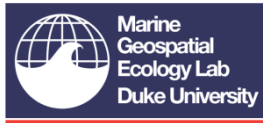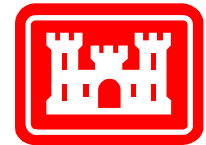# Development of a Decision Support Tool To Reduce Sea Turtle Dredging Entrainment Risk

Doug Piatkowski

Bureau of Ocean Energy Management

Division of Environmental Assessment

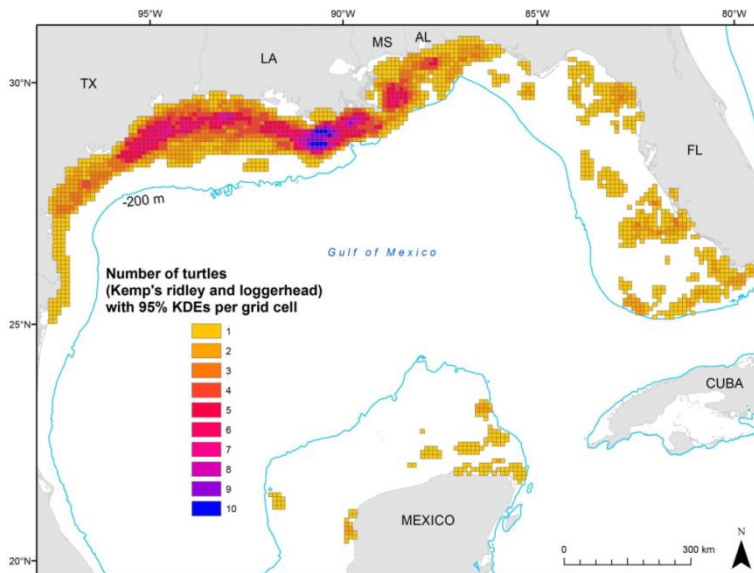Douglas.Piatkowski@boem.gov; 703-787-1833

FSBPA

National conference on Beach Preservation Technology

February 9th 2017 (Session H)

*See "Story Map" for More Information: **http://arcg.is/298s5BO**

OUTLINE

- **Background**

- **Purpose**

- **Objectives**

- **Expert Meetings**

- **Meeting Outcomes**

- **Decision Support Tool Prototype**

- **Project Schedule**

- **Questions**

Source: Kristen Hart, USGS

Source: Jake Levenson, BOEM

Source: Jake Levenson, BOEM

STUDY BACKGROUND
Early Collaboration
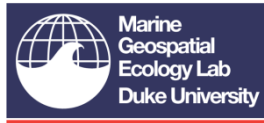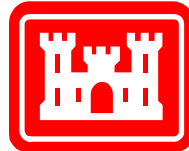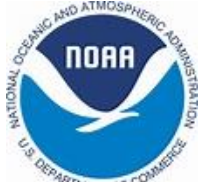
Marine Minerals Program: Responsible for managing development of OCS non-energy marine mineral resources

- **Authority:**
  - Outer Continental Shelf Lands Act (OCSLA) (43 U.S.C. 1331, et. seq.)
  - Public Law 103-426 (43 U.S.C. 1337(k)(2)) (1994)

- **National interest** in long term planning

- **Increased use** of OCS sand sources
  - ~140 MCY of OCS sand conveyed

- **Stewardship** of resources


Source: Charles St. Martin, Rhode Island DOT

Source: Weeks Marine

- **Established Mitigation Measures:** Since the 1990's

- **Since 1996:** >20 sea turtle mortalities associated OCS dredging.

- **Residual Risk:** Limited consideration for project specific efficacy and no risk evaluation standard

- **BOEM Needs:** Minimize entrainment risk through a standardized risk assessment framework

STUDY PURPOSE
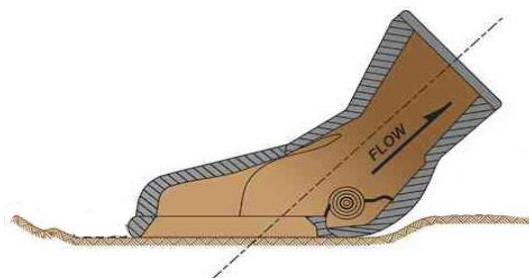
- **Develop a geographically and temporally based decision support tool for BOEM's* use to:**
  - Support risk based planning
  - Standardized and consistent across a regional scale to assess project-specific dredging entrainment risk within a common framework

  * Opportunity to expand user base in the future

Source: USGS

- **Identify risk factors and authoritative data sources to support tool development**

