

Connecticut Institute For Resilience and Climate Adaptation Research Projects

Coastal Flooding and Waves

Inland Flooding

Sea Level Rise

Critical Infrastructure

Living Shorelines

Policy and Planning

Dr. Rebecca A. French

Connecticut Association of Floodplain Managers Conference

October 25, 2016

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Presentation Outline

- CIRCA website – What's new
- Research Products
 - Waves and living shorelines
 - Road Flooding Model
 - Resilience Financing Models
 - Western Connecticut Vulnerability Assessment
- New Projects
- Municipal Resilience Grant Program – Nov. 1

CIRCA Website - What's new

The screenshot shows the CIRCA website homepage. At the top, there's a navigation bar with the UCONN logo and a search bar. Below this, the main header reads "Connecticut Institute for Resilience & Climate Adaptation (CIRCA)". A secondary navigation bar lists links: Home, About, What We Do, Funding Opportunities, Projects & Products, Resources, Media Center, and Contact Us. The main content area features a large aerial image of a flooded area with the text "CRITICAL INFRASTRUCTURE" overlaid. To the right of this image is the CIRCA logo and a section titled "About CIRCA" which describes the mission: "The mission of the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) is to increase the resilience and sustainability of vulnerable communities along Connecticut's coast and inland waterways to the growing impacts of climate change on the natural, built, and human environment." Below this is a "Read More..." link. Underneath the main image is a row of six categories, each with a representative image and a brief description: "Living Shorelines" (preserving natural elements), "Critical Infrastructure" (connecting science with decision-making), "Inland Flooding" (enhancing community resilience), "Coastal Flooding & Waves" (community climate adaptation policy), "Policy & Planning" (community climate adaptation policy), and "Sea Level Rise" (enhancing resilience to sea level rise). At the bottom, there are two sections: "Featured Projects & Products" and "News & Announcements". The "News & Announcements" section includes a "From Our Blog" subsection with two entries: "Branford Connecticut's Coastal Resilience Plan" dated September 27, 2016, and "CIRCA Awards Funding to Towns" dated June 24, 2016.

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Connecticut Institute for Resilience & Climate Adaptation (CIRCA)

Home About What We Do Funding Opportunities Projects & Products Resources Media Center Contact Us

CRITICAL INFRASTRUCTURE

CIRCA

About CIRCA

The mission of the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) is to increase the resilience and sustainability of vulnerable communities along Connecticut's coast and inland waterways to the growing impacts of climate change on the natural, built, and human environment. [Read More...](#)

Living Shorelines: Preserving the natural elements of the shore while also providing protection from erosion.

Critical Infrastructure: Connecting firm science with the decision-making needs of state and local leaders.

Inland Flooding: Working to enhance communities resilience to flooding throughout the state.

Coastal Flooding & Waves: Community climate adaptation policy and planning through research and analysis.

Policy & Planning: Community climate adaptation policy and planning through research and analysis.

Sea Level Rise: Working to enhance resilience to sea level rise along Connecticut's coastline.

Featured Projects & Products

News & Announcements

From Our Blog

Branford Connecticut's Coastal Resilience Plan
September 27, 2016

CIRCA Awards Funding to Towns
June 24, 2016

Living Shorelines | Connecticut

circa.uconn.edu/living-shorelines/

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Living Shorelines

Living shorelines are nature-based erosion control techniques. Living shorelines are not a new concept, though they are new to Connecticut and the Northeast. As much of the State's shoreline is armored with hardened structures, there is a growing interest in preserving the natural elements of the shore while also providing protection from erosion.

This interest can be found even within state government; after significant storms struck Connecticut, the CT Legislature passed Public Act (12-101) (2012): An Act Concerning the Coastal Management Act and Shoreline Flood Erosion Control Structures. This Act calls for consideration of alternatives to hard shoreline armament, like living shorelines. With this specific law in place, there is an urgency to fully understand the science and policy issues surrounding living shoreline deployment in Connecticut. CIRCA is actively working in Connecticut and regionally to provide the necessary information to successfully implement living shorelines where appropriate, across the state.

Living shorelines can be an excellent alternative to hard structures at the coast for a variety of reasons. Importantly, hard structures (e.g. bulkheads, revetments, seawalls, etc.) are often damaging to a coastline. These types of structures can increase erosion at the shore, inhibit natural coastal processes, and destroy natural habitat for fish, animals, and plants. Where hard structures "fail," living shorelines succeed. Living shorelines mimic natural settings and have many positive co-benefits to erosion control, including but not limited to: habitat creation, water quality enhancement, and maintaining natural coastal processes.

