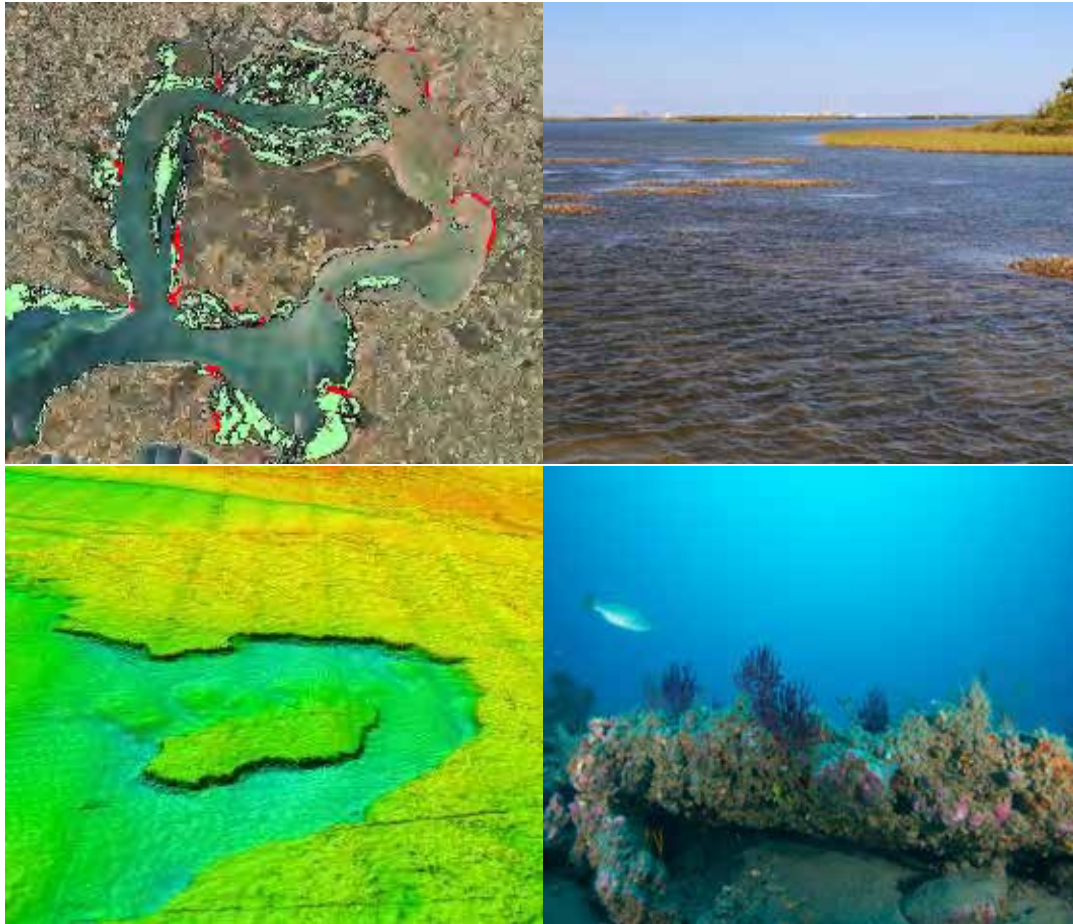# Improving Seafloor Habitat Mapping Coordination on the Southeast US Coast and Outer Continental Shelf

APPENDICES to A Report from Workshops Hosted by

NOAA's Southeast and Caribbean Regional Collaboration Team

Editors:

J. Christopher Taylor, Virginia Crothers, Christine A. Buckel

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Southeast US Seafloor Habitat Mapping Steering Committee:

Adam Bode, Ashley Chappel, Mary F. Conley, Cheryl Hapke, Kyle Ward

This document only contains workshop materials as appendices to the primary report.

12.1 Terms and Agendas for 2016 and 2018 workshops

Improving seafloor mapping coordination in the Southeast US coast and outer continental shelf
NOAA's Office for Coastal Management, Charleston, South Carolina
March 15-16, 2016

Goal

- Improve awareness and coordination of seafloor habitat mapping activities in the Southeast US to support fishery and ecosystem management and ocean planning

Objectives

- Summarize inventory of seafloor mapping data available through government archives; Encourage data discovery and data sharing from non-Federal partners
- Review requirements for seafloor habitat mapping products needed for management and regulatory decisions
- Develop pathway for improved sharing of habitat mapping priority areas to effectively leverage assets, expertise and funding resources

Geographic Focus

- Cape Hatteras to Cape Canaveral (NC, SC, GA, FL)
- Inshore/estuarine waters, ocean coastline to US EEZ

Anticipated Outcomes and Products

- Online data viewer showing mapped/surveyed areas
- Initial outline of seafloor habitat data or products required for coastal management or regulatory decision making
- Initial "short list" of mapping priorities by represented agencies along with suggestions for sharing mapping needs across agencies and organizations

Agenda

Tuesday March 15	ACTIVITY
8:00-8:30	**Arrival and Sign In**
8:30-9:30	**Welcome** **Objective:** Participants will understand context of workshop, know others in the room and why they're attending. Chris Taylor, NOAA National Centers for Coastal Ocean Science, Beaufort, NC
9:30-10:00	**What is a "habitat map"?** **Objectives:** Participants will learn about methods for interpreting data from hydrographic seafloor mapping surveys into habitat maps. Introduction: Chris Taylor Moderator: Pam Kylstra, NOAA Office for Coastal Management Presenter: Laura Kracker, NOAA NCCOS, Silver Spring
10:00 - 10:15	**BREAK**
10:15-12:00	**You have data, we all have data: Building an inventory and online dataviewer** **Objective:** Participants will have an understanding of capabilities across agencies and organizations and identify other participants they'd like to network with. Presenter: Christine Buckel, NOAA NCCOS Introduction to online regional seafloor mapping dataviewer Focus on bathy and backscatter data sets Can you marry (link to or bring in) other data viewrs (USGS BOEM) usgs, boem) with this data viwer? - maybe Presenters: Clark Alexander - Skidaway Institute of Oceanography Stan Locker - US Geological Survey J.P. Walsh - UNC Coastal Studies Institute Leslie Sautter - College of Charleston Warren Mitchell - NOAA NMFS Beaufort Lab
12:00-1:00	**LUNCH**
1:00-	**Continue: You have data, we all have data: Building an inventory and online**

2:30	**dataviewer**
	
	Presenters:
	    1. Meme Lobecker - NOAA Office of Ocean Exploration Research
	    2. Carter Watterson - US Navy
	    3. Chris Taylor - NOAA NCCOS Beaufort Lab
	    4. Mary Conley - The Nature Conservancy
	    5. Paul Gayes - Coastal Carolina University

2:30-2:45	**BREAK**

2:45-4:15	**Open discussion on requirements for habitat maps**
	
	Objective: Participants will identify current "**hot topic**" policy and management decisions requiring habitat data/products and which habitats are most "at risk" and require more information within State and Federal jurisdictions.
	
	Initial Topic Areas:
	    ● Offshore sand resources
	    ● Energy siting
	    ● Biology, essential fish habitats
	    ● Marine transportation, navigation and ports
	    ● Military activities and other
	
	Breakout Sessions - Two or three groups chosen by "hot topics"
	Participants answer the questions:
	    a. What seafloor habitat data or products are needed for management decisions?
	    b. Which seafloor habitat types are of interest?
	    c. What are data gaps or where data are not meeting decision making needs?

4:15 - 4:30	**Wrap up Day 1**
5:00	**Happy Hour**
	END OF DAY 1
Wednesday March 16	**ACTIVITY**
8:30 - 8:35	**Welcome Back**

8:35-9:00	**Report out from Breakout session** **Objective:** Breakout group leads will report out ranked management decisions requiring habitat information.

9:00-10:30	**Develop main topics for habitat mapping - requirements**
	
	Objective: Using "hot topic" management or regulatory issues identified, breakout groups will identify:
	    a. Level of activity/decision/regulatory decision to be made
	    b. Scale, detail, resolution, biological/geological level required
	    c. Preferred sensors used and raw data collected (SSS, MBES, etc.)
	    d. Appropriate attributes or classification scheme required

10:30-10:45	**BREAK**
10:45-11:30	**Report out from morning Breakout Groups**

11:30-12:30	**Overview of interactive mapping prioritization tools**
	
	Objective: Participants will become familiar with the Seasketch project managed by NOAA Office of Coast Survey and Integrated Ocean Coastal Mapping (IOCM) program and review approaches for prioritizing multi-agency mapping projects.
	
	Presenter: Ashley Chappel, NOAA Office of Coast Survey
	    1. Integrated Ocean Coastal Mapping and the Seasketch Project -
	Presenter: Tim Battista, NOAA NCCOS
	    2. Seafloor habitat mapping prioritization tools: Applications in California and Washington State
	Moderator: Pam Kylstra
	    3. Discussion: Is there a desire to develop regional mapping prioritization tool and mechanism for sharing priority areas in the Southeast?

12:30-1:30	**LUNCH**
1:30-3:00	**Representatives share mapping priority areas** **Objective:** Participants will share priority areas for their organization. Real time display in GIS may identify overlap and common interests across organizations/agencies.
3:00 3:30	**Adjourn** Closing remarks and plans for follow-on workshops or data sharing

Improving Seafloor Mapping Coordination in the Southeast US Coast and Outer Continental Shelf

NOAA Office for Coastal Management
Charleston, SC
April 18-19, 2018

Goal

Improve awareness and coordination of seafloor habitat mapping activities in the Southeast US
to support fishery and ecosystem management and ocean planning

Objectives

- Summarize inventory of seafloor mapping data available through government archives
- Encourage data discovery and data sharing from non-Federal partners
- Review requirements for seafloor habitat mapping products needed for management and regulatory decisions
- Develop pathway for improved sharing of habitat mapping priority areas to effectively leverage assets, expertise and funding resources
- Introduce tool to identify priority areas for habitat mapping information

Geographic Focus

- Cape Hatteras to Cape Canaveral (NC, SC, GA, FL)
- Inshore/estuarine waters, ocean coastline to US EEZ

Wi-Fi Information

- Network - "csc-public"
- Password - !2234LinkingPeople!
- Open your browser and try to visit a website. You will be redirected to a registration page. Please create an account for guest network access.

Conference Line / WebEX

- 866-795-0095
- 1113300#
- WebEx - http://www.mymeetings.com/nc/join.php?sigKey=mymeetings&i=748620767&p=&t=c **NO PASSCODE**

Wednesday Apr 18	ACTIVITY
8:00-8:30	**Arrival and Sign In**
8:30-9:30	**Welcome** **Objective:** Participants will understand context of workshop, what was discussed during the last workshop, know others in the room and why they're attending.
9:30-10:00	**What is a "Habitat Map"?** **Objectives:** Participants will: ● Establish common technical language. ● What do you want to see in a habitat map (classes, how they relate to management decisions, standard approach and should it include CMECS, accuracy assessments). ● Minimum criteria/standards for baseline data to create a habitat map. ● Review/incorporate outcomes from 2016 workshop Introduction: Chris Taylor, NOAA NCCOS Moderator: Adam Bode, NOAA OCM Presenter: Laura Kracker, NOAA NCCOS
10:00 - 10:30	**BREAK**
10:30-12:00	**Lightning Round Updates - "You Have Data, We All Have Data"** **Objective:** Participants will have better understanding of capabilities across agencies and organizations and identify other participants they'd like to network with. Technical practitioners will have 10 minutes each to present on their project or program's mapping data holdings, including: 1. Background/rationale on research or surveys 2. Whether data are being used to interpret seafloor composition or habitat types. 3. Ability to access data - any restrictions Presenters: 1. Christine Buckel - Collected Data 2. Ashley Chappell, Paul Turner - NOAA Integrated Ocean and Coastal Mapping Program (IOCM) Overview, Avenues for Collaborative Mapping, 3D National Study, Seabed 2030 3. Lora Turner - BOEM Marine Minerals Program Geographic Information System (MMPGIS) 4. Andrew Tweel - SC DNR / BOEM State Sand Cooperative 5. Derek Sowers, Kasey Cantwell - NOAA Okeanos/OER Plans

	6. Nate Bacheler - NOAA NMFS SE Fishery Survey 7. Jennifer Kist, Matt Boles – USACE Backscatter & Multispectral Backscatter Data Collection and Access 8. Scott Cross – NOAA NCEI Archives & Data Access 9. Scott Harris - College of Charleston
12:00-1:00	**LUNCH**
1:00-2:15	**Southeast Seafloor Mapping Prioritization** **Objective:** Understand and discuss different approaches to prioritization Presenters: 1. Ashley Chappell – NOAA Integrated Ocean and Coastal Mapping (IOCM) 2. Cheryl Hapke – Florida's Approach 3. Tim Battista – The Interactive Prioritization Approach 4. Ginny Crothers, Christine Buckel - Southeast Seafloor Mapping Prioritization Tool Group Discussion
2:15-2:45	**BREAK**
2:45 - 4:00	**How Do We Prioritize Mapping** **Objective:** Gather feedback on the prioritization tool and discuss approach for gathering input.
4:00 - 4:30	**Wrap Up Day 1**
5:00	**Happy Hour**
Thursday Apr 19	**ACTIVITY**
8:30 - 8:45	**Welcome Day 2**
8:45 - 9:15	**Mapping Guidelines and Requirements** **Objective:** Review national standards and outcomes from 2016 workshop with the goal of defining best practices for data collection and mapping.

