
Final Report of the Mid-Atlantic Marine Wildlife Surveys, Modeling, and Data: Workshop to Establish Coordination & Communication Appendix D: Presentations

July 2013

Appendix D: Presentations

Presentation #1

Seabird Survey and Observation Database & Hierarchical Models for Estimating Seabird Distributions in the U.S. Atlantic



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2. North Carolina State University

3. Biodiversity Research Institute

History

- Evaluate seabird distribution for offshore development.
- No centralized repository of seabird data for the U.S. Atlantic.
- USGS/USFWS funding to catalog seabird datasets in 2005.
- Additional FWS funds to compile and standardize data into a single database in 2006.
- MMS (BOEMRE) added funds to continue work and add modeling component in 2008.



Overview of methods

- Develop a catalog of seabird survey and observation datasets
- Acquire seabird and biophysical data (e.g., bathymetry, SST, chlorophyll) for modeling
- Standardize seabird data for modeling
- Match seabird data with biophysical data
- Conduct hierarchical modeling
- Predict species distribution



Seabird Dataset Catalog

- Created a catalog of seabird datasets
- Record information about datasets and information they contain (metadata catalog)
 - Coverage area
 - Abstract
 - Dates
 - Data type (digital, analog, text file, GIS)
- Locate data and archive where possible

Dataset Catalog

NW Atlantic Seabird Distribution - Dataset Catalog

USGS
science for a changing world

Create Date: 08-09-2005 Cat. Date: 12-07-2007 ID: 1

Title: SEFSC Atlantic surveys, 1992

Version: Proj. ID:

Add/edit Contact Data Contact: Garrison, Lance

Keywords:

Subject: seabird and marine mammal survey

Abstract: An Atlantic Ocean ship survey was conducted by NOAA Southeast Fisheries Science Center to study marine mammals and pelagic apex predators. The primary area of operation was in the Blake Plateau area of the Atlantic Ocean between 28 degree and 35 degree North latitude

Purpose: To document and study marine mammals and pelagic apex predators

Source Citation: Oregon II Cruise 92-01

Update Frequency: None Planned

Status: Observation Date

Progress: Complete

Data Set Dates: Start Date: 1/4/1992 End Date: 2/10/1992

Location: Blake Plateau area of the Atlantic Ocean between 28 degree and 35 degree North latitude and from the

West-East Longitude: North-South Latitude: 35 UTM Zone: 28

Coverage: South Atlantic Bight

Data Types Information: GEODB Coord. Sys.: Point Datum:

Format: Excel spreadsheet and shapefile coverage

Date accessed: 7/15/2005 File Size (MB):

File Location: SEFSC Atlantic 1992a-b.csv, SEFSC Atlantic 1992a-b.shp

At USGS? Yes Distribution Cost: Free

Distribution: WWW Address

URL: seamap.env.duke.edu/datasets/detail/3

Data Quality: +VER Verified for Correct Data Entry

Quality Report: Good quality data collected as continuous record observations, although we believe that marine

Comments: Accessed via OBIS-SeaMap website.

Metadata Information: Status: Complete Sensitive? No Standard: FGDC Priority: Sens. Type: N/A Restrictions:

Add Record Delete Record Close

Record: 1 of 54

Example seabird surveys

Dataset	Years of surveys	Region of survey
Manomet Center for Conservation Sciences	1978-1980	Gulf of Maine, Mid-Atlantic Bight
Cetacean and Seabird Assessment Program	1980-1988	Gulf of Maine, Mid-Atlantic Bight
Georgia pelagic surveys	1982-1985	South Atlantic Bight
Southeast Fisheries Science Center surveys	1992,1998,1999	South Atlantic Bight
Winter Survey of the Mid-Atlantic	2001-2003	Mid-Atlantic Bight
Cape Wind, Mass Audubon	2002-2006	Nantucket Sound
North Carolina shelf—trophic predators	2004-2005	Offshore North Carolina
Bar Harbor whale watch	2005-2006	Offshore Mount Desert Island, ME
NOAA Ecosystem Monitoring Survey	2007-2010	Gulf of Maine, Mid-Atlantic Bight
NOAA Herring Acoustic Survey	2006-2010	Gulf of Maine, Mid-Atlantic Bight

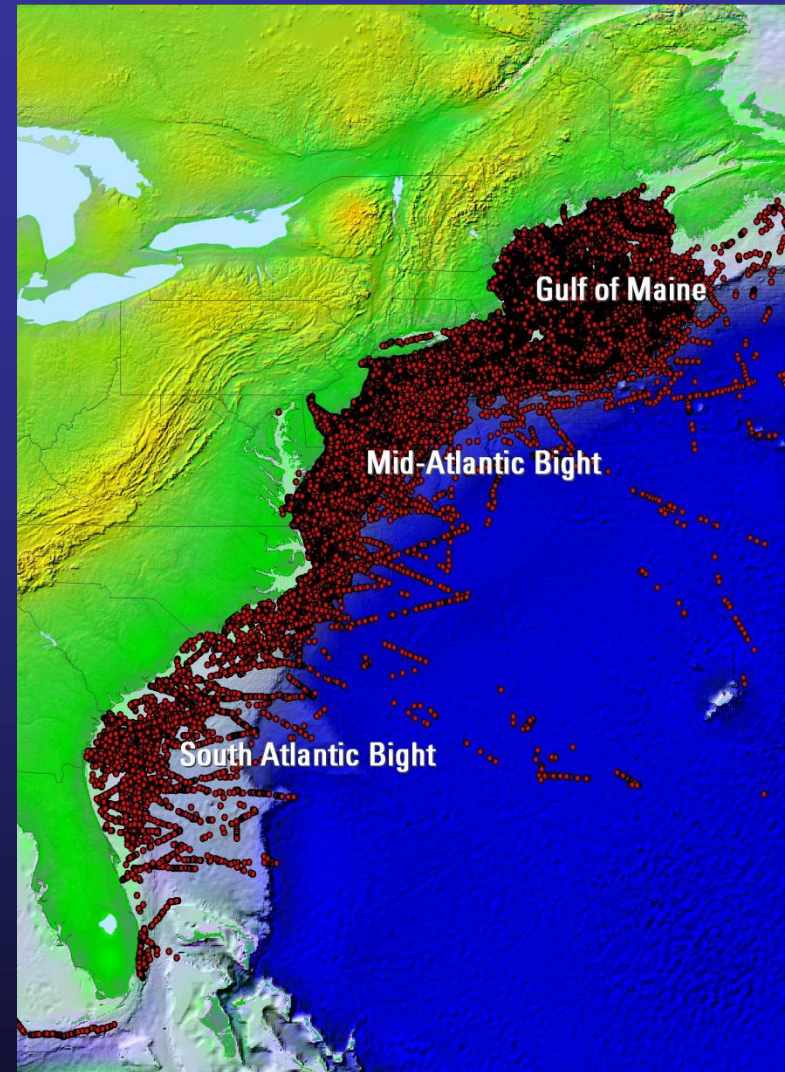
Data standardization

- Create master observation dataset
 - Create standard species lists
 - Create common data fields (date, time, observation ID, effort ID, etc.)
- Create effort dataset when possible and link to species observations
 - presence AND absence data
 - facilitates error detection



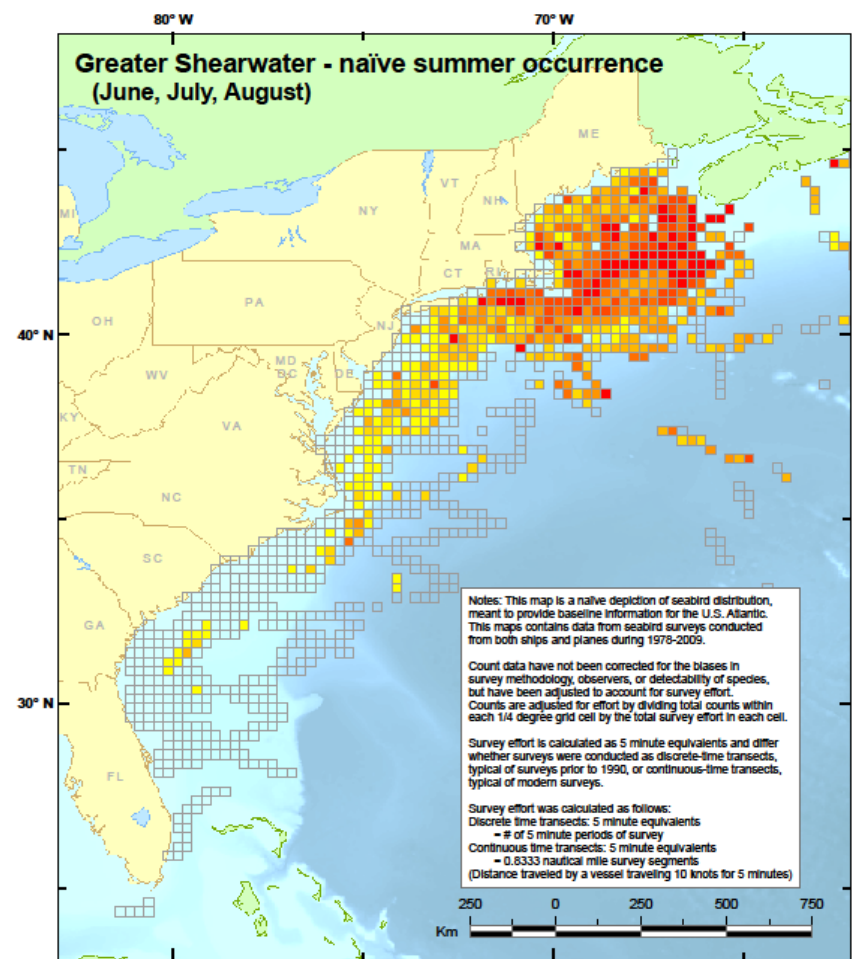
Seabird occurrence data

- >400,000 observations have been accumulated from 70 datasets
- >270,000 seabird observation from U.S. Atlantic waters (>100k from Canada in PIROP)
- >data spans the 1900's, most collected from 1978 through November 2010
- Data collected using a mix of scientific and non-scientific methods



Relational seabird database

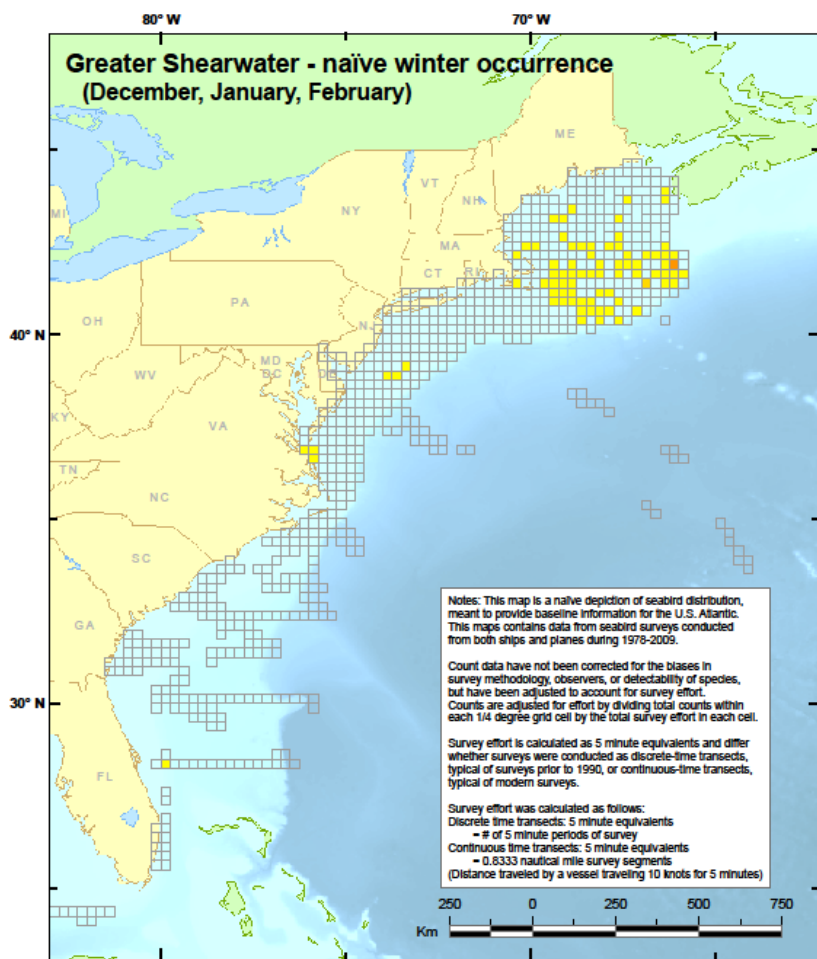
- Postgresql 8.4 (PostGIS) database
- Fully relational database, efficient in design
- Very quick access and querying
- Geometry information can be stored directly in the database in open standards formats
- Allows complex geometry queries
- Can be mapped directly with some GIS products (not ArcGIS 9.3 but in 10 you can map data, but not edit it from the db directly)



USGS
science for a changing world
A. Gilbert, PWRC, USGS
Map produced: 8/5/2010

Explanation - effort-adjusted counts

0	0.1 - 0.25	0.5 - 1	2 - 5
0 - 0.1	0.25 - 0.5	1 - 2	5 - 276.5



USGS
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A. Gilbert, PWRC, USGS
Map produced: 8/5/2010

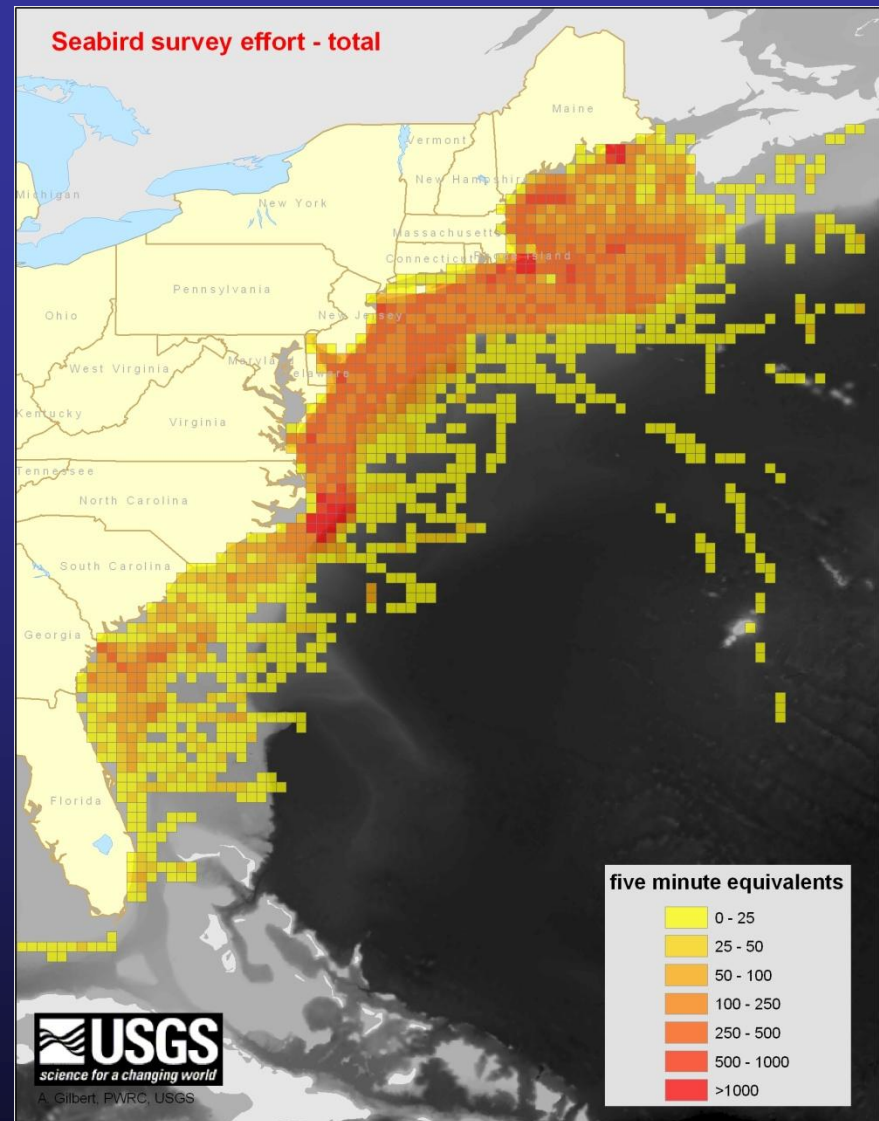
Explanation - effort-adjusted counts

0	0.1 - 0.25	0.5 - 1	2 - 5
0 - 0.1	0.25 - 0.5	1 - 2	>5



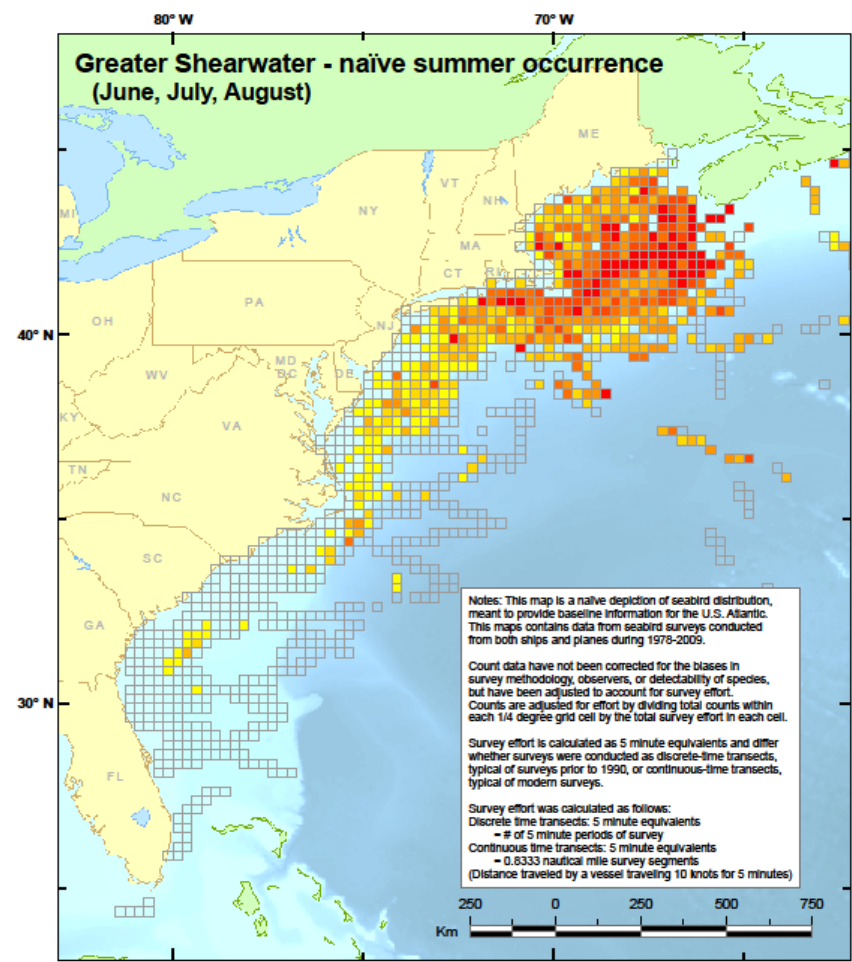
Survey effort

- Standardized survey effort to account for both discrete-time and continuous-strip surveys.
- Color schemes represent a standardized range of the number of surveys conducted in each grid cell in 5 minute equivalents.
 - Discrete time transects: 5 minute equivalents = # of 5 minute periods of survey
 - Continuous time transects: 5 minute equivalents = 0.8333 nautical mile survey segments (the distance traveled by a ship traveling 10 knots for 5 minutes)



Modeling

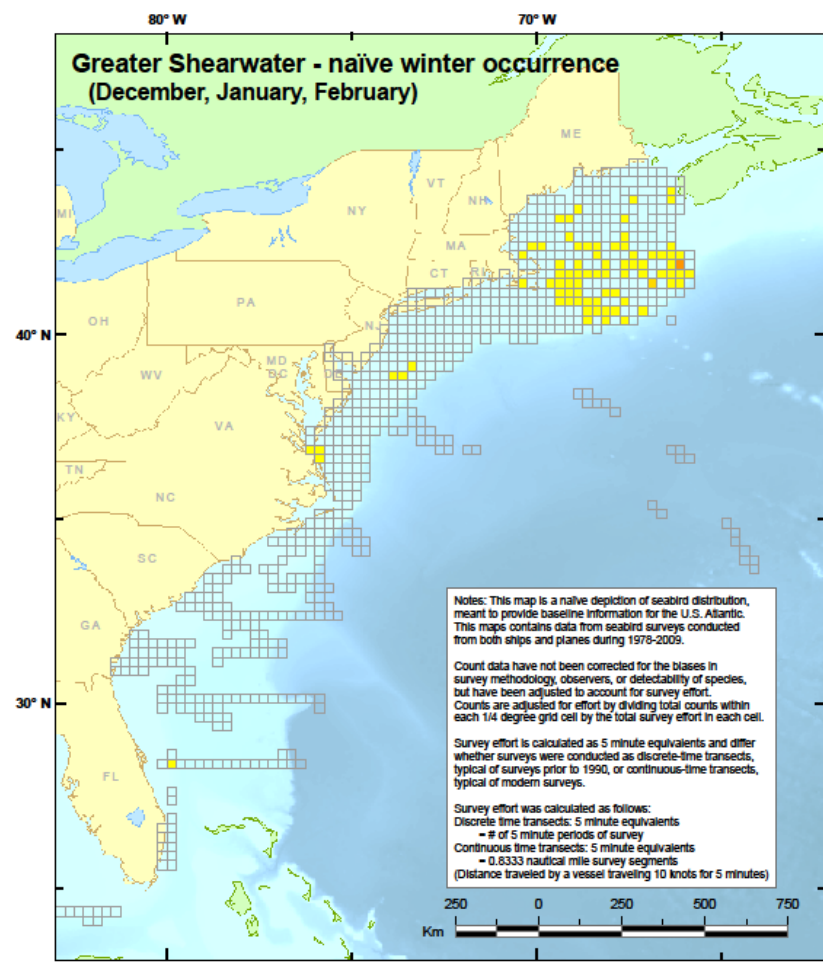
- ~ 70 sea bird species in the data base that are typically found in the Atlantic
 - 10 -15 of particular interest
- Modeling exercises
 - Broad species distribution mapping
 - Community occupancy modeling
 - Seaducks
 - SEANET



USGS
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A. Gilbert, PWRC, USGS
Map produced: 8/5/2010

Explanation - effort-adjusted counts

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USGS
science for a changing world
A. Gilbert, PWRC, USGS
Map produced: 8/5/2010

Explanation - effort-adjusted counts

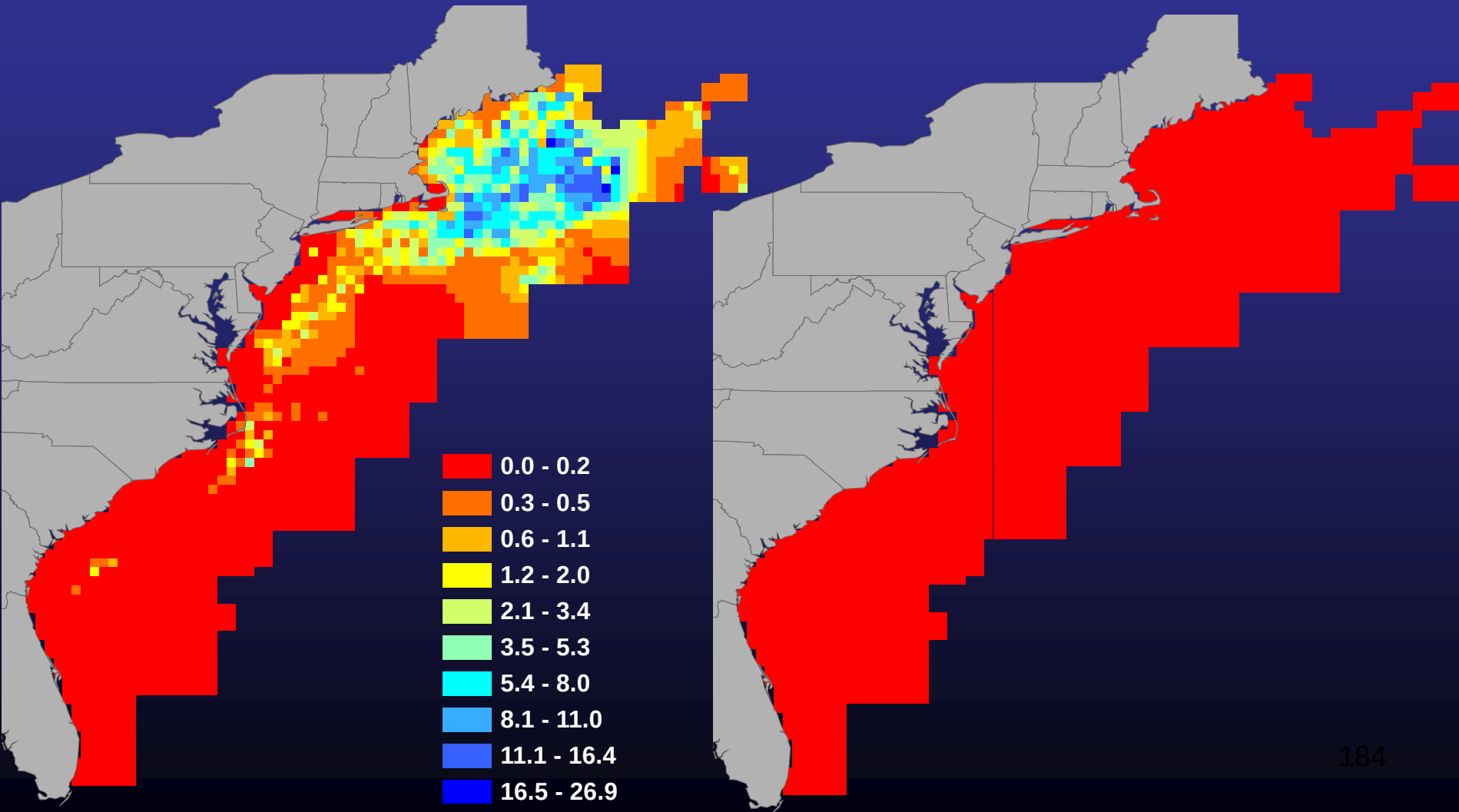
0	0.1 - 0.25	0.5 - 1	2 - 5
0 - 0.1	0.25 - 0.5	1 - 2	>5



Results – GRSH

Summer

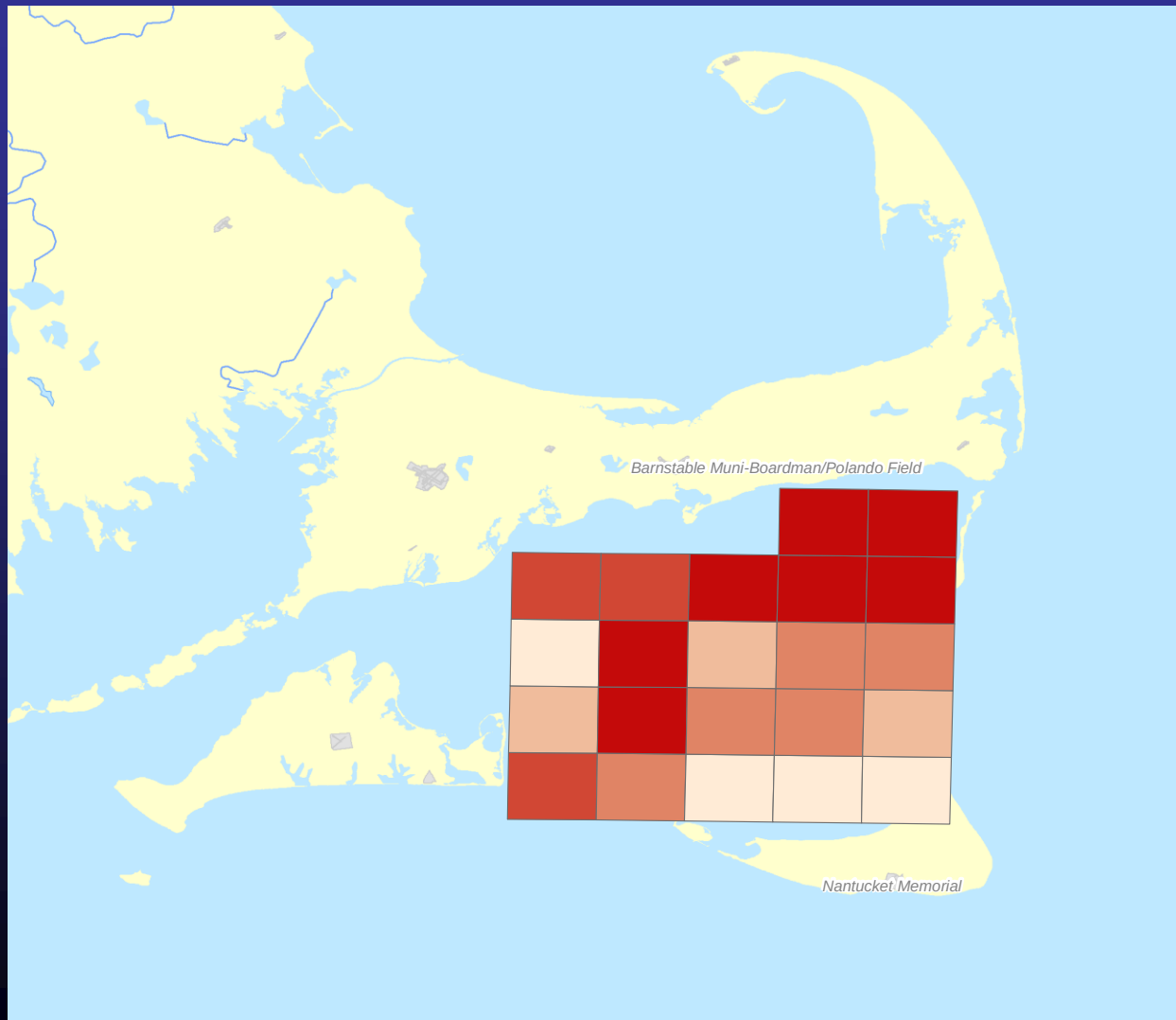
Winter



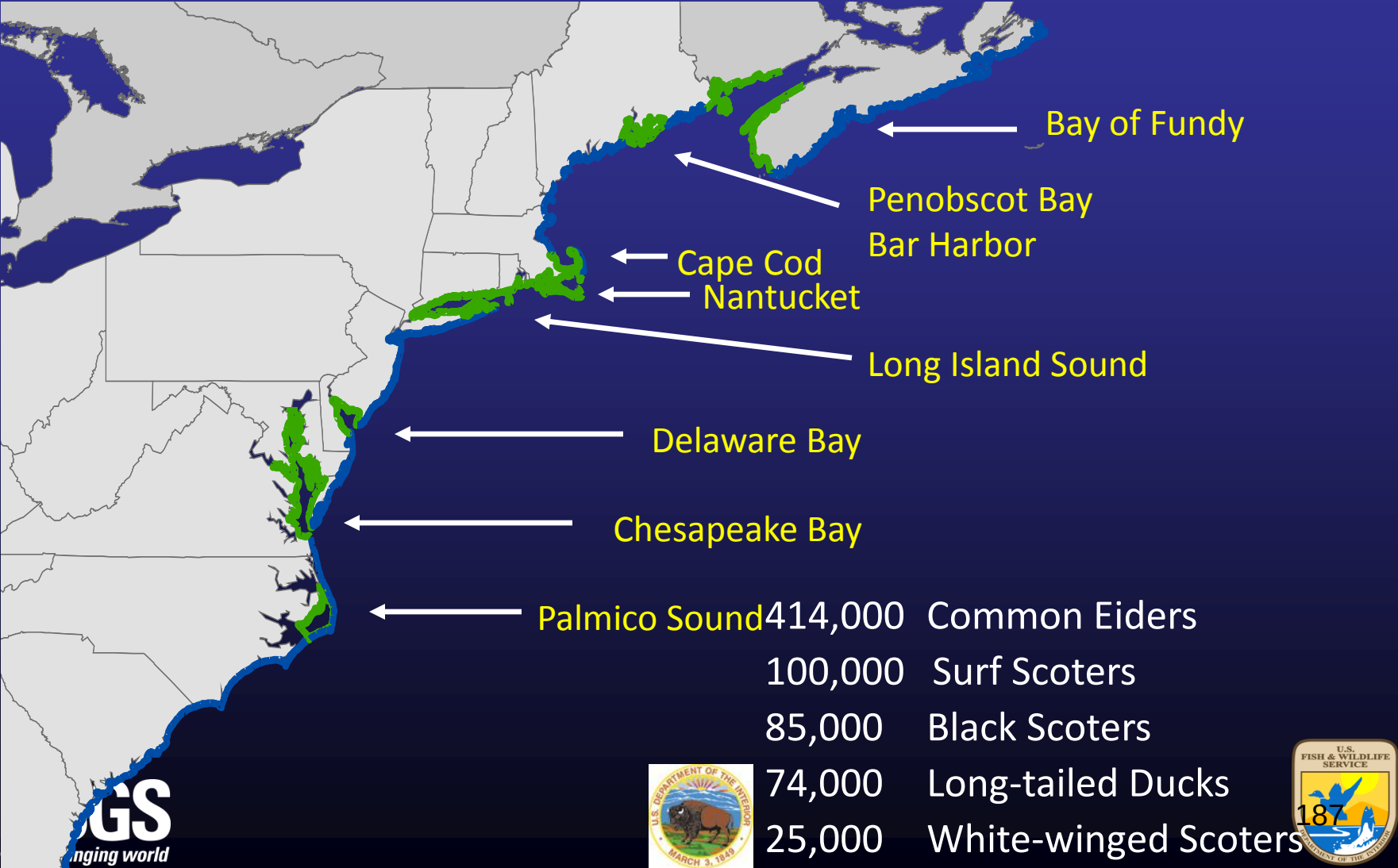
Occupancy Models

- If we look at areas with repeated aerial surveys, we can estimate detection and species richness through the use of site-occupancy models
- This allows us to understand the probability of detecting a species given that it is present
- We expect that detection is very different amongst species

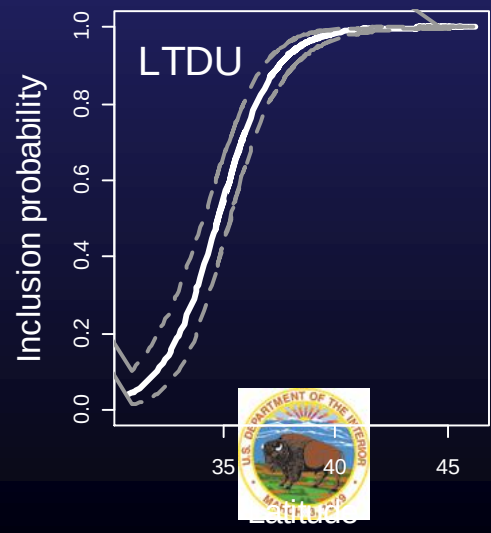
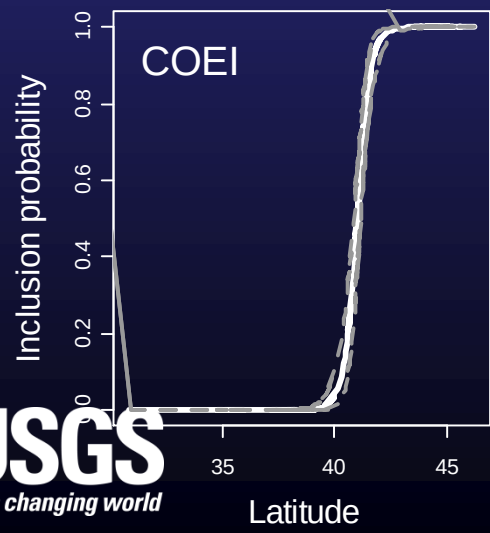
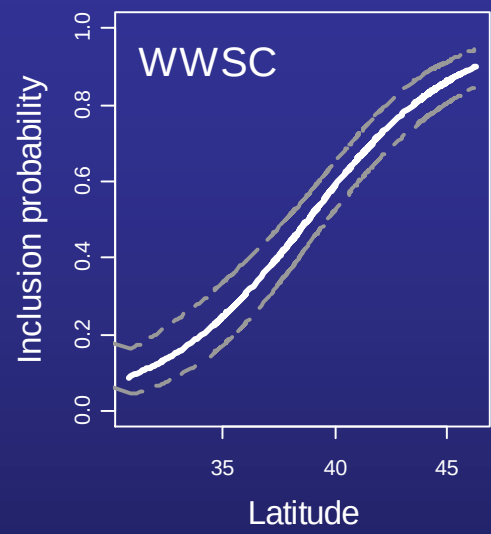
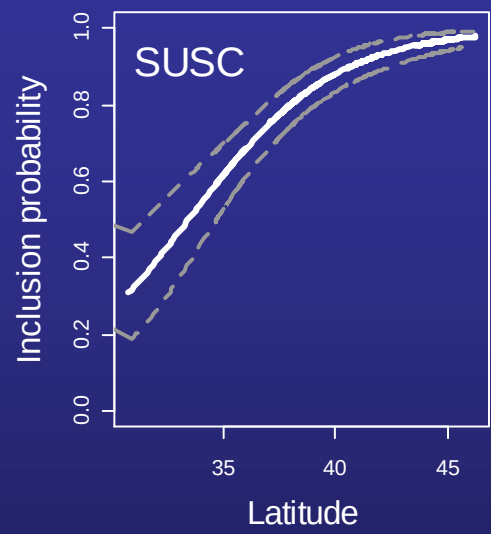
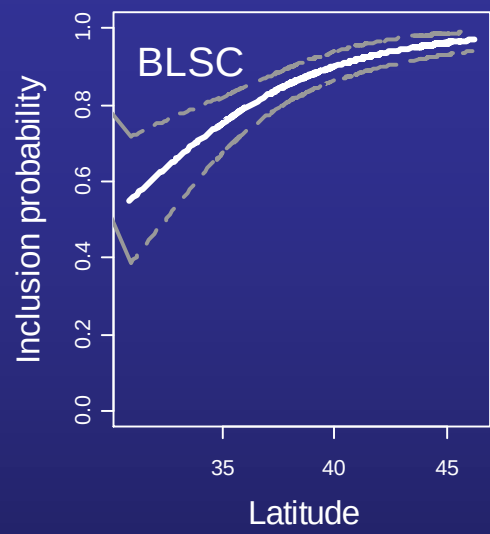
Species Richness



Seaduck Surveys



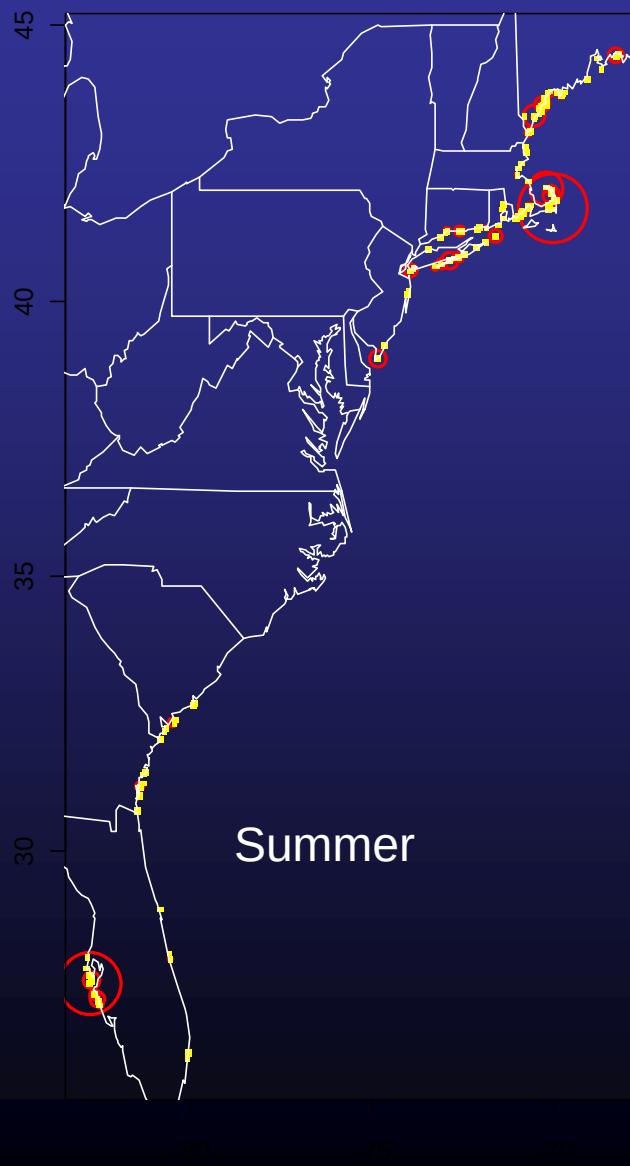
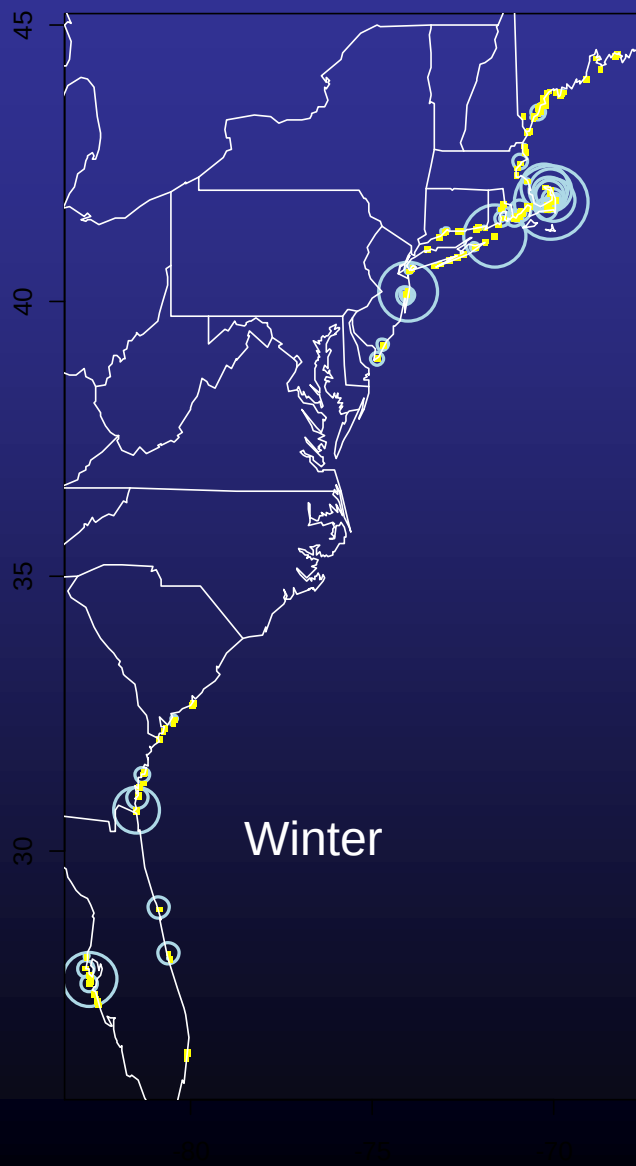
Results – Species ranges



SEANET Data

- **Volunteers walk stretches of beach and record the number of deceased birds**
- **120 beaches surveyed**
 - **3183 total surveys**
- **2003-2009**
- **Beach length varied from 0.23 to 28.8 km**

Surveys



Statistical guidelines for sampling marine avian populations

Elise F. Zipkin
Brian Kinlan
Allison Sussman
Mark Wimer
Allan F. O'Connell



USGS Patuxent Wildlife Research Center
NOAA National Ocean Service

Presentation #2



OBIS-SEAMAP

marine megavertebrate geo-archive

<http://seamap.env.duke.edu>



OBIS-SEAMAP

Protected Species Information & Analysis System

Mid-Atlantic Marine Wildlife Survey, Modeling, and Data Workshop

Jesse Cleary, Pat Halpin, Ei Fujioka
The OBIS-SEAMAP Team

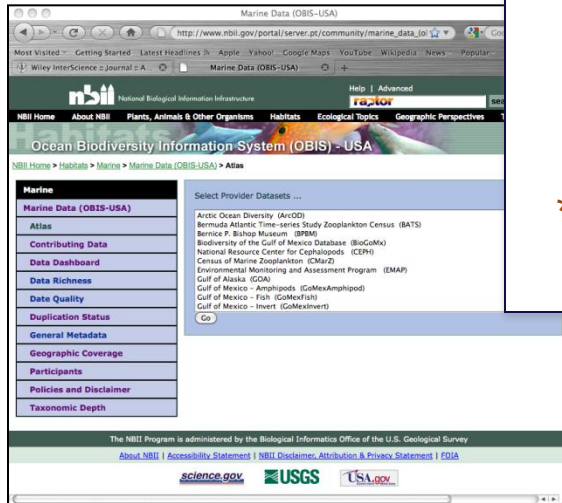


Marine Geospatial Ecology Lab
Nicholas School of the Environment
Duke University



OBIS-USA, OBIS-SEAMAP, iOBIS

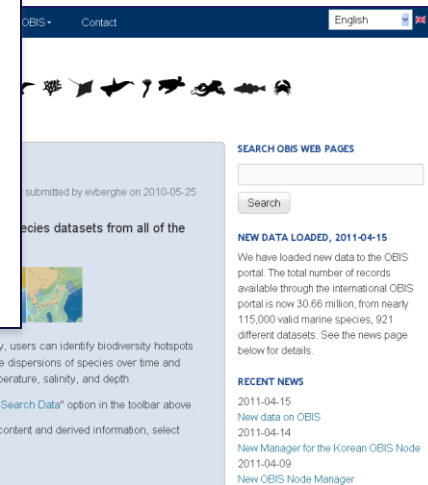
OBIS-USA



OBIS-SEAMAP Niche:

- * Protected species data / tools
- Telemetry / tracking data
- Photo-ID
- Passive acoustics
- Spatial Decision Support
- * Mapping & Analysis R&D*

iOBIS



OBIS-SEAMAP



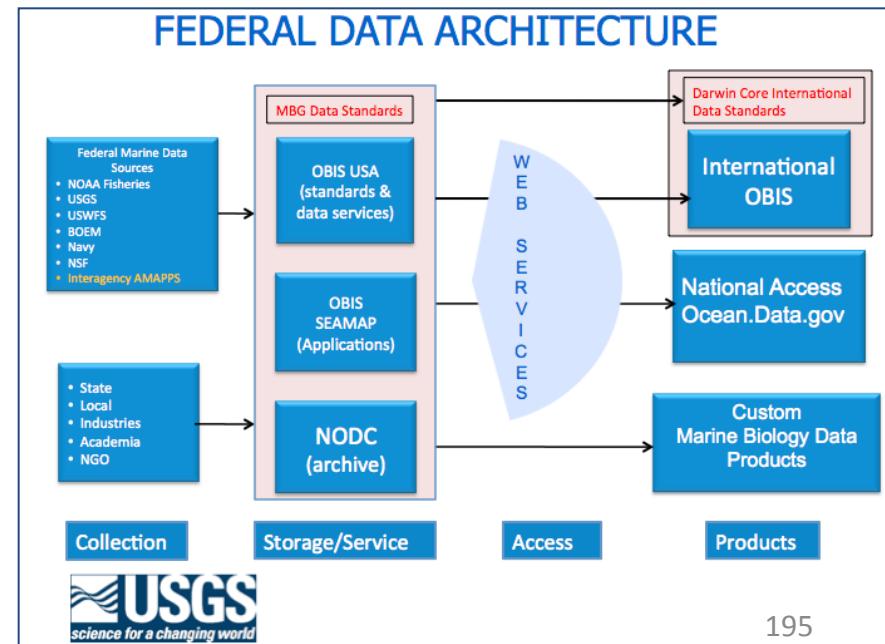
National marine
biodiversity data archive

International marine
biodiversity data archive

OBIS-USA / OBIS-SEAMAP partnership

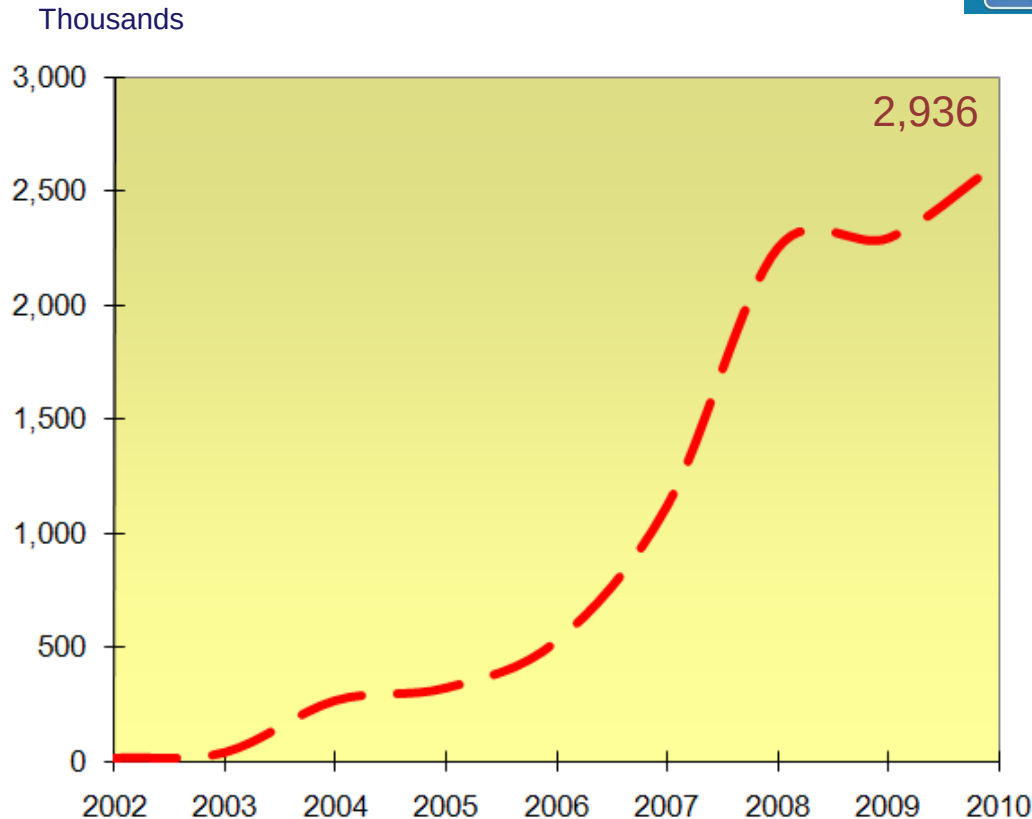
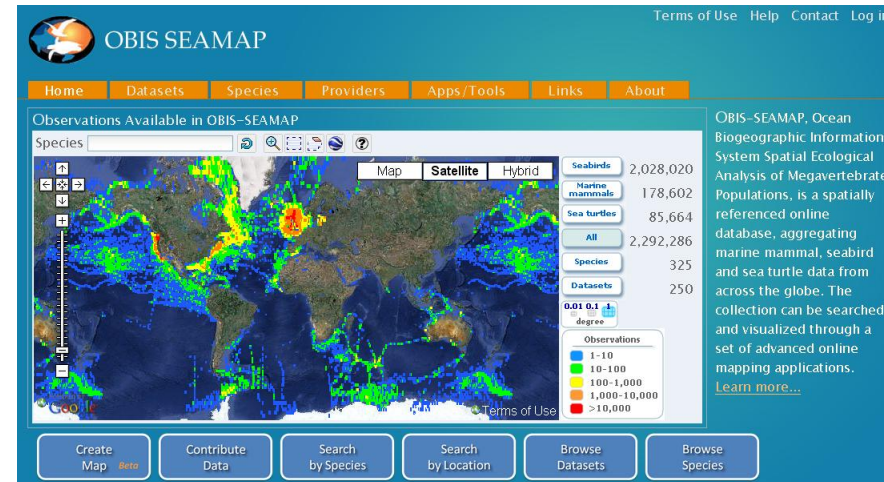
- Single point of US data enrollment in OBIS network
- Advancing biogeographic data standards
- Improved data services, products and applications

OBIS-USA / OBIS-SEAMAP talk
(data track, Wed AM)



OBIS-SEAMAP

Spatially referenced online database, aggregating marine mammal, seabird and sea turtle data from across the globe



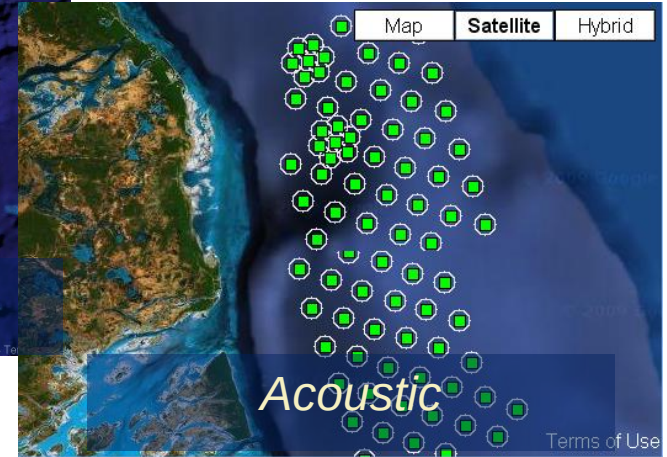
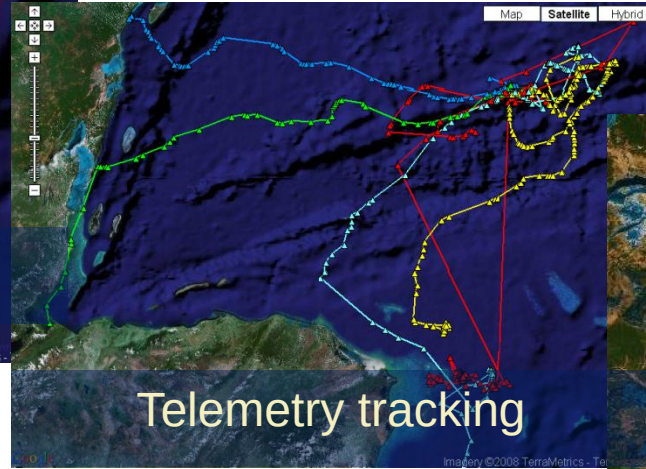
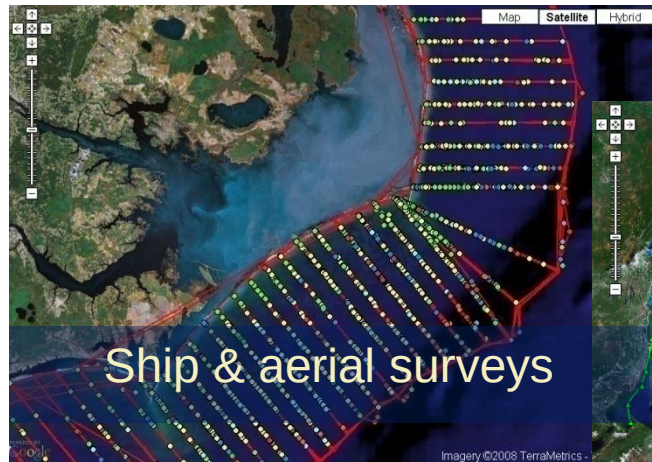
439 datasets
1935 – 2012
>2,936,000 records



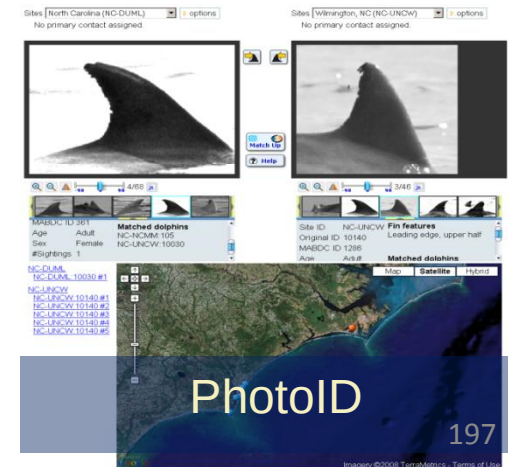
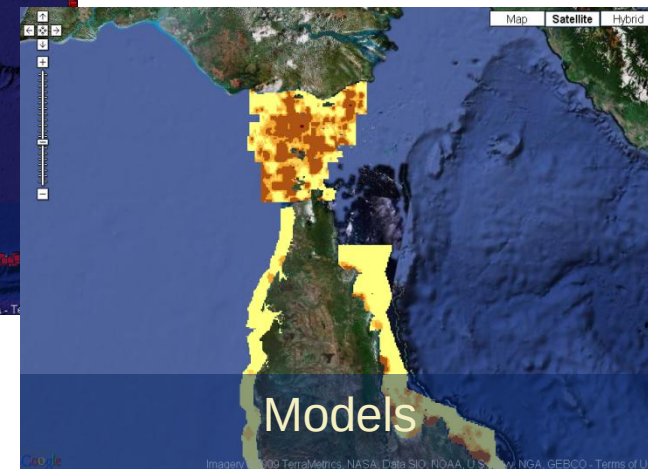
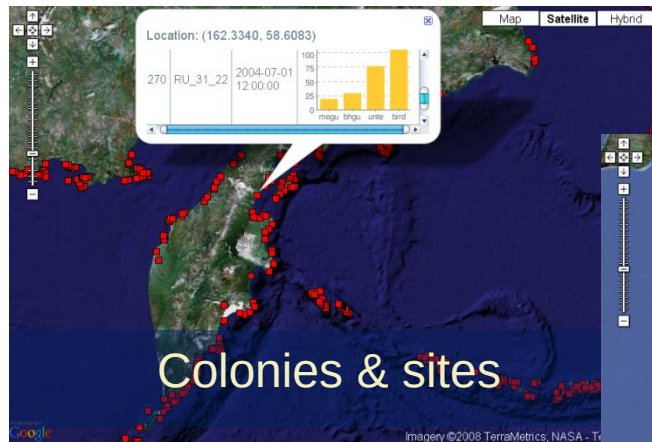
National Science Foundation
WHERE DISCOVERIES BEGIN



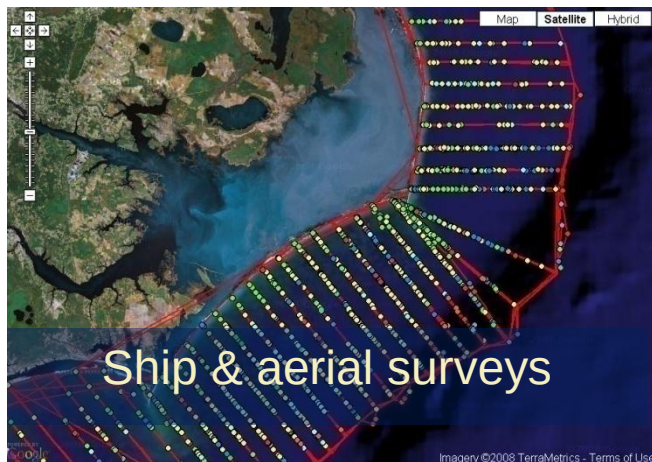
OBIS-SEAMAP supports multiple data types



Genetics

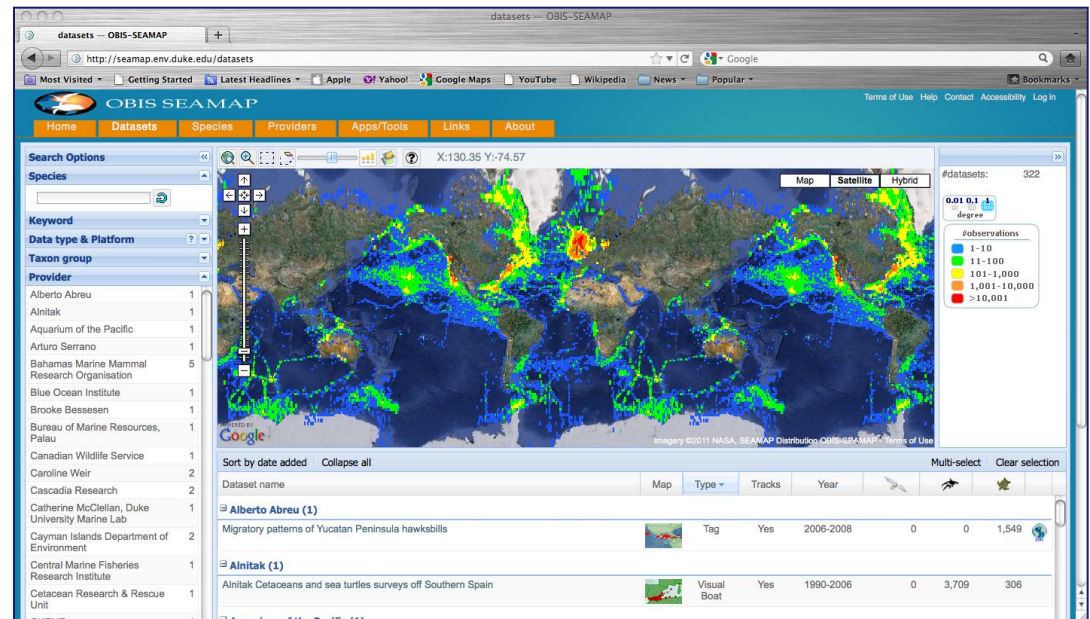


Observation data in OBIS-SEAMAP



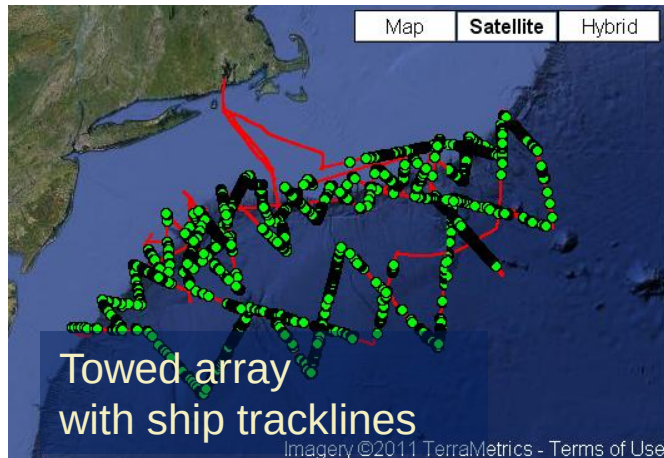
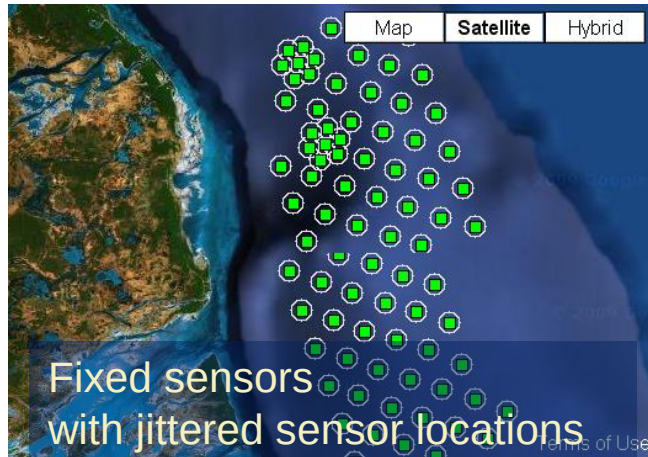
The inclusion of survey effort (tracklines) and additional attributes is essential for the development of statistical models of density or habitat preference.

- Observation data
- Survey effort data
- Survey metadata
- Links to species pages
- Links to data providers

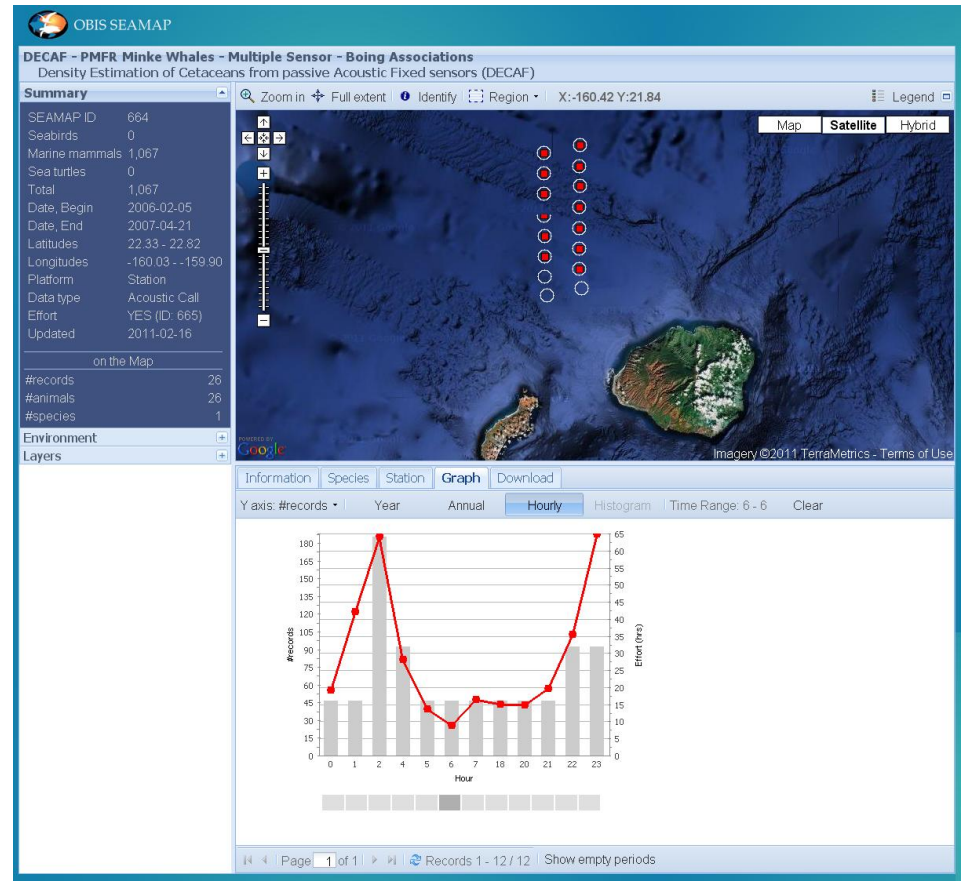


Passive acoustic data in OBIS-SEAMAP

Various acoustic data types



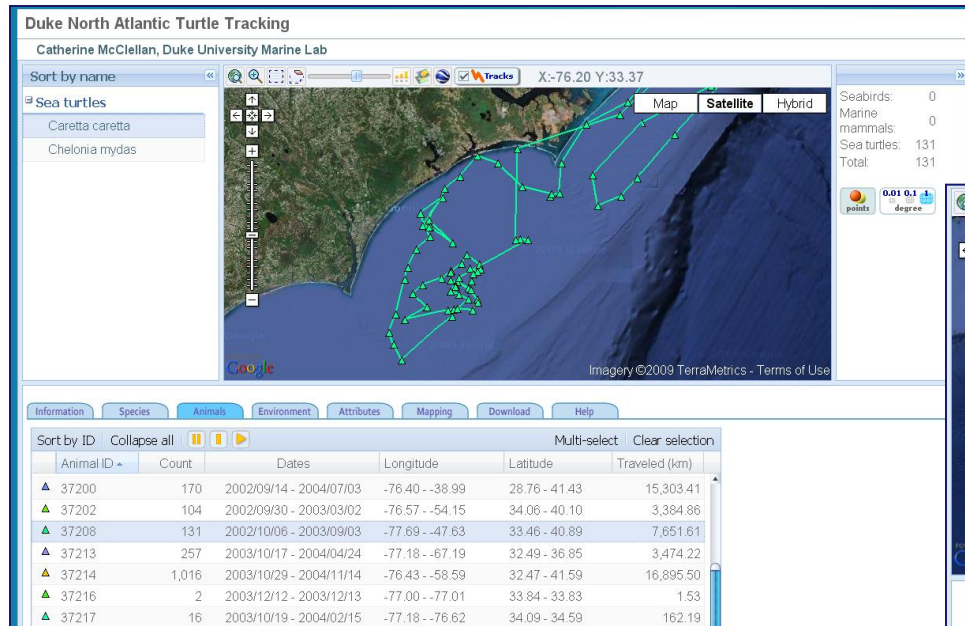
Advanced mapping & visualization



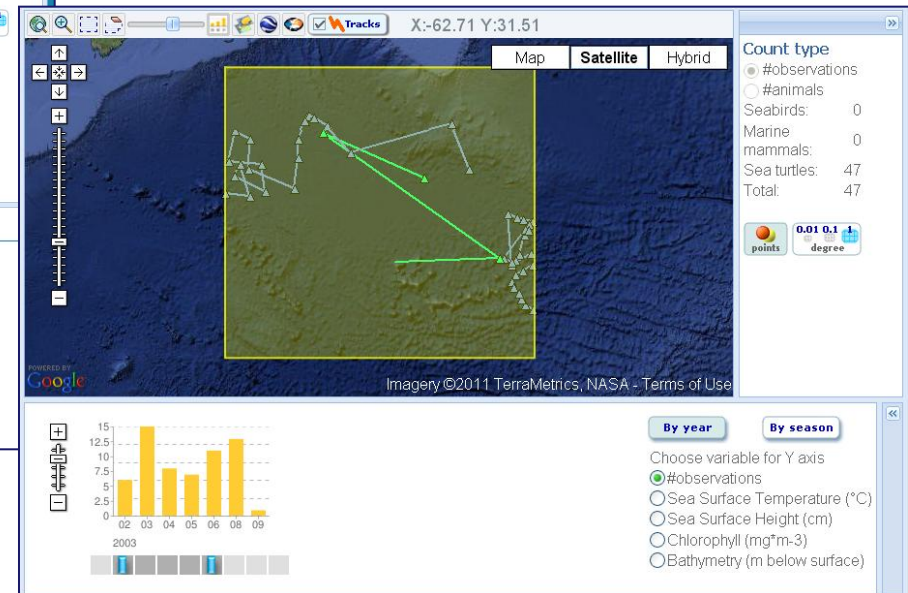
Navy-funded DCAF datasets are in the final stages of approval for publishing through OBIS-SEAMAP.

Telemetry data in OBIS-SEAMAP

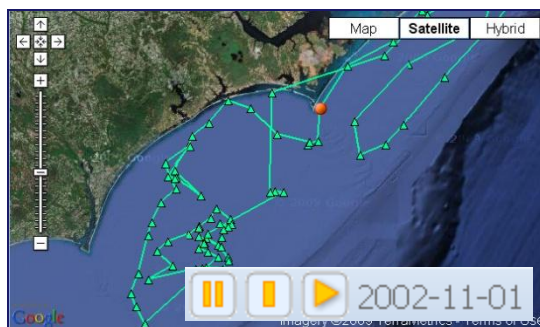
Movement of individual animal



Advanced mapping & visualization



Animation of movement



Movement of multiple animals in an area of interest within a defined time period

Turtle nesting data in OBIS-SEAMAP

New approach ties genetic research with nesting site data

The State of the World's Sea Turtles

Google Earth | Feedback

Map | **Satellite** | Hybrid

Nesting sites

Species

- ▲ *Caretta caretta*
- *Chelonia mydas*
- ◆ *Dermochelys coriacea*
- ★ *Eretmochelys imbricata*
- *Lepidochelys kempii*
- *Lepidochelys olivacea*
- ⊕ *Natator depressus*
- multi-species sites

Count type

- Females
- Crawls
- Clutches

Country

Multi-select

- Australia
- East Atlantic
- East Indian
- East Pacific
- Mediterranean
- Oceania
- West Indian

Site: Flagler
Country: United States of America
nDNA ID: ndna04

To see full attributes on the stock, please download mt/nDNA data.

Turn on/off or download layers

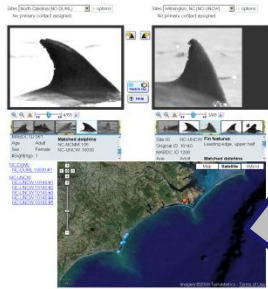
Species	Distribution	RMUs	mtDNA	nDNA
<i>Caretta caretta</i>				
<i>Chelonia mydas</i>				
<i>Dermochelys coriacea</i>				
<i>Eretmochelys imbricata</i>				
<i>Lepidochelys kempii</i>			N/A	N/A
<i>Lepidochelys olivacea</i>				
<i>Natator depressus</i>				N/A

Site name | Regional organization | Species | Year | #females binned | #females exact | #clutches binned | #clutches exact | #crawls binned | #crawls exact

DNA sampling sites along with nesting sites (*both are downloadable*)

PhotoID in OBIS-SEAMAP

- Provides an online scientific workflow for fin matching processes
- Building common framework to incorporate other PhotoID catalogs



Initial application for Mid-Atlantic Bottlenose Dolphin Catalog

A screenshot of the OBIS SEAMAP interface for the Mid-Atlantic Bottlenose Dolphin Photo ID (MABDC) catalog. The interface is divided into several sections. At the top, there is a header with the OBIS SEAMAP logo and a 'Log in as MABDC contributor' button. Below the header, there are two tables for 'Site 1' and 'Site 2'. Site 1 has columns for Research Area, Site ID, Contact, and Affiliation. Site 2 has columns for Research Area, Site ID, Contact, and Affiliation. Below the tables, there are two sections for 'Large images' and 'small images'. Each section has a grid of images and a 'Filtering' dropdown. At the bottom, there are two large image viewers for 'Site 1' and 'Site 2'. Each viewer shows a large image of a dolphin fin and a sidebar with metadata. The 'Site 1' viewer shows a fin with the following metadata: Site ID: BA-WDP, Original ID: Batman, MABDC ID: 6343, Match ID, Age: A, Sex: M, Stranded, #Sightings: 2. The 'Site 2' viewer shows a fin with the following metadata: Site ID: BI-CRC, Original ID: CRC_SI_BI_04, PIPIN ID: 3, Match ID, Age, Sex, Stranded, #Sightings: 1.

New interface for MABDC built on the common framework

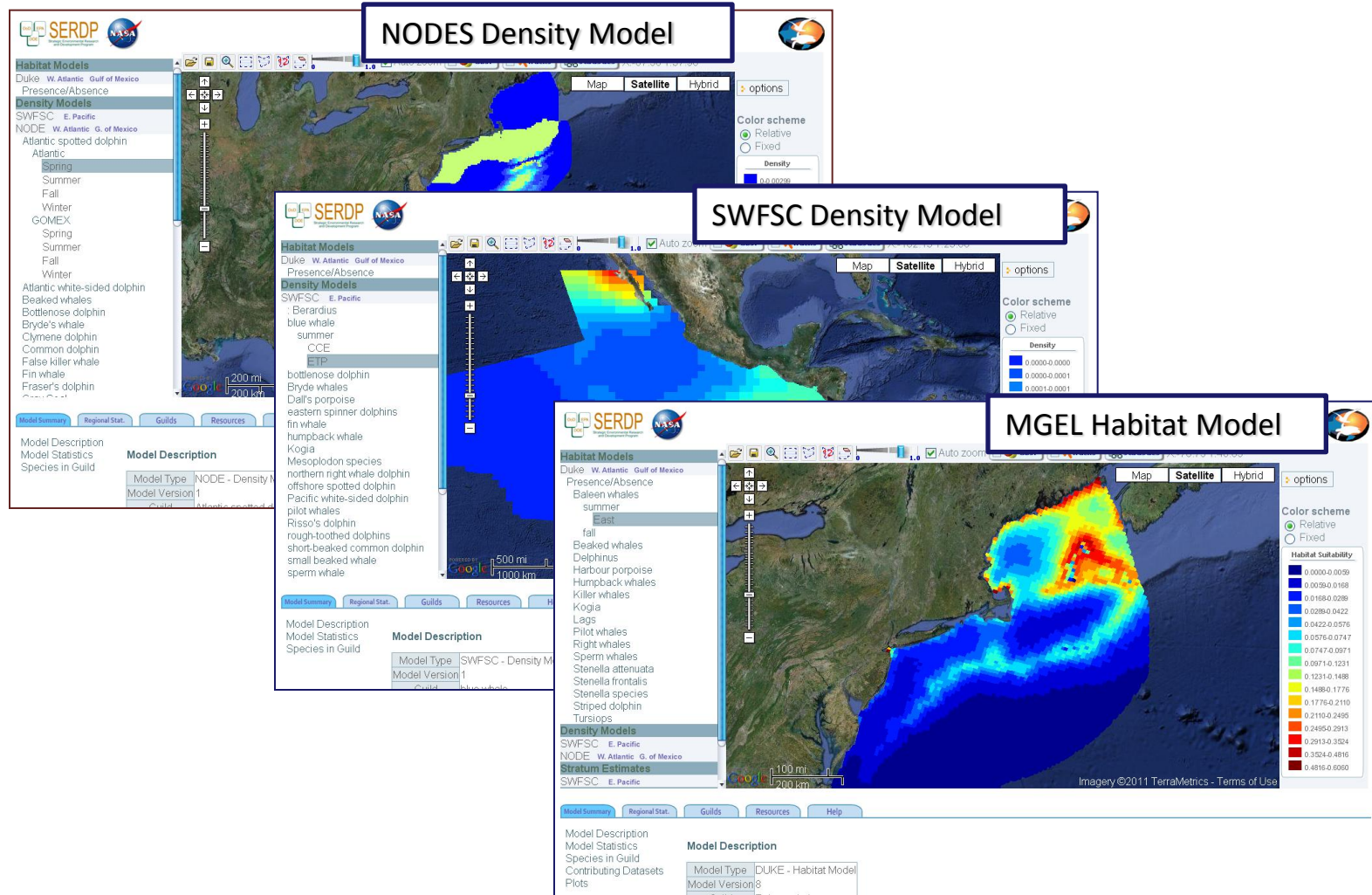
Same framework applied to PIPIN (Spinner dolphins in Hawaiian waters)

A screenshot of the OBIS SEAMAP interface for the PIPIN Spinner Dolphin Photo ID catalog. The interface is divided into several sections. At the top, there is a header with the OBIS SEAMAP logo and a 'Logged in as efujioka' button. Below the header, there are two tables for 'Site 1' and 'Site 2'. Site 1 has columns for Research Area, Site ID, Contact, and Affiliation. Site 2 has columns for Research Area, Site ID, Contact, and Affiliation. Below the tables, there are two sections for 'Large images' and 'small images'. Each section has a grid of images and a 'Filtering' dropdown. At the bottom, there are two large image viewers for 'Site 1' and 'Site 2'. Each viewer shows a large image of a spinner dolphin fin and a sidebar with metadata. The 'Site 1' viewer shows a fin with the following metadata: Site ID: BI-CRC, Original ID: CRC_SI_BI_04, PIPIN ID: 3, Match ID, Age, Sex, Stranded, #Sightings: 1. The 'Site 2' viewer shows a fin with the following metadata: Site ID: KE-CRC, Original ID: CRC_SI_KE_00, PIPIN ID: 259, Match ID, Age, Sex, Stranded, #Sightings: 1.

Cetacean density models in OBIS-SEAMAP

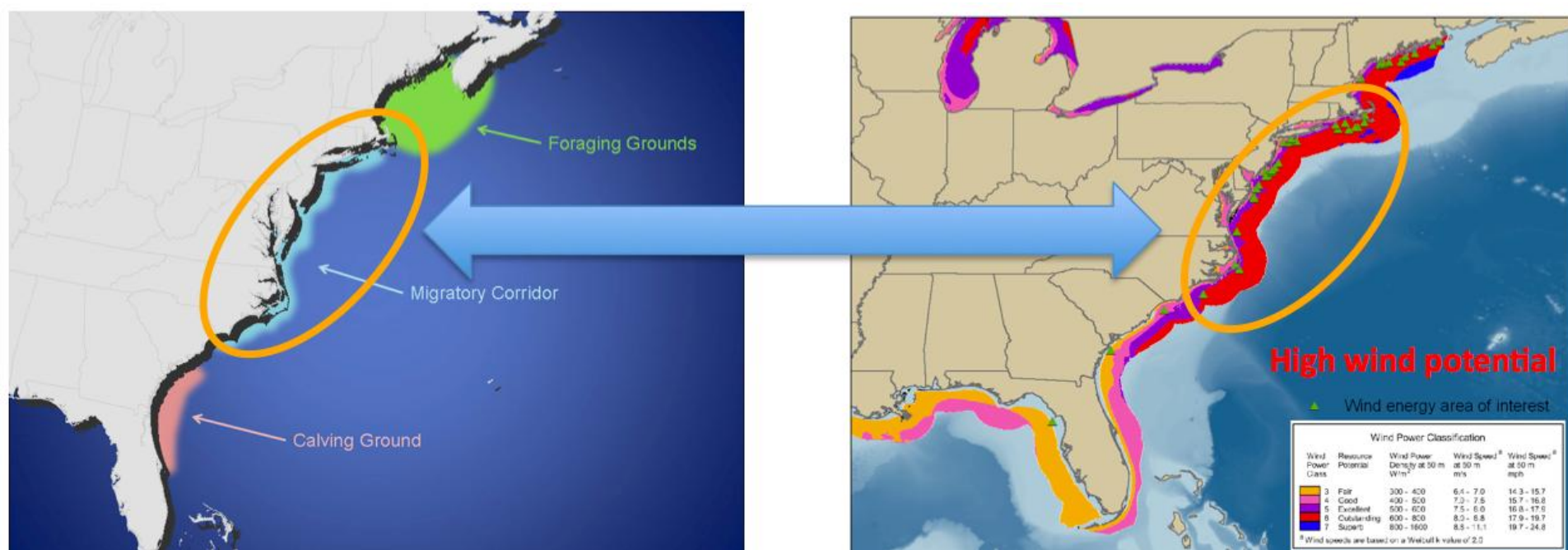
SERDP Spatial Decision Support System
originally funded by SERDP continuing development by NASA

Multiple habitat/density models from different projects



Data needs for renewable energy siting & permitting

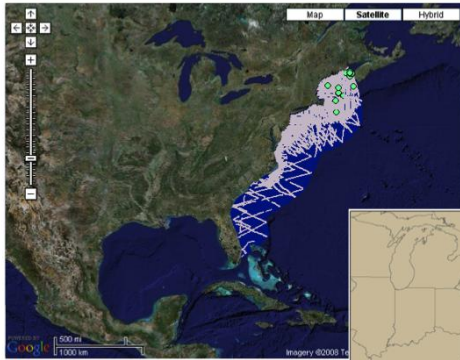
The is significant correspondence between migratory corridors and wind-energy potential on the Atlantic Coast



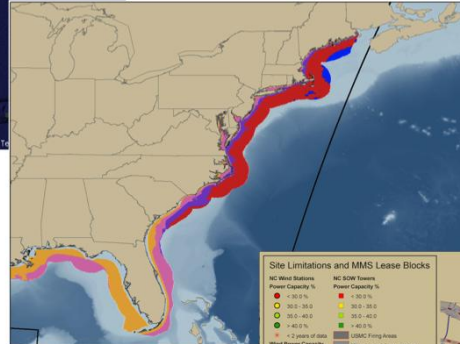
Understanding the potential interaction of migratory species and wind energy development will require long-term data aggregation to support environmental impact analysis and forecasting models.

Data needs for renewable energy siting & permitting

We need to be able to provide necessary data and models to answer renewable energy siting questions at multiple scales

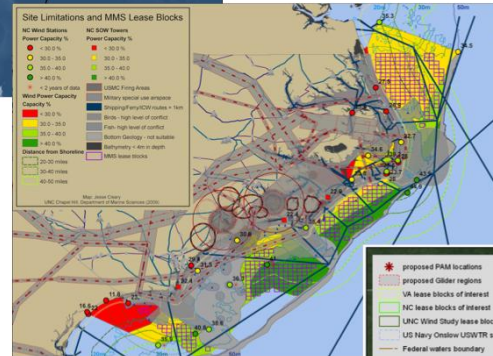


(a) US Atlantic coast
Migratory species data & models



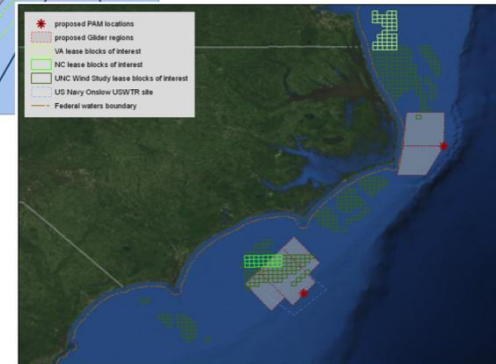
(b) US Atlantic coast
Renewable energy potential

(c) NC Hatteras / Onslow Bay
Renewable energy potential
& constraints



Lease-block scale

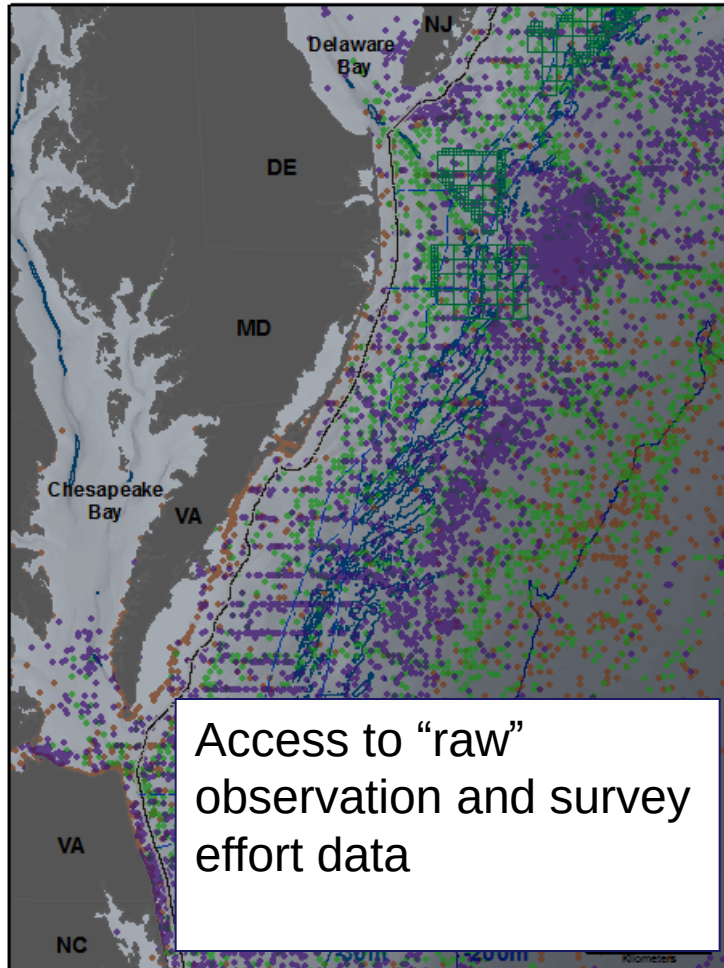
(d) NC Hatteras / Onslow Bay
Passive acoustics study area
Proposed lease blocks



Atlantic Coast scale

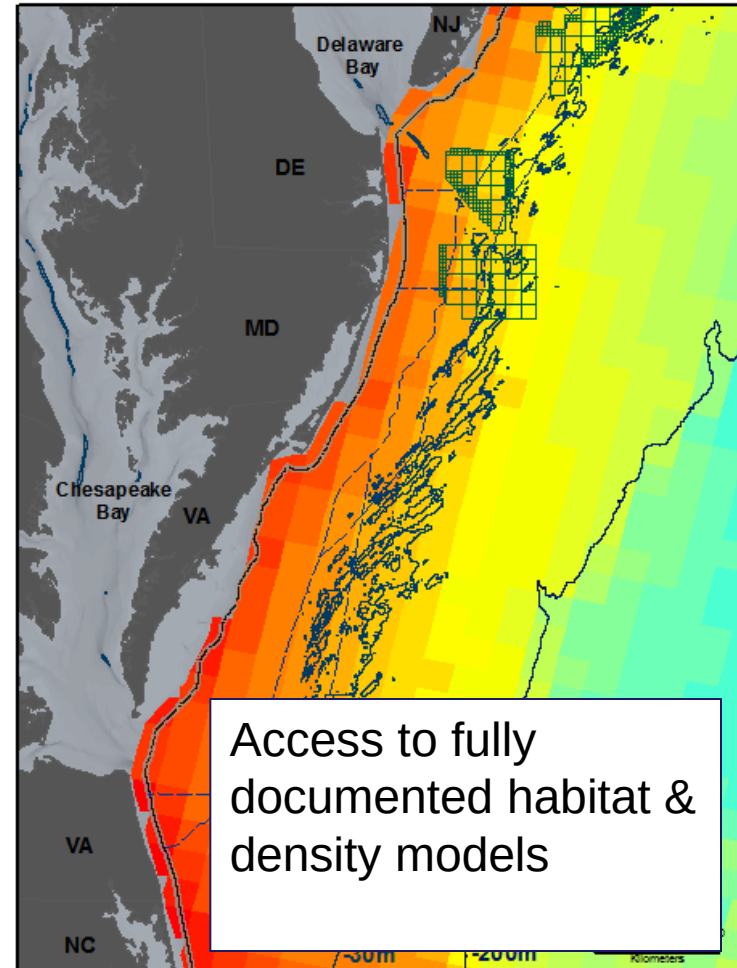
Data needs for renewable energy siting & permitting

Observation data

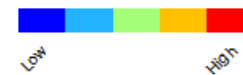


- State Waters Boundary
- AWC Transmission Line Plans
- BOEMRE Wind Energy Area
- Sea Turtle Observation
- Sea Bird Observation
- Marine Mammal Observation

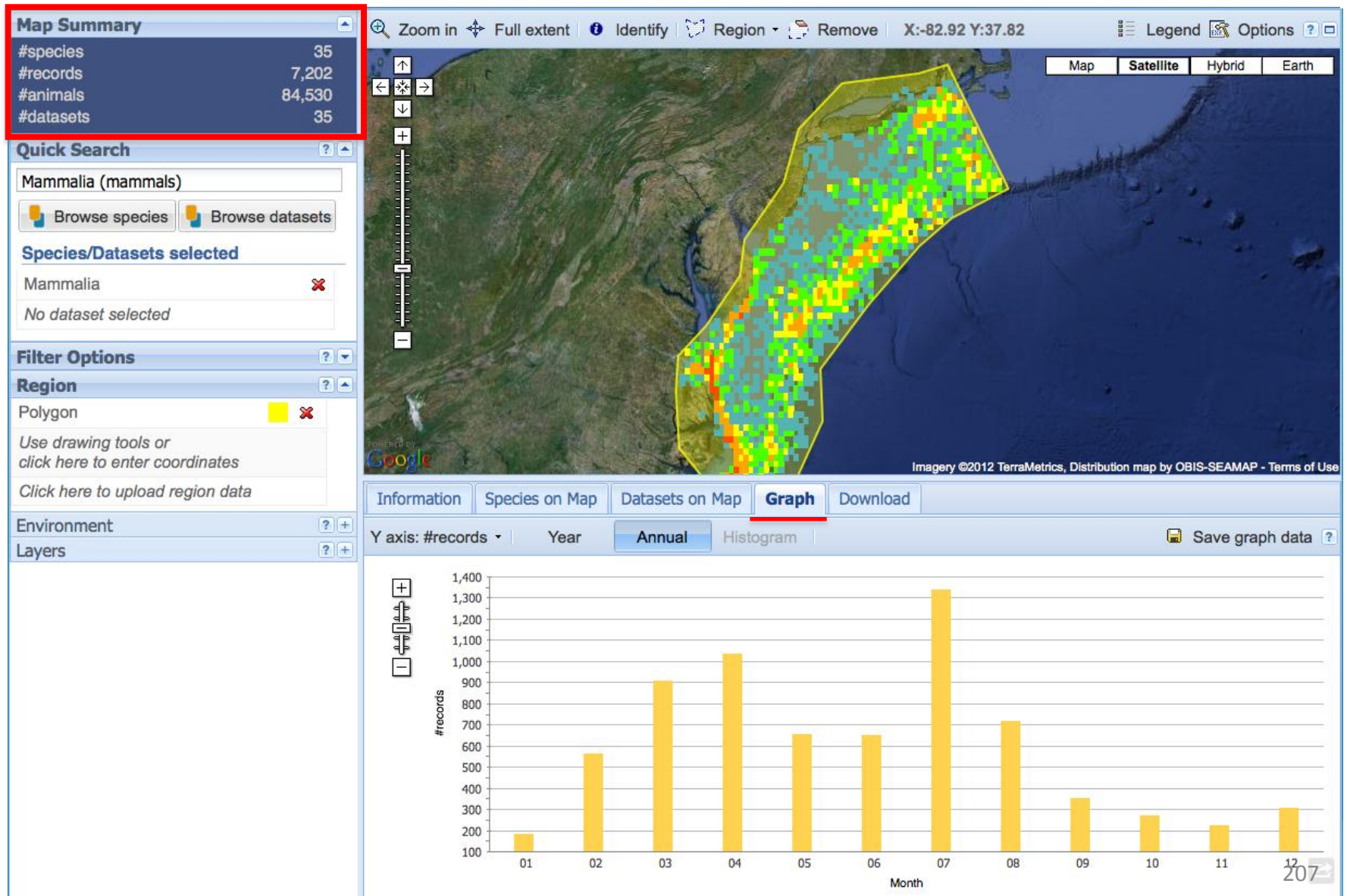
Habitat / Density models



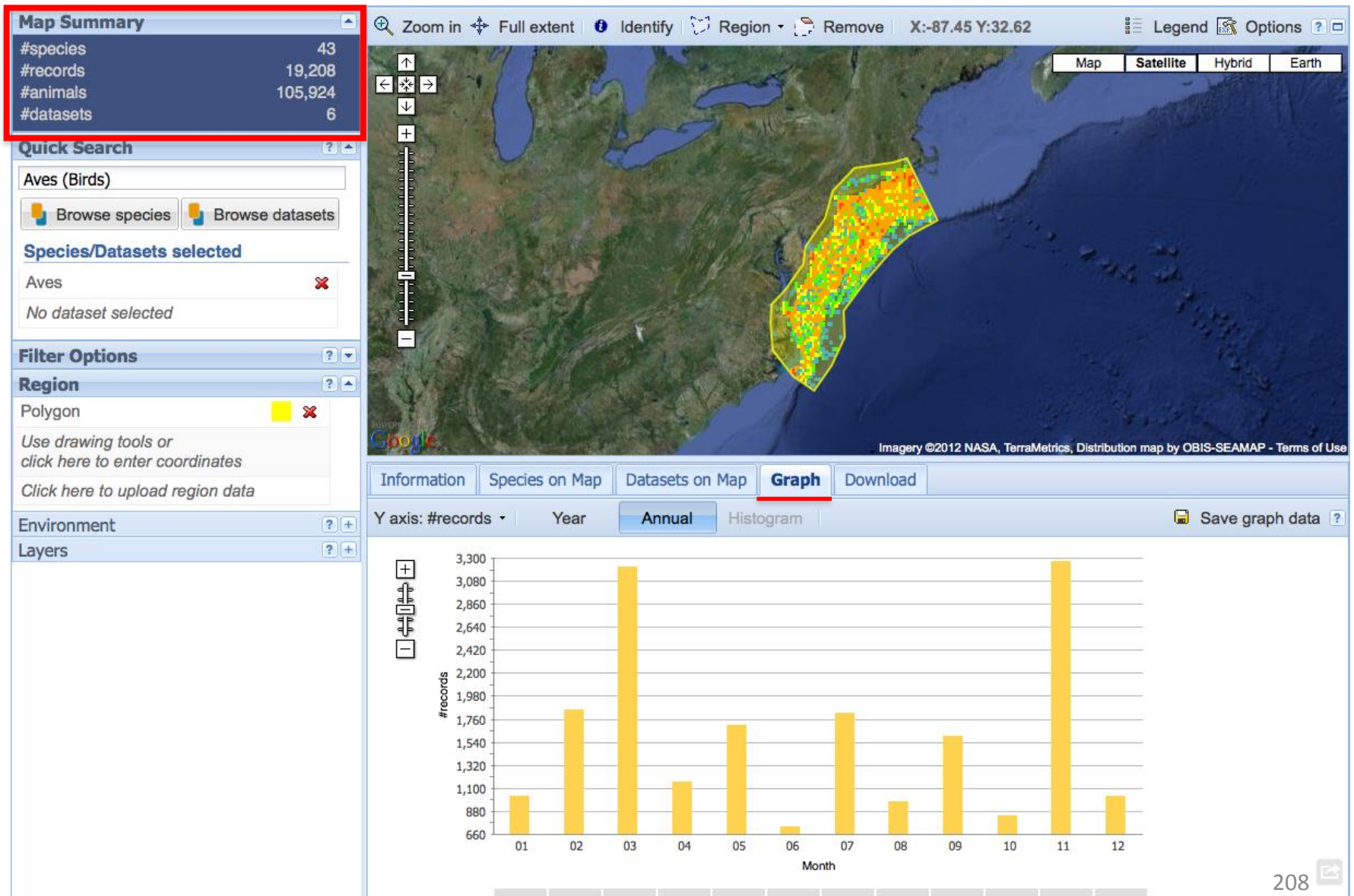
Tursiops habitat affinity (fall)



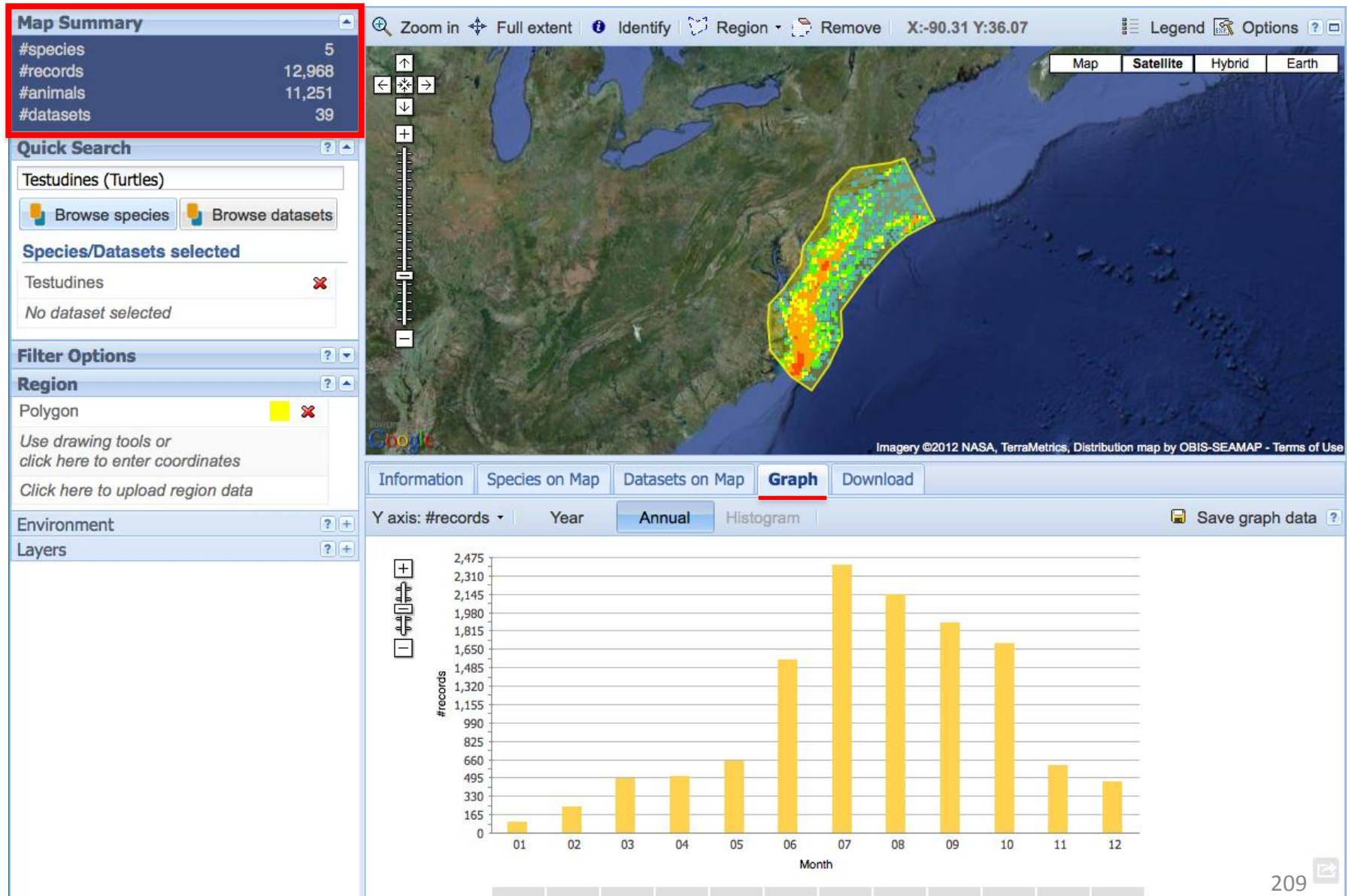
Marine mammal observations in OBIS-SEAMAP



Seabird observations in OBIS-SEAMAP

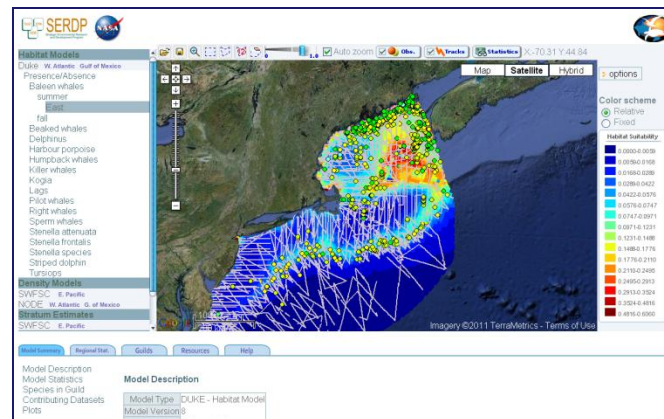


Sea turtle observations in OBIS-SEAMAP



Take-home Messages

- OBIS-SEAMAP is the protected species observation data & modeling node of the international OBIS information network;
- OBIS-SEAMAP specializes in R&D for the synthesis and analysis of marine biological data for applied science and management uses;
- OBIS-SEAMAP/OBIS-USA team is very interested in formally coordinating our work with emerging DOI / BOEM wind energy initiatives in the Atlantic Coast region.





OBIS-SEAMAP

<http://seamap.env.duke.edu/>

OBIS

<http://iobis.org/>

Thank you



National Science Foundation
WHERE DISCOVERIES BEGIN

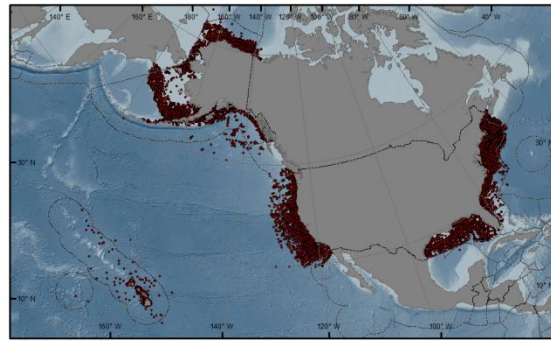


Marine Geospatial Ecology Lab
Nicholas School of the Environment
Duke University

Presentation #3

Cetacean Density and Distribution Mapping Working Group (CetMap)

Project Overview



Mid-Atlantic Marine Wildlife Surveys, Modeling, and Data Workshop

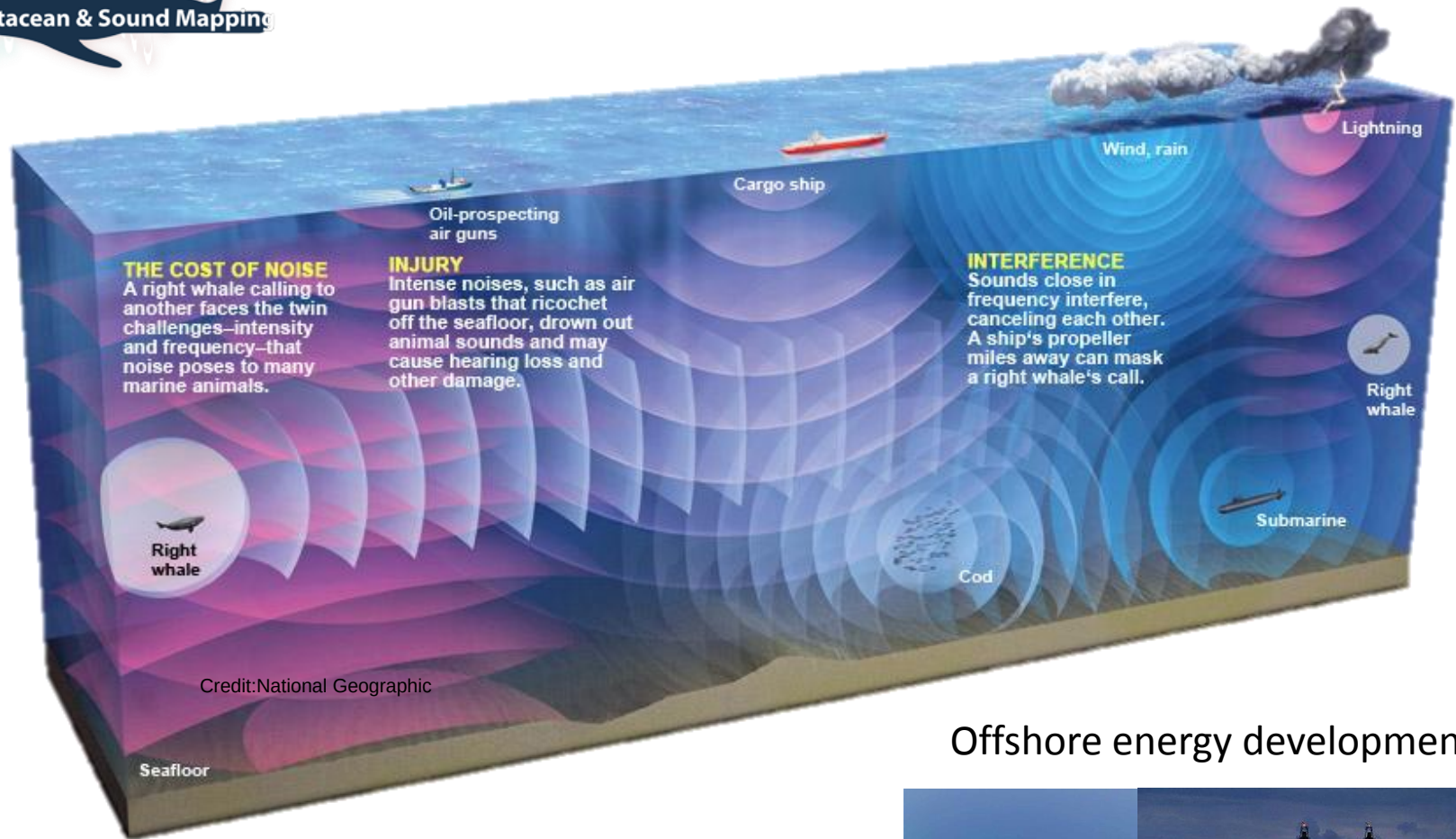
Pat Halpin, Jesse Cleary, Corrie Curtice, Erin LaBrecque
&
the NOAA CetMap Team



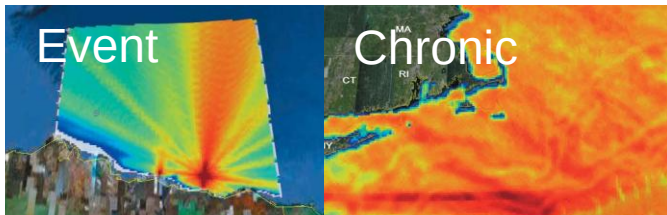
Marine Geospatial Ecology Lab
Nicholas School of the Environment
Duke University



Cetaceans, sound exposure & Marine Spatial Planning



Offshore energy development

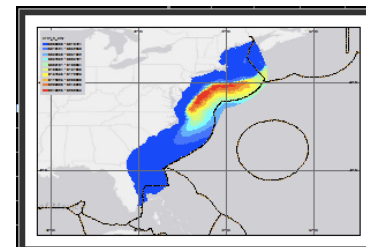
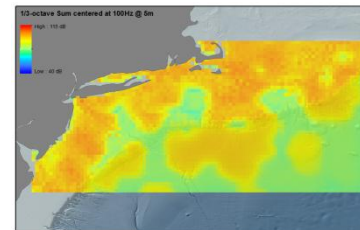


Project Context

NOAA commits to improving the tools used by the agency to evaluate the impacts of human-induced noise on cetacean species.

Two data and product-driven working groups were formed:

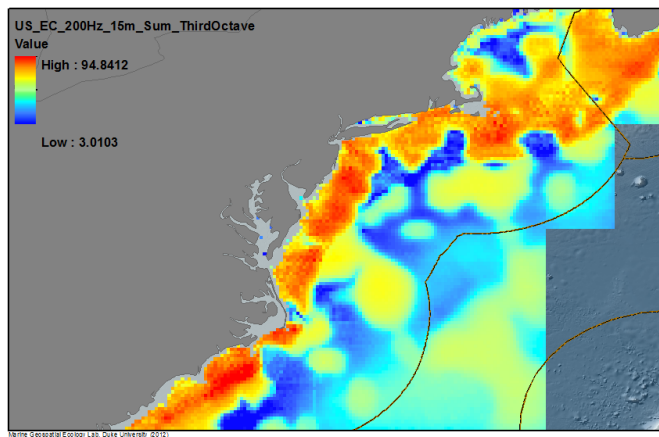
1. Underwater Sound-field Mapping Working Group (SoundMap)
to create mapping methods to depict the temporal, spatial, and spectral characteristics of underwater noise
2. Cetacean Density & Distribution Mapping Working Group (CetMap)
to create regional cetacean density and distribution maps that are time- and species-specific, using survey data and models that estimate density using predictive environmental factors



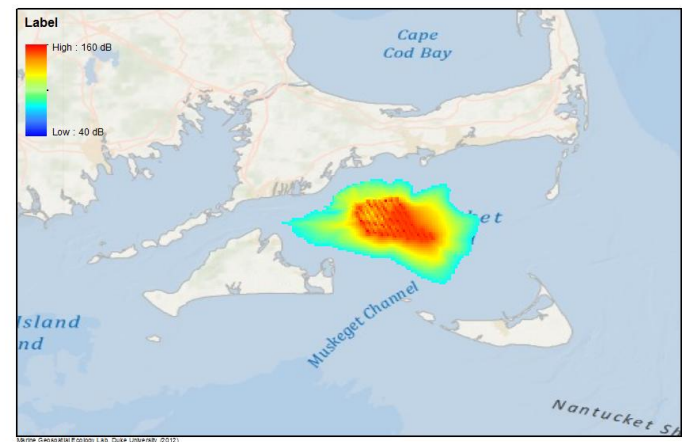
SoundMap Working Group

Chronic and Event based sound modeling

- Depth: 5, 15, 30, 200, 500, 1000m depth bins
- Frequency: 50, 100, 200, 400, 800 Hz
- Basin scale, US EEZ, Event AOIs



Chronic: global shipping, passenger vessels, seismic surveys, rig servicing vehicles => summation



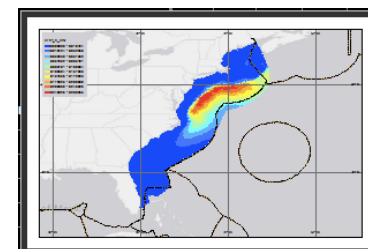
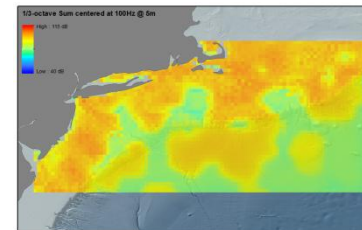
Events: active sonar training, wind farm construction, Alaska seismic surveys

Project Context

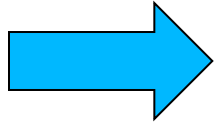
NOAA commits to improving the tools used by the agency to evaluate the impacts of human-induced noise on cetacean species.

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CetMap Working Group tasks

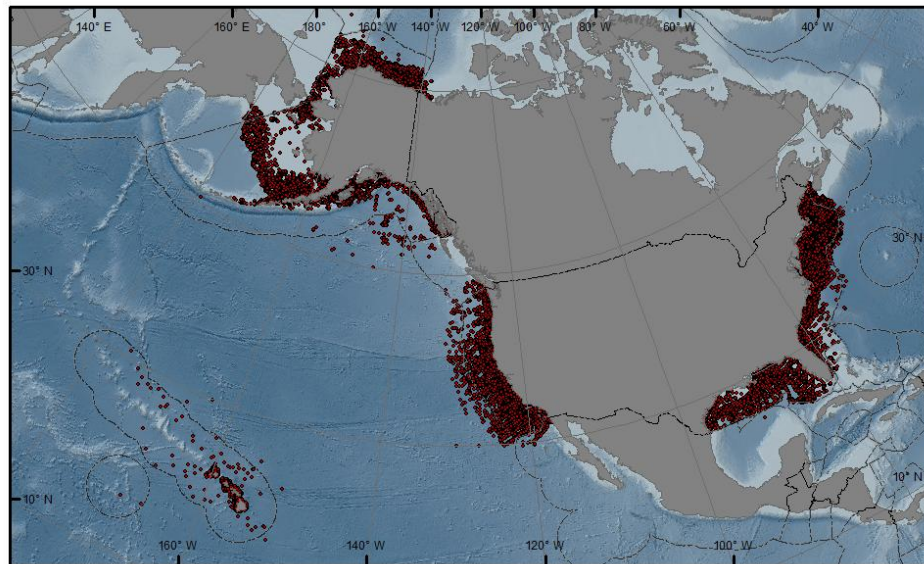


1. Cetacean Data Availability Analysis
2. New Modeling Efforts
3. Biologically Important Areas

Cetacean data & model discovery tool

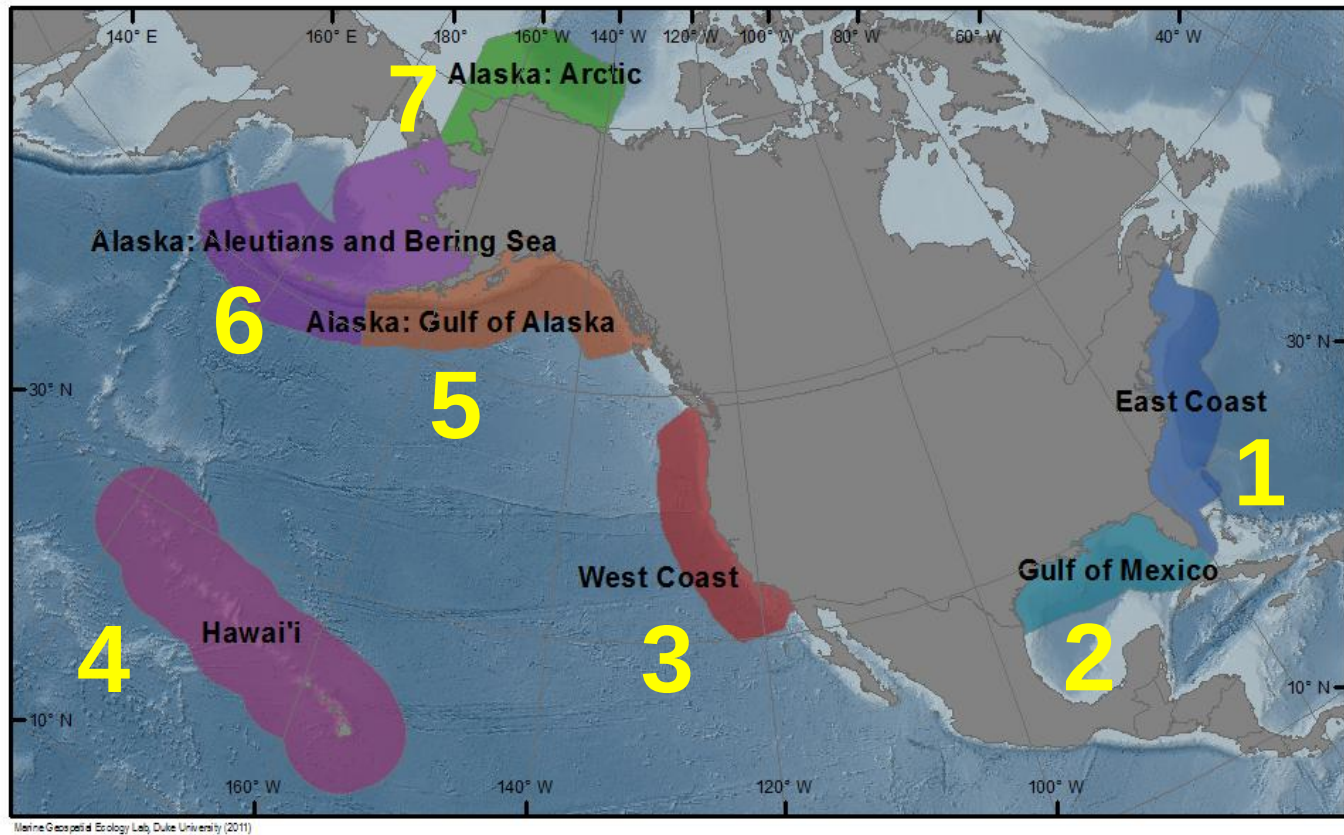
Geospatial Analysis to support the marine mammal acoustics working groups

- Assessment of available data
 - Spatial / regional gaps
 - Temporal / seasonal gaps
- Assessment of available models

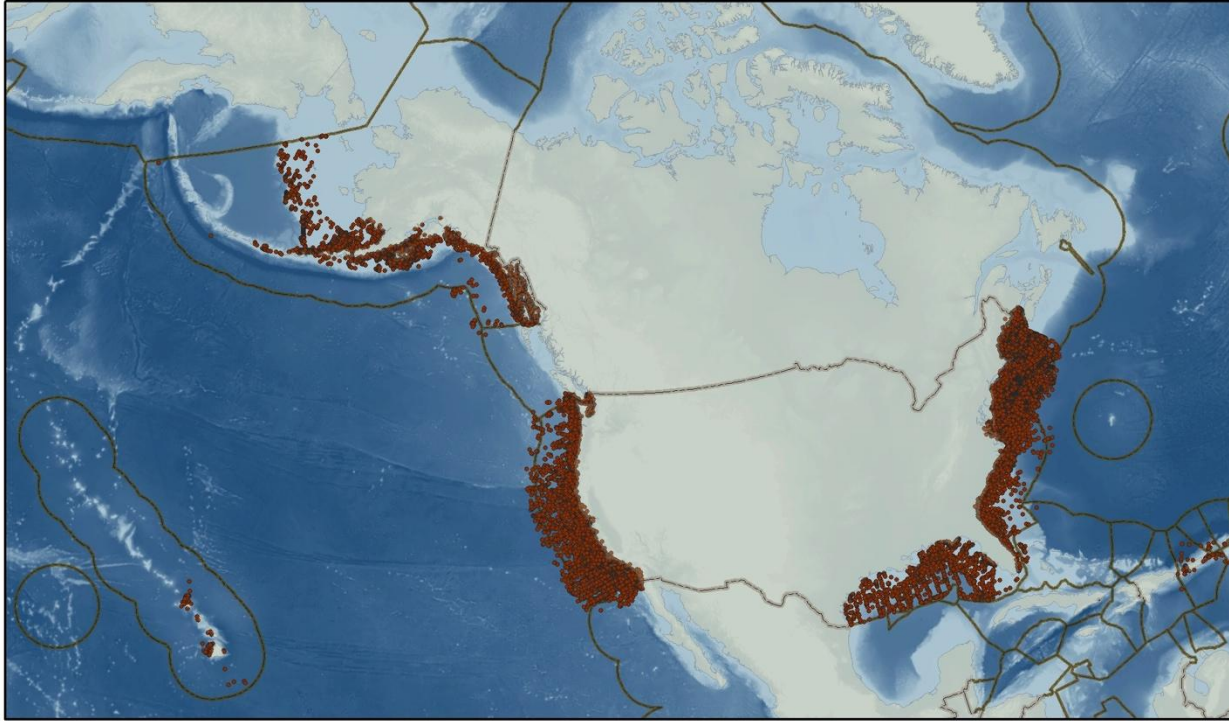


Task 1: Cetacean data availability analysis

7 working regions



Cetacean observations in US Territorial Waters (+50 miles)

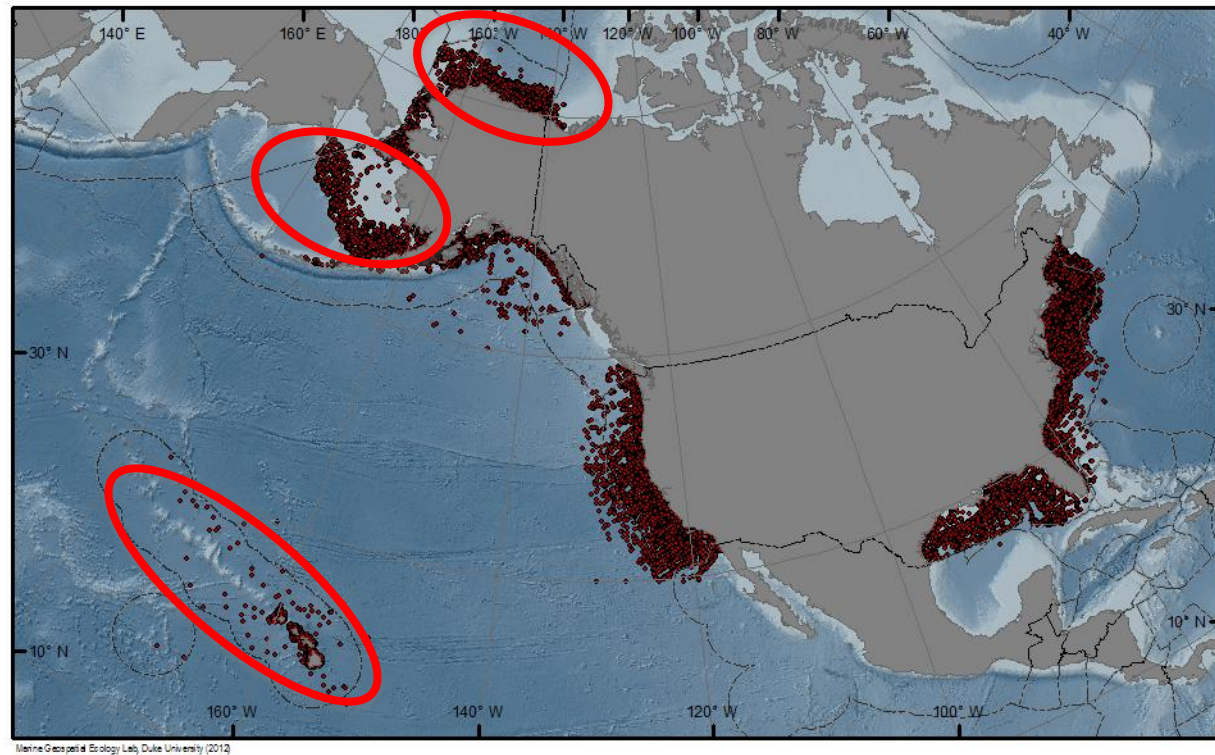


OBIS-SEAMAP Cetacea records: ~141,000

Observation types within Cetacea:

Observation Type	Record Count
point observations	90K
point acoustics / calls	29K
telemetry track	22K

Task 1: Cetacean data availability analysis



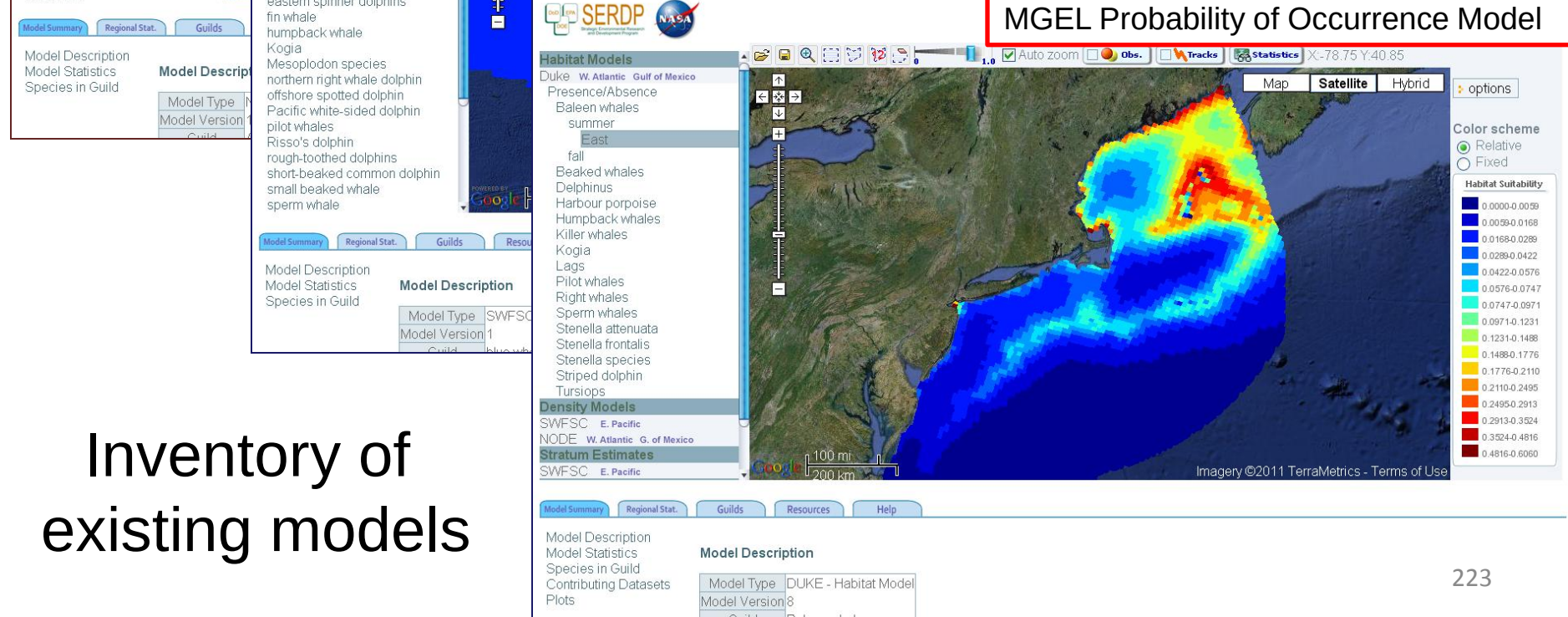
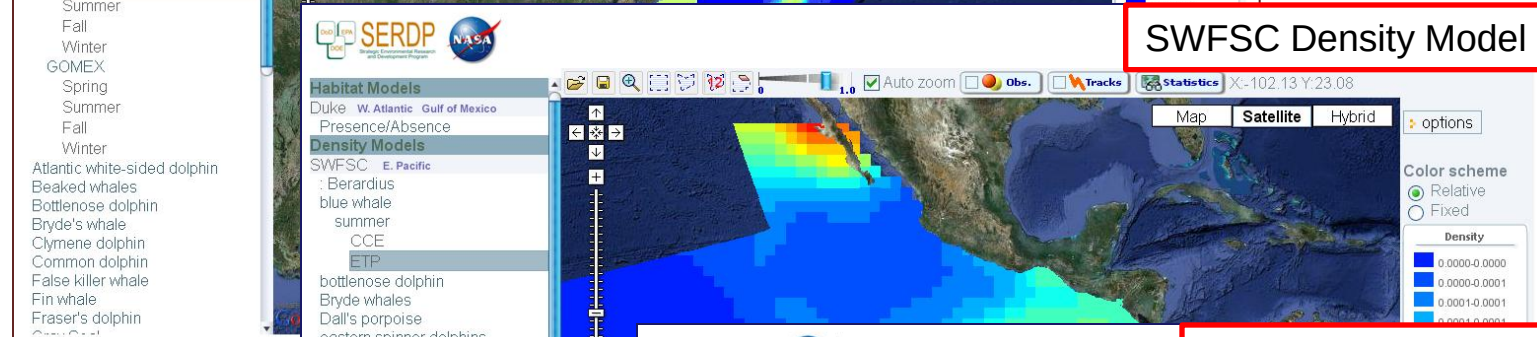
Spring 2011: 141,500

Spring 2012: 172,885

~31,400 additional observations located

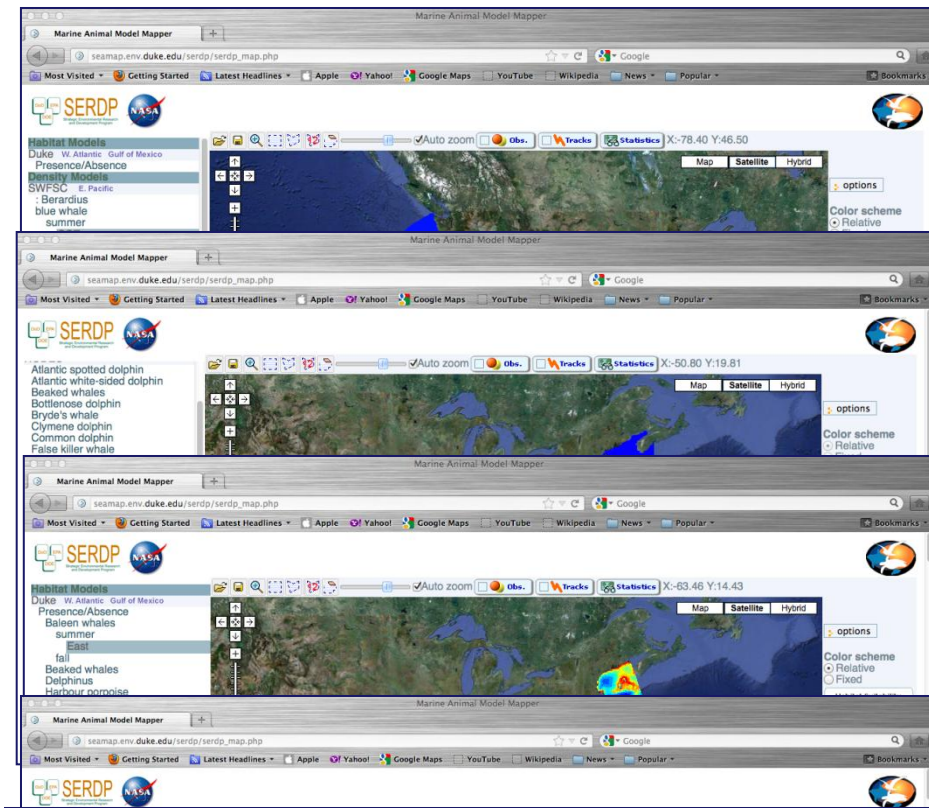
~22% increase

Multiple habitat/density models from different projects



Cetacean data hierarchy

1. Habitat-based Density
2. Stratified Density
3. Probability of Occurrence
4. Records Exist
5. Expert-based



Please add any other cetacean species known to ever exist in the Aleutians Gulf of Alaska that are not on this list.

Note whether any of the species listed below are known to NOT inhabit the Aleutians/ Gulf of Alaska.

If it is unknown whether a species is present in the	in the	Gulf of Alaska , leave it on the list and
--	--------	---

Balaena mysticetus	No					
Balaenoptera acutorostrata	Yes					
Balaenoptera borealis	Yes					
Balaenoptera musculus	Yes	But very rare				
Balaenoptera physalus	Yes					
Berardius bairdii	Yes					
Delphinapterus leucas	Yes					
Eschrichtius robustus	Yes					
Eubalaena japonica	Yes	But very rare				
Grampus griseus	Unknown					
Lagenorhynchus obliquidens	Yes					
Lissodelphis borealis	Yes	Rare - only two sightings				
Megaptera novaeangliae	Yes					
Mesoplodon stejnegeri	Yes					
Monodon monoceros	No					
Orcinus orca	Yes					
Phocoena phocoena	Yes					
Phocoenoides dalli	Yes					
Ziphius cavirostris	Unknown					
Physeter macrocephalus	Yes					

Regional Data Sheets

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total Data+Model Months
Balaenoptera acutorostrata	HD	HD	HD	HD	HD	HD	HD/PO	HD/PO	HD/PO	HD/PO	HD/PO	HD	12
Balaenoptera borealis	HD	HD	HD	HD	HD	HD	HD/PO	HD/PO	HD/PO	HD/PO	HD/PO	HD	12
Balaenoptera edeni	NoData	NoData	NoData	NoData	NoData	NoData	PO	PO	PO	PO	PO	NoData	5
Balaenoptera musculus	REC	1	NoData	3	4	1	2	1	NoData	4	1	NoData	9
Balaenoptera physalus	HD	HD	HD	HD	HD	HD	HD/PO	HD/PO	HD/PO	HD/PO	HD/PO	HD	12
Delphinus delphis	HD	HD	HD	HD	HD	HD	HD/PO	HD/PO	HD/PO	HD/PO	HD	HD	12
Eubalaena glacialis	HD	HD	HD	HD	HD	HD	HD/PO	HD/PO	HD/PO	HD	HD	HD	12
Feresa attenuata	NoData	1	NoData	NoData	NoData	NoData	3	1	NoData	NoData	NoData	NoData	3
Globicephala macrorhynchus	HD/PO	HD/PO	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD/PO	12
Globicephala melas	HD/PO	HD/PO	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD/PO	12
Grampus griseus	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Hyperoodon ampullatus	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Kogia breviceps	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Kogia sima	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Kogia spp.	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Lagenodelphis hosei	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	1
Lagenorhynchus acutus	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Lagenorhynchus albirostris	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	11
Megaptera novaeangliae	HD/PO	HD/PO	HD	HD	HD	HD	HD/PO	HD/PO	HD/PO	HD/PO	HD/PO	HD/PO	12
Mesoplodon bidens	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Mesoplodon densirostris	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Mesoplodon europaeus	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Mesoplodon mirus	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Mesoplodon spp.	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Orcinus orca	NoData	NoData	1	1	6	1	5	8	8	2	NoData	1	9
Peponocephala electra	NoData	NoData	NoData	NoData	NoData	2	NoData	NoData	1	NoData	NoData	NoData	2
Phocoena phocoena	HD	HD	HD	HD	HD	HD	HD/PO	HD/PO	HD/PO	HD/PO	HD/PO	HD	12
Physeter macrocephalus	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Pseudorca crassidens	2	NoData	1	NoData	1	NoData	1	6	1	NoData	1	NoData	7
Stenella attenuata	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Stenella clymene	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Stenella coeruleoalba	HD	HD	HD	HD	HD	HD	HD/PO	HD/PO	HD/PO	HD	HD	HD	12
Stenella frontalis	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12
Stenella longirostris	NoData	NoData	1	1	NoData	NoData	3	2	NoData	NoData	NoData	NoData	4
Steno bredanensis	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	HD	12

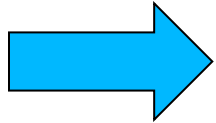
An accounting of data availability in space & time

Monthly summaries

EC	Stenella frontalis	25	42	31	32	11	18	39	109	63	21	4	NoData
EC	Stenella longirostris	NoData	NoData	1	1	NoData	NoData	3	2	NoData	NoData	NoData	NoData
EC	Steno bredanensis	1	NoData	NoData	1	NoData	3	17	1	3	1	NoData	NoData
EC	Tursiops truncatus	2014	1577	1416	2381	736	690	2694	2225	478	1594	650	470
EC	Ziphius cavirostris	1	2	1	NoData	1	1	28	10	NoData	1	NoData	NoData

CetMap Working Group tasks

1. Cetacean Data Availability Analysis

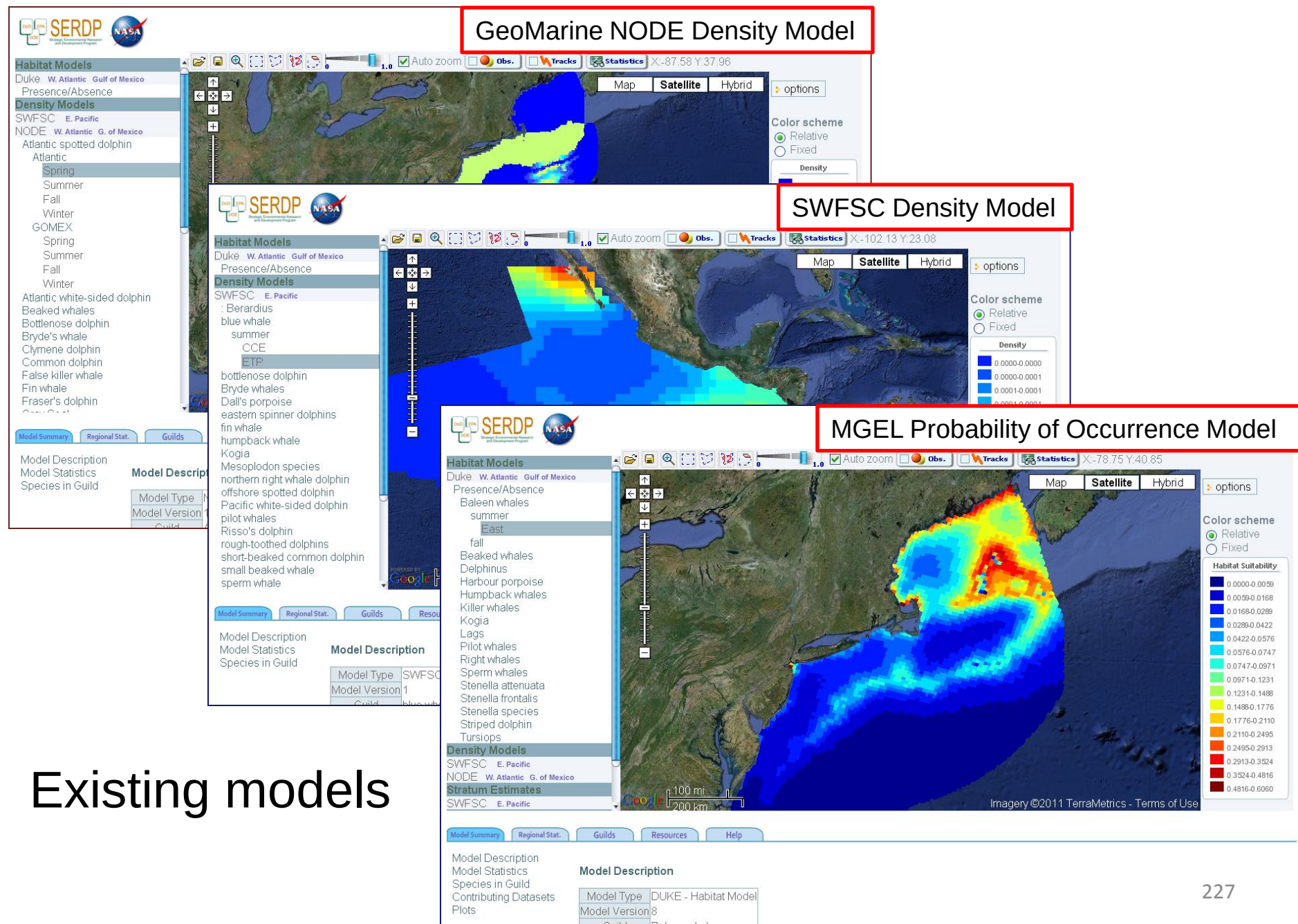


2. New Modeling Efforts

3. Biologically Important Areas

Cetacean data & model discovery tool

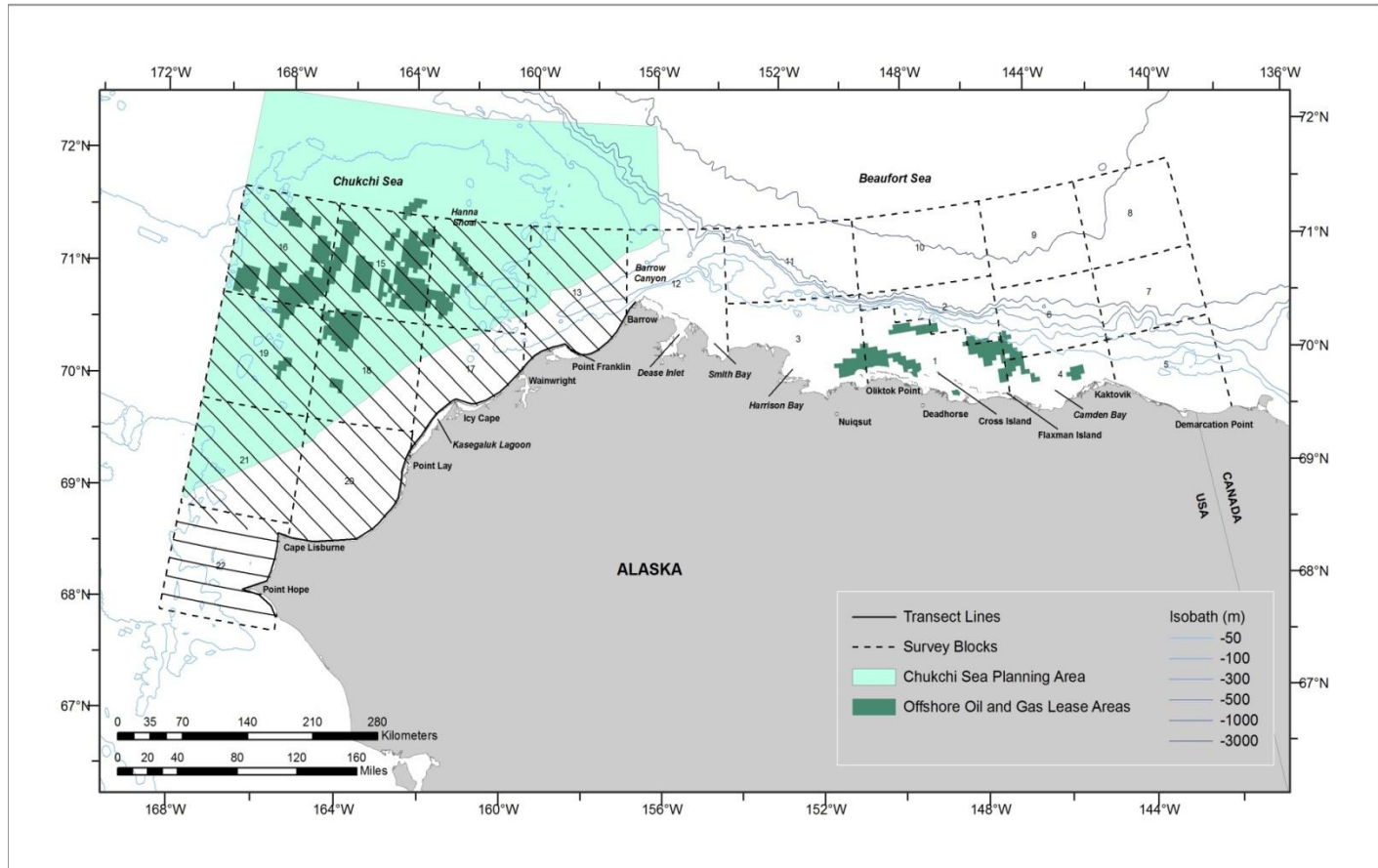
Multiple habitat/density models from different projects



Arctic Habitat-based Density Models

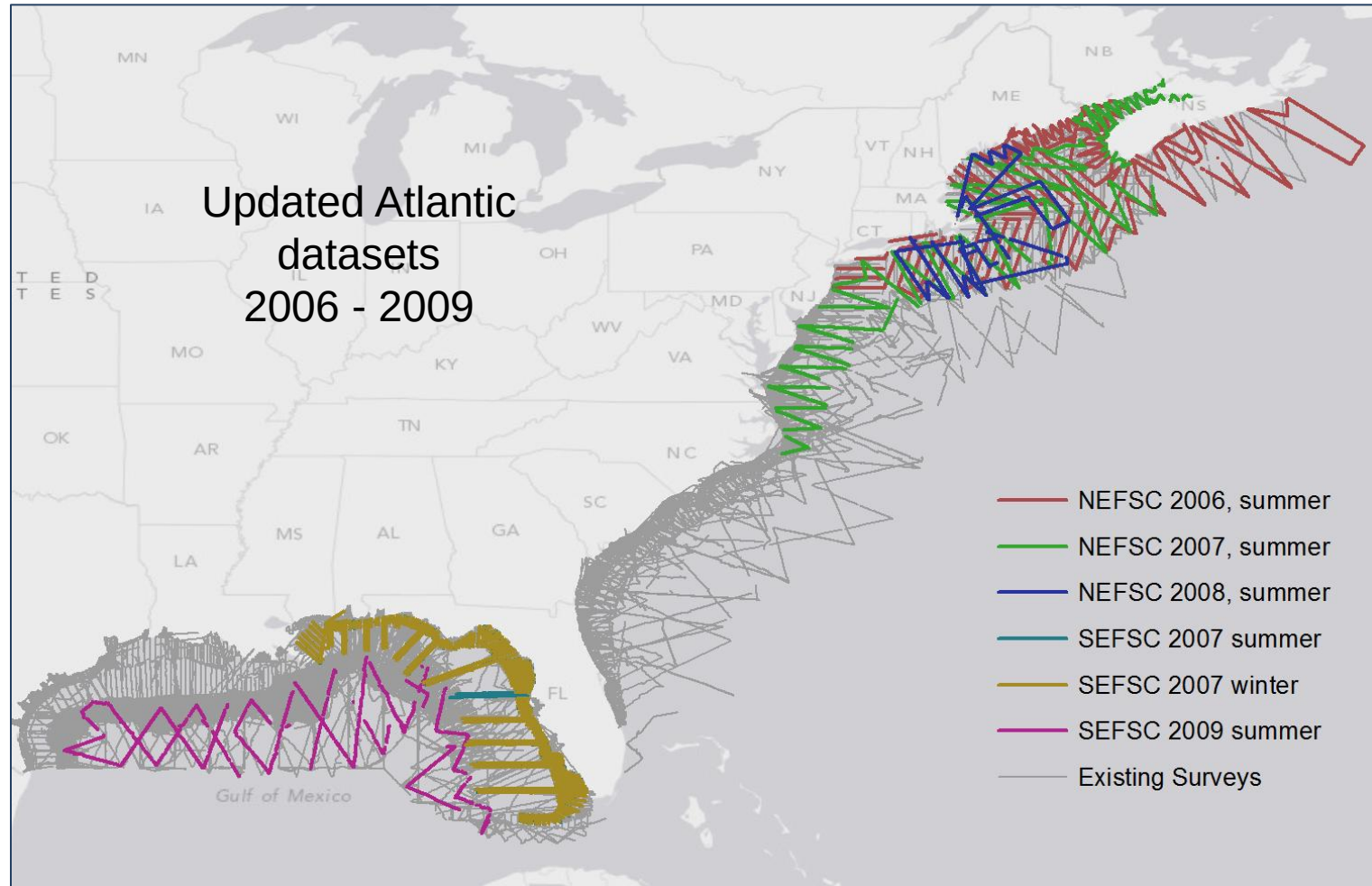
- Bowhead Whales
- Gray Whales
- Belugas

in-progress



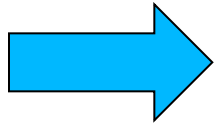
Ferguson pers. comm.

