Changers

QUICK SUMMARY:

✗ COMPARED TO LAST REPORT
✓ COMPARED TO 10 YR. AVERAGE
✗ ON TRACK TO MEET GOAL

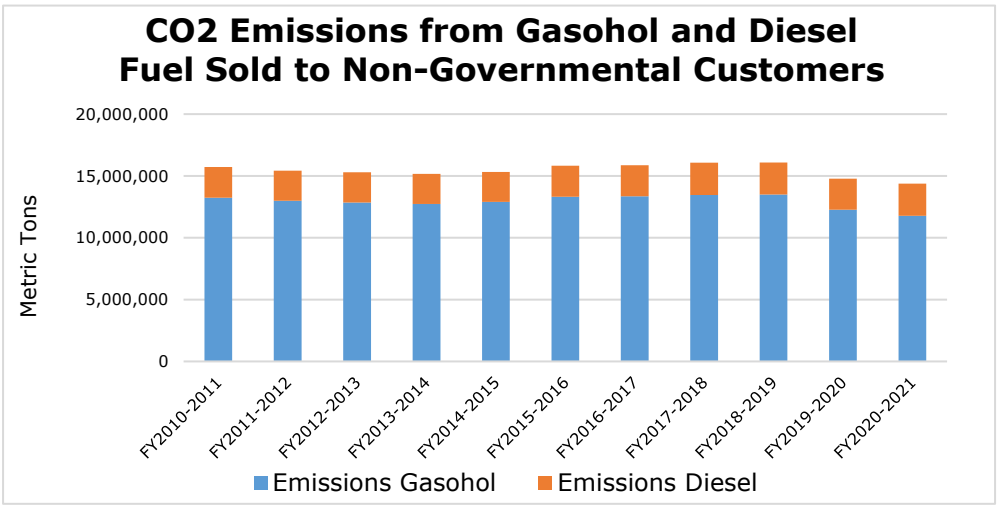
Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

Per-capita carbon dioxide equivalent (CO_{2e}) emissions increased in 2018 and the State is not on track to meet the 2030 and 2050 goals.



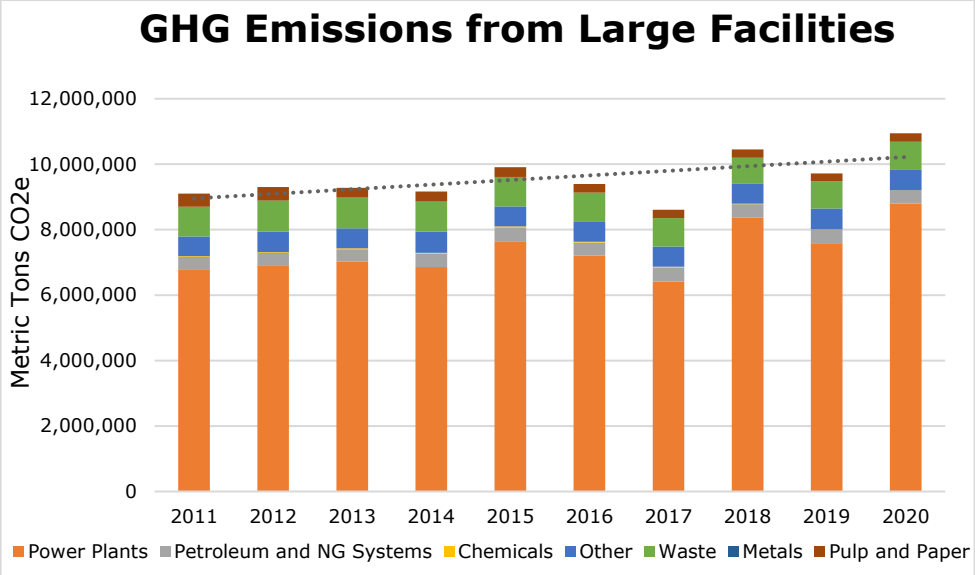
There was a 2.7 percent increase in total greenhouse gas (GHG) emissions* from 2017 to 2018 (the most recent available data). The largest increases from 2017 were in the residential sector (14.7%), the commercial sector (9.75%), and for electric power generation (21.9%). In 2018, transportation again accounted for the most CO2e emissions at 37.4 percent, while electric generation, industry, and the commercial/residential sector accounted for 19.7 percent, 16.2 percent, and 28.3 percent, respectively.** While Connecticut has made progress in reducing emissions of GHG in most sectors since 1990, the commercial and industrial sectors' emissions have increased. In 2018, the State's CO2e emissions were 7.3 percent below 1990 emission levels, 17.8 percent below 2001 emission levels, and 24 percent below the level reported in 2004.[3]

Data on vehicle fuel sales was used to derive CO2 emissions associated with the combustion of gasohol and diesel fuel for transportation for non-governmental customers. The data indicates that fiscal years (FY) 2018 and 2019 had the highest levels of CO2 emissions since fiscal year 2011.[4]



The effect of the pandemic on transportation is evident in the amount of gasohol sold in the state to non-governmental consumers, which declined by 9.1 percent from FY 2019 to FY 2020, and 4.0 percent from FY 2020 to FY 2021. The biggest monthly decline in motor fuel sales in Connecticut occurred in April 2020, which was 40.6 percent less than the gallons sold in April 2019.[5]

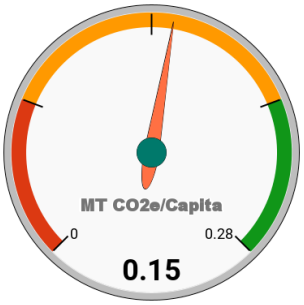
Greenhouse Gas Emissions from Stationary Sources Increased in 2020



Facility-level data from the Environmental Protection Agency (EPA) indicates that large increases in GHG emissions occurred in electricity generation in 2018, 2019 and 2020 from 2017 levels. These facilities in the "power plant" sector reported an approximately 27 percent increase from 2017 to 2020 and a 13 percent increase from 2019 to 2020.[6]*** This is consistent with the Council's analysis of the electric generation data that indicated a significant increase in fossil fuel generation from 2017 to 2020. In addition, per capita residential electric sales increased and energy conservation (electric) decreased from 2017 to 2020.

The needle in the chart depicts the average annual per-capita reduction (0.15 metric tons per capita) of CO2 emissions from 2008-2018. The per capita reduction needed to achieve the 2050 goal, based on the current population, is 0.28 metric tons per year.

2018 Rate (needle) **vs. Rate Needed to Reach Goal**



Goal: State law sets two goals for greenhouse gas emissions: reduce statewide emissions to 10 percent below 1990 levels by 2021 and 80 percent below 2001 levels by 2050. Governor Lamont's Executive Order 3, set a mid-term reduction target of 45 percent below 2001 levels by 2030. The Governor's Council on Climate Change (GC3) released their report in January 2021 with additional recommendations to reduce state-wide GHG emissions.

Technical Note: *Emissions are reported in terms of carbon dioxide equivalence (CO2e, i.e., CO2 and other gasses with equivalent climate warming impact), also referred to as greenhouse gases (GHG). While carbon dioxide is the primary GHG, emissions of other GHGs are expressed on the basis of their potential to contribute to global warming, relative to carbon dioxide's potential. Values from previous reports have been updated based on more current data. The goals on the chart above have been adjusted to account for the growth in population that is projected for 2030 and 2050. **Percent of Consumption-based Accounting Total. ***The "power plant" sector made up 80 percent of GHG emissions from large facilities in Connecticut in 2018, while the "chemicals" sector made up less than 0.2 percent of GHG emissions from large facilities in Connecticut in 2018. Natural gas (NG).

Air Days

QUICK SUMMARY:
- ✗ COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- ✓ ON TRACK TO MEET GOAL

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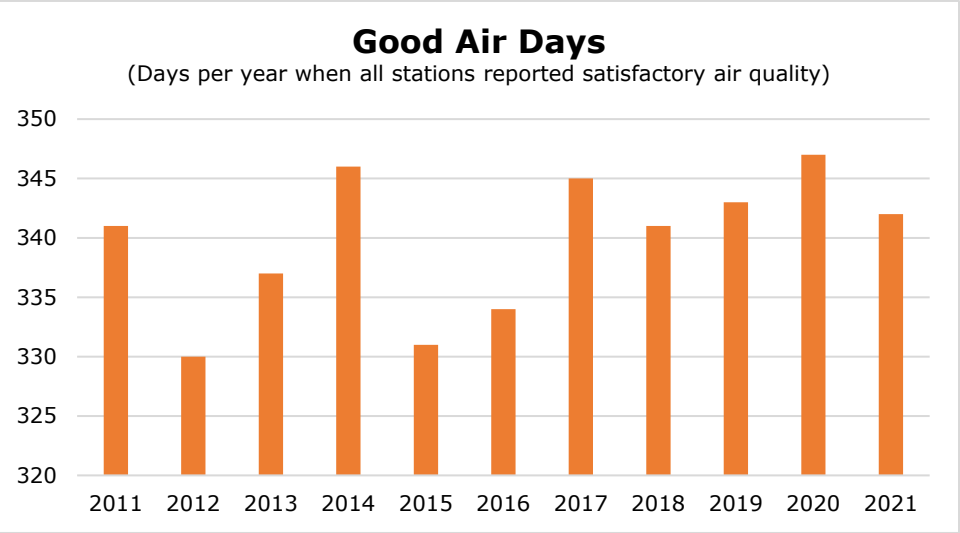
Connecticut residents breathed healthful air on 342 days in 2021: an improvement from the 10-year average (340 days).

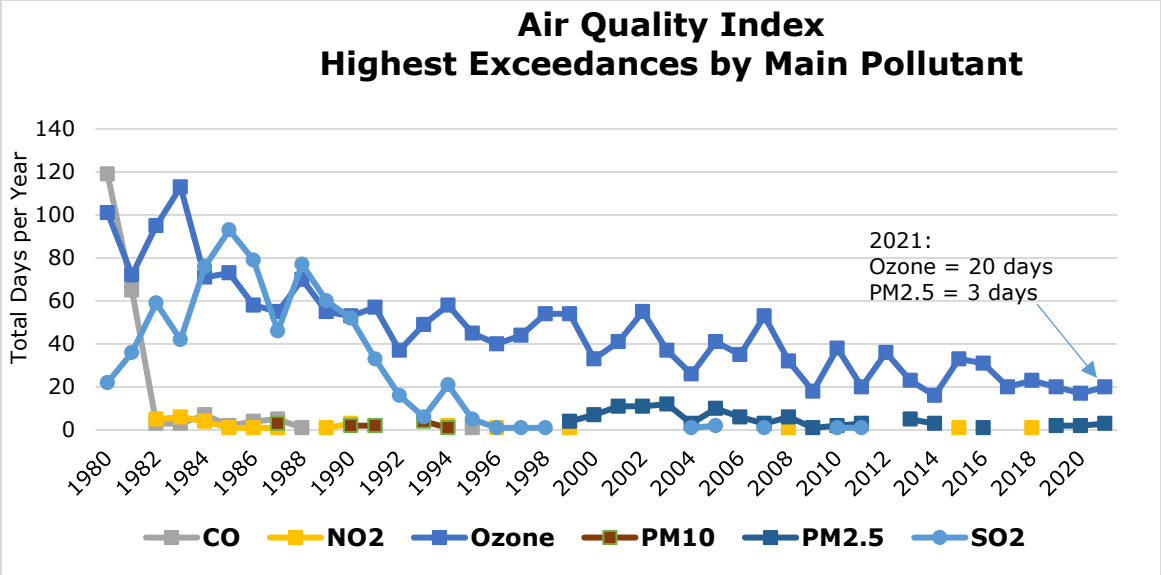


The number of statewide "good air days" decreased in 2021 from 347 in 2020 to 342 days in 2021 , with three days that exceeded the standard for particulate matter (PM 2.5).[7] Elevated levels of fine particles (PM2.5) was, in part, due to wildfires, both in the western United States (U.S.) and Canada, that created smoke plumes that impacted Connecticut. During the summer of 2021, the Department of Energy and Environmental Protection (DEEP) was encouraging residents to limit outdoor activities. A "good air day" is when every monitoring station in the state records satisfactory air quality. "Satisfactory air quality" is defined here as air that meets the health-based National Ambient Air Quality Standard (NAAQS) for all of the following six pollutants: sulfur dioxide, carbon monoxide, particulate matter (PM2.5 and PM10), nitrogen dioxide, and ground-level ozone.*

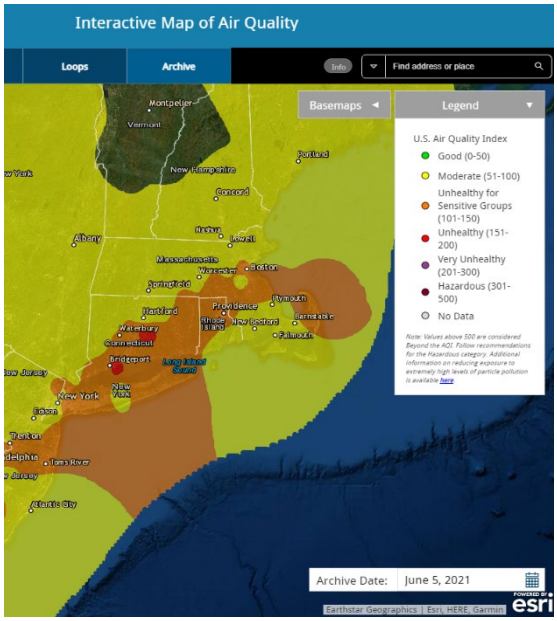
As noted above, Connecticut experienced three days with an Air Quality Index (AQI) above 100 for "fine particles" (such as those found in smoke and haze), which are 2.5 micrometers in diameter or less (PM 2.5). Air with an AQI above 100 is considered "unhealthy for sensitive groups" according to the United States Environmental Protection Agency (EPA)[8], which includes people with heart or lung disease, older adults, and children. Exposure to particle pollution is linked to a variety of significant health problems, ranging from aggravated asthma to premature death in people with heart and lung disease. Fine particles are a health concern because fine particles can easily reach the deepest parts of the lungs.[9]

The long term trend of improved air quality since 2011 is, in part, due to the air pollution controls that were put in place after the 1971 Clean Air Act. The chart below, "Air Pollutants", shows that in the 1980's, exceedances for sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) were common. Statewide exceedances of pollutants, except for ozone, are rarely seen, due to federal restrictions on emitters, mostly to Connecticut's west and southwest. Lead (Pb) is not shown.**

Air Pollutants



The image (below) illustrates a bad-air day in 2021 that was more intense than average but followed the typical pattern of Connecticut having the worst ozone pollution in New England.[10] The yellow areas indicate moderate air quality, but it meets the standard for ground-level ozone, while the orange and red areas did not. Some residents in the yellow areas, who are unusually sensitive to pollution, might have been affected. Much of Connecticut's ground-level ozone originates in states to the west and southwest. Unless emissions in those states are reduced substantially, Connecticut residents are likely to continue to breathe unhealthful air.



Cities and towns in coastal regions of the state usually see more bad ozone days than inland locations. Coastal towns with monitoring stations saw the most unhealthful days in 2021, included Stratford (13), Westport (12); Madison, Middletown, and Greenwich (11 each); while the air monitoring stations in Abington (Pomfret), Cornwall, Stafford, and East Hartford (1) saw the fewest.[11]

No other New England state had more days with unhealthful levels of ozone than Connecticut, which had a total of 21 in 2021. Rhode Island was the next highest with five unhealthful days due to ozone.[12]

Goal: While not formally stated, the goal is for Connecticut residents to have a "good air day", every day.

Technical Note: *The federal air quality standard for ozone was revised prior to the 2016 ozone season. The new standard (0.070 parts per million over eight hours) is slightly more protective of human health than the older standard (0.075). Source of the data represented in the charts is Environmental Protection Agency (EPA) reports that are derived from data received from the Department of Energy and Environmental Protection's monitors. **Connecticut's lead levels have been below the national standard (NAAQS) since 1994.

Preserved Land

QUICK SUMMARY:
- X COMPARED TO LAST REPORT
- X COMPARED TO 10 YR. AVERAGE
- X ON TRACK TO MEET GOAL

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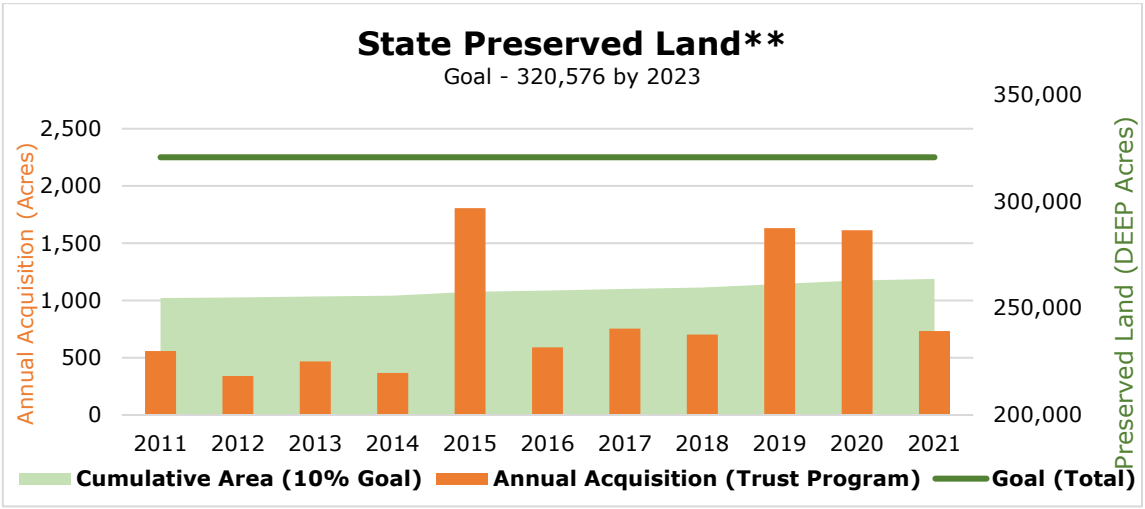
In 2021, the state acquired less land than in 2020 and less than the average for the previous ten years.

Goal #1: State Owned Land – 10 percent

In 2021, the Department of Energy and Environmental Protection (DEEP) acquired 733 acres of land* under the Recreation and Natural Heritage Trust Program (Trust Program), the primary vehicle for adding land to the state's system of parks, forests, wildlife areas, water access areas, and other open spaces.[13] The state invested more than $1.5 million and leveraged more than $1.3 million to acquire the 733 acres in 2021.



The total area of land estimated to be acquired by DEEP as preserved open space is approximately 264,000 acres. Over the previous ten years, the state has preserved an average of 879 acres per year. While DEEP has made steady progress to increase the amount of land preserved, DEEP's preservation efforts are not on track to reach the state's preservation goal of 320,576 acres. At the average acquisition rate of 879 acres per year, it would take DEEP approximately 65 years to achieve the ten percent goal. As the cost of land increases, that goal will become more remote unless the rate of open space acquisition increases.

