

SOUND OUTLOOK

A NEWSLETTER OF THE CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION
EXPLORING LONG ISLAND SOUND – ISSUES AND OPPORTUNITIES

Planning for Climate Change in LIS

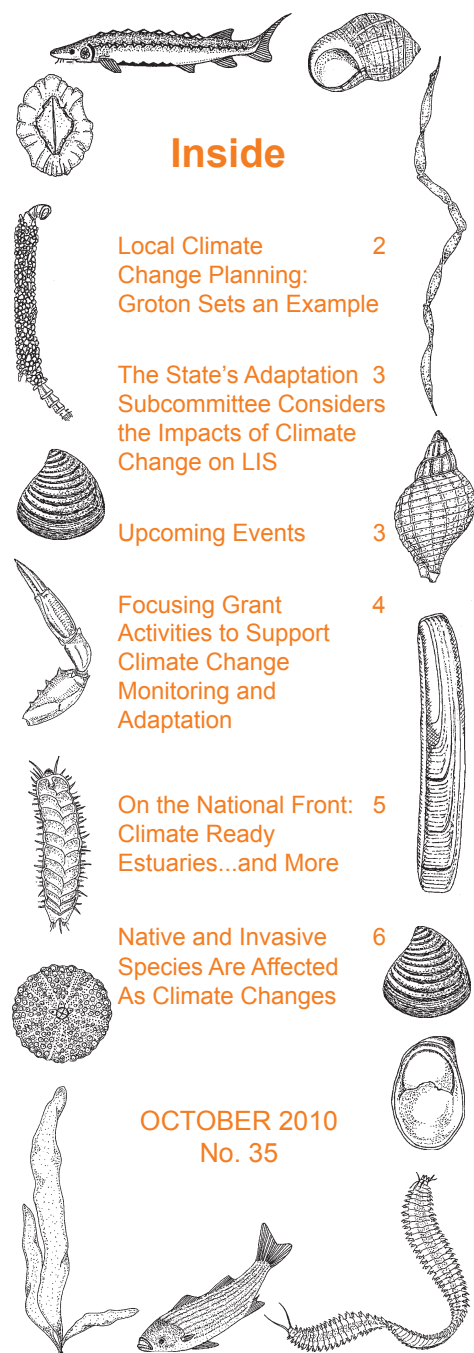
Substantial efforts have been made over the past two years toward adapting to climate change in Connecticut and Long Island Sound. Working together, representatives of all levels of government, as well as academic institutions, non-governmental organizations (NGOs) and other stakeholders, have undertaken collaborative efforts to identify climate change adaptation strategies that could and should be put forth for state and community implementation. In the following pages, we will explore some of the ongoing efforts described briefly below, and highlight continuing challenges for the years ahead.

In 2008 the Governor’s Steering Committee on Climate Change created an Adaptation Subcommittee with work groups focusing on Public Health, Natural Resources, Infrastructure and Agriculture. DEP staff, including representatives of the Office of Long Island Sound Programs (OLISP), sit on these committees. The work groups have developed in-depth impact reports in these planning areas and are currently preparing recommendations to be provided to the state legislature. Additionally, OLISP started its own internal climate change group, which is examining Connecticut’s coastal management policies and procedures with respect to climate change adaptation, and which will make formal recommendations to the state committees for inclusion in the report to the legislature.

OLISP staff have attended and spoken at many events, workshops and conferences on climate change adaptation, at which they have begun to inform communities about climate change issues and to identify effective adaptation strategies. OLISP has received grants in 2009 and 2010 from the Federal EPA’s Climate Ready Estuaries Program (CRE) and the Long Island Sound Study (LISS) to fund the development of Sentinel Monitoring for Climate Change in Long Island Sound along with New York State and Federal partners. This effort has been selected as a pilot project in which lessons learned in LIS will be shared with New England and the New York Bight Region to help them develop a regional monitoring strategy for the coastal ecoregions and associated watersheds.

A major CRE-funded initiative applied at the local level was the Groton Coastal Climate Change Adaptation Project, a series of three workshops held in January, March and June, 2010 and co-led by ICLEI-Local Governments for Sustainability and OLISP. The sessions brought together a wide range of stakeholders to explore the climate change adaptation planning process, with Groton as a model. This successful effort led to additional grant funding through which the lessons learned at the workshops will be shared with other communities by development of an Adaptation Resource Toolbox (ART).

