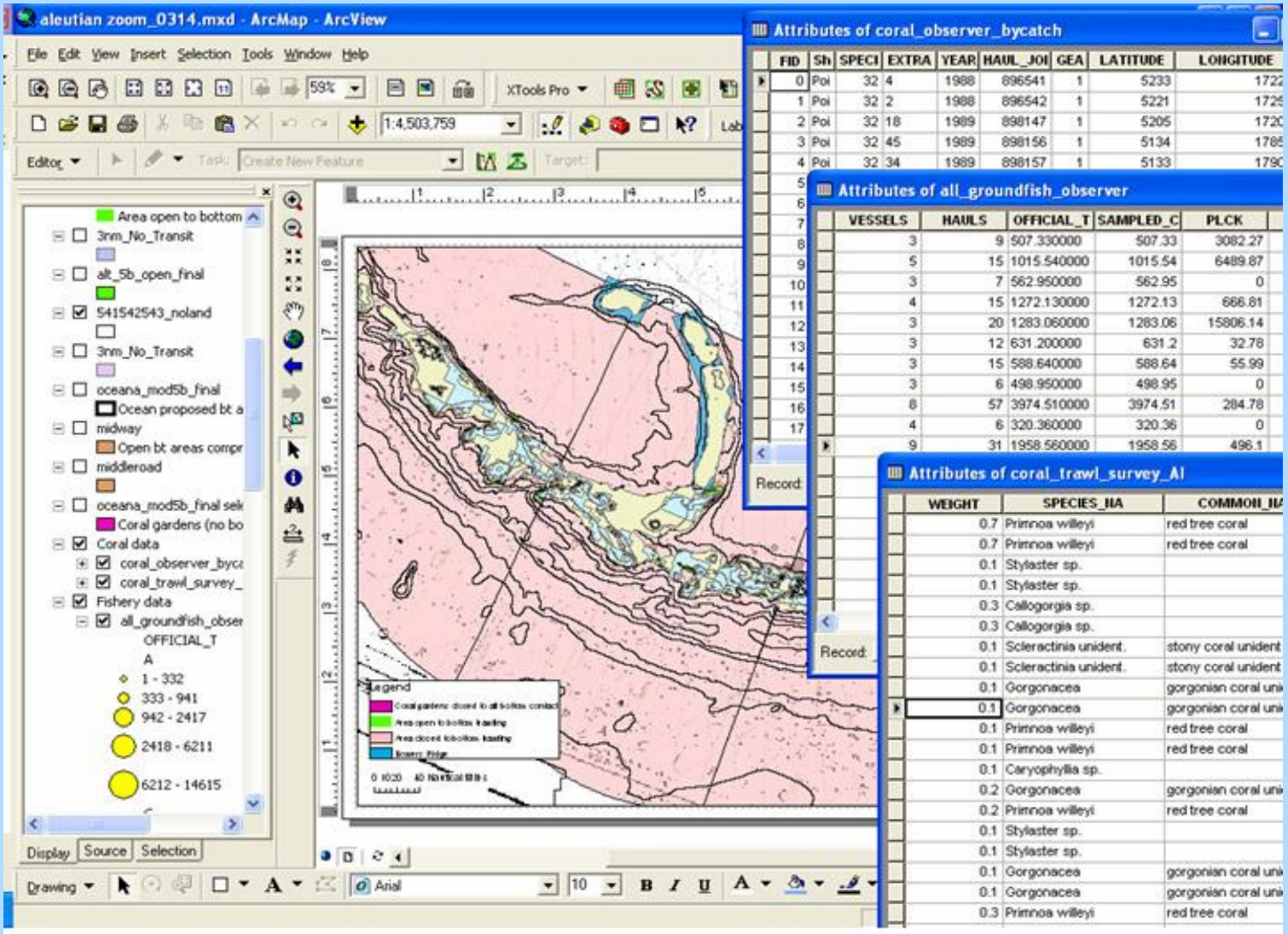
Hiding within these mounds of data is knowledge


aleutian zoom_0314.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Area open to bottom
3nm_No_Transit
alt_5b_open_final
541542543_noland
3nm_No_Transit
oceana_mod5b_final
Ocean proposed bt a
midway
Open bt areas compr
middleroad
oceana_mod5b_final sel
Coral gardens (no bo
Coral data
coral_observer_byca
coral_trawl_survey_
Fishery data
all_groundfish_obser
OFFICIAL_T
A
1 - 332
333 - 941
942 - 2417
2418 - 6211
6212 - 14615
Display Source Selection
Drawing
Arial
Legend
Attributes of coral_observer_bycatch
FID Sh SPECI EXTRA YEAR HAUL_JOI GEA LATITUDE LONGITUDE
0 Poi 32 4 1988 896541 1 5233 1722
1 Poi 32 2 1988 896542 1 5221 1725
2 Poi 32 18 1989 898147 1 5205 1720
3 Poi 32 45 1989 898156 1 5134 1785
4 Poi 32 34 1989 898157 1 5133 1790
Record:
Attributes of all_groundfish_observer
VESSELS HAULS OFFICIAL_T SAMPLED_C PLCK
3 9 507.330000 507.33 3082.27
5 15 1015.540000 1015.54 6489.87
3 7 562.950000 562.95 0
4 15 1272.130000 1272.13 666.81
3 20 1283.060000 1283.06 15806.14
3 12 631.200000 631.2 32.78
3 15 588.640000 588.64 55.99
3 6 498.950000 498.95 0
8 57 3974.510000 3974.51 284.78
4 6 320.360000 320.36 0
9 31 1958.560000 1958.56 496.1
Record:
Attributes of coral_trawl_survey_AI
WEIGHT SPECIES_NA COMMON_NA
0.7 Primnoa willeyi red tree coral
0.7 Primnoa willeyi red tree coral
0.1 Stylaster sp.
0.1 Stylaster sp.
0.3 Callogorgia sp.
0.3 Callogorgia sp.
0.1 Scleractinia unident. stony coral unident
0.1 Scleractinia unident. stony coral unident
0.1 Gorgonacea gorgonian coral uni
0.1 Gorgonacea gorgonian coral uni
0.1 Primnoa willeyi red tree coral
0.1 Primnoa willeyi red tree coral
0.1 Caryophyllia sp.
0.2 Gorgonacea gorgonian coral uni
0.2 Primnoa willeyi red tree coral
0.1 Stylaster sp.
0.1 Stylaster sp.
0.1 Gorgonacea gorgonian coral uni
0.1 Gorgonacea gorgonian coral uni
0.3 Primnoa willeyi red tree coral