  - Temporal and spatial relationship of sea turtle behavior

  - Borrow area design relative to efficacy of existing mitigations
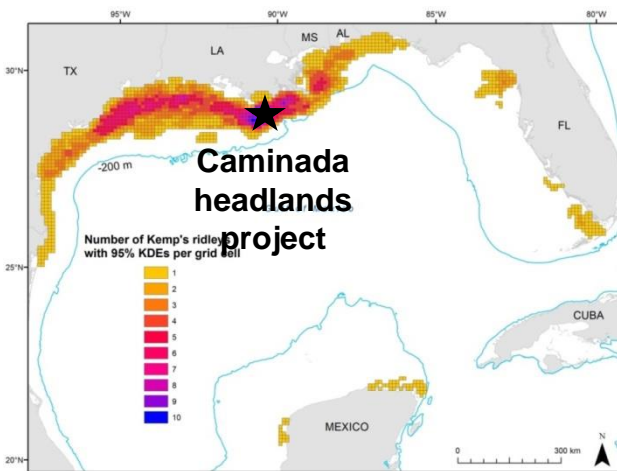
Source: Shaver et. al. 2013
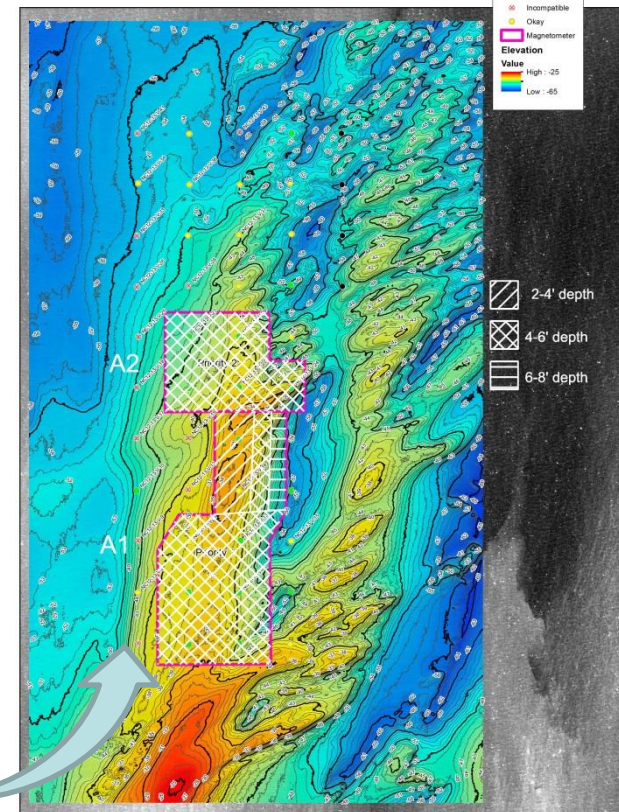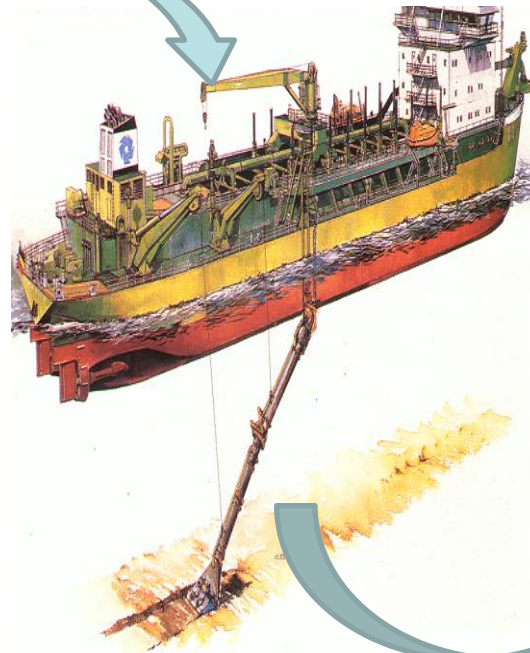
Source: USACE Wilmington District

OBJECTIVES

- **Study overview and partnership**

- **Solicit authoritative knowledge**

- **Solicit new / modified mitigations**

- **Identify significant data gaps**

- **Dredging Entrainment Risks**
  - Sea Turtle Behavior
  - Borrow Area Footprint
  - Borrow Area Design
  - Post Dredging Environment
  - Median Grain Size
  - Sea Floor / Bottom Profile
- **Mitigations**
  - "Tickler Chains"
  - Borrow area BMP's
  - Flexibility for Innovation
  - Water Injections
  - Bed Leveling
  - Adjustable Ground Pressure
  - Relocation Trawling Alternatives
  - Education
  - Strategic Investments

- **Sea Turtle Information**
  - Sea Turtle Behavior
  - Temperature
  - Bottom Type
  - Sea Floor / Bottom Profile
  - Ocean Currents
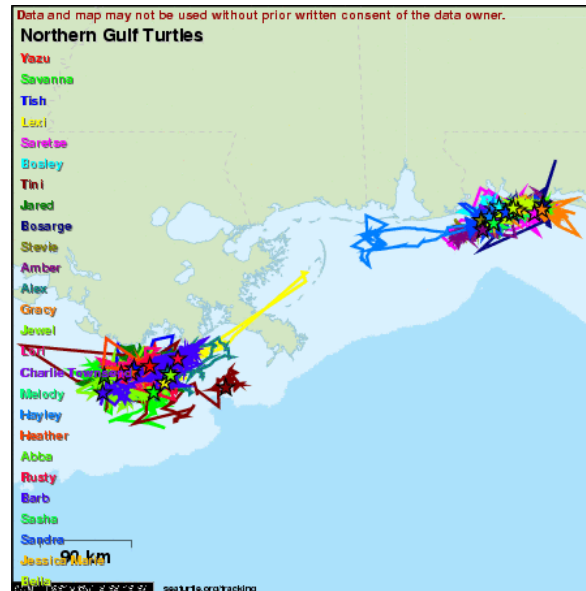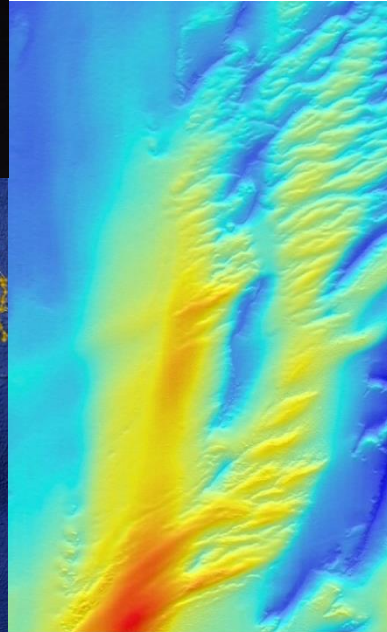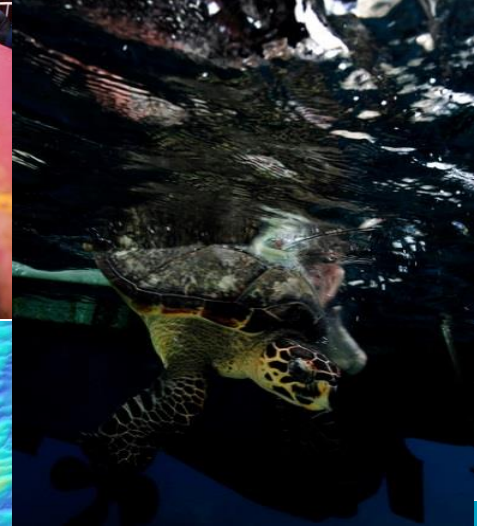
What is the risk of dredging relative to time of year in a particular area?