Connecticut has become a leader in developing feasible climate change adaptation strategies. It is anticipated that continuation of the planning and dialogue described in this issue of *Sound Outlook* will lead to involvement by other stakeholders, and ultimately to implementation of these strategies throughout Connecticut and beyond. For more information on these climate change planning activities, contact Jennifer Pagach of OLISP at 860-424-3295 or at jennifer.pagach@ct.gov.



Inside

Local Climate Change Planning: Groton Sets an Example 2

The State’s Adaptation Subcommittee Considers the Impacts of Climate Change on LIS 3

Upcoming Events 3

Focusing Grant Activities to Support Climate Change Monitoring and Adaptation 4

On the National Front: Climate Ready Estuaries...and More 5

Native and Invasive Species Are Affected As Climate Changes 6

OCTOBER 2010
No. 35

Local Climate Change Planning: Groton Sets an Example

An increasing number of towns across Connecticut are undertaking climate change planning. Visit www.ctclimatechange.com and search under the TOWNS tab for the Menu of Municipal Climate Actions and Resources to see what your town is doing, or to post notice of local activities.

Groton has been one of the most visible and active towns in this respect. In early 2010, the Groton Coastal Climate Change Adaptation Project described on page 1 of this issue brought together more than 100 State, Federal and local government representatives, as well as academicians, NGOs and other stakeholders. Attendees were actually given a real-world introduction to climate-related events: The first session had to be postponed due to a December nor'easter, and in March attendees had to navigate through floodwaters and road washouts to reach the meeting place. The Groton workshops featured many speakers and breakout sessions, both highlighting and inspiring numerous climate change adaptation initiatives. Some of the efforts conducted by, or that benefit, the Town are described below.

The Coastal Hazards Analysis and Management Program (CHAMP) (introduced in the February 2009 issue of *Sound Outlook* - see www.ct.gov/dep/soundoutlook) utilized parts of Groton as a pilot study site. CHAMP included development of a mapping and visualization tool that will feature various forms of inundation modeling along the coast. One model estimates relative inundation under various scenarios of sea level rise. Another model estimates the extent of inundation from storm surges associated with various hurricane or extra-tropical storm scenarios.

SLOSH (Sea Lake and Overland Surge from Hurricanes) mapping, prepared by the Army Corps of Engineers for the Federal Emergency Management Agency (FEMA), projects the impacts of surge on transportation and other infrastructure, residential and commercial development, and ecological resources. Both CHAMP and SLOSH products will be used by the Town in their planning processes, including updating of their Plan of Conservation and Development (POCD). Groton also established a Task Force on Climate Change and Sustainable Community to promote public awareness of climate change, and to identify strategies to avoid and reduce its impacts. Groton received an Energy Efficiency and Conservation Block Grant from the Federal Dept. of Energy for new and retrofitted construction activities designed to improve energy efficiency in


public buildings and thereby reduce the Town's carbon footprint. The Town is also including adaptation criteria in their Capital Improvement Project Criteria, and is using adaptation-friendly designs in the relocation of overhead utilities underground as part of the \$4,000,000 Mystic Streetscape Project. These projects are being administered by the Town of Groton Department of Planning and Development.

The town was also the beneficiary of a pilot Vulnerability Assessment conducted by the DEP State Parks Division at Bluff Point State Park and Coastal Reserve in Groton. The Vulnerability Assessment is a tool that builds upon mapping techniques presented at the workshops. The project ranks the effects of various degrees of sea level rise on park habitats and infrastructure, including parking facilities, on a scale of low, medium or high. The pilot assessment has been expanded by DEP to all other coastal state facilities.

Through the work of the Groton Coastal Climate Change Adaptation Project, it has become clear that a significant barrier to local government action on climate change is the lack of information about existing efforts. Recognizing this need, OLISP and ICLEI-Local Governments for Sustainability are building on the success of the Groton project to develop an Adaptation Resource Toolbox (ART). The ART will be a repository of information on climate change adaptation tools, resources and participating organizations that can be used by local governments in Connecticut and beyond to help them

begin their adaptation efforts. The ART will be easily transferable to any region of the country. Additionally, ICLEI and DEP have proposed the creation of a Connecticut State Climate Protection Network to bring together municipalities concerned about both climate change mitigation and adaptation.