	Presenter: • Chris Taylor – Overview of 2016 Workshop and Terms of Reference

9:15 - 10:30	**Mapping Guidelines and Requirements – Breakout Discussion**
	
	Objective: Further define the requirements (level of detail, resolution, etc.) for seafloor habitat mapping data and products.
	
	Breakout Groups:
	    o Shallow Water Habitats
	        ■ Subject Matter Experts – Mark Finkbeiner, Don Field
	        ■ Facilitator – Chery Hapke
	    o Sand Shoal Habitats
	        ■ Subject Matter Experts – Scott Harris, Katie Luciano
	        ■ Facilitator – Mary Conley
	    o Offshore Rocky Habitats
	        ■ Subject Matter Expert – Chris Taylor
	        ■ Facilitator – Adam Bode

10:30-11:00	**BREAK**
11:00-12:00	**Mapping Guidelines and Requirements - Report Out** **Objective:** Each breakout lead shares the following information: 1. Level of activity/decision/regulatory decision 2. Level of scale, detail, resolution, biological/geological level required 3. Preferred sensors used and raw data collected (SSS, MBES, etc.) 4. Appropriate attributes or classification scheme required **White Paper Discussion** (as time allows)
12:00 - 12:30	**Adjourn** Closing remarks and plans for follow-on workshops or data sharing.
12:30-1:30	**LUNCH**
1:30 - 3:00	**Opportunity to Network and Engage** Opportunity to further sidebar conversations and ideas, network with new contacts, or leave early based on travel arrangements.

Improving seafloor mapping coordination in the Southeast US coast and outer continental shelf
NOAA's Office for Coastal Management, Charleston, South Carolina
April 18-19, 2018
Terms of Reference

Seafloor habitats from the upper estuary to the outer continental shelf support living marine resources and ecosystems of the Southeast US Atlantic and in turn support the economies of our coastal communities through fisheries, eco-tourism and other services. Maps that depict the arrangement of seafloor habitat types are the foundation from which management agencies guide resource assessments and inform marine spatial planning that seek to limit impacts to habitats and living marine resources from human activities such as ocean energy production and coastal development.

As of 2016, less than 12% of the continental shelf (shallower than about 200 meters) of the SE US had been surveyed using modern multibeam sonars. A small fraction of the areas that have been surveyed have been interpreted and classified to geological form or habitat types. In contrast, for estuarine waters, 100% of the seagrass habitats have been mapped in the southeast (NC to FL), though these maps may represent a single time point and may not be repeated to detect change. Vast data gaps exist for structured habitats like oyster reefs in estuarine water and rocky reefs out to the continental shelf break. These gaps impede efficient and informed conservation or regulatory action to minimize potential impacts from human uses of the coastal ocean.

In 2016, NOAAs Southeast and Caribbean Regional Collaboration Team identified habitat mapping as a top priority for improving regional coordination among NOAA offices, other state and federal agencies, and academia. The SECART hosted the first of a series of workshops in March 2016 with the following objectives:
- Inventory seafloor survey data available from: NOAA archives or program offices, other government survey data, as well as survey data from industry and academia; Develop an online, open-access dataviewer displaying existing seafloor survey data resources
- Initiate discussion on management needs, requirements for habitat mapping information, and best practices for collecting data to produce habitat maps
- Identify immediate and near-term habitat mapping data priorities by management agencies and research institutions

Participants at the 2016 workshop were asked to identify management needs that require seafloor habitat maps. The top two management calls were: (1) protecting sensitive coral and rocky reef habitats, and (2) improving maps for sand mining and sand resource management. Additional management needs included informing fishery resource assessments, siting offshore energy development, and identifying and conserving historically significant shipwrecks and cultural resources. Participants were also asked to identify the most important seafloor habitat types to focus mapping efforts. These were (1) sand shoals and (2) offshore rocky reefs and deep corals. An additional habitat type also highlighted by participants was (3) shallow estuarine habitats like seagrass and oyster reefs.

Participants selected two breakout groups to identify an initial list of expectations and approaches to mapping (1) sand shoals and (2) offshore rocky reefs. The approaches included level of detail in descriptors or taxonomy of habitat types, and the necessary spatial resolution needed to make management decisions based on prior identification of management needs. The groups also identified appropriate survey sensors and some approaches used to remotely sense the seafloor at resolutions and levels of detail to meet the management needs.

The 2018 workshop will build upon the 2016 workshop in three areas:
- Receive additional seafloor habitat mapping data from NOAA offices and external partners, sharing through an online data viewer
- Develop a regional habitat mapping prioritization application for participants to contribute agency and research priorities for habitat mapping to identify mutual areas of interest
- Identify management requirements and summarize best practices for developing seafloor habitat maps in three coastal ocean habitat types:
    - Shallow estuarine habitats including seagrass and oyster reefs
    - Coastal ocean sand shoals
    - Continental shelf rocky reefs and deep coral reefs

To facilitate discussion throughout the workshop, the following terms are defined to establish a common language:

Habitat: A description of the estuarine and ocean seafloor relative to its use by living marine organisms. For this workshop it is defined through an hierarchical characterization that includes description of the geological foundation (e.g., fine sediment, hardened materials,man-made structures like shipwrecks, hardened shorelines or purpose-sunk debris and artificial reefs) as well as the biological cover (e.g., attached organisms like algae and grasses, and invertebrates like sponges and corals).

Mapping: The process of collecting georeferenced information on the characteristics of the seafloor using direct observation or remote sensing tools like multibeam sonars or airborne optical sensors.

Classification: Describing the seafloor habitat types requires a common language and set of terms. The Coastal Marine Ecological Classification Standard (CMECS, https://iocm.noaa.gov/cmecs/) will serve as the accepted dictionary of terms used to define and delineate habitats.

Improving seafloor mapping coordination in the Southeast US coast and outer continental shelf
NOAA's Office for Coastal Management, Charleston, South Carolina
April 18-19, 2018
Day 2 Breakout Session

Developing Guidelines and Requirements for Mapping Seafloor Habitats in the SE
Trigger Questions for Breakout Groups

A goal of this workshop is to assemble expert practitioners and users of habitat maps to develop guidelines and requirements for seafloor habitat mapping to deliver actionable data for ecosystem management and coastal ocean planning. Breakout groups will be divided among three habitat topics identified during the 2016 SECART Habitat Mapping Workshop: shallow coastal habitats (e.g. SAV, oyster reefs, saltmarsh), nearshore sand shoals, and offshore rocky and deep coral reefs. The following trigger questions will guide the breakout group discussion:

Ice-Breaker: What mapping programs are being conducted by your agency/organization?

Part 1. Users and Requirements
1. Who are the primary customers for seafloor habitats maps in your focus area?
2. What are the primary management drivers requiring seafloor mapping and related data?
3. What resolution and extent are required for decision making or management actions?
4. How do you receive habitat mapping information?
    a. Online-interactive resources
    b. Digital data shared from owner/source
    c. Paper maps and printed reports

Part 2. Matching State of Science to Requirements
1. What technical standards or operating procedures exist for mapping your habitat area?
2. What remote sensors are most often used to map your habitat area?
    a. List sensor types and platforms used (satellite, airborne, ship, small boats)
    b. Provide ranges for resolution (e.g., meter x meter, by depth) or other coverage metrics for sensors as well as resolution for interpreted maps
3. What classification schemes or standards are used in your habitat area?
4. What ground validation methods are used to interpret remotely sensed data?
    a. Are accuracy assessments expected by end-users?
5. Are there monitoring or change detection programs in place for your habitat area?

A primary outcome of this session is to develop a stronger network of habitat mapping experts in the region to address needs, share expertise and assets. A NOAA Technical report will be developed from this workshop and breakout sessions with the intended audience including NOAA and partners, from practitioners to end-users, from scientists to regulatory agencies.

12.2 Participant list for workshops

2016 Southeast Habitat Mapping Workshop Participant List

Name	Affiliation
Clark Alexander	Skidaway Institute of Oceanography
Paul Gayes	Coastal Carolina University
JP Walsh	UNC Coastal Studies Institute
Leslie Sautter	College of Charleston
Scott Harris	College of Charleston
Adam Bode	NOAA Office for Coastal Management
Mark Finkbeiner	NOAA Office for Coastal Management
Daniel Martin	NOAA Office for Coastal Management
Chris Taylor	NOAA National Centers for Coastal Ocean Science
Tim Battista	NOAA National Centers for Coastal Ocean Science
Laura Kracker	NOAA National Centers for Coastal Ocean Science
Andy David	NMFS SEFSC
Nate Bacheler	NMFS SEFSC
Warren Mitchell	NMFS SEFSC
Mashkoor Malik	NOAA Office of Exploration
Jeremy Potter	NOAA Office of Exploration
Kasey Cantwell	NOAA Office of Exploration
Kyle Ward	Office of Coast Survey (Southeast Navigation Manager)
Paul Turner	Office of Coast Survey (invite through Ashlee Chappell)
Ashley Chappell	Office of Coast Survey (Integrated Ocean and Coastal Mapping)
Sarah Fangman	NOAA Grays Reef National Marine Sanctuary
Tane Casserley	NOAA Monitor National Marine Sanctuary
Carter Watterson	US Navy (request coordinating across DoD)
Amanda Demopoulos	USGS
Bill Schwab	USGS WHOI
Cheryl Hapke	USGS
Brian Hooker	BOEM (Renewable Energy)
Jennifer Culbertson	BOEM (Minerals Management)
Kristine Cherry	GSAA
Debra Hernandez	SECOORA
Mary Conley	Nature Conservancy
Leda Dunmire	Pew
Sonny Emmert	Georgia DNR, Coastal Resources Division
Jessica Boynton	SC OCRM/DHEC
Ann Deaton	NC Div of Marine Fisheries/DEQ
Ted Switzer	Florida
Mel Bell	SC DNR
Bob Van Dolah	SC DNR
Roger Puglise	SA Fishery Management Council
Chip Collier	SA Fishery Management Council
Chris Freeman	Geodynamics Group, LLC (Pine Knoll Shores, NC)

2018 Southeast Habitat Mapping Workshop Participant List

Name	Affiliation
Derek Sowers	NOAA Ocean Exploration & Research
Daniel Wagner	NOAA NCCOS Charleston
Adam Bode	NOAA Office for Coastal Management
Bill O'Beirne	NOAA Office for Coastal Management
Lora Turner	BOEM
Andrew Tweel	SCDNR
Scott White	USC
Paul Turner	NOAA/NOS/IOCM
Cheryl Hapke	USGS
Christine Buckel	NOAA - NOS - NCCOS
Nate Bacheler	NOAA-NMFS-SEFSC-Beaufort Lab
Chip Collier	SAFMC
Ginny Crothers	NOAA
Tane Casserley	NOAA Monitor NMS
Ashley Chappell	NOAA IOCM
Lora Clarke	Pew
Pace Wilber	NOAA Fisheries
Scott Harris	College of Charleston
Anne Deaton	NC DMF
Jessica Boynton	SCDHEC - OCRM
Don Field	NOAA/NOS Beaufort Lab
Mary Conley	The Nature Conservancy
Chris Taylor	NOAA NCCOS
Mark Finkbeiner	NOAA-OCM
Katie Luciano	South Carolina DNR
Liz Fly	The Nature Conservancy South Carolina
William Chappell	Navy
Dave Bernstein	Geodynamics
Scott Cross	NOAA NCEI
Tim Battista	NCCOS
Brad Pickens	NOAA NCCOS
Alexa Ramierz	Quantum Spatial
Marcel Reichert	South Carolina DNR
Rachel Bobich	South Carolina DNR
Phil Wolf	USACE
Paul Gayes	Coastal Carolina University
Jennifer Kist	USACE
Till Hanebuth	Coastal Carolina University
Clark Alexander	Skidaway Institute of Oceanography
Rick DeVoe	S.C. Sea Grant Consortium
Jennifer Dorton	SECOORA