Habitat Density (HD) models in progress: EC & GoMEX



CetMap Working Group tasks

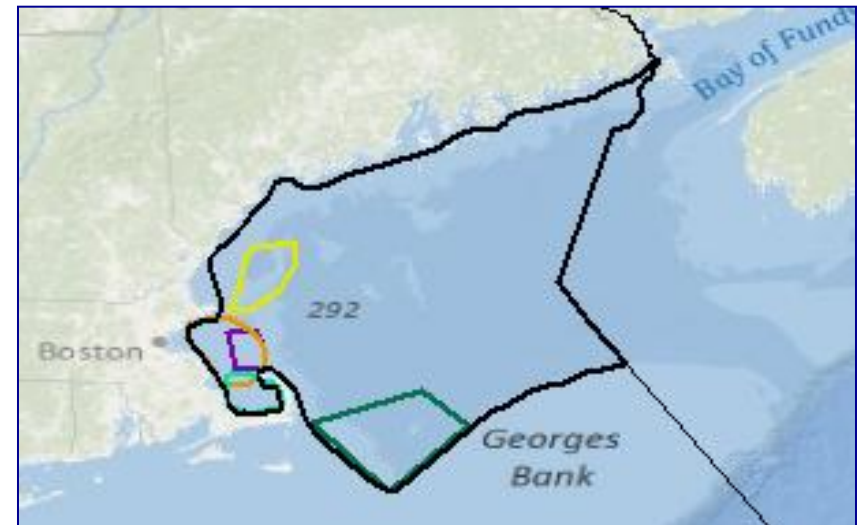
1. Cetacean Data Availability Analysis
2. New Modeling Efforts
3. Biologically Important Areas



Cetacean data & model discovery tool

Biologically Important Areas Criteria

- Reproductive Areas/Times
- Feeding Areas/Times
- Migratory Corridors
- Small or Resident Populations



CetMap Important Areas: East Coast

Erin LaBrecque

Table of Contents

East Coast	2
<i>Balaenoptera acutorostrata</i> (Minke Whale).....	2
<i>Balaenoptera borealis</i> (Sei Whale)	4

Balaenoptera musculus (Blue Whale)

Balaenoptera physalus (Fin Whale)

Eubalaena glacialis (North Atlantic Right Whale)

Megaptera novaeangliae (Humpback Whale)

Phocoena phocoena (Harbor Porpoise)

Tursiops truncatus (Bottlenose Dolphin)

Megaptera novaeangliae (Humpback Whale)

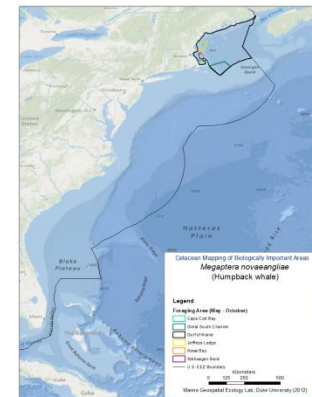
Criteria: migratory species

General

The Gulf of Maine feeding stock is the predominant subpopulation of humpback whales in the U.S. Atlantic Exclusive Economic Zone (EEZ) (Waring *et al.* 2010). Other areas of feeding subpopulations in the North Atlantic include Iceland-Denmark, Southwest Greenland, Southern Labrador and east of Newfoundland, and the Gulf of the St. Lawrence (Katona and Beard 1990, Perry *et al.* 1999). Whales from all the North Atlantic feeding areas migrate to the calving and breeding grounds off the West Indies in the winter (Mattila *et al.* 1989, 1994).

Feeding

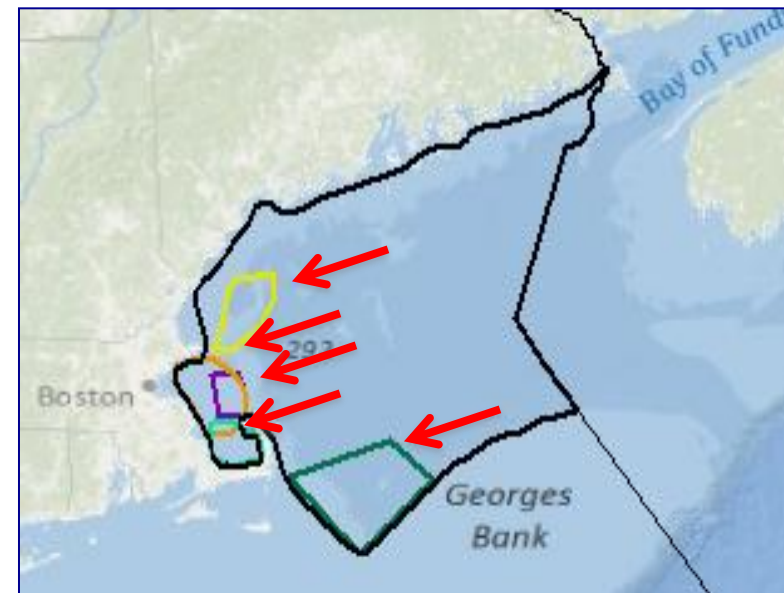
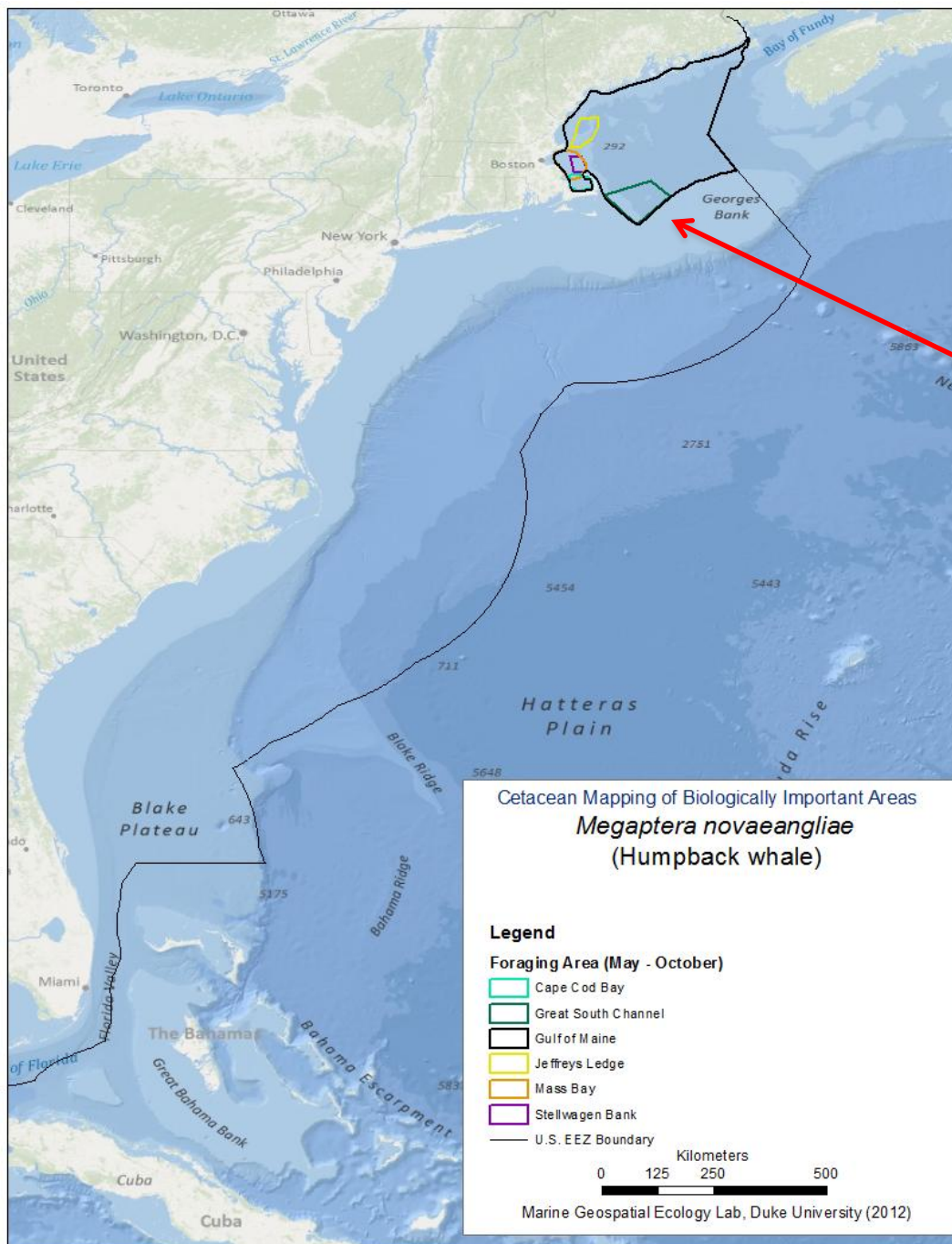
Humpback whales show strong site fidelity to their feeding grounds that is maternally directed (Clapham and Mayo 1987). Humpbacks feed in the Gulf of Maine from May through October although they have been seen feeding in earlier and later months (personal communication Allison Henry, NEFSC). Studies of humpback whale ecology in their feeding grounds in the Gulf of Maine have been ongoing since the mid-1970s (Clapham and Mayo 1987, 1990, Clapham *et al.* 1993, Friedlaender *et al.* 2009, Hazen *et al.* 2009, Payne *et al.* 1986, Weinrich 1991, Weinrich *et al.* 1997, Weinrich and Kuhlberg 1991). The distribution of humpbacks in the Gulf of Maine is related to their prey (herring and sand lance) densities and shifts accordingly. Payne *et al.* (1986) showed that humpbacks shifted from their primary feeding grounds on Georges Bank and the northern Gulf of Maine to Stellwagen Bank and the Great South Channel in response to shifts in the distribution of sand lance. Because prey densities respond to oceanographic influences that can be ephemeral, the entire Gulf of Maine is considered feeding grounds for humpback whales.



Biologically Important Areas

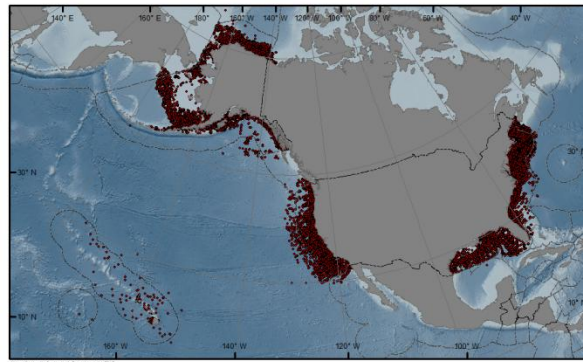
Megaptera novaeangliae
Humpback whale

Important foraging areas



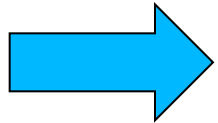
CetMap Data and Model Overview

- ~173,000 records collated
 - ~200 datasets represented
- 115 region + species + season models
 - New Arctic, GoMEX and Atlantic models in process
- 56 stratified density estimates identified
- 70 Biologically Important Areas identified



CetMap Working Group tasks

1. Cetacean Data Availability Analysis
2. New Modeling Efforts
3. Biologically Important Areas



Cetacean data & model discovery tool

Cetacean Data Availability

Purpose: to provide a single tool to discover the available data and models




[Home](#)
[Participants](#)
[Cetacean](#)
[Sound](#)

Tier Code	Description	Extended
1 hd	Habitat-based Density	hde
2 sd	Stratified Density	sde
3 po	Probability of Occurrence	poe
4 rec	Records Exist	rece
5 exp	Expert-based presence	expe
5 exa	Expert-based likely absence	exae

! Biologically Important Areas exist

Cetacean Data Availability

Show data availability for Region = West Coast (WC) ☒ Hide rows where species is absent

Region	Species	Package	Product	J	F	M	A	M	J	J	A	S	O	N	D
▲ WC															
	▼ Balaenoptera acutorostrata			sde	sd			rec	rec	rec	rec	rec	rec	rec	rec
	▼ Balaenoptera borealis			exp	rec		rec			sd					
	▼ Balaenoptera edeni			rec						sd					rec
	▼ Balaenoptera musculus			sde	sd			rec	rec	hd			rec	rec	rec
	▲ Balaenoptera physalus			sde	sd			rec	rec	hd			rec	rec	rec
		swfsc_serdp_cce_2009	swfsc_1_cce_25km_balphy_rs_summer							hd					
		swfsc_stratified_densities_2009	swfsc_strata_cce_bal.phy_winter	sde	sd										
		▼ cetmap_observations_2012		rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec
		cetmap_expertpresence_2012	cetmap_exp_wc_balaenoptera_physalus	exp											
	▼ Berardius bairdii			rec	rec	rec	rec	rec	rec	hd			rec	rec	
	▼ Delphinus capensis			rec			rec		sde	sde		sd			
	▼ Delphinus delphis			rec	rec	rec	rec	rec	rec	hd			rec	rec	rec
	▼ Delphinus spp.			sde	sd			rec	rec	hd			rec	rec	rec
	▼ Eschrichtius robustus			rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec
	▼ Eubalaena japonica			sde	sd			rec							
	▼ Globicephala macrorhynchus			exp		rec				sd					rec
	▼ Grampus griseus			sde	sd			rec	rec	hd			rec	rec	rec
	▼ Kogia breviceps			exp									rec	rec	rec

Take-home Messages

- CetMap project provides a one-stop data and model discovery system;
- CetMap maximizes the value of existing data & modeling efforts.
- CetMap is adaptable and will allow updates for new data & model products.



<http://cetsound.noaa.gov>



Thank you!



National Science Foundation
WHERE DISCOVERIES BEGIN

<http://seamap.env.duke.edu/>

Marine Geospatial Ecology Lab
Nicholas School of the Environment
Duke University

Presentation #4

NJDEP Ocean/Wind Power Ecological Baseline Studies

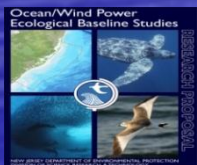
Mid-Atlantic Workshop

July 24, 2012

Gary A. Buchanan, Ph.D.

Office of Science

New Jersey Department of Environmental Protection



Ocean/Wind Power Ecological Baseline Studies

January 2008 – December 2009

FINAL REPORT

Volume I: Overview, Summary, and Application



NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF SCIENCE

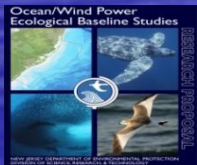
Prepared by:
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2201 K Avenue, Suite A2
Plano, Texas 75074
Phone: 972.423.5480
Fax: 972.422.2736
Web: www.geo-marine.com

July 2010



Specific Objectives – Fill Data Gaps

- In the Study Area, what are the abundance, distribution, and utilization of:
 - Bird Species (flight behavior)
 - Marine Mammals
 - Sea Turtles
- What areas are more/less suitable for renewable energy projects based on potential ecological/environmental impacts?
- Two year study (2008-2009): ~\$7M



STUDY AREA

New
Jersey

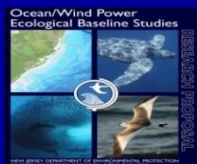
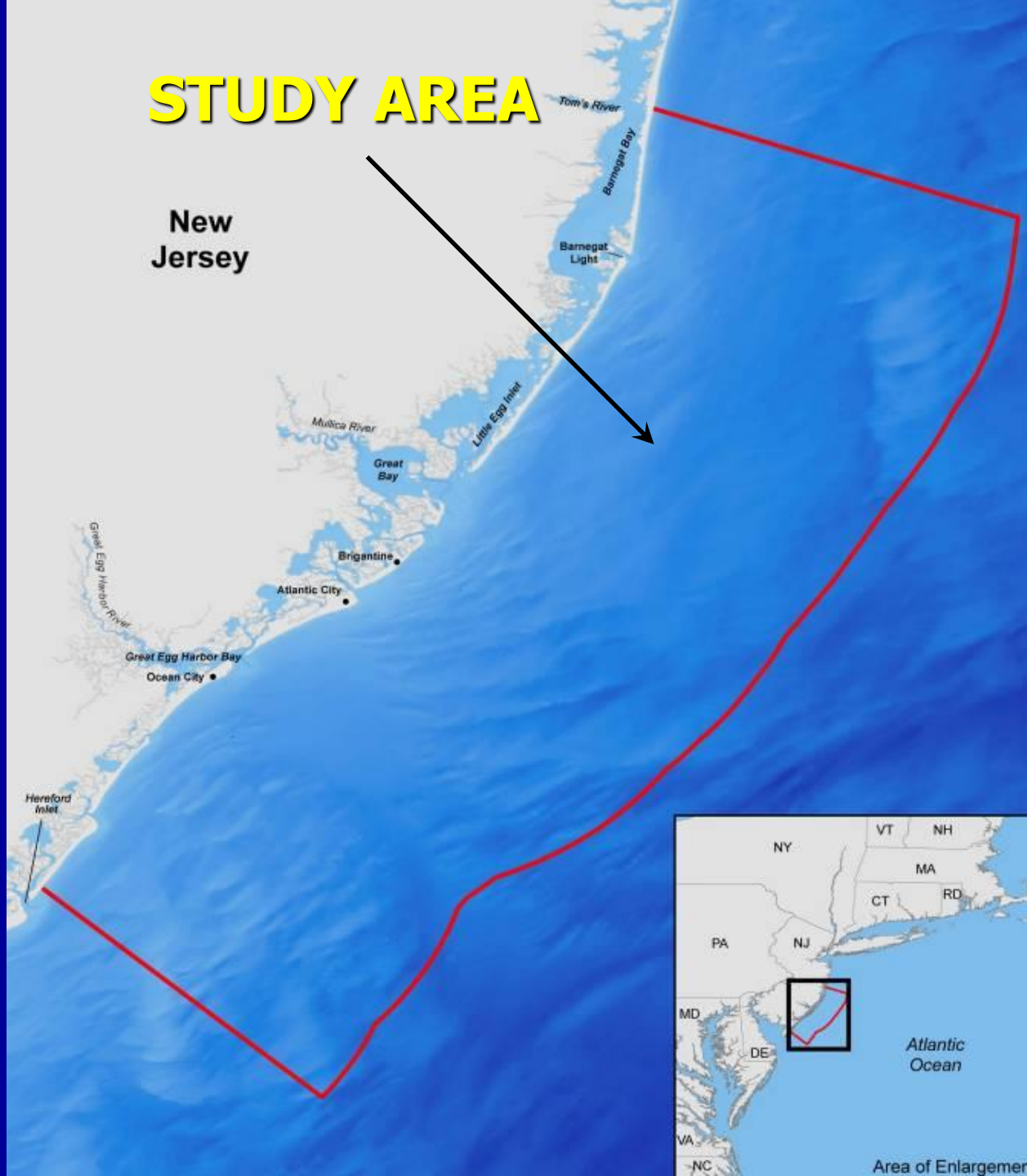
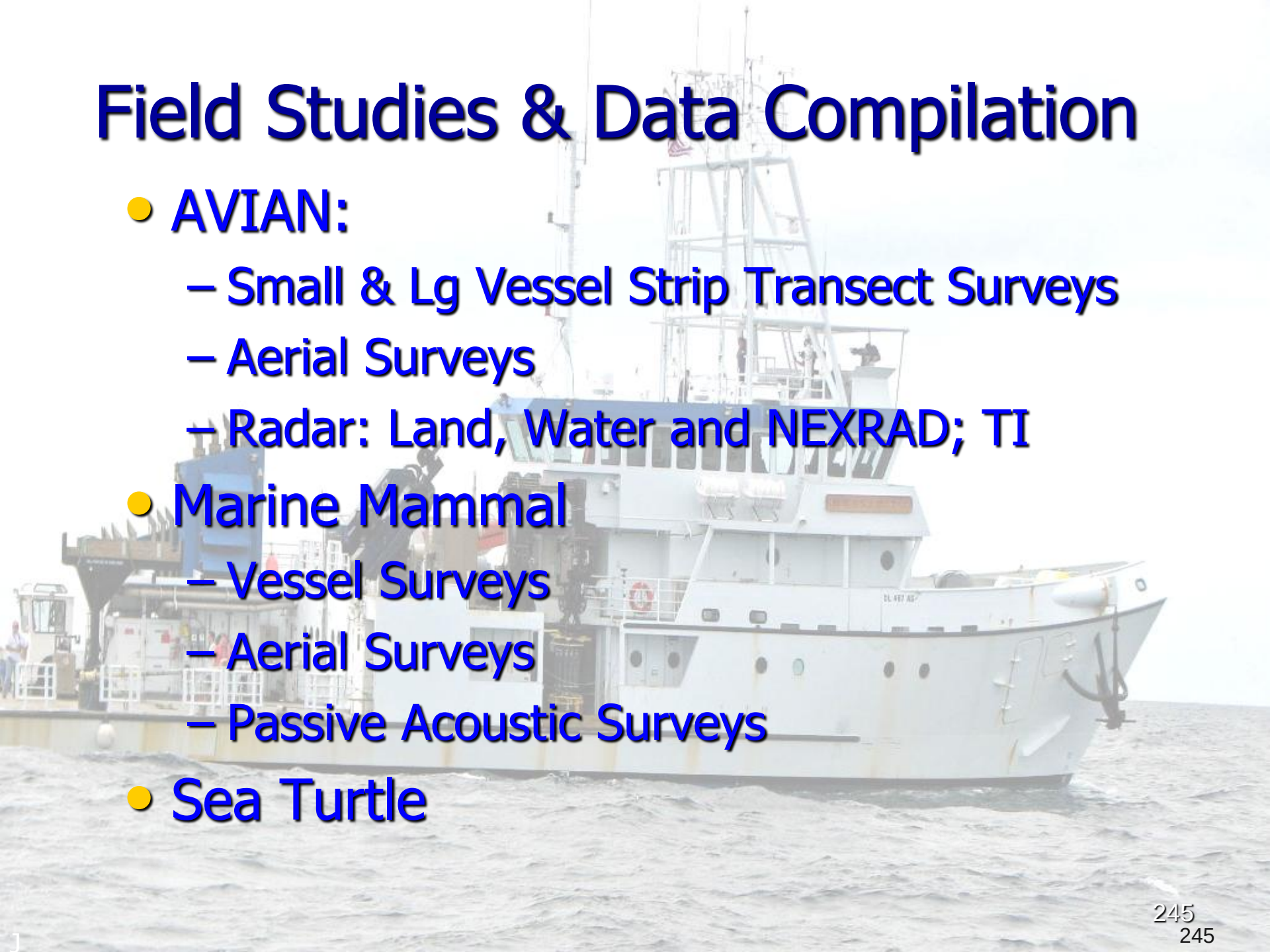




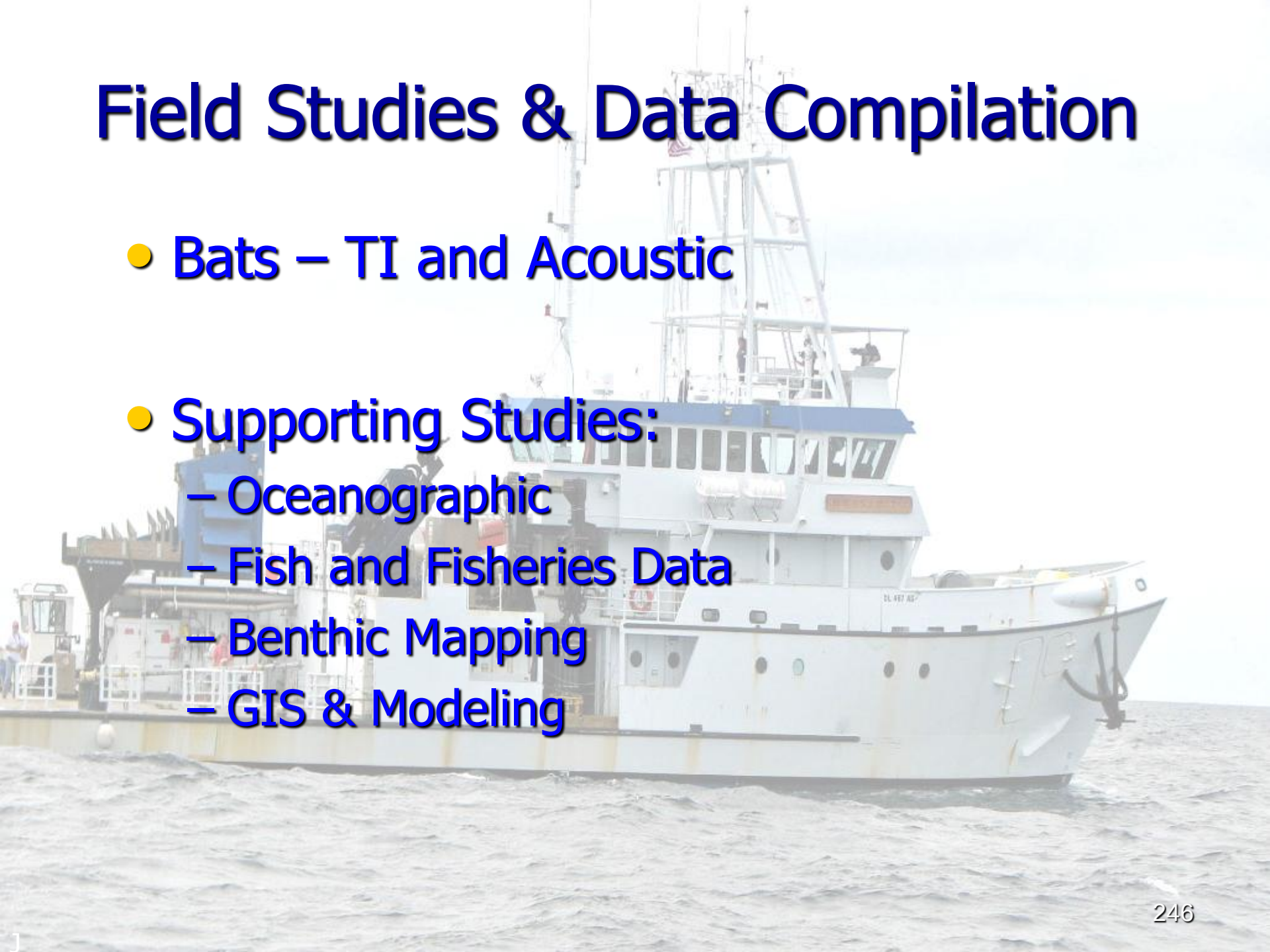
Photo by Tony Leukering, GMI

Field Studies & Data Compilation

A white research vessel with a complex mast and equipment, sailing on the ocean. The vessel has a white hull and a white superstructure. It has a large mast with various antennas and sensors. The vessel is moving through the water, leaving a wake.

- **AVIAN:**
 - Small & Lg Vessel Strip Transect Surveys
 - Aerial Surveys
 - Radar: Land, Water and NEXRAD; TI
- **Marine Mammal**
 - Vessel Surveys
 - Aerial Surveys
 - Passive Acoustic Surveys
- **Sea Turtle**

Field Studies & Data Compilation

A white research vessel with a blue stripe and various scientific equipment on deck, sailing on the ocean. The vessel has a complex rigging system and a large antenna on the mast. The name "DL 407 AG" is visible on the side of the hull.

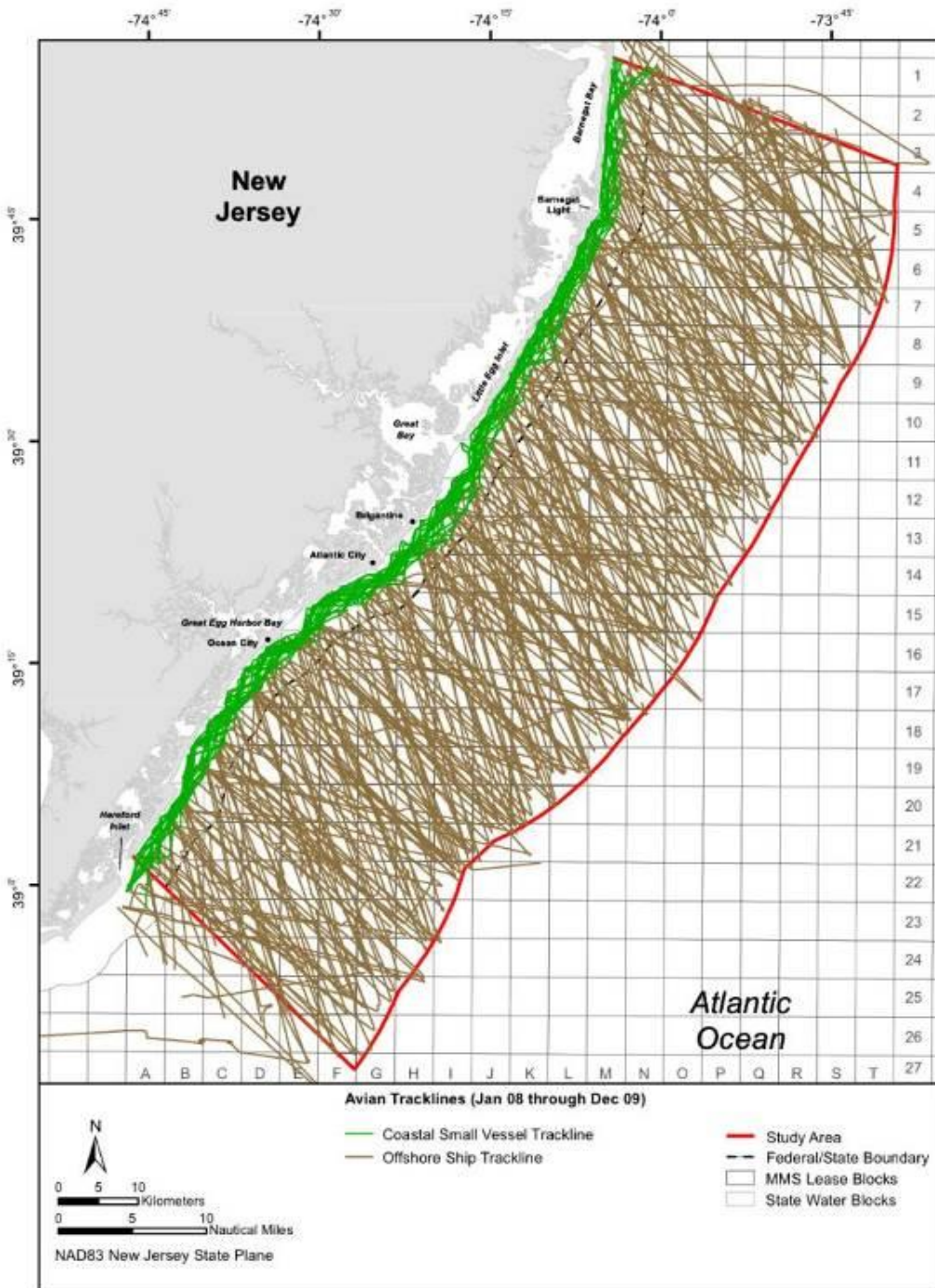
- Bats – TI and Acoustic
- Supporting Studies:
 - Oceanographic
 - Fish and Fisheries Data
 - Benthic Mapping
 - GIS & Modeling



Avian Radar







**TOTAL SURVEY EFFORT
2008-2009**

**Bimonthly coastal and
offshore surveys**

Total km 18,183

Total species:
153 avian
8 marine mammal
2 sea turtle

Detected species

Five federally threatened or endangered species:

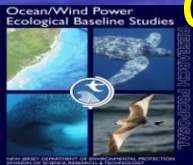
- North Atlantic right whale (*Eubalaena glacialis*)
- Fin whale (*Balaenoptera physalus*)
- Humpback whale (*Megaptera novaeangliae*)
- Leatherback turtle (*Dermochelys coriacea*)
- Loggerhead turtle (*Caretta caretta*)

Also:

- Minke whale (*Balaenoptera acutorostrata*)
- Bottlenose dolphin (*Tursiops truncatus*)
- Short-beaked common dolphin (*Delphinus delphis*)
- Harbor porpoise (*Phocoena phocoena*) and
- Harbor seal (*Phoca vitulina*)

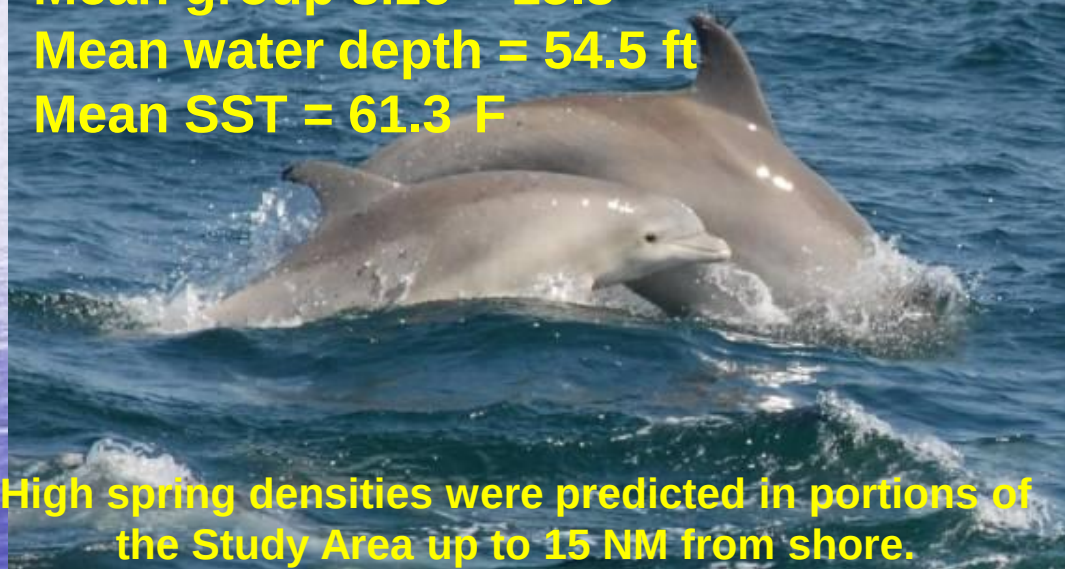
Data Analysis

- Marine Mammals and Sea Turtles: Conventional Distance Sampling (CDS, design-based approach) and Density Surface Modeling (DSM, model-based approach) methods were used to estimate abundance/density for these species or groups.
- Birds: Interpolation (e.g., kernel density), spatial regression, and generalized additive models (GAMs) were used to quantify the relationship between spatial covariates (e.g., bathymetric and distance based metrics) and birds.

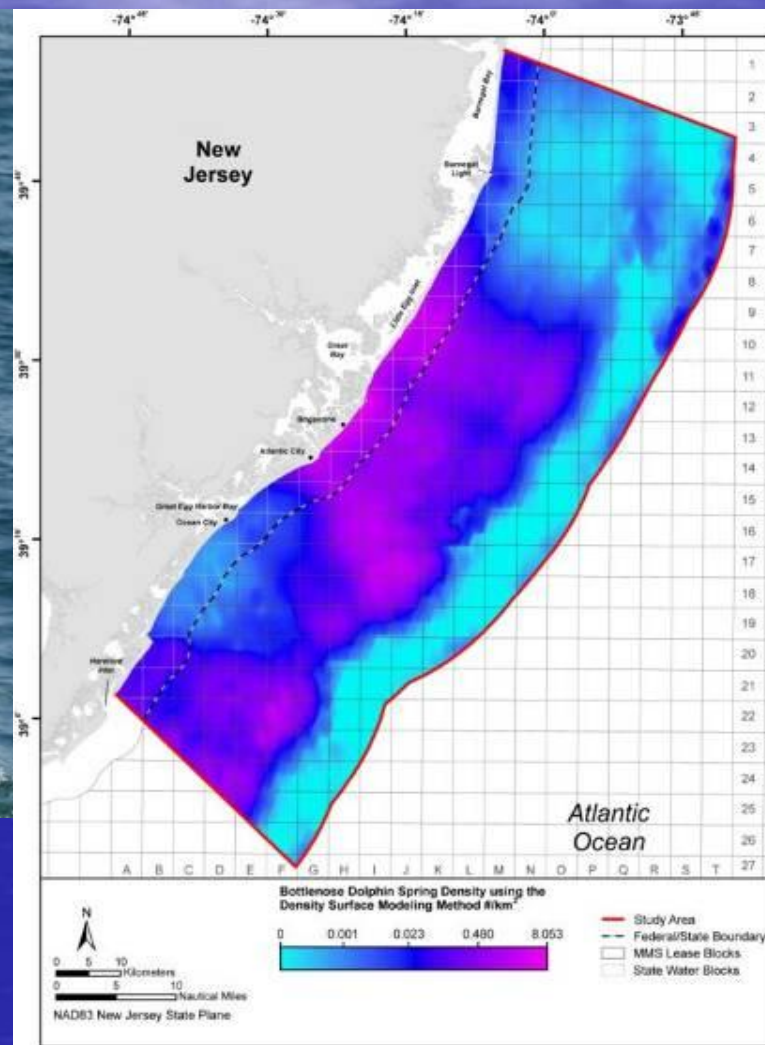


Bottlenose Dolphin

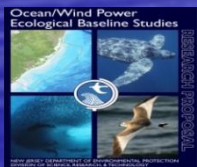
- Detected during all seasons (mostly spring and summer)
- Total sightings = 319
- Mean group size = 15.3
- Mean water depth = 54.5 ft
- Mean SST = 61.3 F



Peak densities were predicted in State waters off Atlantic City north to Brigantine and Little Egg Inlet.

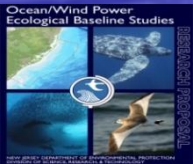


Spring abundance = 722 animals

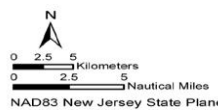
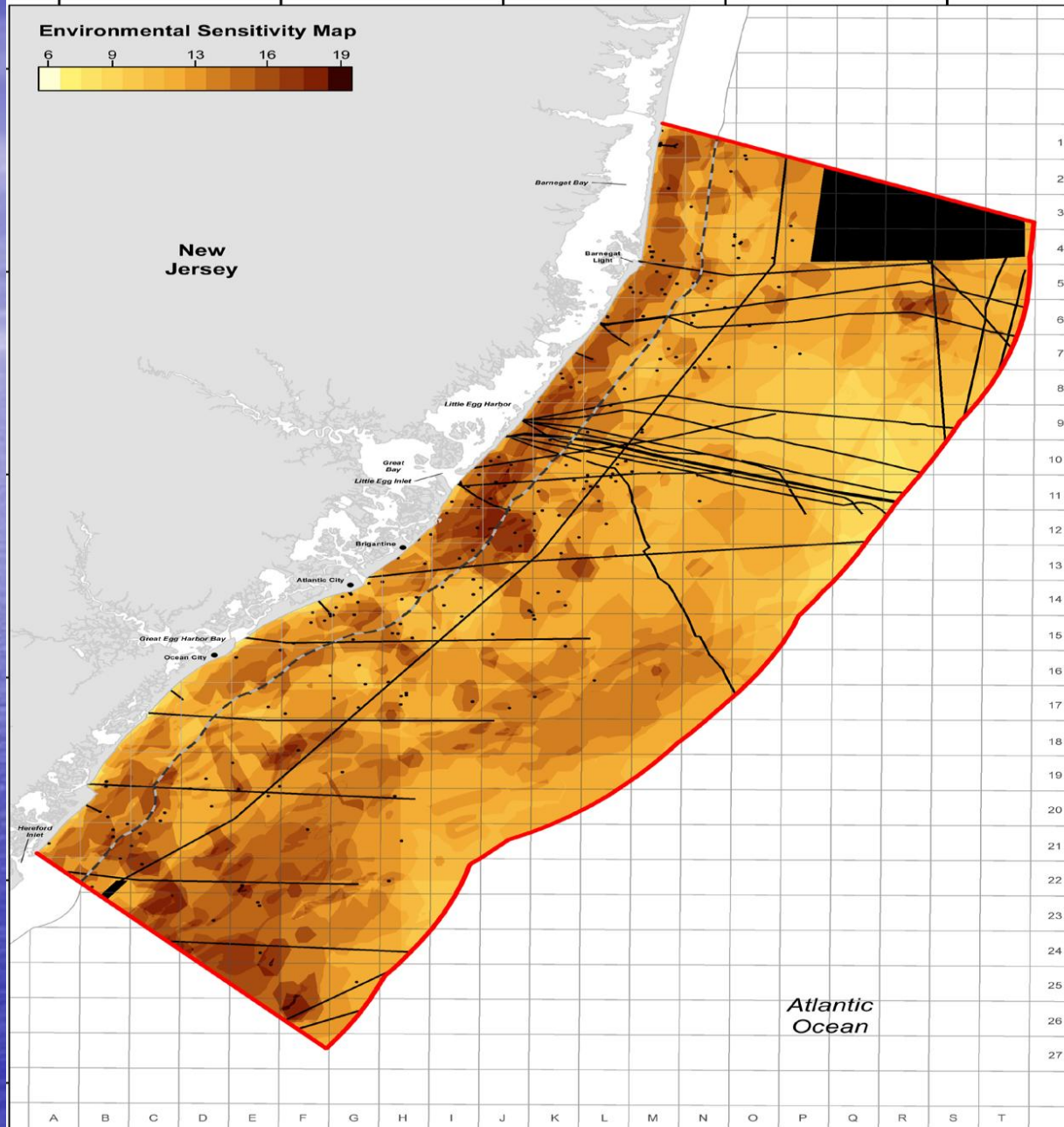


Sensitivity Map

- Simple weighting of GIS layers by natural & physical resources
- More heavily shaded areas indicate greater potential for impacts
- Used for input to BOEMRE for *Call for Information and Nominations for Commercial Leasing for Wind Power on the Outer Continental Shelf Offshore New Jersey*



Environmental Sensitivity Map



NAD83 New Jersey State Plane

Categories/Ranking:

Artificial Reef Areas = 1
Commercial Fisheries = 1
Marine Protected Areas (MPA) = 1
Recreational Fishing
Hotspots/Grounds = 1
Shoals = 1

Marine Mammal Density (All Species)

0.000000001 - 0.0162 $\#/km^2$ = 1
0.0163 - 0.1342 $\#/km^2$ = 2
0.1343 - 0.9871 $\#/km^2$ = 3

Marine Mammal Density (T and E Species)

0.0000001 - 0.000008 $\#/km^2$ = 1
0.000009 - 0.0004 $\#/km^2$ = 2
0.0005 - 0.0165 $\#/km^2$ = 3

Sea Turtle

(Sightings per km)
0.0039 - 0.0059 $\#/km$ = 1
0.0060 - 0.0073 $\#/km$ = 2
0.0074 - 0.0261 $\#/km$ = 3

Avian Kernel Density Total Birds (All Behavior)

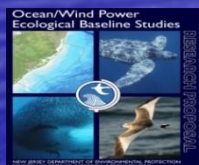
0.01-50 $\#/km^2$ = 2
51-100 $\#/km^2$ = 4
101+ $\#/km^2$ = 6

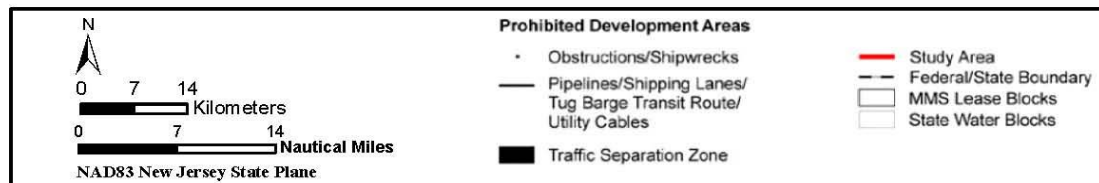
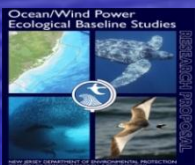
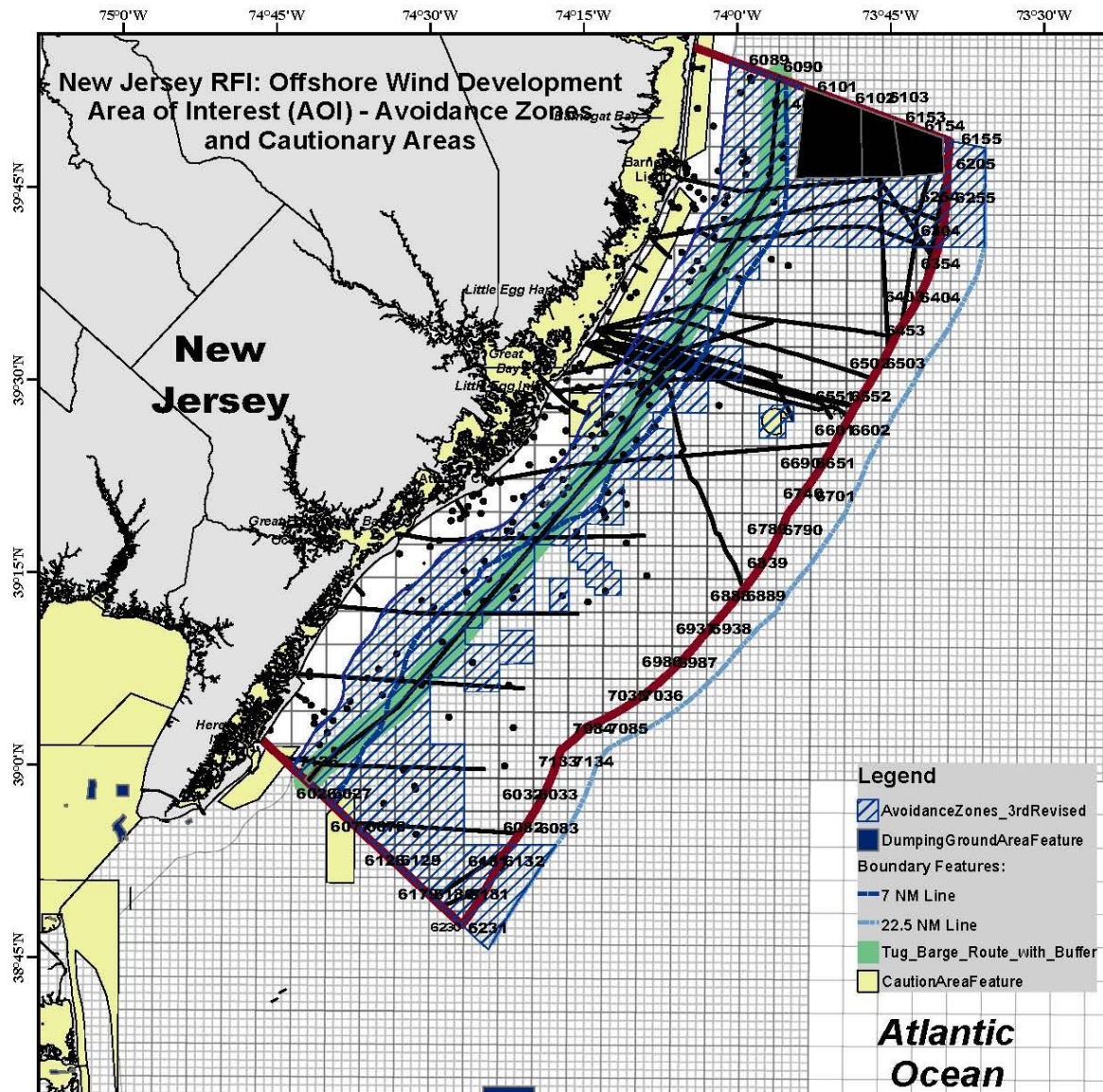
of Essential Fish Habitat Designations (All Species/Lifestages)

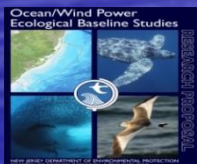
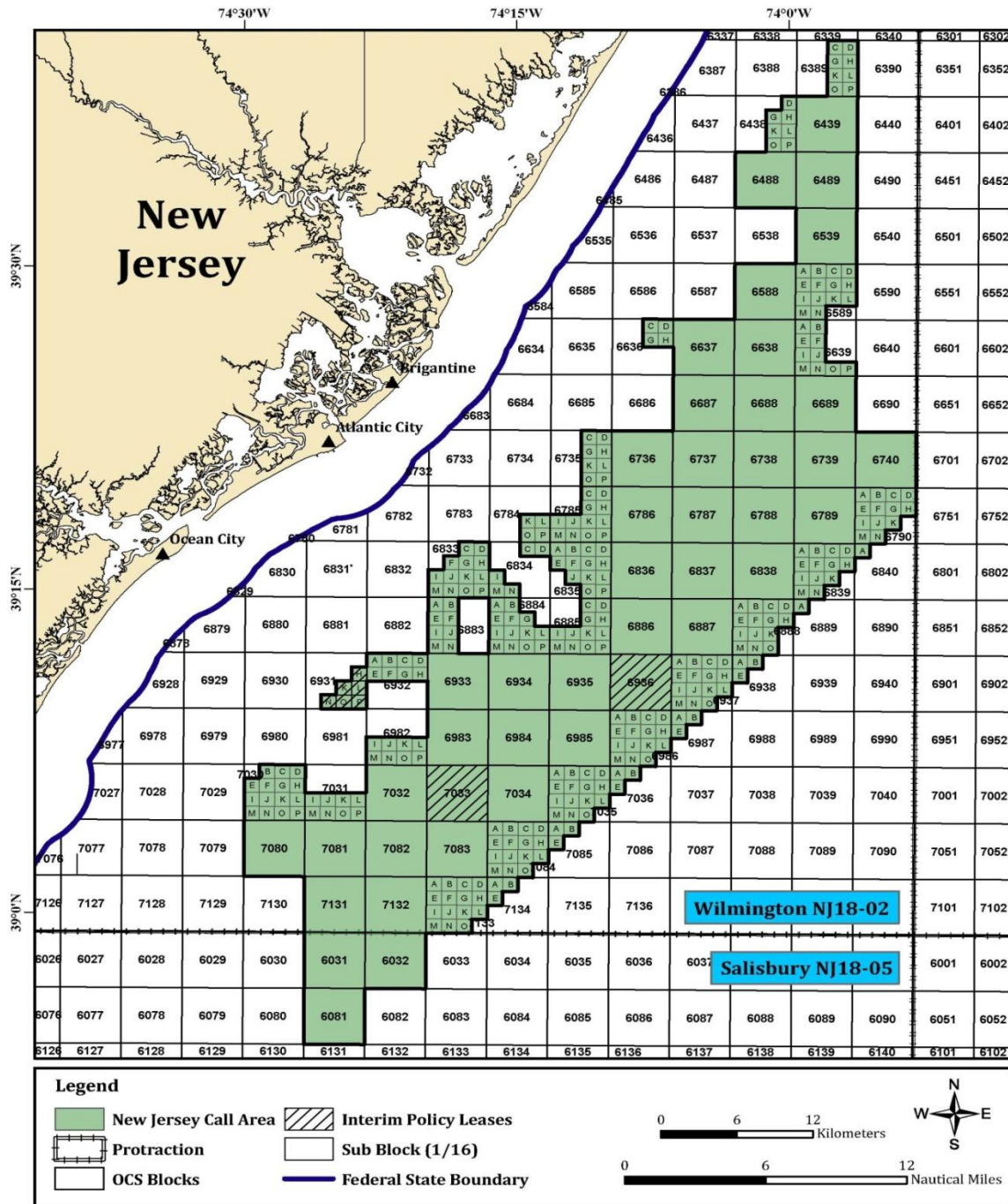
1-12 = 1
13-24 = 2
25-38 = 3

Prohibited Development Areas

- Obstructions/Shipwrecks
- Pipelines/Shipping Lanes/
- Tug Barge Transit Route/
- Utility Cables
- Traffic Separation Zone
- Study Area
- Federal/State Boundary
- MMS Lease Blocks
- State Water Blocks

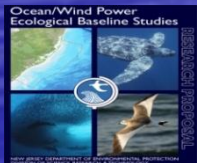






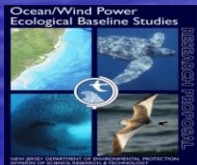
Assist in Siting/Permitting Decisions

- Information and data can be used for:
 - Baseline data for projects in study area
 - Design of future monitoring
 - Regional surveys
 - Screening of potential sites (Phase II)
 - List of species - may be impacted esp. T&E
 - Estimate of relative scale of potential mitigation



Data Gaps/Future Studies

- Site-specific (footprint) studies - radar
- OWPEBS – potential template
- U.S. accepted techniques/methods – allows comparison between studies and for comprehensive geospatial analysis
- Migratory nature of protected species indicates the need for regional or coast-wide studies



Acknowledgments – Project Team

- **Geo-Marine, Inc.**

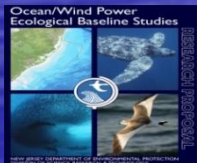
- Dan Wilkinson, Ph.D, Chris Clark, Suzanne Bates, Amy Whitt, Kathleen Dudzinski, Ph.D., Sid Gauthreaux, Ph.D., Jarrod Santora, Ph.D., Jason See, Ph.D., and many others...

- **Rutgers University**

- **Cornell University**

- **Aqua Survey Inc.**

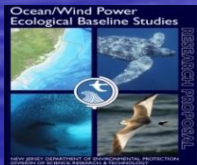
- **University of Delaware**



Acknowledgements (cont)

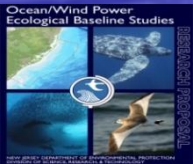
Technical Review Committee - NJDEP

- Coastal Management – Kevin Hassel
- ENSP: Dave Golden, Sharon Petzinger, Jeanette Bowers
- Marine Fisheries - Don Byrne
- Wildlife Management - Ted Nichols
- NJGS – Jane Uptegrove
- Permit Coordination – Ken Koschek
- Land Use Management – Mark Godfrey
- DSRT/Office of Science: Joe Bilinski, Gail Carter, Joel Pecchioli (SRP)



Acknowledgements (Federal)

- USFWS - Carlo Popolizio & Doug Forsell
- NOAA/NMFS
 - Gordon Waring, Ph.D.
 - Debra Palka, Ph.D.
 - Karen Greene
- MMS/BOEM - Will Waskes



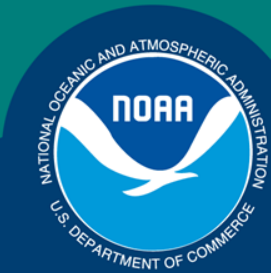
NJDEP Office of Science website:
www.state.nj.us/dep/dsr/



Activity conducted pursuant to NOAA Permit No. 10014-02
Photo by Tony Leukering, GMI



Presentation #5



Survey Efforts:

Atlantic Marine Assessment Program for Protected Species (AMAPPS)

National Marine Fisheries Service

Northeast Fisheries Science Center

Southeast Fisheries Science Center

By

Dr. Debi Palka

**NOAA
FISHERIES
SERVICE**

Atlantic Marine Assessment Program for Protected Species (AMAPPS) 2010 - 2014 (+?)



Whales



Dolphins



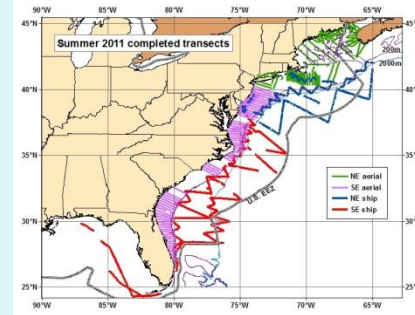
Turtles



Seabirds



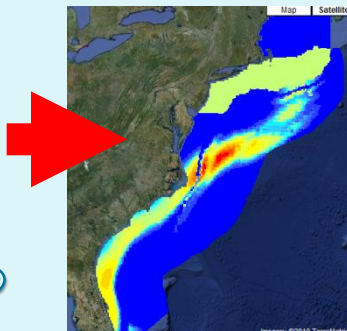
Seals



Quarterly collect distribution and abundance data via shipboard and aerial visual and acoustic surveys



Tag turtles, seals and seabirds to correct visual abundance data for animals not seen



Model seasonal, spatially-explicit density estimates incorporating habitat characteristics



BOEM

NAVY



Data and map may not be used without prior written consent of the data owner.

NOAA Northeast Fisheries Science Center - Satellite Tracking -

AMAPPS

(http://www.seaturtle.org/tracking/?project_id=537)

2010.06.115

2010.03.116

2010.02.117

2010.09.118

2010.05.120

2010.10.121

2010.07.122

2010.14.123

2010.13.124

2010.04.125

2010.08.126

2010.01.127

2010.12.128

2010.11.129

2011.01.377

2011.02.378

2011.06.379

2011.05.380

2011.09.381

2011.10.382

2011.13.383.TW

2011.14.384

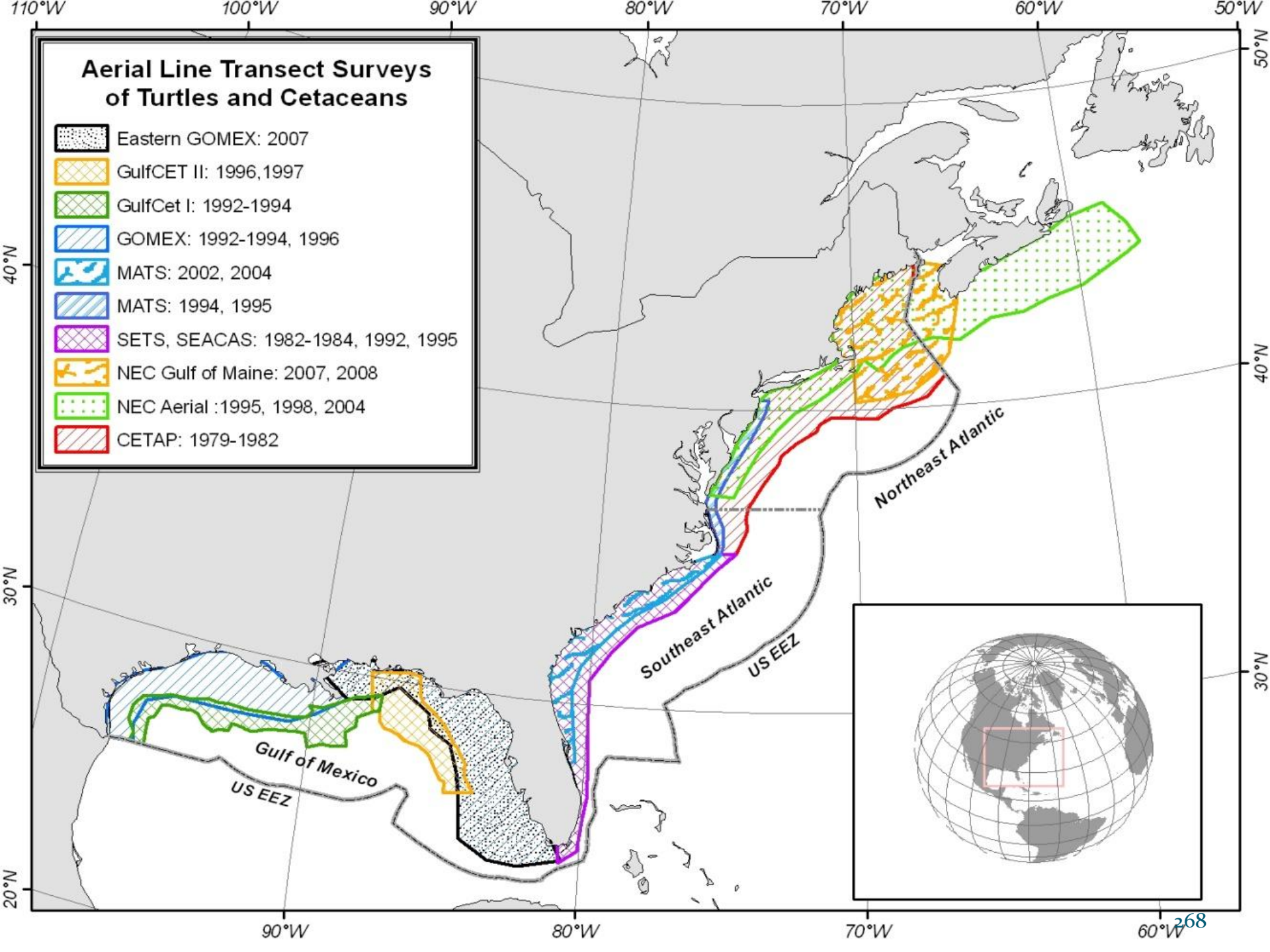
2011.17.385

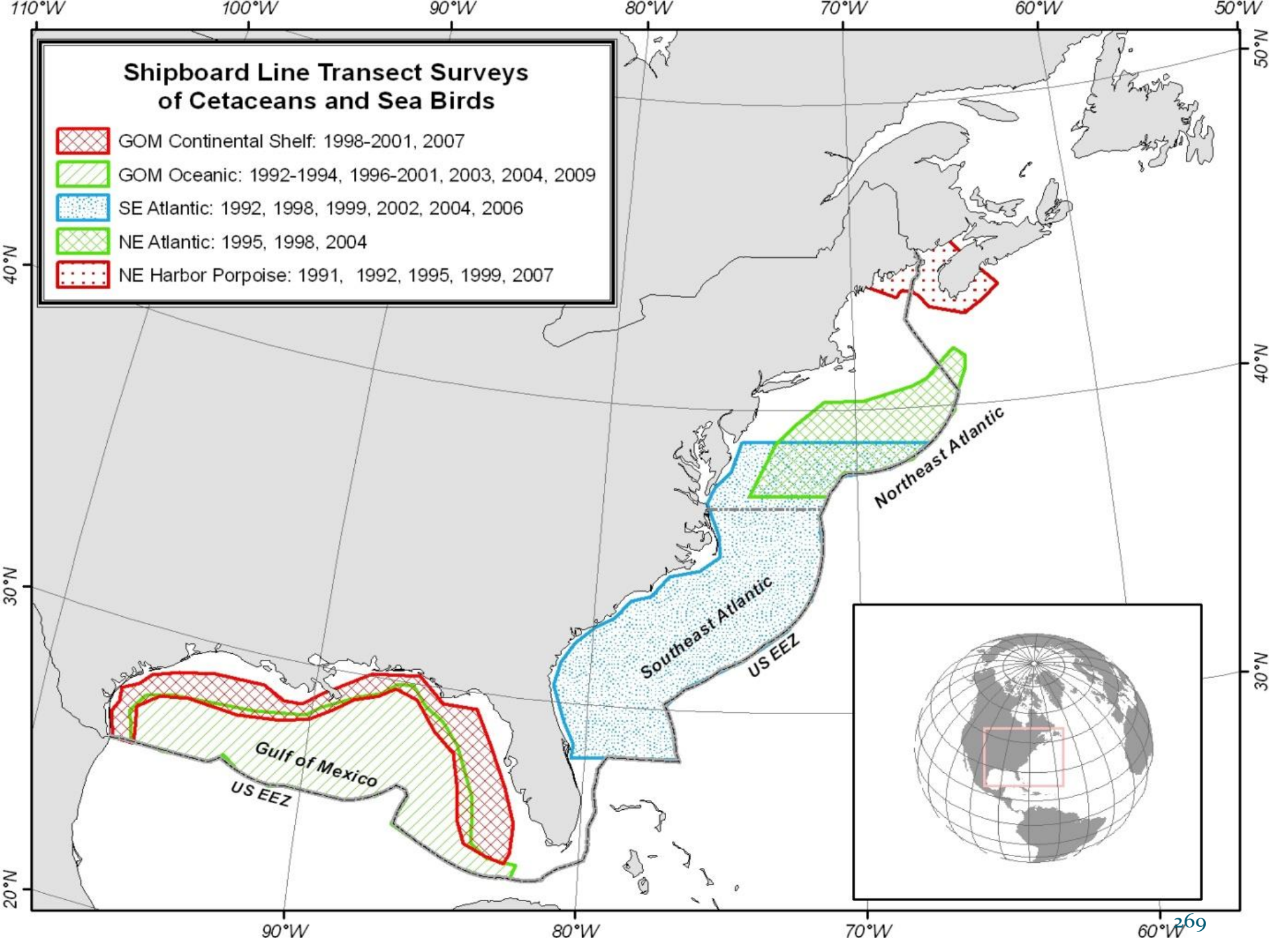
2011.18.386

2011.21.387

Tracks of 2010 and 2011 tags

300 km



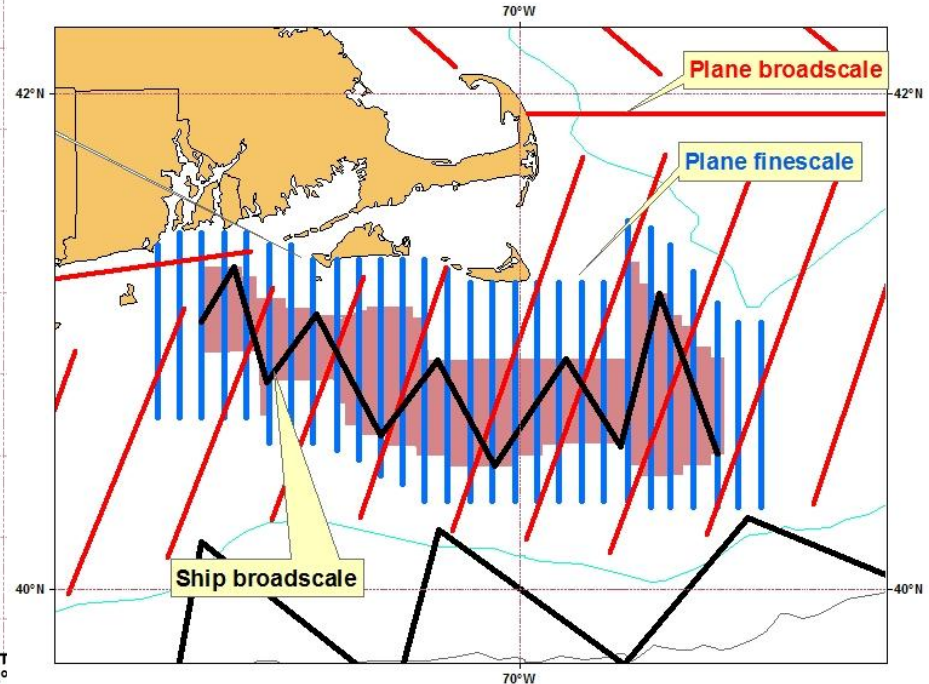
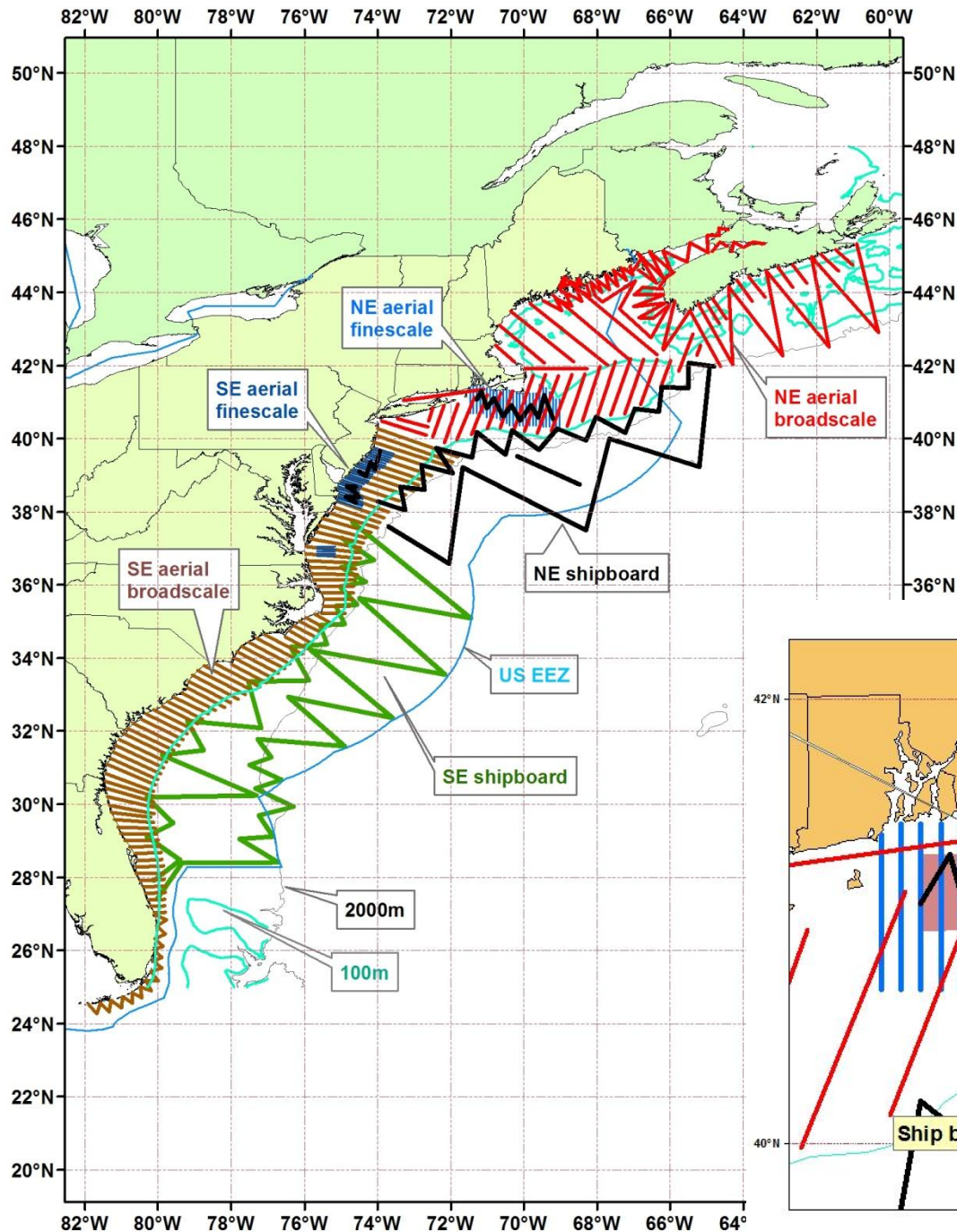


NMFS surveys:

Broad scale with some finer scale areas

NOAA Twin Otter airplanes – to 200m. Every quarter.

NOAA ships – 200m to EEZ. At least during summer.

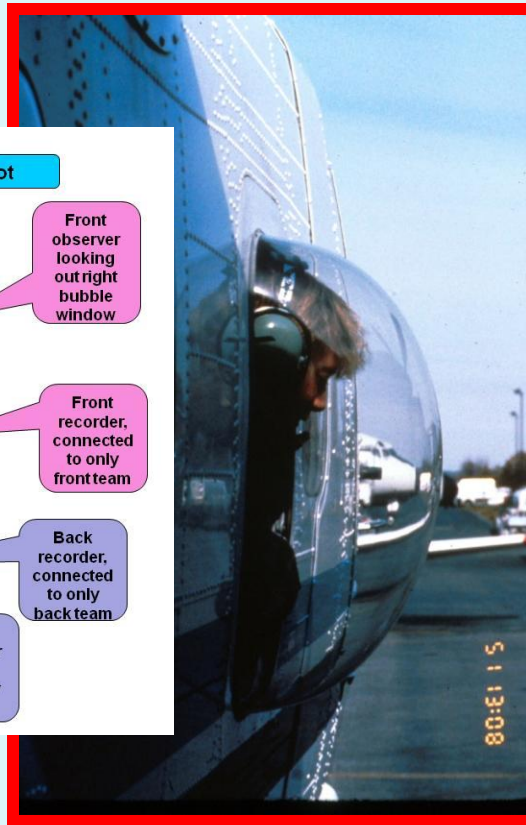
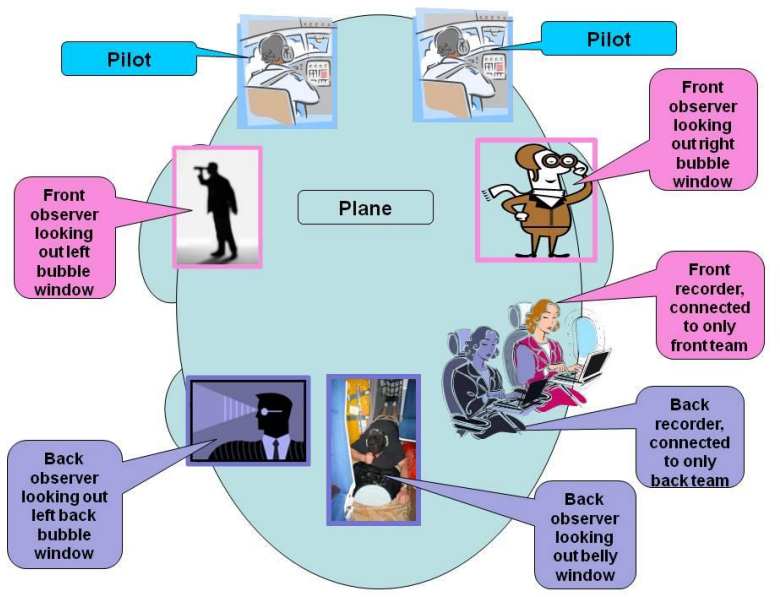




NMFS Aerial Surveys

Cetaceans, seals, turtles,
sunfish, basking sharks

Surveys flown at 600 ft,
airspeed of 110 knots,
winds < 10 knots, up to 20
knots



Line transect data
collection methods. Two
teams to estimate $g(0)$ –
probability of detection.

Effort - sighting conditions,
glare severity, cloud cover,
Beaufort sea state

Sighting - species, group
size, declination angle,
behavior, swim direction,
cue

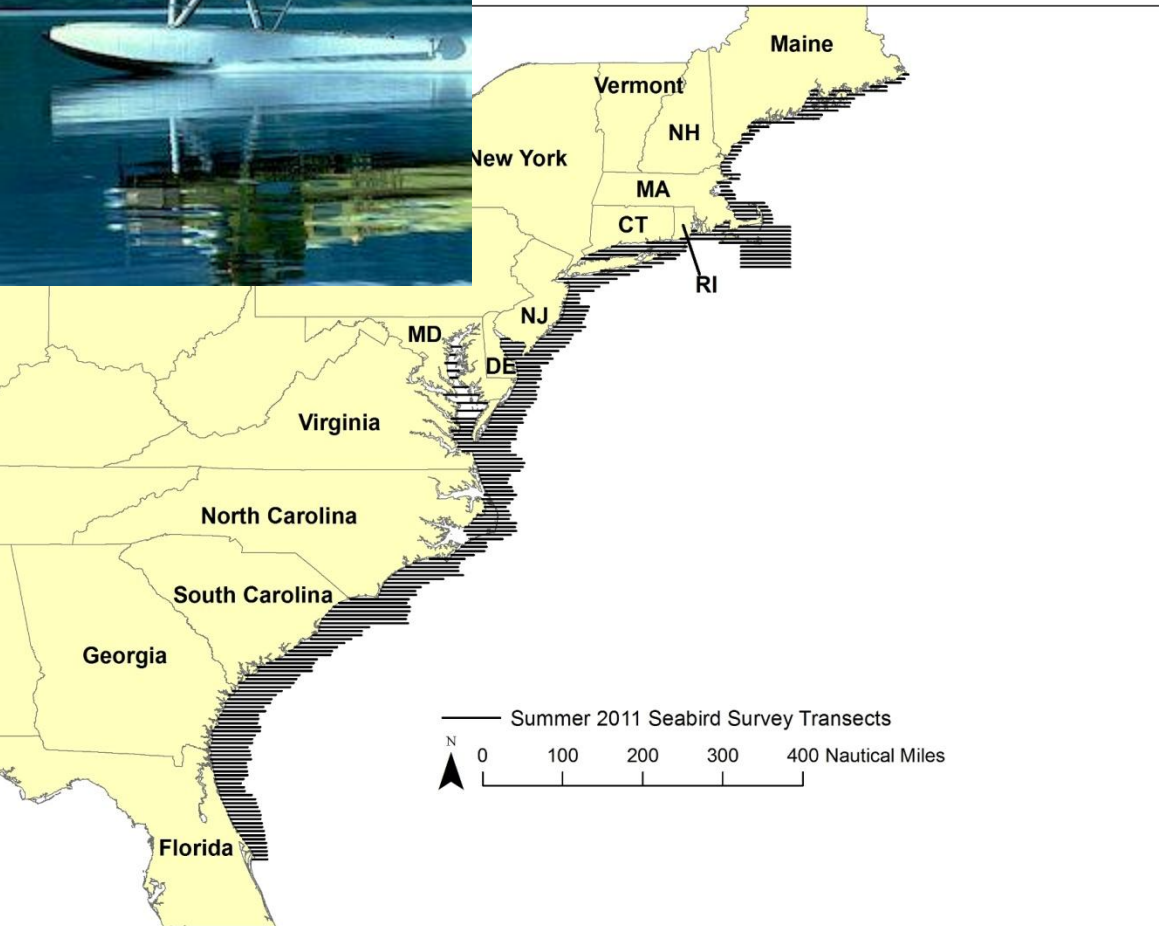
FWS Aerial Surveys

Kodiak float planes

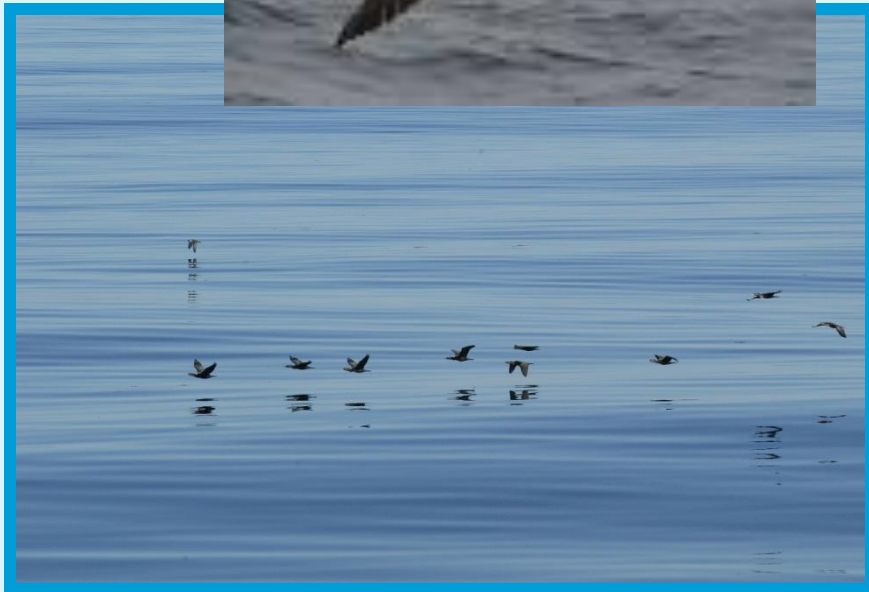
Fine scale

**Coastal transects
perpendicular to coast
5 nmi apart**

Seasonally



FWS Aerial Surveys



Primary target: Sea birds

Secondary targets: marine mammals, boats

**Flown at 110 knots at 200 ft,
Winds < 15 knots, up to 20 knots.**

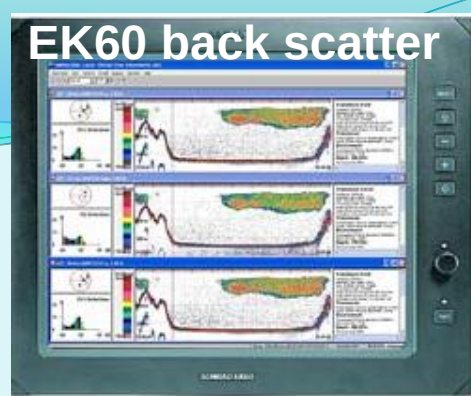
Strip transect to 200 m

**Sightings: type (Flying or sitting),
species id, sighting condition,
distance band**

**Effort: time and location of starts
and stops, observer positions,
sighting conditions, transect
number**



Summer shipboard surveys



- 1) Two independent teams (4 people each) to collect line transect cetacean and turtle data
- 1) One team (2 people) to collect strip transect seabird data
- 2) One team (2 people) to collect passive and active acoustic data
- 3) One team (2 people) to collect plankton data
- 4) Ship's SCS system to collect static and dynamic oceanography data

2010 – summer NMFS aerial

2011 – winter NMFS & FWS aerial

– summer NMFS & FWS aerial and shipboard

2012 – spring NMFS & FWS aerial

– fall NMFS & FWS aerial

2013 – summer NMFS shipboard & FWS aerial

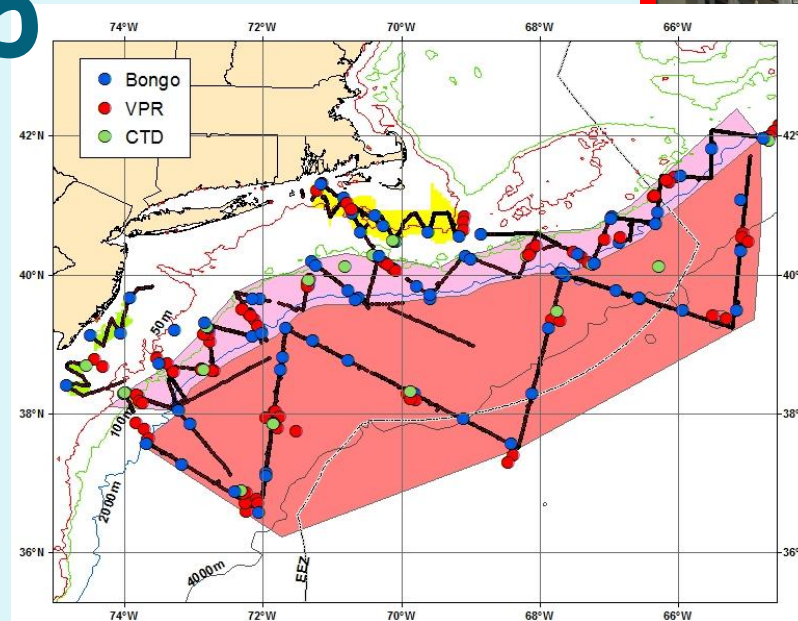
2014 – winter NMFS & FWS aerial

– fall NMFS & FWS aerial

2015 – spring NMFS & FWS aerial

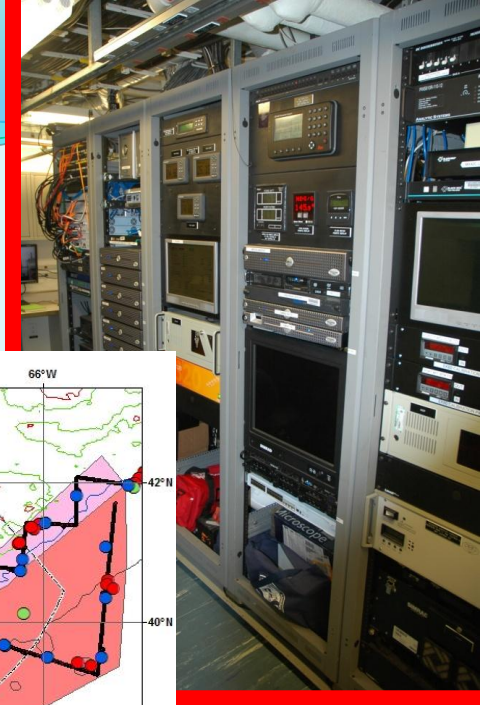
Oceanography environmental data from the ship

- **Continuous**
- Depth
- Water speed
- Surface temperature
- Surface salinity
- Surface conductivity
- Surface chlorophyll
- Sound velocity



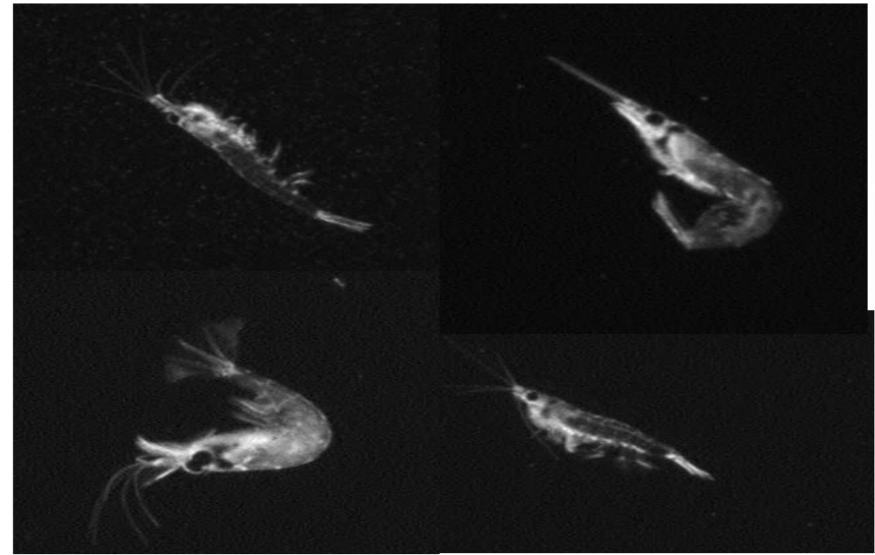
**Water column
at stations with CTD**

- Conductivity/salinity
- Temperature/thermal cline
- Depth

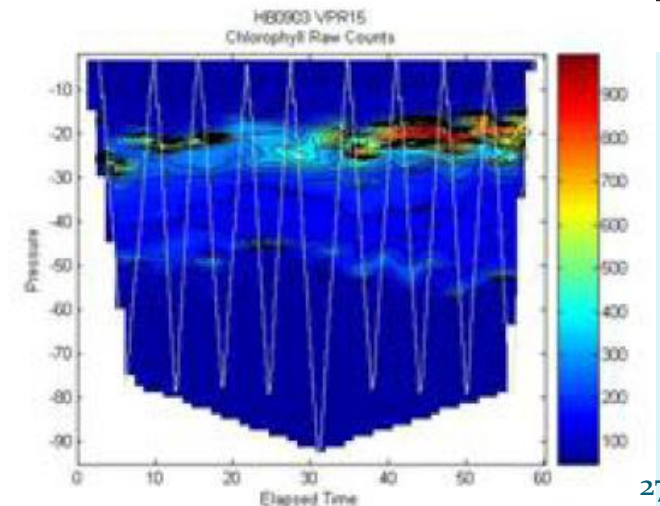
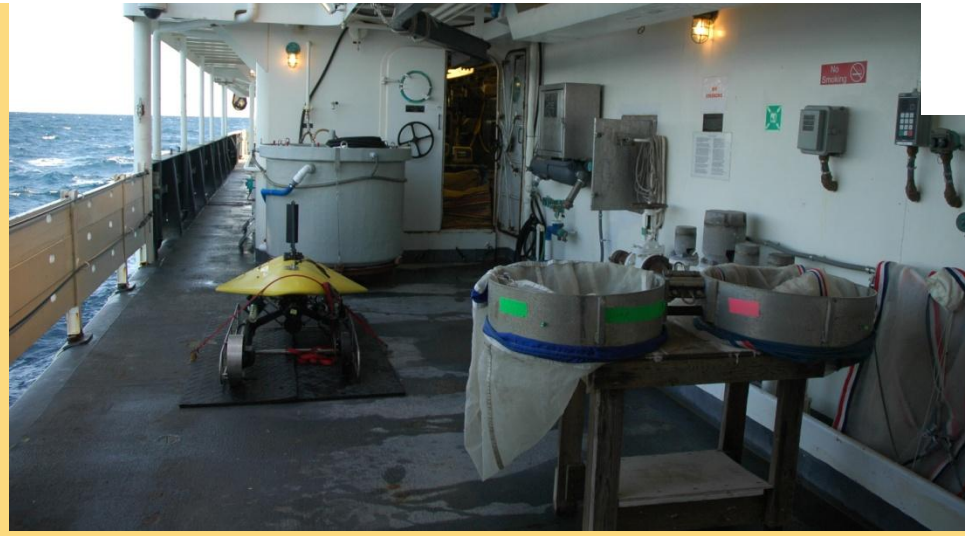
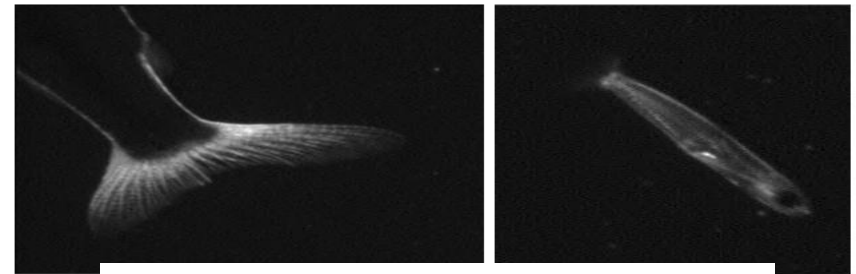


Plankton team - VPR, bongo nets, neuston nets, CTD

- **From water column at night:**
- Water temperature
- Water salinity
- Turbidity
- Chlorophyll concentration
- Individual zooplankton and fish



Euphausiids - Krill



m backscatter data
 mass/density



Density and biomass of zooplankton/fish

For all surveys: Satellite oceanography data

- **Sea surface temperature**
- **Chlorophyll**
- **Fronts**

The screenshot shows the 'Satellite Data Retriever' application window. It features a title bar with standard Windows window controls. The main interface includes a text input field for file paths, a 'Browse for Input CSV File' button, a dropdown menu for selecting a link (currently showing 'Link3 (Observer)'), a 'Choose Link' button, another text input field for output folders (showing 'C:\Documents and Settings\Default User\Desktop'), and a 'Browse for Output Folder' button. Below these are checkboxes for 'Use Network Files' (unchecked), 'SST Selection' (checked), 'Chlorophyll Selection' (checked), and 'Fronts Selection' (checked). A dropdown menu for network drives is set to 'No Network Drive'. At the bottom are three large buttons: 'RUN', 'Help', and 'QUIT'.

Satellite Data Retriever

Browse for file, or type csv path and filename here

Browse for Input CSV File

Link3 (Observer) ▼

Choose Link

C:\Documents and Settings\Default User\Desktop

Browse for Output Folder

☐ Use Network Files No Network Drive ▼ Mounted Network Drive

☒ SST Selection ☒ Chlorophyll Selection ☒ Fronts Selection

RUN Help QUIT

Oceanography - from other data sources

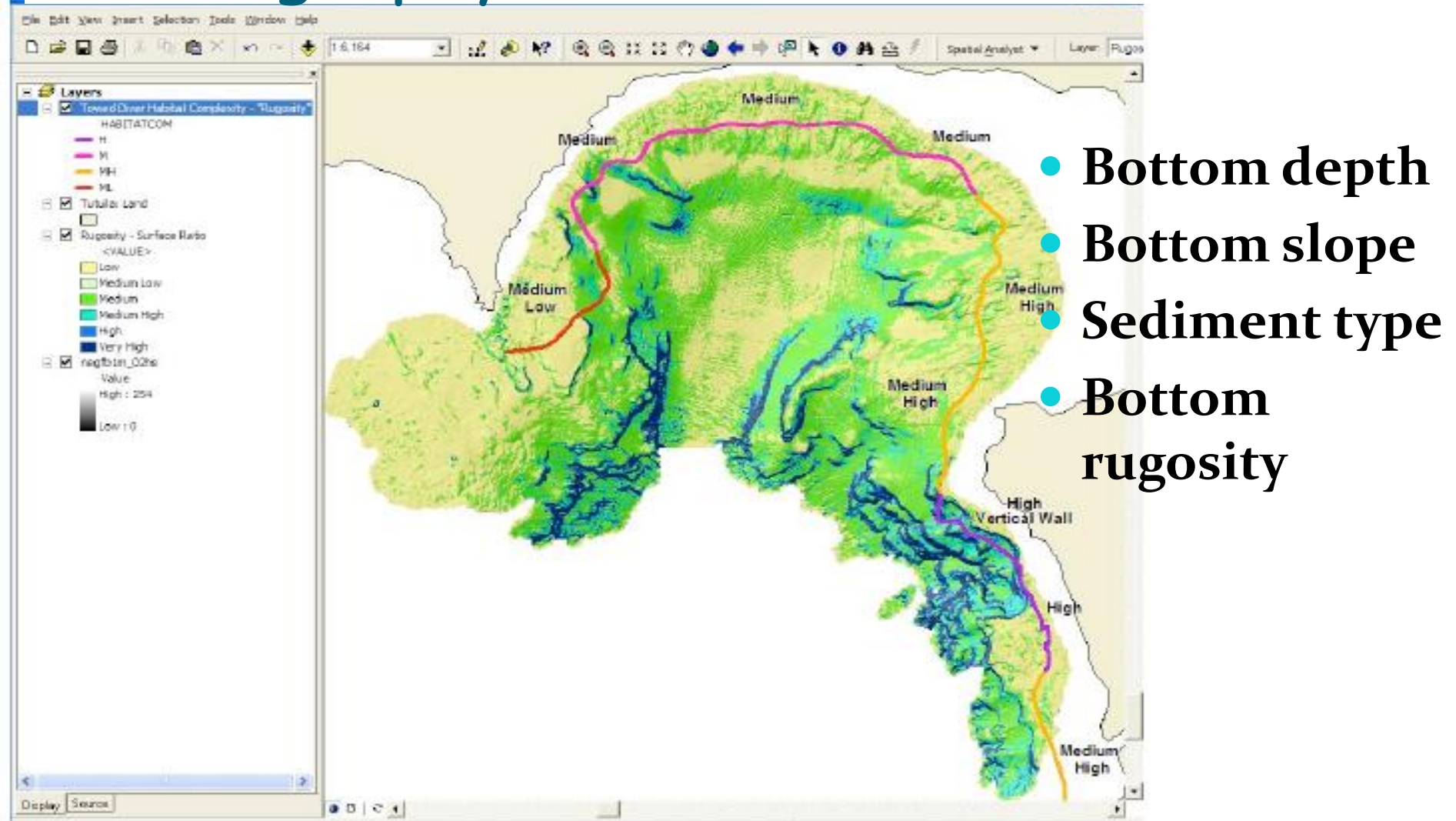
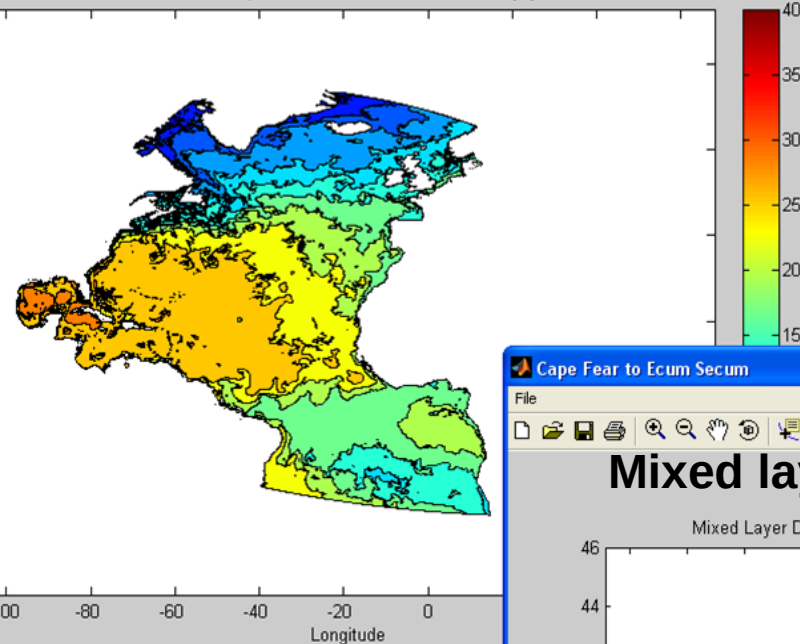


Figure 6 Rugosity derived in ArcView® 3.3 and towed-diver video transects symbolized by habitat complexity observations. Transects overlaid on rugosity grid shows the relationship between the two data sets.

Oceanography - from ocean models

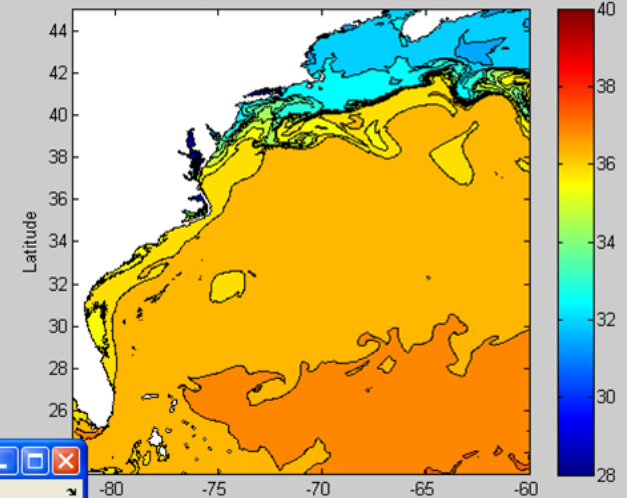
Water temperature at 20m

Water Temperature at 20 m on 01-SEP-2006 [C]



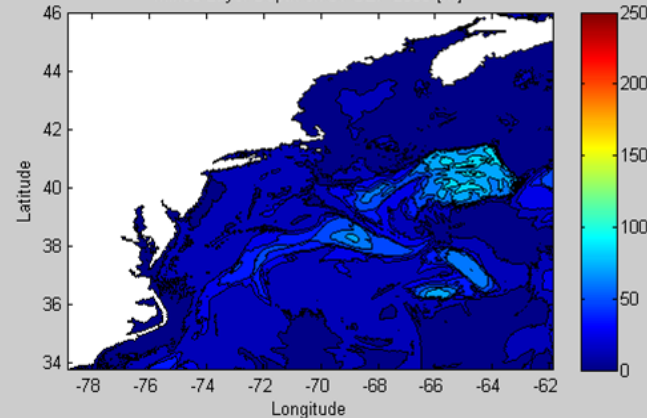
Salinity at surface

Salinity at 0 m on 01-SEP-2006 [g/kg]



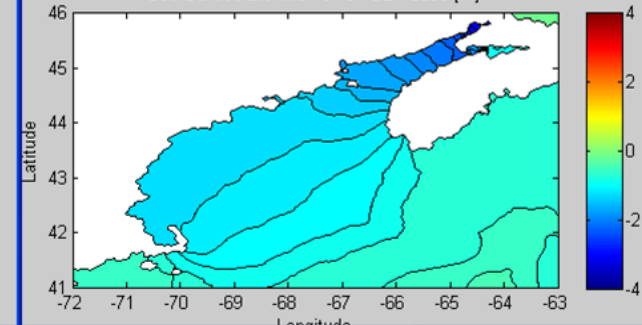
Mixed layer depth

Mixed Layer Depth on 01-SEP-2006 [m]



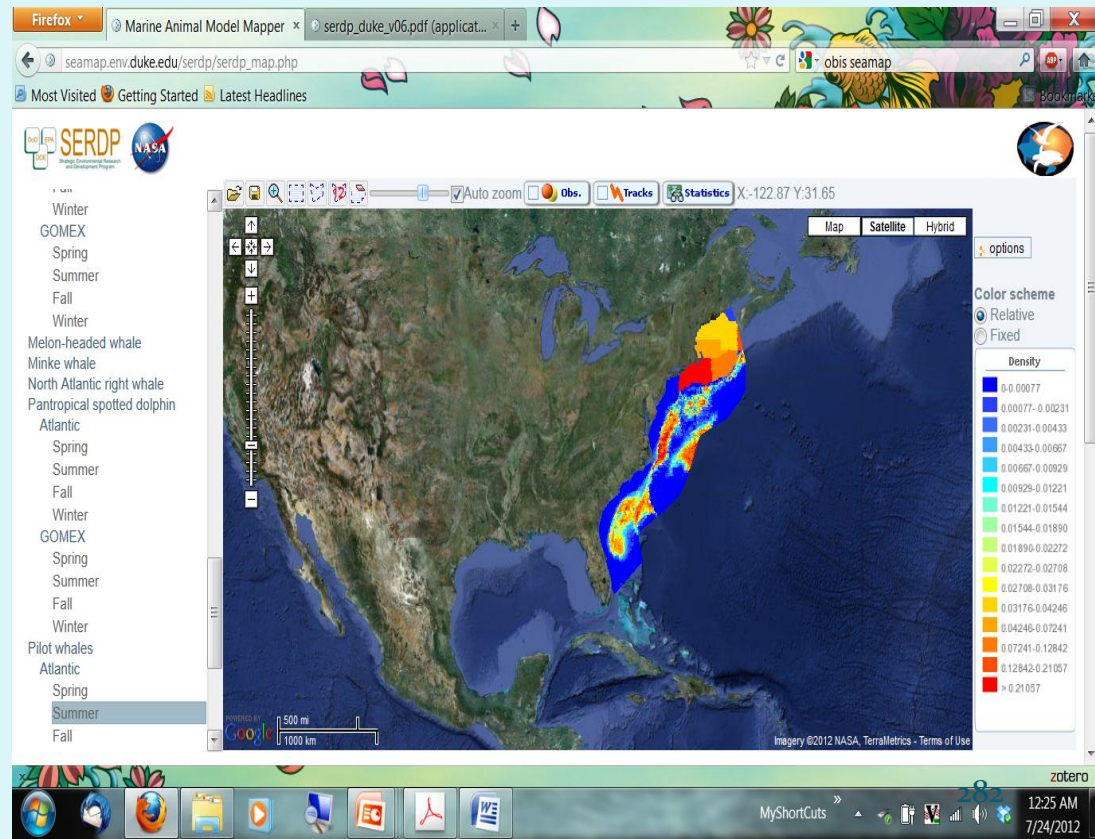
Sea surface elevation

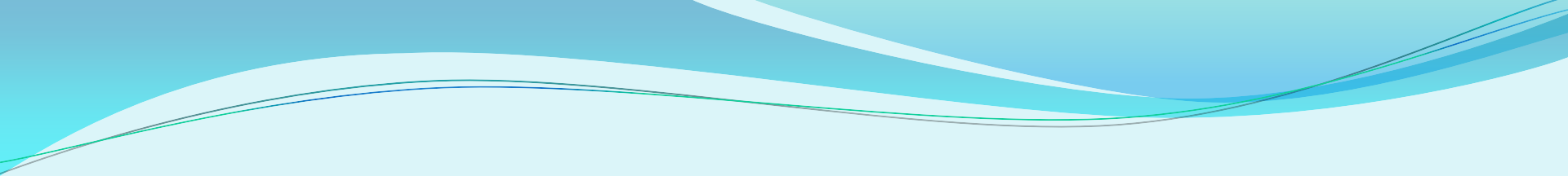
Sea Surface Elevation on 01-SEP-2006 [m]



Data analyses and storage

- Previously data analyzed mostly for **abundance estimates** for the cetacean populations using independent observer approaches assuming point independence
 - Accounting for detectability at track line and off trackline using covariates
 - Group size bias
 - Reaction to platform
- **Density maps:**
 - CetMap
 - NODES
 - SERDP
- **Data stored in:**
 - NMFS databases
 - OBIS-SEAMAP





ANY QUESTIONS?

- **Sightings**
- Species id
- Group size
- Declination angle
- Swim direction
- Initial cue
- Behavior
- Size of turtle



Effort

- Time, latitude, longitude
- Position of observers
- Transect number
- Sighting conditions (glare, sea state, cloud cover, turbidity, overall quality)

Plus processed info related to abundance estimates

Line transect data from the visual cetacean and turtle teams

Sightings

- Species id
- Group size
- Distance
- Bearing
- Swim direction
- Initial cue
- Behavior

Effort

- Time, latitude, longitude
- Position of observers
- Transect number
- Weather (glare, sea state, visibility, swell angle and height, cloud cover)

Plus processed info related to abundance estimates



Strip transect data from the seabird team

- Sightings
- Species id
- Group size
- Distance
- Flight direction
- Behavior
- Associations
- Age
- Molt

Effort

- Time, latitude, longitude
- Observer
- Transect number
- Weather data (from MM team)

Plus processed info related to abundance estimates



Leach's storm petrel

Acoustic team - Passive

Sightings

- Species id, if possible
- Group size
- First detection distance
- Bearing and distance when abeam
- Acoustic behavior
- Visual sightings detected
- All sounds detected



Effort

- Time, latitude, longitude
- Who is listening
- Transect number

Processed:

- sound library
- duplicates with visual team
- automatic detections

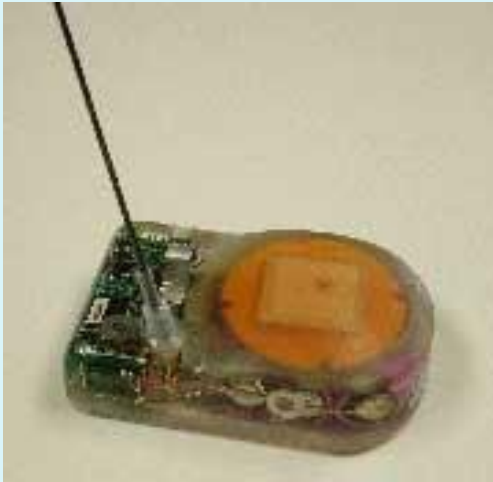


Sea turtle tagging project

- Objective
 - Satellite tag immature loggerhead turtles in offshore Mid-Atlantic waters to determine:
 - how turtles utilize their habitat, and
 - how much time they spend in surface waters and are available to be seen during aerial abundance surveys so that the aerial surface abundance estimate can be corrected for availability.



Sea Turtle Tag Telemetry



**Wildlife Computers MK-10 AF (SE)
or SMRU Satellite Relay Data
Logger (NE)**

- Fast-loc GPS for improved position accuracy**
- Depth sensors and programming to report binned depth data and dive-duration**
- Durations of several months up to one year**



Sea turtle tagging project results

In collaboration with Coonamessett Farm Foundation:

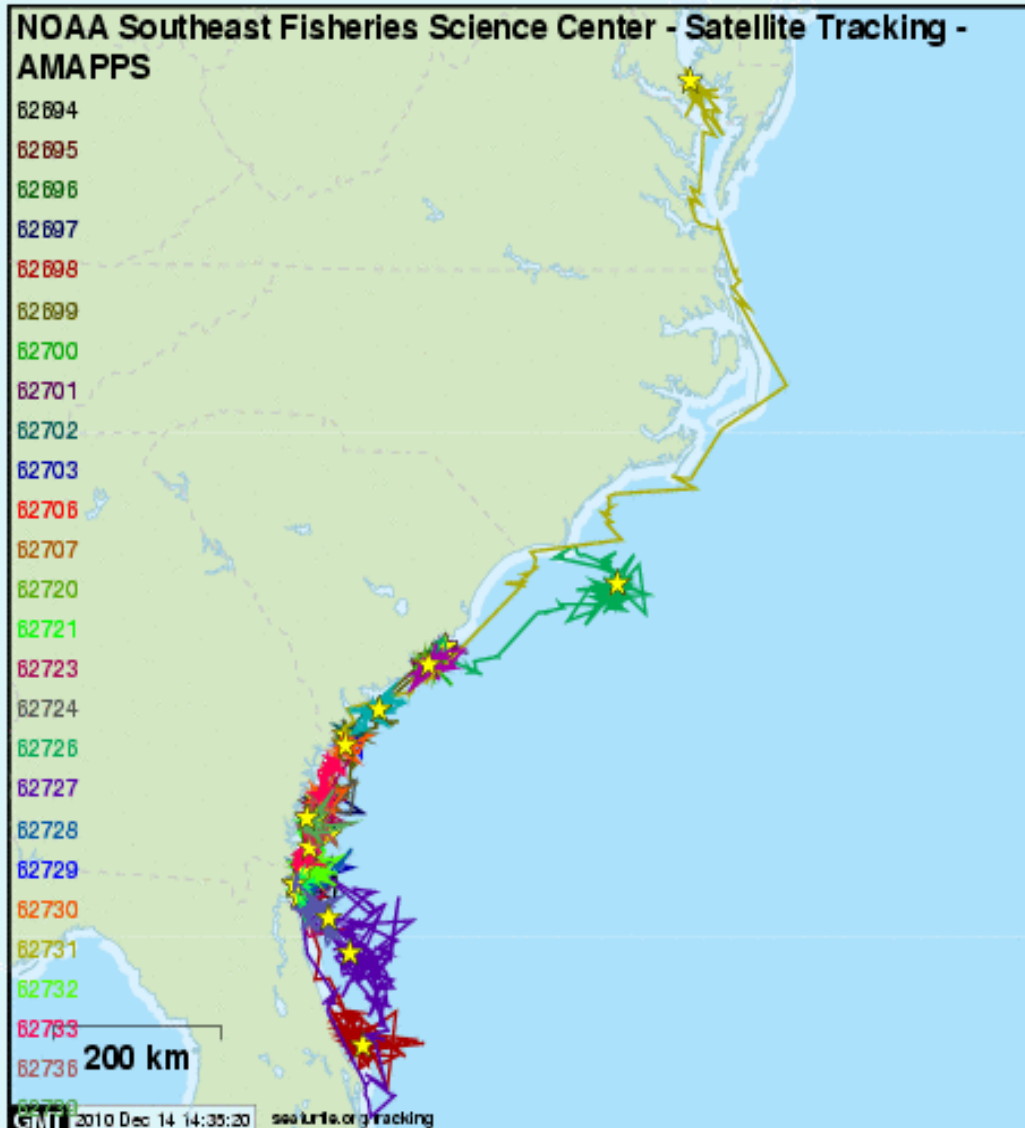
- used 2 commercial scallop fishing vessels to locate and tag loggerhead turtles during June 2 – 6, 2011 offshore of Delaware through Virginia.

For 15 loggerheads (63-93 cm CCL) did the following:

- Attached SMRU satellite, flipper and PIT tags
- Measured length, width body depth, and weight
- Took biopsy samples for genetic analyses and stable isotope analyses
- Took blood samples for testosterone levels and general blood chemistry to identify sex and assess the health of the animal
- Photographed



Sea Turtle Tag Telemetry - SE



30 loggerheads were tagged between Florida and South Carolina

Average duration (as of December) of 91 days for these tags

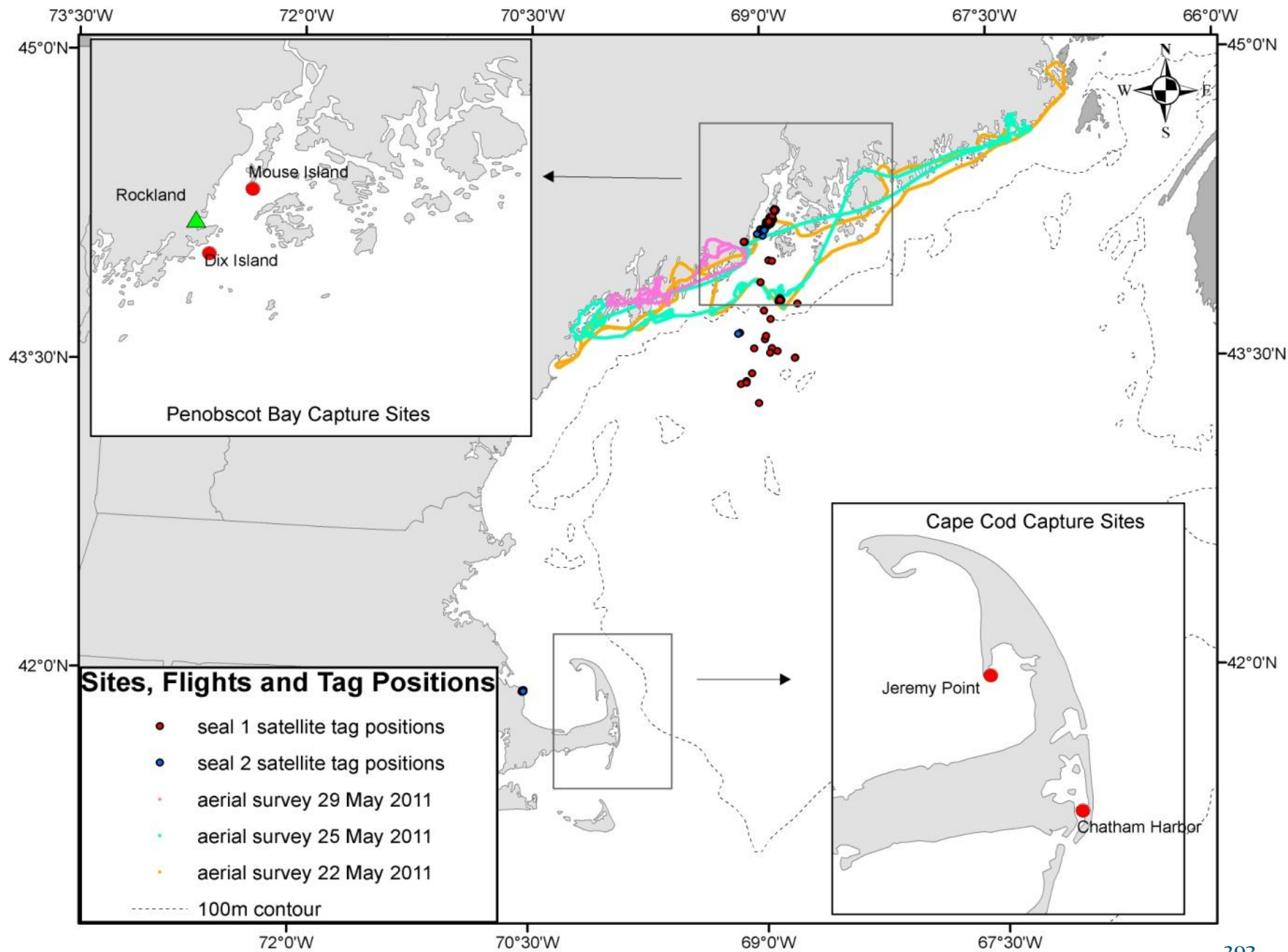
Turtles generally stayed near the tagging location, with the exception of one animal that moved into Chesapeake Bay

Spring harbor seal abundance project

- Objectives

- Develop a statistically robust harbor seal aerial abundance survey based on bay units
- Tag seals in Chatham Harbor, Cape Cod and western Penobscot Bay with VHF, satellite and sonic tags
- Conduct aerial photographic surveys and VHF radio tracking





Presentation #6

Mid-Atlantic Baseline Studies Project



© Dan Poleschook

**Kate Williams, Evan Adams,
David Evers, and
Iain Stenhouse**
Biodiversity Research Institute

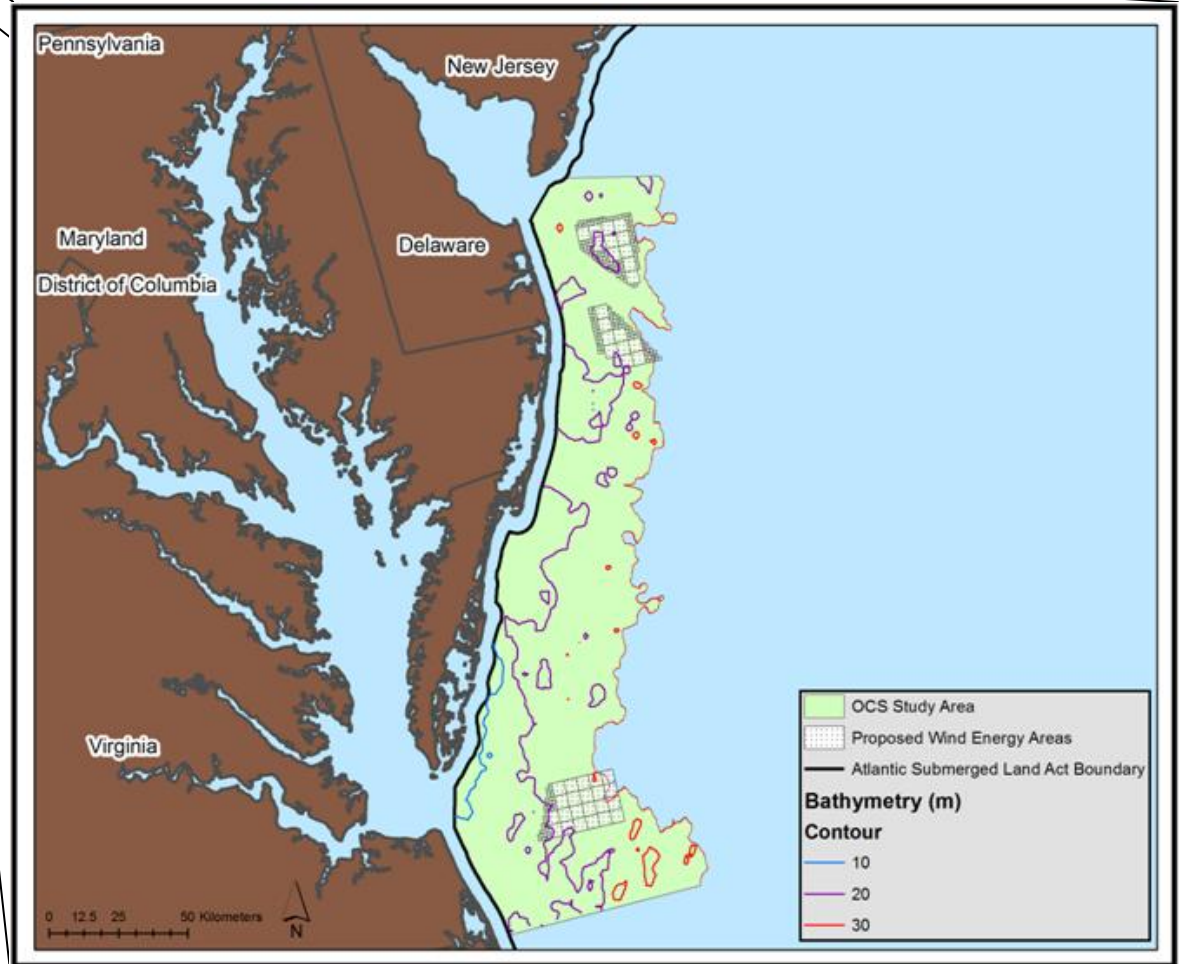
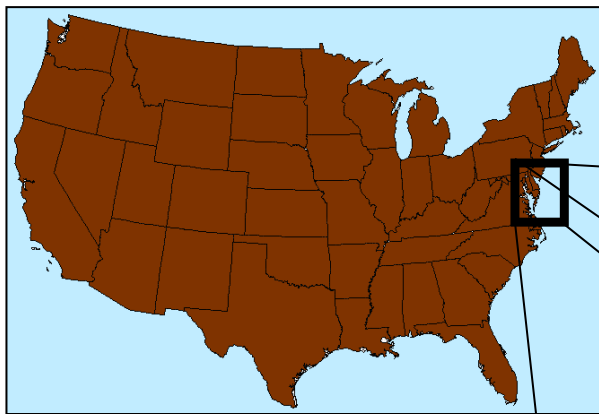
Beth Gardner
NC State University

**Ari Friedlaender and
David Johnston**
Duke University Marine Lab

Richard Veit
College of Staten Island

Mid-Atlantic Baseline Studies

- Department of Energy (DOE)-funded ecological baseline studies project
- 2012-2015
- BRI project lead; over a dozen co-PIs and collaborators
- **Project goal:** Facilitate the permitting and environmental review of offshore wind development on the mid-Atlantic outer continental shelf.

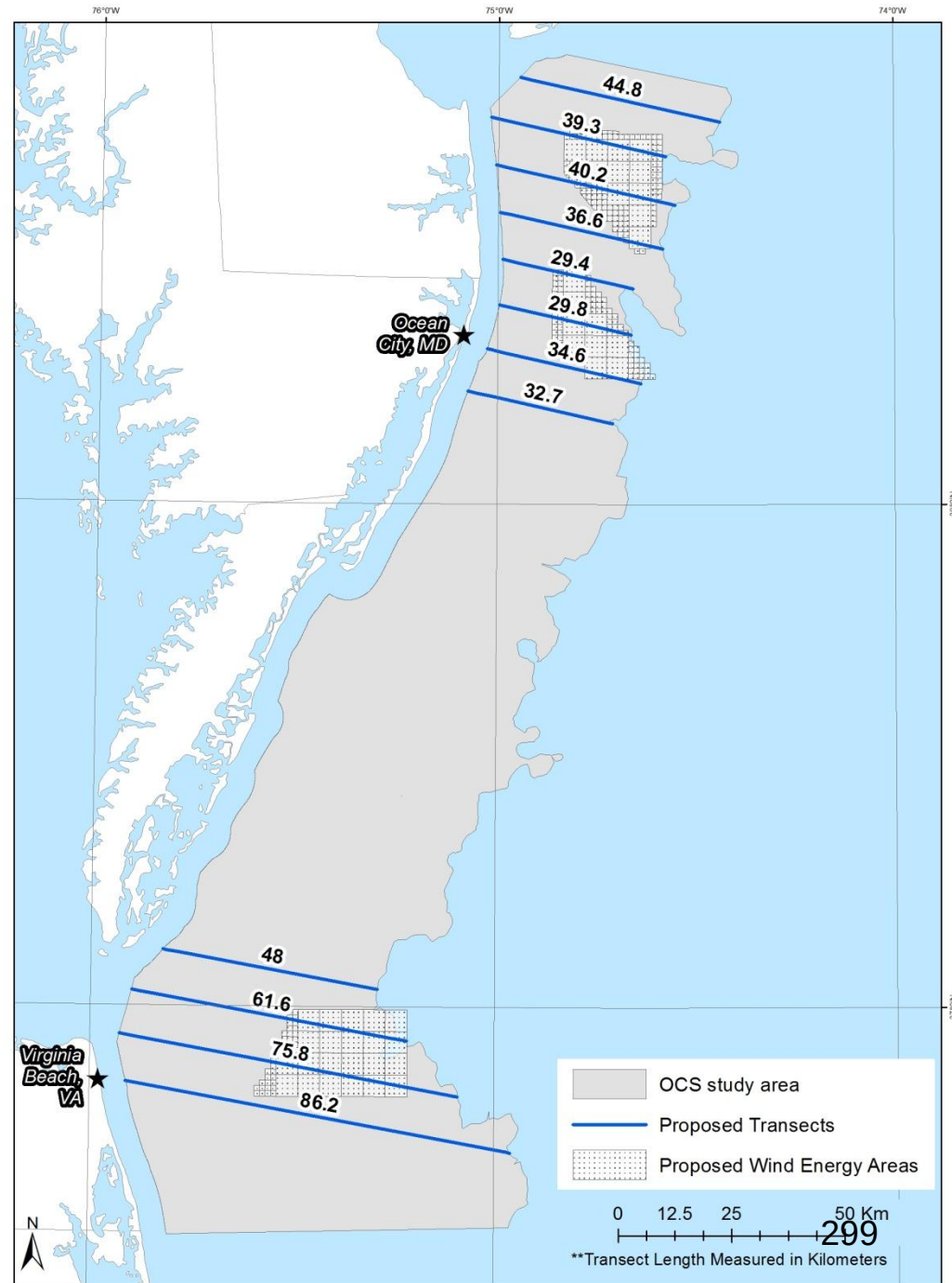


Mid-Atlantic Baseline Studies

- Boat Surveys
- Aerial Surveys (hi-def video)
- Aerial-Boat Comparison Study
- Individual Tracking of Key Bird Species
- Nocturnal Migration Studies
- Hierarchical Modeling
- Dissemination of Project Results

Boat Surveys

- 2 years
- 16 surveys
- Data on birds, marine mammals, and sea turtles
- Ancillary data collection



Boat Surveys

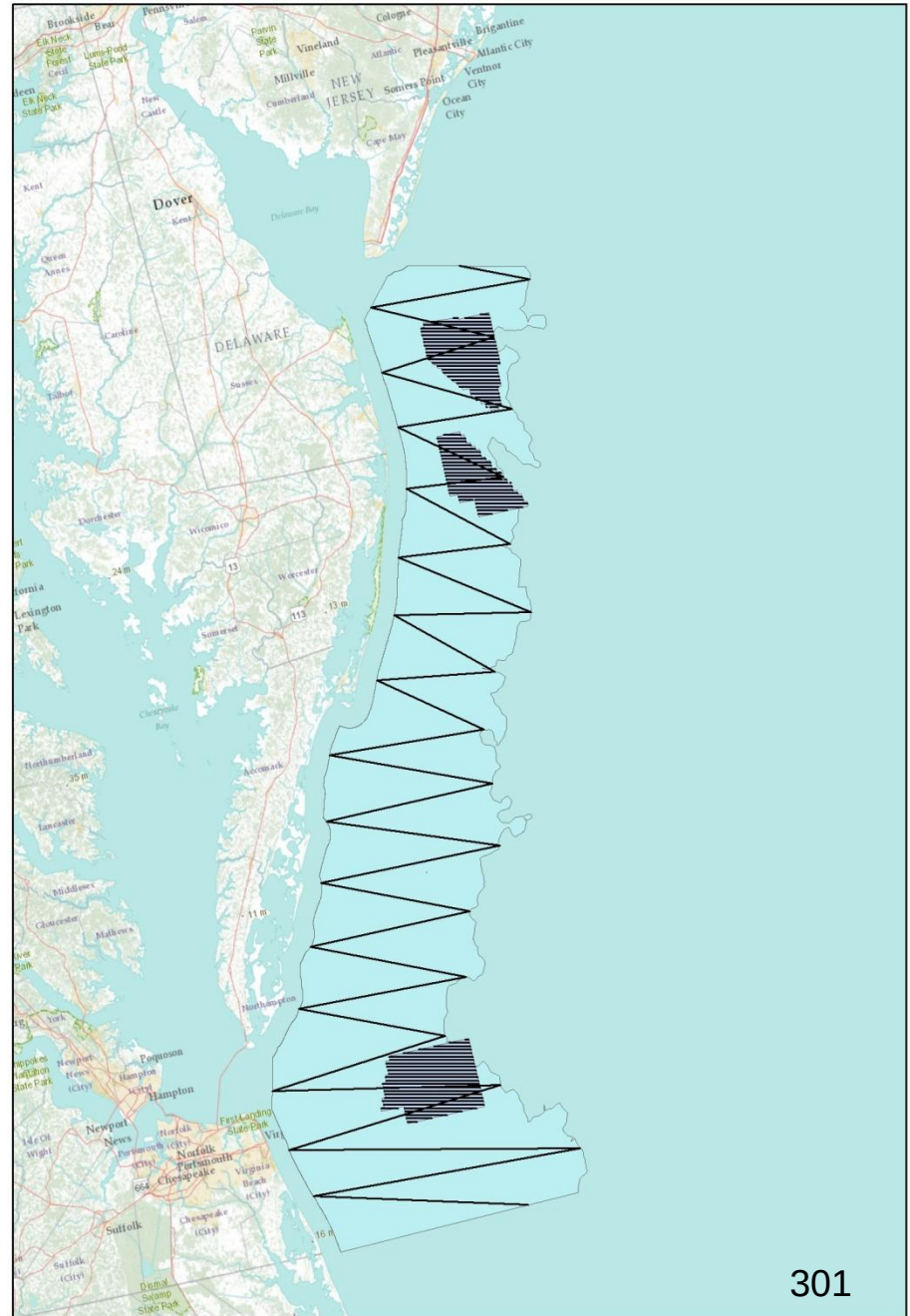
- First boat survey
April 25-29, 2012
- Second survey
June 18-21
- Most common species on the 1st
survey: COLO, NOGA, BODO, BASW,
LAGU, ROYT, FOTE



Photo by BRI staff

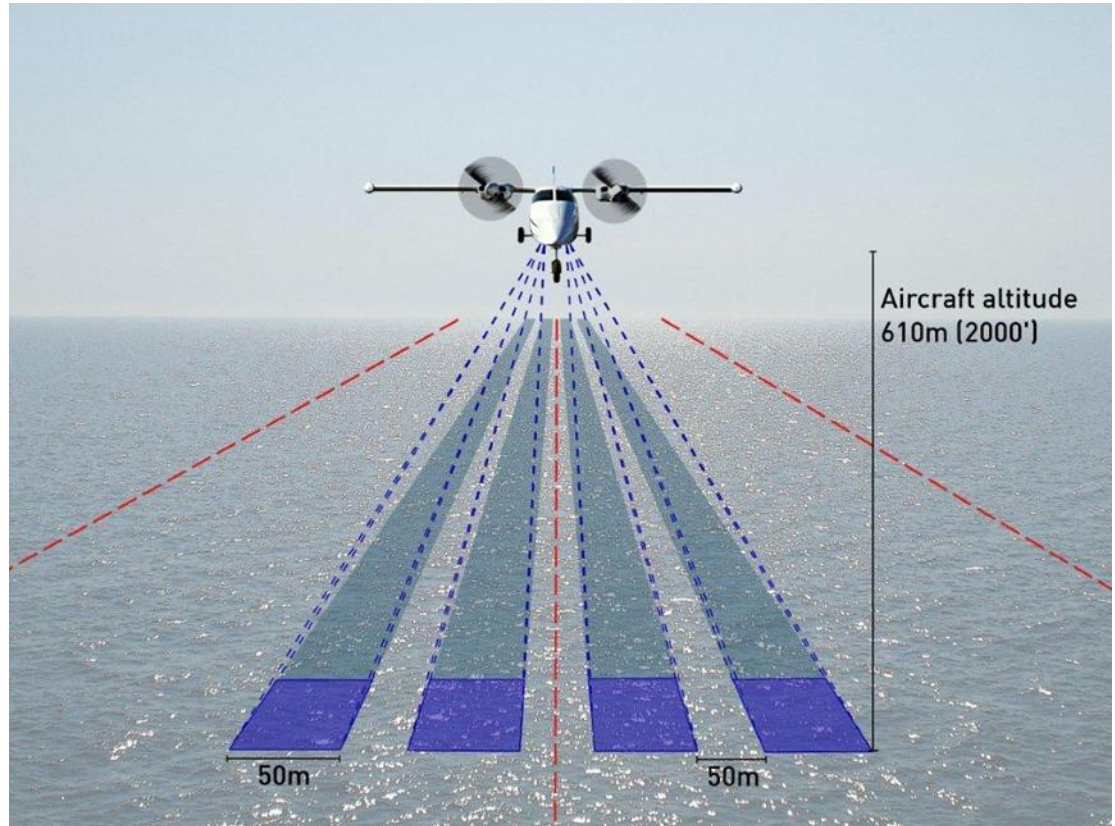
Aerial Surveys

- HiDef Aerial Surveying, Inc.
- High-definition video
- 14 surveys over 2 years
- 20% coverage in WEAs



High definition video surveys

- Four belly-mounted cameras
- Resolution of 3cm and 2cm ground sample distance
- Flown at 2000' asl
- Objects detected by HiDef reviewers
- Objects identified by BRI biologists
- Full QA process
- Flight height calculated from video images



Identification Category	March count (as of 7/20)
Scoters (BLSC, SUSC, WWSC, SCNS, UNSC)	7038
Fish	2525
Loons (COLO, RTLO, UNLO)	835
Unknown or ID impossible	471
Northern Gannets	311
Gulls (BOGU, GBBG, HERG, LBBG, RBGU, UNGU, UNLG, UNSG)	262
Unidentified Birds	215
Tern or small/medium gull	172
Dolphins and sm. beaked cets. (BODO, CODO, UNDO, SBCE)	40
Turtles	29
Boats, fishing gear, misc. abiota	13
Terns (ROYT, UNLT, UNTE)	5
Grebes (HOGR, UNGR)	4
Other (sharks, seals, etc.)	4
Phalaropes (UNPH)	2
Storm Petrels (UNSP)	1
Total objects	³⁰³ 11927





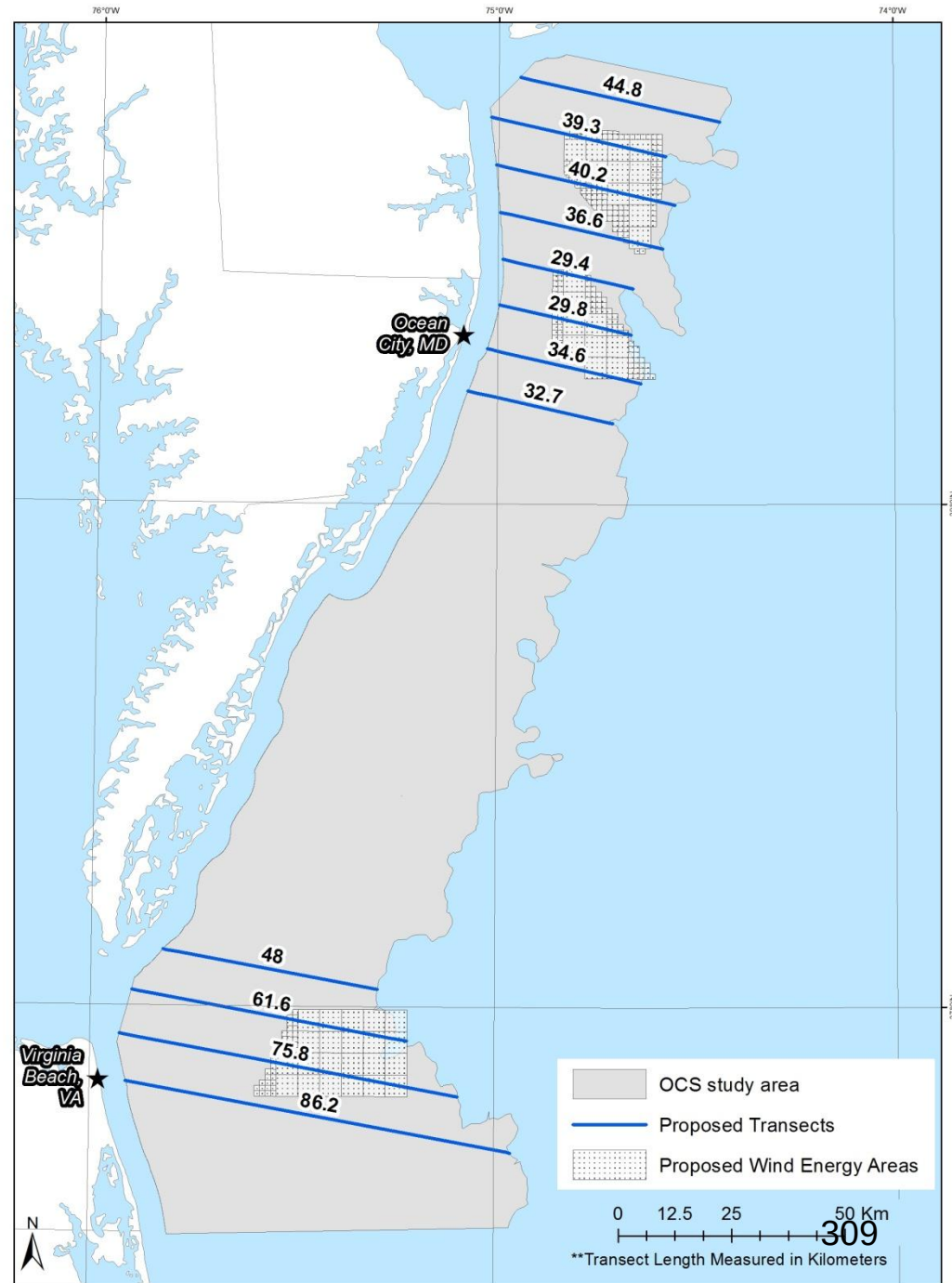






Survey Comparison

- Aerial-boat comparison
- Spring 2012...?