The success and cutting-edge nature of the Groton workshops have not gone unnoticed. The workshops have been nationally and internationally highlighted at the Yale Municipal Climate Summit, the Climate Ready Estuaries Workshop in

Washington, DC, the Global Oceans Conference in Paris, France, and the Resilient Cities conference in Bonn, Germany, among others. Reports of the Groton Coastal Climate Change Adaptation Project are available online at ICLEI's website, www.icleiusa.org/action-center/planning/climate-adaptation-planning-resources/groton-connecticut-coastal-climate-adaptation-workshop-presentations/ 



Groton Coastal Climate Change Adaptation Project, workshop attendees.

The State's Adaptation Subcommittee Considers the Impacts of Climate Change on Long Island Sound

Connecticut has taken a number of steps to address issues of climate change since the creation in 2002 of the Governor's Steering Committee on Climate Change (GSC) (<http://ctclimatechange.com/index.php/ct-happenings/gsc/>). The GSC is made up of leaders from key state agencies, with DEP Commissioner Amey Marrella serving as chair. The GSC is responsible for enacting the *Connecticut Climate Change Action Plan* (<http://ctclimatechange.com/index.php/2005-connecticut-climate-action-plan/>) and for developing and implementing strategies to meet Connecticut's target of reducing greenhouse gas emissions 80% below 2001 levels by the year 2050.

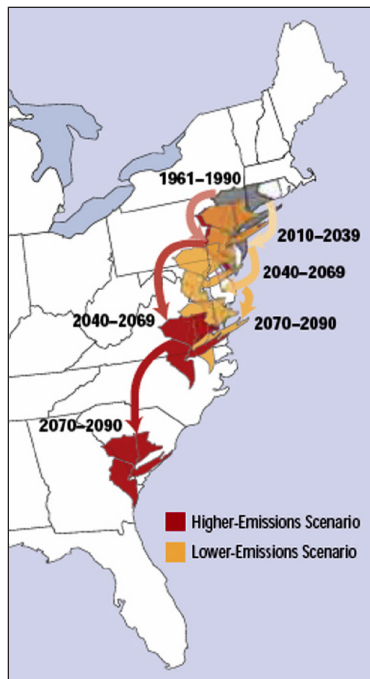
Focus Areas and Workgroups

In addition to the GSC's mitigation efforts, an Adaptation Subcommittee, of which Commissioner Marrella is co-chair, was created in 2008 (<http://ctclimatechange.com/index.php/ct-happenings/gsc-adaptation-subcommittee>). The goal of the subcommittee is to evaluate the projected impact of climate change on four specific focus areas: **agriculture, infrastructure, natural resources, and public health**. Workgroups were appointed to explore impacts and adaptation strategies relative to each focus area. The subcommittee assessment, on which this discussion is based, was published in April 2010.

The Subcommittee projected the effects on each focus area of climate-related changes in precipitation, water temperature and sea level rise at each of three future dates - 2020, 2050 and 2080. The most notable affects of climate change on Sound-related **agriculture** include impacts to shellfish, which are now and would continue to be at risk from increases in water temperature. In particular, oysters and hard clams, while southern species that should adapt easily to warmer water, might also be susceptible to diseases whose prevalence may increase with water temperature. Ocean acidification, caused by climate related increases in the production of carbon dioxide, may pose further risk to shellfish populations by eroding their calcareous shells.

Coastal **infrastructure** will be affected by both increased precipitation and sea level rise. Increased storm water runoff, if exacerbated by inadequate drainage facilities, could cause inundation and isolation of shoreline roads, bridges, railroads and airports. Capacities of coastal flood control structures could be reduced, while infrastructure could be damaged by salt water-caused corrosion. Salt water intrusion into public and private water supplies due to sea level rise would affect domestic water quality, and when combined with increased precipitation, impair the integrity of septic systems and sewage treatment plants.

A number of coastal **natural resource** systems are at risk from climate change. Shoreline habitats would be most affected by sea level rise. High elevation salt marsh



Migrating State Climates, courtesy of the Union of Concerned Scientists.

Red arrows show that under a high carbon emissions scenario, by the end of this century, summers in the greater New York City metropolitan region (encompassing parts of New Jersey and Connecticut) could feel as warm as those presently experienced in South Carolina and Georgia. Under a lower-emissions scenario (yellow arrows) summers here could feel like they do now in Virginia.