Attending Remotely

Name	Affiliation
Kasey Cantwell	NOAA OER
Laura Kracker	NOAA NOS NCCOS
George Sedberry	retired (at that point)
Jason Chaytor	USGS
Erik Cordes	Temple University
Caitlin Adams	NOAA OER
Richard Viso	Coastal Carolina University
Todd Kellison	NOAA - NMFS
Heather Coleman	NOAA Fisheries, Office of Habitat Conservation
Nick Farmer	NOAA Fisheries
Ken Buja	NOAA
Reide Corbett	East Carolina University
Leslie Sautter	College of Charleston - BEAMS Program

12.3 Presentation from 2018 workshop

You Have Data, We All Have Data

Presentations

1. Collected Data - Christine Buckel
2. NOAA IOCM, Avenues for Collaborative Mapping, 3D National Study – Ashley Chappell, Paul Turner
3. BOEM Marine Minerals Information System (MMIS) – Lora Turner
4. SC DNR / BOEM State Sand Cooperative Update – Andrew Tweel

Building a map of where we've mapped...
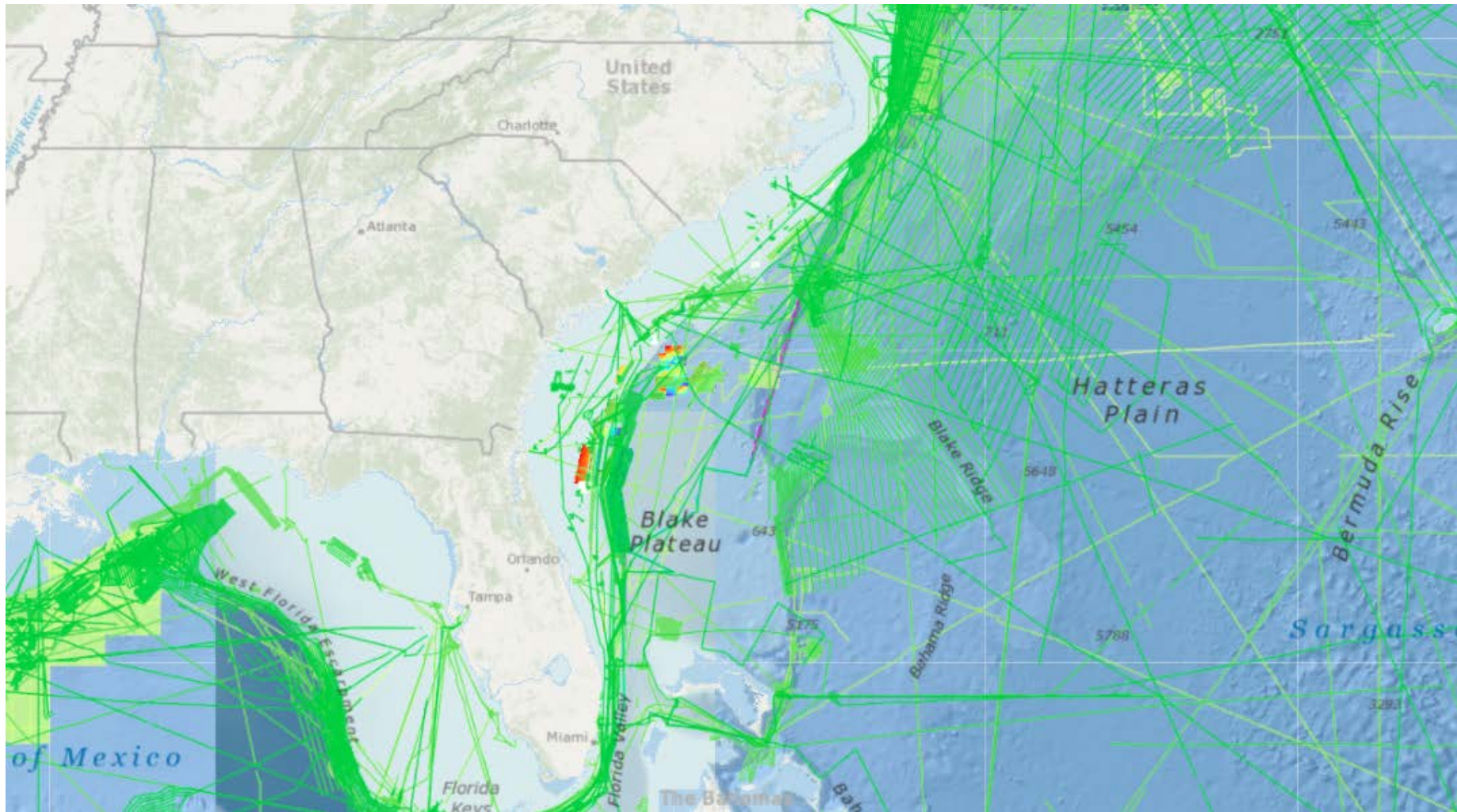
Building a map of where we've mapped...
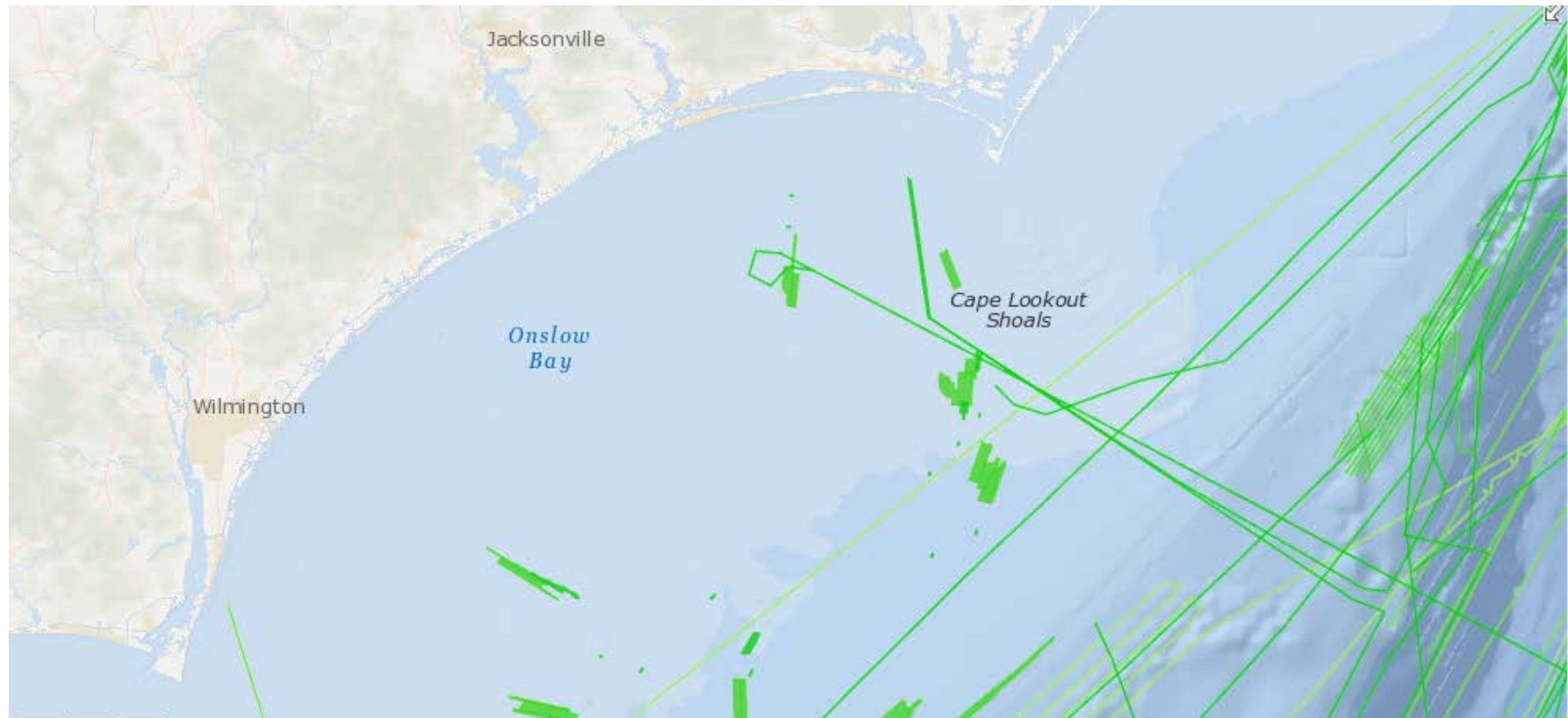
Building a map of where we've mapped…
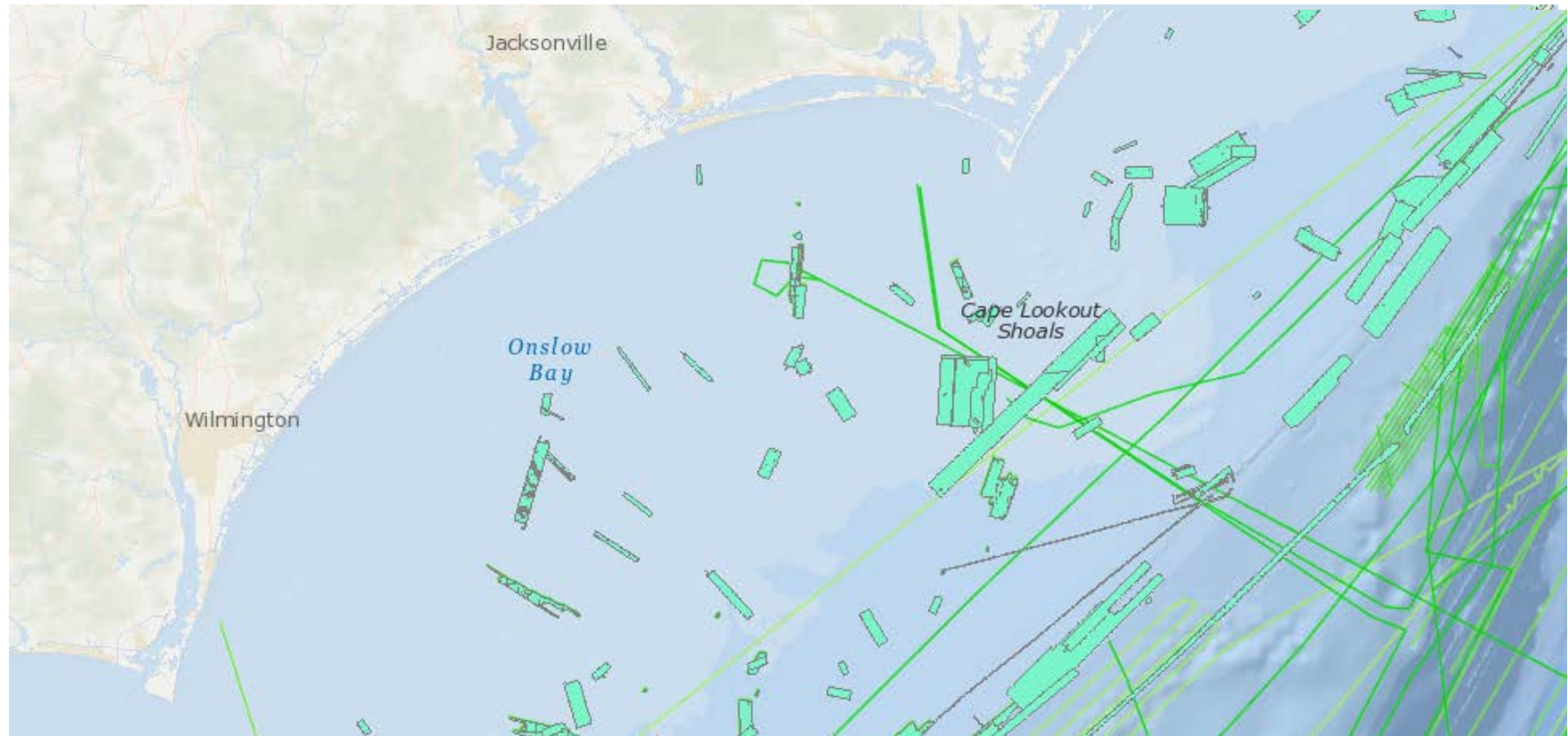
Building a map of where we've mapped…

