Building a Stakeholder-Supported Tool for Oyster Siting in the Eastern Bay

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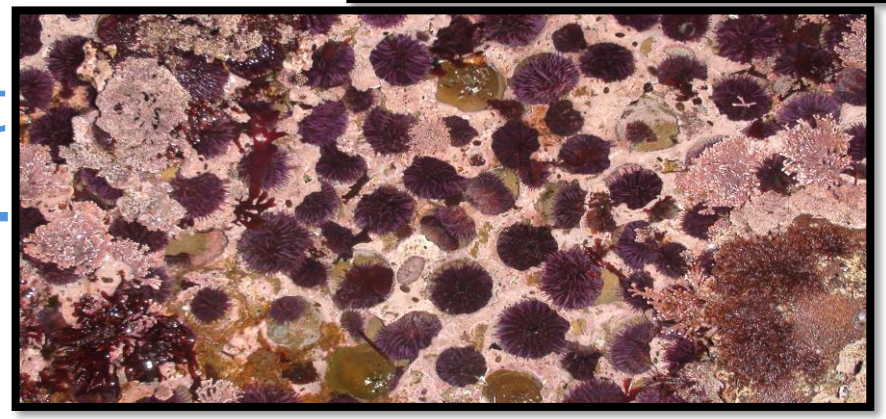
My Background

- CSS, inc. contracted to work for NOAA's NCCOS Oxford lab
- Conducted biology research in a variety of fields
- Excited to work with and learn more about oysters
- I'm from the government and I'm here to help…



Project Goals and Outline

- Develop a tool to inform site selection for oyster restoration and aquaculture in the Eastern Bay
- Stakeholder-Supported Restoration Suitability Model (SSRSM) based on Howie et al. (2024)
- Identify ecologically ideal locations for oysters
- Minimize conflict with current competing waterway uses
- Solicit input from a broad group of stakeholders to include their preferences in site selection

The Bones of the Tool – Habitat Suitability Model

- Spatially-explicit biophysical data
- Which parameters?
- Following ORP's 2021 report

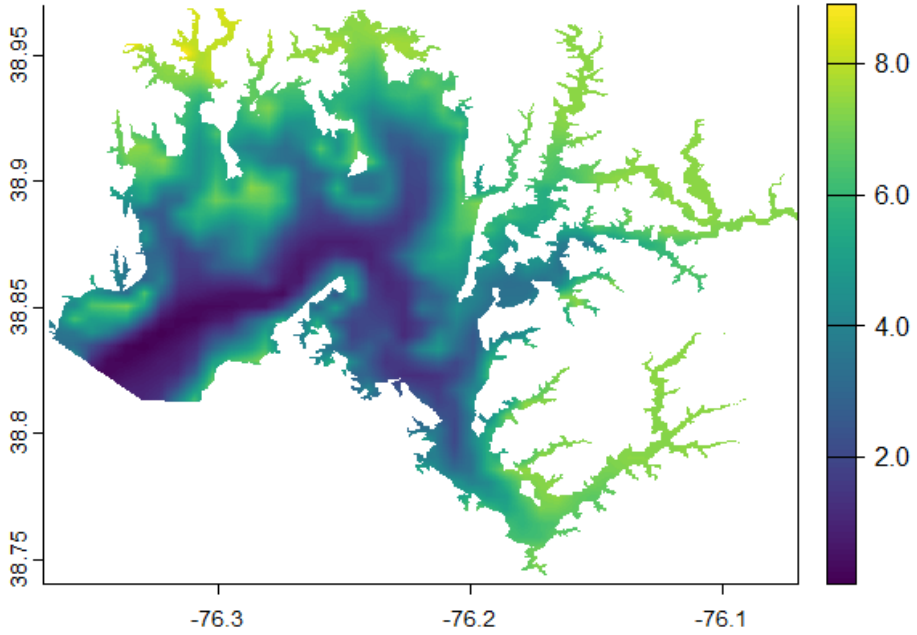
Variable	1	2	3	4	5	6	7	8	9	10	11
Salinity, average	x	x	x	x	x	x	x	x	x	x	x
Bottom type/Substrate	x	x		x			x	x	x	x	x
Water depth	x	x			x	x			x		x
Water temperature	x	x	x		x	x					
Dissolved oxygen		x	x		x	x					
Turbidity		x	x		x	x					
Disease		x	x	x			x				
Predator intensity			x	x			x				
Food availability		x	x		x						
Freshet frequency	x			x			x				
Oyster abundance				x			x				
Fouling organisms			x								
pH			x								
Water flow			x								
Sedimentary environment									x		
Salinity during spawning season										x	
Salinity, annual minimum										x	

