The Use of Management Strategy Evaluation to Explore Habitat Area of Particular Concern Designations in the Gulf of Mexico

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Gulf of Mexico Fishery Management Council

NOAA CORAL REEF CONSERVATION PROGRAM

Background – HAPC designation

Qualitative

- Current method
- Pros:
  - Proposed by coral scientists based on actual coral locations
  - Affords many opportunities for stakeholder input
- Cons:
  - Time-consuming
  - Limited survey of Gulf
  - Stakeholder input only from those who attend meetings or speak up
  - More subjective

Quantitative

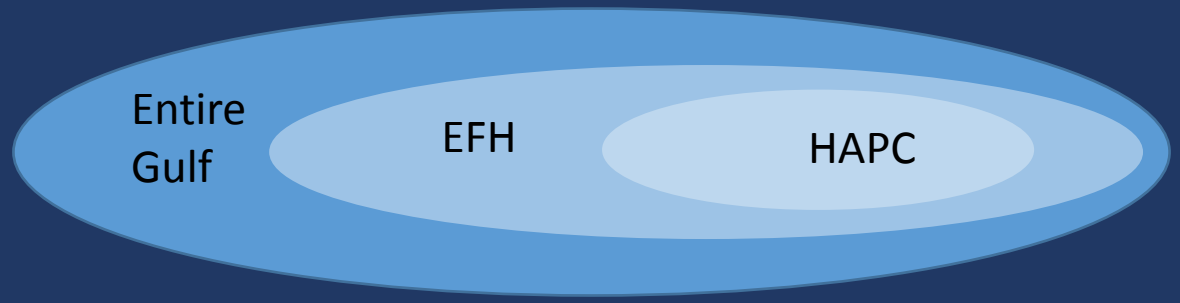
- Alternative method
- Pros:
  - Relatively fast
  - Model-based coral distribution
  - Less subjective
- Cons:
  - Requires adequate data
  - Minimal stakeholder input

Management strategy evaluation (MSE) involves using simulation to compare the relative effectiveness for achieving management objectives of different combinations of data collection schemes, methods of analysis and subsequent processes leading to management actions.

- Punt et al. 2014

Management

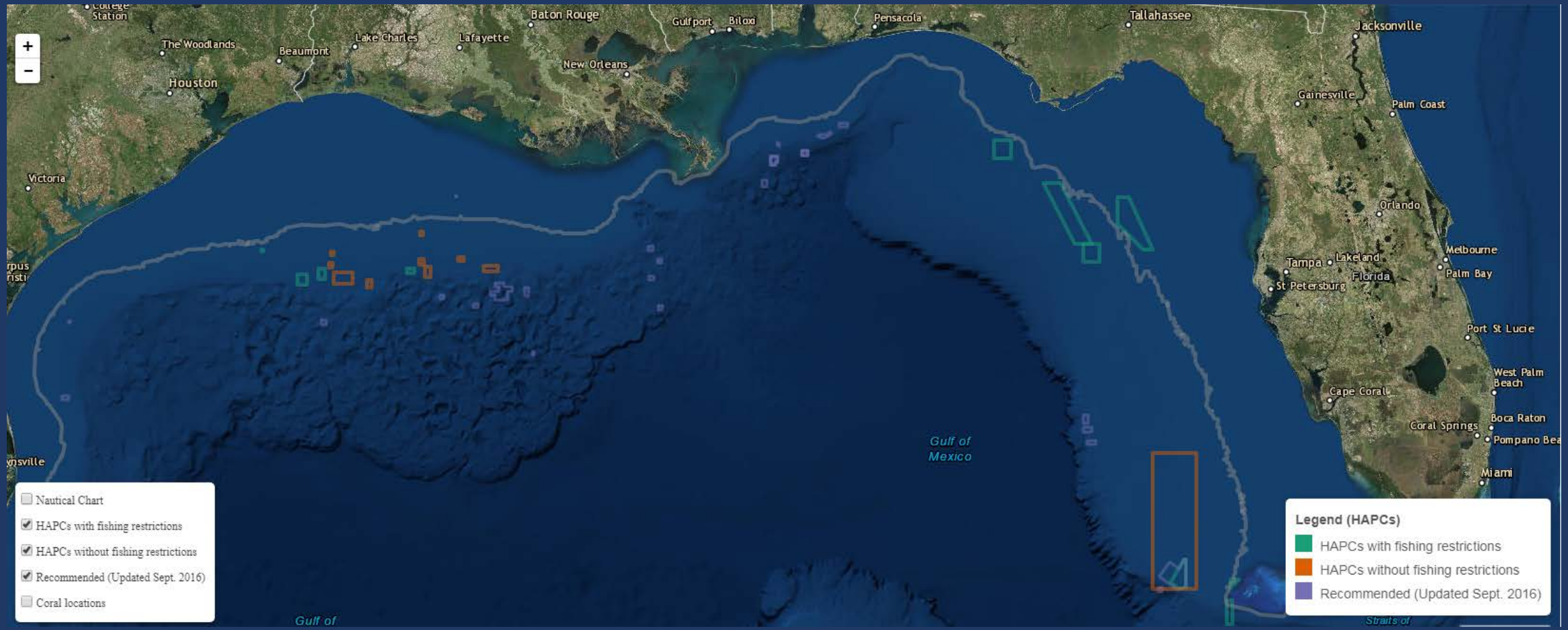
- The Gulf Council manages corals through a Coral FMP
  - >100 species (stony and black)
- Spatial management of deep-sea corals in the Gulf
  - HAPCs, a subset of EFH
  - Can have fishing restrictions, but don't have to



- Some discrete, very well studied areas. Mostly unknown distribution.

Management
(recent proposed HAPC identification process)

- 2013 - workshop with coral and fish scientists
  - Recommendation to reevaluate coral areas for protection
- 2014 - working group of scientists
  - identified 47 areas (including existing HAPCs) in need of protection
- 2015 - Coral SSC and AP + shrimp community
  - Reviewed areas, identified those in need of boundary refinement
- 2016 - Coral SSC, Coral AP, Shrimp AP + royal red shrimpers, bottom longliners
  - Narrowed areas to 15 w/ regs, 8 w/out regs
- 2016 - began policy development
  - Based on feedback from previously convened bodies



Gulf Council Coral HAPC Explorer: http://portal.gulfcouncil.org/coralhapc.html

Strategy

- **Maximize coral protection while minimizing fishery displacement**
  - Identify competing interests
    - Fishing effort
      - Commercial reef fish
        - Pings hourly
      - Shrimp
        - Pings every 10 minutes
    - Conservation
      - Coral habitat
      - MaxEnt
      - Species = black, stony, octocorals
- Develop methods/workflow

Evaluation

- MARXAN
  - Spatial optimization model
  - Attempts to maximize conservation area while minimizing cost

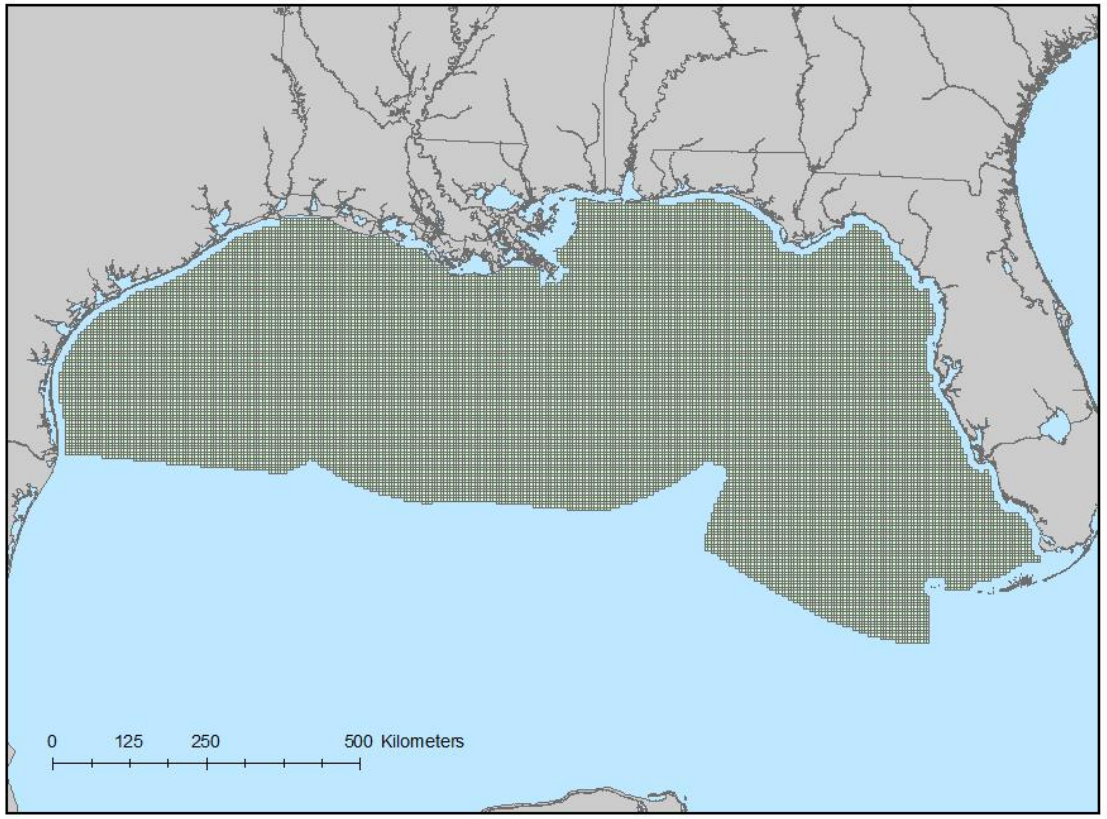
Data + Controllable Inputs = Model Output

- Planning Unit
- Reserves
- Cost surface (fishing effort)
- Conservation features