Multibeam Data Footprints (NOAA): H12929_MB_2m_MLLW

Name	H12929_MB_2m_MLLW
SpatialRef	EPSG_32617
MinDepth	-30.07
MaxDepth	-48.11
Resolution	2.0m x 2.0m
AreaSqKm	196.99
CruiseDetails	Cape Fear Approach
DataType	Elevation
PrimarySensor	Multibeam
SecondarySensor	Sidescan
DerivedProduct	'Bathy Grid'
PrimaryInstrument	Reson 7125 Multibeam Echosounder
SecondaryInstrument	Unknown
Platform	Ferdinand Hassler
PlatformType	Vessel
SurveyYear	2,016
ChiefScientist	J. Christopher Taylor
DataLocation	R:\Seafloor_Mapping_SE\OCS Projects\Wilmingt
DownloadURL	More info
SurveyID	OPR-F309-FH-16
StartDate	12/31/2015, 7:00 PM
EndDate	12/30/2016, 7:00 PM
Report	N/A

NOAA's Southeast and Caribbean Region
Science, Service, and Stewardship

ArcToolbox

- ArcToolbox
  - 3D Analyst Tools
  - Analysis Tools
  - Cartography Tools
  - Conversion Tools
  - Data Interoperability Tools
  - Data Management Tools
  - Editing Tools
  - footprint_creation
  - Geocoding Tools
  - Geostatistical Analyst Tools
  - Linear Referencing Tools
  - Multidimension Tools
  - Network Analyst Tools
  - Parcel Fabric Tools
  - Schematics Tools
  - SeafloorMappingSE
    - Seafloor Mapping Footprint User Tool
  - Server Tools
  - Space Time Pattern Mining Tools
  - Spatial Analyst Tools

Seafloor Mapping Footprint User Tool

- Input Data Location

- Output Geodatabase

  Output Filename
  footprints_

- Survey ID

- Cruise Details

- Datatype

- Primary Sensor

- Secondary Sensor

- Derived Product(s)
  - [ ] Bathy Grid
  - [ ] Backscatter Intensity
  - [ ] Sidescan Intensity/Reflectivity
  - [ ] Habitat Map Product
  - [ ] None
  - [ ] Unknown

  [Select All] [Unselect All]

- Primary Instrument(s)

Multibeam Data Footprints (NOAA): H12929_MB_2m_MLLW

Name	H12929_MB_2m_MLLW
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AreaSqKm	196.99
CruiseDetails	Cape Fear Approach
DataType	Elevation
PrimarySensor	Multibeam
SecondarySensor	Sidescan
DerivedProduct	'Bathy Grid'
PrimaryInstrument	Reson 7125 Multibeam Echosounder
SecondaryInstrument	Unknown
Platform	Ferdinand Hassler
PlatformType	Vessel
SurveyYear	2,016
ChiefScientist	J. Christopher Taylor
DataLocation	R:\Seafloor_Mapping_SE\OCS Projects\
DownloadURL	More info
SurveyID	OPR-F309-FH-16
StartDate	12/31/2015, 7:00 PM
EndDate	12/30/2016, 7:00 PM
Report	N/A

NOAA's Southeast and Caribbean Region
Science, Service, and Stewardship

Next Steps:

- **Data inventory are background of the prioritization tool**

- **Footprints integrated with SeaSketch and other online mapping resources**

- **Can be updated with your data –**

  - Formally archive your data (for NCEI - talk with Scott)

  - Send Chris.Taylor@noaa.gov footprints of your data (toolbox will be distributed with meeting materials)

NOAA's Southeast and Caribbean Region
Science, Service, and Stewardship

You Have Data, We All Have Data

Presentations

1. Collected Data - Christine Buckel
2. NOAA IOCM, Avenues for Collaborative Mapping, 3D National Study – Ashley Chappell, Paul Turner
3. BOEM Marine Minerals Information System (MMIS) – Lora Turner
4. SC DNR / BOEM State Sand Cooperative Update – Andrew Tweel

NOAA's Southeast and Caribbean Region
Science, Service, and Stewardship

You Have Data, We All Have Data

Presentations

5. NOAA Okeanos / OER Plans – Derek Sowers, Kasey Cantwell
6. NOAA NMFS SE Fishery Survey – Nate Bacheler
7. US Navy Collection of Benthic Habitat Data – Scott Chappell
8. USACE Data Collection & Access – Jennifer Kist, Matt Boles
9. NOAA NCEI Archives & Data Access – Scott Cross
10. College of Charleston / BEAMS Program – Scott Harris

Southeast Seafloor Mapping Prioritization

1. NOAA Integrated Ocean and Coastal Mapping Program (IOCM)
   - ❖ Ashley Chappell

2. Florida's Approach
   - ❖ Cheryl Hapke

3. A Prioritization Approach
   - ❖ Tim Battista

4. Southeast Seafloor Mapping Prioritization Tool
   - ❖ Ginny Crothers, Christine Buckel

SE Seafloor Mapping Prioritization

Goals of the Tool

- Assist SECART and partners in prioritizing and coordinating seafloor habitat mapping in the SE Atlantic

- Visualize existing data and protected and managed areas in the region

- Identify your organization's priorities for future seafloor mapping
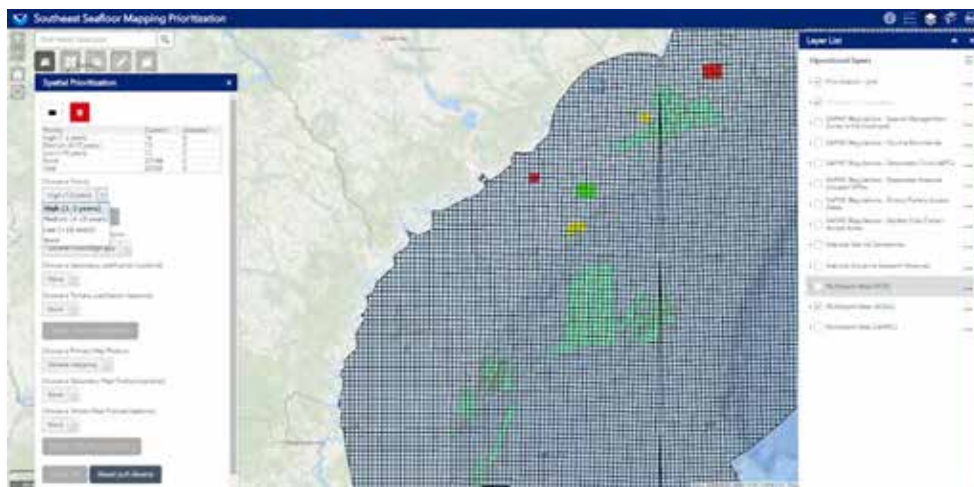
Thanks to Ken Buja and Tim Battista (NOS/NCCOS) for their development of the prioritization tool

Objectives for Today

- Introduction of tool through demo

- Receive initial feedback *(see survey handout!)*

NOAA's Southeast and Caribbean Region
Science, Service, and Stewardship

Next Steps

❏ Get feedback today on the tool and prioritization parameters

    ❏ *Please fill out the survey provided!*

❏ Identify agency representatives (April 26)

    ❏ *Email chris.taylor@noaa.gov*

❏ Distribute user guide and launch tool (early May)

❏ Receive submissions for priority areas (June 1)

❏ Aggregate priority mapping areas and utilize in inter-agency planning

Thank you for your participation!

Ginny Crothers
JHT, Inc. for NOAA
virginia.crothers@noaa.gov

How Do We Prioritize Mapping?

1. Why are we mapping?
2. Where is that important?
3. Best approach for gap analysis?
4. What information do we have or need?
5. Where might we join forces of mapping project(s)?

Day 2 Outline

8:30 – 8:45   Welcome and Day 1 Summary

8:45 – 9:15   Mapping Guidelines & Requirements

9:15 – 10:30   Breakout Group Discussion

10:30 – 11:00   *Break*

11:00 – 12:00   Breakout Group Report Out

12:00 – 12:30   Adjourn

12:30 – 1:30   *Lunch*

1:30 – 3:00   Opportunity to Network & Engage

Summary from yesterday

- **Interpreting habitats from hydrographic multibeam surveys**
  - a new method, still depends on the best quality elevation data (and likely backscatter in the SE)

- **Lots of activities in our region**

- **Lots of data being made more readily available**
  - URL from presentations will be shared in workshop report

- **Federal agencies are looking for input on where to map in the SE (Exploration, Charting, Habitats)**

Summary from yesterday

- **Prioritizing seafloor mapping in the SE**
  - It is a VERY large area
  - Be sure to include EVERYBODY, but at what level within large organizations (esp. Federal agencies)
  - How much time is needed to provide useful input to prioritization
  - What is the schedule of upcoming resource allocation decision making?

  Is it reasonable to distribute SE Prioritization Tool?

  What is a reasonable timeline?

Day 2 Outline

8:30 – 8:45	Welcome and Day 1 Summary
8:45 – 9:15	Mapping Guidelines & Requirements
9:15 – 10:30	Breakout Group Discussion
10:30 – 11:00	*Break*
11:00 – 12:00	Breakout Group Report Out
12:00 – 12:30	Adjourn
12:30 – 1:30	*Lunch*
1:30 – 3:00	Opportunity to Network & Engage

Mapping Guidelines & Requirements Breakout Groups

GOAL: Identify management drivers and requirements for habitat maps and summarize best-practices for mapping habitat types/areas

	Shallow SAV and Oysters	Nearshore Sand/Shoals	Offshore Rocky/coral reefs
Experts	Field/Finkbeiner	Luciano/Harris	Taylor
Facilitator	Hapke	Bode	Conley
Notes	Chappell	Crothers	Buckel
Location			

Mapping Guidelines & Requirements Trigger Questions

Part 1. Users and Requirements

1. Who are the primary customers for seafloor habitats maps in your focus area?

2. What are the primary management drivers requiring seafloor mapping and related data?

3. What resolution and extent are required for decision making or management actions?

4. How do you receive habitat mapping information?

   - Online-interactive resources
   - Digital data shared from owner/source
   - Paper maps and printed reports

Mapping Guidelines & Requirements Trigger Questions

Part 2. Matching State of Science to Requirements

1. What technical standards or operating procedures exist for mapping your habitat area?

2. What remote sensors are most often used to map your habitat area?

    *   List sensor types and platforms used (satellite, airborne, ship, small boats)

    *   Provide ranges for resolution (e.g., meter x meter, by depth) or other coverage metrics for sensors as well as resolution for interpreted maps

3. What classification schemes or standards are used in your habitat area?

4. What ground validation methods are used to interpret remotely sensed data?

    *   Are accuracy assessments expected by end-users?

5. Are there monitoring or change detection programs in place for your habitat area?

SHALLOW WATER HABITATS

How do you access habitat data? (Online? Directly from the source?)

Who are the customers?