Continued on page 4

LOOK OUT for upcoming events!!

Connecticut Audubon Coastal Center
Milford Point, Milford, CT
Call 203-878-7440 for information, times, and required registration.

Family Canoe Tour of Wheeler Salt Marsh Led by CAS Guides

Sun., Oct. 24, 11 a.m.-1:30 p.m.

(Special Fall Foliage Tour and last canoe tour) Time and route weather dependent – call to confirm. Bring water bottle and wear shoes that can get wet.

Long Island Sound Study (LISS)

Committee Meetings

Management Committee

Thur.-Fri., October 21-22, 2010

Danford's Inn, Port Jefferson, NY
Call the New England Interstate Water Pollution Control Commission (NEIWPCC) at 978-323-7929 to register.

Science & Technical Advisory Committee

Friday, November 19, 2010

Stony Brook University, Stony Brook, NY
Call 203-977-1542 to register.

Citizen's Advisory Committee

Thursday, December 9, 2010

Univ. of Connecticut, Bridgeport, CT
Call 203-977-1542 to register.

Management Committee

Thursday, January 20, 2011

Univ. of Connecticut, Stamford, CT
Call 203 977-1541 to register.

November: Harbor seals arrive in LIS from northern New England; winter flounder move into shallower water.

December: Bald eagles return to Connecticut for the winter. Viewing at: **Shepaug Dam Bald Eagle Observation Area, Southbury, CT**
Call 1-800-368-8954 after Dec. 8 to register.

Norwalk Maritime Aquarium

10 North Water St., Norwalk, CT

Call 203-852-0700 x2206 to register.

Winter Creature Cruises,

Saturdays and Sundays in January, Dates and times vary.

Look for harbor seals, gray seals and occasional harp seals wintering in LIS.

NOTE: All cruise passengers must be over 42" tall.

Please be sure to check the Calendar of Events listed on DEP's website:

www.ct.gov/dep/calendar

Focusing Grant Activities to Support Climate Change Monitoring and Adaptation

DEP administers or participates in a number of grant programs, including the Long Island Sound Fund (License Plate Program), which is normally reported in this space. As climate change has become a more visible concern, these grant programs have been tailored to also target appropriate monitoring and adaptation strategies.

In June 2010, DEP requested proposals for Statewide Ecosystem Management and Habitat Restoration Grants. The RFP included a category that encouraged the submission of proposals for acquisition of land to preserve or protect ecosystem services, i.e., to preserve the societal benefits of the natural environment, including flood control, water purification and wildlife preservation. Such acquisition would provide room for wetlands and other habitats to retreat landward in dynamic response to rising sea level.

Grant proposals were also requested earlier this year for the Long Island Sound

Futures Fund. A funding category entitled Large Grant Stewardship Acquisition was added for this grant round. Monies awarded would provide for acquisition of coastal properties through full fee acquisition or conservation easement. Eligible sites included those already identified through the Long Island Sound Stewardship Initiative (see <http://longislandsoundstudy.net/issues-actions/stewardship>) as places with significant ecological or recreational value, as well as other non-designated but significant coastal natural habitats. Funded acquisition would preserve the same ecosystem services described above. We will report on grant awards for these programs in a future issue of *Sound Outlook*.

Several Long Island Sound Fund (LISF) grant awards that have been reported in this space already incorporate activities that address monitoring of and adaptation to climate change. For example, research funds were awarded in

June 2008 to install additional monitoring equipment for the Long Island Sound Integrated Coastal Observing System - LISICOS on U.S. Geological Survey (USGS) stream gauges in the Connecticut River (see *Sound Outlook*, June 2009, Issue No. 31 at www.ct.gov/dep/soundoutlook). These gauges track sea level rise and changes in estuarine salinity concentration.

LISF research funds were also awarded in 2002, 2005 and 2006 to the University of Connecticut for surveys of salt marshes throughout the state to document the geographic range of saltmarsh sharp-tailed sparrow, a state listed species of special concern. This data will be utilized as we continue to monitor the impacts of climate change on these critical habitats and the species that depend on them.

For additional information on the grant programs discussed above, contact Kate Hughes Brown at 860-424-3652 or kate.brown@ct.gov.