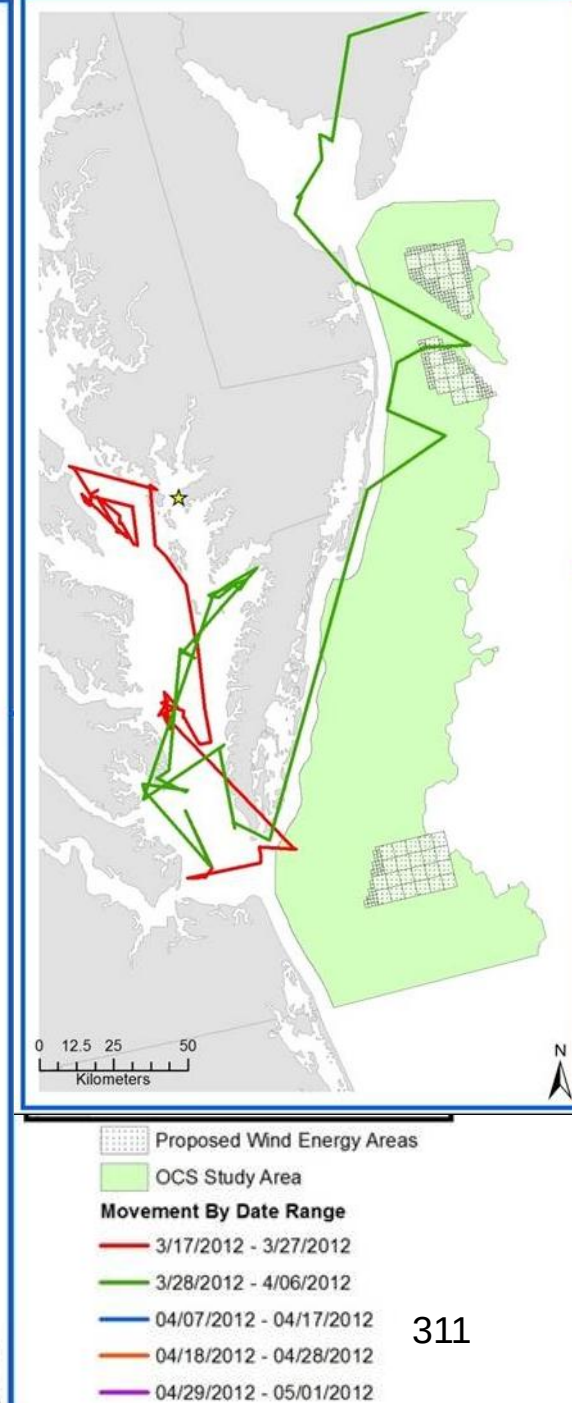
Individual Tracking of Bird Species

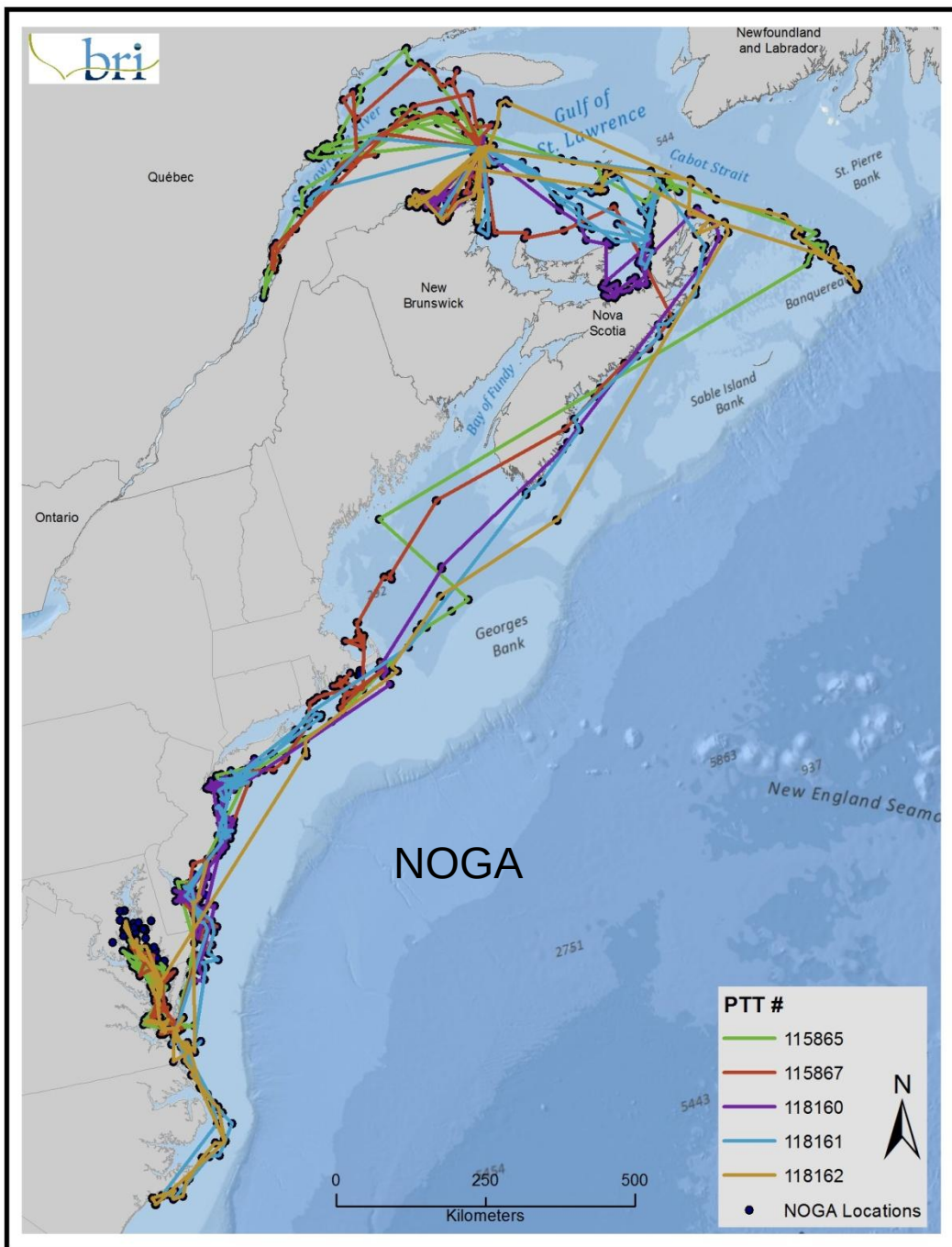
- Collaboration (BOEM, USFWS, BRI, DOE, Memorial University of Newfoundland...)
- Focal species: Northern Gannets, Red-throated Loons, Surf Scoters, and Peregrine Falcons



Photo by BRI staff

Disclaimer: Location data and movement tracks depicted in these maps have not yet been proofed for accuracy or analyzed. Lines connecting location points are theoretical, based on the shortest distance between the points, and are not necessarily the actual flight paths taken. Therefore, caution should be used in identifying patterns or drawing conclusions from the data. Formal interpretation of the data will be included in future reports submitted to the Bureau of Ocean Energy Management, and in peer reviewed manuscripts. For more information please contact: Caleb Spiegel, U.S. Fish and Wildlife Service (caleb_spiegel@fws.gov).



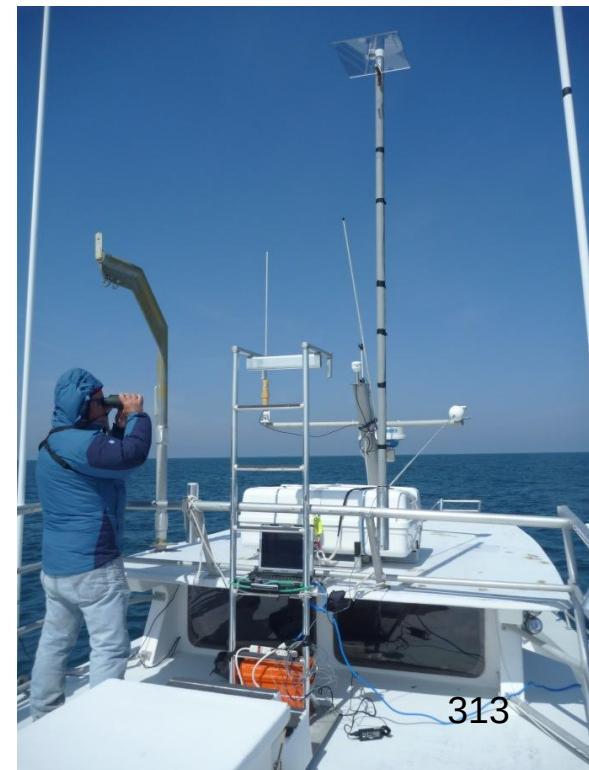


Disclaimer: Location data and movement tracks depicted in these maps have not yet been proofed for accuracy or analyzed. Lines connecting location points are theoretical, based on the shortest distance between the points, and are not necessarily the actual flight patterns or drawing conclusions from the data. Formal interpretation of the data will be included in future reports submitted to the Bureau of Ocean Energy Management, and in peer reviewed manuscripts. For more information please contact: Caleb Spiegel, U.S. Fish and Wildlife Service (caleb_spiegel@fws.gov).

Mid-Atlantic Baseline Studies

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Photo by BRI staff



This material is based upon work supported by:

- Department of Energy (award DE-EE0005362)
- Bureau of Ocean Energy Management
- US Fish and Wildlife Service
- Bailey Foundation

Thank you!

Kate.williams@briloon.org



Presentation #7

Atlantic coast wintering sea duck survey, 2008-11

Atlantic Coast Joint Venture
Sea Duck Joint Venture
and
Population & Habitat Assessment and
Migratory Bird Survey Branches
Division of Migratory Bird Management, USFWS



Bureau of Ocean Energy Management/NOAA
(2009-11)

Goals

Design a multi-species survey to

- Inform management decisions
- Provide an index of winter popn status/trends
- Relate index to breeding population status
- Characterize winter distributions (including fidelity)
- Understand factors affecting habitat use
- Detect distributional shifts

Basic survey protocol

Five crews of 2 observers (*Four* in 2011)

Fixed wing aircraft

200 ft altitude at 110 knots

400m strip transect, 2 observers

Transects extend east from $\frac{1}{4}$ NM offshore

Count all sea ducks, diving ducks, seabirds

Report observation condition (1 to 5)

Feb 4-25, 2008

Jan 31-Feb 18, 2009

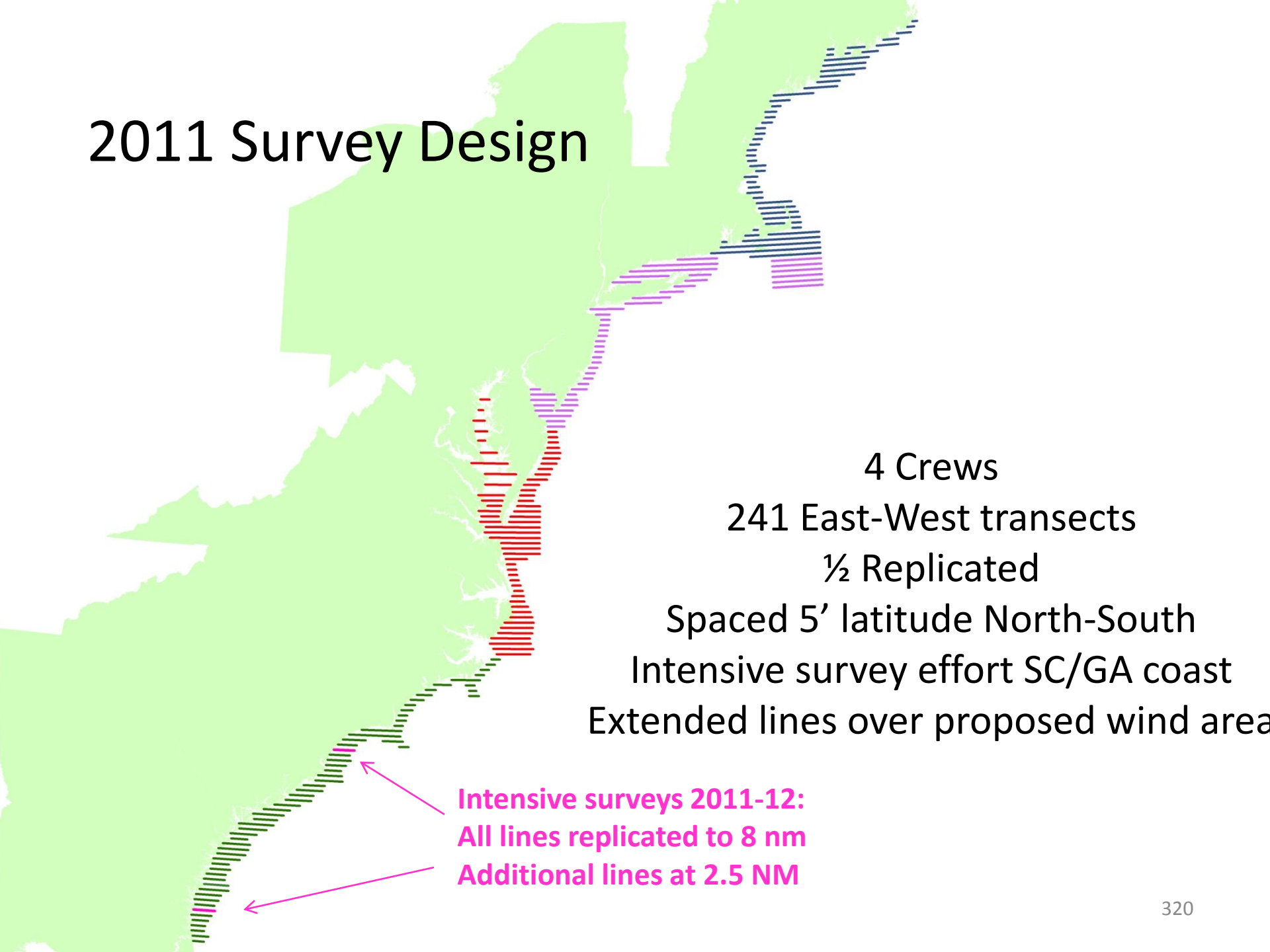
Jan 23-March 3, 2010

Jan 31-Feb 17, 2011

Summary of survey efforts

Year	Range	Design
2008	Cape Cod, MA Palm Beach, FL	Alternating pairs of transects to 8 & 15 NM; Flew historic coastal "transect"
2009	US/CA border Cape Canaveral, FL	Transects to longer of 8 NM or 16m depth; Flew historic coastal "transect"
2010	US/CA border Cape Canaveral, FL	Transects to longer of 8 NM or 16m depth; No coastal "transect;" 5th crew flew 4 replicates MD/DE, lower Chesapeake Bay
2011	US/CA border GA/FL border	Transects to longer of 8 NM or 16m depth; No coastal "transect;" extra survey work off SC/GA coast
2012	SC/GA coast	2.5 NM spacing, all 5 NM transects replicated;

2011 Survey Design



4 Crews

241 East-West transects

$\frac{1}{2}$ Replicated

Spaced 5' latitude North-South

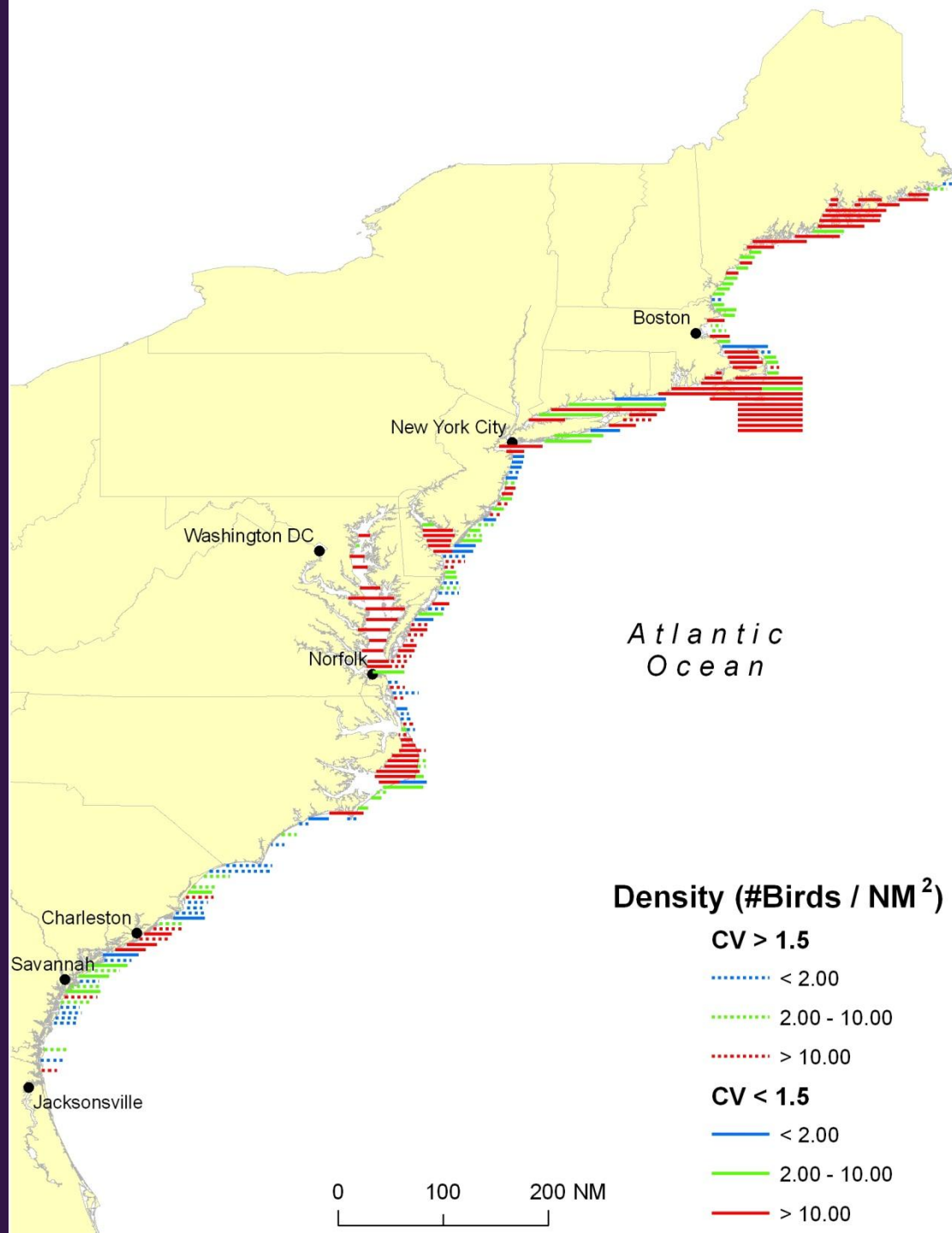
Intensive survey effort SC/GA coast

Extended lines over proposed wind area

Intensive surveys 2011-12:
All lines replicated to 8 nm
Additional lines at 2.5 NM

Products to date

- 2008-2011 Annual Reports
- Summary Report, October 2012
- Zipkin et al. 2012. *Fitting statistical distributions to sea duck count data: implications for survey design and abundance estimation*. In Review Statistical Methodology.
- Access Database



AMAPPs survey efforts

Date	Range	Details
Aug 2010	Bald Head Island, NC Key West, FL	Transects to longer of 8 NM or 16m depth; Flew Florida Bay to Naples Preliminary survey effort, 2 crews
Feb 2011	US/CA border Cape Canaveral, FL	Winter sea duck survey 4 crews
Aug 2011	US/CA border Cape Canaveral, FL	Transects to 30m depth 3 crews
Mar 2012	US/CA border Cape Canaveral, FL	Transects to 30m depth 4 crews

Presentation #8

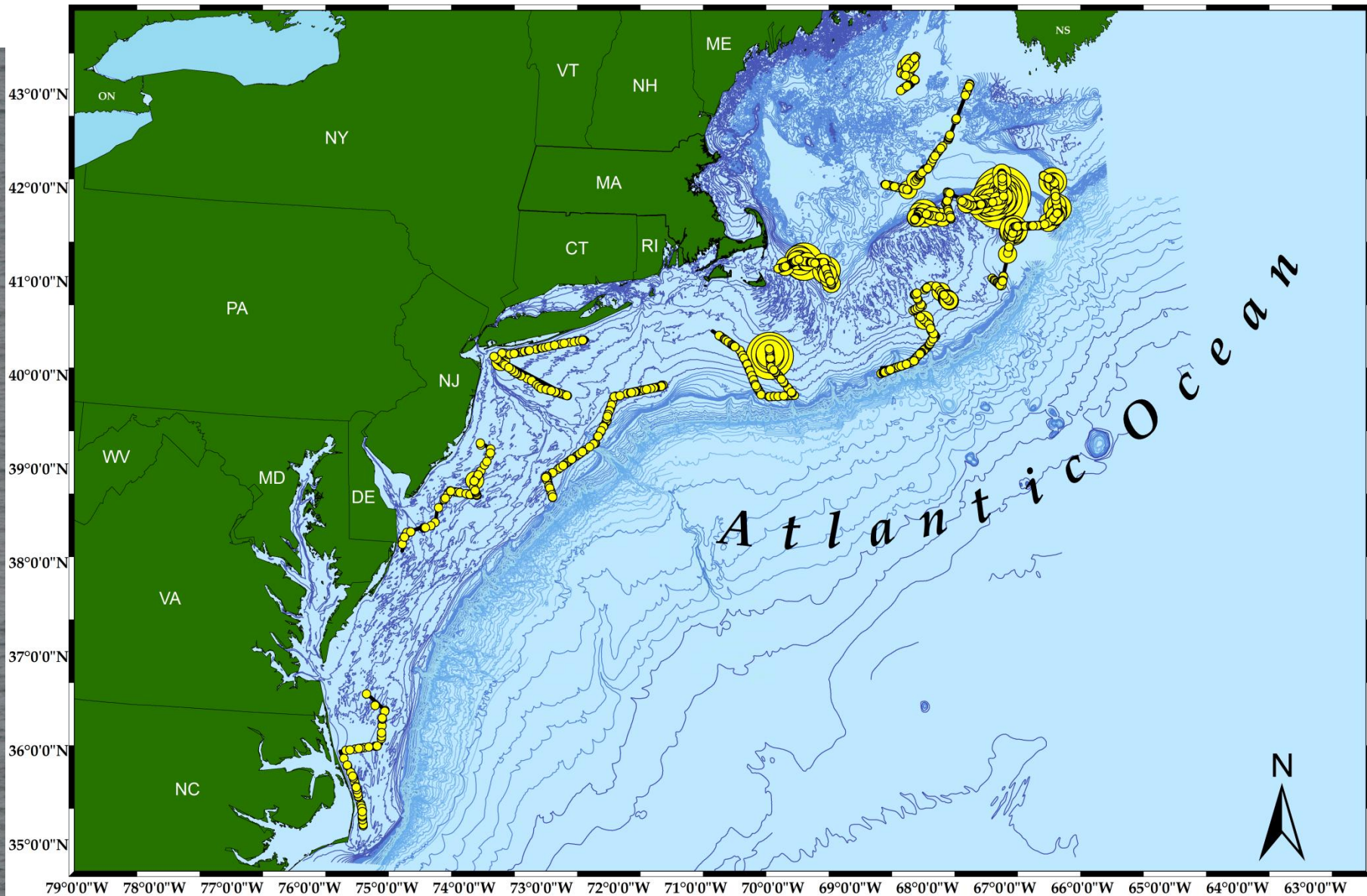
BROADSCALE DISTRIBUTION OF PELAGIC BIRDS OFF THE U.S. EAST COAST, MAINE TO NORTH CAROLINA

Richard R. Veit
Timothy P. White
Marie-Caroline Martin

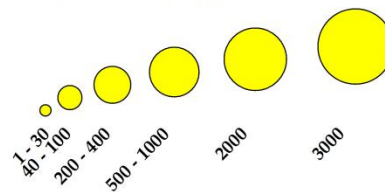
*Biology Department\
College of Staten Island/
City University of New York
2800 Victory Boulevard
Staten Island, NY 10309*

Melanie J. Steinkamp
USFWS



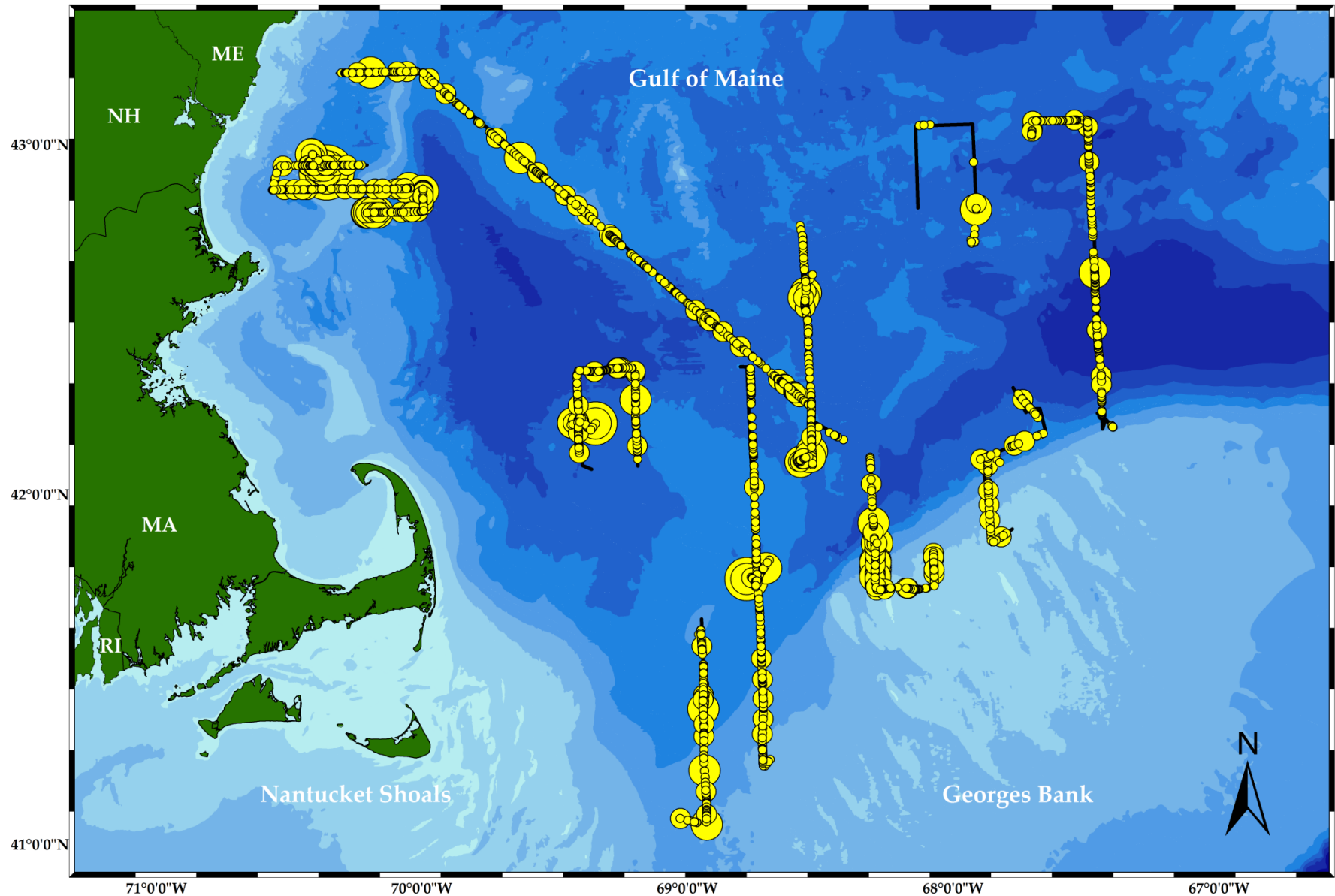


NUMBER OF SEABIRDS

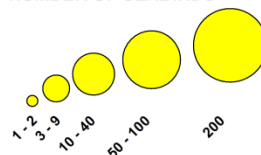


SPRING 2007--EFFORT DURING ZOOPLANKTON SURVEY

0 95 190 380 Kilometers



NUMBER OF SEABIRDS



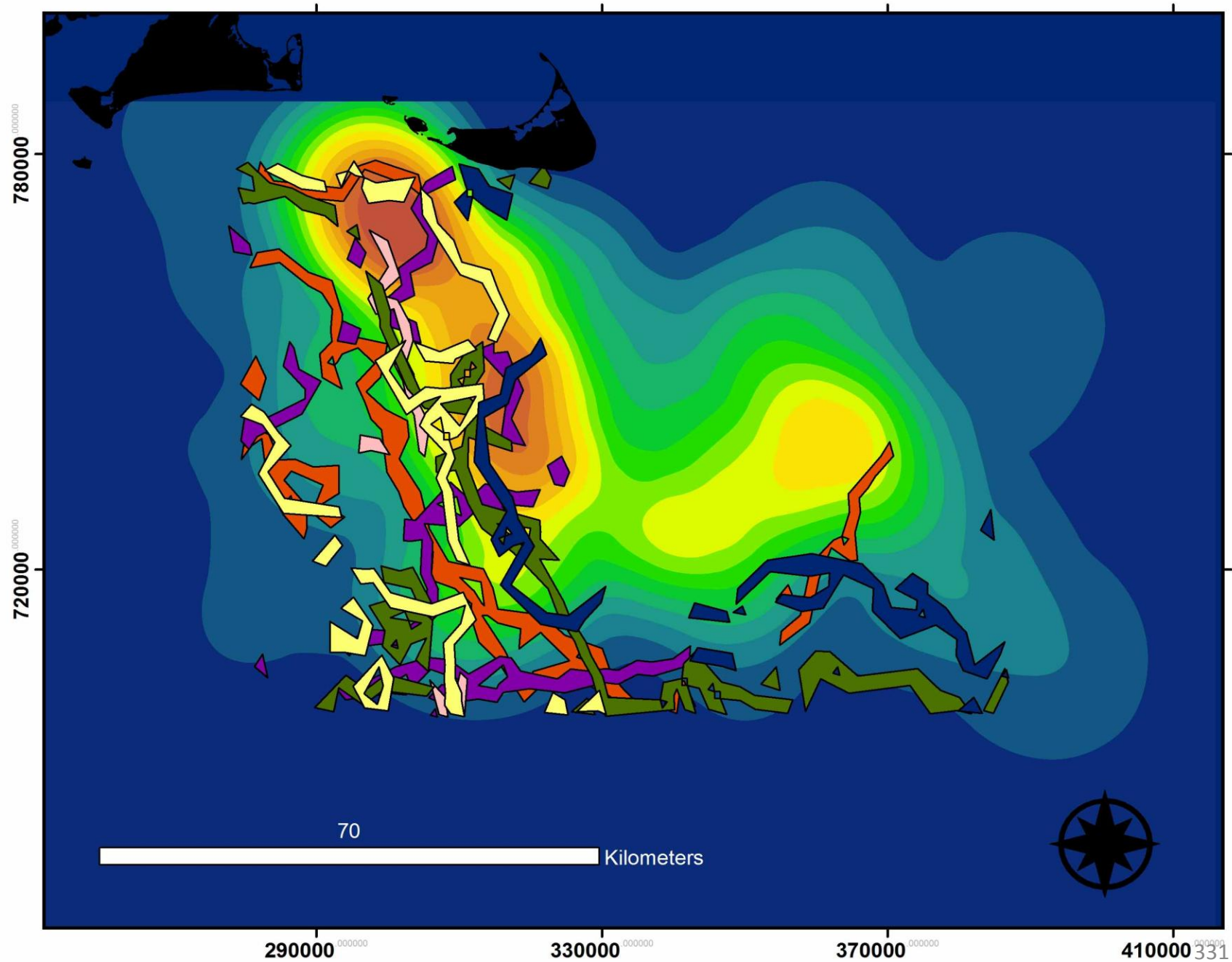
OCTOBER 2007--EFFORT DURING HERRING SURVEY

So 31 cruises so far
Summer 2007-February 2011

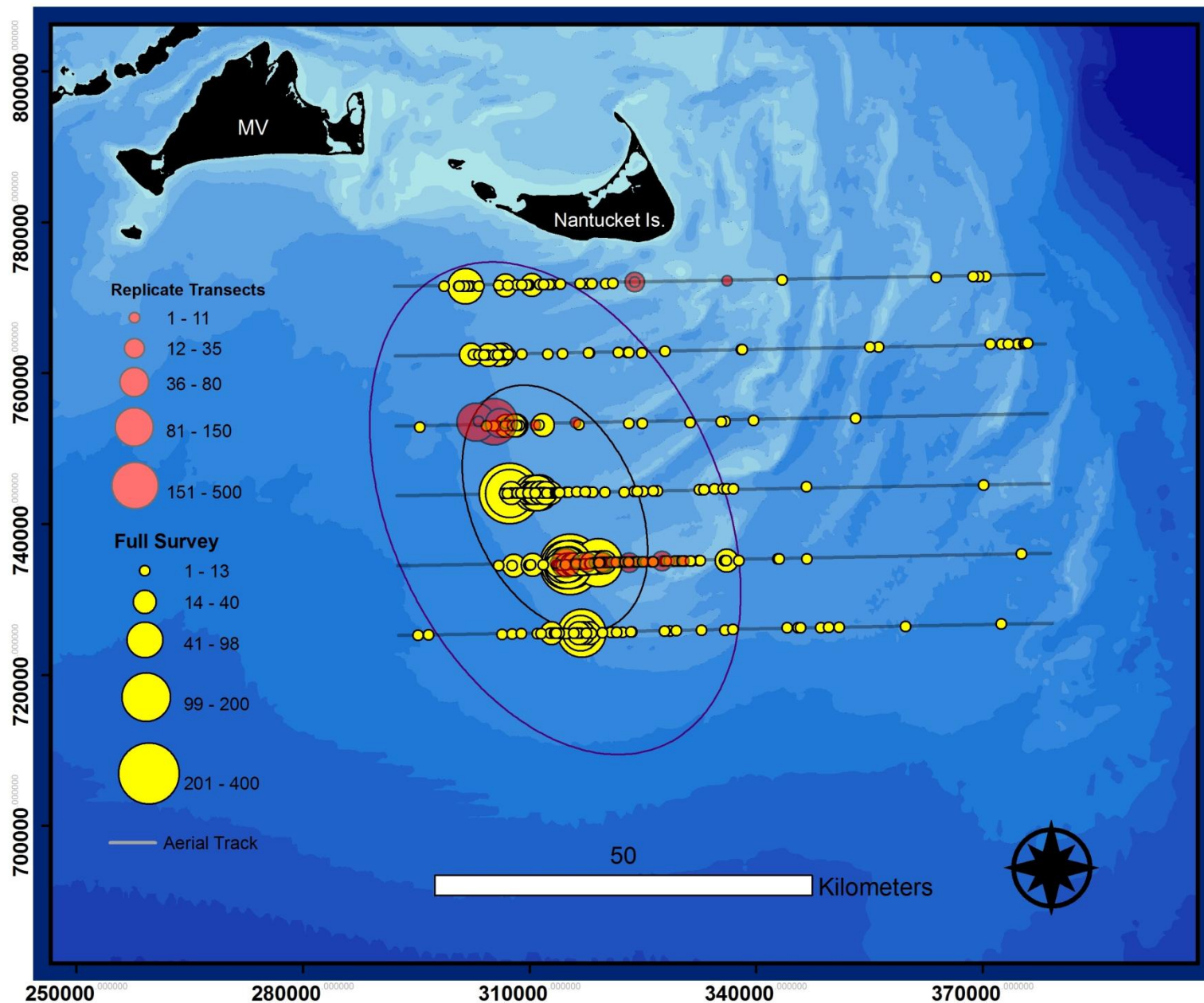
4 Ecomon per year
1-2 Herring per year
3 whoi cruises

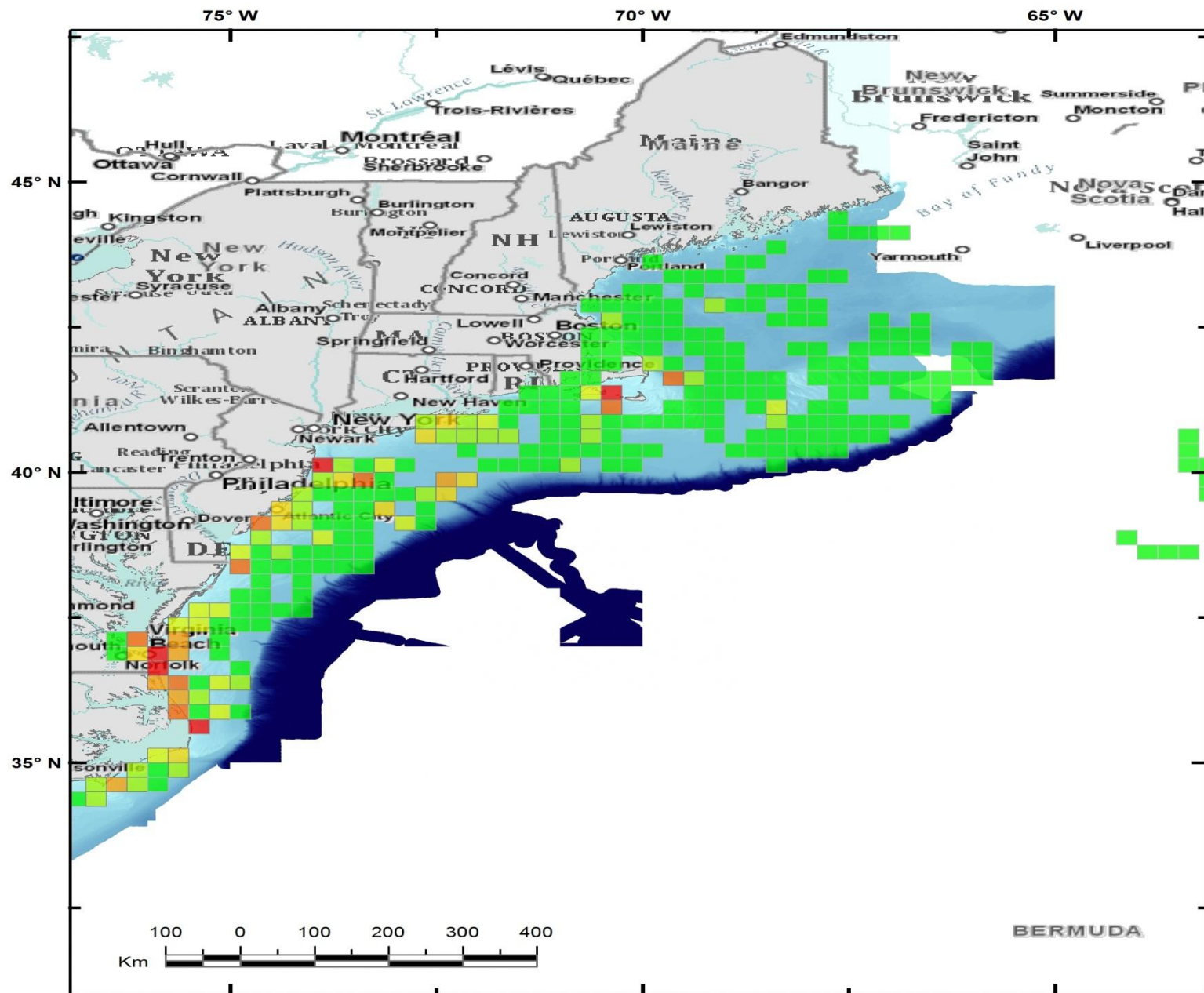
Hotspots

**Combining shipboard data with large
spatio-temporal databases**









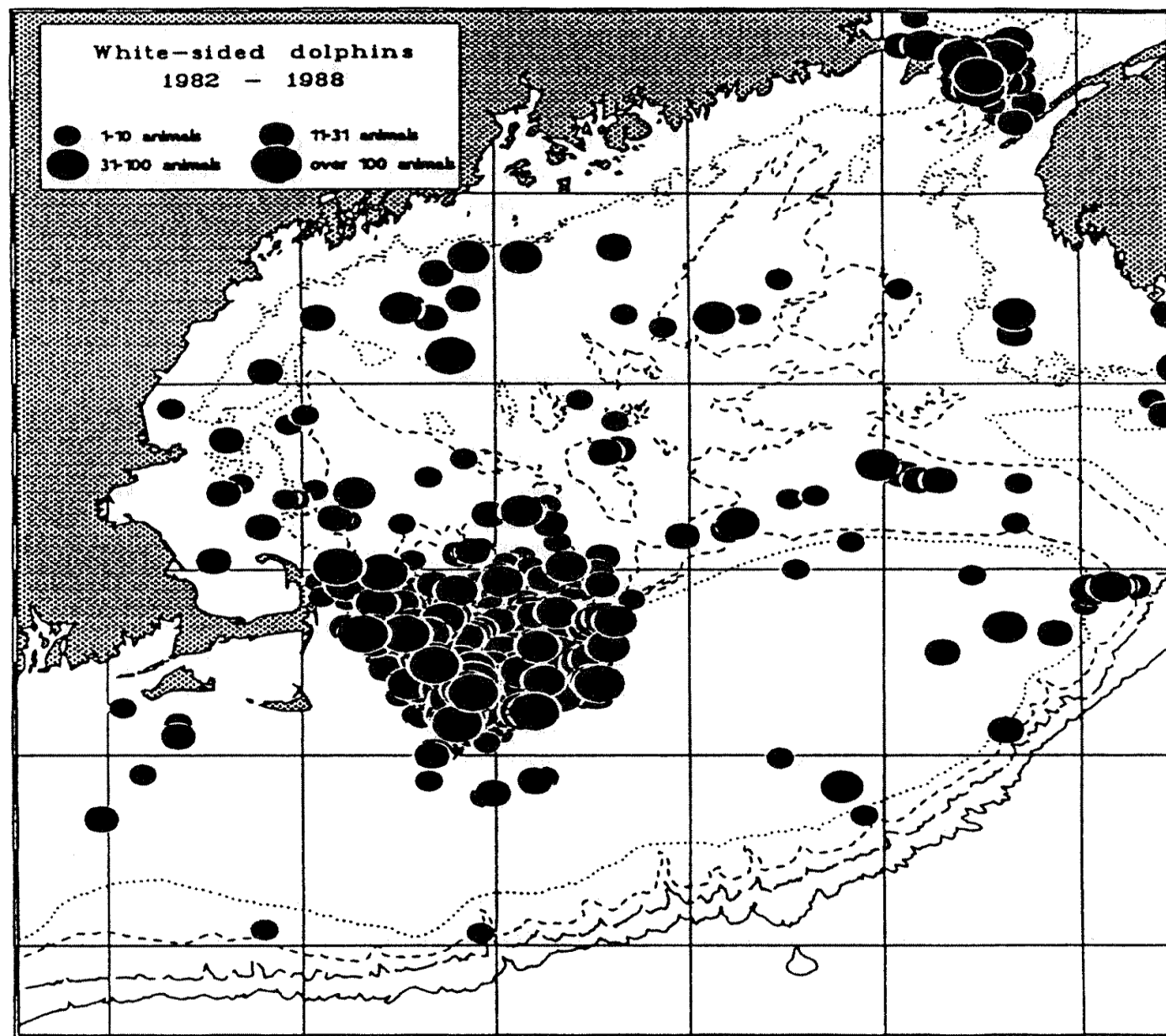
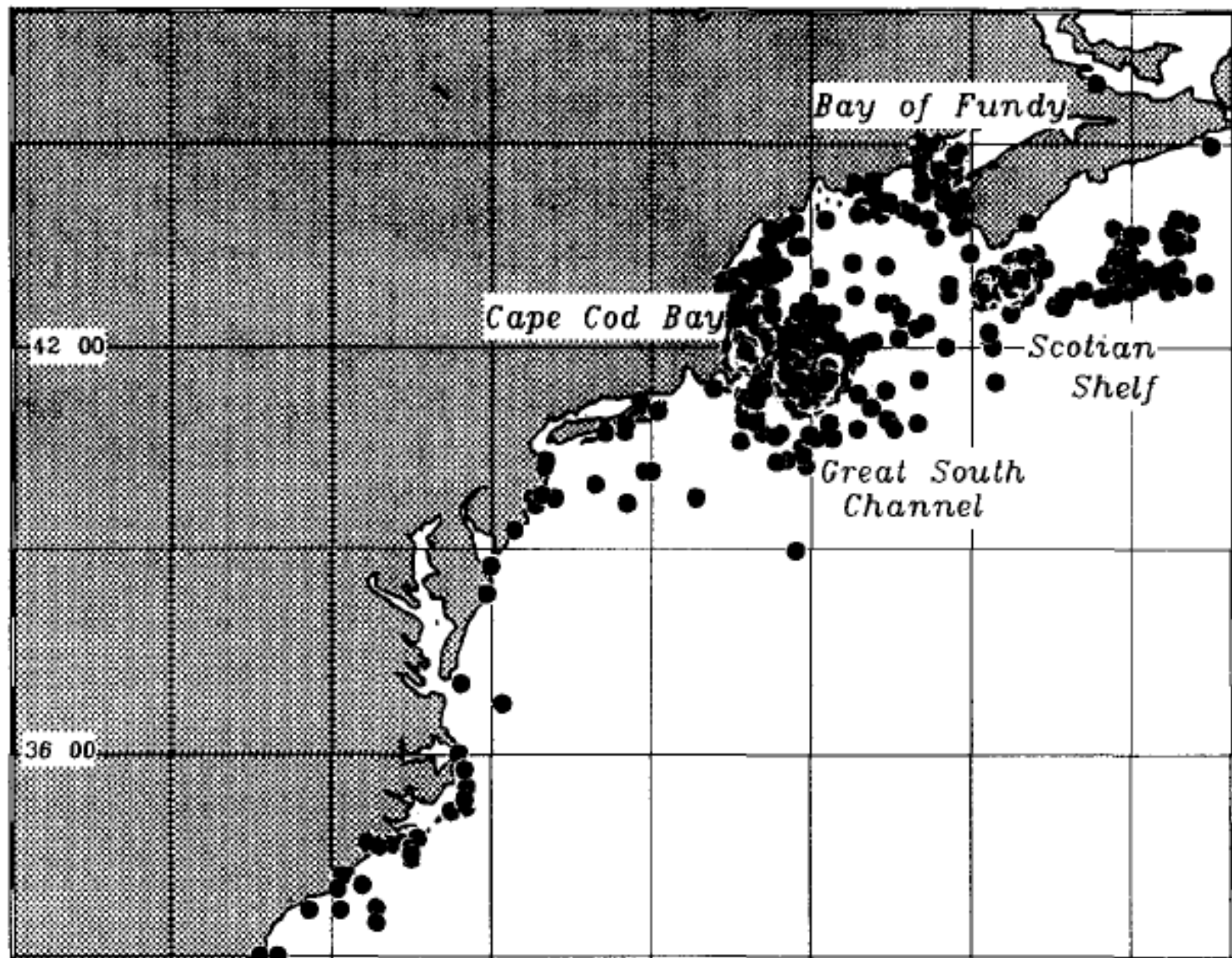
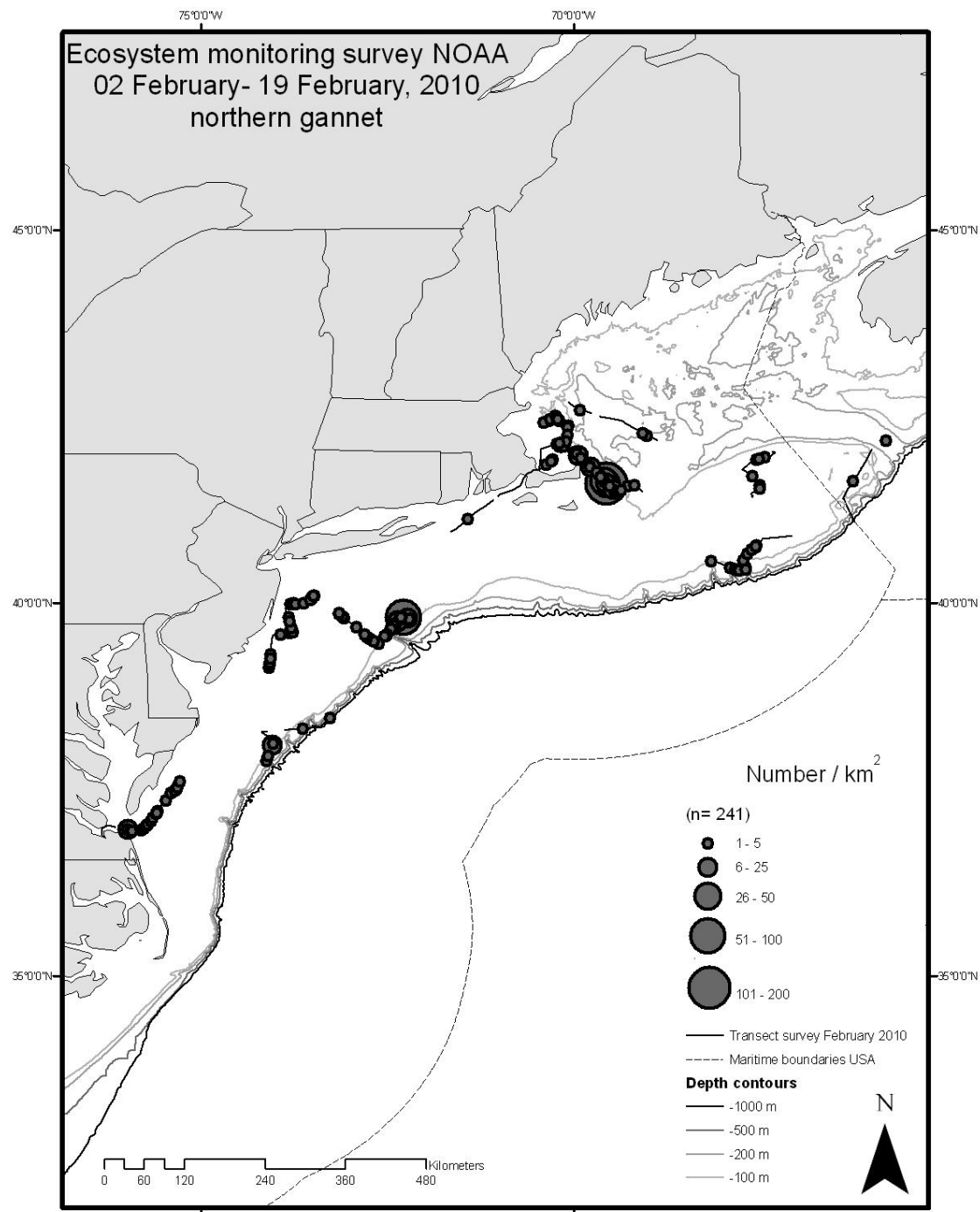


Figure 10-3. The distribution of white-sided dolphin (*Lagenorhynchus acutus*) sightings throughout the study area, 1982–1988.

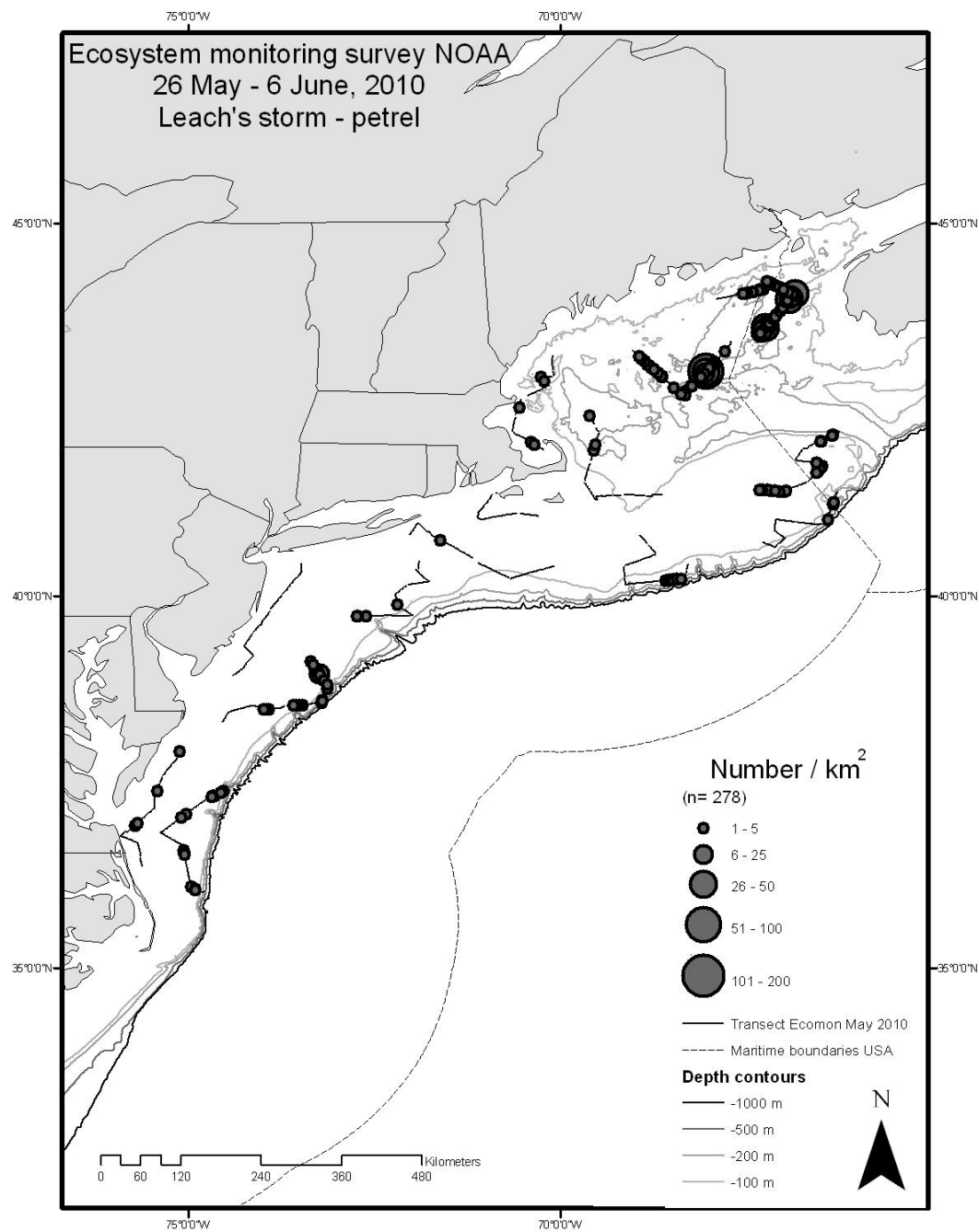




Historical Comparisons

Manomet Bird Observatory Data
1970s-1980s





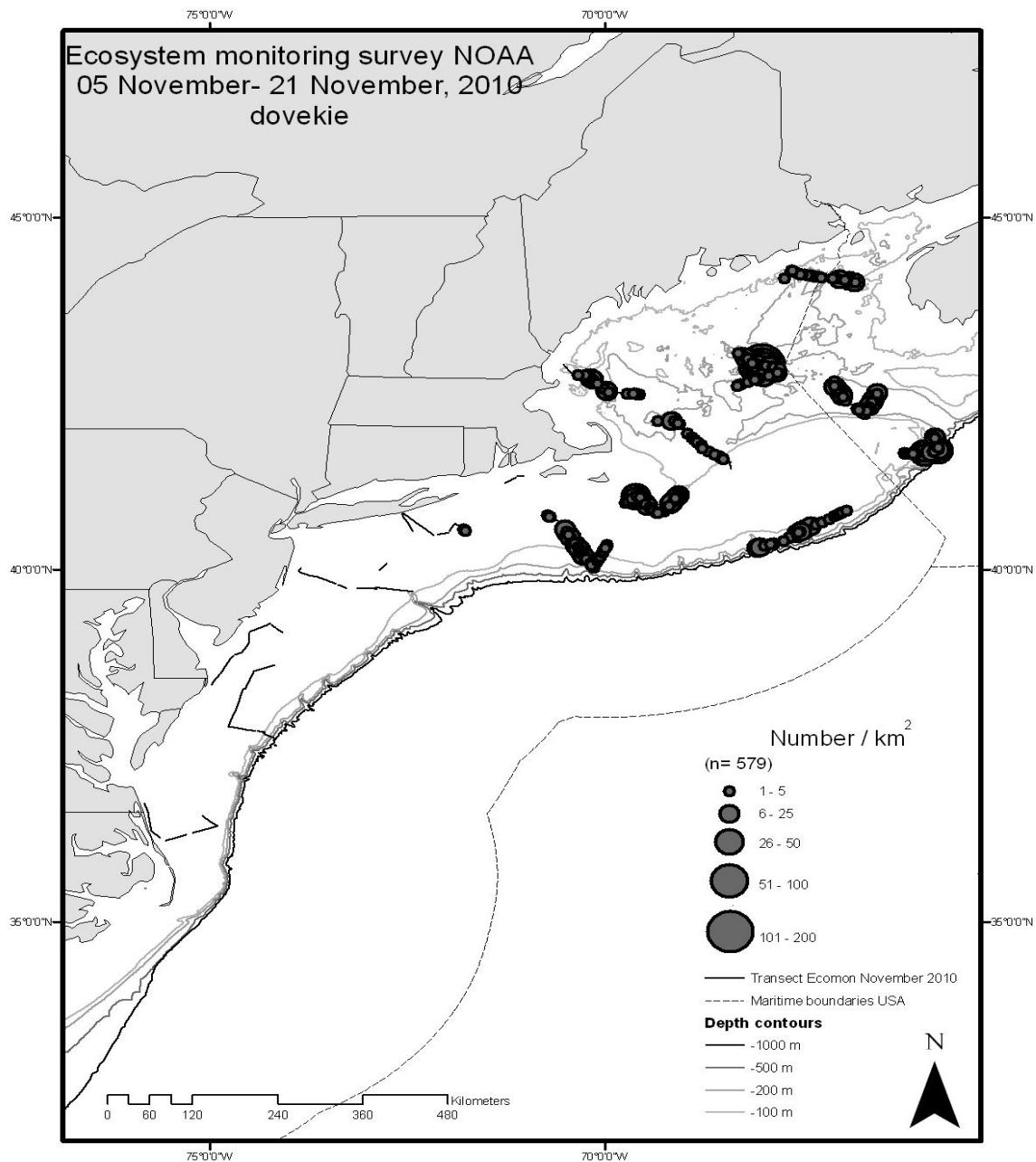


Table 2. Densities of dominant species recorded in 2010 (birds/km²). Density estimates for 1970s-1980s (from Powers 1983) given *in italics* below.

	February 2010	May 2010	August 2010	November 2010
Northern Fulmar	2.4 <i>(7.5)</i>	1.6 <i>(3.8)</i>	0 <i>(0)</i>	8.5 <i>(1.5)</i>
Greater Shearwater	0 <i>(0)</i>	6.8 <i>(1.5)</i>	7.3 <i>(2.75)</i>	5.7 <i>(7.5)</i>
Wilson's Storm-petrel	0 <i>(0)</i>	4.4 <i>(6.0)</i>	3.9 <i>(8.0)</i>	1.59 <i>(0.5)</i>
Northern Gannet	1.4 <i>(1.0)</i>	0.28 <i>(1.75)</i>	0.29 <i>(0.25)</i>	6.3 <i>(1.25)</i>
Herring Gull	2.6 <i>(3.75)</i>	0.50 <i>(1.5)</i>	1.7 <i>(0.75)</i>	2.3 <i>(8.5)</i>
Dovekie	0.36 <i>(1.0)</i>	0.09 <i>(1.0)</i>	0 <i>(0)</i>	8.1 <i>(0)</i>

Table 3. Greater Shearwater abundance within four strata sampled both in the 1970s (Powers 1983) , 2008-2009 and 2010 (this study).

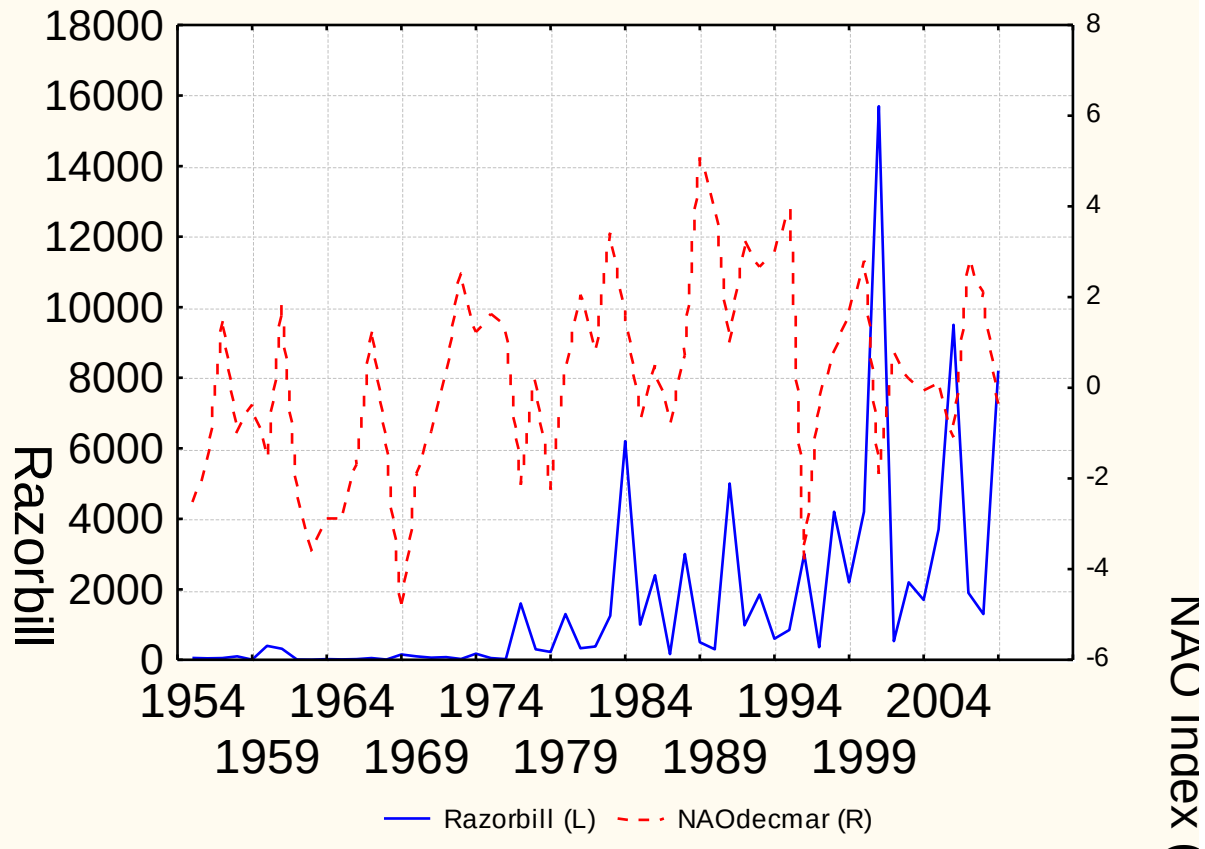
		1970s (Powers 1983) Birds/km ²		2008-2009 Birds/km ²		2010 Birds/km ²
May		2.0		3.7		19.8
		2.0		4.3		7.3
		2.0		0.1		0.2
	Mid	0		4.1		0.05
August		8.0		3.0		12.9
		3.0		0.3		8.1
		3.0		0.3		1.0
	Mid	0		0.1		0
October		30.0		4.4		(Nov) 6.2
		12.0		5.7		(Nov) 5.9
		15.0		0.7		(Nov) 2.8
	Mid	2.0		0		(Nov) 8.0

Climate Change

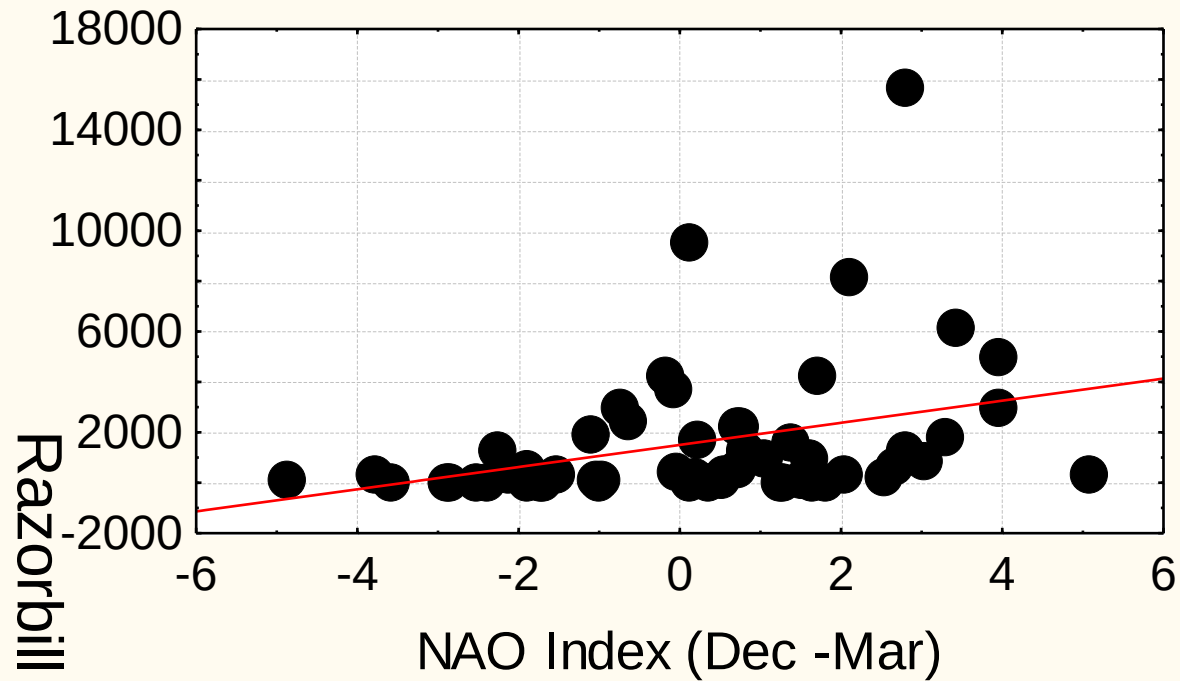
Need to know this for interpretation
of current data



Razorbill Total in Massachusetts

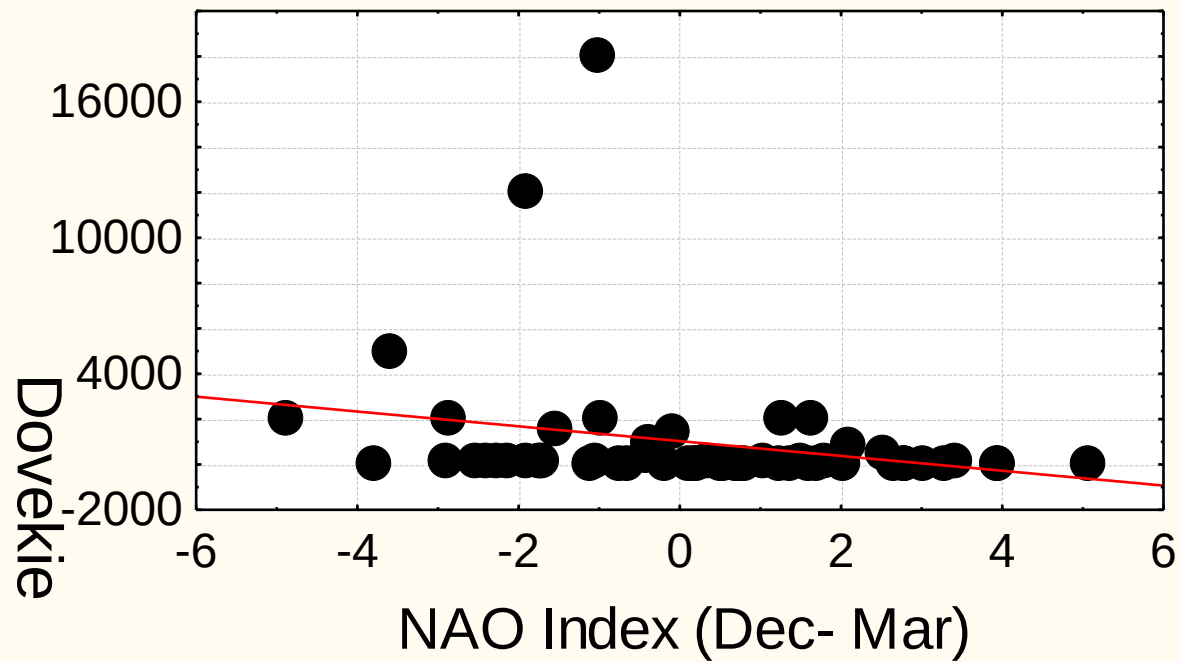


Spearman $r = 0.41$
 $p = 0.002$



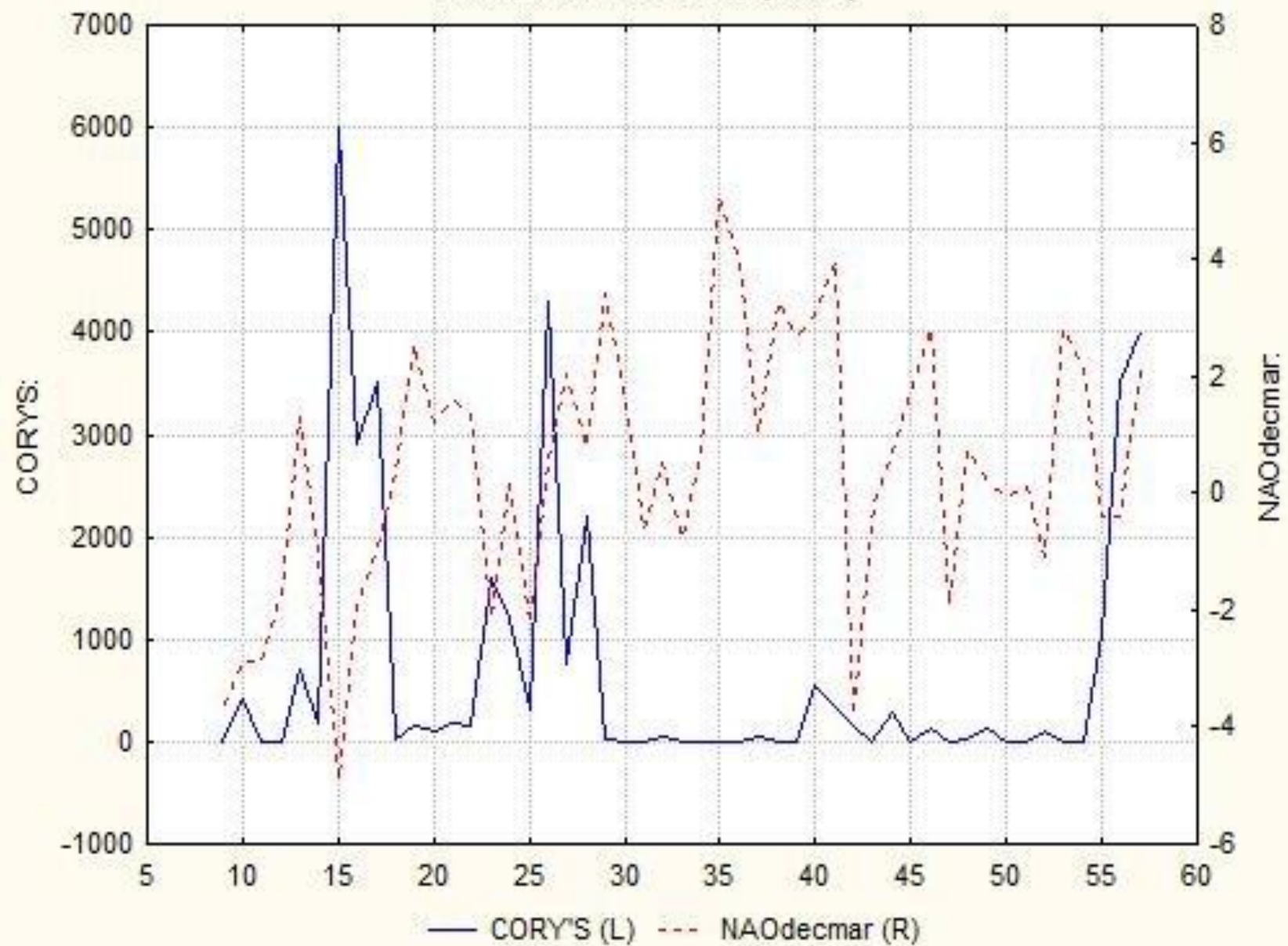


Spearman $r = -0.43$
 $p = 0.0012$





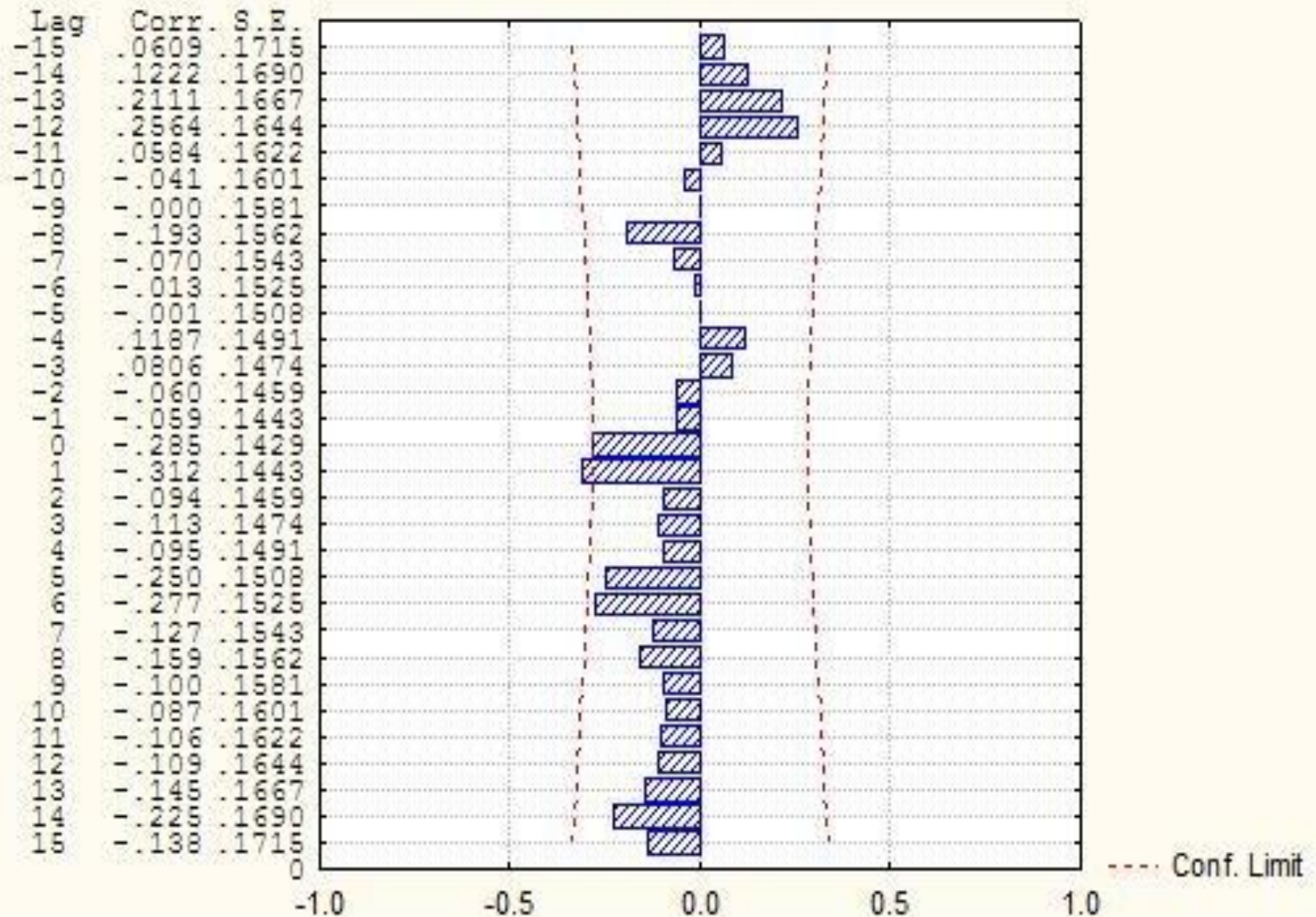
Plot of selected variables (series)



CrossCorrelation Function

First : CORY'S

Lagged: NAOdecmar



Summary

- 1.) Hotspots are evident and persistent
- 2.) Changes evident 1970s-present
- 3.) Changing climate has impacted birds

Presentation #9

Update on Offshore Acoustic Bat Research in Atlantic & Great Lakes Regions

Mid-Atlantic Marine Wildlife Survey, Modeling, and Data Workshop

**July 24-25, 2012
Silver Spring, MD**

Steve Pelletier, CWB, Principal Scientist
Trevor Peterson, Senior Wildlife Biologist
Sarah Boyden, Project Scientist
Joel Perkins, Project Technician



2009–2011 Stantec Studies



Objectives

- Test effectiveness of acoustic equipment and methods to document offshore bat activity
- Assess presence of bats in a variety of offshore locations
- Assess offshore fall migration activity patterns
 - Activity levels (mid-July – November)
 - Species composition
 - Seasonal activity trends
 - Nightly activity trends
- Assess annual variability in activity by repeating surveys
- Assess implications for offshore wind energy

Long-Distance Migrants

LABO



Eastern red bat
(*Lasiurus borealis*)

LANO



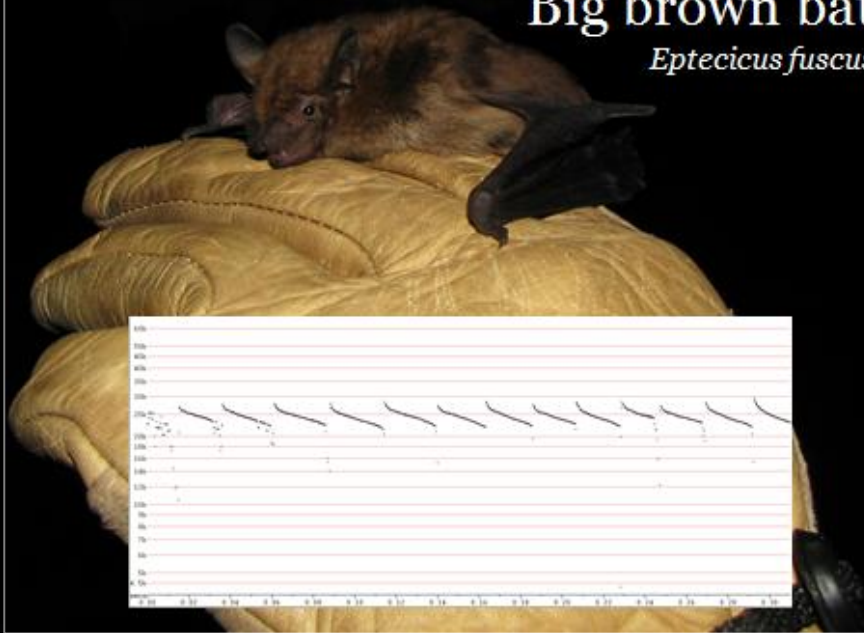
Silver-haired bat
(*Lasionycteris noctivagans*)

LACI

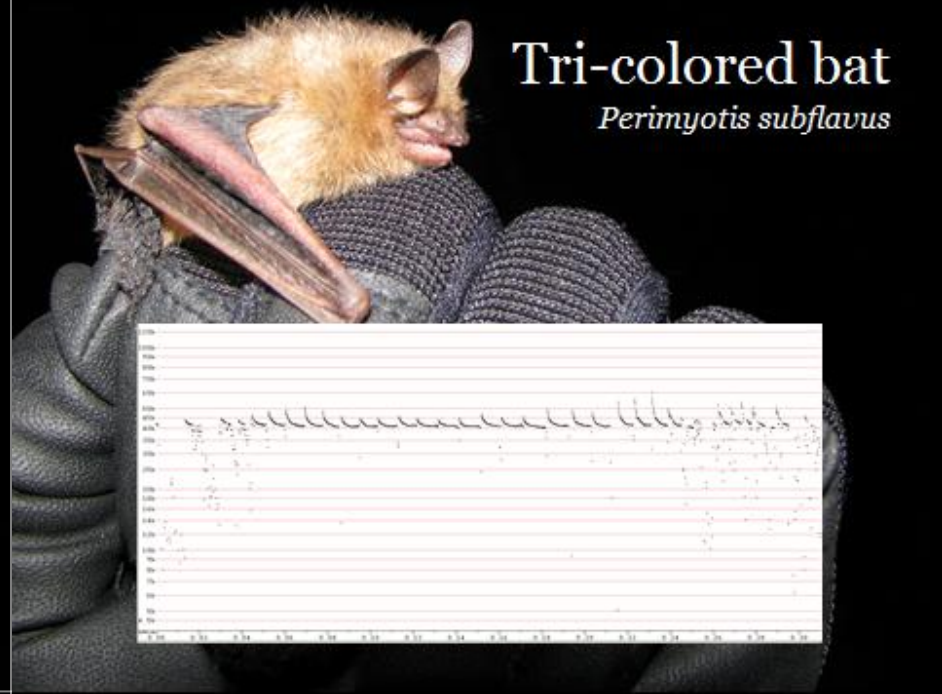


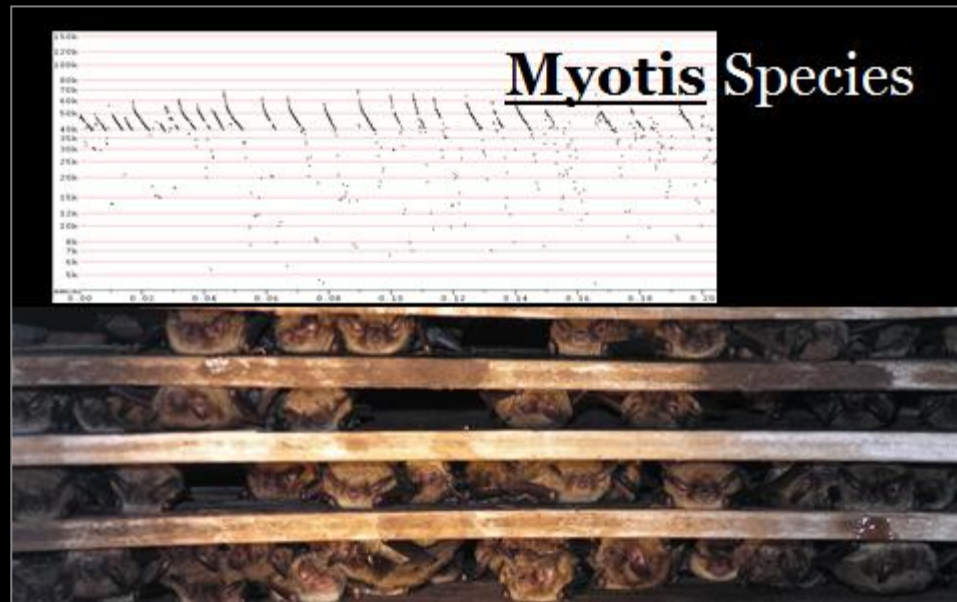
Hoary bat
(*Lasiurus cinereus*)

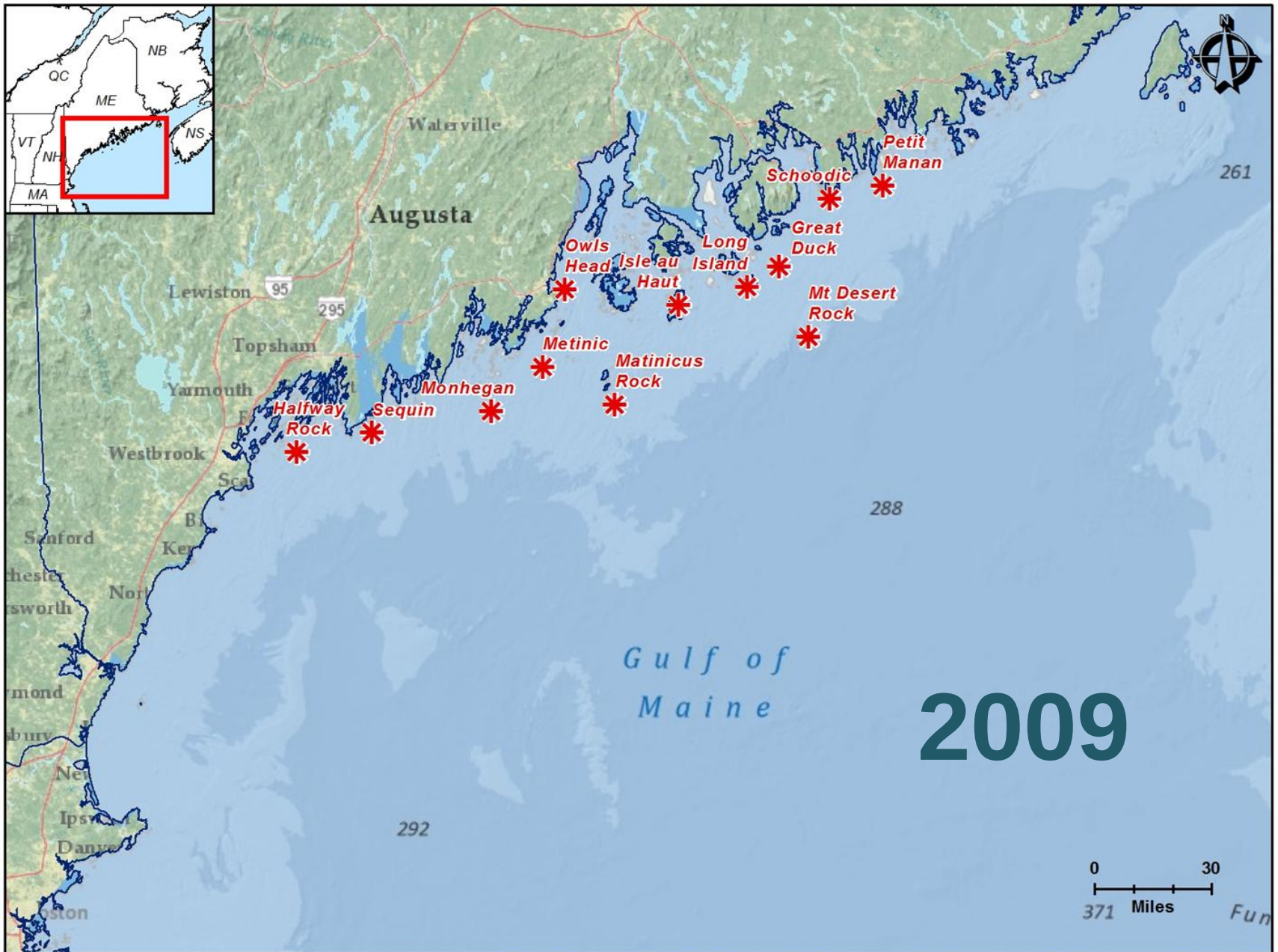
Big brown bat
Eptesicus fuscus

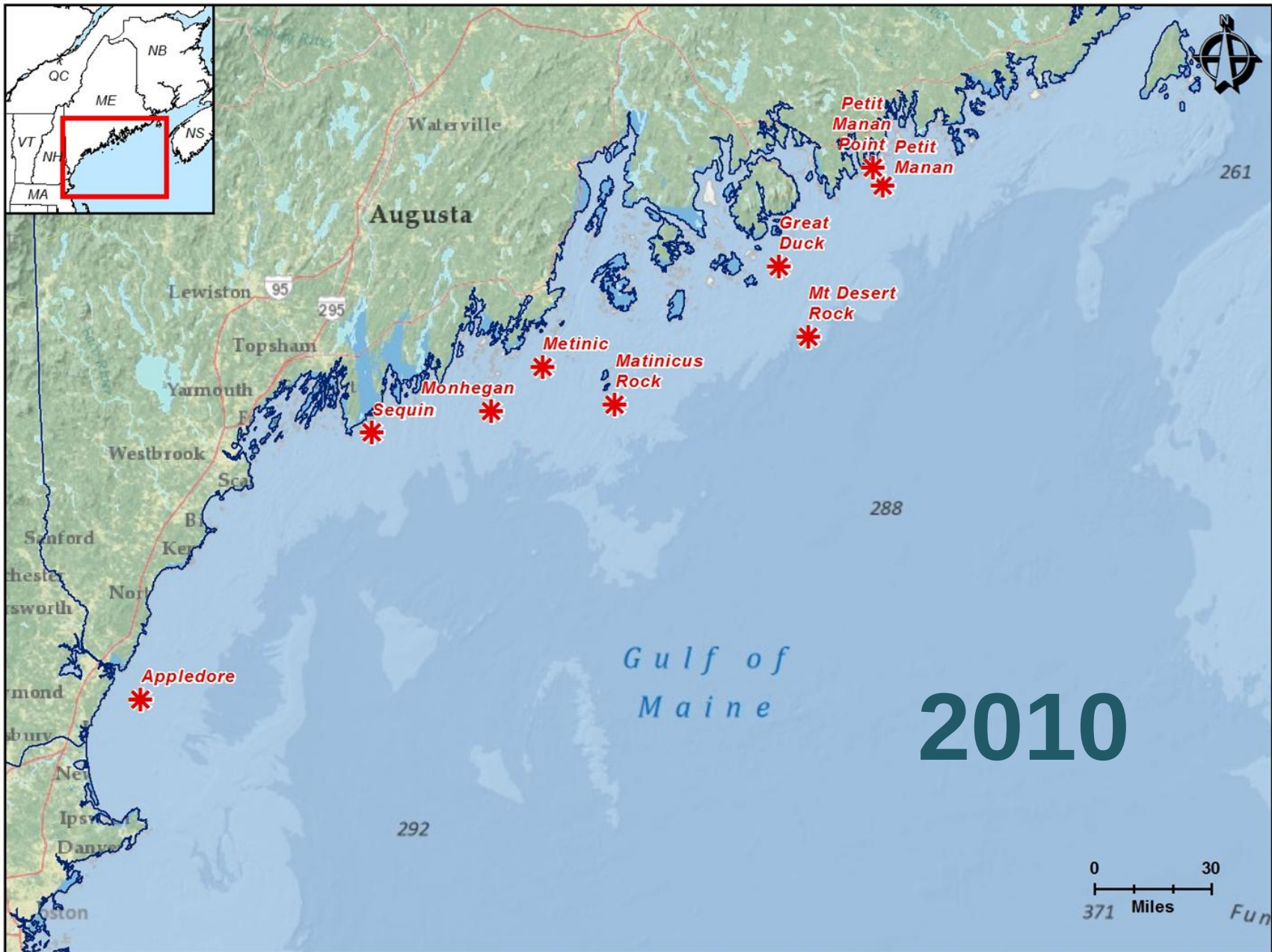


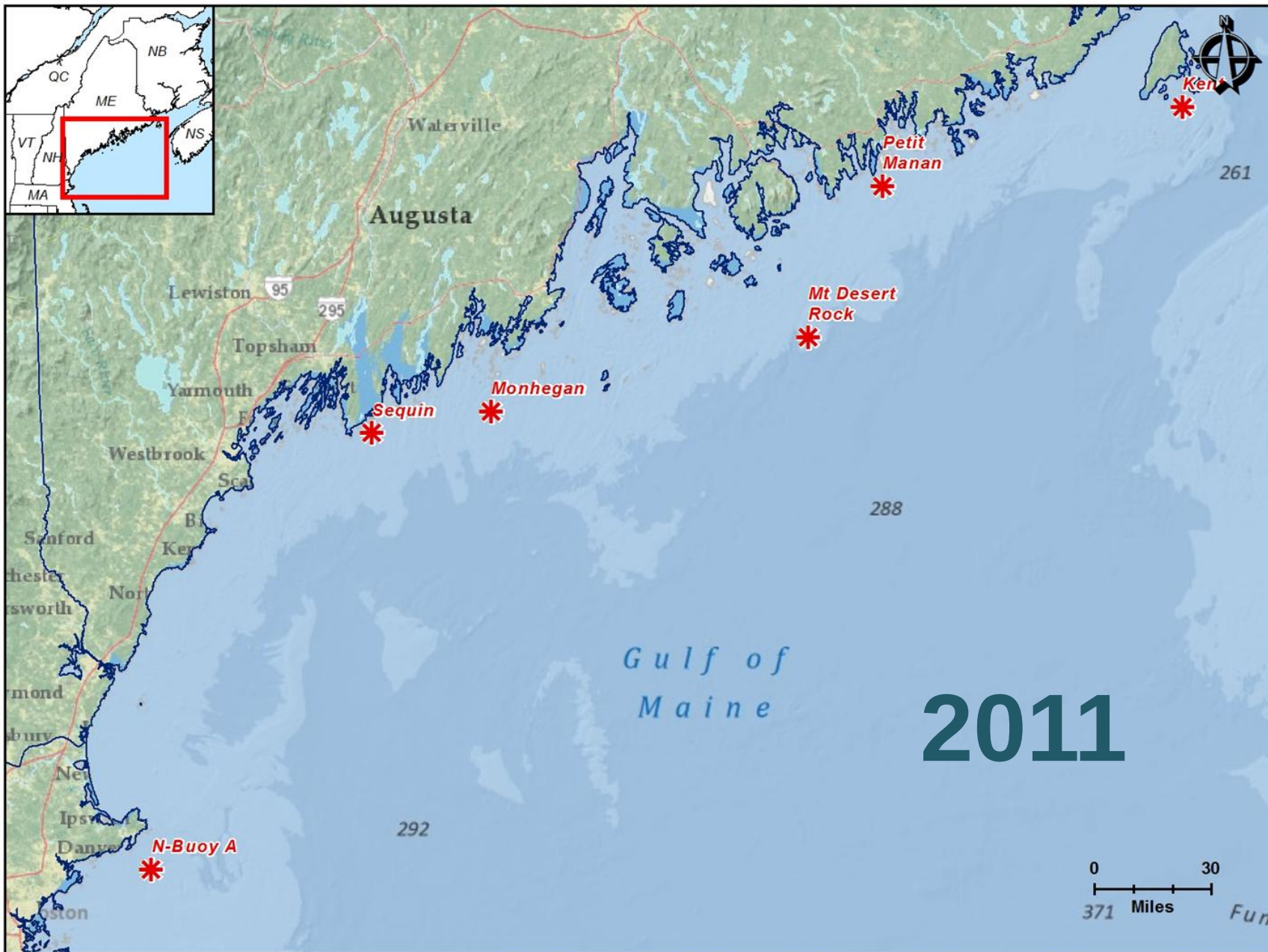
Tri-colored bat
Perimyotis subflavus











Results

- Remote acoustic detectors effective for long-term detection and monitoring of northeast bat species
- Bats detected at all 2009 - 2011 survey sites
- Peak movement periods detected
- Bats detected April thru November
- Non-migratory and migratory species documented at most sites



2012 - 2014

Department of Energy Study

3 Year Study

Expanded Regional Surveys

- Gulf of Maine
- US Coastal Mid- Atlantic
- Great Lakes

Targeted Spring – Early Winter



W Holdings LLC. 2008 All Rights Reserved

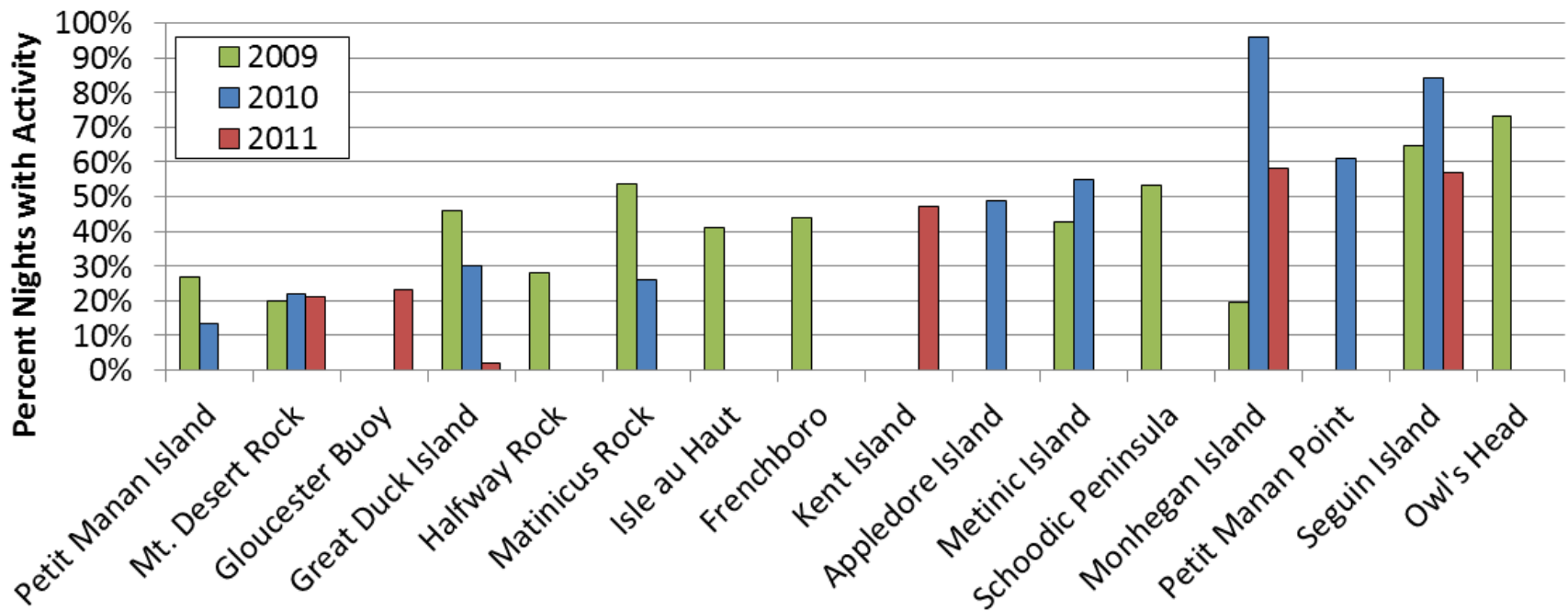
Data Analysis to Date

Survey Effort

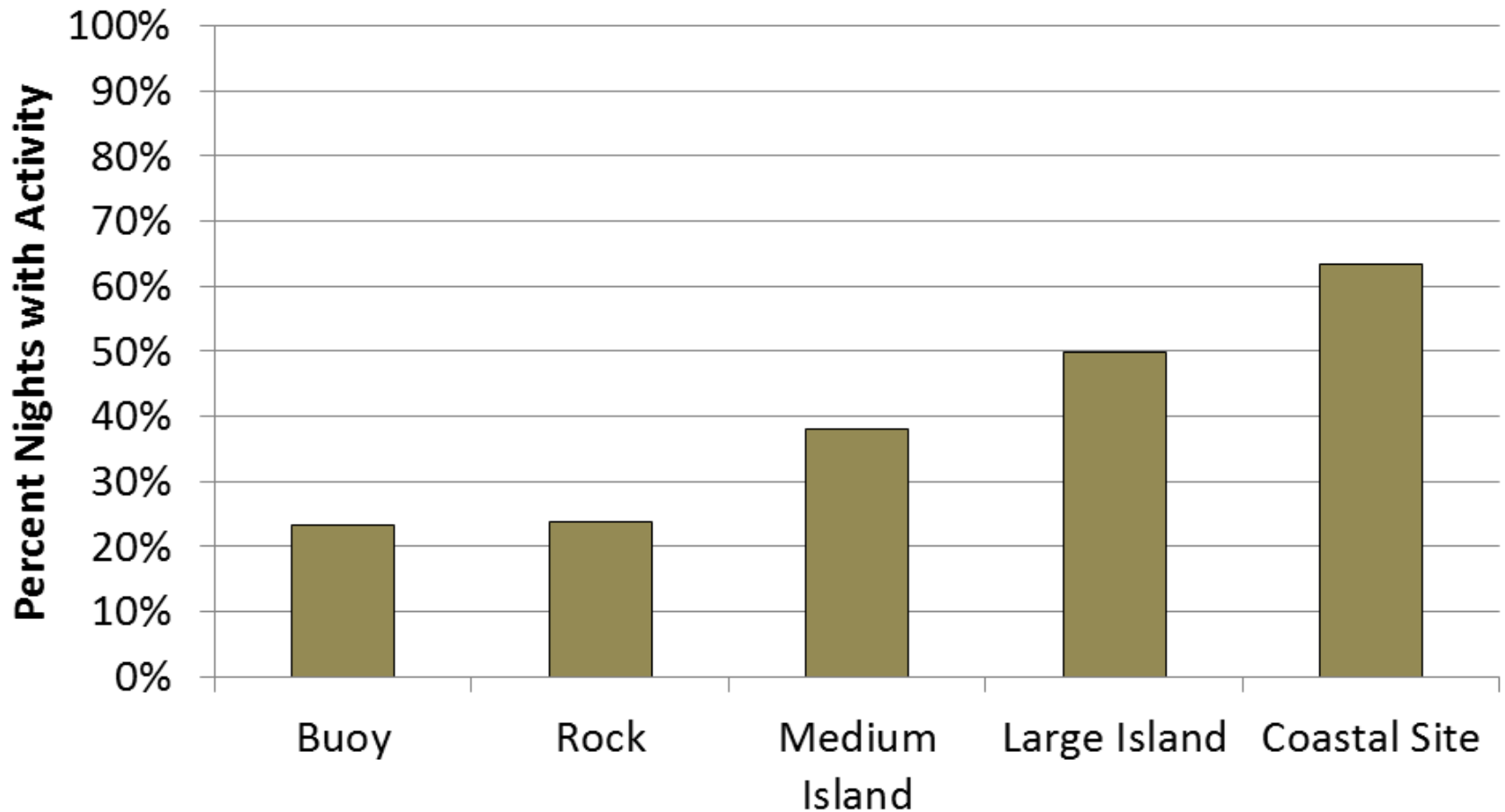
Year	2009	2010	2011
Survey Sites	12	9	6
Geographic Area	~125 miles	~170 miles	~240 miles
Survey Period	7/28–11/30	7/15–11/30	4/1-11/30
Survey Nights	948	801	600
Calendar Nights	126	139	244
% Active Nights	72	73	45

SITE	YEAR	SURVEY DATES	# SURVEY NIGHTS	% ACTIVE NIGHTS
Appledore Island	2010	8/10-11/30	113	49%
Frenchboro	2009	8/28-11/3	68	44%
Gloucester Buoy	2011	6/1-10/15	137	23%
Great Duck Island	2009	8/17-10/20	65	46%
	2010	8/27-11/30	96	30%
	2011	4/1-5/31	61	2%
Halfway Rock	2009	8/13-11/30	110	28%
Isle au Haut	2009	8/26-11/11	78	41%
Kent Island	2011	7/3-8/18	47	47%
Matinicus Rock	2009	9/2-9/14	13	54%
	2010	8/5-10/31	88	26%
Metinic Island	2009	7/29-10/27	91	43%
	2010	7/16-10/16	93	55%
Monhegan Island	2009	9/16-11/30	76	20%
	2010	7/19-9/4	48	96%
	2011	8/12-11/30	111	58%
Mt. Desert Rock	2009	8/17-11/30	106	20%
	2010	8/26-11/30	97	22%
	2011	4/1-9/17	170	21%
Owl's Head	2009	8/11-11/14	93	73%
Petit Manan Island	2009	7/28-10/29	94	27%
	2010	7/30-11/11	105	13%
Petit Manan Point	2010	9/7-11/4	59	61%
Schoodic Peninsula	2009	8/18-10/31	75	53%
Seguin Island	2009	8/25-11/11	79	65%
	2010	7/15-10/24	102	84%
	2011	8/27-11/8	74	57%
Overall	2009	7/28-11/30	948	41%
	2010	7/15-11/30	801	45%
	2011	4/1-11/30	600	36%

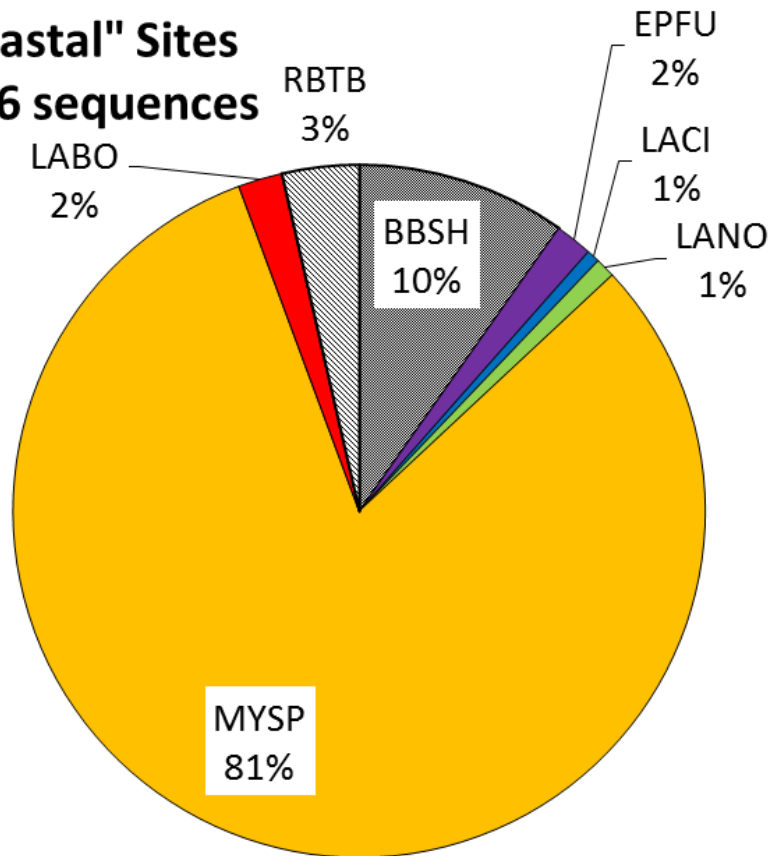
% Active Nights by Year 2009 thru 2011



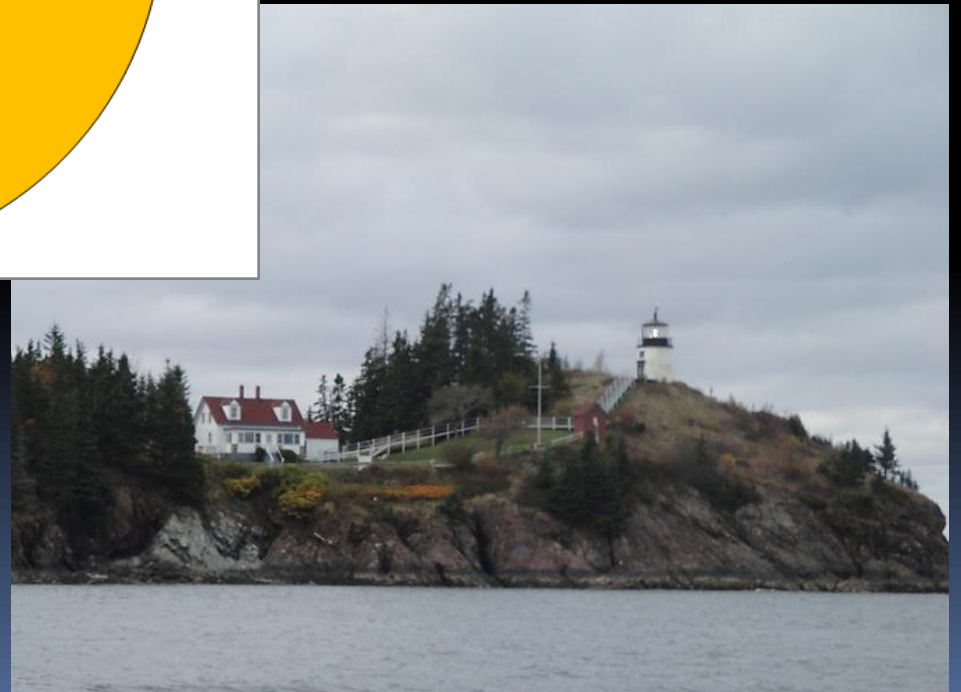
% Active Nights vs Site Type



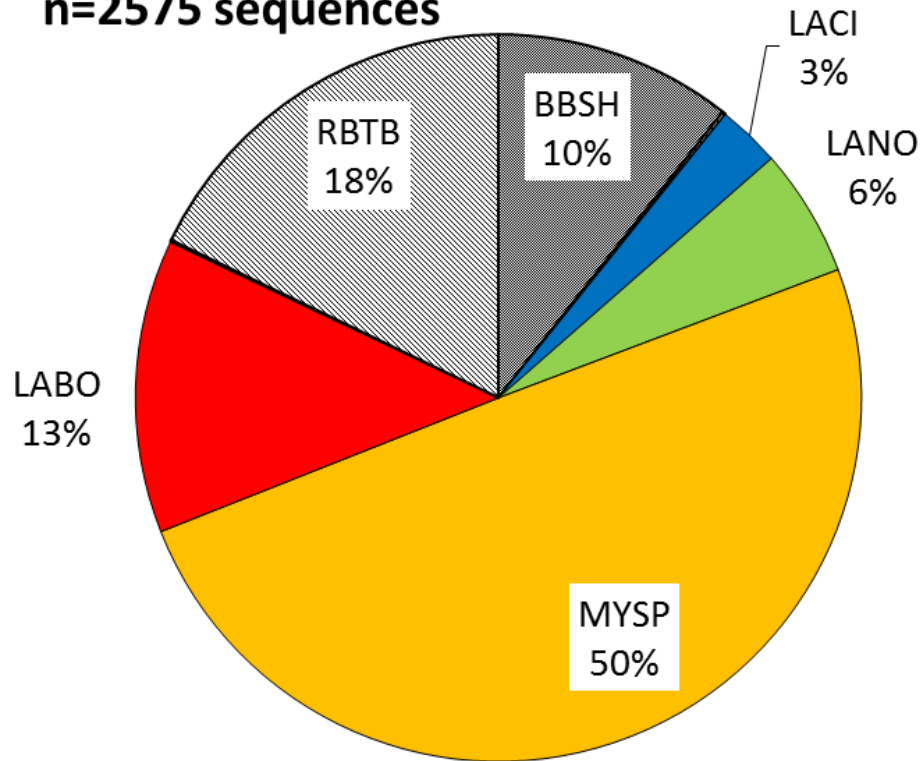
3 "Coastal" Sites n=5416 sequences



Coastal Sites



**4 "Large" Islands
n=2575 sequences**

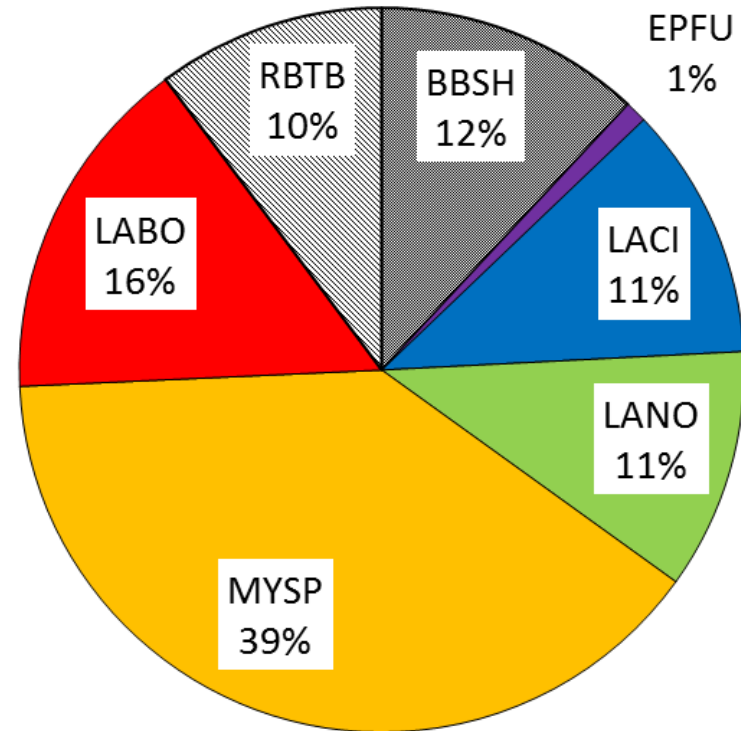


Large Island Sites

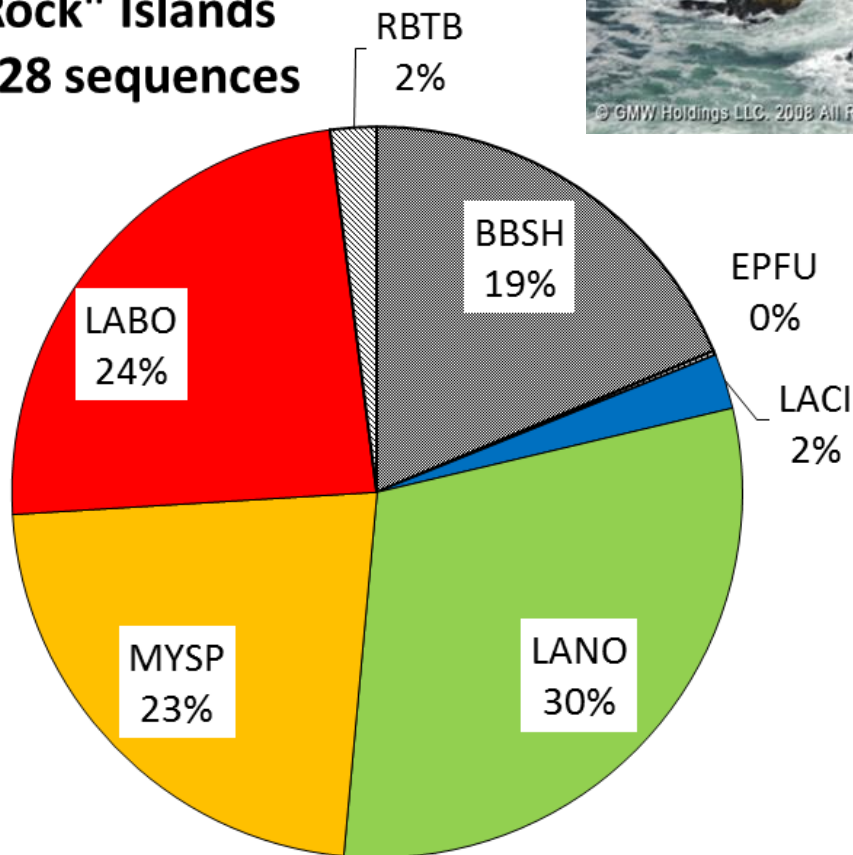


Medium Island Sites

4 "Medium" Islands
n=521 sequences



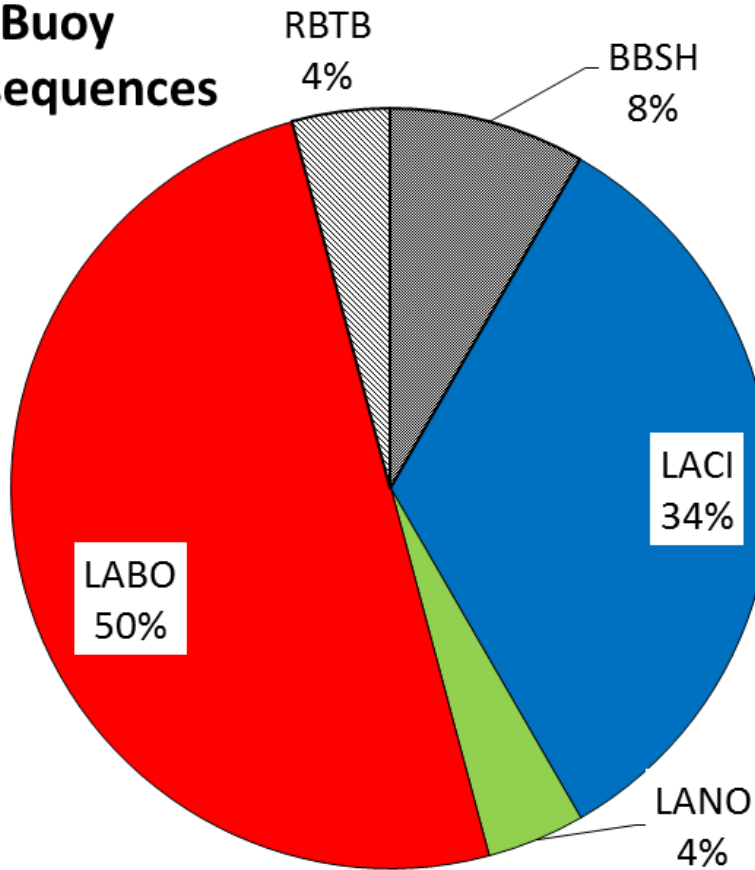
**3 "Rock" Islands
n=1028 sequences**



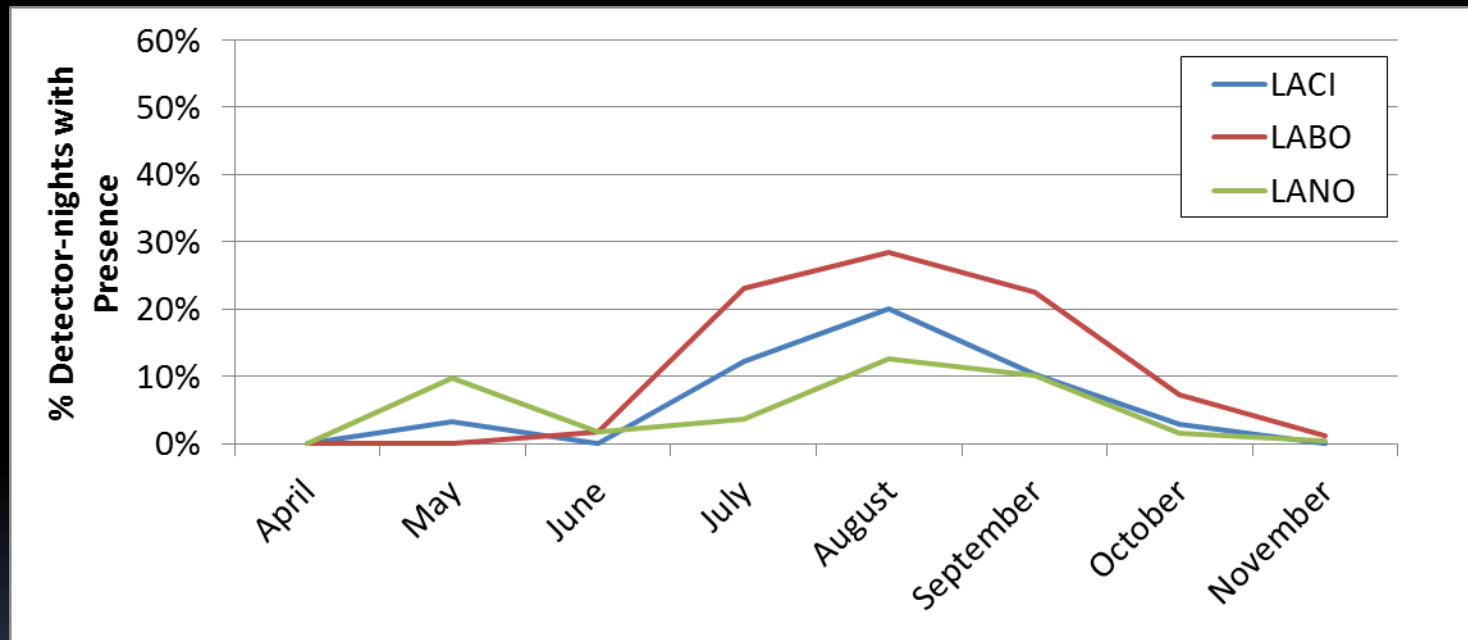
**Rock
Island
Sites**

Buoy Site

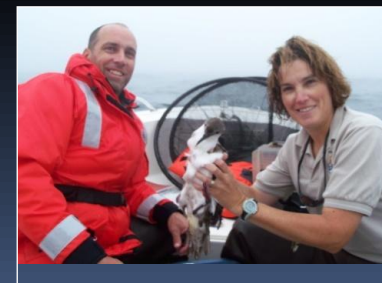
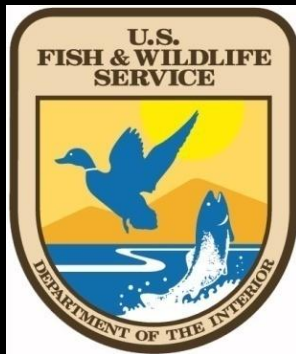
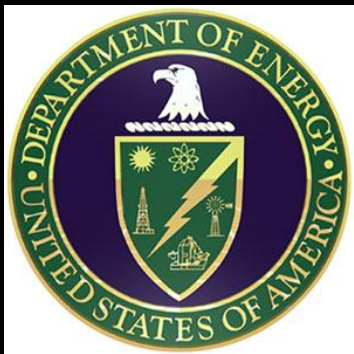
1 Buoy
n=24 sequences



Monthly Presence – Long Distant Migrants



Collaborating Organizations



Thank You

Questions:
Steve Pelletier, CWB

Stantec Consulting
steve.pelletier@stantec.com



Offshore X-Band Radar



Presentation #10

Mid-Atlantic Aerial Surveys for Marine Mammals, Sea Turtles and Other Large Marine Vertebrates 1998 - 2012

**What we did...
and where we did it...**

**William McLellan
UNC Wilmington**



Team Approach



Extensive marine mammal management experience
15 years of vessel surveys in the mid-Atlantic
experience with acoustic monitoring



Extensive experience with survey design
Literally “wrote the book” on line transect surveys



Extensive marine mammal stranding response
and survey experience all aimed at conservation



They invented the ocean...

Aerial Surveys

Methods

- CFR Part 135 certified aircraft
- 2 dedicated pilots
- Surveys conducted at 305 m and ~185 km/hr
- 2 observers conducting separate strip surveys



Aerial Surveys

Methods

- CFR Part 135 certified aircraft
- 2 dedicated pilots
- Surveys conducted at 305 m and ~185 km/hr
- 2 observers conducting separate strip surveys



Line Transect Methodology

On Effort

Recording trackline points

Recording environmental variables



Line Transect Methodology

Sighting cue observed

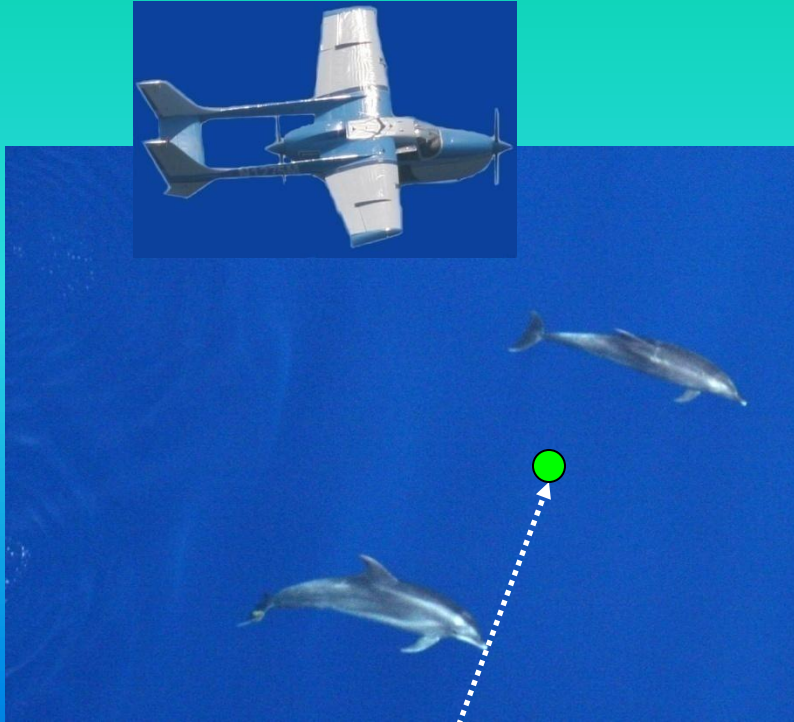


1. Break from track line

- Record GPS position and time
- Record cue and confidence
- Record horizontal and vertical angle to cue
- Go Off Effort
- Direct pilots to location of cue



Line Transect Methodology



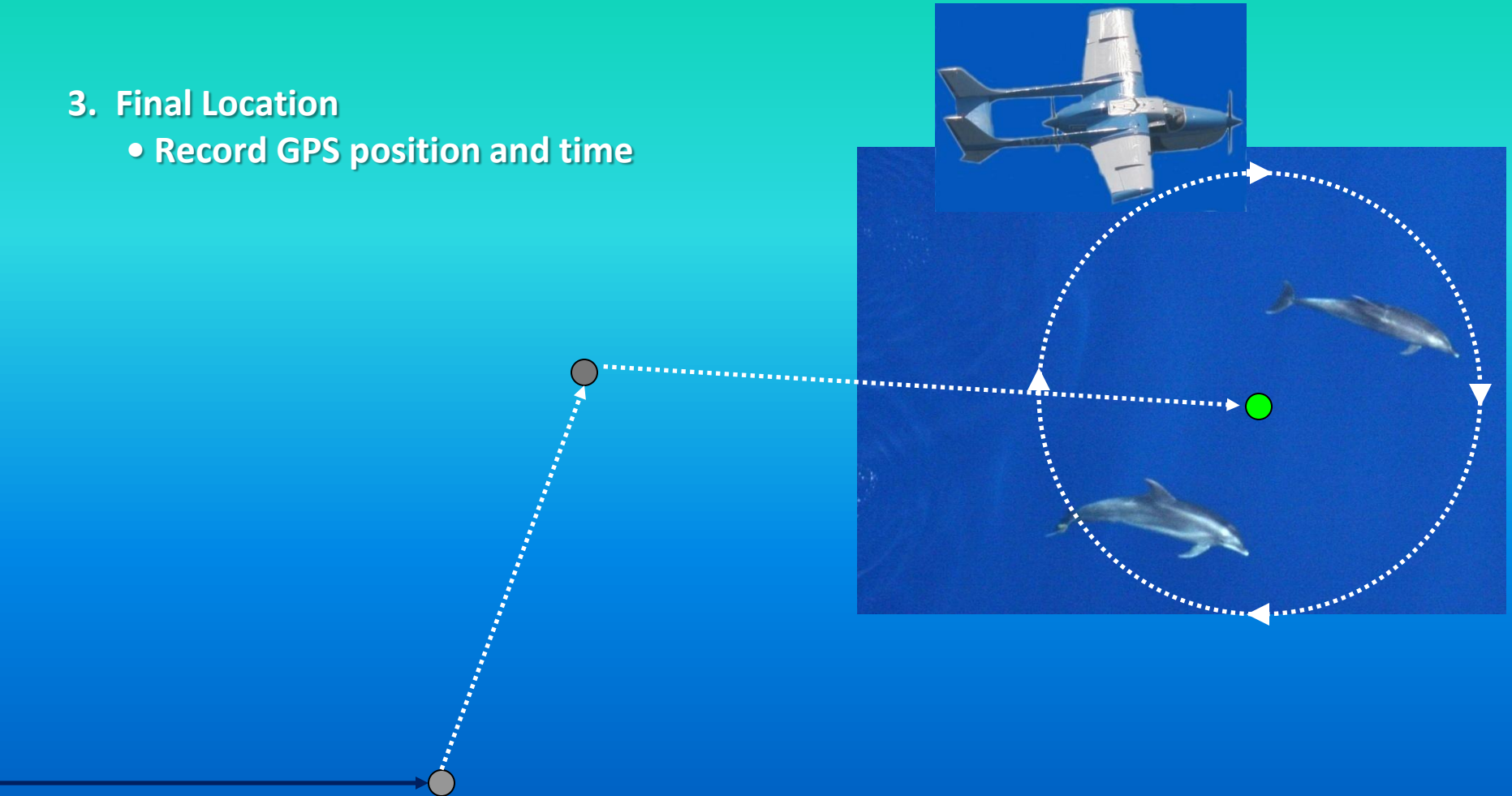
2. Actual Location

- Record GPS position and time
- Photo documentation
- Estimate group size
- Identify probable species
- Note behavior

Line Transect Methodology

3. Final Location

- Record GPS position and time



Line Transect Methodology

4. Rejoin track line

- Return to location of break
- Record GPS position and time
- Resume On Effort survey



Species ID protocol

Initial species ID is made in the field while reviewing images.

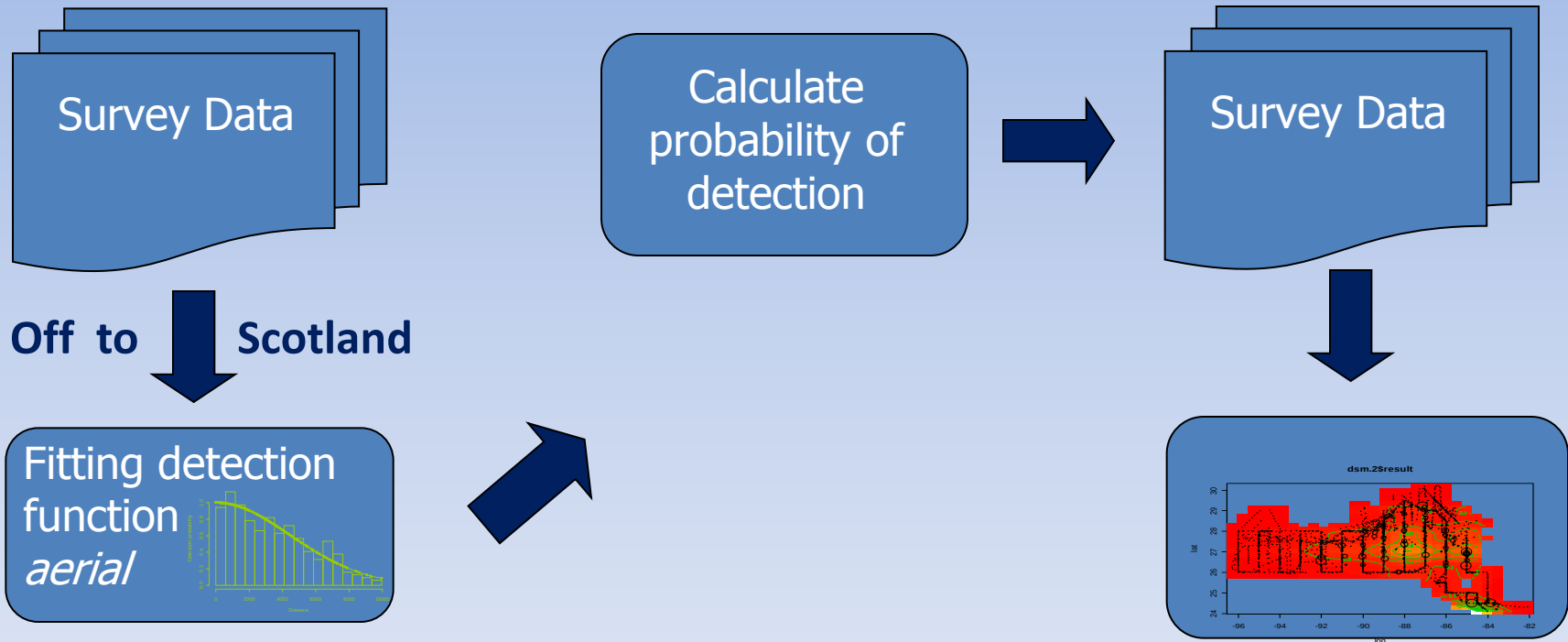
Final species ID is made after reviewing digital images in lab.

If in doubt of species ID sighting is labeled as unidentified.

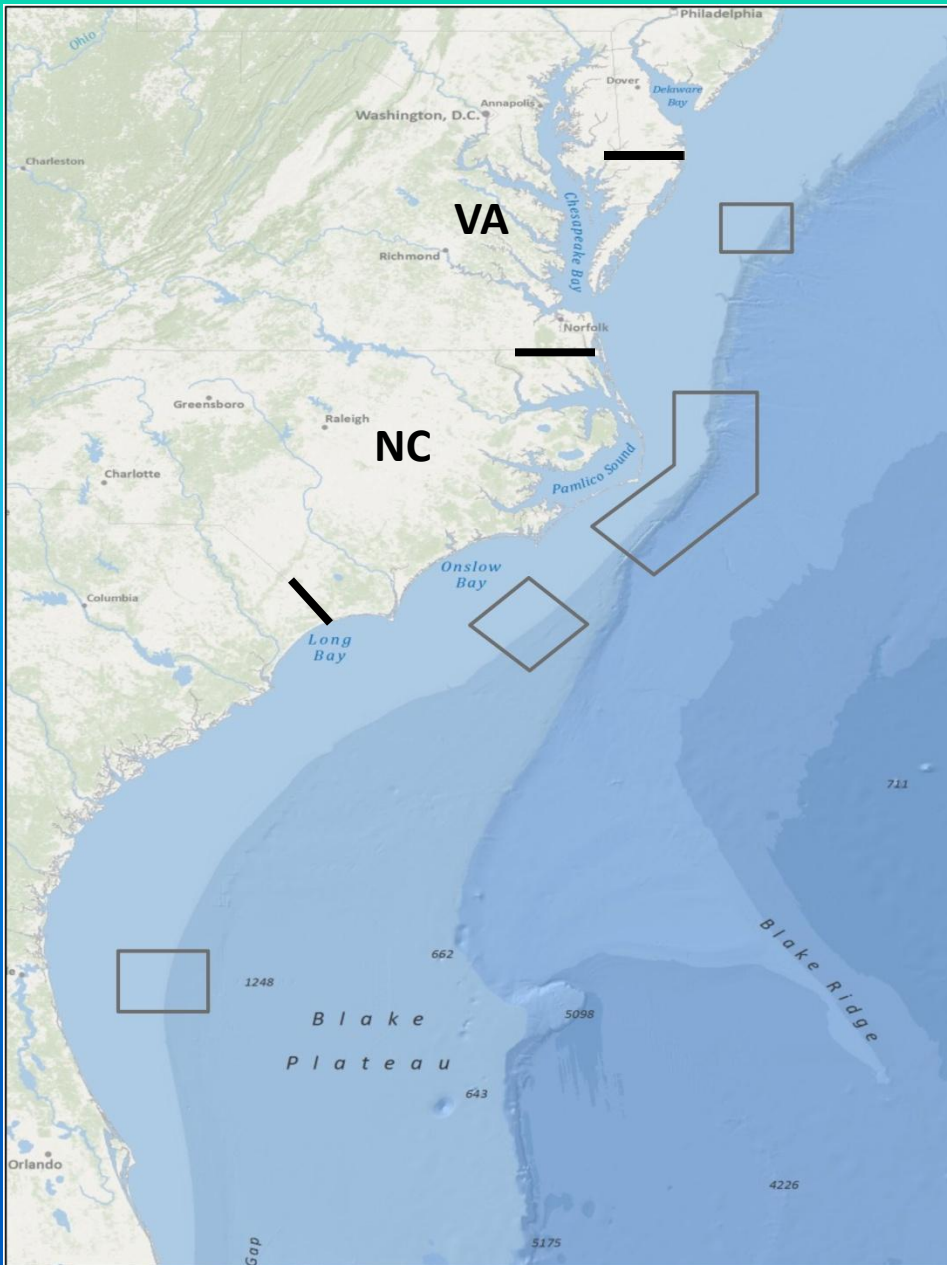
Over 95% of all sightings are now identified to species.