Living shorelines are built, and may include some hardened elements (hybrid approaches). See photos for different types of living shorelines.

CIRCA and Living Shorelines

CIRCA's research projects are intended to better understand the application of living shorelines as an erosion control technique in the State. Little is known on what to site, where to site, or how to site, in terms of the use of this technology in Connecticut. CIRCA will work to advance the general understanding of living shorelines as well technical aspects. As living shorelines are a relatively new erosion control method in the State and region, CIRCA will work to increase public awareness in Connecticut and with regional partners.

CIRCA Research Projects

CIRCA's current research projects in the area of living shorelines are listed below.

NOAA Coastal Resilience Networks: "Enhancing Coastal Resilience in Connecticut" (CREST)

The NOAA Coastal Resilience Networks: "Enhancing Coastal Resilience in Connecticut" project provided wave information for the harbors in Old Saybrook and New Haven, a review of design guidelines and tools for site assessment of living shorelines, and an online map viewer.

Scoping of Dredge Material Islands & Wetlands for Green Infrastructure Resiliency


The Scoping of Dredge Material Islands and Wetlands for Green Infrastructure Resiliency project...

Further Reading


Center for Coastal Resources Management of

New Jersey DEP Living Shorelines Guidelines [and](#) CT

NYS&NJCCP



Bank Stabilization with Coir Logs. Photo courtesy of Wilkinson Ecological Design, Inc.



Artificial Reef with Reef Balls. Photo courtesy of R. Francis, CT Department of Energy and Environmental Protection.

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NOAA Coastal Resilience Networks: "Enhancing Coastal Resilience in Connecticut" (CREST)

[circa.uconn.edu/projects/noaa-crest/](#)

NOAA Coastal Resilience Networks: "Enhancing Coastal Resilience in Connecticut" (CREST)

Projects by Topic

- [All Projects](#)
- [Living Shorelines Projects](#)
- [Critical Infrastructure Projects](#)
- [Inland Flooding Projects](#)
- [Coastal Flooding & Waves Projects](#)
- [Sea Level Rise Projects](#)
- [Policy & Planning Projects](#)

All Projects

- [Enhancing Coastal Resilience \(CREST\)](#)
- [High Resolution Coastal Forecasting \(HRCF\)](#)
- [Coastal Green Infrastructure Resilience Planning](#)
- [Real-time Flood Prediction and Vulnerability Analysis](#)
- [Jarvis Creek Sea Level & Flooding Variability](#)
- [Municipal Resilience Planning Assistance](#)
- [HUD National Disaster Resilience Competition \(phase II\)](#)
- [Financing Resilience in Connecticut](#)
- [Public Support for Adaptation to Sea Level Rise](#)
- [Resilient Coastal Communities under Wind & Flood Hazards](#)

About the Project

The CREST Project, "Enhancing Coastal Resilience in Connecticut," was funded by a two-year grant from the National Oceanic and Atmospheric Administration (NOAA) to the University of Connecticut. A team of research and extension faculty and staff from the departments of Civil and Environmental Engineering, Extension and UConn Marine Sciences, along with Connecticut Sea Grant, the Center for Land Use Education and Research and the Connecticut Department of Energy and Environmental Protection's Office of Long Island Sound Programs worked on the following objectives:



- An assessment of existing patterns of coastal erosion;
- Identification of shoreline character and coastal protection approaches in-place;
- Determination of storm wave characteristics at the shoreline to provide information needed to create design guidelines for assessment of protection alternatives under current and likely future climate states;
- Review of available design guidelines for the deployment of "living shoreline" shore protection strategies and the development of a research agenda to enhance understanding of the effectiveness of the approach in Connecticut;
- Development of an online Map Viewer;
- Incorporation of the knowledge developed in the project in both coast-wide and in-depth community-level educational programs, targeted at local land use officials.

Products

The website developed for the project contains a [map viewer](#) for site suitability for living shorelines, a [description of the wave research model and findings](#), and the [results of a wave model](#) at five locations in Long Island Sound.