Level of activity/ decision/ regulatory decision	Level of scale, detail, resolution, biological / geological level required	Preferred sensors used and standards for data collection	Appropriate attributes or classification scheme required	Type of validation used (visual, camera, other)
Managing Cultural Resources Hazards resilience planning Other Planning Dredging	(1)	•	•	•

NOAA's Southeast and Caribbean Region
Science, Service, and Stewardship

Breakout Group Report Out

Report Out

1. Level of activity, decision, regulatory decision

2. Level of scale, detail, resolution, and biological/geological level required

3. Preferred sensors used and raw data collected (SSS, MBES, etc)

4. Appropriate attributes or classification scheme required

5. What information do we have or need?

White Paper Discussion

Georgia Regional Status Update

Clark Alexander

**Skidaway Institute of Oceanography
University of Georgia**

Left map — Georgia Sediments

Legend:
- Quantified
- Bathymetric Contours
- 8-nm boundary
- 3-nm boundary

Labels:
- 2.5+/-2.2 Φ
- 2.4+/-1.2 Φ
- 2.4+/-0.9 Φ
- 1.5+/-0.8 Φ

Right map — Georgia Sediments, 2.4-phi centered, Phi_mean

Legend:
- < -1.74
- -1.74 – -0.75
- -0.74 – 0.75
- 0.76 – 1.25
- 1.26 – 1.75
- 1.76 – 2.00
- 2.01 – 2.25
- 2.26 – 2.50
- 2.51 – 2.75
- 2.76 – 3.00
- 3.01 – 3.50
- 3.51 – 4.00
- 4.01 – 5.00
- 5.01 – 6.00
- > 6.00
- Bathymetric Contours
- 8-nm boundary
- 3-nm boundary

Scale bars (both maps): 0, 12.5, 25, 50 Kilometers

Left panel labels: VC 11, VC 09, VC 07, VC 06, VC 05, VC 03, VC 01

Right panel labels: VC 07, VC 06, VC 05, SS 04

Legend (left panel):
- Vibra Core
- Grab Sampl
- 3-nm Bound
- 8-nm Bound
- Bathymetric

Legend (right panel):
- Vibra Core
- Grab Sample
- 3-nm Boundary
- 8-nm Boundary
- Bathymetric Contours

Scale bar (left): 0 5 10 20 Kilometers

Scale bar (right): 0 1.5 3 6 Kilometers

Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

SKIO 2014
Meters (MLLW)

	-2.2 - 0
	0.1 - 0.5
	0.6 - 1
	1.1 - 1.5
	1.6 - 2
	2.1 - 2.5
	2.6 - 3
	3.1 - 3.5
	3.6 - 4
	4.1 - 4.5
	4.6 - 5
	5.1 - 5.5
	5.6 - 6
	6.1 - 6.5
	6.6 - 7
	7.1 - 7.5
	7.6 - 8
	8.1 - 8.5
	8.6 - 9
	9.1 - 9.5
	9.6 - 10
	10.1 - 10.5
	10.6 - 11
	11.1 - 11.5
	11.6 - 12
	12.1 - 12.5
	12.6 - 13
	13.1 - 13.5
	13.6 - 14
	14.1 - 14.5
	14.6 - 15
	15.1 - 23

y Sound - SKIO Hydrographic Survey - 2014

1.5   3 Kilometers

Background Imagery:
Chatham County, GA 201

Not for Navigational Use

Ossabaw Sound

Ossabaw Sound Area - Bathymetric Surface Map

Depth in meters relative to mean lower low water (MLLW)
Hydrographic survey date: 2017

For information contact: Dr. Clark Alexander
Skidaway Institute of Oceanography
University of Georgia (SKIO/UGA)
clark.alexander@skio.uga.edu
Map created by: Mike Robinson, SKIO/UGA
Background imagery: Chatham County, GA, 2013
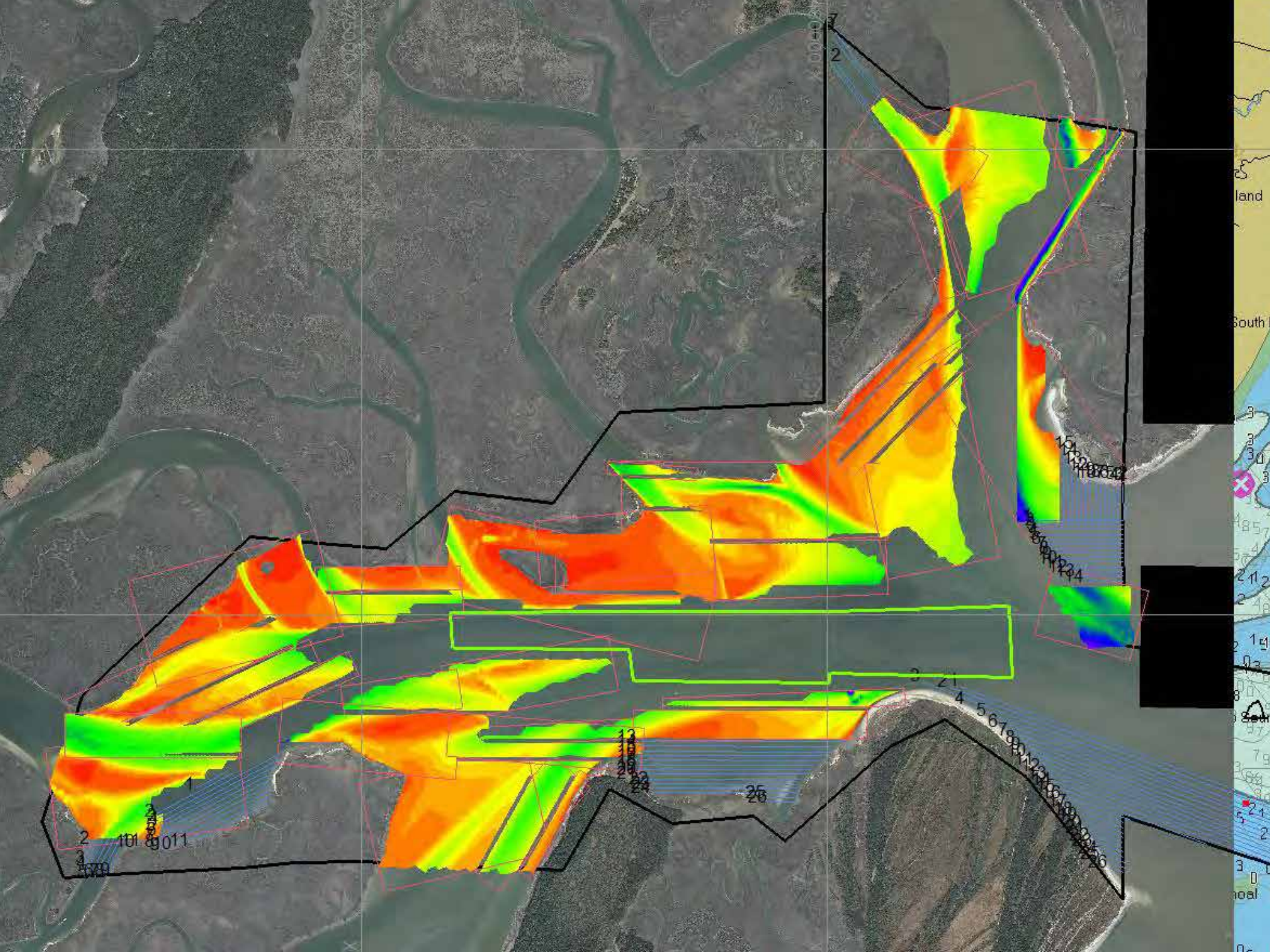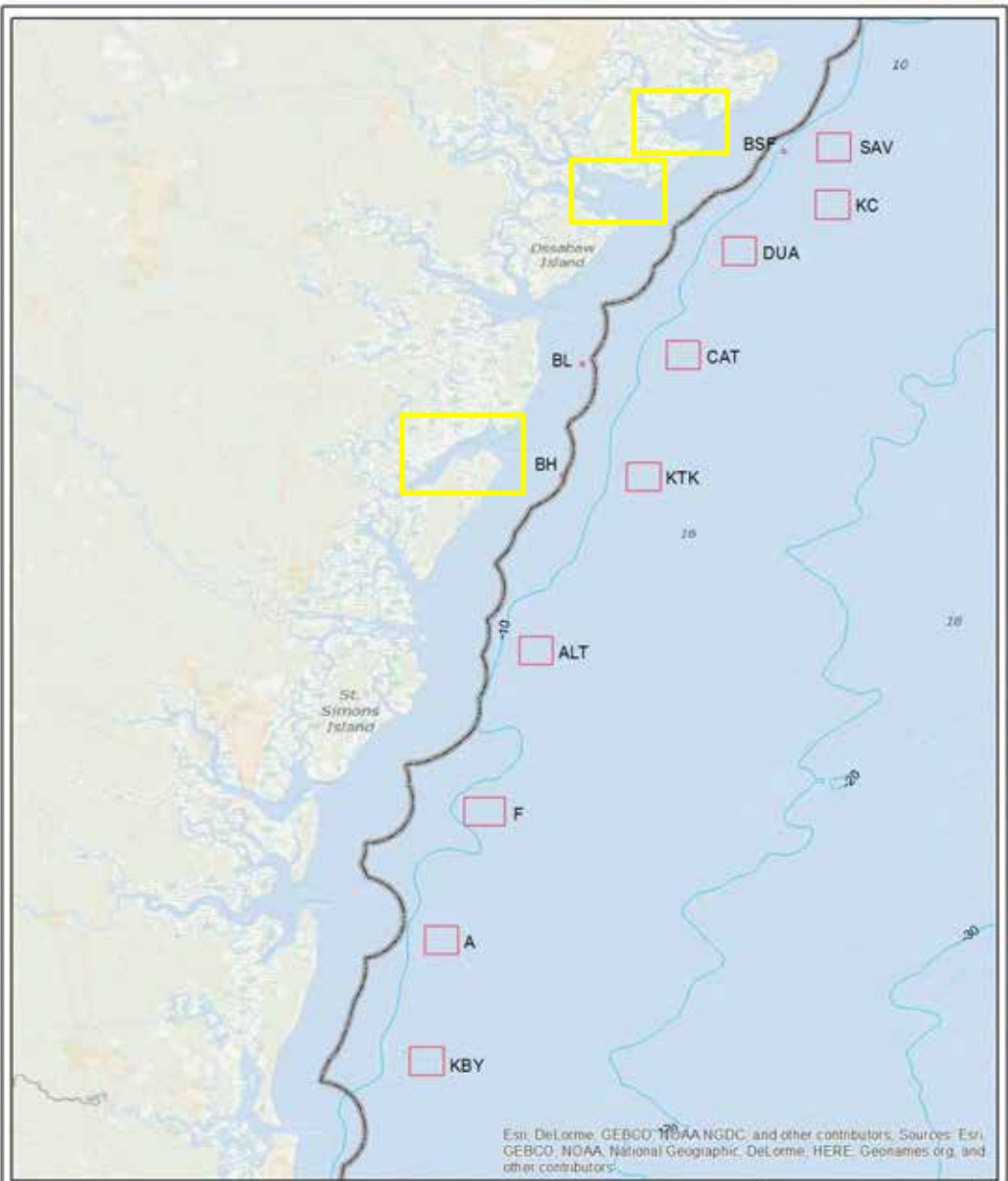
Depth		
Meters	4.6 - 5	10.6 - 11
-4.7 - 0	5.1 - 5.5	11.1 - 11.5
0.1 - 0.5	5.6 - 6	11.6 - 12
0.6 - 1	6.1 - 6.5	12.1 - 12.5
1.1 - 1.5	6.6 - 7	12.6 - 13
1.6 - 2	7.1 - 7.5	13.1 - 13.5
2.1 - 2.5	7.6 - 8	13.6 - 14
2.6 - 3	8.1 - 8.5	14.1 - 14.5
3.1 - 3.5	8.6 - 9	14.6 - 15
3.6 - 4	9.1 - 9.5	15.1 - 21.5
4.1 - 4.5	9.6 - 10	

GEORGIA

SkIO
The University of Georgia

Proposed Mapping Locations for
Georgia Department of Natural Resources
Artificial Reefs

Southeast Fishery-Independent Survey (SEFIS)

- Began in 2010
- Work with SCDNR-MARMAP
- Reef fish sampling program
- Use chevron traps and video
- Target hardbottom habitats
- Cape Hatteras to south FL

U.S. Department of Commerce

Why has multibeam sonar been used by SEFIS?
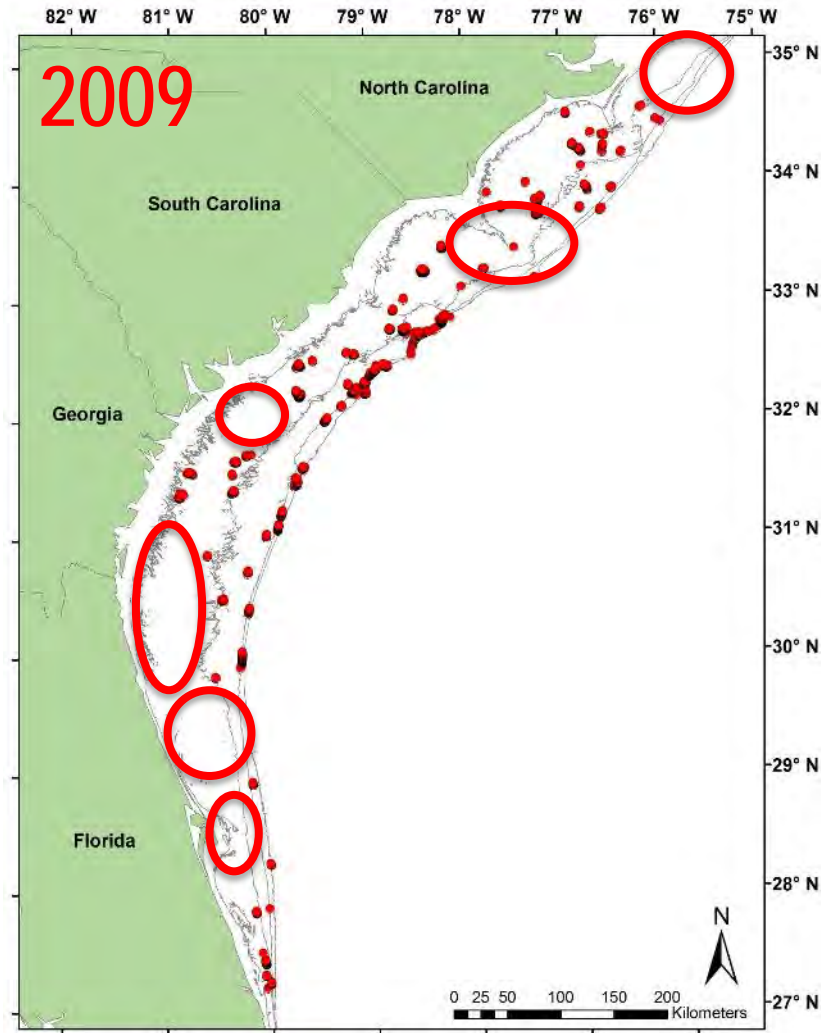
How has multibeam sonar been used by SEFIS?