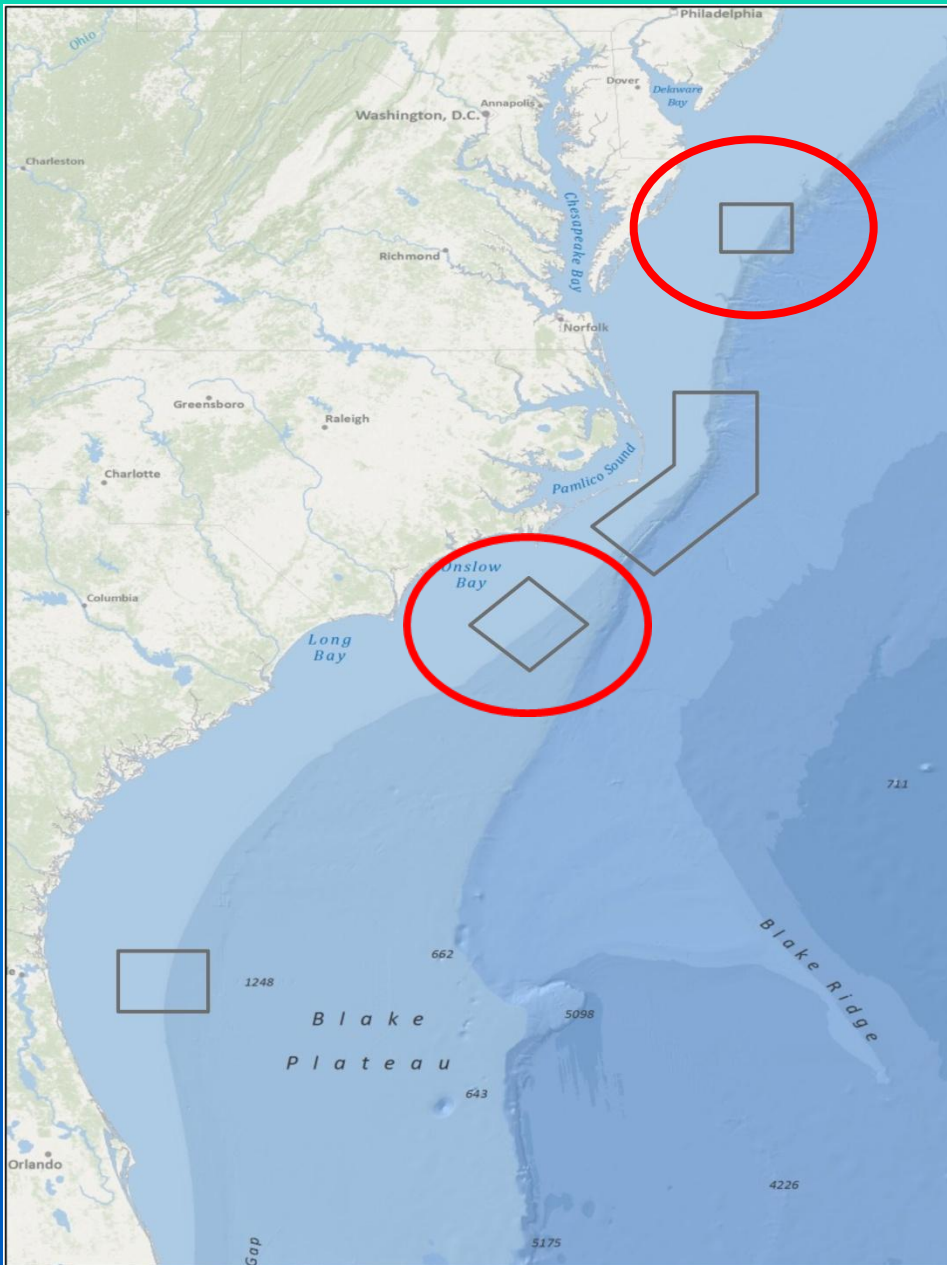


Data Analysis



Where We Did It





Wallops Island & Onslow Bay

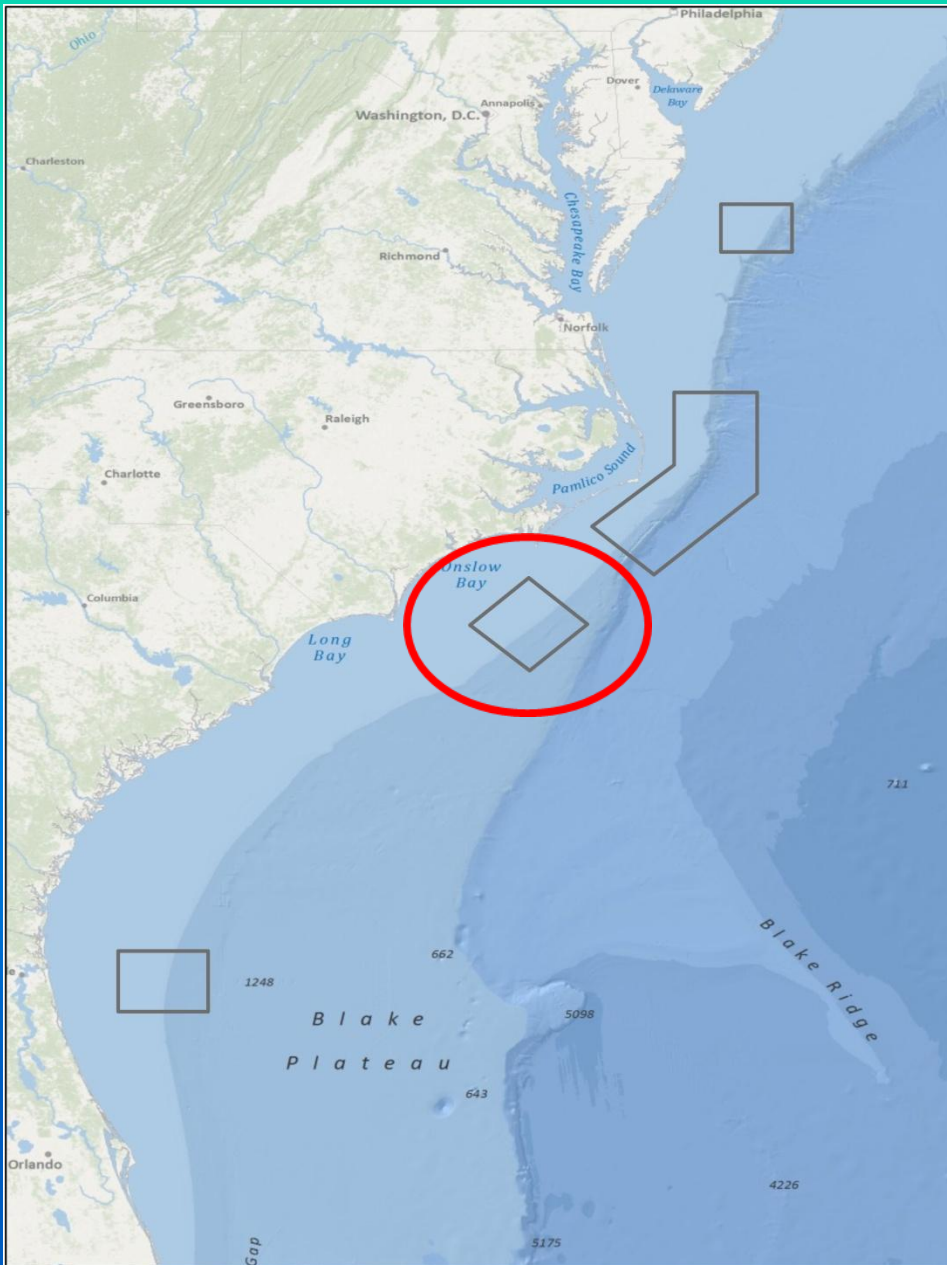
1998 - 1999

All cetaceans

Sea turtles

Large pelagic fish/sharks

Funded by US Navy



Onslow Bay

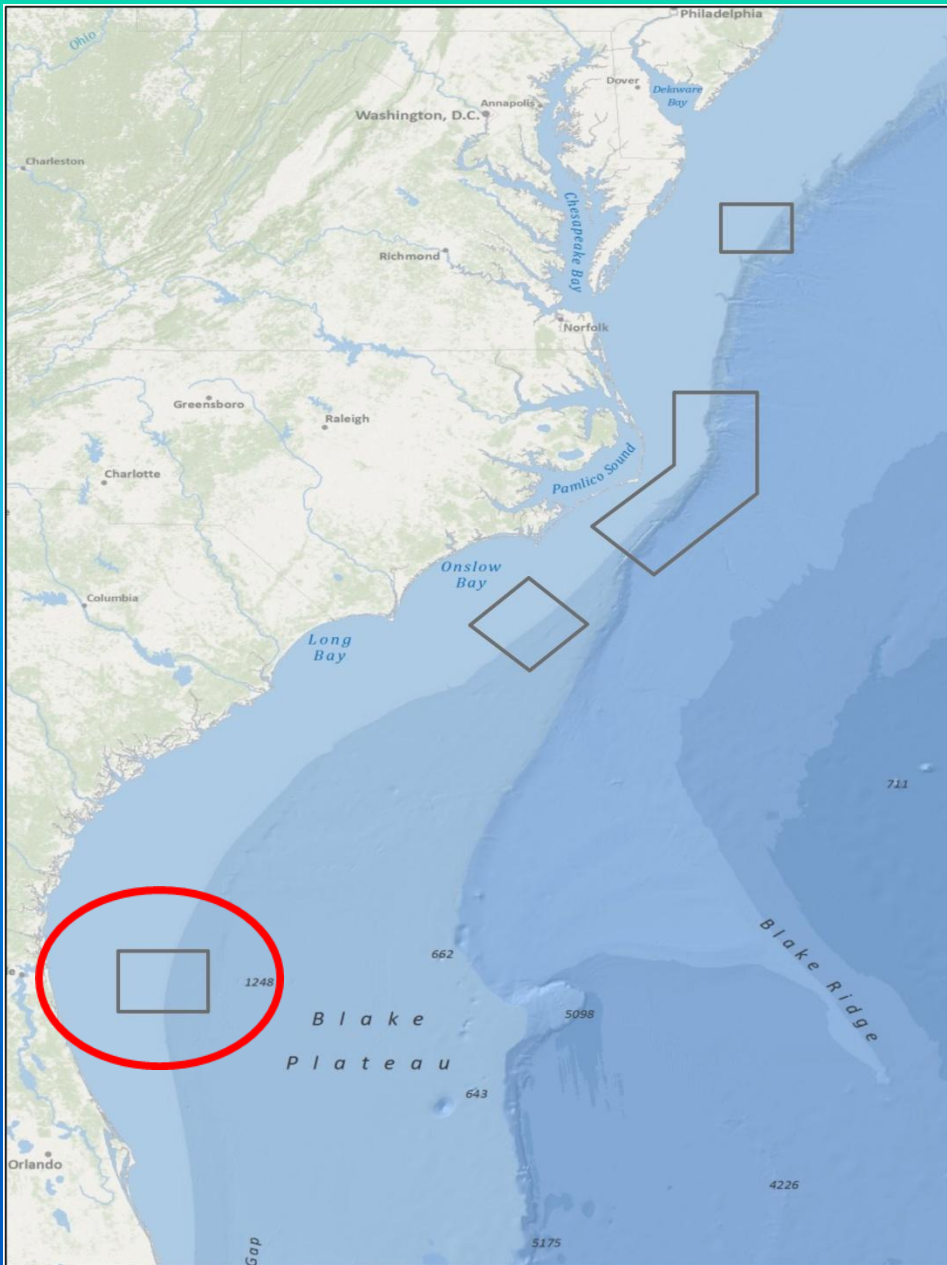
2007 – 2011

All cetaceans

Sea turtles

Large pelagics

Funded by US Navy



Jacksonville

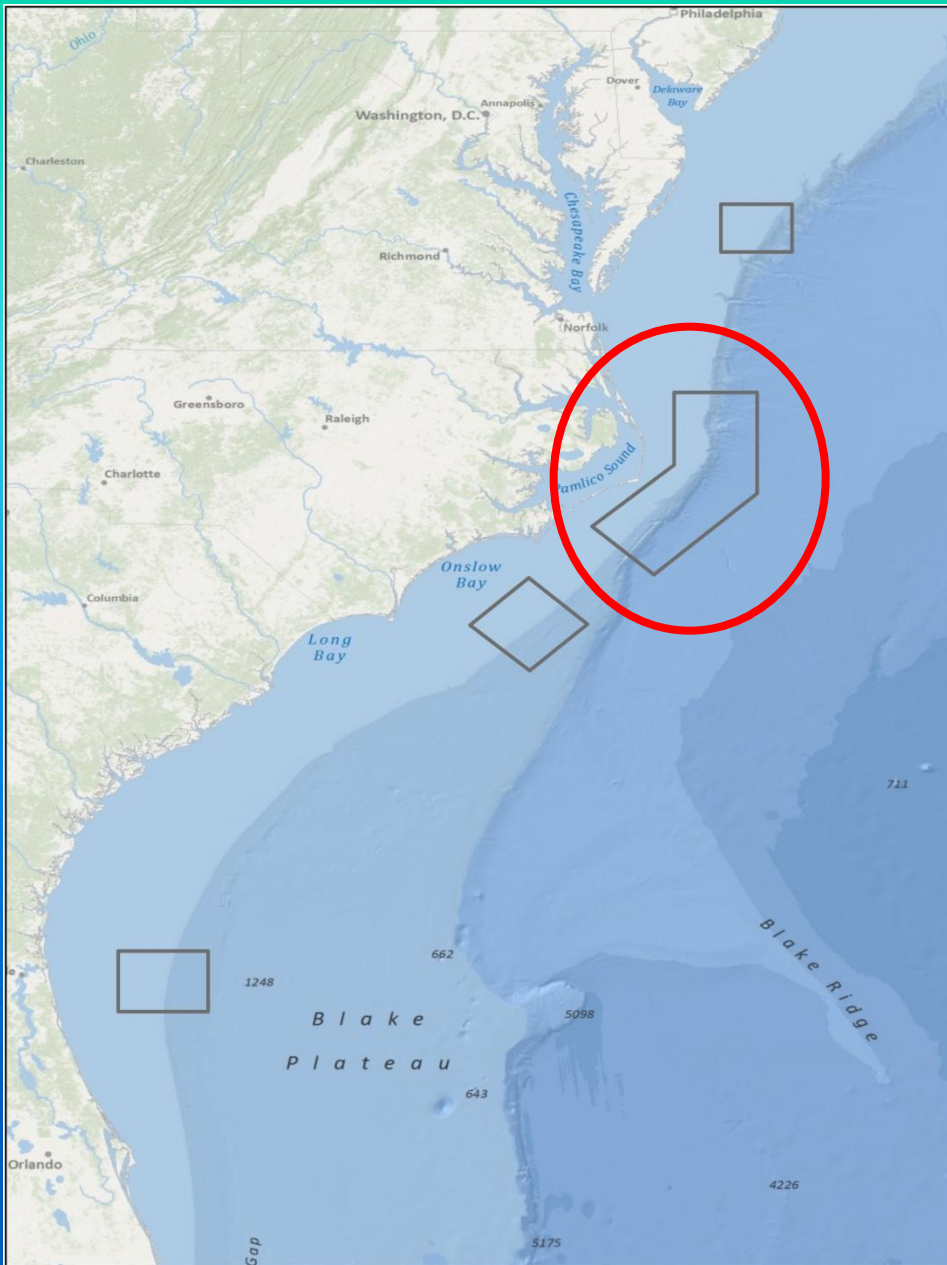
2009 – present

All cetaceans

Sea turtles

Large pelagics

Funded by US Navy



Cape Hatteras

2011 - present

All cetaceans

Sea turtles

Large pelagics

Funded by US Navy

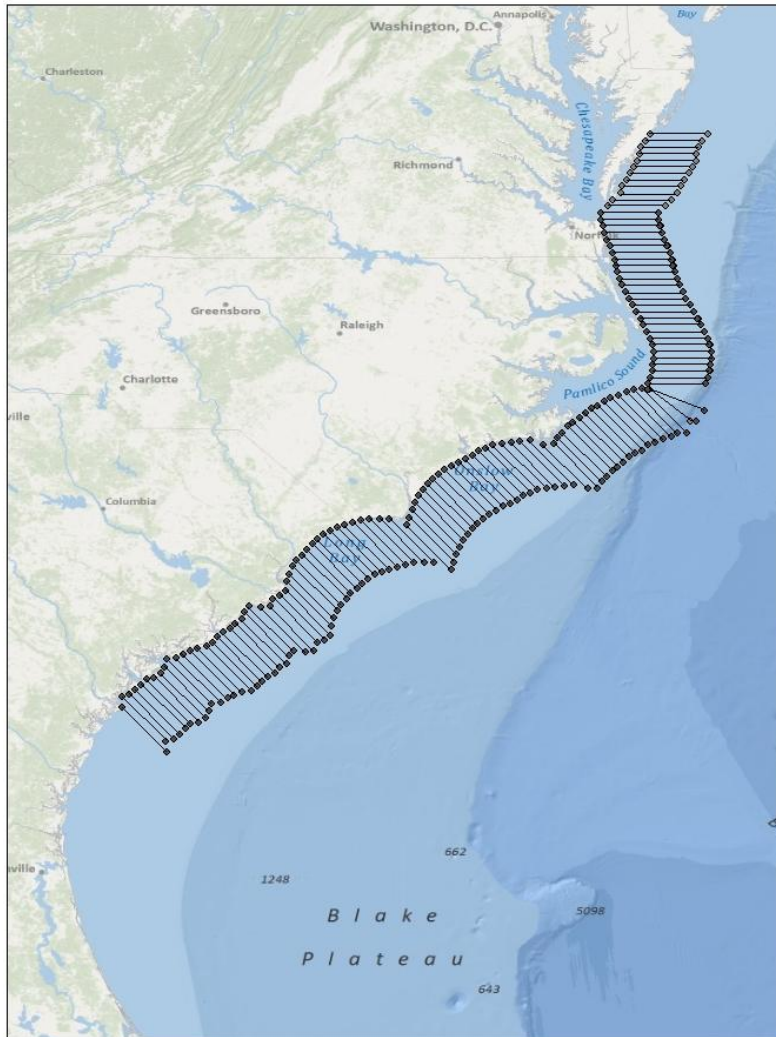
Right Whale Surveys

2001- 2008

Cetaceans

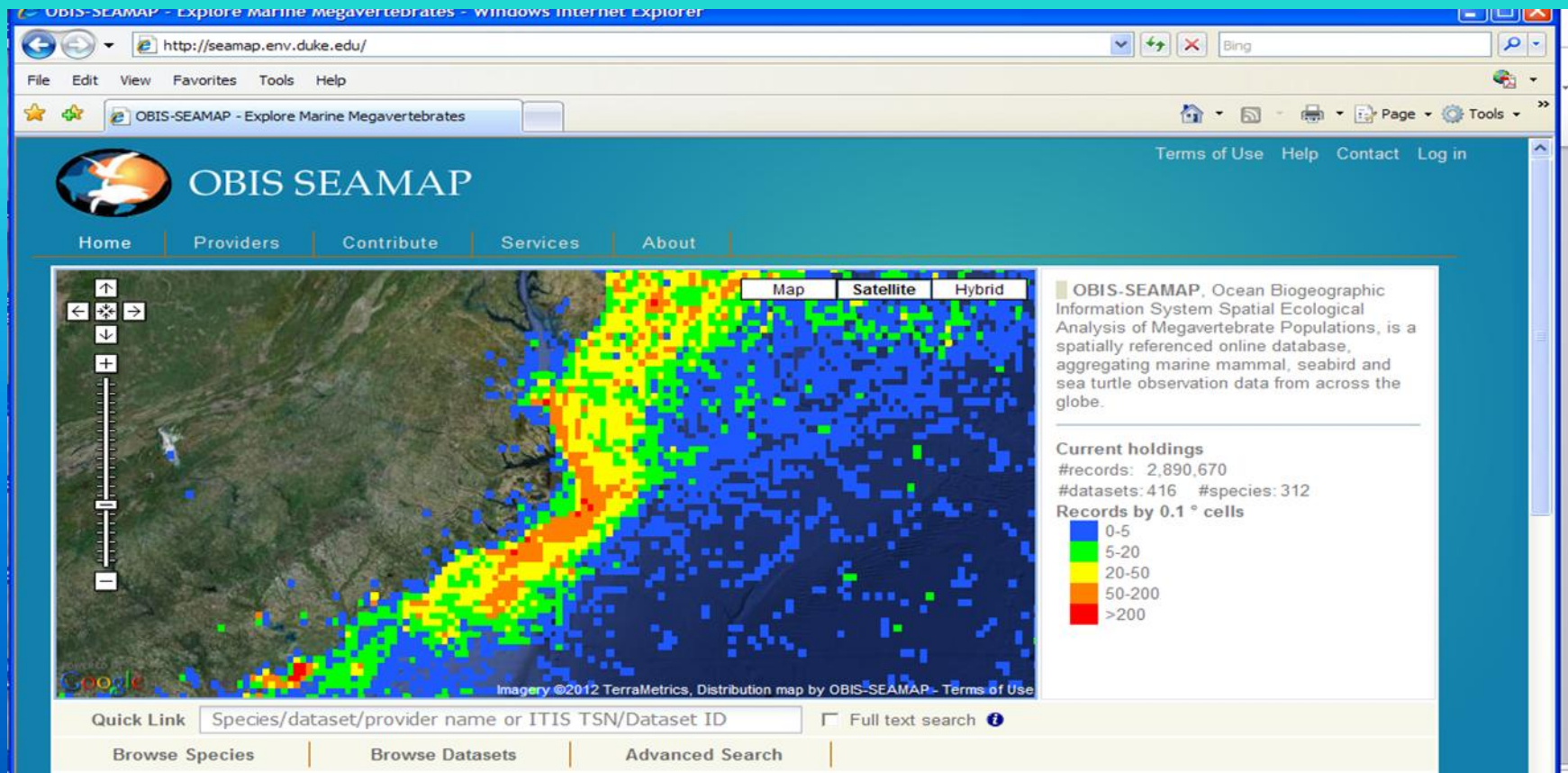
Large pelagics

Funded by NOAA Fisheries



ALL Aerial Observations Are Now Posted On OBIS-SEAMAP

[//seamap.env.duke.edu](http://seamap.env.duke.edu)



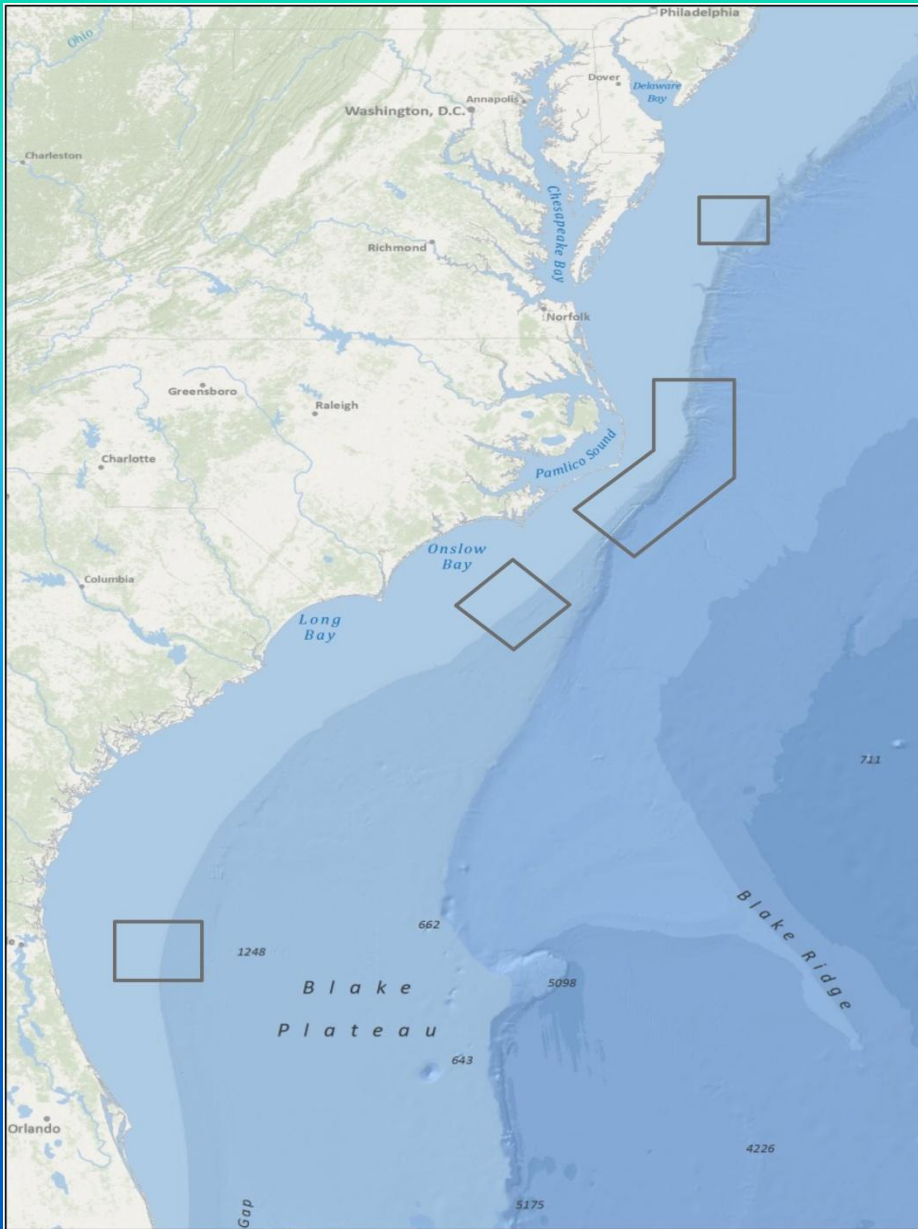
with current data sets in cue, UNCW has provided 23 data sets to OBIS SEAMAP

Future Effort

Virginia Beach
wind energy project

Continue Cape Hatteras
monthly surveys

Continue JAX
monthly surveys



Acknowledgements

Ed Coffman and pilots of Orion Aviation

All of the observers over the years

Joel Bell, Lance Garrison, Mike Payne

Andy Read, Mark Swingle, Sue Barco

Ann Pabst

Funding from

US Navy

NOAA Fisheries



21 April 2007

25 nm offshore of the VA/NC border

All surveys conducted under NOAA Scientific Permits to UNCW

Presentation #11

Avian Surveys for the Rhode Island Ocean Special Area Management Plan



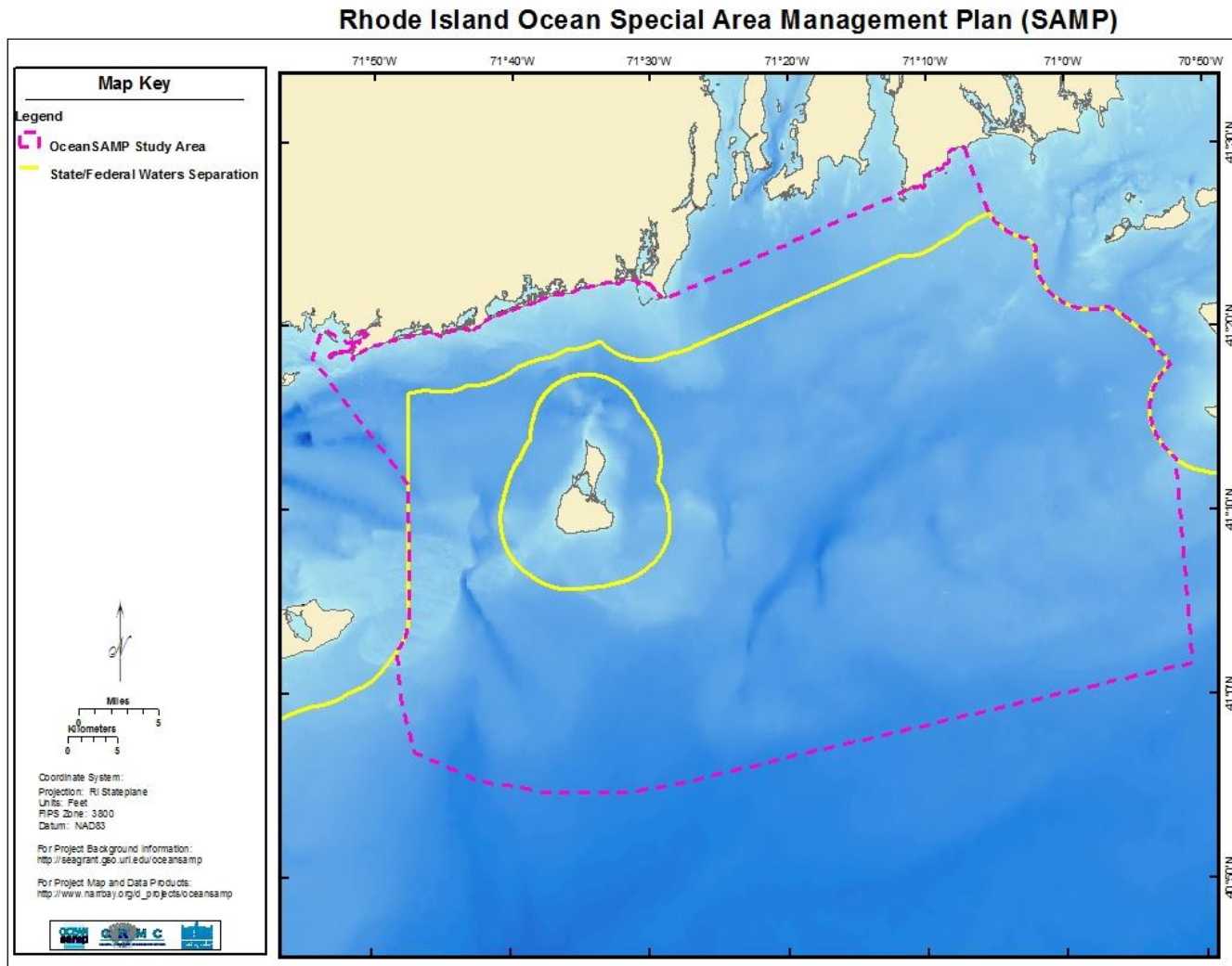
Kristopher J. Winiarski, Peter W.C. Paton, Scott R. McWilliams, and David Miller
Department of Natural Resources Science, University of Rhode Island, Kingston, RI 02881
SILVER SPRINGS, MARYLAND
JULY 2012



Avian studies for RI Ocean SAMP

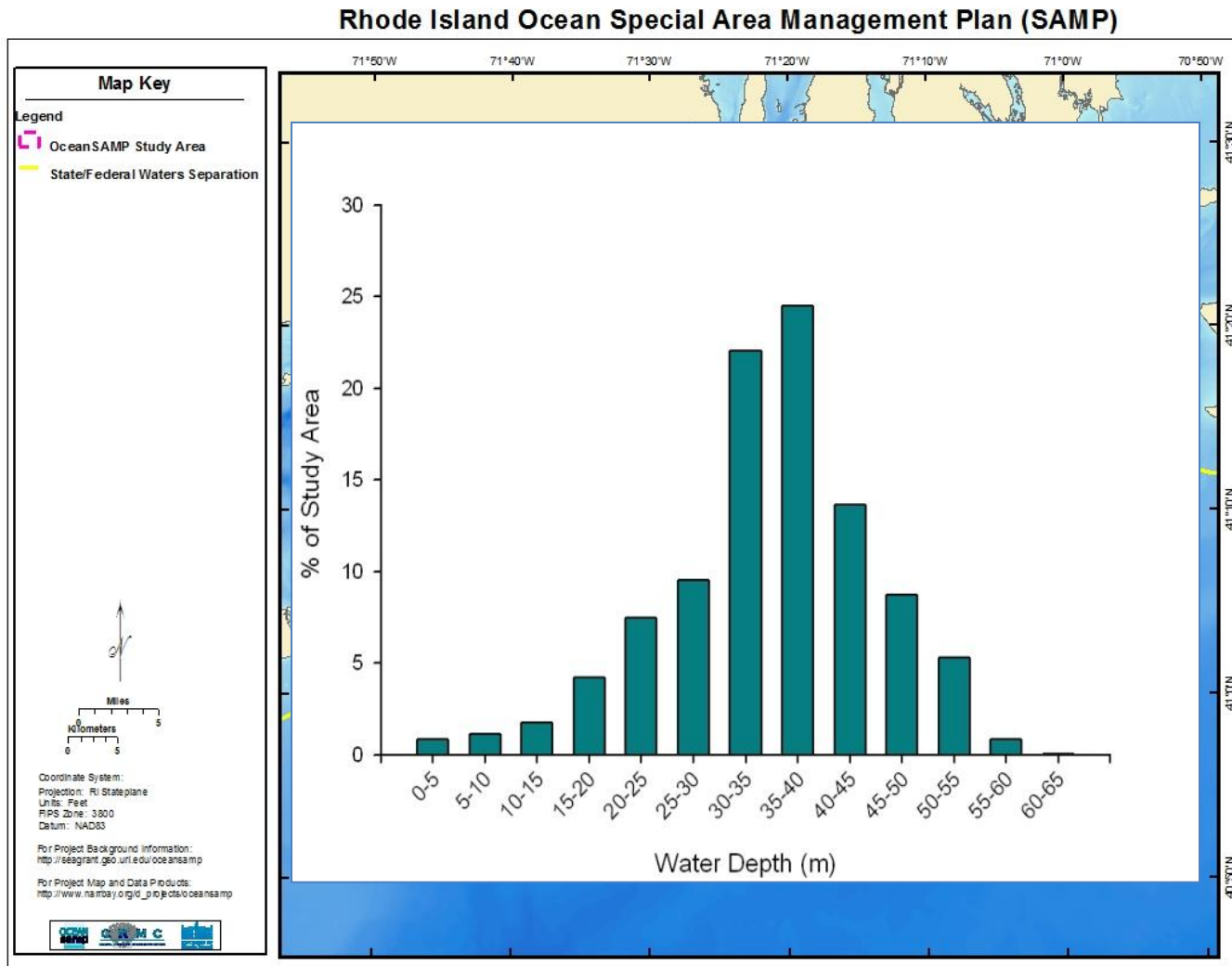
- **Goal:** Assess current spatial and temporal patterns of avian abundance and movement ecology within Ocean SAMP study area boundaries.
- **Primary Objectives:**
 - 1) Assess temporal variation (seasonal and annual) in avian spatial distribution and abundance in Ocean SAMP study area.
 - 2) Quantify flight behavior of birds in Ocean SAMP study area.

OSAMP Study Area



-Approximately 3,800 km².

OSAMP Study Area



-Approximately 3,800 km².

Much Different Marine Bird Habitat than Nantucket Sound

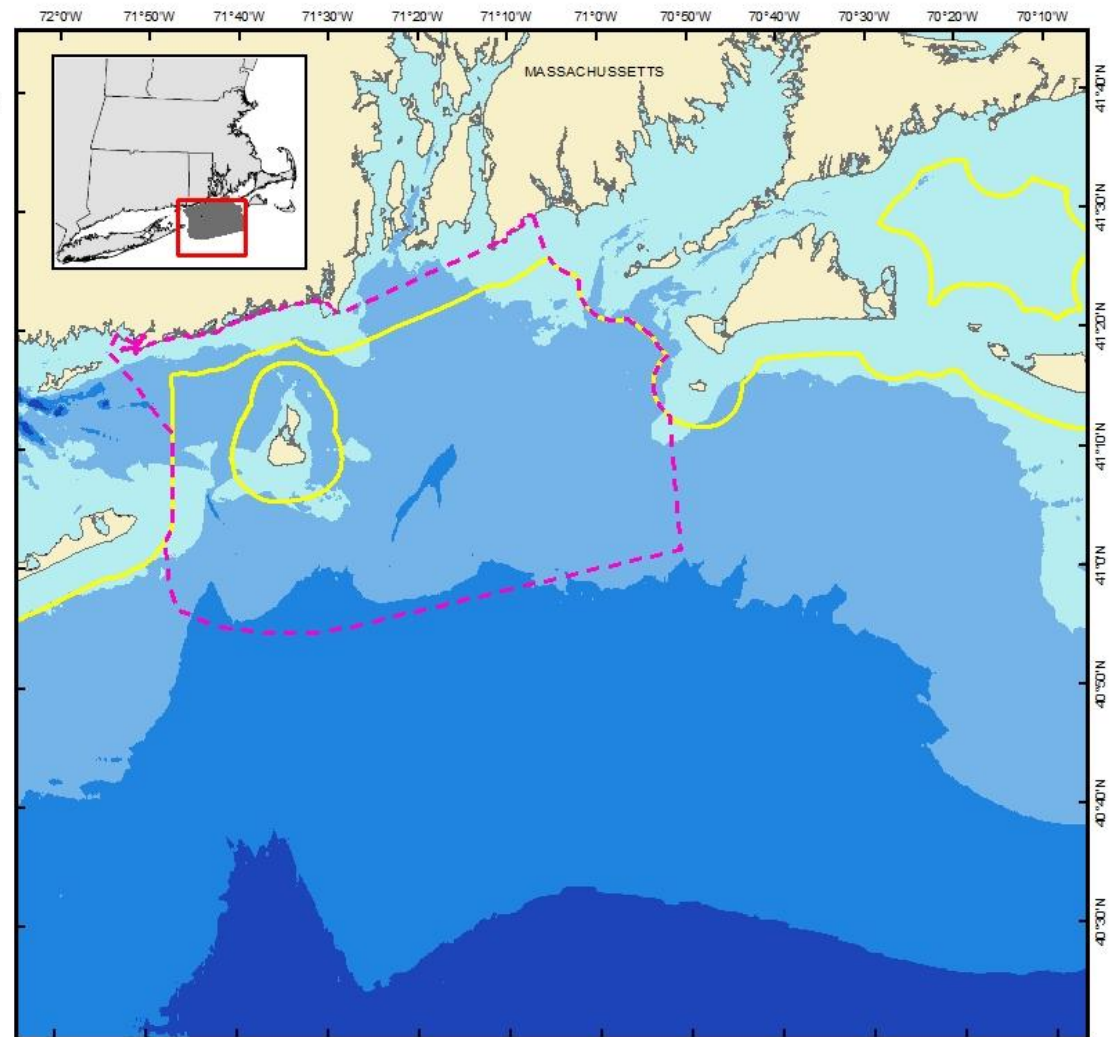
Legend

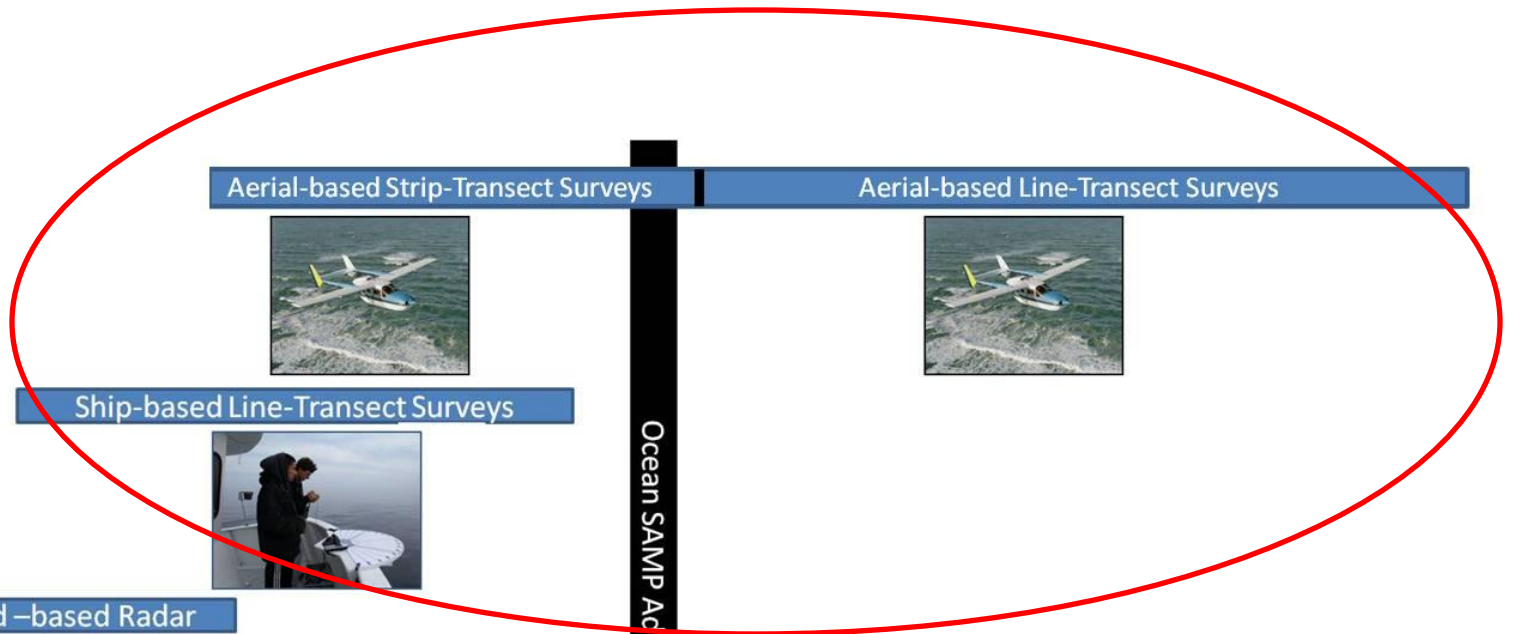
-  OceanSAMP Study Area
-  State/Federal Waters Separation

BIS Bathymetry

Value

-  High : -2.82701e-006
-  Low : -362.702





Land-based Radar

Land-based Radar

200

January-
February-
March-
April-
May-
June-
July-

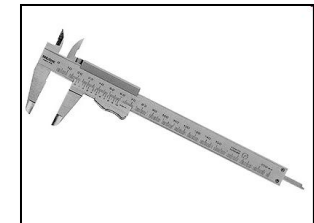
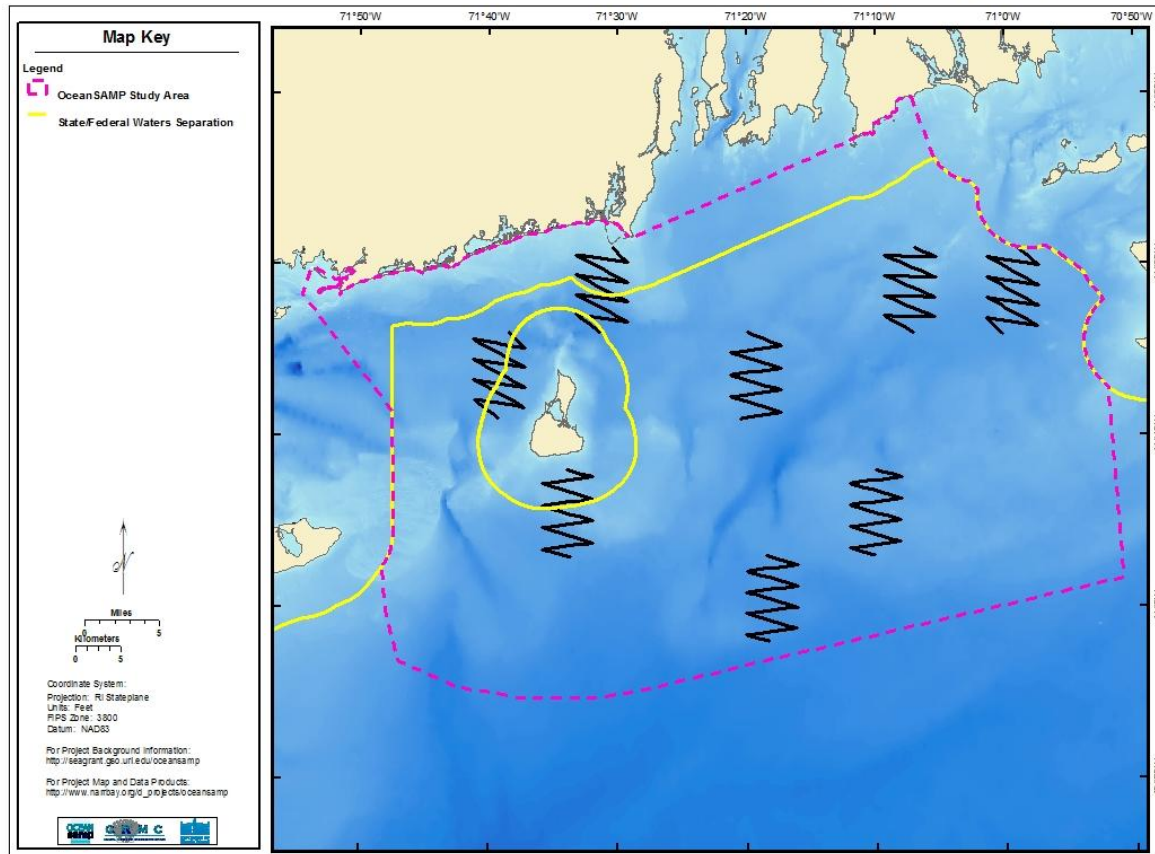


2012

March-
April-
May-
June-
July-

Ship-based Line Transect Surveys

Rhode Island Ocean Special Area Management Plan (SAMP)



*Calipers used to estimate distance (*Heinemann, 1981*)

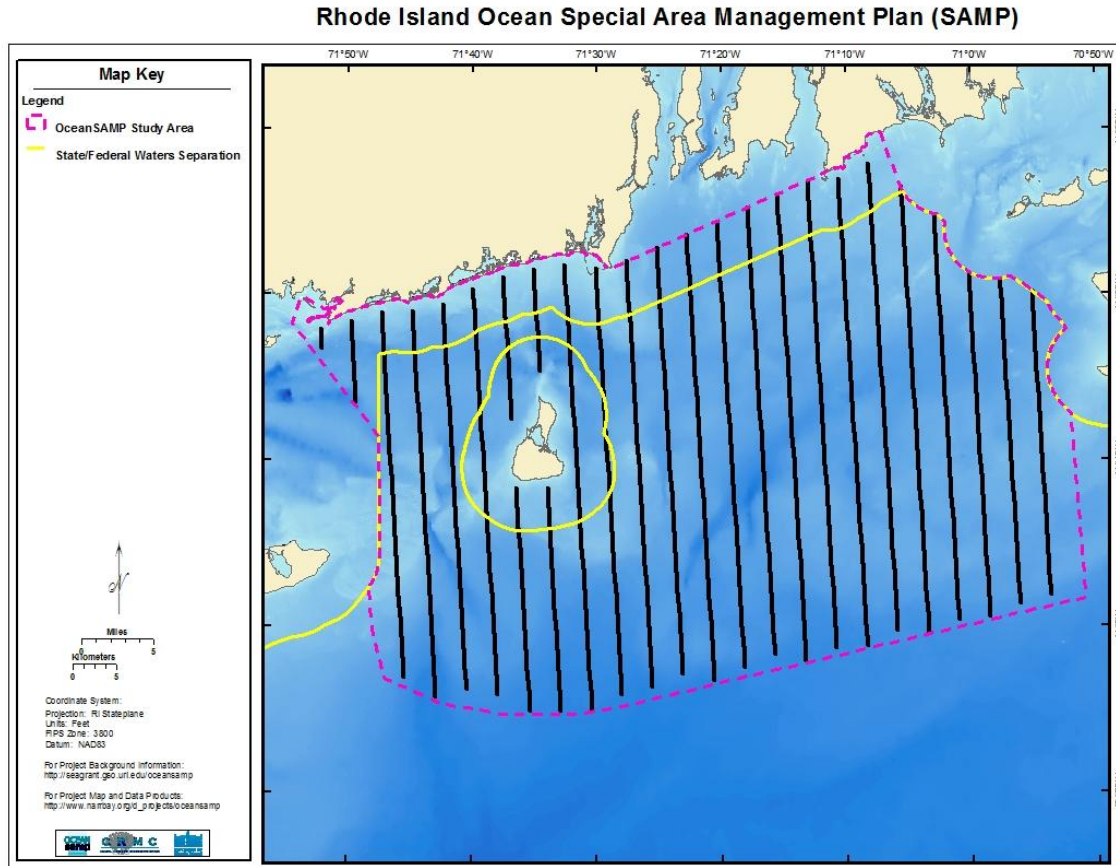
Eight Sawtooth (4x5nm) sampling areas

Each surveyed 1x per month (2.5 hours, survey 2 grids/week)

1 observer and 1 observer/recorder

Recorded: # individuals, species, bearing, distance estimate (first sighting), GPS location, behavior, flight elevation/direction for birds in flight and survey conditions.

Aerial-based Strip Transect Surveys



Twenty four transects perpendicular to coast

Survey 24 transects 1x per month

Fly 100kts at 500'

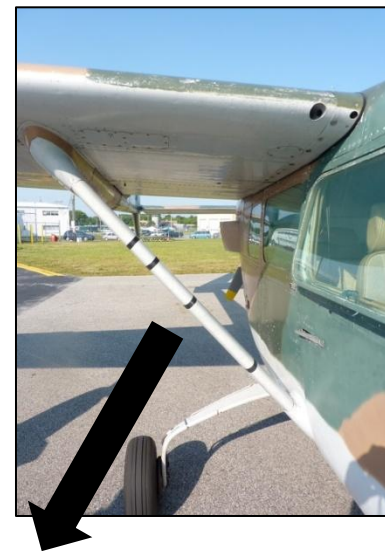
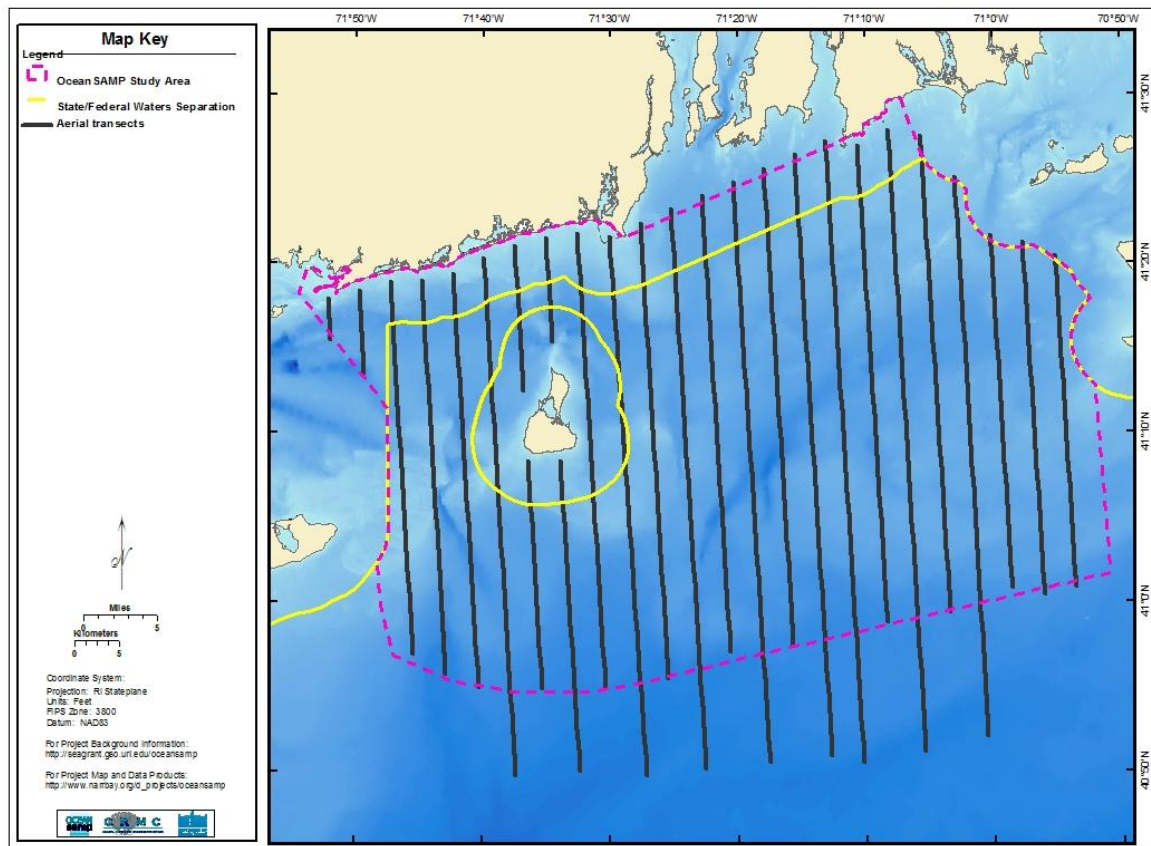
Survey 110m on both sides of plane (wing struts are marked)

2 observers

-Recorded: # individuals, species, time of sighting, behavior (flying, sitting) and survey conditions.

Aerial-based Line Transect Surveys

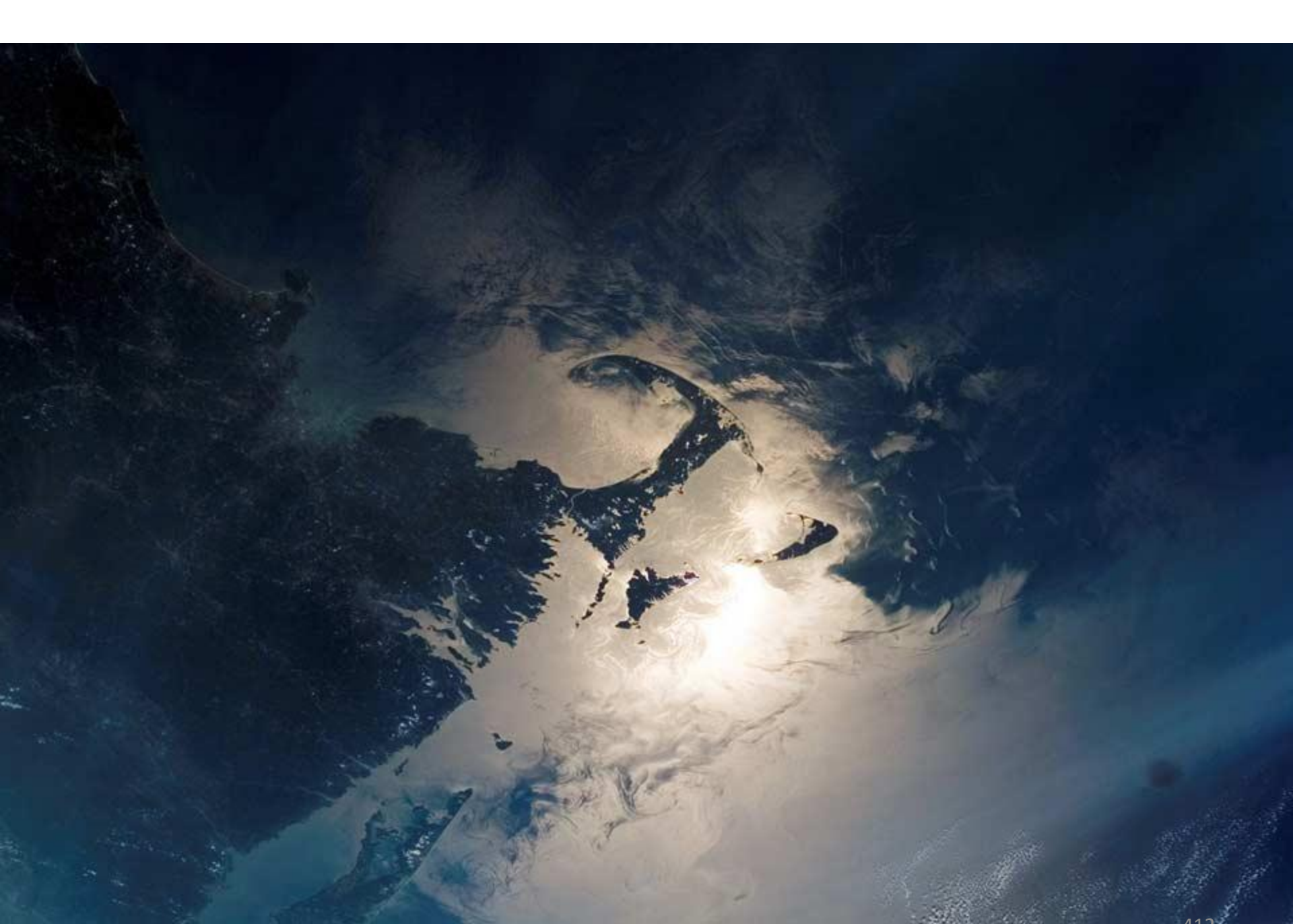
Rhode Island Ocean Special Area Management Plan (SAMP)



24 transects perpendicular to coast
 Survey 24 transects 1x per month
 Fly 100kts at 250'
 2 observers

Recorded: # individuals, species, time of sighting, behavior (flying, sitting), sighting bin and environmental conditions.

Band	Boundary distances (in m.) perpendicular out from track line	Declination in degrees from the horizontal
A	44-163	60-25
B	164-432	25-10
C	433-1000	10-4



Avian Modeling for the Rhode Island Ocean Special Area Management Plan

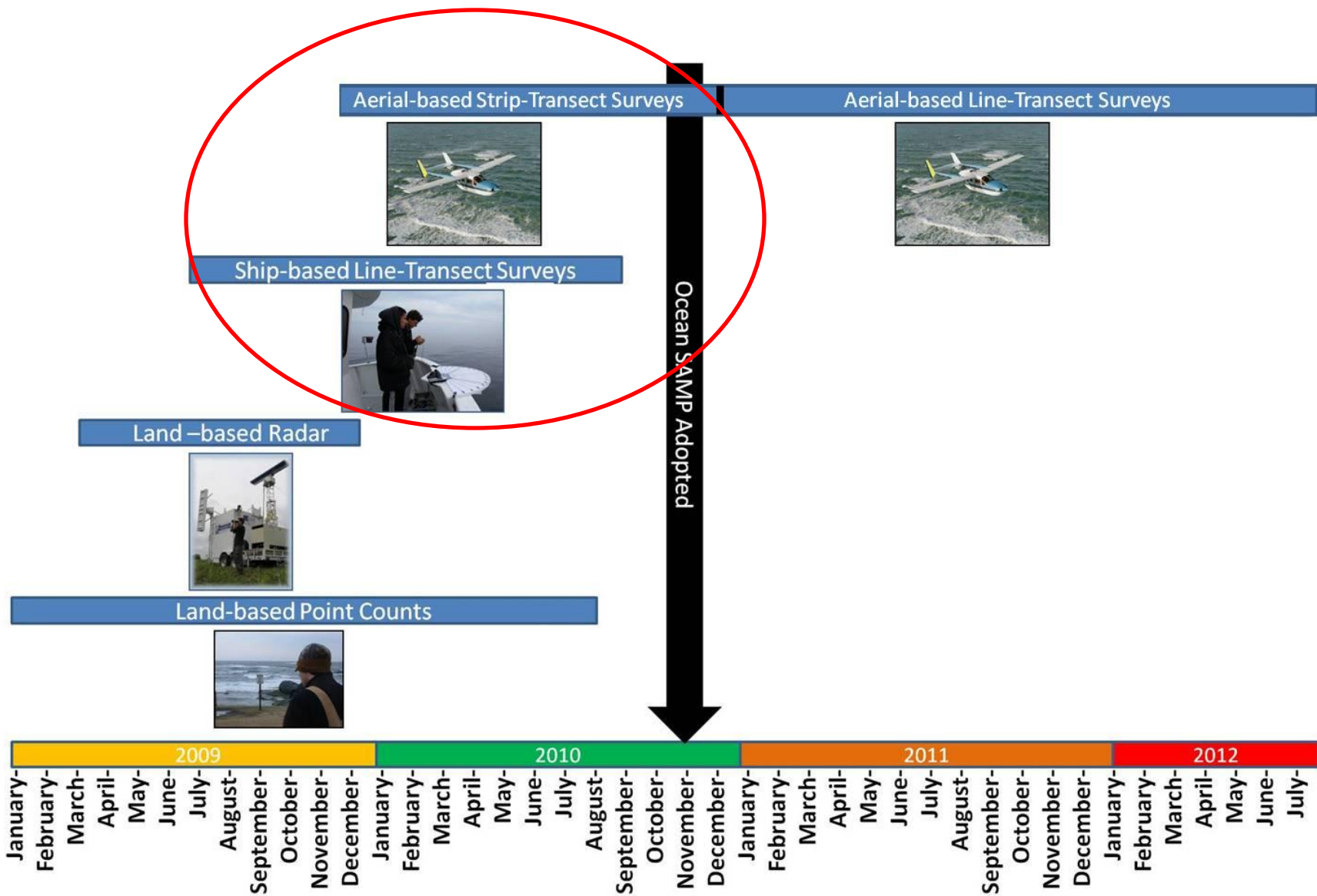


Kristopher J. Winiarski, Peter W.C. Paton, Scott R. McWilliams, and David Miller
Department of Natural Resources Science, University of Rhode Island, Kingston, RI 02881

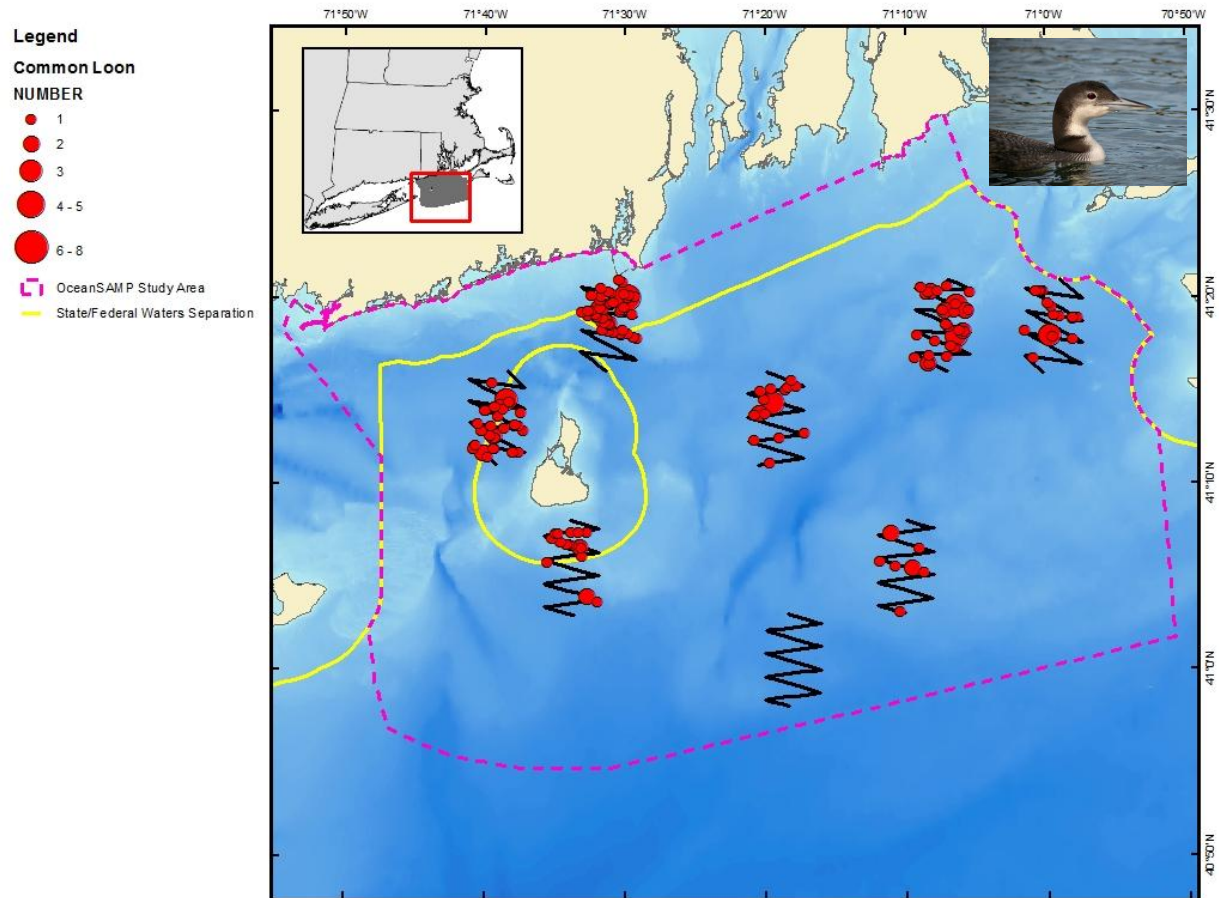
SILVER SPRINGS, MARYLAND

JULY 2012



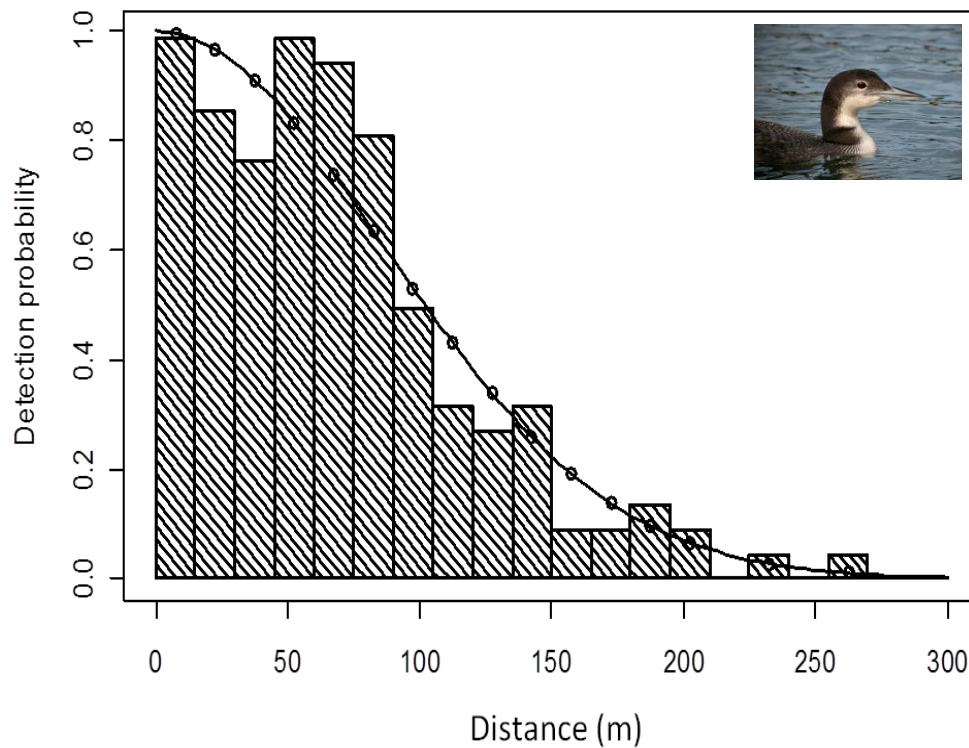


Density Surface Model (DSM) Approach



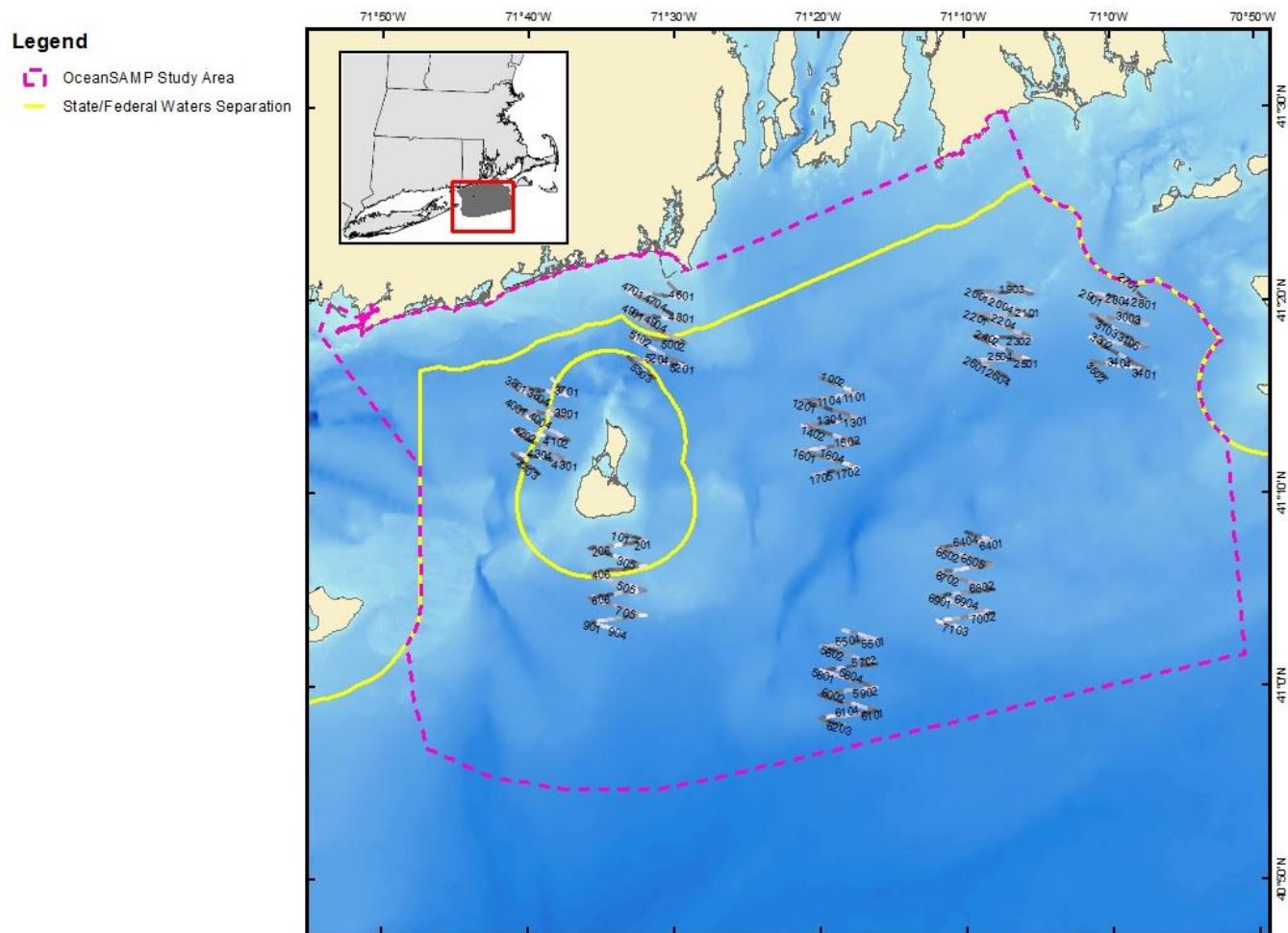
-Common Loon observations from ship-based line transect surveys.

Step #1- Fit detection function to control for incomplete detection.



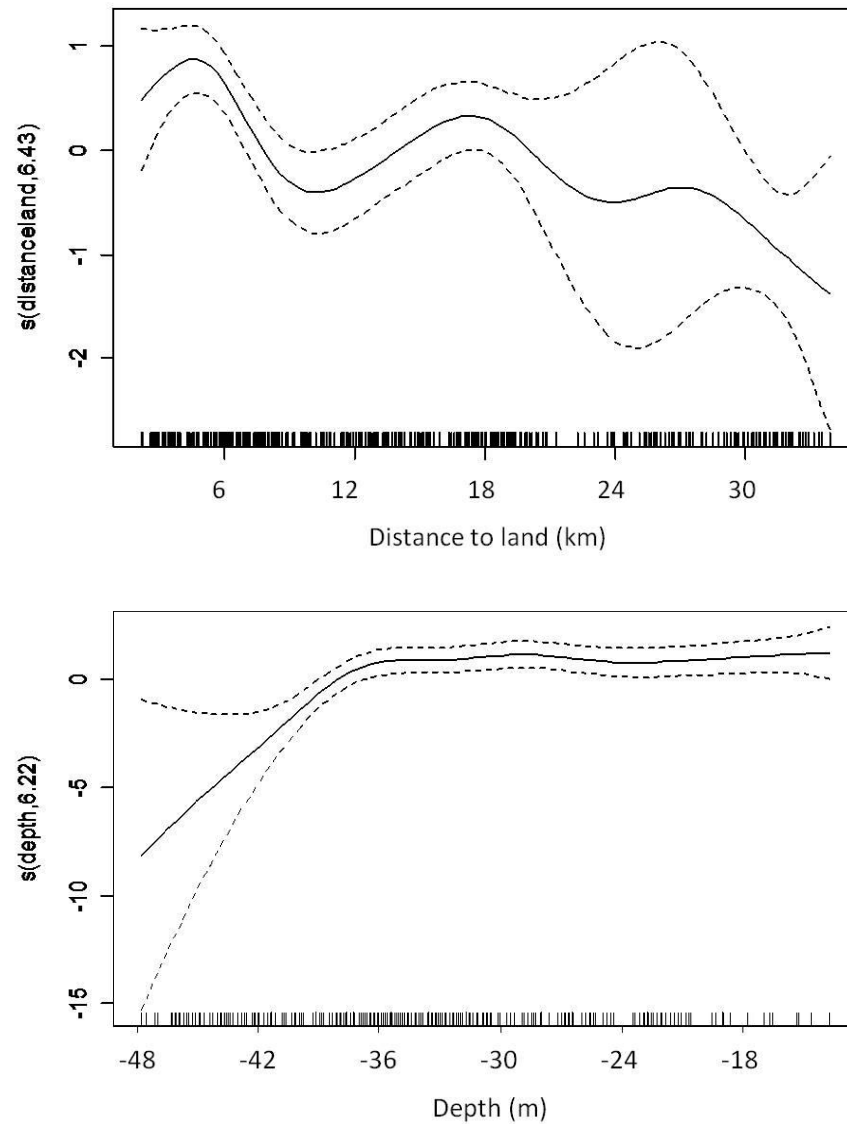
-Fit detection function to control for imperfect detection.

Step #2-Divide transects into unique segments.



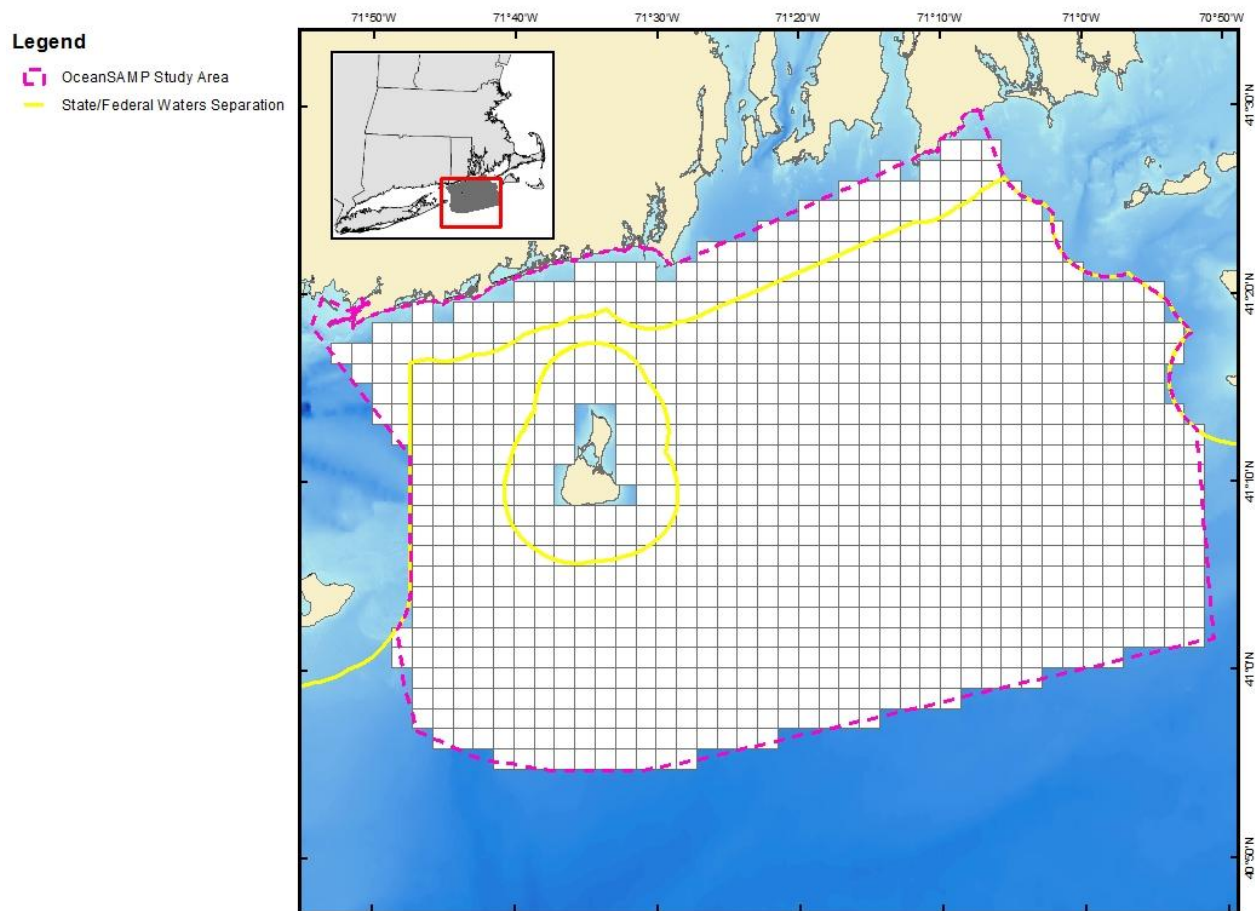
- Total of 465 unique segment (each 830m long).
- Environmental covariates at midpoint of each segment (water depth, distance from land).

Step #3 – Fit Generalized Additive Models



-Best Model distance to land + depth.

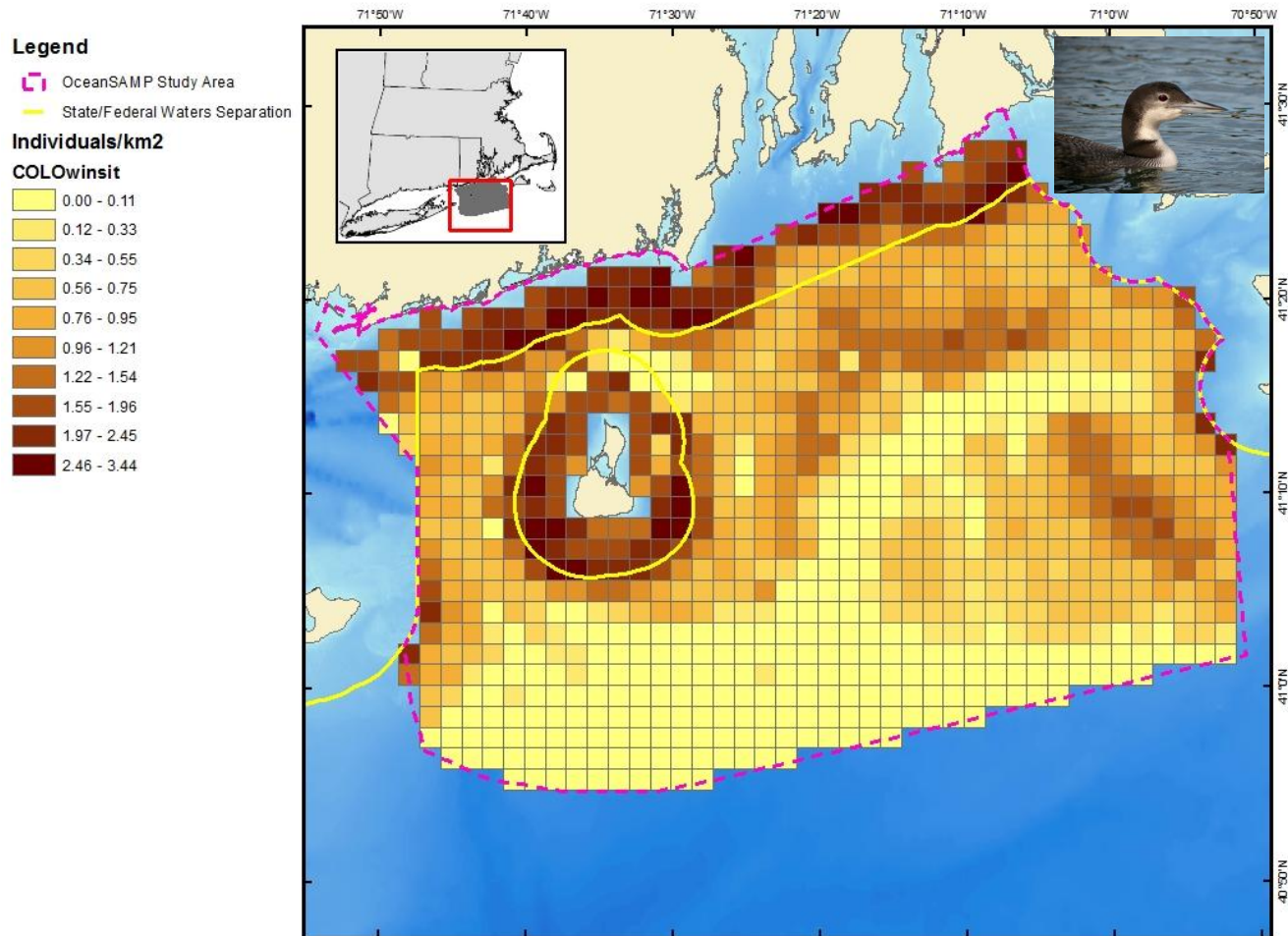
Step #4- Divide study area into predictive grid.



-920 cells; each 4km².

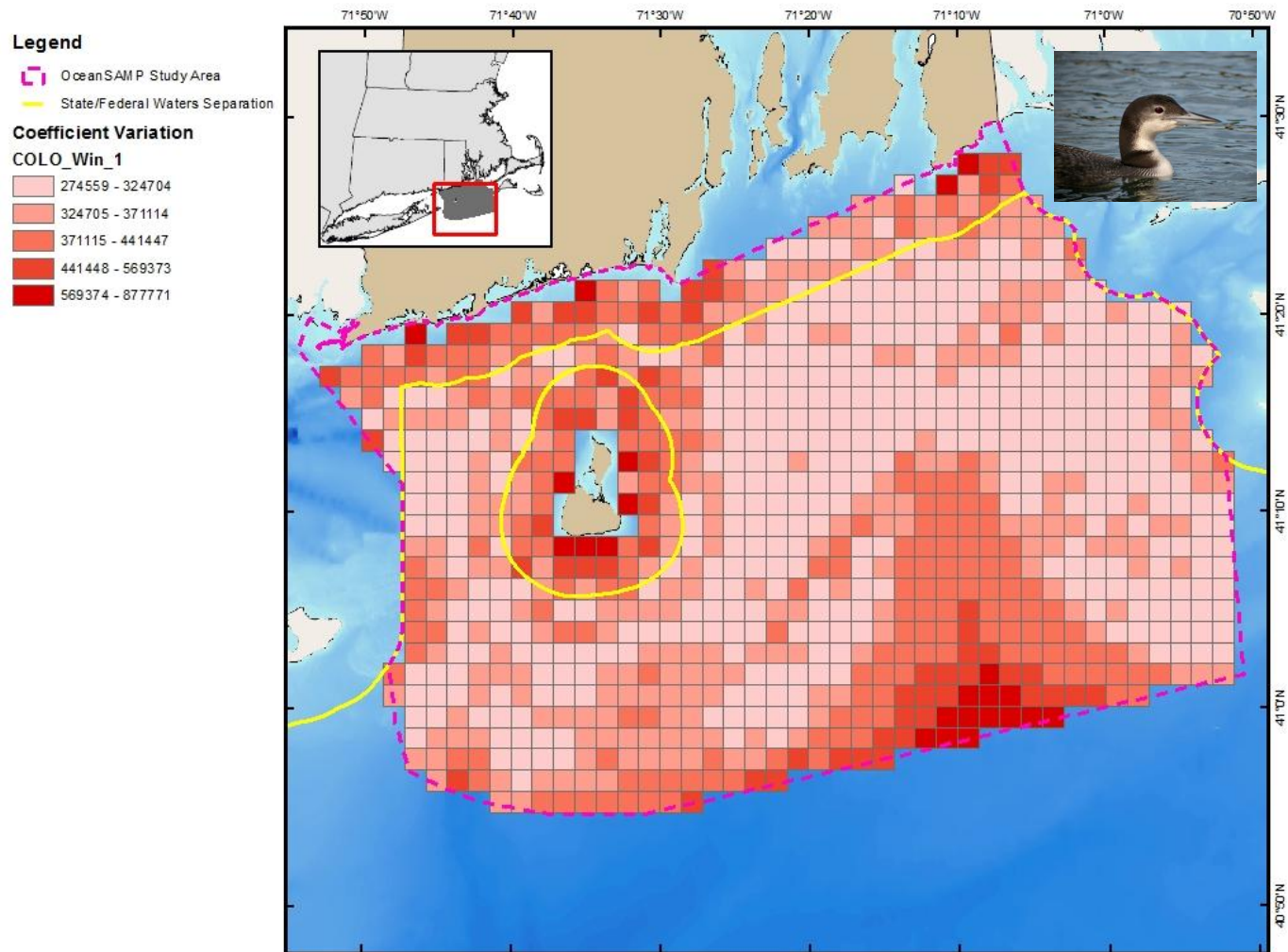
-Environmental covariates at the midpoint of each predictive cell (water depth, distance to land).

DSM-Common Loon

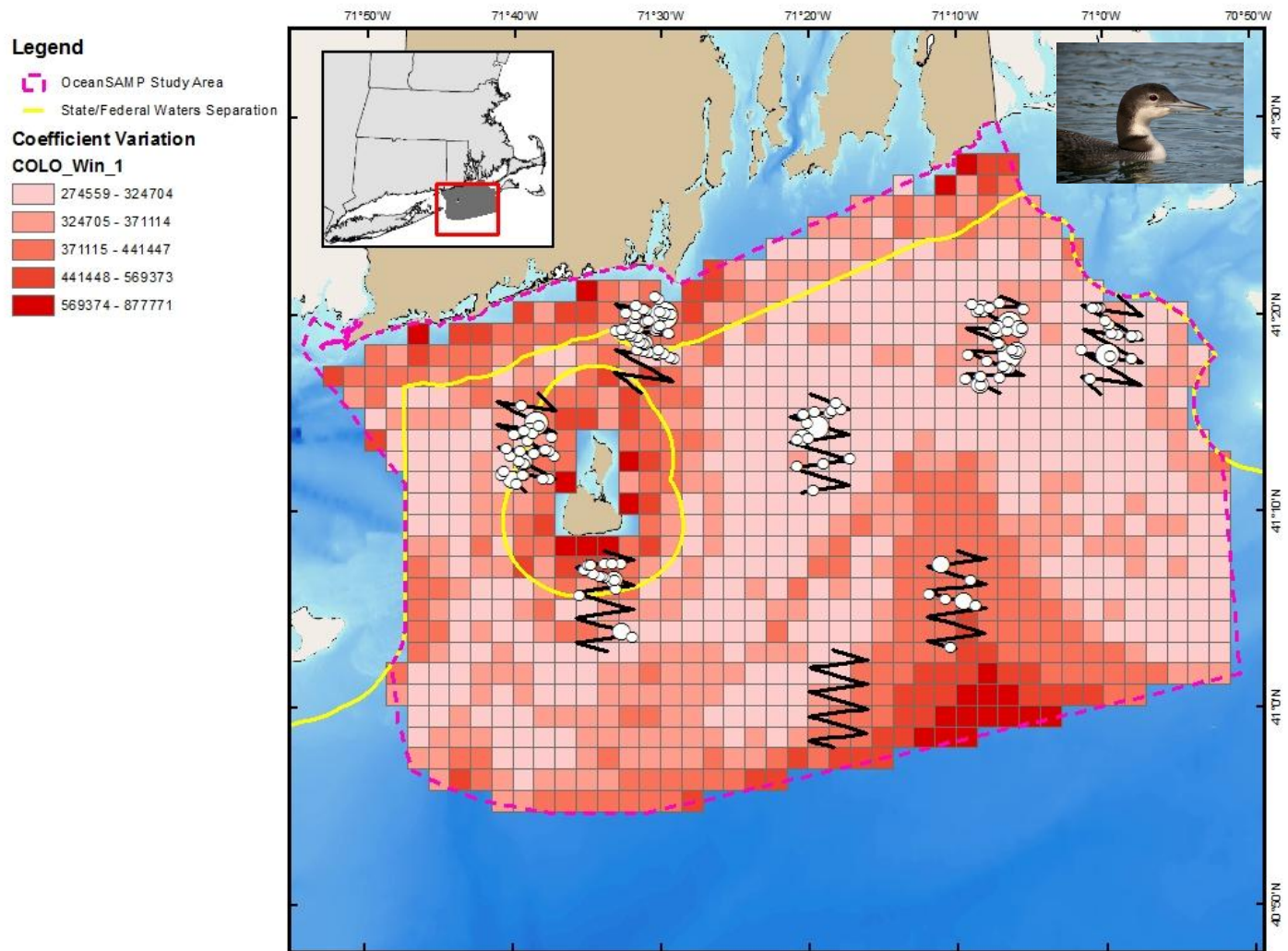


Daily population estimate winter – 7,284 (0.186)

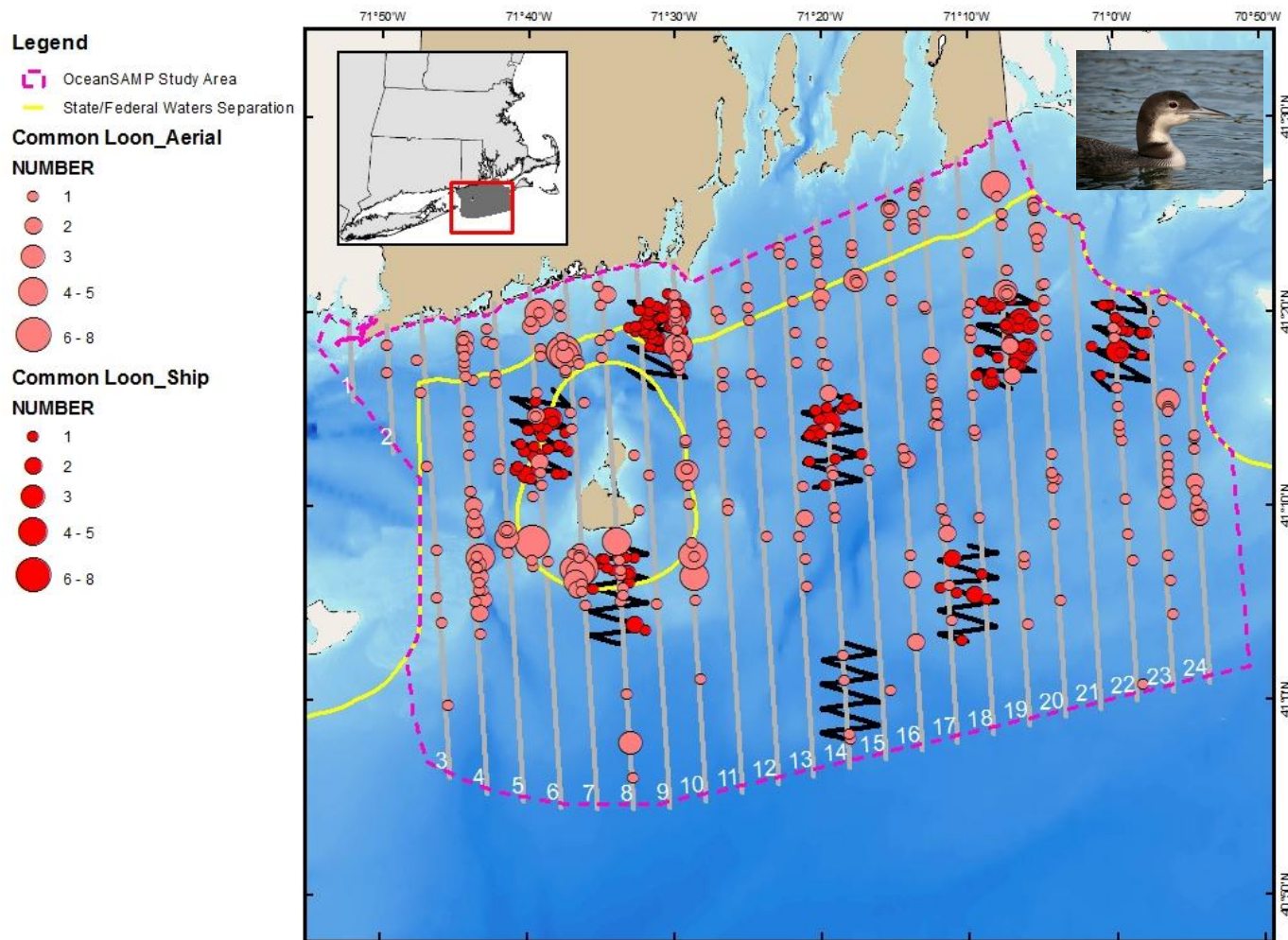
DSM-Uncertainty



DSM-Uncertainty



DSM – Using Survey Data from Multiple Platforms



Ship



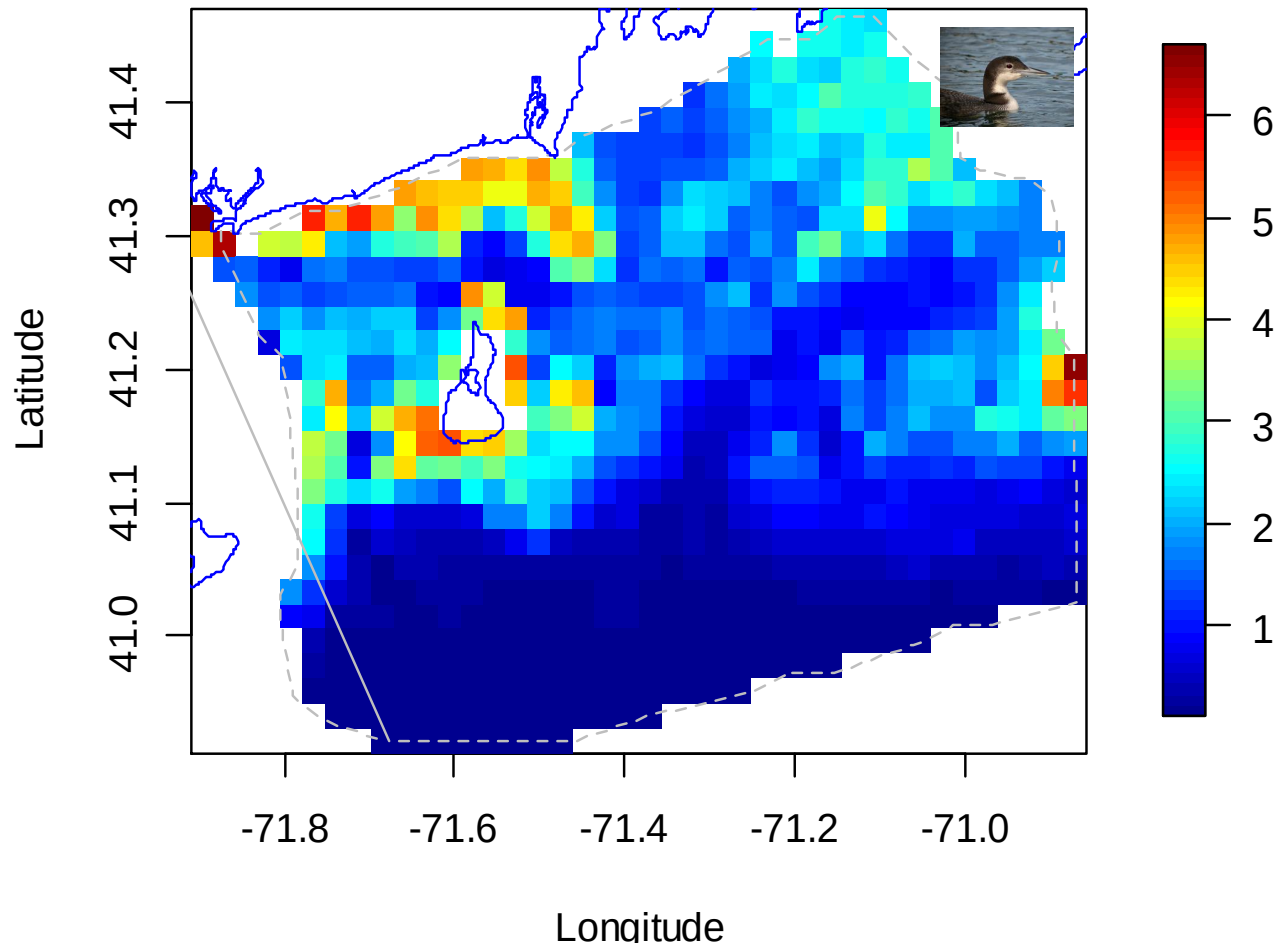
+



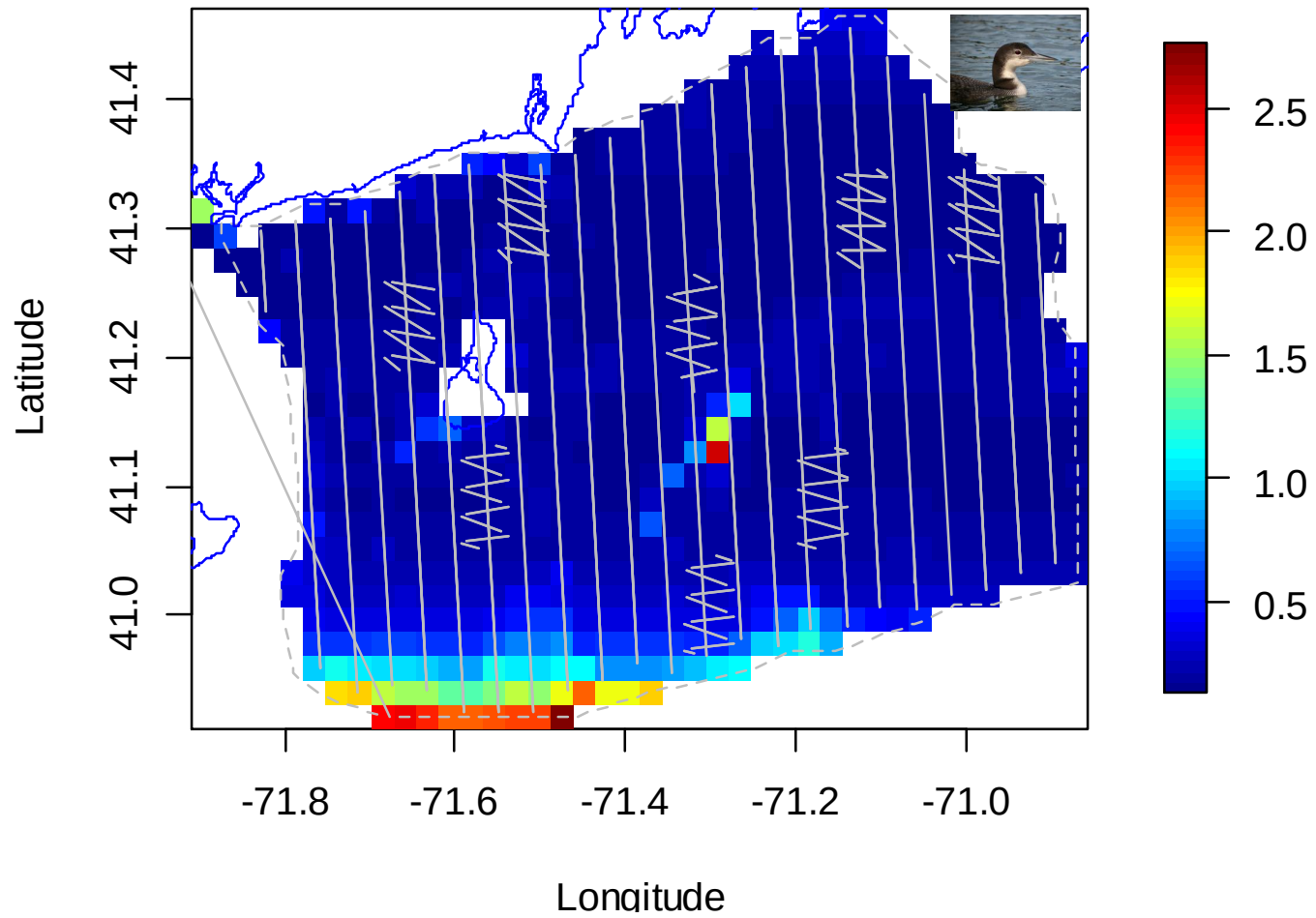
Aerial

-Raw observations of Common Loons winter 2009-2010.

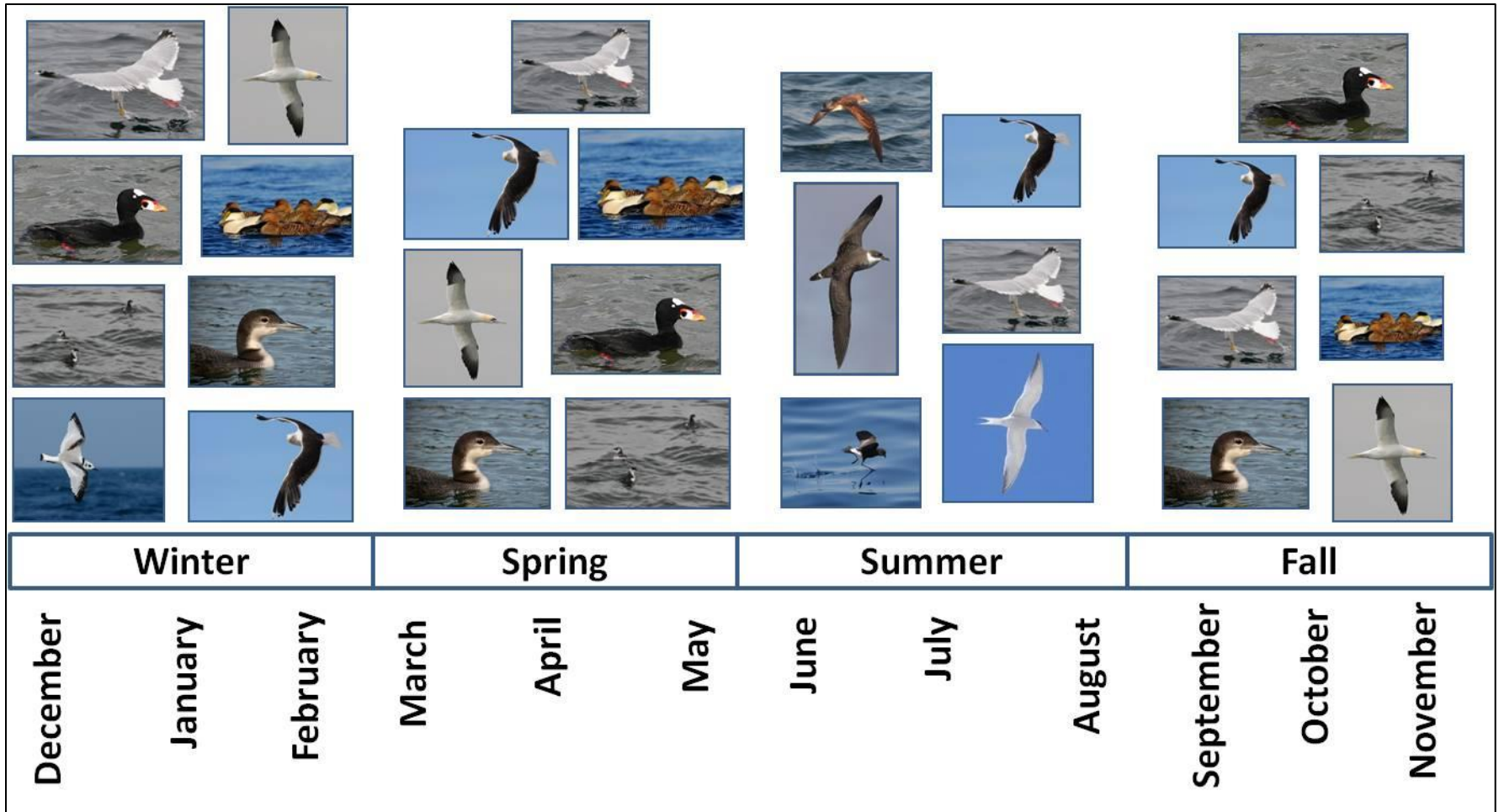
DSM – Using Survey Data from Multiple Platforms



DSM – Uncertainty

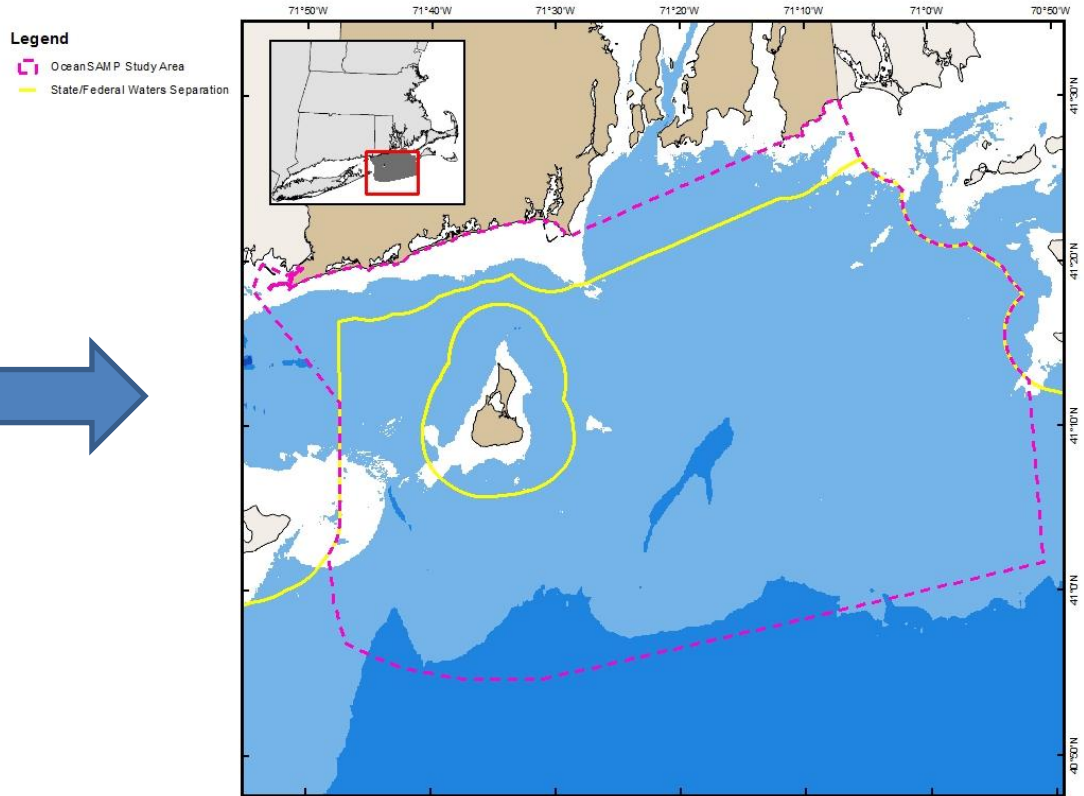
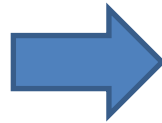
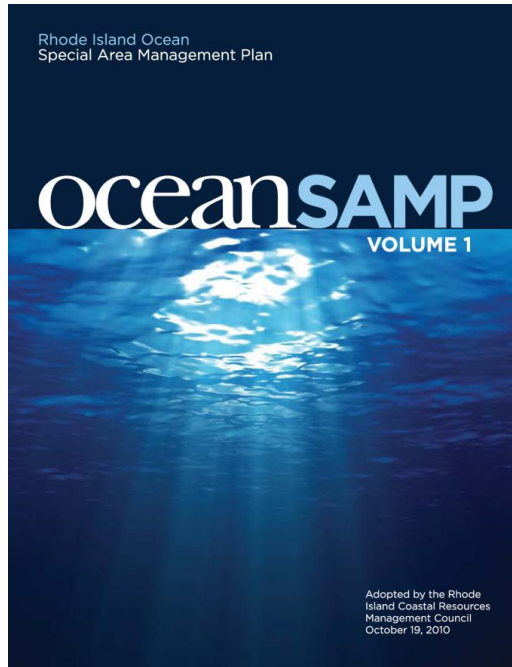


Lots of Predictive Maps for Policy Folks



-Our final OSAMP report contained 80 DSM maps.

OWED Siting in the OSAMP



- Waters <20m (in white) off limits to future development to protect seaduck foraging areas.
- Represent 8% of total SAMP study area.

How Can We Best Incorporate this Type of Modeling Output into OWED Siting Decisions?



Prioritizing multiple-use landscapes for conservation: methods for large multi-species planning problems

Atte Moilanen^{1,*}, Aldina M. A. Franco², Regan I. Early², Richard Fox³,
Brendan Wintle⁴ and Chris D. Thomas²

Biological Conservation xxx (2011) xxx–xxx



Contents lists available at SciVerse ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon



Comparison of five modelling techniques to predict the spatial distribution and abundance of seabirds

Steffen Oppel^{a,*}, Ana Meirinho^b, Iván Ramírez^b, Beth Gardner^c, Allan F. O'Connell^d, Peter I. Miller^e, Maite Louzao^{f,g}

Journal of Applied Ecology



Journal of Applied Ecology 2011, 48, 726–735

doi: 10.1111/j.1365-2664.2011.01985.x

Optimizing regional conservation planning for forest birds

Frederic Beaudry^{1,*}, Anna M. Pidgeon¹, David J. Mladenoff¹, Robert W. Howe²,
Gerald A. Bartelt³ and Volker C. Radeloff¹

ICES Journal of Marine Science



ICES Journal of Marine Science (2012), 69(1), 75–83. doi:10.1093/icesjms/fsr180

Systematic conservation planning in the eastern English Channel: comparing the Marxan and Zonation decision-support tools

Juliette Delavenne^{1,*}, Kristian Metcalfe², Robert J. Smith², Sandrine Vaz¹, Corinne S. Martin³,
Ludovic Dupuis⁴, Franck Coppin¹, and Andre Carpentier¹

**Aim and purpose:**

To provide a tool for large-scale high resolution spatial conservation planning using GIS grid data.

Analyses:

Identification of optimal conservation areas.

Balancing of alternative land uses.

Data:

Presence/absence

Probabilities of occurrence

Abundance/density

Uncertainty

Features:

Species priorities via weighting

Methods for dealing with connectivity

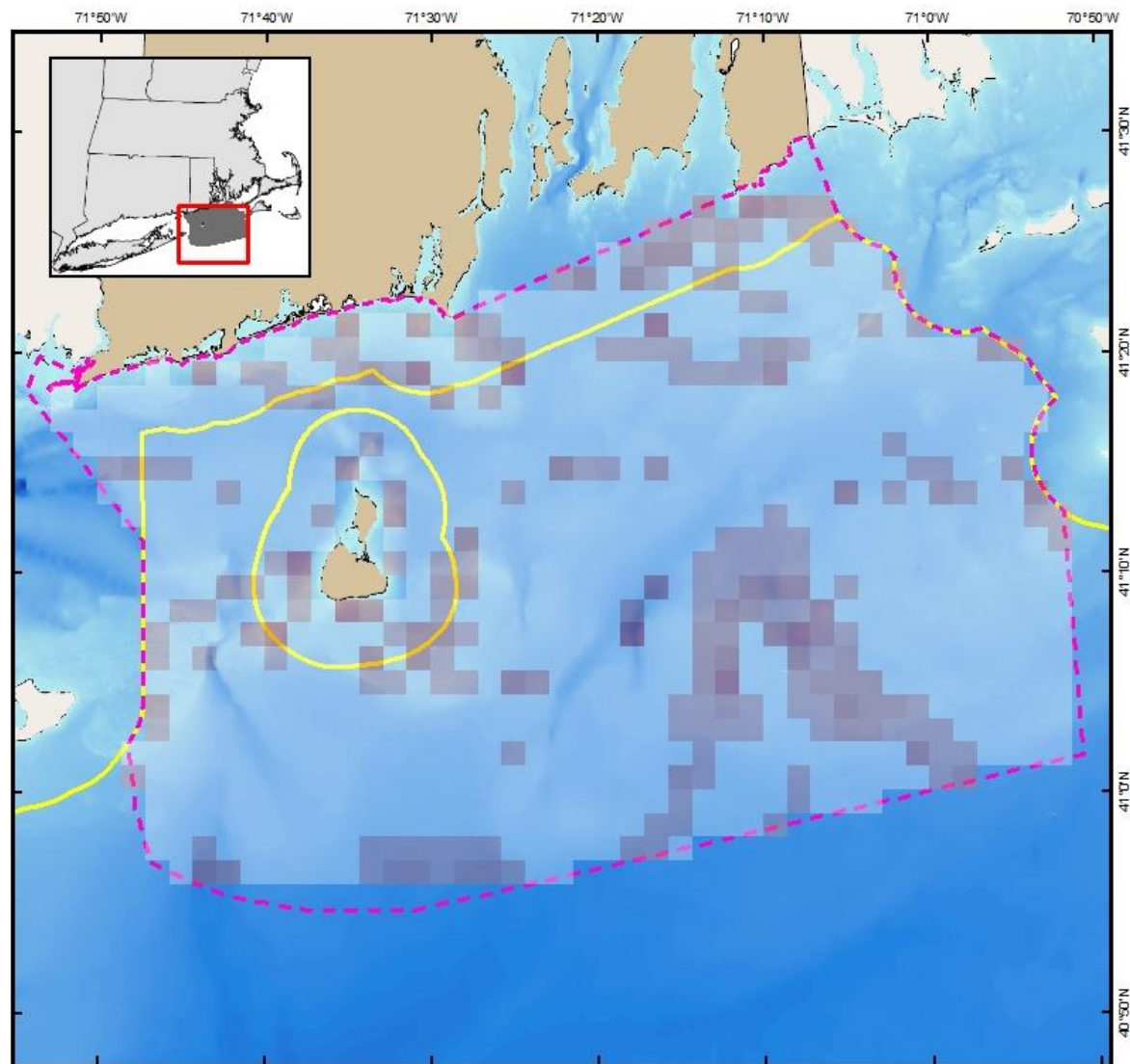
Legend

-  OceanSAMP Study Area
-  State/Federal Waters Separation

Zonation_{summerwinter}

<VALUE>

-  0
-  0.01 - 0.75
-  0.76 - 0.9
-  0.91 - 0.95
-  0.96 - 0.99
-  1

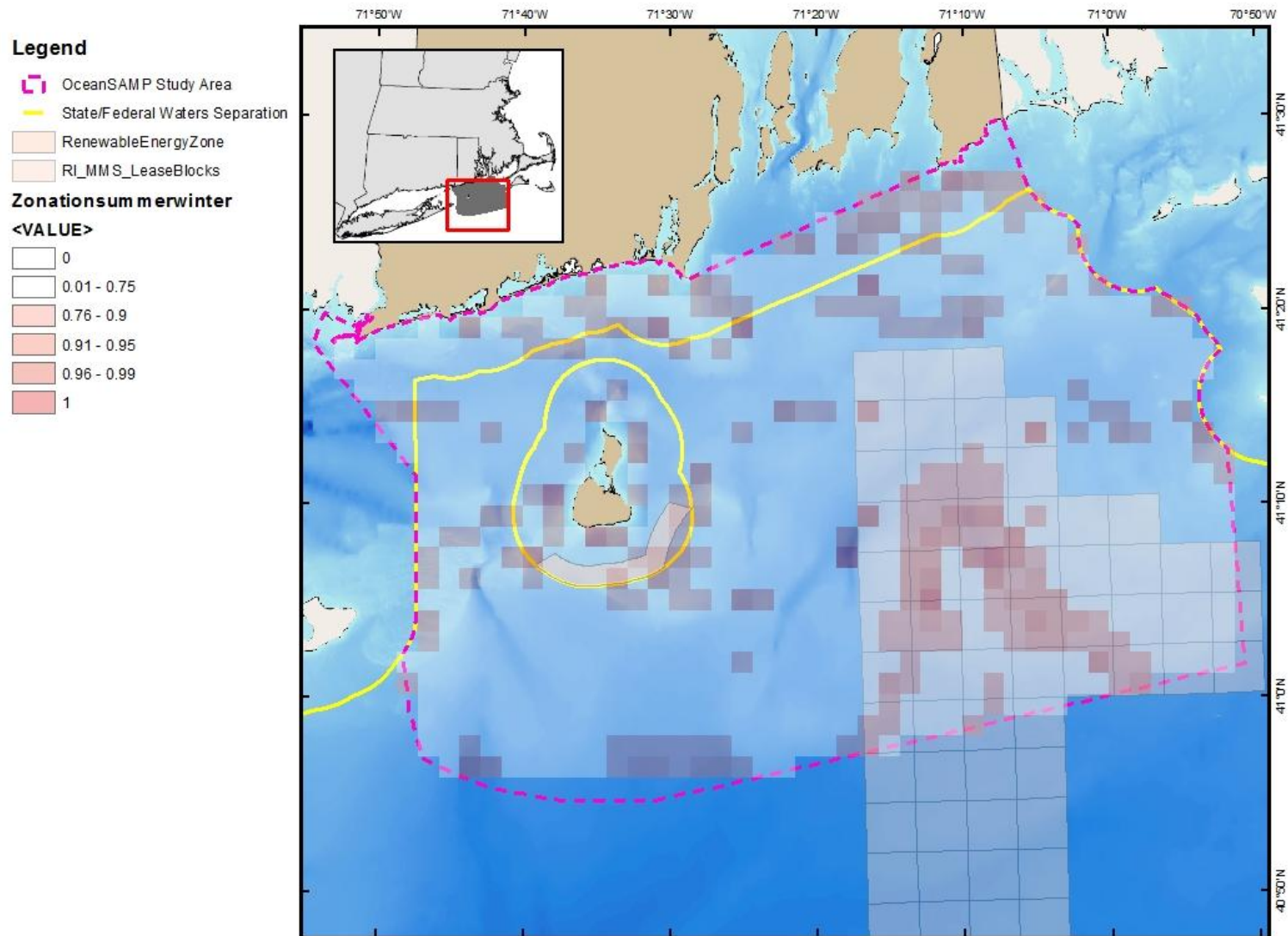


Input Layers:

Winter-Gulls, Alcids, Seaducks, Northern Gannet and Loons.

Summer-Gulls, Shearwaters, Petrels and Terns.

- All layers equally ranked.

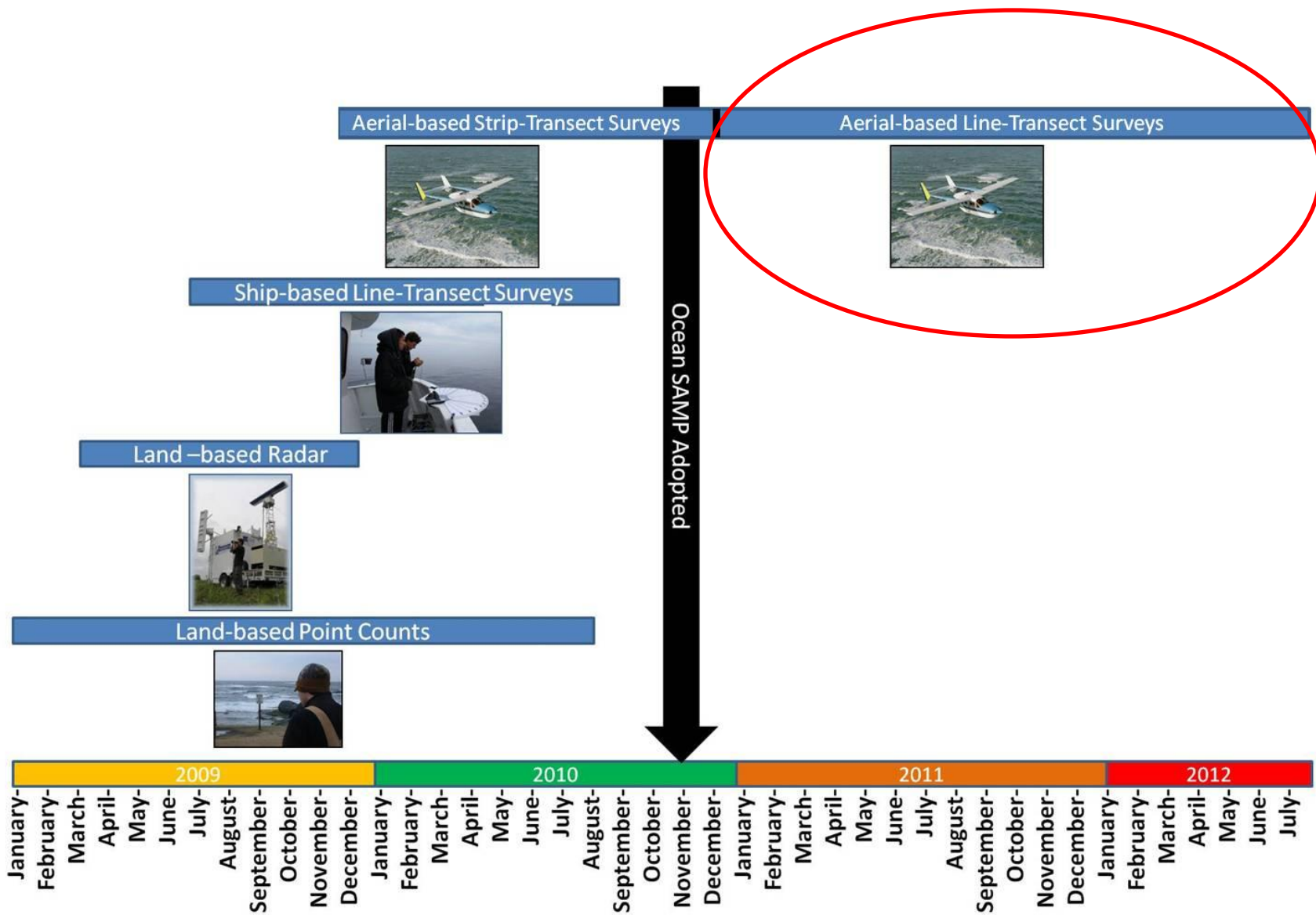


Input Layers:

Winter-Gulls, Alcids, Seaducks, Northern Gannet and Loons.

Summer-Gulls, Shearwaters, Petrels and Terns.

- All layers equally ranked.



Incorporate More Predictive Environmental Covariates into Models?

Many available environmental covariates:

Static

Distance to coast
Bathymetry
Slope
Roughness
Grain size

Dynamic

SST
Chlorophyll a
SSH
Density of ocean fronts

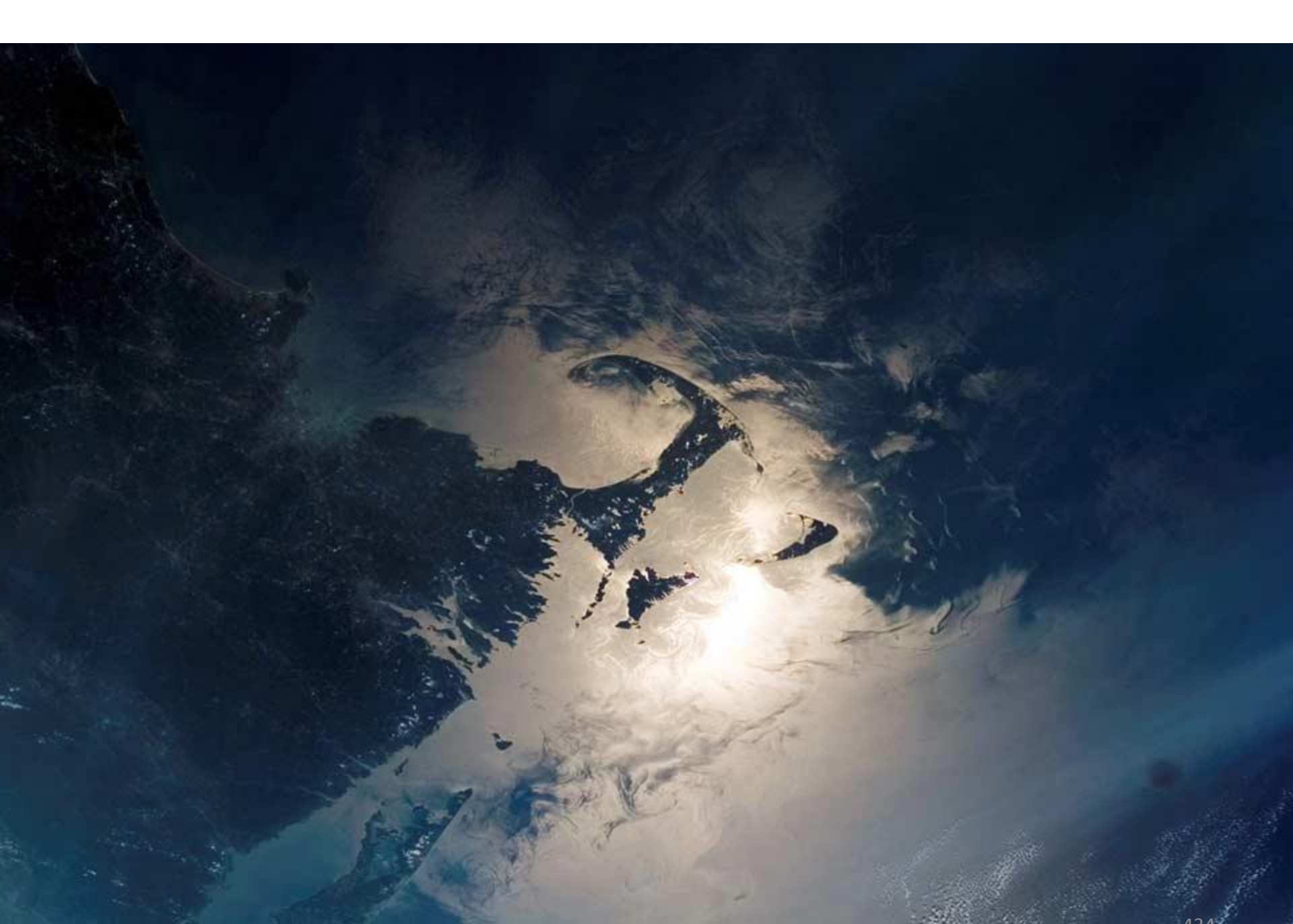
Distance to ocean front
Stratification
Turbidity
Zooplankton
Oscillation Indexes

Dynamic variables

- Temporal decisions
 - Same time period as survey data or three months prior?
- Do we look at the average, min, max, variability, variability within nearby cells?

Potential issues

- High collinearity
- Explanatory vs. predictive model?
 - Increasing number of variables -> increase in difficulty interpreting model.
- Dynamic could be the only way to understand annual variability
 - Many years of survey data.



Presentation #12

Field Studies of Whales and Sea Turtles for Offshore Alternative Energy Planning in Massachusetts. Sponsored by Massachusetts Clean Energy Center

Scott D. Kraus, Ph.D., and Jessica Taylor
New England Aquarium
Boston, MA 02110

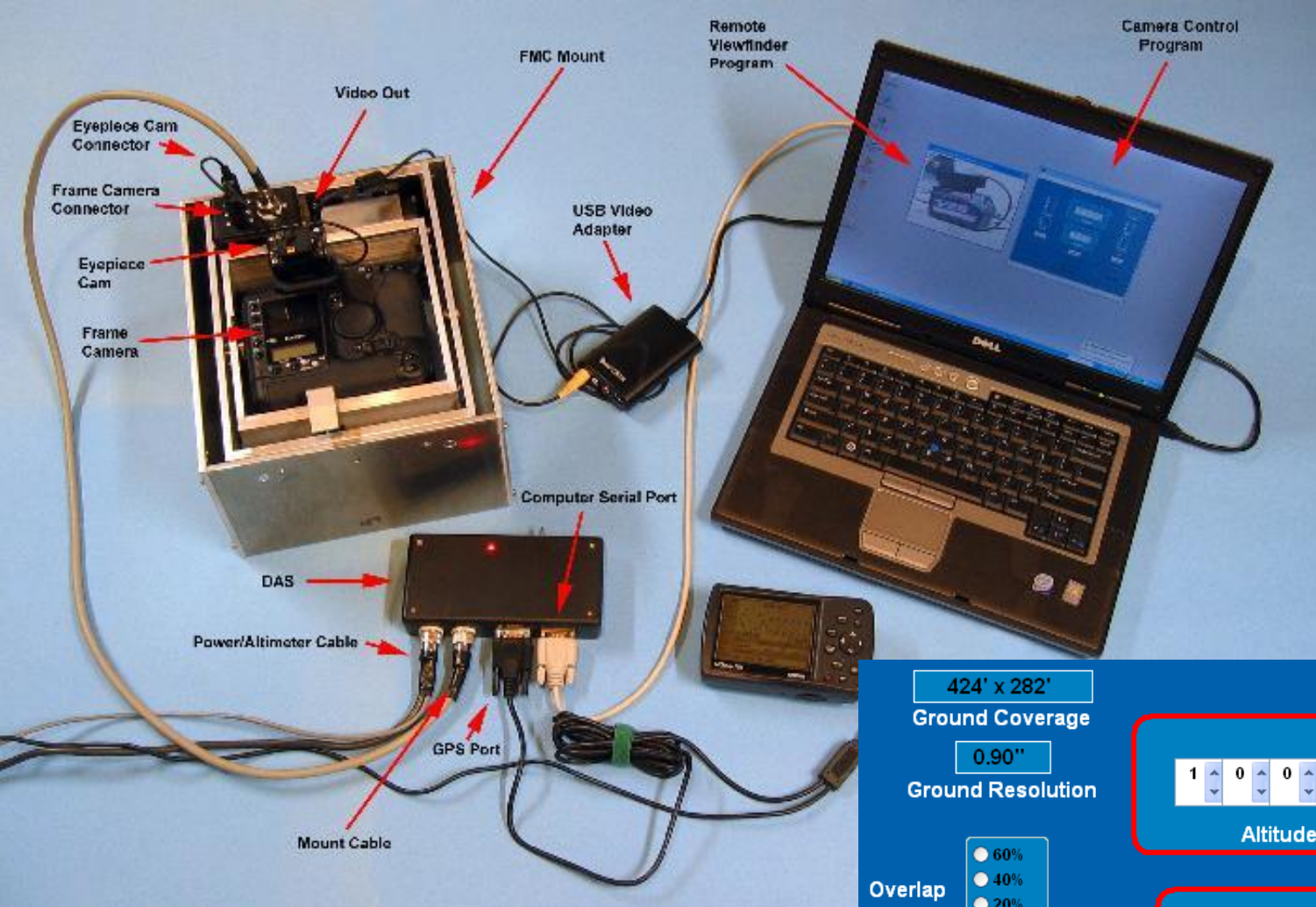
Charles Mayo, PhD., Laura Ganley, and Pat Hughes
Provincetown Center for Coastal Studies
Provincetown, Ma 02657

Robert D. Kenney, Ph.D.
University of Rhode Island
Graduate School of Oceanography
Narragansett, RI 02882-1197

Christopher W. Clark, Ph.D. and Aaron N. Rice, Ph.D.
Bioacoustics Research Program
Cornell Lab of Ornithology
Cornell University
Ithaca, NY, 14850, USA







424' x 282'

Ground Coverage

0.90"

Ground Resolution

☒ 60%
 ☐ 40%
 ☐ 20%
 ☒ None

Overlap

Lens

85mm

Comment (F4)

8992

Frame

☒ On
 ☐ Off

Warnings

☐ Auto (F5)
 ☒ Off (F5)

Operate

☐

Trip (F9)

Altitude

1 0 0 0

Speed

1 0 7

\$CCU,1,499,1

Using Com1 at 19200,n,8,1 in NMEA mode

Lat: N41°54.673'

Local: 16:42:10

Events: 0

Long: W070°43.840

Mode: No GPS

Sightings: 0

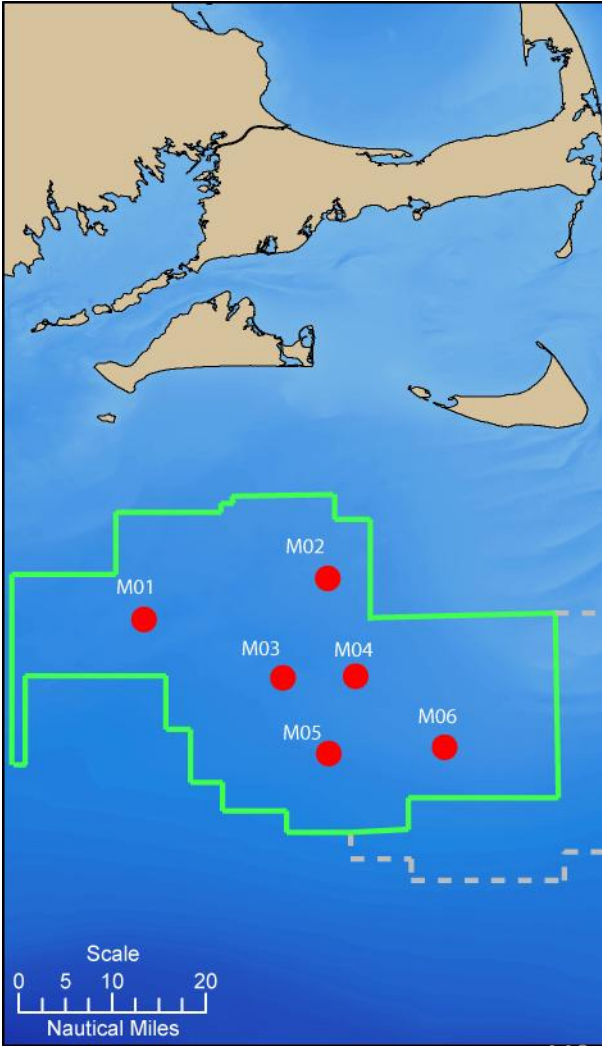
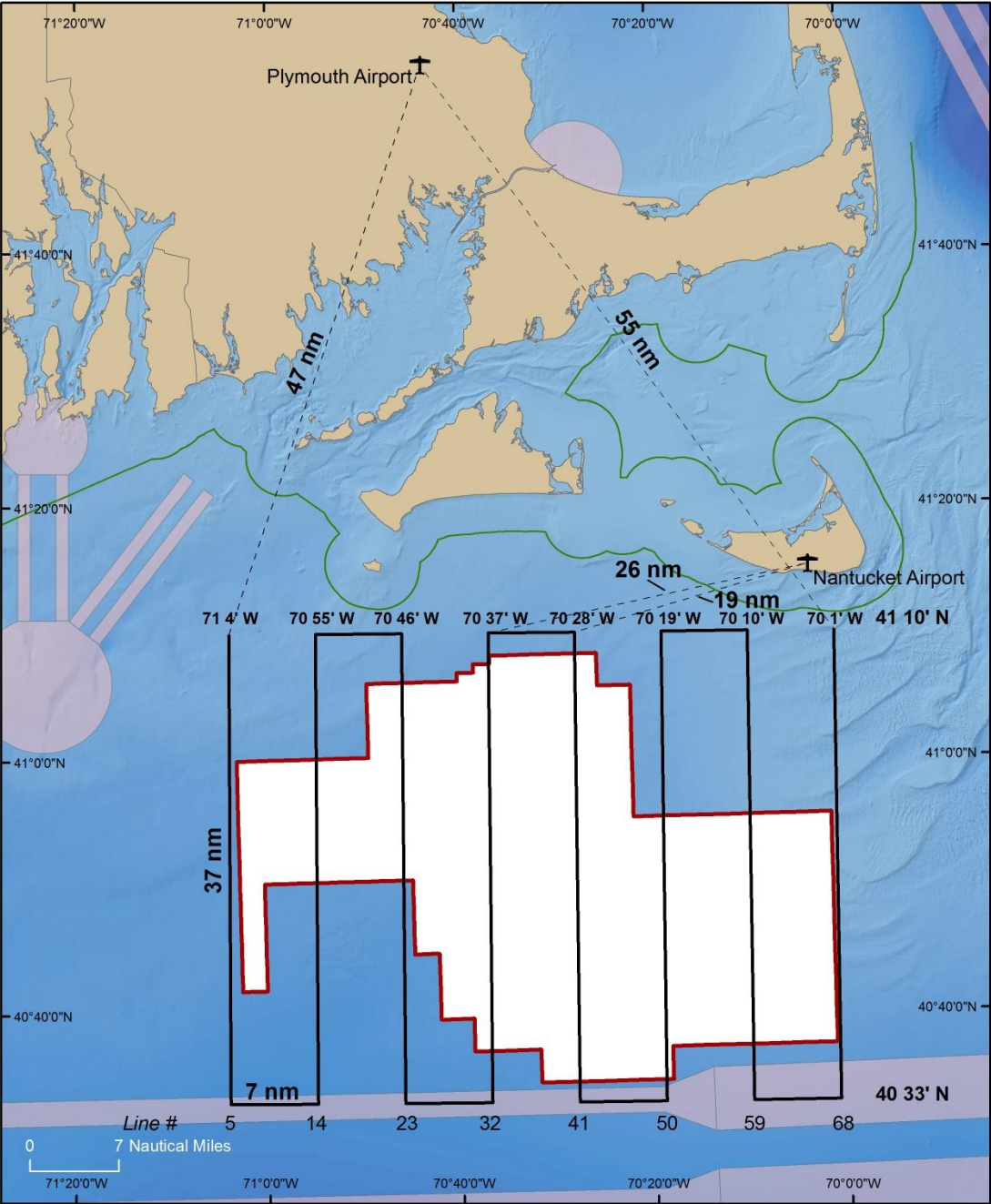
MSL Altitude:

GPS Course:

(P) 0 (S) 0

Start line: W to E - Line #5: 71 4' W
E to W - Line #68: 70 1' W

Option #5



Presentation #13

Documenting Whale Migration Off Virginia's Coast for Use in Marine Spatial Planning

*NOAA Coastal Zone Management Administration
Project of Special Merit Award*

**Virginia Aquarium & Marine Science Center Foundation
Virginia Coastal Zone Management Program
University of North Carolina Wilmington
The Nature Conservancy**

Overall Project Description:

“... collect important data on the presence, density and seasonality of endangered large whale species in the vicinity of the Virginia Wind Energy Area as designated by the Bureau of Ocean Energy Management.”

Study area includes an approximately 10,000 sqkm area that encompasses the Virginia WEA.

Aerial and vessel surveys to be conducted from November 2012 through April 2013.

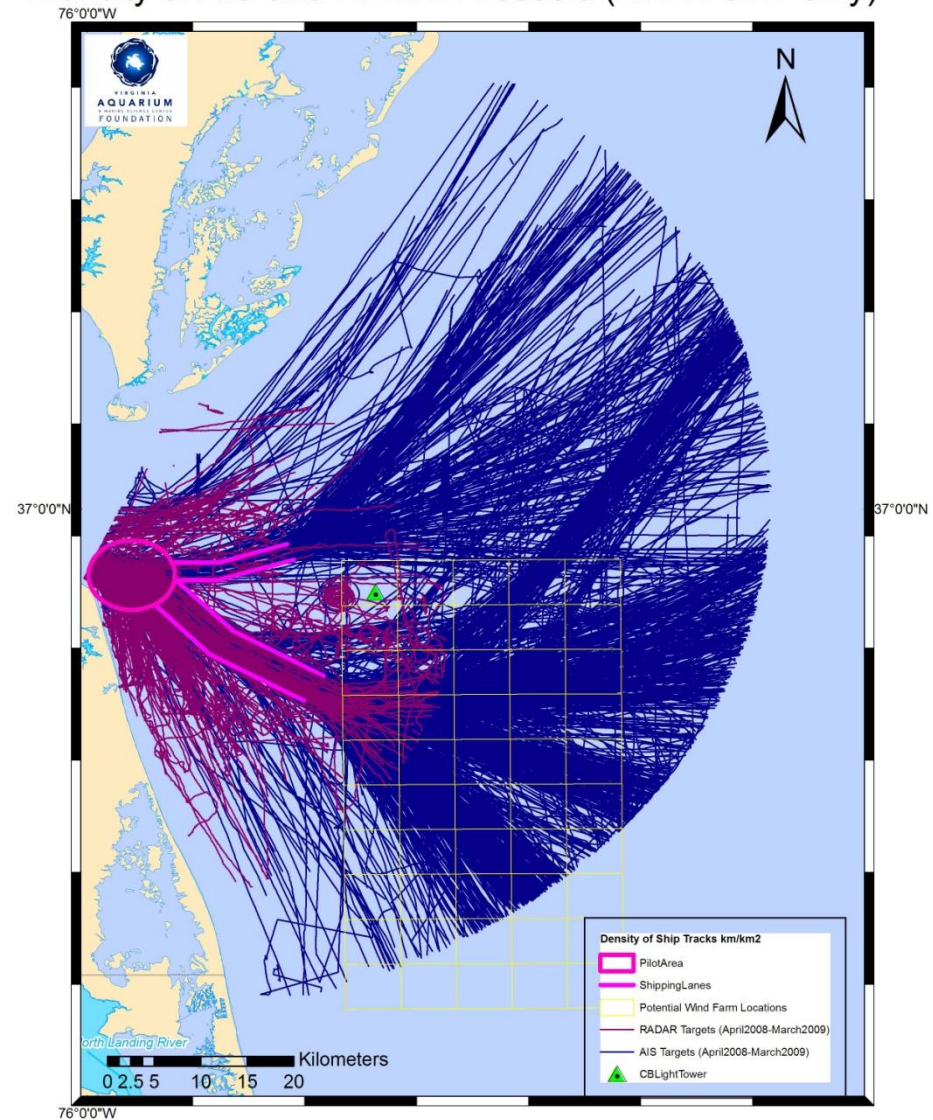
Project Activities

1. 2 days per month of aerial surveys for 6 months
2. 8 vessel days for directed observations of whales
3. Import of GIS data into MARCO Mapping and Planning Portal and other regional data sets such as OBIS SEAMAP



Figure 1: Large whale survey area (black box) with VA wind energy area (WEA) at the center.

Density of AIS and RADAR Vessels (DAYLIGHT only)



Project Contacts:

Virginia Aquarium & Marine Science Center Foundation

Susan Barco, Research Coordinator & Senior Scientist

Phone: 757-385-6476

E-mail: SGBarco@VirginiaAquarium.com

Gwen Lockhart, GIS Research Specialist

Phone: 757-385-6486

E-mail: Glockhar@VirginiaAquarium.com

Mark Swingle, Director of Research & Conservation

Phone: 757-385-0326

E-mail: Mswingle@VirginiaAquarium.com

Presentation #14

Virginia/Maryland Sea Turtle Research & Conservation Initiative

NOAA Section 6 Species Recovery Grant

**Virginia Aquarium & Marine Science Center Foundation
Virginia Department of Game & Inland Fisheries
Maryland Department of Natural Resources**

Primary Sub-contractors for Surveys:

**Riverhead Foundation for Marine Research and Preservation
Research Unit for Wildlife Population Assessment, University of St. Andrews**

Overall Project Description:

“... collection of a comprehensive set of data on the life history, health and abundance of sea turtle species.”

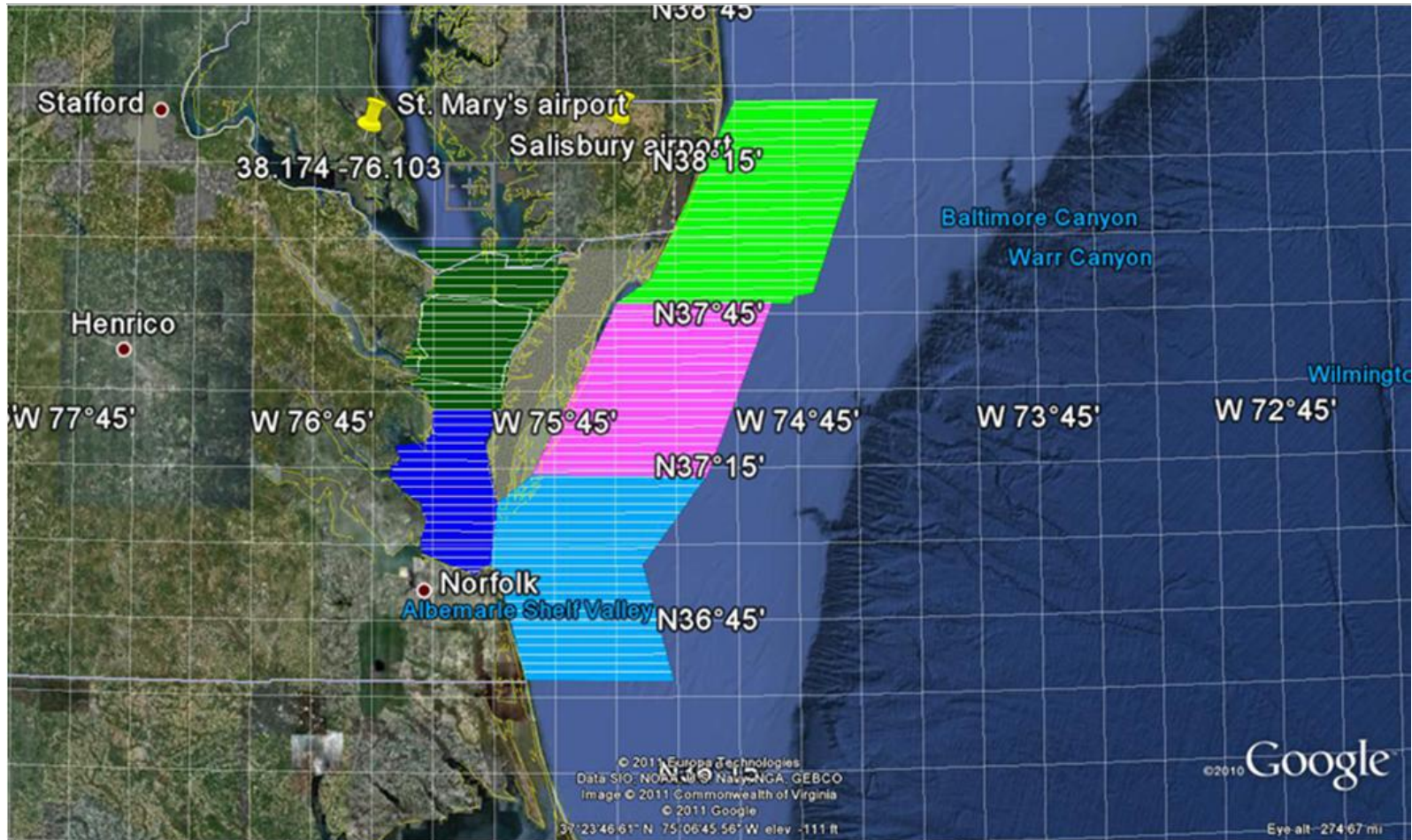
Goal 1: Develop robust seasonal distribution and abundance estimates for loggerhead and Kemp’s ridley sea turtles in the study area.

Study area includes the Chesapeake Bay and coastal ocean waters of Virginia and Maryland.

Population Assessment Action Plan

1. Quantify turtle surfacing time for calculating seasonal and annual differences in availability.
2. Conduct aerial abundance surveys in a manner that will allow calculation of perception bias to create robust estimates of seasonal and annual abundance.
3. Compare abundance estimates with previous studies.

Survey Stratum Design



5 survey strata

113 east to west transit lines

3.3 km apart

strip width = 1 km

Survey Methodology

- Four observers – two independent teams
 - Team 1 looked out port and starboard bubble windows
 - Team 2 looked out through a belly window and a side window
- Hiby circle back technique was used in Fall 2011 and Spring 2012
- Observers report – angle to sighting, species, number of animals, other sighting information, and environmental data
- Perpendicular distance of the animal to the transect line was calculated from the angle and the height of the plane
- Animals detected by both teams (called a duplicate detection) were later identified on the basis of timing and position



Estimating Density and Abundance

- Within each stratum, group density (D_s) and group abundance (N_s) of animals available for detection were estimated as follows:

$$\hat{D}_s = \frac{1}{2wL} \sum_{j=1}^n \frac{1}{\hat{p}_j} \quad \text{and} \quad \hat{N}_s = A\hat{D}_s$$

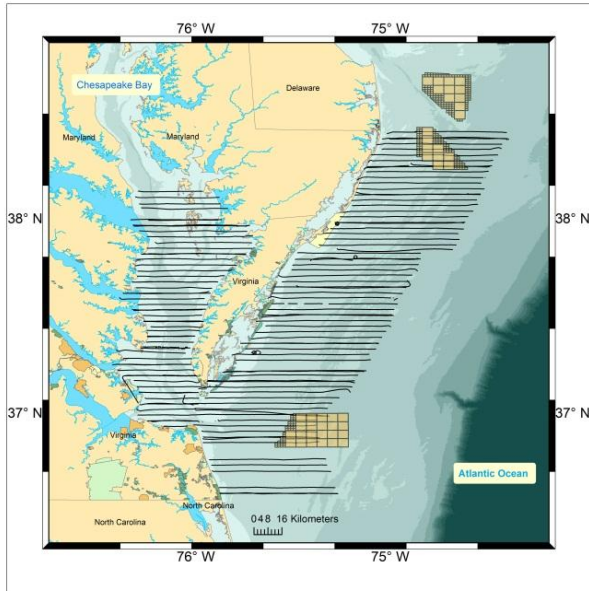
where A is the size of stratum, w is the truncation distance, L is the total effort achieved in the stratum, n is the total number of detections in the stratum and p is the estimated probability of detecting group j (see below). Individual animal density (D) and abundance (N) were obtained from

$$\hat{D} = \frac{1}{2wL} \sum_{j=1}^n \frac{s_j}{\hat{p}_j} \quad \text{and} \quad \hat{N} = A\hat{D}$$

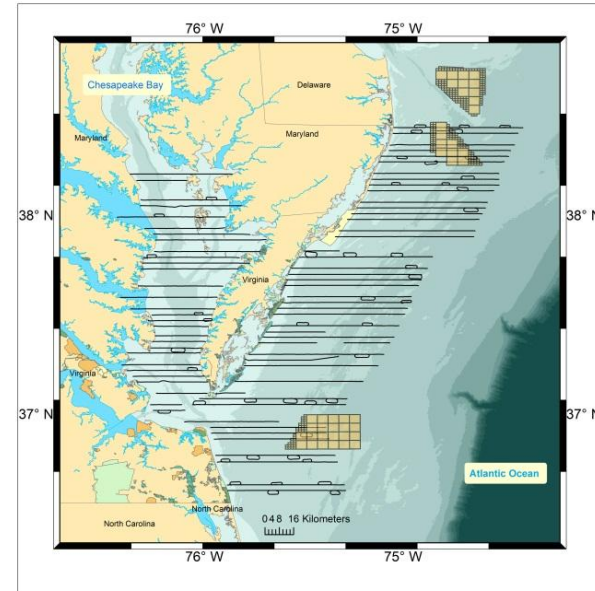
Estimation of Detection Probabilities

- Mark and recapture techniques using 2 teams of observers (Laake and Borchers 2004)
- Distance sampling model used both a hazard-rate ($1 - \exp(-x/\sigma) - b$) and a half-normal form ($\exp(-x^2/2\sigma^2)$) (Buckland *et al.* 2001)
- Effects of covariates were incorporated into the model by setting the scale parameter in the model to be an exponential function of the covariates (Marques and Buckland 2004).
 - season, strata, observer position (left, right or center), group size and Beaufort sea state
- Akaike's Information Criterion (AIC) and goodness of fit statistics were used to select the final model and all model selection was performed in the program Distance (Thomas *et al.* 2010; version 6.1 Beta 1 and version 2.0.6 of the mrds R library).