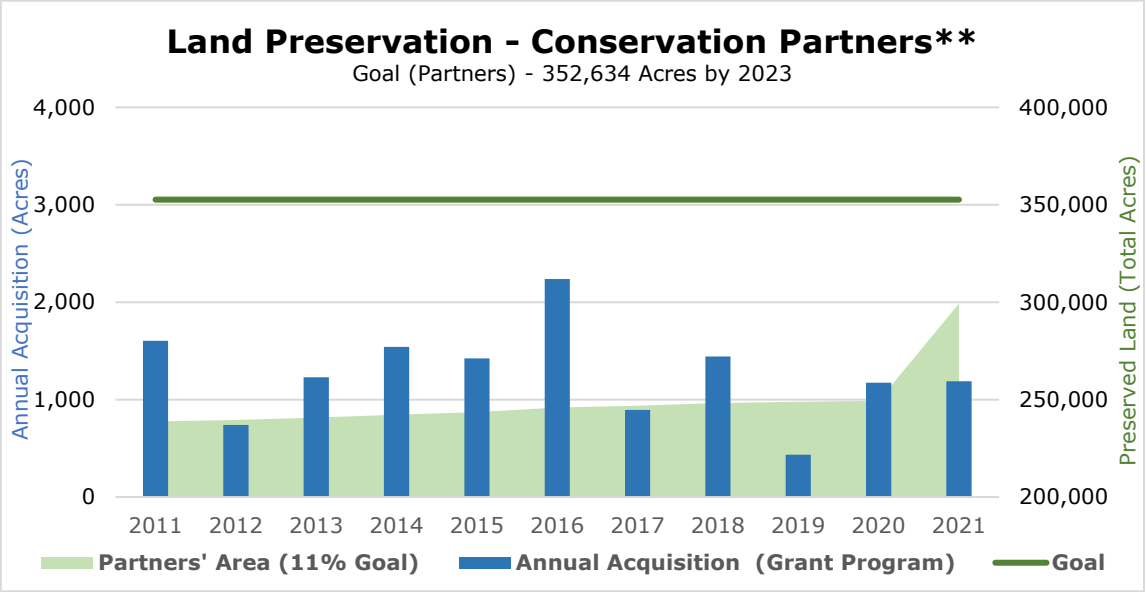
Open space provides Connecticut's residents with options for outdoor activities, preservation of scenic beauty, habitat protection, increased biodiversity, water protection and flood control. In addition, forests, farmland and other natural habitats absorbed more than twelve percent of the nation's greenhouse gas (GHG) emissions.[14] Land conservation offers a double benefit for the climate: it helps absorb GHG emissions and it prevents significant GHG emissions that would result from development.

Goal #1: The State shall acquire ten percent of Connecticut's land for preserved open space. This goal was set in statute in 1997 (Connecticut General Statutes, (CGS) Sec 23-8(b)).

Technical Note: *State land is primarily owned in fee by the State. A notable exception is a 111-acre easement acquired in 2020, which is included in the State acquisition total. Acquisitions by "conservation partners" often include easements. State "preserved land" does not mean land that is not managed or harvested. The lands acquired by the state as open space might not be restricted from logging or other types of management or from recreational activities.

Goal #2: Other Conservation Lands – 11 percent

In 2021, state grants helped municipalities and land trusts acquire or protect 1,189 acres through the Open Space and Watershed Land Acquisition Grant Program (Grant Program), whereby DEEP provides financial assistance to municipalities and nonprofit land conservation organizations to acquire land for open space, and to water companies to acquire land to be classified as Class I or Class II water supply property.[15] The amount of land preserved as the result of grants from the Grant Program in 2021 was less than the ten year average of 1,272 acres.



Unfortunately, the exact amount of land held by DEEP's conservation partners is very difficult, if not impossible, to determine. Land trusts are continuously acquiring properties for conservation and outdoor recreation, the inventory of municipal land is incomplete, it is very difficult to track easements, and there is no centralized accounting of privately preserved lands. The Council estimated that more than 299,000 acres are held as open space land in fee by its "conservation partners." This would be approximately 85 percent of the goal of 352,634 acres. The spike in 2021, depicted in the chart above, is due to the addition this year of the Council's assessment of land trust land and water company land. As of July 1 2021, land trusts held approximately 111,300 acres in fee, not easements. Approximately 103,800 acres of "undeveloped" Class I and Class II land is owned by the water companies in the state. DEEP's 2019 Open Space Annual Report estimated that municipalities held approximately 84,100 acres as open space.

As noted above, it is estimated that DEEP has preserved approximately 264,000 acres (Goal 1) and its conservation partners "hold" approximately 299,000 acres (Goal 2) as open space for a total of approximately 562,900 acres or 84 percent of the total statewide goal of 21 percent or 673,210 acres.

Public Act 14-169 required DEEP to "...establish a publicly accessible geographic information map system and database that contains a public use and benefit land registry…" DEEP launched a registry portal as a pilot. To date, DEEP has only added about 26,000 acres or roughly 10 percent of the state-owned open space land into the registry. No progress on the land registry was completed in 2021, nor since September 2018.

Goal #2: Pursuant to CGS 23-8(b), "not less than eleven per cent of the state's land area is held by municipalities, water companies or nonprofit land conservation organizations as open space".

Technical Note: **The right vertical axes in the land preservation charts above have been shortened, beginning at 200,000 acres rather than the customary zero.

Forests

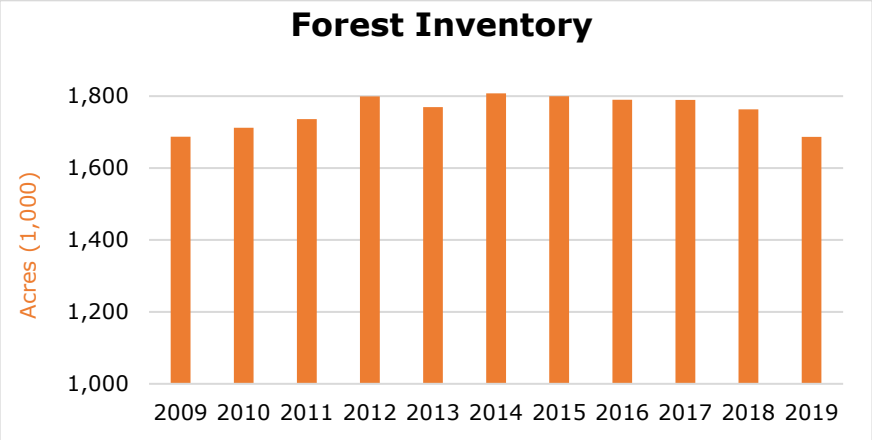
QUICK SUMMARY:
- ✗ COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL

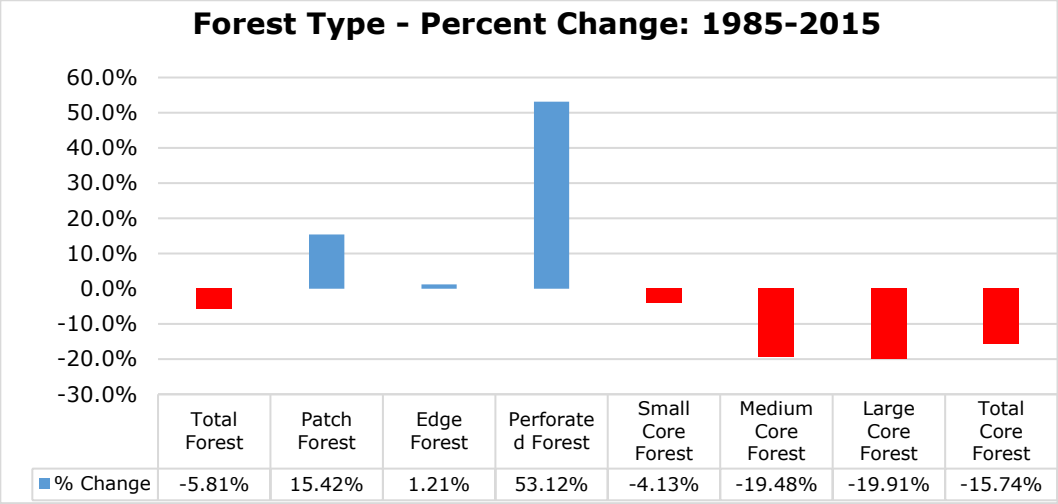
Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

Forest acreage has generally declined over the last five years. The reduction of core forests is concerning.

Forests and other natural habitats reduce water quality impacts associated with development, impervious surfaces, and certain agricultural practices; and provide valuable habitat. Research is showing that visiting a forest has real, quantifiable health benefits, both mental and physical.[16]

Forest Inventory*: It is estimated that forests cover approximately 55 percent of the land area in the state. The amount of forest land in Connecticut in 2019 (most recent data available) is estimated to have decreased since the 2018 inventory.[17] Forest loss has stabilized somewhat from significant declines in forestland between the 1980s and early 2000s. In 1972, the first full year of the Council's existence, the amount of forest land in Connecticut was estimated to be 1,860,800 acres or roughly 59 percent of the area of the state.[18]





Core Forest Acres: Core forests** have been defined as forest features that are relatively far (more than 300 feet) from the forest-nonforest boundary. Core forests provide habitat for many species of wildlife that cannot tolerate significant disturbance. The loss of core forests diminishes the remaining forests' water purification and habitat values, and could result in heavier runoff, which might lead to poorer water quality and impaired habitat.[19] Forests that are fragmented, or divided by roads and clearings, provide some forest functions but are not fully-functioning forest ecosystems. Fragmented forests*** are known to provide substandard or poor habitat for some species of wildlife and, in many cases, less opportunity for hunting and a variety of recreational activities. Invasive species of plants and animals often colonize areas in the wake of activities that result in fragmented forests.

Edge forests comprise the majority of forest type in Connecticut. These are areas that are the boundary between core forest and non-forested land cover features. Medium (250-500 acres) and large (>500 acres) core forests have seen the greatest percentage decline since 1985. Perforated forests have seen the greatest percentage increase over that same time period; however, perforated forests only make up about five percent of forest type in Connecticut. Overall, total core forest area has declined by more than 15 percent over the last 35 years.[20]

Connecticut's forests offer an ability to sequester and store carbon above and below ground in their roots, trunks and branches and as long-lived wood products (e.g., carbon stored in lumber and furniture). Carbon sequestration rates and storage vary by stand age, tree species, growing conditions (including soil type, regional climate, topography, and disturbance regimes (natural or silvicultural).[21] In the northeastern United States, carbon sequestration rates typically peak when forests are around 30–70 years old, but trees continue to sequester carbon through their entire life span. Approximately 85 percent of Connecticut's forests are over 61 years of age. Carbon sequestration is also impacted by the type of trees that comprise the forest. Forests comprised of Oak/Hickory and Maple/Beech/Birch groups store a significant amount of carbon per hectare. These forest types combined comprise about 84 percent of Connecticut's forests.[22]

The Council recently developed a position paper that examined the potential applicability of the Connecticut Environmental Policy Act (CEPA) for state sponsored forestry, forest management and tree maintenance activities. The Department of Energy and Environmental Protection (DEEP) is aware that tree removal operations on a significant scale can affect the land and water and requires that forestry plans include consideration of wetlands, erosion, invasive species, endangered species, riparian corridors and many other factors that are normally considered in most environmental impact evaluations. Furthermore, forestry and forest management operations could "serve short term to the disadvantage of long-term environmental goals" such as retention of trees for their value as carbon sinks, retaining wildlife habitat, providing water purification for associated water bodies and protecting wetlands and riparian corridors. Consequently, it is the Council's position that certain forestry, forest management and tree maintenance activities should be subject to CEPA review and that an agency-specific Environmental Classification Document (ECD) be developed to establish criteria/thresholds for such review.

Goal: "Keeping forest as forest" is the overarching goal of Connecticut's 2020 Forest Action Plan.

Technical Note: *The vertical axis in the "Forest Inventory" chart above has been shortened, beginning at 1,000 (1,000 acres) or one million acres rather than the customary zero. **Estimates of core forest acres were derived from the most recent data of the University of Connecticut's (UConn) Center for Land Use Education and Research (CLEAR), which uses satellite imagery to identify forests that are at least 300 feet from non-forest development, such as roads, buildings and farms. ***Fragmented forests consist of patch forest, which is forest along the edge of an interior gap in a forest that are degraded by "edge effects"; edge forest, which is forest along the exterior perimeter of a forest that are degraded by "edge effects"; and perforated forest, which consists of small, isolated fragments of forest that are surrounded by non-forest features and completely degraded by "edge effects"**.**

Farmland

QUICK SUMMARY:

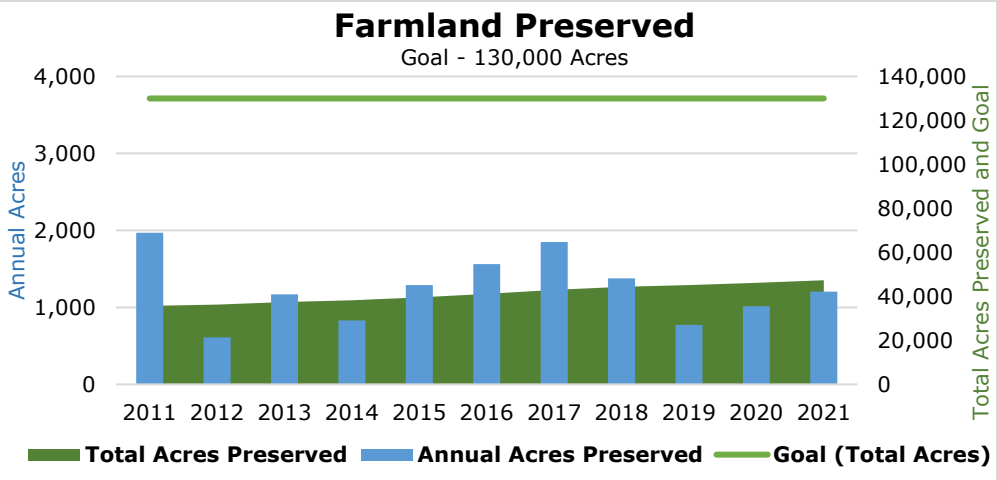
✓ COMPARED TO LAST REPORT

✗ COMPARED TO 10 YR. AVERAGE

✗ ON TRACK TO MEET GOAL

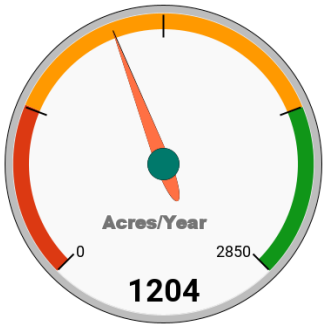
Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

More agricultural land was preserved in 2021 than in 2020.



In 2021, Connecticut preserved 1,204 acres of agricultural land.[23] This is approximately 190 more than the 1,015 acres preserved in 2020, but less than the previous 10-year annual average of 1,245 acres. The cumulative acreage preserved by the Connecticut Department of Agriculture (DoAg), which began preserving agricultural land by purchasing development rights in 1978,[24] has increased slowly over the last 10 years. It is estimated that Connecticut's farms operate on approximately 380,000 acres statewide.[25] Through September 2021, approximately 12,000 parcels, with a total of approximately 234,000 acres of just farmland, were classified as "Public Act 490" land*.[26]

Current Rate (needle) **vs. Rate Needed to Reach Goal**



In addition to the production of food and agricultural products, Connecticut's farms have a role in mitigation, adaptation, and resiliency to the negative impacts of climate change. Well managed farms store carbon from the atmosphere in soils and plants, capture and store water from extreme precipitation events, and provide for bio-mass derived renewable energy. Soil is one of the sinks for atmospheric carbon, and one that can be managed to mitigate the effects of climate change.[27]

Council projections prepared in 2021 indicate that the goal of preserving 130,000 acres could be reached by 2050 at an annual preservation rate of approximately 2,850 acres per year as depicted in the gauge chart. However, using the average annual acquisition rate for the last ten years, it would take approximately 66 years to achieve the State's farmland preservation goal. During that time, additional farmland can be expected to be lost to development.

From 1985 to 2015, it is estimated that Connecticut lost approximately 45,000 acres of "agricultural fields",[28] which represents a loss of approximately 16 percent. The rate of farmland loss may change as demand for locally produced food and agricultural products increases or as development pressure increases, such as electricity generation. As detailed in the solar photovoltaics indicator, there were a significant number of proposals for solar development that would convert agricultural land from agricultural use to power generation use in 2021.**

Goal: DoAg adopted a farmland preservation goal 130,000 acres in total.

Technical Note: *Public Act 490 is Connecticut's law (Connecticut General Statutes (CGS) Sections 12-107a through 107-f) that allows farm, forest, or open space land to be assessed at its use value rather than its fair market or highest and best use value. **Based on proposals approved or pending by the Connecticut Siting Council in 2021. Some, if not all of the proposals on agricultural land included some type of agricultural co-use at the sites.

Wetlands

Inland Wetlands:
Inland wetlands are defined, in Connecticut, as land, including submerged land (not including tidal wetlands) "which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial, and floodplain by the National Cooperative Soil Survey, as may be amended from time to time, of the Natural Resources Conservation Service (NRCS) of the United States Department of Agriculture (USDA)".[29] According to data from the USDA's NRCS, there are or were approximately 95,000 acres of alluvial and floodplain soils and 366,000 acres of poorly drained and very poorly drained soils in Connecticut. Collectively, the area underlain by these soils is estimated to account for approximately 14 percent of the total area in Connecticut.

Implementation of the inland wetlands law has been problematic.
In 1972, the state legislature enacted the Inland Wetlands and Watercourses Act (IWWA), which provides a regulatory process to protect wetlands. Activities that are likely to affect inland wetlands and watercourses are regulated by each town's municipal inland wetlands agency; however, there is no standard requirement for regulation of the upland area adjacent to identified wetlands. Regulated activities include, but are not limited to, filling, dredging, clearing, grubbing, grading, piping, culverting, channelizing, diverting, damming, dewatering or otherwise temporarily or permanently altering inland wetlands and watercourses. A report by the Council in 2008, *Swamped*, identified a number of problems with how the law is implemented. Though some improvements have been made, there remain structural impediments to efficient implementation:

- The requirement that at least one member of a municipal inland wetlands agency be trained is not enforced.*
- Continued funding for the online training program for municipal inland wetland officials has not been secured.
- Forms that are required to be submitted by municipalities on the actions of their inland wetlands agencies are not submitted electronically. This requires the limited staff resources to convert the written filings to electronic records.**

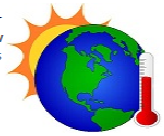
Tidal Wetlands:
Tidal wetlands are defined in the Tidal Wetlands Act by their current or former tidal connection, and their capacity to support certain wetland vegetation. Unlike inland wetlands, tidal wetlands are regulated exclusively by DEEP and not by municipal inland wetlands agencies. Tidal wetlands are threatened with inundation due to the projected rise in sea level due to climate warming that will result in loss of habitat for marsh-dependent species.

Wetlands serve many functions; one of them being their unique ability to store and sequester carbon. Tidal wetlands remove more carbon dioxide (CO_2) from the atmosphere per hectare than forests. Likewise, forested wetlands, which comprise most of the inland wetlands in the state serve as important carbon sinks and continue to sequester carbon as organic matter within the forested system (both above and below ground). Although coastal wetlands are generally better carbon sinks than freshwater wetlands, the substantial extent of forested wetlands across the state should be recognized as important to greenhouse gas (GHG) mitigation strategies and incorporated into inland wetland protection efforts in Connecticut. [30]

Technical Note: *Connecticut General Statutes (CGS) Section 22a-42(d) requires that at least one member of the inland wetlands agency or staff of the agency be a person who has completed the comprehensive training program. An online course would fulfill that training requirement as well as for duly authorized agents (pursuant to CGS section 22a-42a(c)(2)). **Many towns (up to 20 percent) fail to meet their mandated reporting requirements. The unreliableness of municipal data led the Council to drop its tracking of "reported" wetlands lost.

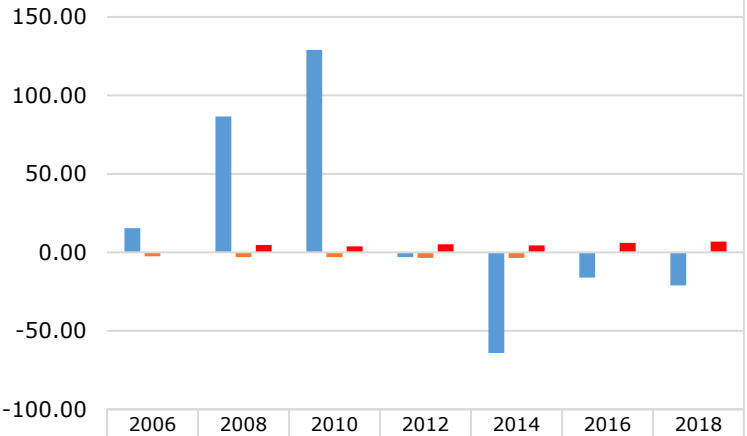
Rivers, Lakes, and Estuaries

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information



Water quality shows little signs of improvement.