Adaptation Subcommittee (Continued from page 3)

would be flooded more frequently and converted to low marsh and ultimately to mudflat, with attendant loss of habitat for finfish and other wildlife. As the estuarine salt wedge moves farther upstream in tidal rivers, brackish and freshwater wetlands would be lost or converted to more saline environments. Beaches and dunes would be subject to increased erosion and sediment deposition. The open waters of Long Island Sound would be most directly affected by increasing water temperature. Cold water species such as lobster would become less viable, while warm water species from the South will be more inclined to visit or to set up housekeeping. Indeed, during the past summer, the Sound hosted a manatee, typically a resident of Florida.

Public health in coastal areas will also be adversely affected by climate change, with warmer air and water temperatures bringing more and different vector-borne diseases as, for example, populations of disease-carrying mosquitoes increase.

Workgroup Intersections

The Subcommittee has examined “intersections,” or interrelationships, between the focus areas, and has discussed means to assure that the adaptation strategies developed by the respective workgroups do not conflict or overlap. The major intersections applicable to Long Island Sound include **water quality and quantity** and **ecosystem services** (referring to societal benefits of the natural environment). For example, it is important that flood control structures designed to mitigate the effects of sea level rise on **infrastructure** also mitigate impacts of sea level rise on **natural resources** by allowing for the migration of coastal wetlands or by providing safe corridors for isolated wildlife.

Recommendations

The Adaptation Subcommittee has identified the following preliminary strategies through which to address the expected impacts of changing climate in Long Island Sound (issuance of public health recommendations was deferred):

- **Agriculture:** conduct research to select disease-resistant aquacultural shellfish species, and determine adaptive strategies to mitigate the effects of increased disease prevalence and ocean acidification, as necessary.
- **Infrastructure:** map the location, elevation, value and condition of vulnerable infrastructure, in combination with flood and sea level rise mapping, for use in conducting risk assessments.
- **Natural Resources:** identify critical habitats at risk from climate change, and for which additional research information is needed, with particular regard to their relative function and significance within the southern New England ecosystem.

The Workgroups will continue their deliberations and will produce an Adaptation Strategies report in the coming months. Look for an update in a future issue of *Sound Outlook*.

On the National Front: Climate Ready Estuaries ... and More

As discussed in the previous articles, the local and state level climate change planning initiatives taking place in Connecticut and in other states receive funding or guidance from a number of national programs. Among those is the Environmental Protection Agency's (EPA) Climate Ready Estuaries (CRE) program (see www.epa.gov/cre), which provides a wealth of information in itself in addition to support for state efforts.

CRE works with EPA's http://water.epa.gov/type/oceb/nep/estuaries_index.cfm (NEP), established by Congress in 1987, to assess climate change vulnerabilities, develop and implement adaptation strategies, engage and educate stakeholders, and share the lessons learned with other coastal managers. The Long Island Sound Study (LISS) is one of 28 National Estuary Programs funded by EPA, and in 1987 Long Island Sound was designated an estuary of national importance under the program. The major focuses of the National Estuary Program include habitat restoration and protection and propagation of a balanced, indigenous population of fish, shellfish and wildlife

CRE has supported two Connecticut activities that have already been discussed – the Groton Coastal Climate Change Adaptation Project, and Sentinel Monitoring for Climate Change in Long Island Sound. CRE has available a Coastal Toolkit

(www.epa.gov/climatereadyestuaries/toolkit.html) which provides a template for projects like the Adaptation Resource Toolbox (ART) that is being developed pursuant to the Groton workshop. CRE's Coastal Toolkit provides information and links to websites, reports, and other resources related to climate-change monitoring and adaptation planning activities. The Toolkit highlights existing Smart Growth strategies through which communities can increase their resilience to climate change, and provides a large number of communications and outreach resources available to coastal resource managers and others seeking to share information with the public and decision makers about planning for climate change impacts in coastal areas.

