Selection of wave energy sites in Southern Oregon's Territorial Sea

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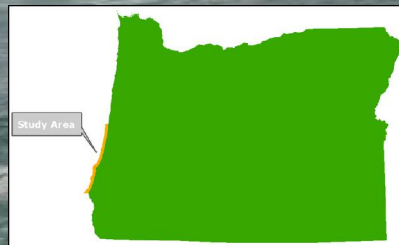# Wave Energy in Oregon

- Goal: 500 megawatts by 2025 (OWET) (enough power for 200,000 homes)

- Conflicting uses

- Most suitable areas

- Site selection via GIS analysis

Research Question

- What areas are most suitable for wave energy sites in Oregon?

Study Area:
Southern Oregon
Territorial Sea (3 miles)
Heceta Head to Cape
Blanco

Literature

- Nobre et al. (2009)
  - Framework

- Electric Power Research Institute (EPRI)
  - Wave Energy Conversion Project
  - Oregon Site Assessment (2004)
  - Personal Communication

Restrictions (exclusionary factors)

- Underwater cables
  - 500 meter buffer (Nobre et al. 2009)
- Depth
  - Between 30 and 200 meters (Nobre et al. 2009)
- Navigation channels and harbor entrances
- Three miles (territorial sea)
- Marine gardens/protected areas

Weighted factors

- Wave Climatology
  - Wave height, wave period, wave power

- Sea bottom
  - Rock, mud, sand, gravel, shell

- Distance to port cities

Gathering Wave Data

- Buoy data collected from: the National Data Buoy Center and the Coastal Data Information Program

Calculations:

- Mean significant wave heights (Hs) and mean peak wave periods (Tp) were averaged for all active years for each buoy

- Mean wave power (kW/m) was calculated using the formula: $P = 0.42 \times Hs^2 \times Tp$

- Simplified formula from EPRI literature
  - Adequate for initial assessments

Creating a Buoy Shapefile

Number	ID	Name	Source	Latitude	Longitude	Mean_Hs	Mean_Tp	Mean_Power
1	00037	COQUILLE RIVER INNER, OR	CDIP	43.11333500	-124.51333600	2.04	10.46	18.36
2	00053	UMPQUA RIVER, OR	CDIP	43.67666600	-124.23833500	1.94	9.73	15.29
3	00064	SIUSLAW, OR	CDIP	44.01499900	-124.24166900	2.79	11.40	37.19
4	00126	COOS BAY, OR	CDIP	43.39704900	-124.65011600	2.70	12.20	37.35
5	00135	COOS BAY NORTH, OR	CDIP	43.61821700	-124.55836500	2.05	11.04	19.49
6	00137	COQUILLE RIVER OUTER, OR	CDIP	43.20833200	-124.70333100	2.44	9.93	24.76
7	00139	UMPQUA OFFSHORE, OR	CDIP	43.76667000	-124.55085000	2.56	11.35	31.29
8	00035	COQUILLE RIVER, OR	CDIP	43.12333300	-124.44000200	2.16	10.91	21.34
9	46015	PORT ORFORD, OR	NDBC	42.74700000	-124.82300000	2.45	7.18	18.15
10	46027	CRESCENT CITY, CA	NCBC	41.85000000	-124.38100000	2.30	7.17	15.91

- Add Excel spreadsheet to ArcMap
- Display XY data
- Export as a shapefile

Methods: Using Constraints to Define The Study Area

1. Potential Study Area.

2. The SA was split by the 30 m bathymetric contour. All marine protected areas were near the coastline, within the 30 m depth range.