SEFIS obtains hardbottom information from many sources:

- Fishermen
- Drop cameras
- Fishing charts
- Observers
- Agencies
- Predictive maps
- Fishery sonars

NOAA FISHERIES
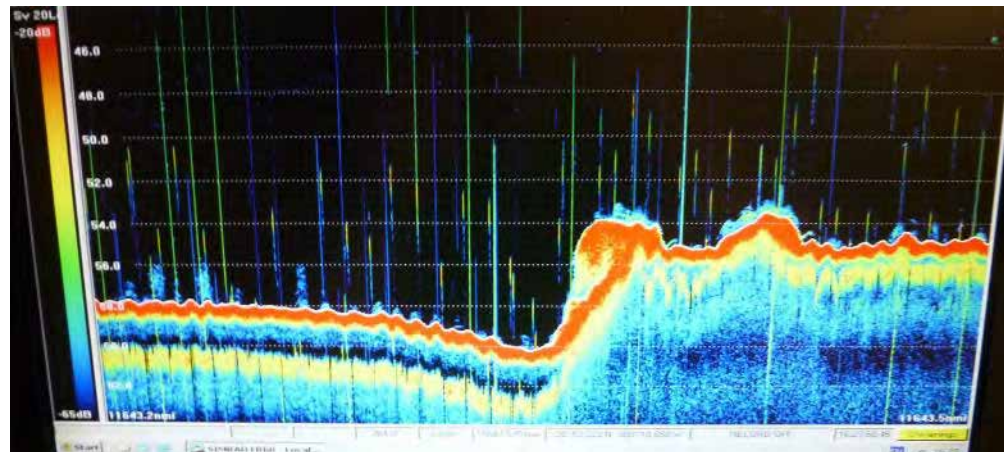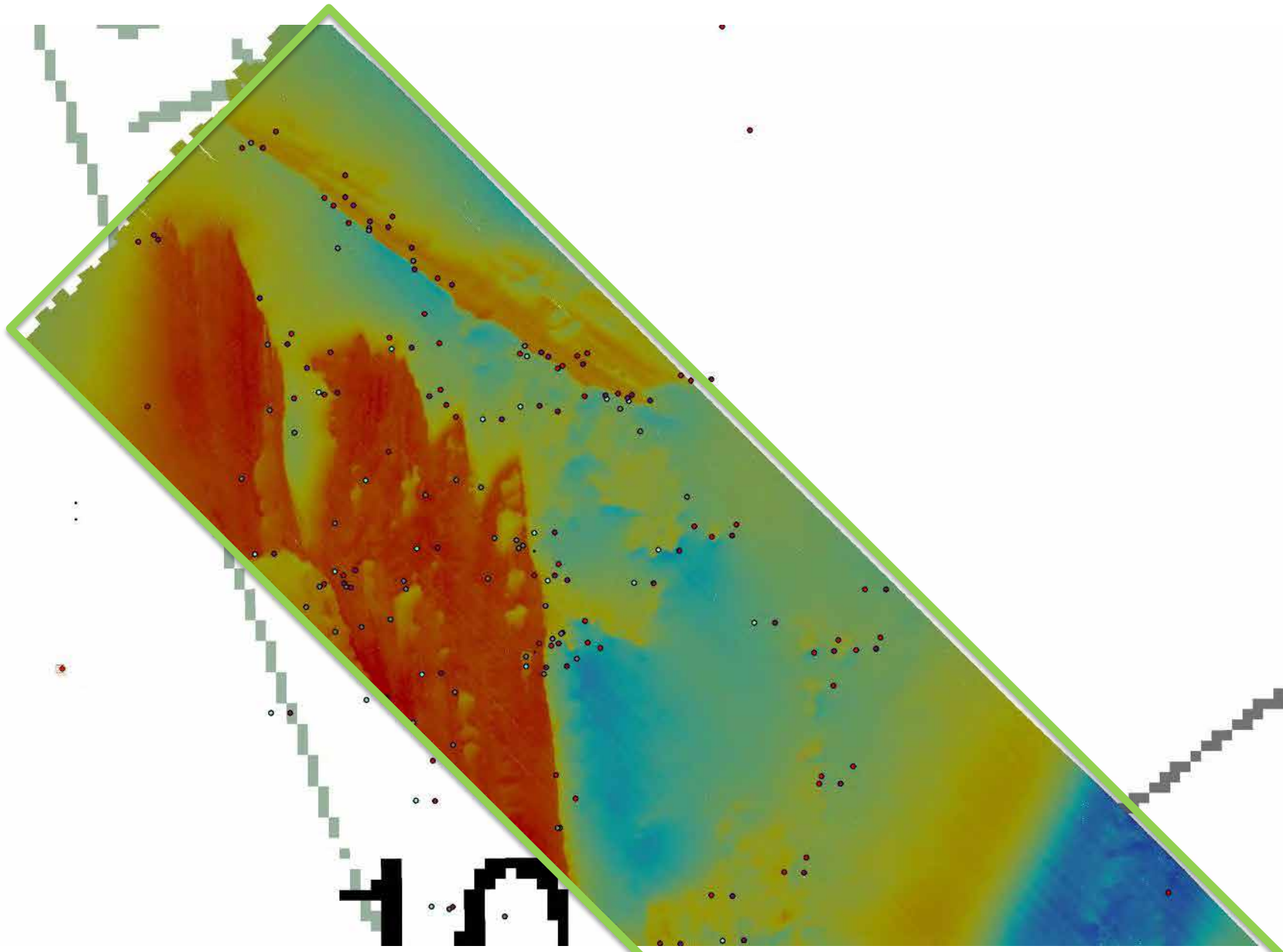
What ships have been used by SEFIS for mapping?

2010: NOAA Ship *Nancy Foster*

Reson 7125

Operated by survey techs

2011-2017: NOAA Ship *Pisces*

Simrad ME-70

Operated ourselves

Map quality from *Nancy Foster?*
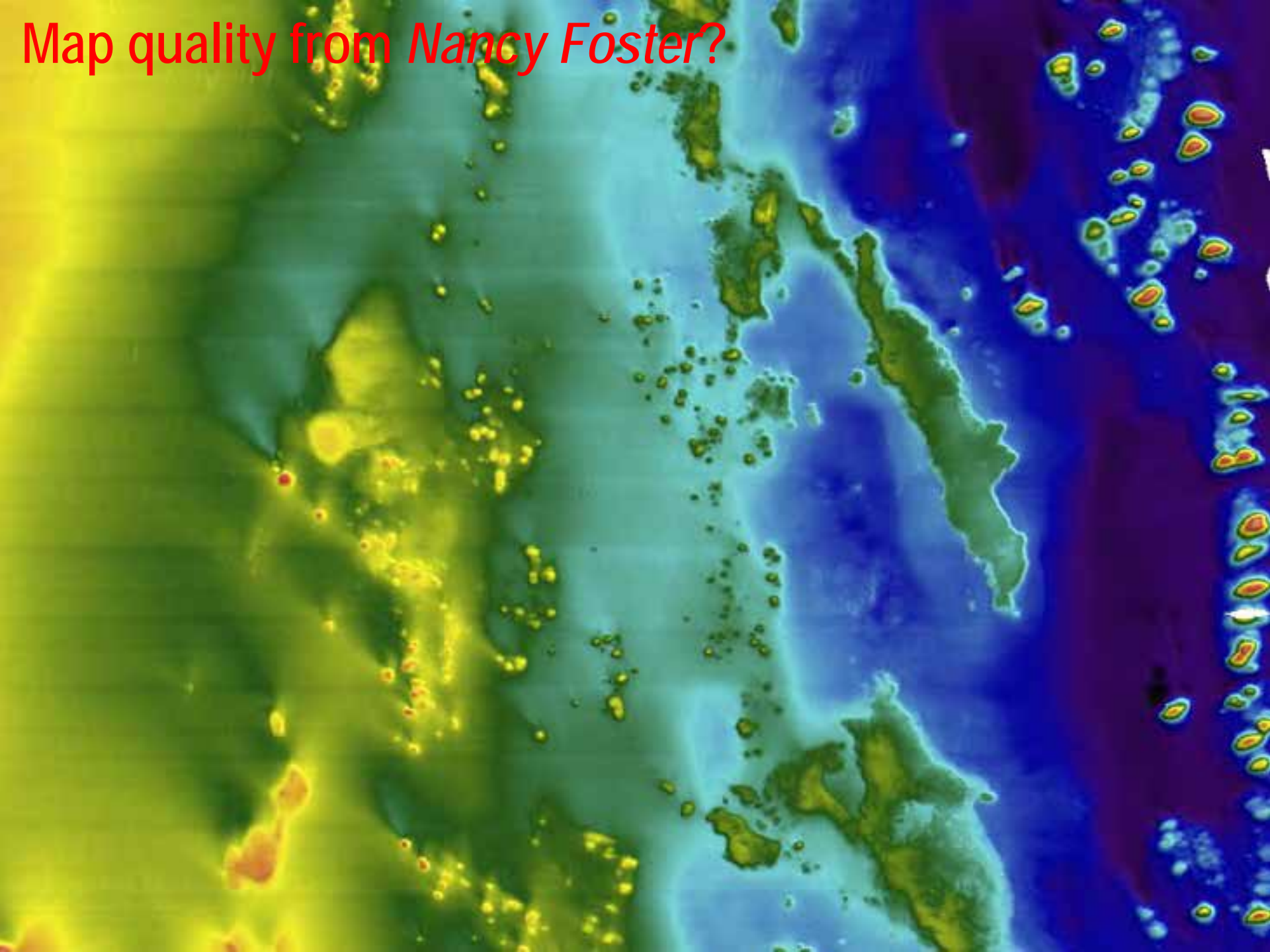
Map quality from *Pisces*?

