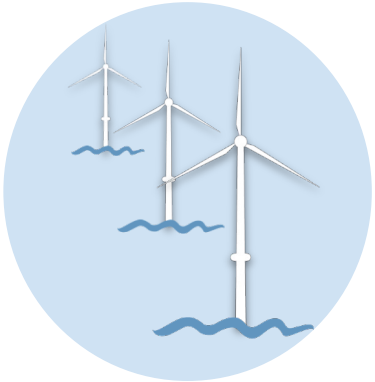
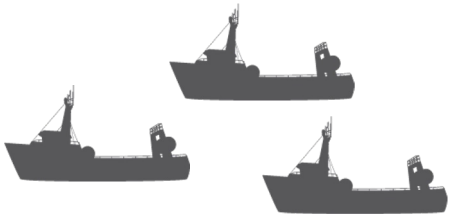
Representing Fisheries Footprints in a Suitability Model for Offshore Wind Energy Planning





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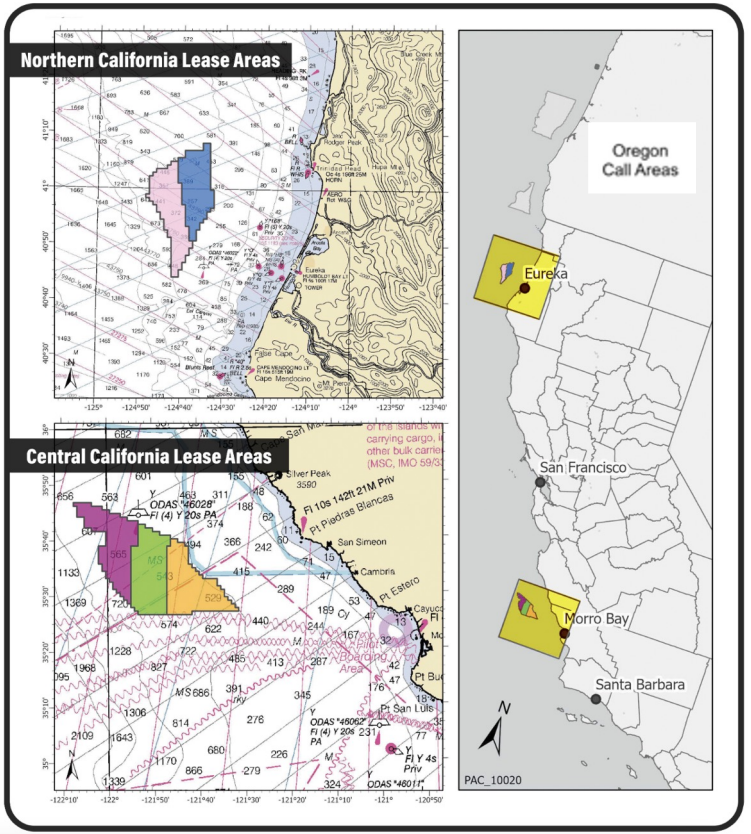
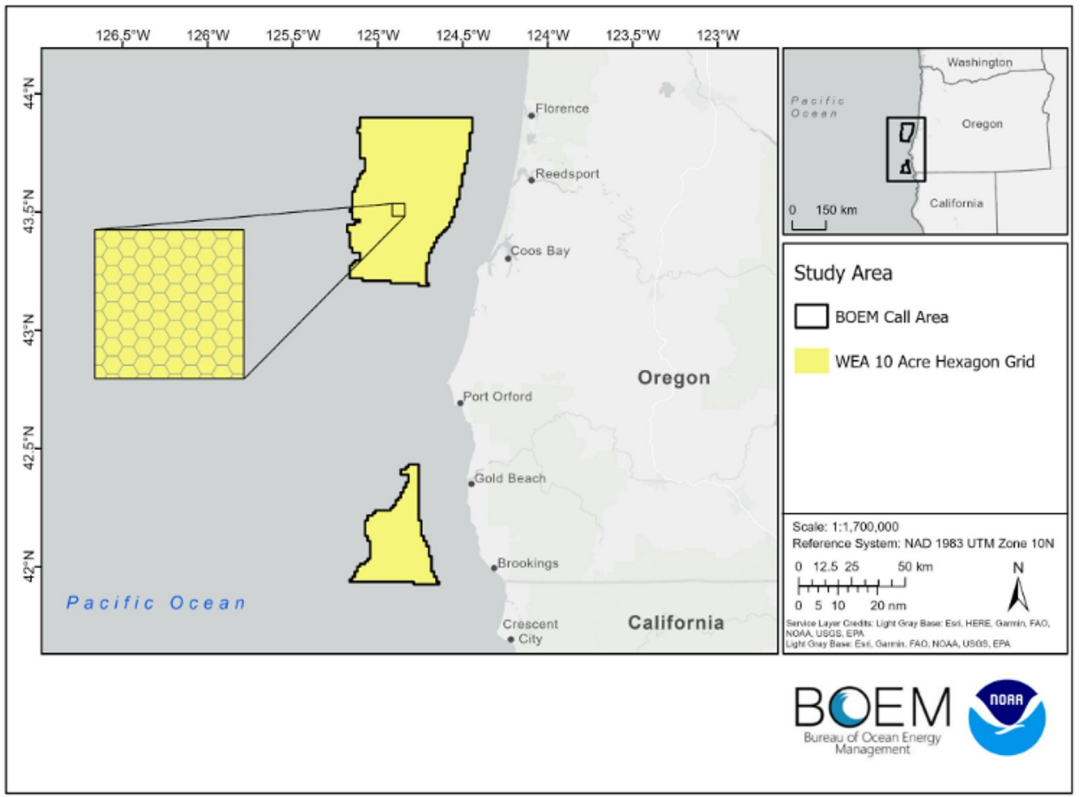
World Fisheries Congress March 2024

Offshore wind energy development on U.S. West Coast

- OWE areas identified in California and Oregon by BOEM
- Planning efforts have considered conflicts with other ocean users and environmental resources
- BOEM is using a suitability model (NOAA NCCOS) for recent efforts in Oregon and other regions of the U.S.