Salinity (ppt)

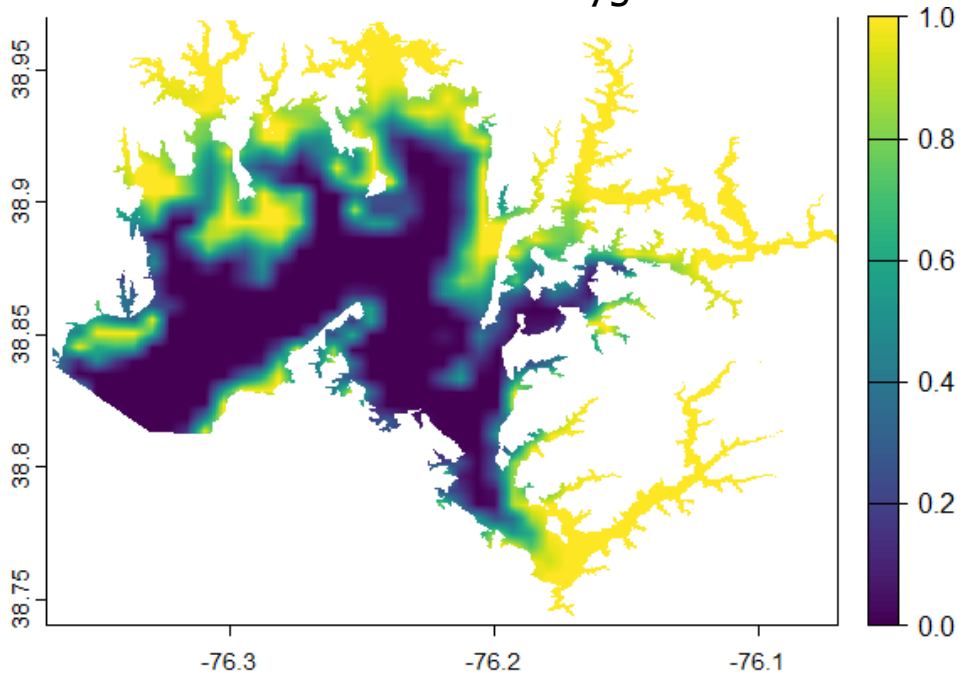
Adapted from Theuerkauf and Lipcius 2016

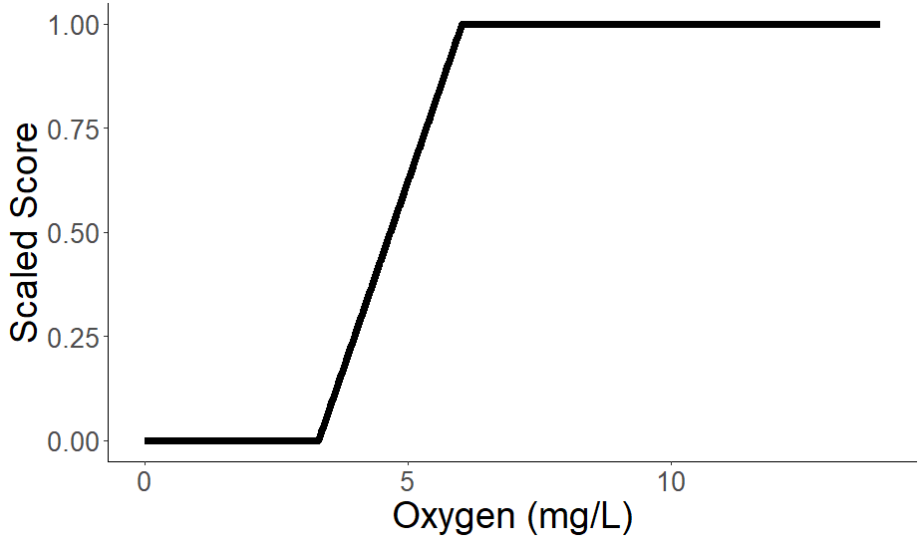
Scoring Raw Data Layer Using Curve

Raw Dissolved Oxygen (mg/L)