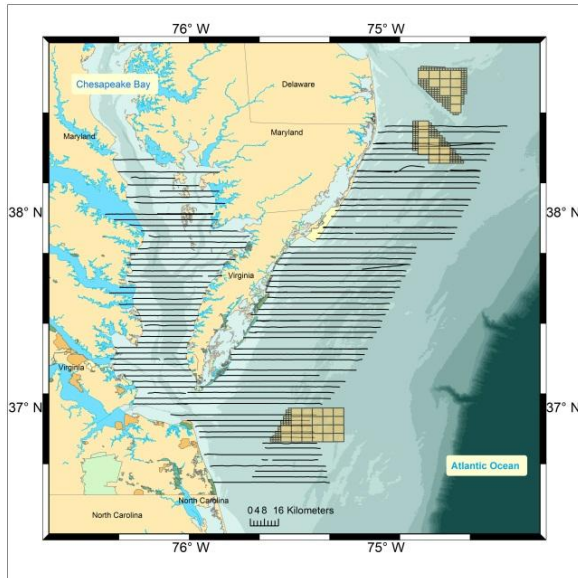
Actual Survey Transits



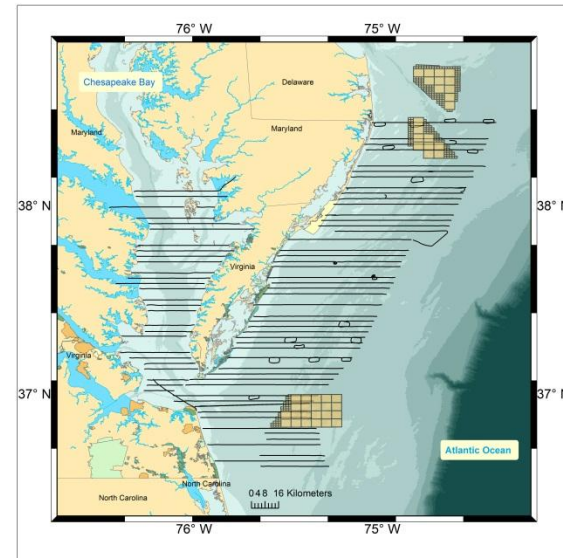
- > Spring 2011
- > 22 May to 1 June
- > Percent Area covered = 35%



- > Fall 2011
- > Sept & October
- > Percent Area covered = 20%



- > Summer 2011
- > 22 to 28 July
- > Percent Area covered = 29%



- > Spring 2012
- > 29 Sept to 7 Oct

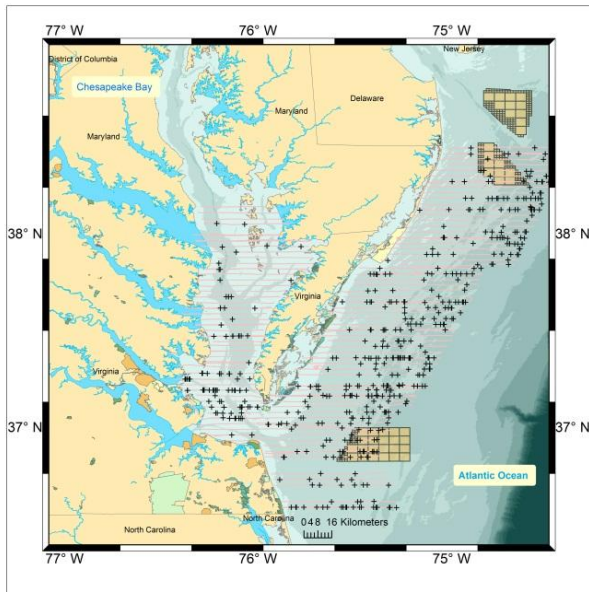
Wind Energy Areas



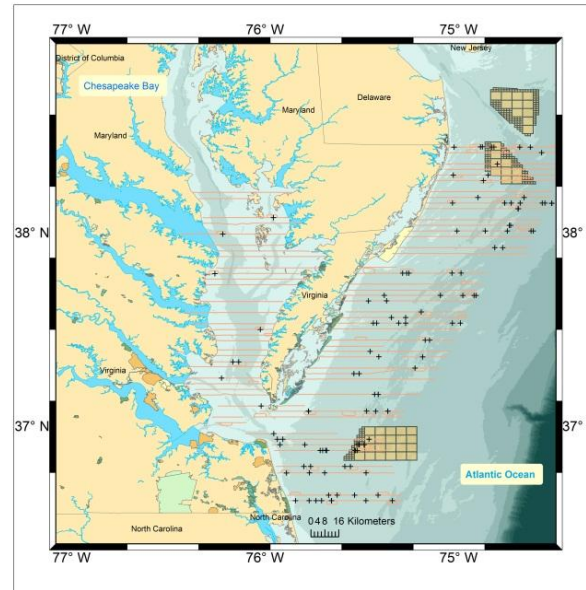
Depth in meters



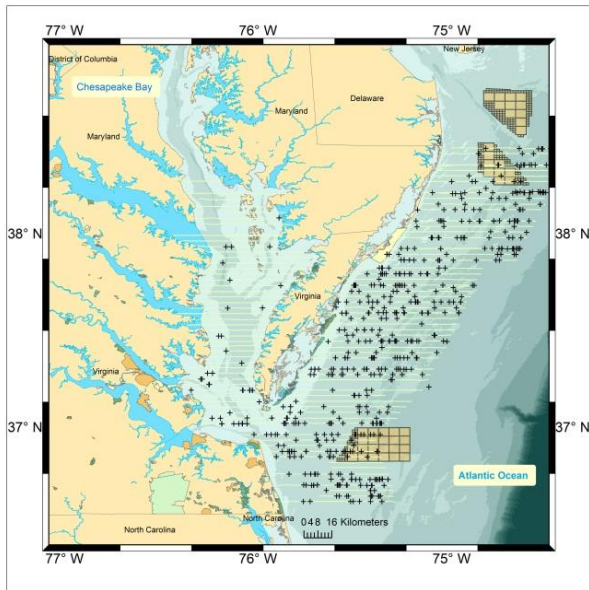
Loggerhead Sightings - 2011



- Spring 2011
- Team 1 = 769
- Team 2 = 517
- Duplicates = 130
- Unique = 1156



- Fall 2011
- Team 1 = 119
- Team 2 = 86
- Duplicates = 25
- Unique = 180

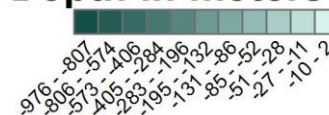


- Summer 2011
- Team 1 = 365
- Team 2 = 301
- Duplicates = 57
- Unique = 609

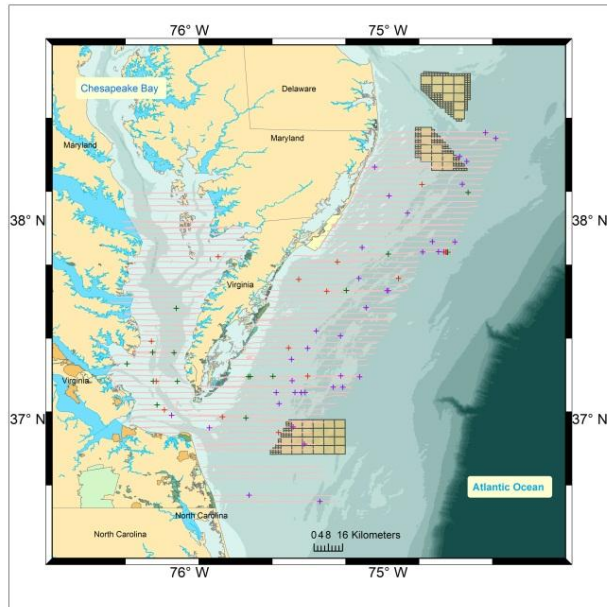
Wind Energy Areas



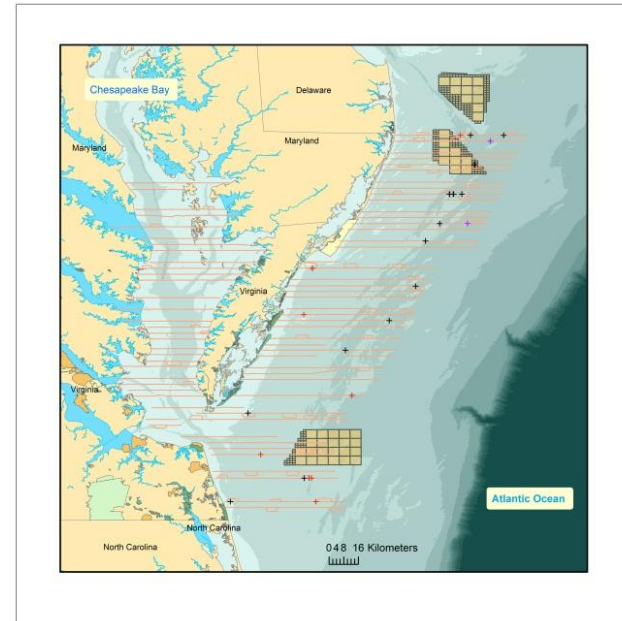
Depth in meters



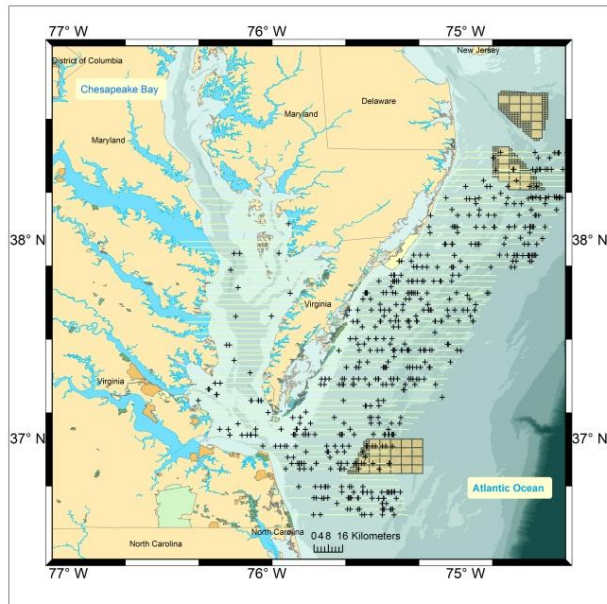
Other Turtle Sightings - 2011



- Spring 2011
- Team 1 = 117
- Team 2 = 580
- Duplicates = 145
- Unique = 163



- Fall 2011
- Team 1 = 28
- Team 2 = 14
- Duplicates = 1
- Unique = 41



- Summer 2011
- Team 1 = 122
- Team 2 = 94
- Duplicates = 13
- Unique = 203

- + Kemp's ridley
- + green
- + leatherback
- + unidentified turtle

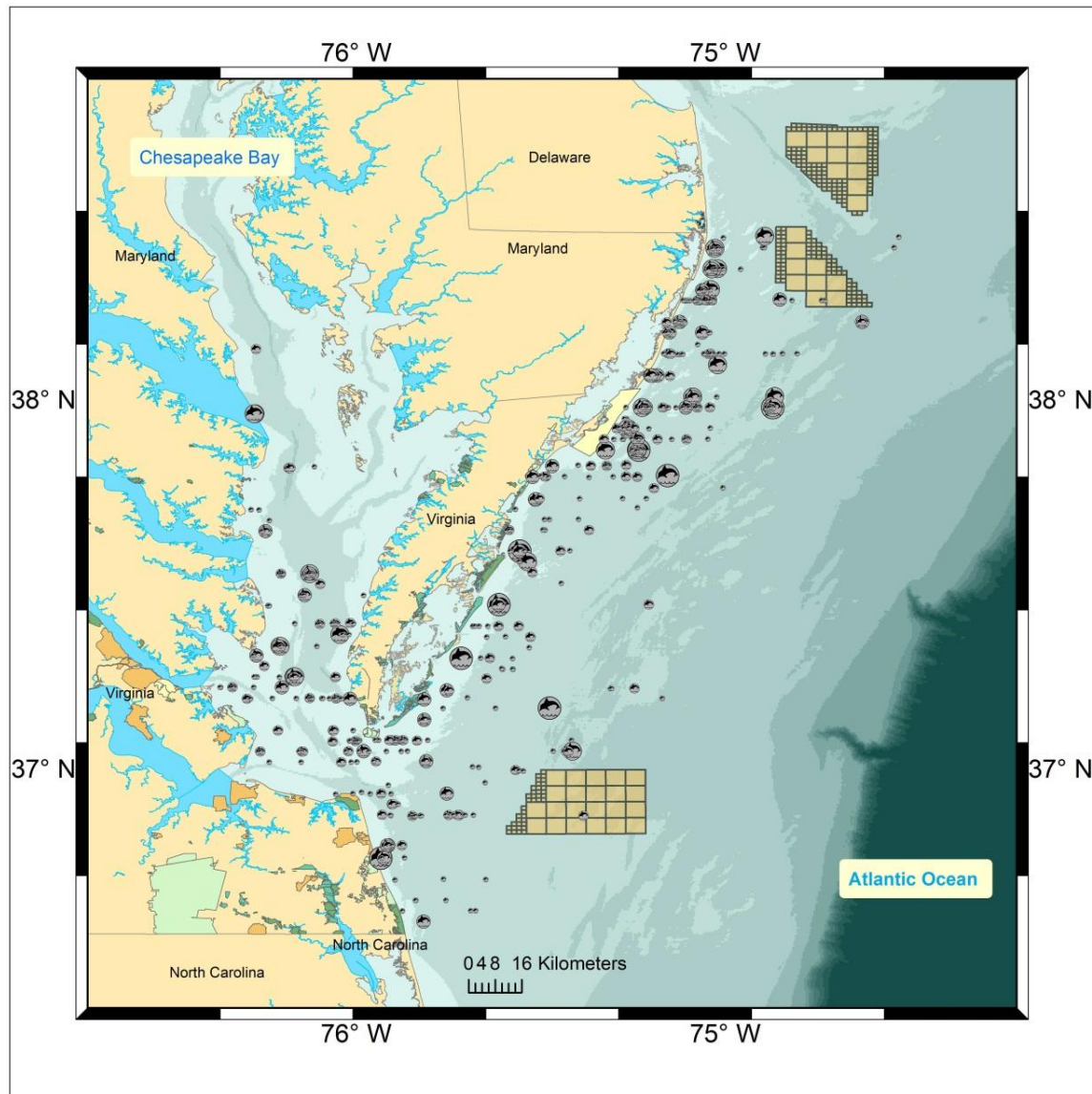
Wind Energy Areas



Depth in meters



Bottlenose Dolphin Groups - 2011



- Team 1 = 425
- Team 2 = 306
- Duplicates = 90
- Unique = 641

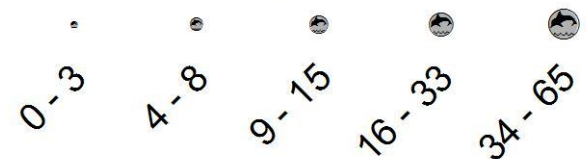
Wind Energy Areas



Depth in meters



Number in Group



Project Contacts:

Virginia Aquarium & Marine Science Center Foundation

Susan Barco, Research Coordinator & Senior Scientist

Phone: 757-385-6476

E-mail: SGBarco@VirginiaAquarium.com

Gwen Lockhart, GIS Research Specialist

Phone: 757-385-6486

E-mail: Glockhar@VirginiaAquarium.com

Mark Swingle, Director of Research & Conservation

Phone: 757-385-0326

E-mail: Mswingle@VirginiaAquarium.com

Presentation #15

Navy Integrated Comprehensive Monitoring Program (ICMP)



Dr. Robert Gisiner

Office of the Chief of Naval Operations,
Energy & Environmental Readiness Div
(OPNAV N45)

bob.gisiner@navy.mil

Development of the Current U.S. Navy Risk Assessment and Monitoring Process



GULF OF ALASKA



HAWAII - SOUTHERN CALIFORNIA
TRAINING AND TESTING (HSTT)



MARIANA ISLANDS
TRAINING AND TESTING (MITT)



MEDITERRANEAN

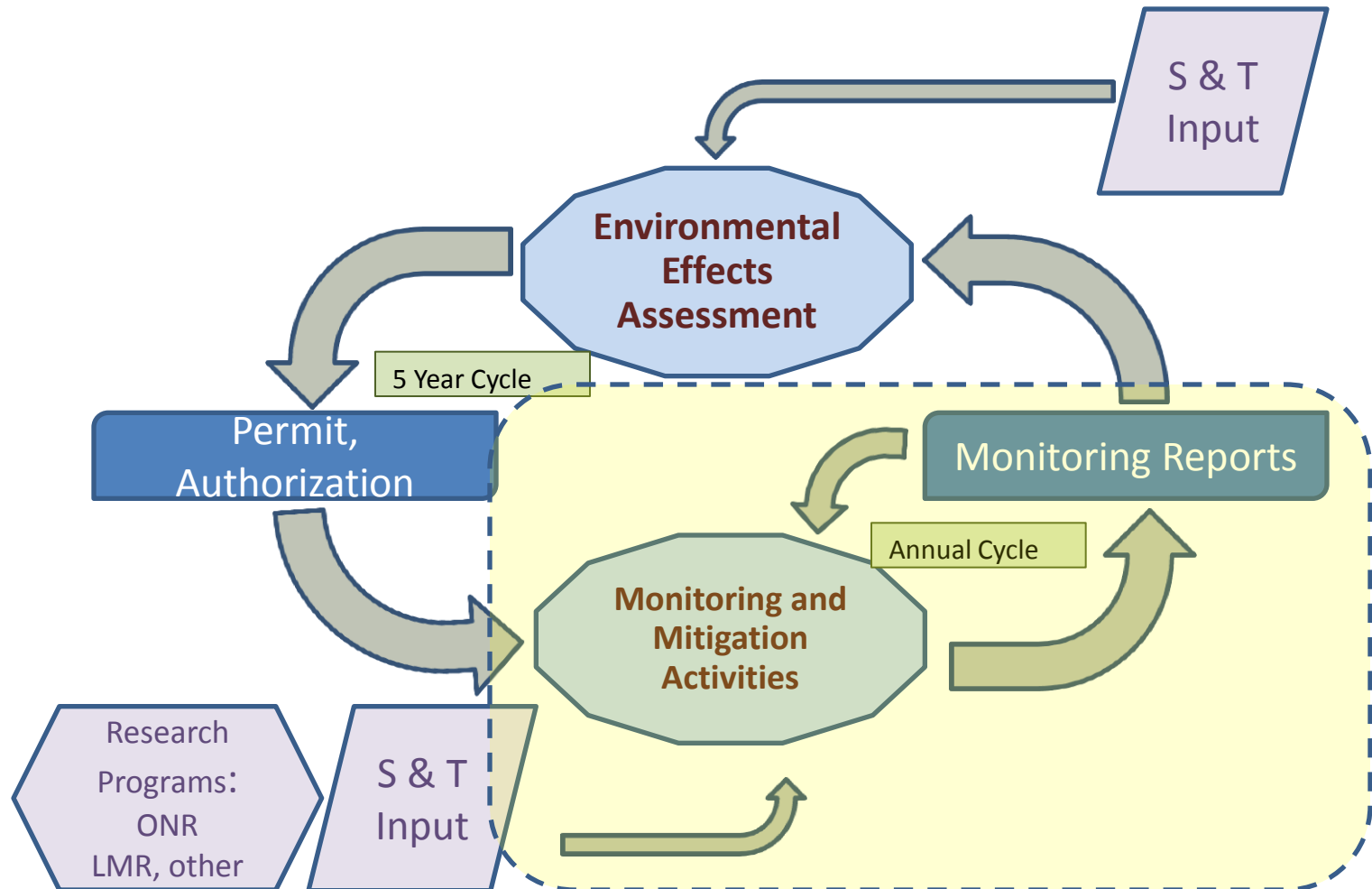
The Navy needs marine mammal and T/E species data for all waters of the United States and US Trust Territories

- **Phase II** permit renewals are in public and regulator agency review now, for January 2014 start

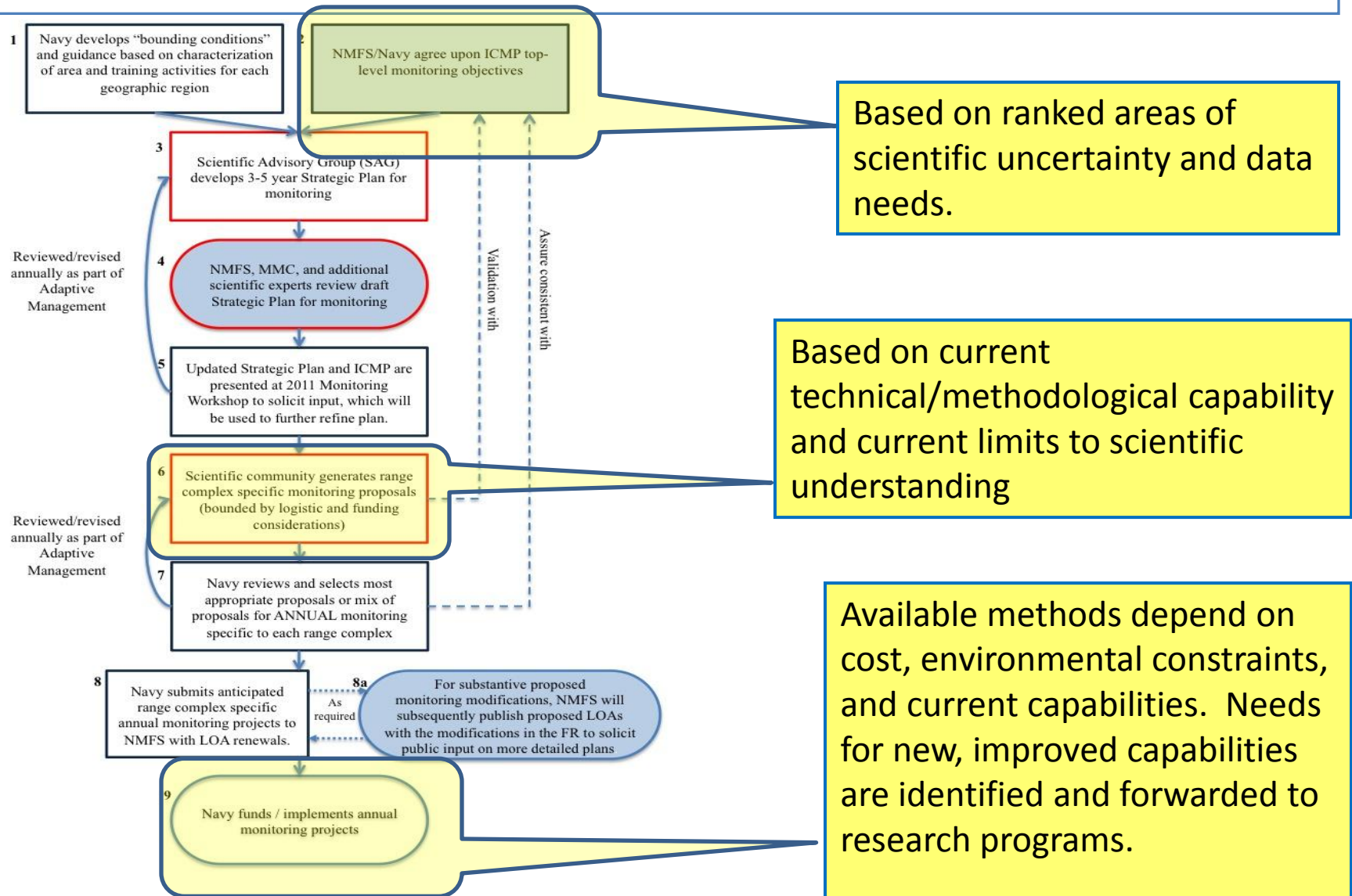
- Number of permits have been consolidated
- Coverage area and types of assessed activities have been expanded.

- **Adaptive Management** is used to annually review new science, and results of ongoing monitoring with the regulator (NOAA Fisheries).
- Annual Investment by Navy in research and environmental risk management is \$25-30M/year.

The U.S. Navy's 5 Year Cycle for Environmental Stewardship

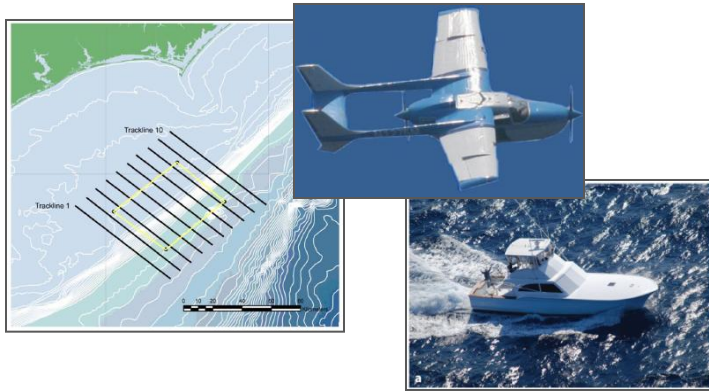


U.S. Navy's Annual Monitoring and Mitigation Process, with science input/output.

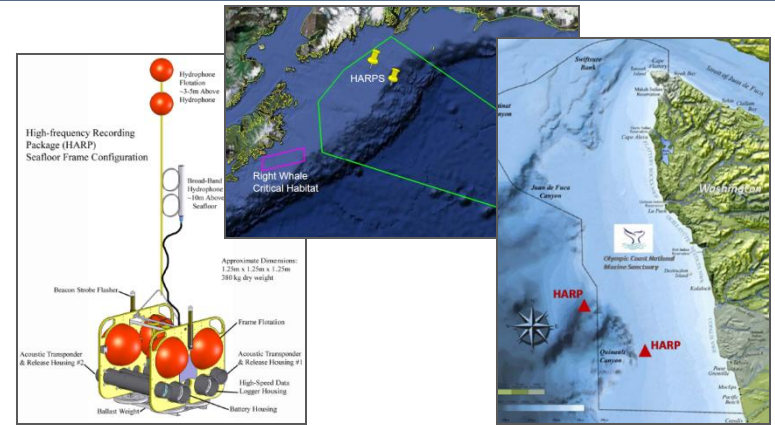


Navy Funded Data Collection

Visual Surveys (aerial and vessel)



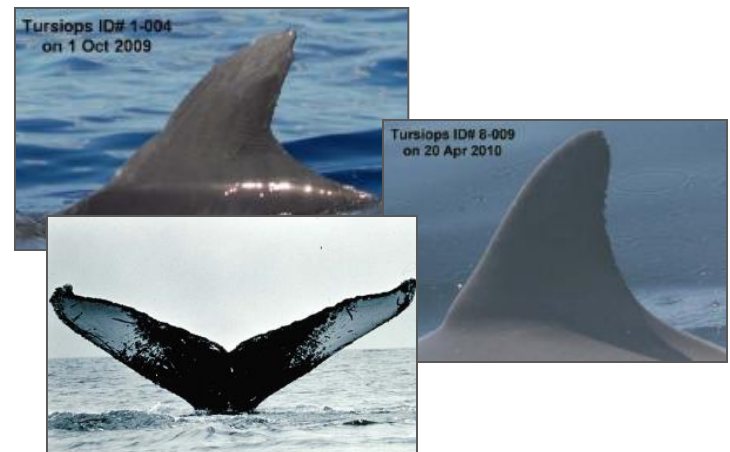
Passive Acoustic Monitoring



Behavioral Response Studies



Photo Identification



A partial list of recent and ongoing data collection efforts

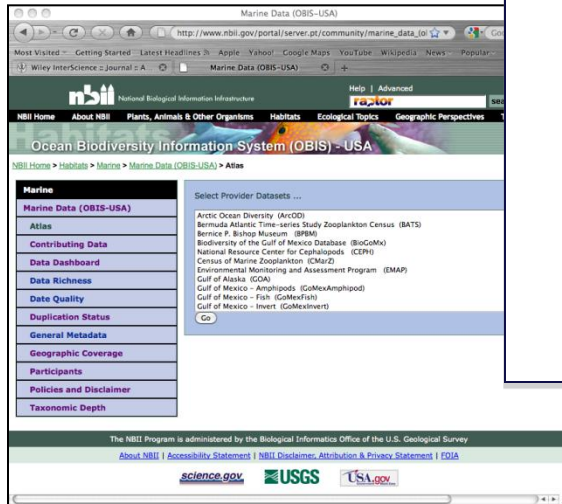
- US Atlantic Coast and Gulf of Mexico
 - Duke University et al – Cape Hatteras survey and BRS
 - AMAPPS – joint BOEMRE, NOAA , USGS, Navy and USFWS
- Southern California Bight
 - Behavioral Response Study (multiple partners)
 - SCOR range surveys, acoustics (remote and instrumented range)
 - ONR and Navy N45 research projects (Scripps, others)
- Northwest US
 - Passive acoustic monitoring, animal tagging
- Gulf of Alaska
 - Passive acoustic monitoring and visual survey (vessel-based)
- Hawaii
 - Aerial visual surveys, boat-based survey and animal tagging, passive acoustics (remote and instrumented range)
- Mariana Islands
 - Aerial and boat-based surveys, remote passive acoustics
- Navy CNO N45 research projects – acoustics, tagging, visual survey in various locations: Hawaii, southern California, The Bahamas
- Office of Naval Research – various projects

Making the Data Accessible

- OBIS SEAMAP
 - Jointly funded by Navy and the Sloan Foundation as part of the Ocean Biogeographic Information System
 - Navy data from Duke U and AMAPPS is periodically archived in OBIS SEAMAP
- OBIS USA
 - A USGS core funded activity
 - Linked to the National Biogeographic Information System (NBIS) – a national terrestrial biodiversity database
 - Linked to OBIS SEAMAP and other OBIS data collection archival efforts (FishBase, CephBase, HexBase)
 - National Ocean Data Center (NOAA NODC) backs up and archives all OBIS USA data
- An interagency goal: to place all survey data in OBIS USA for common agency and public use
 - The Navy partners with BOEM and other agencies to support this common marine biological data architecture
 - The Navy encourages other federal and private sector data collectors to contribute to a common national data archive via NODC, OBIS USA or OBIS SEAMAP
 - NODC, OBIS USA, OBIS SEAMAP are working together to ratify common data and metadata standards, data sharing protocols and data provider support services

OBIS-USA, OBIS-SEAMAP, iOBIS

OBIS-USA



OBIS-SEAMAP Niche:

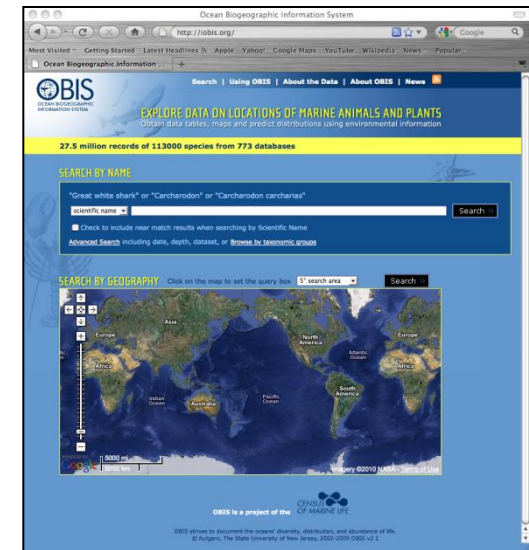
Protected species data / tools
Telemetry / tracking data
Photo-ID
Passive acoustics
Spatial Decision Support
Mapping & Analysis R&D*

OBIS-SEAMAP

National biogeographic
data, standards and
services
[archival at NODC]

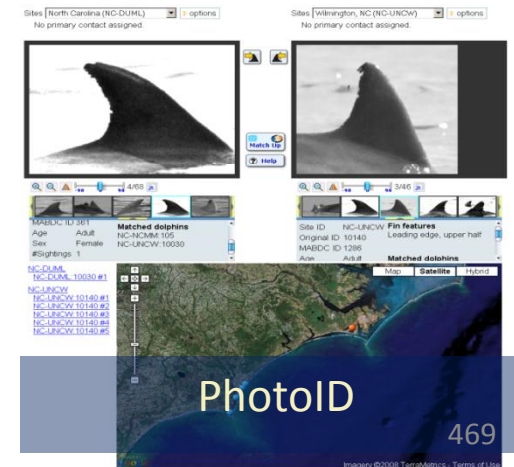
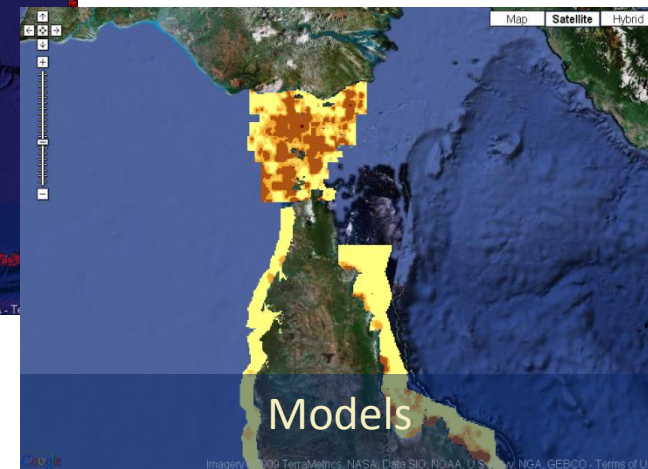
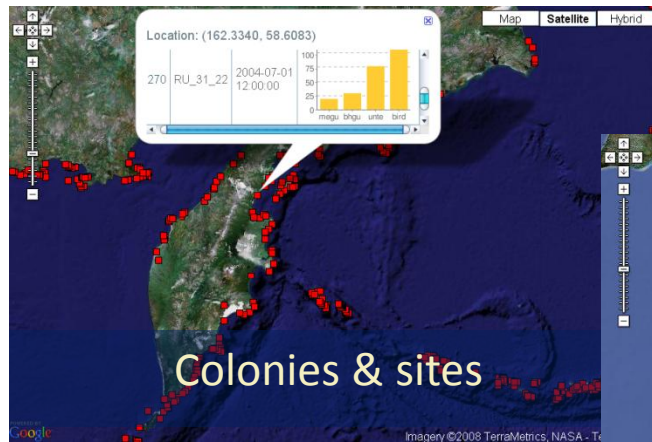
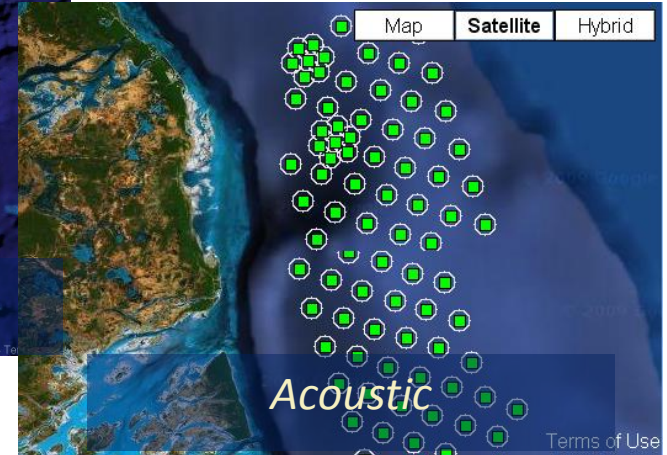
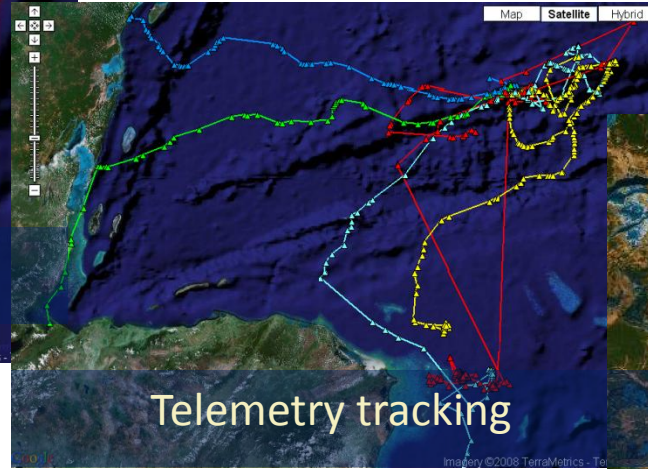
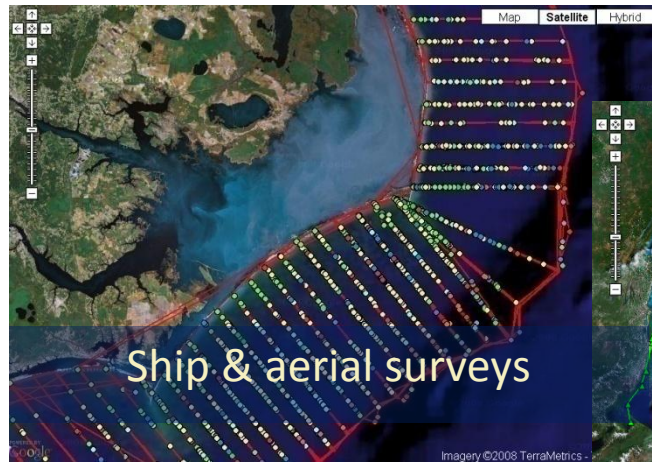


iOBIS

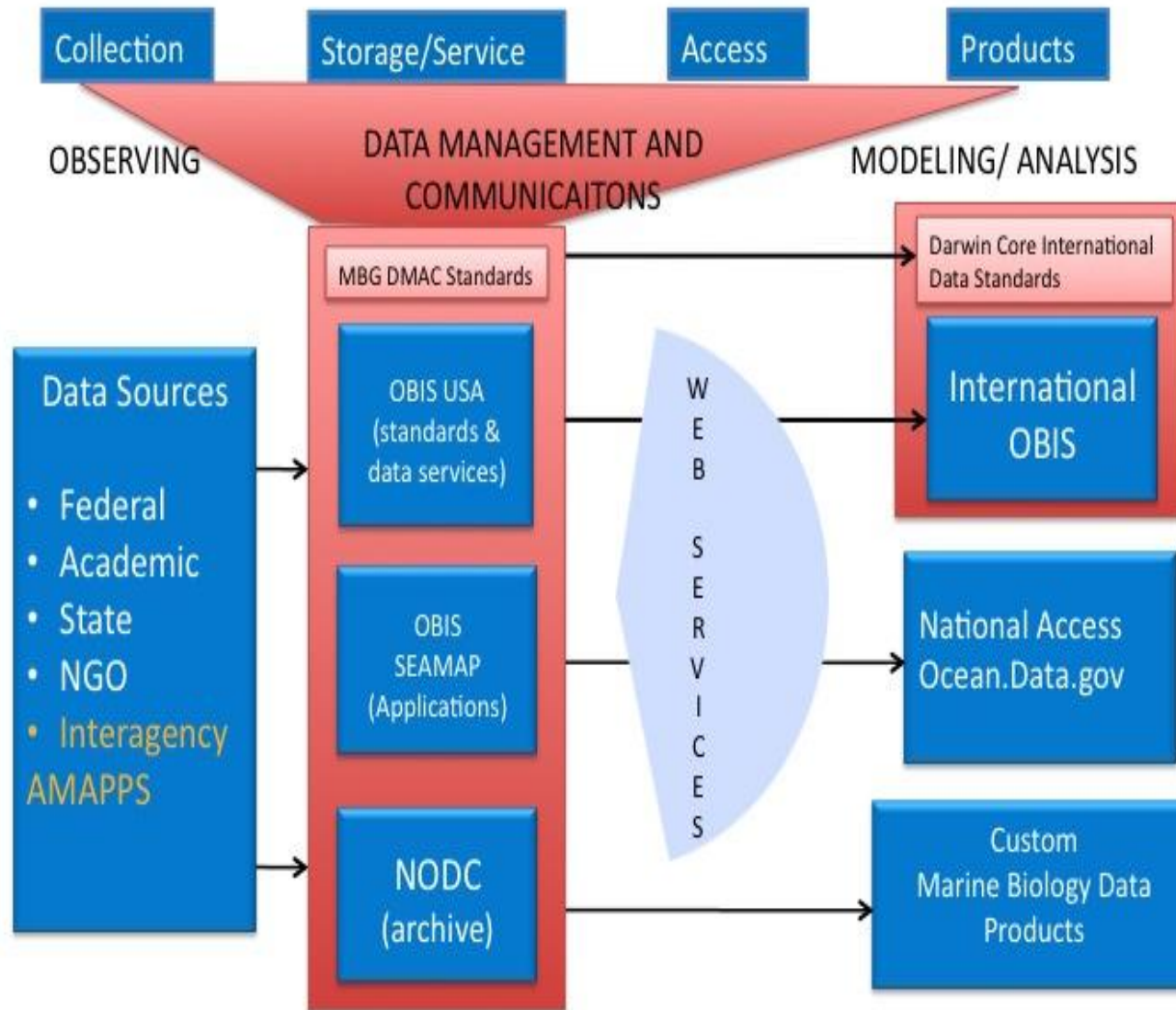


International marine
biodiversity data archive

OBIS-SEAMAP supports multiple data types



FEDERAL DATA ARCHITECTURE



Summary: Navy Data Collection

- Data collection decisions are coordinated with the regulatory agencies (NOAA Fisheries, USFWS) through **adaptive management** processes.
- Data are collected to the highest possible standards
 - Visual surveys use **effort-based methods** (e.g. Distance), **correlated with environmental data**
 - Navy LMR and ONR research programs invest in **standards development**
- Data are archived in a **common, open data architecture**
 - to ensure **maximum utility** to all agencies and the public
 - and **minimize duplication of effort** among agencies

Presentation #16

Multipurpose Marine Cadastre

Mid-Atlantic Marine Wildlife Surveys, Modeling, and
Data: Workshop to Establish Coordination &
Communication

Daniel R. Martin
Room 9153
9:00-10:45 July 25 2012



NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

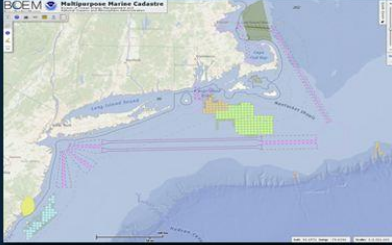
Offshore Geographic Information



MarineCadaastre.gov

MARINECADASTRE.GOV

[Home](#)[About](#)[Partnerships](#)[Data](#)[Maps and Apps](#)[Support](#)



MMC Viewer and Data Registry

The Multipurpose Marine Cadastre (MMC) is an integrated marine information system that provides authoritative and regularly updated ocean information, including offshore boundaries, infrastructure, human use, energy potential, and other data sets. The MMC is especially useful to those looking to assess suitability for ocean uses, such as energy siting. Data can be viewed in the national viewer or downloaded from its original source.

[Launch the Viewer](#)[Access the Data](#)

Highlights

South Carolina Creates an Ocean Report on the Future of their Ocean Management

South Carolina, like many coastal states, depends on the coast and oceans for a variety of revenue producing purposes. South Carolina aimed to prepare and respond to potential management challenges by implementing a new ...

So What? Marine Protected Areas

Marine protected areas (MPAs) are defined as, "... any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection ...

[Read More](#)

Map Gallery



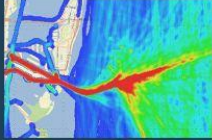
[View and create custom maps](#)

In Practice



[View examples of MarineCadaastre.gov uses](#)

Planning Tools



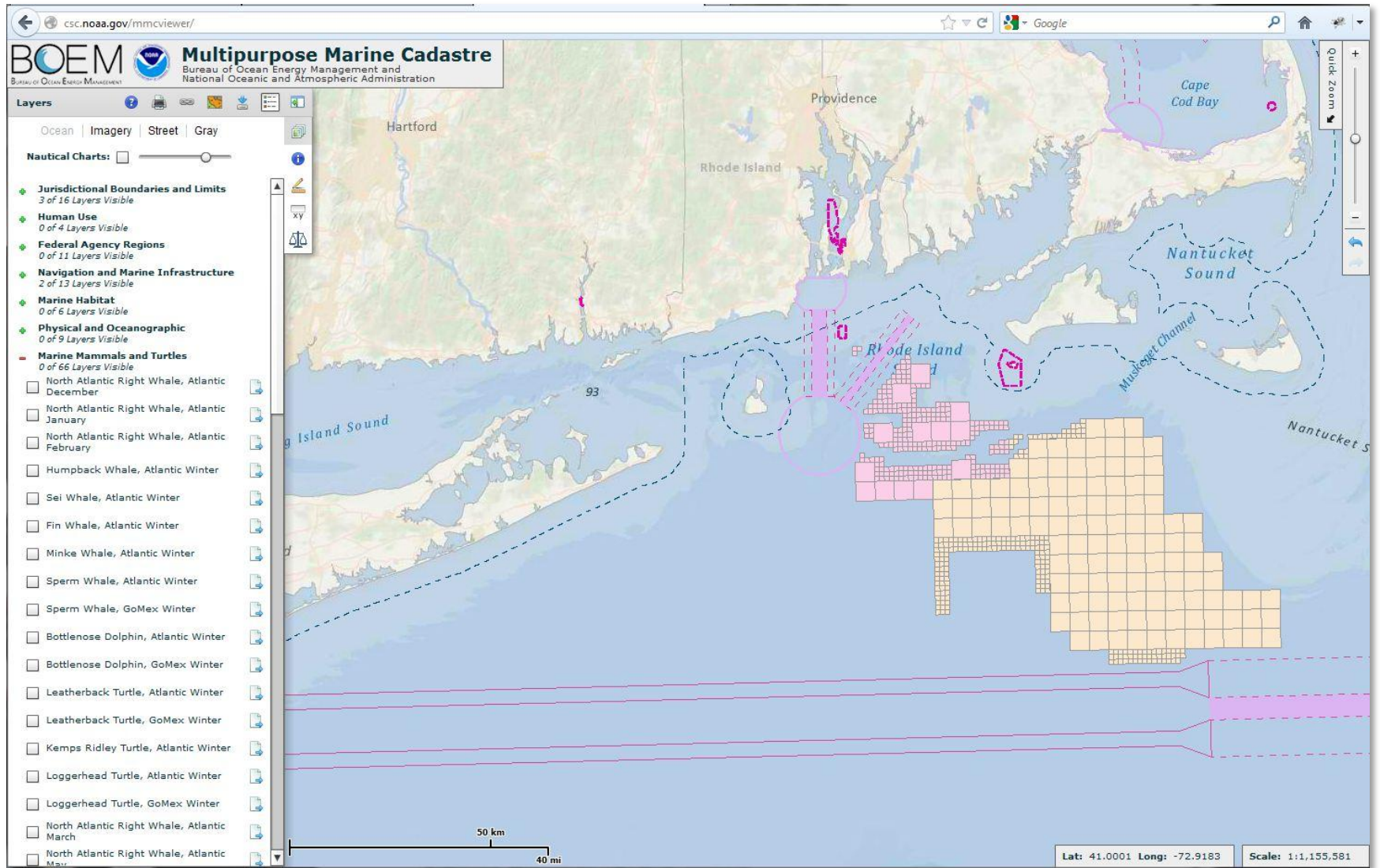
[View planning tools](#)

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Web Site Owner: [NOAA Coastal Services Center](#)

Map Viewer



Data Registry

146 layers			Themes
12NM Territorial Sea	Data Esri Service WMS	Description	Federal Agency Regions (11)
NOAA Office of Coast Survey			Federal GeoRegulations (13)
			Human Use (4)
			Jurisdictional Boundaries and Limits (23)
			Marine Habitat (7)
			Marine Mammals and Turtles (66)
			Navigation and Marine Infrastructure (13)
			Physical and Oceanographic (9)
2009 Vessel Traffic (AIS)	Data Esri Service WMS	Description	Provider
Bureau of Ocean Energy Management			Bureau of Ocean Energy Management (19)
			Department of Defense, U.S. Navy (70)
			DOE Federal Energy Regulatory Commission (1)
			DOE National Renewable Energy Laboratory (1)
			DOE Office of Energy Efficiency and Renewable Energy (2)
			National Geospatial Intelligence Agency (1)
			NOAA Coastal Services Center (32)
			NOAA National Marine Fisheries Service (3)
			NOAA National Marine Fisheries Service Southwest Regional Office (1)
			NOAA National Marine Sanctuary Program (3)
			NOAA National MPA Center (2)
			NOAA Office of Coast Survey (6)
			Pacific Coast Marine Habitat Program (2)
			U.S. Fish and Wildlife Service (1)
			U.S. Geological Survey (2)
200NM EEZ and Maritime Boundaries	Data Esri Service WMS	Description	
NOAA Office of Coast Survey			
24NM Contiguous Zone	Data Esri Service WMS	Description	
NOAA Office of Coast Survey			
Abandoned Shipwreck Act	Data Esri Service WMS	Description	
NOAA Coastal Services Center			
Active Oil and Gas Leases	Data Esri Service WMS	Description	
Bureau of Ocean Energy Management			
Active Renewable Energy Leases	Data Esri Service WMS	Description	
Bureau of Ocean Energy Management			
Aids to Navigation	Data Esri Service WMS	Description	
NOAA Coastal Services Center			
Anchorage Areas	Data Esri Service WMS	Description	
NOAA Coastal Services Center			

Gallery

MARINECADASTRE.GOV

Home

About

Partnerships

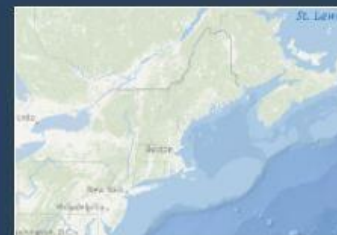
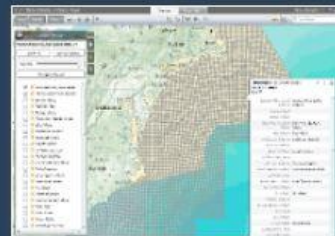
Data

Maps and Apps

Support

Map Gallery

The Marine Cadastre Map Gallery, a collection of ArcGIS Explorer Online maps, enables ocean planners to create custom data viewers by combining authoritative data from the Marine Cadastre Data Registry with more locally relevant web map services. Some examples of custom data viewers are below. Users can import data into an existing map within the gallery or start fresh. View the Map Gallery resources to learn how to create a map for the Map Gallery. Additional maps can be found within our group on [ArcGIS Explorer Online](#).



Overview

- What is ArcGIS Online?
- What is ArcGIS Explorer Online?

The Basics

- Open and Explore a Map
- Create a New Map
- Find and Add Content
- Share Your Map

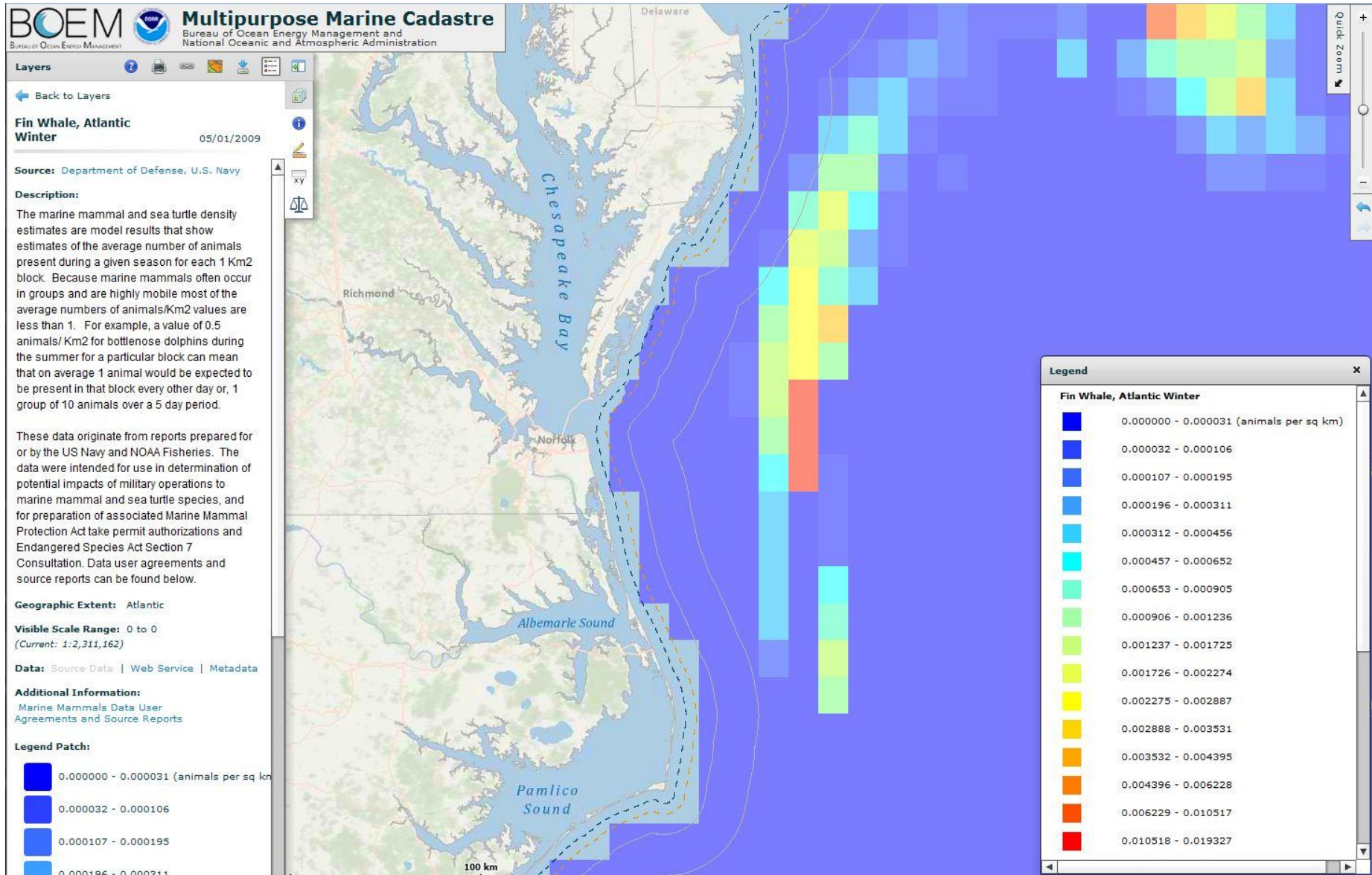
Advance Use

- Organize the Map
- Adjust Transparency
- Work with Queries

Sample Data Resources

- Marine Cadastre Data Registry
- NOAA CMSP Data Registry
- Ocean Community
- Northeast Ocean Data Portal

Documentation

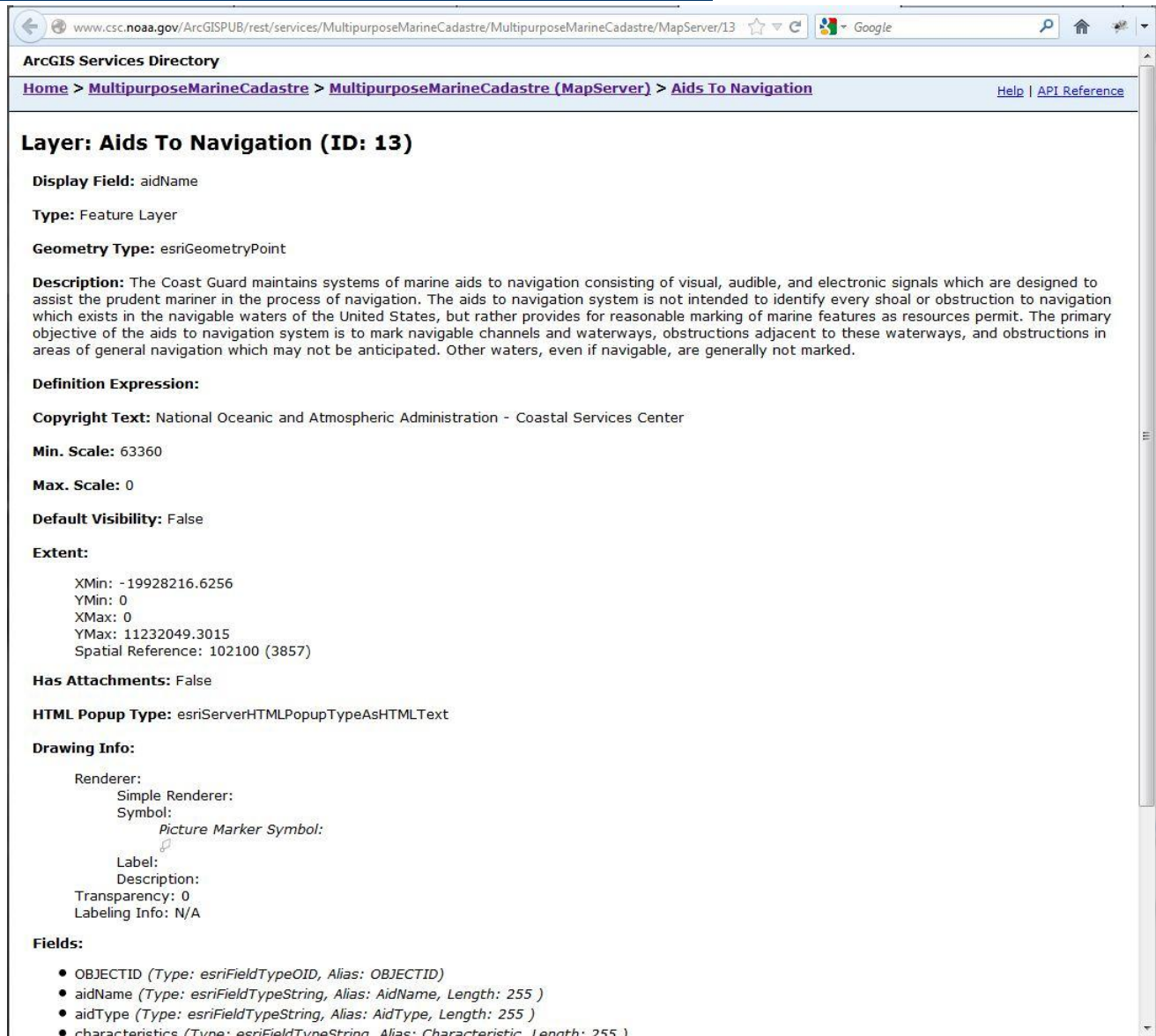


Architecture

- Distributed
 - Storage
 - Application Server
 - Clients
-
- Ocean.data.gov



Our API / Web Services



The screenshot shows a web browser window displaying the ArcGIS Services Directory. The address bar shows the URL: www.csc.noaa.gov/ArcGIS/PUB/rest/services/MultipurposeMarineCadastr/MultipurposeMarineCadastr/MapServer/13. The page title is "ArcGIS Services Directory". The breadcrumb navigation is: [Home](#) > [MultipurposeMarineCadastr](#) > [MultipurposeMarineCadastr \(MapServer\)](#) > [Aids To Navigation](#). There are links for [Help](#) and [API Reference](#).

Layer: Aids To Navigation (ID: 13)

Display Field: aidName

Type: Feature Layer

Geometry Type: esriGeometryPoint

Description: The Coast Guard maintains systems of marine aids to navigation consisting of visual, audible, and electronic signals which are designed to assist the prudent mariner in the process of navigation. The aids to navigation system is not intended to identify every shoal or obstruction to navigation which exists in the navigable waters of the United States, but rather provides for reasonable marking of marine features as resources permit. The primary objective of the aids to navigation system is to mark navigable channels and waterways, obstructions adjacent to these waterways, and obstructions in areas of general navigation which may not be anticipated. Other waters, even if navigable, are generally not marked.

Definition Expression:

Copyright Text: National Oceanic and Atmospheric Administration - Coastal Services Center

Min. Scale: 63360

Max. Scale: 0

Default Visibility: False

Extent:

XMin: -19928216.6256
YMin: 0
XMax: 0
YMax: 11232049.3015
Spatial Reference: 102100 (3857)

Has Attachments: False

HTML Popup Type: esriServerHTMLPopupTypeAsHTMLText

Drawing Info:

Renderer:
Simple Renderer:
Symbol:
Picture Marker Symbol:
Label:
Description:
Transparency: 0
Labeling Info: N/A

Fields:

- OBJECTID (Type: esriFieldTypeOID, Alias: OBJECTID)
- aidName (Type: esriFieldTypeString, Alias: AidName, Length: 255)
- aidType (Type: esriFieldTypeString, Alias: AidType, Length: 255)
- characteristics (Type: esriFieldTypeString, Alias: Characteristic, Length: 255)

Next Year

- New data products
- New map viewers and other user tools
- Ongoing requirements process
- Regional network
- Direct technical assistance



Daniel R. Martin
daniel.martin@noaa.gov

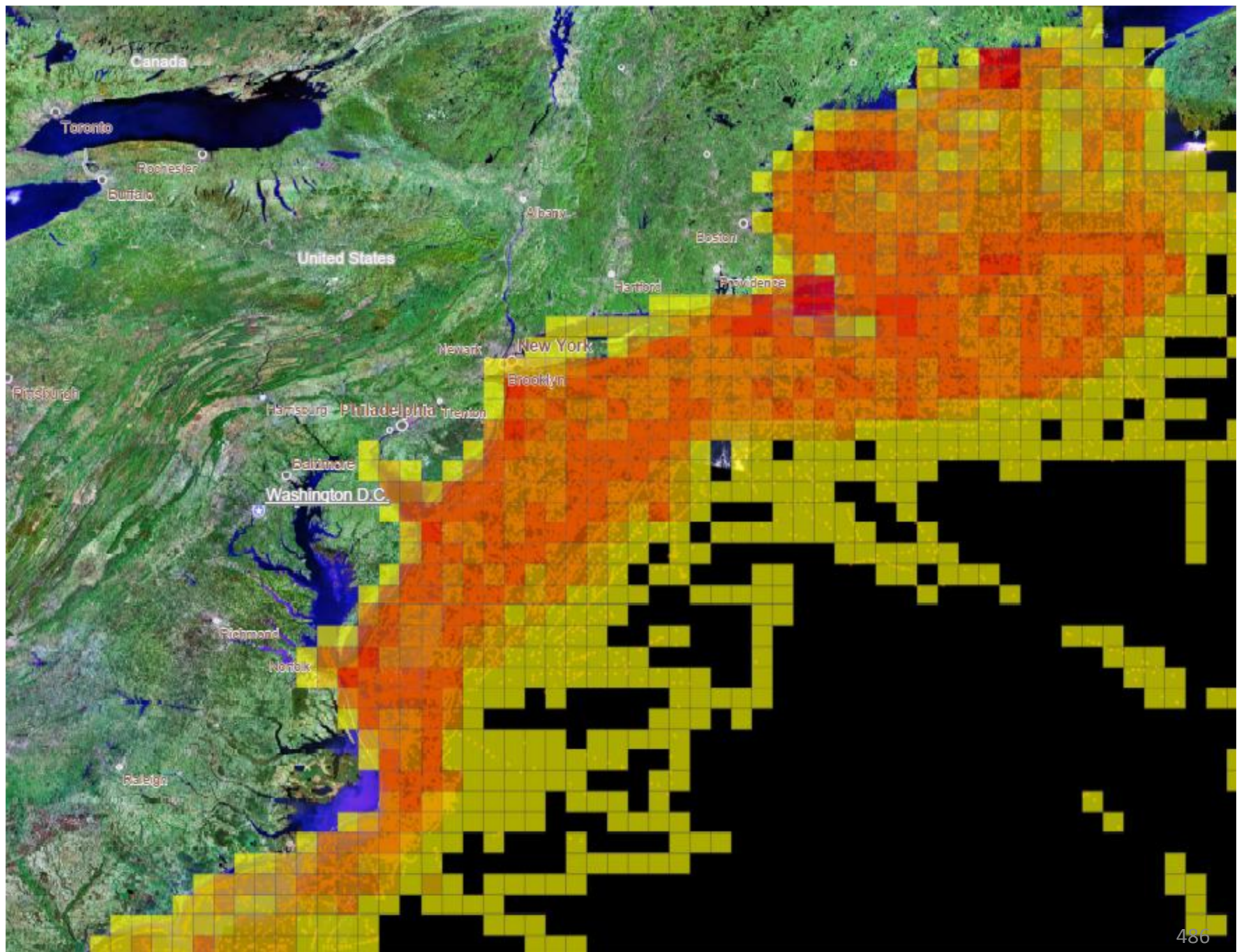


NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

Presentation #17

Atlantic Seabird Survey Compendium

DOE / NOAA Coordination Meeting
Mid-Atlantic Marine Wildlife Surveys, Modeling, and Data
24 – 25 July, 2012 Silver Spring, MD



Data Lifecycle

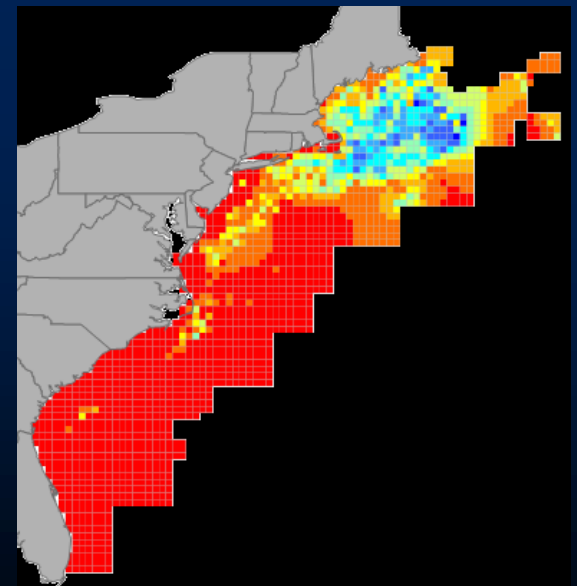
- Field...paper or file?
 - Jessica Taylor's example of a photo per second, with loc/elevation/airspeed, other covariates: metadata vs data at point, transect, survey, study.
- Capture to file
 - corrections
- Conversion, e.g to gdb / other db
 - Corrections
- To data repository or bigger gdb or other db
 - Corrections
- Who has latest copy?
 - Corrections, maybe a paper is published
- To archive / repository

Data Lifecycle, continued

- What to capture?
 - From survey
 - To local entry
 - To merged dataset
 - To archive /repository
- What gets dropped along the way?
 - It isn't free
 - We can't store NEXRAD data – multi-pronged studies

Primary purpose

- Supporting research & modeling
 - Supporting Brian Kinlan/ Elise Zipkin & others
 - Andrew Gilbert's work with Beth Gardner
- Management / Planning
- Sharing / broader use
 - The derived products
 - Raw data last



Sharing and Integration

- Purpose of sharing?
 - Cost vs. value? With respect to decision-making?
- Tension: specificity vs. broad sharing
- What's bad about federal data standards and big repositories?
 - Trick question! (in space, no one can hear you...)
 - Data collectors: archiving != data mgmt
 - Planners: data != “data”
 - Part of the broader ecosystem of tools

Future: where will we be in two years?

- The future: Who cares?
 - “Owned by FWS” down the road? Pipe dreams / shared reality
 - Let’s recognizing a shared resource
 - Not a single steward or a single expert
- NOW: coordination, modeling, planning
 - Our collaboration with FWS & BOEM
 - Coordination with community

Example: interoperability vs. storage format

pgAdmin III

File Edit Plugins View Tools Help

Object browser

- Functions (0)
- Sequences (22)
- Tables (32)
 - atl_blkdp
 - bathymetry_slope
 - citeinfo
 - cntinfo
 - conveyance
 - counts_temp
 - crosstab_observation
 - datacat
 - dataset
 - dataset_type
 - effort_temp
 - email
 - five_min_equiv
 - location
 - lu_country
 - lu_coveragearea
 - lu_people
 - lu_qual
 - lu_states
 - lu_subject
 - monthly_chlor
 - monthly_fronts_sst
 - monthly_nao
 - monthly_oceanwinds
 - seabird_datasets
 - species
 - species_type
 - survey_method
 - survey_platform
 - temp_focal_bird_counts

Query - seabirds on postgres@localhost:5433 *

File Edit Query Favourites Macros View Help

SQL Editor Graphical Query Builder

Previous queries

```

1 SELECT title, keywords, datastatus, progress, startdate, enddate
2 FROM seabird.datacat

```

Output pane

Data Output Explain Messages History

	title character varying(255)	keywords character varying(255)	datastatus character varying(255)	progress character v
1	Cape Wind - Nantucket Sc	Seabird, aerial sur	Observation Date	Complete
2	Acoustic Herring Survey	herring, acoustic h	Ground Condition	Complete
3	Acoustic Herring Survey	herring, acoustic h	Ground Condition	Complete
4	Acoustic Herring Survey	herring, acoustic h	Ground Condition	Complete
5	Cape Wind - Nantucket Sc	Seabird, aerial sur	Observation Date	Complete
6	NJ DEP 2009			
7	Winter Survey of Mid-Atl	seabirds, Mid-Atlan	Observation Date	Complete
8	Sargasso cruise - bird s	seabirds; Sargasso	Observation Date	Complete
9	Seabird bycatch - Northv	seabird, bycatch, e	Observation Date	In Work
10	Acoustic Herring Survey	herring, acoustic h	Ground Condition	Complete

Getting Coordination / Communication into the Data Lifecycle

- Coordination tools are very different from archiving tools
 - What about the URI surveys? Or was that SAMP? Or was that Paton?
 - “Do you have Dick Veit’s data?”
 - Where is “Onslow Bay?”
- Data policy
- Coordination

Information is Coordination

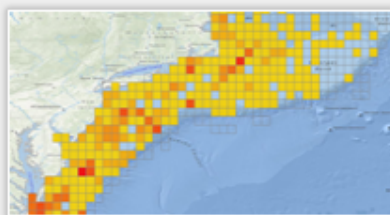
- Lifecycle includes
 - Analytical tools attached to OBIS-Seamap
 - Downloadable data with complete metadata
 - Derived tools for MARCO
- Lifecycle includes:
 - Data policy and metadata go along with occurrence datasets

OCEAN, COAST, AND GREAT LAKES PLANNING DATA

Explore, discover and access a variety of rich spatial and non-spatial data. We've identified a few data sources that we want to highlight. We've identified other data sources you may want to access in your search and we are providing a link to geo.data.gov where you can search all of the Federal geospatial data available through data.gov. We are just getting started, so if you can't find the data you are looking for, **please tell us!**

[BROWSE ALL DATASETS](#)

Featured Data

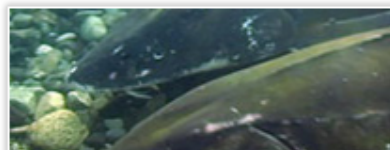


Atlantic Offshore Seabird Dataset Catalog

U.S. Geological Survey

Several bureaus within the Department of Interior compiled available information from seabird observation datasets from the Atlantic Outer...

[\(View full metadata\)](#)



Endangered Species Act Critical Habitat

NOAA, National Marine Fisheries Service, Office of Protected Resources
Critical habitat (CH) is designated for the survival and recovery of species listed as threatened or endangered under the Endangered Species Act (ESA...

[\(View full metadata\)](#)

Quick Search

- > Administrative and Regulatory
- > Biology and Habitats
- > Ecological Functions, Processes, and Impacts
- > Elevation and Bathymetry
- > Energy and Mineral Resources
- > Human Use
- > Physical and Oceanographic

Other Data Sources

Presentation #18



National Oceanographic Data Center

An Ocean of Data and Information

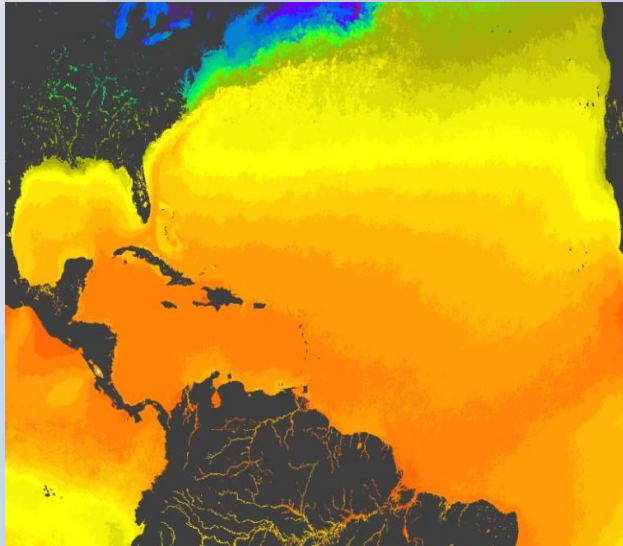
Krisa Arzayus, PhD

Mid-Atlantic Marine Wildlife Surveys, Modeling, and Data Workshop
July 24-25, 2012



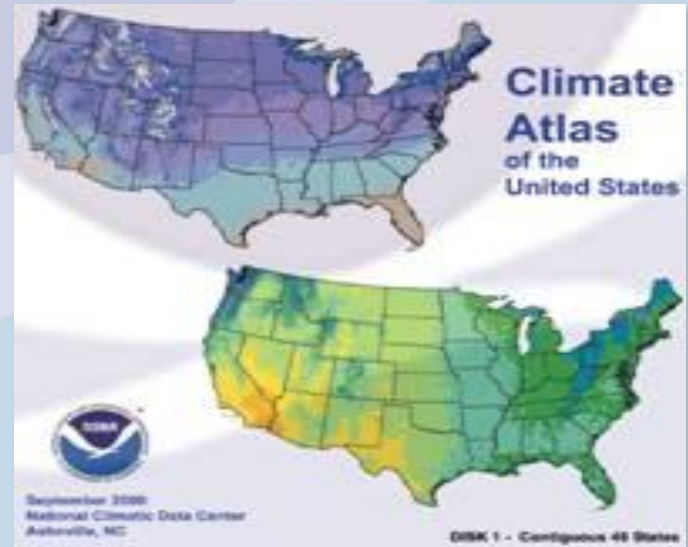
NOAA Data Centers

NODC - Understanding Our Coasts and Oceans

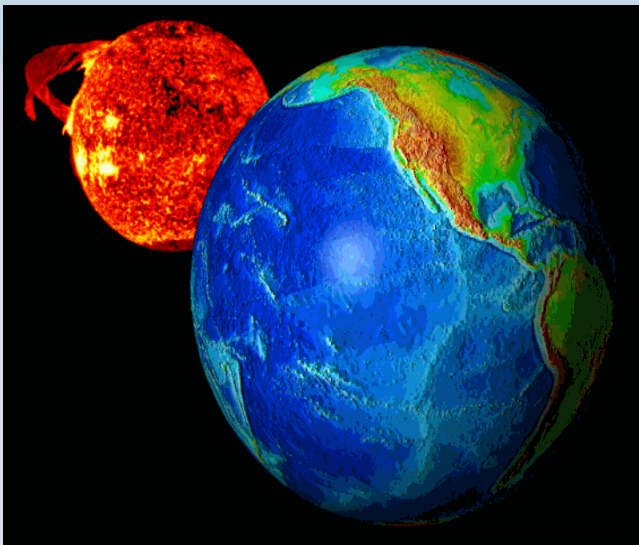


Archive – Access - Stewardship

NCDC - Understanding Our Climate



NGDC - Understanding Our World



Curators of the Nation's Environmental Data

NODC Mission

To provide scientific stewardship of marine data and information



Underway



CTD/Niskin



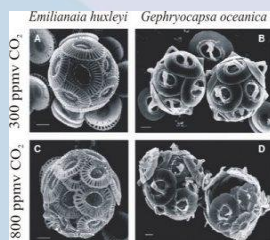
Buoys



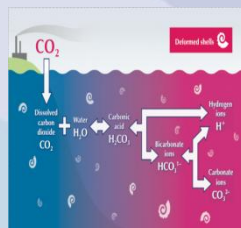
Plankton



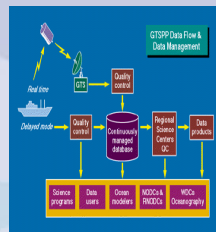
Arg



experimental



mode



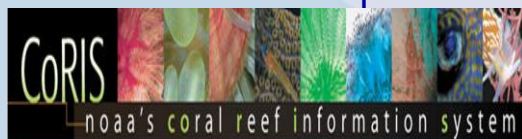
GTSP



satellite



Glider



Coral Reef Information System



Instrumented Animals



SeaSor

NODC manages the world's largest collection of publicly available *in situ* and remotely sensed physical, chemical, and biological oceanographic data.



NODC History

- The NOAA National Oceanographic Data Center (NODC) opened its doors in 1961, recently celebrating fifty years of acquiring, archiving, assessing, and providing access to ocean data and information.
- The NODC archive has evolved from a disparate collection of databases to a unified Archive Management System, and most recently has begun incorporating a wide range of internationally accepted interoperable data tools and services.
 - Discovery Services: the OGC Catalog Service for the Web (CSW) and Search and Retrieval by URL (SRU) profile of ISO 23950.
 - Data access and use services: OPeNDAP's Data Access Protocol (DAP), the OGC Web Mapping Service (WMS), Web Coverage Service (WCS)
 - Metadata services: FGDC metadata and increasingly ISO 19115.
 - Online browse, visualization and analysis systems: Live Access Server (LAS), ArcGIS Server, and a Geoportal

1961: NODC dedicated, primarily handling MBT data	1967: "Accession" structure implemented	1968: First magnetic tape	1970s-1990s: Multiple inventory databases with Catalog Database wrapper. Scope of collections expands dramatically	1992: NOAA library catalog goes online (up to 9600 baud!)	1999: Accession Tracking Data Base (ATDB) implemented	2003: NODC "parameter neutral" Archive Management System emerges	2003: DODS, precursor to OPeNDAP, goes live	2006: First automated data stream (GHRSSST)	Mar 2010: Web Accessible Folders (WAF) of metadata published	Apr 2010: THREDDS Data Server goes live	Jun 2010: Live Access Server goes live	Sep 2011: Geoportal Server and ArcGIS Server go live
---	---	---------------------------	--	---	---	--	---	---	--	---	--	--

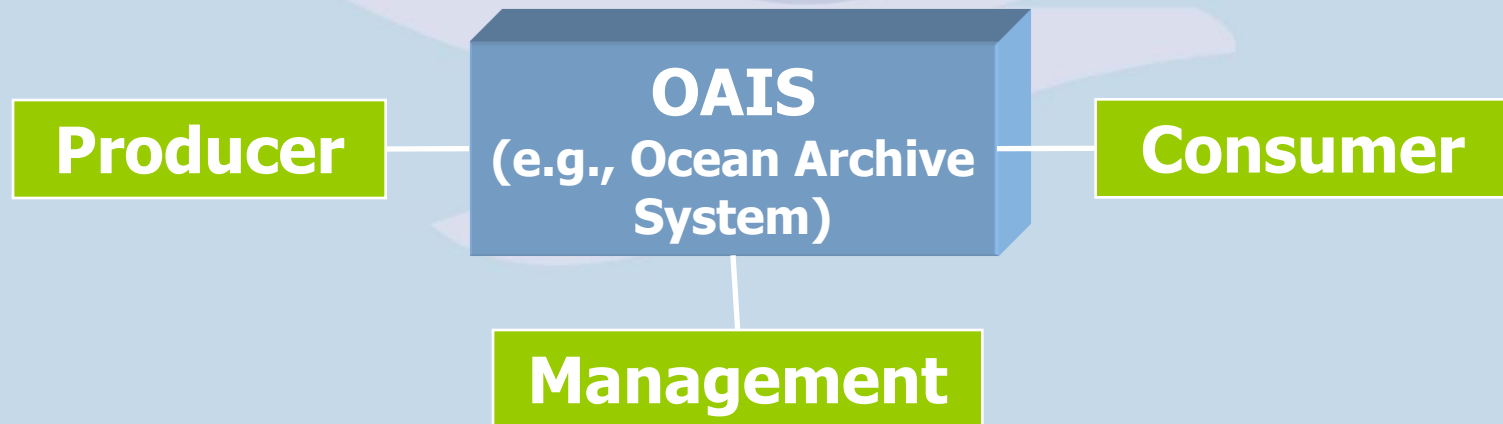


NODC's Ocean Archive System

(An Open Archival Information System)

<http://www.nodc.noaa.gov/Archive/Search/>

- **Producer** provides information to be preserved
- **Management** sets overall policy
- **Consumer** seeks and acquires preserved information

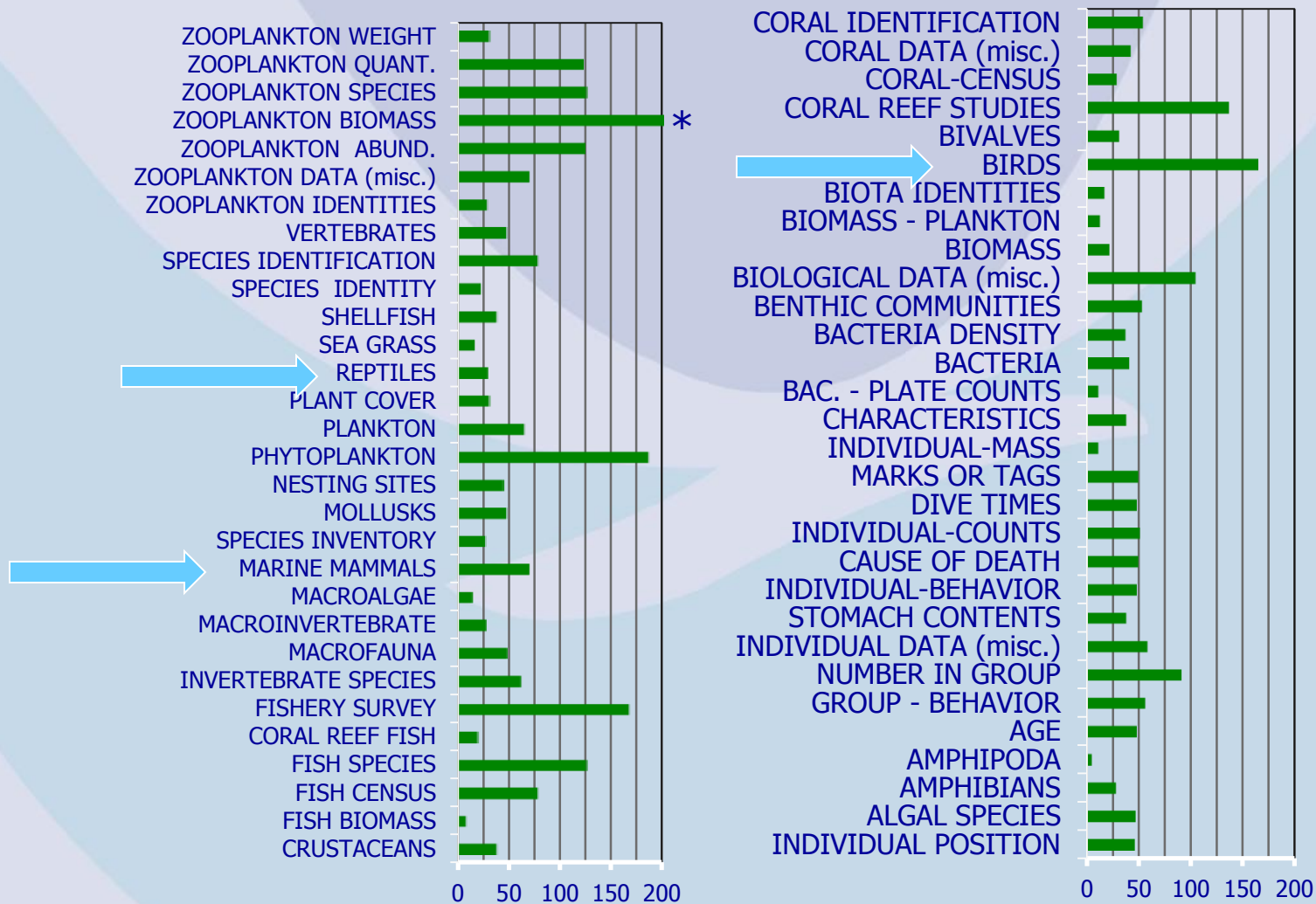


The OAIS Environment from 30,000 ft



Overview of NODC Biological Data (as of April 2011)

2000+ accessions; 678 from Cape Hatteras to Scotian Shelf



Number of Data Sets (in units of NODC Accessions)

502
* > 200



Ocean Data Access

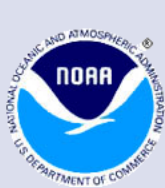
NODC data used for a multitude of purposes



An effective data archive should provide for discovery, access, and integration

Objectives:

- Provide data discovery protocols for coastal and ocean data;
- Develop tools that support NOAA's requirements for data integration;
- Engage with the data providers to ensure appropriate metadata are submitted;
- Train and educate data producers and consumers in metadata production.



NODC Enables Archived Data to Serve as a Platform for Science and Applications





NODC Levels of Stewardship

**Lead
Community**

Build CDRs

Derive Products

**Scientific QC, Reprocess,
Improve**

**Tailored
Access**

**Long-Term Preservation and
Access**

Core services:

- Archive and preserve ocean data;
- Describe data to facilitate discovery and use;
- Provide access and visualization services; Improve quality of data;
- Derive products such as climatologies (which improve the quality and value of the data);
- Long term quality, consistency, accuracy
- Lead the community in development of stewardship standards

Presentation #19

Virginia and Mid-Atlantic Ocean Planning



Laura McKay



Virginia Coastal Zone
MANAGEMENT PROGRAM



Regional Ocean Partnerships



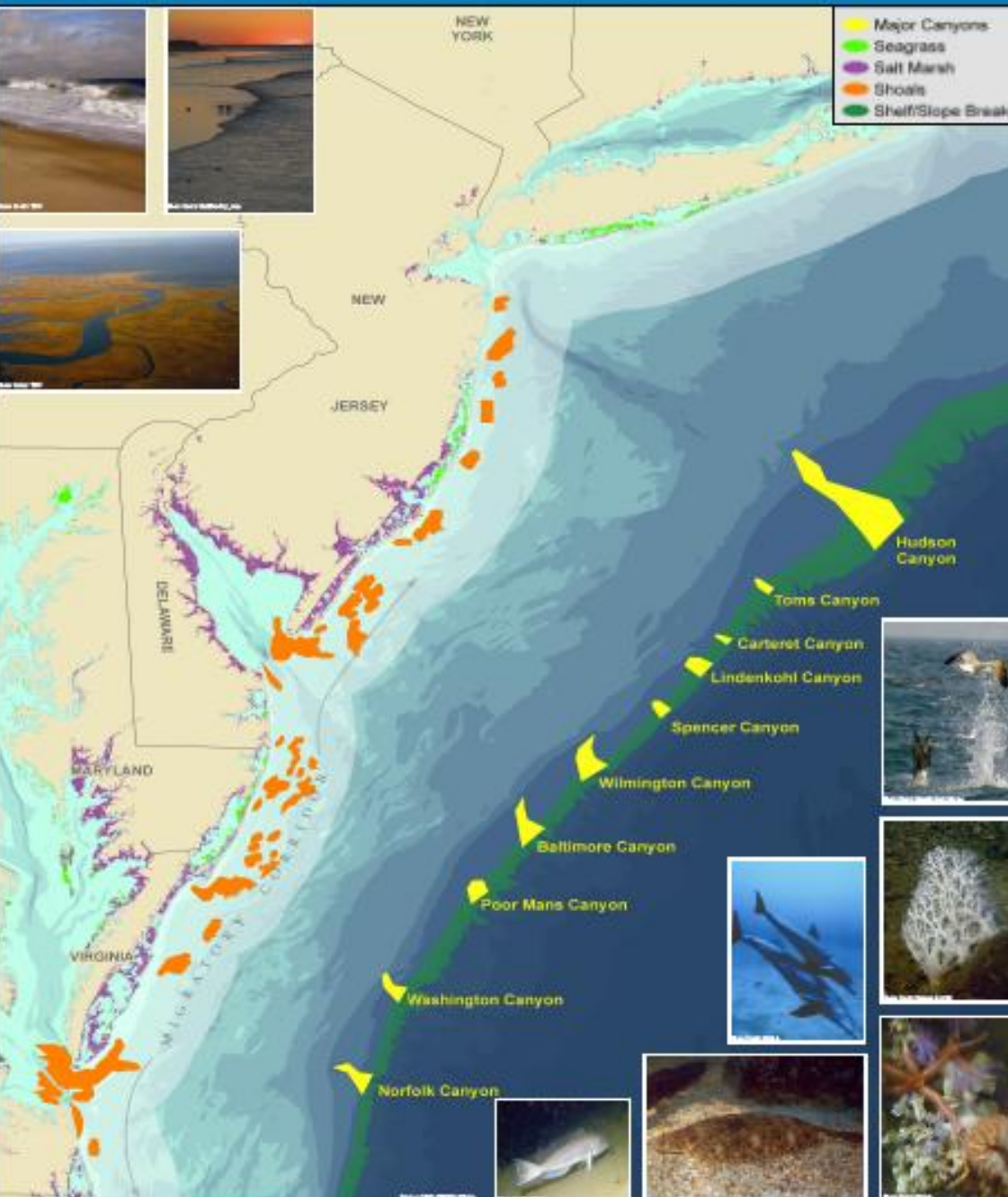
- New England Regional Ocean Council (NROC)
- Mid-Atlantic Regional Council on the Ocean (MARCO)
- South Atlantic Governors' Alliance (SAGA)
- Gulf Mexico Alliance (GOMA)
- West Coast Governors' Alliance (WCGA)

Mid-Atlantic Regional Council on the Ocean (MARCO)

- June 2009 the five governors signed the Mid-Atlantic Ocean Governors' Agreement on Ocean Conservation
- December 2009 held Stakeholder Conference in New York



Mid-Atlantic Ocean - Habitats



MARCO Priorities

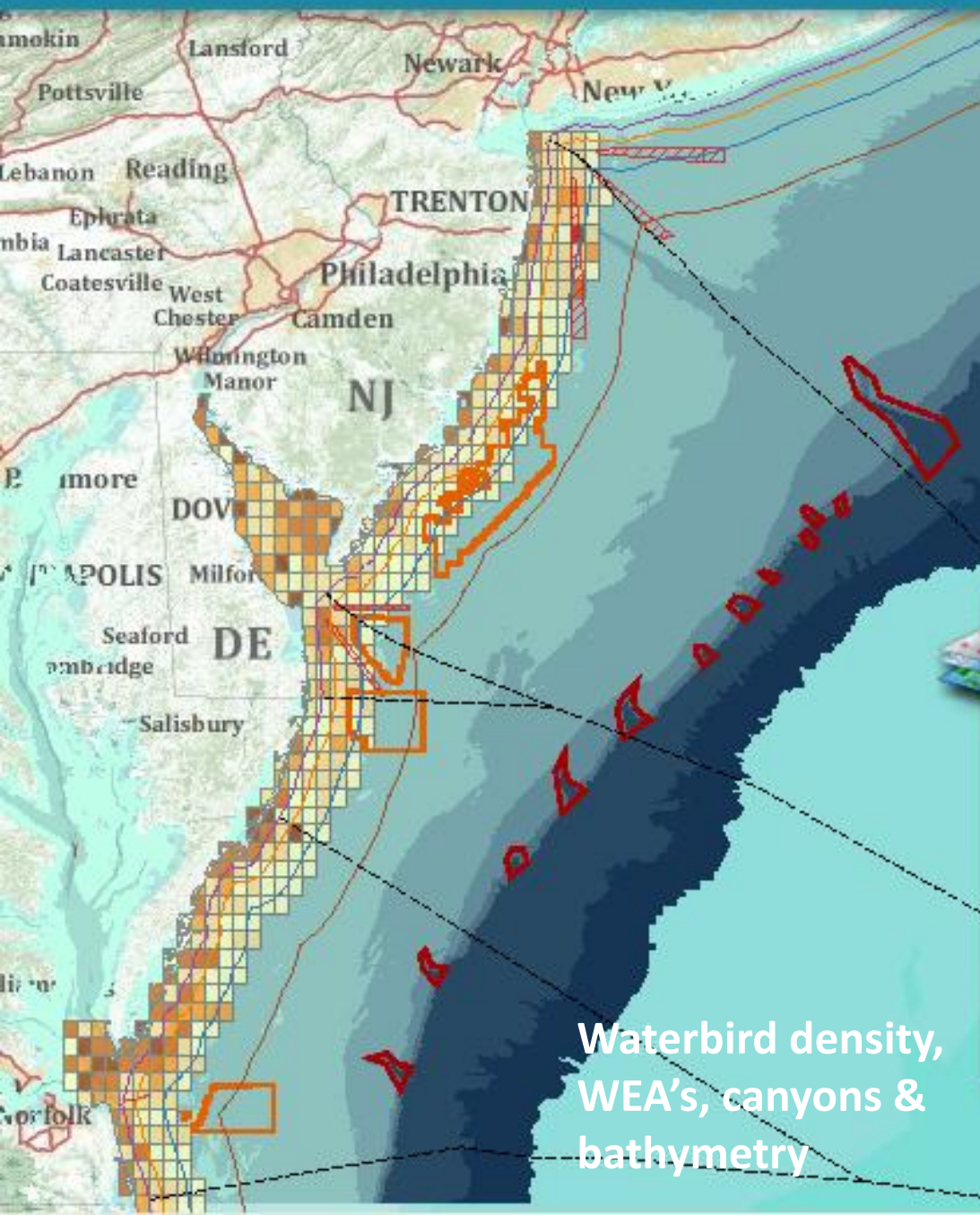
- Protect Key Ocean Habitats
- Improve Water Quality
- Adapt to Climate Change
- Promote Renewable Offshore Energy
- Ocean Planning

MARCO Structure

Five Action Teams:

1. Offshore Habitats
Lead: NY – Greg Capobianco
2. Water Quality
Lead: MD – Sarah Lane
3. Climate Change and Coastal Resiliency
Lead: DE – Sarah Cooksey
4. Offshore Renewable Energy
Lead: MD – Gwynne Schultz
5. Ocean Planning (previously CMSP)
Lead: VA – Laura McKay





• Ocean Planning

VA CZM funded portal development by TNC in December 2009

First in nation regional ocean portal launched December 2010

- 6 categories
- 30 data layers
- user-friendly fact sheets

Waterbird density,
WEA's, canyons &
bathymetry

National Ocean Policy

- Regional Planning Bodies being formed
 - Mid-Atlantic federal reps already appointed
 - NOC letters mailed to Governor McDonnell and MAFMC on June 15. Two VA appointees and one MAFMC by July 10
- 5 years to develop regional goals and ocean plans



THE WHITE HOUSE COUNCIL ON ENVIRONMENTAL QUALITY

*Final Recommendations
Of The
Interagency Ocean Policy
Task Force
July 19, 2010*



5 Year CZM Grant for Virginia Ocean Plan

- About \$100k/yr for 5 years: Oct 2011 – Sep 2016
- Funds for staff support, workshops, data
- Opportunity to compete for NOAA/CZM “Projects of Special Merit” *VA CZM Received \$180k for a PSM to document whale migration off Virginia’s coast*



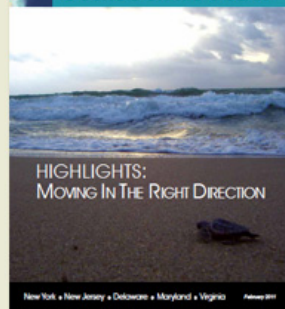
Mid-Atlantic Regional Council on the Ocean

New York New Jersey Delaware Maryland Virginia


[Home](#) | [Agreement](#) | [Documents](#) | [State Links](#) | [MARCO Portal](#) | [Contact Us](#)

MARCO Highlights - Moving in the Right Direction

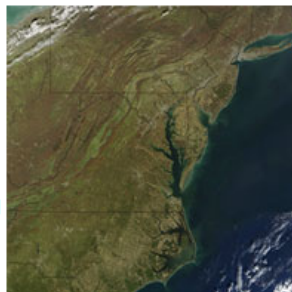
MID-ATLANTIC REGIONAL COUNCIL ON THE OCEAN



Since the first conversations among the States in 2008, MARCO has made significant progress in establishing and embarking on a regional agenda

What is the Mid-Atlantic Regional Council on the Ocean?

The ocean waters of the Mid-Atlantic, stretching from New York to Virginia, provide a wealth of economic and environmental services to local communities, States, and the nation. At the same time, the people of the Mid-Atlantic region are a significant force that influences our ocean and coastal environment. We change the coastline and watershed through our buildings and development, we harvest the ocean's resources through increasingly efficient means, and we rely on offshore waters to support diverse activities such as maritime commerce and recreation. As the intensity of these human influences has increased, they have at times led to significant threats to the health of our ecosystems. Now our ocean and coastal resources face a new generation of challenges, and these challenges are only growing in their urgency.



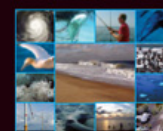
To successfully address these challenges, and to ensure that future generations can enjoy healthy and productive ocean ecosystems, the Governors of New York, New Jersey, Delaware, Maryland and Virginia

2011-2012 MARCO Workplan

MID-ATLANTIC REGIONAL COUNCIL ON THE OCEAN

2011-2012
MARCO Workplan

June 15, 2011



New York - New Jersey - Delaware - Maryland - Virginia

The 2011-2012 MARCO Workplan describes the actions that will be completed by MARCO's five issue Action Teams. Click the thumbnail above to view the Workplan.

Governors

Martin O'Malley
Governor, Maryland
Andrew Cuomo
Governor, New York
Chris Christie
Governor, New Jersey
Jack A. Markell
Governor, Delaware
Robert F. McDonnell
Governor, Virginia



quality of life and economic vitality of our region's communities well into the future.

[Mid-Atlantic Governors' Agreement on Ocean Conservation](#) (June, 2009)

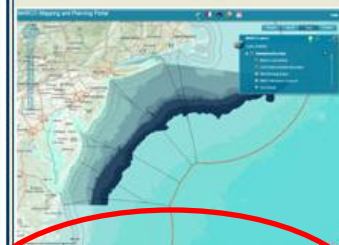
[Actions, Timelines, and Leadership to Advance The Mid-Atlantic Governors' Agreement on Ocean Conservation](#) (August, 2009)



Regional Photo Courtesy of Jacques Desloittres, MODIS Rapid Response Team

Getting to the Portal via MARCO's Website

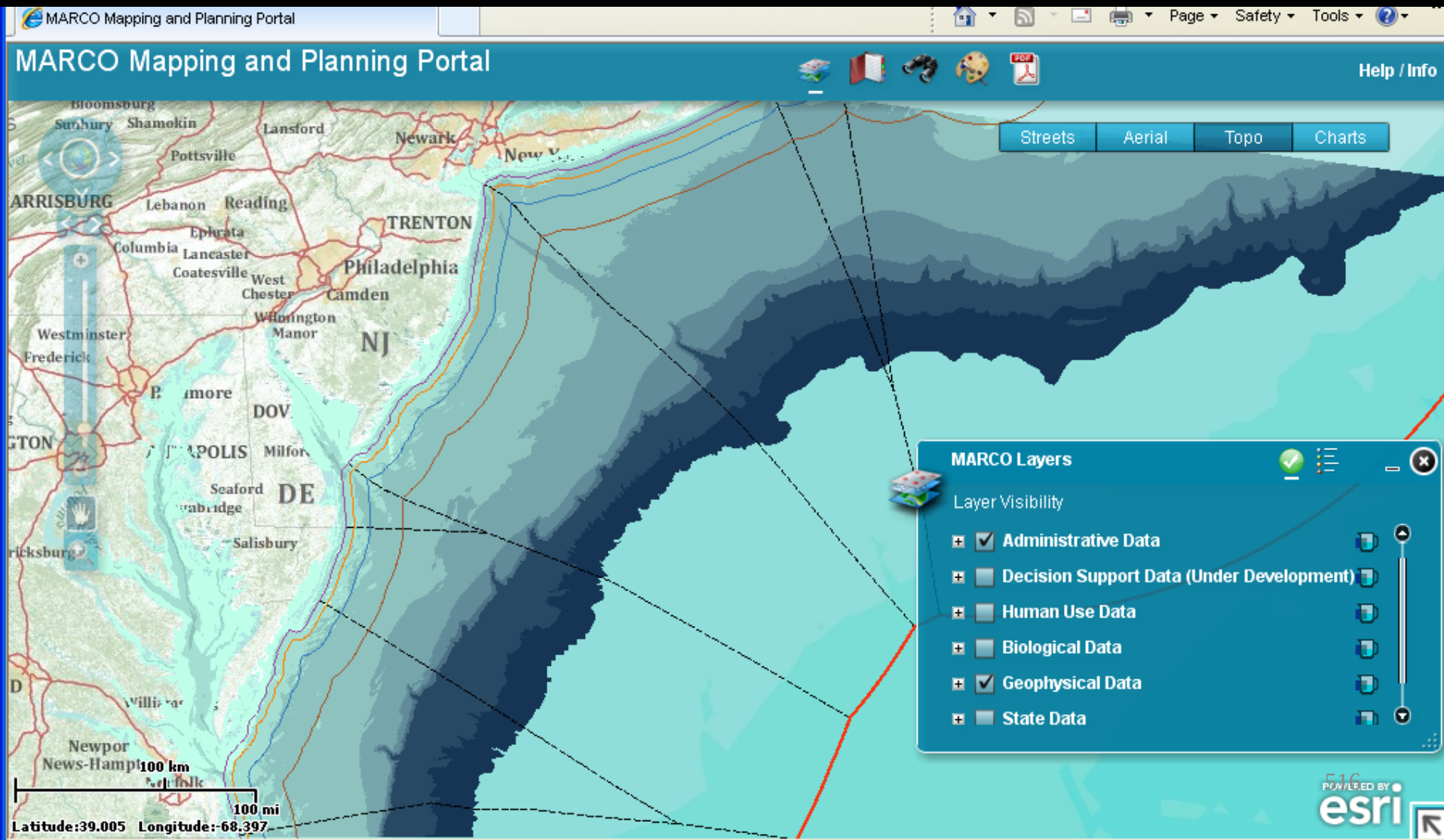
MARCO Announces New Mapping and Planning Portal for Mid-Atlantic Region



The [MARCO Mapping and Planning Portal](#) is an online tool that allows state, federal, and local decision-makers and the public to visualize, query, map, and analyze ocean and coastal data in the Mid-Atlantic region. The Virginia Coastal Zone Management Program provided funding (through their CZM Award from the National Oceanic and

MARCO Mapping & Planning Portal

Available at www.midatlanticocean.org



Data Needs Update

Administrative

- Work Underway Military, hazard & restricted areas

Biological

- No Work Coastal Bird Habitat & Migration
- Work Underway Deep water corals, locations, predictive model
- Work Underway Marine Mammal Migratory Pathways
- Work Underway Sea Bird Predictive Distribution Model
- No Work Select TNC NAM ERA data

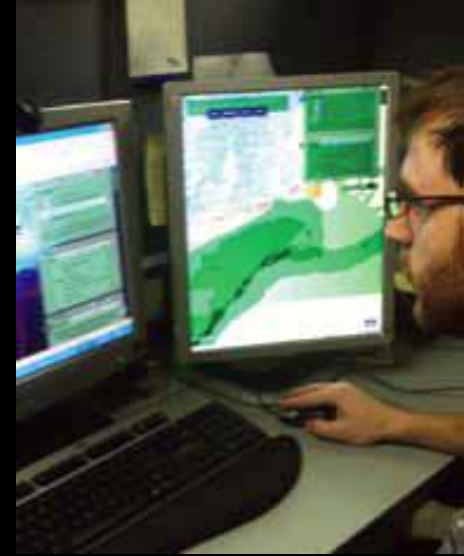
Geophysical

- Work Underway Finite Volume Coastal Ocean Model

Human Use

- No Work State fisheries data

- Work Underway Discharge points
- Work Underway Port locations
- Work Underway Energy Facilities
- Work Underway Mining locations
- Work Underway Recreational boating and fishing
- Work Underway Commercial fisheries: VMS
- No Work Commercial fisheries: VTR
- No Work Commercial shipping: AIS



Legend

- No Work
- Work Underway
- Data Products Available

Monmouth Team

ROP Grant from NOAA

Portal Enhancements

July 2012

- Additional data acquisition and viewing functions
- NOAA and MARCO review

August 2012

- New website version launched
- More data
- Viewable sector-specific parameters and spatial filters

December 2012

- More data
- More spatial filters
- Ability to design/ analyze areas and generate reports

June 2013 - Final Portal

- Peer reviewed
- All stakeholder data incorporated
- Improved feature and functions



**SUBAQUEOUS
LANDS**

DUNES



WETLANDS



**SHORELINE
SANITATION**



Virginia Coastal Zone
MANAGEMENT PROGRAM



LEAD AGENCY

FISHERIES



AIR POLLUTION



**NONPOINT SOURCE
WATER POLLUTION**

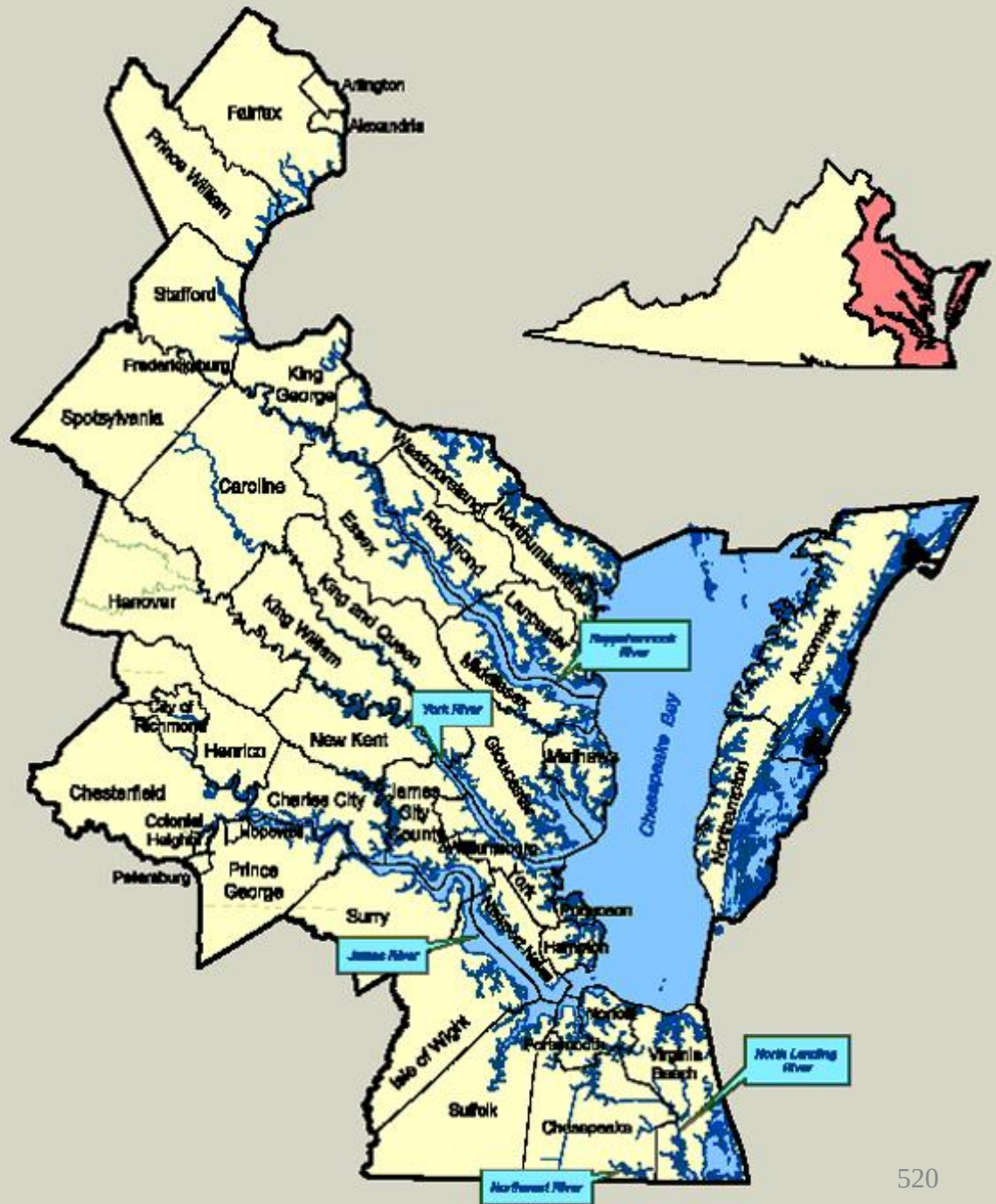
**POINT SOURCE
WATER
POLLUTION**



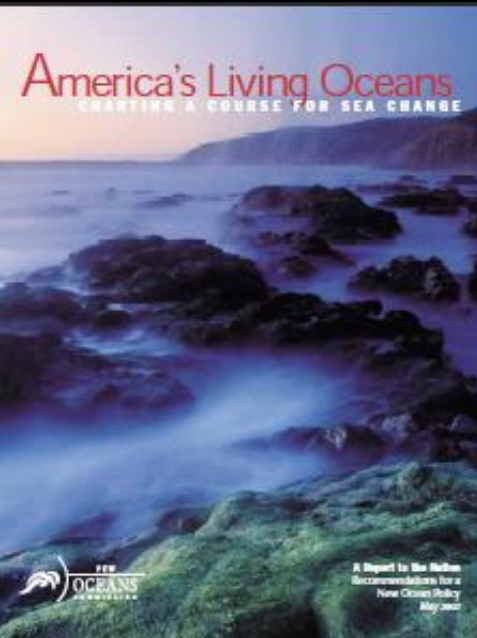
**COASTAL LANDS
MANAGEMENT**



Virginia's Coastal Zone

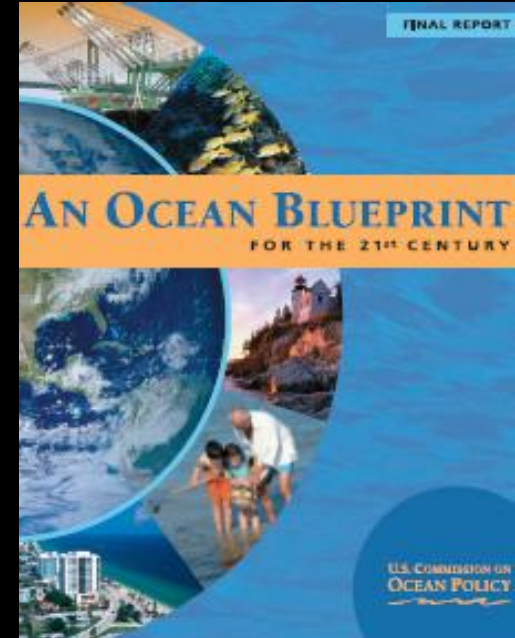


Why Ocean Planning?



Pew Ocean Commission
2003

US Ocean Commission
2004



- Increasing pressures & uses
- Decreasing habitats and resources
- Lack of sense of stewardship
- Only federal agencies bear responsibility
- Call for states to form regional governance

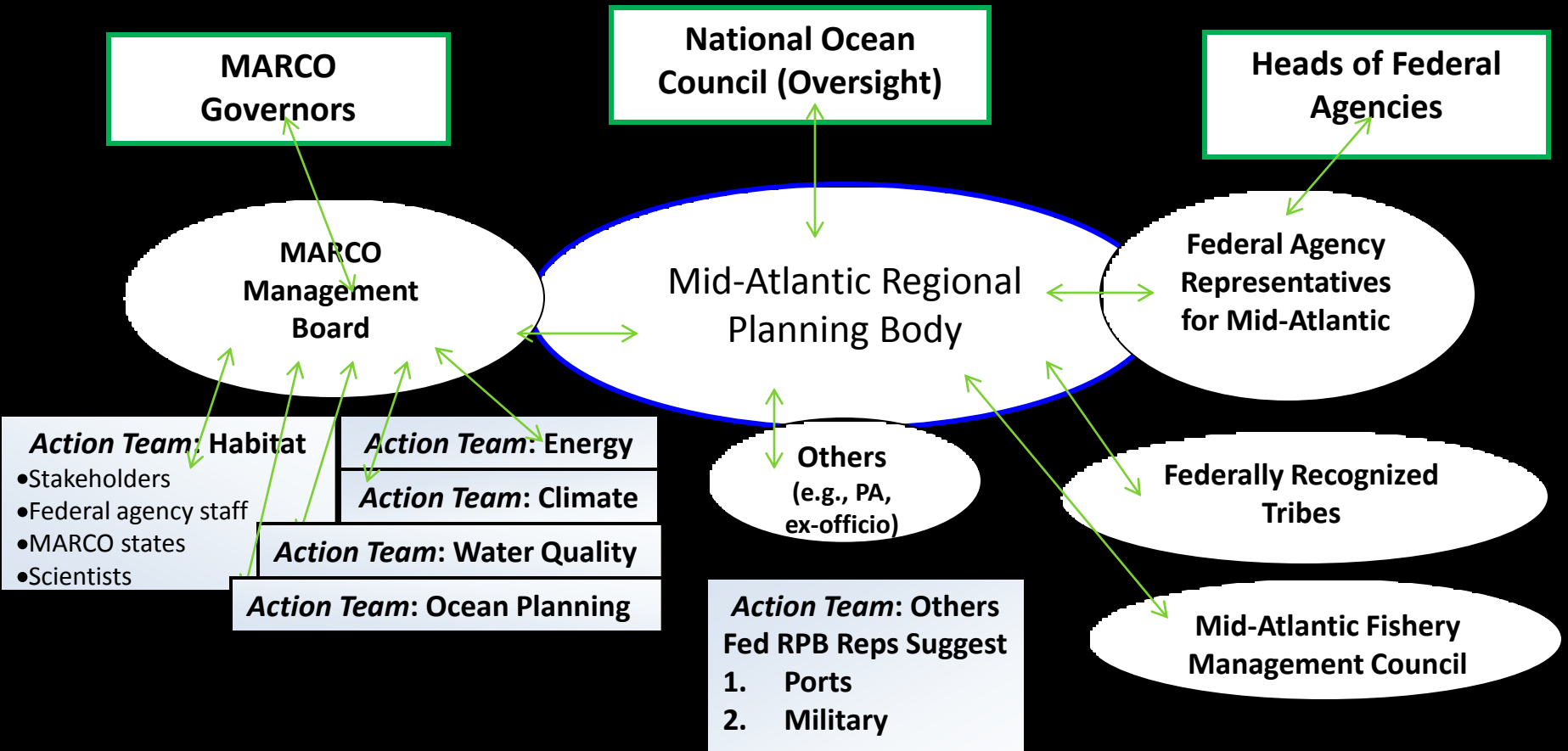
What is Regional Ocean Planning?

A regionally-based public planning process for stakeholders to analyze current and anticipated uses of ocean in order to:

- Minimize conflicts among users
- Facilitate compatible ocean activities
- Preserve ecosystem health to meet economic, security, societal, and ecological goals.

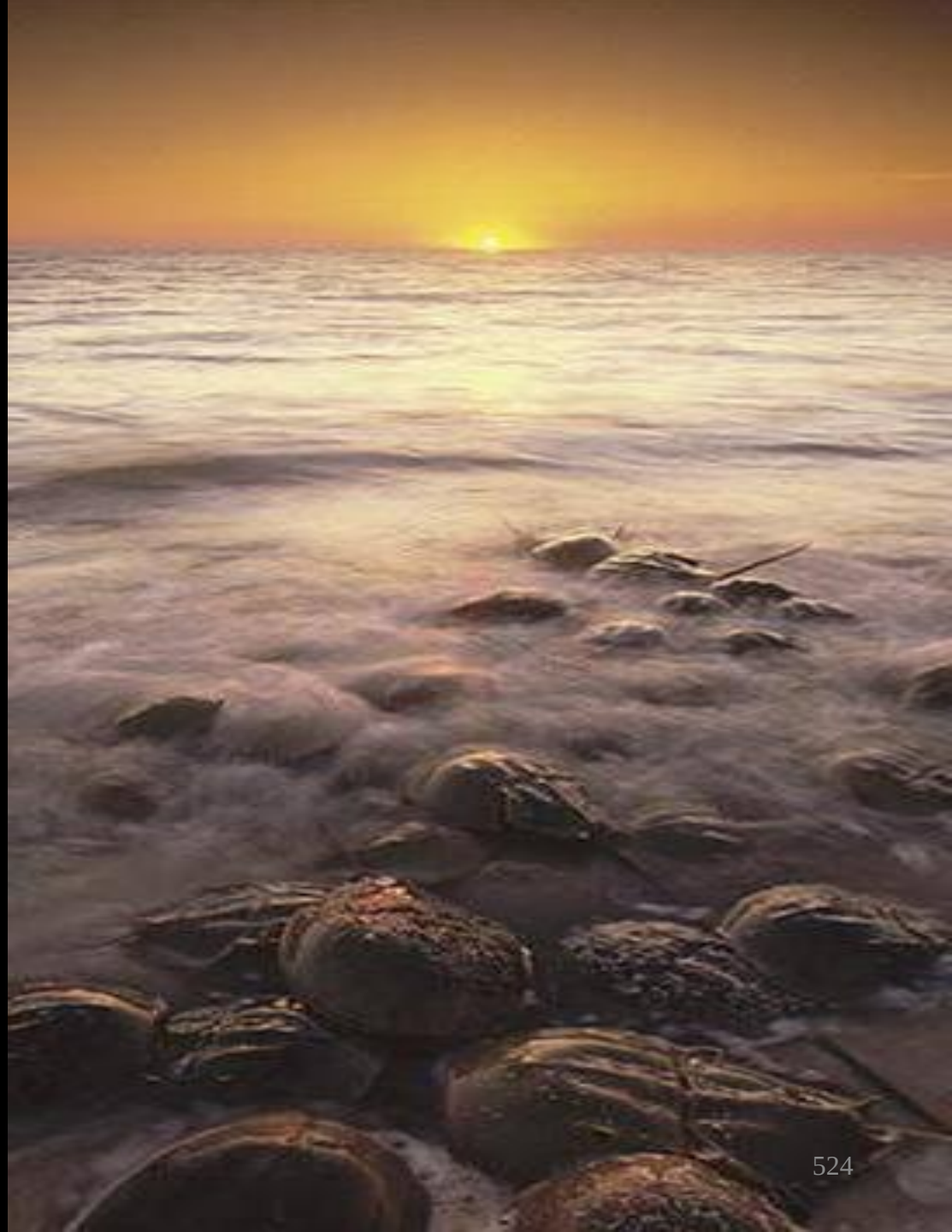


Proposed MARCO Relationship to RPB



Next Steps

- *July 10*
PGIS Training
- *July 11 and 12*
Recreational Use
Workshops on
Eastern Shore
- November 27-29,
2012
*Regional Workshop
in MD, NJ or DE*



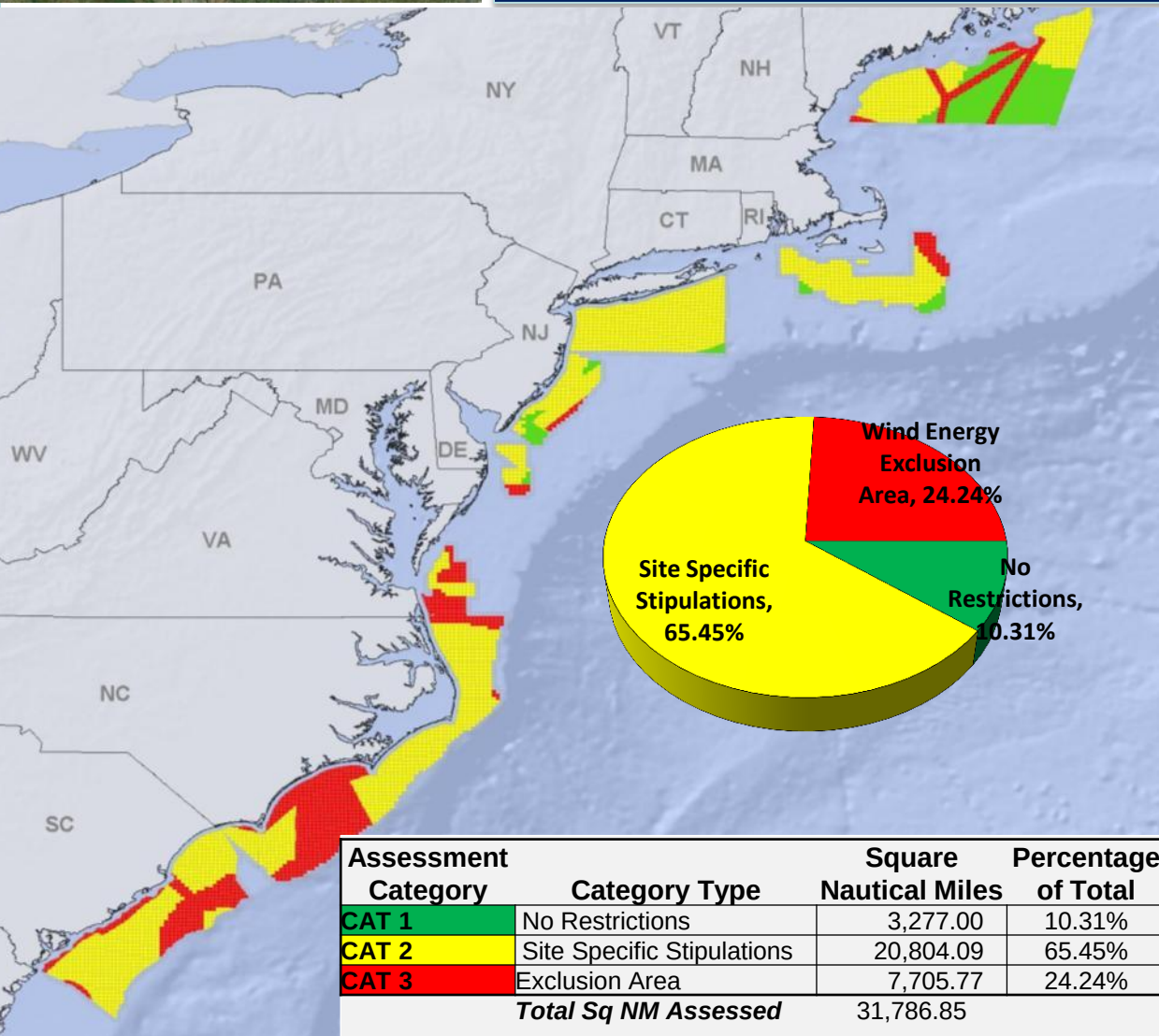
Presentation #20

Presentation #20

MARCO Portal: Data and Tool Development

Mid-Atlantic Marine Wildlife Surveys, Modeling & Data Workshop
Silver Spring, MD
July 25, 2012

Administrative Data: DOD



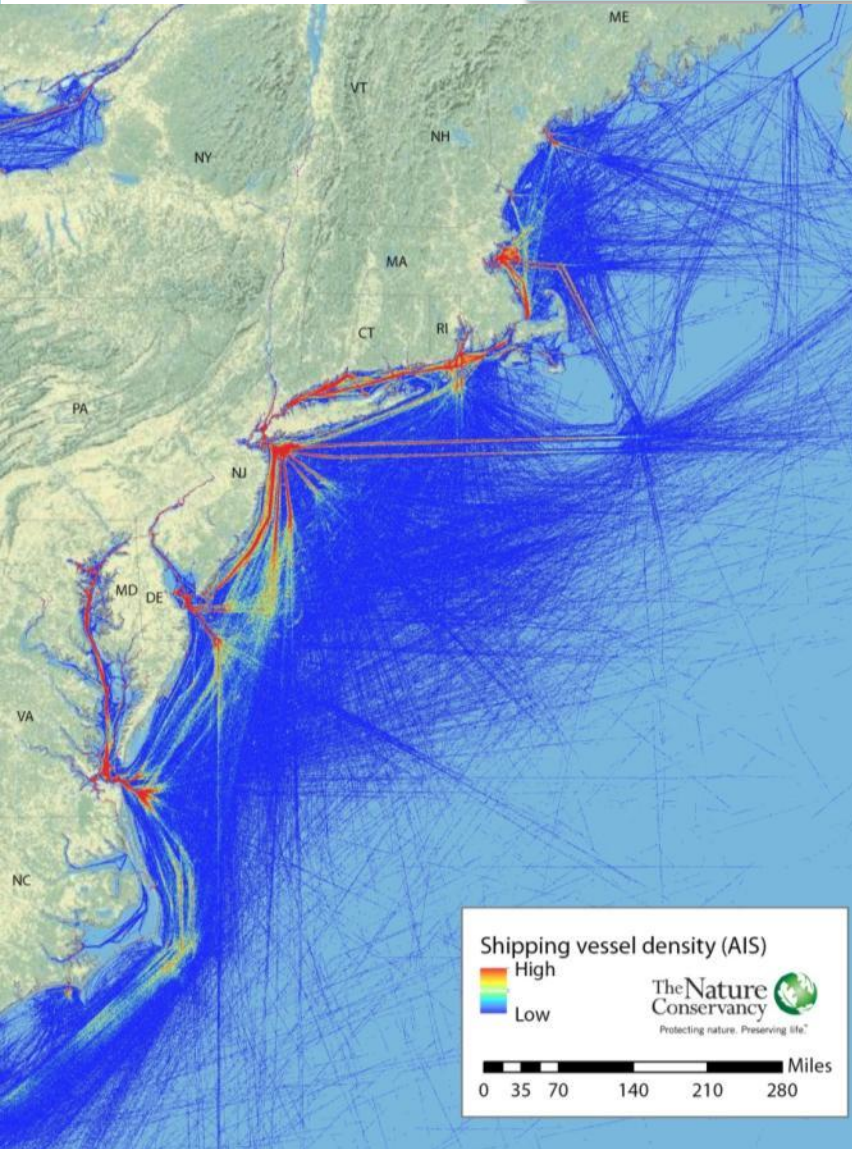
Source: DOD East Coast OCS Wind Energy Assessment

Provider: BOEM

Summary:
Assessment of OCS blocks where wind excluded or allowed with site specific stipulations

In discussion with BOEM, NOAA and DOD to obtain

Human Use Data: Commercial Shipping



Source: 2009 United States Automatic Identification System (AIS) Database

Data Provider: NOAA CSC, USCG's AIS program

Summary: Vessel traffic data summarized into a density grid for planning purposes within the U.S. coastal waters.

*Complete as of this week,
uploaded to Portal by June 1st*

Data Layers

Mid-Atlantic

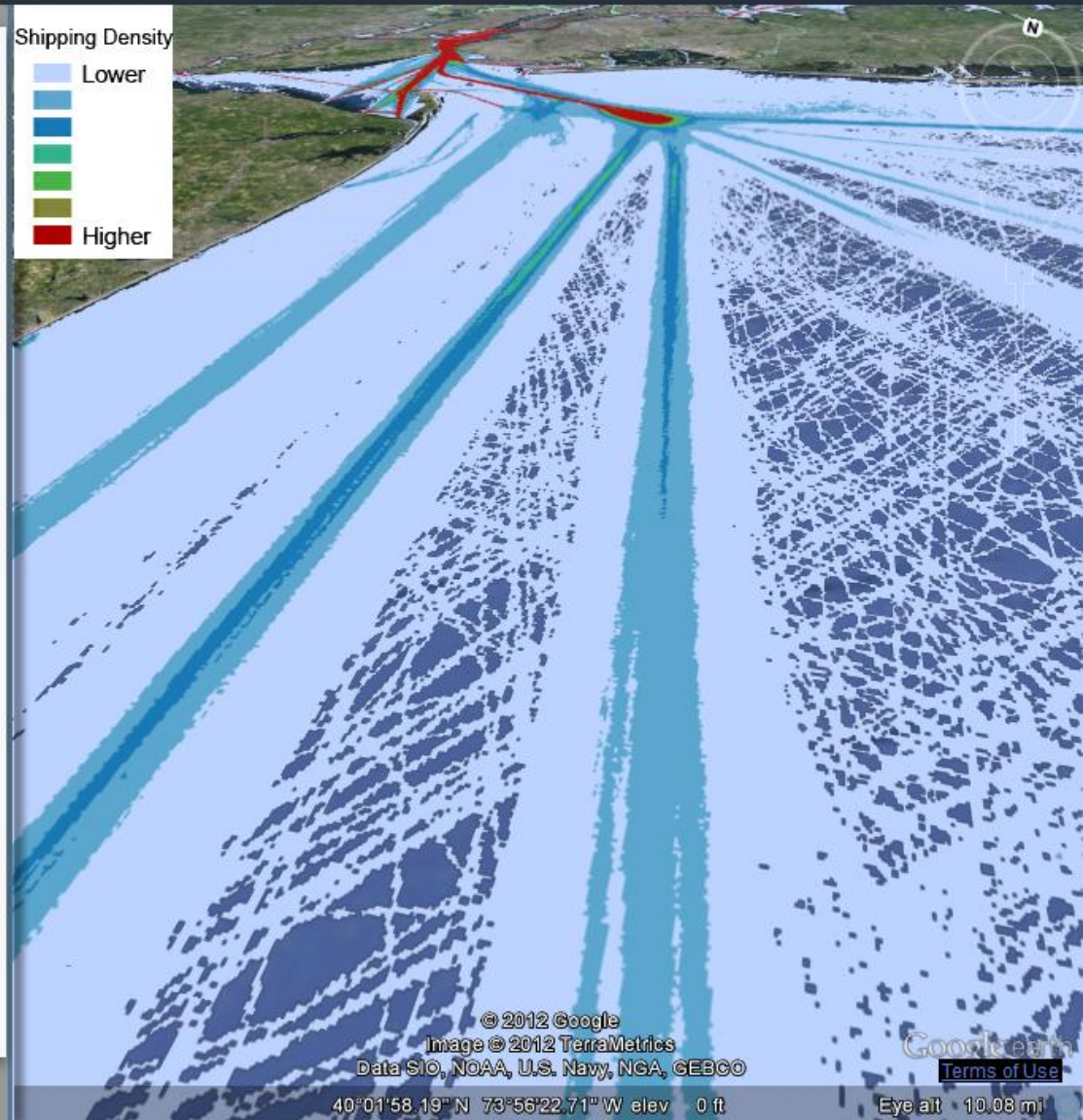
- ☐ Administrative
- ☐ Biological
- ☐ Geophysical
- ☒ Human Use
 - ☐ Submarine Cables
 - ☐ Ship Traffic Separation Zones
 - ☒ AIS Shipping Density
 - ☐ Fishing Effort

Google Earth Layers

- ☐ Roads
- ☒ Borders and Labels
- ☐ 3d Buildings
- ☐ Low Resolution 3d Buildings

Shipping Density

- Lower
- Higher



Data Layers

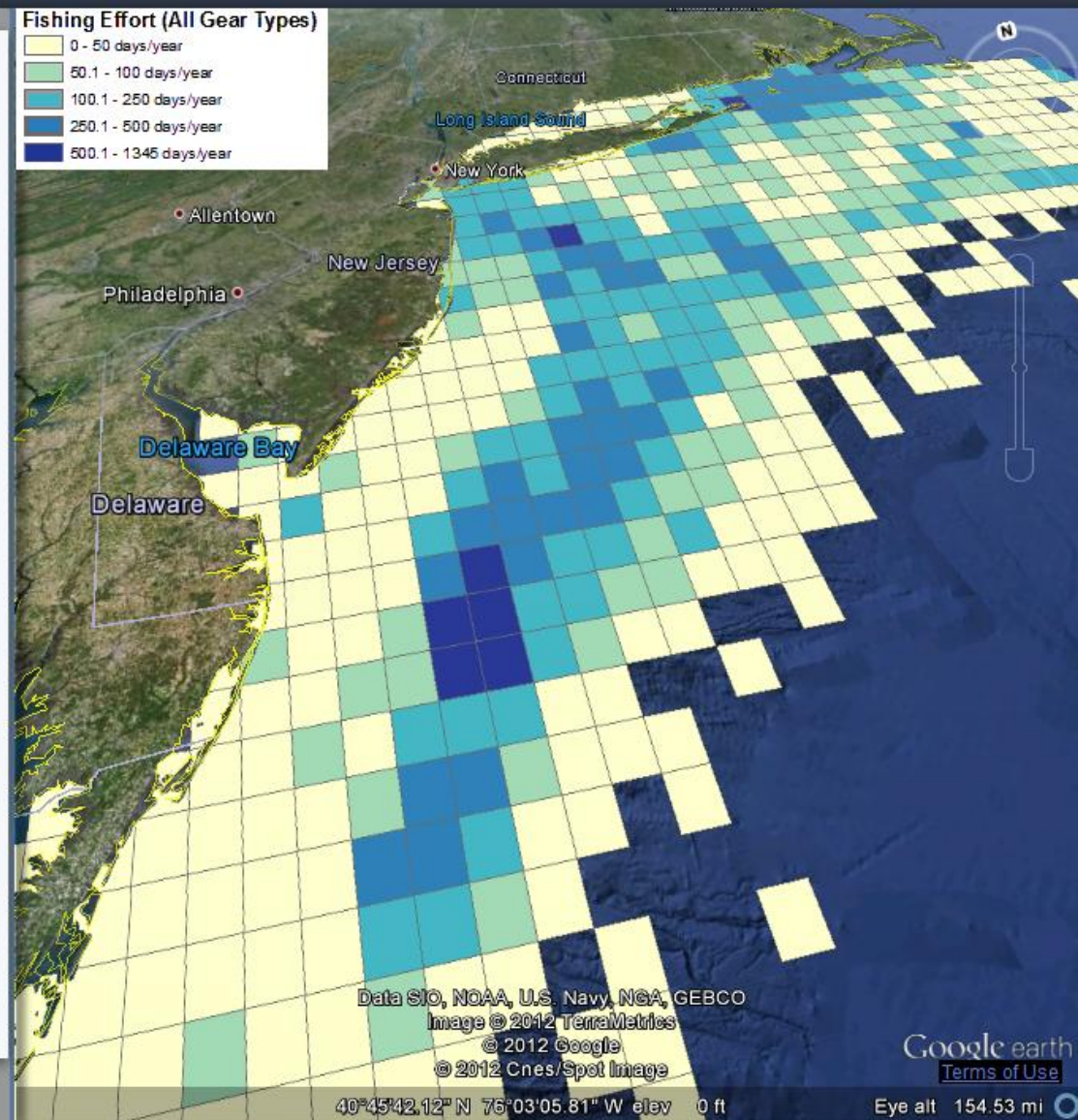
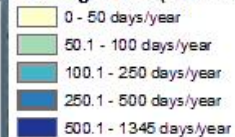
Mid-Atlantic

- ☐ Administrative
- ☐ Biological
- ☐ Geophysical
- ☒ Human Use
 - ☐ Submarine Cables
 - ☐ Ship Traffic
 - ☒ Fishing Effort
 - ☒ All Gear Types
 - ☐ Bottom Gear Types
 - ☐ Pelagic Gear Types
 - ☐ Summer Flounder Landings

Google Earth Layers

- ☐ Roads
- ☒ Borders and Labels
- ☐ 3d Buildings
- ☐ Low Resolution 3d Buildings

Fishing Effort (All Gear Types)





Biological Data: Sea Birds

Abundance Hotspots

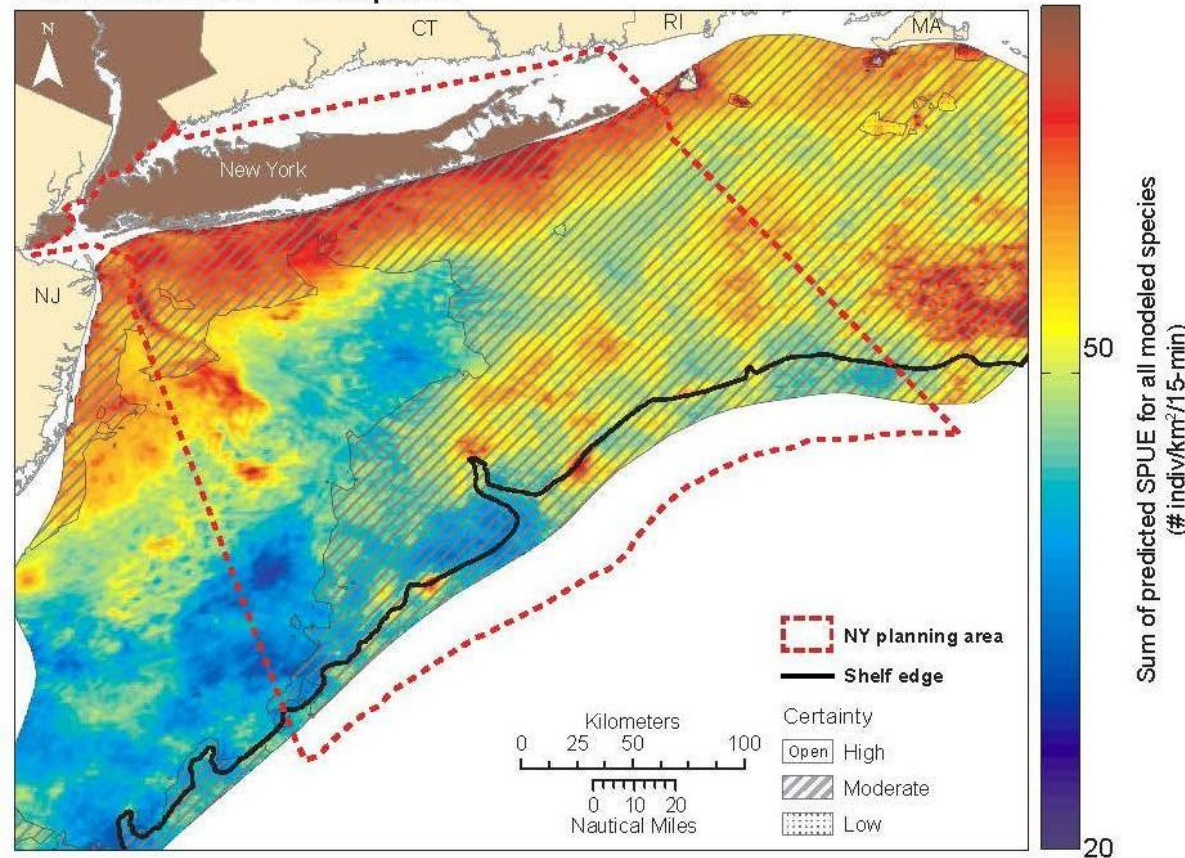


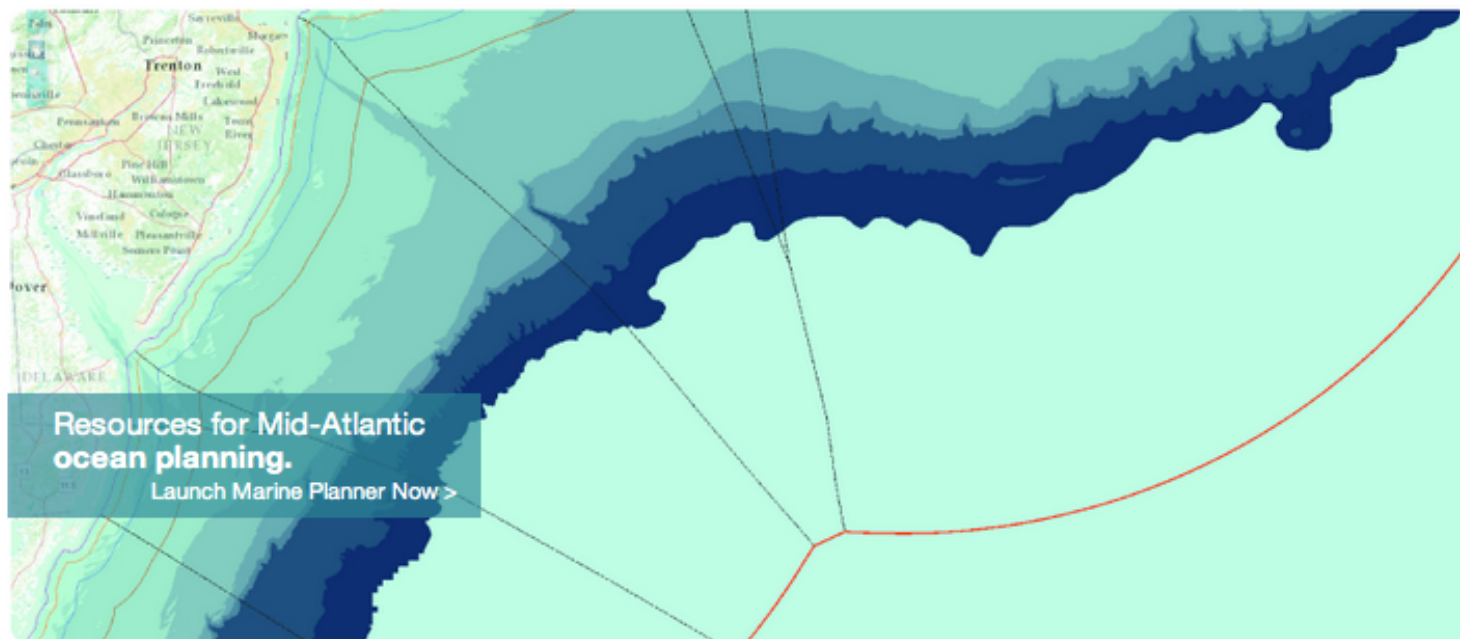
Figure 6.35. Predicted seabird abundance hotspot map.