A Method for Identifying Important Ecological Areas in the Arctic

Jon Warrenchuk
Brianne Mecum
Molly Zaleski - Oceana

Jeff Short - JWS Consulting

OCEANA Protecting the World's Oceans

The Challenge

Climate Change

2018

2050

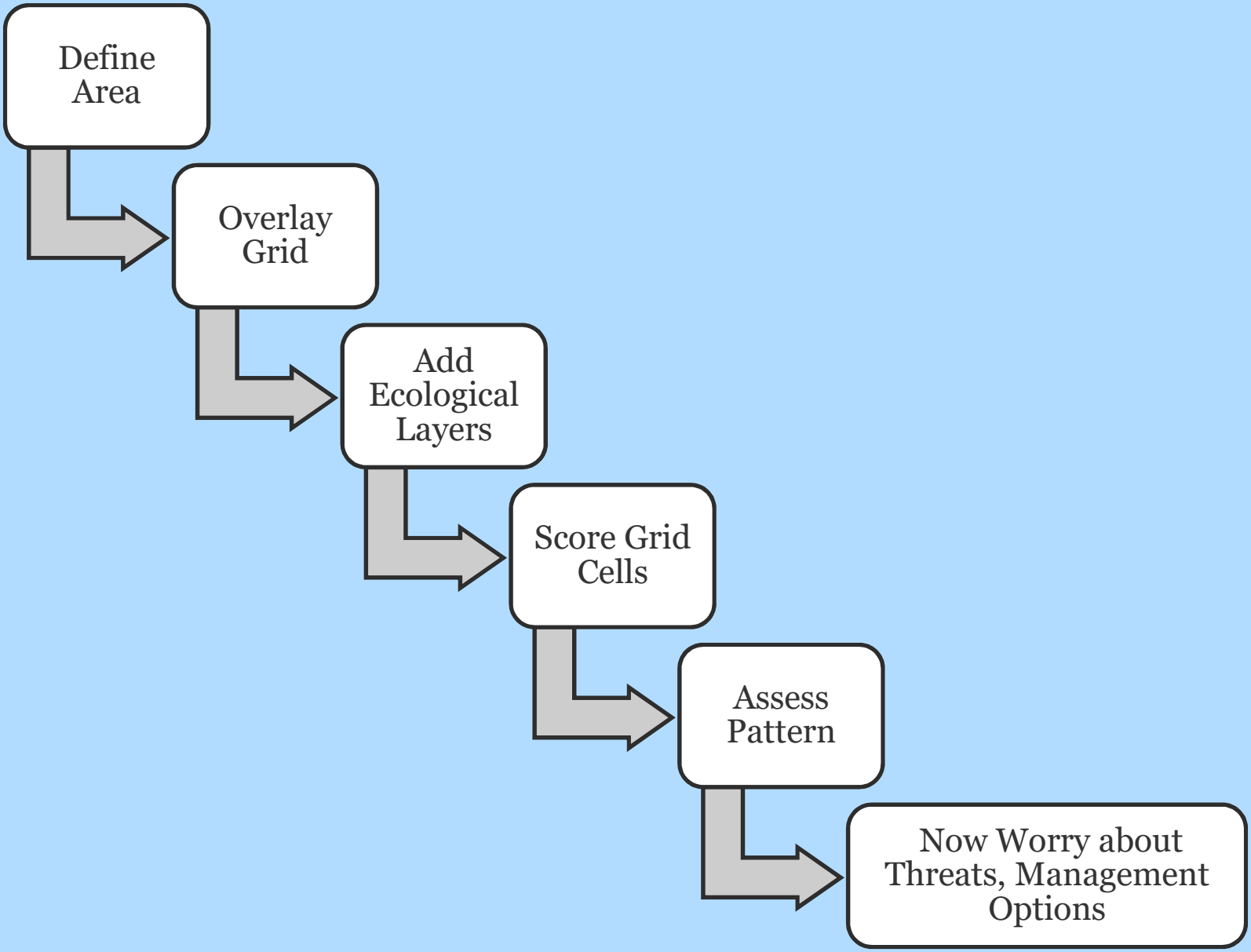
? ? ? ? ? ?

A Practical Approach for Marine Spatial Conservation is Urgently Needed

- Scientific consideration important…but equally so is policy context
- State assumptions clearly
- Results dependent on spatial scale
- Live with the data we have
- Identifying what's important is a negotiation