Researchers and Staff Supported on Project

- [James O'Donnell](#), UConn Marine Sciences
- [Manos Anagnostou](#), Civil and Environmental Engineering, UConn CIRCA
- [Sylvain De Guise](#), Pathobiology & Veterinary Science, CT Sea Grant
- [Brian Thompson](#), CT DEEP Office of Long Island Sound Programs
- [Chet Arnold](#), UConn CLEAR
- [Emily Wilson](#), UConn CLEAR
- [Joel Stocker](#), Extension, UConn CLEAR
- [Juliana Barrett](#), Extension, CT Sea Grant, UConn CLEAR
- [Bruce Hyde](#), Extension, UConn CLEAR
- [Jennifer O'Donnell](#), UConn Marine Sciences
- [Alejandro Chaves-Lorenzo](#), Postdoctoral Fellow, UConn Marine Sciences
- [Jason Zylberman](#), Graduate Student, Dept of Natural Resources and the Environment

"What We Do" Areas

This project is a part of the following topical areas:

- [Coastal Flooding & Waves](#)
- [Living Shorelines](#)

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Waves and Living Shorelines

- Traditional methods of shoreline stabilization utilize hard structures such as sea walls, groins, and bulkheads, which have adverse environmental consequences.
- Living shorelines are an innovative and environmentally-friendly alternative to reduce coastal risk from both anthropogenic and natural causes of erosion.
- Living shorelines are nature-based shoreline protection strategies which also enhance natural habitat and ecosystem services.






Waves and Living Shorelines

NOAA CREST Project

- Old Saybrook Study Area and New Haven Study Area
 - Two 4-mile pilot areas
 - Detailed analysis of existing coastal structures,
 - Shoreline photos in high density
- Results Living Shorelines Site Suitability Analysis
 - The Connecticut shore was analyzed for the potential success of four living shoreline methods
 - The CREST Map Viewer contains layers indicating the potential of a particular living shoreline technique

Structure Display

- inland hard
- inland hard natural
- inland medium
- inland medium natural
- inland soft
- inland soft natural
- shore MHW
- shore MHW natural
- shore hard
- shore hard natural
- shore medium natural

-  Potential for Marsh with Structures
-  Potential for Marsh Enhancement
-  Potential for Offshore Breakwaters
-  Potential for Beach Enhancement
-  Areas Excluded in Analysis

CREST Map Viewer



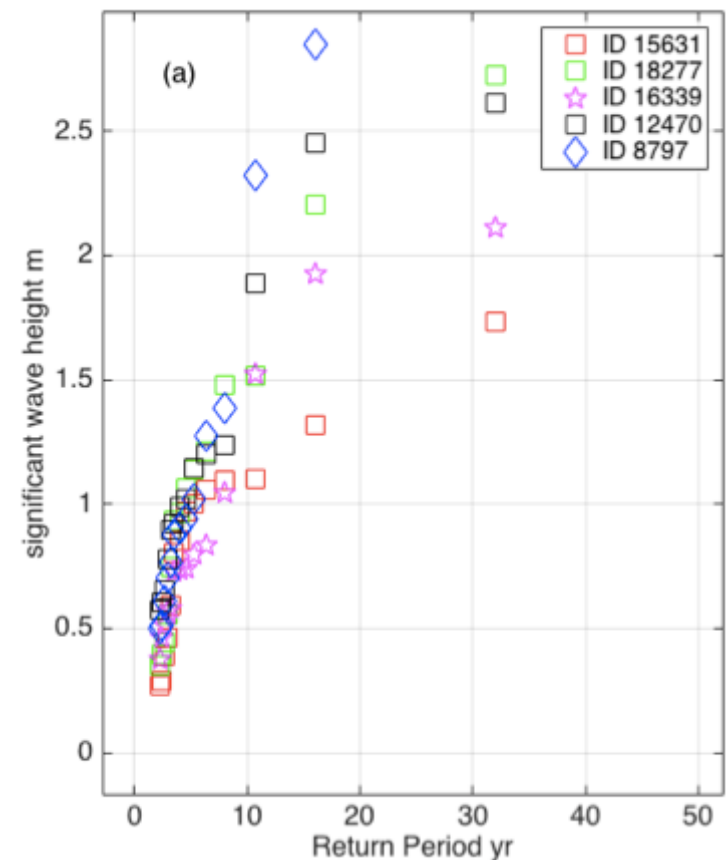
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Wave Model Results