Assumptions

- Particular area = OCS block on or near a sand resource

- Users will want to select one or more OCS block

- Time of year is either a month or season
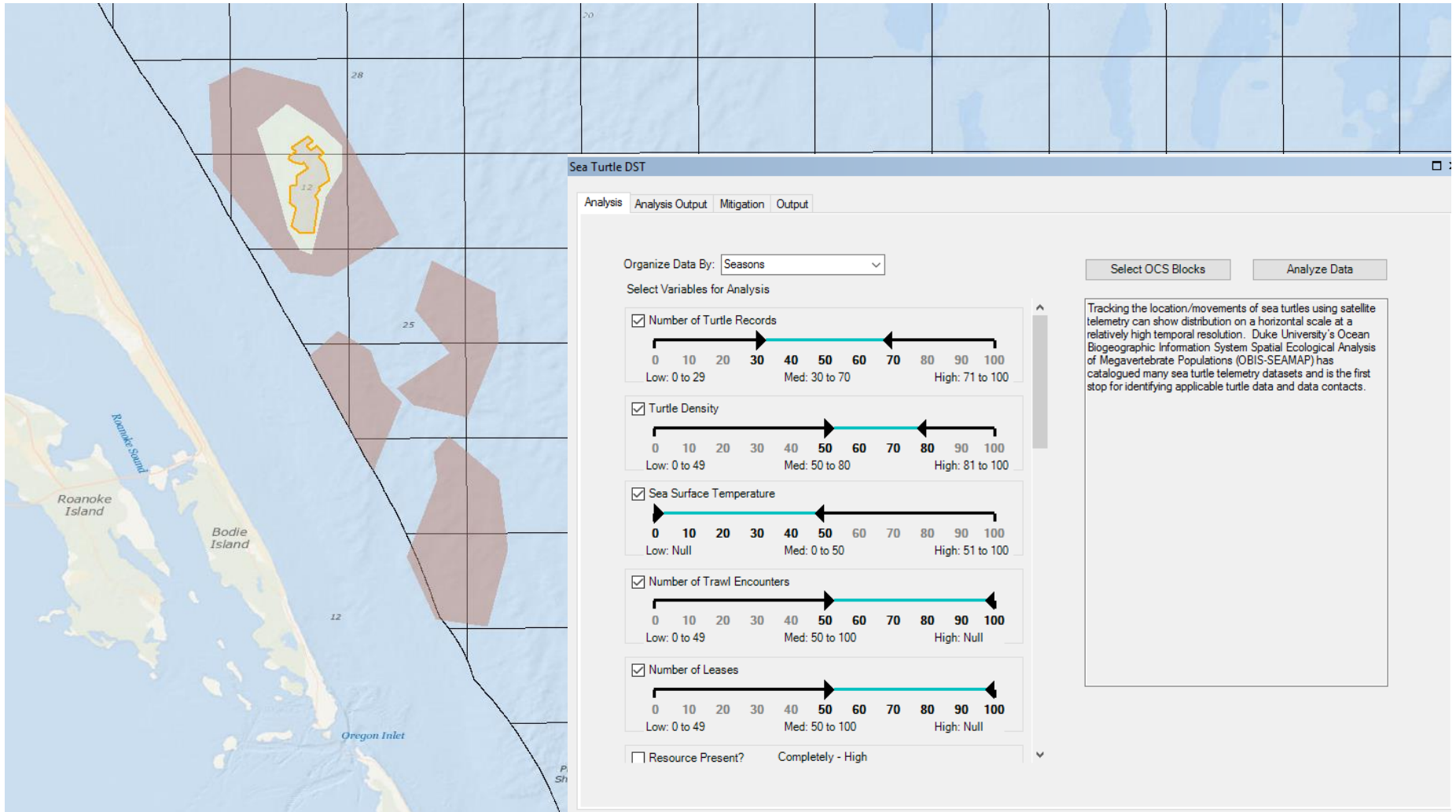
DATA SOURCES

- Number of Turtle Records
- Turtle Density
- Sea Surface Temperature
- Number of Trawl Encounters
- Number of Leases
- Resource Present?
- Depth
- Hard bottom Present?
- Seagrass Present?
- Critical Habitat Present?
- Sand Samples Present?
- Slope
- Roughness
- Current Speed
- Wind Speed
- Significant Wave Height
- Chlorophyll A