2011
Poor quality but useful

NOAA FISHERIES
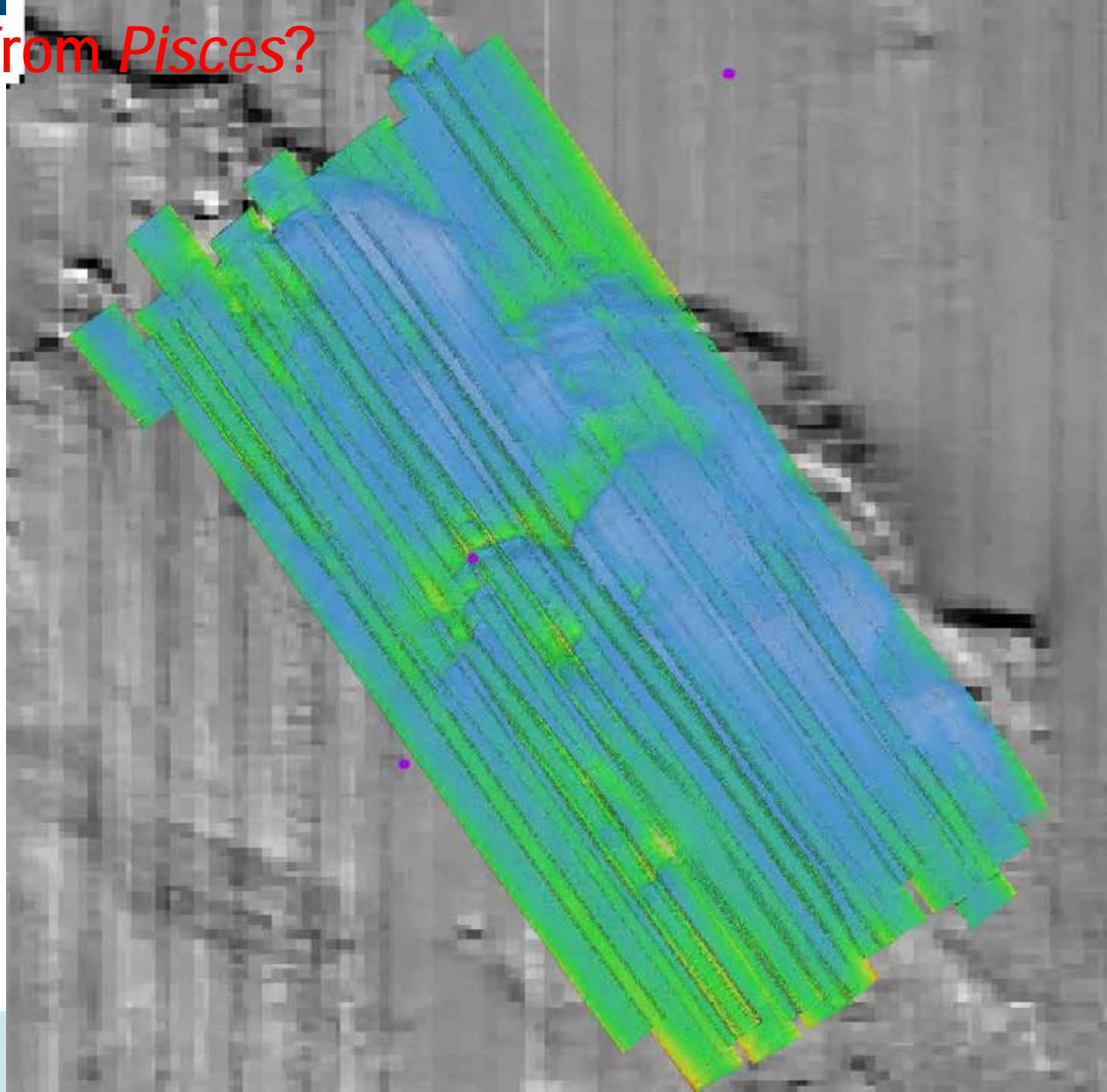
2012-13
Slightly better quality

Final Box 42

PC-12-04 Leg II Night 13
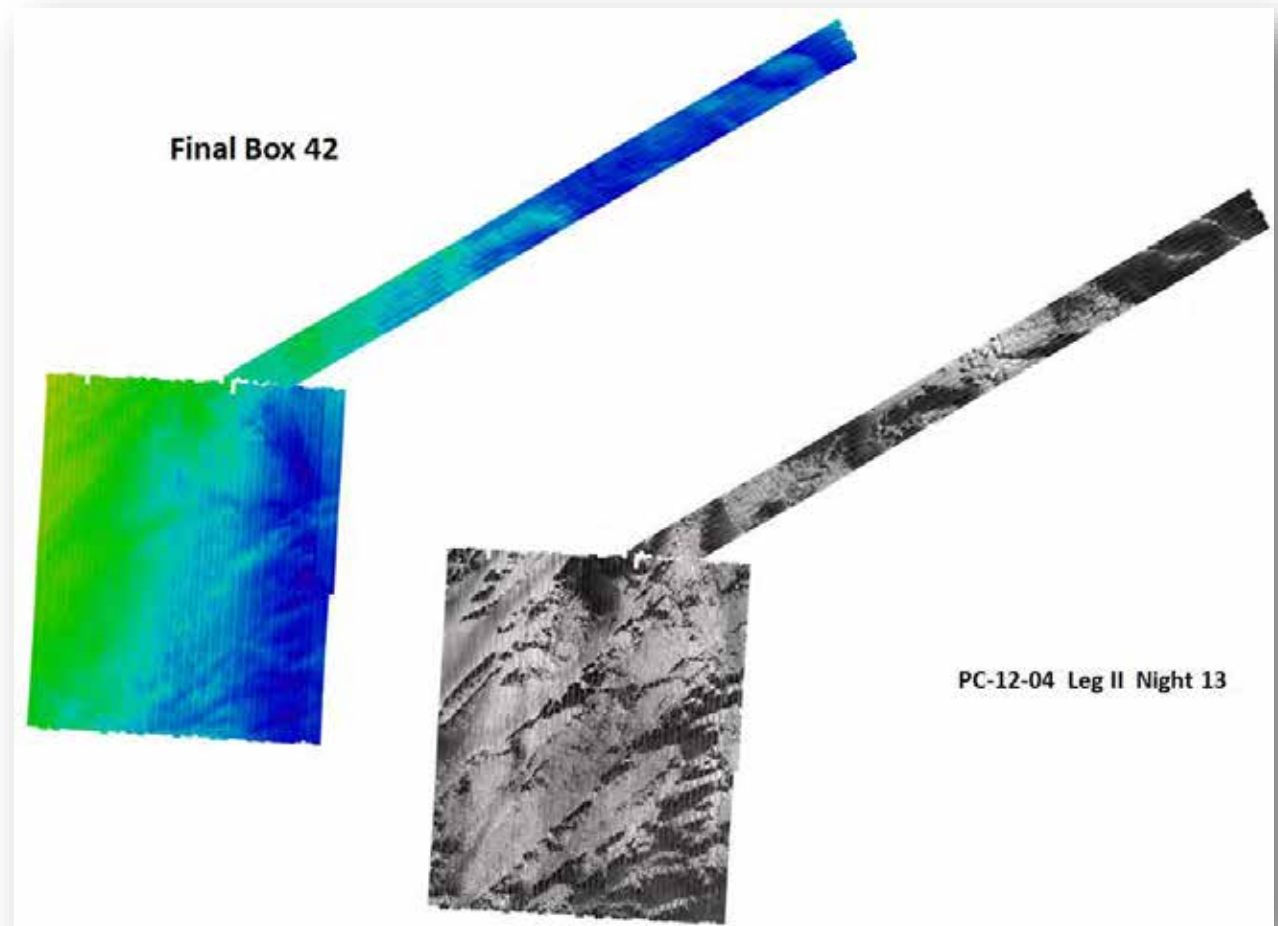
2014-17

Decent quality
Some data accepted for charts
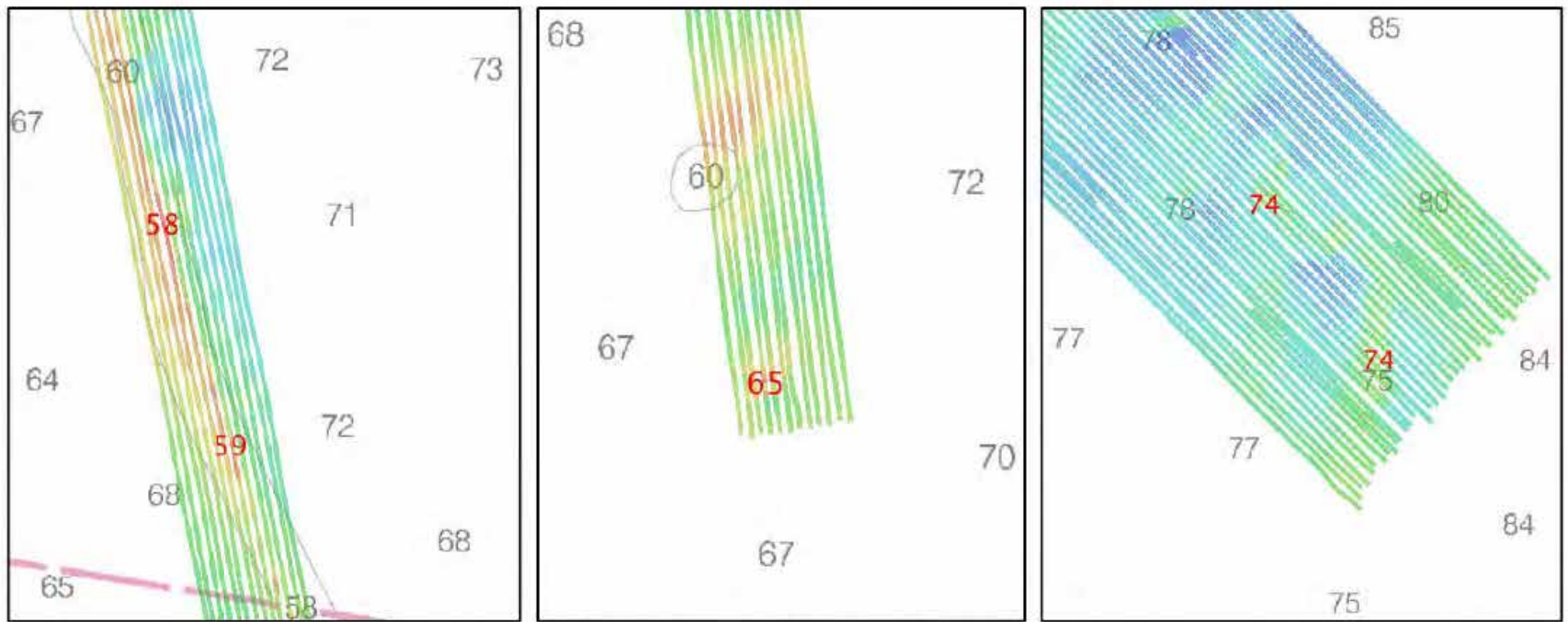
Figure 32. Filtered bathymetry and recommended soundings (red) from Box 108 (left), Box 97 (middle), and Box 92 (right). Charted soundings (grey) from Chart 11484. All soundings are in feet.