- Boundary length modifier
- Conservation target
- Species Penalty Factor

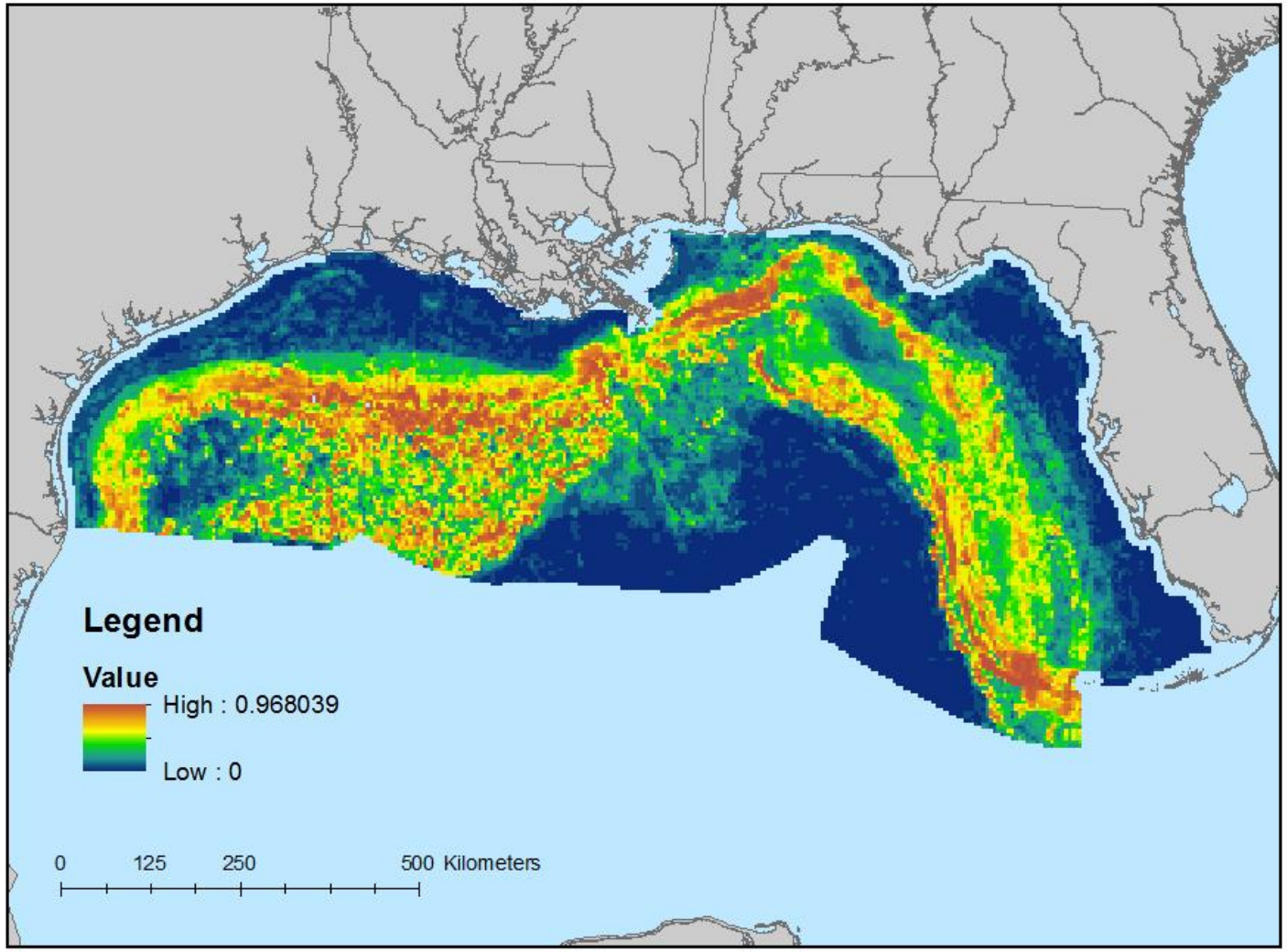
Planning Unit

- 5 km^2 , 10 km^2 grids
- EEZ, clipped to exclude state waters (mostly)



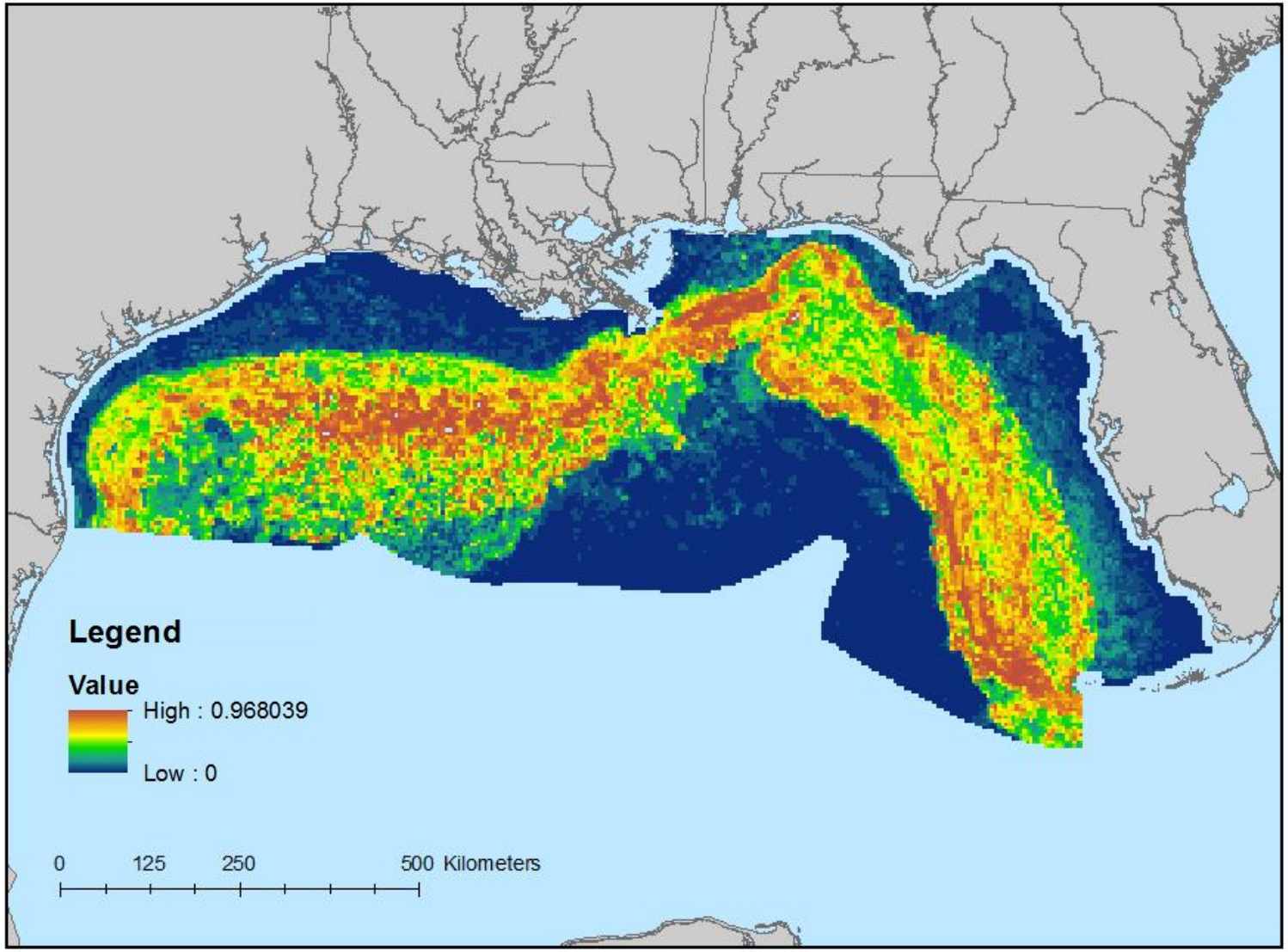
Octocoral Habitat Suitability

- MaxEnt
  - Taxa presence
  - Spatially explicit environmental predictors
  - N=6371