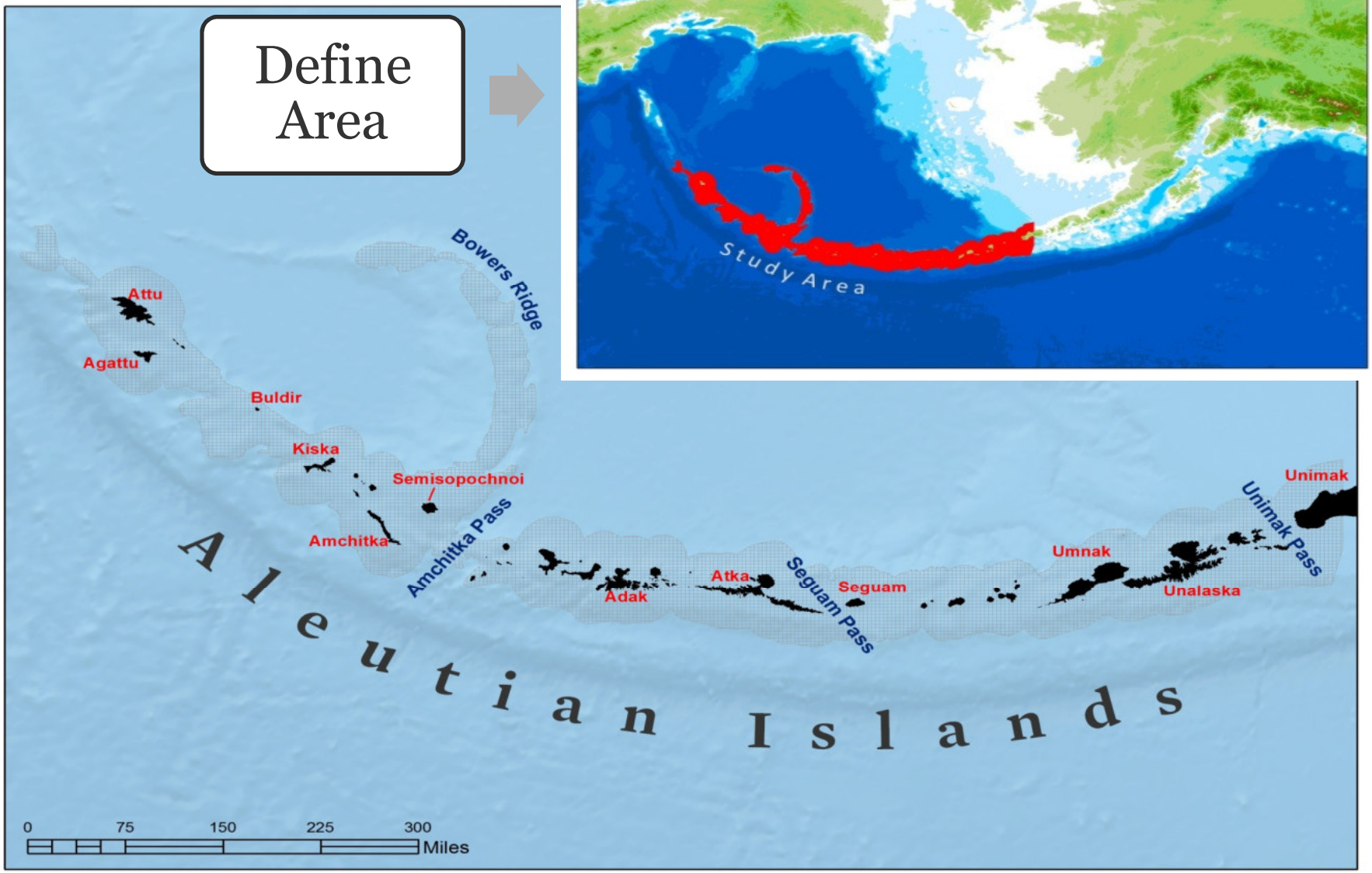
Important Ecological Areas

Geographically delineated areas which by themselves or in a network have distinguishing ecological characteristics, are important for maintaining habitat heterogeneity or the viability of a species, or contribute **disproportionately** to an ecosystem's health, including its productivity, biodiversity, function, structure, or resilience


Define Area
Overlay Grid
Add Ecological Layers
Score Grid Cells
Assess Pattern
Now Worry about Threats, Management Options

Define Area


Study Area

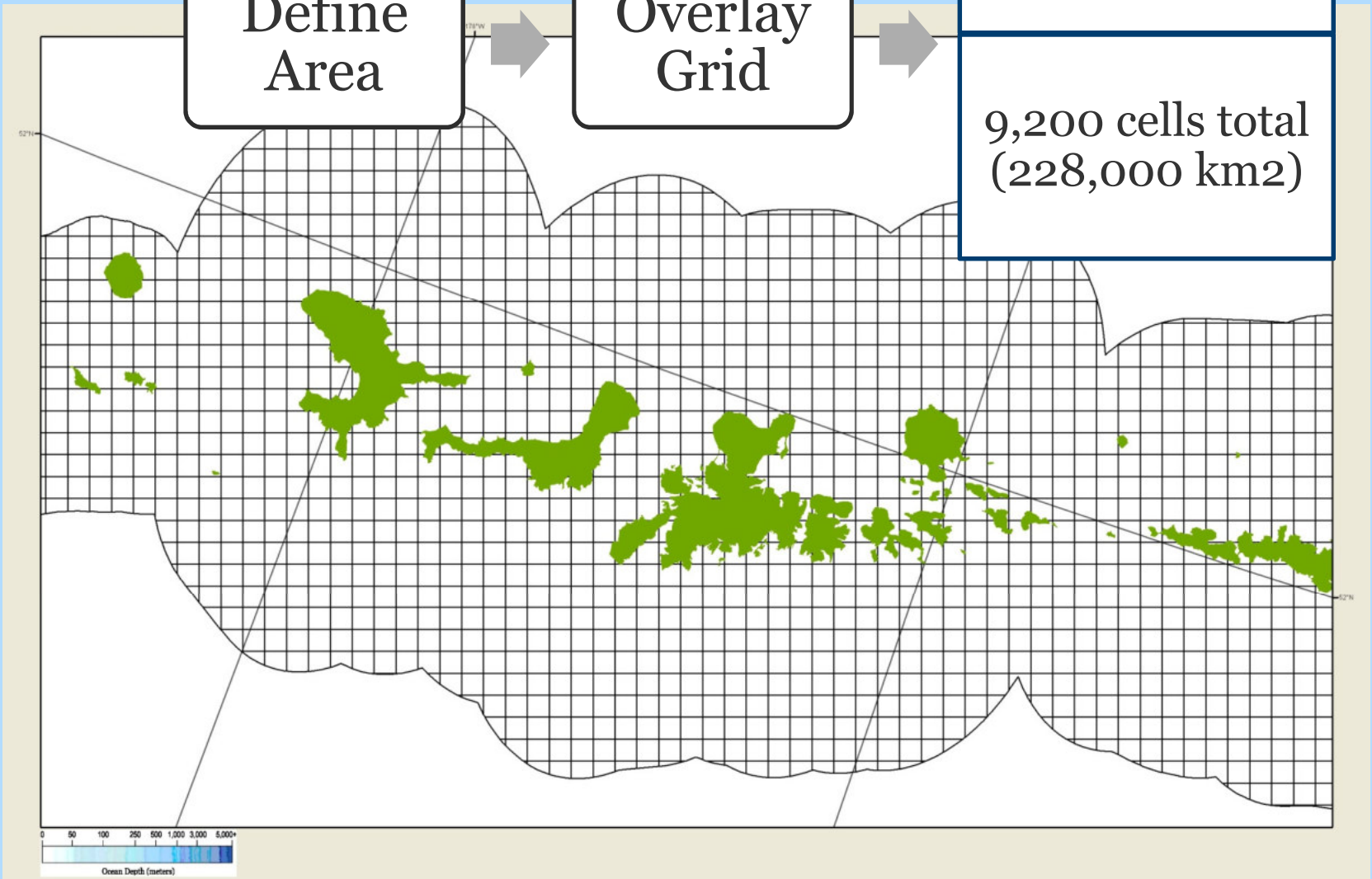

Bowers Ridge
Attu
Agattu
Buldir
Kiska
Semisopochnoi
Amchitka
Amchitka Pass
Adak
Atka
Seguam Pass
Seguam
Umnak
Unalaska
Unimak Pass
Unimak
Aleutian Islands
0
75
150
225
300
Miles