- Most western location (ID 15631, red squares) the probability of a significant wave height exceeding 1.7 m (5.6 ft) any given year is **1/32**.
- At the eastern end (ID 8797, blue diamond) a 1.5 m (4.9 ft) significant wave height shows a **1/10** probability any given year

Significant Wave Height
– Return Period plot



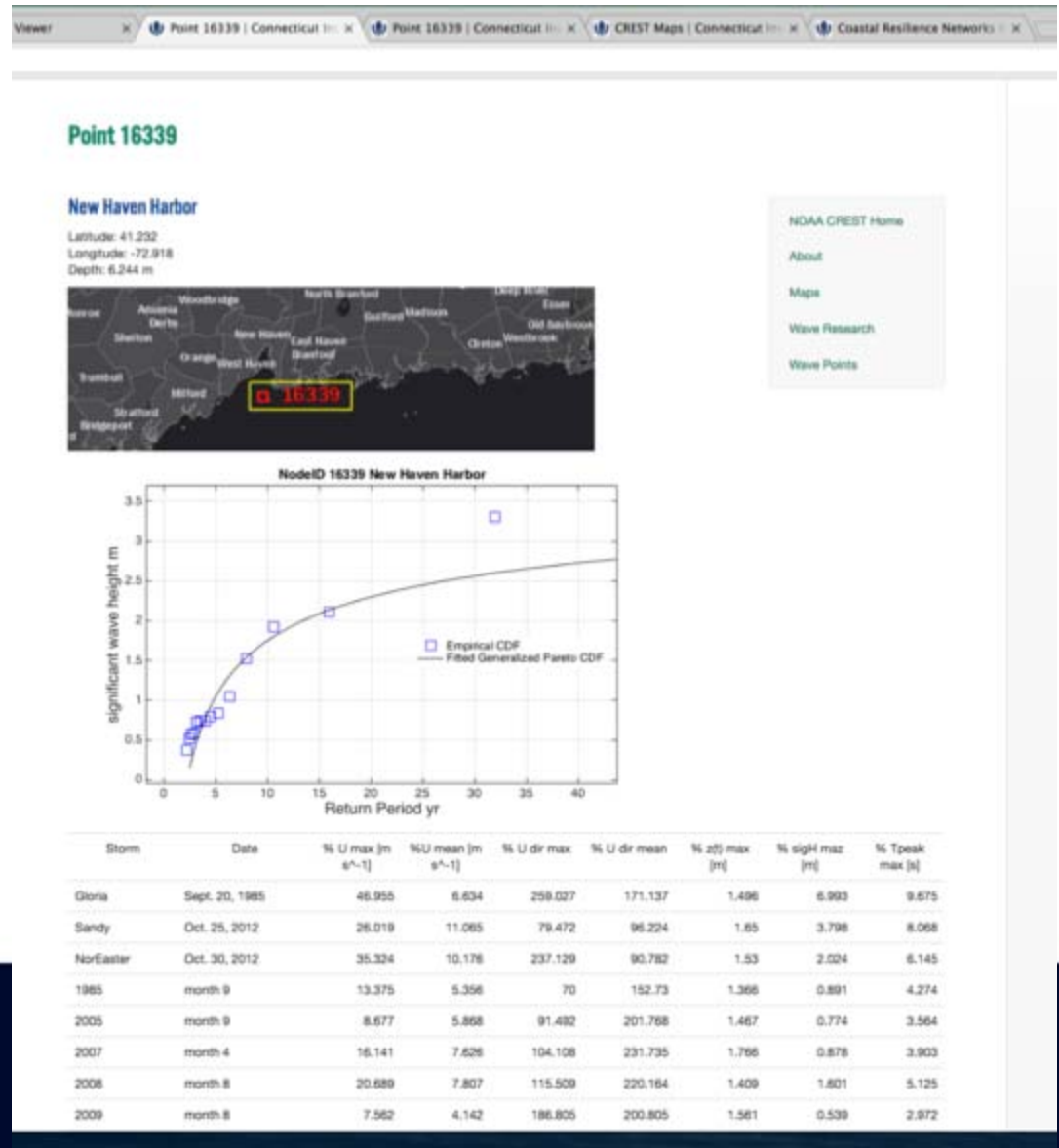
CREST Map Viewer



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CREST Map Viewer



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Road Flooding Model

- **Problem:** High water levels at Jarvis Creek Marsh, CT, have led to flooding on Leetes Island Road (RT 146)
- **Product:** Development of a mathematical model that quantitatively assesses the influence of the tide gate and the berm on the exchange with Long Island Sound and the frequency of flooding
- **REPORT ON CIRCA WEBSITE**



