U.S. coastal county socioeconomic and shoreline condition data synthesis and derived calculations from data sources between 2005 to 2010 (EstuarineMetaDyn project)

Website: https://www.bco-dmo.org/dataset/687894
Data Type: experimental
Version:
Version Date: 2017-04-19

Project
» Interacting Effects of Local Demography and Larval Connectivity on Estuarine Metapopulation Dynamics (EstuarineMetaDyn)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **N**:49.3458 **E**:-66.9514 **S**:24.7433 **W**:-124.7844

Dataset Description

This dataset contains shoreline condition and socioeconomic data for U.S. coastal counties. Included in the data are the length of hardened shoreline, number of storms, relative sea level rise, shoreline slope, tidal range, erosion or accretion rate, geomorphology, housing density, the number of years shoreline hardening has been banned, and U.S. Gross Domestic Product (GDP). These data and derived calculations were obtained from various databases specified in the Methods & Sampling section.

These data were used for regression tree analyses in the following publication:

Gittman, RK, FJ Fodrie, AM Popowich, DA Keller, JF Bruno, CA Currin, CH Peterson, and MF Piehler (2015) Engineering away our natural defenses: an analysis of shoreline hardening in the United States. Frontiers in Ecology and the Environment 13: 301–307. doi:10.1890/150065

Methods & Sampling

We used the National Oceanic and Atmospheric Administration (NOAA) Office of Response and Restoration's Environmental Sensitivity Index (ESI) geodatabases to calculate the linear kilometers of total shoreline and kilometers of hardened shoreline for each coastal county within the continental US (NOAA 2005).

To evaluate the relationship between potential drivers and the percentage of hardened shoreline in each US coastal county, we considered the following factors: 2010 housing density (units per square kilometer), 2010 gross domestic product (GDP, expressed in US dollars), coastal slope (%), accretion/erosion rates (meters per year [m yr–1]), geomorphology, mean tidal range (m), mean wave height (m), relative SLR (millimeters per year [mm yr–1]), storm frequency between the years 1970–2010, relative county shoreline position (north to south or west to east along the coast), and years since a ban on shoreline hardening was passed (sources included: the US Census Bureau, the National Ocean Economics Program, the US Geological Survey Coastal Vulnerability Index [USGS CVI] [for a description of the variables, see Hammer-Klose and Thiehler 2001], the Federal Emergency Management Agency's US Presidential Major Disaster and/or Emergency Declarations [FEMA 2014], and federal and state legislation and permitting procedures).

We grouped all man-made structures (seawalls, bulkheads, riprap structures [revetments, breakwaters, groins/jetties], and hybrid seawall/bulkheads with riprap) to calculate the cumulative lengths of hardened shoreline. We divided each state's ESI shoreline by coastal county and, for the Pacific and Atlantic coasts, by whether the shoreline was "open" (ie directly exposed to the ocean) or "sheltered" (ie located in a bay, sound, lagoon, or tidally influenced river). We did not divide the Gulf of Mexico coast into "open" or "sheltered" categories because much of the Gulf coastline (eg the Louisiana coastline, the Big Bend region of Florida) consists of reticulated wetlands that cannot be easily classified in this way. We then calculated the length (in kilometers) of tidal shoreline (total and armored), as well as the percentage of hardened shore for each county. Additionally, we calculated the length of tidal wetland shoreline (total and armored).

BCO-DMO Processing Description

* added a conventional header with dataset name, PI name, version date
* modified parameter names to conform with BCO-DMO naming conventions
* blank values replaced with no data value 'nd'
* apostrophes removed from county names "St. Mary's" and "Queen Anne's"

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Data Files

File
counties.csv (Comma Separated Values (.csv), 36.31 KB) MD5:09852567d1aec1335db9fa4c699d0d60 Primary data file for dataset ID 687894

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Parameters

Parameter	Description	Units
county	US county	unitless
state	US State	unitless
coast	US coast (Atlantic/Pacific)	unitless
shore_type	Type of shoreline (Open/Sheltered/Closed)	unitless
hardened_shore	Percentage of shoreline that is hardened	percent (%)
total_shore	Total shoreline legth	kilometers (km)
storms	Number of storms with National Disaster Declarations from 1970-2010	count
SLR	Relative rate of sea level rise	millimeters per year
slope	Slope of the shoreline	percent (%)
tide_range	Tide range	meters (m)
wave_height	Wave height	meters (m)
erosion_accretion	Erosion or accretion rate of the shoreline	millimeters per year
geomorphology	Geomorphology of the shoreline	unitless
housing_density	density of houses per US coastal county in 2010	housing units per square kilometer
order	Geographic order along the shoreline from north to south or east to west	unitless
ban	The number of years shoreline hardening has been banned in the state	years
GDP	US Gross Domestic Product for 2010	U.S. dollars

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Project Information

Interacting Effects of Local Demography and Larval Connectivity on Estuarine Metapopulation Dynamics (EstuarineMetaDyn)

Coverage: North Carolina Estuaries

Description from NSF award abstract:
The PIs will use the eastern oyster (*Crassostrea virginica*) in Pamlico Sound, North Carolina, as a model system and will attempt to optimize the design of networks of no-take reserves as a strategy for maintaining metapopulations of this commercially harvested species. The project specifically recognizes that network persistence depends on (1) the potential for growth, survival, and reproduction within reserves, and (2) the potential to distribute offspring among reserves. Thus, demographic processes within reserves and settling areas play important roles, along with variability of physical transport. The PIs plan to:
(1) test and refine 3D bio-physical models of connectivity due to oyster larval transport in a shallow, wind-dominated system;
(2) test, refine, and apply technology to detect natal origins of larvae using geochemical tags in larval shell; and
(3) integrate regional connectivity and demographic rates to model metapopulation dynamics.

This study will produce new tools and test and refine others used for studying larval connectivity, a fundamentally important process in the maintenance of natural populations, and thus in biological conservation and resource management. The tools include a hydrodynamic modeling tool coupled with an open-source particle tracking model that will be available on-line with computer code and user guide. The project will use integrated modeling approaches to evaluate the design of reserve networks: results will be directly useful to improving oyster and ecosystem-based management in Pamlico Sound, and the methods will inform approaches to network design in other locations.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1155628

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