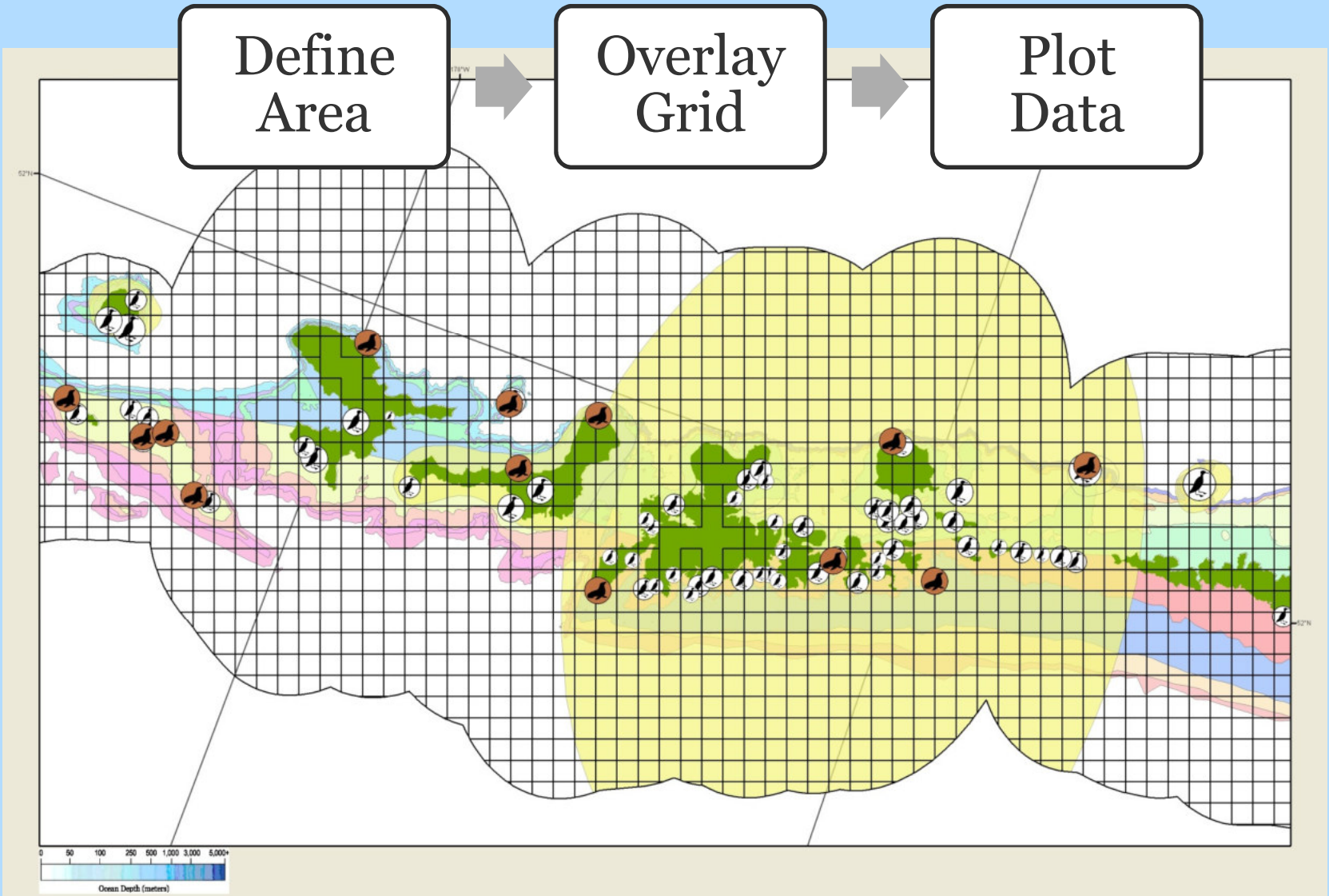
Define Area

Overlay Grid

5km X 5 km square grid cells

9,200 cells total (228,000 km2)




Define Area
Overlay Grid
Plot Data
0 50 100 250 500 1,000 3,000 5,000+
Ocean Depth (meters)