Source: Manomet Bird Observatory Seabird and Cetacean Assessment Program (CSAP)

Data Provider: NOAA NCCOS, BOEM

Summary:

- Relative abundance predictive models for individual species.
- Hotspots of abundance, richness and diversity for multiple species.
- *NCOOS to complete by end of 2012*



LEARN

Read the latest news and updates on Mid-Atlantic planning.



EXPLORE

Access our data catalog and links to other data and services



VISUALIZE

Launch our Marine Planner mapping application along with other maps and tools



MID-ATLANTIC OCEAN DATA PORTAL

ABOUT
THE PORTAL

CONTACT US

VISIT MARCO
COUNCIL

SEARCH



MARCO Data Catalog

In order to support marine planning in the Mid-Atlantic Region, MARCO provides geographic data as downloadable files and web mapping services.

The data cover the physical, biological and social characteristics of the area.

Visit the [Data Needs page](#) to view some of the highest priority unmet ocean planning

Administrative

Conservation

Benthic Habitats	view in planner	map tiles	kml	data download	metadata	source
Coldwater Corals	view in planner	map tiles	kml	data download	metadata	source
Essential Fish Habitats	currently unavailable	view in planner	map tiles	kml	data download	metadata
Marine Mammals and Sea Turtles	view in planner	map tiles	kml	data download	metadata	source
Waterbird Survey	view in planner	map tiles	kml	data download	metadata	source

Energy

Fishing

Military

Themes preloaded with sector specific data

The screenshot displays the MARCO Planner web application. The browser address bar shows <http://portal.midatlanticocean.org/planner>. The application has a top navigation bar with 'MARCO Portal', 'Help', and 'About' links, and a user profile dropdown labeled 'Firstname Lastname'.

The main interface is divided into three sections:

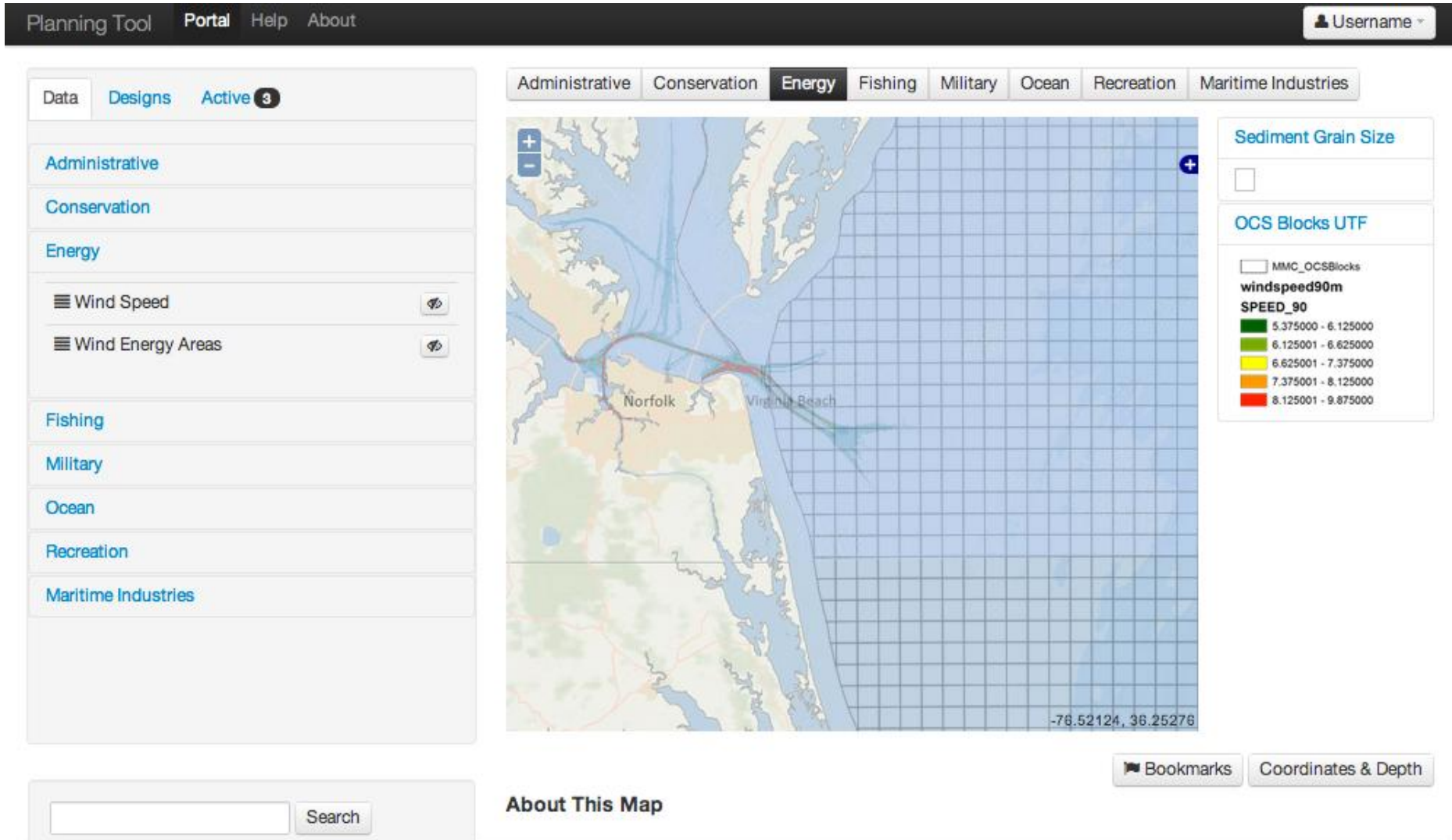
- Left Panel:** Contains tabs for 'Data', 'Designs', and 'Active'. Under the 'Data' tab, there are sections for 'Conservation', 'Fishing', 'Shipping', and 'Wind Energy'. The 'Fishing' section is expanded, showing a list of data layers: 'Essential Fish Habitat', 'National Marine Sanctuaries', 'Gray Whale Migration', and 'Fishing Effort'. Each layer has a visibility icon (an eye or a crossed-out eye).
- Center Panel:** Features a map of Massachusetts Bay. Above the map are tabs for 'Conservation', 'Fishing' (selected), 'Shipping', and 'Wind Energy'. The map shows various geographical features and data overlays, including a large green area and a red area. Labels on the map include 'Scotum Basin', 'Cape Ann', and 'Massachusetts Bay'.
- Right Panel:** Contains a 'Create Bookmark' dialog box. It has fields for 'Name' (with the placeholder 'bookmark name') and 'URL' (with the placeholder 'http://portal...ean.org/planner/?bookmark=5'). There are 'Cancel' and 'Save' buttons.

Below the map, there is a section titled 'About the Fishing Data' with a paragraph of text: 'Sartorial single-origin coffee umami tofu art party chambray. Marfa skateboard mixtape excruciation portland diche put a bird on it, hoodie ex post-ironic williamsburg. Twee hoodie salvage gentrify, mcsweeney's kale chips before they sold out anim sint butcher. Wolf tempor gastropub pop-up semiotics, wes anderson synth consequat dolor sunt.'

At the bottom of the interface, there is a 'Bookmarks' dropdown menu with options: 'Create Bookmark', 'Existing Bookmark', 'Existing Bookmark', 'Legend', 'Edit', 'Share', 'Stakeholders', 'Planners', and 'Copy URL to Clipboard'. There is also a 'Coordinates & Depth' dropdown menu.

The page number '535' is visible in the bottom right corner.

Themes preloaded with sector specific data



Spatial filters (show me the areas that meet certain criteria)

SDC Planning

←

→

X

🏠

http://dev.marco.marineplanning.org

Q

My Shapes

Shared With Me

New SDC for Wind Energy

Step 1 of 3

Select 1 or more parameters for this sector

Wind Energy

[Hide Parameters](#)

☐ Distance to Shore

☒ Distance to AWC Transmission Hubs

☒ Depth Range

☒ Wind Speed

Maximum Distance (miles)

15

Desired Range (feet)

100

to

300

Minimum Speed (mph)

18

Cancel

Next >



Image © 2012 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google Earth
41°08'42.78"N 73°55'4.66"W elev: 0ft Eye alt: 369.53mi

537

<http://dev.marco.marineplanning.org>[My Shapes](#) / [Shared With Me](#)

New SDC for Wind Energy

Step 2 of 3

Choose filtering parameters from other sectors

Shipping [Hide Parameters](#)☒ Distance from Shipping Lanes

Minimum Distance (miles)

3

☒ Ship Traffic Density

Limit Traffic to the following Density Level

Low

Medium

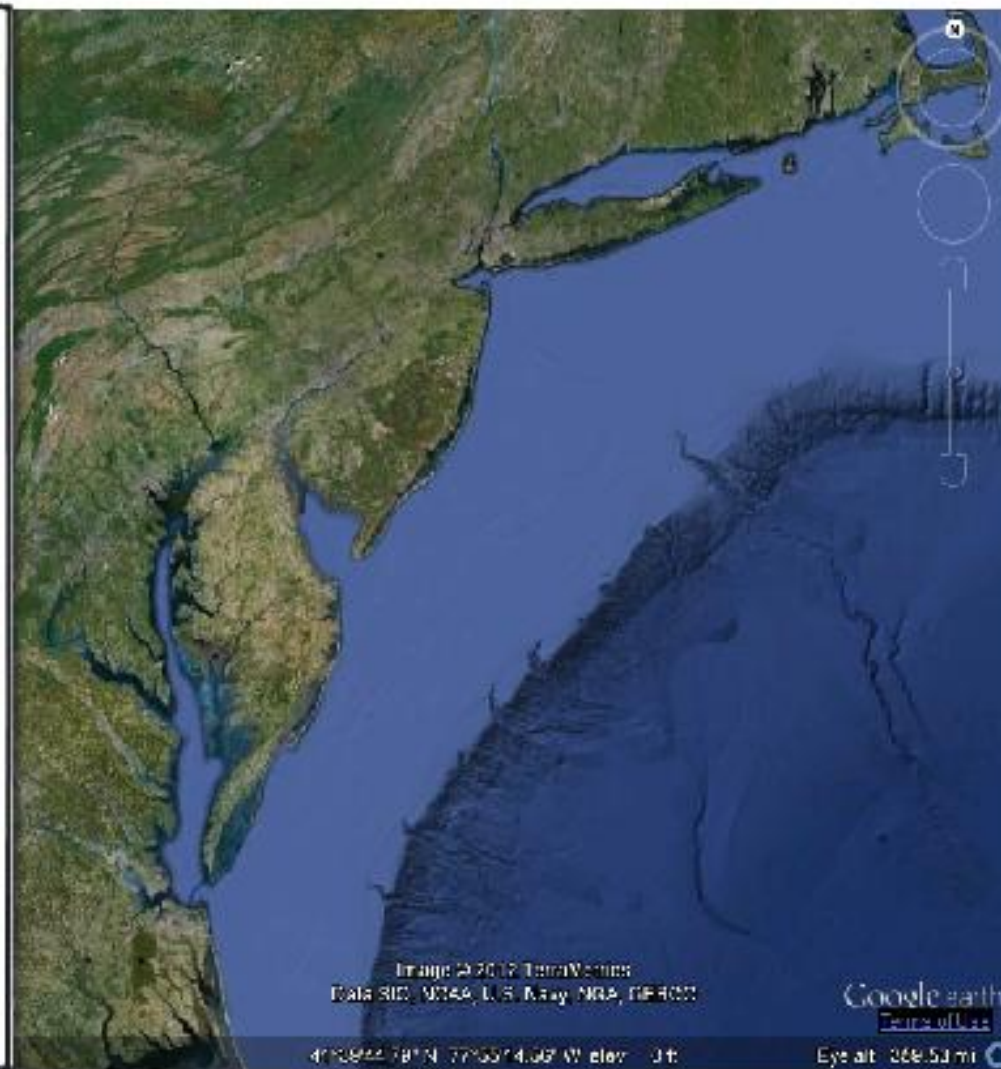
High

Military [Hide Parameters](#)☒ Exclude DoD Assessment Areas☒ Exclude Unexploded Ordinance Areas

< Prev

Cancel

Next >



[My Shapes](#)[Shared With Me](#)

New SDC for Wind Energy

Step 3 of 3

Provide a name to identify your Spatial Design Criteria

Name

Optionally, add a description and/or attach a file

Description

Support File

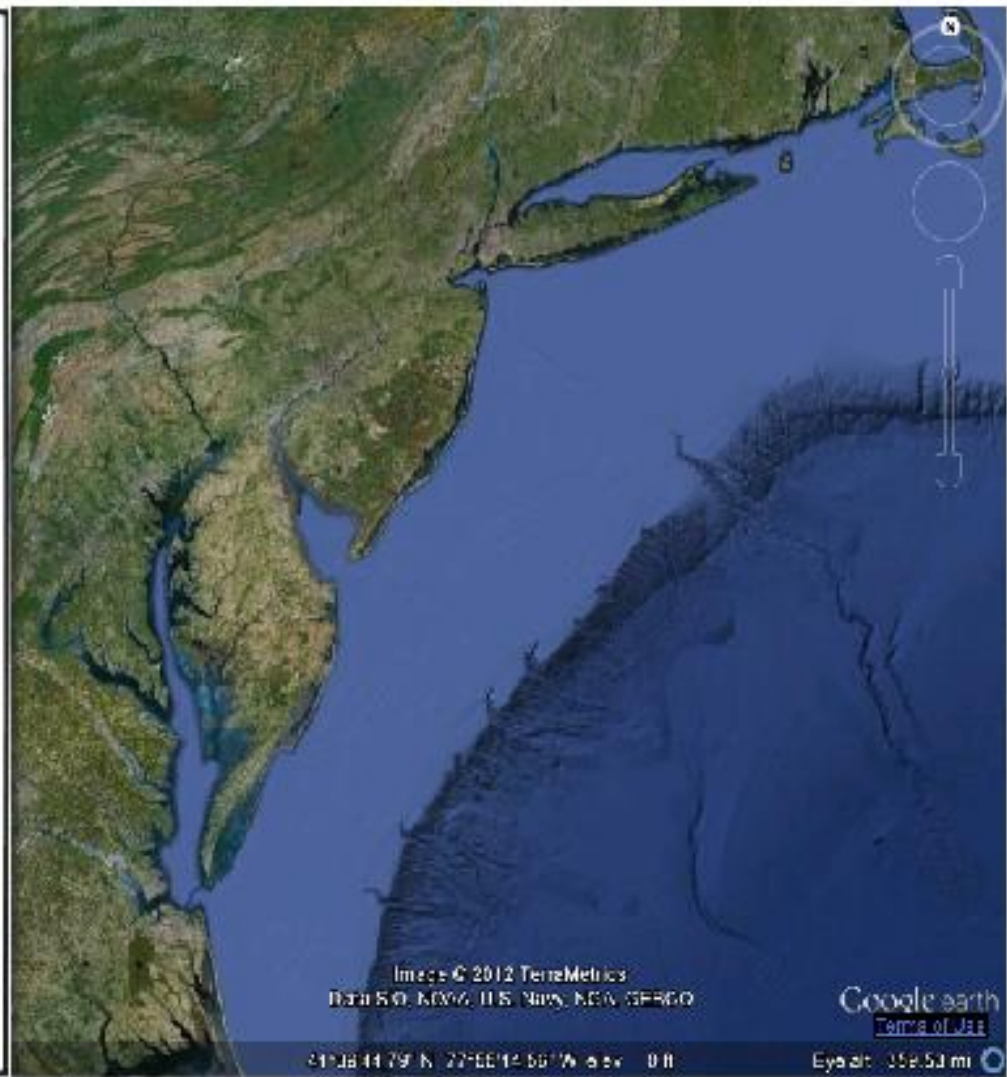


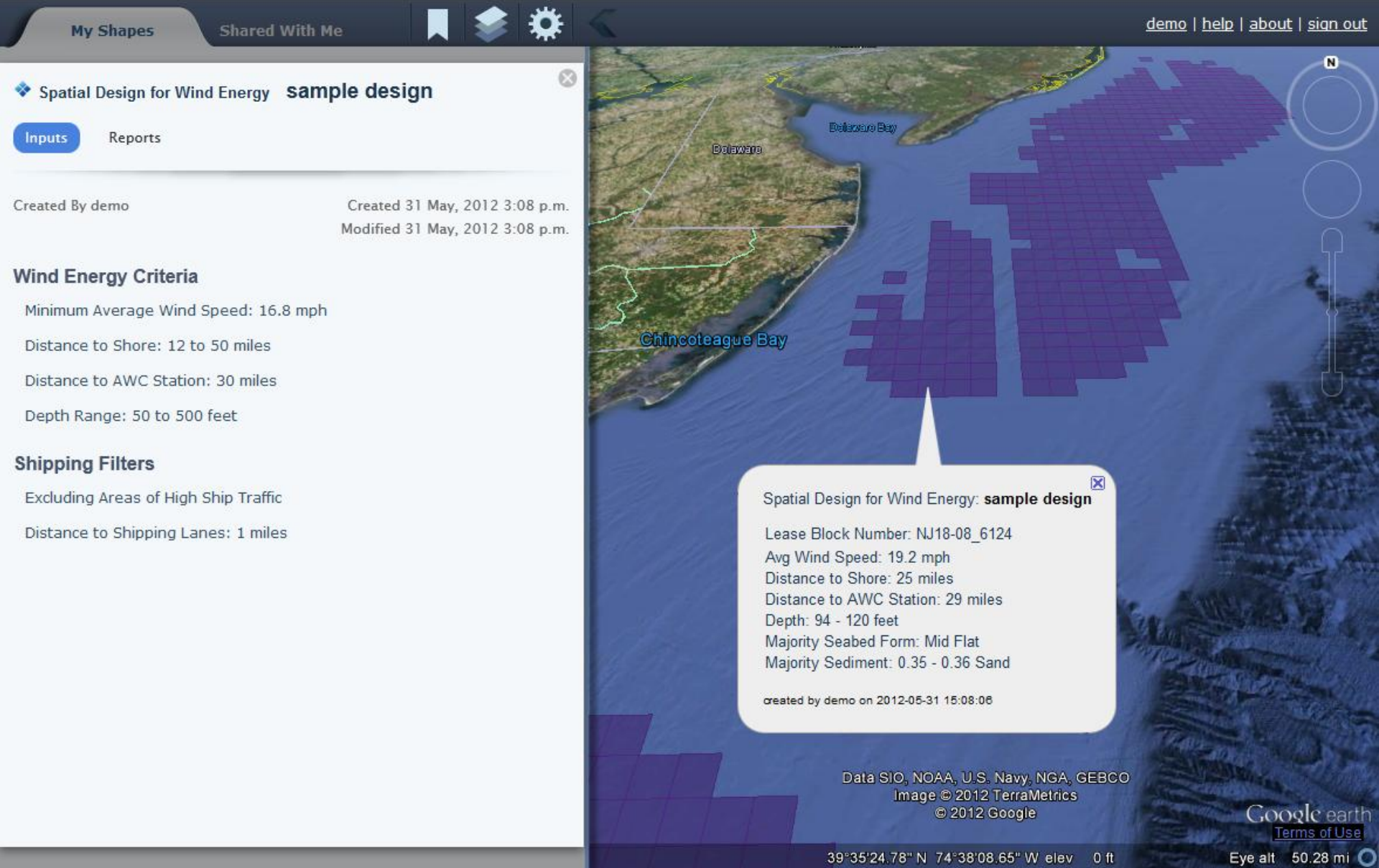
Image © 2012 TerraMetrics
Data S.O. KING, U.S. Navy, NOAA, GEBCO

Google earth
[Terms of Use](#)

41°08'44.79" N 72°55'14.50" W elev: 0 ft

Eye alt: 159.53 mi

User defined results & reports





Portal Enhancement

Version I

- Enhanced Portal
- Stakeholder interviews /mtgs
- data acquisition and viewing functions
- **July 2012**

Version II

- Portal website launch
- More data
- Viewable sector-specific parameters and spatial filters
- Stakeholder vetting
- **August 2012**

Version III

- More data
- Improved spatial filters, based on stakeholder
- Ability to design and generate reports
- **Late Fall 2012**

Enhanced Portal

- Peer reviewed
- All stakeholder data and views incorporated
- Improved feature and functions
- **June 2013**



<http://ecotrust.github.com/marco-portal/>

Presentation #21



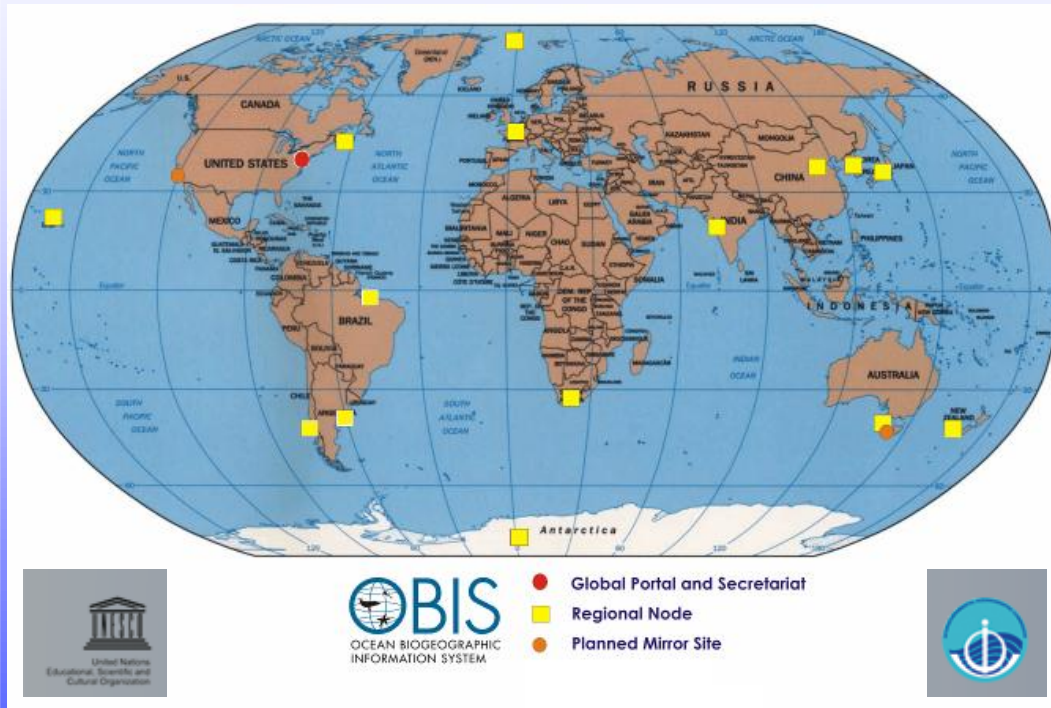
OBIS-USA Data Management: Standards, Applications and Life Cycle

July 25, 2012

Silver Spring, MD

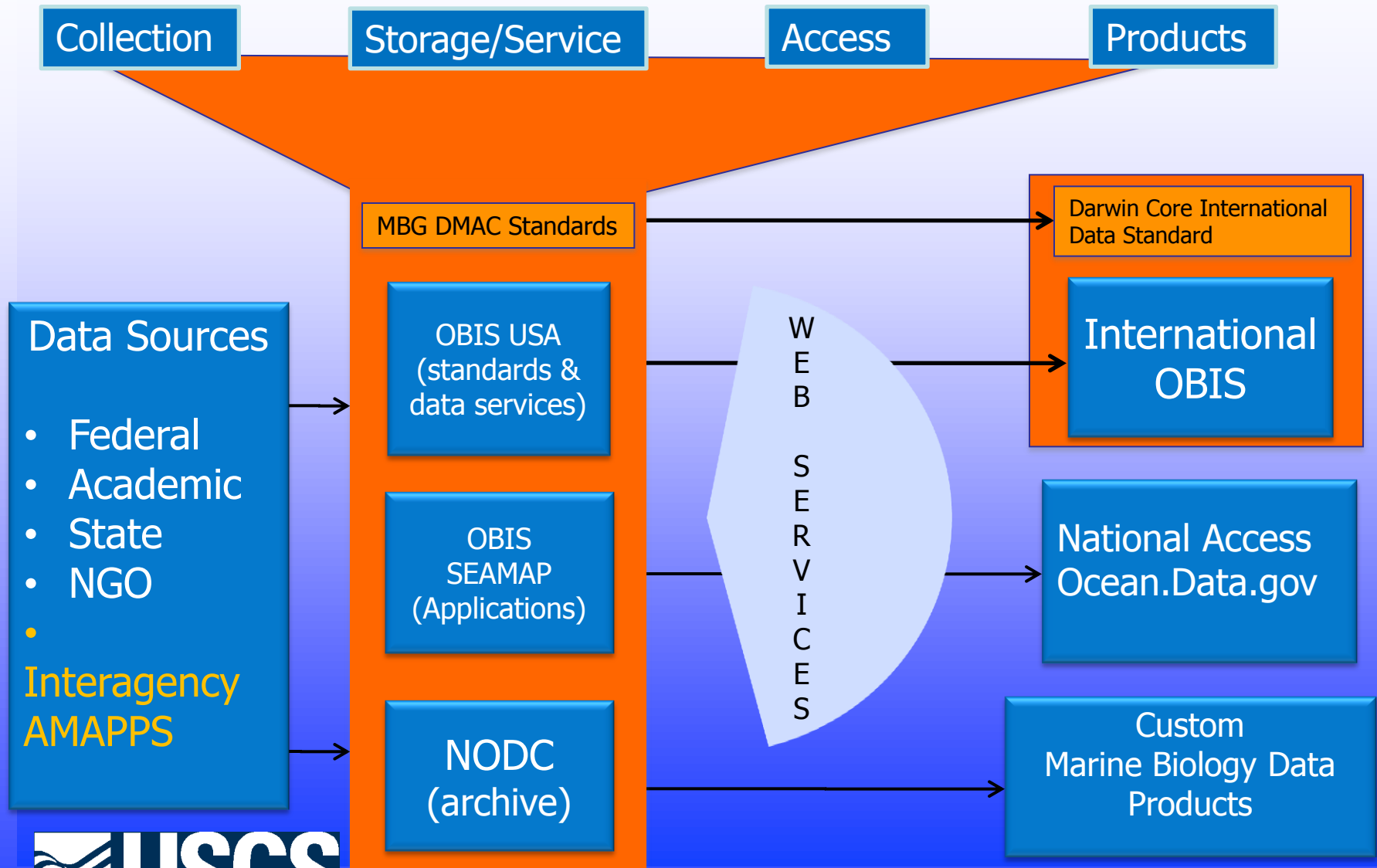
Mark Fornwall. Philip Goldstein and Jesse Cleary

Global Network



- Regional Nodes
- Thematic Nodes
- Global Network
- Data Standards
- 31 Million Records

Federal Data Architecture



OBIS-USA Data

- Taxonomically, spatially and temporally resolved;
- Comply with US and international data standards;
- Accompanied by FGDC compliant metadata;
- Available through a variety of web services;
- Linked back to Data Originator/Holder; and
- Rapid evaluation of suitability for use

Data, Semantics, and Interoperability

Biological Data Contents

- *Each Record is ...*

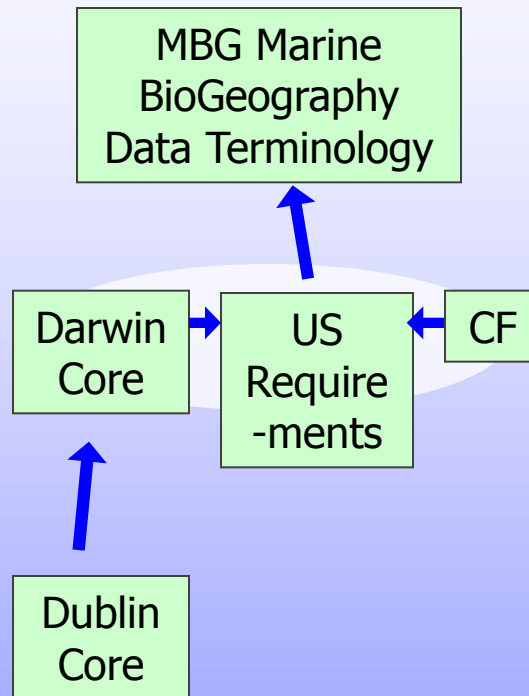
Observation Event

Point Data
Presence - Absence -
Quantification

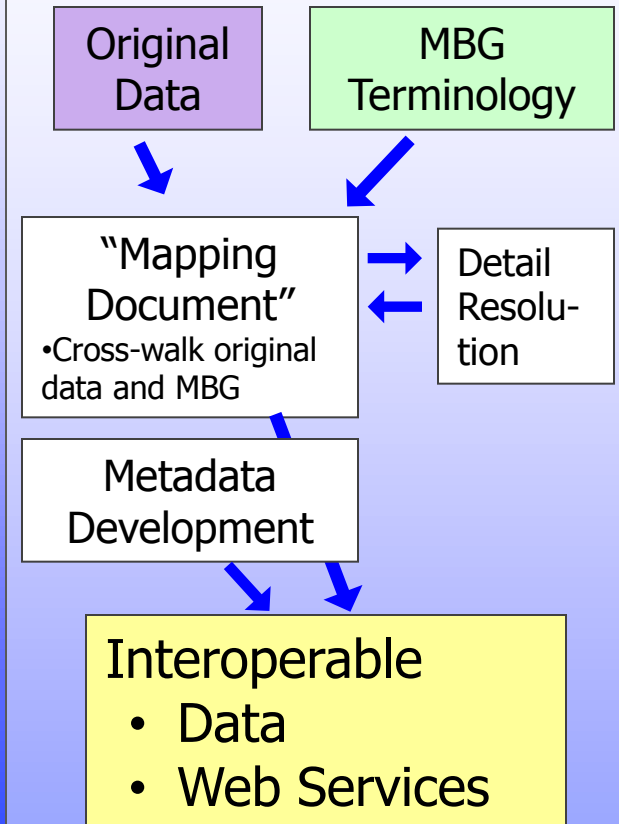
- *Record Details include ...*

- Record Identity / Citation
- Georeference (x, y, z, t, e)
- Taxon / Identification
- Observation / Biological Details
- Sampling / Calculation Details (method, transect, tracking, quantification)

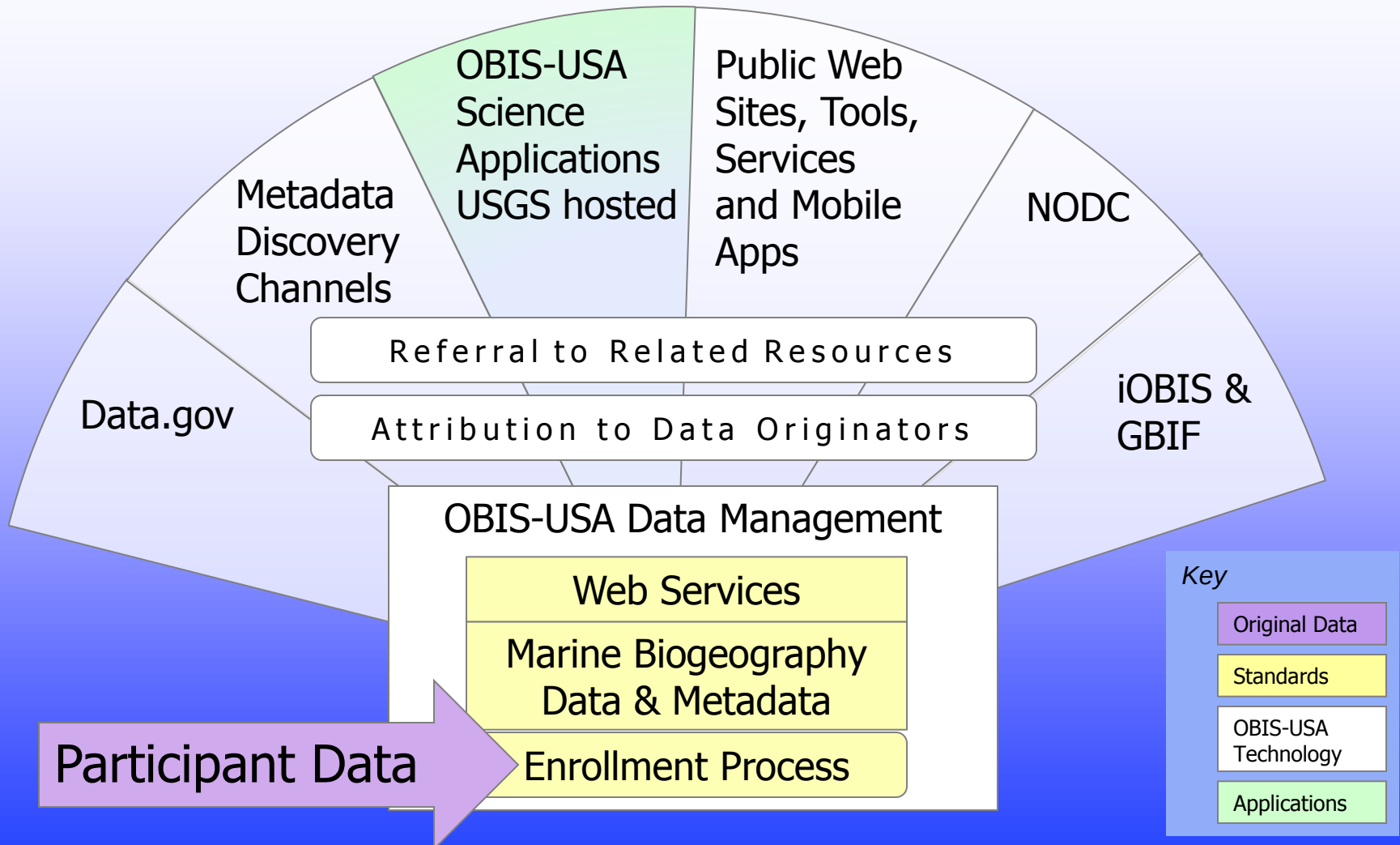
Semantics



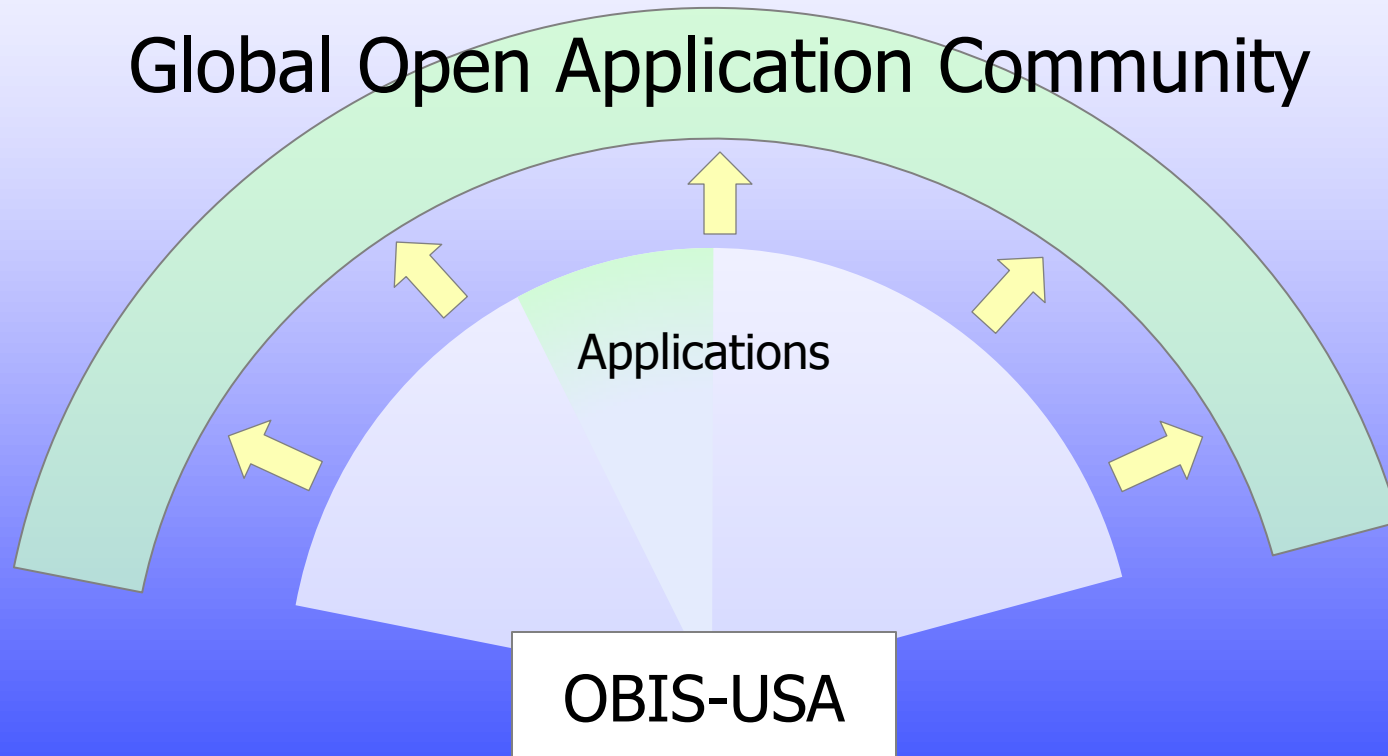
Data Mapping



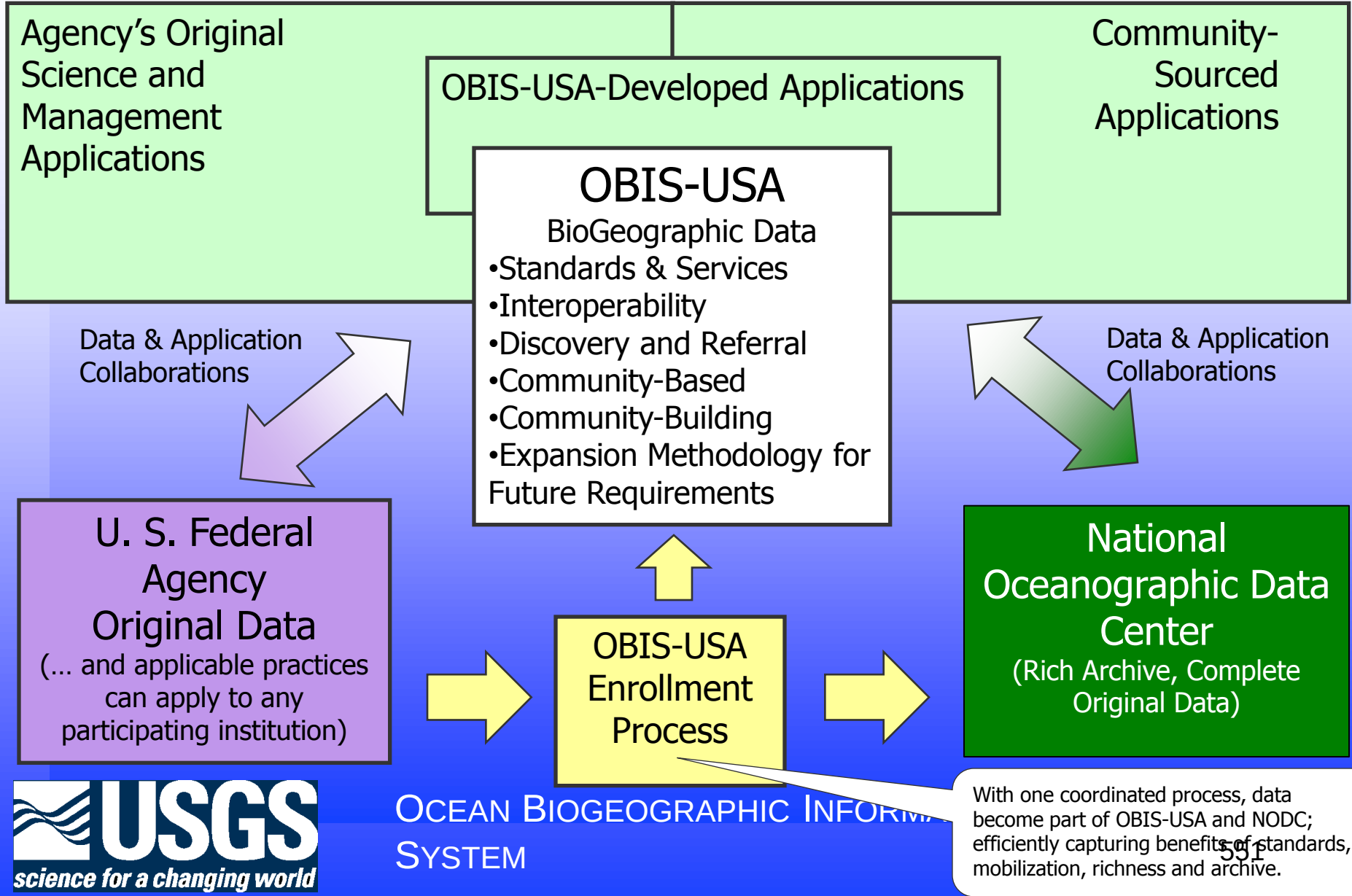
OBIS-USA Direct Community Integration



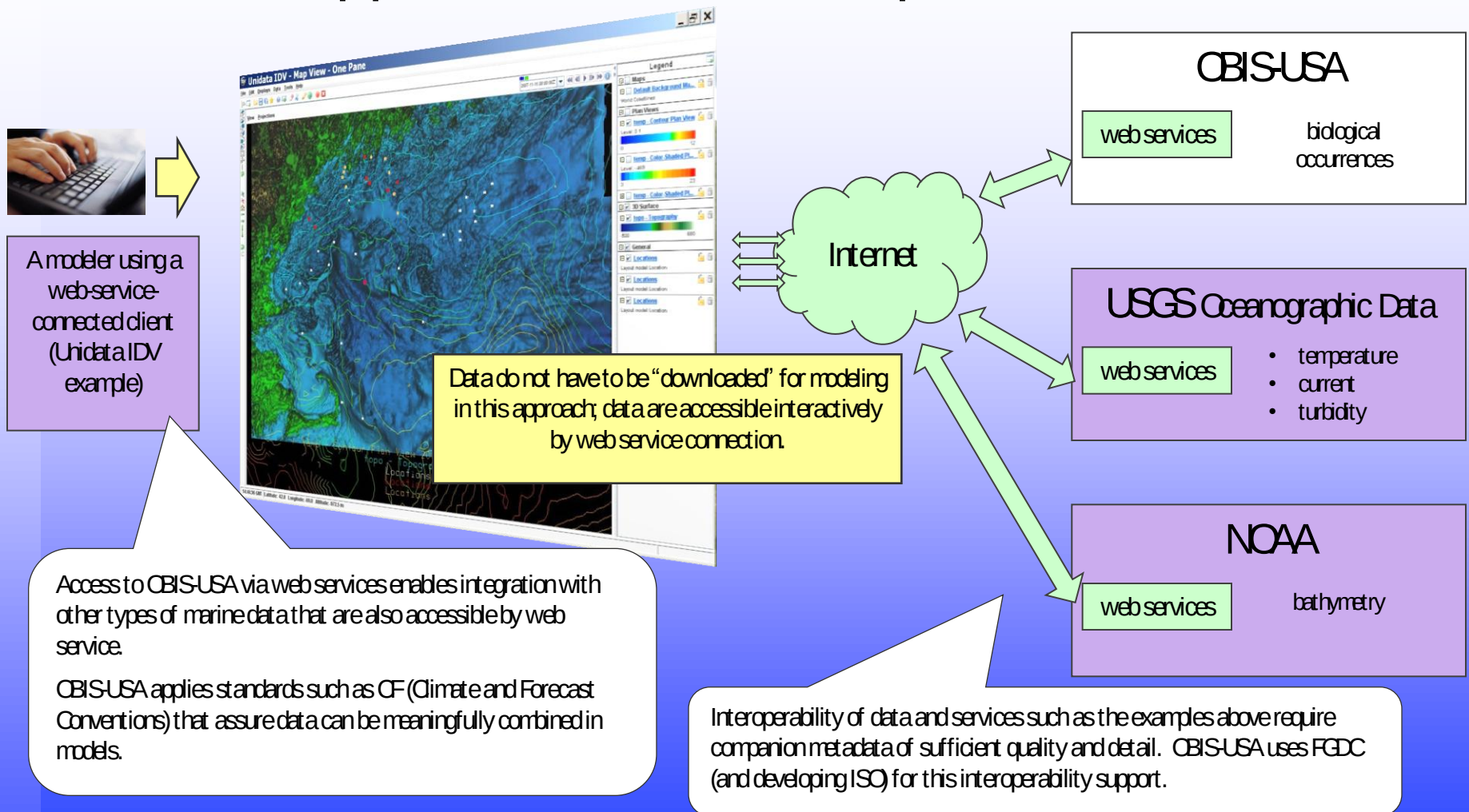
OBIS-USA Open Application Community



Federal Data Life Cycle



Another Approach ... IDV Example



OBIS-USA MBG Functional Enhancement

2009

OBIS-USA is doing:

- Biodiversity (presence)
- Integration with Metadata

OBIS-USA is hearing about:

Integration with Physical Data,
Quantification, Tracking

2012

OBIS-USA is doing:

- Biodiversity (presence)
- Integration with Metadata
- Integration with Physical Data
- Absence, Quantification,
Tracking, Sampling
Methodology, Transect Data

OBIS-USA is hearing about:

Life Stage, Behavior, Experimental
Biology

Data Applications

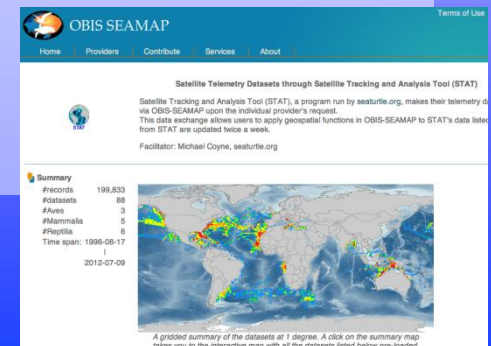
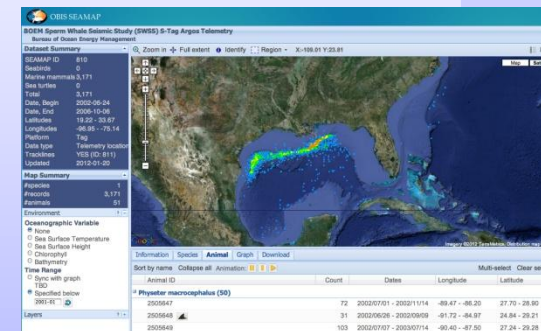
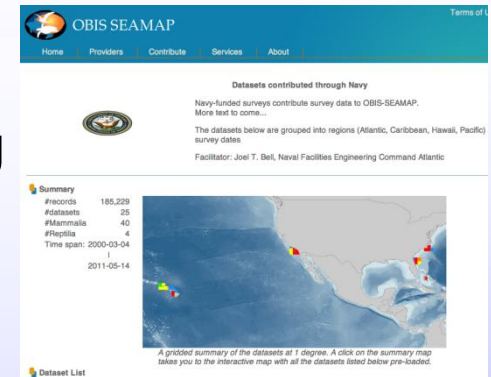
Liaison with data providers and users to provide custom applications:

- Custom web services
- Custom web portals
- Data exploration tools
 - Integrate multiple data types
 - Integrate oceanographic data
 - Decision support tools
- Develop distribution and density models

Leverage emerging data standards and service infrastructure to build custom APIs and Portals for data users

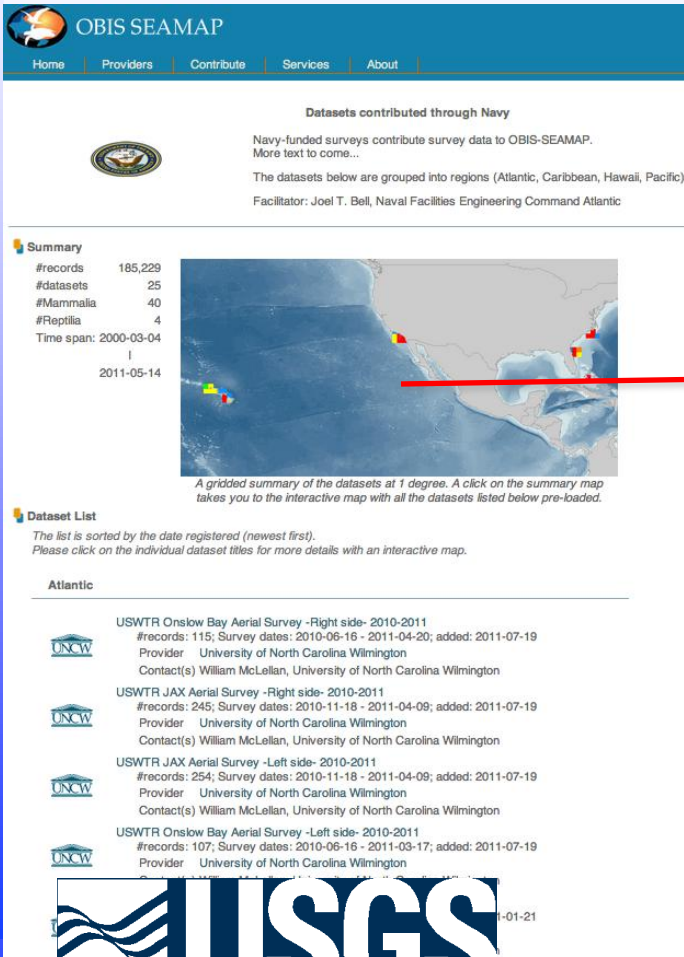
Application Examples

- US Navy Cetacean Monitoring data
 - Single web portal to show all Navy monitoring data
 - GIS web services for USN EIMS system
- BOEM GoMEX sperm whale data
 - Mixed data types
 - S-TAG, Acoustic, PhotoID, Genetic
 - Integrated data exploration portal
- Satellite Tracking and Analysis Tool (STAT)
 - Automated data collection
 - Customized data viewer



US Navy cetacean monitoring data

- Single view of all monitoring data
- GIS web services for EIMS data viewer



OBIS SEAMAP

Home Providers Contribute Services About

Datasets contributed through Navy

Navy-funded surveys contribute survey data to OBIS-SEAMAP. More text to come...

The datasets below are grouped into regions (Atlantic, Caribbean, Hawaii, Pacific)

Facilitator: Joel T. Bell, Naval Facilities Engineering Command Atlantic

Summary

- #records: 185,229
- #datasets: 25
- #Mammalia: 40
- #Reptilia: 4
- Time span: 2000-03-04 to 2011-05-14

A gridded summary of the datasets at 1 degree. A click on the summary map takes you to the interactive map with all the datasets listed below pre-loaded.

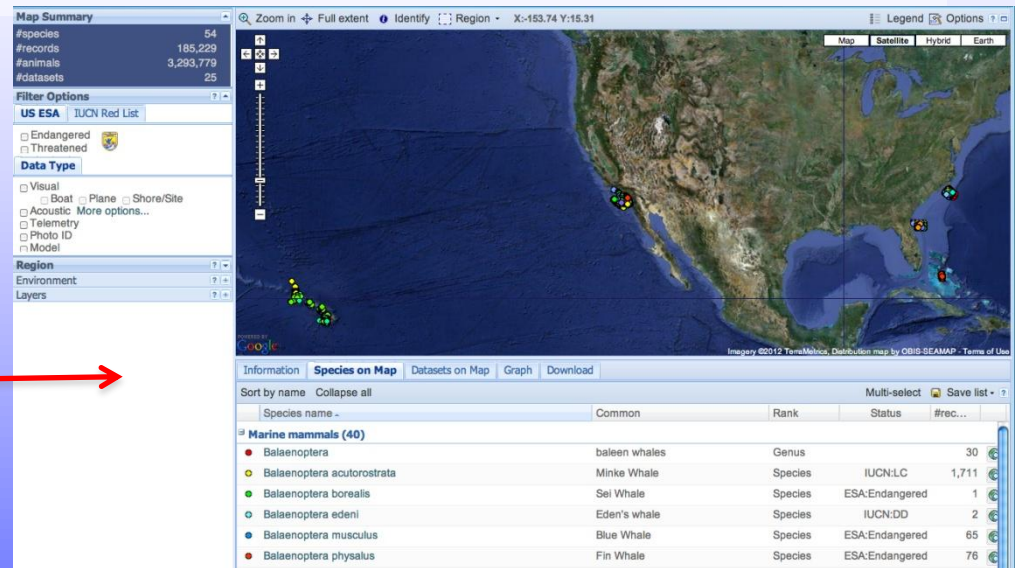
Dataset List

The list is sorted by the date registered (newest first). Please click on the individual dataset titles for more details with an interactive map.

Atlantic

- USWTR Onslow Bay Aerial Survey -Right side- 2010-2011**
#records: 115; Survey dates: 2010-06-16 - 2011-04-20; added: 2011-07-19
Provider: University of North Carolina Wilmington
Contact(s): William McLellan, University of North Carolina Wilmington
- USWTR JAX Aerial Survey -Right side- 2010-2011**
#records: 245; Survey dates: 2010-11-18 - 2011-04-09; added: 2011-07-19
Provider: University of North Carolina Wilmington
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#records: 107; Survey dates: 2010-06-16 - 2011-03-17; added: 2011-07-19
Provider: University of North Carolina Wilmington

USGS
science for a changing world



Map Summary

- #species: 54
- #records: 185,229
- #animals: 3,293,779
- #datasets: 25

Filter Options

US ESA IUCN Red List

☐ Endangered
☐ Threatened

Data Type

☐ Visual
☐ Boat ☐ Plane ☐ Shore/Site
☐ Acoustic More options...
☐ Telemetry
☐ Photo ID
☐ Model

Region

Environment Layers

Species on Map

Sort by name Collapse all Multi-select Save list

Species name	Common	Rank	Status	#rec...
Marine mammals (40)				
Balaenoptera	baleen whales	Genus		30
Balaenoptera acutorostrata	Minke Whale	Species	IUCN:LC	1,711
Balaenoptera borealis	Sei Whale	Species	ESA:Endangered	1
Balaenoptera edeni	Eden's whale	Species	IUCN:DD	2
Balaenoptera musculus	Blue Whale	Species	ESA:Endangered	65
Balaenoptera physalus	Fin Whale	Species	ESA:Endangered	76

Data Applications

- Single view of all monitoring data
- GIS web services for EIMS data viewer

OBIS SEAMAP

Home Providers Contribute Services About

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1
2011-05-14



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USWTR Onslow Bay Aerial Survey -Left side- 2010-2011
#records: 107; Survey dates: 2010-06-16 - 2011-03-17; added: 2011-07-19
Provider University of North Carolina Wilmington

USGS
science for a changing world

USWTR Onslow Bay Aerial Survey -Right side- 2010-2011
University of North Carolina Wilmington

Dataset Summary

SEAMAP ID 751
Seabirds 0
Marine mammals 23
Sea turtles 74
Total 115
Date, Begin 2010-06-16
Date, End 2011-04-20
Latitudes 33.39 - 34.23
Longitudes -77.16 - -76.14
Platform Plane
Data type Animal sighting
Effort YES (ID: 752)
Traveled (km) 9,838
Effort hours 70
Source Navy
Updated 2011-07-19

Map Summary

#species 10
#records 115
#animals 823

Environment Layers

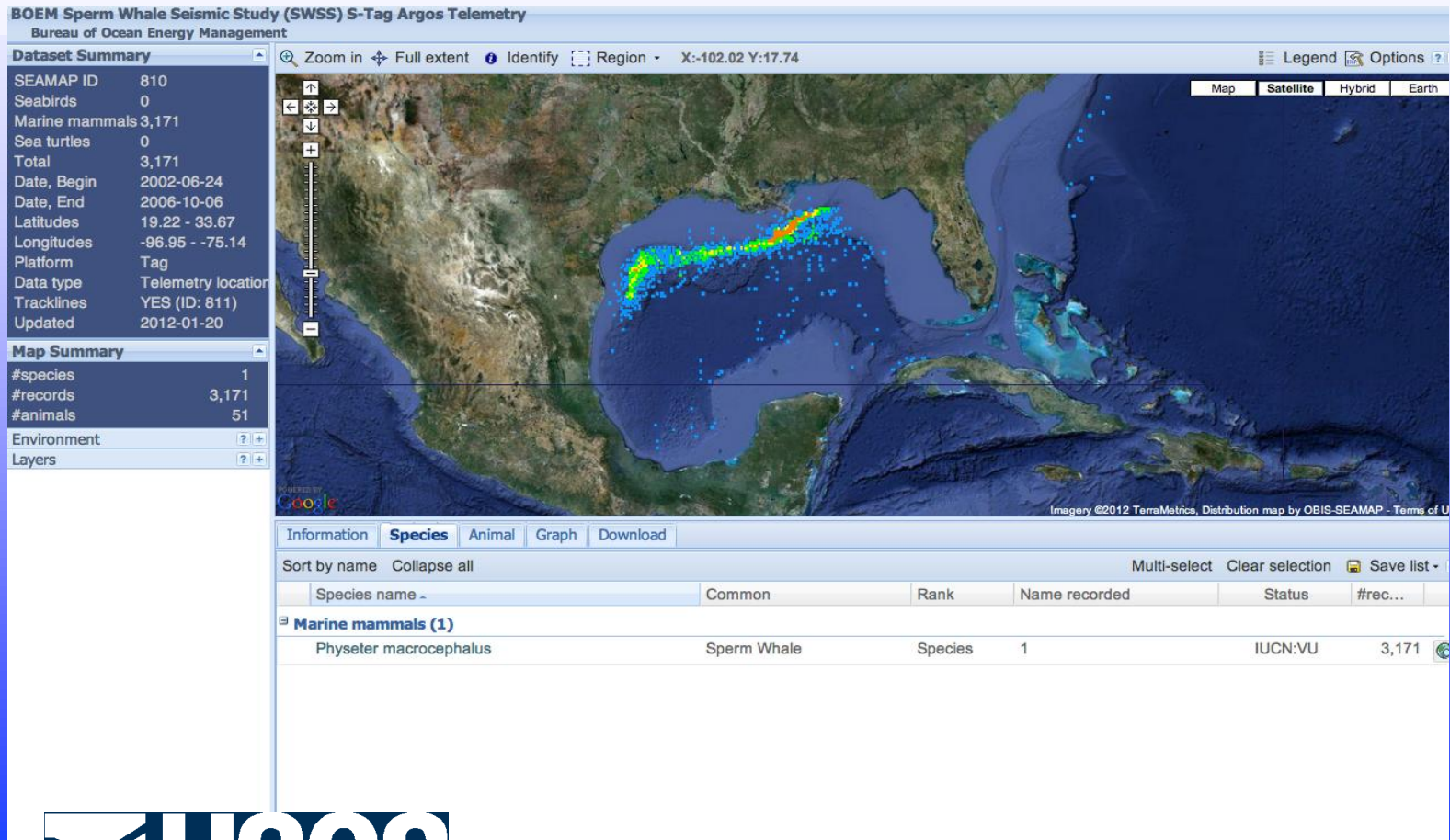
Information Species Graph Download

Sort by name Collapse all Multi-select Clear selection Save list

Species name	Common	Rank	Name recorded	Status	#rec...
Marine mammals (5)					
Balaenoptera acutorostrata	Minke Whale	Species	BAC	IUCN:LC	2
Delphinidae	dolphins	Family	DELP		1
Grampus griseus	Risso's Dolphin	Species	GGR	IUCN:LC	1
Stenella frontalis	Atlantic Spotted Dolphin	Species	SFR	IUCN:DD	8
Tursiops truncatus	Bottlenose Dolphin	Species	TTR	IUCN:LC	11
Sea turtles (2)					
Caretta caretta	Loggerhead	Species	CCA	ESA:Threatened	52
Cheloniidae	Sea Turtles	Family	TURT		22

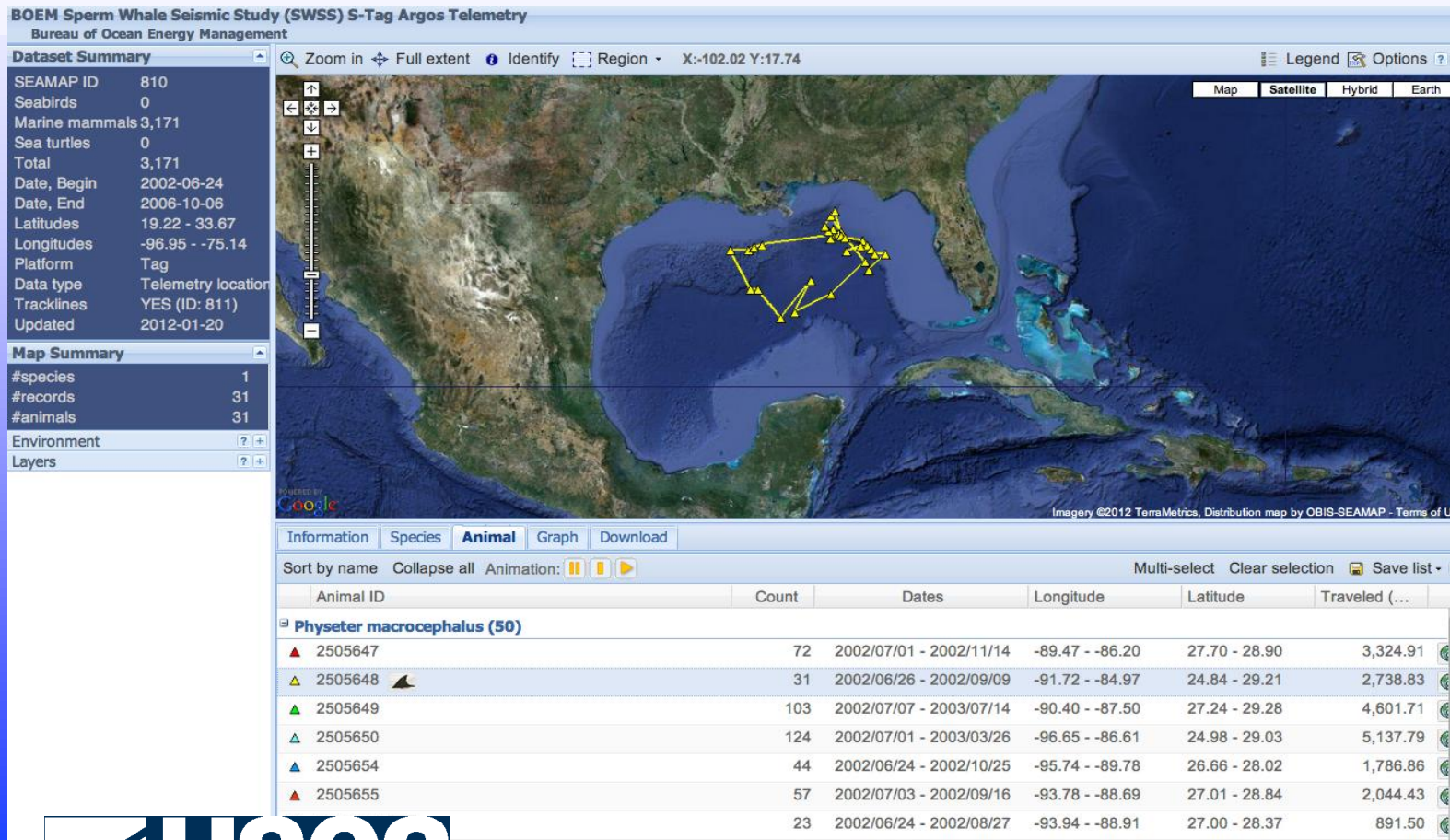
BOEM GoMEX Sperm Whale data

Integrated data viewer – explore S-TAG, PhotoID, Genetic data



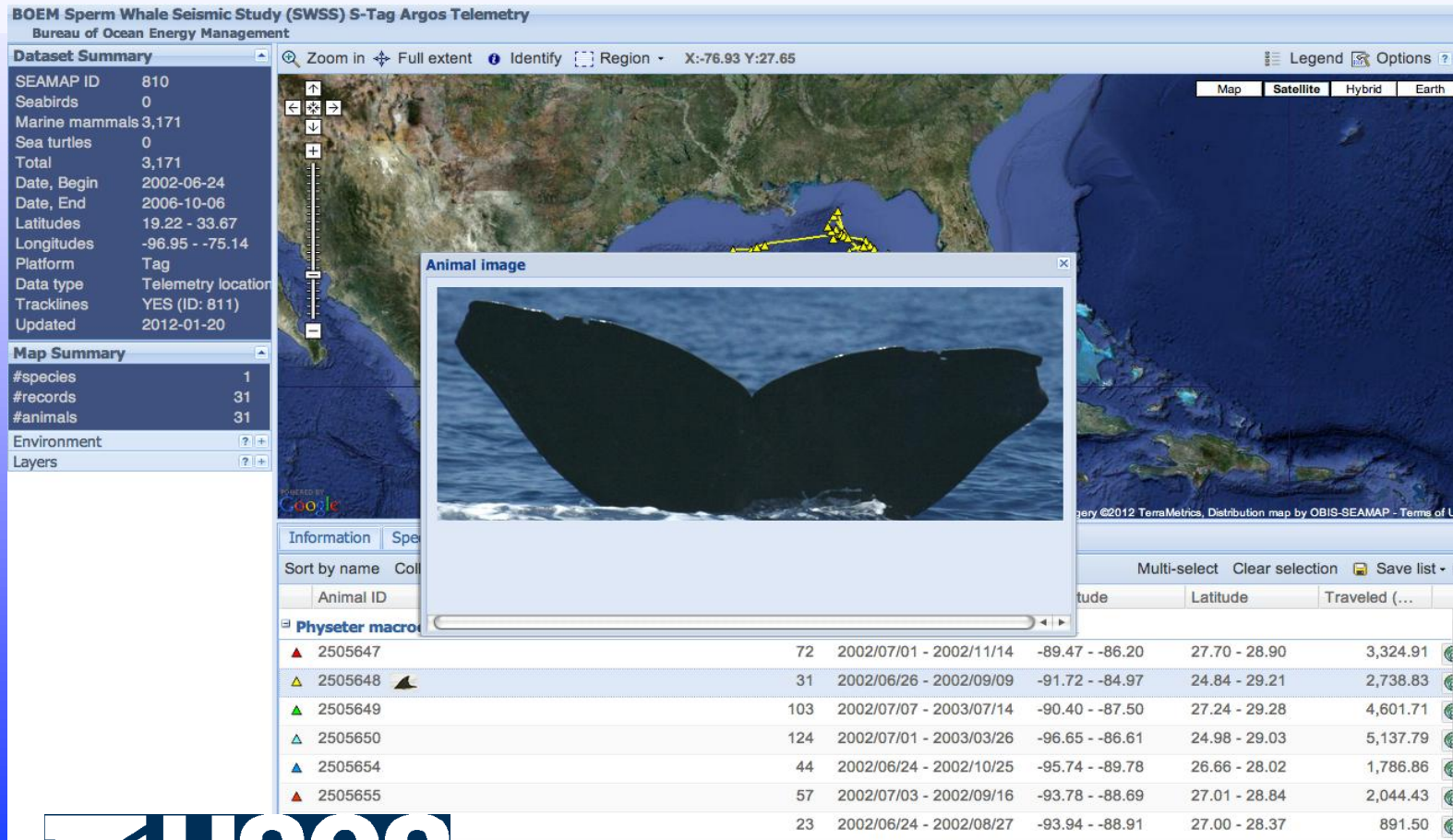
BOEM GoMEX Sperm Whale data

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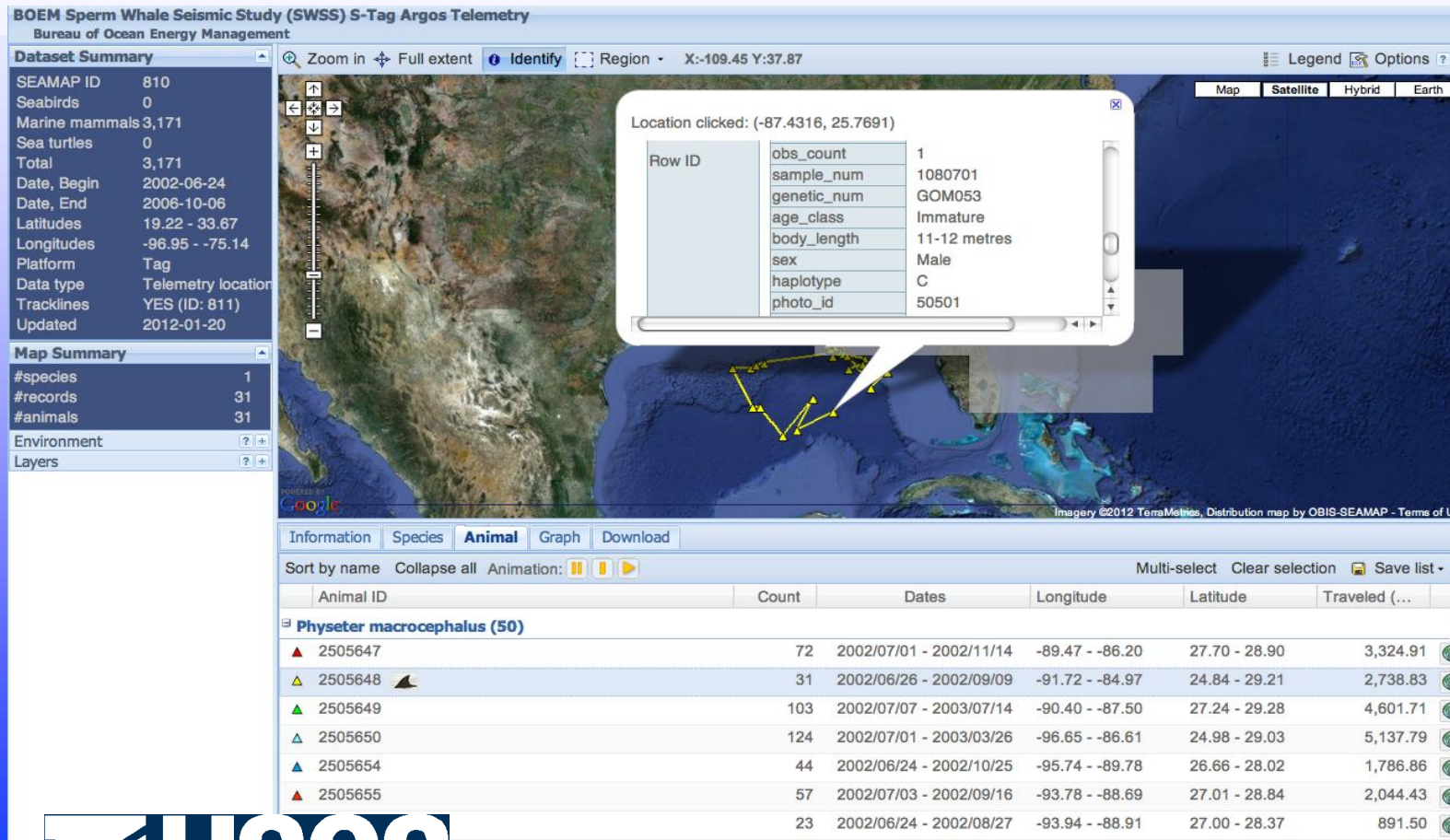
BOEM GoMEX Sperm Whale data

Integrated data viewer – explore S-TAG, PhotoID, Genetic data



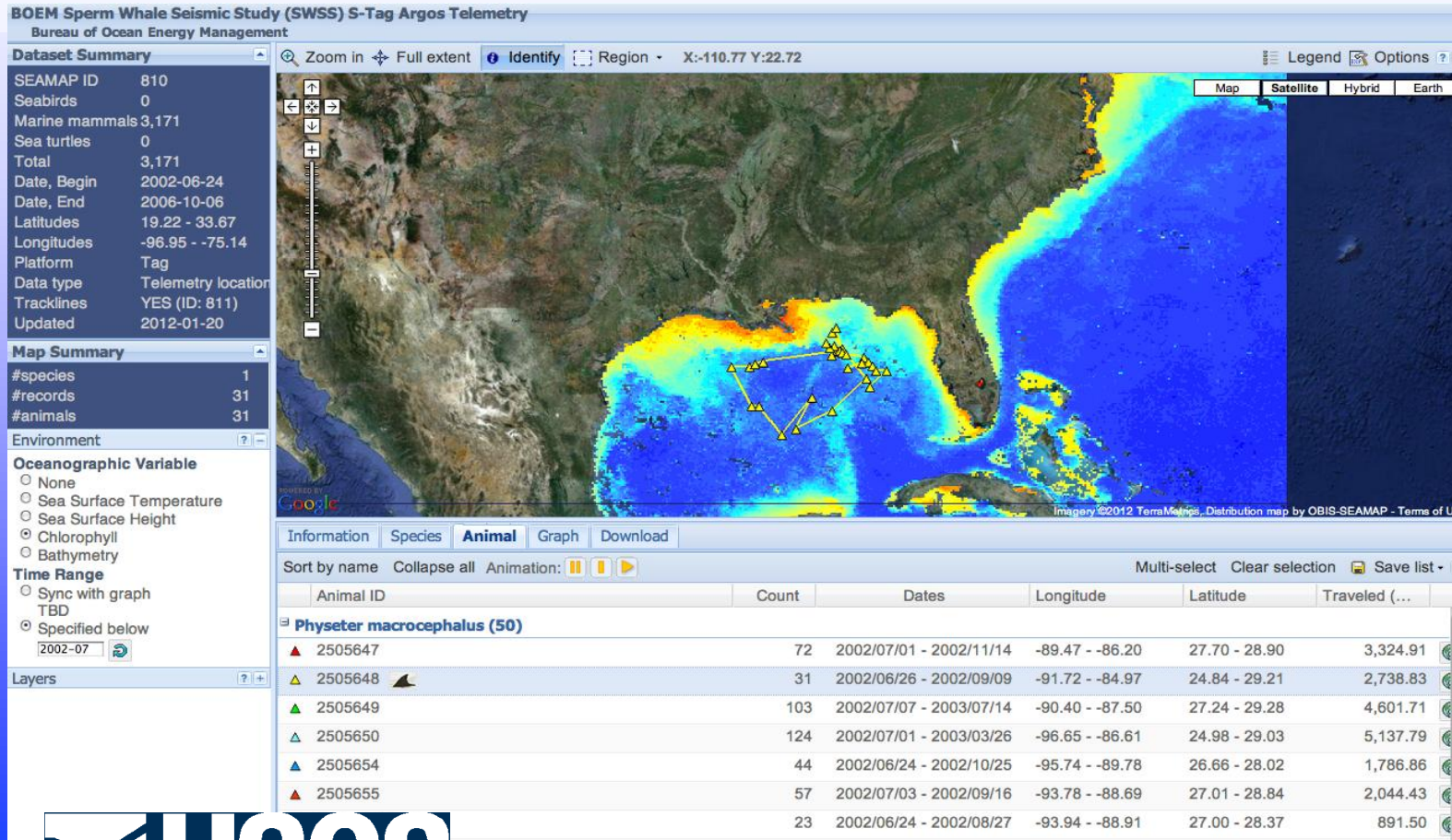
BOEM GoMEX Sperm Whale data

Integrated data viewer – explore S-TAG, PhotoID, Genetic data



BOEM GoMEX Sperm Whale data

Integrated data viewer – explore S-TAG, PhotoID, Genetic data



Application Possibilities

- Portal for BOEM data
 - Could include contextual CMSP data
- Portal focused on Atlantic WEAs
 - Animal observations
 - Distribution and density models
 - Contextual CMSP data
- Develop GIS tools for ESRI model builder including OBIS data extraction
 - Using existing OBIS-USA ERDDAP client
 - Marine Geospatial Ecology Tools (MGET) package

Conclusions

- Enrollment in OBIS-USA / SEAMAP
 - Standards-accessible Content and Services
 - Original data and contacts readily accessible
 - Benefits of Rich Metadata
 - Follow-through to NODC
- Multiple output applications
 - Reliable data meaning for applications
 - Customized service development – various queries, output formats and client applications
 - Integration into thematic portals
 - Integration into distribution, density models, future model frameworks ...

Presentation #22



NOAA/NCCOS Biogeography Statistical Modeling of Seabird Distributions



Brian Kinlan

brian.kinlan@noaa.gov



Collaborators:

Chris Caldow (Chief, NOS/NCCOS/CCMA Biogeography Branch)

Allan O'Connell, Elise Zipkin (USGS Patuxent Wildlife Research Center)

Mark Wimer, Allison Sussman (USGS Patuxent Wildlife Research Center)

All opinions expressed in this talk are those of the lead author and do not necessarily reflect the opinions of NOAA, project funders, or project partners.

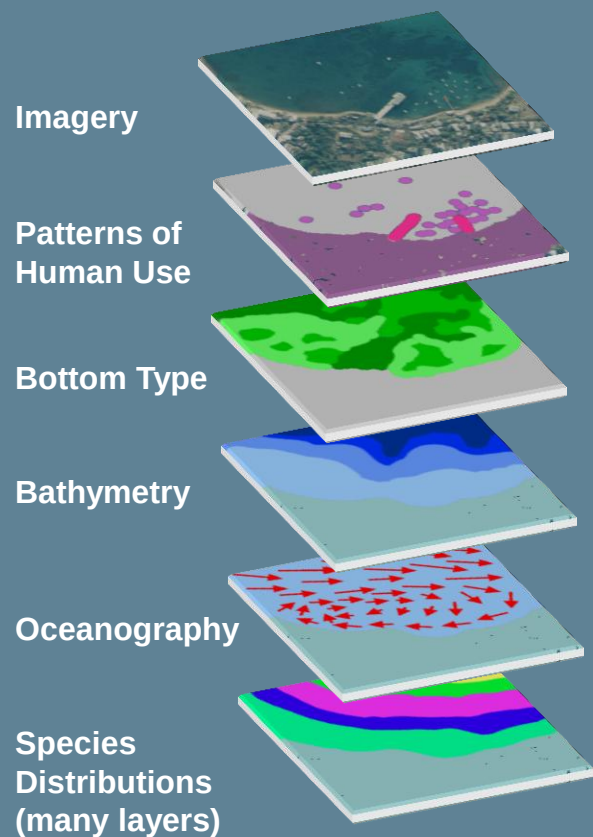
NOAA's Biogeography Branch

Mission: To develop information and analytical products through research, monitoring, and assessment on the distribution and ecology of living marine resources and their associated habitats



Biogeographic Assessment Approach

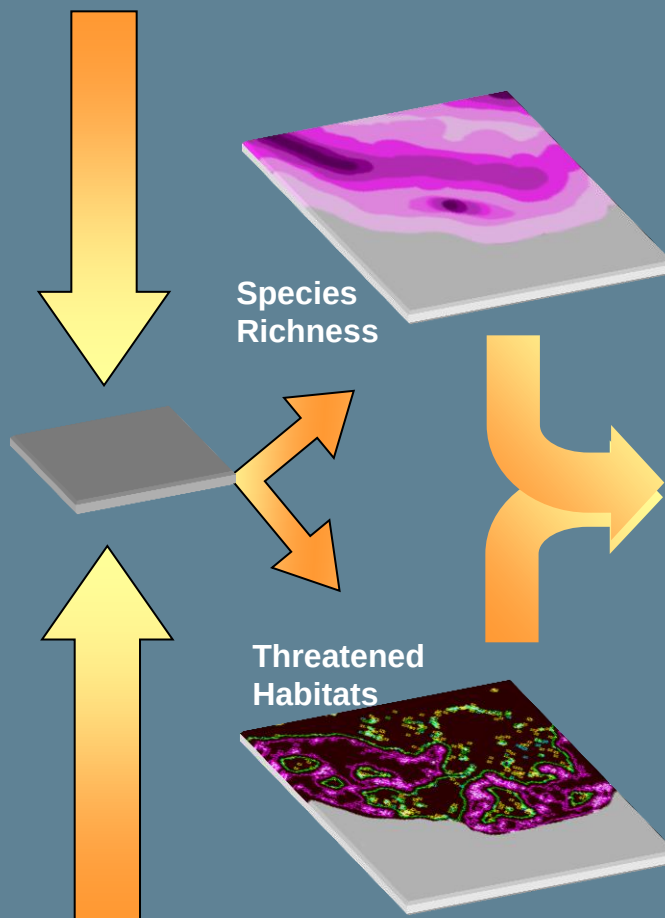
Biogeographic Data Layers



Combine Biogeographic Layers for Analysis

Example Integrated Biogeographic Analyses*

* Specific analyses targeted to management needs

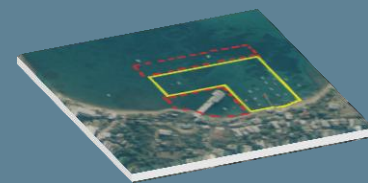


Products to Aid Management

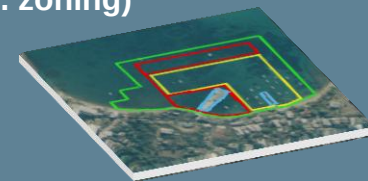
Defining and analyzing existing conditions



Defining and analyzing future conditions



Evaluate alternative management strategies (e.g. zoning)



Analytical Products to Meet Management Objectives



Objective: provide spatially explicit information to aid site selection and environmental assessment for offshore wind



Photo credit: David Pereksta, BOEM

Risk assessment framework

1. What species of birds are present in the vicinity of a wind farm and how many? (**Exposure**)
2. What is the per capita probability of an adverse effect of wind farms on birds of a given species, given that they are present in the area? (**Species-Specific Hazard** or **Sensitivity**)
3. How much are the potential adverse impacts from combining (1) and (2) likely to impact the population of each species, given its current status, trends, and ecological traits? (**Population Vulnerability**)

Modified from the Crichton (1999) definition: “**Risk is the probability of a loss, and depends on three elements, hazard, vulnerability and exposure.**”

Outline:

1. Climatological Mapping/Modeling

a. Past work: NY Bight Modeling

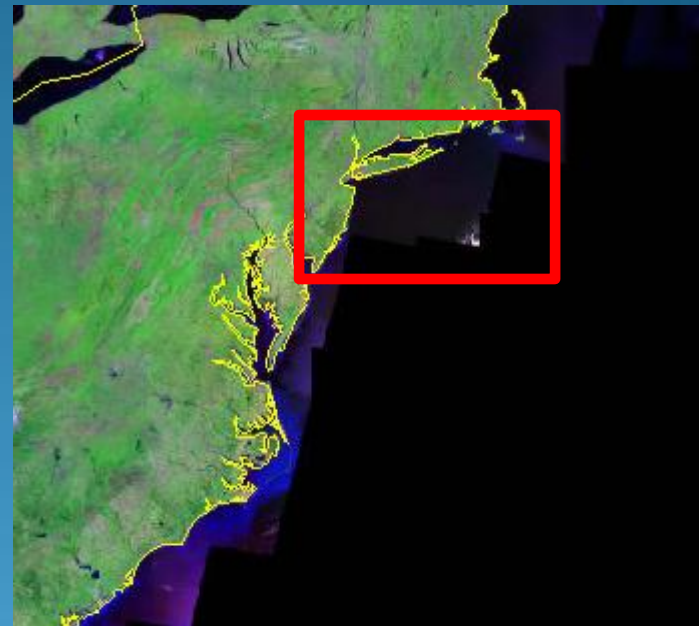
b. Current work: Mid-Atl. Predictive Modeling

2. Power Analysis and Sampling Design

Prior work (2010-2012): Predictive Modeling of Seabirds in NY Bight

Collaboration with New York's Department of State (DOS) to collect and interpret ecological information needed by DOS to:

- Use when considering offshore renewable energy development proposals,
- Advance the protection of critical offshore habitats, and
- Support an Amendment to NY's Coastal Management Program.



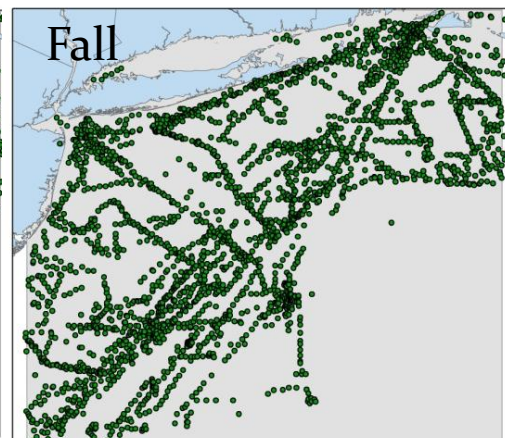
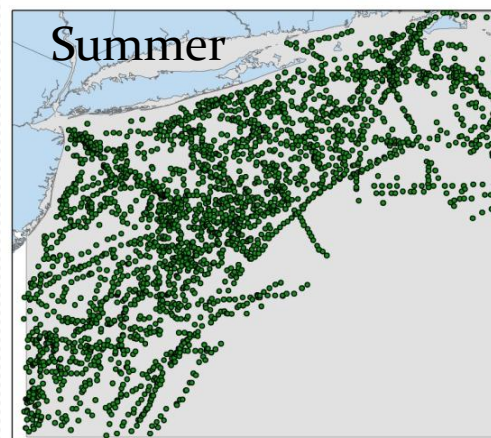
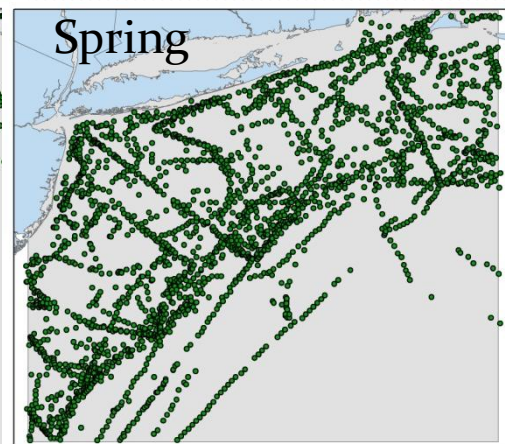
NOS Technical Memorandum:

Kinlan, B.P., C. Menza, and F. Huettmann. 2012. Predictive Modeling of Seabird Distribution Patterns in the New York Bight.

Chapter 6 in C. Menza, B.P. Kinlan, D.S. Dorfman, M. Poti and C. Caldw (eds.). A Biogeographic Assessment of Seabirds, Deep Sea Corals and Ocean Habitats of the New York Bight: Science to Support Offshore Spatial Planning. NOAA Technical Memorandum NOS NCCOS 141. Silver Spring, MD. 224 pp.

DATA: MBO CSAP Seabird Survey 1980-1988

- Manomet Bird Observatory Cetacean and Seabird Assessment Program
- Timed shipboard visual strip transects resulting in estimates of sightings per unit effort (SPUE)
- Scattered survey locations in space/time, 1980-1988
- We focused on 43 species of seabirds, shorebirds, and waterfowl



Species and groups modeled

Table 3.4. Summary of numbers of identifiable species, unidentified types, and contributions to species richness of each mapped species and group.

Species or group name	# of positively identified species in group	# of unidentified categories in group	Minimum contribution to species richness	Maximum contribution to species richness
Individually mapped species				
Black-legged Kittiwake	1	0	1	1
Common Loon	1	0	1	1
Common Tern	1	0	1	1
Cory's Shearwater	1	0	1	1
Dovekie	1	0	1	1
Great Black-backed Gull	1	0	1	1
Greater Shearwater	1	0	1	1
Herring Gull	1	0	1	1
Laughing Gull	1	0	1	1
Northern Fulmar	1	0	1	1
Northern Gannet	1	0	1	1
Pomarine Jaeger	1	0	1	1
Sooty Shearwater	1	0	1	1
Wilson's Storm-Petrel	1	0	1	1
Subtotals	14	0	14	14
Modeled species groups				
Alcids, less common	4	4	1	4
Coastal Waterfowl	7	3	1	7
Jaegers	2	1	1	2
Phalaropes	2	1	1	2
Shearwaters, less common	2	2	1	2
Small Gulls, less common	2	0	1	2
Storm-Petrels, less common	3	1	1	3
Terns, less common	7	2	1	7
Unidentified Gull	0	2	0	0
Subtotals	29	16	8	29
Non-modeled species groups				
Cormorants	2	1	1	2
Rare Visitor	10	2	1	10
Skuas, less common	1	1	1	1
Subtotals	13	4	3	13
Grand totals				
Modeled	43	16	22	43
Not modeled	13	4	3	13
All	56	20	25	56

- Modeled species individually where possible
- Otherwise grouped taxonomically and ecologically similar species
- Up to four seasonal models for each species/group: Spring, Summer, Fall, Winter

Environmental predictors

- Synthesized satellite, hydrographic, geological, and other databases
- Bathymetry, bottom substrate, oceanography, biology
- Seasonal climatologies of dynamic variables
- ~1km resolution (30 arc-second)

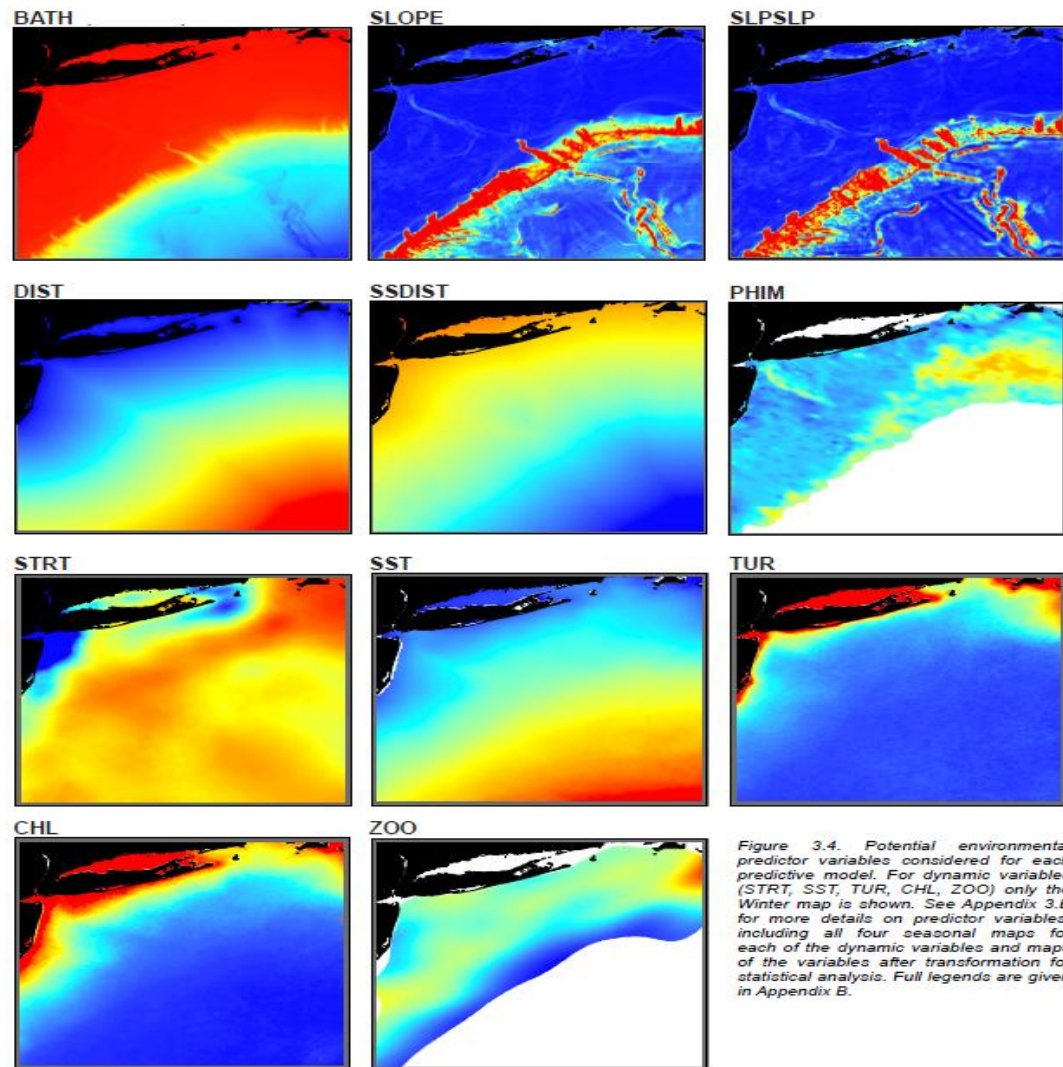


Figure 3.4. Potential environmental predictor variables considered for each predictive model. For dynamic variables (STRT, SST, TUR, CHL, ZOO) only the Winter map is shown. See Appendix 3.B for more details on predictor variables, including all four seasonal maps for each of the dynamic variables and maps of the variables after transformation for statistical analysis. Full legends are given in Appendix B.

Statistical modeling approach

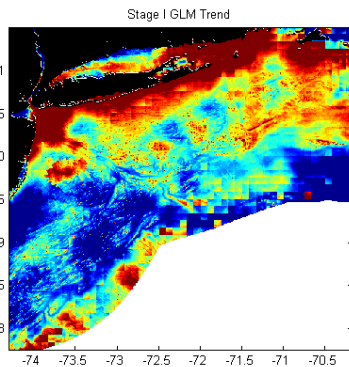
Two stage regression-kriging

Stage I: Probability of Presence

Data

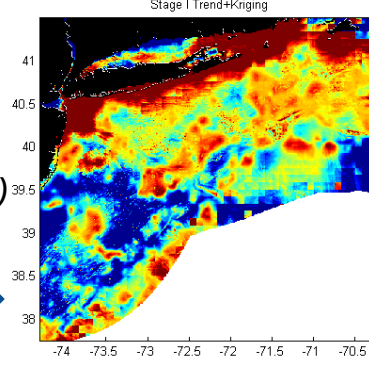


Trend model
*Binomial
GLM,
Logit link*



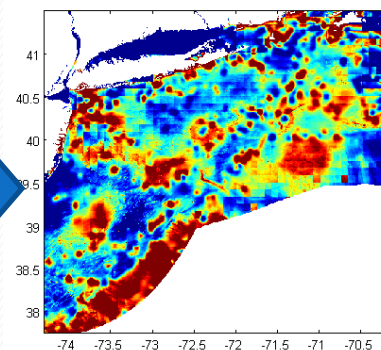
Prob(Trend)

Spatial
model
*Indicator
Kriging (IK)*

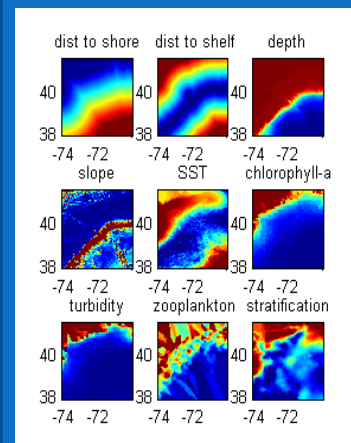


Prob (Resid. |
Trend)

Predicted SPUE

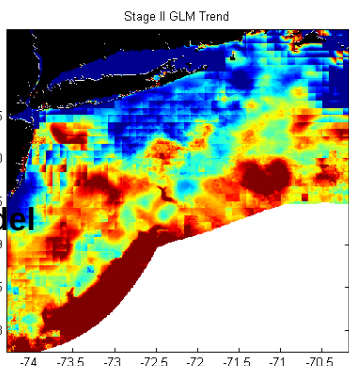


Predictors



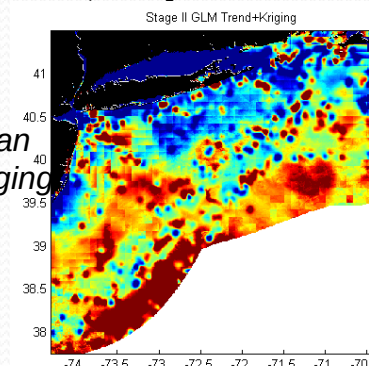
Stage II: Abundance (SPUE) if present

Trend model
*Gaussian
GLM,
Box-Cox
transform*



Trend

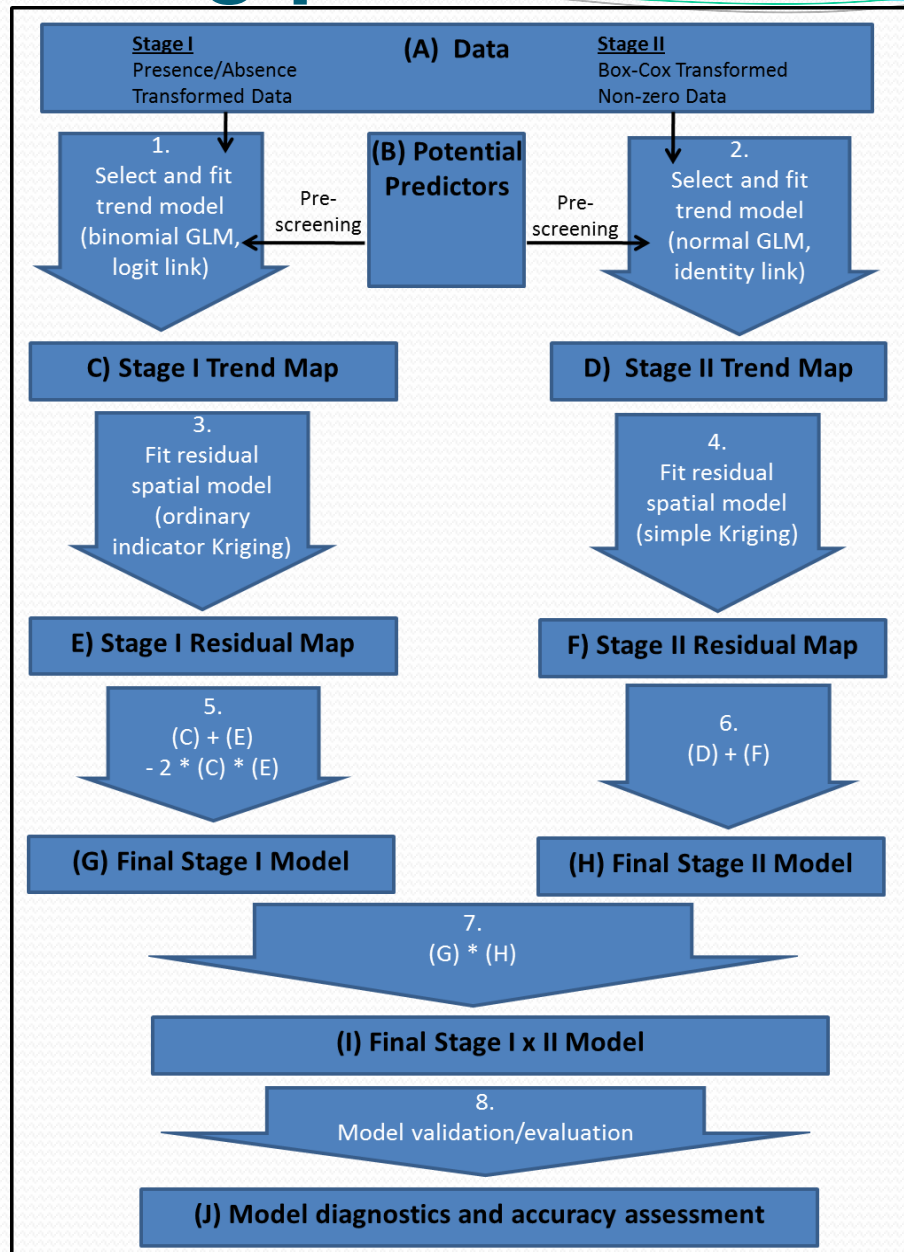
Spatial
model
*Transgaussian
Ordinary Kriging
(OK)*



Trend+Residual

- Assess predictive skill with cross validation

Modeling process overview



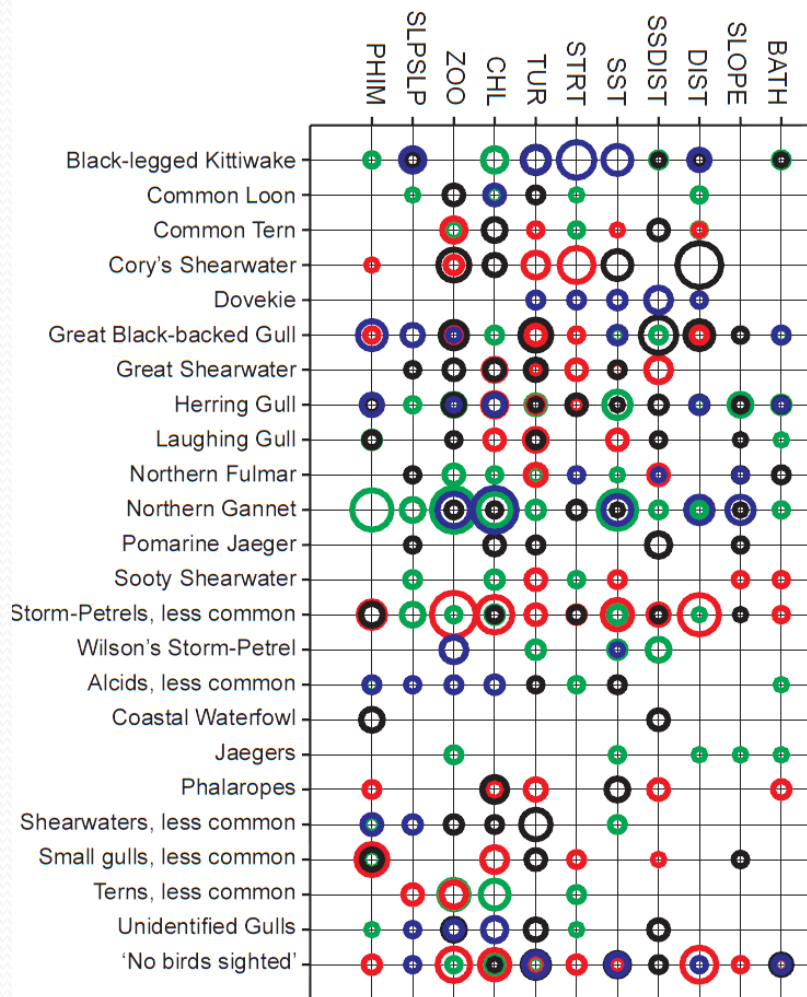


- Outputs

Predictor importances (simple slopes)

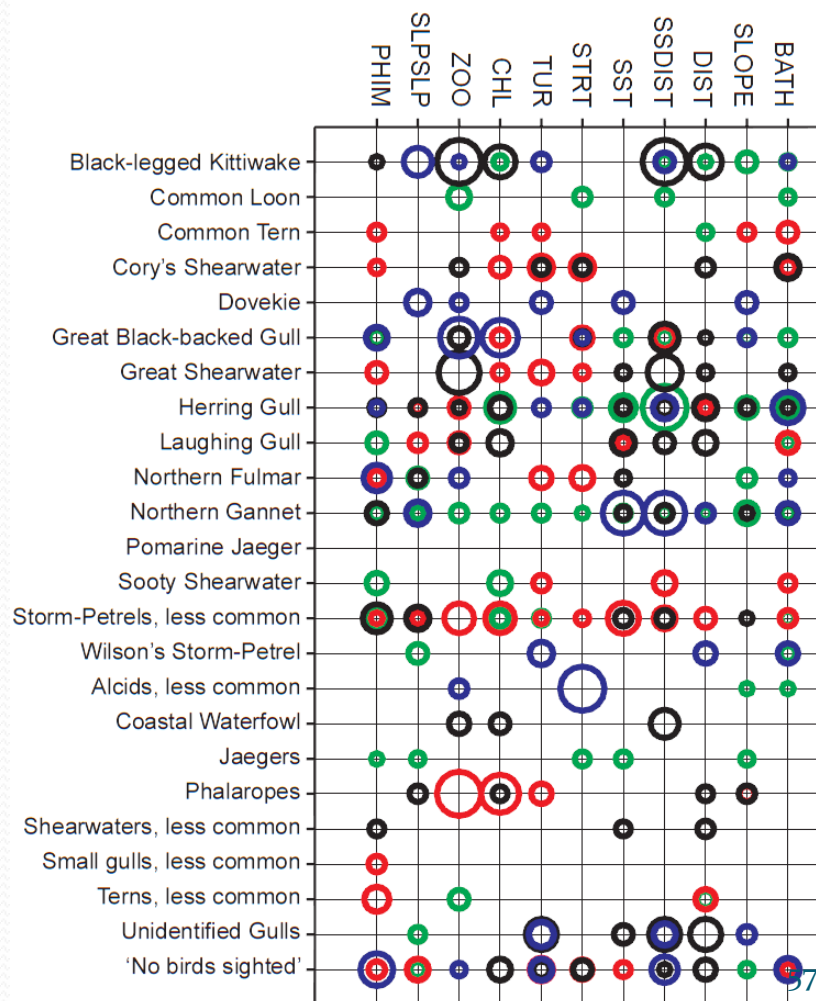
Stage I (Occurrence)

Predictor Variable



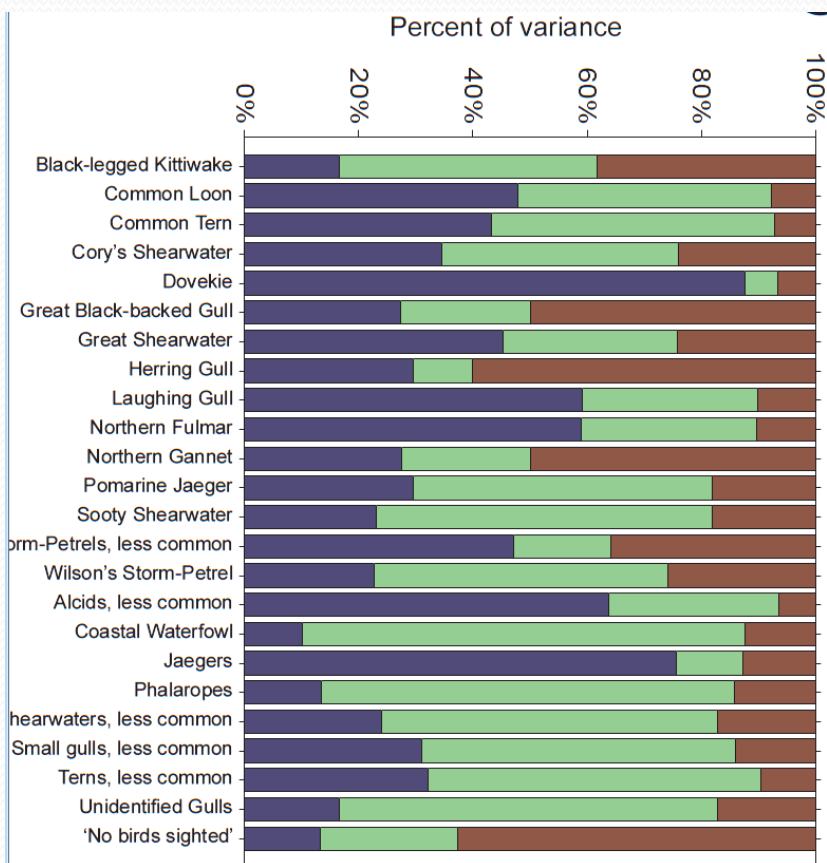
Stage II (Abundance | Present)

Predictor Variable

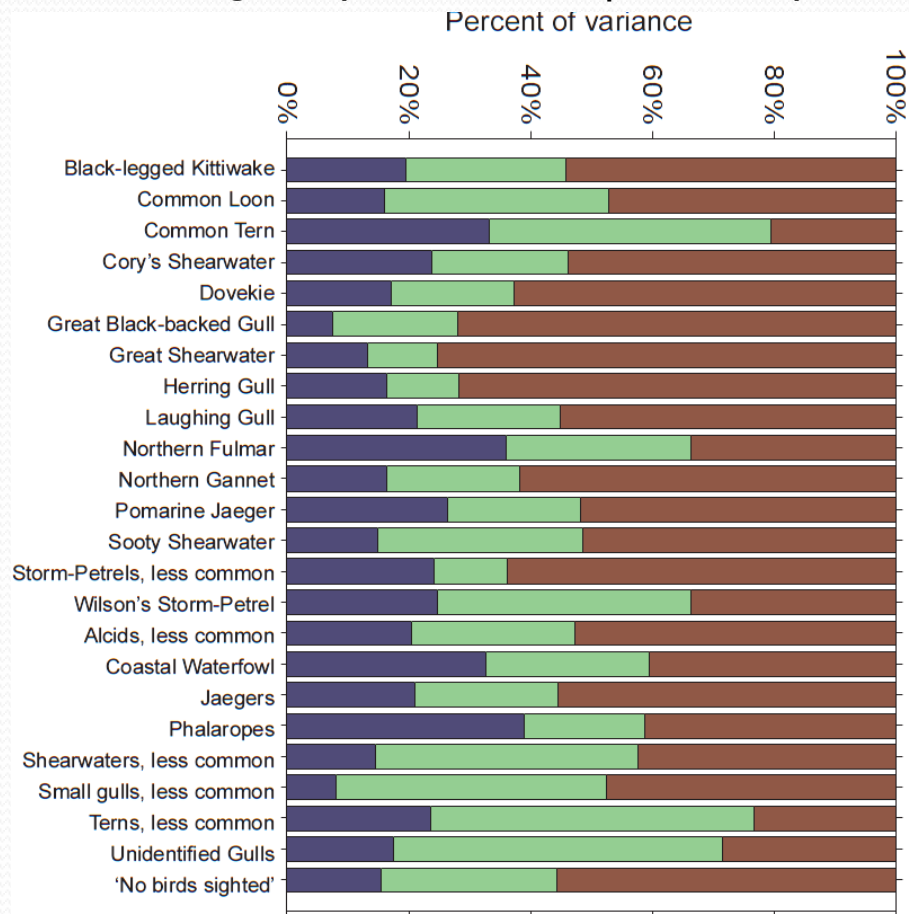


Variance partitioning

Stage I (Occurrence)



Stage II (Abundance | Present)

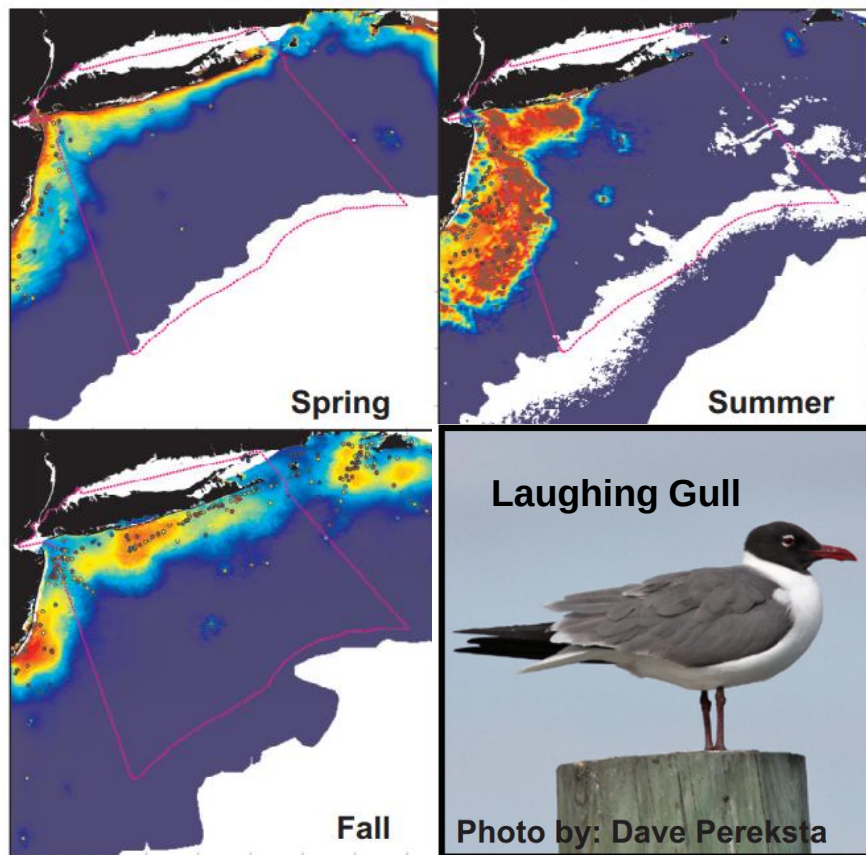


Species seasonal climatologies

PREDICTIONS

SPUE (birds per 15 minute survey per km²)

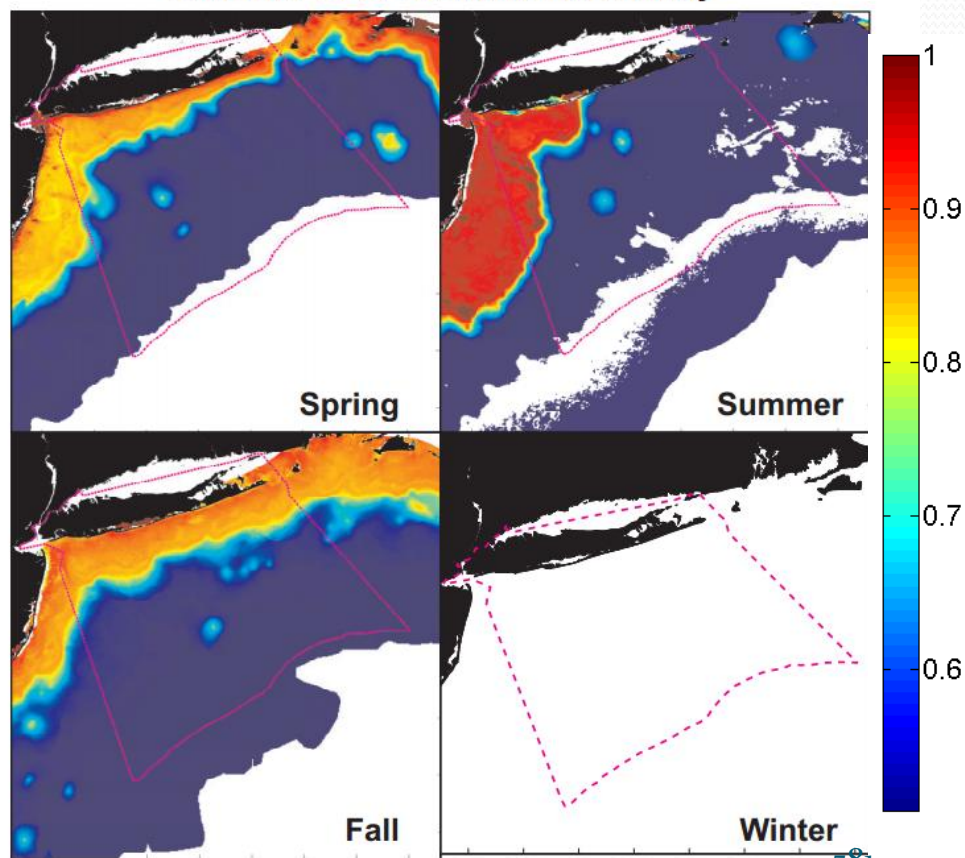
Seasonal Predicted SPUE Maps



UNCERTAINTY

Relative units (0=perfect certainty, 1=no better than global mean)

Seasonal SPUE Relative Uncertainty

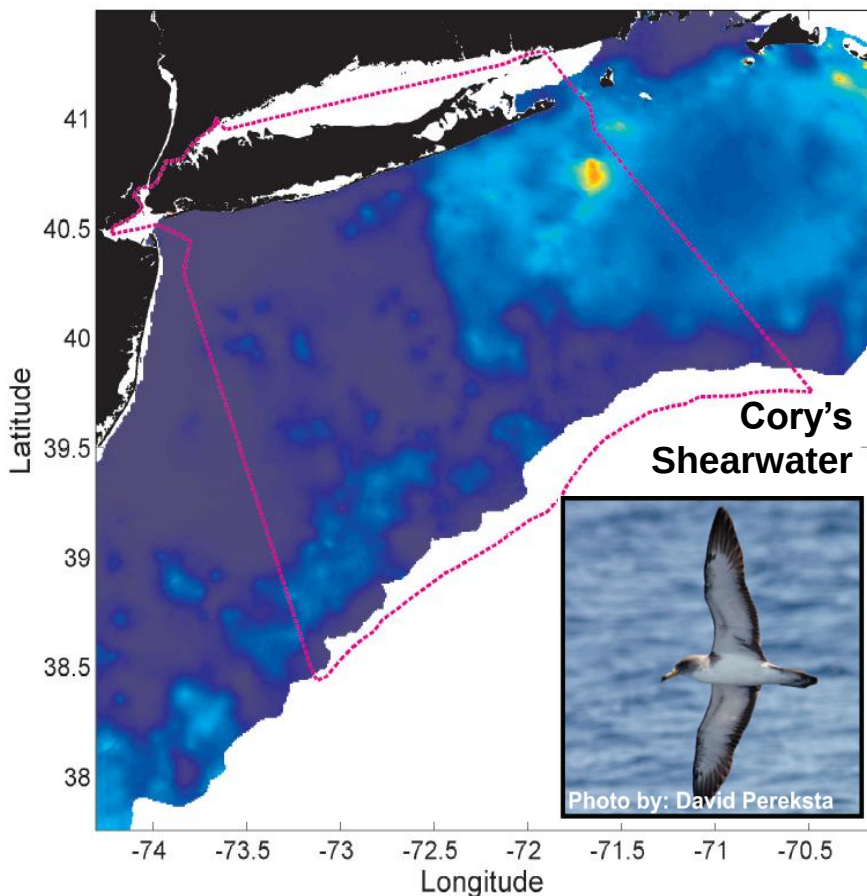


Species annual climatologies

PREDICTIONS

SPUE (birds per 15 minute survey per km²)

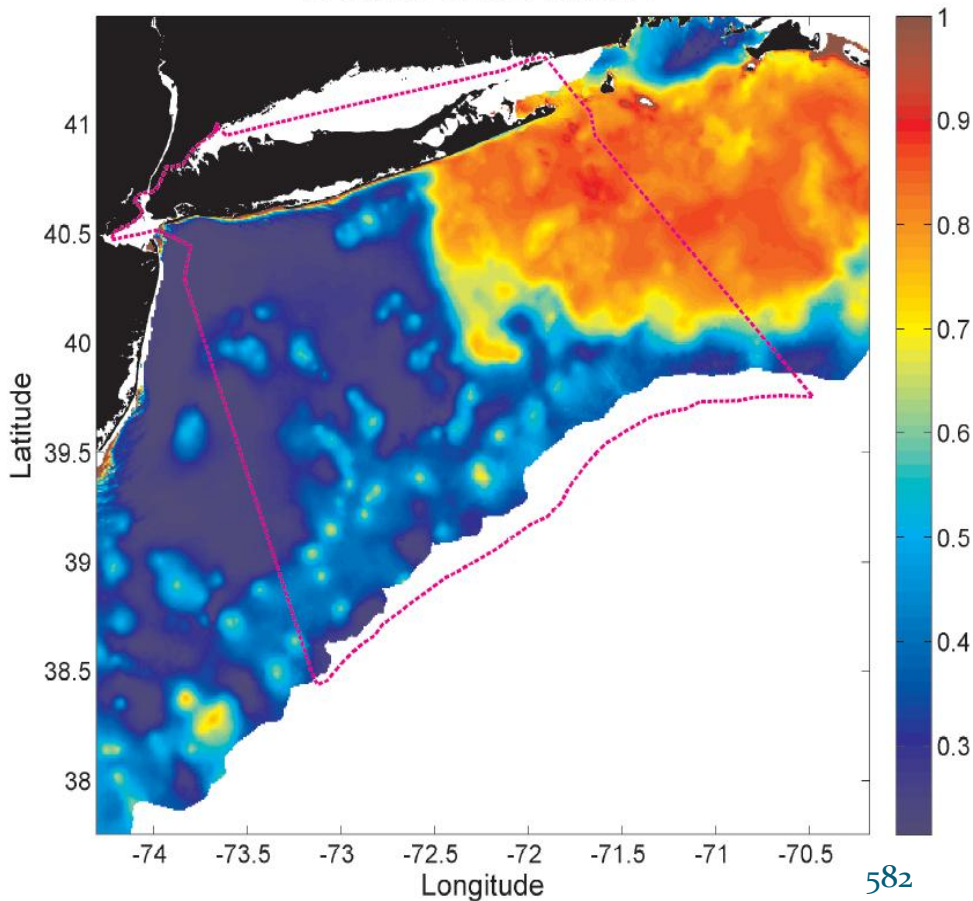
ANNUAL PREDICTED SPUE



UNCERTAINTY

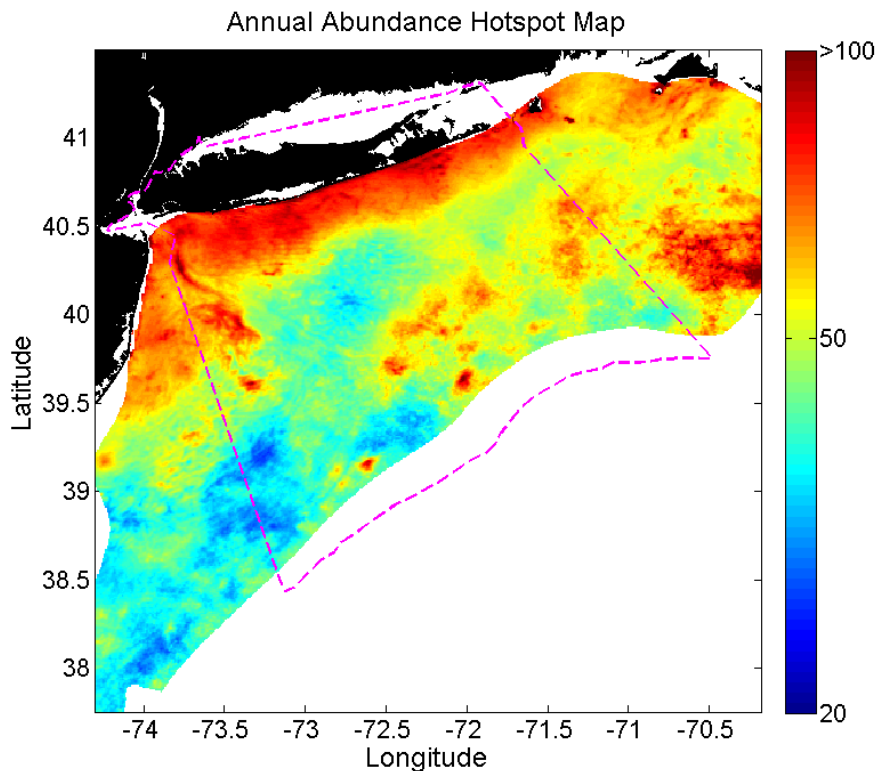
Relative units (0=perfect certainty, 1=no better than global mean)

ANNUAL UNCERTAINTY

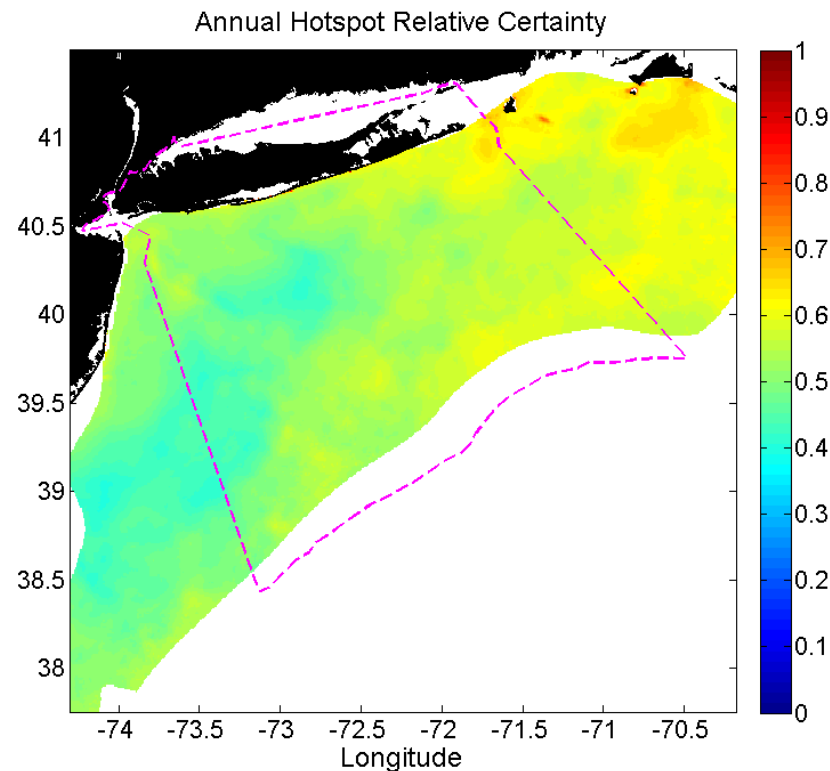


“Hotspots” of total predicted abundance

PREDICTIONS



UNCERTAINTY



Abundance “hotspot” analysis:

- *Summed predicted relative abundance (SPUE) over all species and groups*
- *Repeated for species richness and diversity indices*

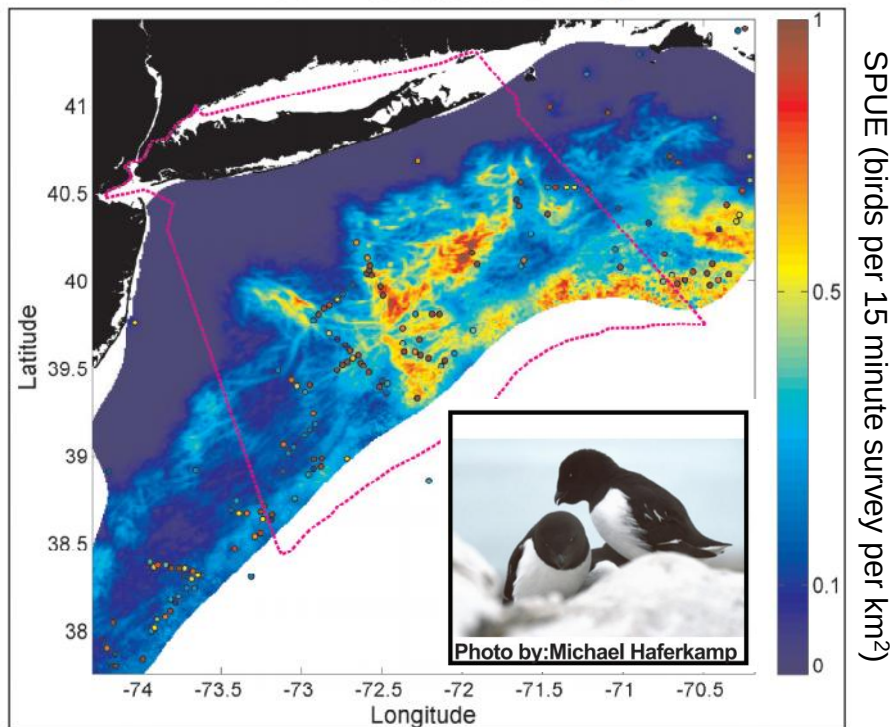
- **Uncertainty**
- **Model validation**
- **Accuracy assessment**

What do the uncertainty maps mean?

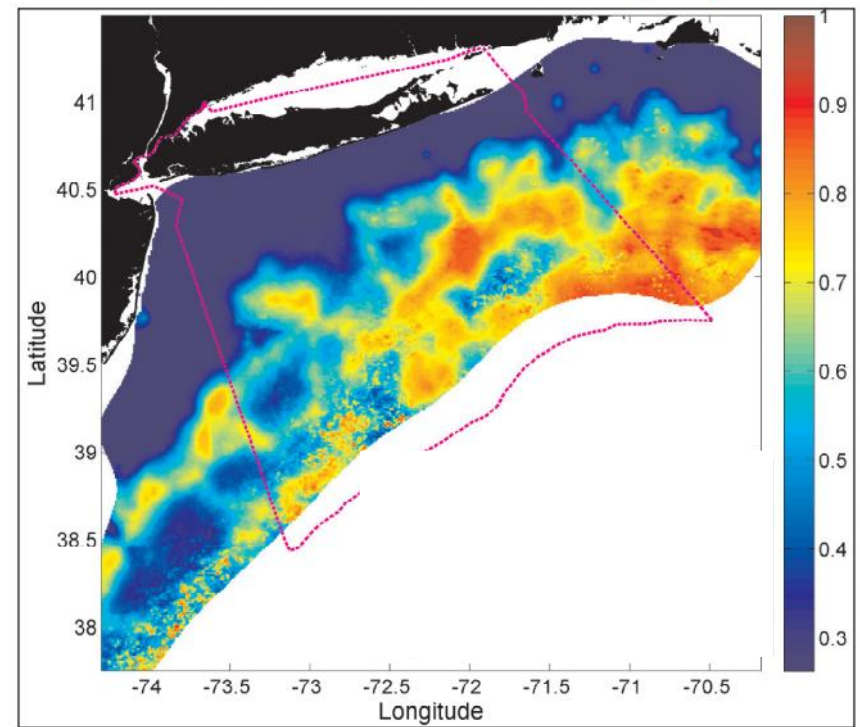
Dovekie

Stage I x II: Relative Abundance Predictive Model

Annual Predicted SPUE Map



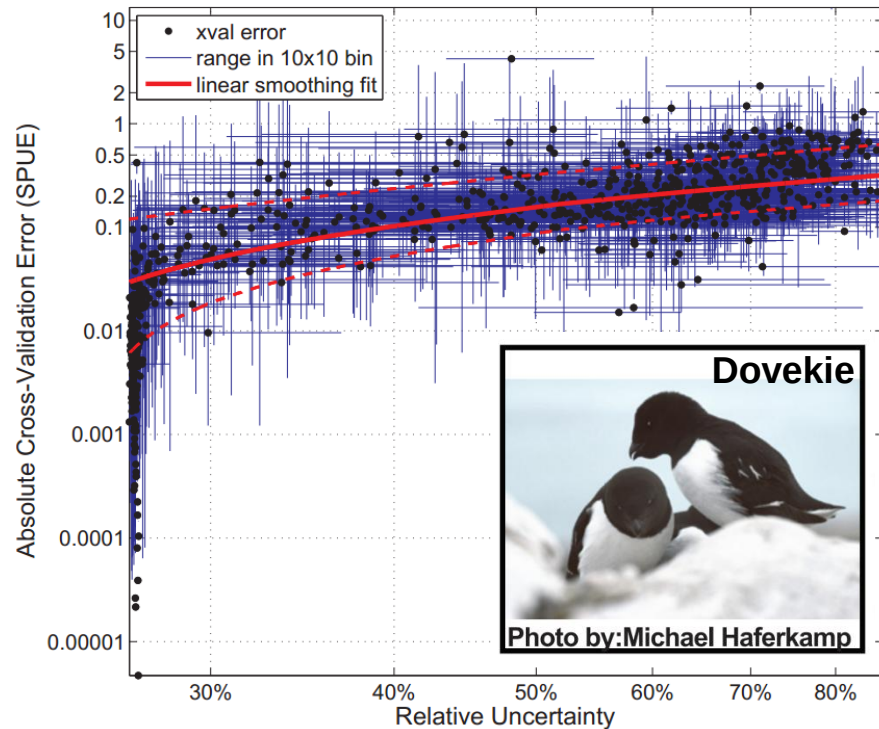
Annual SPUE Relative Uncertainty Map



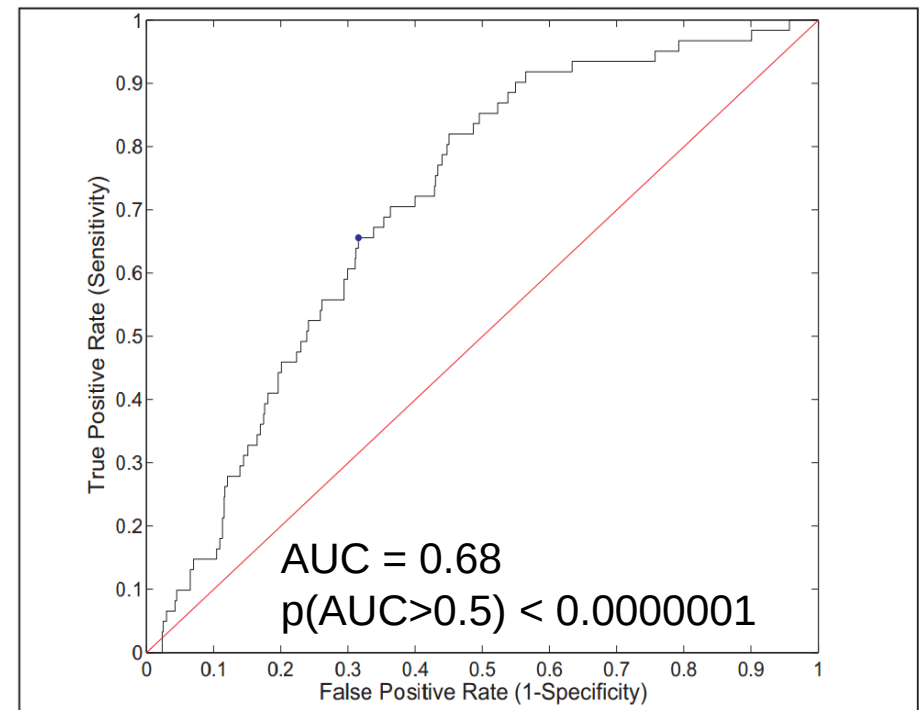
Cross-validation model assessment

- ❖ Train with 50% of data, use other 50% for independent assessment of error

Annual SPUE Uncertainty Calibration Plot



Annual Cross-Validation ROC Plot



Diagnostic statistics

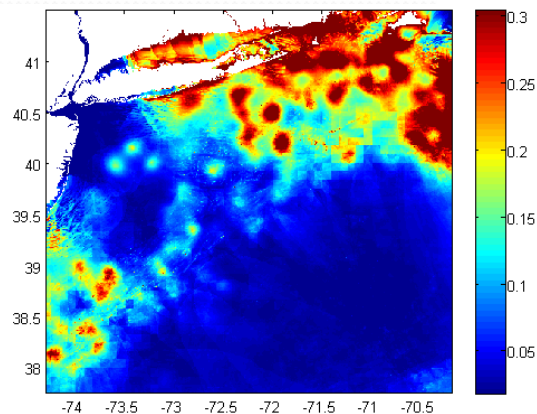
Table 6.7 Summary of cross-validation diagnostic statistics for annual models*.

Diagnostic statistic	Description
Rank R	Spearman rank correlation coefficient of observed vs. predicted
%1SD	Percent of observations within +/- 1 standard deviation (or standard error) confidence intervals of predicted value; theoretical expectation is 68%
AUC	Area Under Curve statistic; area under the receiver operating characteristic (ROC) curve
p(AUC)	p-Value for significance test of the AUC statistic
MAPE	Mean Absolute Percentage Error = $\text{mean}(\text{obs}-\text{pred} /\text{obs}) \times 100\%$
Rel.MAE	Relative Mean Absolute Error (expressed as a % of the 90th percentile - 10th percentile range of the data)
Rel.RMSE	Relative Root Mean Square Error (expressed as a % of the 90th percentile - 10th percentile range of the data)
Rel.Bias	Relative Absolute Bias (expressed as a % of the 90th percentile - 10th percentile range of the data)
Bias Dir.	Sign (+ or -) of the Bias statistic. + indicates predicted value tends to be greater than observed value.

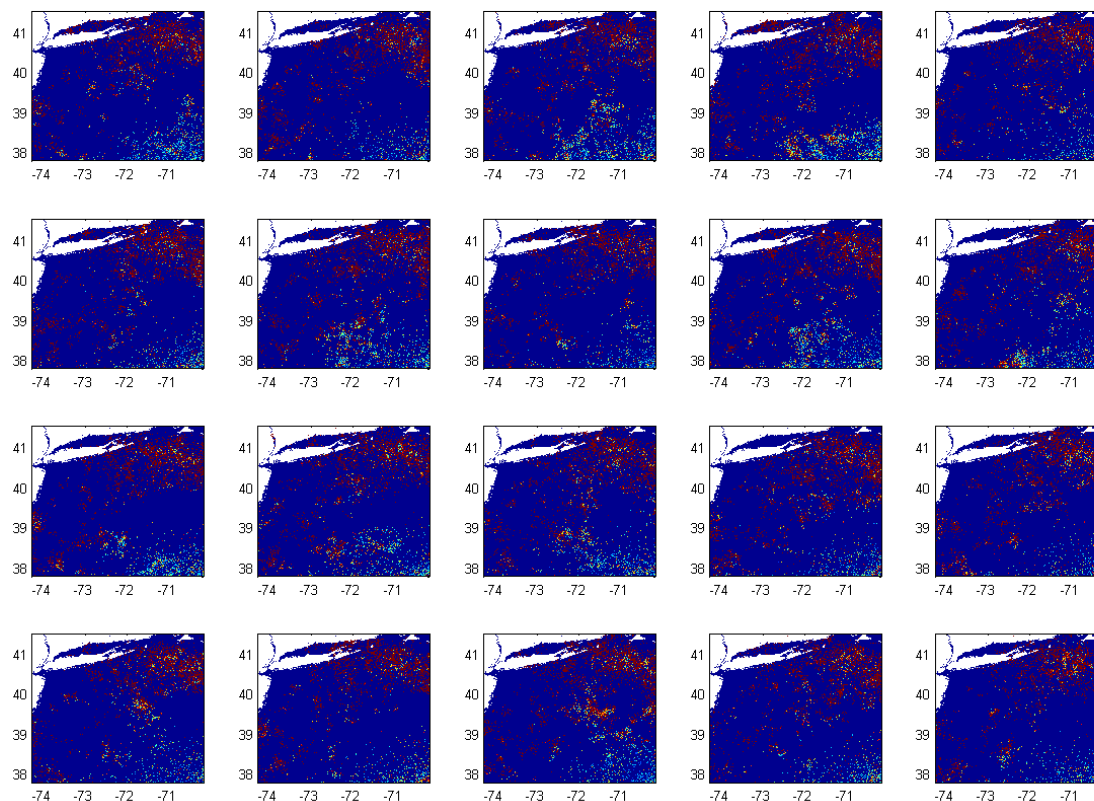
DIAGNOSTIC STATISTICS**								
SPECIES OR GROUP NAME	Rank R	%1SD	AUC	p(AUC)	MAPE	Rel. MAE	Rel. RMSE	Rel. Bias
Species								
Black-legged Kittiwake	0.02	84.0%	0.47	0.7011	145%	44%	78%	14%
Common Loon	-0.04	33.3%	0.77	0.0000	258%	40%	67%	41%
Common Tern	0.26	46.7%	0.77	0.0000	579%	24%	34%	18%
Cory's Shearwater	0.20	78.6%	0.64	0.0000	112%	22%	69%	5%
Dovekie	0.20	62.3%	0.71	0.0000	216%	5%	15%	5%
Great Black-backed Gull	0.32	91.4%	0.77	0.0000	134%	33%	46%	7%
Great Shearwater	0.07	75.6%	0.65	0.0000	221%	27%	65%	-1%
Herring Gull	0.13	82.8%	0.56	0.3192	176%	43%	70%	-11%
Laughing Gull	0.33	76.1%	0.89	0.0000	161%	15%	28%	0%
Northern Fulmar	0.21	53.3%	0.80	0.0000	396%	60%	101%	46%
Northern Gannet	0.17	87.9%	0.64	0.0095	259%	32%	48%	0%
Pomarine Jaeger	0.30	66.7%	0.64	0.0012	590%	11%	15%	9%
Sooty Shearwater	0.28	72.4%	0.62	0.0025	135%	19%	27%	21%
Storm-Petrels, less common	0.24	61.5%	0.63	0.0072	306%	18%	25%	22%
Wilson's Storm-Petrel	0.29	75.2%	0.68	0.0000	396%	45%	95%	-17%
Mean	0.20	69.9%	0.68	n/a	272%	29%	52%	11%
Groups								
Alcids, less common	0.22	76.7%	0.59	0.0509	158%	23%	33%	26%
Coastal Waterfowl	0.20	64.3%	0.77	0.0000	395%	22%	66%	14%
Jaegers	-0.16	65.4%	0.62	0.0213	471%	13%	25%	10%
Phalaropes	0.16	70.6%	0.76	0.0000	908%	23%	77%	-9%
Shearwaters, less common	-0.05	76.5%	0.51	0.3915	156%	21%	32%	26%
Small gulls, less common	0.16	77.8%	0.72	0.0011	131%	27%	32%	34%
Terns, less common	0.52	61.9%	0.67	0.0047	874%	26%	39%	28%
Unidentified Gulls	0.14	56.8%	0.62	0.0173	291%	21%	27%	26%
Mean	0.15	68.7%	0.66	n/a	423%	22%	41%	19%

Ensemble spatial simulation

Mean

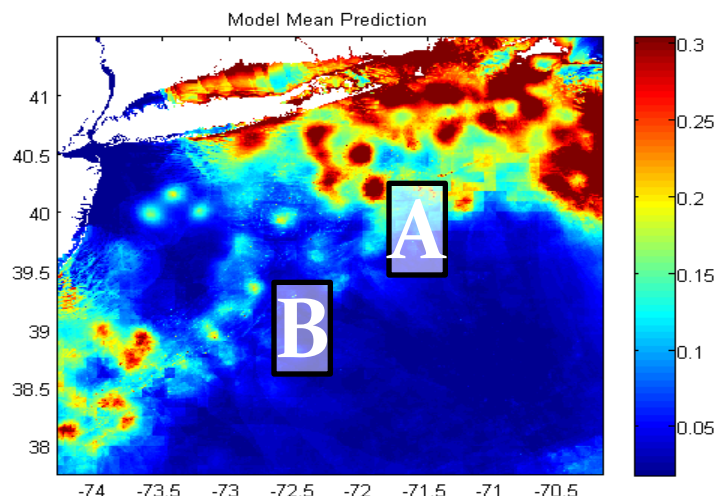


Simulated ensemble:

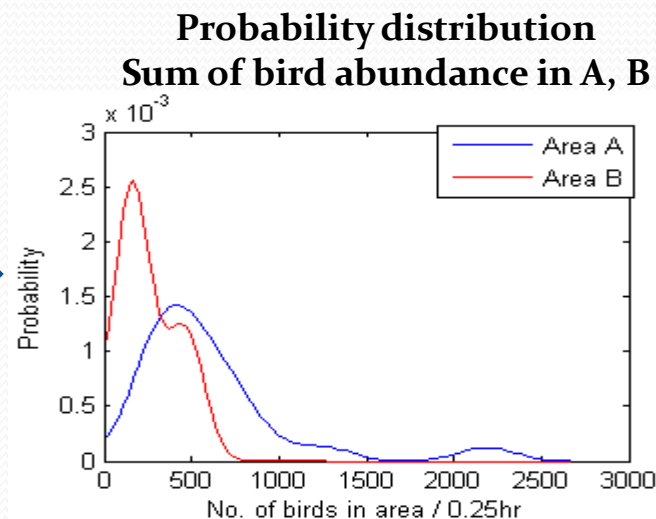


20 equally probable “realizations” of the true species distribution, generated using a **stochastic spatial simulation** algorithm called **conditional sequential Gaussian simulation**

Propagating uncertainty through management & decision-making processes



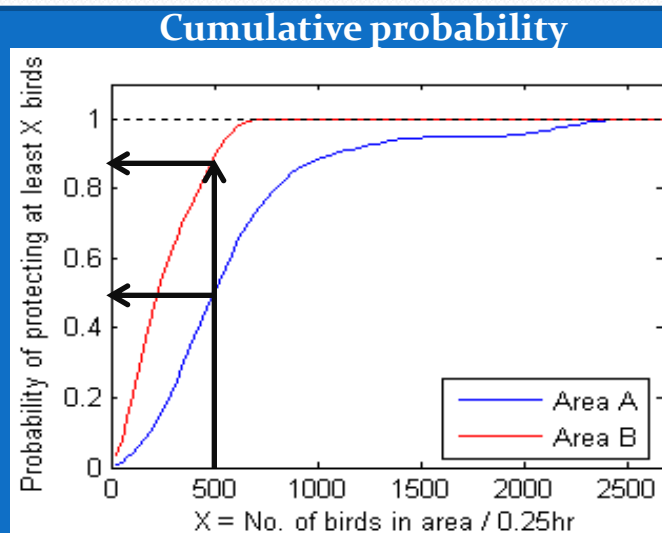
Spatial
simulation



What is the probability of achieving a given management target?