Scored Dissolve Oxygen





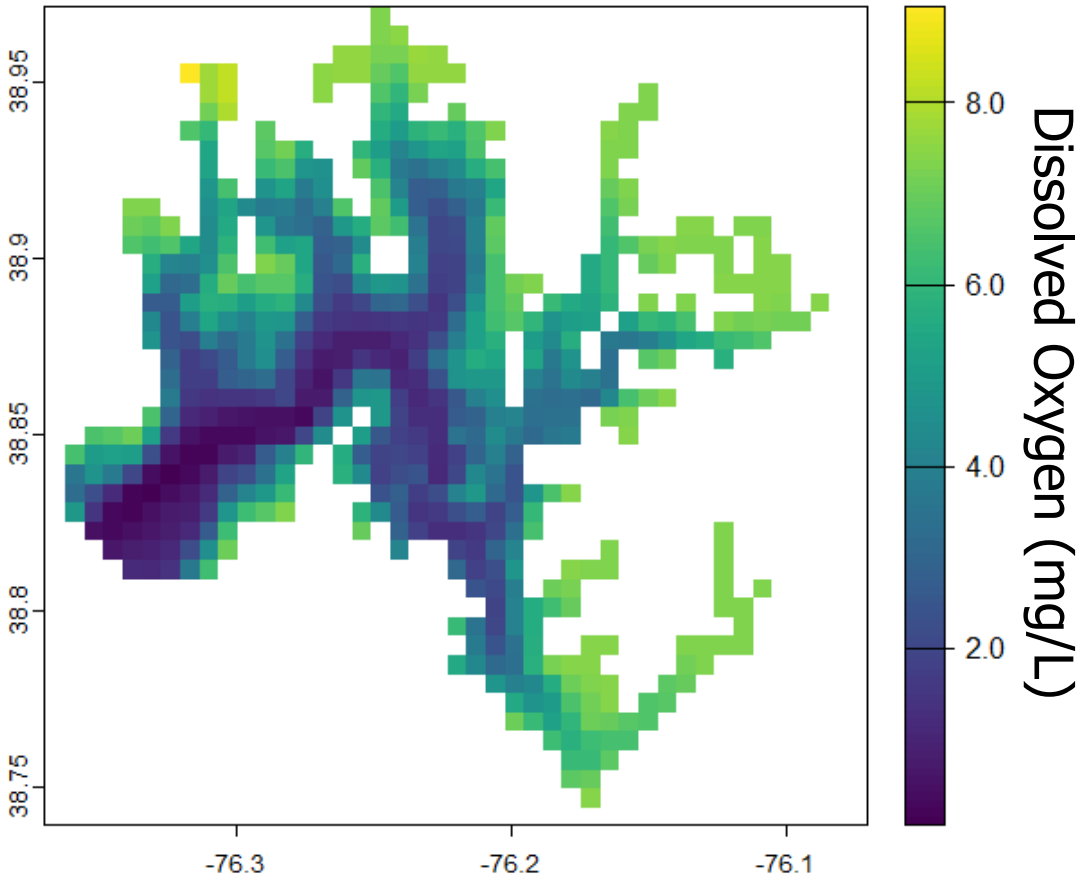
Habitat Suitability Model Calculation

- Individual variables and HSI are scaled from 0 to 1
- Geometric mean of variables
- HSI ranges from 0 to 1
- 0's for any variable make the overall HSI = 0