The chart depicts the net change in water quality for each 305B reporting year compared to 2020. Only includes changes to "fully supporting" and "not supporting" segments*.



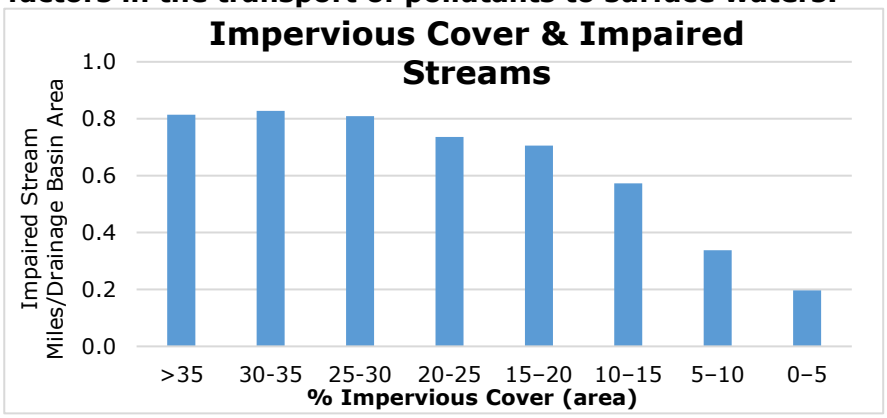
	2006	2008	2010	2012	2014	2016	2018
River (Miles)	15.39	86.57	128.96	-3.06	-64.12	-16.08	-21.08
Lakes (square Miles)	-2.48	-3.01	-3.01	-3.55	-3.56	0.00	0.00
Estuaries (Square Miles)		4.70	3.76	5.10	4.41	6.01	6.83

There are estimated to be 7,772 river miles, 72,509 acres of lakes, and 611.91 square miles of estuarine waters in Connecticut.[31] Connecticut's waterbodies provide several key functions, such as the redistribution of sediment and nutrients vital to aquatic habitats; provision of water for drinking, power, and irrigation; and essential habitat for an abundance of diverse plants and animals.[32]

The Department of Energy and Environmental Protection (DEEP) assesses water quality for each designated use (aquatic life, recreation, and fish consumption) for some waterbodies in the state as either fully supporting, not supporting, insufficient information, or not assessed, which characterizes whether or not the water is suitable for that use. While there has been an increase in the miles of rivers assessed to all those tracked by DEEP, there has been little improvement in the miles of assessed rivers that fully support aquatic life and recreation for 2012 through 2018. Conversely, the lakes identified in assessments from 2006-2014 declined, while the lakes assessed in 2016 and 2018 remained neutral.[33]

Impervious cover, wastewater treatment outflows, stormwater drainage systems and over land flow are primary factors in the transport of pollutants to surface waters!

The Council assessed the relationship between the percent of impervious cover (2012 data**) and the stream/river miles (2020 data) that do not support aquatic life or recreation for each impervious cover grouping. The ratio of the number of impaired stream/river miles divided by the total area of drainage basins for each impervious cover grouping highlights the relative impact that impervious cover has on water quality.



Goal: Attainment, wherever possible, of "water quality, which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water".

Technical Note: *Analysis of water quality is the net difference in river miles, and area of lakes and estuaries for aquatic life and recreation only. Apparent fluctuations in year-to-year water quality results may be due to limitations in data collection and study design and not to widespread changes in water quality. Section 305(b) of the Federal Clean Water Act (CWA) requires each State to monitor, assess and report on the quality of its waters relative to designated uses. ** Based on data from the Connecticut Environmental Conditions Online (CT ECO).

Water Quality

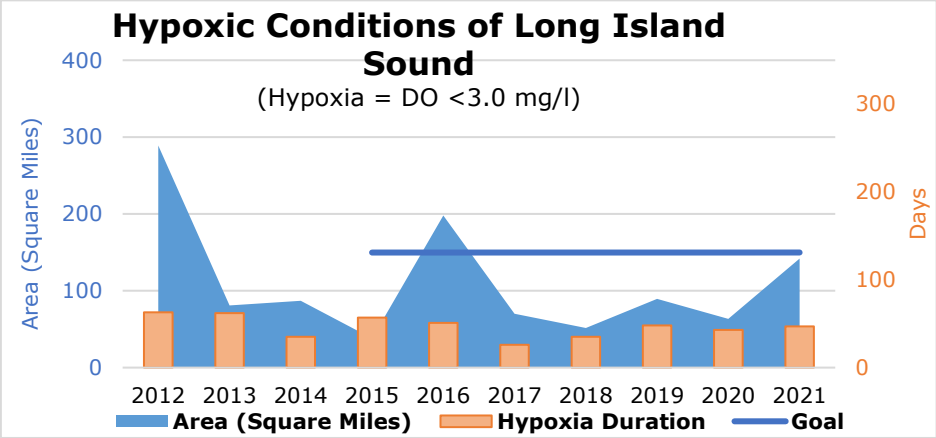
The Water of Long Island Sound

QUICK SUMMARY:

- ✗ COMPARED TO LAST REPORT
- ✗ COMPARED TO 10 YR. AVERAGE
- ✓ ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

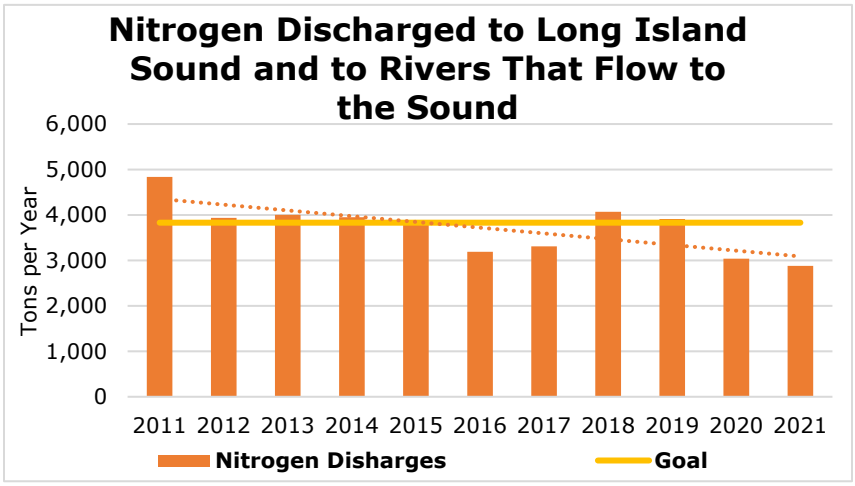
The area of Long Island Sound with hypoxic conditions increased in 2021.



The maximum area of Long Island Sound with hypoxia, water with dissolved oxygen (DO) concentration less than 3.0 milligrams per liter (mg/l), increased from 63 square miles in 2020 to 142 square miles in 2021. In addition, the duration of the hypoxic conditions increased from 43 days in 2020 to 47 days in 2021.[34] The area of hypoxic conditions for 2021 was approximately 30 percent higher than the ten-year average. Most, if not all, of the hypoxic conditions are found in the western basin of the Sound, which is also affected by contributions from New York State. The primary cause of hypoxia is nutrient pollution, primarily nitrogen and phosphorus from runoff and wastewater treatment effluent that fuels the growth of phytoplankton in the Sound. The average annual dissolved nitrogen concentration at the bottom of the Sound was approximately 0.18 mg/l (.18 parts per million) in 2021; a decrease from 2020 and less than the ten-year average of .21 mg/l.[35] However, there were 25 percent and 33 percent less samples taken in 2020 and 2021, respectively compared to previous years.

Goal: The goal line on the top chart is an approximation of the maximum area of the hypoxia target adopted in the 2015 edition of the Long Island Sound Study's Comprehensive Conservation and Management Plan to "Measurably reduce the area of hypoxia in Long Island Sound … by 2035, as measured by the five-year running average size of the zone."

The amount of nitrogen discharged to the Sound in 2021 was lower than in 2020.[36]



Connecticut has reduced nitrogen discharges over the last decade. By investing in nitrogen-removal technology at sewage treatment plants and implementing a Nitrogen Control Program, nitrogen discharges from point sources have been reduced; however, reducing nitrogen discharges from non-point sources remains a challenge.

Goal: Substantial reduction of nitrogen discharges to the Sound is a goal that is shared by Connecticut and New York. Connecticut established a reduction goal of about 6,670 tons annually by 2014, which is the result of a 63.5 percent reduction from the point source baseline of 10,500 tons per year. Therefore, Connecticut's goal was established as a maximum of 3,830 tons per year.[37] Nitrogen discharges "upstream" of Connecticut (Massachusetts, New Hampshire, and Vermont) also contribute to the nitrogen loading in Long Island Sound.

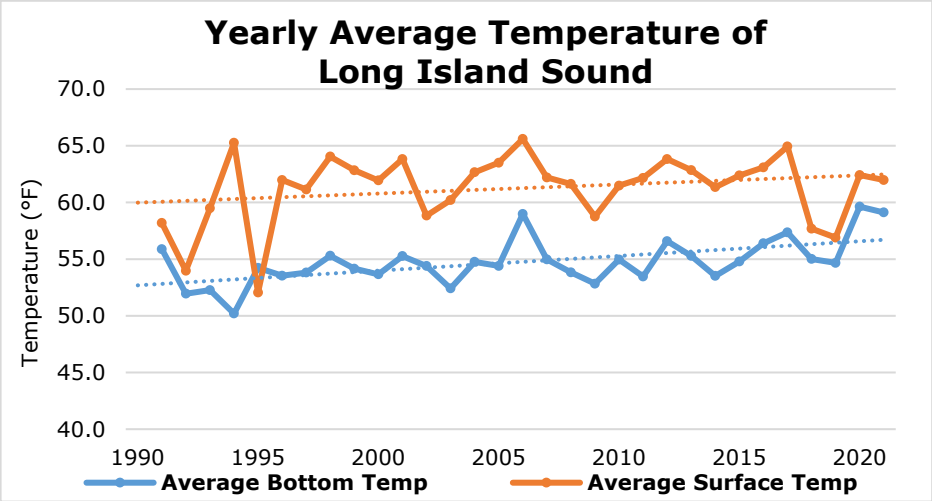
The Warming and Rising Waters of Long Island Sound

QUICK SUMMARY:

✓ COMPARED TO LAST REPORT
X COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

Annual average bottom and surface water temperature decreased from the previous year, but remains higher than the 10 and 30-year average.



The average bottom and surface temperature of the water in Long Island Sound has been rising, with the average bottom temperature rising faster than the surface water.

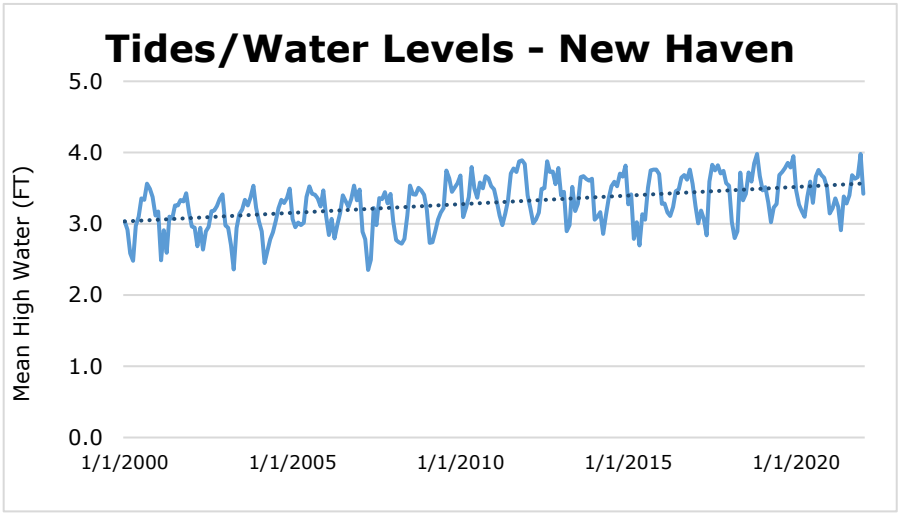
In 2021, the average annual surface water temperature (62°F) for the Sound was above the average for the previous 30 years (61.24°F. Likewise, the average annual bottom water temperature for the Sound (59.1°F) in 2021 was also above the average for the previous 30 years (54.6°F).[38] The average monthly value for mean high water (MHW) for 2021 was unchanged from 2020 and was less than the average for the last ten years. However, the trend for monthly average for MHW data from 2000 to the present for the monitoring station near New Haven indicates that water levels have increased over the prior 21-year period.[39]

While the long-term impact of warmer water in the Sound is unknown, species diversity and biomass remain high, although there has been a shift to warm water tolerant species. Conversely, the decline in lobster population in the Sound might be the result of warmer water.

As the Sound rises, more tidal wetlands will be flooded. The natural "migration" of wetlands landward in response to sea level rise is prevented in many places by fill and development. In addition, shore birds that nest in coastal areas, such as the piping plover, might be displaced.

Goal: While there is no established goal for water temperature or sea level rise in Long Island Sound, it is assumed that an increase in both temperature and water level is not a desired outcome.

Technical Note: *The vertical axis in the average temperature of Long Island Sound chart above has been shortened, beginning at 40.0°F rather than the customary zero. Year to year variations in water temperature and water levels in the Sound are less important than longer term trends.



Swimming

QUICK SUMMARY:

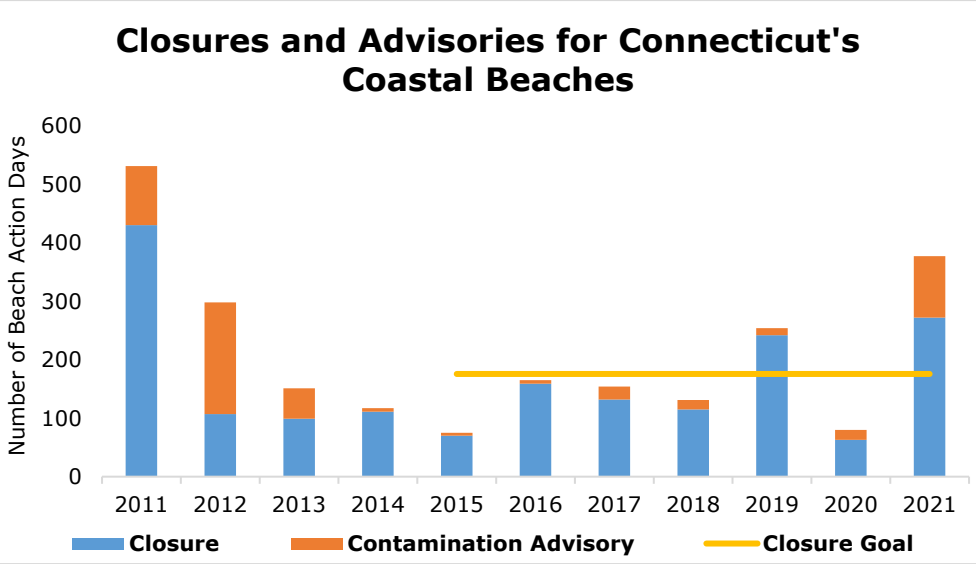
X COMPARED TO LAST REPORT

X COMPARED TO 10 YR. AVERAGE

— ON TRACK TO MEET GOAL

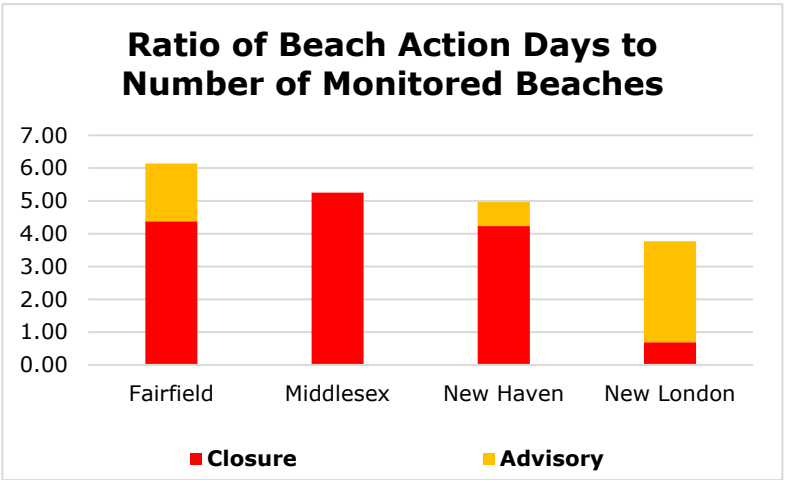
Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

Coastal swimmers saw considerably more beach actions in 2021.



There were 377 beach action days in 2021, 267 (71 percent) of which were closures and 110 (29 percent) were advisories. Of the 377 beach action days, 59 percent were "preemptory actions" while 41 percent were due to elevated levels of bacteria.[40] There were ten days during the reporting period where rain totals exceeded one inch, with four of those days exceeding 2.4 inches of rain. The chart above displays both closings and advisories at Connecticut's public beaches since 2011, which from a water quality perspective are functional equivalents. This is different than prior years when only closings were displayed. The beach-specific advisories or closings* are issued by the reporting state or local government entity.

Because the number of beaches varies by county, the Council utilizes a ratio of beach action days (closures and advisories) to the number of reporting beaches in each county to illustrate the relative impact that pollution has had on coastal recreation waters. Typically, the western half of the coastline, which has more impervious surfaces, sees the most beach actions.



Goal: The goal for keeping beaches open is to reduce the number of beach closings in half by 2035 (from 2014, with the number for 2014 calculated using a five-year rolling average). This goal was identified in the 2015 edition of the Long Island Sound Study's Comprehensive Conservation and Management Plan.

Technical Note: *During a beach closure, water conditions are deemed unsafe for swimmers and other users. A beach advisory is a warning and users decide whether they wish to risk going into the water. An action can be based on a model or policy and not be a monitored beach. The data, derived from the U.S. Environmental Protection Agency (EPA) Beach Advisory and Closing Online Notification (BEACON2) system, includes information on pollution occurrences in coastal recreation waters for 72 reporting beaches along the Connecticut shoreline in 2021. The high number of beach actions in 2011 may be attributed to Tropical Storm Irene. "Preemptory actions" might be issued to inform the public of possible fecal contamination, based on past experience, prior to receiving confirmation of the water quality sample from the laboratory.

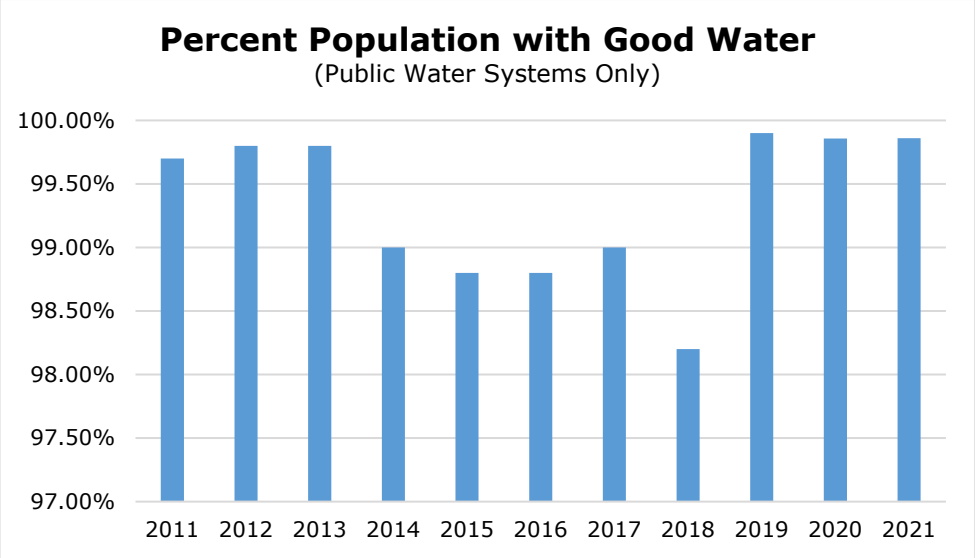
Drinking Water

QUICK SUMMARY:

— COMPARED TO LAST REPORT
✓ COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

Drinking water quality in 2021 was very good, but chloride was again the most common contaminant detected in public water systems.