Suitability model for Call Areas off Oregon:

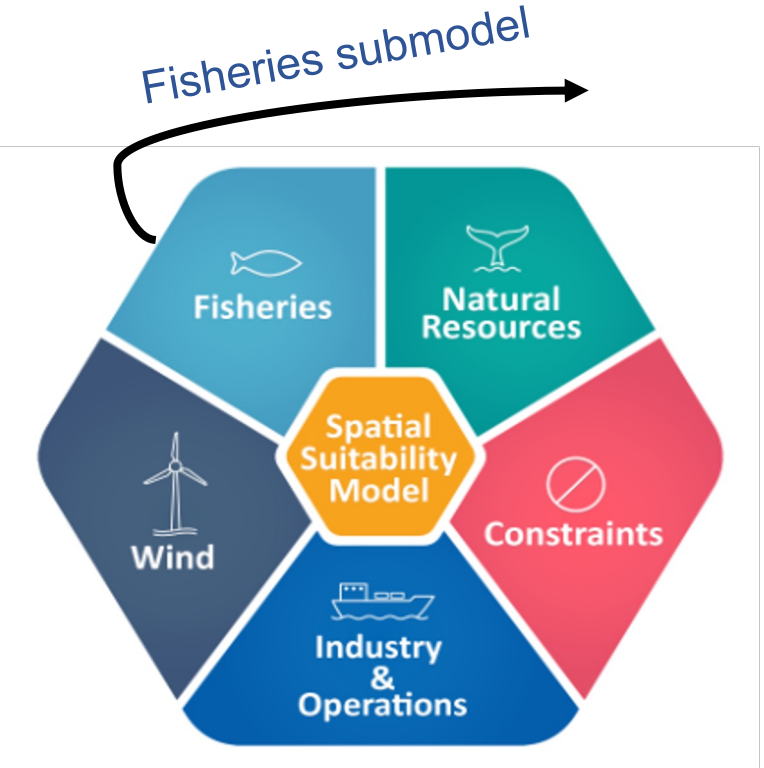


Submodels

Suitability model for Call Areas off Oregon:

- Data that describes the spatial importance of each grid cell for each submodel
- Each data layer scored/summarized/ standardized by subject matter experts
- Geometric mean calculated for each grid cell across all data layers within each submodel
- Final suitability score was calculated for each grid cell using the geometric mean across all submodels

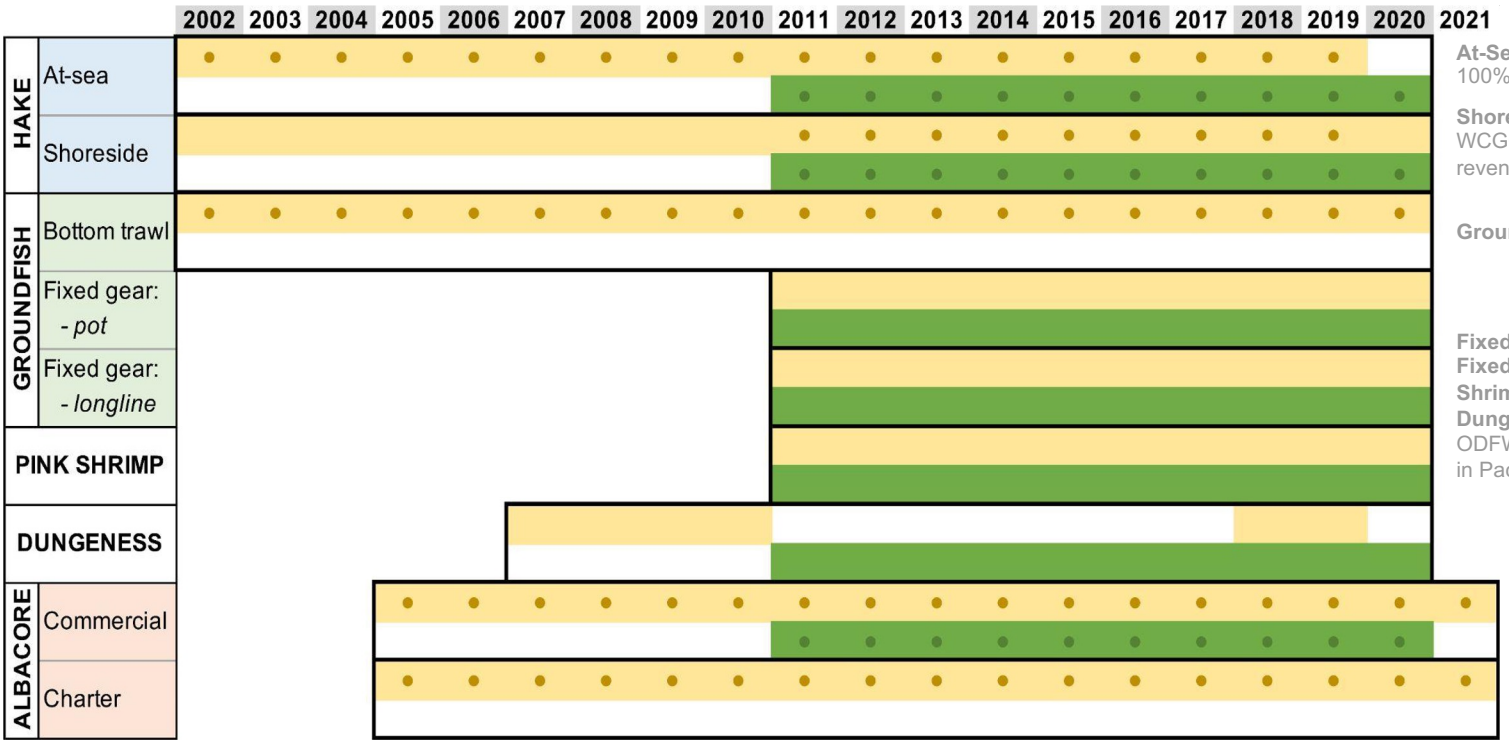
Identify potential conflicts between OWE areas and West Coast fisheries



- We were asked to provide data for the Fisheries Submodel
- NMFS and ODFW worked together to determine what data could best represent the space used by West Coast fisheries
  - What metrics?
  - What fisheries?
  - What years of data?