Resilience Financing Models

Existing Programs

- Shore Up Connecticut
- Microgrids Program and Green Bank
- Clean Water Revolving Loan Funds

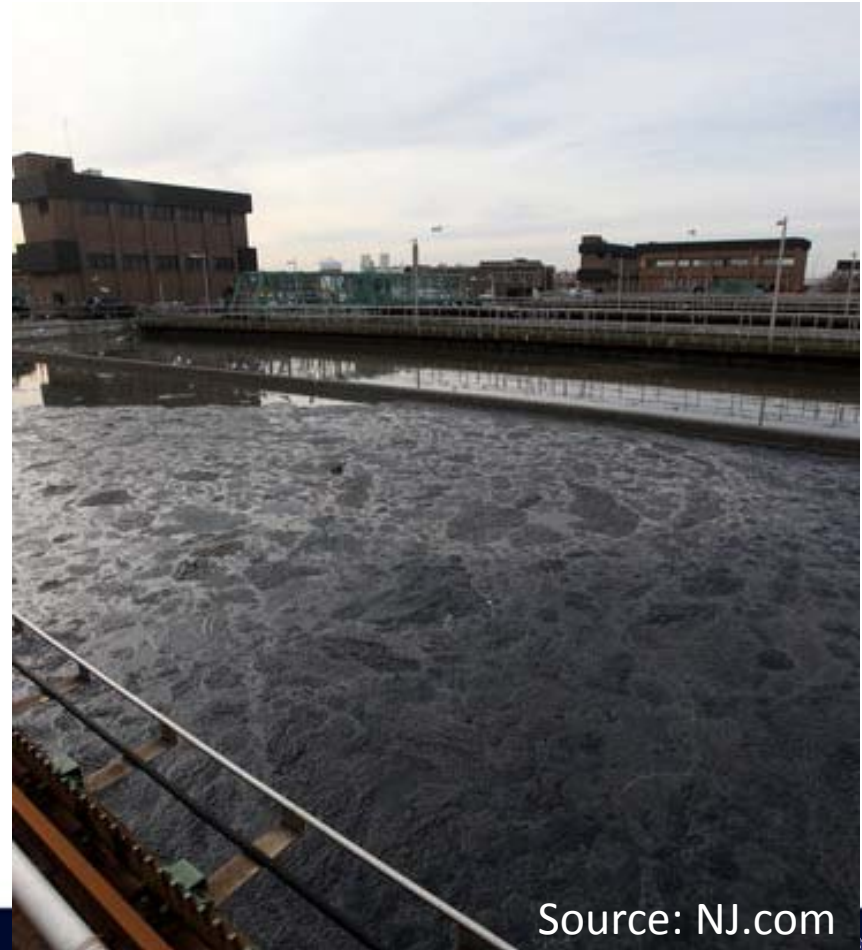
Models

- Resilience Bonds
- New Jersey Energy Resilience Bank
- Tax Increment Financing Districts
- Connecticut Green Bank C-PACE and R-PACE
- Energy Savings Performance Contracts (ESPCs)



New Jersey Energy Resilience Bank

- Funding for distributed energy resource technologies
- Grants and low-interest loans capitalized with federal disaster recovery dollars
- Can become self-sustaining after disaster dollars spent
- Waiver from small business rule due to broad public benefit of privately-owned utilities