MITIGATION

REVIEW RESULTS

OUTPUT REPORT

Sea Turtle DST Output Report — Generated: 12/2/2016

Sea Turtle DST Output Report — Generated: 12/2/2016
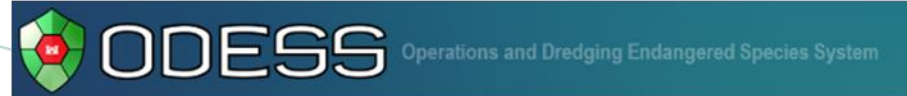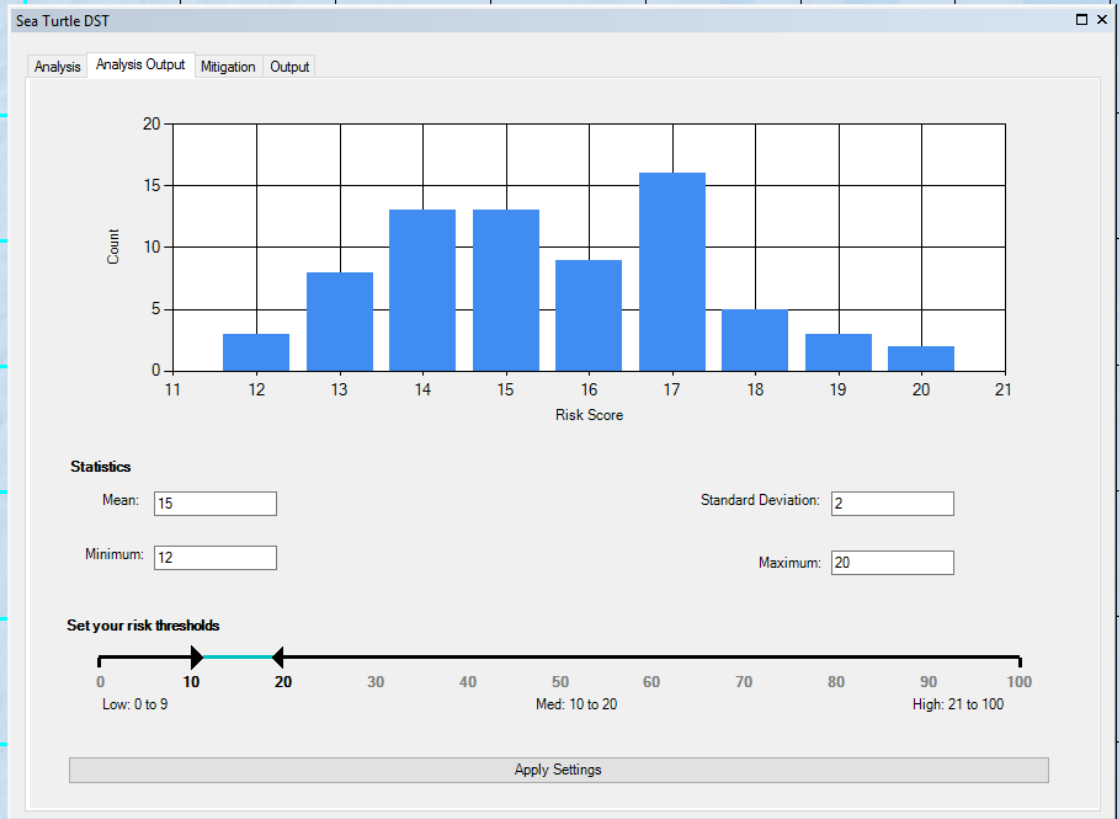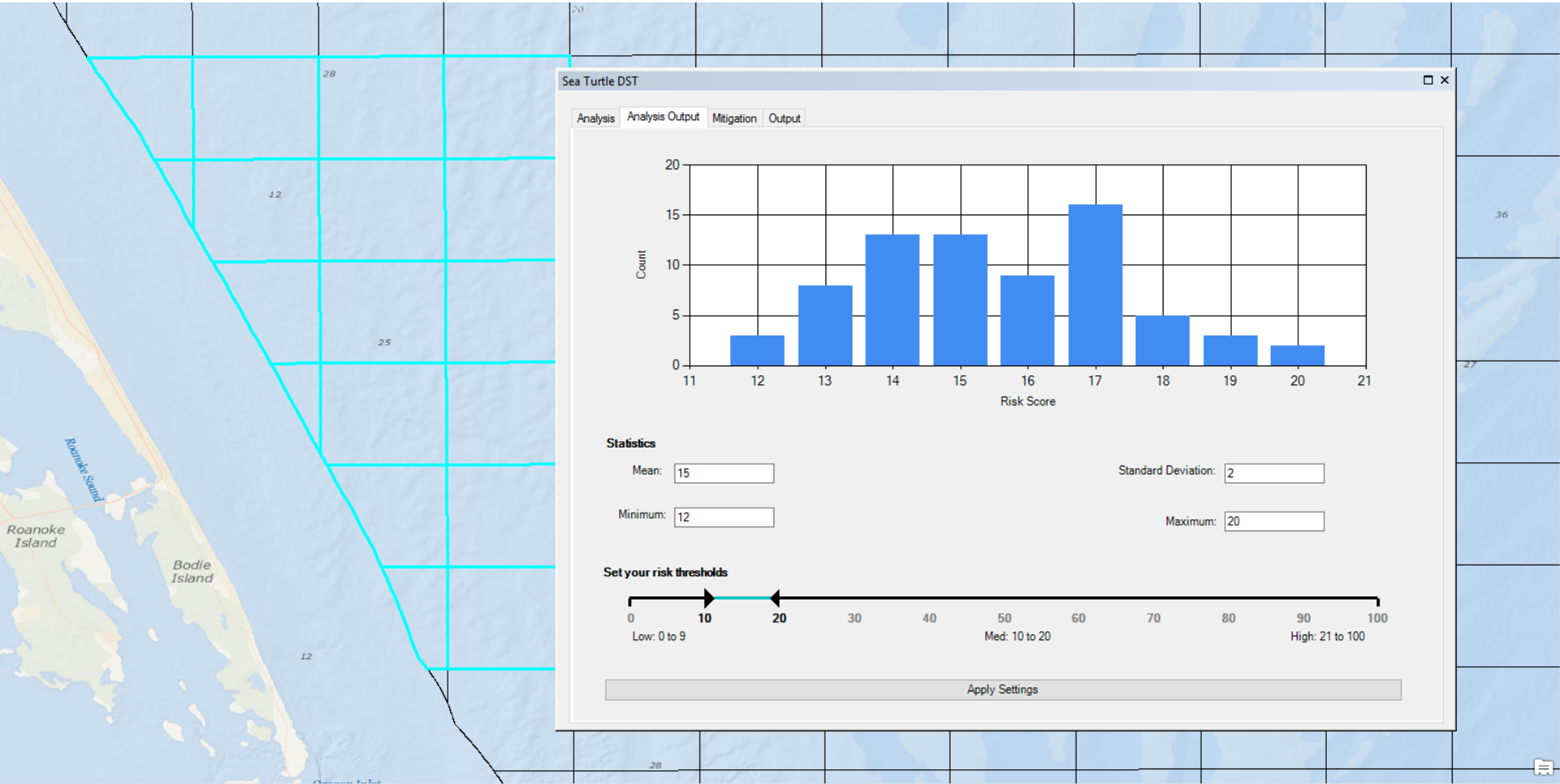
1. Data Outputs

The data layers selected for analysis are listed below along with the parameters chosen to define risk intervals. The average risk designation represents the average values for all of the selected blocks. Specific data values and risk designations for individual OCS Blocks can be viewed in the output feature class associated with this output report (**STDST_ 20161202_123155**).