Sectors and Years Analyzed (sum over all years)

ASHOP = At-sea hake Observer Program
WCGOP = West Coast Groundfish Observer Program



At-Sea: ASHOP & PacFIN for revenue (nearly 100% coverage)

Shoreside: OR and PacFIN logbook for effort; WCGOP & ODFW Fish Tickets in PacFIN for revenue

Groundfish BT: logbook data from PacFIN

Fixed gear pot,
Fixed gear longline,
Shrimp,
Dungeness Crab:
ODFW State logbooks & ODFW Fish Tickets in PacFIN for revenue

Albacore Commercial and Charter: Federal logbooks & ODFW Fish Tickets in PacFIN for revenue

● ● Includes catch landed at all ports on the west coast; otherwise only catch landed at OR ports included.

Effort: fishing coordinates, duration fished & amount of fixed gear from state or federal logbooks or ASHOP

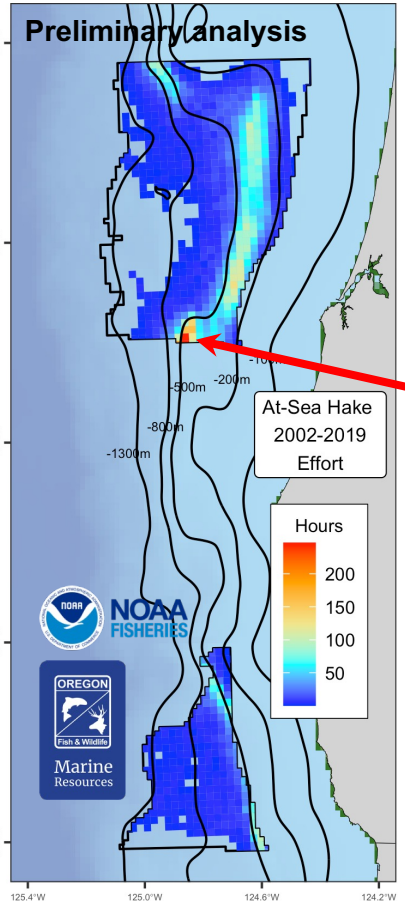
Revenue: state or federal logbooks or WCGOP or ASHOP data matched to PacFIN fish ticket database

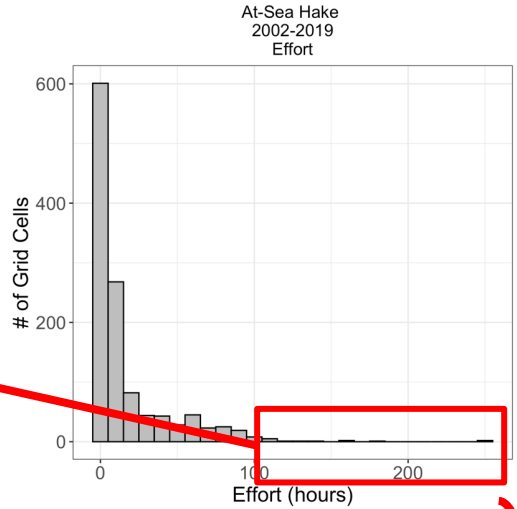
NOAA FISHERIES

OREGON Fish & Wildlife Marine Resources

Sept 30, 2022

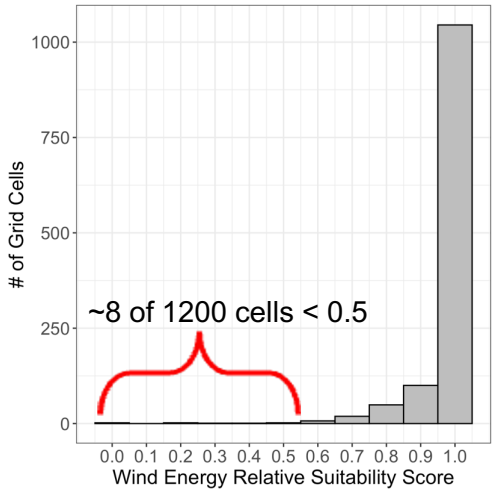
Will the distribution of raw data be problematic?



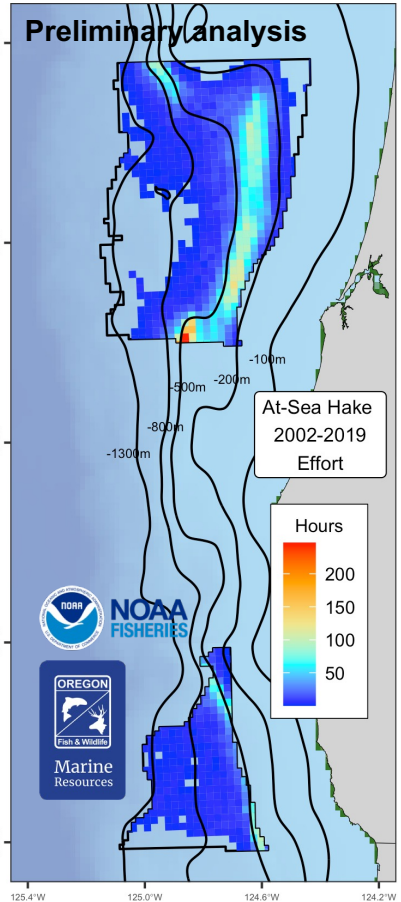


These very few, really high values **de-emphasize** the amount of space used by the fishery…

Transformed to Suitability Scores in the suitability model



Will the distribution of raw data be problematic?