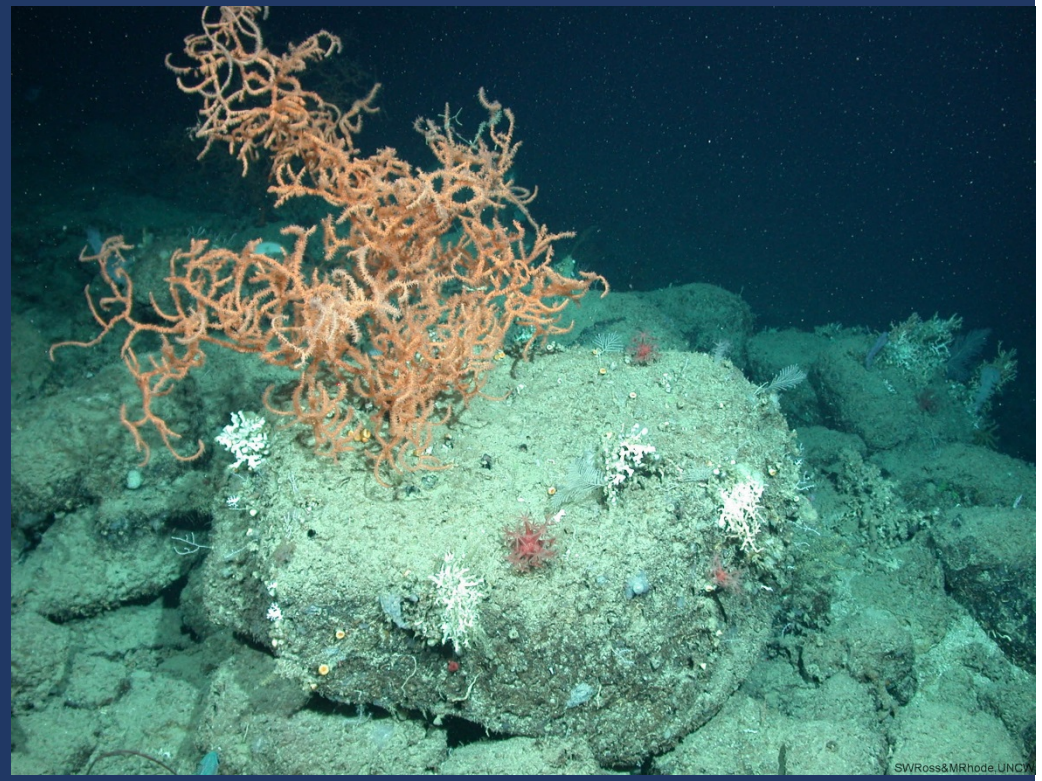
Stony Coral Habitat Suitability

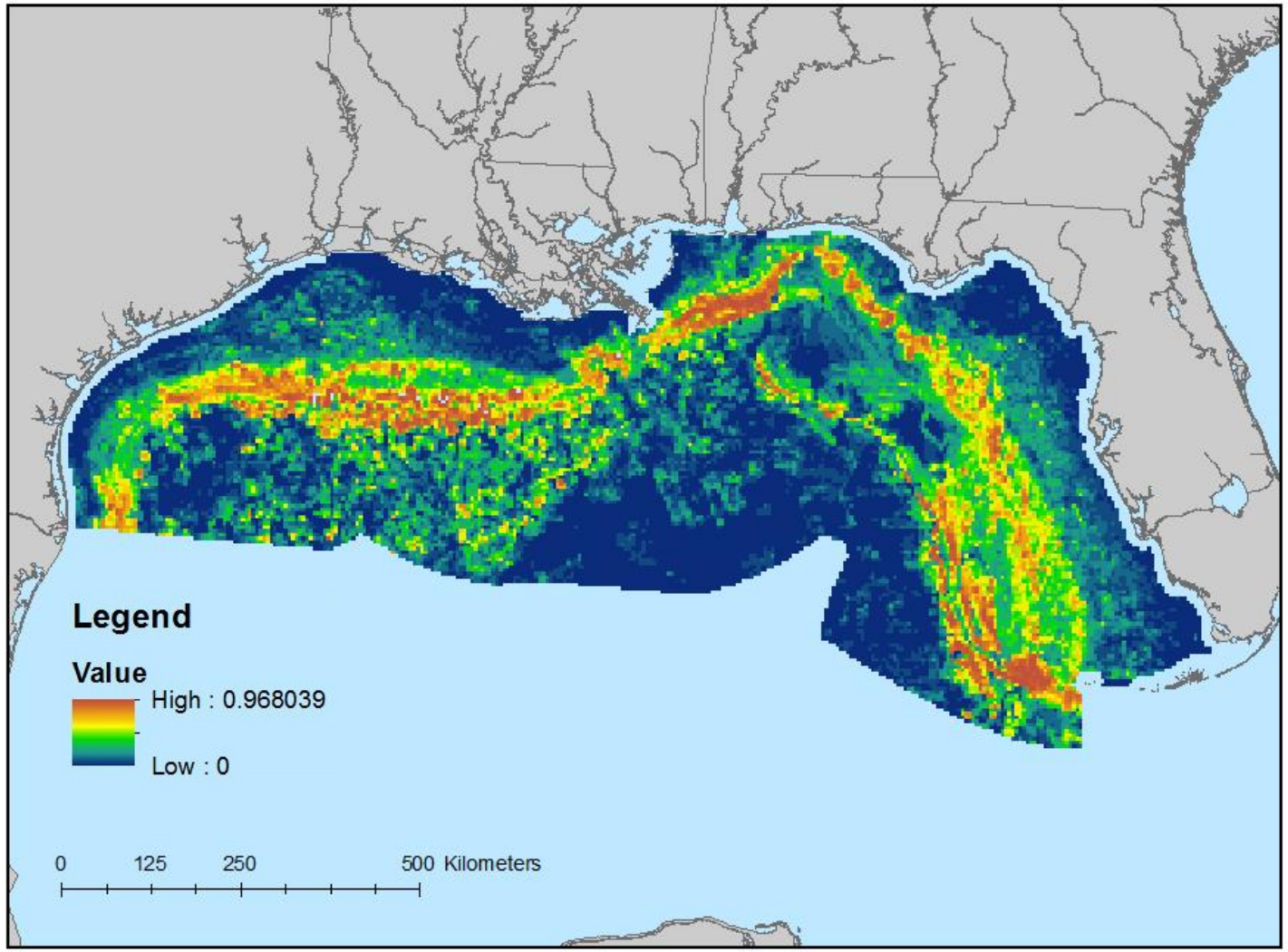
- MaxEnt
  - Taxa presence
  - Spatially explicit environmental predictors
  - N=1571



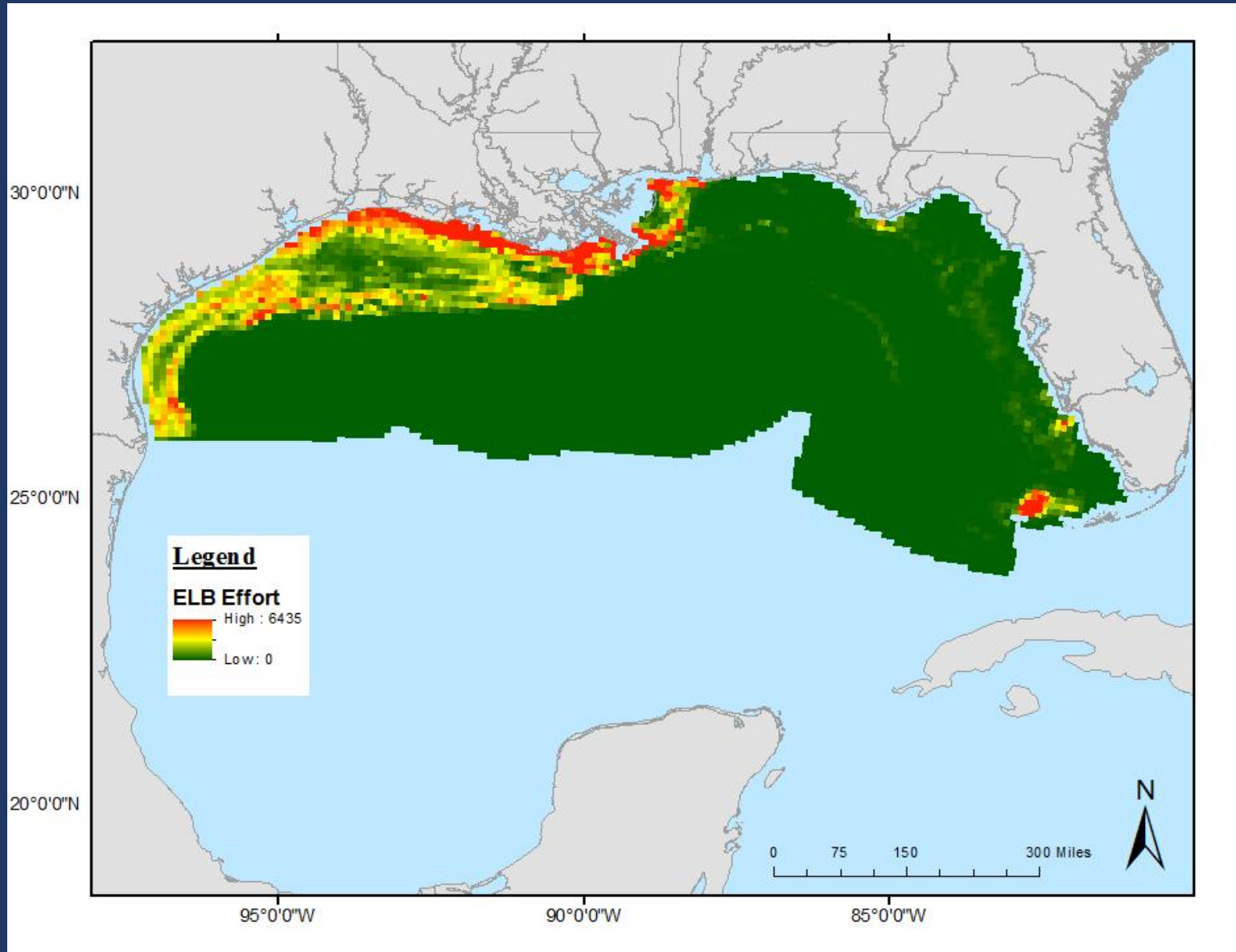
Black Coral Habitat Suitability

- MaxEnt
  - Taxa presence
  - Spatially explicit environmental predictors
  - N=2223

