OysterFutures simulation model code, input files, and model description

Website: https://www.bco-dmo.org/dataset/875301
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Project
» Coastal SEES Collaborative Research: Oyster fisheries in the Chesapeake Bay: Integrating stakeholder objectives with natural system models to promote sustainable policy (Chesapeake Bay Oyster Fisheries)

Contributors	Affiliation	Role
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Abstract
This dataset contains the OysterFutures simulation model code, input files, and model description. This model was collaboratively developed with OysterFutures stakeholders to simulate outcomes of potential management and restoration options for oysters in the Choptank River complex in Maryland, U.S.A.

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Dataset Description

The open-source OysterFutures simulation model was developed to forecast effects of potential management options for oysters in the Choptank and Little Choptank Rivers in Maryland, USA. The model was collaboratively developed with the OysterFutures stakeholder workgroup. The model is written in AD Model Builder (https://www.admb-project.org/), and the model files are oyster_sim_model2.tpl (the model code), and two data files, oyster_sim_model2.dat and options.dat.

The operating model describes the population and fishery dynamics. The model tracks age classes 0-14+ (plus group is an aggregate age class for age 5 and older), and has length classes 10 mm-180 mm+ (the plus group is individuals that size and larger) with a 5 mm bin width. The model operates for 26 years, with two 6-month time steps annual, with the initial values set in year 0 at the most recent estimates of abundance. For detailed information about the model, see the attached Supplemental File, "OysterFutures_Model_Description_2-28-2022.pdf".

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Data Files

File	
options.dat	(Octet Stream, 715.44 KB) MD5:7e178e627970f58ad2239ecbe4cbb111
File associated with dataset https://www.bco-dmo.org/dataset/875301, "OysterFutures simulation model". The model included a number of potential management options that could be set up in the options.dat file including sanctuaries, shell/substrate addition, spat on shell addition, rotational harvest, and enforcement/compliance.	
oyster_sim_model2.dat	(Octet Stream, 9.88 MB) MD5:16c1a3d79cb66e6ab33e21a31597e549
File associated with dataset https://www.bco-dmo.org/dataset/875301, "OysterFutures simulation model". oyster_sim_model2.dat is the input data file.	
oyster_sim_model2.tpl	(Octet Stream, 110.28 KB) MD5:3fa690319758b113c8a0e30eb5fb9f94
File associated with dataset https://www.bco-dmo.org/dataset/875301, "OysterFutures simulation model". oyster_sim_model2.tpl is the model code.	

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Supplemental Files

File	
OysterFutures_Model_Description_2-28-2022.pdf	(Portable Document Format (.pdf), 291.03 KB) MD5:81e4d9e1401d1a0e003a0ba0ee88a8f0
File associated with dataset https://www.bco-dmo.org/dataset/875301, "OysterFutures simulation model". This file contains detailed documentation describing the OysterFutures simulation model.	

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Parameters

Parameters for this dataset have not yet been identified

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Project Information

Coastal SEES Collaborative Research: Oyster fisheries in the Chesapeake Bay: Integrating stakeholder objectives with natural system models to promote sustainable policy (Chesapeake Bay Oyster Fisheries)

Website: https://oysterfutures.wordpress.com/

Coverage: Chesapeake Bay

NSF Award Abstract:
Researchers will use the oyster fisheries in the Chesapeake Bay as a test case for collaborative policy development that is grounded in sound science. Environmental policies often create controversy and can be difficult to enforce, particularly when people do not understand the reason for the rules or do not consider the rules to be fair. Natural resources can be better sustained by policies developed cooperatively among all

affected stakeholders, scientists, and government representatives. In a systematic approach, the project team will hold a series of workshops in which a full set of stakeholders will work with scientists to guide development of a model, select policy objectives, and apply the model to make policy recommendations. A collaborative modeling approach will ensure that stakeholders have an opportunity to incorporate their values, objectives, and knowledge into the model of the estuarine ecosystem which will include many benefits from the natural system such as commercial and recreational fishing, safe swimmable water, and other ecosystem services. Researchers will study the sociology and economics that influence stakeholder involvement and policy formation in order to better understand the human dimensions, improve the process, and enhance the implementation success of recommended policies. The lessons learned regarding the oyster ecosystem and fishery will advance the tools and practices of sustainable management of shellfisheries. The policy recommendations from the stakeholder workshops will be evaluated by state and federal agencies, and if implemented, would be an outcome that would directly enhance coastal sustainability. One Ph.D. student, two masters students, and one postdoctoral researcher will be trained in the science of coupled natural-human systems. This project is supported as part of the National Science Foundation's Coastal Science, Engineering, and Education for Sustainability program - Coastal SEES.

This research aims to improve the utility of predictive models for shaping natural resource policy and management. The research team will build an innovative natural systems model that integrates three-dimensional hydrodynamic, water quality and larval transport models with oyster demographics, human uses, and economics at a scale that is applicable to restoration and management. The modeling system developed will substantially advance methods for investigating, and understanding, natural systems with complex feedbacks between physical conditions, vital rates of organisms, and humans. Researchers will include stakeholder values, objectives, and knowledge in the model design process. Through a series of workshops, stakeholders will select the policy objectives and the integrated model will project how well policies are expected to meet these objectives. This iterative process will ensure that the natural system model will incorporate the complex human uses of the ecosystem. A targeted effort will be made to study the socioeconomic drivers of stakeholder involvement, information flow, use and influence, and the policy formation in order to improve the process and enhance the implementation success of recommended policies. By doing so, this research will advance understanding of the human dimensions needed to create sustainable policy as well as provide important new strategies for integrating natural and social sciences, and scientists, in sustainable resource management. This generalizable research component provides an important complement to the research on oysters, both of which will advance the tools and practices of sustainable management of shellfisheries.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1427019

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