Sentinel Monitoring for Climate Change in Long Island was described in the February 2010 issue of *Sound Outlook* (see www.ct.gov/dep/soundoutlook). This federally supported, bi-state (Connecticut and New York) initiative focuses on identifying the natural resource and societal impacts of climate


change in LIS. As described on page 1, CRE is partially funding the development of a pilot project in which lessons learned from sentinel monitoring in LIS will be shared with New England and the New York Bight Region to help them develop a regional coastal monitoring strategy. As part of this effort, a survey to help prioritize indicators and monitoring needs was sent to New York and Connecticut workgroup members in August. The response to the survey was excellent, and tentative results indicate that there is consistency between responses from scientists and managers in the two states

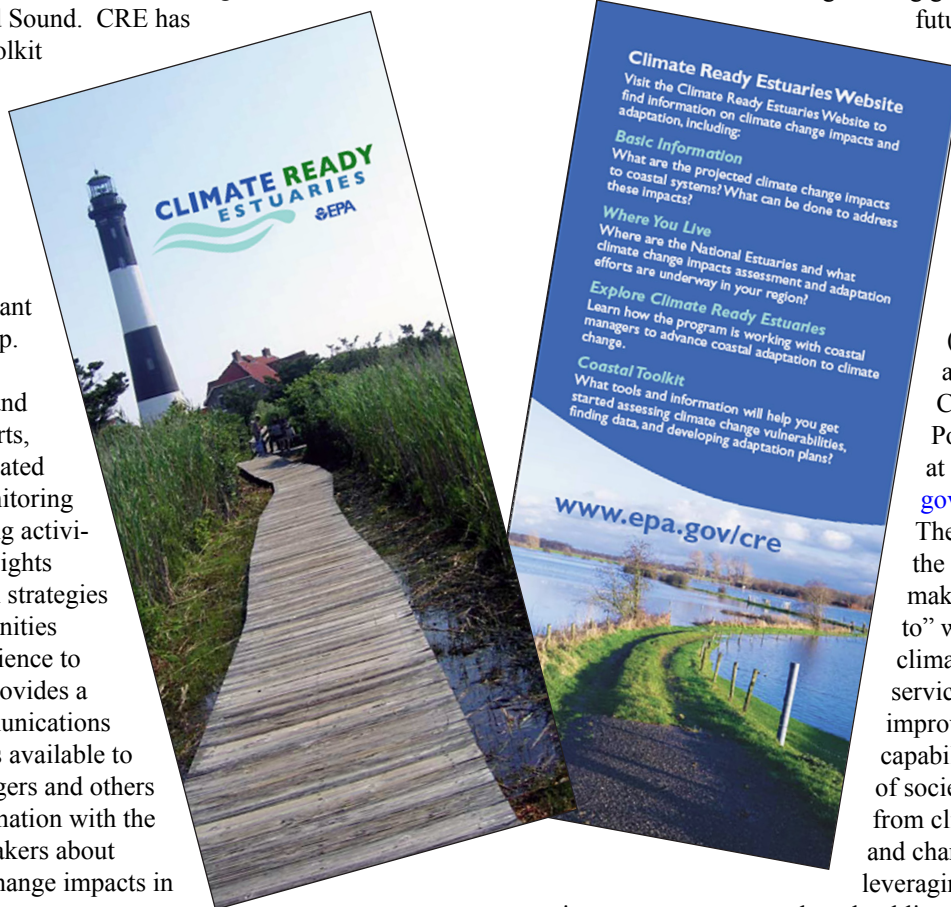
The Army Corps of Engineers (ACE), has launched the Responses to Climate Change Program that focuses on the need to reduce potential vulnerabilities to the nation's water resources and infrastructure, including that operated by the ACE, from climate change and climate variability. The Army's Institute for Water Resources (IWR) and other federal science and water management agencies are partners in this effort. The intent of the program is to develop and implement policies and strategies that will ensure continued effective and efficient water operations in both the short term (5-10 years) and long term (10-50 years). This program will also provide planning and engineering guidance to ensure that

future infrastructure is designed to be sustainable and robust over a range of changing climate conditions.

The National Oceanic and Atmospheric Administration (NOAA) has posted a prototype NOAA Climate Services Portal (NCS Portal) at www.climate.gov/#climateWatch.

The website explains that the agency's goal is to make the portal the "go-to" website for NOAA's climate data, products and services for all users, to improve decision-making capabilities across all sectors of society facing impacts from climate variability and change, and to enable leveraging of climate data and

services to support research and public education. The initial components of the portal, which will be expanded over time, include a *Climate Watch* magazine, a data library, interactive resources for understanding climate, and education tools including teaching resources, professional development and multimedia presentations. 