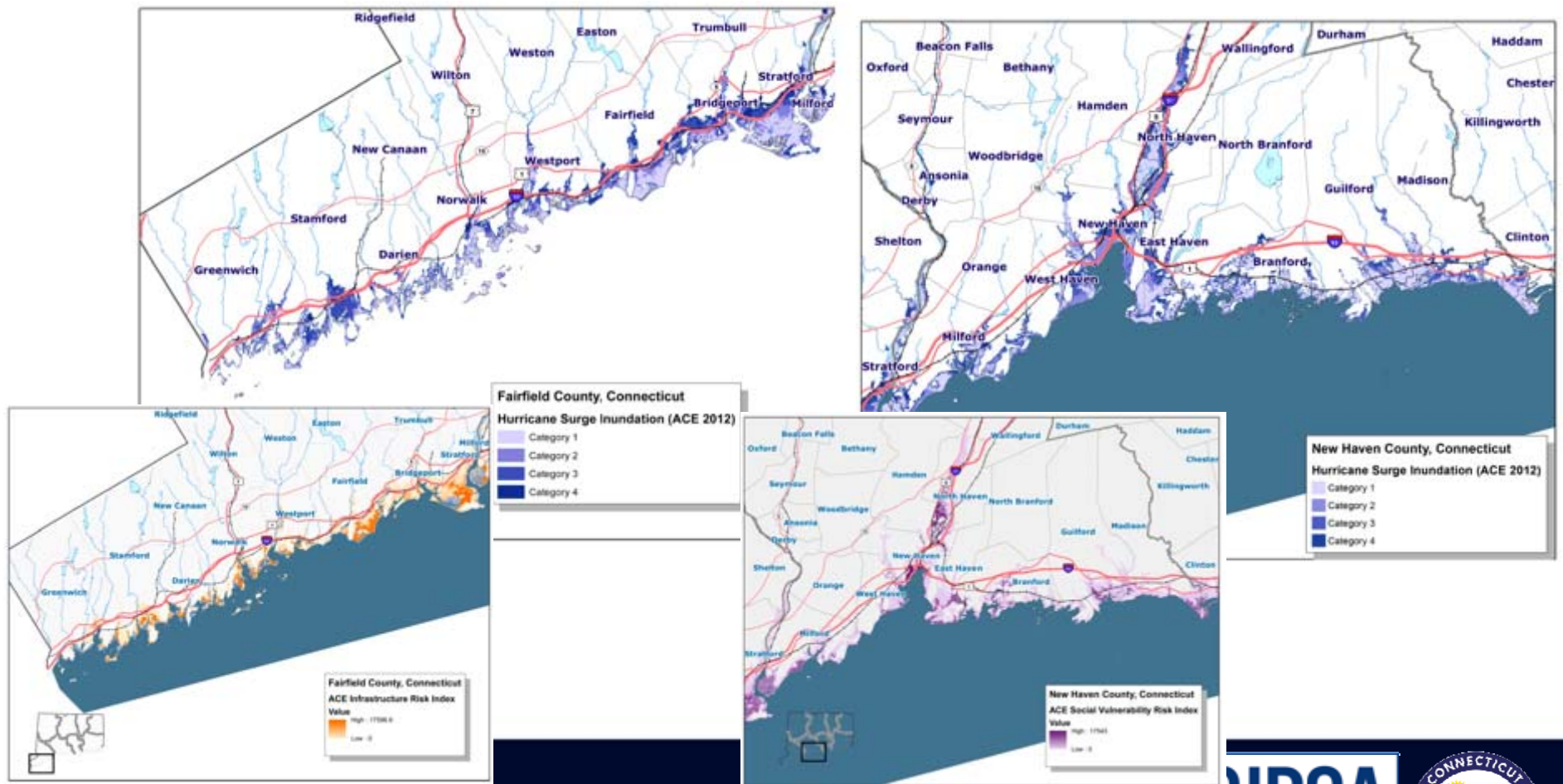


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Western Connecticut Vulnerability Assessment

SAFR Connecticut Connections: NDRC Phase I Application



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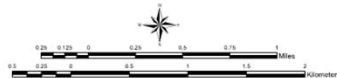


Bridgeport, CT



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Potential Severe Storm Surge and Effects of Hurricane Sandy



Infrastructure Sites

- Energy Facilities
- Wastewater Treatment Facilities
- Water Resources
- Water Storage

FEMA Individual Assistance (IA) Household Inspection Damage

Damage Classification (Hurricane Sandy Impacts)

- Minor - Total Full Market Loss (FVL) greater than \$1 to \$1,000
- Major - Total Full Market Loss (FVL) greater than \$1,000 to \$17,000
- Extensive - Total Full Market Loss (FVL) greater than \$17,000

FINAL - High Resolution Storm Surge Extent

- Estimated Sandy Storm Surge Extent (2012 Impact Analysis)
- Projected Hurricane Surge Inundation Areas

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NEW PROJECTS

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Scoping of Dredge Material Islands and Wetlands for Green Infrastructure Resiliency