***50% chance that area A** would be found to contain 500 or more birds*

***85% chance that area B** would be found to contain 500 or more birds*



Summary

- Predictive modeling can produce **continuous, statistically consistent maps** from discontinuous, spatially biased data
 - Maximizes value of data by incorporating relationships with environmental predictors & spatial autocorrelation
- **Fine-scale** predictions are possible
 - But uncertainty needs to be characterized
- Identifies **long-term average spatial patterns** in bird distribution
- **Uncertainty** can be quantified and dealt with
 - Quantitative uncertainty maps
 - Spatial ensemble simulation methods → risk models
- **Caveats:**
 - Temporal change
 - Data quality
 - Detectability not incorporated

Outline:

1. Climatological Mapping/Modeling

a. Past work: NY Bight Modeling

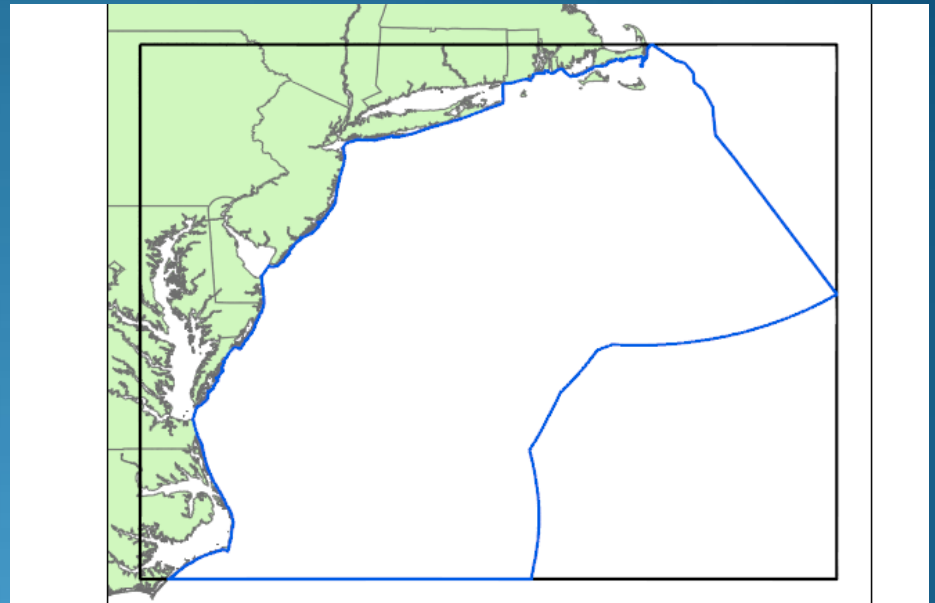
b. Current work: Mid-Atlantic Predictive Modeling

2. Power Analysis and Sampling Design

Current work (2011-2014): Predictive Modeling of Seabirds in the Mid-Atlantic

BOEM-funded collaboration with USGS Patuxent Wildlife Research Center to:

- Develop predictive spatial models of long-term average patterns of seabird abundance and occurrence in the Mid-Atlantic Bight,
- Validate products and characterize uncertainty
- Provide useful map products to support offshore wind siting and environmental assessment

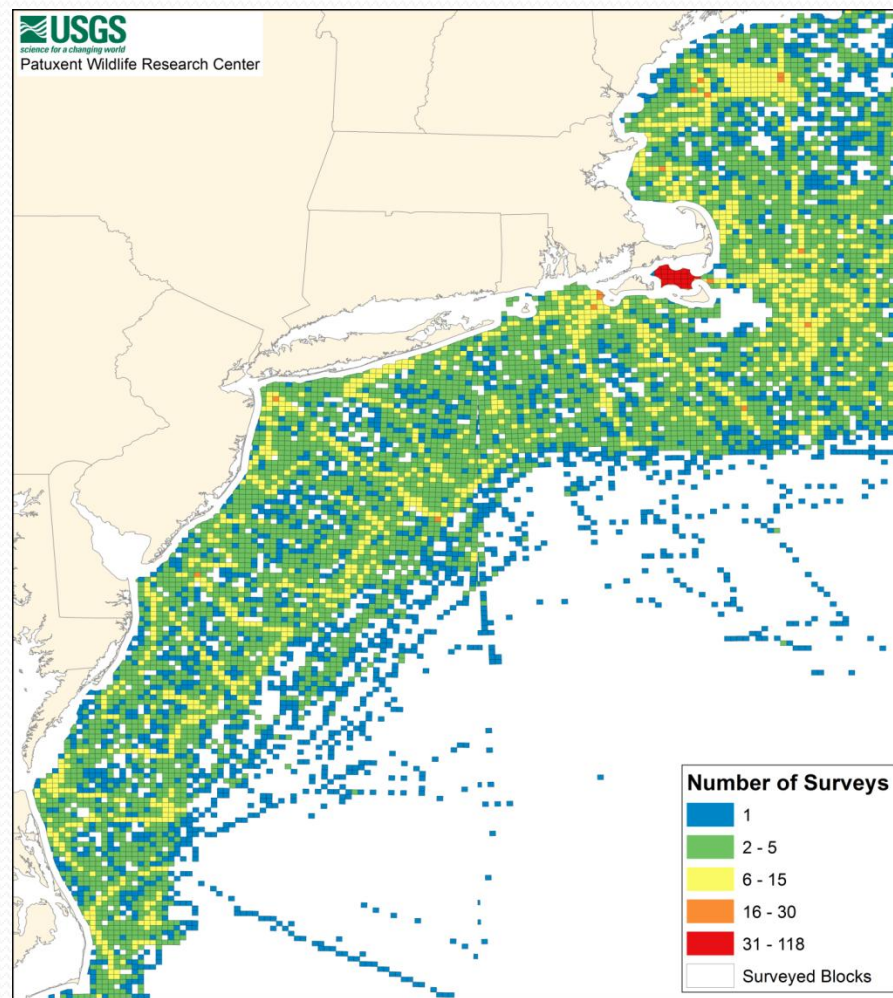


Collaboration between USGS and NOAA:
Allan O'Connell (USGS), Beth Gardner (NC State), Mark Wimer (USGS)

Project started Fall 2011, ongoing

The Atlantic Seabird Compendium

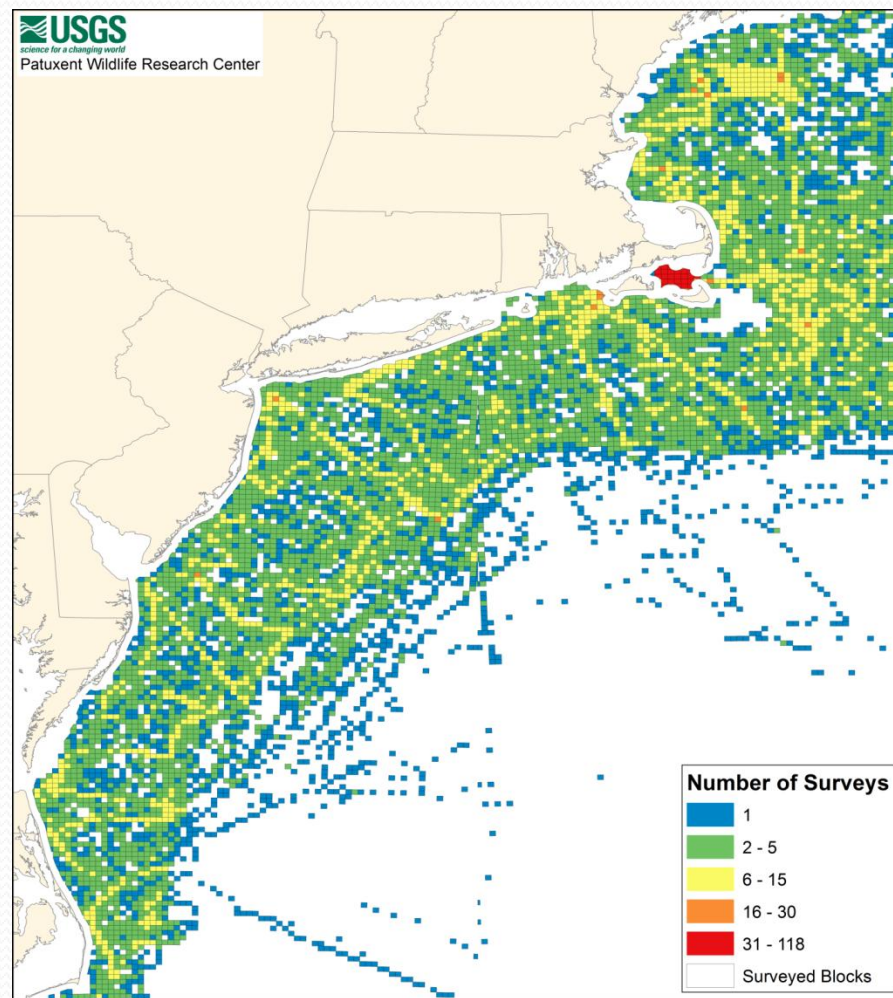
- >250,000 seabird observations from U.S. Atlantic waters
- >80 datasets Collected from 1978 through 2011
- Data collected using a mix of methods including non-scientific approaches



The Atlantic Seabird Compendium

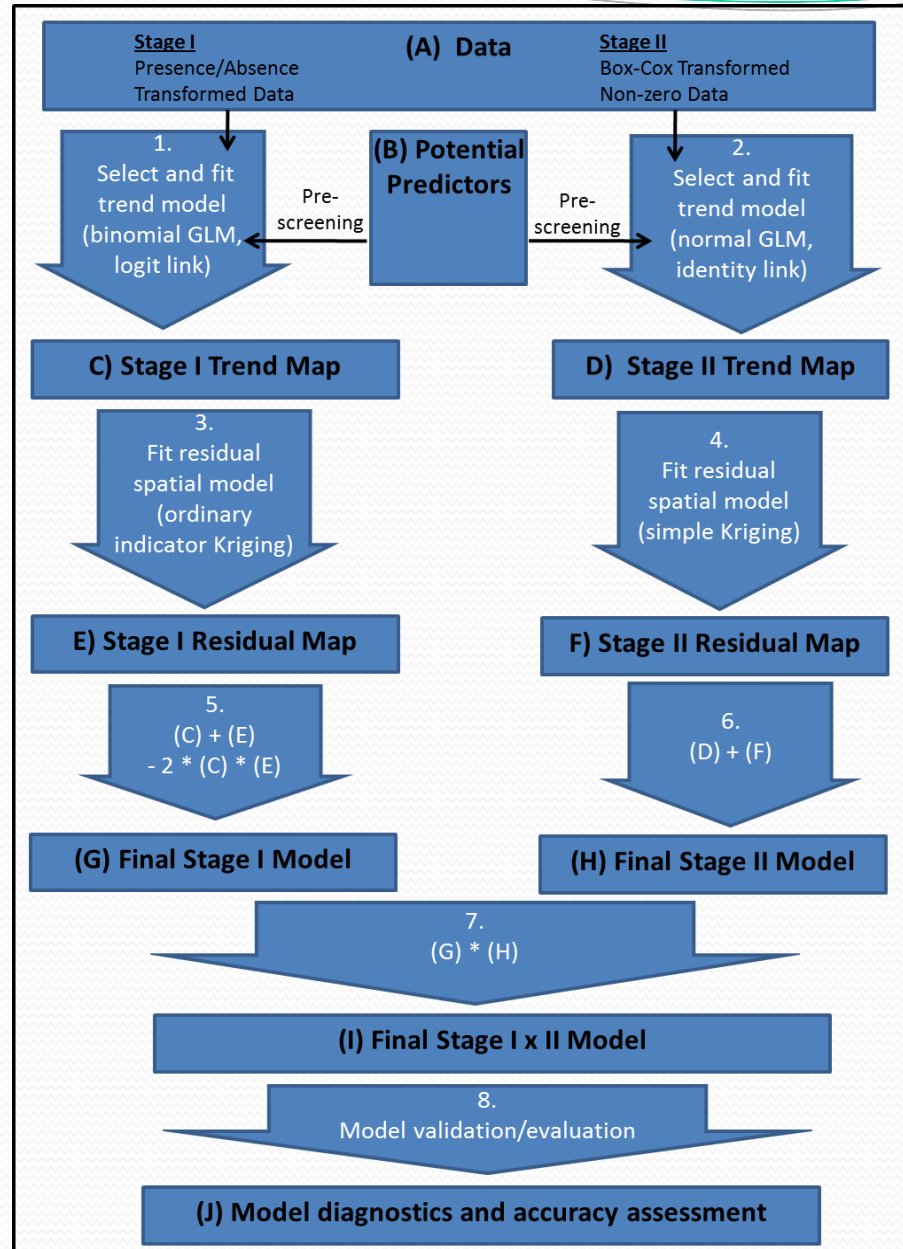
For modeling purposes:

- 32 scientific data sets – 28 ship-based, 4 aerial
- Transects were standardized to 4.63km
- 44,176 survey transects representing 463 species



Modeling process overview

Incorporate additional environmental predictors (e.g., front probability, upwelling, Lagrangian Coherent Structures, zooplankton and forage species abundance where possible



Standardize
surveys to
common effort
unit

Incorporate
different error
terms and
weights for
different surveys
and
surveys/species?

Incorporate detectability from small-scale modeling results (Beth Gardner-NC State work)?



Outline:

1. Climatological Mapping/Modeling
 - a. Past work: NY Bight Modeling
 - b. Current work: Mid-Atl. Predictive Modeling
- 2. Power Analysis and Sampling Design**



Current work (2012-2013): Sampling Design / Power Analysis for Seabird Surveys

**BOEM-funded project led by
NOAA/NCCOS**

**Collaboration with USGS Patuxent
Wildlife Research Center**

- Develop methodology for simulation-based power analysis of seabird survey sampling designs
- Focus on detecting hotspots/coldspots of occurrence and abundance in a lease block grid
- Validate and demonstrate on USGS Avian Compendium and USFWS Seaduck Survey datasets

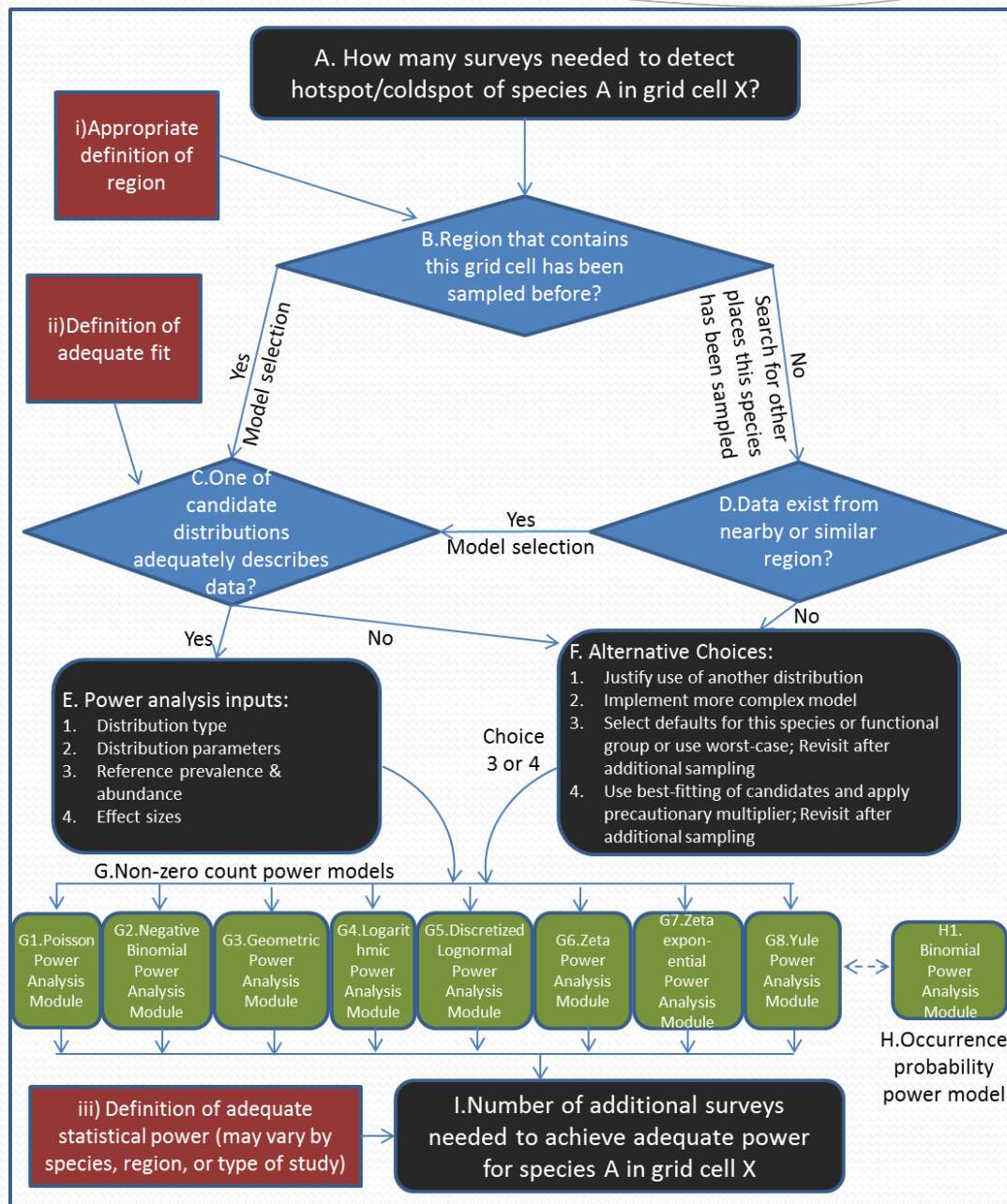
**Project leads: Brian Kinlan, Chris Caldow
(NOAA/NCCOS)**

**Collaborators: Allan O'Connell (USGS),
Elise Zipkin (USGS), Mark Wimer (USGS),
Allison Sussman (USGS)**

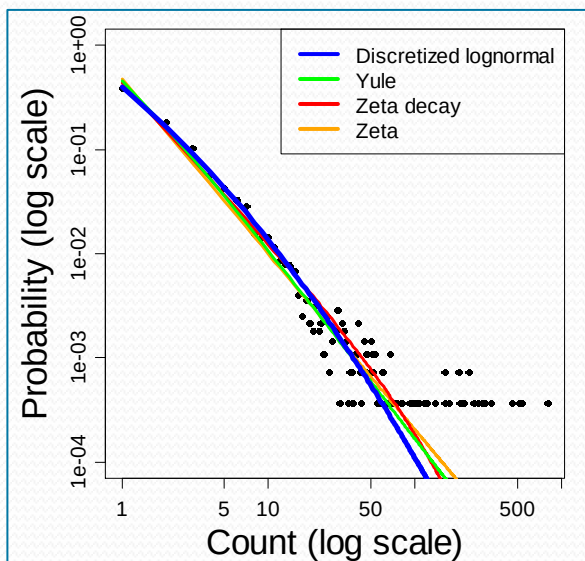
**Seaduck application: Emily Silverman
(USFWS), Jeffery Leirness (USFWS)**

**Project started January 2012, results
expected late 2012**

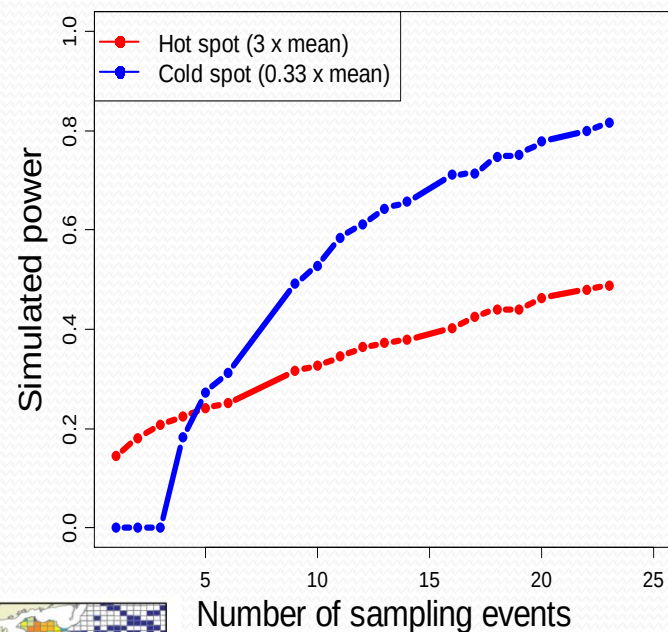
How many surveys?



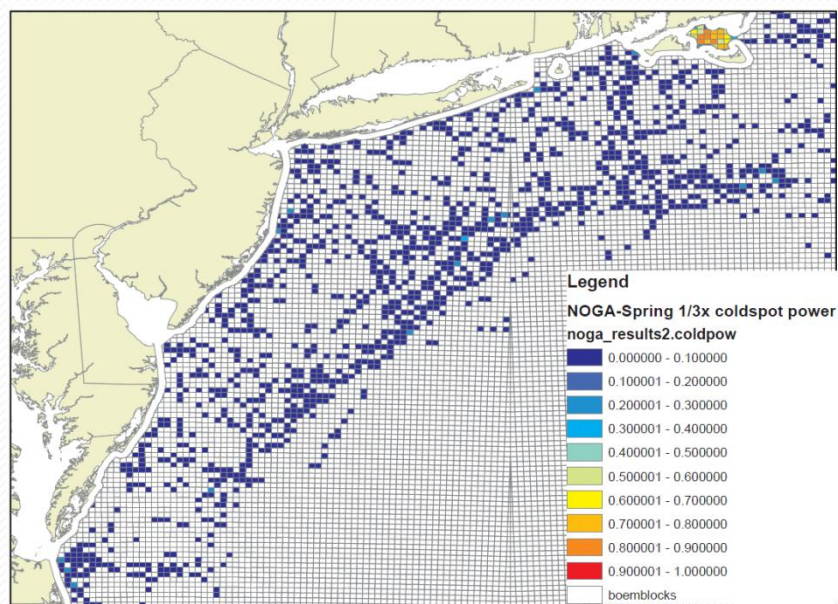
Model selection



Power curves



Power Maps





Acknowledgements

New York Bight Seabird Assessment

Charlie Menza (NOAA Biogeo)
Chris Caldwell (NOAA Biogeo)
Mark Monaco (NOAA CCMA/Biogeo)
Falk Huettmann (UA-Fairbanks)
Jeff Herter (NYDOS)
Greg Capobianco (NYDOS)
& others

Data:

Manomet Bird Observatory
The Nature Conservancy

Funding:

New York Department of State; NOAA

Mid-Atlantic Predictive Modeling Project

Allan O'Connell (USGS-Patuxent)
Andrew Gilbert (BRI)
Beth Gardner (NC State)
Mark Wimer (USGS Patuxent)
Allison Sussman (USGS Patuxent)
Charlie Menza (NOAA Biogeo)
Chris Caldwell (NOAA Biogeo)
Tom McGrath (NOAA Biogeo)
& others

Data :

Atlantic Seabird Survey Compendium

Funding:

BOEM, USGS

Sampling Design/Power Analysis Project

Elise Zipkin (USGS-Patuxent)
Allan O'Connell (USGS-Patuxent)
Diana Rypkema (NOAA Hollings Scholar)
Emily Silverman (USFWS)
Jeffery Leirness (USFWS)
Mark Wimer (USGS Patuxent)
Allison Sussman (USGS Patuxent)
& others

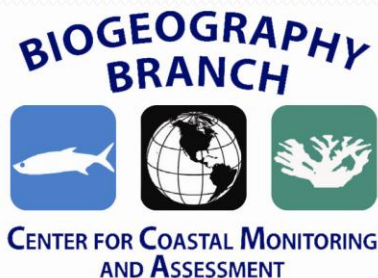
Data :

Atlantic Seabird Survey Compendium

Funding:

BOEM, USGS

Brian.Kinlan@NOAA.gov 301-713-3028 x157



Presentation #23

Avian Surveys for the Rhode Island Ocean Special Area Management Plan



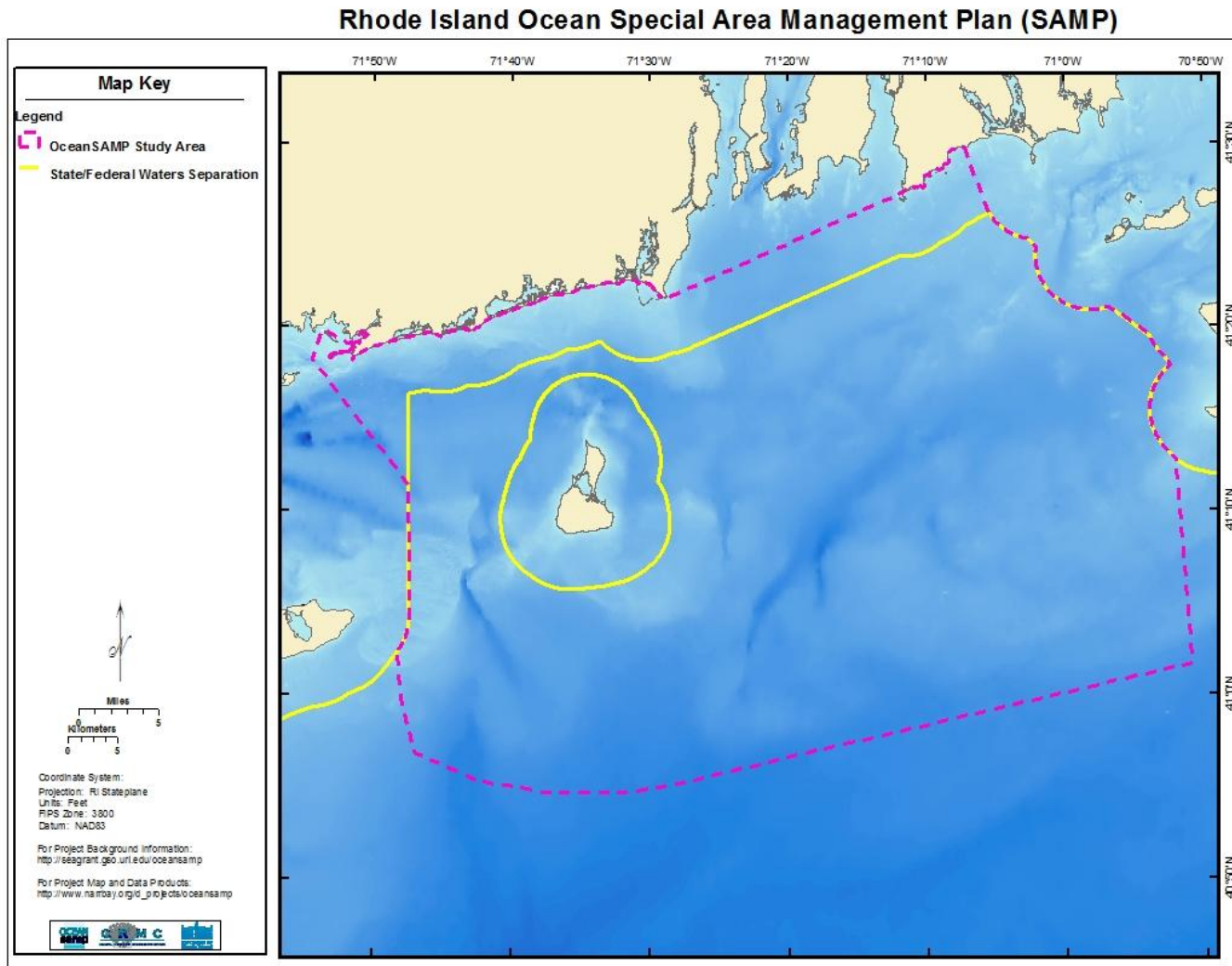
Kristopher J. Winiarski, Peter W.C. Paton, Scott R. McWilliams, and David Miller
Department of Natural Resources Science, University of Rhode Island, Kingston, RI 02881
SILVER SPRINGS, MARYLAND
JULY 2012



Avian studies for RI Ocean SAMP

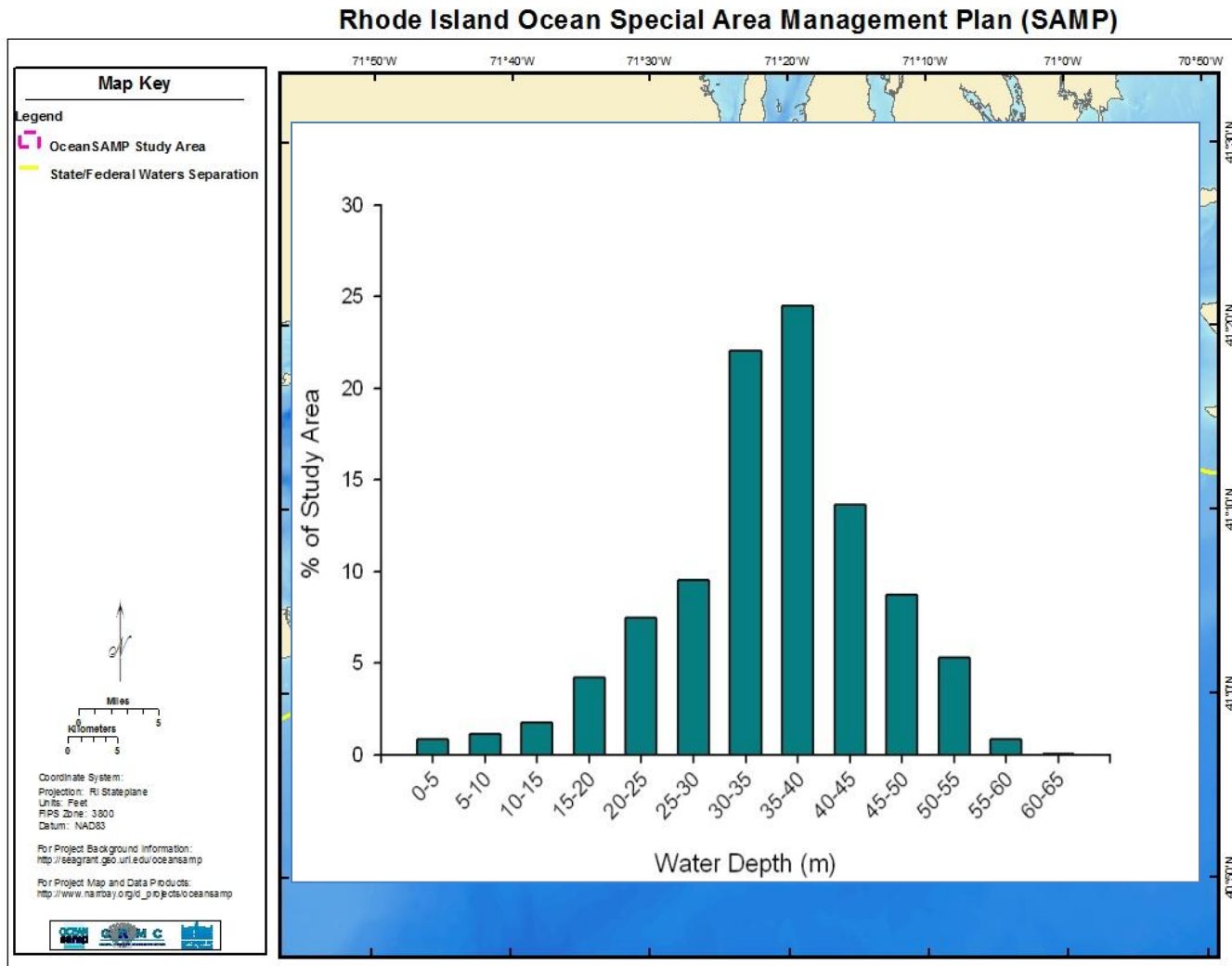
- **Goal:** Assess current spatial and temporal patterns of avian abundance and movement ecology within Ocean SAMP study area boundaries.
- **Primary Objectives:**
 - 1) Assess temporal variation (seasonal and annual) in avian spatial distribution and abundance in Ocean SAMP study area.
 - 2) Quantify flight behavior of birds in Ocean SAMP study area.

OSAMP Study Area



-Approximately 3,800 km².

OSAMP Study Area



-Approximately 3,800 km².

Much Different Marine Bird Habitat than Nantucket Sound

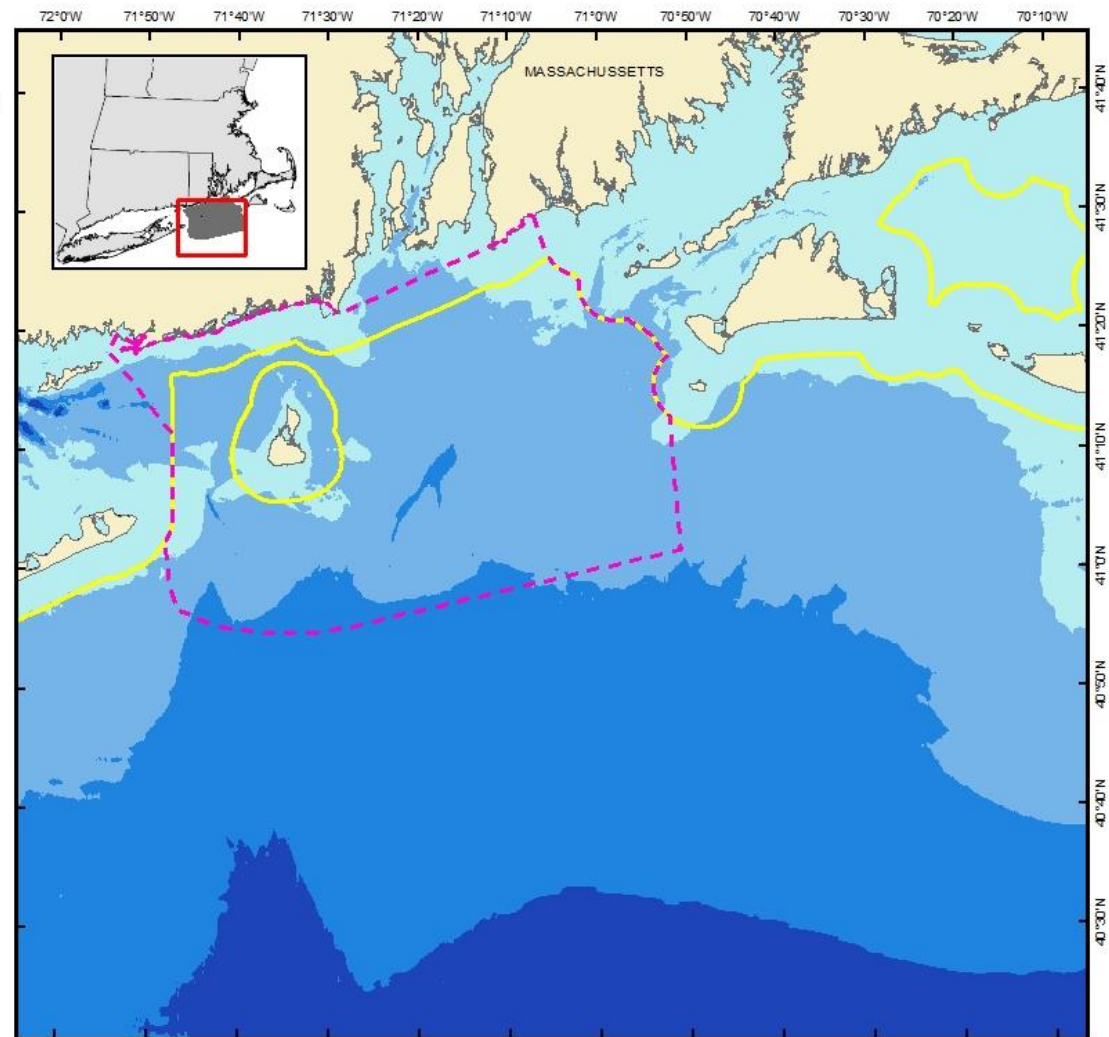
Legend

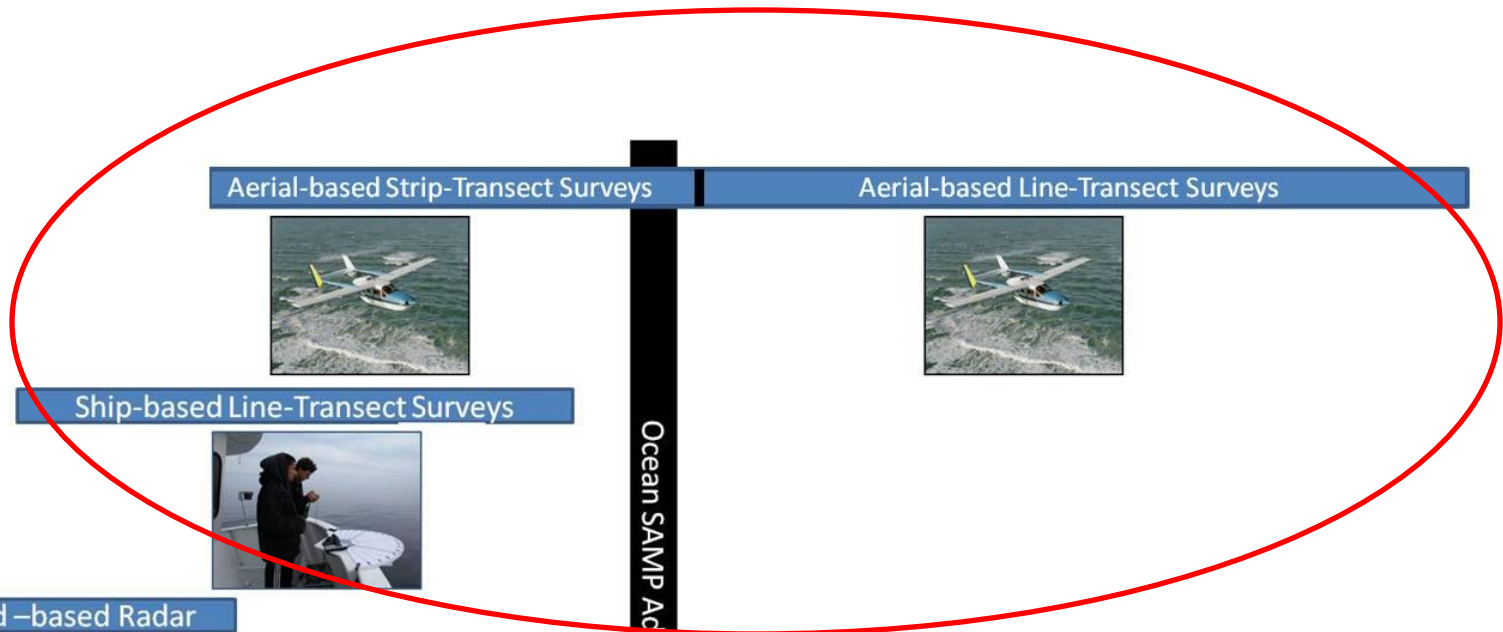
-  OceanSAMP Study Area
-  State/Federal Waters Separation

BIS Bathymetry

Value

-  High : -2.82701e-006
-  Low : -362.702





Land-based Radar

Land-based Radar

200

January-
February-
March-
April-
May-
June-
July-

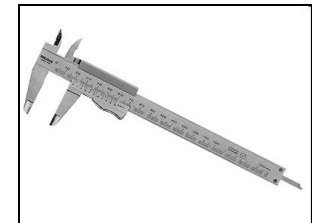
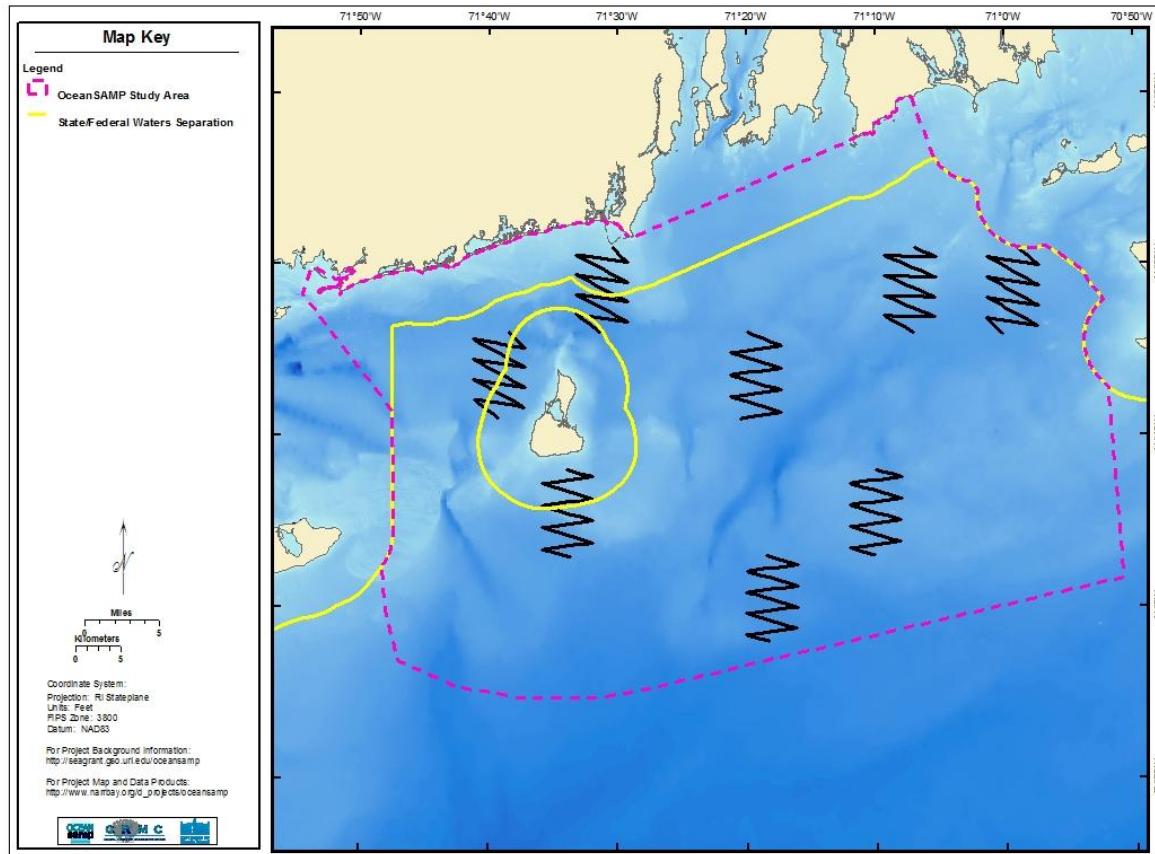


2012

March-
April-
May-
June-
July-

Ship-based Line Transect Surveys

Rhode Island Ocean Special Area Management Plan (SAMP)



*Calipers used to estimate distance (*Heinemann, 1981*)

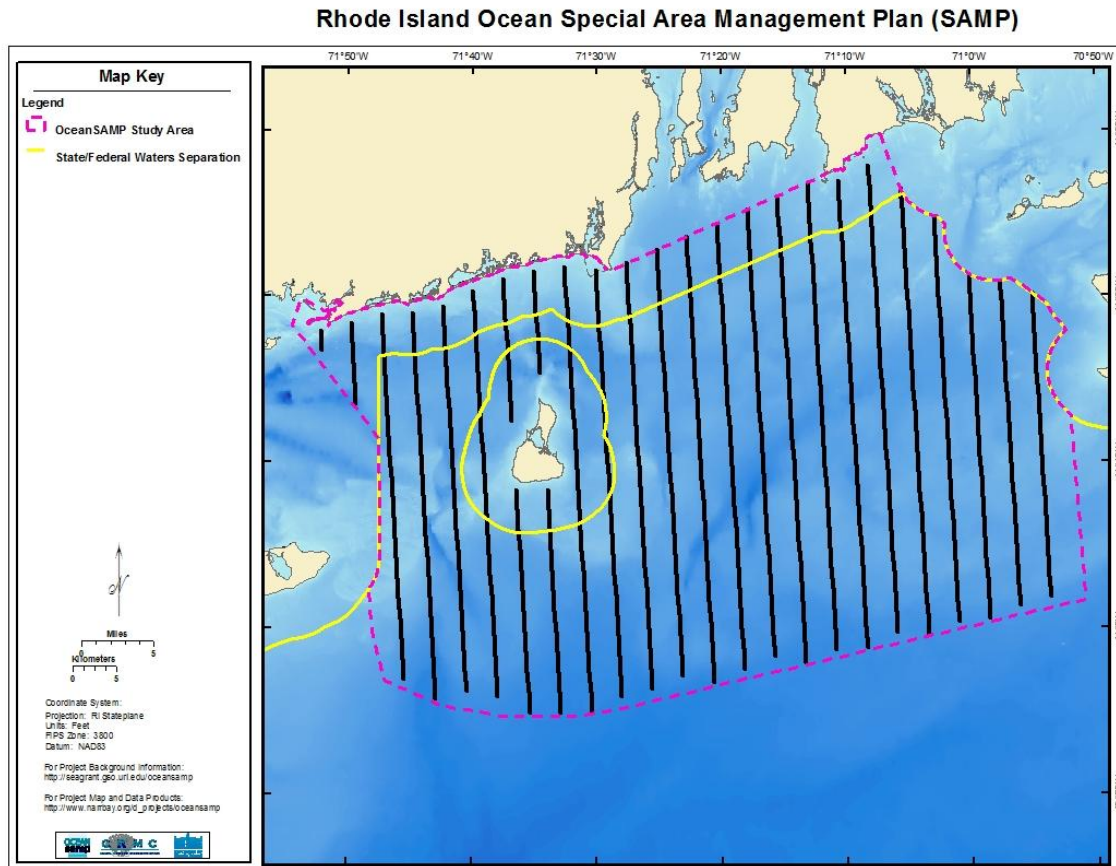
Eight Sawtooth (4x5nm) sampling areas

Each surveyed 1x per month (2.5 hours, survey 2 grids/week)

1 observer and 1 observer/recorder

Recorded: # individuals, species, bearing, distance estimate (first sighting), GPS location, behavior, flight elevation/direction for birds in flight and survey conditions.

Aerial-based Strip Transect Surveys



Twenty four transects perpendicular to coast

Survey 24 transects 1x per month

Fly 100kts at 500'

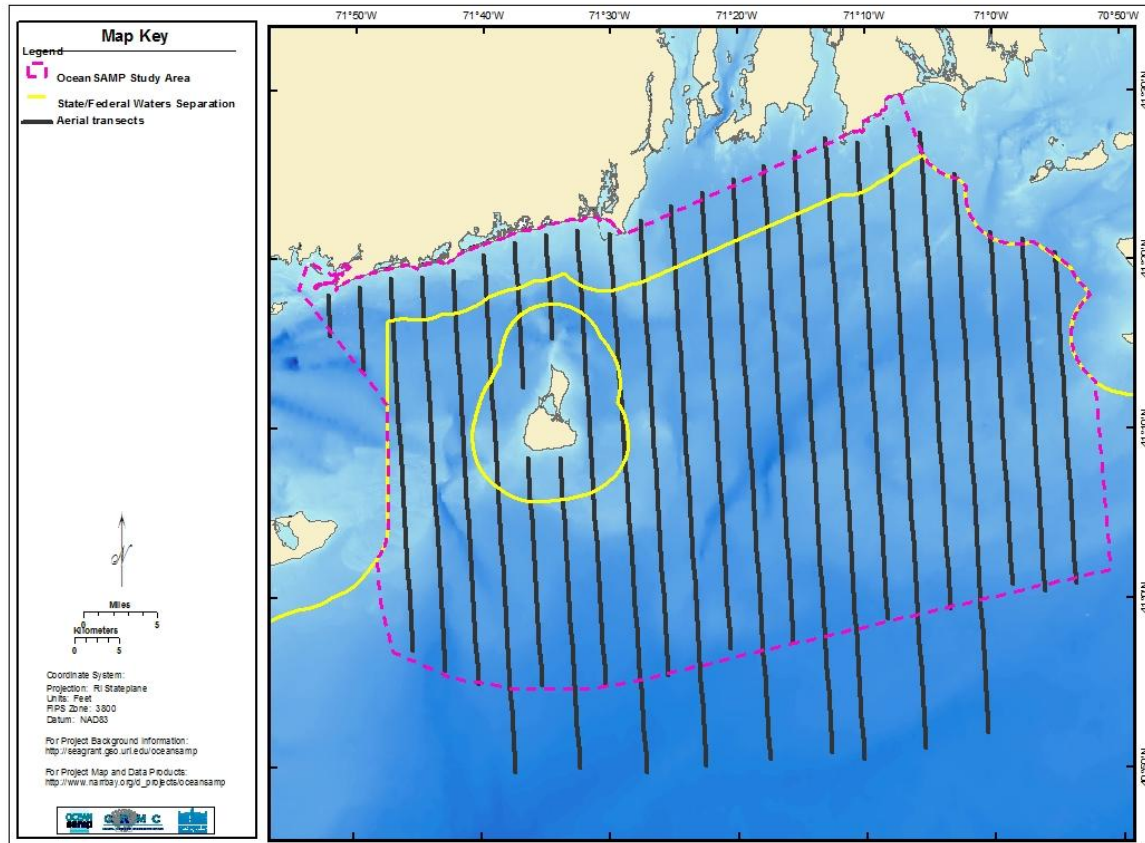
Survey 110m on both sides of plane (wing struts are marked)

2 observers

-Recorded: # individuals, species, time of sighting, behavior (flying, sitting) and survey conditions.

Aerial-based Line Transect Surveys

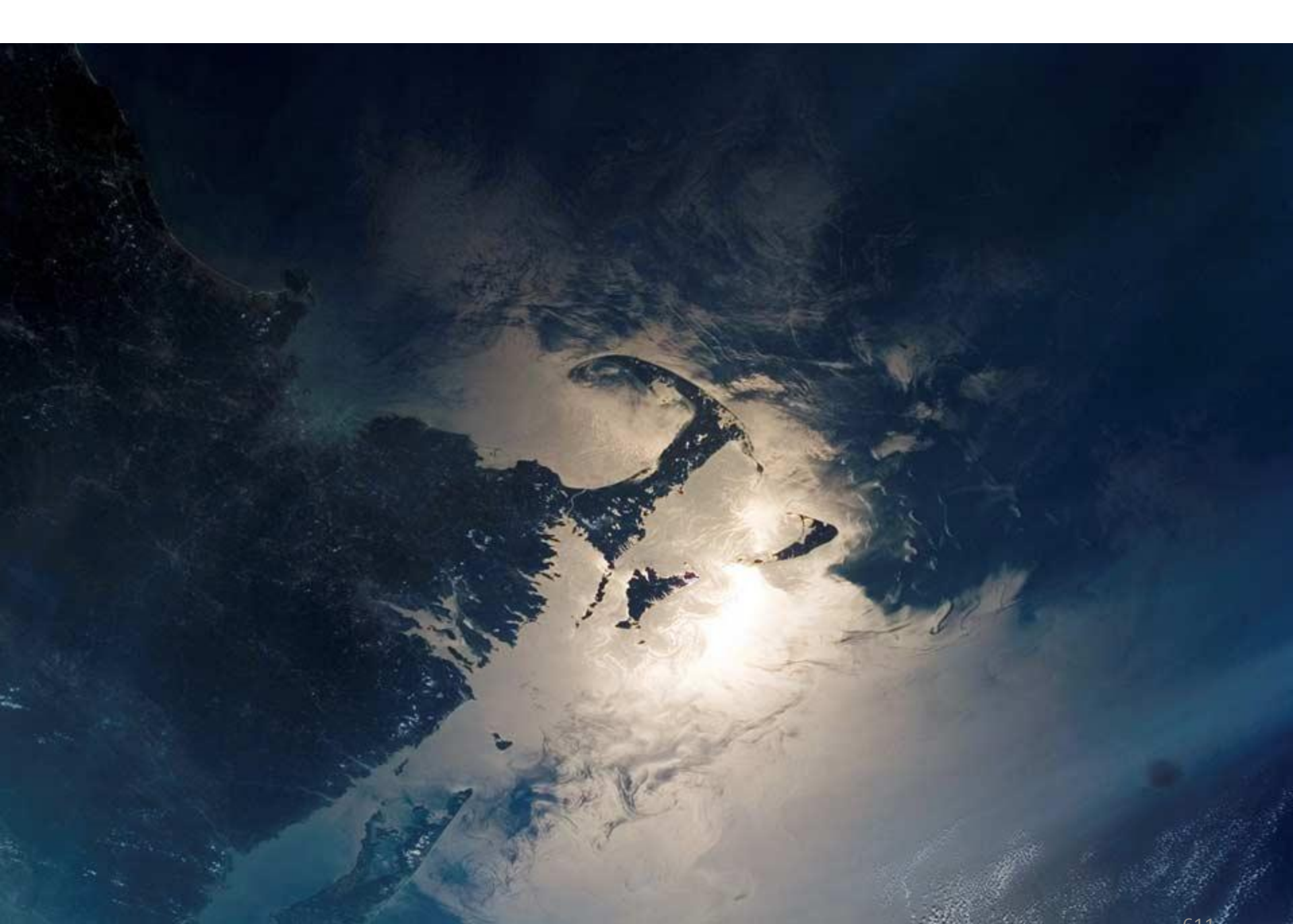
Rhode Island Ocean Special Area Management Plan (SAMP)



24 transects perpendicular to coast
 Survey 24 transects 1x per month
 Fly 100kts at 250'
 2 observers

Recorded: # individuals, species, time of sighting, behavior (flying, sitting), sighting bin and environmental conditions.

Band	Boundary distances (in m.) perpendicular out from track line	Declination in degrees from the horizontal
A	44-163	60-25
B	164-432	25-10
C	433-1000	10-4



Avian Modeling for the Rhode Island Ocean Special Area Management Plan

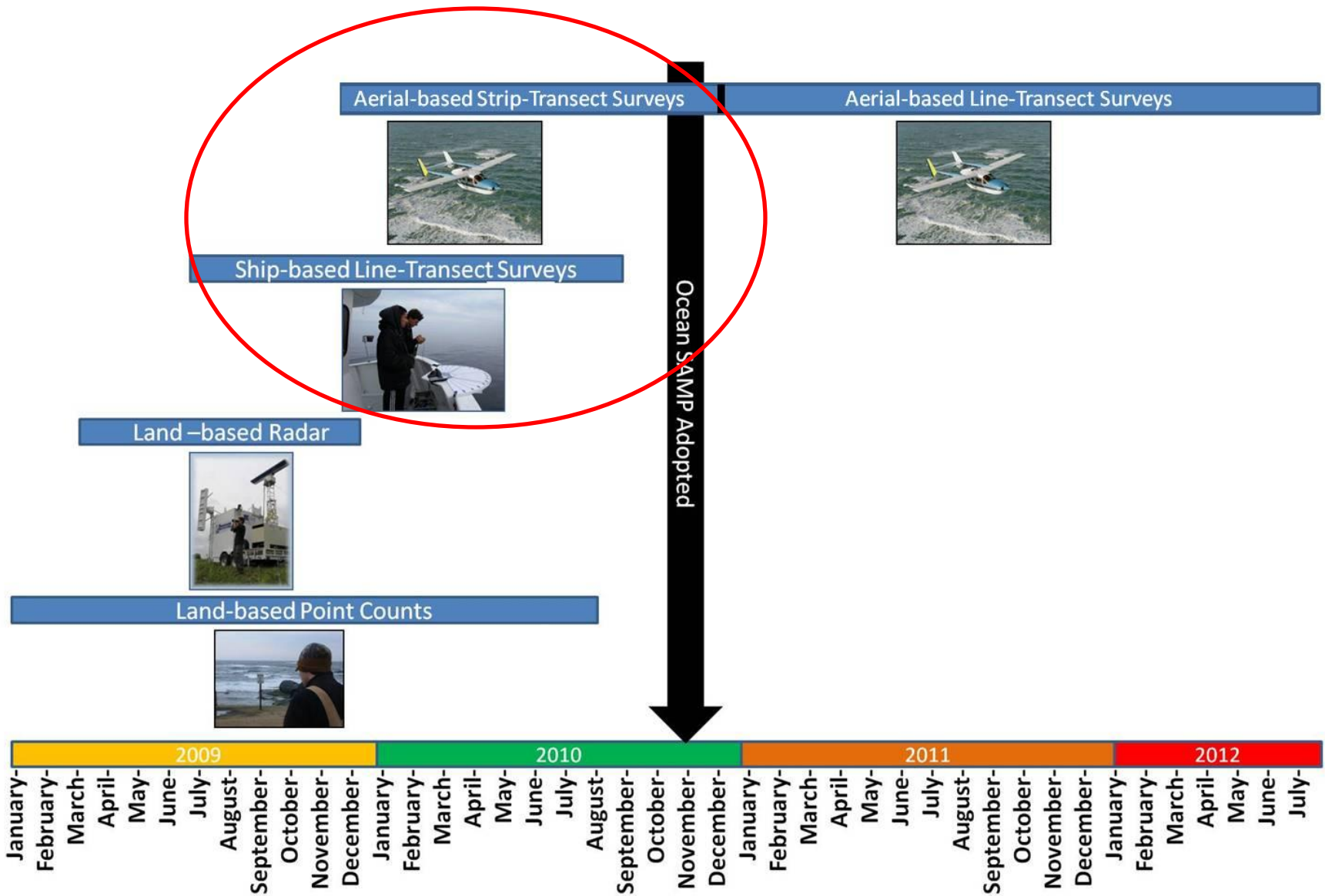


Kristopher J. Winiarski, Peter W.C. Paton, Scott R. McWilliams, and David Miller
Department of Natural Resources Science, University of Rhode Island, Kingston, RI 02881

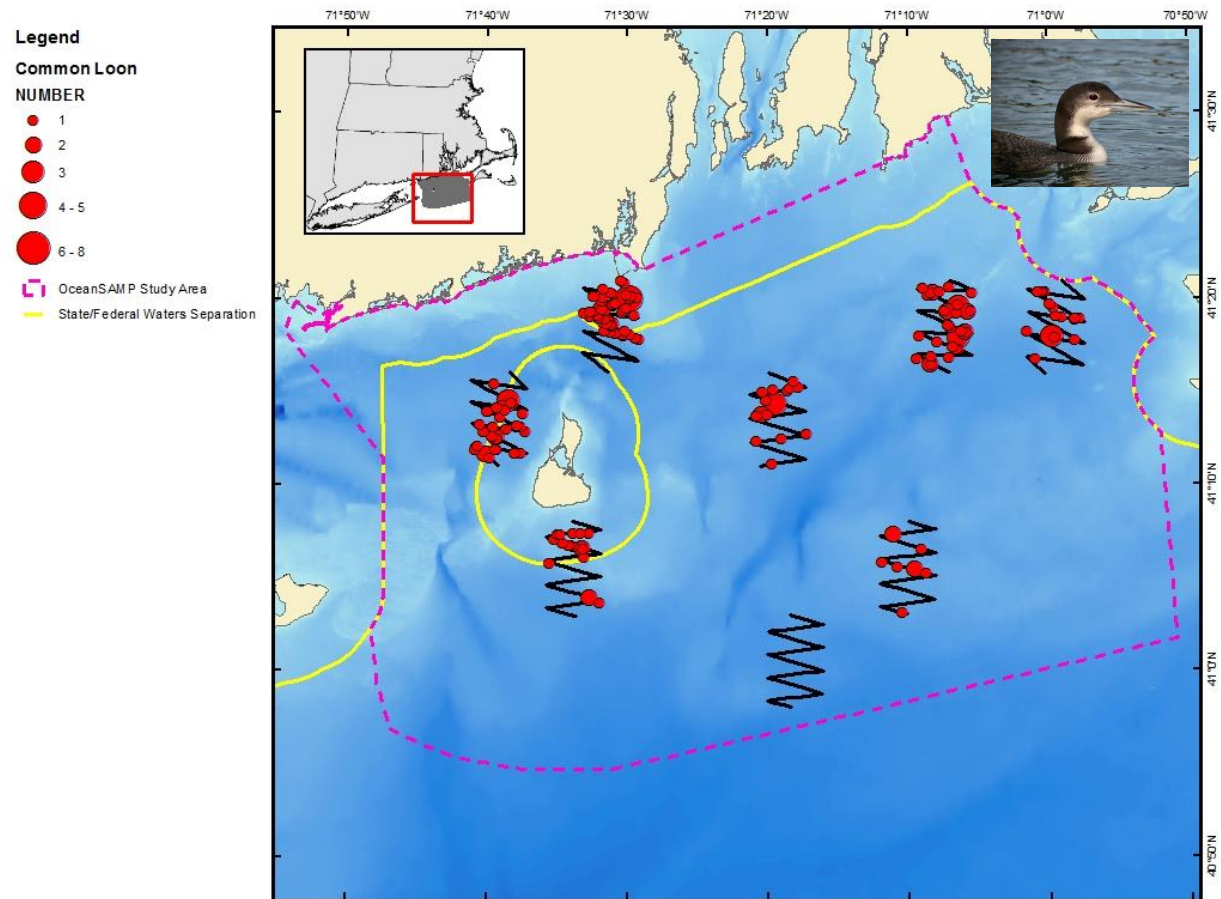
SILVER SPRINGS, MARYLAND

JULY 2012



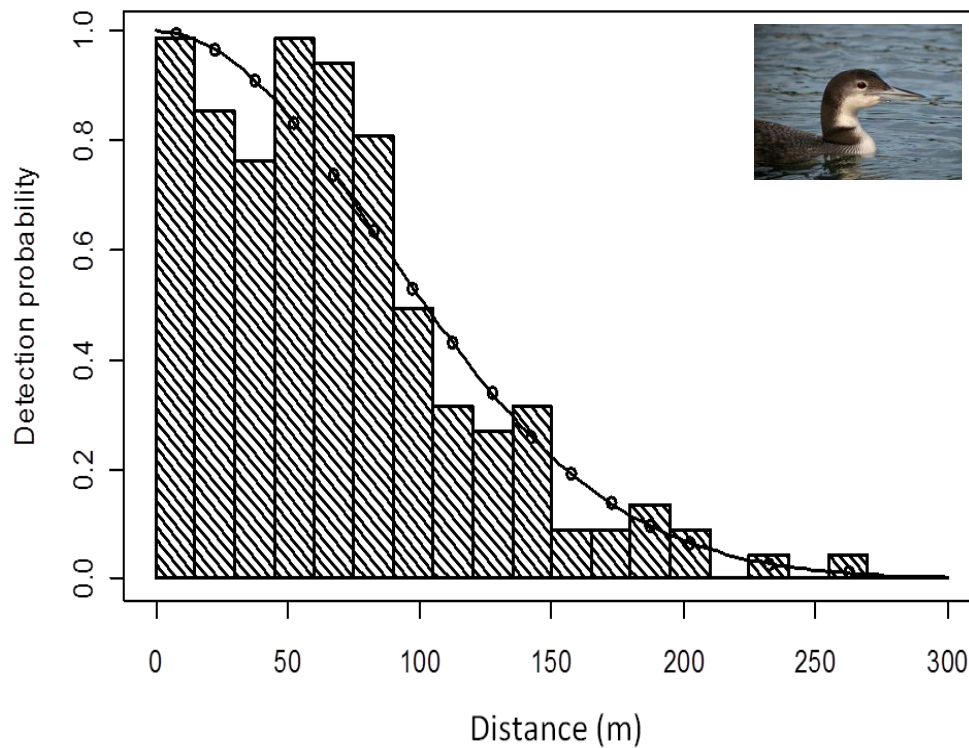


Density Surface Model (DSM) Approach



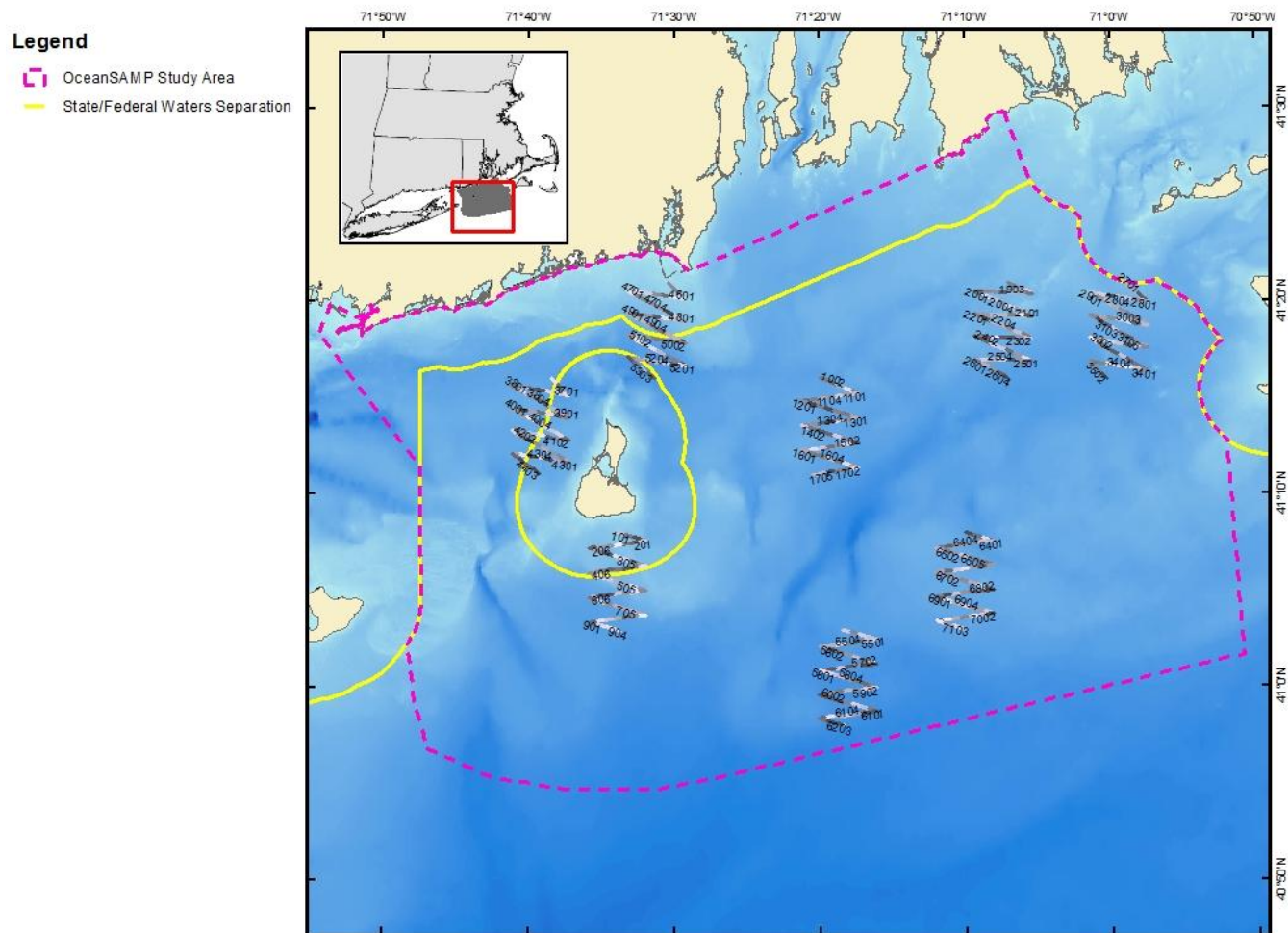
-Common Loon observations from ship-based line transect surveys.

Step #1- Fit detection function to control for incomplete detection.



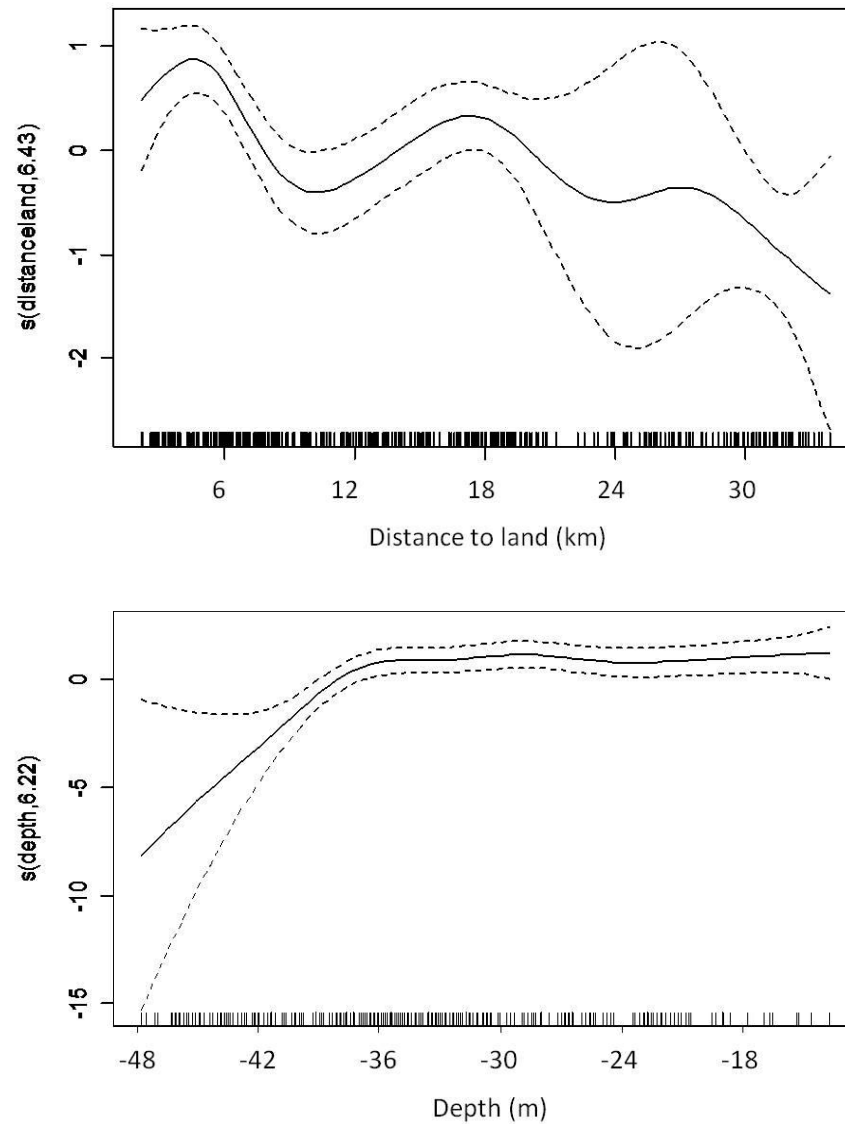
-Fit detection function to control for imperfect detection.

Step #2-Divide transects into unique segments.



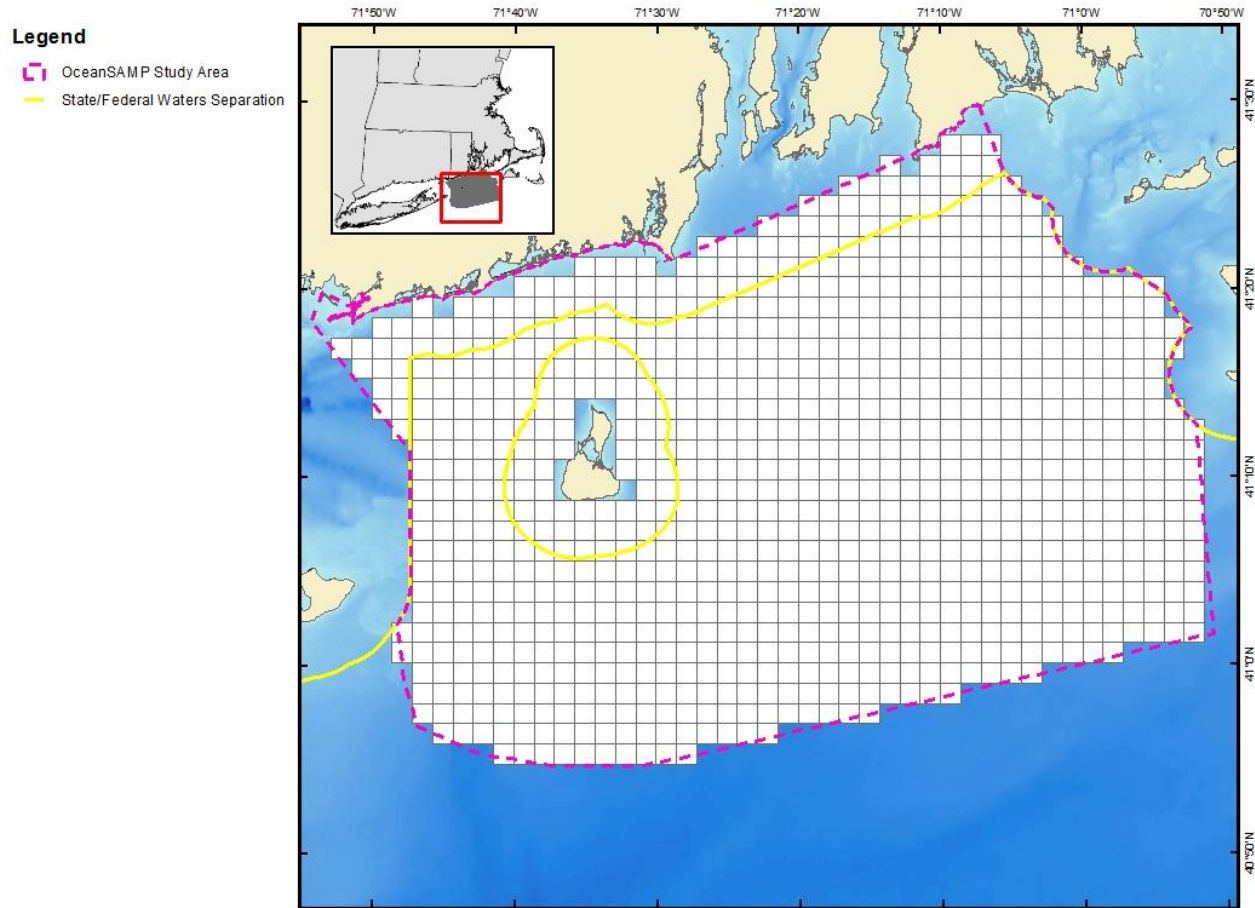
- Total of 465 unique segment (each 830m long).
- Environmental covariates at midpoint of each segment (water depth, distance from land).

Step #3 – Fit Generalized Additive Models



-Best Model distance to land + depth.

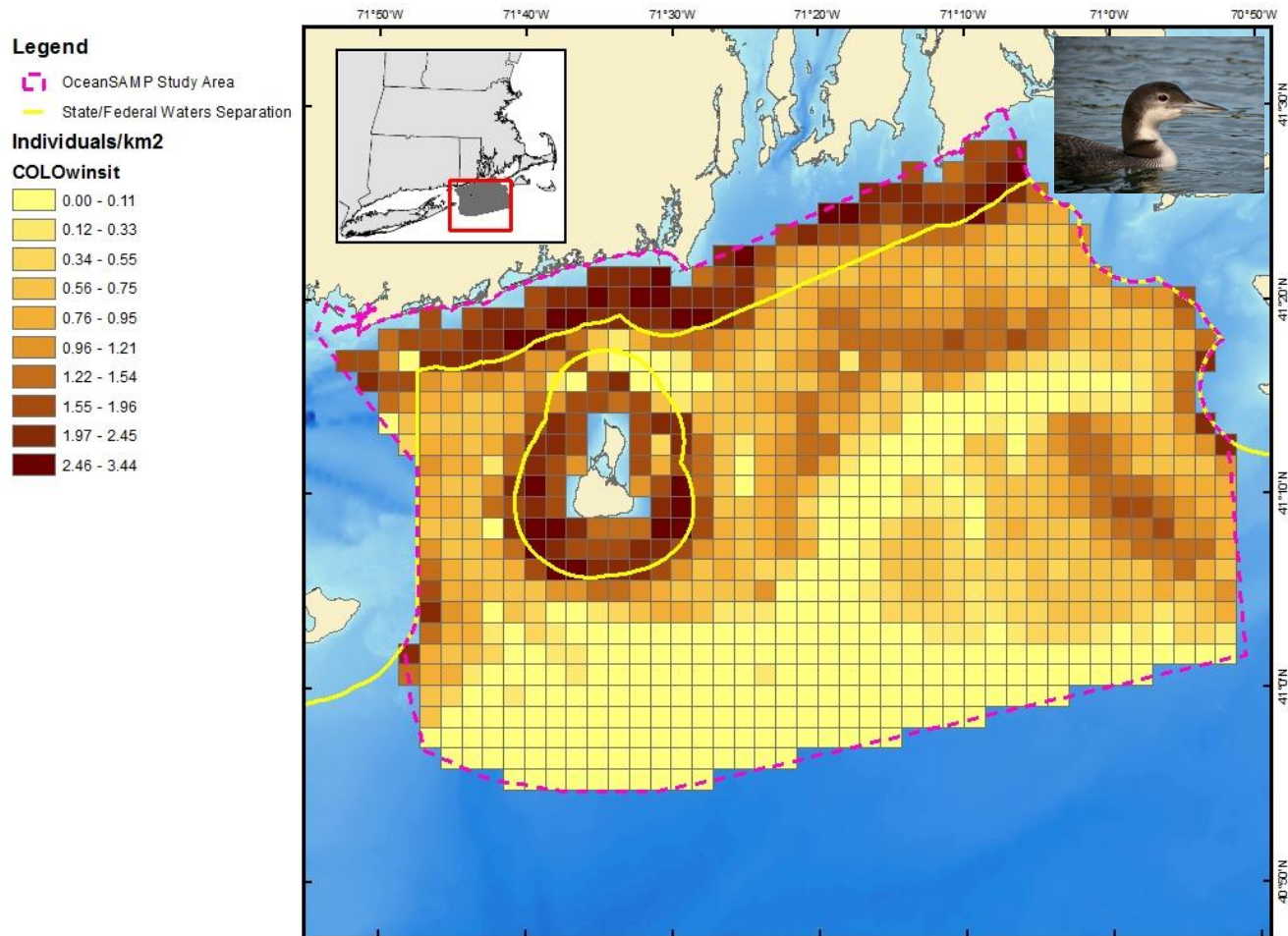
Step #4- Divide study area into predictive grid.



-920 cells; each 4km².

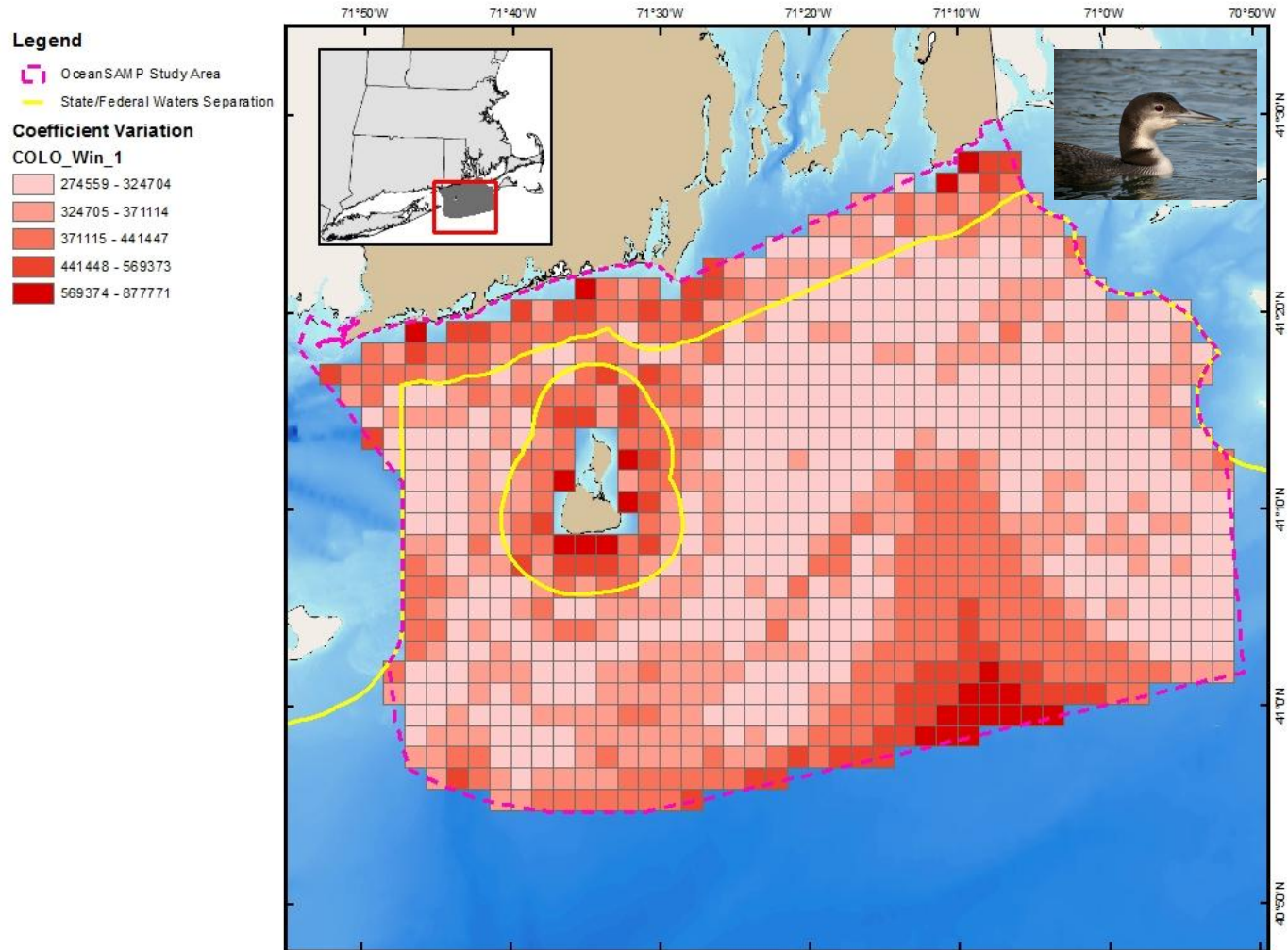
-Environmental covariates at the midpoint of each predictive cell (water depth, distance to land).

DSM–Common Loon

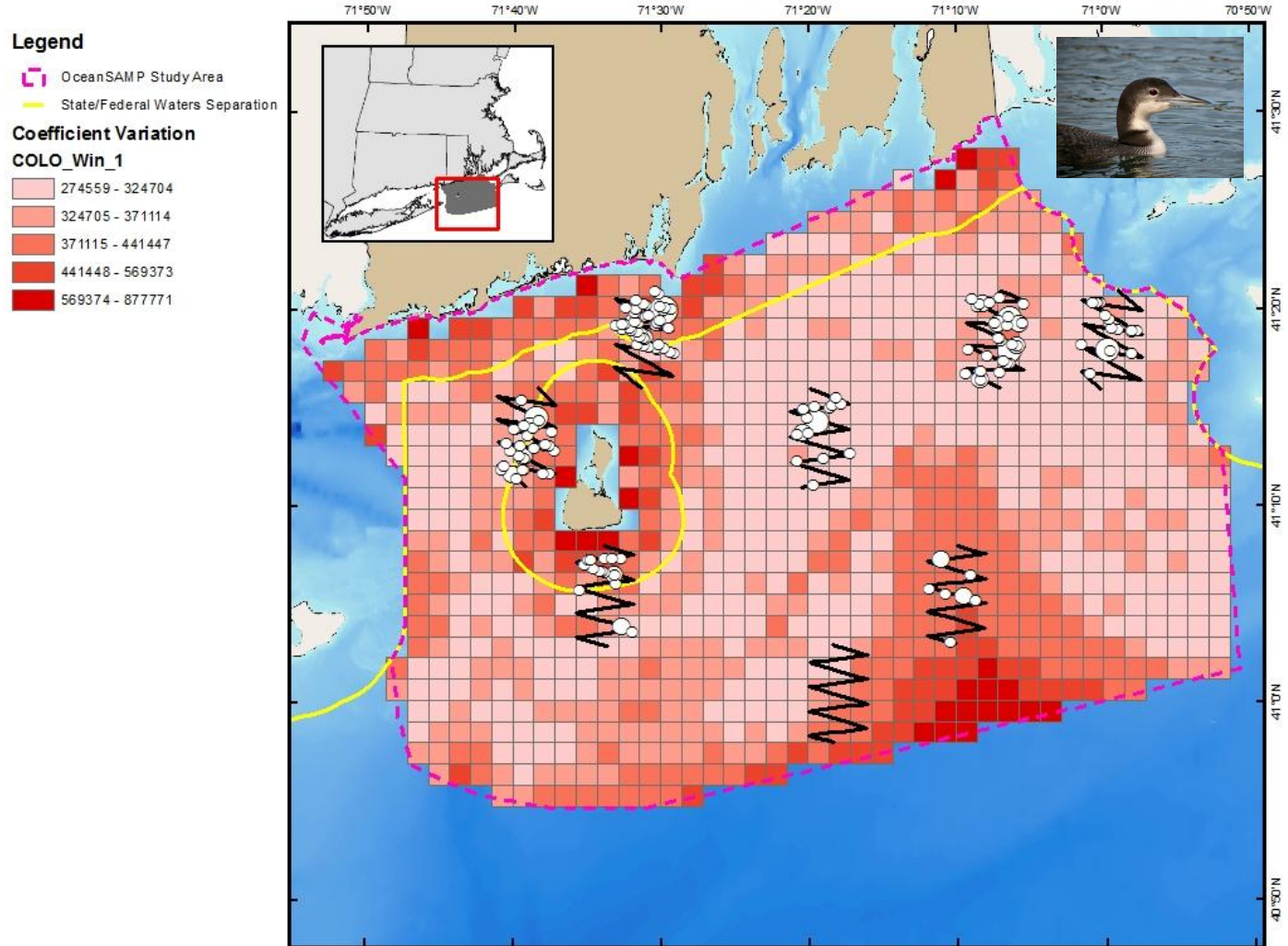


Daily population estimate winter – 7,284 (0.186)

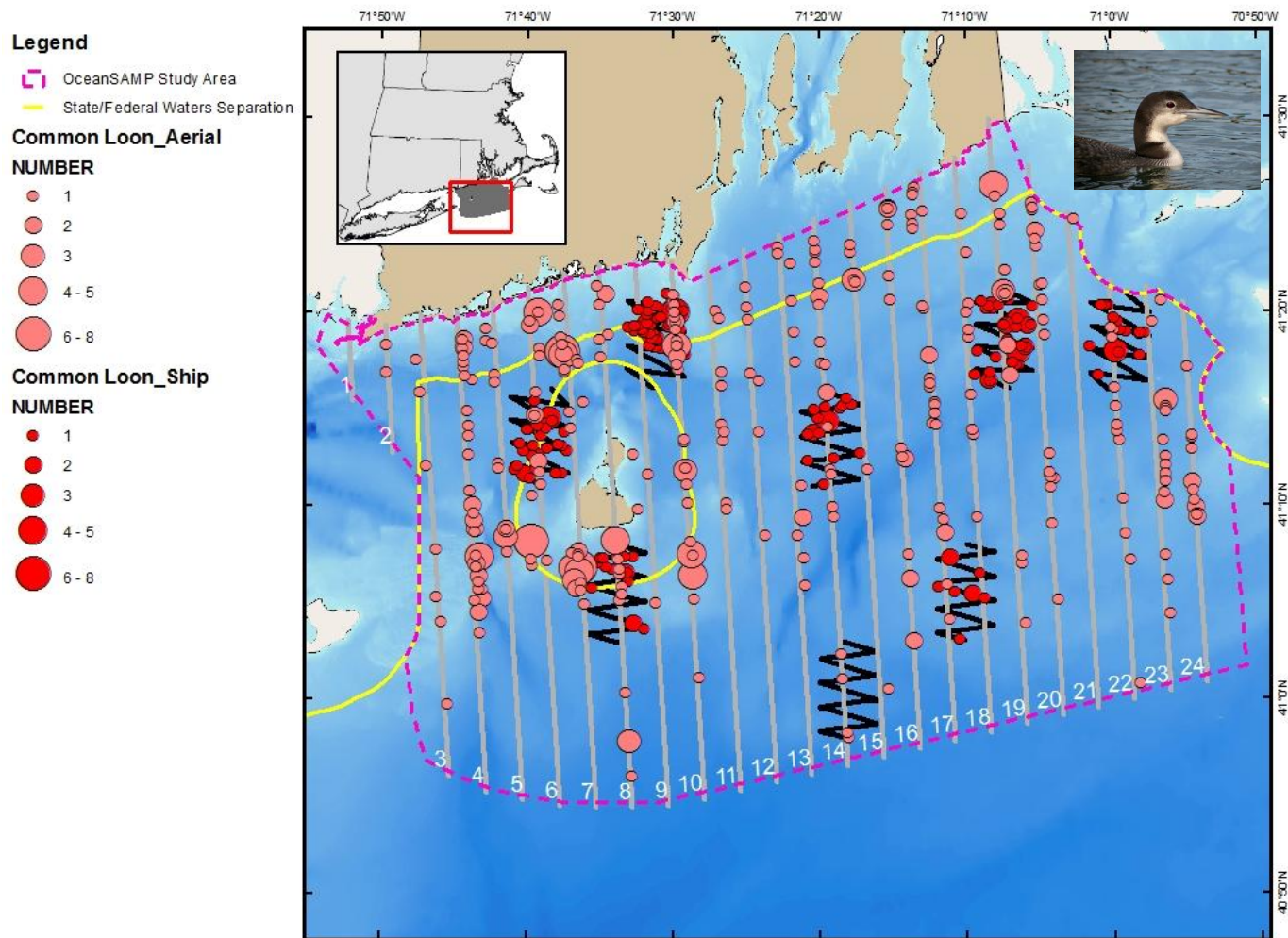
DSM-Uncertainty



DSM-Uncertainty



DSM – Using Survey Data from Multiple Platforms



Ship



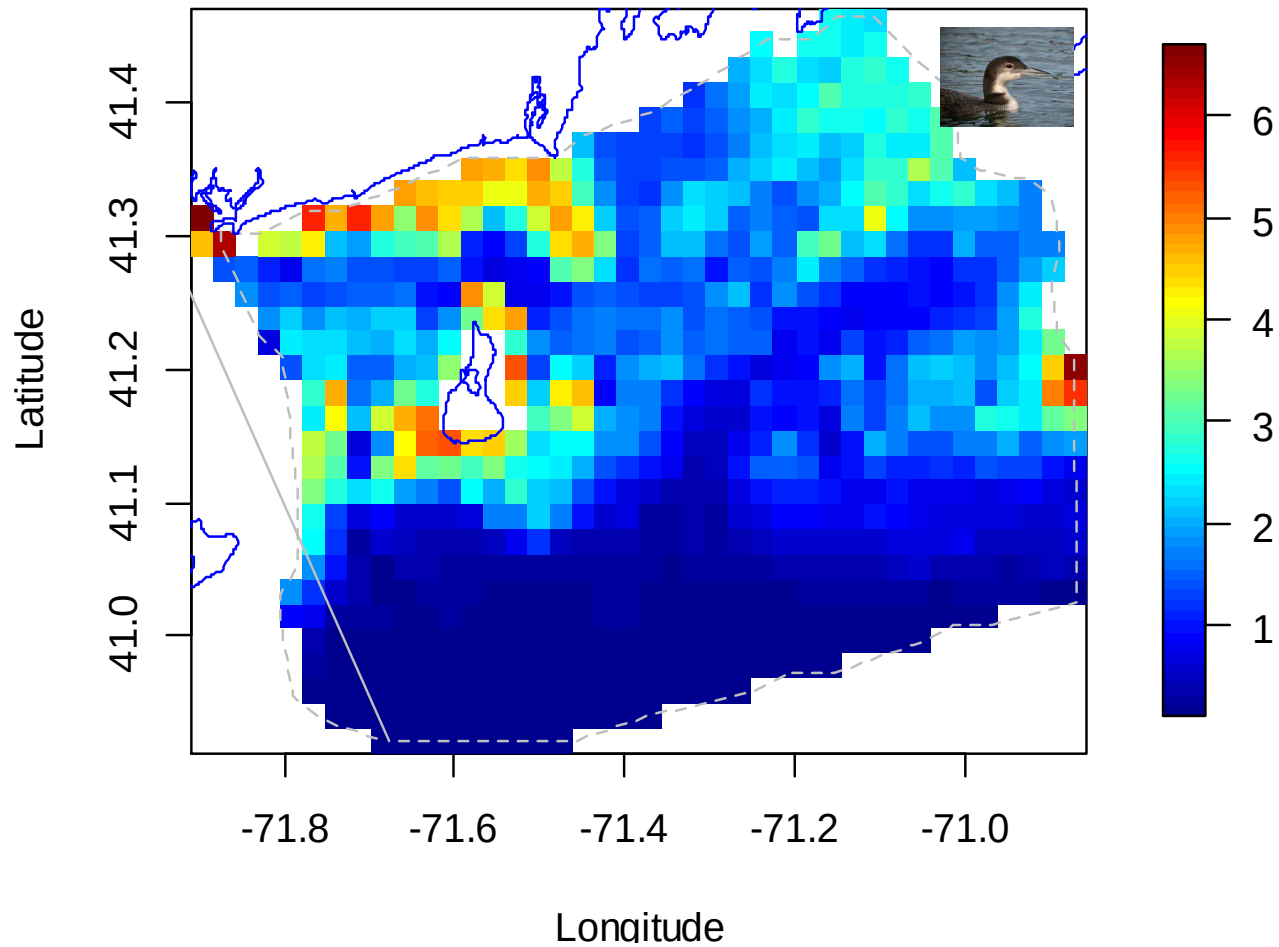
+



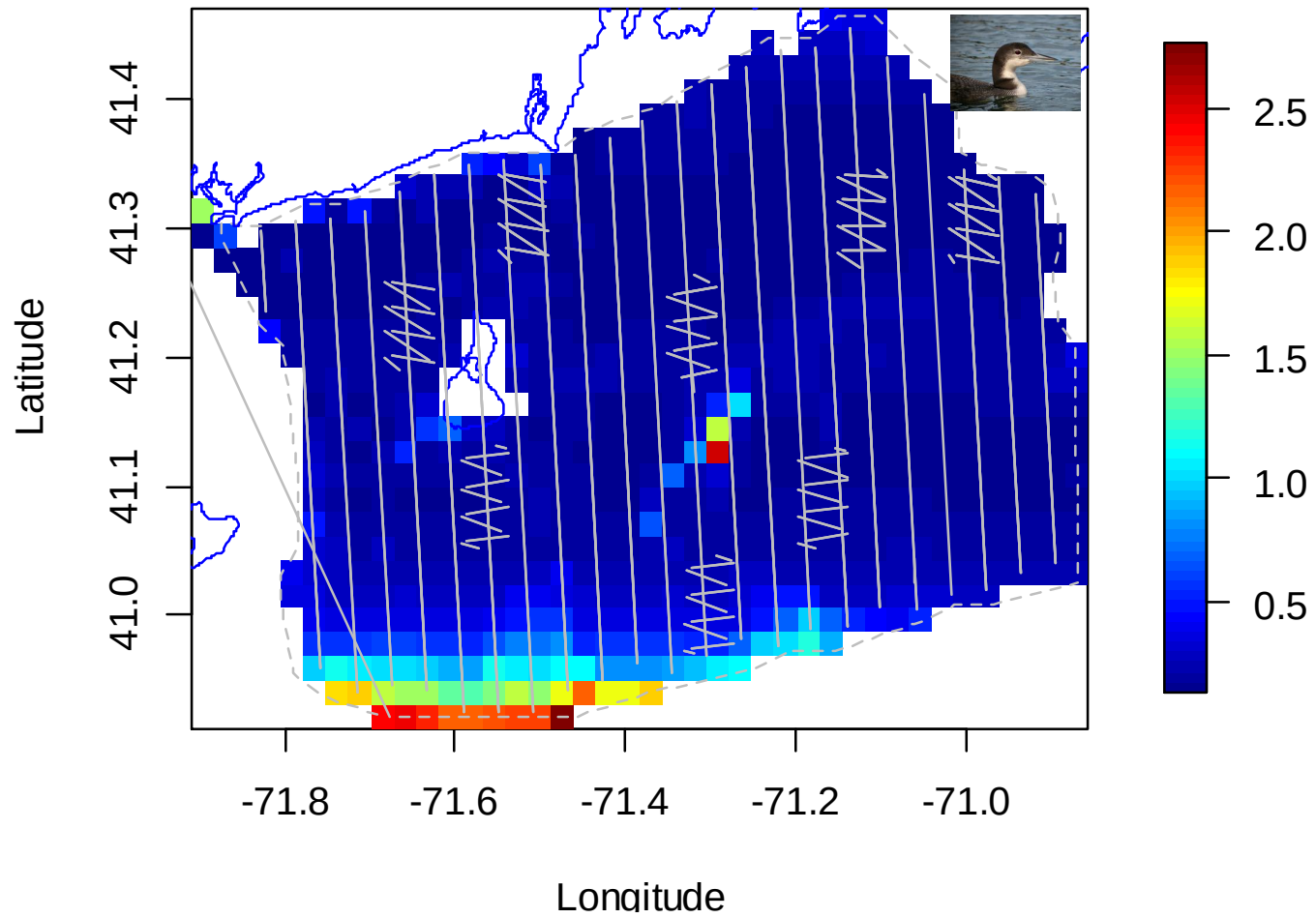
Aerial

-Raw observations of Common Loons winter 2009-2010.

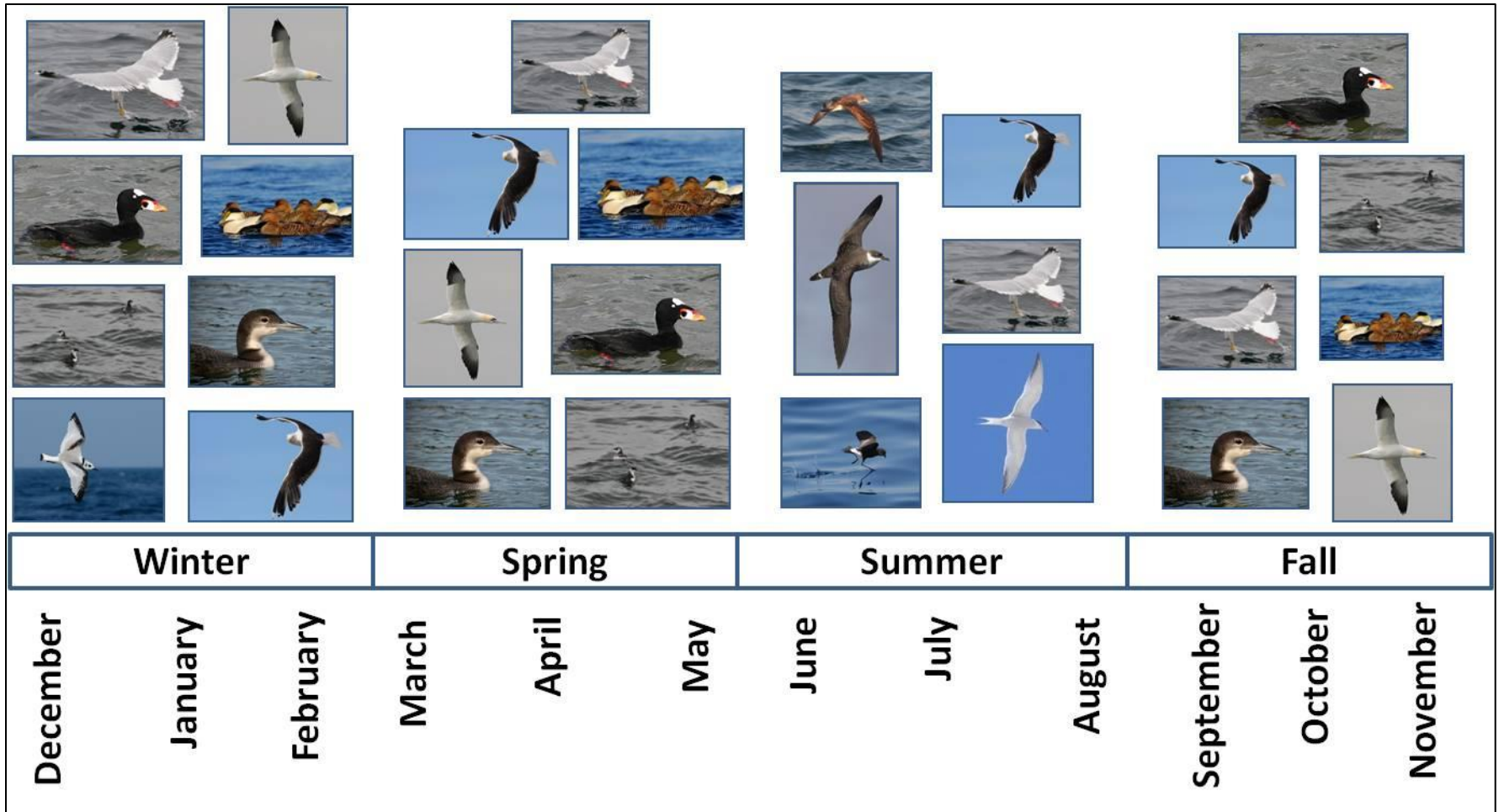
DSM – Using Survey Data from Multiple Platforms



DSM – Uncertainty

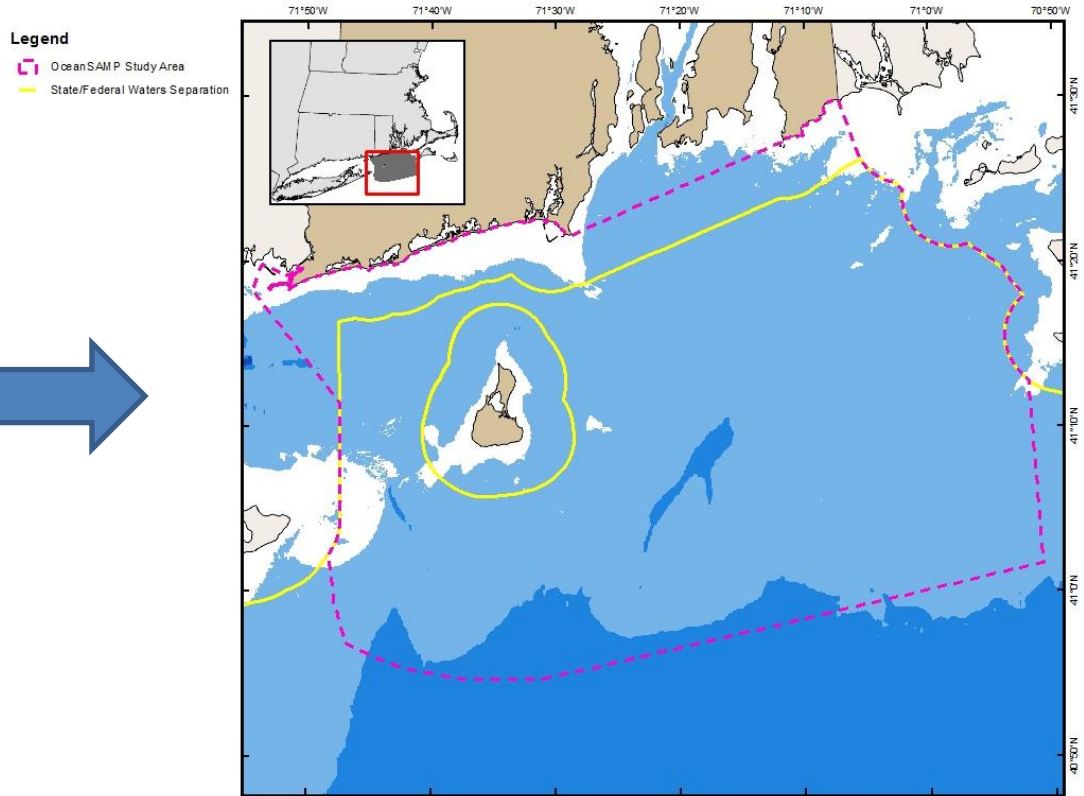
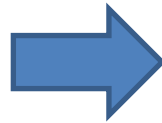
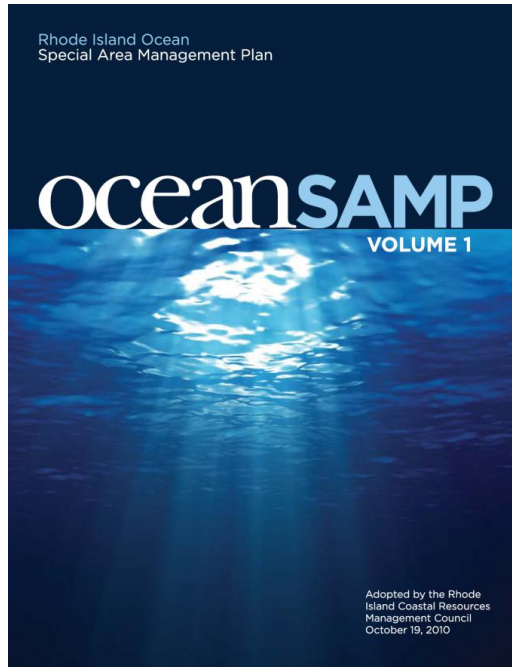


Lots of Predictive Maps for Policy Folks



-Our final OSAMP report contained 80 DSM maps.

OWED Siting in the OSAMP



- Waters <20m (in white) off limits to future development to protect seaduck foraging areas.
- Represent 8% of total SAMP study area.

How Can We Best Incorporate this Type of Modeling Output into OWED Siting Decisions?



PROCEEDINGS
OF
THE ROYAL
SOCIETY

B

Proc. R. Soc. B (2005) 272, 1885–1891

doi:10.1098/rspb.2005.3164

Published online 2 August 2005

Prioritizing multiple-use landscapes for conservation: methods for large multi-species planning problems

Atte Moilanen^{1,*}, Aldina M. A. Franco², Regan I. Early², Richard Fox³,
Brendan Wintle⁴ and Chris D. Thomas²

Biological Conservation xxx (2011) xxx–xxx



Contents lists available at SciVerse ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon



Comparison of five modelling techniques to predict the spatial distribution and abundance of seabirds

Steffen Oppel^{a,*}, Ana Meirinho^b, Iván Ramírez^b, Beth Gardner^c, Allan F. O'Connell^d, Peter I. Miller^e, Maite Louzao^{f,g}

Journal of Applied Ecology



Journal of Applied Ecology 2011, 48, 726–735

doi: 10.1111/j.1365-2664.2011.01985.x

Optimizing regional conservation planning for forest birds

Frederic Beaudry^{1,*}, Anna M. Pidgeon¹, David J. Mladenoff¹, Robert W. Howe²,
Gerald A. Bartelt³ and Volker C. Radeloff¹

ICES Journal of Marine Science



ICES Journal of Marine Science (2012), 69(1), 75–83. doi:10.1093/icesjms/fsr180

Systematic conservation planning in the eastern English Channel: comparing the Marxan and Zonation decision-support tools

Juliette Delavenne^{1,*}, Kristian Metcalfe², Robert J. Smith², Sandrine Vaz¹, Corinne S. Martin³,
Ludovic Dupuis⁴, Franck Coppin¹, and Andre Carpentier¹

**Aim and purpose:**

To provide a tool for large-scale high resolution spatial conservation planning using GIS grid data.

Analyses:

Identification of optimal conservation areas.

Balancing of alternative land uses.

Data:

Presence/absence

Probabilities of occurrence

Abundance/density

Uncertainty

Features:

Species priorities via weighting

Methods for dealing with connectivity

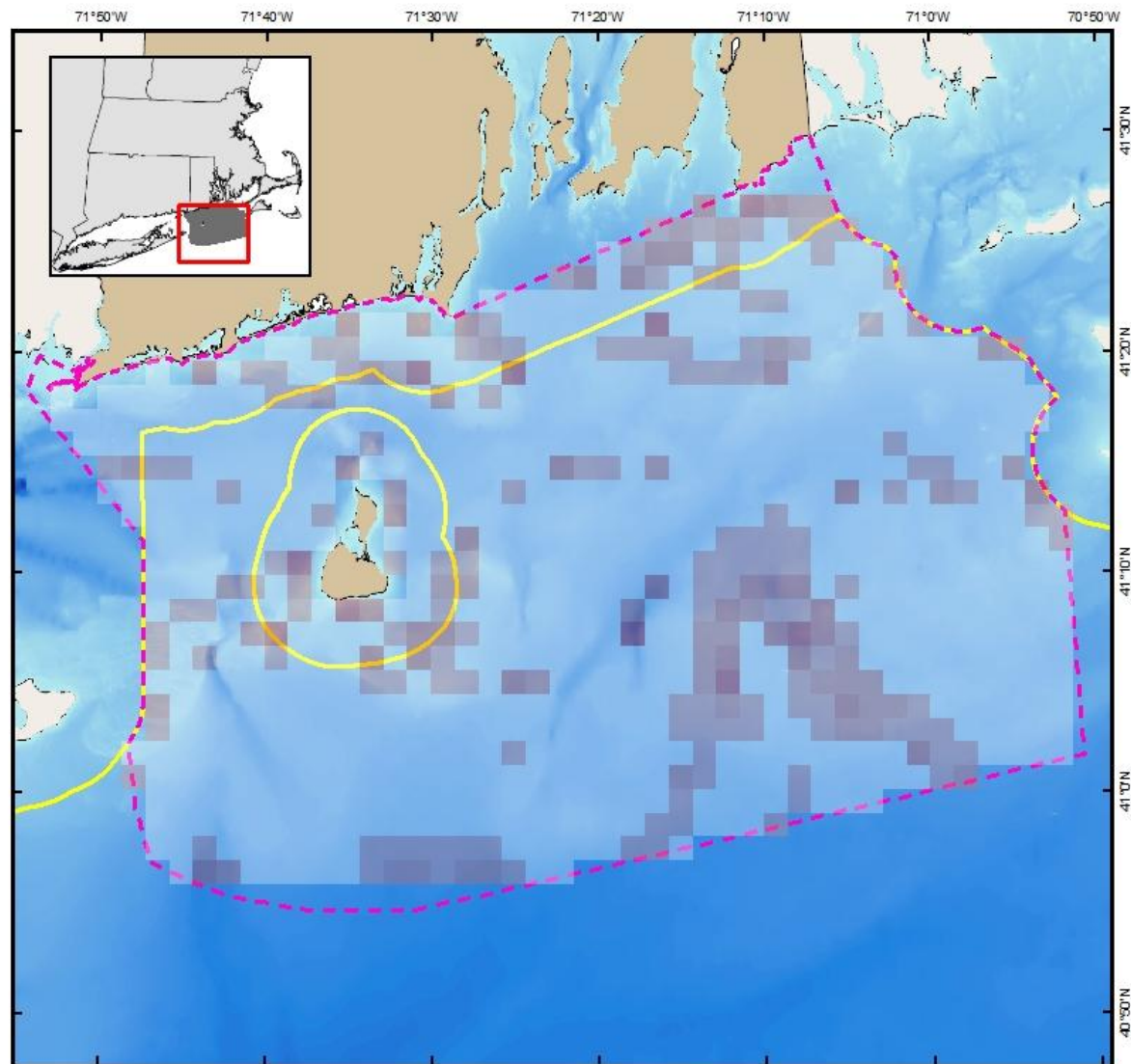
Legend

-  OceanSAMP Study Area
-  State/Federal Waters Separation

Zonationsummerwinter

<VALUE>

-  0
-  0.01 - 0.75
-  0.76 - 0.9
-  0.91 - 0.95
-  0.96 - 0.99
-  1

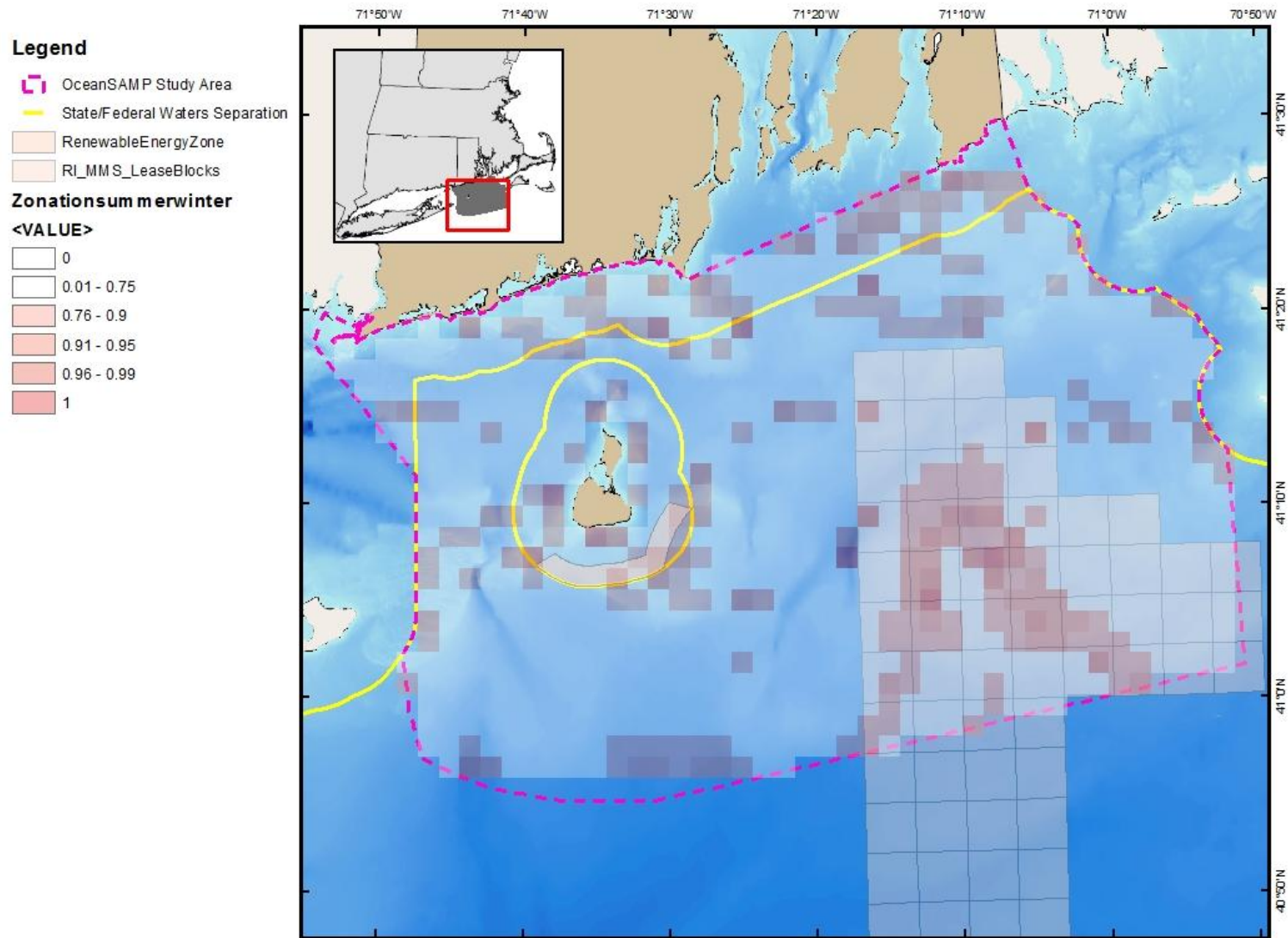


Input Layers:

Winter-Gulls, Alcids, Seaducks, Northern Gannet and Loons.

Summer-Gulls, Shearwaters, Petrels and Terns.

- All layers equally ranked.

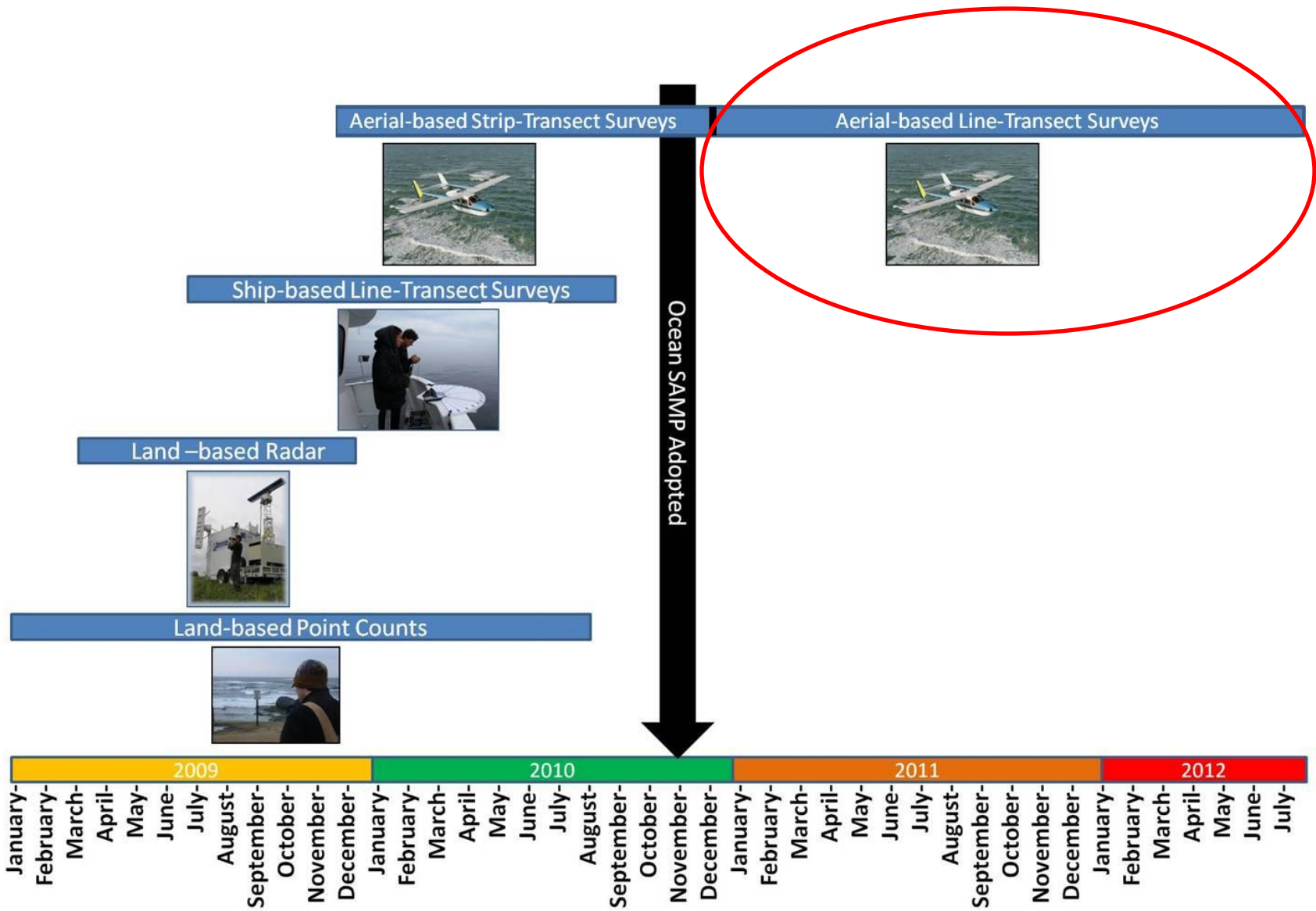


Input Layers:

Winter-Gulls, Alcids, Seaducks, Northern Gannet and Loons.

Summer-Gulls, Shearwaters, Petrels and Terns.

- All layers equally ranked.



Incorporate More Predictive Environmental Covariates into Models?

Many available environmental covariates:

Static

Distance to coast
Bathymetry
Slope
Roughness
Grain size

Dynamic

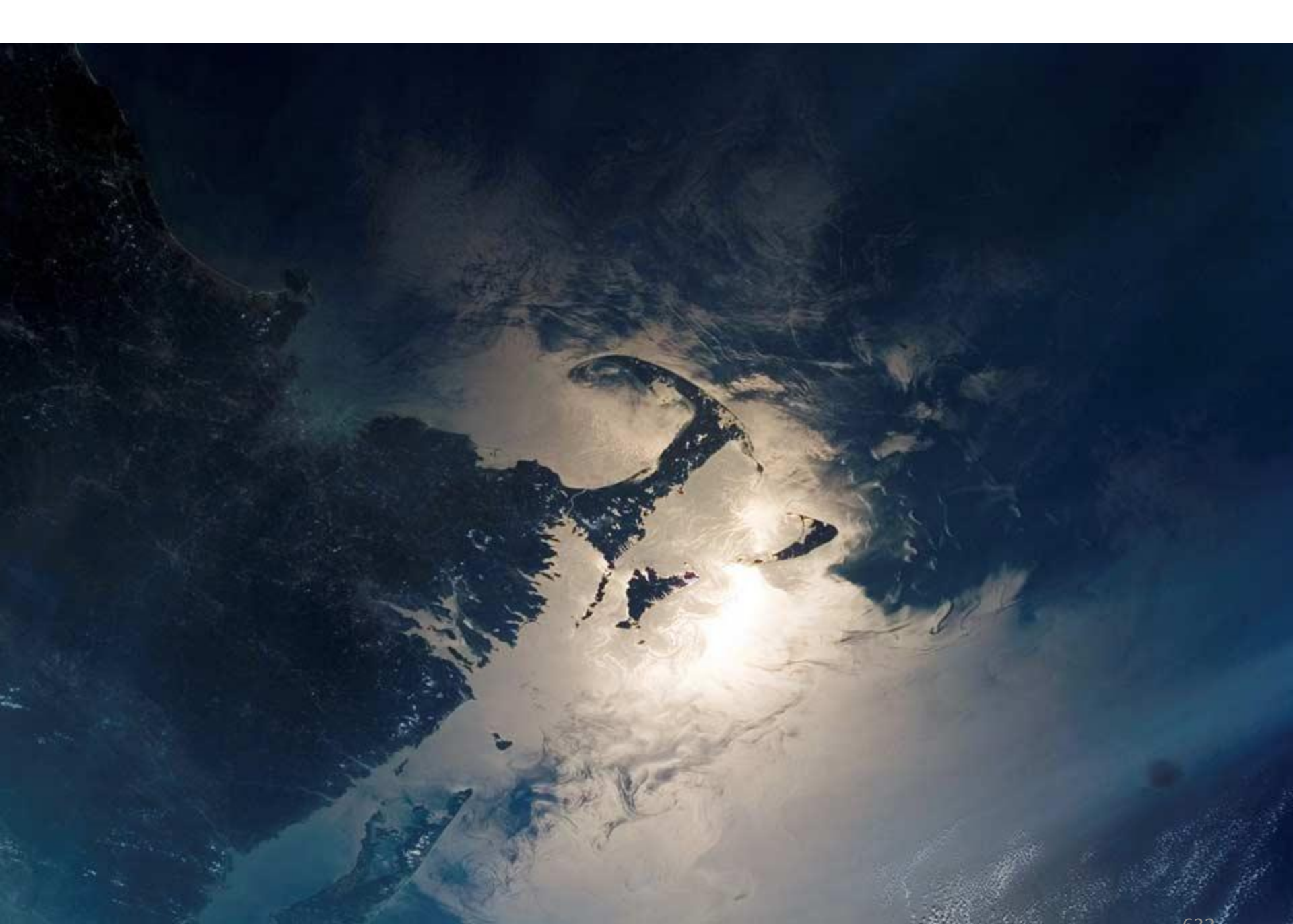
SST	Distance to ocean front
Chlorophyll a	Stratification
SSH	Turbidity
Density of ocean fronts	Zooplankton
	Oscillation Indexes

Dynamic variables

- Temporal decisions
 - Same time period as survey data or three months prior?
- Do we look at the average, min, max, variability, variability within nearby cells?

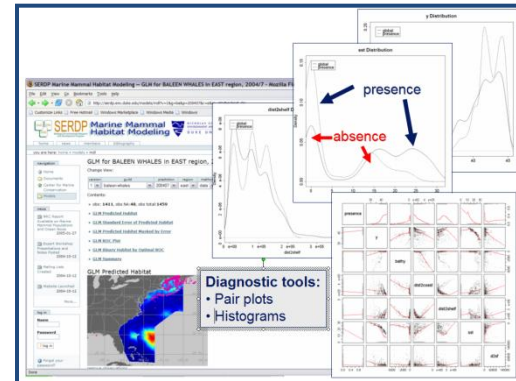
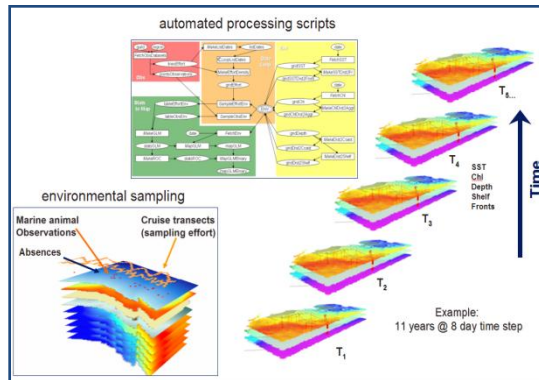
Potential issues

- High collinearity
- Explanatory vs. predictive model?
 - Increasing number of variables -> increase in difficulty interpreting model.
- Dynamic could be the only way to understand annual variability
 - Many years of survey data.

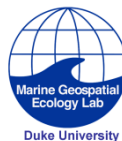


Presentation #24

Cetacean Distribution and Density Modeling Efforts at Duke



Patrick Halpin, Ben Best, Jason Roberts, Ei Fujioka, Jesse Cleary
Marine Geospatial Ecology Lab
Duke University



Modeling Efforts at Duke

— Existing:

- SERDP Atlantic and GoMEX cetacean probability of occurrence models

— Current:

- Update to SERDP models (Duke)

— Upcoming:

- Western Atlantic cetacean modeling - US Navy Atlantic Fleet Training and Testing (AFTT) Area

— Meta:

- CetMap project overview

Modeling Efforts at Duke

— Existing:

- SERDP Atlantic and GoMEX cetacean probability of occurrence models

— Current:

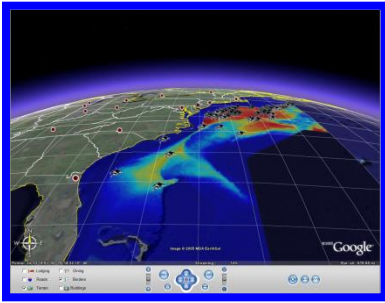
- Update to SERDP models (Duke)

— Upcoming:

- Western Atlantic cetacean modeling - US Navy Atlantic Fleet Training and Testing (AFTT) Area

— Meta:

- CetMap project overview



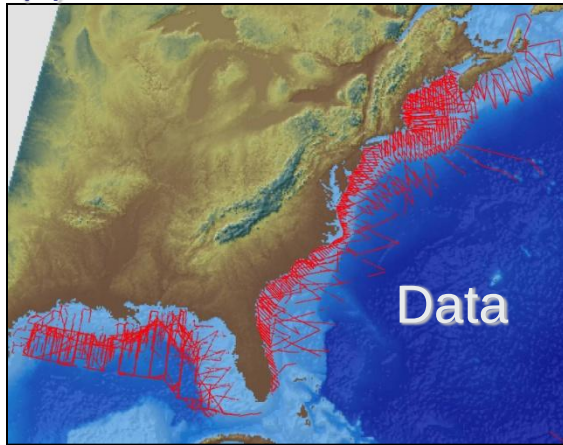
Societal need: We need to minimize risk to protected species from potentially harmful marine interactions (e.g. ship strikes, seismic surveys, oil drilling noise, Navy sonar training exercises.)

Project: Duke University and NOAA's Southwest Fisheries Science Center (SWFSC) teamed up to develop an online Spatial Decision Support System (SDSS) that provides spatiotemporally-explicit, quantitative predictions of the density and probability of occurrence of marine mammals.