This indicator shows that 99.86 percent of the time, the population served by Community Water systems and Non-Transient Non-Community Water systems demonstrated full compliance with applicable standards, after weighting the reports to account for the number of people served by each system. Though long-term problems occur, they are rare in large systems.

Data for 2021 show no increase in the number of violations, based on the number of people served, from 2020 levels.[41] By far, the most common problem during 2021 in water systems was excessive levels of chloride, which is typical of most years. In addition, the Connecticut Department of Public Health (DPH) oversees the monitoring for lead by public water supplies, and also requires public water to be tested for corrosive properties (including pH) that might result in lead contamination.

A 2019 report by the Auditors of Public Accounts for calendar year 2017 recommended that the DPH strengthen oversight and enforcement drinking water laws. A 2020 update indicated that DPH implemented seven of the Auditor's recommendations, and was still working on addressing the other ten recommendations identified in the 2019 Audit Report.

About 80 percent of people in Connecticut are supplied by the public water systems included in the chart above. The remainder of the population relies on private wells, which are not monitored by any government agency and are not counted in this indicator. An unknown but significant number of private wells are contaminated by pollution or naturally occurring toxins, such as arsenic and uranium. A recent United State Geological Survey study of groundwater samples collected from more than 2,000 private wells in bedrock aquifers in Connecticut found that 3.9 percent of collected samples contained arsenic concentrations greater than the U.S. Environmental Protection Agency's (EPA) maximum contaminant level (MCL) of 10 micrograms per liter (µg/L), and 4.7 percent of collected samples contained uranium concentrations greater than the EPA MCL of 30 µg/L.[42] The DPH provides guidelines for testing of private wells.

Goal: It is assumed that the goal is for everyone to have safe drinking water.

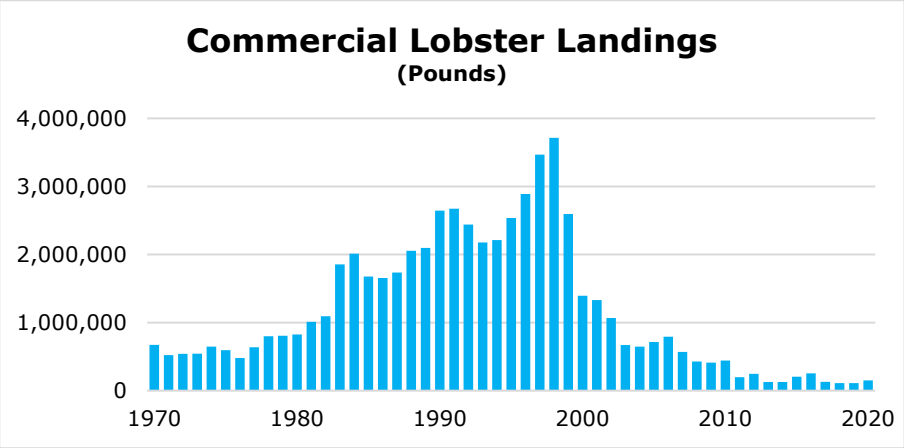
Technical Notes: *The vertical axis in the chart above has been shortened, beginning at 97 percent rather than the customary zero. This allows the reader to see year-to-year differences, which would be nearly imperceptible if the chart began at zero.

Lobster and Fishes of Long Island Sound

QUICK SUMMARY:
- ✓ COMPARED TO LAST REPORT
- X COMPARED TO 10 YR. AVERAGE
- — ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

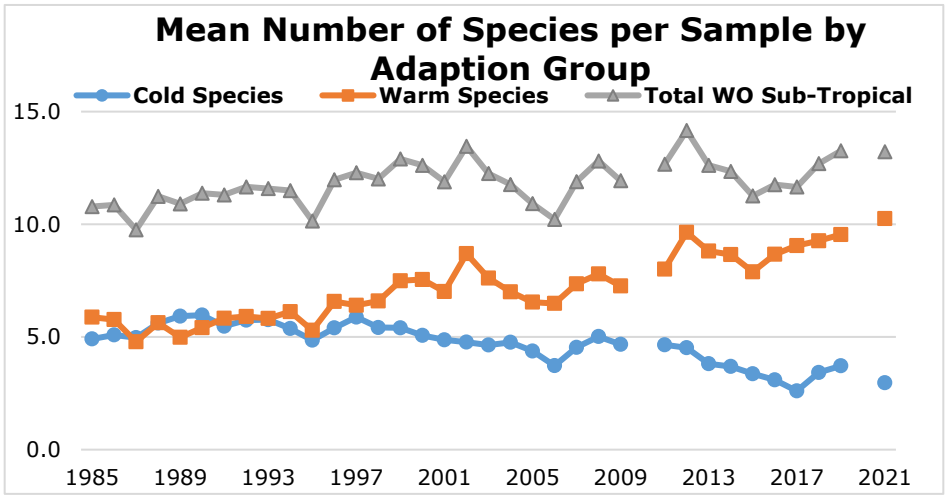
Long Island Sound's species are trending towards animals that prefer warm water.



Lobster, which thrive in cold water, have become less common in Connecticut waters. Lobster landings in the state have declined dramatically from a high of over 3.7 million pounds in 1998 to a low of approximately 111,000 pounds in both 2018 and 2019 – almost a 97 percent drop. In 2020, lobster landings increased to approximately 151,000 pounds[43]

Researchers investigated several possible causes for the dramatic downturn in lobster populations since 1998 including disease, changes in water quality, changes in climatic conditions and other human impacts to Long Island Sound, such as the presence of pesticides. Scientists did not detect pesticides in lobsters collected in 2014,[44] leaving the warming waters as the most likely cause for Connecticut's lobster decline.

The decline in lobsters was also confirmed by Department of Energy and Environmental Protection's (DEEP) spring and fall trawl surveys. DEEP surveys marine fish, squid and lobster populations, usually every spring and fall, by towing nets from a research vessel.* The chart shows the average number of fish species caught in each tow during the spring and fall surveys combined. The well-documented trend toward species that favor warm water is apparent.[45]



The impacts of warmer water temperatures have had mixed effects on finfish found in Connecticut waters. As depicted above, the trend indicates that the mean number of warm-adapted species increased significantly while the average number of cold-adapted species declined since 1985. Overall, finfish diversity in Long Island Sound remains high, indicating that the Sound is healthy.**

Technical Note: *Data from 2010 and 2020 are missing because no fall and/or spring survey were conducted those years. **Finfish species captured in the Connecticut DEEP Long Island Sound Trawl Survey were divided into adaptation groups based on their temperature tolerance and seasonal spawning habits.

Clamming and Oystering

QUICK SUMMARY:

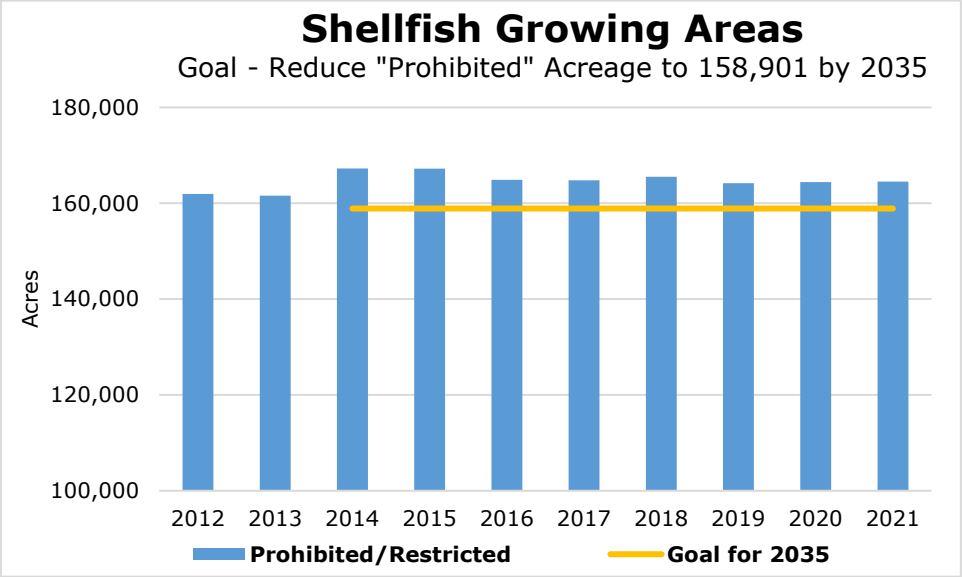
XX COMPARED TO LAST REPORT

XX COMPARED TO 10 YR. AVERAGE

— ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

The area of the Sound approved for harvesting shellfish was less in 2021 than in 2020 and less than the ten-year average.



The chart* shows the acreage of shellfish growing areas that are designated as "restricted" areas that include "prohibited", "restricted relay", and "conditionally restricted relay" designations. There has been a slight decline in "approved" acreage and a slight increase in "restricted" acreage from 2020 to 2021.[46] The area of restricted/prohibited shellfish growing areas is determined by bacteria contamination, which is an indicator of possible sewage contamination and polluted runoff. Changes in the classification of shellfish growing area are related to improvement or decline in water quality, based upon the results of water quality monitoring and/or updated sanitary survey findings. The Connecticut Department of Agriculture's (DoAg) Bureau of Aquaculture and Laboratory Services monitors water quality and classifies shellfish growing areas according to their potential for yielding healthful, uncontaminated shellfish.

Water quality assessment criteria for shellfishing as a designated use only applies to inner-shore, and mid-shore estuarine waters where shellfish growth is viable, which is approximately 50 percent of Connecticut's estuarine waters. According to the Department of Energy and Environmental Protection's (DEEP) 2020 Integrated Water Quality Report, only about 16 percent of the estuarine waters assessed can fully support shellfish harvesting from Class SA waters.** This percentage is unchanged since the 2018 report. Meanwhile, the percent of estuarine waters that can fully support shellfish harvesting from Class SB waters declined since the 2018 report.

Goal: The goal for marine shellfishing, adopted in the 2015 edition of the Long Island Sound Study's Comprehensive Conservation and Management Plan, is to "upgrade 5 percent of the acreage restricted or closed for shellfishing in 2014 by 2035". The "restricted or closed" acreage in 2014 totaled 167,264 acres, which included areas designated by DoAg as "prohibited", "restricted relay", and "conditionally restricted relay". Therefore, the goal is a reduction of restricted or closed acreage to 158,901 acres by 2035, shown on the chart as a gold horizontal line.

Technical Notes: *The vertical axis in the chart above has been shortened, beginning at 100,000 acres rather than the customary zero. **SA waters allow shellfish harvesting for direct human consumption where authorized, whereas SB waters allow shellfish harvesting with depuration or relay where authorized. Depuration is the action or process of freeing something of impurities. In the case of shellfish, this usually means moving the shellfish to areas with better water quality.

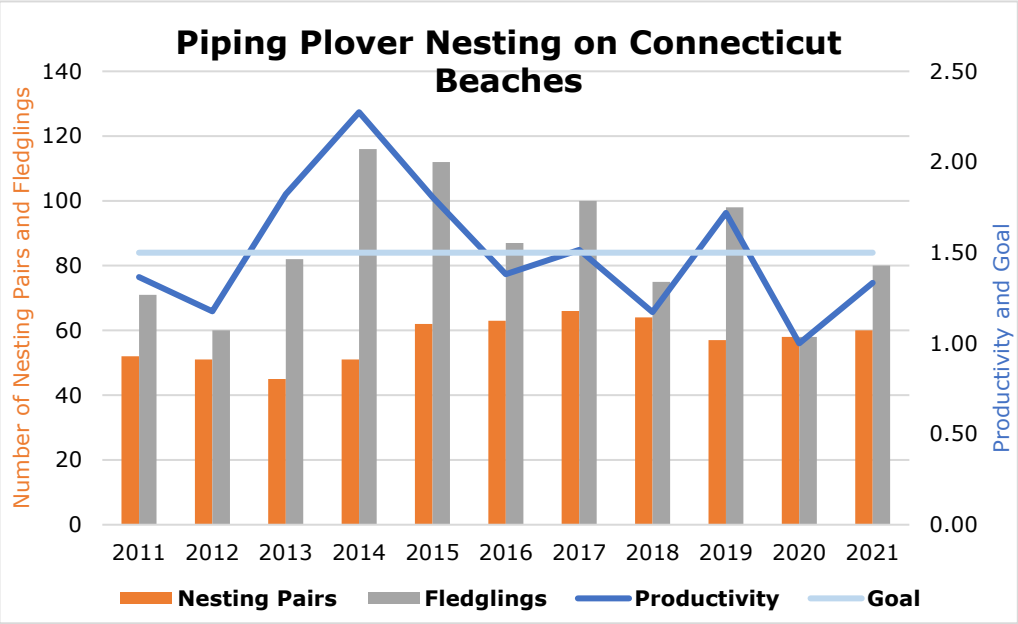
Piping Plovers

QUICK SUMMARY:

✓ COMPARED TO LAST REPORT
X COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

The number of plover chicks to reach flight age or "fledge" in 2021 was up from 2020.



In 2021, piping plovers in Connecticut raised an average of 1.33 chicks per nest. While productivity was good in 2021 compared to 2020, it was less than the goal and less than the ten-year average of 1.5. Some of the causes for the lower than average productivity in 2021 was attributed to storm events that washed out some nests and renests, predation, human/pet interaction, and the use of drones, which piping plovers may perceive as aerial predators.[47] In 1984, only 30 nesting piping plovers were observed in Connecticut. In 2021, 60 pairs successfully raised 80 young plovers on Connecticut beaches. Scientists estimate that each pair must successfully raise an average of 1.20 young per year to maintain a stable population and an average of 1.50 young per year to successfully increase the population of piping plovers to sustainable levels. Since protection and monitoring efforts began in 1984, nesting success has generally improved, resulting in more returning adults in subsequent years. However, the modest size of the population requires that the species continue in threatened status at the state and national level.

Piping plovers are small shorebirds that nest only on sandy beaches with sparse vegetation. The piping plover population is, according to the United States Fish and Wildlife Service (USFWS), "an indicator of the health of the fragile beach ecosystem."[48] Their habitat is a narrow strip squeezed between a rising Sound and higher ground. If their habitat is able to migrate upslope and inland in response to sea level rise, breeding areas could increase. However, habitat loss is anticipated on 45 percent of sandy ocean beaches that are already developed. Coastal flooding during breeding season might also affect piping plover breeding success by flooding nests and thereby increasing chick mortality, as was the case in 2021.[49]

Goal: The goal for piping plover was derived from the Piping Plover Atlantic Coast Population Revised Recovery Plan (1996). That Plan's goal calls for 2,000 pairs along the east coast with 625 pairs throughout New England, and a five-year average productivity of 1.5 fledged chicks per pair.

****UPDATE****

According to the U.S. Fish and Wildlife Service's 2019 Atlantic Coast Piping Plover Abundance and Productivity Estimates, there were 2,008 breeding pairs along the Atlantic coast, with over 980 breeding pairs in New England![50]

Raptors Rebound

QUICK SUMMARY:
- ✓ COMPARED TO LAST REPORT
- ✓ COMPARED TO 10 YR. AVERAGE
- ✓ ON TRACK TO MEET GOAL

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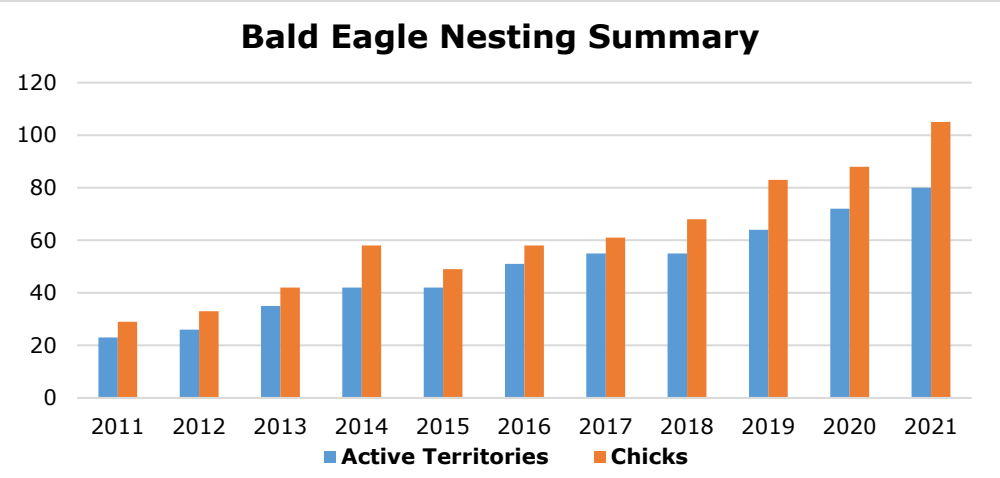
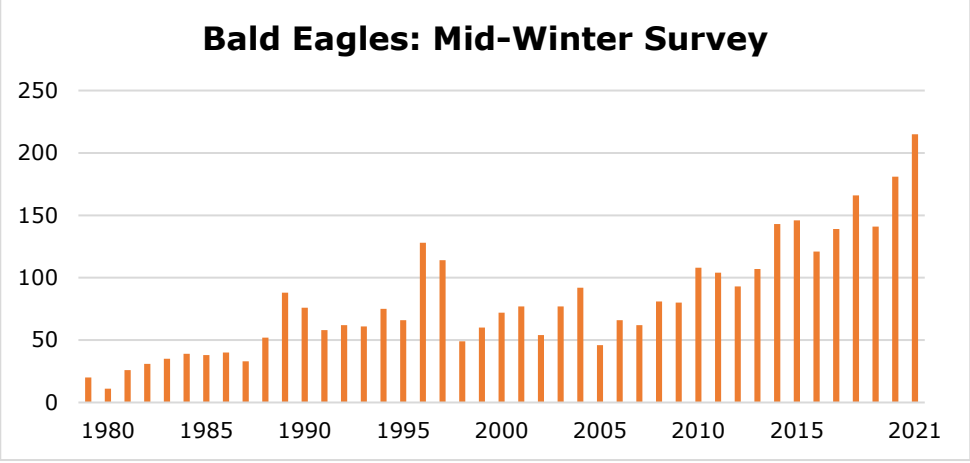
Bald eagles continue their dramatic comeback; ospreys are doing well, too.



In 2021, the number of active territories and bald eagle chicks was the highest observed over the last 25 years, and likely much longer. Of the record 80 active territories, 13 were new territories for 2021.

The population of bald eagles is included as an indicator because the eagle is representative of species, which require large areas of relatively undisturbed land near rivers or lakes where the birds can find adequate supplies of fish and other prey that are – very importantly – only minimally contaminated. Iced-over rivers to the north can push more eagles south to Connecticut. The eagles spend their winter mostly along larger rivers where they have become a regular sight.

Goal: Territories are resource areas used by eagles that have only one active nest. The goal for bald eagles is derived from the 1983 Northern States Bald Eagle Recovery Plan, prepared by the United States Fish and Wildlife Service (USFWS). The Plan established a goal of 20 breeding birds (10 nests) for Connecticut. According to experts in the Bald Eagle Study Group, Connecticut could eventually host up to 200 nesting eagles (100 nests).