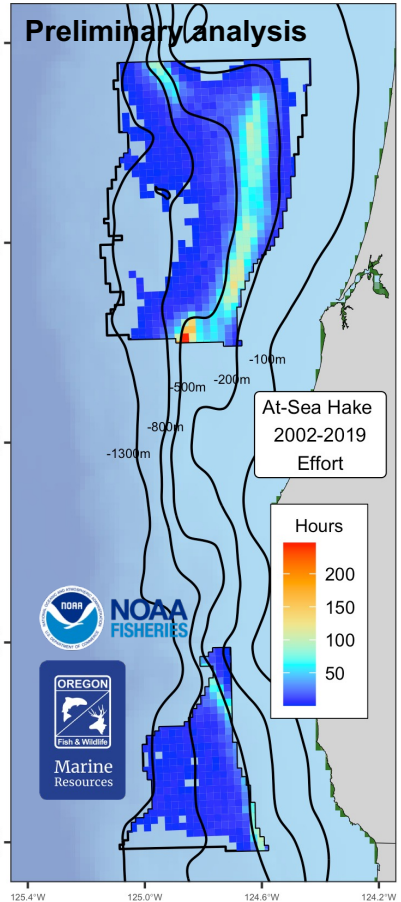
- Are we asking the best question?

"How much fishing is associated with a specific location?"

Or:

"What are next-best locations to fish and earn income if good locations become off-limits?"

Will the distribution of raw data be problematic?



- Are we asking the best question?

  "How much fishing is associated with a specific location?"

  Or:

  "What are next-best locations to fish and earn income if good locations become off-limits?"

- With this second question in mind, we decided to **rank transform** the raw effort and revenue data

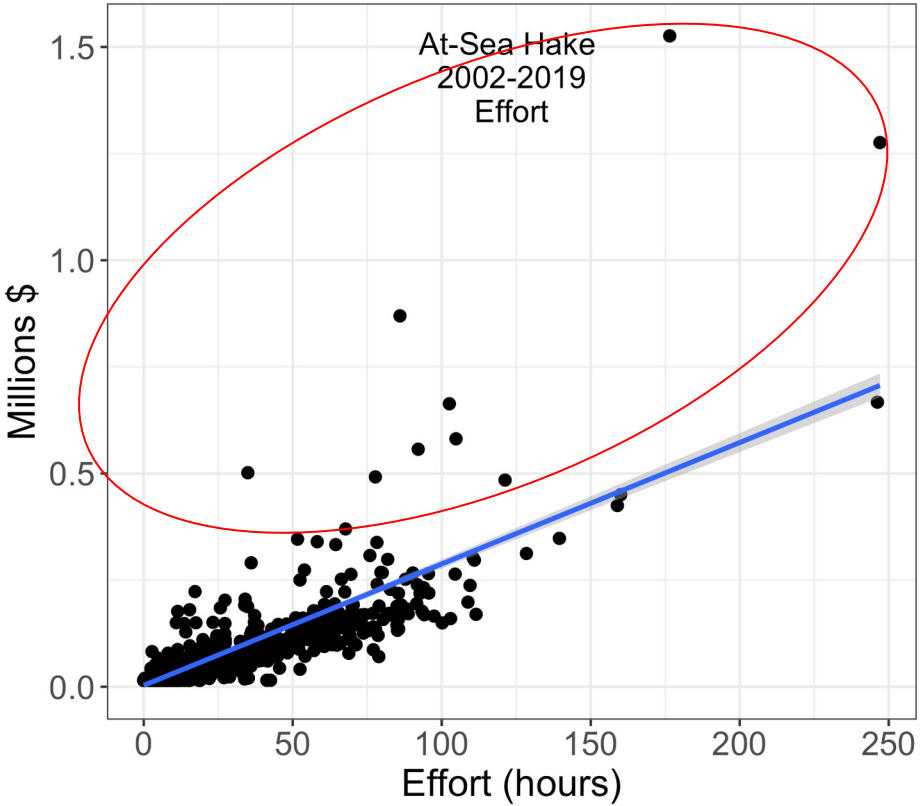
How to capture the most important fishery characteristic?