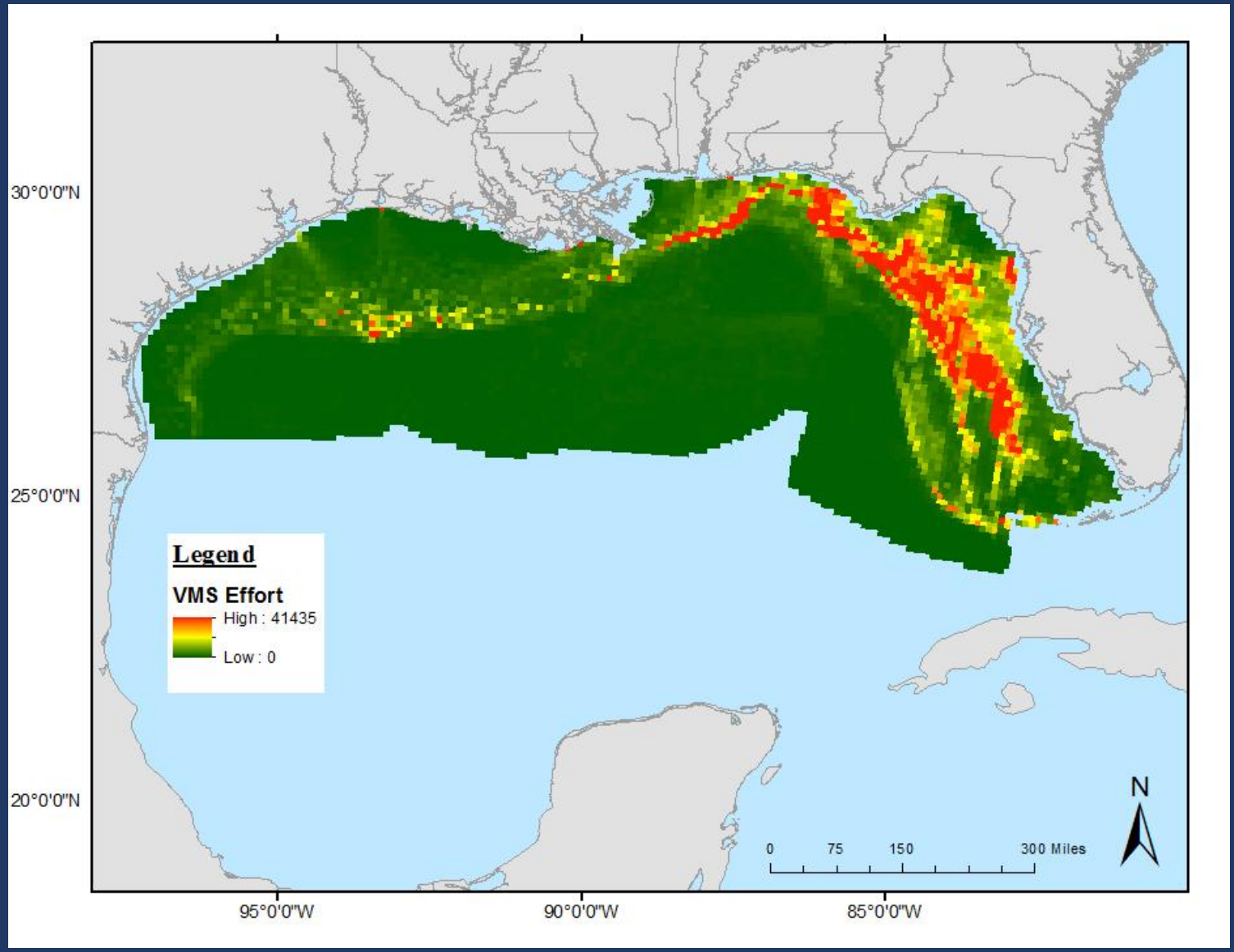




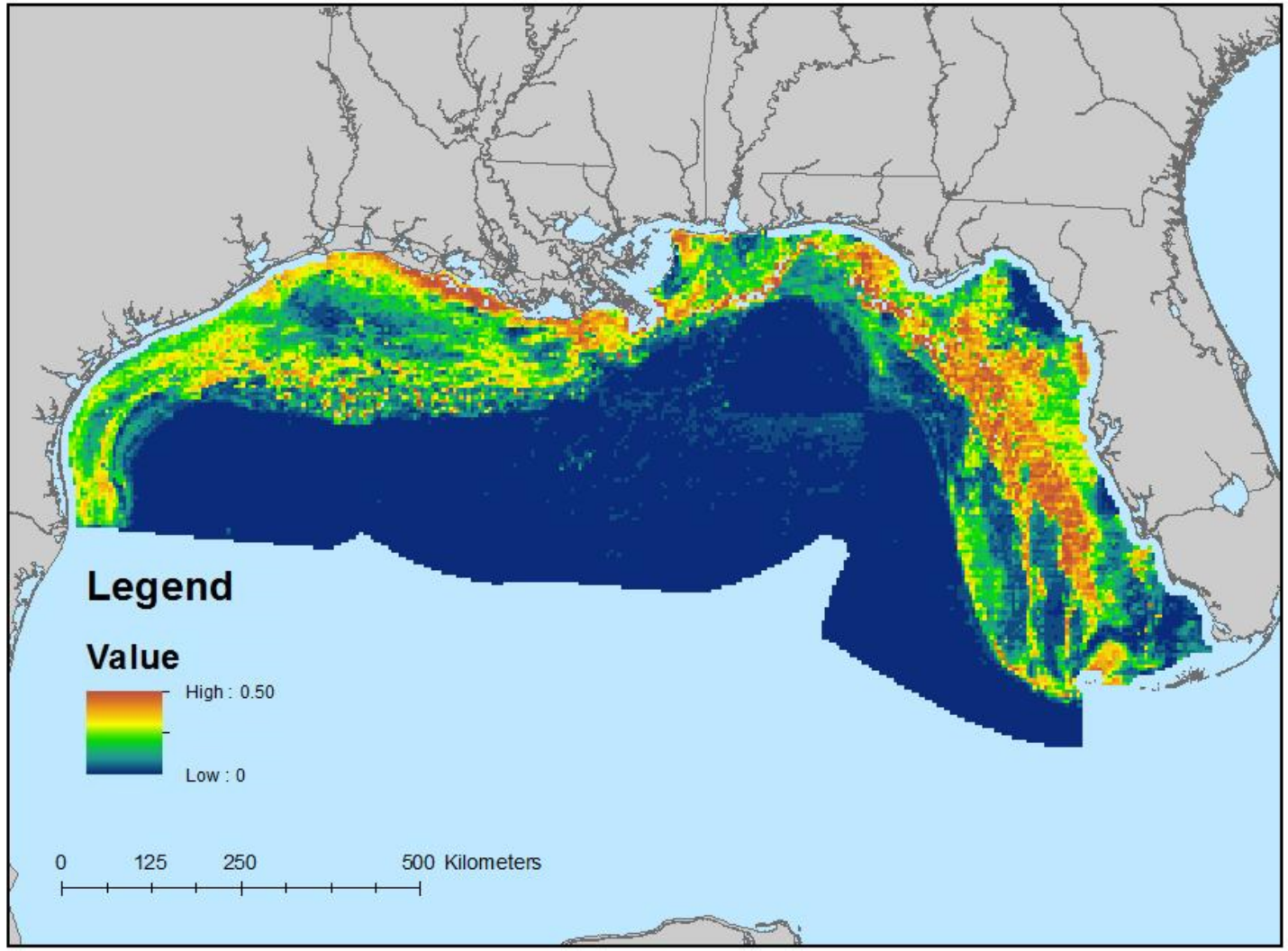
Shrimp Fishing Effort



Commercial Reef Fish Effort



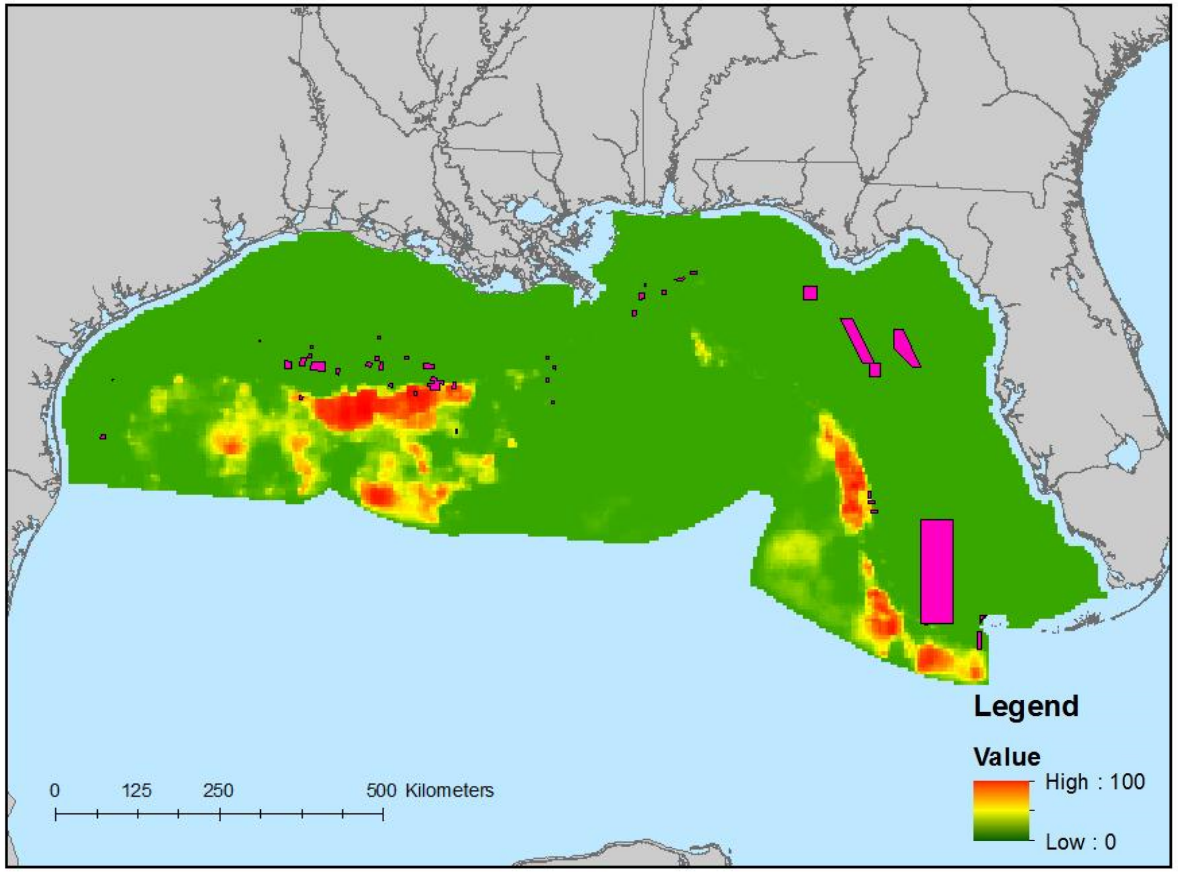
Final Cost Input; Shrimp ELB + Reef Fish VMS