IEA Analytical Approach

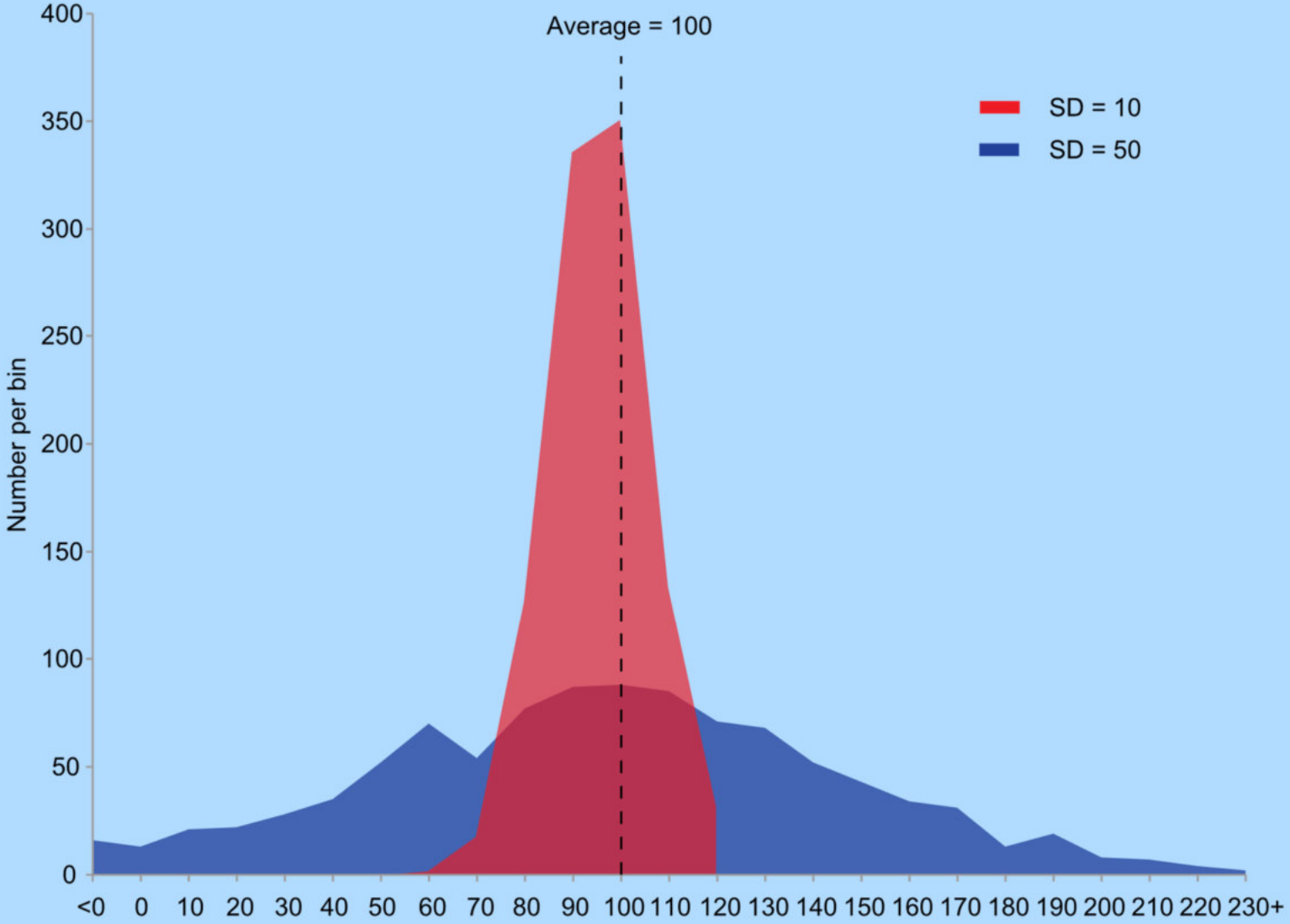
Focus:

- "contribute disproportionately"

Key Challenge:

- How to combine different types of information?
- How can a single measuring stick be created?

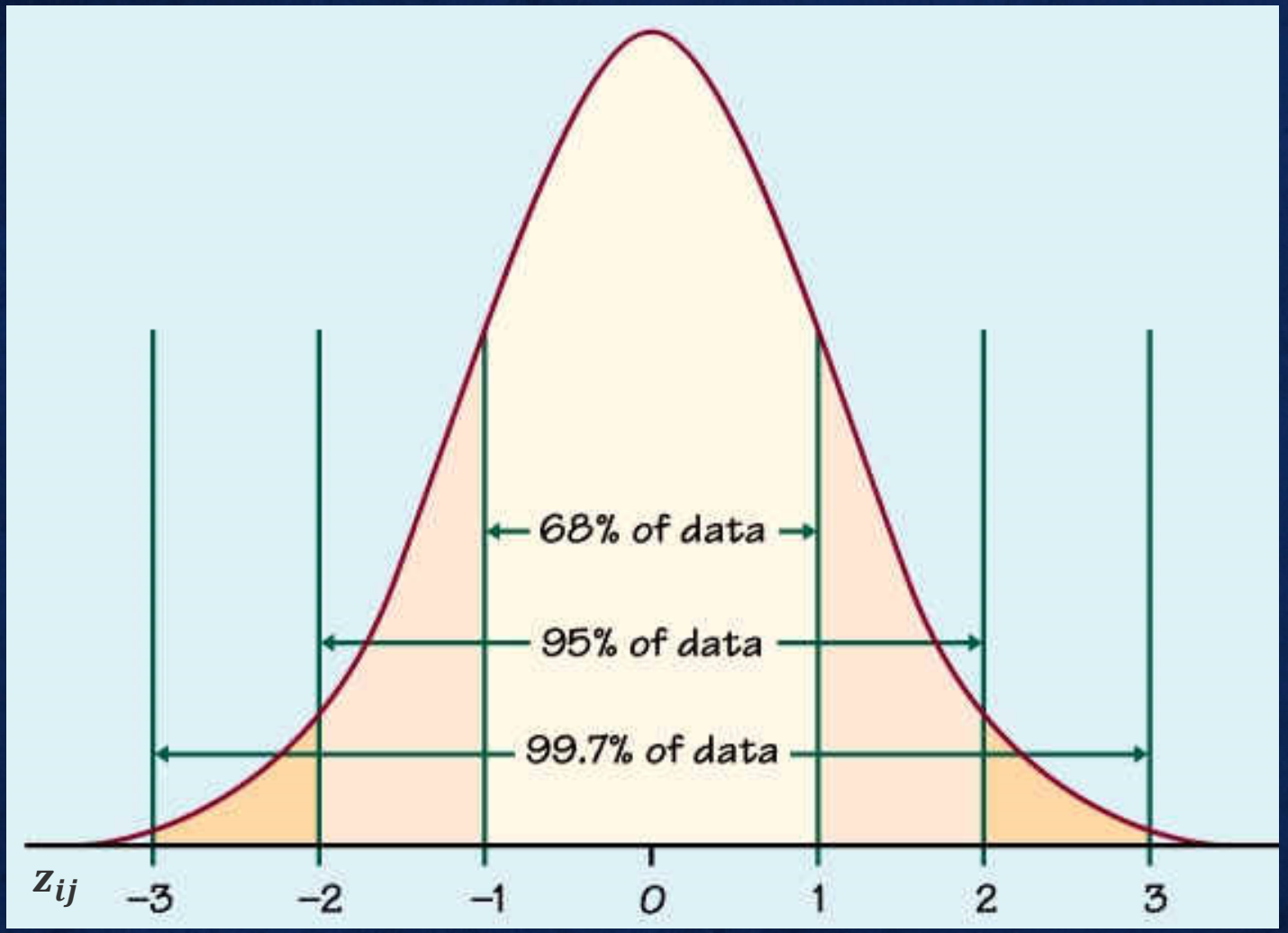
  -> Standard deviates



Step 1 – Standard Deviates

$$z_{ij} = \frac{x_{ij} - \overline{x_i}}{\sigma_i}$$

Where (x_{ij}) is the value of grid cell j for the i^{th} ecological feature, $\overline{x_i}$ is the mean of the ecological feature across all grid cells, and (z_{ij}) is the standard deviate.