In 2021, Connecticut's mid-winter survey recorded 215 eagles throughout the State. Since 1979, observations of eagles during the Midwinter Eagle Survey have increased significantly.[51]

By the 1950's, the bald eagle was no longer a nesting species (extirpated) in Connecticut. The bald eagle was first declared an endangered species with the passage of the federal Endangered Species Act in 1973. Populations eventually began to recover due to the ban on the pesticide DDT, the successful reintroduction programs of fostered chicks and fledglings, and protection measures. In 1995, the U.S. Fish and Wildlife Service reclassified the bald eagle from endangered to threatened in the lower 48 states. Populations continued to recover enough that, in 2007, the bald eagle was officially removed from the federal Endangered Species List. When Connecticut's first official Endangered, Threatened, and Special Concern Species List was passed in

1992, the bald eagle was classified as "endangered". Because of the increase in nesting pairs in recent years, the bald eagle's status in the state was reclassified as "threatened" in 2010.[52]

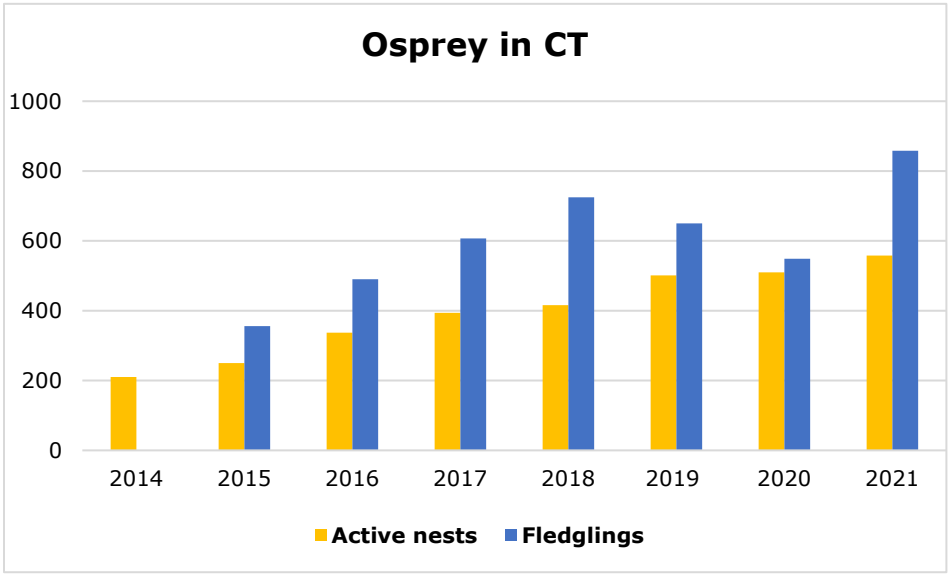
Osprey:

QUICK SUMMARY:

✓ COMPARED TO LAST REPORT

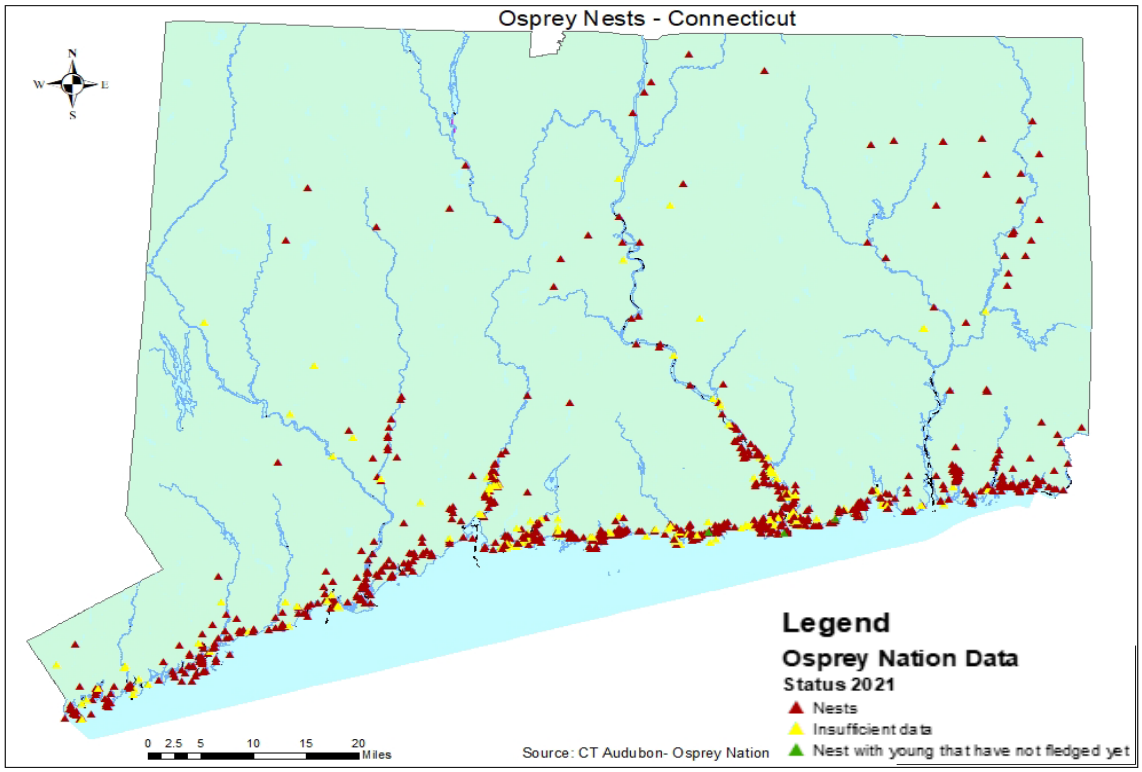
✓ COMPARED TO 10 YR. AVERAGE

— ON TRACK TO MEET GOAL



Another large fish-eating bird of prey, the osprey, has rebounded in similar fashion to the eagle. From a low of nine nesting pairs in 1974, ospreys*, counted by the Connecticut Audubon Society's volunteers, were seen at more than 510 active nests in 2021, meaning they were occupied by an osprey pair. The 558 active nests resulted in 858 observed fledglings.[53]

Osprey feed primarily on live fish; consequently, osprey nests are typically located along the Connecticut shore or proximate to water.



Goal: There is no established goal for ospreys in Connecticut, but ospreys are a "sentinel species," meaning their health indicates the health of the environment around them. Ospreys are being monitored by the Department of Energy and Environmental Protection (DEEP), the Connecticut Audubon Society, and volunteers.

Technical Note: *Data on fledglings for Osprey for 2014 was not available.

Forest Birds

QUICK SUMMARY:

— COMPARED TO LAST REPORT
X COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

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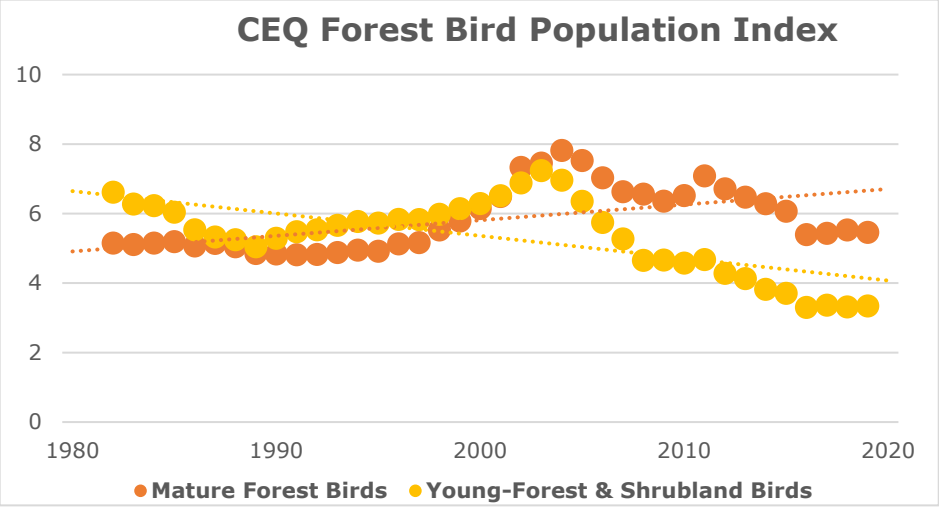
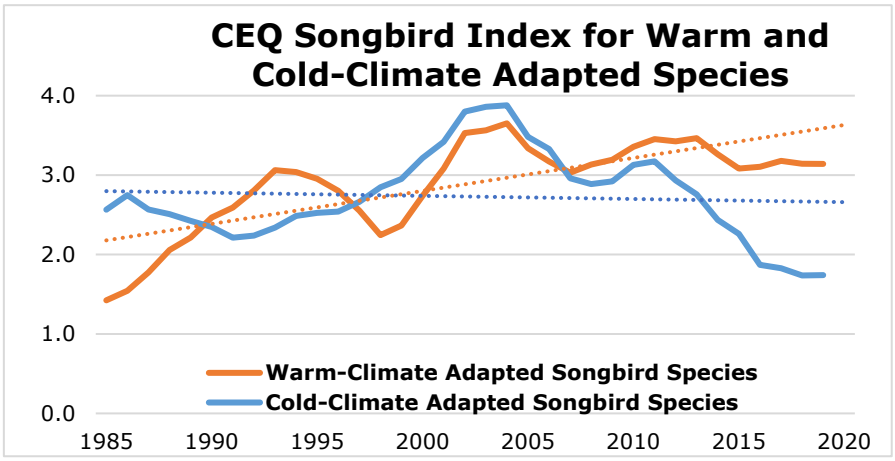
Forest birds, which are indicators of forest health, are on the decline.



The combined nesting populations of eight species of birds that typically inhabit mature forests and five species of shrubland birds that typically inhabit forests that are young or dominated by shrubby vegetation, sometimes known as "shrublands", has declined over the last 15 years.* As the amount of young forest and shrubland habitat has declined in Connecticut, so have the wildlife species dependent on it. Most of the mature-forest bird species are affected greatly by fragmentation. Predators, invasive species, overpopulating deer and human activities follow roads and other intrusions into the forests and cause nesting success to falter. The true forest birds, those that are not adapted to disturbed roadside or suburban habitat, will succeed in the long term only in forests that are not fragmented (i.e., core forests). Nationally, it is estimated that there has been a net loss of 2.9 billion breeding birds since 1970. Approximately 63.5 percent of Eastern forest avifauna, which is comprised of 63 species, are in decline.[54]

Historic data indicate that the composition of Connecticut's songbird population is changing. Songbirds that prefer warmer climates are increasing at a faster rate than cold-adapted songbird species. Warm-climate adapted songbirds have increased more than cold-adapted songbirds, which had a modest increase since 1984, but a decline in recent years.**[55]



Goal: The goal for a variety of landbird species identified in the Partners in Flight Landbird Conservation Plan 2016 is to prevent further decline, stabilize populations in the short-term, and then reclaim a portion of their populations within 30 years.

Technical Notes: *The Council calculates index values (using advice from statistics experts) to show the combined population trends of several species (for mature forest birds: Hairy Woodpecker, Wood Thrush, Eastern Wood-Pewee, Red-eyed Vireo, Scarlet Tanager, Black-and-white Warbler, Veery, Ovenbird; for bird species that typically inhabit forests that are young or dominated by shrubby vegetation: American Redstart, Blue-winged Warbler, Chestnut-sided Warbler, Eastern Towhee, and Yellow Warbler. **The CEQ Index is used to assess the presence and abundance of a total of eighteen warm-climate adapted and cold-climate adapted songbird species. Survey data were not available for 2020, and 2021 (as of the date of publication).

State-Listed Species

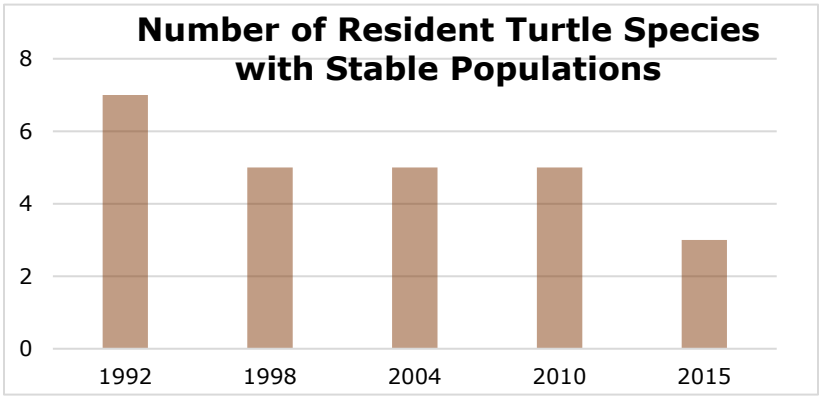
Resident Turtles

QUICK SUMMARY:

— COMPARED TO LAST REPORT

X COMPARED TO 10 YR. AVERAGE

X ON TRACK TO MEET GOAL



Five of the eight turtle species that live in Connecticut year-round are listed as endangered, threatened, or of special concern. Turtles are excellent indicators of ecological health. This indicator includes the eight species of turtle that live in Connecticut (but not the four marine species that visit Long Island Sound in summer, all of which are threatened or endangered). In 2015, five of the eight resident turtle species were listed as endangered or of special concern: bog turtle (endangered), eastern box turtle, wood turtle northern, diamondback terrapin, and spotted turtle (species of special concern).[56] Turtle species in Connecticut have declined, in part, because of poaching, and the degradation and segmentation of their habitat. The ability for turtles to sustain a stable population will be difficult because turtles take a long time to reach sexual maturity and have low survivorship when newly hatched.

Goal: The goal for all endangered and threatened species is for recovery of their populations to a stable, sustainable level.

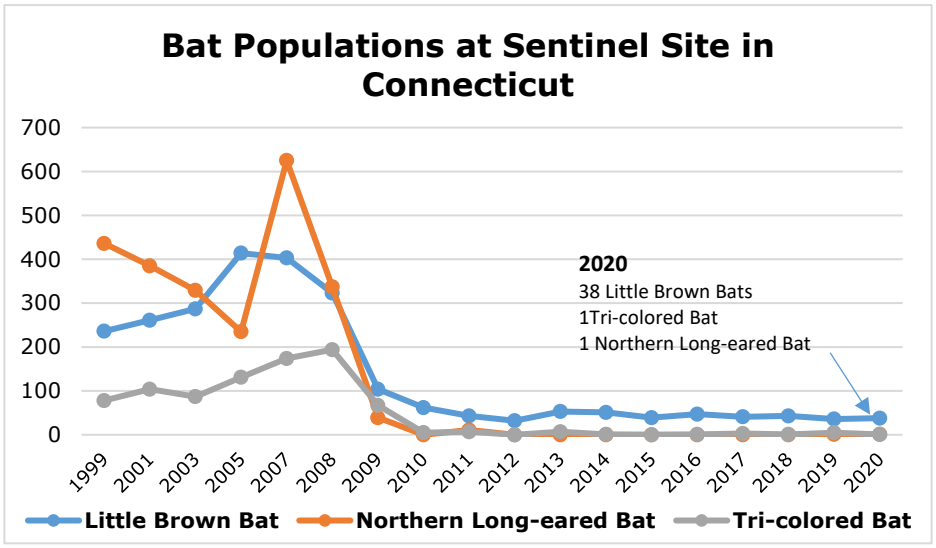
Bats

QUICK SUMMARY:

X COMPARED TO LAST REPORT

X COMPARED TO 10 YR. AVERAGE

X ON TRACK TO MEET GOAL



Eight of the nine bat species are on the latest list of species that are endangered, threatened, or of special concern. Bat populations in Connecticut have experienced a catastrophic decline that led to the classification in 2015 of three more bat species as endangered in Connecticut and has raised concerns about the future of bats in the state. This decline in bat population, between 2007 and 2010, is primarily due to an epidemic fungal disease called white-nose syndrome (WNS). The chart depicts data for the winter population of three cave-dwelling bat species at a sentinel hibernation site monitored annually by the Department of Energy and Environmental Protection (DEEP).[57] This sentinel cave is one of Connecticut's best remaining overwintering site for cave bats. While there were no bat surveys performed in 2021 due to COVID-19, recovery, if one occurs, will be slow: adult female bats usually produce just one pup per year. Bats eat insects, including mosquitoes, a number of which may carry diseases that affect humans, birds, horses and other animals.

Goal: The goal for bats is for recovery of all nine species to a stable, sustainable population.

Technical Note: The horizontal axis for bats displays every other year between 1999 and 2007.

Invasive Insects

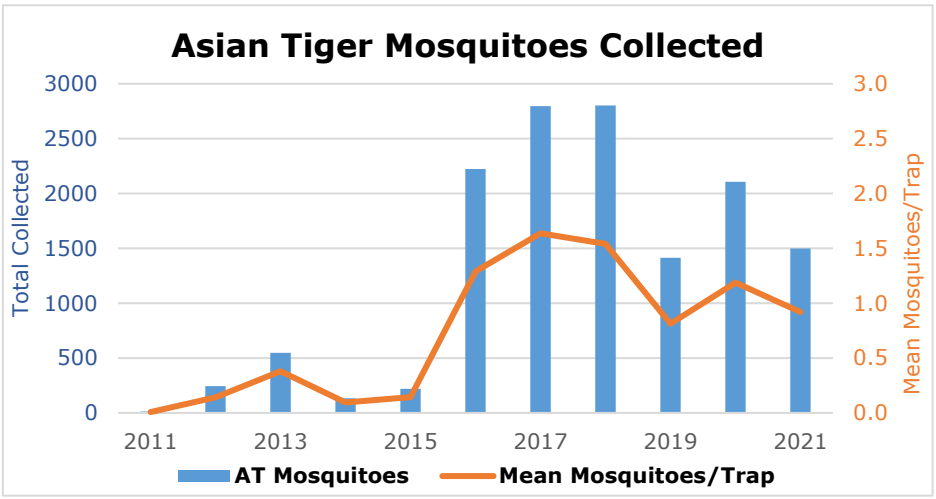
Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

The "Invasive Disruptors" described in this section are two examples of species that are not native to Connecticut that have the potential to upset the ecological balance or threaten public health.

Asian Tiger Mosquitoes[58]

QUICK SUMMARY:

✓ COMPARED TO LAST REPORT
X COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

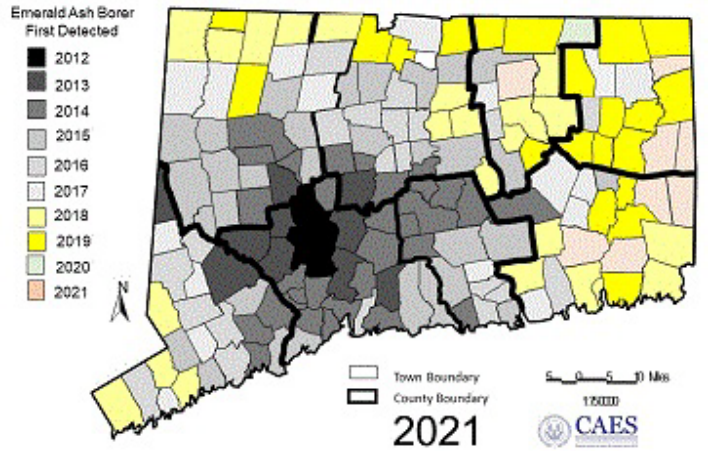


The range of the Asian tiger mosquito is expanding in the United States, particularly into Connecticut and other northeastern states. Infection rates of mosquito-borne diseases, such as Dengue and Zika, are likely to rise over the long term, as a warming climate creates more favorable habitats for mosquitoes. Connecticut is expected to get warmer and wetter over the coming century, enhancing mosquito populations by creating more suitable habitat. Data suggests that precipitation during the summer months has a greater impact on the number of mosquitoes in the state than does winter temperature. Additional information about mosquito management in Connecticut can be found on Department of Energy and Environmental Protection's (DEEP) website or the Connecticut Agricultural Experiment Station (CAES) portal.ct.gov/CAES.

Emerald Ash Borer[59]

QUICK SUMMARY:

X COMPARED TO LAST REPORT
— COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL



The emerald ash borer attacks ash trees almost exclusively. In Connecticut, ash trees make up just slightly less than three percent of the trees in the forest, most of which are white ash. The loss of ash trees in a forest stand also reduces vital habitat and allows undesirable invasive plants to fill the gap created. Movement of ash, in particular as firewood, nursery stock, logs and wood packaging materials, has been cited as the most likely means by which emerald ash borer has spread so rapidly.[60] Additional information about the emerald ash borer in Connecticut can be found on DEEP's website or CAES portal.ct.gov/CAES.