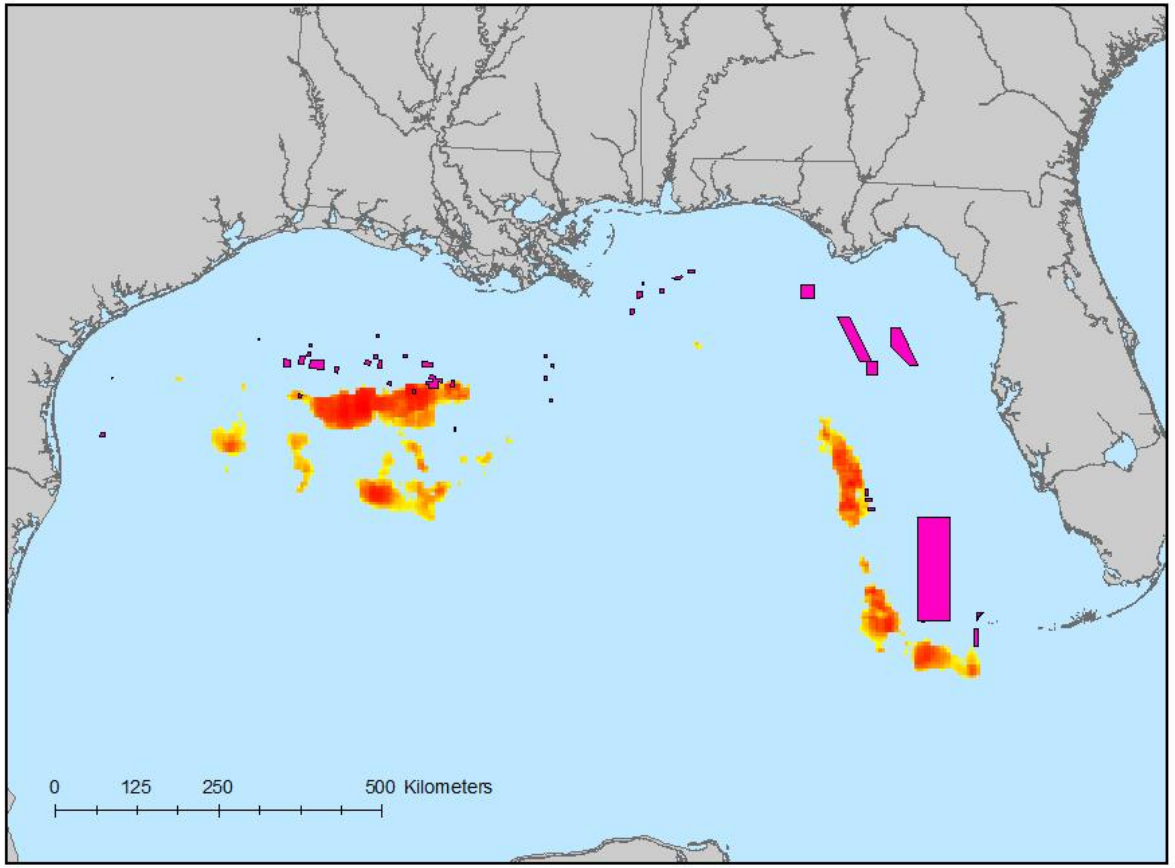


Evaluation

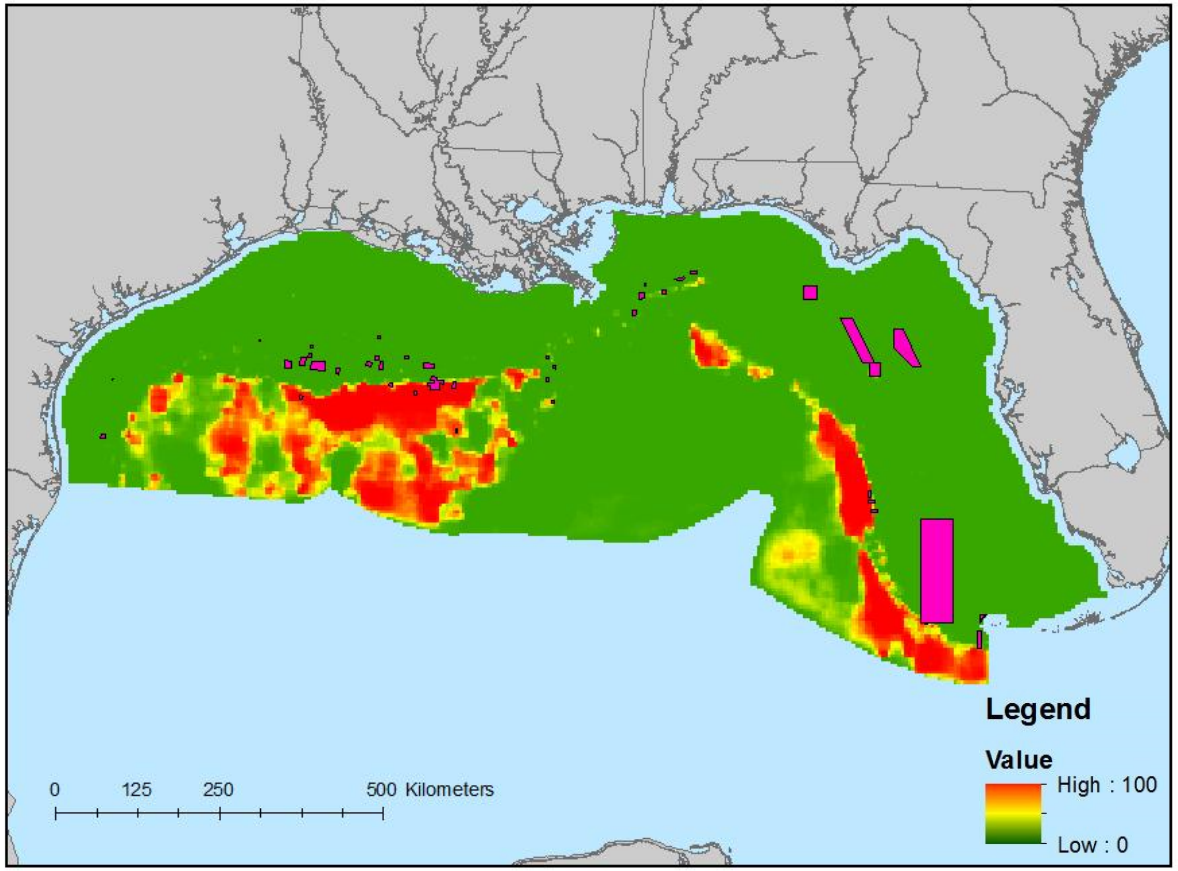
- Base run using QGIS and Qmarxan
- Developed R code to automate and execute MARXAN
- Conducted subsequent runs, changing:
  - Conservation target (10%, 20%, 30%)
  - Boundary Length Modifier
  - Species Penalty Factor
- https://github.com/claire-roberts/MARXAN