Native and Invasive Species Are Affected As Climate Changes

Among the effects of global warming and regional climate change in the Long Island Sound is the increasing opportunity for invasive or non-native species from warmer regions of the world to move into the estuary, as discussed earlier in this issue. Over the past 20 years, Connecticut DEP's Fish Trawl surveys have observed an increased incidence of warm temperate fish species from an average of 7 species per tow to 9 per tow (see Fig. 1) and a decline in cold water species from 7 species to 5 (see Fig. 2). In all, 19 "warm temperate" species have exhibited increases in occurrence in the fall trawl survey, including American shad, bluefish, butterfish, striped bass, summer flounder and weakfish. Recreational fishermen in Long Island Sound have also noticed changes, and are already adjusting their fishing strategies and target species to adapt to those changes. A recent article in the New England edition of *The Fisherman* magazine by Dr. Martin Garrell of Adelphi University, entitled *Climate Change: How Will It Affect Our Fishing?* speculates that: "Some species already caught occasionally during summer months might populate our waters in greater numbers during most of the season, giving us diversity that will take some getting used to." The relative benefits of these changing population dynamics are also evolving: in Long Island Sound the non-native Asian shore crab has invaded rocky shorelines, pushing out native competitors, but fisherman have adapted and found that these small crabs are great bait for black fish and other recreational fish species. Many bait shops are now selling Asian crabs for bait.

The American lobster, already at the southern limit of its range in Long Island Sound, may be pushed northward to colder, more hospitable waters, while blue crabs will become more abundant as the warming waters of the Sound come to resemble those of their native Chesapeake Bay. In the tidal marshes of LIS, rising sea level will cause the landward migration of the wetland border and associated plants such as common reed *Phragmites australis*, and marsh elder, while warmer temperatures will cause warmer temperate zone invasive plants to move into freshwater and brackish tidal wetlands.

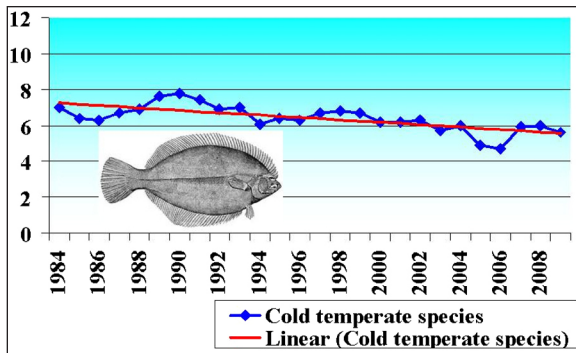


Fig. 2. Decreasing numbers of cold temperate species in DEP Fish Trawl surveys.

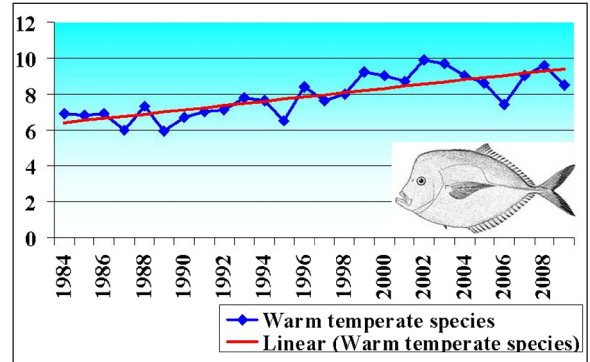


Fig. 1. Increasing numbers of warm temperate species in DEP Fish Trawl surveys.

Interestingly, a somewhat different pattern is occurring at the plankton level of the Sound ecosystem. Oceanographers and marine biologists have observed a decline of cold water algae in LIS, but without a correlative increase in warm water algae. This has helped to improve water clarity (or visibility) but is reducing the food supply to zooplankton and plankton feeding fish (*Nature News*, 28 July 2010 – *Ocean Greenery under Warming Stress*).

affected their natural heritage. The report was developed as a model to inform the revision of state wildlife action plans nationwide (see www.defenders.org/climatechange/NC_Wildlife). Perhaps Long Island Sound partners could follow North Carolina's lead. As plant and animal diversity shifts in the Long Island Sound region, Connecticut and New York would do well to adapt to the changes that cannot be prevented and restore and protect habitats and resources that can be saved. Knowing the difference is key. 🐾

In North Carolina, the Wildlife Resources Commission authorized a report entitled *Understanding the Impacts of Climate Change on Fish and Wildlife in North Carolina* to better understand how climate change may

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