Figure 1. Reference map displaying selected blocks analyzed and summarized in this report.
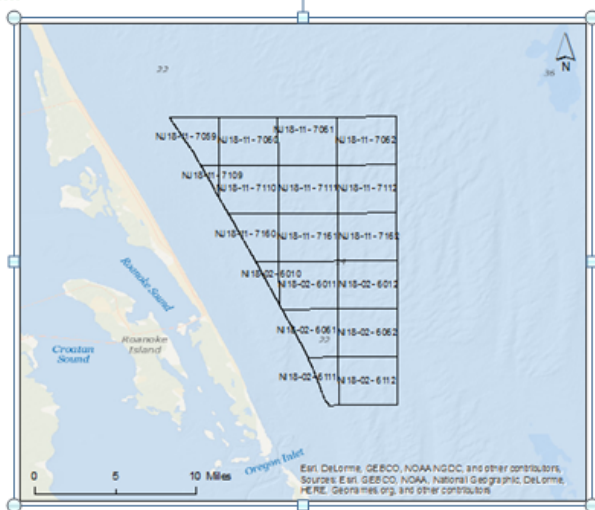
Table 1. Input parameters selected by the user.

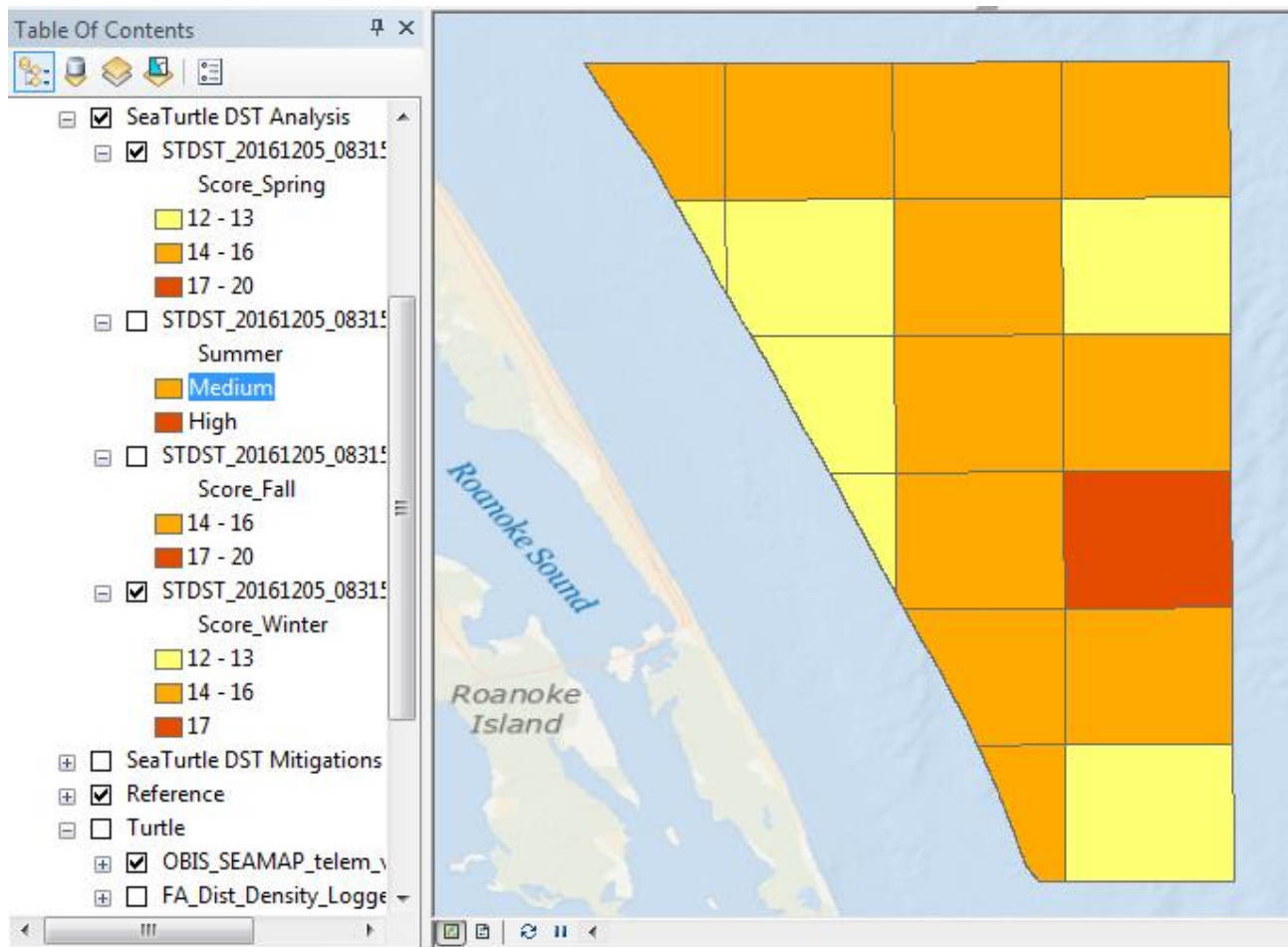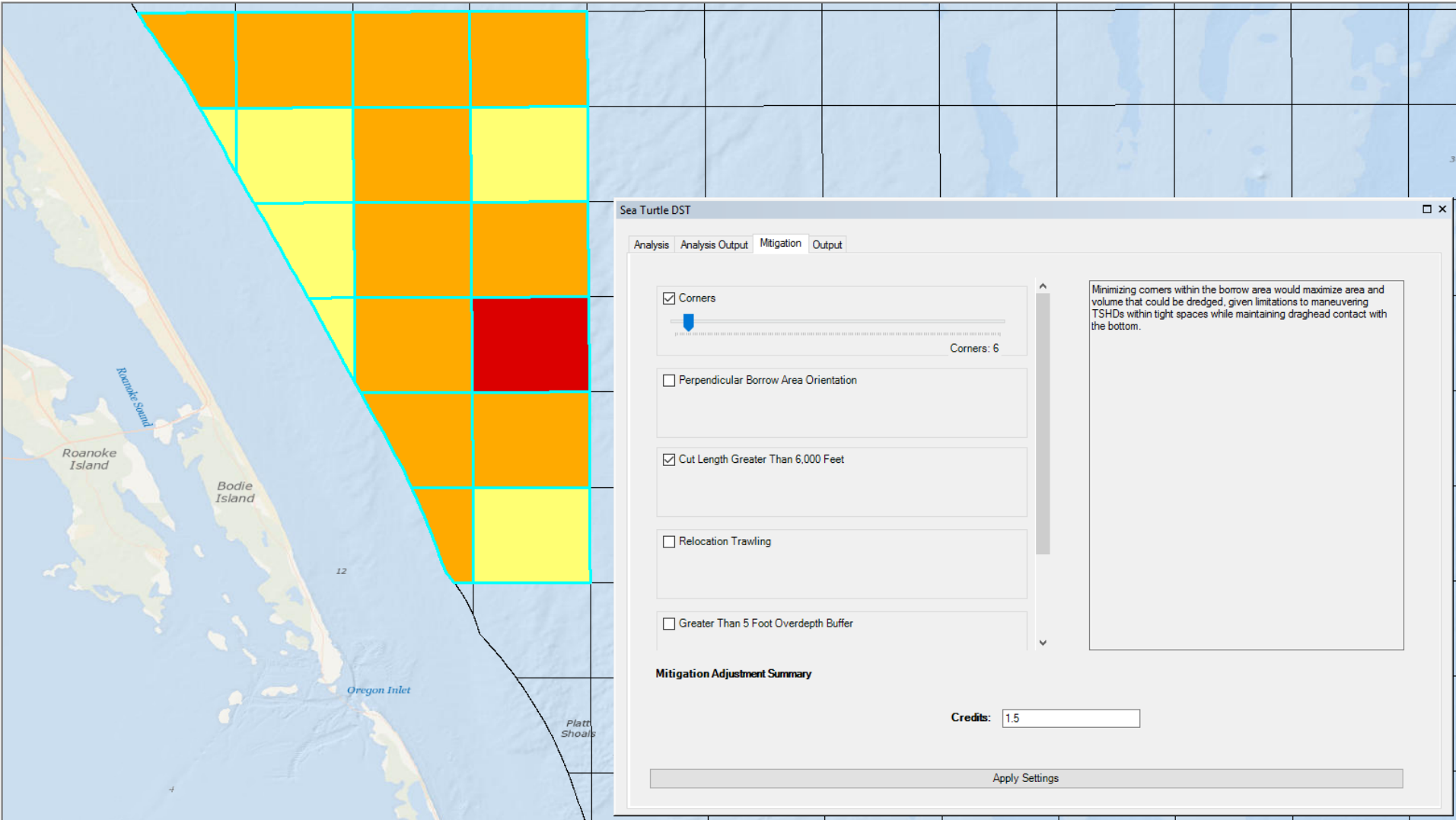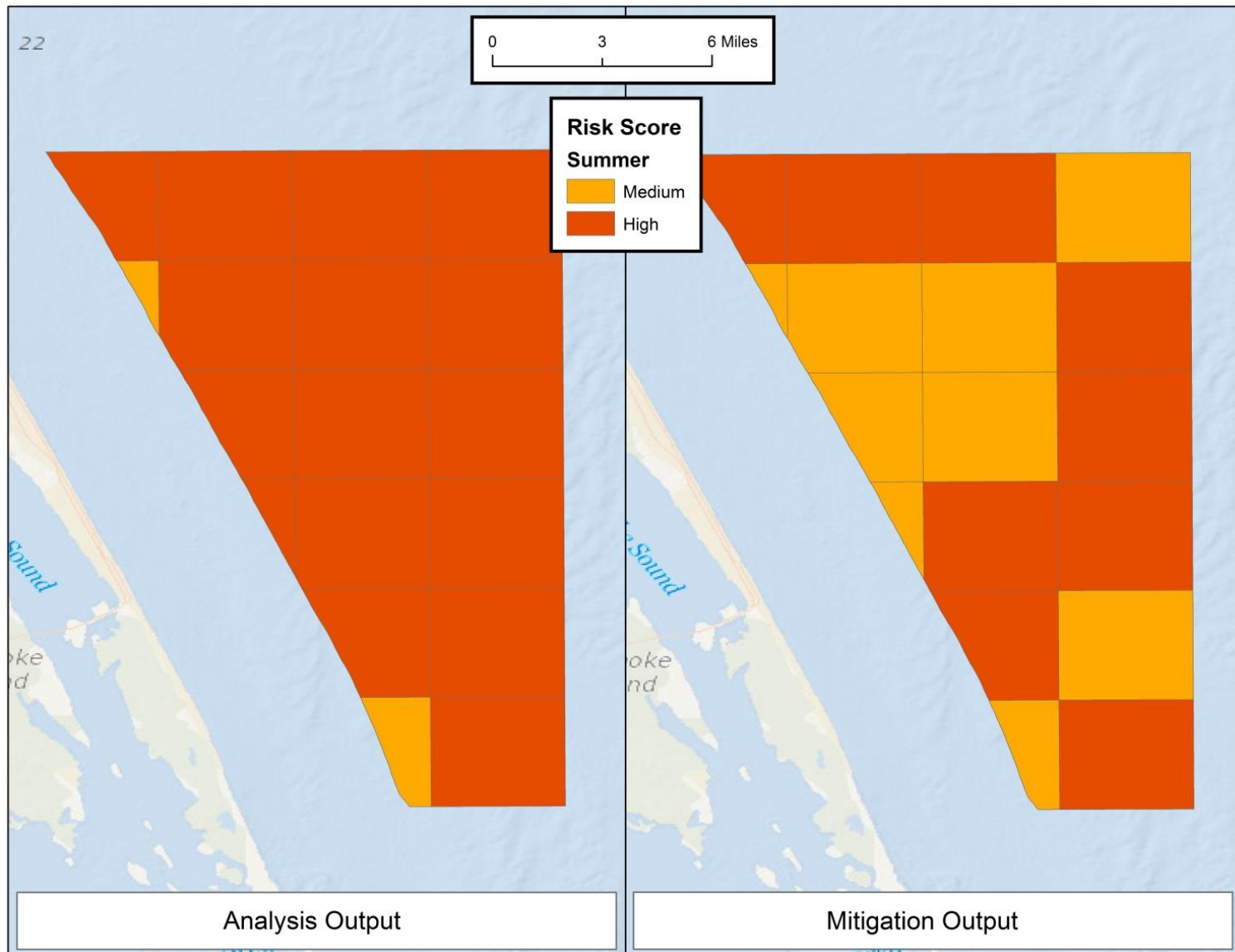| Variable	Risk Definition	Average Risk Designation			
		Spring	Summer	Fall	Winter
Number of Turtle Records	>20 – High 10-20 – Medium <10 - Low	Medium	Medium	High	Low
Turtle Density	>0.088 – High 0.042-0.088 – Medium <0.042 - Low	Medium	High	Medium	Medium
Sea Surface Temperature	>15°C – High <15°C - Low	Low	High	High	Low
Number of Trawl Encounters	>10 – Medium <10 - Low	Low	Low	Low	Low
Number of Leases	>1 – High 1 – Medium 0 - Low	Medium	Medium	Medium	Medium
Resource Present?	Completely – High Partially – Medium None - Low	Medium	Medium	Medium	Medium
Depth	>35m – Low 3-35m – Medium <3m - Low	Medium	Medium	Medium	Medium
Hard bottom Present?	Yes – Low No – High	Low	Low	Low	Low
Seagrass Present?	Yes – High No - Low	Low	Low	Low	Low
Critical Habitat Present?	Yes – High No - Low	Low	Low	Low	High
Sand Samples Present?	Yes – Medium No - Low	Medium	Medium	Medium	Medium
Score		17	20	20	18