Technical Note: Collection data for 2016-2018 has been modified from previous reports because of the introduction of new data from a trapping site in Bridgeport. Invasive species have been identified as a cause in decline of at least 48 percent of species listed as threatened or endangered under the United States Endangered Species Act. Information on other invasive species can be found in the Council's 2022 special report Invasives: Previously Described and Newly Arrived.

Personal Impact*

Waste Diversion

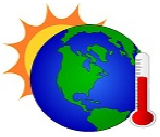
QUICK SUMMARY:

✗ COMPARED TO LAST REPORT

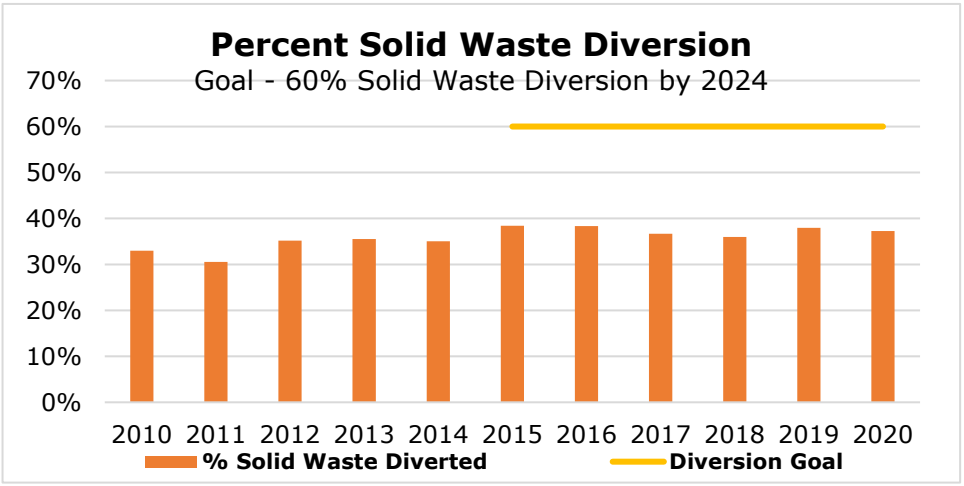
✓ COMPARED TO 10 YR. AVERAGE

✗ ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

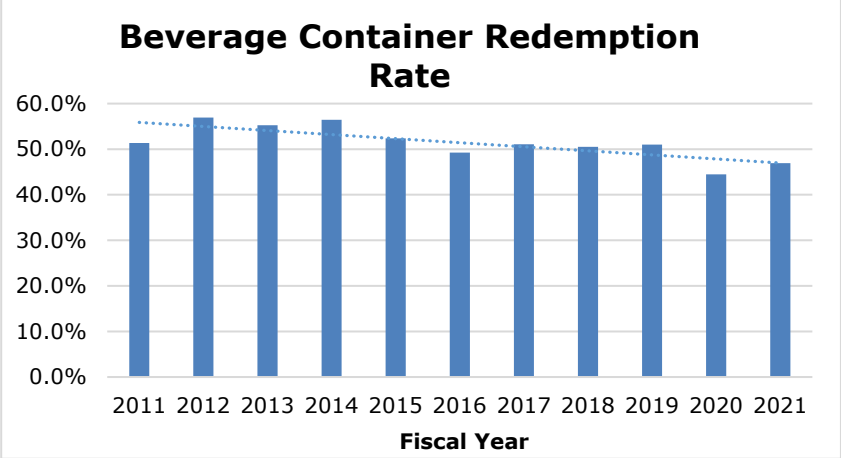


Solid waste diversion continues to be a challenge in the state.



In 2020, (most recent data available) an estimated 1.4 million tons (37.3 percent) of the State's solid waste was diverted** from disposal.[61] The amount of solid waste diverted was less than in 2019 (38%), but greater than the ten-year average of 35.7 percent. With the adoption of An Act Concerning Connecticut's Recycling and Materials Management Strategy in 2014 (Public Act 14-94), Connecticut set a challenging goal to achieve by 2024: divert 60 percent of municipal solid waste (MSW) from disposal. Based on the trend over the last 10 years, Connecticut is not expected to achieve the goal of 60 percent diversion by 2024 under existing conditions.[62]

In 2020 (most recent data available), approximately 492,000 tons of designated recyclables, which are compatible with Connecticut's single-stream recycling programs, were sent to end markets or recycling or reuse facilities.



The redemption rate in Connecticut was higher in fiscal year (FY) 2021 than in FY 2020, but the trend has been declining for over a decade.[63] The Council examined Connecticut's beverage container redemption program in 2021 and found that the redemption rate for deposit beverage containers has dropped by approximately 17 percent, over the last decade. In the Council's special report, *Low Deposit, Low Return*, the Council recommended ways to increase the redemption rate and divert more beverage containers from disposal. In 2021, legislation was enacted (Public Act 21-58) with provisions for improving the beverage container redemption program, including but not limited to: expanding the types of beverage containers that are subject to a deposit, increasing the deposit to $0.10 per container, requiring beverage containers to have barcodes, increasing the container handling fee to 2½ – 3½ cents, and establishing a beverage container stewardship organization.

Technical Note: *Personal Impact indicators illustrate trends in behavior or practices that can be expected to influence the condition of tomorrow's air, water, land and wildlife. **"Diversion" includes the reduction of materials before it makes it into the waste stream, reuse, recycling, composting, and waste conversion. Estimated "Diversion" based on 2005 Baseline of 3.8 million tons, which is a planning value taken from the Solid Waste Management Plan; it is not actual solid waste generation.

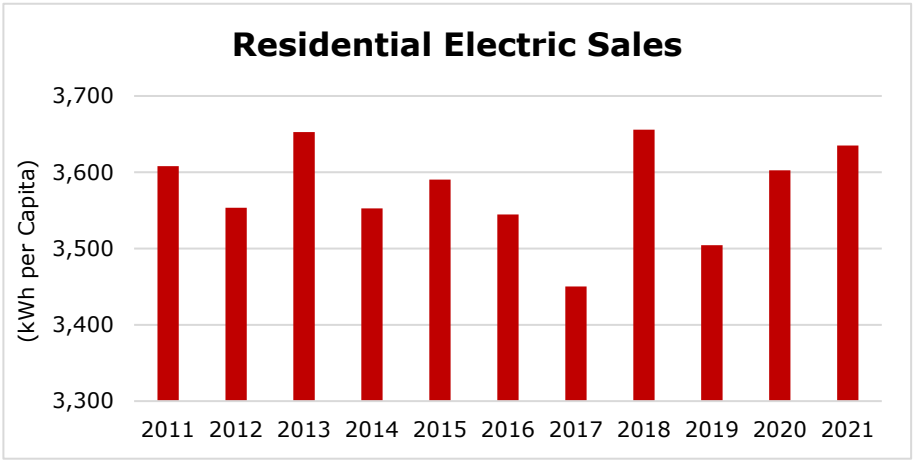
Electricity at Home and Work

QUICK SUMMARY:

✗ COMPARED TO LAST REPORT
✗ COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

The average Connecticut resident's electric consumption increased in 2021 to 3,635 Kilowatt-hours (kWh) per person.

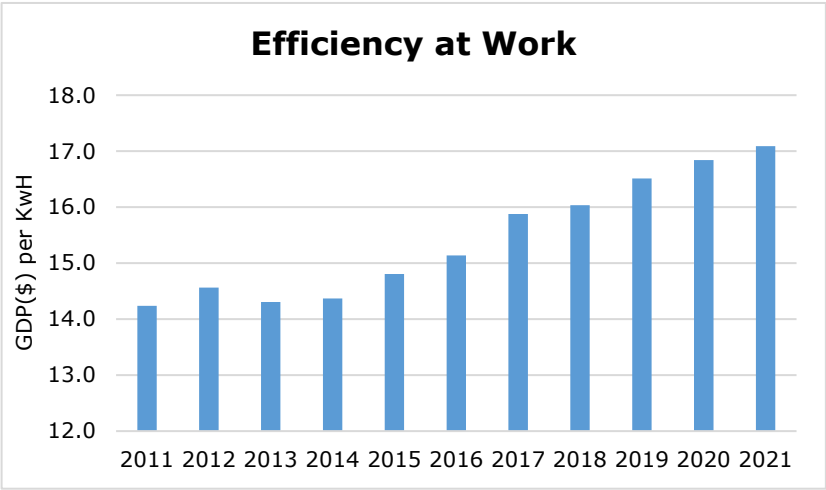


In 2021, Connecticut's residential sector consumed approximately 13,099 million kWh,[64] an increase of 0.9 percent from 2020 (12,982 million kWh) and higher than the prior ten-year average (12,808 million kWh). The use of fossil fuels for electric generation increases air pollution, especially from marginal units used to meet peak demand. Increasing the efficiency of generating units, using renewable sources, reducing electricity use and peak demand, and carbon capture and sequestration are all viable strategies to reduce air pollution from the electricity sector. The increase in 2021 came in a year with 18 days with temperatures greater than 90°F, which was greater than the 20- and 60-year average, but considerably less than the 30 days with temperatures greater than 90°F in 2020. Typically, the hotter the summer, the more electricity is used by residents to cool their homes and the more greenhouse gas emissions are released to the environment. In addition, the increase is likely attributed to more people learning and working from home for some time in 2021 than in previous years in response to the COVID 19 virus.

Connecticut's commercial and industrial sectors are using electricity more efficiently in 2021

QUICK SUMMARY:

✓ COMPARED TO LAST REPORT
✓ COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL



In 2021, Connecticut's commercial and industrial sector consumed approximately 14,382 million kWh.[65] The consumption of electricity in the commercial sector increased by 3.6 percent, while electricity consumption in the industrial sector decreased 1.0 percent from 2020 levels. Connecticut's 2021 annual average Gross Domestic Product (GDP), which is the total value of goods and services produced within the state in a single year, has been calculated by the Council using data provided by the Federal Bureau of Economic Analysis at approximately $244,454 million**.

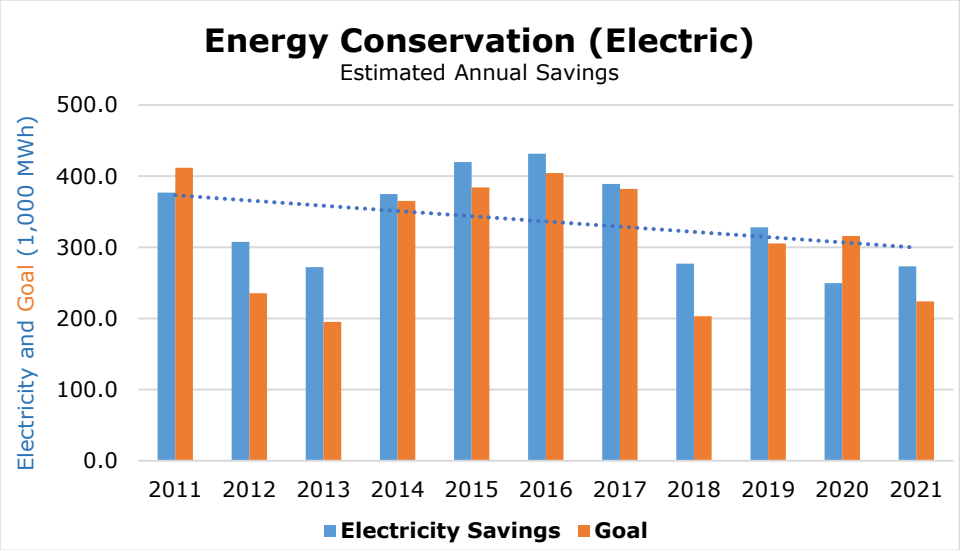
Estimated annual savings from electricity conservation measures have generally been declining since 2016.

QUICK SUMMARY:

COMPARED TO LAST REPORT

COMPARED TO 10 YR. AVERAGE

ON TRACK TO MEET GOAL



As mentioned above, reducing electricity use is an effective strategy for reducing air emissions from electric generation. Estimated annual savings from energy efficiency measures in 2021 (273,318 megawatt hours (MWh)) was greater than in 2020 (249,734 MWh), but less than the ten-year average of approximately 342,705 MWH.[66] The trend for annual electric savings has declined since 2011. Connecticut has energy-efficiency programs that have helped small and large businesses, homeowners and renters, and state and local governments manage their energy use. The Connecticut Energy Efficiency Fund (CEEF) has funded programs that provide financial incentives to reduce energy use. These programs and services, administered and delivered by Connecticut's electric and gas utilities, are funded from the CEEF through a "Public Benefits Charge" on electric bills and through a conservation charge included in natural gas rates. As expected, there is a correlation between electricity conserved, or electricity that need not be generated to meet demand, and reduction of air emissions associated with electric generation.

While the average annual emission rates (pounds of CO2/MWH) for fossil fuel electric generation units in Connecticut has decreased over the last 10 years, [67] Connecticut could make more use of energy efficiency measures and energy efficient building design, including greater use of solar energy in building design and orientation as a means of reducing air emissions and other environmental impacts.

The Independent System Operator for New England (ISO-NE) estimates that the cumulative annual energy savings, net of embedded expiring measures, is expected to increase over the next ten years; however, the rate at which additional measures are applied in future years is expected to decline.[68] Residential and commercial buildings use 74 percent of all electricity and 39 percent of all energy use in the United States. In Connecticut, the approximately 1.4 million households and 140,000 businesses together account for more than 70 percent of Connecticut's 750 trillion BTU of annual energy consumption.[69] With widespread adoption of existing energy-efficiency building technologies, greater use of more energy efficient multi-family housing and the introduction and use of new energy efficiency technologies, energy use in homes and commercial buildings could be reduced by 50 percent.[70]

Goal: Public Act 18-50 introduced a new policy of the state to reduce energy consumption by 1.6 million MMBtus (one million British Thermal Units), or "the equivalent megawatts of electricity," annually each year for calendar years commencing on and after January 1, 2020 through calendar year 2025. Specific goals for electric savings vary for each year based on a number of factors, including the proposed budget.

Technical Note: *Personal Impact indicators illustrate trends in behavior or practices that can be expected to influence the condition of tomorrow's air, water, land and wildlife. The vertical axis in the charts above "Residential Electric Sales" and "Efficiency at Work" have been shortened, beginning at 3,300 kWh/capita and 12.0 GDP($)/kWh, respectively, rather than the customary zero. **GDP in seasonally adjusted 2012 chained dollars.

Personal Impact*

Zero-Carbon Energy

QUICK SUMMARY:

✓ **COMPARED TO LAST REPORT**

X **COMPARED TO 10 YR. AVERAGE**

X **ON TRACK TO MEET GOAL**

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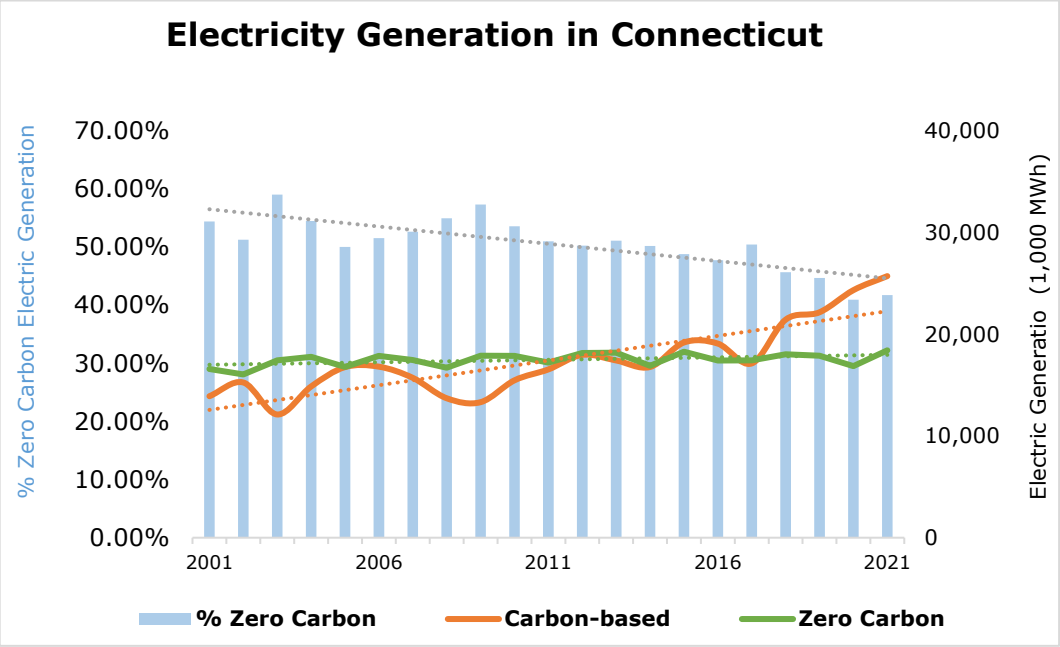
The ratio of zero carbon electricity to total electricity generation in Connecticut has been generally declining.



On September 3, 2020, Governor Lamont issued Executive Order No. 3 that seeks to address climate change adaption and resiliency, and calls for the Department of Energy and Environmental Protection (DEEP), in consultation with the Public Utilities Regulatory Authority (PURA), to "analyze pathways and recommended strategies for achieving a 100 percent zero carbon target for the electric sector by 2040". Connecticut's 2020 Integrated Resources Plan (IRP) did, in fact, analyze pathways and recommended strategies, as required by Executive Order 3. However, as depicted on the chart, the percentage of zero carbon electric generation** located in the state has decreased, while the percentage of carbon-based generation and total electric generation have increased.[71] Achieving 100 percent zero carbon generation with intermittent renewable technologies will require a significant amount of energy storage and/or upgrades to the electric transmission system.

Zero Carbon Goal & Increasing Consumption

In 2020, Connecticut was estimated to be at approximately 64 percent of the target for 100 percent zero carbon generation, based on total electricity consumed in the state.[72] The state recently procured approximately 710 megawatts (MW) of grid-scale solar capacity, 1,108 MW of offshore wind capacity, and the environmental attributes from the electric generation from Millstone.*** While these recent procurements will eventually increase the amount of zero-emission energy available for the state's residents and businesses, it might still leave the state short of its 100 percent zero carbon target in 2040. The shortfall is more likely if one or more of the Millstone units are retired and/or the projected increases in electric demand for transportation (64,000 EVs by 2030) and thermal (80 GWH by 2030) are accurate.

Goal: There is an ambitious goal of 100 percent zero carbon for the electric sector by 2040. By statute, a minimum percentage of electricity, which is sold to Connecticut customers, must be generated from renewable energy sources. That minimum amount is 22.5 percent in 2021 and will escalate to 40 percent in 2030 (Class I).

Technical Notes: *Personal Impact indicators illustrate trends in behavior or practices that can be expected to influence the condition of tomorrow's air, water, land and wildlife. **Zero carbon generation includes utility scale renewables and nuclear generation and it is not the same as Class I renewable sources. The chart does not include biogas, biomass, wood, municipal solid waste, and landfill gas as zero carbon. ***Includes all environmental attributes associated with the facility through 2029.