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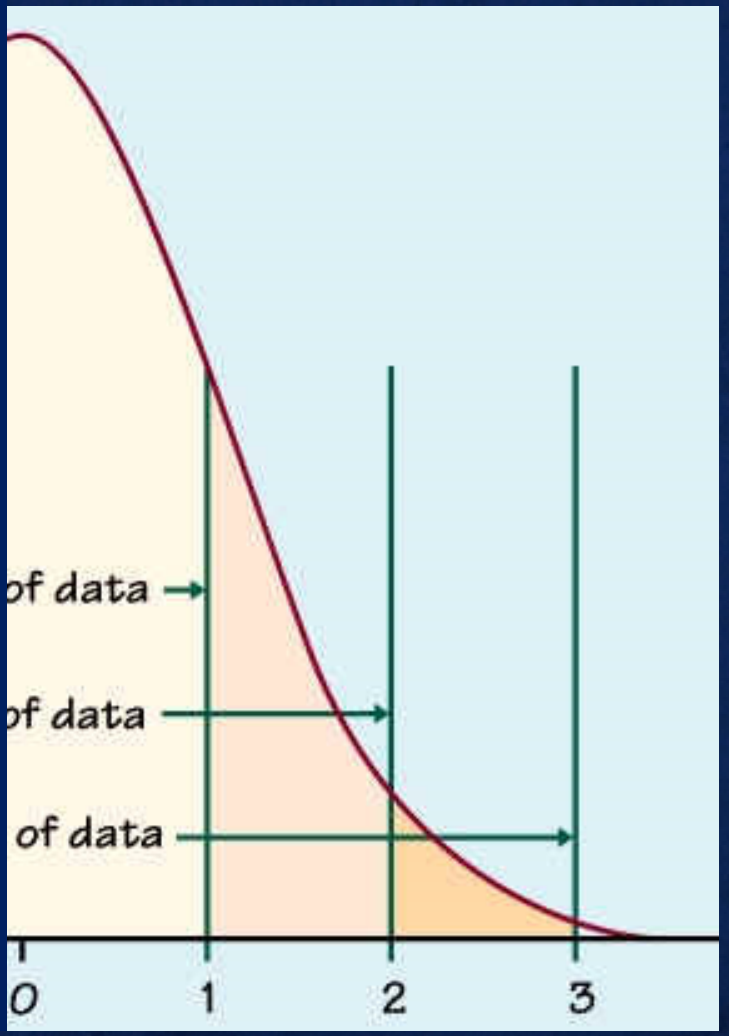
Step 2 – Ignore data below the mean