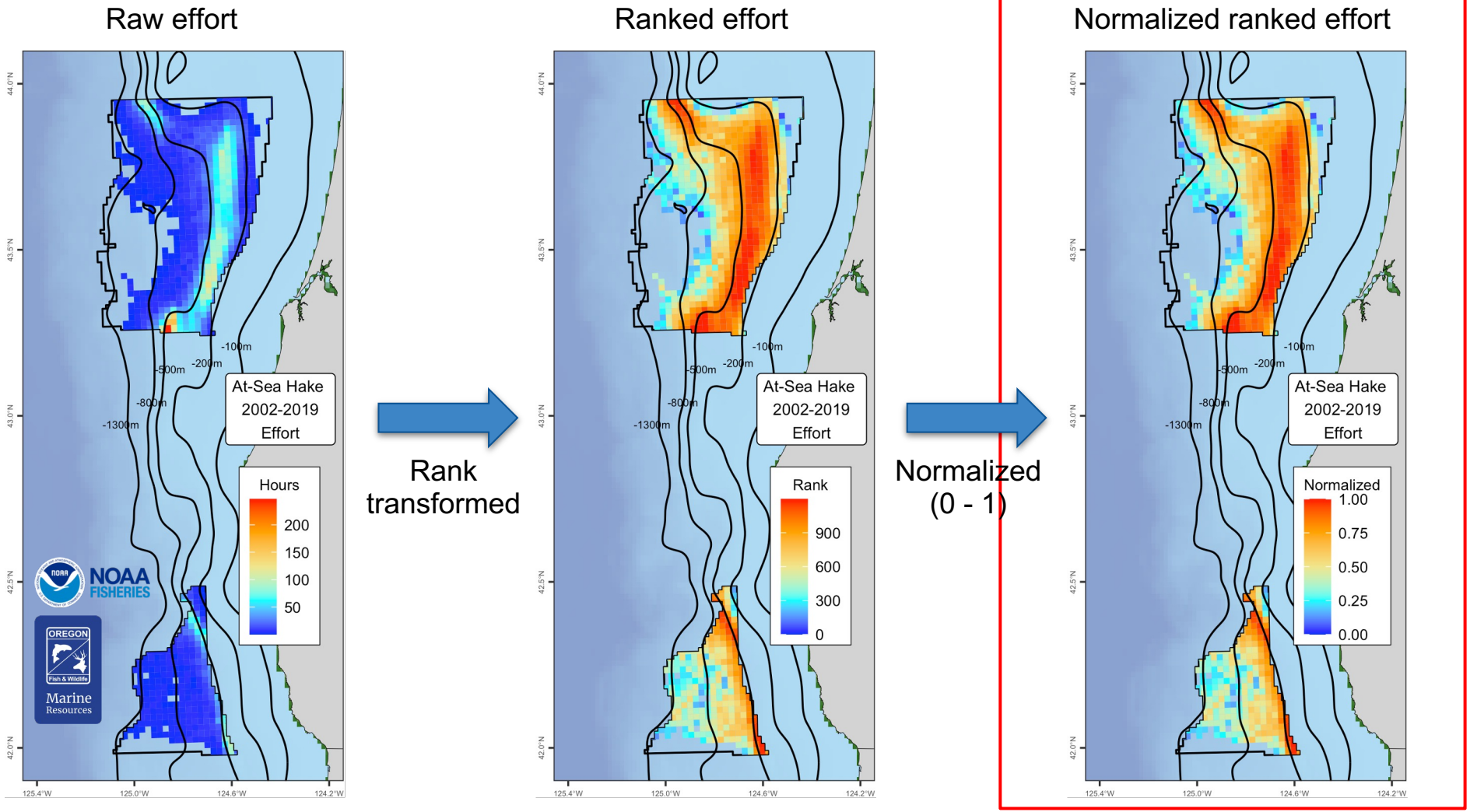
Considerations

- Effort? Revenue? Both metrics?
- Datasets are generally correlated, but…

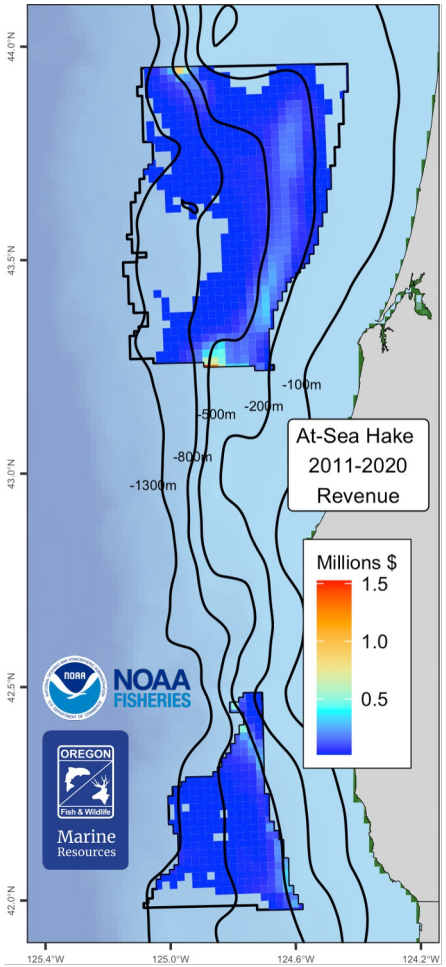
Decision

- Calculate a single combined metric
  - Normalize each ranked metric between 0 and 1
  - Select highest normalized value between effort and revenue



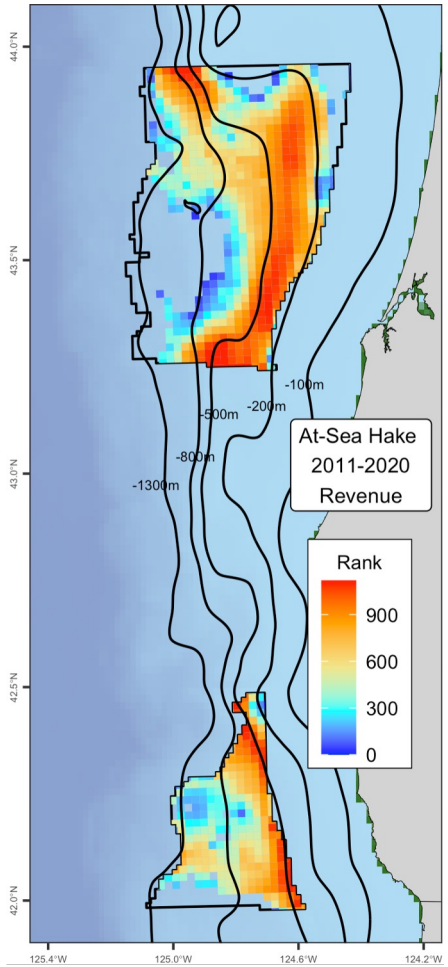

Raw effort
Ranked effort
Normalized ranked effort
Rank transformed
Normalized (0 - 1)
At-Sea Hake 2002-2019 Effort
Hours
200
150
100
50
Rank
900
600
300
0
Normalized
1.00
0.75
0.50
0.25
0.00
-100m
-200m
-500m
-800m
-1300m
44.0°N
43.5°N
43.0°N
42.5°N
42.0°N
125.4°W
125.0°W
124.6°W
124.2°W
NOAA FISHERIES
OREGON
Fish & Wildlife
Marine Resources