Solar Photovoltaics

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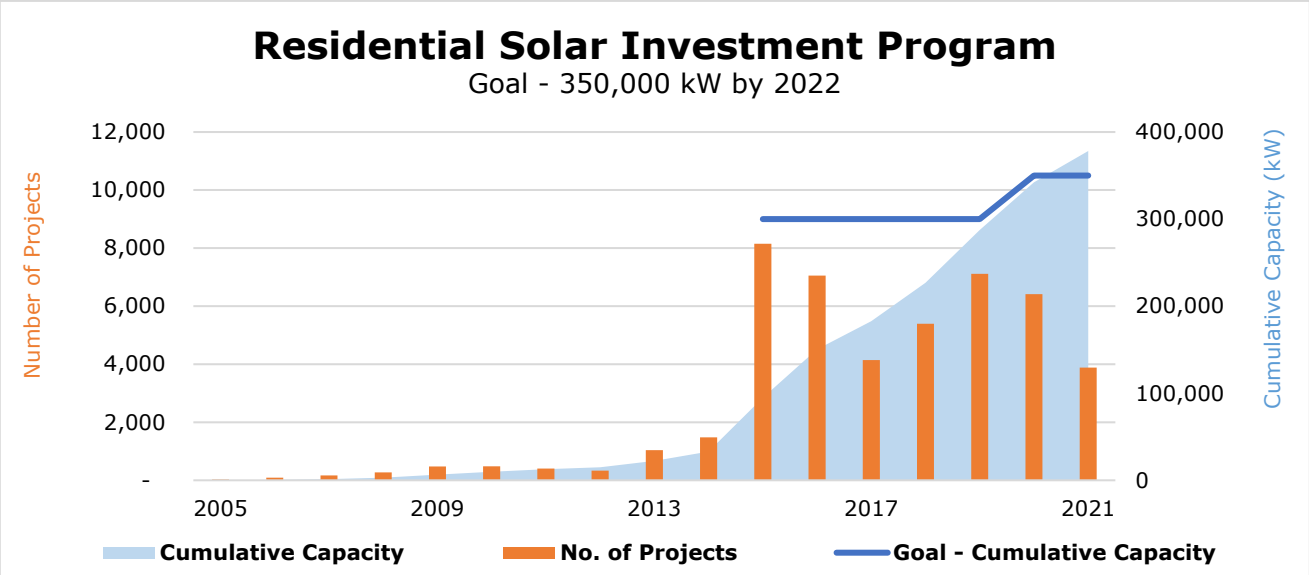
In 2021, the Residential Solar Investment Program exceeded its goal and fulfilled the intent of the program to promote residential solar PV.



Thousands of Connecticut homes now use the sun to generate much of their own electricity. In 2021, 10,280 residential solar PV systems were installed for a total capacity of 80,169 kilowatts (kW).[73] Of this total, 3,883 solar PV systems were installed with assistance from the Residential Solar Incentive (RSI) Program for a total capacity of 36,073 kW. From 2005 through the end of 2021, the total number of residential solar PV projects that received assistance from the RSI Program exceeded 46,918 projects with a total capacity of more than 378 megawatts (MW), exceeding the revised goal of 350 MW ahead of December 2022 program end.[74] On January 1, 2022, the new Residential Renewable Energy Solutions program replaced the previous net metering and RSI Program for residential renewable energy projects. The Residential Renewable Energy Solutions program offers residential solar installations the opportunity to sell the energy produced and the renewable energy certificates (RECs) at a fixed 20-year price by selecting one of two incentive rate structures (tariffs).

Goal: Legislation adopted in 2015 set a goal of 300 MW of new photovoltaic capacity installed on residential properties. That goal was increased to 350 MW in 2019 (CGS 16-245ff).

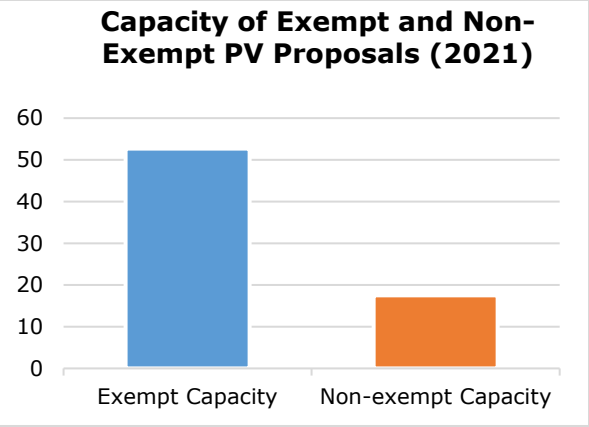
Utility Scale and Behind-The-Meter Solar PV

The Independent System Operator for New England (ISO-NE) projected that the total solar PV capacity in Connecticut could be over 790 MW through 2021. The ISO-NE also projected that a total of approximately 1,626 MW of solar PV capacity could be installed in Connecticut by 2030.[75] The environmental and social impact of solar PV installations in Connecticut is mixed. The primary advantage of solar PV electric generating equipment is that it produces electricity with zero emissions – no air pollution, wastewater, or noise. The 790+ MW of installed PV capacity in the state in 2021 is estimated to have produced more than one million megawatt-hours (MWh) of electricity in 2021, which is calculated to have potentially displaced over 290,000 metric tons** of carbon dioxide equivalent (CO_2e) emissions.[76] However, an issue with land-based solar PV installations, primarily

for utility scale solar PV installations, is the impact such development has on farmland, forests, shrublands, and the species that inhabit these ecosystems.

Regulation of Certain Solar PV Systems

As a result of citizens' concerns regarding the proliferation of land-based solar PV systems in Connecticut, the Council issued a special report in 2017, *Energy Sprawl in Connecticut*, that identified deficiencies in state policy regarding the selection and siting of land-based PV installations and recommendations to ensure prime farmland and core forest habitats were protected. In response to citizen concerns, Public Act 17-218 was enacted, which requires certain solar projects to acquire written confirmation that the subject proposal would not materially affect the status of such land as prime farmland or core forest. Since Public Act 17-218 was enacted, the capacity of individual commercial PV projects, submitted to the Connecticut Siting Council for regulatory approval through the Petition for Declaratory Ruling process, has decreased.



Certain provisions of Public Act 17-218 require written determination regarding the impact to core forest and prime farmland only apply to certain commercial solar PV proposals. Indeed, ten of the 14 proposals for commercial solar PV systems submitted to the Siting Council in 2021 were exempt from the requirements of the law (71 percent). These exempt proposals, which totaled 52.7 MW of PV capacity (75 percent of the capacity proposed in 2021), were exempt either because the projects' capacity was less than two MW, the project was reopened from an earlier date, the project was selected as part of a Department of Energy and Environmental Protection (DEEP) request for proposals (RFP), or because the proposals were submitted to the Siting Council as an application for a Certificate (as required by Connecticut General Statutes (CGS) Section 16-50k), not through the Petition for Declaratory Ruling process. In fact, one of the Petitions submitted in 2020 (Petition 1437) withdrew their project and refiled the project in 2021 as an application for a Certificate (Docket 497), after receiving correspondence from the DEEP that the proposed project would have a material affect on core forest resources.[77] Notwithstanding the exemptions associated with Public Act 17-218, all state agencies can submit comments to the Siting Council for all proposal filings, within the schedule provided, which are considered by the Siting Council in their deliberations.

Technical Note: *Personal impact indicators illustrate trends in behavior or practices that can be expected to influence the condition of tomorrow's air, water, land and wildlife. **Based on Annual Average Generator Emission Rates (lbs/MWh) for New England - 633 lbs/MWh.

Personal Impact*

Transportation

QUICK SUMMARY:

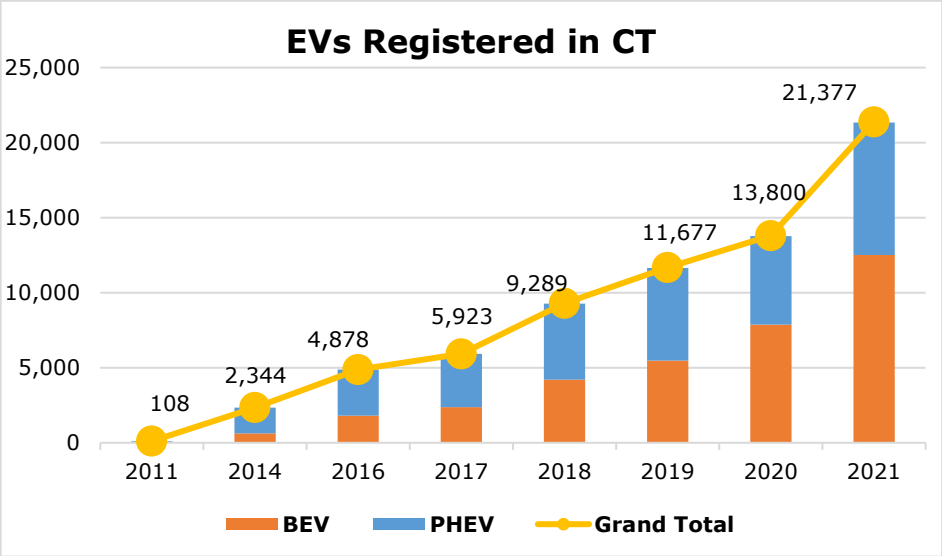
✓ COMPARED TO LAST REPORT

✓ COMPARED TO 10 YR. AVERAGE

✗ ON TRACK TO MEET GOAL

Move your cursor over the globe to learn how climate change affects the data on this page, or click on it for more detailed information

Transportation contributed 37.4 percent of Connecticut's economy-wide emissions of greenhouse gases (GHG).[78]



Significant reductions of GHG emissions are achievable by reducing the combustion of fossil fuels in the transportation sector, which will likely be achieved by increased fuel efficiency, increased use of mass transit, and the use of electric drive vehicles that operate on electricity or "green" hydrogen. Electric drive vehicles (EVs) include plug-in hybrid electric (PHEV), battery electric (BEV), electric motorcycles, and fuel cell electric (FCEV) vehicles.** While there has been substantial growth in EVs in the state, it is unlikely that Connecticut will achieve the goal of 125,000 EVs in Connecticut by 2025[79] since they currently account for less than two percent of all passenger vehicle registrations.[80] Furthermore, there are only thirteen electric drive light duty vehicles, of the more than 3,600 vehicles, leased by Department of Administrative Services for state use.[81] The state's EV adoption rate is only 0.36 percent, compared with a statewide EV adoption rate of 1.76 percent for 2021.

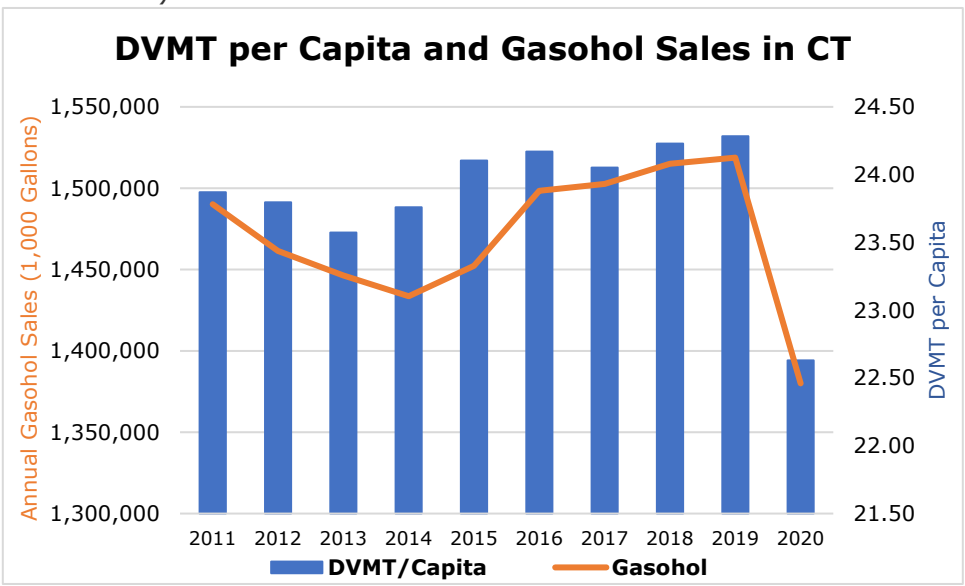
Driving: The recent trend of driving more changed in 2020, likely due to the impact of the COVID 19 pandemic (most recent data).

QUICK SUMMARY:

✗ COMPARED TO LAST REPORT

✗ COMPARED TO 10 YR. AVERAGE

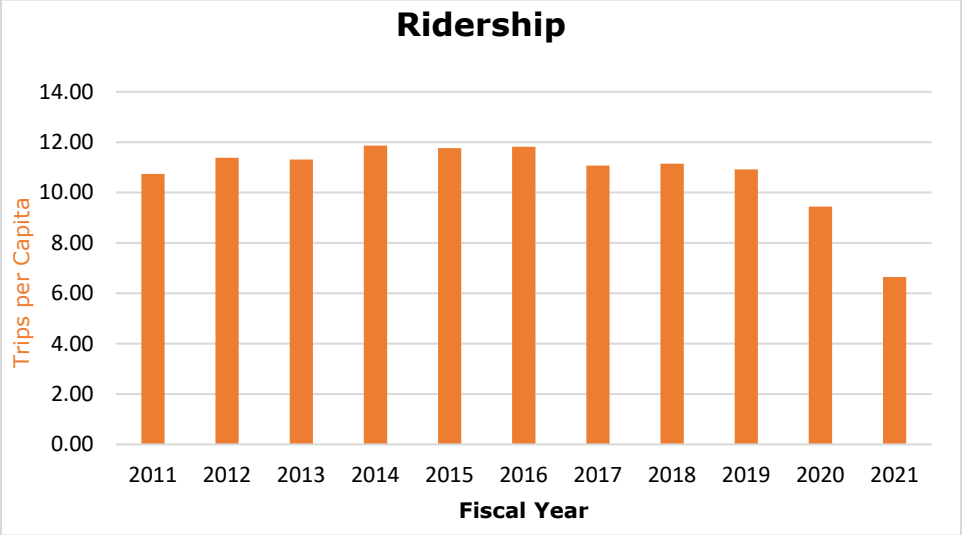
— ON TRACK TO MEET GOAL



In 2020 (most recent data available), the average daily vehicle miles travelled (DVMT) declined almost seven percent from 2019 with an average of 22.6 miles per person; likely due to the impact of COVID 19. [82] From 2013 through 2019, the DVMT generally increased, which is consistent with the increase in employment in the state, and the decrease of both gas prices and bus ridership depicted in the chart below. In the past, as residents drove more, gasoline consumption increased, which caused more air pollution. However, analysis of the

data for the period 2009-2019 suggests that the trend for gasoline consumption increased at a rate greater than the trend for driving (DVMT/capita).[83] A likely reason is that the new vehicle market has shifted away from cars towards sport utility vehicles (SUVs) and pickups. Light duty trucks made up 76.4 percent of vehicle sales in 2020, up from 51.2 percent in 2010.[84]

Ridership: People got on the bus less often in Connecticut in 2021.



QUICK SUMMARY:

XX COMPARED TO LAST REPORT
XX COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

In fiscal year (FY) 2021 (July 2020 through June 2021), ridership on fixed route, commuter, and Americans with Disabilities Act (ADA) transit services declined to the lowest ridership numbers since 2011. In FY 2021, the passenger trips per capita value was 6.17, which is approximately 40 percent lower than the ten-year average.[85] The primary reason for the decline in ridership in FY 2021 is the impact of COVID 19; however, other factors such as employment, fuel prices, and the success in ride sharing efforts could also be partially responsible for the decline.

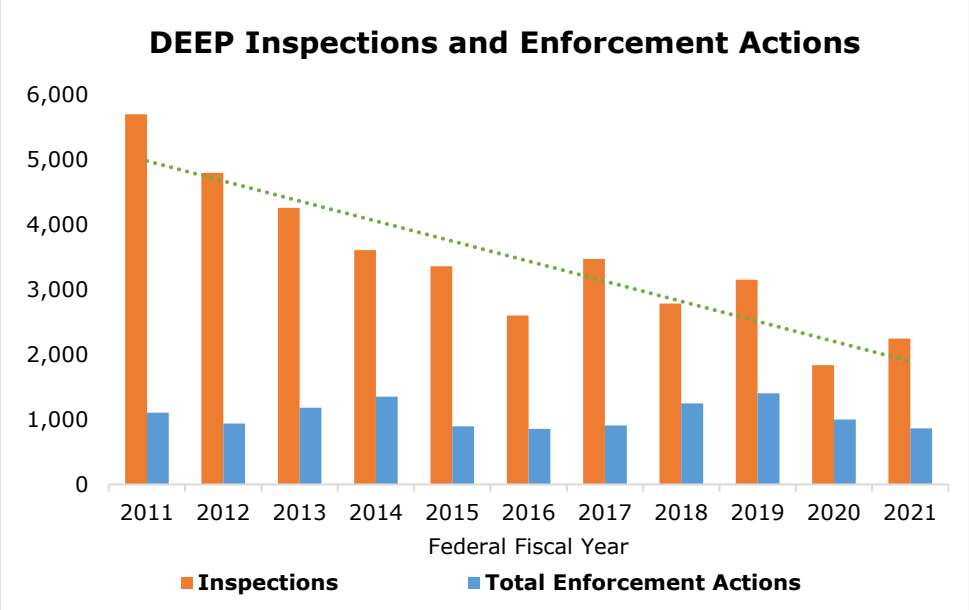
Technical Note: *Personal Impact indicators illustrate trends in behavior or practices that can be expected to influence the condition of tomorrow's air, water, land and wildlife. **Electric motorcycles and fuel cell electric vehicles are included in the total number of EVs registered in the State. "Green" hydrogen refers to the production of hydrogen from sources other than fossil fuel. The vertical axis in the chart above has been shortened, beginning at 21.5 DVMT/capita and 1,3 billion gallons rather than the customary zero.

Compliance

QUICK SUMMARY:

✓ COMPARED TO LAST REPORT
✗ COMPARED TO 10 YR. AVERAGE
— ON TRACK TO MEET GOAL

In 2021, DEEP's inspections and enforcement actions were low compared to almost each year over the last ten years, (except for 2020 – COVID year)



In the 2021 Federal Fiscal Year (FFY21: October 1, 2020 – September 30, 2021), there were 2,246 inspections performed by the Department of Energy and Environmental Protection (DEEP); a decrease of 37 percent compared to the ten-year average. The number of DEEP inspections in FFY21 is due, in part, to the state of emergency issued in Connecticut as a result of the COVID 19 virus outbreak. While the impact of COVID 19 may have resulted in fewer inspections in FFY20 and FFY21; there has been a significant decline in the number of inspections performed by DEEP over the last ten years. In FFY21, there were 863 enforcement actions, which included 839 "Informal Enforcement Actions", consisting of Notices of Violation (NOV), Notice of Non-Compliance (NON), and warning letters; 23 "Orders"; and 1 "Referral" to the Attorney General.

The Informal Enforcement Actions are enforcement tools, generally issued whenever DEEP detects one or more violations at a facility or permitted use. They can be issued for relatively minor or major violations; in cases of the latter type, the recipient might also receive an order, which might carry a financial penalty. In FFY21, DEEP assessed administrative penalties totaling $583,580 and required violators to fund supplemental environmental projects (SEP) totaling $212,670.[86]

Climate Notes

This page explains how climate change affects the environmental indicators in this report.

Bald Eagles and Osprey: Climate change affects the survival of bald eagles on multiple levels, according to scientists. As climate change progresses, the National Audubon Society's climate model projects that bald eagles will have just 26 percent of their current summer range by 2080. It is possible that the birds will adapt and reclaim summer terrain as new areas become hospitable, but it isn't known whether the birds will be able to find the food and habitat they need to survive.

Climate Changers: Greenhouse gases (GHG), including carbon dioxide (CO2), from human activities are the most significant drivers of observed climate change since the mid-20th century. Carbon dioxide is generated as a result of the combustion of fossil fuels and to a lesser extent, the clearing of land for agriculture, industry, and other human activities. As described in a recent study released by the Governor's Council on Climate Change, average temperatures in Connecticut could increase by 5°F (2.7°C) by 2050 compared to the 1970-1999 baseline in Connecticut.

Degree Days: Degree days are defined as the number of degrees by which the average daily temperature is higher than 65°F (cooling degree days) or lower than 65°F (heating degree days).

Drinking Water: Extreme rainfall events lead to more runoff when the soil simply is not able to absorb the precipitation at the rate it is falling. In urban, suburban, and agricultural areas, this runoff will pick up pollutants from the landscape and carry them to nearby rivers and other waterways, ultimately affecting the quality of drinking water. In addition to more intense storms and flooding, more frequent or longer dry spells are also projected in many climate change scenarios, which makes the scarcity of water a concern.

Electricity at Home and Work: Increases in temperature will likely increase energy demand, as well as change our ability to produce electricity and deliver it reliably. In a warmer climate, more electricity will be used for air conditioning and less natural gas, oil, and wood for heating. To the extent that the increased demand is met by sources that are not zero-carbon, climate warming could be exacerbated.