$$HSI = \sqrt[n]{V_1 * V_2 * V_3 * \ldots V_n}$$

Water Quality Data Layers – VIMS ChesROMS

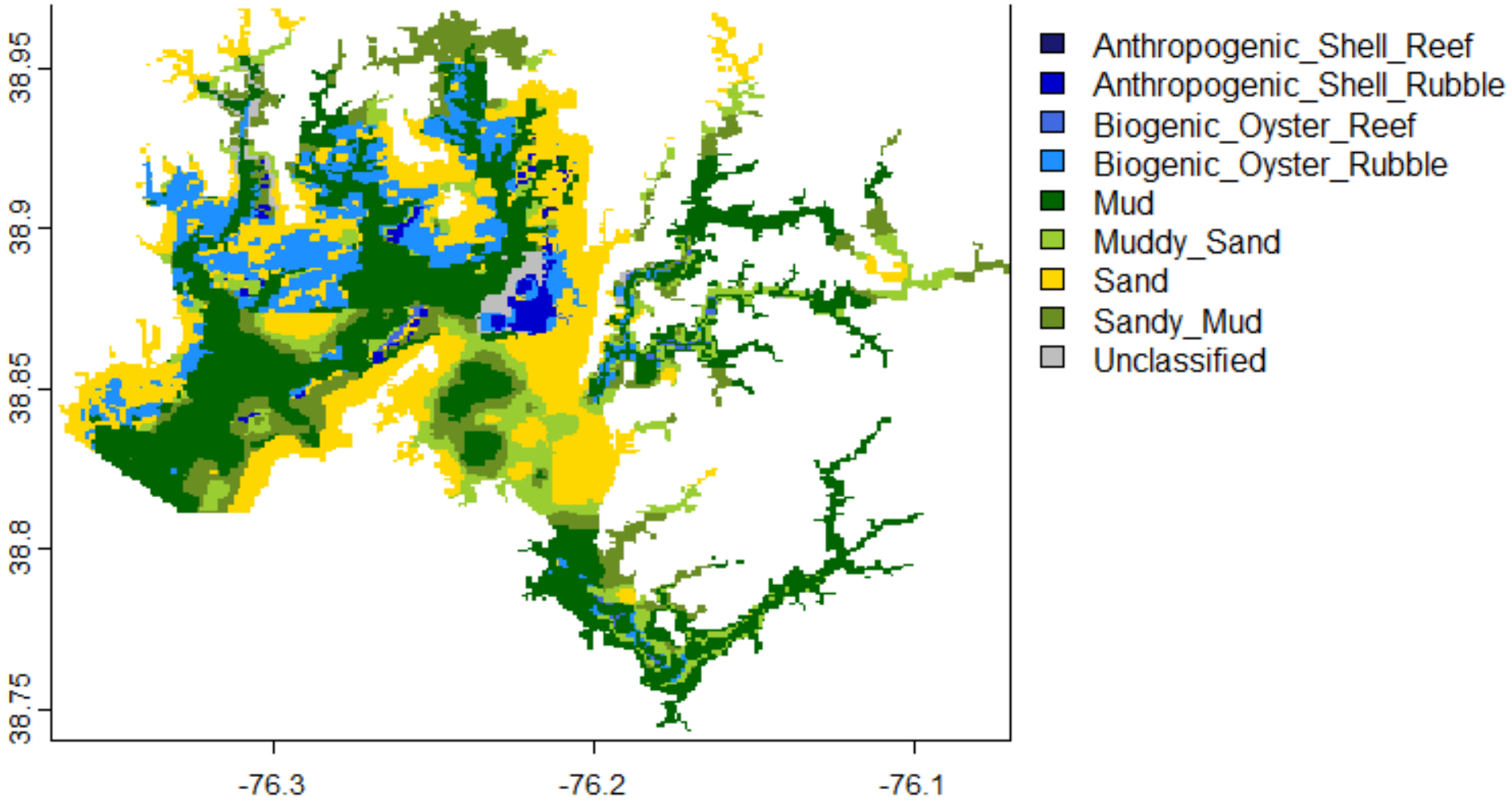
- Water quality data from VIMS-ChesROMS
- Daily values for 2014 – 2023
- Average grid size 600 m x 600 m
- Minimum monthly salinity
- Minimum monthly dissolved oxygen
- Mean phytoplankton concentration