$$\text{If } (x_{ij} - \bar{x}_i) \geq 0 \text{ then}$$

$$z_{ij} = \frac{x_{ij} - \overline{x_i}}{\sigma_i}$$

$$\text{and if } x_{ij} - \bar{x}_i < 0 \text{ then}$$

$$z_{ij} = 0$$

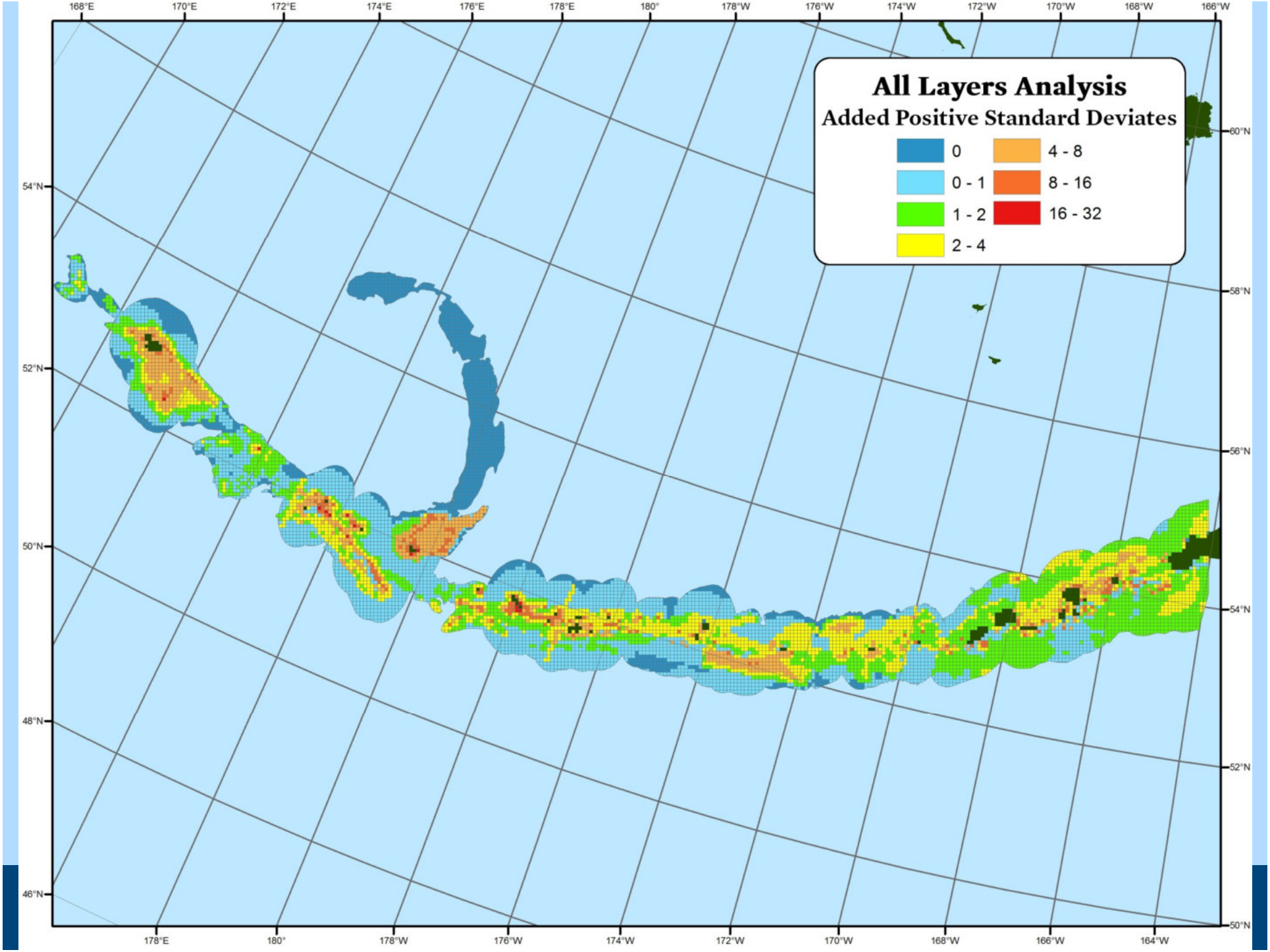


Compositive Additive Index

Adding it all up…

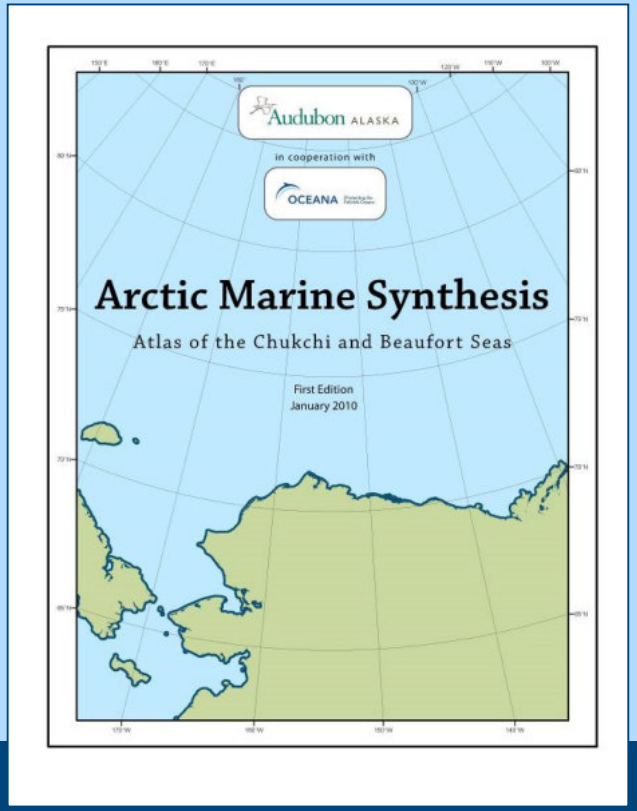
$$H_j = \sum_i z_{ij}$$

Where H_j is the sum of ecological feature standard deviates for the jth grid cell.


All Layers Analysis
Added Positive Standard Deviates
0
0 - 1
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
168°E
170°E
172°E
174°E
176°E
178°E
180°
178°W
176°W
174°W
172°W
170°W
168°W
166°W
60°N
58°N
56°N
54°N
52°N
50°N
48°N
46°N
178°E
180°
178°W
176°W
174°W
172°W
170°W
168°W
166°W
164°W