Renewable Energy: Renewable energy is one of the most effective tools against climate change. Zero-carbon energy sources provide a tremendous resource for generating clean and sustainable electricity without toxic pollution or global warming emissions. Solar panels, wind turbines, hydroelectric facilities and other zero-emission technologies do not release any emissions as they generate electricity.

Farmland: The extent of farmland in Connecticut depends greatly on farms' profitability. Climate change may benefit some plants by lengthening growing seasons and increasing carbon sequestration. However, other effects of a warmer climate, such as more pests, droughts, flooding, changes in ground-level ozone concentrations will be less beneficial for agriculture.

Forest Birds: Climate change affects birds both directly and indirectly. As temperatures warm, some bird species will benefit from milder winters and extended breeding seasons. Others, such as northern birds associated with forest habitats, will likely decline in Connecticut, due in part, to increased competition and increased frequency of droughts and extreme storm events may inflict higher mortality during the breeding seasons.

Good Air Days: The number of days with bad air is related to a number of factors, including ambient air temperature, concentrations of air emissions, wildfires, weather patterns, etc. Elevated temperatures can directly increase the rate of ground-level ozone formation, which is formed when nitrogen oxides and volatile organic compounds react in the presence of sunlight and hot weather.

Invasions: Global warming threatens to increase the extent, frequency, and severity of invasive species. The milder winters and extended spring that comes with climate change are helping invasive species extend their ranges, pushing aside native species and transforming habitats. The removal of temperature or moisture constraints will allow species to move into and successfully invade new areas. Species range shifts will also lead to native species moving out of their current habitat or becoming rarer. This creates ecological space for other species to increase in abundance and become invasive, or for non-native invasive species to move in.

Lobsters: Climate change is increasing the water temperature of Long Island Sound. Ocean warming, due to climate change, will act as a likely stressor to the ecosystem's southern lobster fisheries, which will continue to drive further contraction of lobster habitats into northern areas.

Piping Plovers: Coastal-nesting birds such as the piping plover are among the species most threatened by climate change. Rising sea levels might reduce nesting areas available for many coastal and nesting birds.

Preserved Land and Forests: The climate influences the structure and function of forest ecosystems and plays an essential role in forest health. Forests are sensitive to changes in temperature and precipitation and are greatly affected by fragmentation and land-use change, invasion by nonnative species, forest diseases and insect pests, and extreme weather events. One study by the United States Department of Agriculture (USDA) states that climate also affects the frequency and severity of many forest disturbances. Land conservation can help to reduce the impacts of climate change by absorbing carbon dioxide from the air.

Rivers and Streams: Rivers and streams are affected greatly by fluctuations in precipitation and evaporation patterns around the world. Warming temperatures are altering the water cycle and shifting precipitation patterns. Changes in the timing and location of precipitation combined with rising levels of water pollution will strain ecosystems and threaten the survival of many fish and wildlife species. An increase in severe storms due to climate change will degrade water quality and increase the risk of catastrophic floods. On the other end of the spectrum, frequent droughts, enhanced evaporation, and decreases in overall annual rainfall result in reduced water levels in streams, rivers, and lakes, which leaves less water to dilute common pollutants.

Swimming, Clamming and Oystering: As the atmosphere warms, changes to the amount, timing, distribution, and intensity of precipitation will continue. Warmer temperatures increase the rate of evaporation of water into the atmosphere and increase the atmosphere's capacity to hold water. What evaporates will fall as excess precipitation in many regions. As more intense precipitation leads to increased runoff, more pollution is washed into waterways, including sediments, nitrogen from fertilizers, disease pathogens and pesticides. The same factors that affect beaches present problems for shellfish beds.

Transportation - Driving and Riding: Combustion of fossil fuels, such as gasoline and diesel, releases carbon dioxide, a greenhouse gas (GHG) into the atmosphere. Both nationally and in Connecticut, the transportation sector is the greatest contributor of GHG emissions.

Warming and Rising Waters: Global mean sea level has risen about 8–9 inches (21–24 centimeters) since 1880, with about a third of that coming in just the last two and a half decades. The rising water level is mostly due to a combination of meltwater from glaciers and ice sheets and thermal expansion of seawater as it warms. The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) recommended that Connecticut plan for and expect 50 centimeters (20 inches) of sea level rise by 2050 with further increases following that date.

Waste Diversion: Recycling and waste reduction have many direct benefits; however, the indirect benefits are also significant. Recycling and waste diversion reduce greenhouse gas (GHG)

emissions that would be created by the production, transport, and disposal of municipal solid waste. Increasing recycling and source reduction has been identified as a key strategy for reducing GHG emissions in Connecticut's Climate Change Action Plan.

Water of Long Island Sound: Climate change has a variety of direct and indirect effects on ocean ecosystems. Increasing temperatures have the capability to make coastal and marine ecosystems more vulnerable to hypoxic conditions, as well as drive the expansion of hypoxic environments. In general, warmer water holds less dissolved oxygen than colder water. As the estuaries and oceans heat up, less oxygen is held; stratification of the Sound waters intensifies, and deeper waters then lose even more oxygen. Precipitation also is important climate factor that can affect hypoxic rates and expansion. Changes in precipitation patterns affect nutrient and hypoxic dynamics in coastal ecosystems.

Wetlands: Wetlands play a role in our ability to manage risks from climate change. Wetlands are an important sink for greenhouse gases, where carbon is stored and prevented from entering the atmosphere. Wetlands provide important functions including: cleaning up polluted water. slowing and storing floodwaters and snow melt, recharging groundwater. and supporting habitat for many different native plant and animal species.

Activities of the Council in 2021

Research and Reports

The Council published the 2020 *Environmental Quality in Connecticut* Annual Report in April 2021. In this year's Annual Report, the Council expanded its assessment of water quality and included new data and charts on greenhouse gas emissions from large facilities and transportation fuels. There was no new data for forest birds, forest acreage, wetlands and bats and turtles. The inclusion of biological indicators requires considerable care in the selection of appropriate species, and the Council is grateful for the advice it received from experts.

In 2021, Public Act 21-58 was enacted to address Connecticut's beverage container redemption program. Certain provisions of that law addressed many of the Council's issues highlighted in the Council's 2020 report *Low Deposit, Low Return*, which included recommendations to decrease solid waste in the state by capturing redeemables that are now lost to the waste stream. In that special report, the Council recommended a five-cent increase in the deposit fee to raise the redemption rate for beverage containers, expanding the types of beverage containers eligible for a deposit, increasing the handling fee for retailers and redemption centers, and increasing the amount of post-consumer content in materials made and sold in the State and region. (see Waste Diversion)

The Council reiterated the need for training of municipal inland wetland officials/commission members, as required by Connecticut General Statutes (CGS) Section 22a-42(d) and CGS Section 22a-42a(c)(2). The Council again reviewed Connecticut's inland wetland regulations and analyzed the data provided by municipalities throughout the state. The Council noted that the data reported by municipal inland wetland agencies was not current; lacked specific information regarding direct impacts to wetlands, watercourses, and upland areas; and in some cases – was not provided at all. The Council urged the Department of Energy and Environmental Protection (DEEP) to make the training materials available online (which was completed January 10, 2022), to expand the use of in-person training, and to assess the possibility of using electronic submission of the "Activity Reporting Form" to enhance municipal participation and to increase efficiency of the reporting process.

The Council conducted significant research in 2021 to develop a special report on invasive species in Connecticut. The special report, *Invasives: Previously Described and Newly Arrived*, which was published in 2022, is an update to the 2002 special report by the Council, *Great Infestations*.

Advice to Other Agencies

Council staff reviewed Environmental Impact Evaluations and scoping notices prepared by other agencies, and submitted comments when deemed appropriate. The Council provided training to several state agencies and updated some of the notice templates to assist state agencies to develop notices for publication in the *Environmental Monitor*.

The Council commented on several state activities and plans, including the following:

- An Environmental Impact Evaluation (EIE) for Naugatuck Valley Wastewater Treatment Study;
- DEEP's Sustainable, Transparent and Efficient Practices (STEPs) for Solar Development;
- DEEP's Shared Clean Energy Facility Program;
- DEEP's Implementation of Public Act 21-58: Bottle Bill Modernization;
- Draft 2022-2024 Conservation and Load Management Plan;
- DEEP's Spill Reporting Regulations; and
- Proposed legislation that could have impacted Connecticut's environment.

The Council also commented on five applications for a Certificate of Environmental Compatibility and Public Need and 11 Petitions for Declaratory Ruling to the Connecticut Siting Council.

Public Act 20-9, An Act Revising Provisions of the Transfer Act and Authorizing the Development and Implementation of a Release-Based Remediation Program, stipulated that the Council would be a member of a working group to develop regulations to implement a Release-Based Remediation Program. The Council participated in the working group through the "Tiers" subcommittee and also participated in a team that examined issues related to releases on residential properties. Through the subcommittee and team, the Council was able to advocate for measures that would eliminate or reduce the likelihood of a heating oil spill, consistent with the recommendations identified in the Council's 2019 report, *Fuel for Thought*.

Citizen Concerns and Complaints

State law directs the Council to investigate citizen complaints alleging violation of any statute or regulation in respect to environmental quality. The Council receives weekly inquiries regarding routine matters that are addressed by providing the person who inquired with the correct person or agency to handle the matter.

Every month the Council discusses the inquiries and complaints of environmental consequence that were presented to the Council by individuals and groups. Many times that leads to special reports, such as the Council's 2020 report *Low Deposit, Low Return*, on the problem with the State's beverage container redemption program. The Council was also made aware DEEP's tree removal activities at Housatonic Meadows State Park from citizens concerned about the removal of certain trees at the Park.

In 2021, staff investigated numerous complaints, including on-going air pollution violations and potential soil contamination in Stamford, unauthorized camping and vehicle access on state-owned lands; invasive species; flooding; wetland impacts; pesticide applications; ridgeline protection, historic preservation; and water quality.

The Council regularly engages with state agencies and is appreciative of the assistance provided by the Departments of Energy and Environmental Protection, Public Health, and Transportation; the Office of Policy and Management; and others to answer citizen inquiries and resolve complaints. The Council also participates in webinars, meetings, workshops and other outreach activities of State agencies and stakeholder groups to offer information and to stay current on environmental issues.

Council Duties

The main responsibilities of the Council on Environmental Quality are described in Sections 22a-11 through 22a-13 of the Connecticut General Statutes.

The Council is a nine-member board that works independently of the Department of Energy and Environmental Protection (except for administrative functions). The Chairman and four other members are appointed by the Governor, two members by the President Pro Tempore of the Senate and two by the Speaker of the House. The Council's responsibilities include:

1. Submittal to the Governor of an annual report on the status of Connecticut's environment, including progress toward goals of the statewide environmental plan, with recommendations for remedying deficiencies of state programs.

2. Review of state agencies' construction projects.

3. Investigation of citizens' complaints and allegations of violations of environmental laws.

4. Review of environmental impact evaluations that state agencies prepare for major projects under the Connecticut Environmental Policy Act (CEPA). The CEPA regulations were amended in September 2019.

5. Publication of the *Environmental Monitor*, the site where all state agencies must post their scoping notices and environmental impact evaluations under CEPA. The *Environmental Monitor* also is the official publication for notice of intent by state agencies to sell or transfer state lands.

6. Participation in studies and working groups on environmental issues, as directed by the legislature.

Council Members

Keith Ainsworth
Keith Ainsworth has been an environmental and land use litigator of the New Haven Bar for nearly three decades. Keith has a broad conservation-based practice representing land trusts, non-profits, land owners and businesses in transactions and litigation throughout Connecticut before administrative agencies and state and federal courts. As a former chair of the Connecticut Bar Association Environmental Law section and a municipal first selectman (Haddam), Keith has a perspective from several sides of the table. A graduate of Tufts with a B.S. in biology, environmental studies and English literature, Keith brings a scientific and analytical background to the law. Keith is a life member of the Madison Land Conservation Trust and served on the national leadership council of Trout Unlimited. Keith also serves as General Counsel to Vista Live Innovations, Inc., a private educational institute for adults with intellectual disabilities. Keith is also an avid outdoorsman and author of several volumes of poetry.

Alicea Charamut
Resident of Newington. Executive Director of Rivers Alliance of Connecticut. Board of Directors, Farmington Valley Chapter of Trout Unlimited. Secretary, Fisheries Advisory Council. Co-Chair, Water Planning Council Advisory Group. Advisory Board, Connecticut Institute of Water Resources.

David Kalafa
Resident of Middletown. Over thirty years working for the State of Connecticut developing and implementing policy for energy and conservation at the Office of Policy and Management and Department of Energy and Environmental Protection. Retired as Undersecretary for Comprehensive Planning and Intergovernmental Policy at the Office of Policy Management. Served on the State Water Planning Council and Governor's Climate Change Commission. Holds a Master of Public Administration from the State University of New York and a Bachelor’s degree in Economics from Skidmore College.

Kip Kolesinskas
Resident of Manchester. Consulting Conservation Scientist. Current projects include assisting agencies, NGO’s, and private individuals with farmland protection, land access and affordability for new and beginning farmers, farmland restoration, and climate change adaptation strategies. Co-Chairs the Working Lands Alliance Steering Committee, and has contributed to numerous publications and initiatives including Conservation Options for Connecticut Farmland, Planning for Agriculture-A Guide for Connecticut Municipalities, and the award-winning training videos for CT DEEP’s Municipal Inland Wetland’s Agency Training Program. Formerly USDA Natural Resources Conservation Service State Soil Scientist for Connecticut and Rhode Island, where he worked extensively with farmers, educators, government and nonprofits to help them protect farmland and wetlands, and use soils information to make better informed land use decisions. He is a recognized regional and national speaker on soils and land use planning, farmland protection, climate change adaptation, farmland access, and wetlands.

Matthew Reiser
Resident of Avon. Environmental, health and safety consultant with over 20 years of experience performing regulatory compliance auditing, planning, training and reporting; air, water and waste discharge permitting; and air, water and waste sampling for industrial, commercial, municipal and institutional facilities. Member, Connecticut Chapter of the Academy of Certified Hazardous Materials Managers and Connecticut Marine Trades Association Environment Committee.

Charles Vidich
Resident of Ashford. Environmental and land use consultant concerned with energy efficient and sustainable patterns of development. Served as manager of the United States Postal Service Corporate Sustainability Initiatives program with responsibility for sustainability, energy efficiency

and environmental management systems for the nation's 32,000 domestic and overseas Post Offices. Previously served as the principal planner for the Central Naugatuck Valley Council of Governments where he developed solar conscious land use ordinances and the nation's first comprehensive regional plan of development. Appointed to the Connecticut Land Use Education Council with the mission to improve the skills and resources available to local planning and zoning commissions. Received the Lifetime Achievement Award from EPA's National Sustainable Materials Management program. Appointed as a visiting scientist to the Harvard School of Public Health as well as the Harvard Humanitarian Initiative where he lectured on scientific approaches on the use of quarantine and the environmental control of communicable disease. He served as the pivotal expert witness in a celebrated Connecticut Supreme Court case that successfully overturned restrictive zoning regulations and in a federal district court case that successfully overturned discriminatory land use practices.

William Warzecha
Resident of Norwich. Retired from the Department of Energy and Environmental Protection with 36+ years of service. Early in his career, he served as the geologist/hydrogeologist to the Eastern Connecticut and King's Mark Environmental Review Teams applying his technical background and expertise mainly in the areas of water supply development, waste disposal, and geologic development concerns with respect to major land-use projects, watershed studies and natural resource inventories statewide and assisted staff of the Connecticut Geological & Natural History Survey on geologic studies and investigations. Retired as the supervising environmental analyst for the Department's Remediation Division primarily responsible for enforcing the state's ground water pollution and potable water laws, protecting the state's water resources, and overseeing the clean-up of soil and ground water at polluted industrial and commercial sites. He was a long-time Board member representing the City of Norwich to the Uncas Health District, and is presently serving as a Trustee at the Norwich Free Academy and a member of the Board of Commissioners for the City of Norwich's Public Utilities and Sewer Authority. Holds a Master's degree in Environmental Management and Policy and a Bachelor's degree in Environmental Earth Science.

Former Council Members – Term Expired 2021

Lee E. Dunbar
Resident of Mansfield. Retired. Previously, Assistant Director, Bureau of Water Management and Land Re-Use, Planning and Standards Division, Connecticut Department of Environmental Protection. Responsible for developing scientifically defensible water quality standards and criteria to protect human health and aquatic life. Developed and implemented environmental monitoring and assessment methods; participated in the development of regulations to better manage stream flow in Connecticut streams affected by water withdrawals and diversions; and oversaw the development of regulatory programs including the Total Maximum Daily Load (TMDL) Program, Nitrogen Trading Program, and Water Quality-based Discharge Permitting Program. Awarded Lifetime Achievement Environmental Merit Award by the U.S. EPA in 2010 for significant contributions to environmental awareness and problem solving. President of the Eastern Connecticut Forest Landowners Association and Board Member, Wolf Den Land Trust.

Alison Hilding
Resident of Mansfield. Long-time advocate for the environment and children, viewing the protection of clean water and air as important dimensions of child advocacy, President, Mansfield Environmental Trust. Commissioner and Executive Board Member, Connecticut Commission on Children, 2003 to 2016; and founding member, Mansfield's Citizens for Responsible Growth. Background in financial management; worked for NYNEX Corporation on the capital budget with responsibility for growth and modernization; currently engaged on the grassroots level in promoting streambelt protective zoning and sustainable land use practices in Mansfield and the northeast corner of CT. Member of various CT environmental organizations.

Acknowledgments

The Council acknowledges the contributions of environmentalists that have worked tirelessly to improve the quality of life for all species on Earth. Being the 50th Anniversary Issue, the Council recognizes all the former members of the Council and staff. The Council also wants to acknowledge two Council members whose terms expired in 2021 – Alison Hilding and Lee Dunbar.

The Council appreciates the assistance of the many people in the Departments of Agriculture, Energy and Environmental Protection (DEEP), Transportation, and Public Health; the Connecticut Agricultural Experiment Station; the Connecticut Green Bank; and the Connecticut Siting Council who, annually, provide data for this report.

It is appropriate to acknowledge the many individuals and organizations that have contributed greatly to the stewardship of Connecticut's environment. This includes the many State employees who administered the environmental programs, put in place by the Legislature over the last five decades, who are now about to retire, or have retired, from a career of public service. The Council especially thanks the many citizens, businesses, and organizations who offered information and viewpoints about public policies, many of which led to the Council's special reports over the years. The Council also appreciates the work of its Executive Director, Peter Hearn, and Paul Aresta, Environmental Analyst II, in drafting this report for review by the Council and preparing the final version for publication.

Image Credits: The "warming earth" symbol used to denote indicators affected by climate change was created by the Council. The images of the box turtle and bats is attributed to Paul Fusco. The image of the Asian tiger mosquito is attributed to Susan Ellis. The image of the map of Connecticut with the status of Ospreys' nests was obtained from Connecticut Audubon, Osprey Nation Map. The image of the emerald ash borer was obtained from forestimages.org and the emerald ash borer map was produced by the Connecticut Agricultural Experiment Station. The image on the cover of the Chatfield Hollow State Park was provided by Paul Aresta. The Council greatly appreciates their generosity in allowing the use of these excellent images in this report.

Resources

[1] National Oceanic and Atmospheric Administration (NOAA), National Weather Service; w2.weather.gov/climate/xmacis.php?wfo=box.
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[3] DEEP, Climate Change, 2018 Connecticut Greenhouse Gas Emissions Inventory; portal.ct.gov/-/media/DEEP/climatechange/GHG_Emissions_Inventory_2018.pdf.
[4] Department of Revenue Services (DRS), Motor fuel sold to non-governmental customers. DRS Annual Reports, portal.ct.gov/DRS/DRS-Reports/Annual-Reports/Department-of-Revenue-Services-Annual-Reports.
[5] DRS, Motor Fuel Comparison Report, Fiscal Years 2019-2020 compared to Fiscal Years 2020-2021; portal.ct.gov/-/media/DRS/Research/ComparativeMotorFuel/Schedule-A--B-1920FY20.pdf.
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