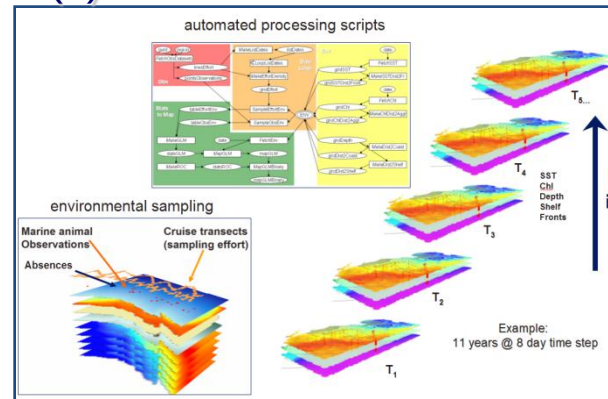
Initial development: Strategic Environmental Research and Development Program
SERDP projects SI-1390 at Duke University and SI-1391 at NOAA-SWFSC

Modeling Workflow

(1) animal observation data

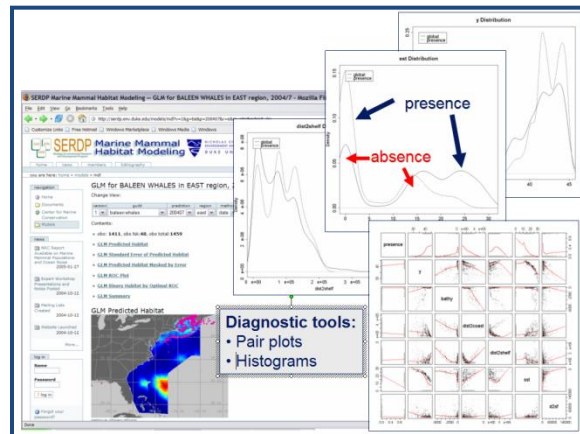


(2) ocean observation data



Temporally
matched
covariates

GAM models of
density
&
habitat



(3) statistical analysis & modeling

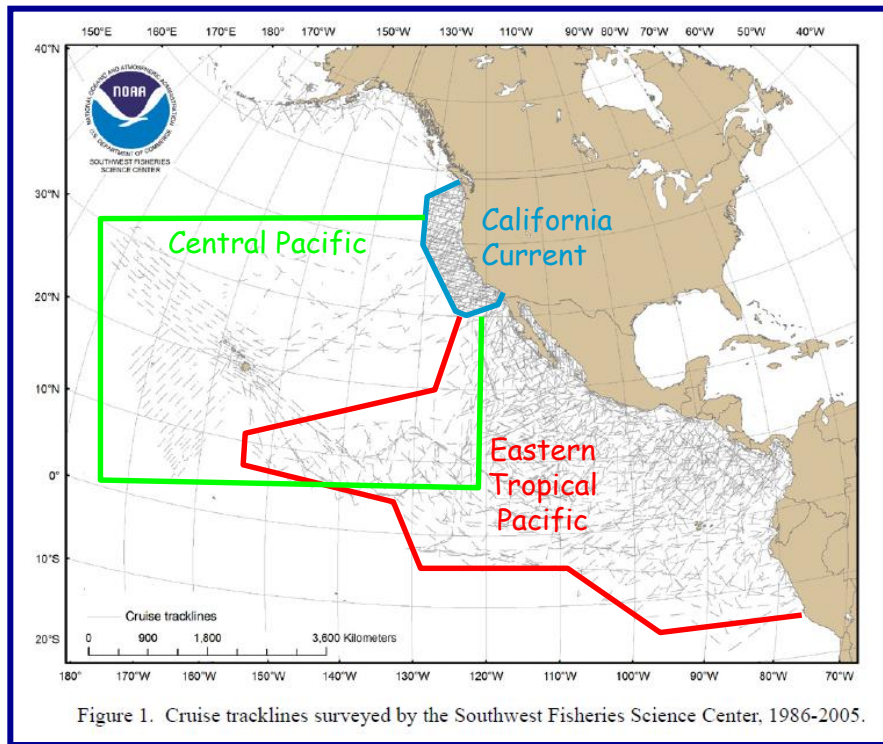
(4) spatial decision support system



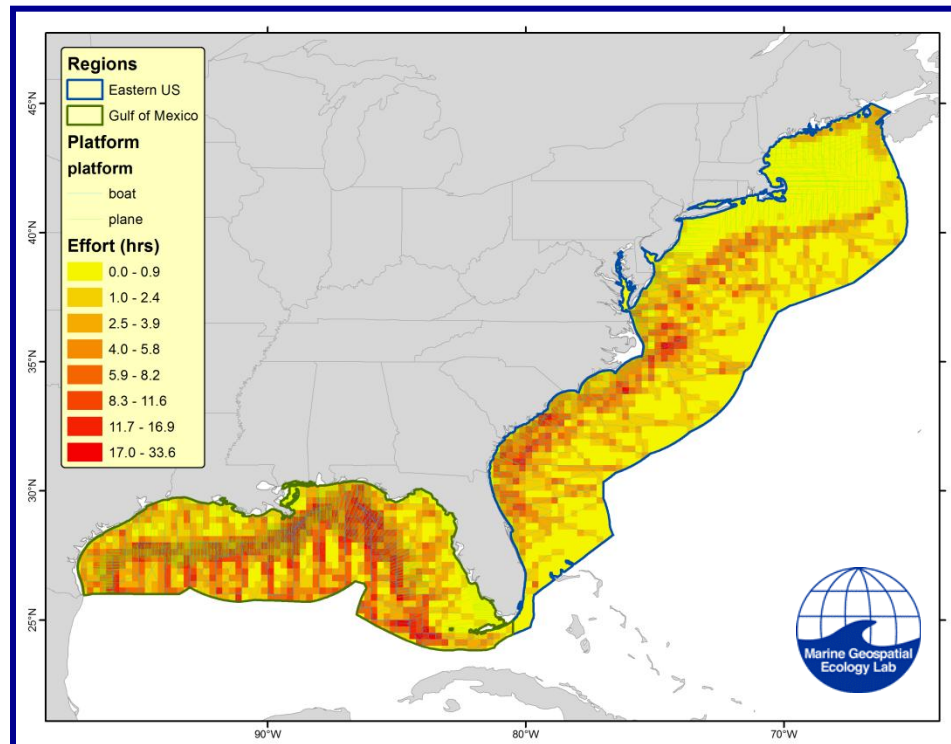
Integrating Ocean Observing Data to Enhance Protected Species Spatial Decision Support Systems

Joint Academic & Federal Agency Team

Pacific: NOAA - SWFSC

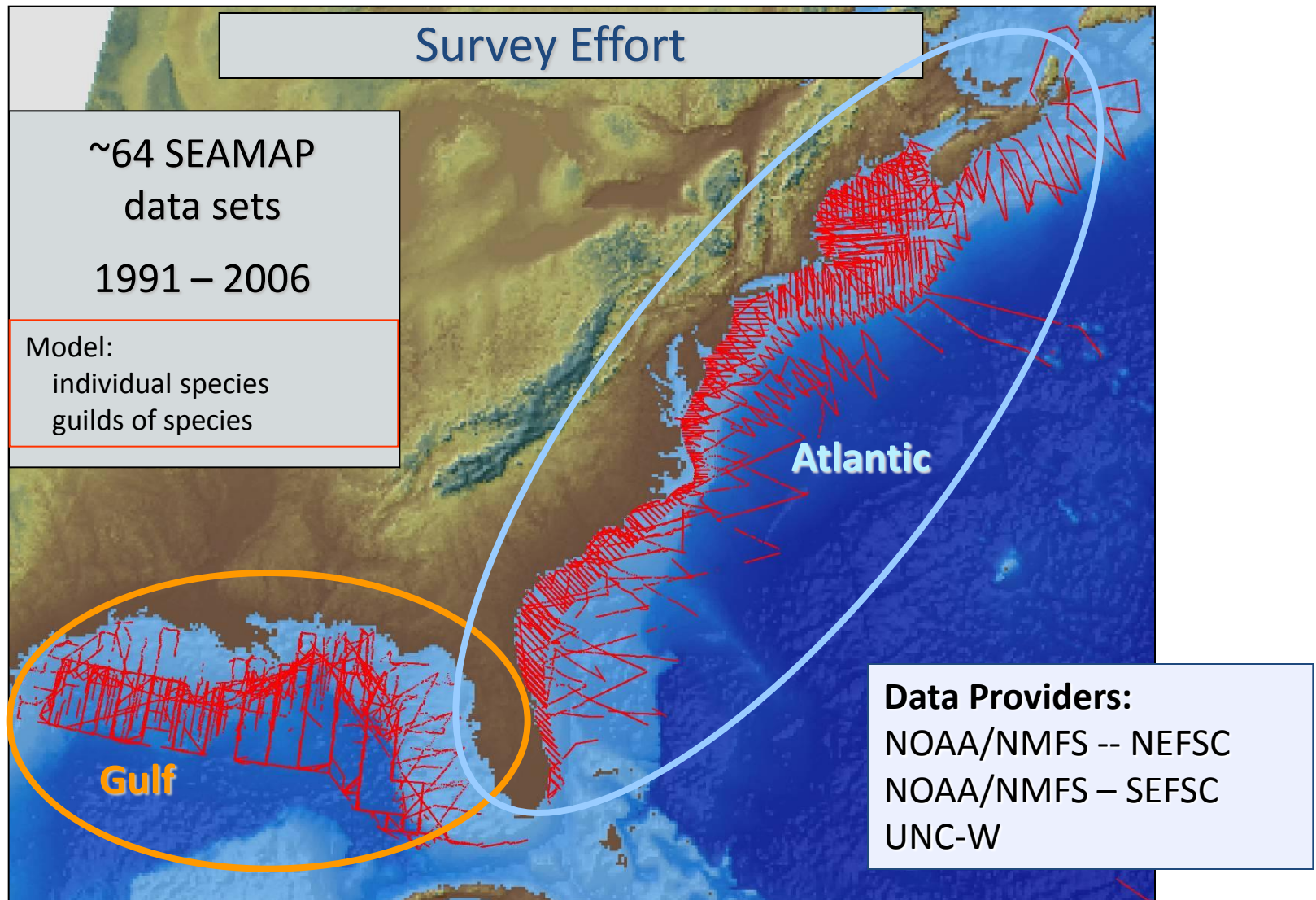


Atlantic & Gulf of Mexico: Duke University

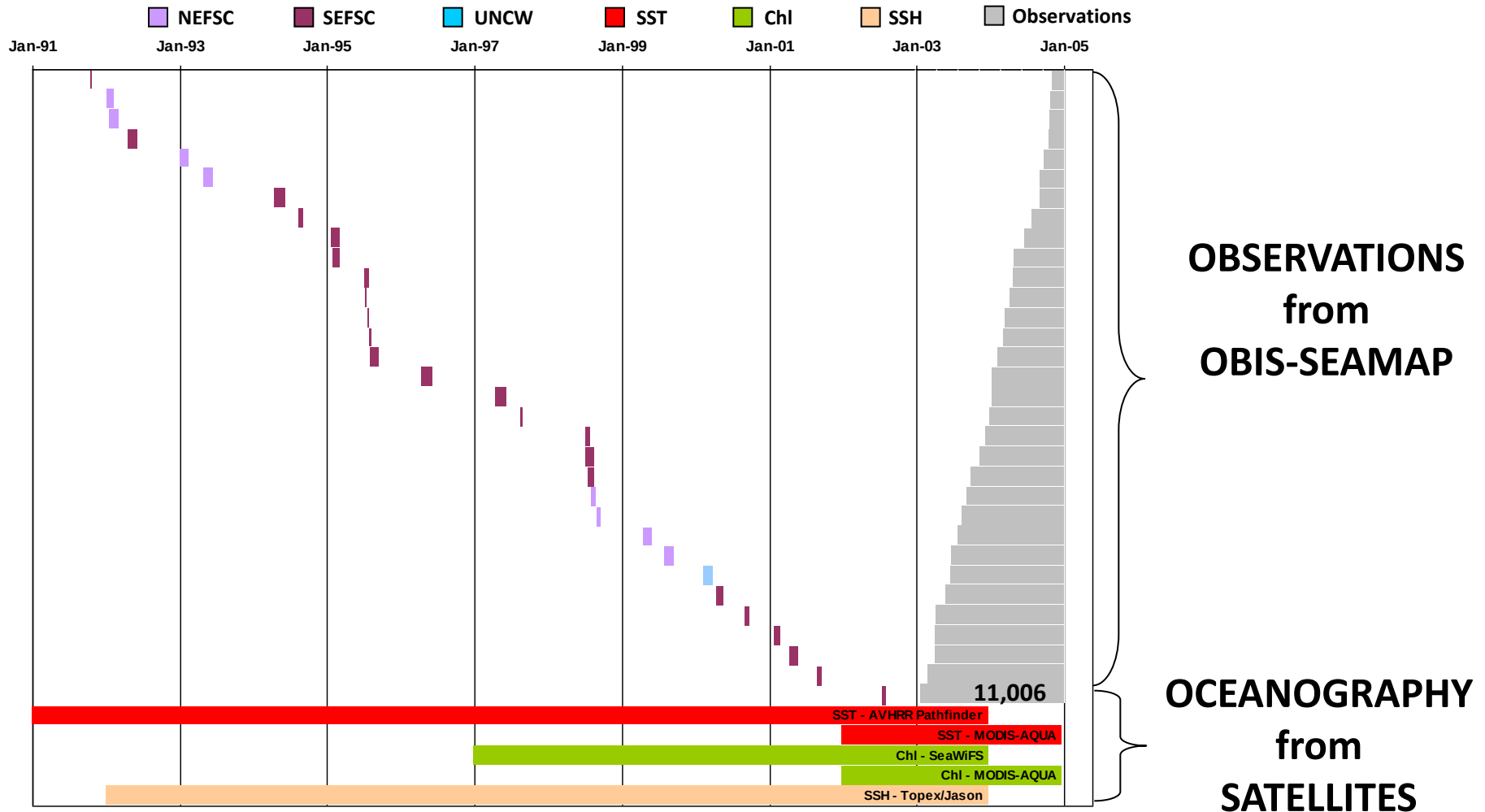


Density of protected species ship & aircraft surveys

OBIS-SEAMAP aggregated data

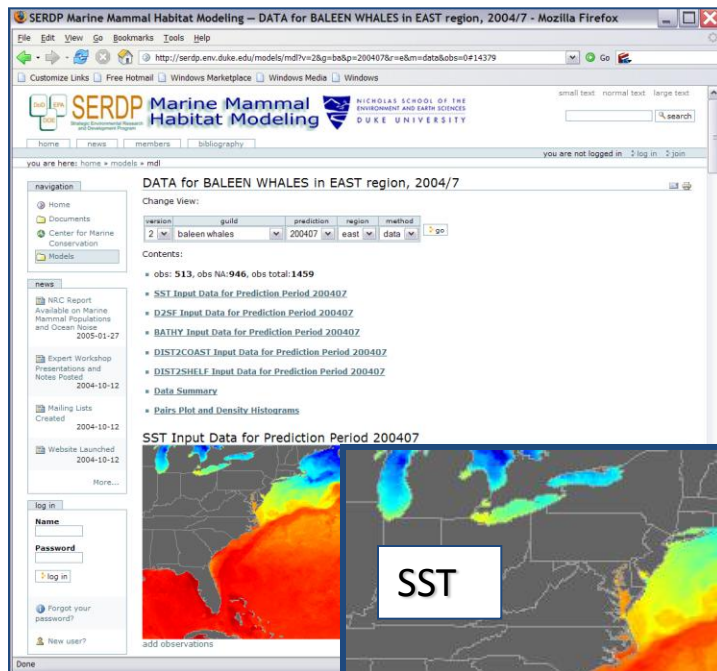


Fusion of marine animal & Ocean Observation data



- **64** datasets from 3 sources: NEFSC, SEFSC, UNCW
- **11,006** unique marine mammal observations between **1991** and **2006**

Geospatial & Ocean Observing Data



Distance
to Shore

Geospatial
variables

Distance
to Shelf

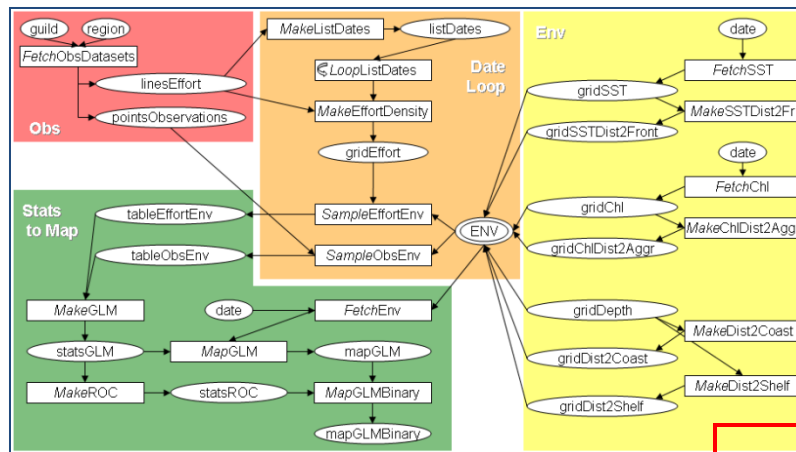
SST

Distance
to Fronts

Depth

Ocean
Observation
variables

Ocean Observing sampling through time automated processing scripts

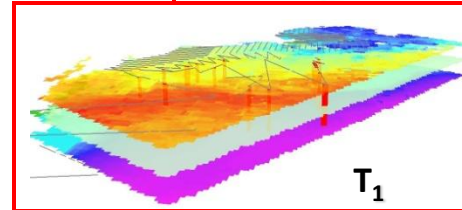
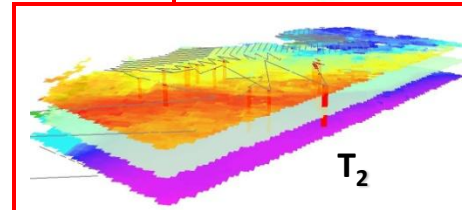
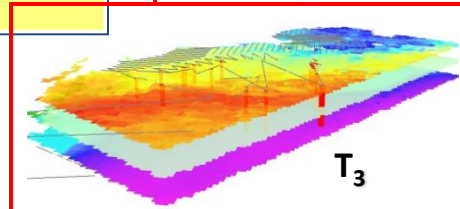
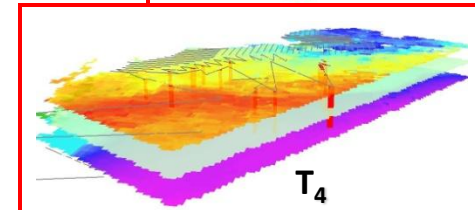
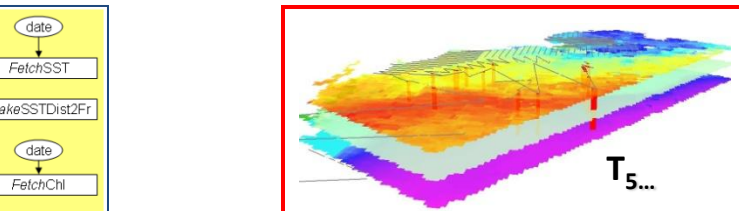
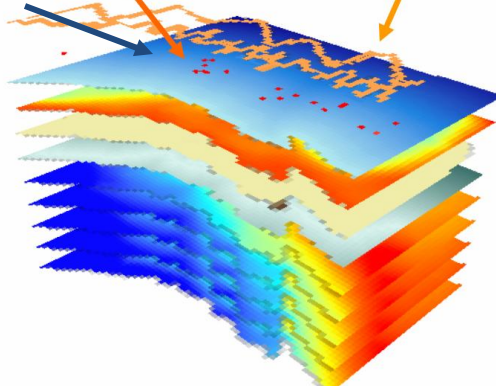


environmental sampling

Marine animal
Observations

Cruise transects
(sampling effort)

Absences



SST
Chl
Depth
Shelf
Fronts

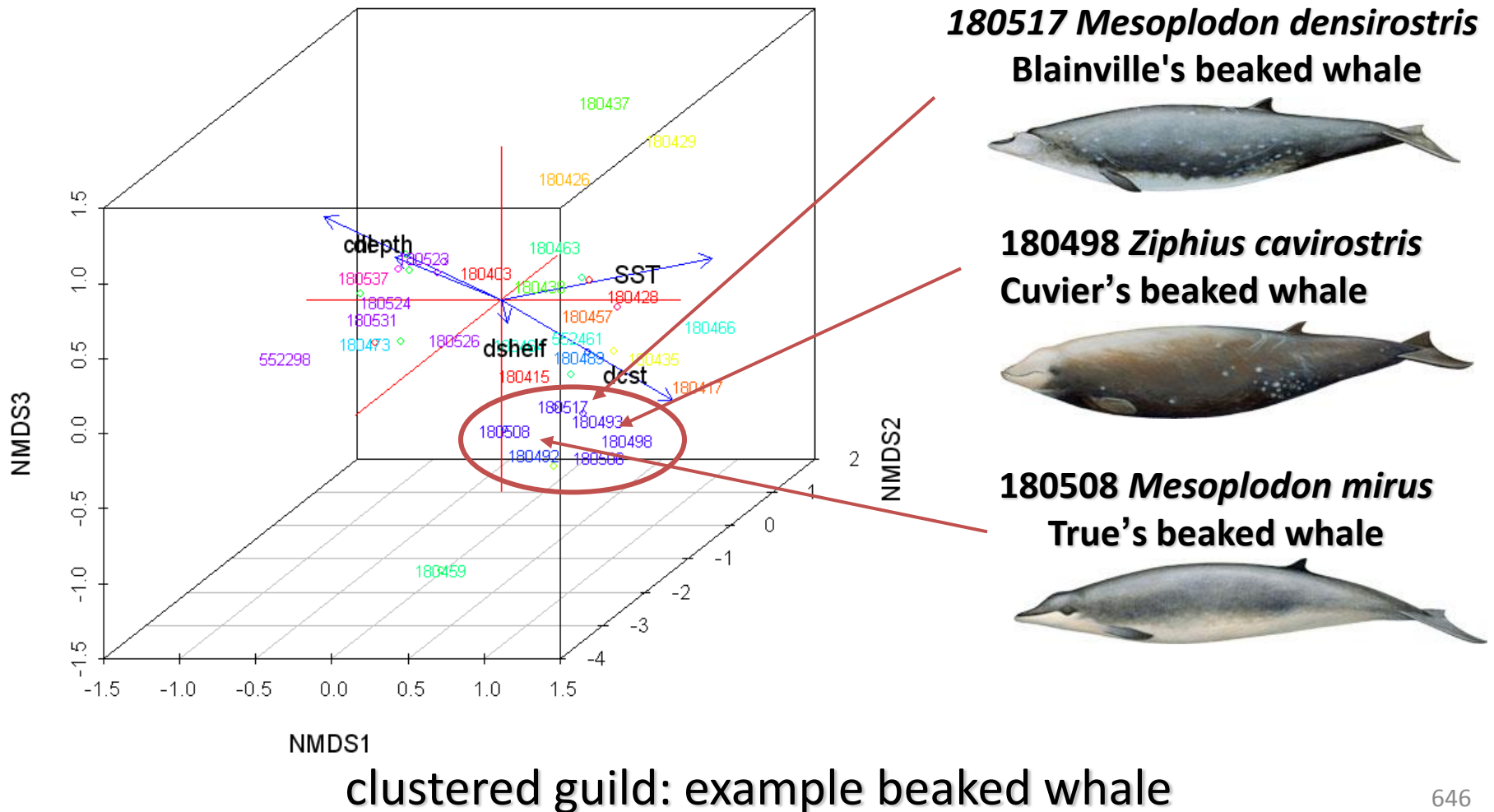
Time

Example:
11 years @ 8 day time step

Model Guilds

Guild	Scientific name	Common name	Status
Baleen whale	<i>Balaenoptera</i> spp.	Baleen whales	
	<i>Balaenoptera acutorostrata</i>	Minke whale	LC
	<i>Balaenoptera borealis</i>	Sei whale	EN
	<i>Balaenoptera edeni</i>	Bryde's whale	DD
	<i>Balaenoptera musculus</i>	Blue whale	EN
	<i>Balaenoptera physalus</i>	Fin whale	EN
Humpback whale	<i>Megaptera novaeangliae</i>	Humpback whale	LC
Right whale	<i>Eubalaena glacialis</i>	North Atlantic right whale	EN
Beaked whale	<i>Berardius bairdii</i>	Baird's beaked whale	DD
	<i>Hyperoodon ampullatus</i>	North Atlantic bottlenose whale	LC
	<i>Mesoplodon</i> spp.	Beaked whales	
	<i>Mesoplodon bidens</i>	Sowerby's beaked whale	DD
	<i>Mesoplodon densirostris</i>	Blainville's beaked whale	DD
	<i>Mesoplodon europaeus</i>	Gervais' beaked whale	DD
	<i>Mesoplodon mirus</i>	True's beaked whale	DD
	Ziphiidae	Beaked whales	
	<i>Ziphius</i> spp.	Goose-beaked whales	
	<i>Ziphius cavirostris</i>	Cuvier's beaked whale	LC
	<i>Physeter macrocephalus</i>	Sperm whale	VU
Sperm whale			
<i>Kogia</i> spp.	<i>Kogia</i> spp.	Kogia	
	<i>Kogia breviceps</i>	Pygmy sperm whale	DD
	<i>Kogia sima</i>	Dwarf sperm whale	DD
Killer whale	<i>Orcinus orca</i>	Killer whale	DD
	<i>Feresa attenuata</i>	Pygmy killer whale	DD
	<i>Peponocephala electra</i>	Melon-headed whale	LC
	<i>Pseudorca crassidens</i>	False killer whale	DD
Pilot whale	<i>Globicephala</i> spp.	Pilot whales	
	<i>Globicephala macrorhynchus</i>	Short-finned pilot whale	DD
	<i>Globicephala melas</i>	Long-finned pilot whale	DD
<i>Lagenorhynchus</i> spp.	<i>Lagenorhynchus</i> spp.	White-beaked dolphins	
	<i>Lagenorhynchus acutus</i>	Atlantic white-sided dolphin	LC
	<i>Lagenorhynchus albirostris</i>	White-beaked dolphin	LC
Common dolphin	<i>Delphinus</i> spp.	Common dolphin	
	<i>Delphinus delphis</i>	Common dolphin	LC
Spinner dolphin	<i>Stenella clymene</i>	Short-snouted spinner dolphin	DD
	<i>Stenella longirostris</i>	Spinner dolphin	DD
	<i>Stenella coeruleoalba</i>	Striped dolphin	LC
<i>Stenella coeruleoalba</i>			
<i>Stenella attenuata</i>	<i>Stenella attenuata</i>	Pantropical spotted dolphin	LC
<i>Stenella frontalis</i>	<i>Stenella frontalis</i>	Atlantic spotted dolphin	DD
Bottlenose dolphin	<i>Tursiops truncatus</i>	Bottlenose dolphin	LC
Harbor porpoise	<i>Phocoena phocoena</i>	Harbor porpoise	LC

Analysis of species group clusters (NMDS ordination, Schick et al 2011)

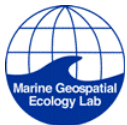


16 cetacean guilds

Species data providers

Ocean data providers

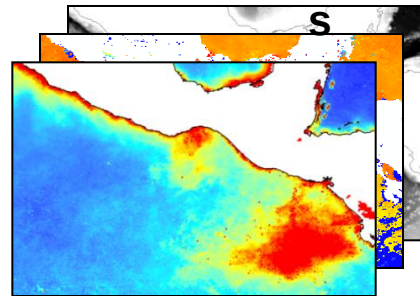
Protected Species Decision Support System



Species observation



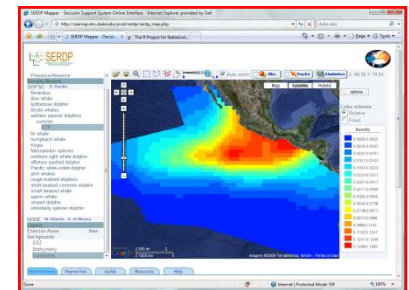
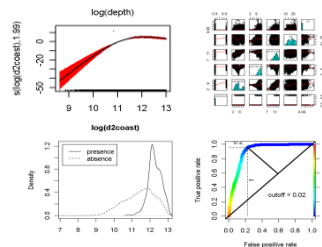
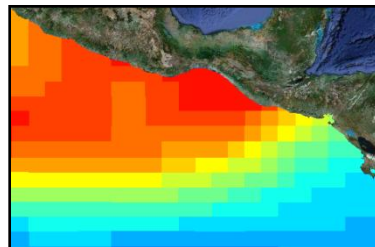
Ocean observation



Statistical models

$$g(\mu) = \beta_0 + \beta_1 x_1 + \dots + \beta_m x_m$$

$$g(E(Y)) = \beta_0 + f_1(x_1) + f_2(x_2) + \dots + f_m(x_m).$$



Predicted distributions Summary plots

SDSS website

Duke SERDP Model Overview

Probability of occurrence from static environmental variables and time-varying conditions

Approach: Integrated surveys conducted by ship and aircraft, weighting a GAM by minutes surveyed within space–time grid cells

- Maps of Presence versus Absence - receiver operator characteristic (ROC) curve thresholds
- Marine Geospatial Ecology Tools (MGET) were used for fetching and sampling of environmental data within ArcGIS and generation of GAMs with the R statistics package mgcv
- Covariates: depth, distance to shore, distance to shelf, sea surface temperature
- Resolution: 10km, Seasonal, Guilds

Duke SERDP Model Overview

Guilds: Sample sizes were inadequate to build separate habitat suitability models for most individual species:

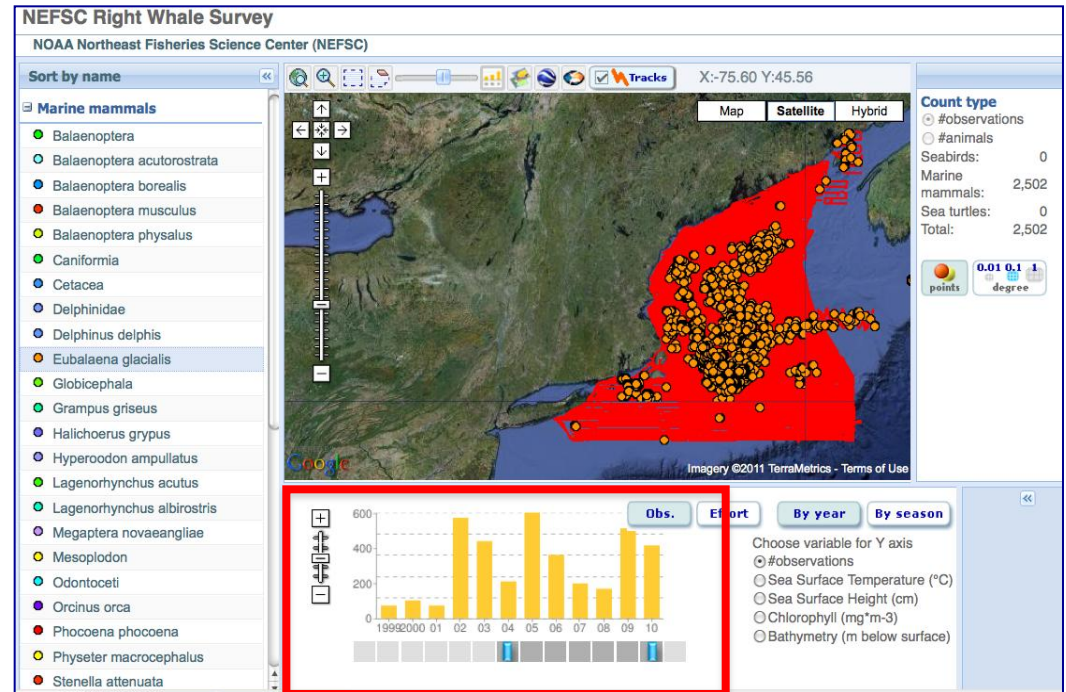
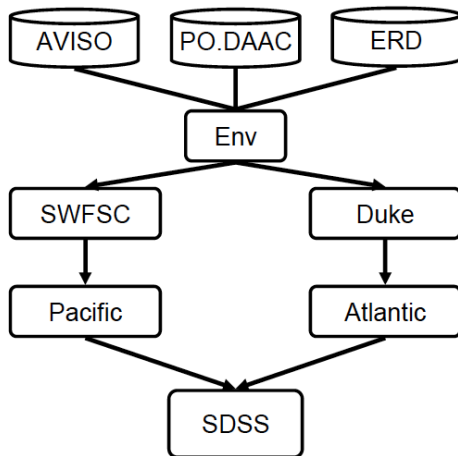
- grouped species at various taxonomic levels to create species ‘guilds’
- established using information on species distributions, interactions, and other expert knowledge
- compared to environmental ordination results for validation of members

References: Best et al. 2007, Schick et al. 2011, Best et al. 2012

Spatial Decision Support System

SDSS Provides:

- Density models
- Links to data
- Links to metadata
- Links to variables
- Visualization by time



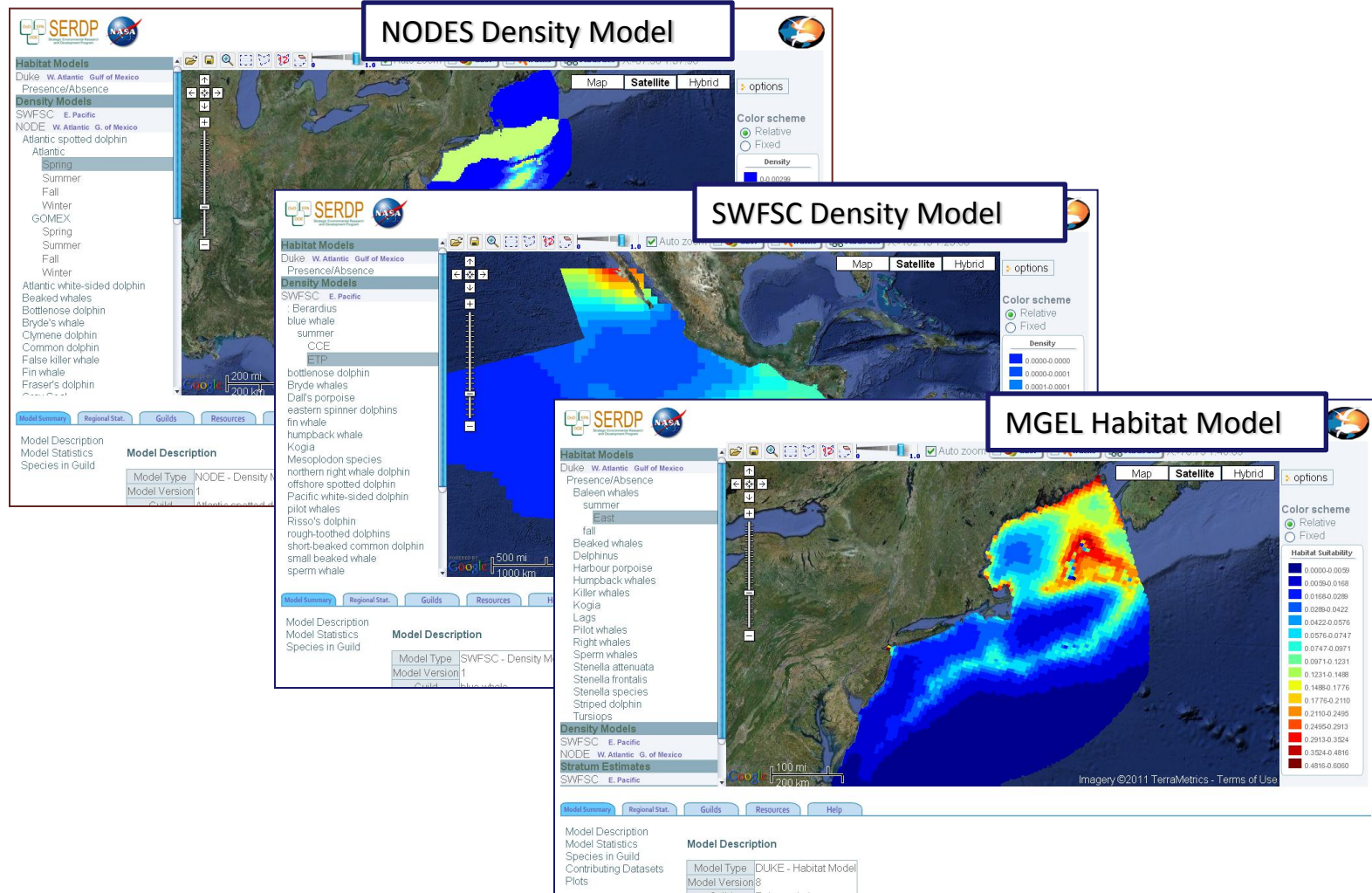
Observations and survey effort of North Atlantic right whale dataset hosted on SEAMAP since 2004 when HYCOM data is available.

Cetacean density models in OBIS-SEAMAP

SERDP Spatial Decision Support System

originally funded by SERDP, continuing development by NASA

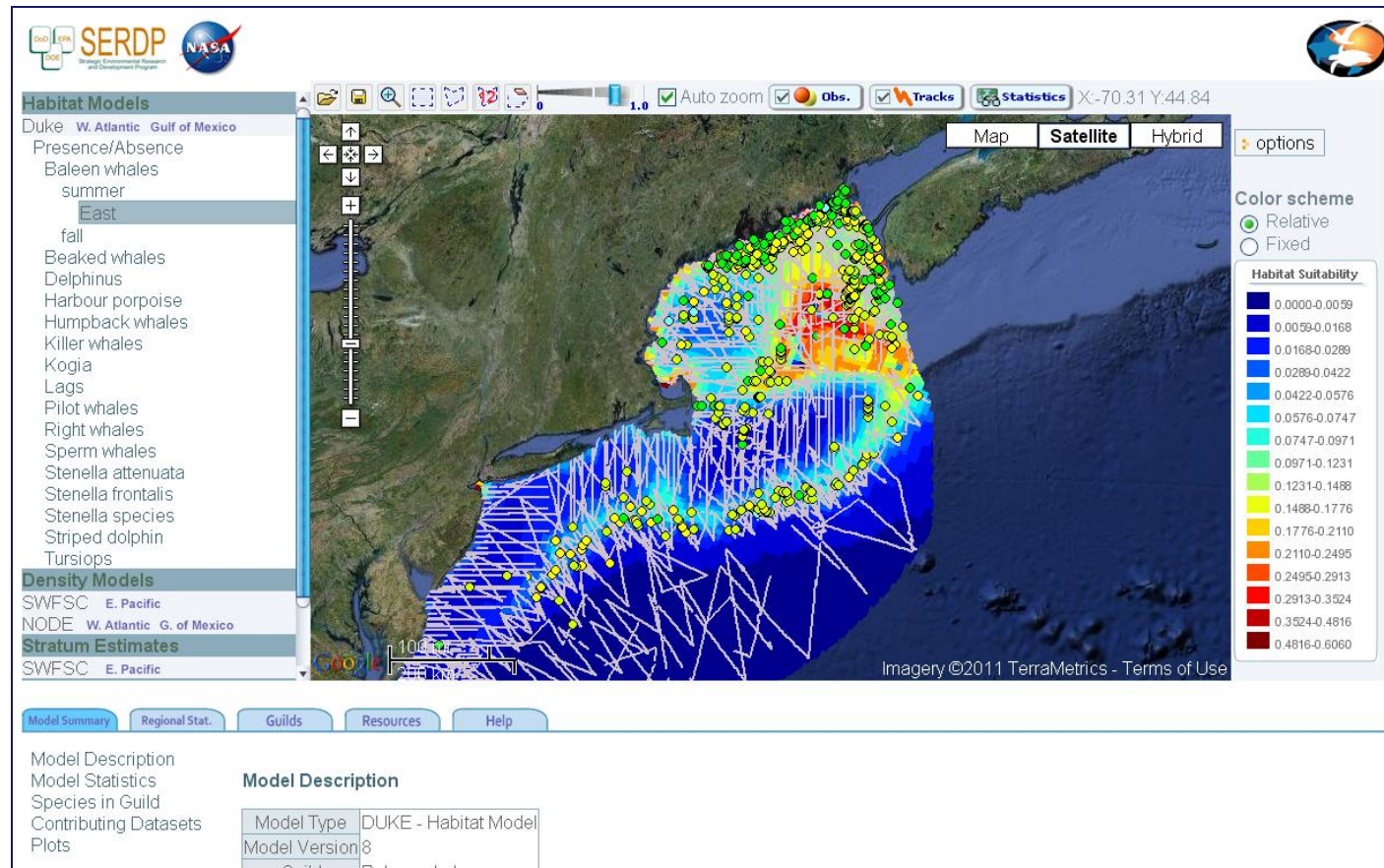
Multiple habitat/density models from different projects



Cetacean density models in OBIS-SEAMAP

Interactive decision support

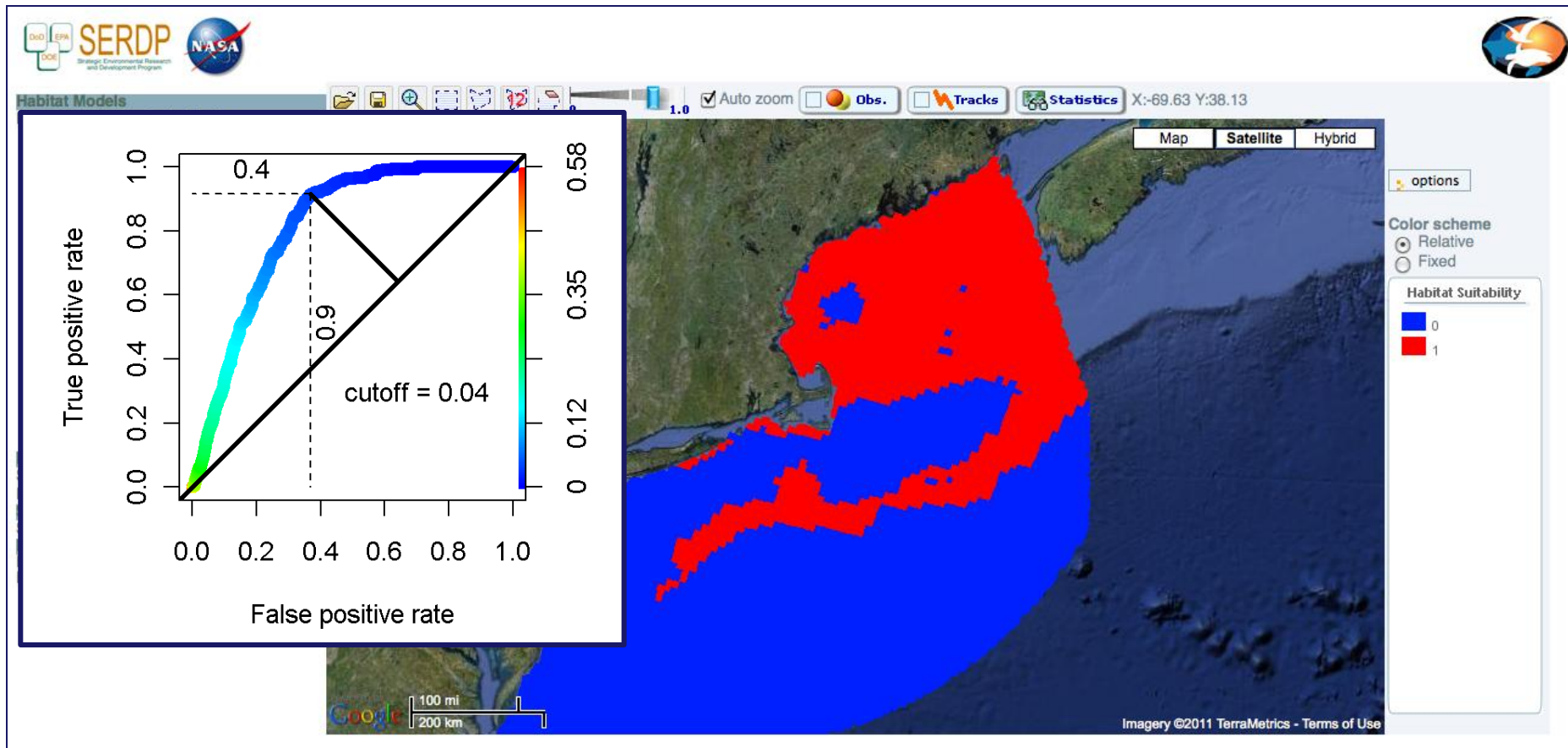
Model outputs presented with original data (including effort)



Cetacean density models in OBIS-SEAMAP

Interactive decision support

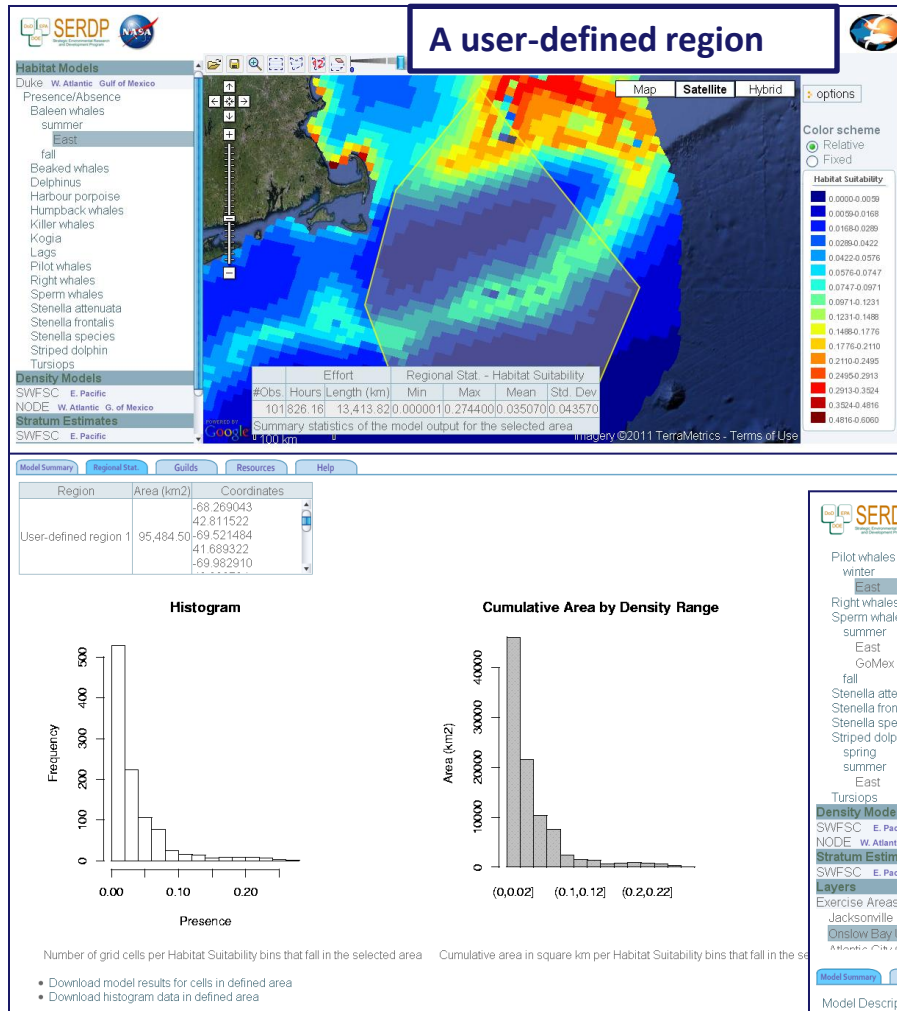
Critical habitats evaluated with ROC analysis



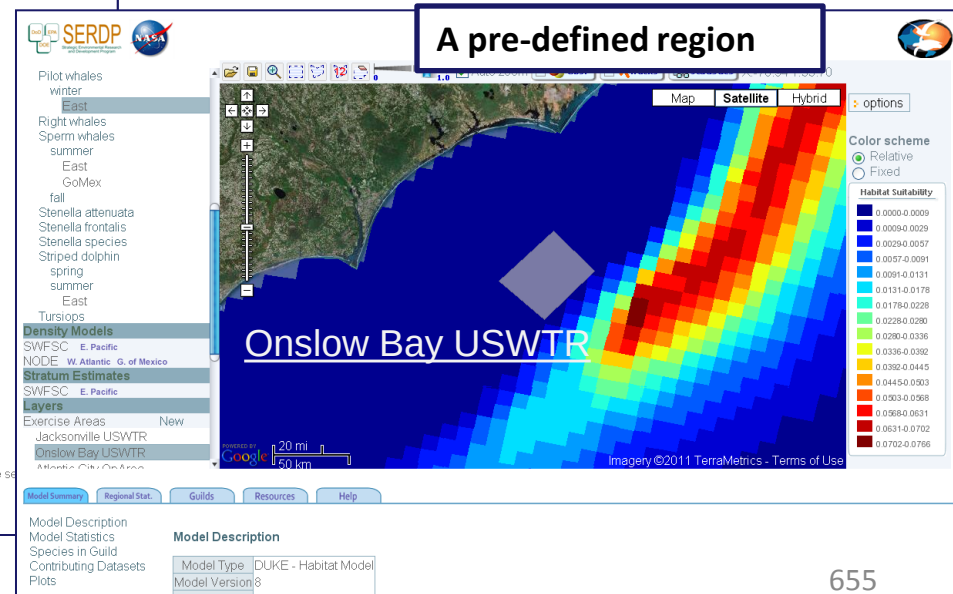
Cetacean density models in OBIS-SEAMAP

Interactive decision support

Queries by regions of interest



Queries can be calculated against pre-defined areas (e.g. Navy operation areas)



[illegible]

- 656

Modeling Efforts at Duke

— Existing:

- SERDP Atlantic and GoMEX cetacean probability of occurrence models

— Current:

- Update to SERDP models (Duke)

— Upcoming:

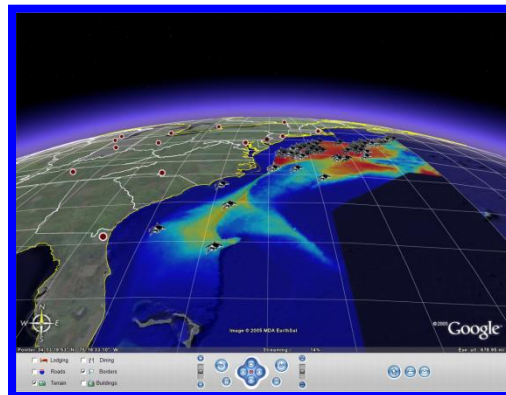
- Western Atlantic cetacean modeling - US Navy Atlantic Fleet Training and Testing (AFTT) Area

— Meta:

- CetMap project overview

Forecasting model & SDSS improvements

- Incorporating a wider range of remotely-sensed ocean observations, including new geographic areas.
- Deriving more ecologically-important model parameters from the ocean observations.
- Exploring the implementation of near-real-time now-cast and forecast capabilities.
- Publishing key algorithms in a free, GIS-integrated toolbox.



Species data providers

Ocean data providers

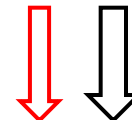
Protected Species Decision Support System



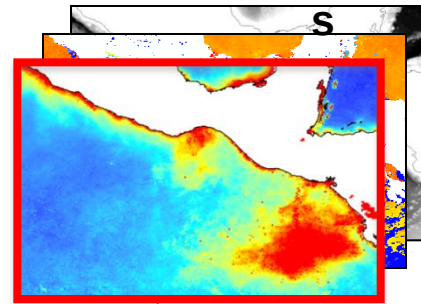
Species observation



More



Ocean observation



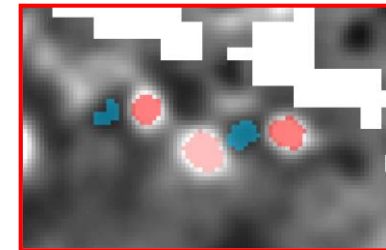
NASA project enhancements

Algorithms

$$u = -\frac{g}{f} \frac{\partial h}{\partial y}, \quad v = \frac{g}{f} \frac{\partial h}{\partial x}$$

$$\omega = \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}, \quad s_n = \frac{\partial u}{\partial x} - \frac{\partial v}{\partial y}, \quad s_s = \frac{\partial v}{\partial x} + \frac{\partial u}{\partial y}$$

$$W = s_n^2 + s_s^2 - \omega^2$$



Ecologically-important parameters

Statistical models

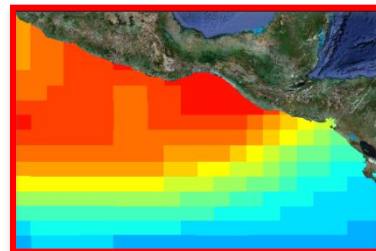
$$g(\mu) = \beta_0 + \beta_1 x_1 + \dots + \beta_m x_m$$

$$g(E(Y)) = \beta_0 + f_1(x_1) + f_2(x_2) + \dots + f_m(x_m)$$

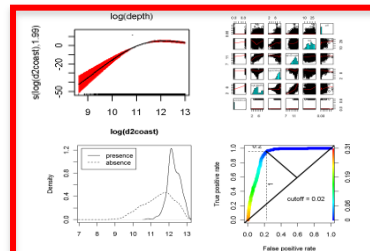


GIS Tools

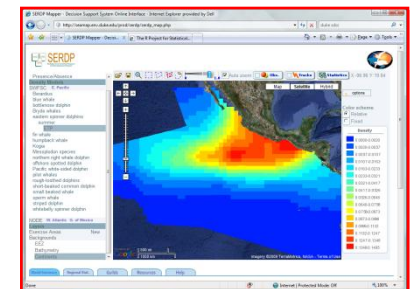
- Marine Geospatial Ecology Tools
 - Connectivity Analysis
 - Conversion
 - Data Management
 - Data Products
 - Oceanographic Analysis
 - Spatial Analysis
 - Statistics



Predicted distributions



Summary plots

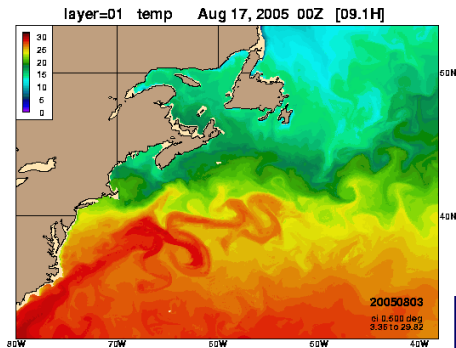


SDSS website

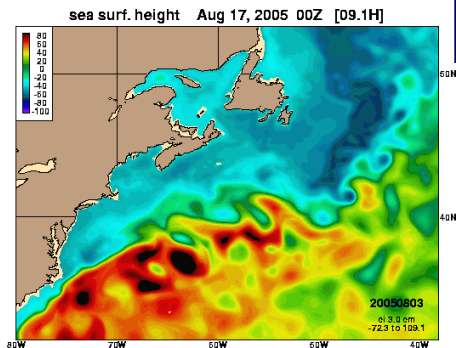
Example forecasting system

HYBRID COORDINATE OCEAN MODEL
HYCOM

SST

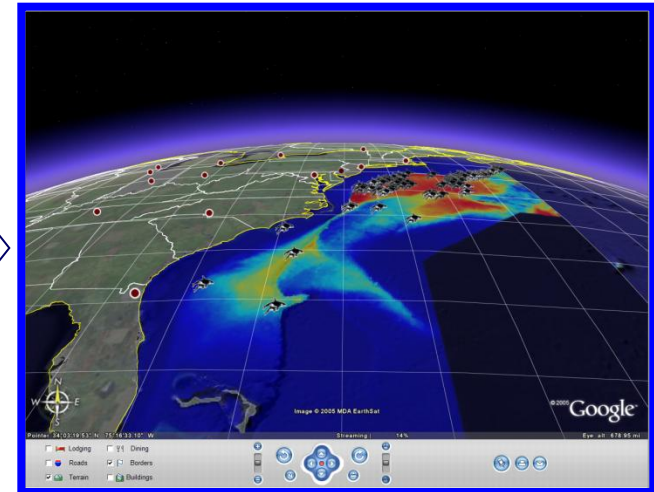


SSH



Prediction built from
past observations

Spatial Decision Support System



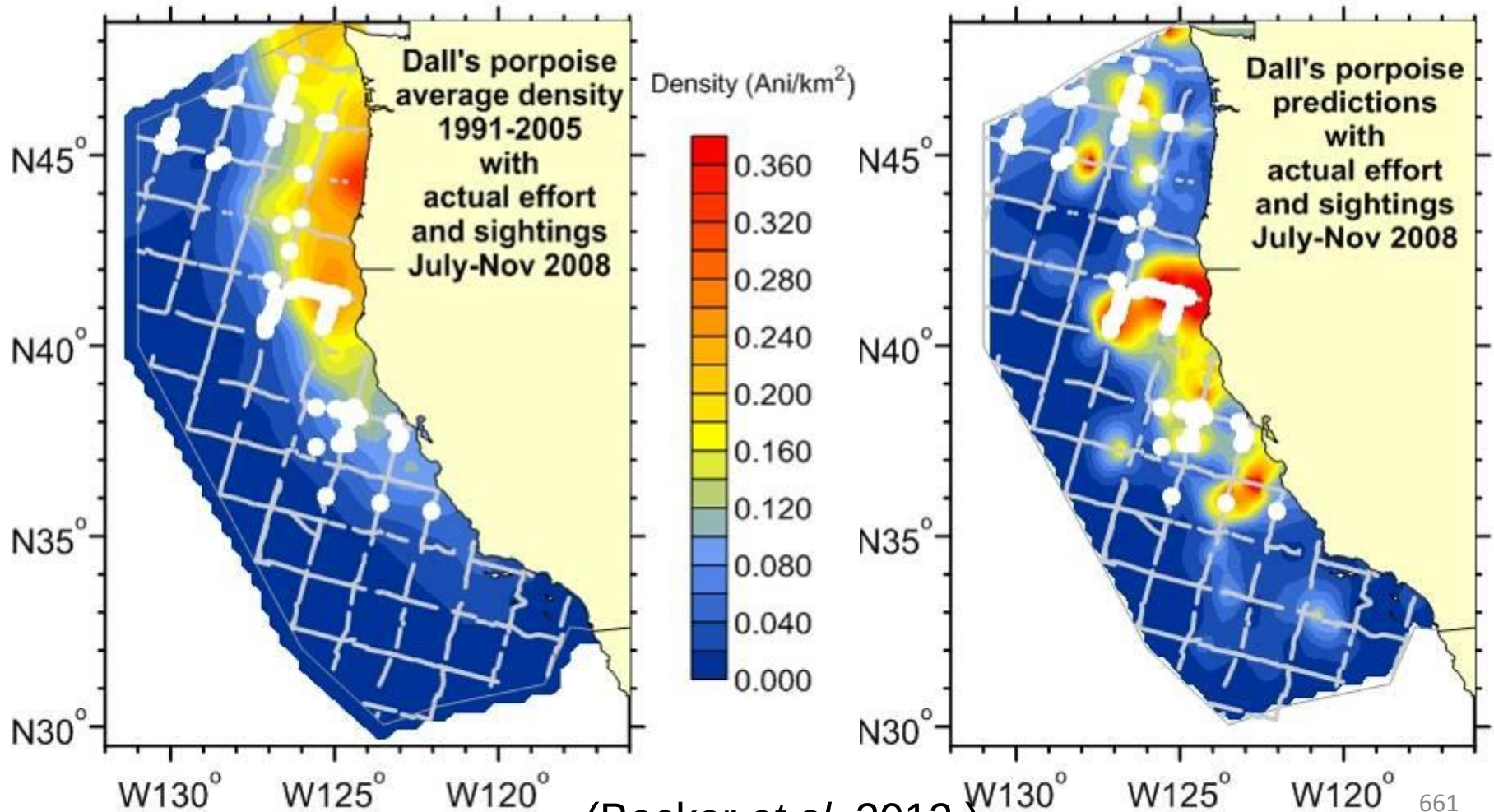
→ 1/24 deg (3.8 km / 1.8 nm)

(HYCOM images from Bub 2006)

NOWCAST – Dall's porpoise density for novel 2008 survey (July-Nov)

“1991-2005 Climatology”

“Daily forecast”



(Becker *et al.* 2012)

Habitat Density (HD) models in progress: EC & GoMEX

Existing data used in density estimations:

~1990's - 2005

region.platform

GM:boat
GM:plane
NE:boat
NE:plane
SE:boat
SE:plane

Datasets

GM_gulfcet2aerial, plane
GM_gunter2004, boat
GM_nmfs9296aerial, plane
GM_ocncetship9601, boat
GM_shlfcetship, boat
NE_aj98eff, boat
NE_aj99eff, boat
NE_en04eff, boat
NE_to02eff, plane
NE_to04eff, plane
NE_to98eff, plane
NE_to99eff, plane
SE_gu0201, boat
SE_gu0403, boat
SE_gu0502, boat
SE_gu9801, boat
SE_mats02sum, plane
SE_mats02win, plane
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SE_mats05win, plane
SE_ot9905, boat

0

0

2

4

6

8

10

12

New Density Models In Progress

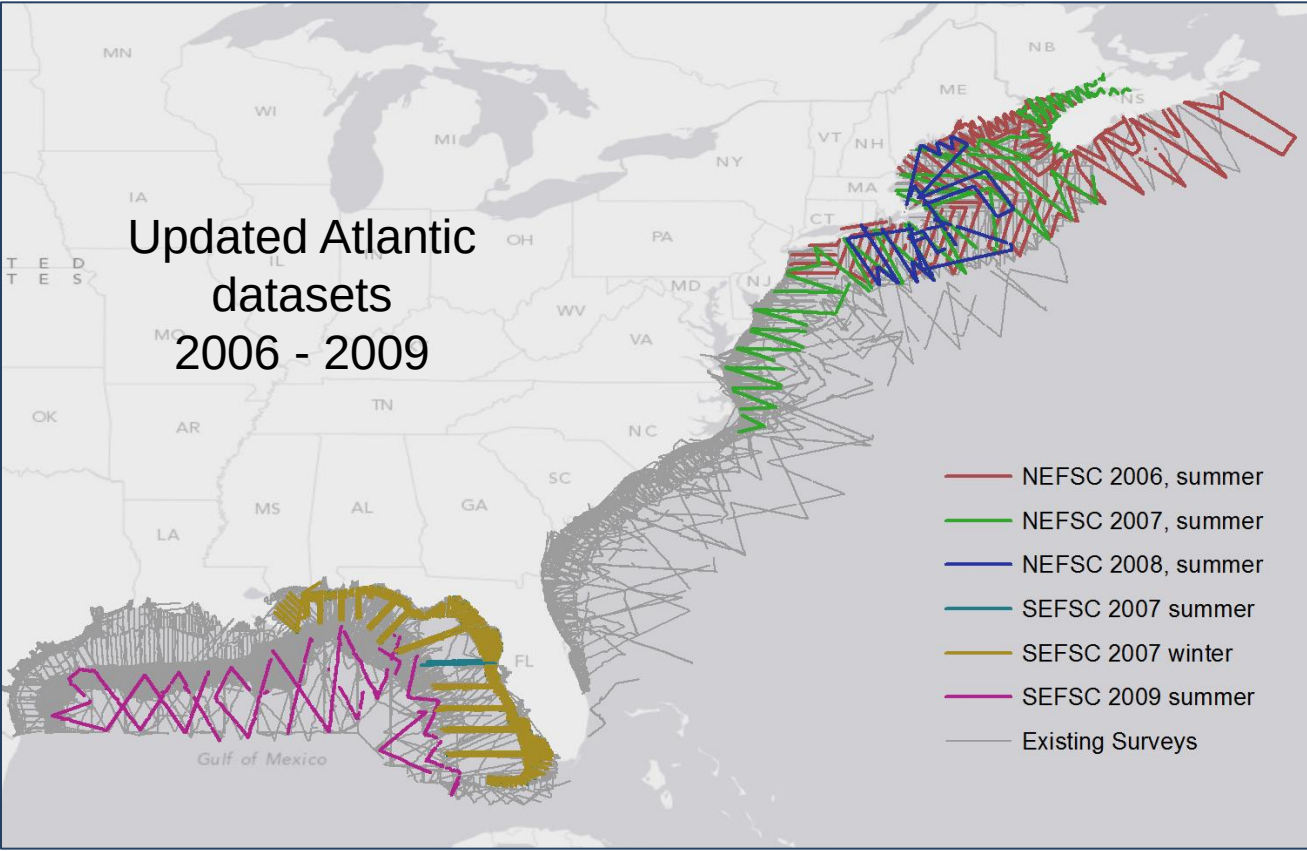
New Atlantic datasets now processed for producing updated cetacean density surface models. Models are being built in two stages.

1) Using similar methods to Pacific for a comparative similar product

2) Using novel methods

- Unstructured grid with finer resolution closer to coast

Updated Atlantic
datasets
2006 - 2009

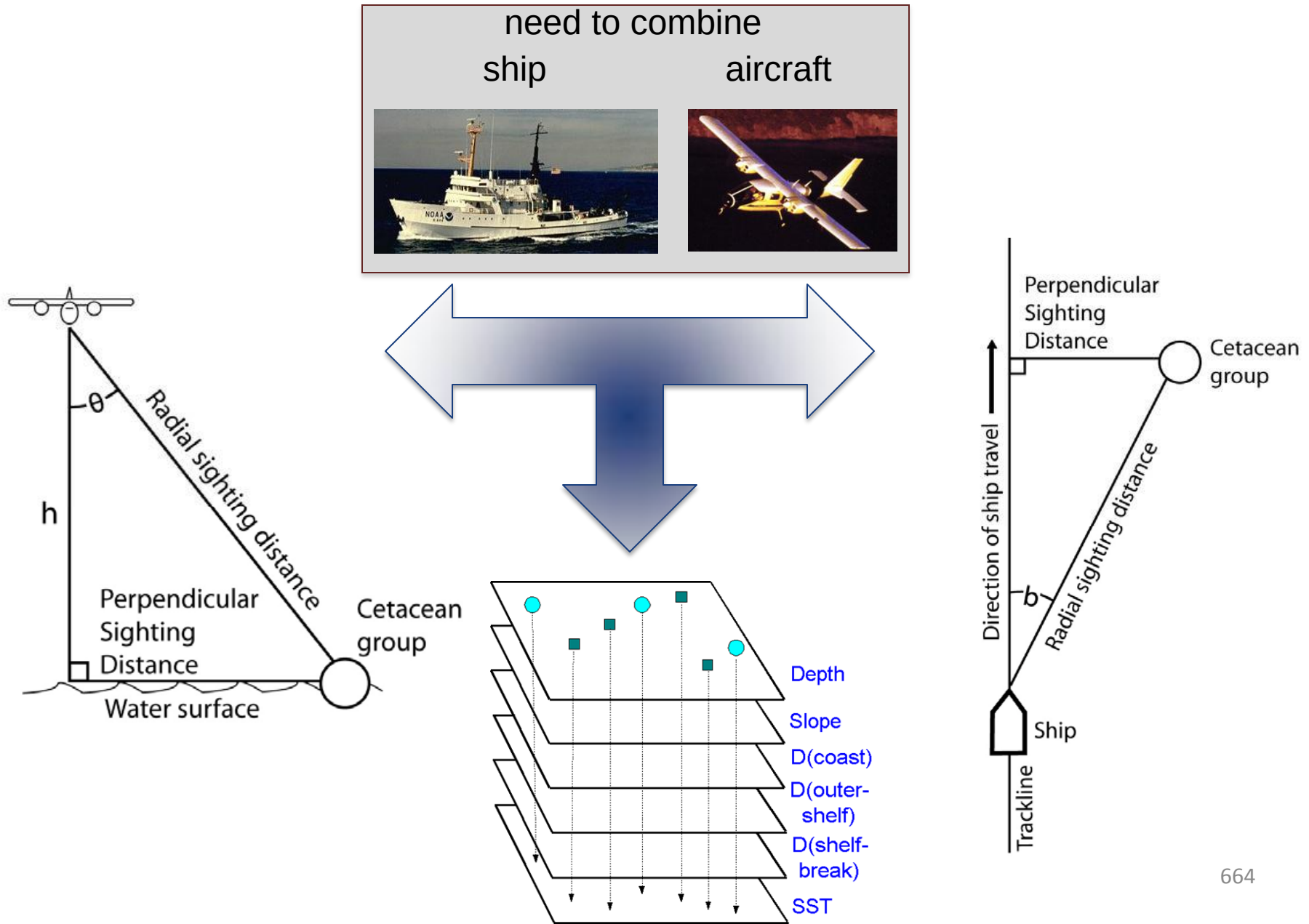


— NEFSC 2006, summer
— NEFSC 2007, summer
— NEFSC 2008, summer
— SEFSC 2007 summer
— SEFSC 2007 winter
— SEFSC 2009 summer
— Existing Surveys

New covariates

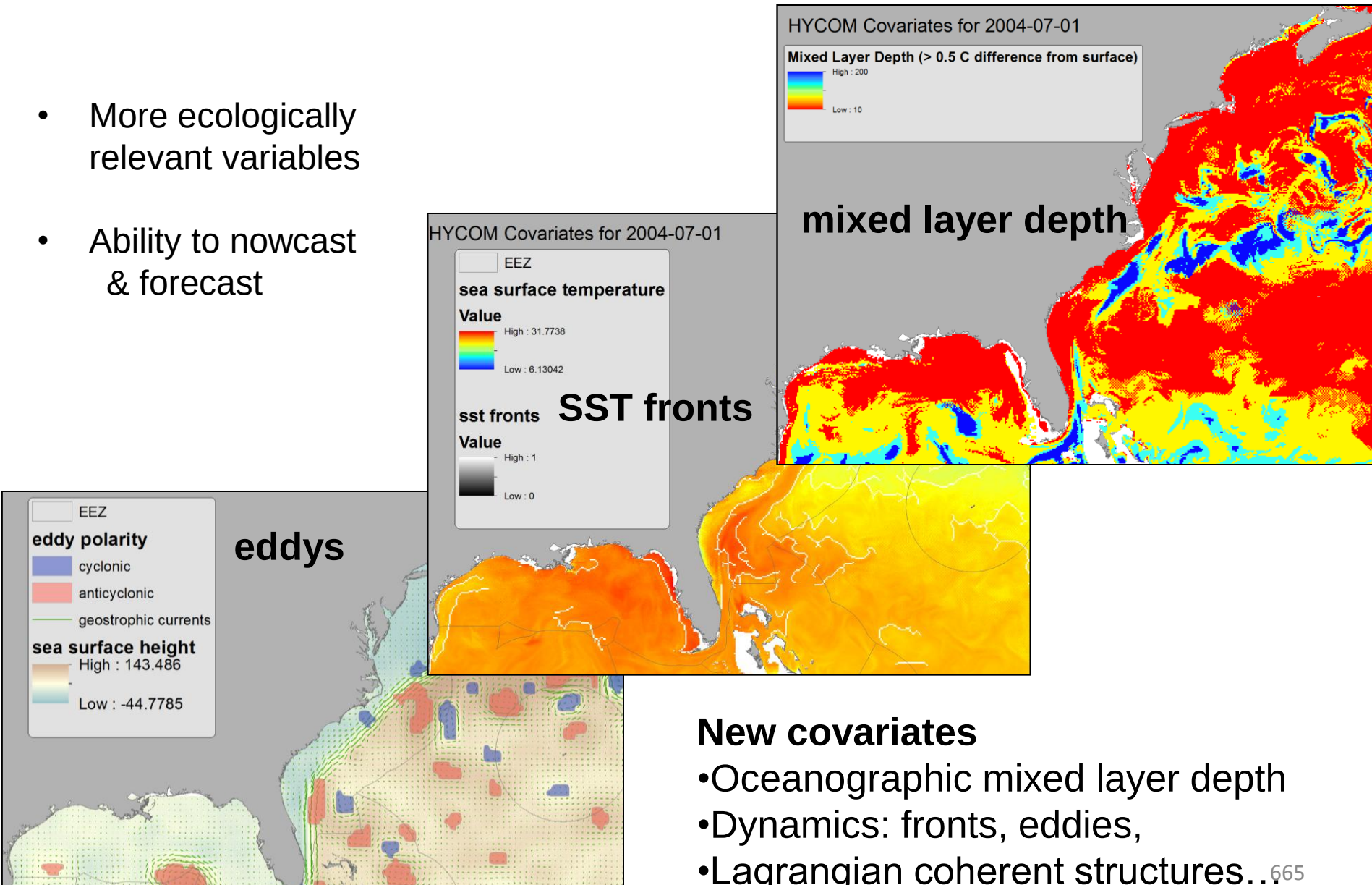
- Time of year as a circular statistic
- Oceanographic model outputs, including mixed layer depth
- Dynamics: fronts, eddies, Lagrangian coherent structures...

Habitat Density (HD) models in progress: EC & GoMEX



Habitat Density (HD) models in progress: EC & GoMEX

- More ecologically relevant variables
- Ability to nowcast & forecast



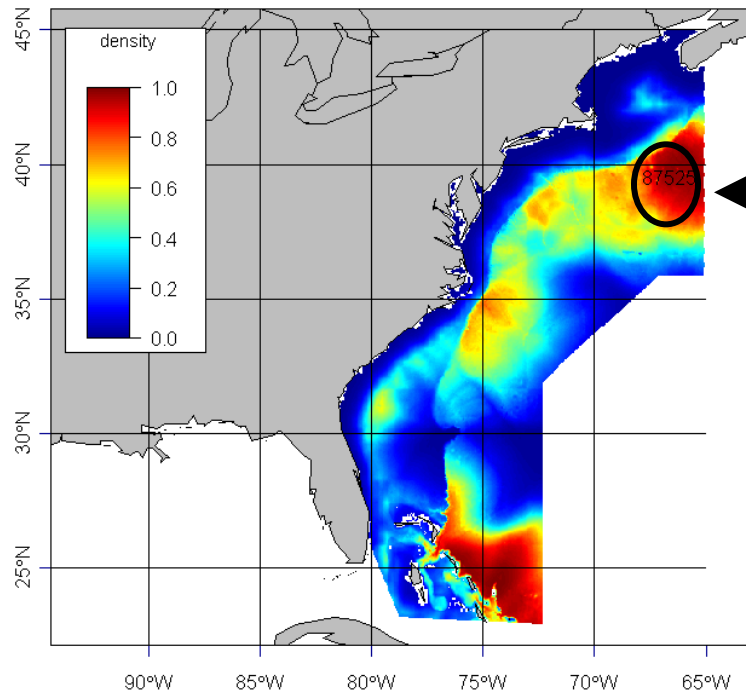
New covariates

- Oceanographic mixed layer depth
- Dynamics: fronts, eddies,
- Lagrangian coherent structures..665

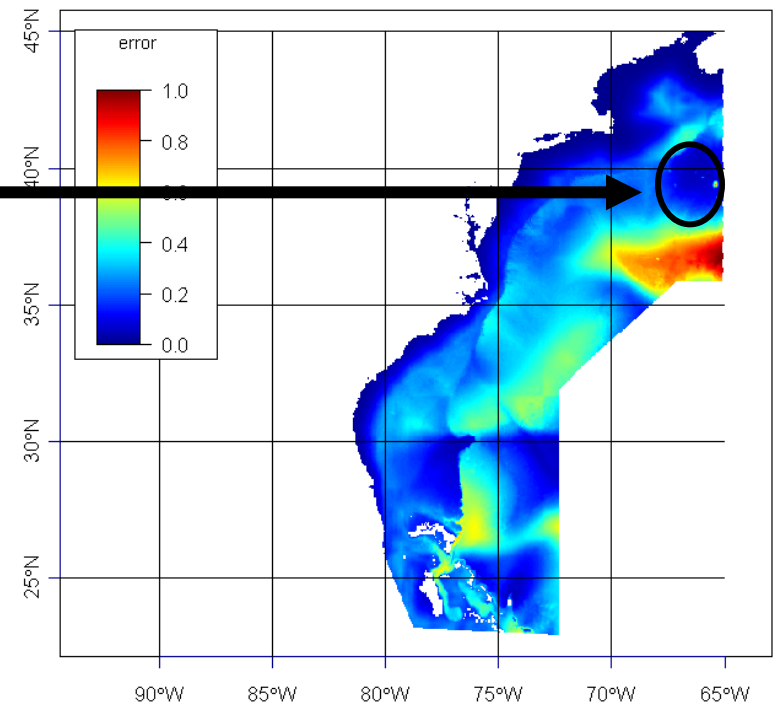
Uncertainty & risk assessment

High probability of encounter | Low model error

Prediction



Model Error



Area of high predicted
encounter



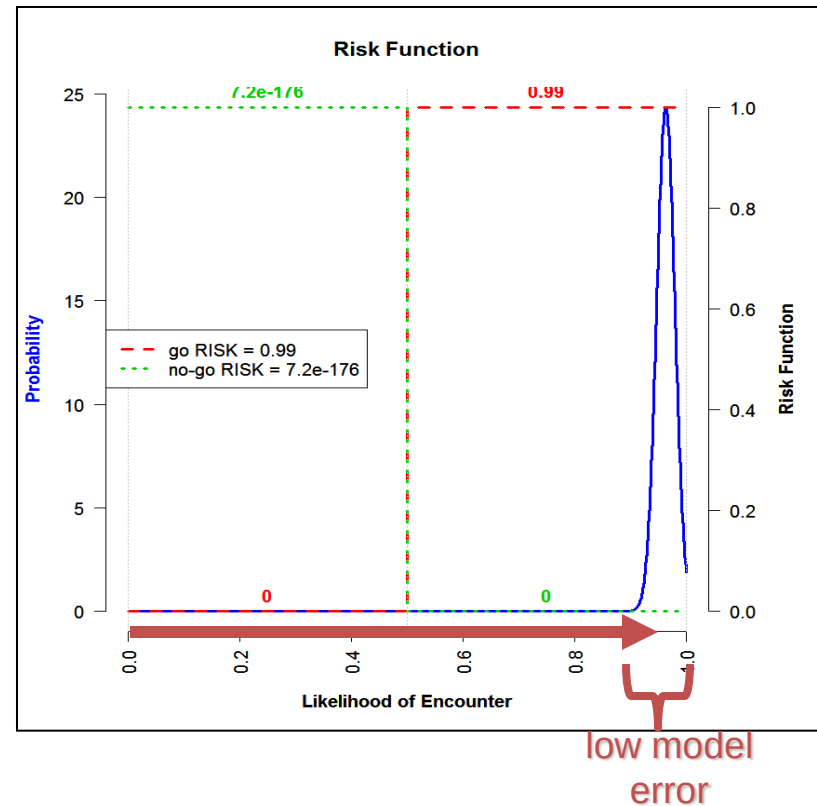
Area of low model error

Uncertainty & risk assessment

User defined threshold breaks

	0	0.5	1
go	0	0	1
no-go	1	1	0

Risk of conducting an exercise in this region exceeds the selected decision threshold

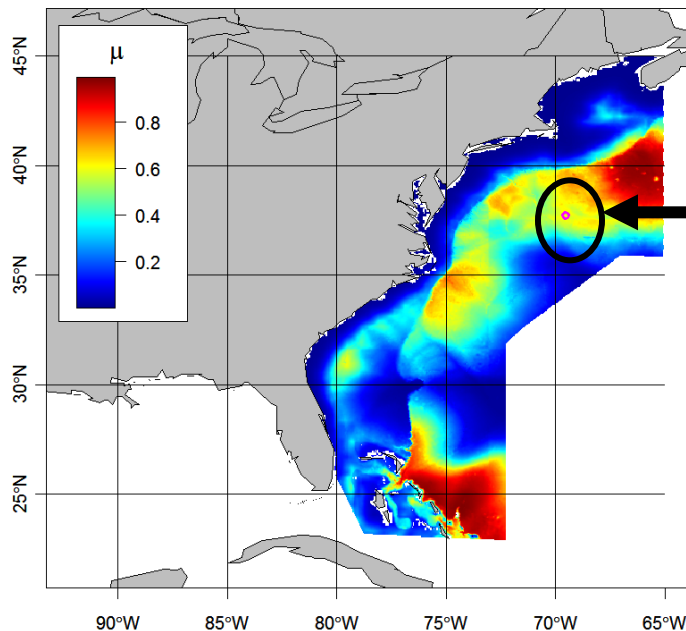


Uncertainty & risk assessment

“Moderate” probability of encounter | “Moderate” model error

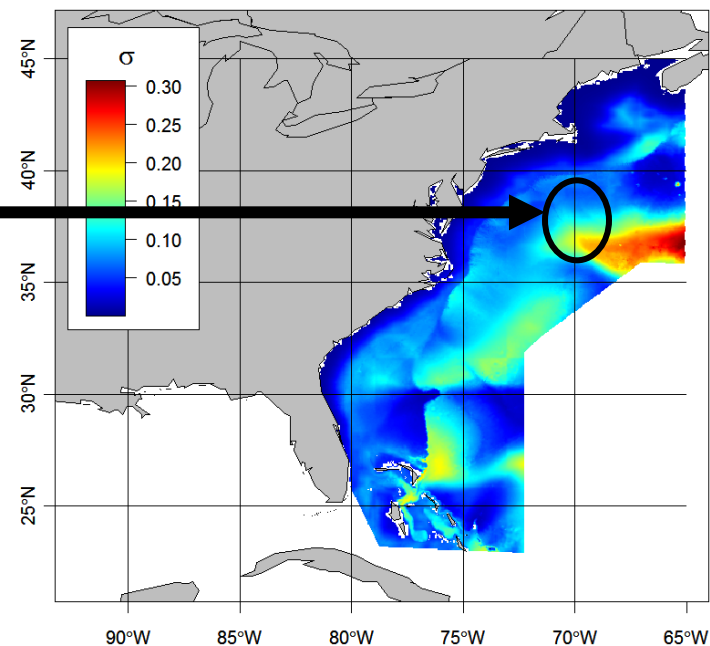
Prediction

Habitat (Likelihood of Encounter)



Model Error

Standard Error of Habitat



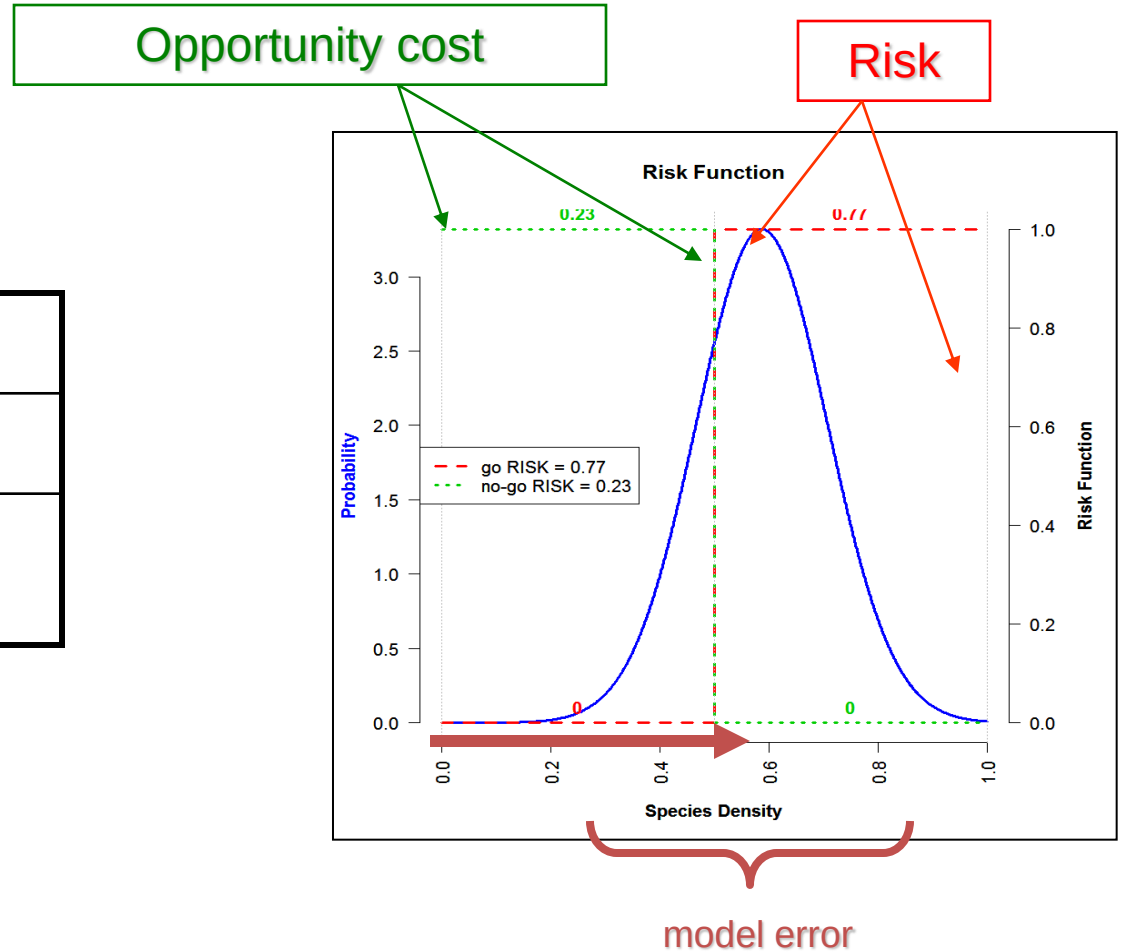
Area of medium predicted
density / habitat

Area of moderate model error

Uncertainty & risk assessment

User defined
threshold breaks

0	0.5	1
go	0	1
no-go	1	0



Modeling Efforts at Duke

— Existing:

- SERDP Atlantic and GoMEX cetacean probability of occurrence models

— Current:

- Update to SERDP models (Duke)

— Upcoming:

- Western Atlantic cetacean modeling - US Navy Atlantic Fleet Training and Testing (AFTT) Area

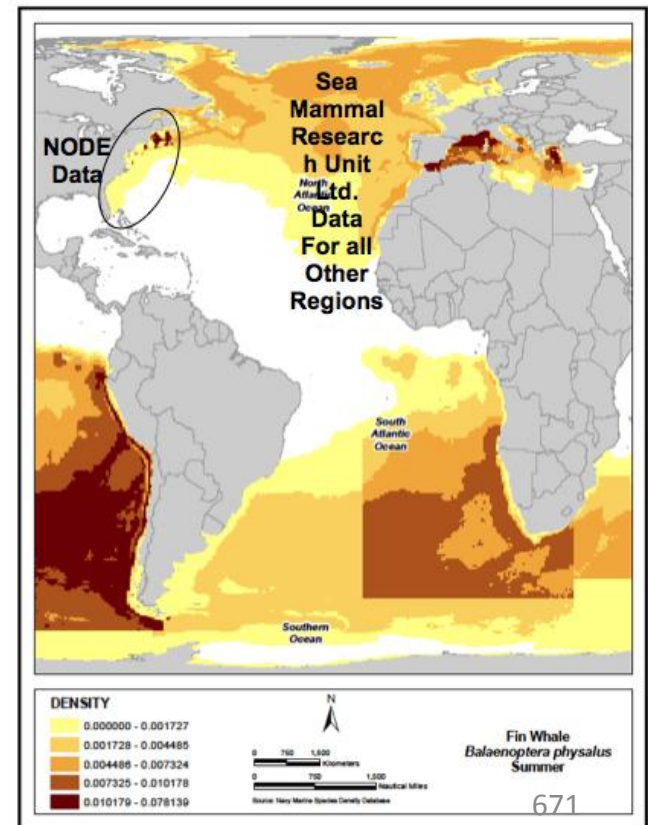
— Meta:

- CetMap project overview

AFTT cetacean modeling

Current:

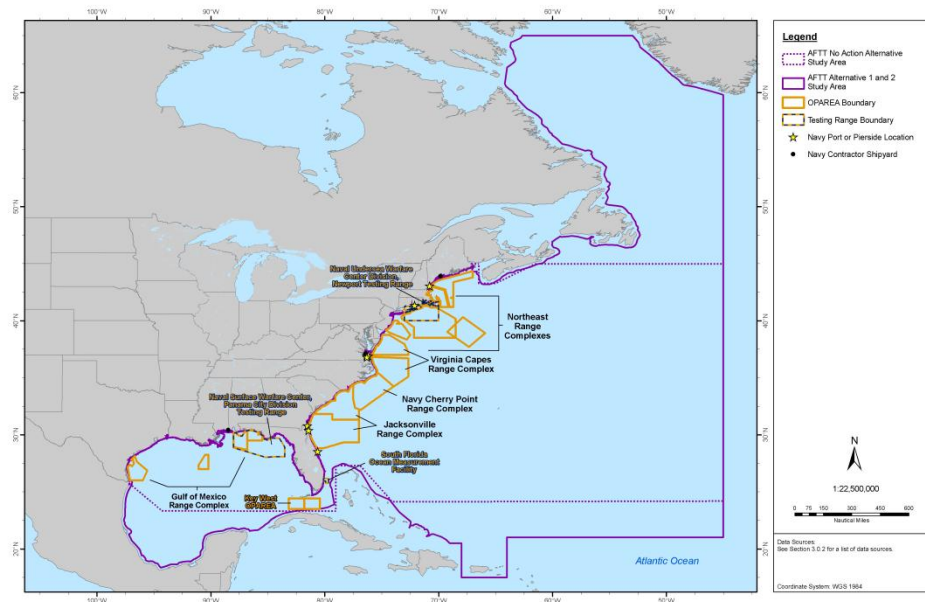
- Navy OPAREA Density Estimate (NODE) models
 - US EEZ (ATL/GOMEX)
- Kaschner / St Andrew's RES density estimates elsewhere



AFTT cetacean modeling

New effort: USN, Duke, NOAA NMFS

- Investigate new statistical methods to better estimate density across the AFTT study area
- Update “pier side” data - build on CetMap work



AFTT cetacean modeling

Current:

- Navy OPAREA Density Estimate (NODE) models
 - US EEZ (ATL/GOMEX)
- Kaschner / St Andrew's RES density estimates elsewhere

New effort:

- Investigate new statistical methods to better estimate density across the AFTT study area
- Update “pier side” data – build on CetMap work

Models into Navy Marine Species Density Database (NMSDD)
-> Navy Acoustic Effects Model (NAEMO)

Workshop end of October at Duke

Modeling Efforts at Duke

— Existing:

- SERDP Atlantic and GoMEX cetacean probability of occurrence models

— Current:

- Update to SERDP models (Duke)

— Upcoming:

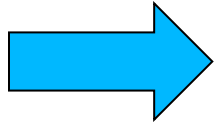
- Western Atlantic cetacean modeling - US Navy Atlantic Fleet Training and Testing (AFTT) Area

— Meta:

- CetMap project overview

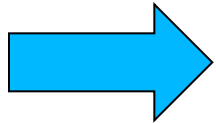
CetMap Working Group tasks

1. Cetacean Data Availability Analysis



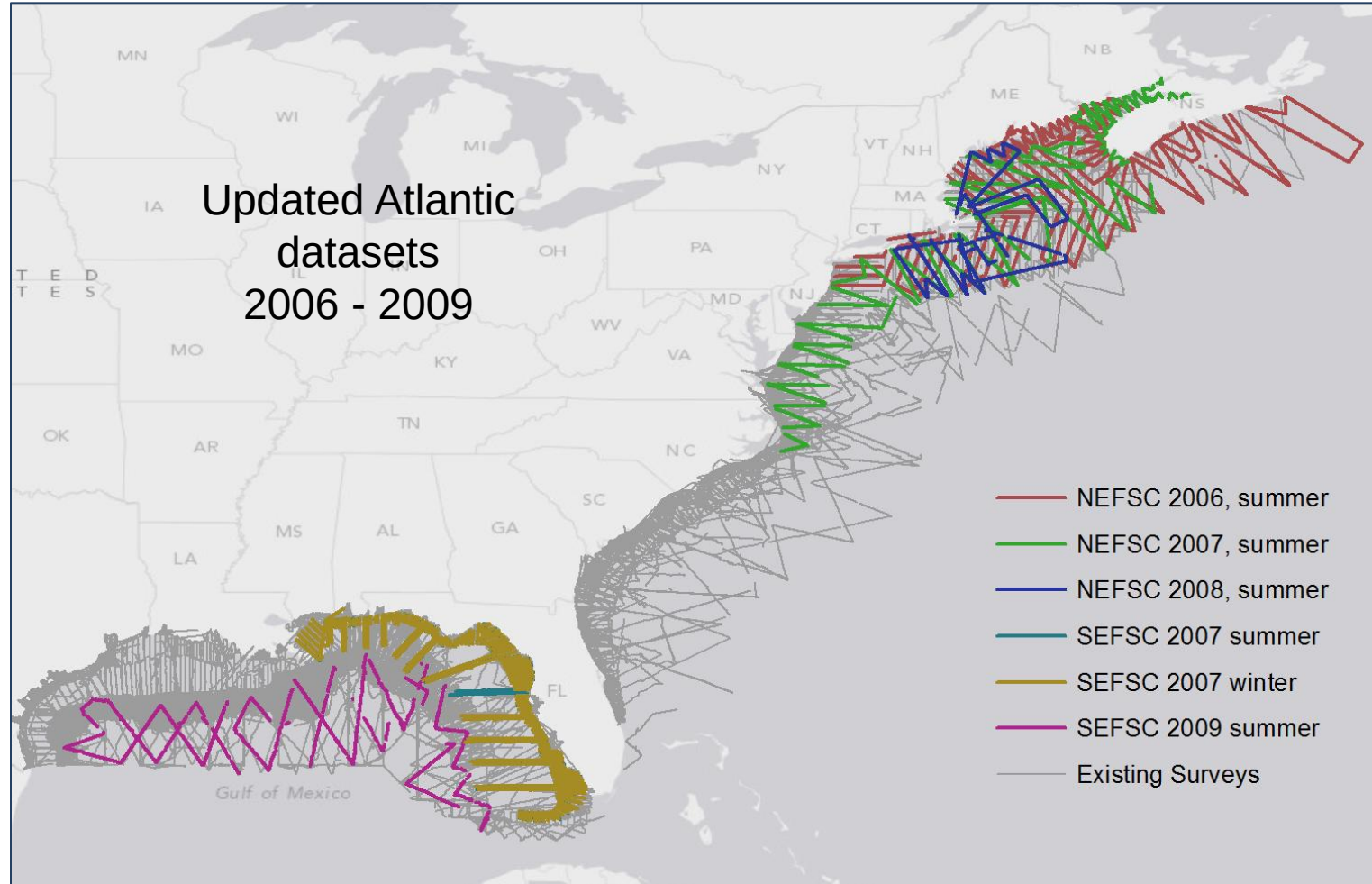
2. New Modeling Efforts

3. Biologically Important Areas



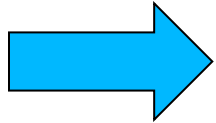
Cetacean data & model discovery tool

Habitat Density (HD) models in progress: EC & GoMEX



CetMap Working Group tasks

1. Cetacean Data Availability Analysis

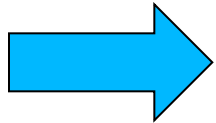


2. New Modeling Efforts

Placeholders are in CetMap

- no data download
- include this fall

3. Biologically Important Areas



Cetacean data & model discovery tool

Cetacean Data Availability

Purpose: to provide a single tool to discover the available data and models





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Cetacean Data Availability

Show data availability for Region = West Coast (WC) ☒ Hide rows where species is absent

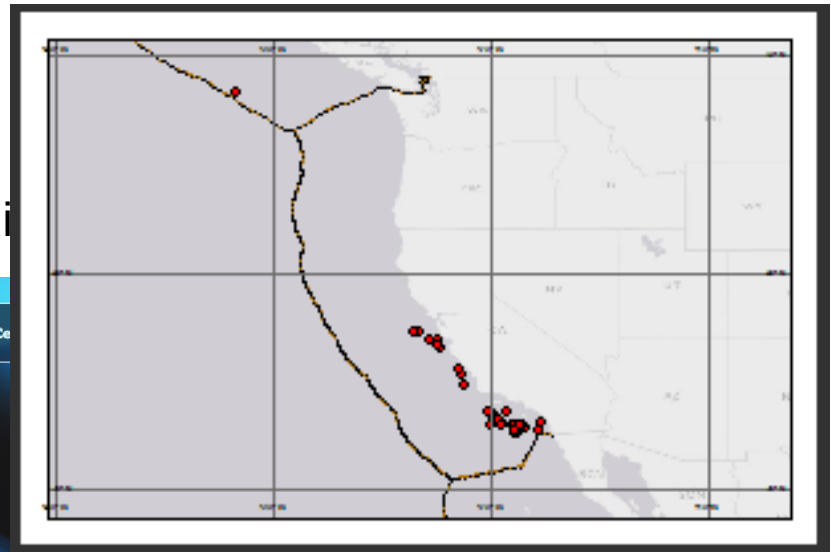
Tier Code	Description	Extended
1 hd	Habitat-based Density	hde
2 sd	Stratified Density	sde
3 po	Probability of Occurrence	poe
4 rec	Records Exist	rece
5 exp	Expert-based presence	expe
5 exa	Expert-based likely absence	exae

! Biologically Important Areas exist

Region	Species	Package	Product	J	F	M	A	M	J	J	A	S	O	N	D
▲ WC															
	▼ Balaenoptera acutorostrata			sde	sd			rec	rec	rec	rec	rec	rec	rec	rec
	▼ Balaenoptera borealis			exp	rec		rec			sd					
	▼ Balaenoptera edeni			rec						sd					rec
	▼ Balaenoptera musculus			sde	sd			rec	rec	hd			rec	rec	rec
	▲ Balaenoptera physalus			sde	sd			rec	rec	hd			rec	rec	rec
		swfsc_serdp_cce_2009	swfsc_1_cce_25km_balphy_rs_summer							hd					
		swfsc_stratified_densities_2009	swfsc_strata_cce_bal.phy_winter	sde	sd										
		▼ cetmap_observations_2012		rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec
		cetmap_expertpresence_2012	cetmap_exp_wc_balaenoptera_physalus	exp											
	▼ Berardius bairdii			rec	rec	rec	rec	rec	rec	hd			rec	rec	
	▼ Delphinus capensis			rec			rec		sde	sde		sd			
	▼ Delphinus delphis			rec	rec	rec	rec	rec	rec	hd			rec	rec	rec
	▼ Delphinus spp.			sde	sd			rec	rec	hd			rec	rec	rec
	▼ Eschrichtius robustus			rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec
	▼ Eubalaena japonica			sde	sd			rec							
	▼ Globicephala macrorhynchus			exp		rec				sd					rec
	▼ Grampus griseus			sde	sd			rec	rec	hd			rec	rec	rec
	▼ Kogia breviceps			exp									rec	rec	rec

Cetacean Data

Query by region



NOAA Cetacean & Sound Mapping

Home Participants Ce

Cetacean Data Availability

Show data availability for Region = West Coast (WC) ☐ Hide rows where species is absent

Months

Region	Species	Package	Product	J	F	M	A	M	J	J	A	S	O	N	D
WC															
	Balaenoptera acutorostrata			sde	sd			rec	rec	rec	rec	rec	rec	rec	rec
	Balaenoptera borealis			exp	rec		rec			sd					
	Balaenoptera edeni			rec						sd					rec
	Balaenoptera musculus			sde	sd			rec	rec	hd			rec	rec	rec
	Balaenoptera physalus			sde	sd			rec	rec	hd			rec	rec	rec
		swfsc_serdp_cce_2009	swfsc_1_cce_25km_balphy_rs_summer							hd					
		swfsc_stratified_densities_2009	swfsc_strata_cce_bal.phy_winter	sde	sd										
		cetmap_observations_2012		rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec
		cetmap_expertpresence_2012	cetmap_exp_wc_balaenoptera_physalus	exp											
	Berardius bairdii			rec	rec	rec	rec	rec	rec	hd			rec	rec	
	Delphinus capensis			rec			rec		sde	sde		sd			
	Delphinus delphis			rec	rec	rec	rec	rec	rec	hd			rec	rec	rec
	Delphinus spp.			sde	sd			rec	rec	hd			rec	rec	rec
	Eschrichtius robustus			rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec	rec
	Eubalaena japonica			sde	sd			rec							
	Globicephala macrorhynchus			exp		rec				sd					rec
	Grampus griseus			sde	sd			rec	rec	hd			rec	rec	rec
	Kogia breviceps			exp									rec	rec	rec

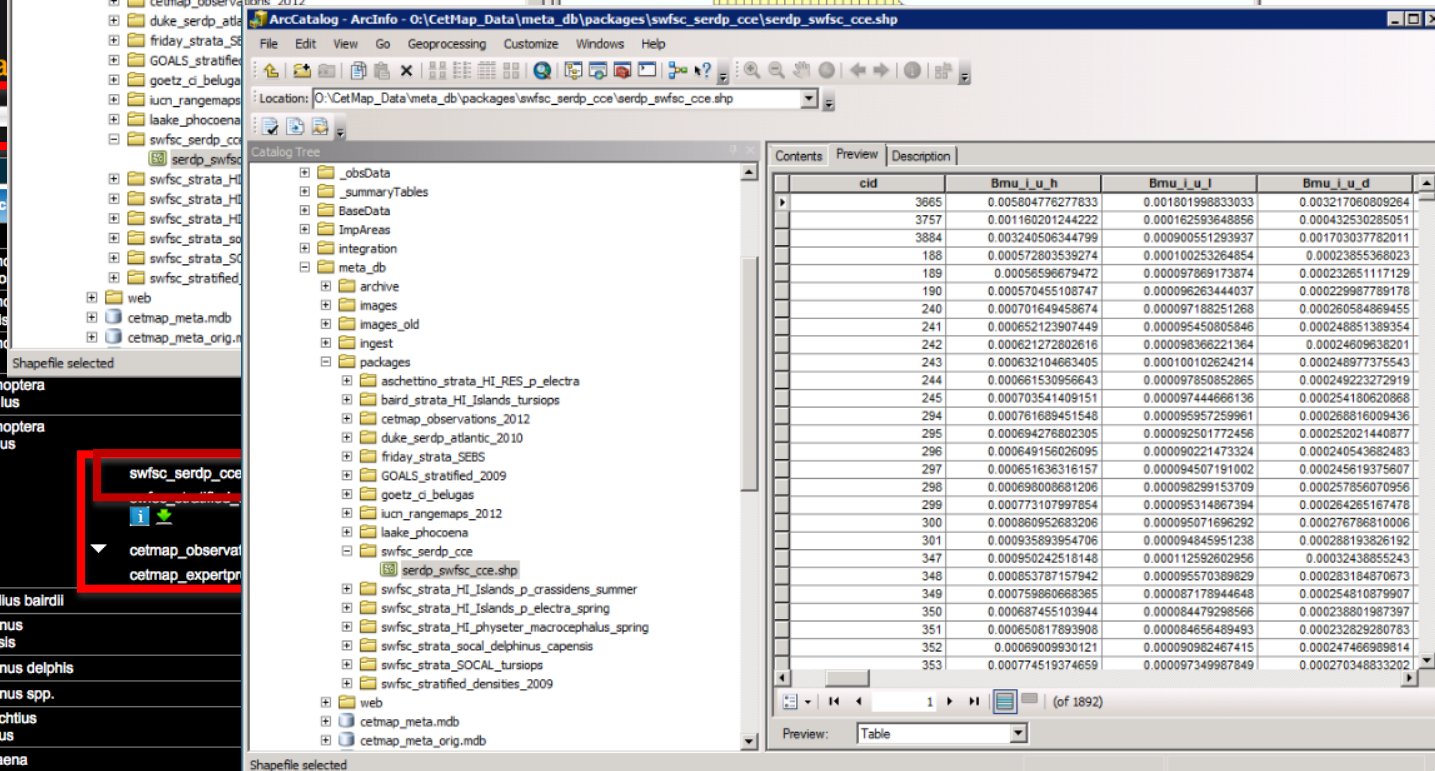
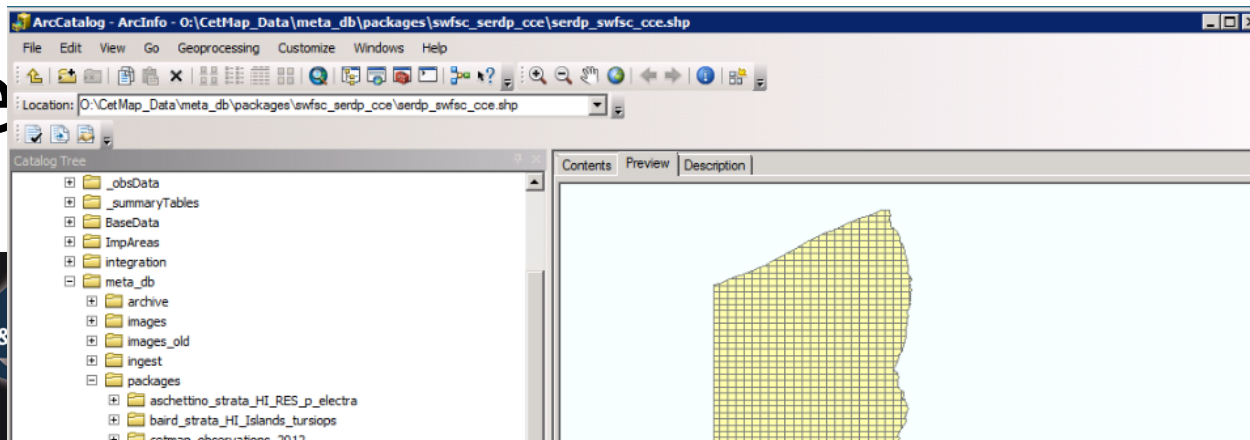
Ce



Cetacean Data Availability

Show data availability for Region

Region	Species
WC	
Balaenoptera acutorostrata	
Balaenoptera borealis	
Balaenoptera edeni	
Balaenoptera musculus	
Balaenoptera physalus	
Berardius bairdii	
Delphinus capensis	
Delphinus delphis	
Delphinus spp.	
Eschrichtius robustus	
Eubalaena japonica	
Globicephala macrorhynchus	
Grampus griseus	
Kogia breviceps	



exp	rec				sd				rec
sde	sd		rec	rec	hd		rec	rec	rec

Cetacean Data Availability

Query by species



Cetacean & Sound Mapping

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[Participants](#)
[Cetacean](#)
[Sound](#)

Cetacean Data Availability

Show data availability for

Species
▼

=

Megaptera novaeangliae
▼

☒ Hide rows where species is absent

Tier Code	Description	Extended
1 hd	Habitat-based Density	hde
2 sd	Stratified Density	sde
3 po	Probability of Occurrence	poe
4 rec	Records Exist	rece
5 exp	Expert-based presence	expe
5 exa	Expert-based likely absence	exae

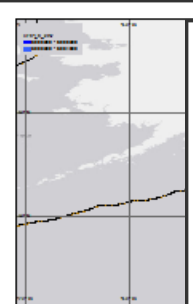
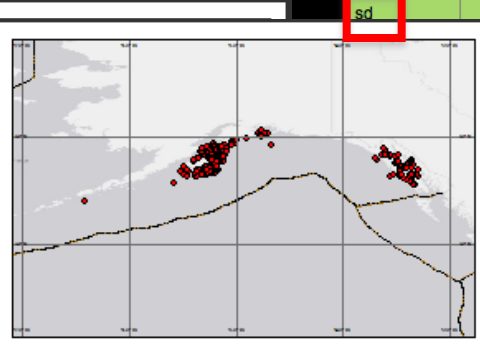
! Biologically Important Areas exist

Region	Species	Package	Product
ABS	▼ Megaptera novaeangliae		
ARC	▼ Megaptera novaeangliae		
EC	▼ Megaptera novaeangliae		
GOA	▲ Megaptera novaeangliae		
GOALS_stratified_2009 ▼ cetmap_observations_2012 i cetmap_expertpresence_2012 cetmap_la_2012 GOA			
GOM	▼ Megaptera novaeangliae		
HI	▼ Megaptera novaeangliae		
WC	▼ Megaptera novaeangliae		

Months

	J	F	M	A	M	J	J	A	S	O	N	D
ABS	exp					sd	!	rec	rec	rec	rec	
ARC	exp						rec		rec	!		
EC	po	po	!			!	!	!	!	!	!	
GOA	rec	rec	rec	sd		!	!	rec	rec	rec	rec	rec
				sd								
						rec	rec	rec	rec	rec	rec	rec
						!	!	!				
						rec						
						rec				rec	rec	
						hd			rec	rec	rec	

Regions

Modeling Efforts at Duke

End to End data system:

- Data-> Models -> Discovery -> Decision Support

Interested in collaborating on Mid-Atlantic data and modeling efforts.



Thank you!



National Science Foundation
WHERE DISCOVERIES BEGIN

<http://seamap.env.duke.edu/>

**Marine Geospatial Ecology Lab
Nicholas School of the Environment
Duke University**

Presentation #25

How the Navy Utilizes OBIS SEAMAP, CetMap, and other derived data products



Dr. Robert Gisiner

Office of the Chief of Naval Operations,
Energy & Environmental Readiness Div
(OPNAV N45)

bob.gisiner@navy.mil

Development of the Current U.S. Navy Risk Assessment and Monitoring Process



GULF OF ALASKA



HAWAII - SOUTHERN CALIFORNIA
TRAINING AND TESTING (HSTT)



MARIANA ISLANDS
TRAINING AND TESTING (MITT)



MEDITERRANEAN

The Navy needs marine mammal and T/E species data for all waters of the United States and US Trust Territories

- **Phase II** permit renewals are in public and regulator agency review now, for January 2014 start

- Number of permits have been consolidated
- Coverage area and types of assessed activities have been expanded.

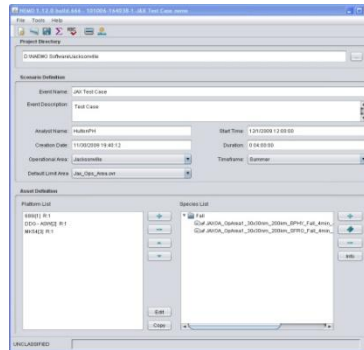
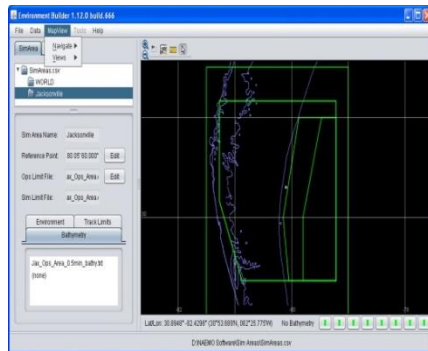
- **Adaptive Management** is used to annually review new science, and results of ongoing monitoring with the regulator (NOAA Fisheries).
- Annual Investment by Navy in research and environmental risk management is \$25-30M/year.

NAEMO Components

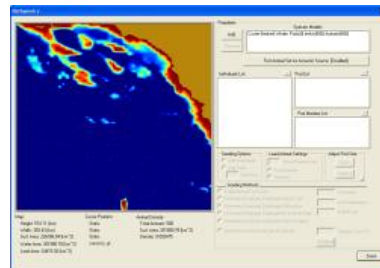
Scenario Builder

Planned Replacement by 3MB Software

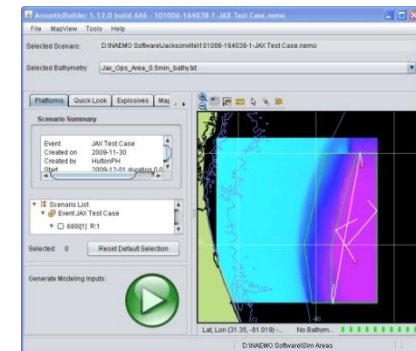
Environment Builder



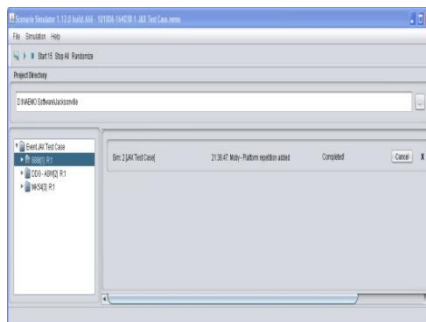
NUWC SMB



Acoustic Builder



Scenario Simulator



Exposure Report Generator

Species	ESA Stat.	Non-TTS	TTS	PTS	Level A	Level B
Atlantic L.	Normal	70.0	70.0	70.0	140.0	
Fm Whale	Endange.	7.0	7.0	7.0	7.0	14.0

Post Processor

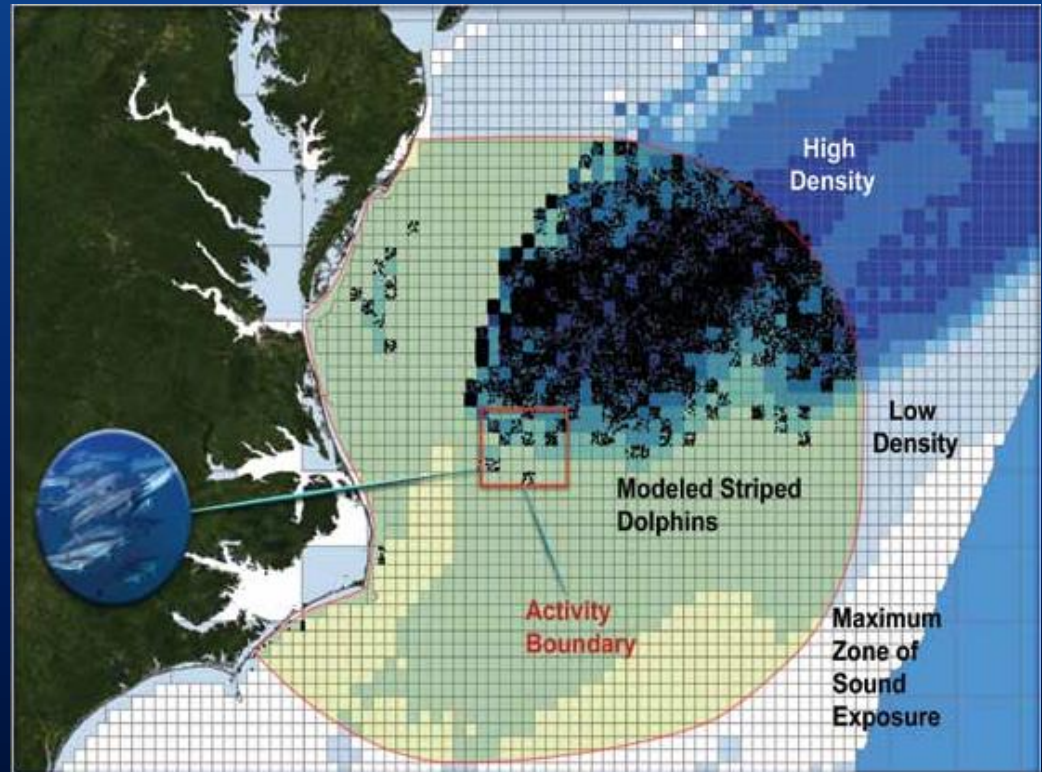
Species Code	Species Name	Exposure Result
Species Code 18	Bransford's Beaked Whale	bransford_whale_spring omb
Species Code 24	Reference Dolphin	reference_dolphin_spring omb
Species Code 29	Cetacean Dolphin	cetacean_dolphin_spring omb
Species Code 36	Humpback Whale	humpback_whale_spring omb
Species Code 47	Dwarf Spinn Whale	dwarf_spinn_omb
Species Code 4	Common mink whale	common_mink_omb
Species Code 27	Parrotfish	parrotfish_spring omb
Species Code 48	Roundhead Pilot Whale	roundhead_pilot_omb
Species Code 23	Risso's Dolphin	risso_dolphin_spring omb
Species Code 12	Rough Toothed Dolphin	rough_toothed_dolphin_spring omb
Species Code 16	Spinn Whale	spinn_omb
Species Code 28	Atlantic Spotted Dolphin	atlantic_spotted_dolphin_spring omb



NAEMO Individual-based Modeling

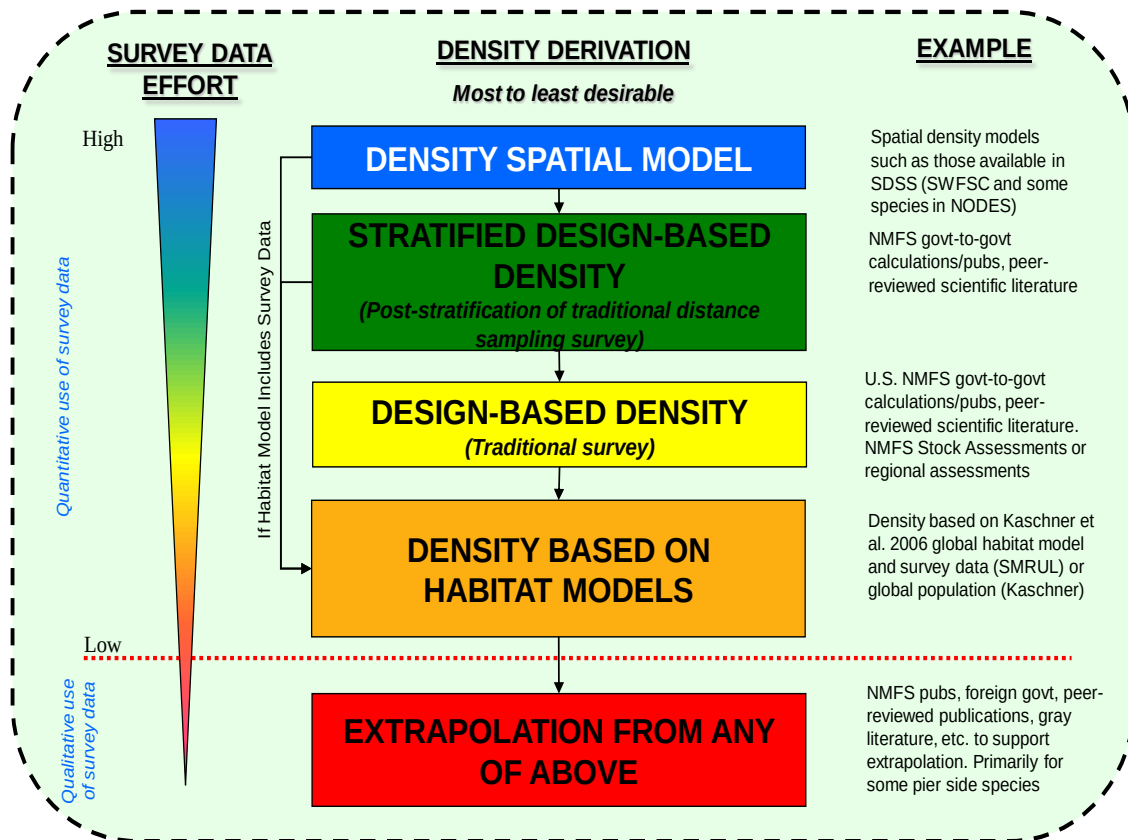
- Marine species distribution data sources
 - Gridded density data
 - Various sources
 - Species and region-specific group size data
 - NMFS cruise reports, scientific literature
 - Species-specific depth distribution data
 - NMFS, scientific literature

Navy Marine Species Density Database



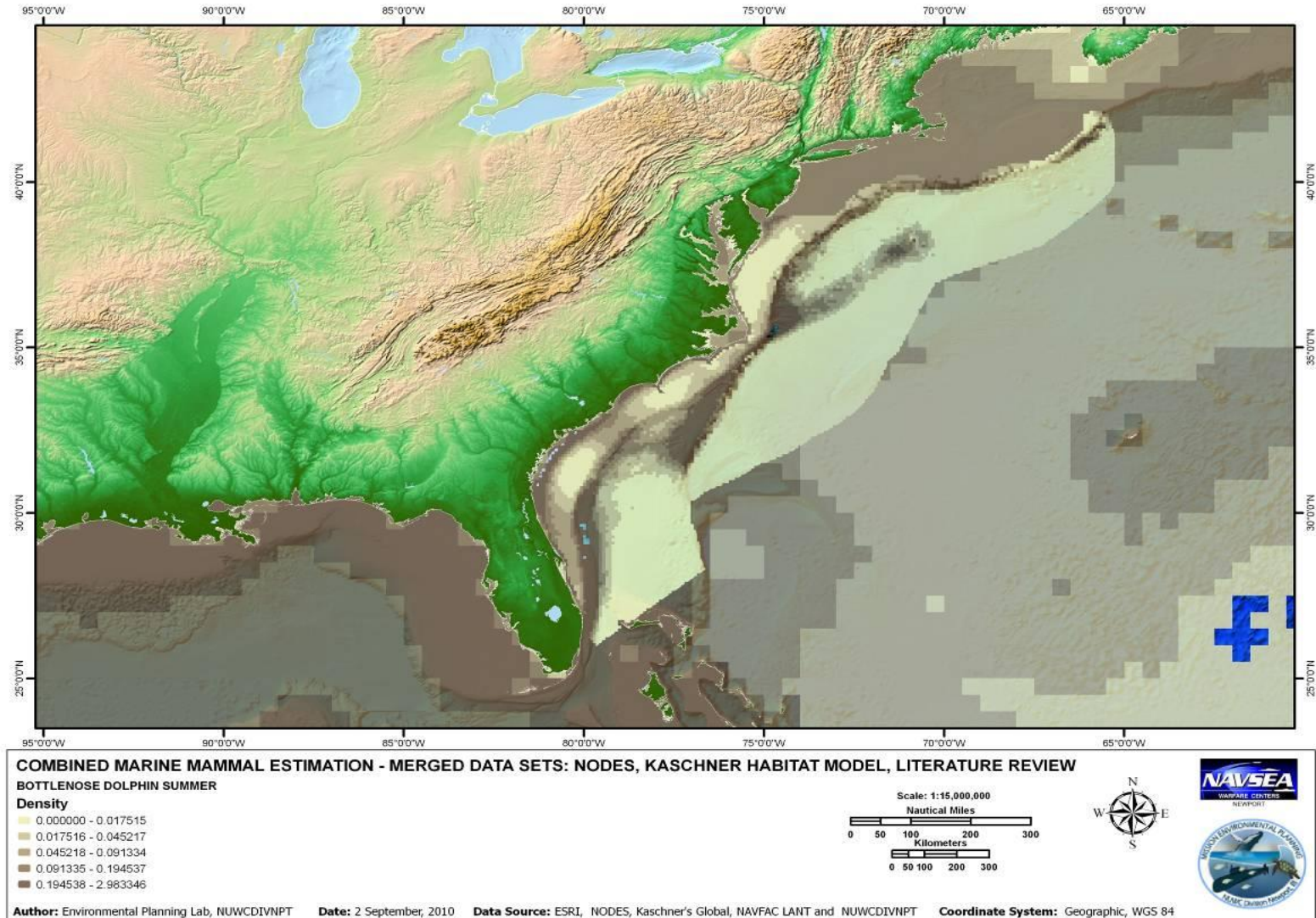
- Distribution Process
 - Individuals distributed in horizontal space according to density data
 - Individuals distributed in depth according to depth distribution data
 - Individuals change depth every 4 minutes during the simulation
 - Individuals do not move in horizontal space during the simulation
 - **Houser 3MB model (ESME) of complex 3D movement planned for NAEMO v.2 (Phase III, 2015)**

MSDD Hierarchical Data Use

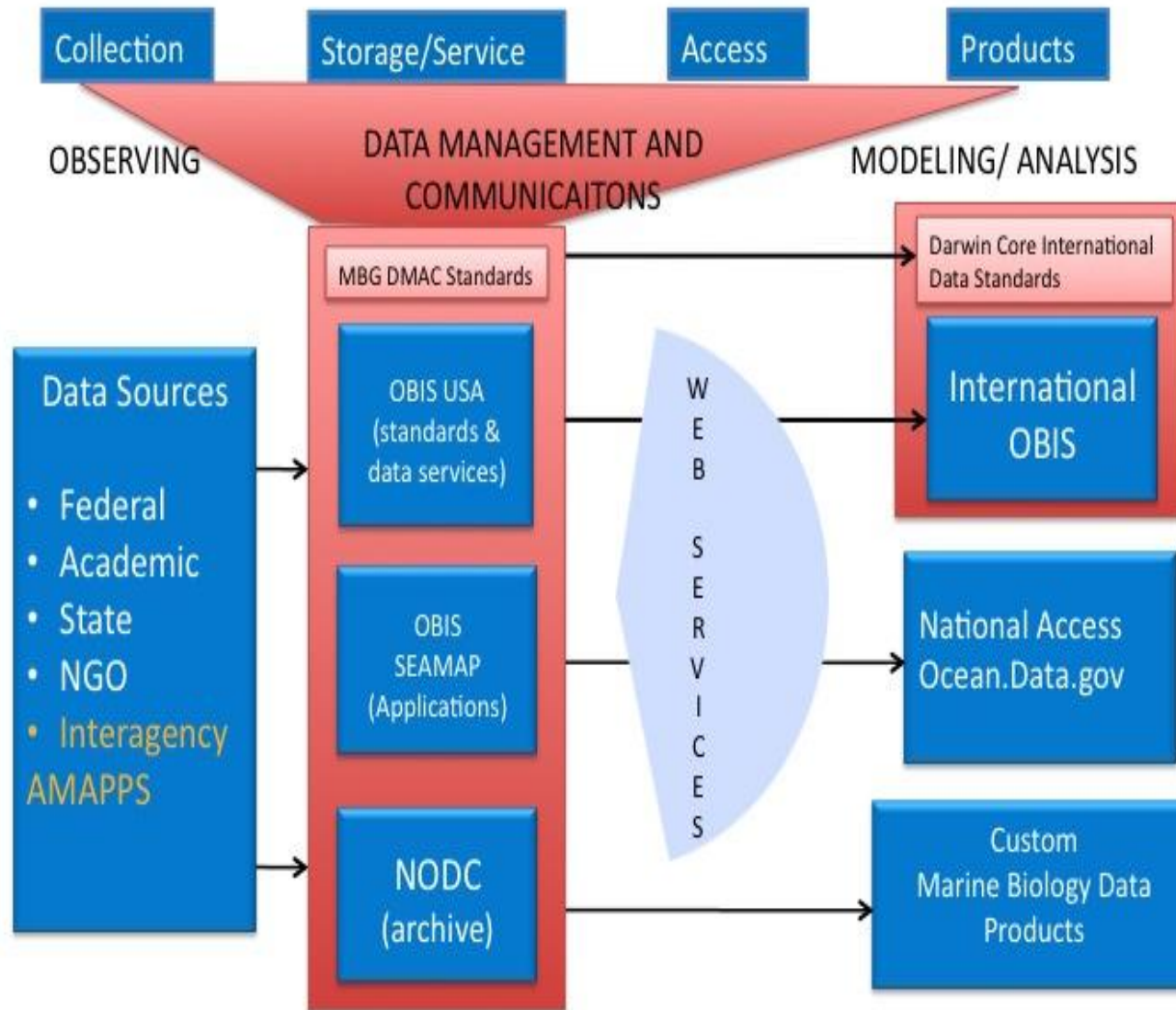


- US Marine Mammal Protection Act requires a quantitative expression of risk (take).
- NAEMO model uses gridded density values
- Preference is based on
 - Effort corrected observations
 - More recent data
 - Lowest model uncertainty (c.v.)
- Directed surveys are conducted to fill data gaps
 - Gaps identified in Adaptive Mgmt. process (ICMP)

Density Data Shapefile



FEDERAL DATA ARCHITECTURE



Summary:

Navy Data Use in Risk Modeling

- All data have value
 - But some data are better than others!
 - The Navy uses a hierarchical weighting process
 - Essentially identical to the NOAA CETMAP process
- The Navy contracting process for new data:
 - Requires best effort-based methods; e.g. Distance
 - Requires derived products to use environmentally correlated geospatial density mapping
 - e.g. GAM, GLM
- Navy and contractor data collections are deposited in OBIS SEAMAP
 - Data are made available to CETMAP
 - Data are made available to the national ocean data infrastructure via OBIS USA, NODC, and IOOS

Presentation #26



A Consistent Approach to Using Density Estimates for Use In Navy Acoustic Effects Modeling

Anu Kumar

NAVFAC Atlantic

25 July 2012

anurag.kumar@navy.mil



Consistent Navy Approach To Include Density Data

Navy's Study Areas



GULF OF ALASKA



HAWAII - SOUTHERN CALIFORNIA
TRAINING AND TESTING (HSTT)



MARIANA ISLANDS
TRAINING AND TESTING (MITT)



MEDITERRANEAN

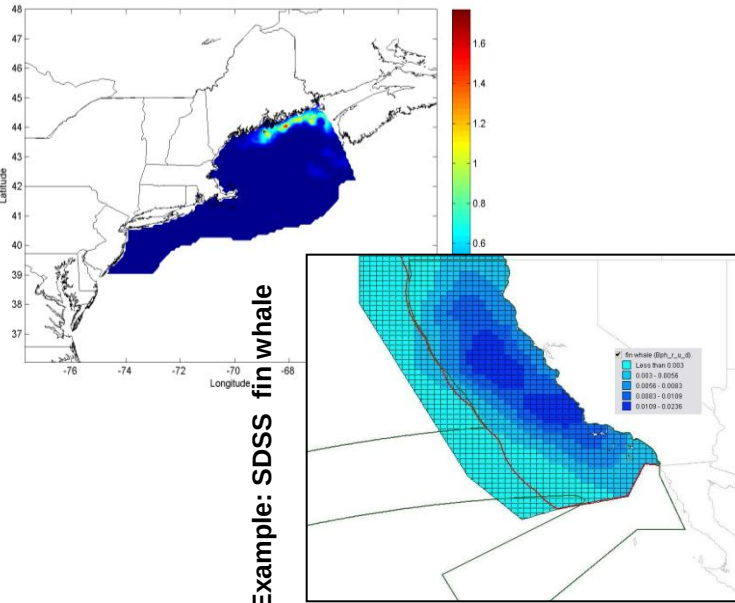
- **Need - NMSDD:**
 - Navy covering broader geographic area of Phase II 2014
 - Needs to estimate density to quantify impacts to species
 - Existing density data to come from variety of sources to characterize species abundance and distribution for both surveyed and un-surveyed areas within Navy's study areas
 - Approach needs to guide implementation of density data from various sources, ensuring that best available science (quality/detail of data) is used



Spatial Models & Stratified Density

Density Spatial Model

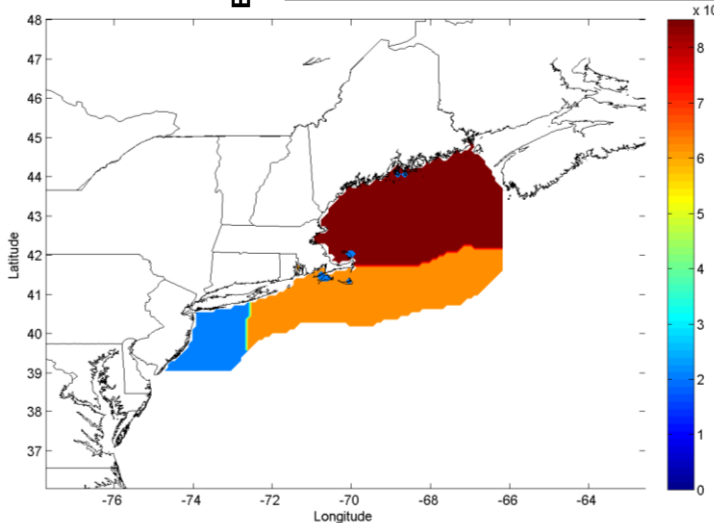
Example: NODES harbor porpoise



Example: SDSS fin whale

Stratified

Example: bottlenose



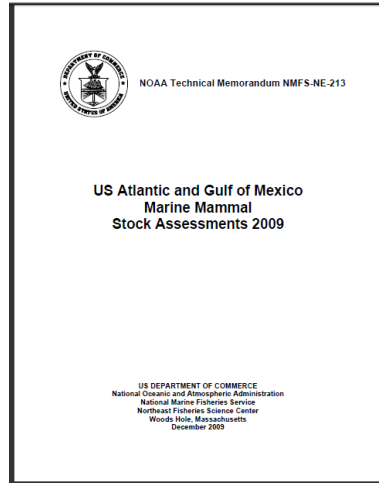
- **Density spatial models (Habitat-based)**
 - Spatial models based on survey data and environmental parameters used as predictors (SDSS and some species in NODES)
 - Line-transect survey coverage needed throughout the modeled area
 - Most data-intensive survey method, but provides the greatest quality of spatial detail
- **Stratified design-based density estimates**
 - NMFS post-stratification of survey to spatially characterize areas of density
 - Method parses survey data, possibly increasing uncertainty



Other Sources

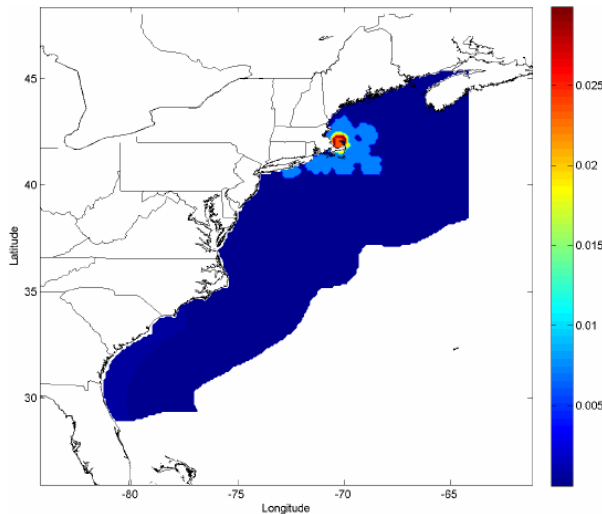
Stock Assessment Based

Example: North Atlantic right whale



Peer Reviewed Model

Example: North Atlantic right whale

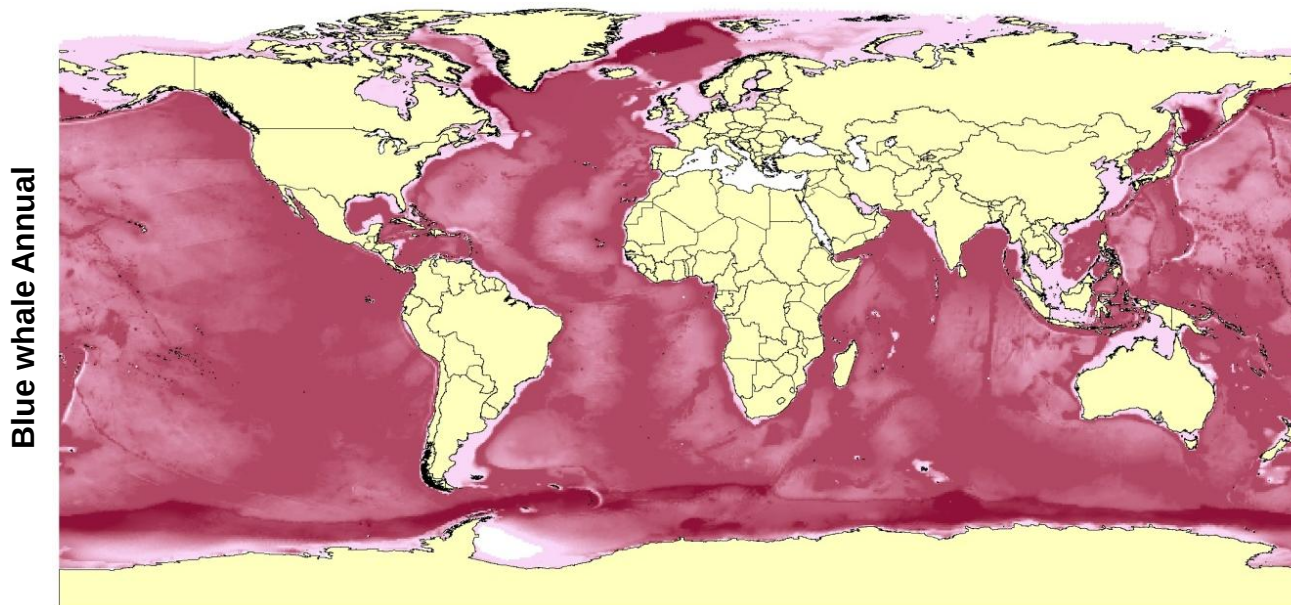


- **NMFS Stock Assessment Report**
 - Available for the proportion of the species population occurring within the U.S. EEZ
- **Literature derived estimates and peer-reviewed recommendations from independent experts**
 - Density data derived from literature who's purpose was to characterize species abundance for a specific area.
 - Peer reviewed recommendations from scientists conducting the survey



Global Sources of Density Data

- **Kaschner[©] Global data**
 - Annual estimates available for 70 species to 3 nm boundary
 - Distribute average published population abundance estimates over habitat model to estimate density in each grid
- Visit: www.searoundus.org

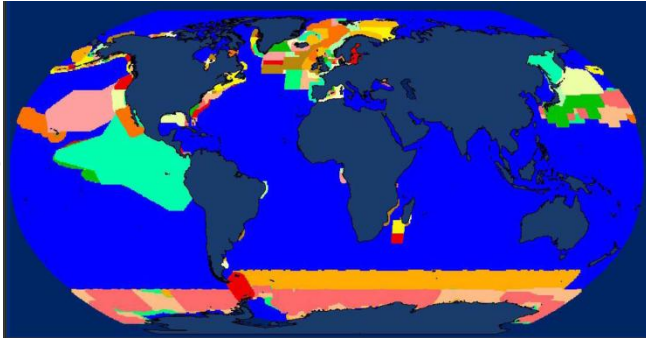




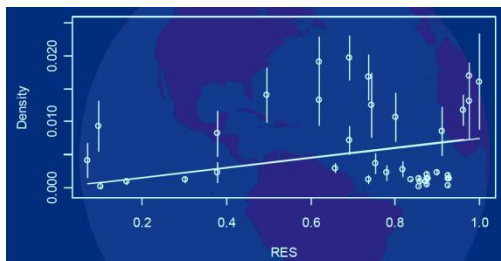
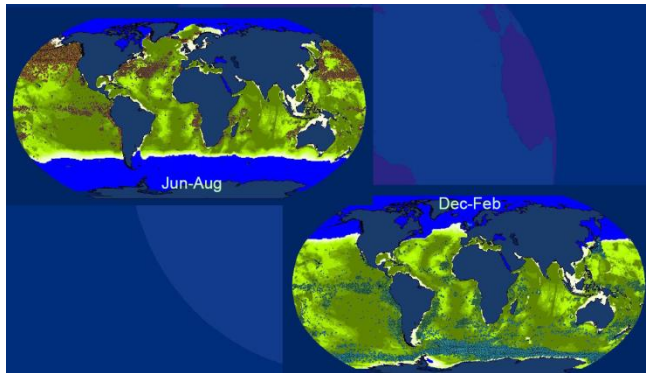
Global Sources of Density Data

- **SMRU Ltd. Global Density Data[©]**
 - 45 species available
 - Four seasons
 - Used Kashner's Relative Environmental Suitability (RES) model in conjunction with results from line-transect survey data from 315 sources from (1978-2006)
 - Developed regressions of available density in relation to habitat to predict density beyond survey coverage

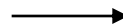
Survey Data



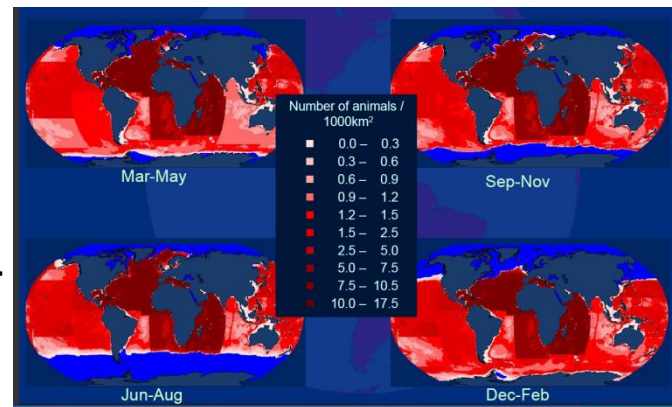
RES



Regression/Prediction

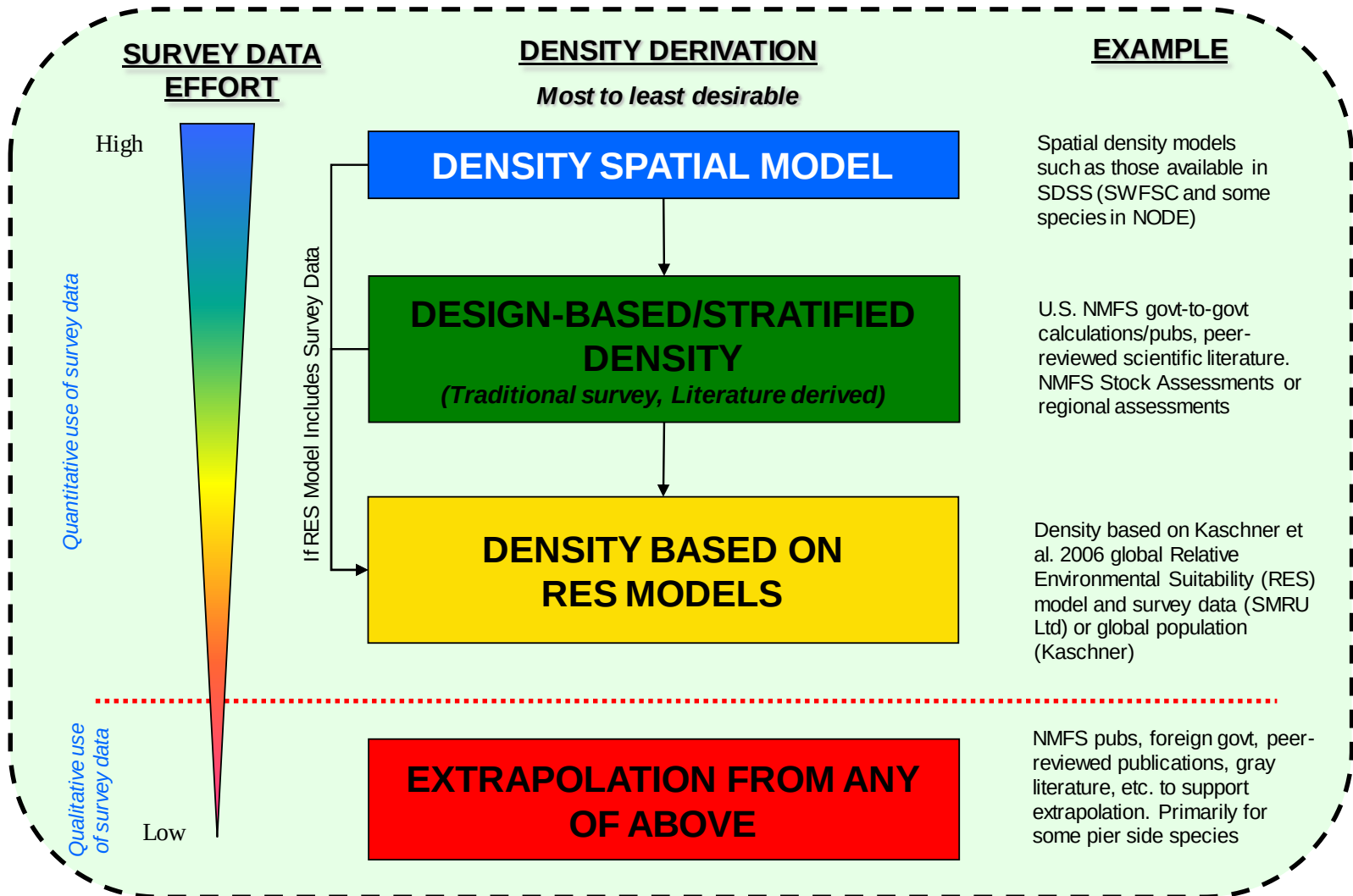


Sperm Whale





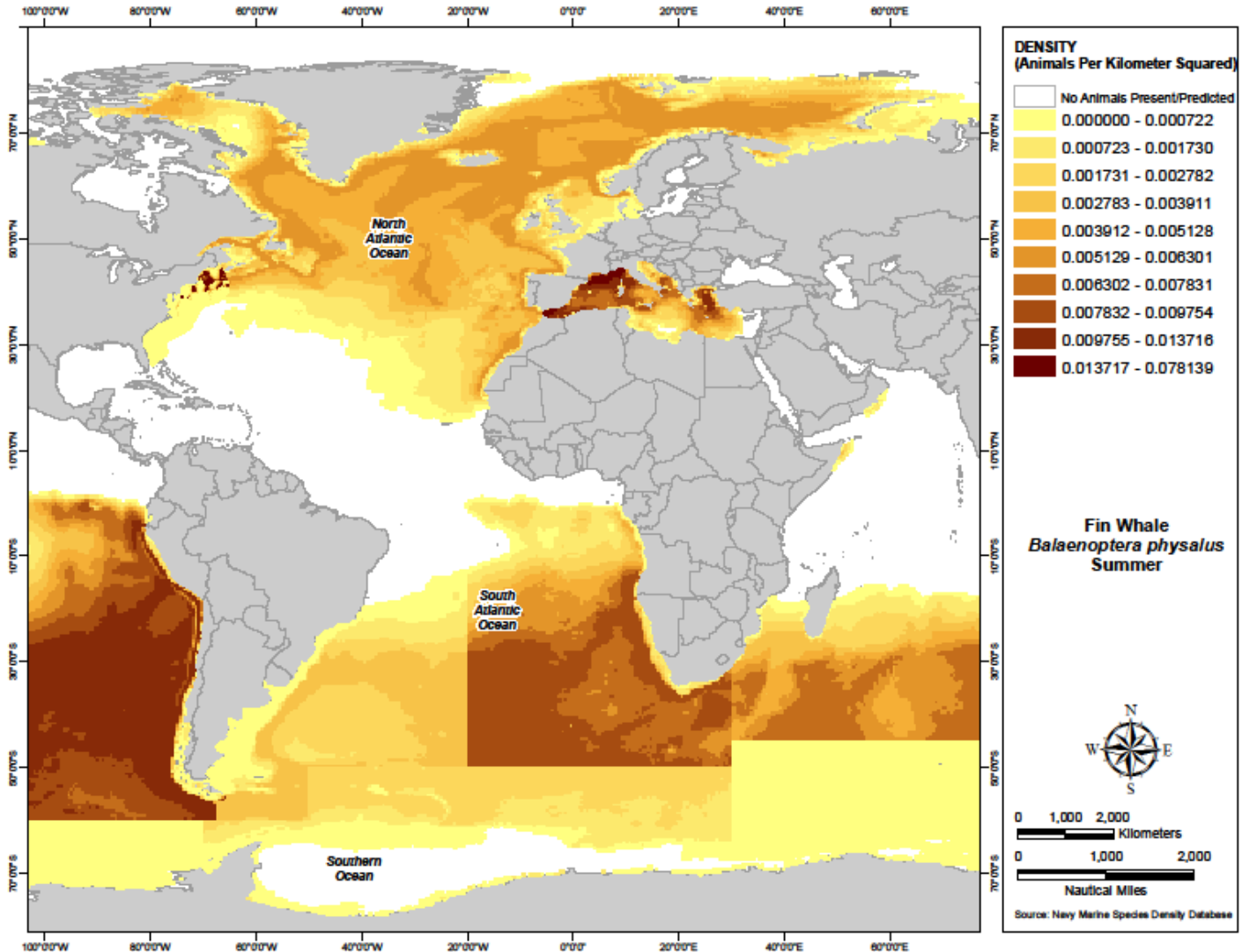
Density Hierarchy





Example of Combined Density

Fin whale Summer composite of SMRUL, and NODES data

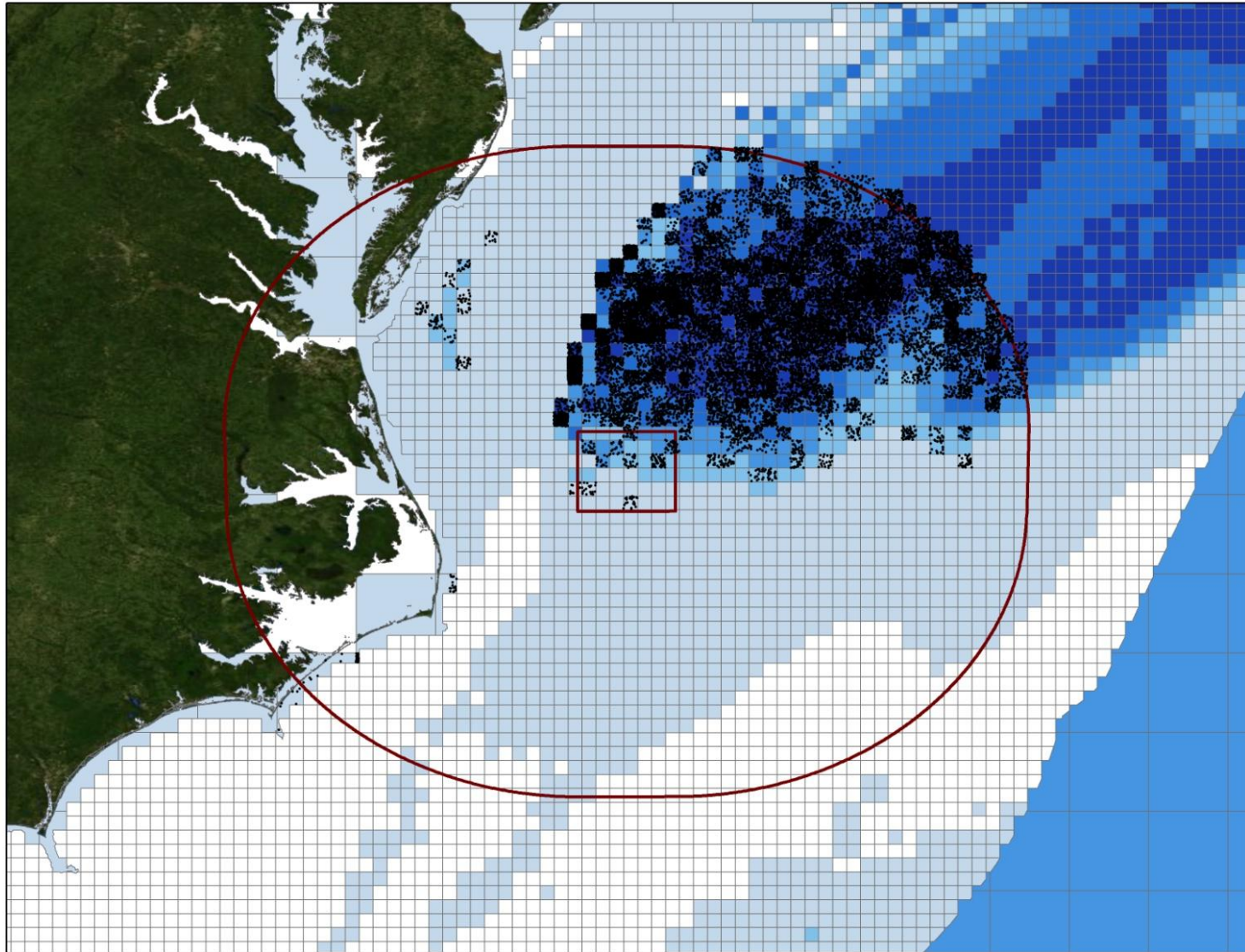




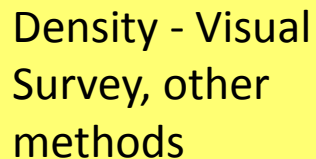
- All merged species/season datasets are in ArcGIS compatible format
- No density values provided were manipulated
- Number of seasonal files are broken up by the most temporally parsimonious data source used
- Within each season, for a given species, beginning and ending timeframes are for each density value
- Files were broken up by Atlantic, Pacific, and working on combining these.
- Metadata included for all density values



Density in NAEMO to Quantify Risk



Striped dolphins Summer Density



Depth - Tagged Animal Data

Group Size - Visual Survey

Risk Threshold Criteria



NMSDD Future

- Incorporate new data from CetMap, AMAPPs, Etc.
- Duke revisit at the SMRUL/Kaschner density data for AFTT
- Update the database management system for future upgradeability, version control, and deployment
- Make the results available to the public
- Collaborate with other modelers

Current technical reports:

www.aftteis.com and www.hstteis.com

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Presentation #27

AMAPPS Modeling

**Northeast Fisheries Science Center
Southeast Fisheries Science Center**

**By
Dr. Debi Palka**

Objectives

- **Develop spatial-temporal fine scale density maps of cetaceans, sea turtles, and sea birds within US Atlantic waters that function of habitat and detection factors.**
- **Investigate trends, hot spots, potential climate efforts**
- **Investigate trophic ecosystem relationships**

Types of models

● **Density maps that account for:**

- Seasonal-temporal patterns and variability
- Probability of detection given appropriate covariates
- Group size given appropriate covariates
- Encounter rates given appropriate covariates
- $g(0)$ – probability of detection on track line
- Availability – dive and surface times given appropriate covariates
- Spatial autocorrelation, if present

Specifics

- Will need to pool some species
- Probably use Bayesian Hierarchical framework to put all parts together
- Spatial Resolution: Ideally 4 km, but will need to also use 10 or 20 km resolution depending on sample sizes
- Temporal resolution : season or month

Type	Source	Extent / Resolution
depth	ETOPO5 and coastal relief model	3 arc-minute and 3 arc-second
distance to shore and various depth contours	in-house	variable vector resolution
Sediment type	200m isobath of GEBCO	
sea surface temperature	SST since 1991, available from various sources (MODIS, Pathfinder, GOES) merged, and interpolated by Narragansett lab staff	1991 – 2010; hourly; 1 – 9 km resolution
chlorophyll	SeaWiFS and MODIS processed by Narragansett lab staff	1997 – 2011; hourly; 1 – 4 km resolution
SST and chlorophyll fronts intensity and distance to	Above processed in-house	1997 – 2010 (or 2011); 5-day averages; 4 km resolution
Mixed layer depth and salinity or density at depth	Ocean Model output	1997 – 2010; daily; 4 – 10 km resolution

Wind and Water Power Technologies Office
Wind Program
wind.energy.gov
DOE/EE-0925