2. Results Summary

Based on the Average Risk Designations, **Summer** and **Fall** are anticipated to be the highest risk seasons for turtle entrainment in the selected area. **Spring** is anticipated to be the lowest risk season for entrainment.

OUTPUT REPORT

10 **Increasing collaboration across agencies and communities**
   - Communicating with practitioners and managers regarding the use and evaluation of a standardized tool/method (such as a the proposed BOEM DST) is needed for any improved decision-making.
   - Regional collaboration among stakeholders in different communities (e.g., sea turtle research, research engineers, dredging industry, etc.) should be promoted to support more informed decisions.

11 **Making strategic investments to fill data gaps that can "fine-tune" management decisions**
   - Purchasing scientific research tag/equipment and coordinating with regional partners to take advantage of opportunistic tag/research opportunities was suggested.
   - Investigating in the feasibility of side scan sonar technology to detect sea turtle presence and assess abundance within a borrow area could be a priority.
   - Investigating in the feasibility of monitoring sea turtle presence with the use of acoustic cameras and high definition videos is needed.
   - Researching other ways to deter sea turtles, possibly from lessons learned in the fisheries community (e.g., black lights on sharks/predator shapes to scare sea turtles, lightsticks, acoustics, etc.) or researching physical properties (e.g., suction fields) within the pipe and surrounding a draghead was mentioned.
   - Building flexibility for gathering sea turtle information opportunistically in future NMFS Biological Opinions as an alternative to requiring Endangered Species Act Section 10 permits allowing direct and incidental take for scientific purposes or to enhance survival of sea turtles, was determined as highly important.

Relevant Turtle Studies to the Selected Area:

Study Name	Provider	Contact Information
SEFSC Mid-Atlantic Tursiops Survey, 1995 3	Lance Garrison	lance.garrison@noaa.gov
BLM CETAP AIR Sightings	Robert Kenney	rkenney@gso.uri.edu
Virginia Aquarium Stranding Response Program	Gwen Lockhart	glockhar@virginiaaquarium.com
North Carolina Aquarium at Pine Knoll Shores Sea Turtle Awareness	Michele Lamping	michele.lamping@ncaquariums.com
Virginia Aquarium and US NAVY Sea Turtle Research Project	Gwen Lockhart	glockhar@virginiaaquarium.com