Raw revenue



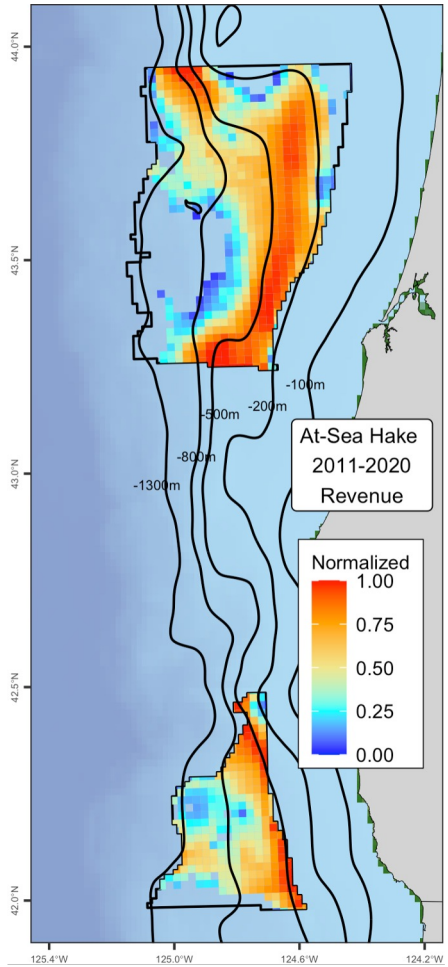
Rank transformed

Ranked revenue

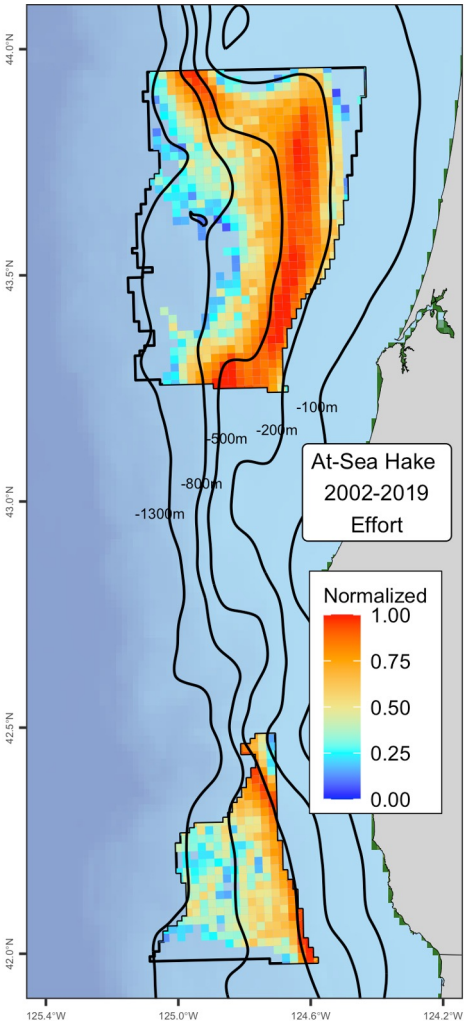


Normalized (0 - 1)