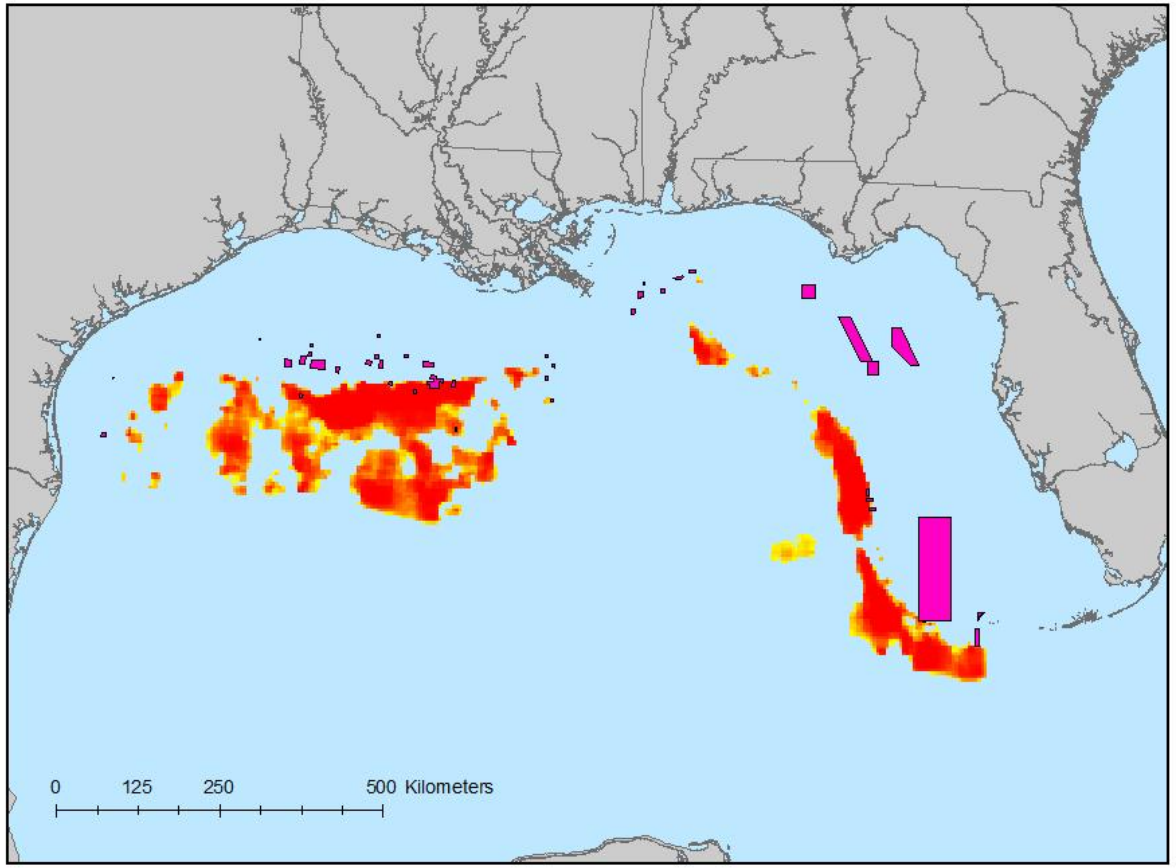
5 km^2 grid, 10% conservation target



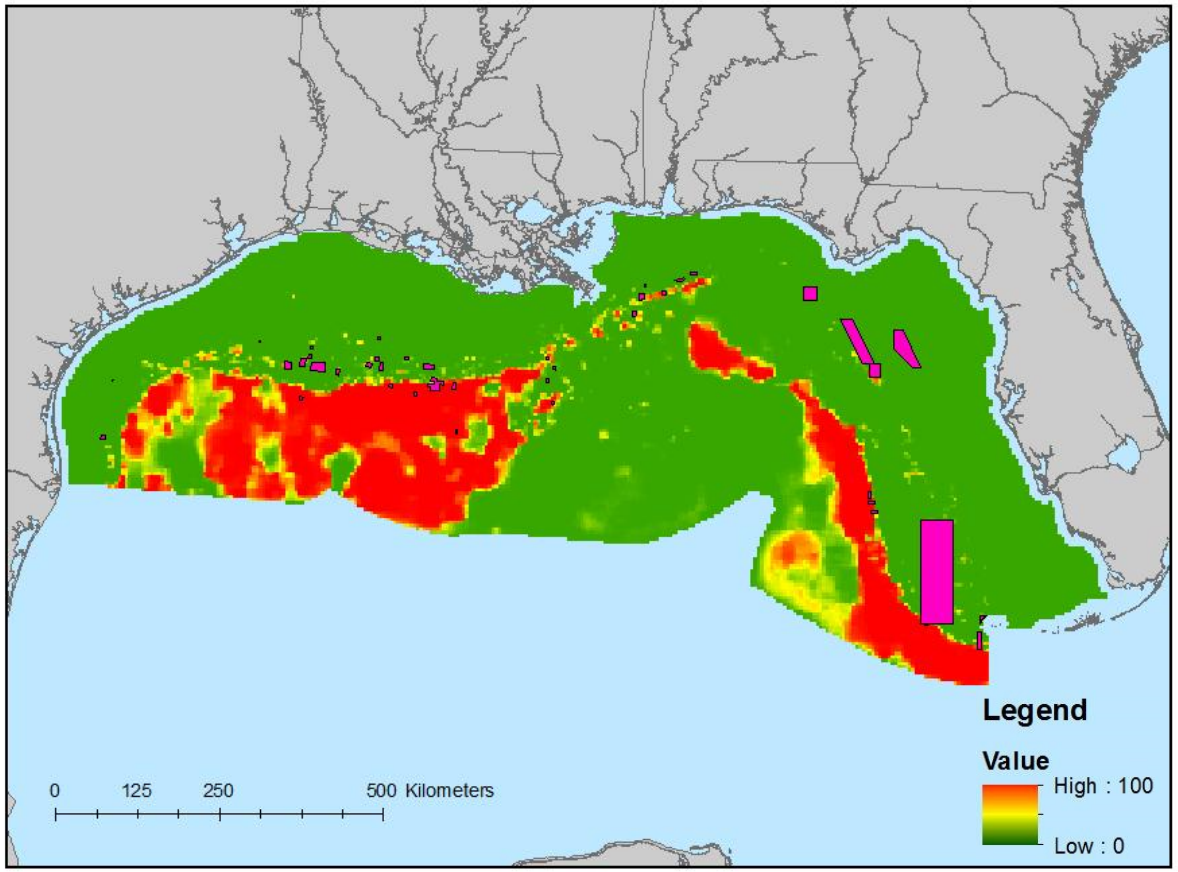


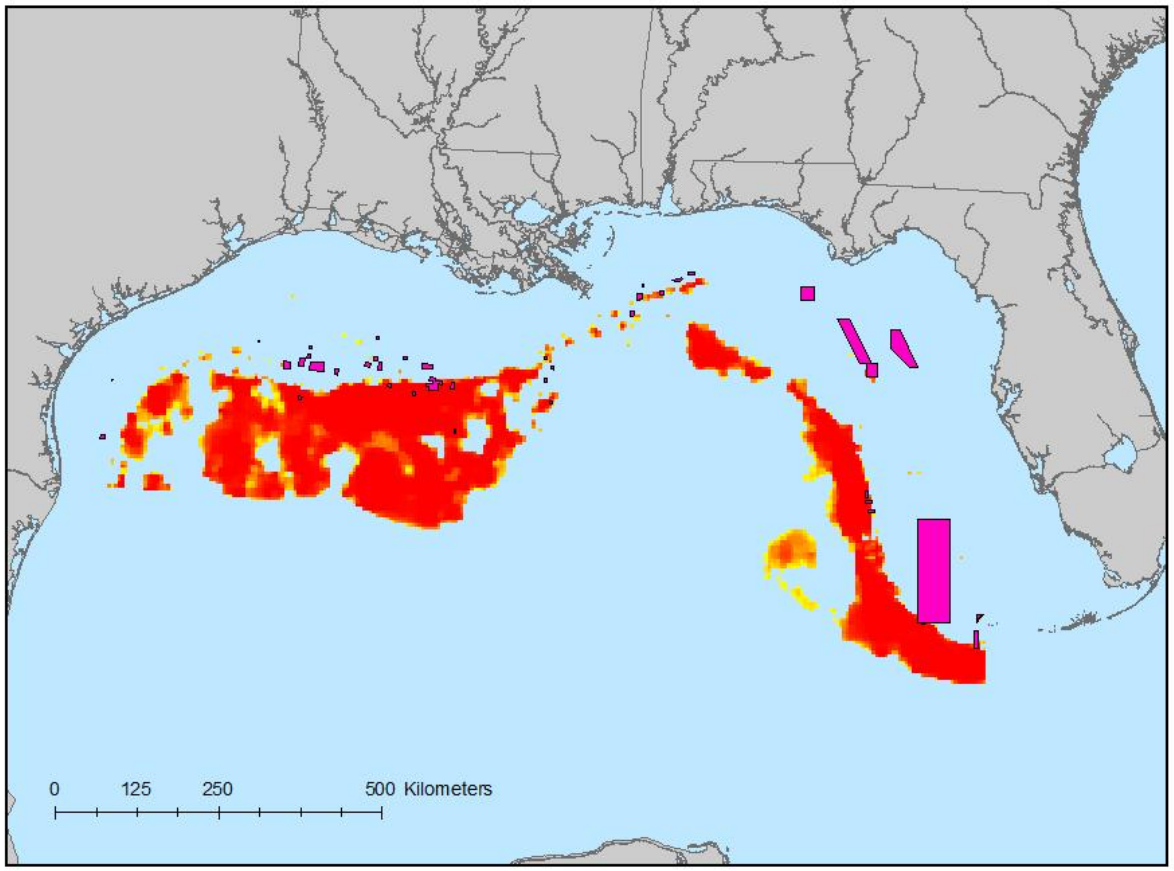
5 km^2 grid, 20% conservation target



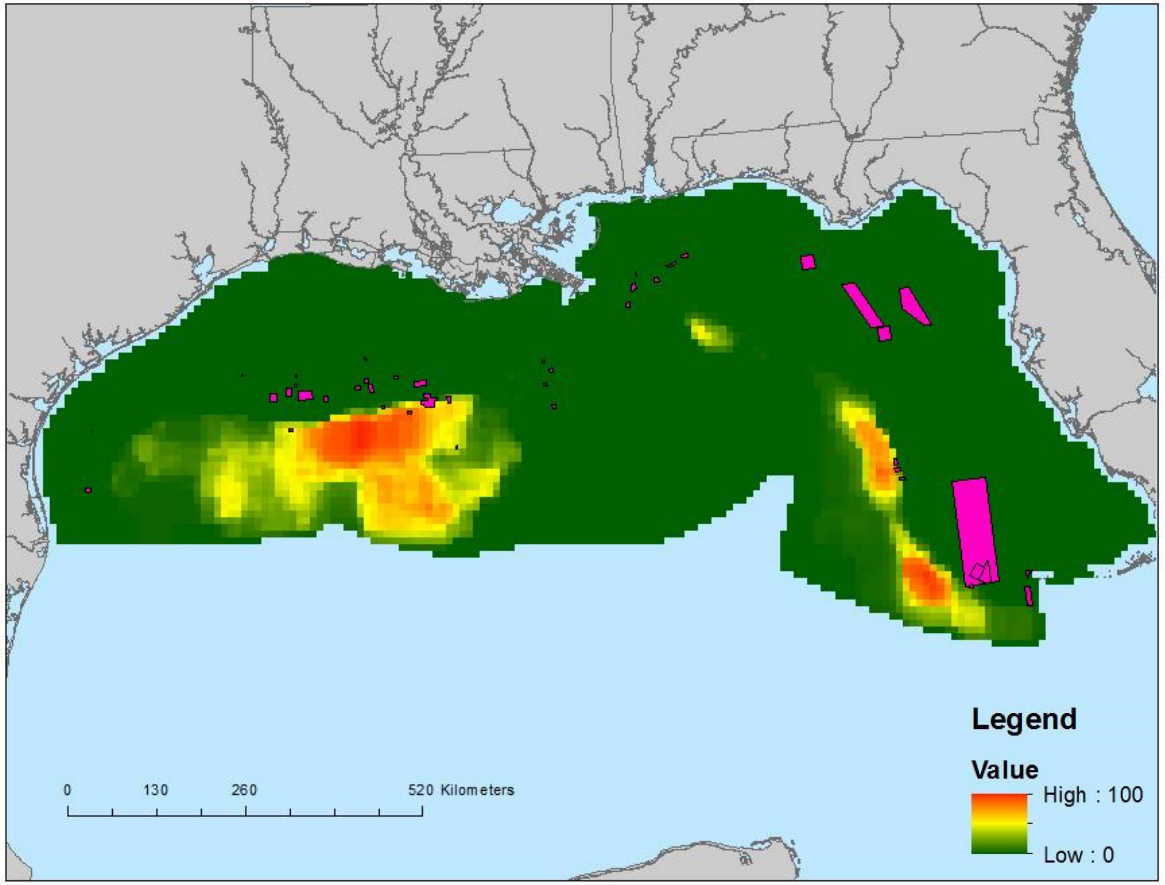


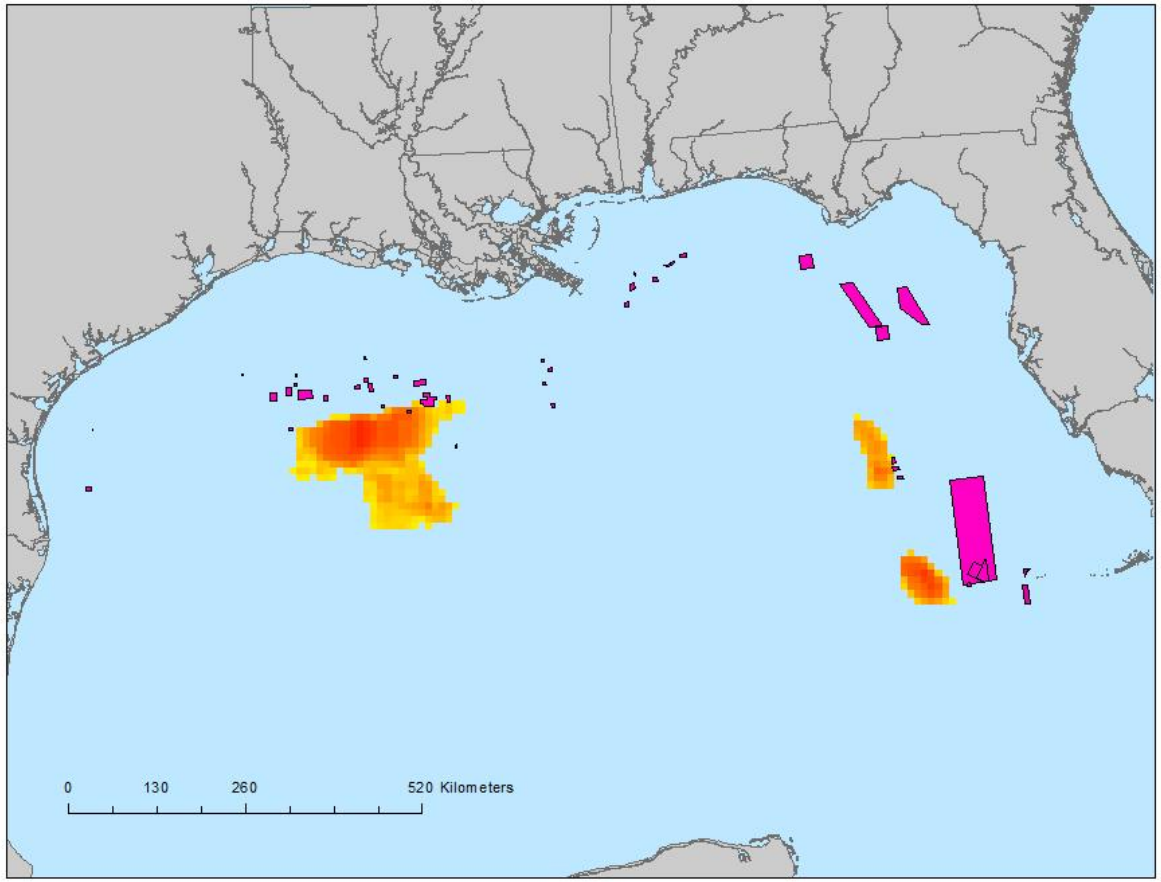
5 km^2 grid, 30% conservation target



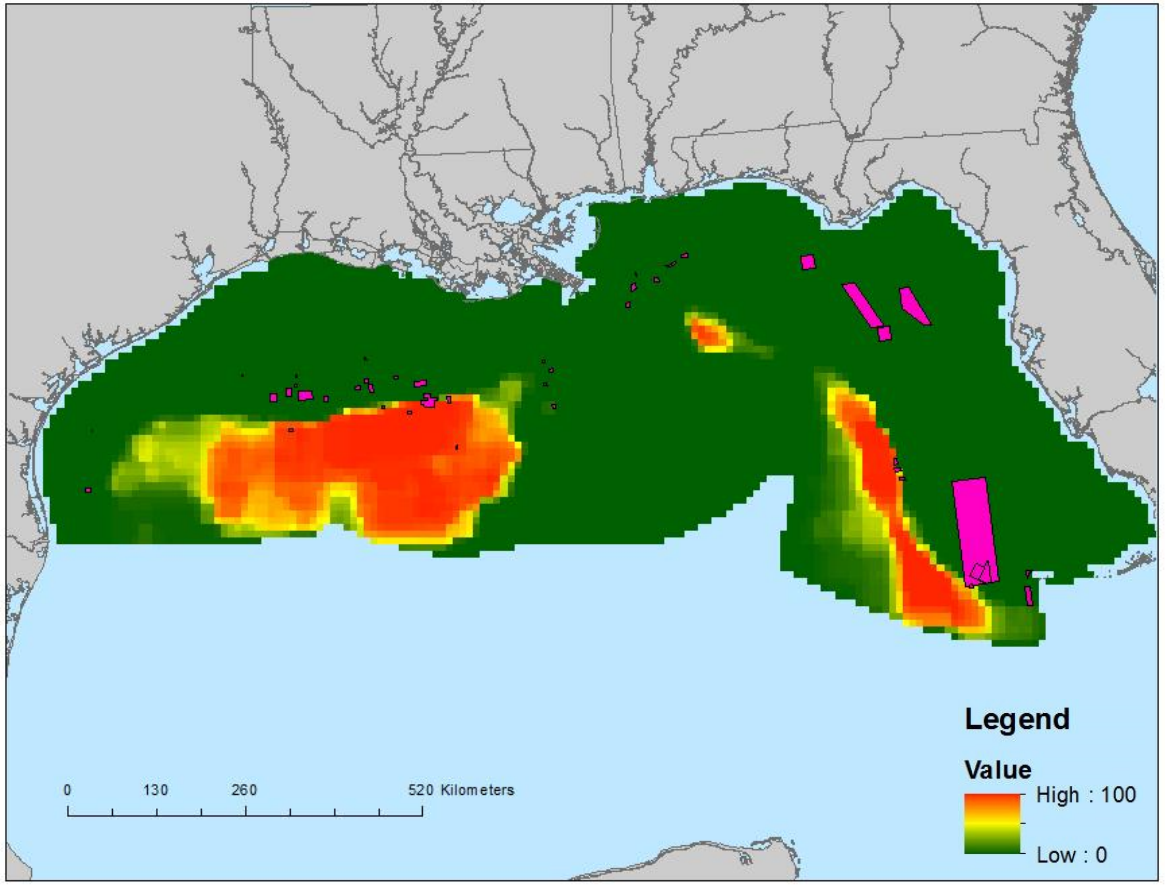