- Can we utilize dredge materials to construct artificial marshes and islands to decrease erosion and improve drainage?
 - Feasibility assessment
 - Design parameters
 - Regulatory framework
 - Evaluation impact on the health and safety of vulnerable populations



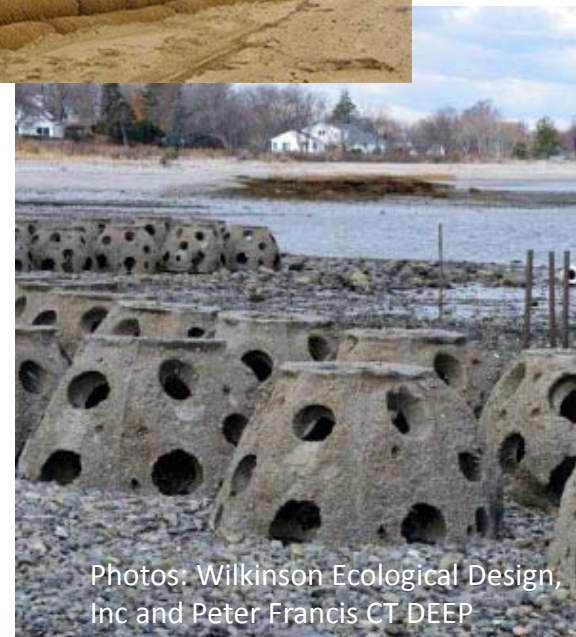
Funding from CT DOH CDBG-DR

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Advancing High Resolution Coastal Forecasting and Living Shorelines Approaches in the Northeast

- NERACOOS 100-year return interval (1% annual chance) online maps
- NROC advancing living shorelines in Northeast
 - ‘state-of-the-science’
 - identify barriers and potential solutions
 - educational materials and workshops for the public



Photos: Wilkinson Ecological Design, Inc and Peter Francis CT DEEP

Municipal Resilience Planning Assistance

- Sea level rise projections for Long Island Sound
- Models and maps of the combined impacts of riverine flooding and storm surge
- Models and maps of inland flooding under current future climates
 - 20%, 10%, 5%, 2%, and 1% annual chance flood inundation from storms
 - Evaluation of extreme future climate storm scenarios (category II hurricane) against the current 1% (100-year) and 0.2% (500-year) flood inundation levels
- Vulnerability assessment process for wastewater treatment plants
- Policy and financing options based on a survey of municipal needs

Funding from CT DEEP from CT DOH CDBG-DR

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MUNICIPAL RESILIENCE GRANT PROGRAM

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Municipal Resilience Grant Program

- Amount of funding available: **\$200,000*** total for all awards together
- **Prefer minimum of \$20,000 request per proposal (may review smaller requests)***
- Eligible Applicants: Municipalities and Councils of Government
 - Partnerships are encouraged
- Proposal Deadline: **November 1, 2016 by 5 pm**

***New for 3rd round**

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MRGP Selection Criteria

- Does the proposed project enhance community resilience to the impacts of climate change and extreme weather?
- Does the proposed project have transferable results?
- Does the proposed project involve collaboration with CIRCA and, **if applicable, demonstrated use of one or more of CIRCA's research products?***
- Does the proposed project have measurable goals?
- Will the proposed project be completed in an 18-month timescale?
- Does the proposed project have multiple funding sources?
- Does the proposed project emphasize implementation?

Questions?

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Sign Up for Resilience Roundup & Announcements

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Required Information

Please format your project description and workplan with the following sections:

1. *Project description (include project name and project address);*
2. *Workplan (including major phases, deliverables, project dates, permitting process (if applicable), project team members and roles);*
3. *Resumes for team members;*
4. *Permits required and plan for acquisition, if applicable, including all drawings and plans to be submitted during the permitting process;*
5. *Partner roles and responsibilities (if applicable);*
6. *Sources of leverage and amounts (if applicable);*
7. *How project will advance mission of CIRCA;*
8. *Define collaboration with CIRCA (if applicable);*
9. *Description of how project satisfies a priority area of CIRCA, indicating which priority area(s) and, if applicable, demonstrated use of one or more of CIRCA's research products**
10. *Description of acknowledgement; and*
11. *Letters of support (if applicable).*
12. *Statement affirming that applicant participated in the September 19, 2016 webinar or reviewed the recording**

**New for 3rd round*

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