3. Tow Lane areas were then removed.

4. A buffered Cable Area was Removed
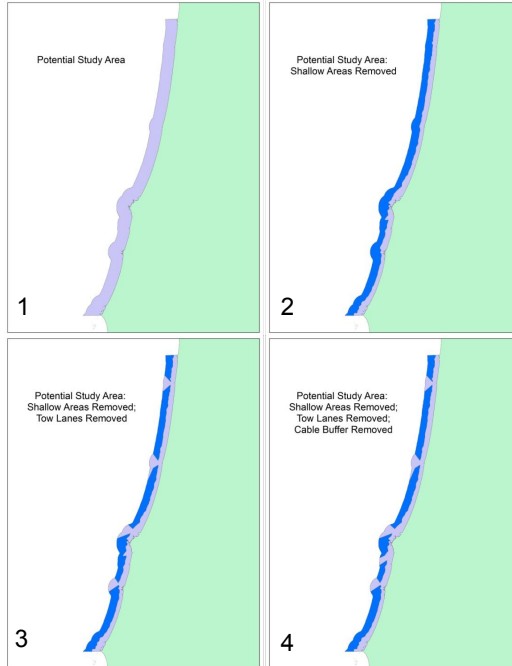
Methods: Creating Suitability Rasters

1. Distance from Port City: Euclidean distance was used with a 20 mile limit and Reclassified into 10 classes (2 mile bands)

2. Extracted to study region

3. Sea Bottom Type: Existing raster was reclassified. Rocks/Shell = 1; Gravel = 5; Sand/Mud = 10.
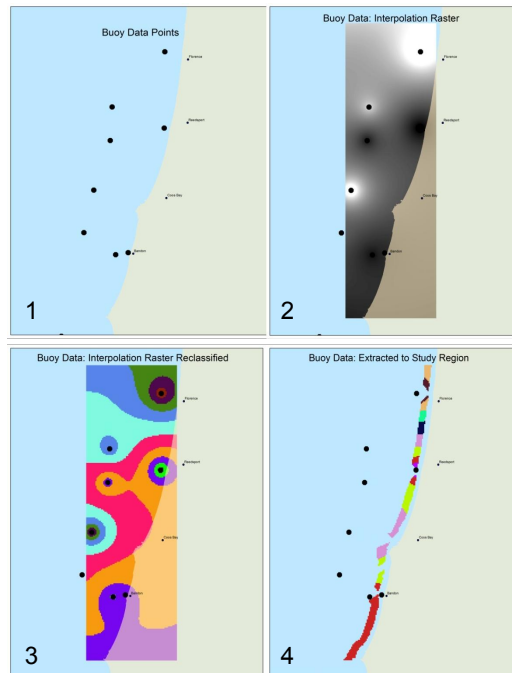
   (Waveplam: Wave Energy Planning and Marketing)
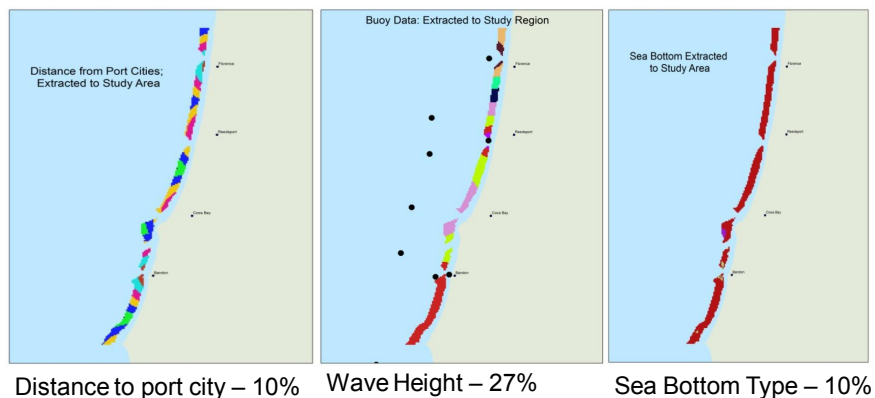
4. Extracted to study region
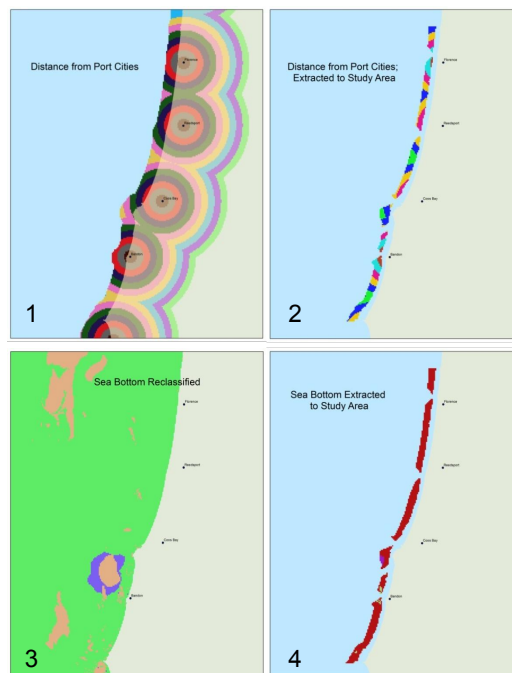
Methods: Creating Suitability Rasters
Wave Layers (Height, Frequency, Power)