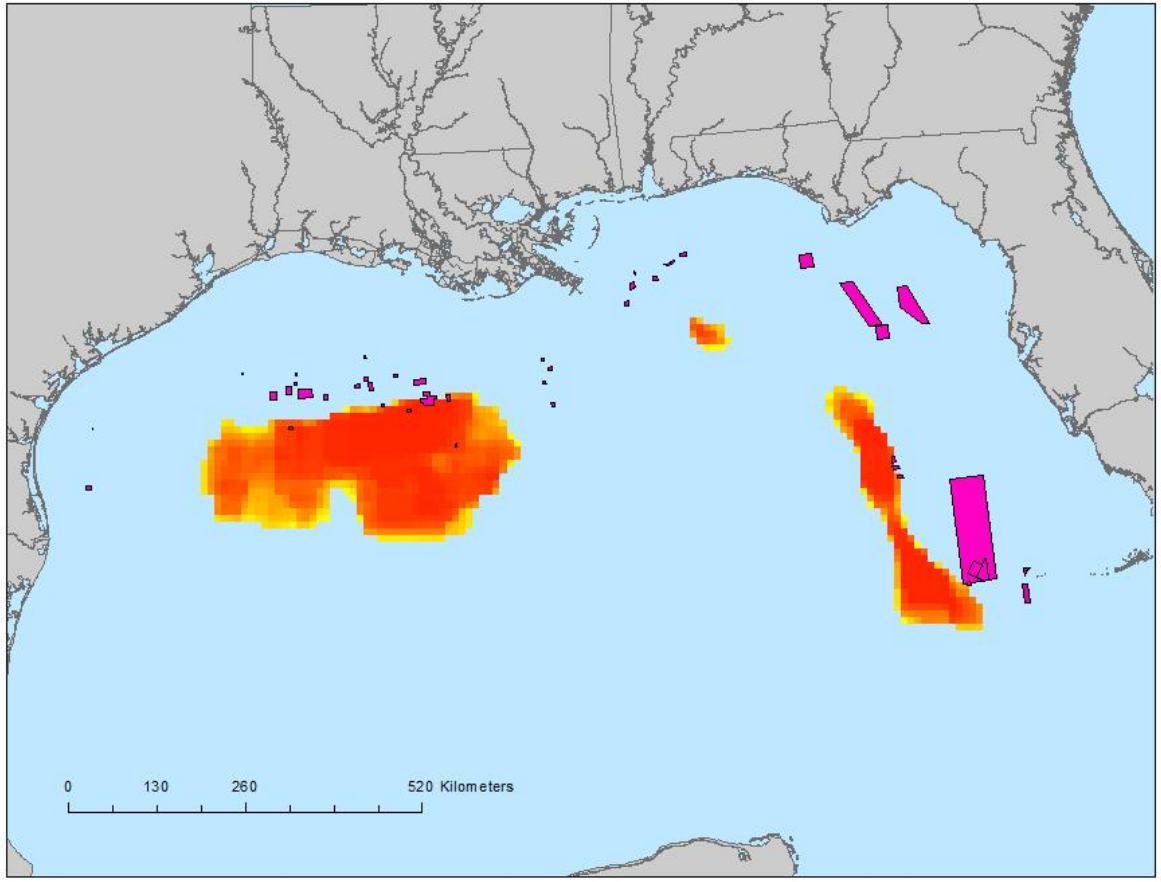
10 km^2 grid, 10% conservation target



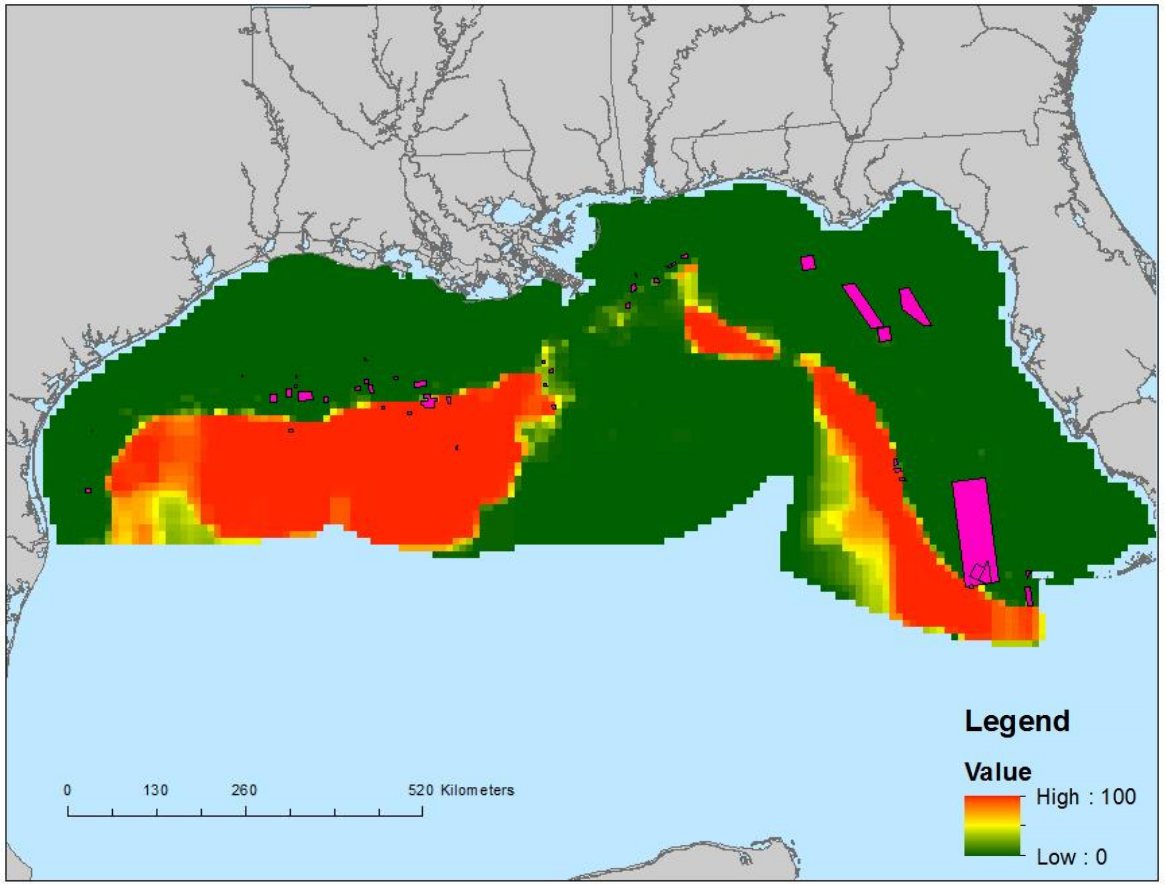


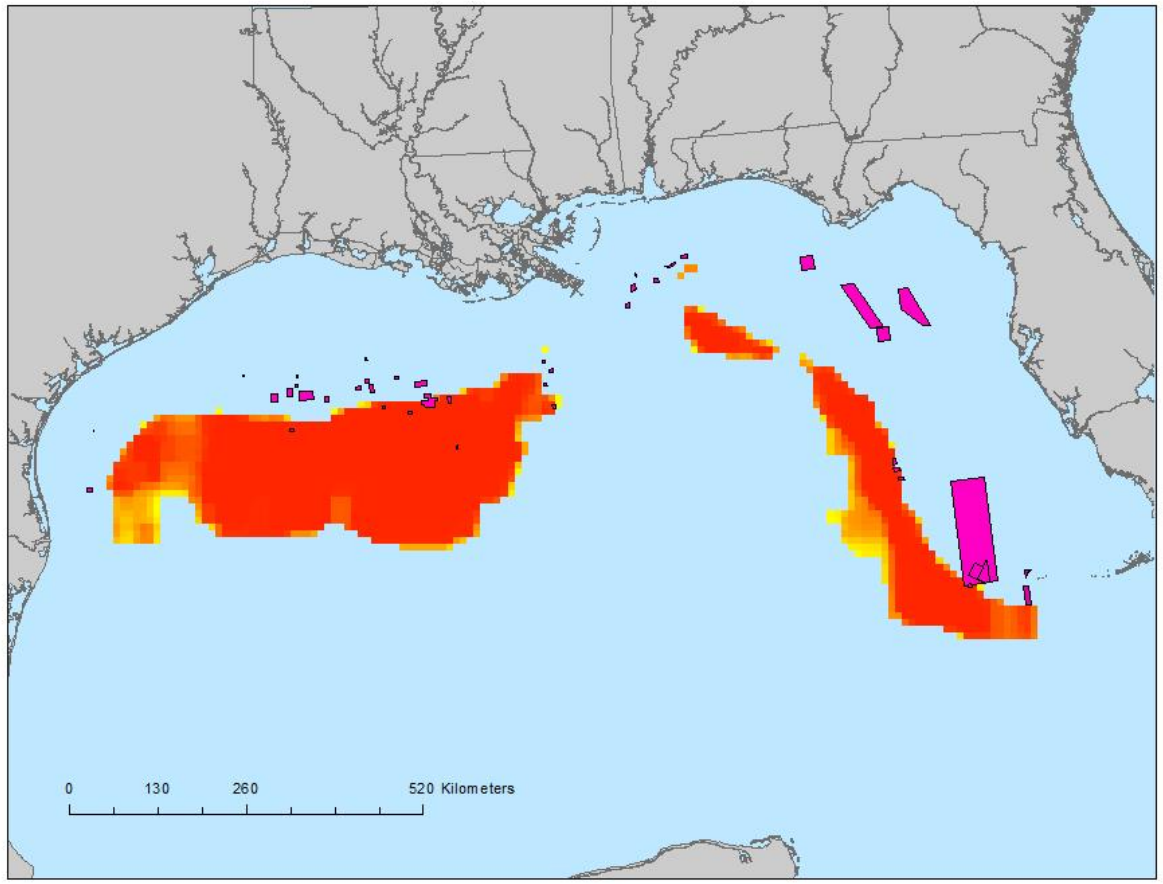
10 km^2 grid, 20% conservation target





10 km^2 grid, 30% conservation target



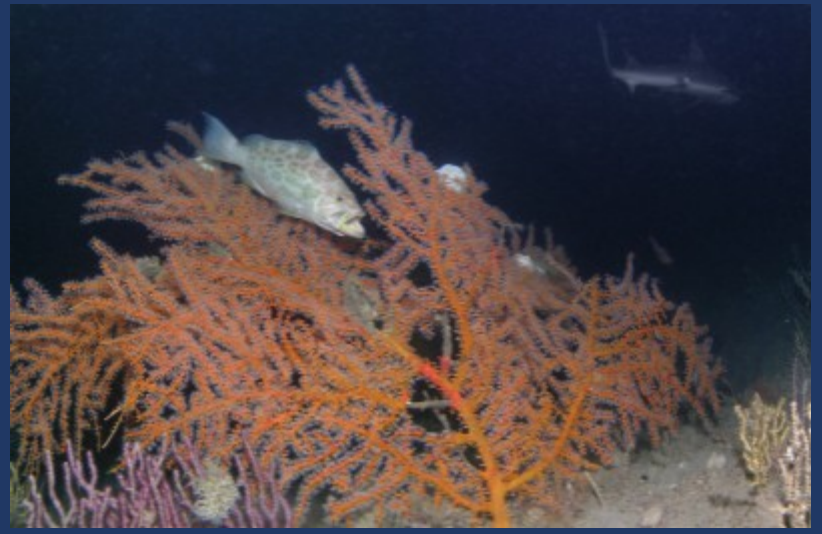


Conclusions

- Not prescriptive management advice
- MSE requires:
  - Identifying clear objectives
  - Conversation about prioritization
  - Critical consideration of available data
- Provides prioritization for research efforts

Questions:

- Is this approach suitable for management advice?
- Should other inputs be considered?



Questions

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