Identification of IEAs

- **Identify Ecological Features**
- **Gather Information**



ECOLOGICAL ATLAS OF THE BERING, CHUKCHI, AND BEAUFORT SEAS

Audubon ALASKA

Bering Strait

Marine Life and Subsistence Use Data Synthesis

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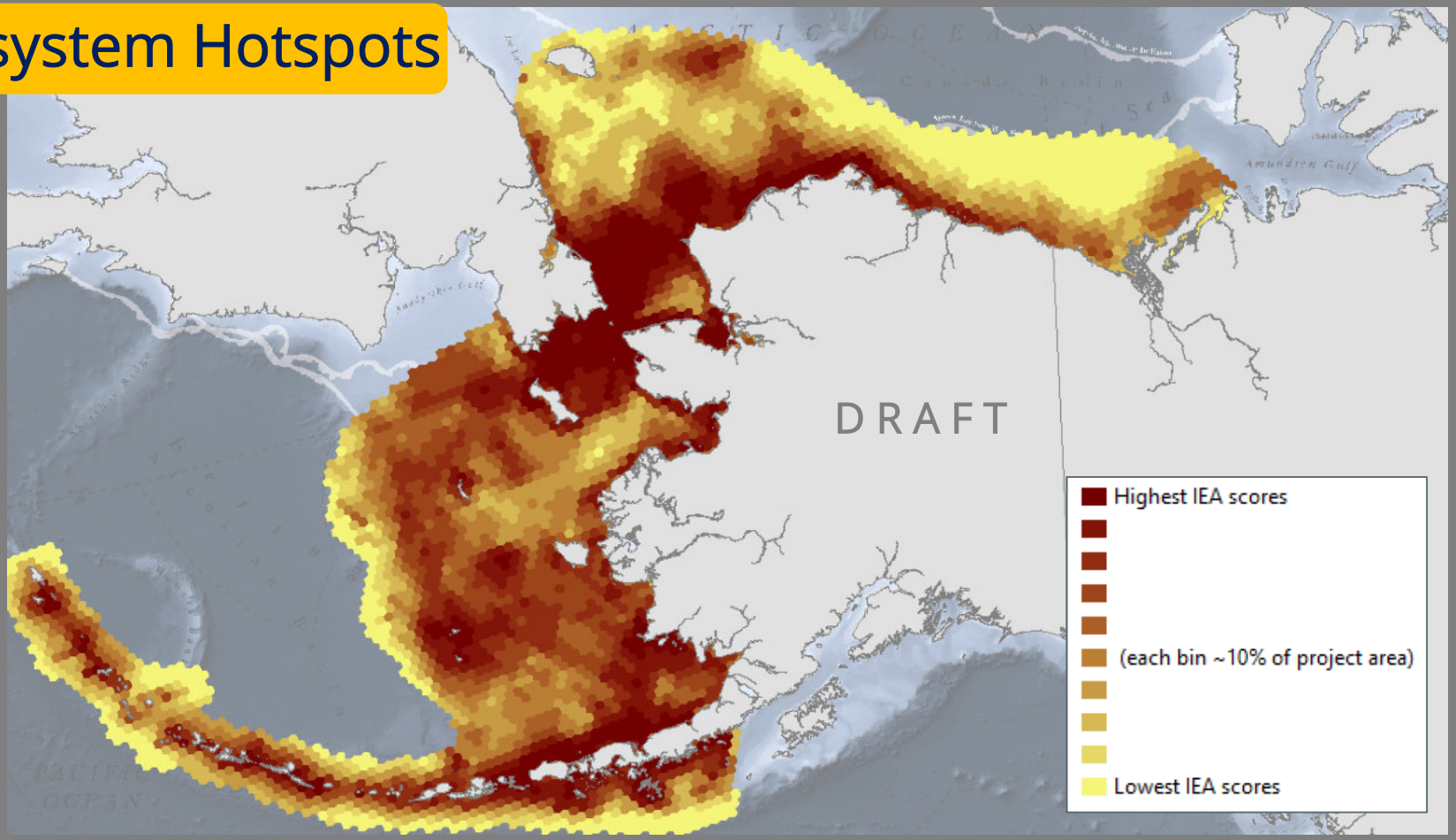
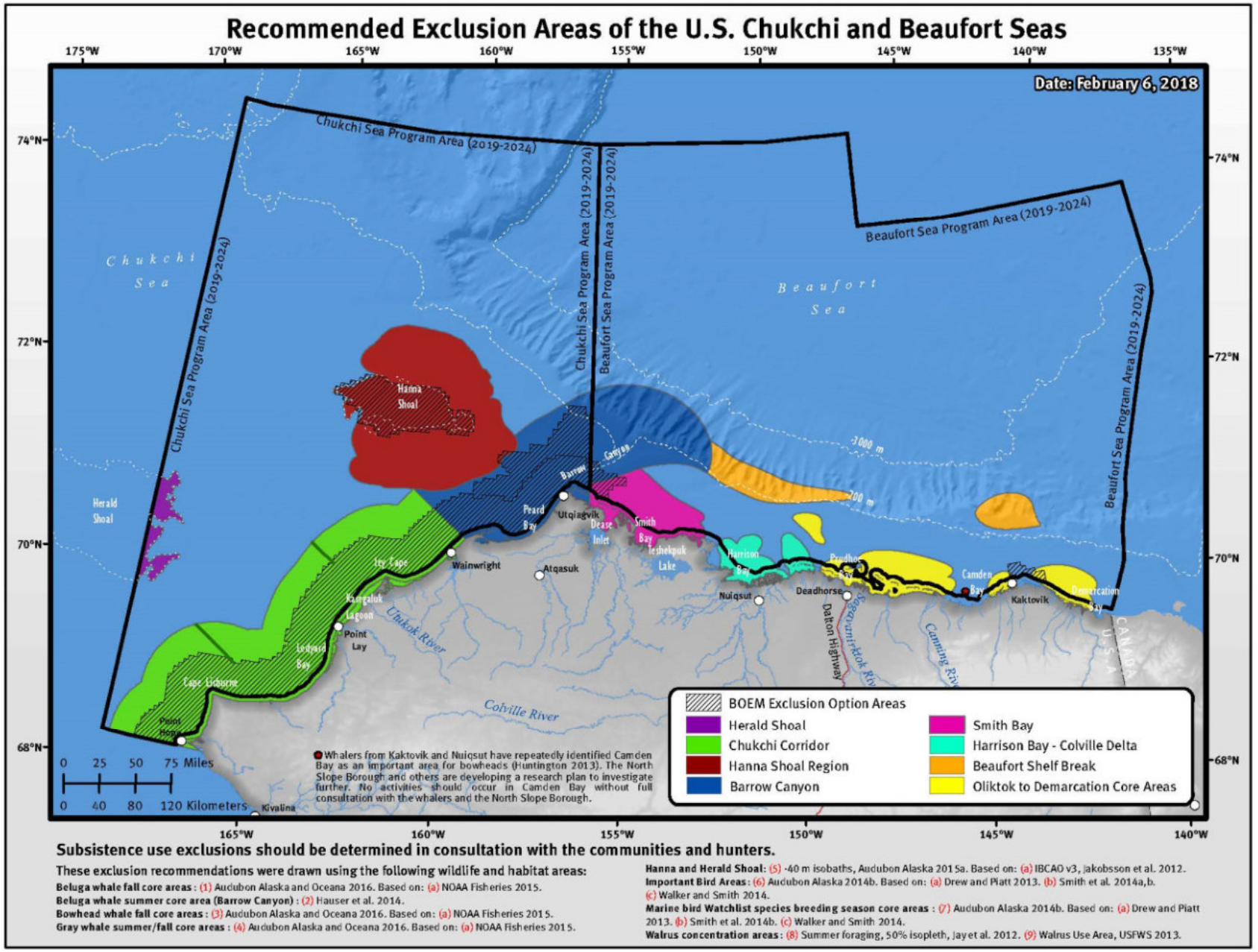
KAWERAK, INC.

Identify Patterns

Ecosystem Hotspots





Subsistence use exclusions should be determined in consultation with the communities and hunters.

These exclusion recommendations were drawn using the following wildlife and habitat areas:

Beluga whale fall core areas : (1) Audubon Alaska and Oceana 2016. Based on: (a) NOAA Fisheries 2015.
Beluga whale summer core area (Barrow Canyon) : (2) Hauser et al. 2014.
Bowhead whale fall core areas : (3) Audubon Alaska and Oceana 2016. Based on: (a) NOAA Fisheries 2015.
Gray whale summer/fall core areas : (4) Audubon Alaska and Oceana 2016. Based on: (a) NOAA Fisheries 2015.

Hanna and Herald Shoal: (5) -40 m isobaths, Audubon Alaska 2015a. Based on: (a) IBCAO v3, Jakobsson et al. 2012.
Important Bird Areas: (6) Audubon Alaska 2014b. Based on: (a) Drew and Platt 2013. (b) Smith et al. 2014a,b. (c) Walker and Smith 2014.
Marine bird Watchlist species breeding season core areas : (7) Audubon Alaska 2014b. Based on: (a) Drew and Platt 2013. (b) Smith et al. 2014b. (c) Walker and Smith 2014.
Walrus concentration areas: (8) Summer foraging, 50% isopleth, Jay et al. 2012. (9) Walrus Use Area, USFWS 2013.

Thank You!

Oceana Pacific team

Audubon Alaska

Oak Foundation

Packard Foundation

Campion Foundation

Aleutian Pribilof Islands Association

Kawerak, Inc.