1. Buoy Data Points

2. Interpolation using Inverse Distance Weighting – export to raster

3. Reclassified into 10 classes

4. Extrapolated and extracted to study region
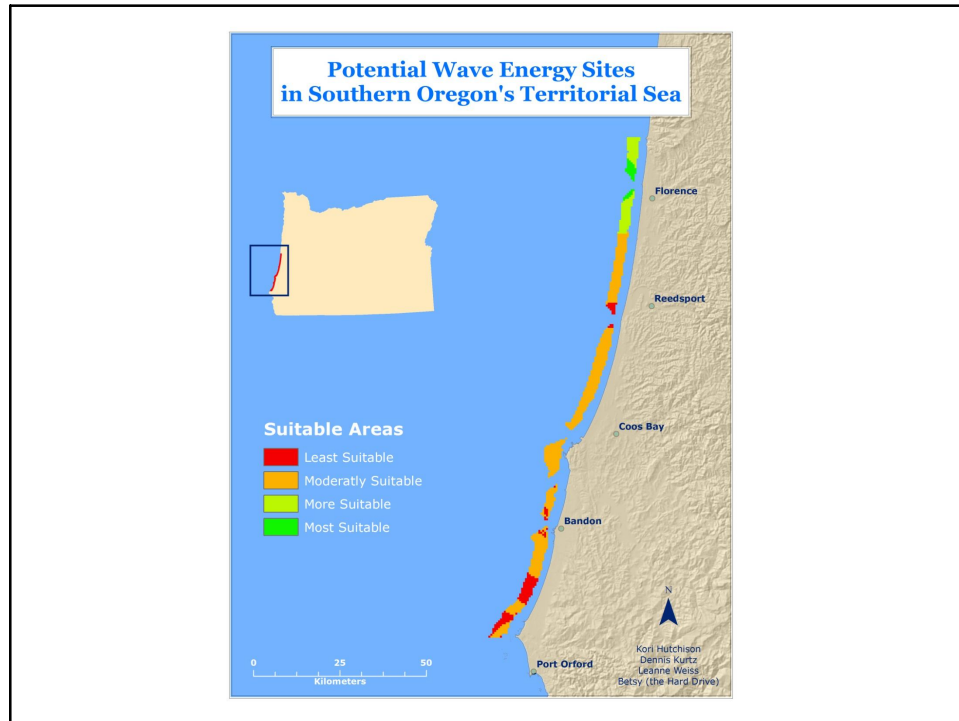

Weighted Overlay: 2 to 10 by 2

Distance to port city – 10%   Wave Height – 27%   Sea Bottom Type – 10%

Wave Frequency – 27%

Wave Power – 26%

Potential Wave Energy Sites in Southern Oregon's Territorial Sea

Suitable Areas
- Least Suitable
- Moderatly Suitable
- More Suitable
- Most Suitable

Florence

Reedsport

Coos Bay

Bandon

Port Orford

Kori Hutchison
Dennis Kurtz
Leanne Weiss
Betsy (the Hard Drive)

0   25   50
Kilometers

Limitations of study

- Lack of literature with specific guidelines

  – Most dependent on device type

    • Scoring System

    • Weighting Schemes

- Interpolation
  – 10 points
  – 5,000 square miles
- Electrical Grid
- Land