4. Data Sources

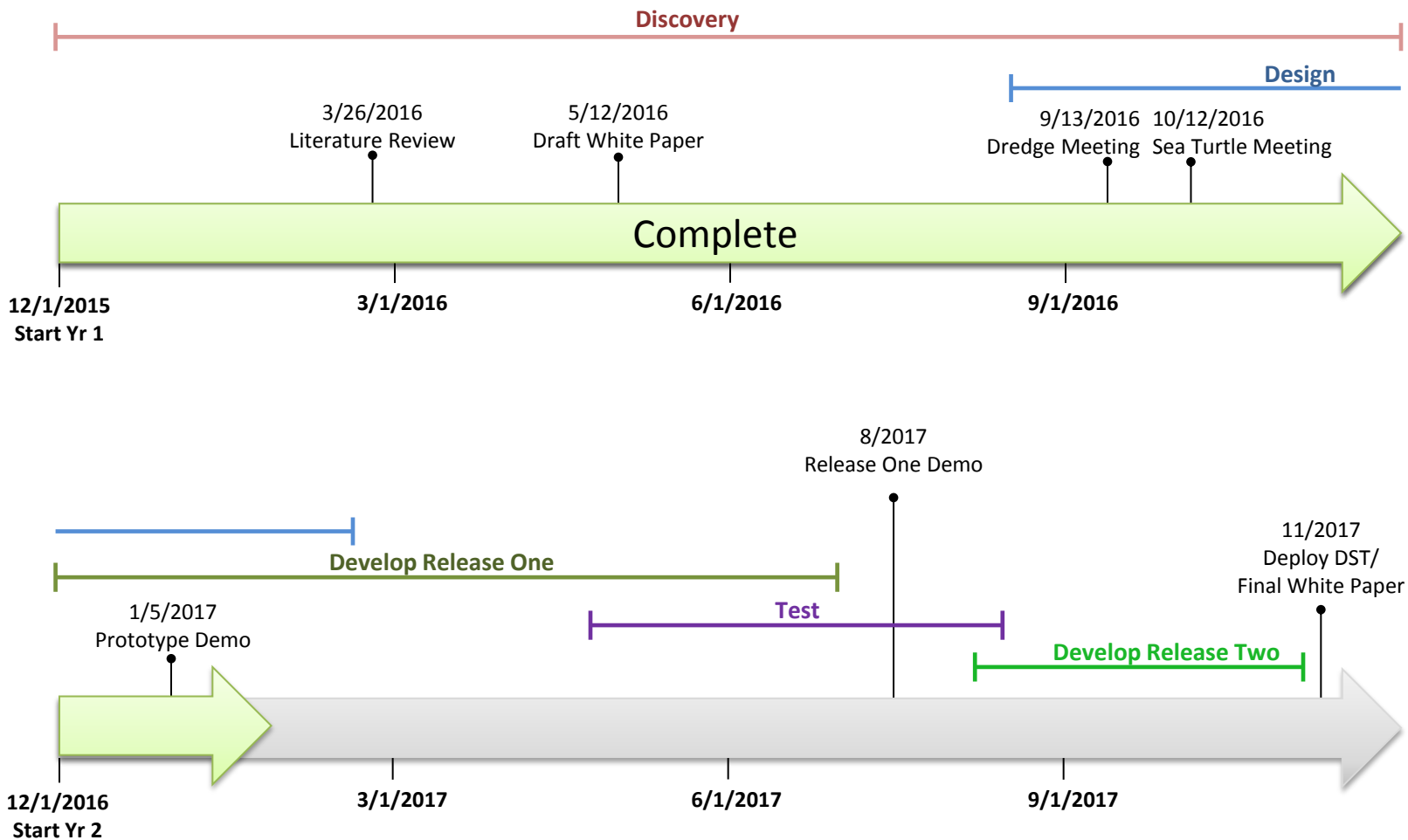| Variable	Source(s)	Link
Resource Present?	BOEM MMPGIS Sand Resource Areas Feature Class	Unavailable
Number of Turtle Records	OBIS-SEAMAP Cc Telemetry and Visual Records at 0.01 degree resolution	http://seamap.env.duke.edu/serdp
Turtle Density	SERDP NODES Habitat Density Models	http://seamap.env.duke.edu/serdp

Hard bottom Present?	The Nature Conservancy Benthic Habitat Feature Classes	https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/reportsdata/marine/namera/namspatial/Pages/default.aspx
Seagrass Present?	NOAA Seagrasses in the continental United States as of March 2015	ftp://ftp.coast.noaa.gov/pub/MSP/Seagrasses.zip
Critical Habitat Present?	NOAA Critical Habitat Designations in the United States as of January 2016	ftp://ftp.coast.noaa.gov/pub/MSP/CriticalHabitatDesignations.zip
Number of Trawl Encounters	BOEM MMPGIS Direct Species Impacts Feature Class	Unavailable
Number of Leases	BOEM MMPGIS Federal Outer Continental Shelf (OCS) Sand and Gravel Borrow Areas (Lease Areas)	http://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/Federal-Sand-n-Gravel-Lease-Borrow-Areas_gdb.aspx
Sand Samples Present?	USGS National Seafloor Sediment (usSEABED)	https://walrus.wr.usgs.gov/usseabed/data.html
Sea Surface Temperature	Canada Meteorological Center. 2012. GHRSST Level 4 CMC0.2deg Global Foundation Sea Surface Temperature Analysis (GDS version 2). Ver. 2.0. PO.DAAC, CA, USA – monthly climatological average for previous 10 years	http://dx.doi.org/10.5067/GHCMC-4FM02
Depth	NOAA Coastal Relief Model	https://www.ngdc.noaa.gov/mgg/coastal/crm.html

5. Citations

Piatowski, D. Kot, C. Development of a Decision Support Tool to Reduce Sea Turtle Dredging Entrainment Risk. 2017. https://opendata.boem.gov/BOEM-ESP-Ongoing-Study-Profiles-2016-FYQ1/BOEM-ESP-NT-15-02.pdf

PROJECT TIMELINE

BOEM
BUREAU OF OCEAN ENERGY MANAGEMENT

Discovery

Design

3/26/2016
Literature Review

5/12/2016
Draft White Paper

9/13/2016
Dredge Meeting

10/12/2016
Sea Turtle Meeting

Complete

12/1/2015
Start Yr 1

3/1/2016

6/1/2016

9/1/2016

8/2017
Release One Demo

11/2017
Deploy DST/
Final White Paper

Develop Release One

1/5/2017
Prototype Demo

Test

Develop Release Two

12/1/2016
Start Yr 2

3/1/2017

6/1/2017

9/1/2017

QUESTIONS

"Using available science, data, and dredging operational knowledge to inform decisions"

*See "Story Map" for More Information: http://arcg.is/298s5BO