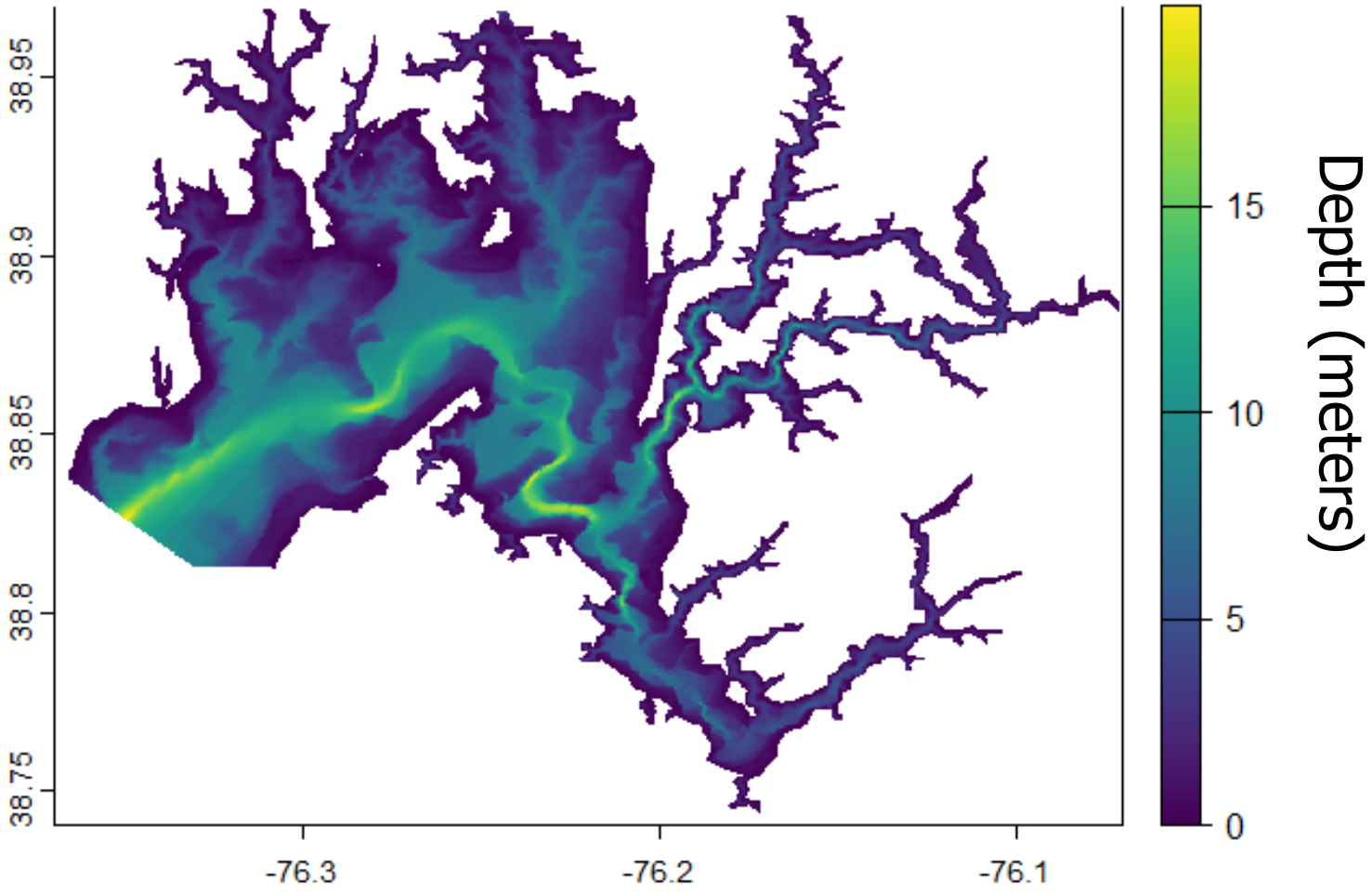
Example chesROMS Dissolved Oxygen Data

Bottom Sediment Type - CMECS

- Coastal and Marine Ecological Classification Standard



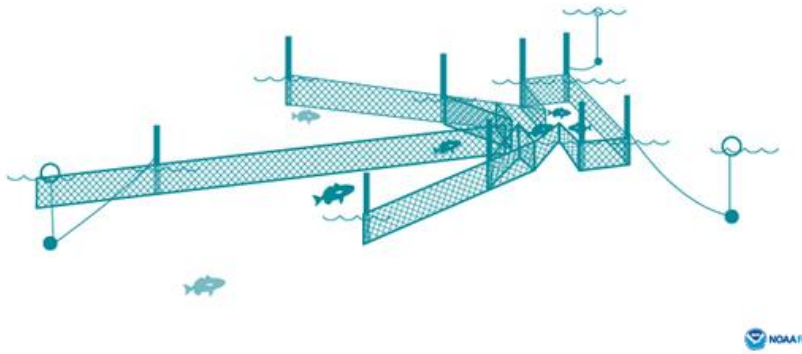
NOAA/NOS Bathymetric Digital Elevation Model



All models are wrong, but some are useful. ~ George E. P. Box

Competing Uses Exclusionary Layer

- Represent areas of human activity (mostly)
- Many include buffers to be conservative
- Scored like other layers
- Exclusionary



What are the Competing Uses?

- To ArcGIS!

Stakeholder Survey and Participatory Mapping

Eastern Bay Survey

Help us understand where to site (and not site) oyster aquaculture

Begin

Settings

Survey Questions and Process

- How often do you visit the Eastern Bay and its tributaries?
- How do you primarily use the Eastern Bay and its tributaries?
- Is your income directly dependent on the Eastern Bay and its tributaries?
- If you work in the study area, for which sector do you work?
- Do you, in principle, support oyster restoration and aquaculture in Eastern Bay and its tributaries?

Mapping Exercise Demo

Analysis of mapping data

- How we incorporate this data will depend on the nature of the data
- Density layer of where siting is supported
- Jumping off point for areas that are otherwise great

Next Steps

- Improvements to HSI
- Including more competing uses
- Getting survey out and processing results
- Ecosystem services

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Rebecca Thur

Please send all thoughts about competing uses, model parameters, survey questions, general complaints, specific grievances, and constructive criticisms to

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