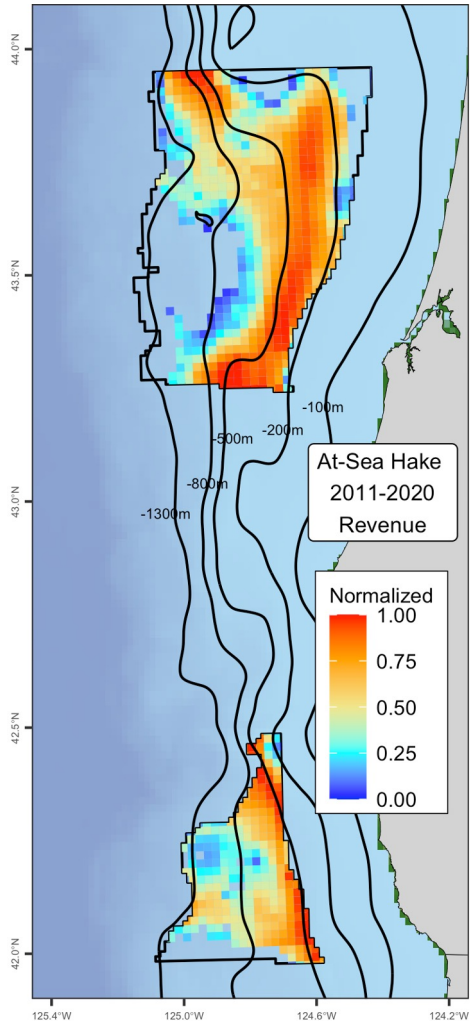
Normalized ranked revenue



Normalized ranked effort

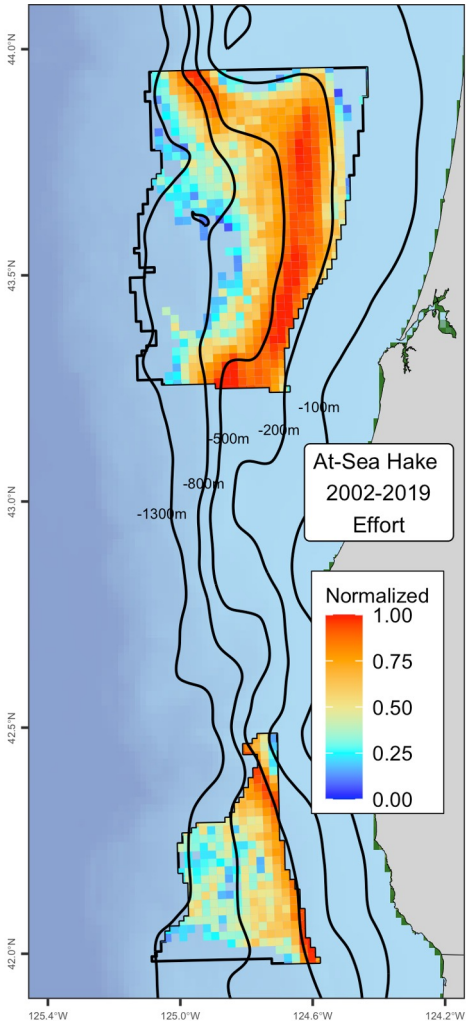


Normalized ranked revenue

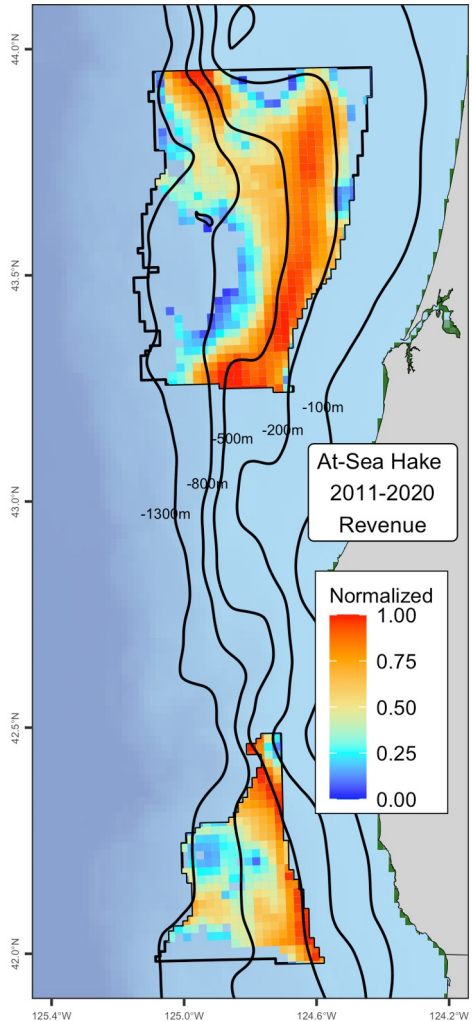


Select highest value from effort or revenue layer

Normalized ranked effort

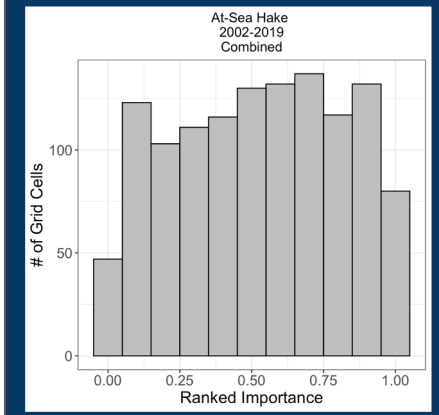


Normalized ranked revenue

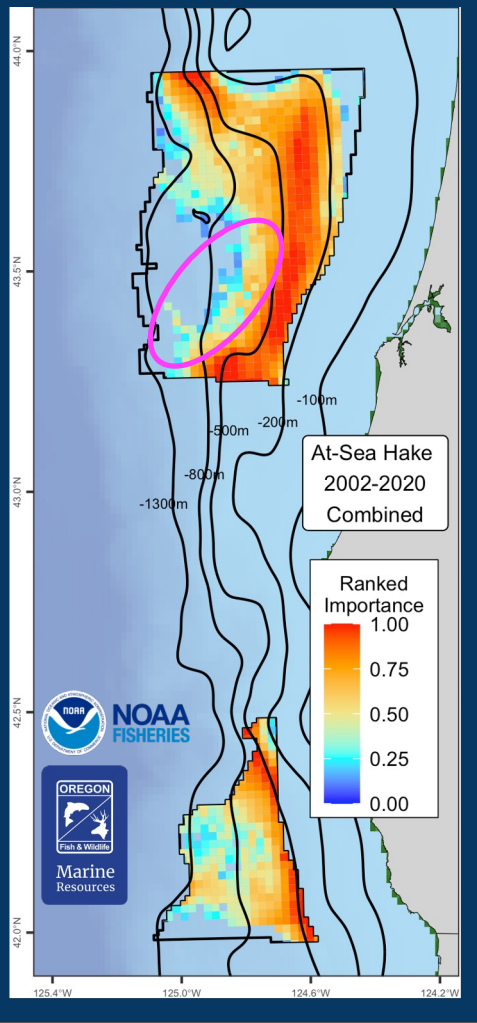


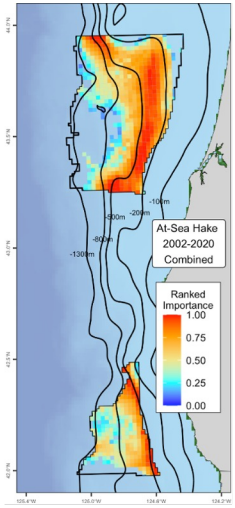
Select highest value from effort or revenue layer

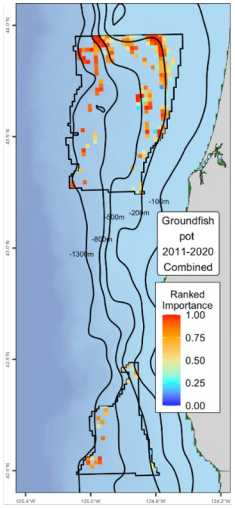
Data we provided to BOEM/NCCOS:

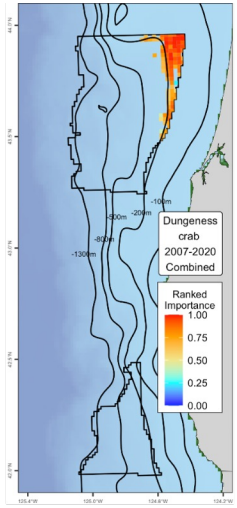


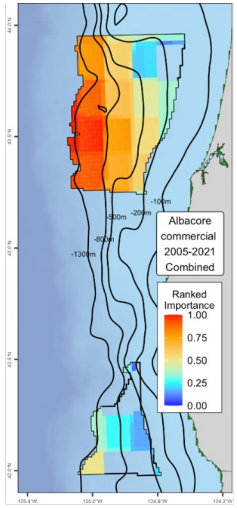
Combined effort & revenue

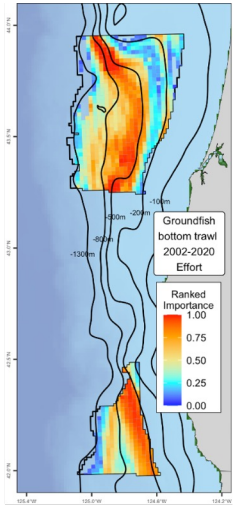


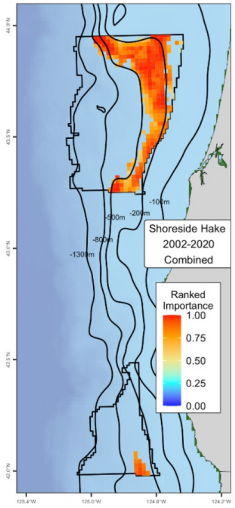


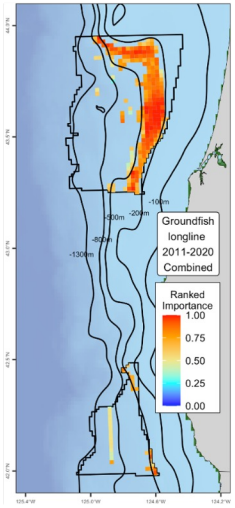


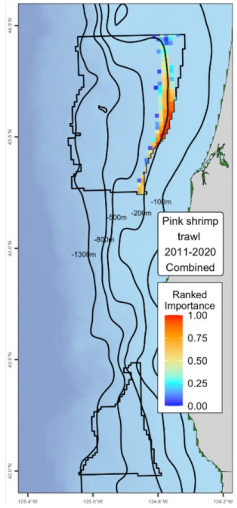


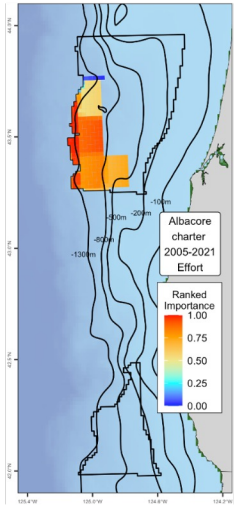












Combine and calculate suitability score across all nine fisheries

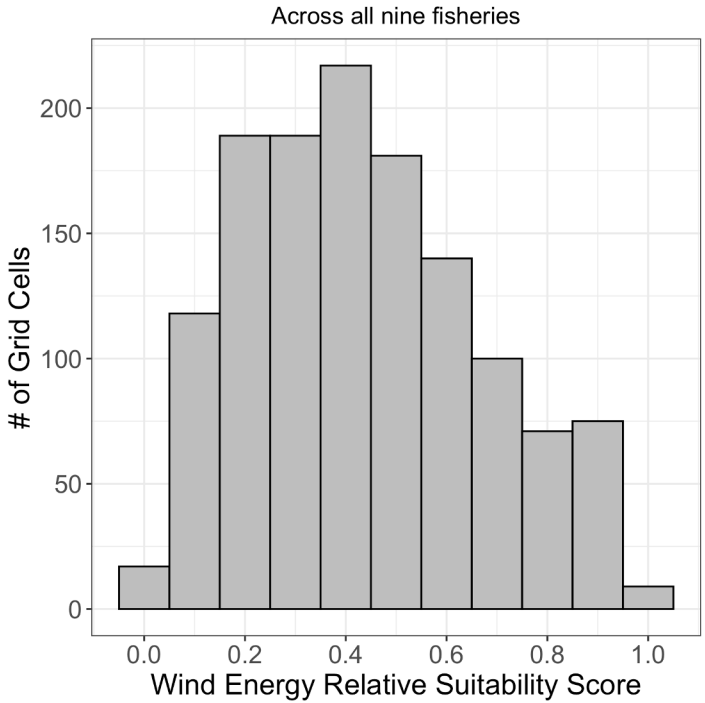
Geometric mean:

$$Suitability\ score = \sqrt[9]{ASH * SSH * GFP * GFL * CRAB * PS * ALCO * ALCH * GFBT}$$

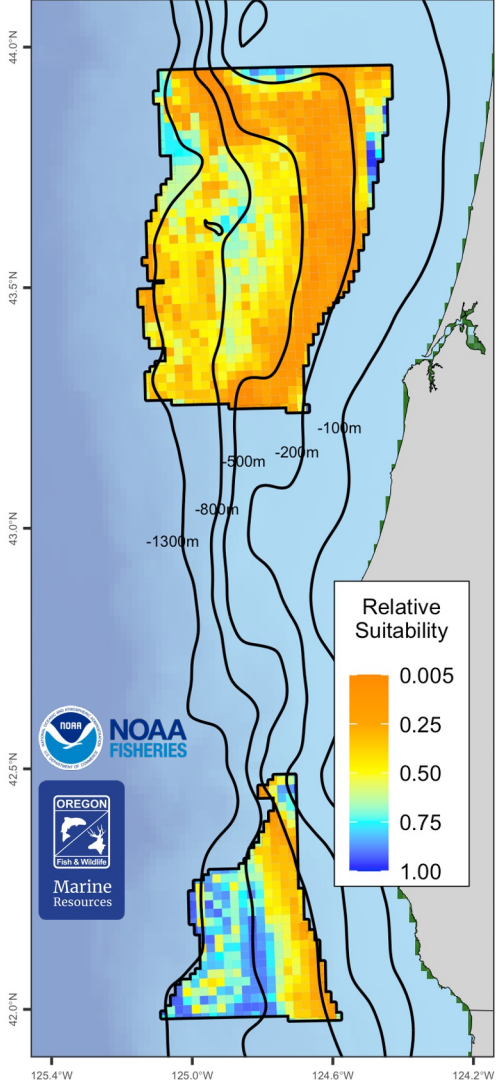
*many low 'Importance' blue grid cells can not be shown due to confidentiality rules

Combined fisheries submodel using Ranked Importance

More overlap with fisheries



Less overlap with fisheries



Less suitable to OWE ⟷ More suitable to OWE

Application of fisheries footprints

- BOEM used these fisheries data, in addition to spatial data across all other submodels

- Final Wind Energy Areas off the coast of southern Oregon largely avoided the most broadly-important locations for these nine fisheries.

QUESTIONS?