NOAA FISHERIES

Annual mapping totals

Year	Total mapping (km^2)
2010	350
2011	150
2012	385
2013	259
2014	250
2015	0
2016	465
2017	302
TOTAL	2,161
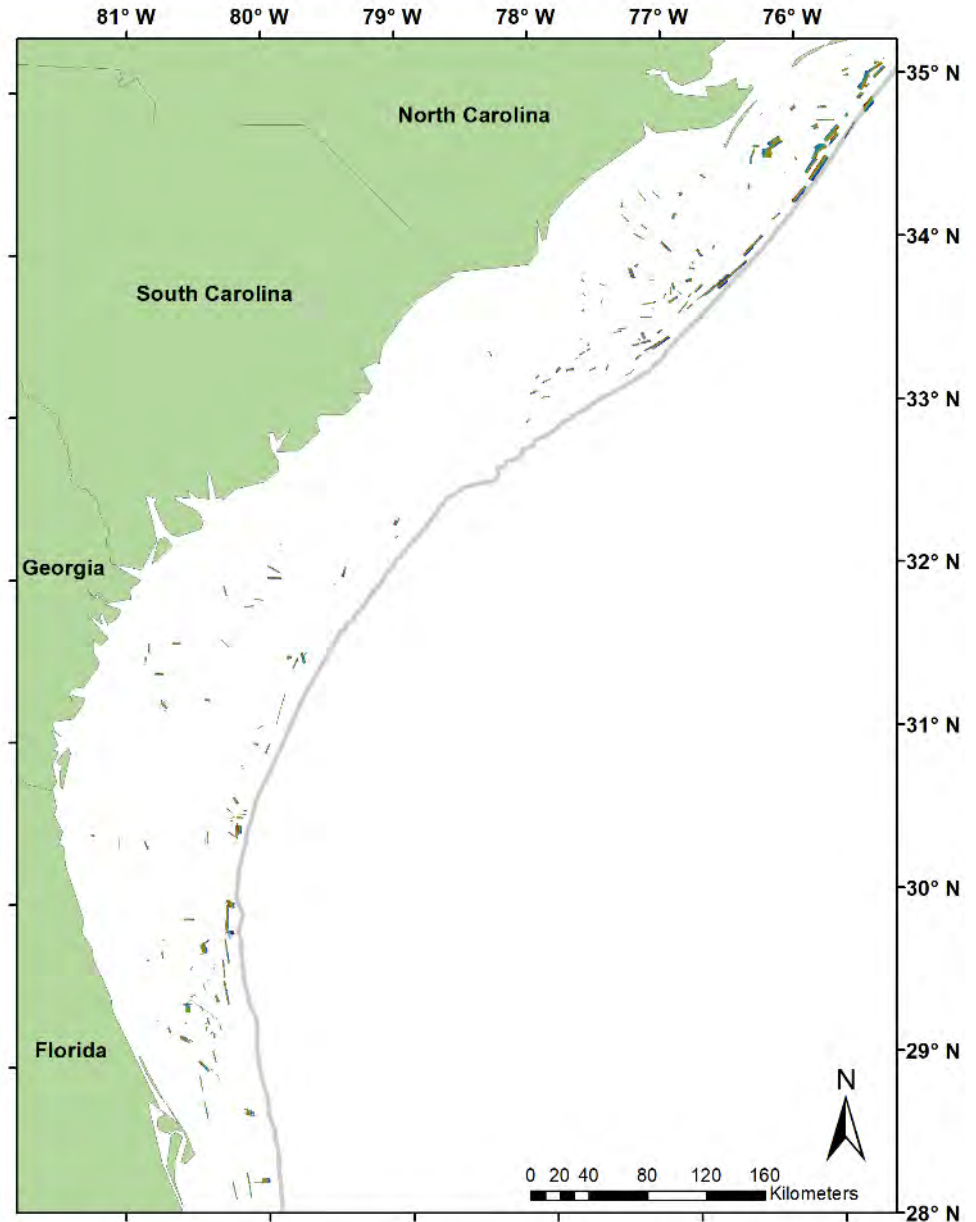
Sample universe expansion due to sonar mapping
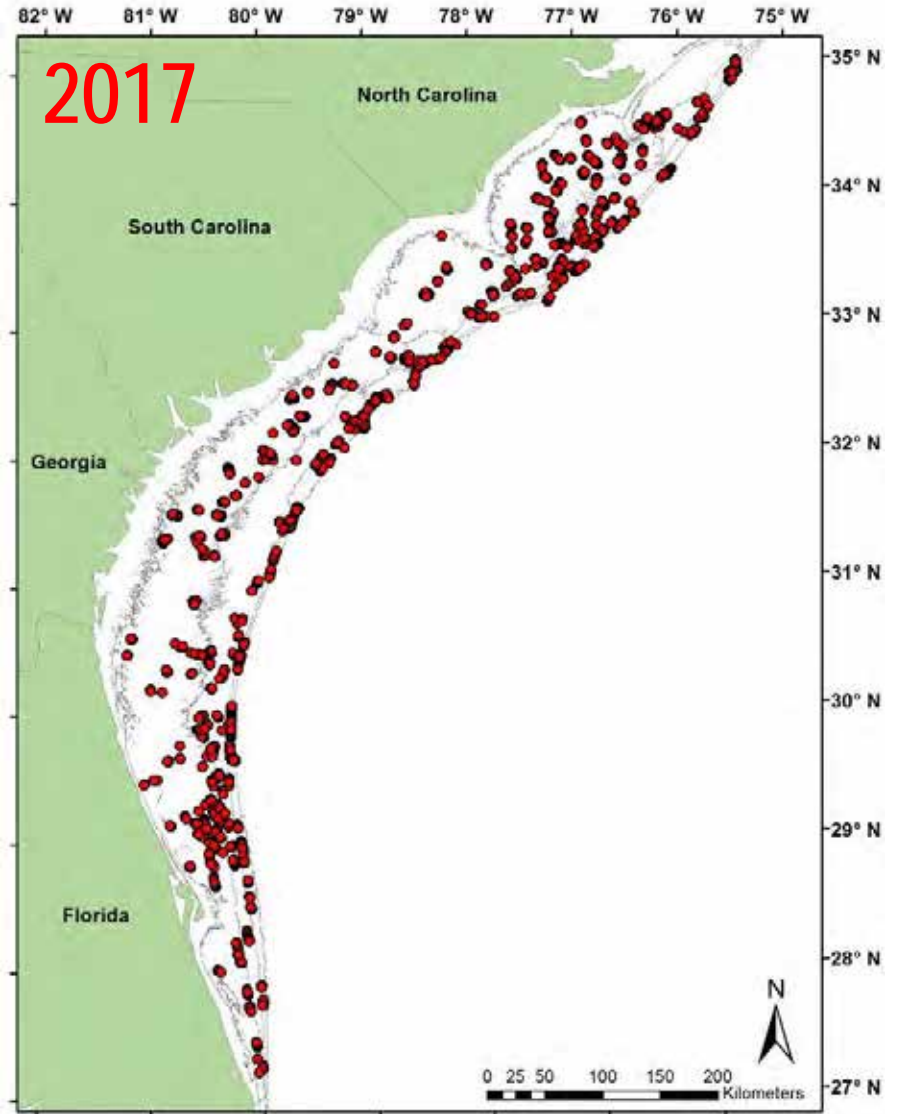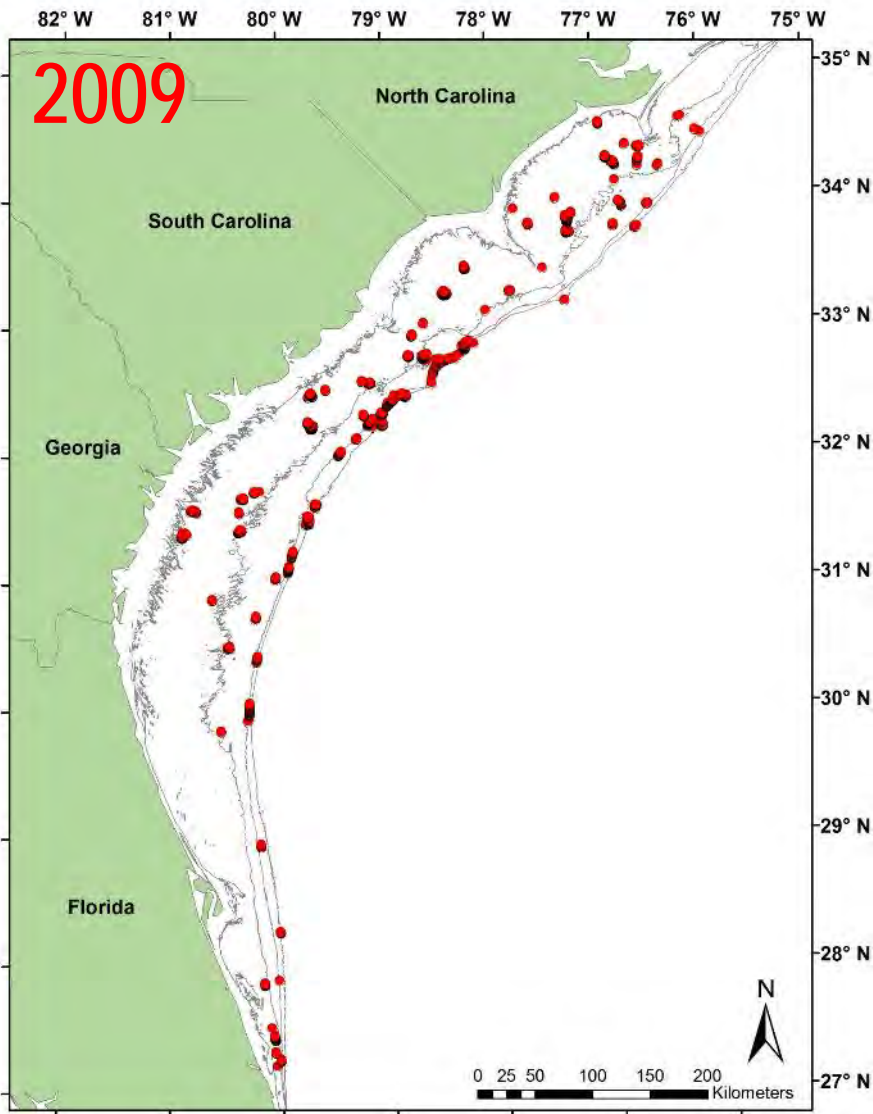
Future needs for multibeam data

- Any multibeam data in southeast USA between 13 and 200 m deep

- Any information on locations and extent of hardbottom

- Sonar maps classified into various habitat types is very helpful
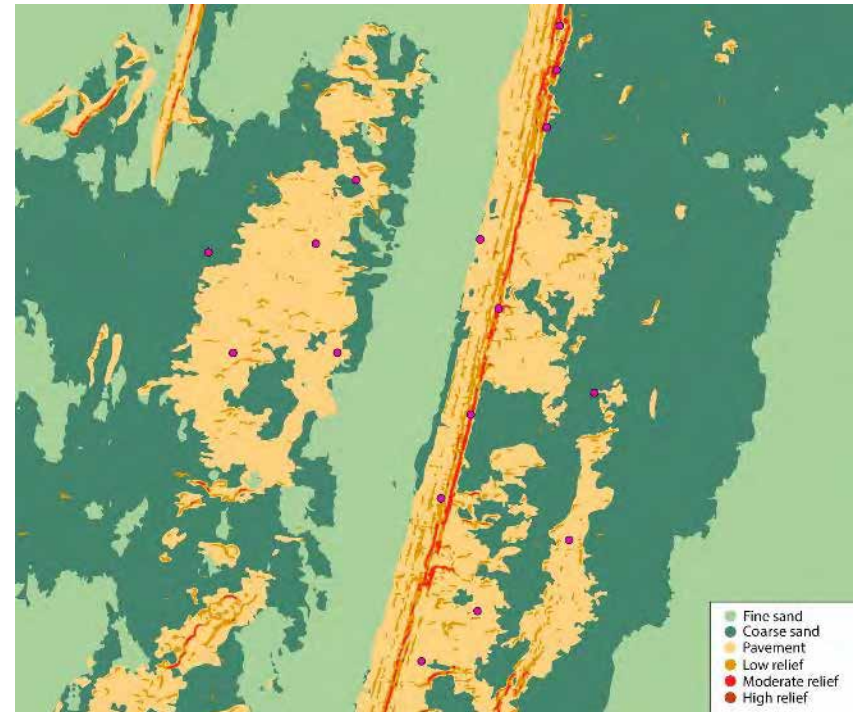
Acknowledgements

- NOAA Fisheries SEFSC staff: Warren Mitchell, David Berrane, Zeb Schobernd, Christina Schobernd, Charles Thompson, Brandi Noble

- Glen Rice, Matt Wilson, Laura Kracker

- Sonar watch standers: SCDNR and College of Charleston students

- Tom Weber, University of New Hampshire

- Randy Cutter, NOAA Fisheries SWFSC

- Josh Mode, Teledyne CARIS

- NOAA ship *Nancy Foster* and *Pisces* crew, officers, ETs, and STs, augmenting Survey Technicians

- SCDNR-MARMAP

A Process to Prioritization Seafloor Mapping

FL Coastal Mapping Program Workshop

Tim Battista

NOAA's Ocean Service

Marine Spatial Ecology Division

Habitat Mapping Team

January 10, 2018

Assumptions

- There are **<u>Not</u>** sufficient resources to map the entire coast.

- Not all areas have the same informational needs or level of importance.

- Data gaps exist and/or existing information may be adequate.

- Identifying priority locations maximizes the use of limited resources and strengthens support.

- A cohesive community is more effective– the Whole is bigger then the Sum of the parts.

Objectives

- "Where" - Solicit independent "priorities" from Agencies and Tribes. Seek convergence across all entries.

- "Why" - Capture the underlying management or planning need driving the priority. Use this to target products, technology and approach.

- Codify the community towards better collaboration, and addressing broader requirements.

- Embrace common collection standards, shared data, and shared resources.

- Invigorate future investments.

Implementation

- Long Island Sound - 2012
  (Battista & O'Brien 2015. Coastal Management, 43: 35-51)

- US Caribbean - 2013

- Washington State – 2015
  (Battista, T., Buja, K., Christensen, J, Hennessey, J., and K. Lassiter. Prioritizing Seafloor Mapping for Washington's Pacific Coast. Sensors, 17(4), 701)

- Southern California Bight - 2016

- Lake Michigan - 2017

Project Timeline

Phase 1: Spatial Prioritization (SP) Pre-Planning (TAT). *June – Sep '14*

Phase 2: SP Planning Workshop I (TAT & Stakeholders). Oct '14

Phase 3: SP Exercise. *(Jan 29 to Mar 18 '15)*

Phase 4: SP Workshop II (TAT & Stakeholders). *May '15*

Workshop 2 Objectives

Spatial Prioritization Exercise

Analyze Priority Areas

Refine Priority Areas

Where And Why

Develop Priority Narratives

Why^2

Select Mapping Product Categories

What

Study Area
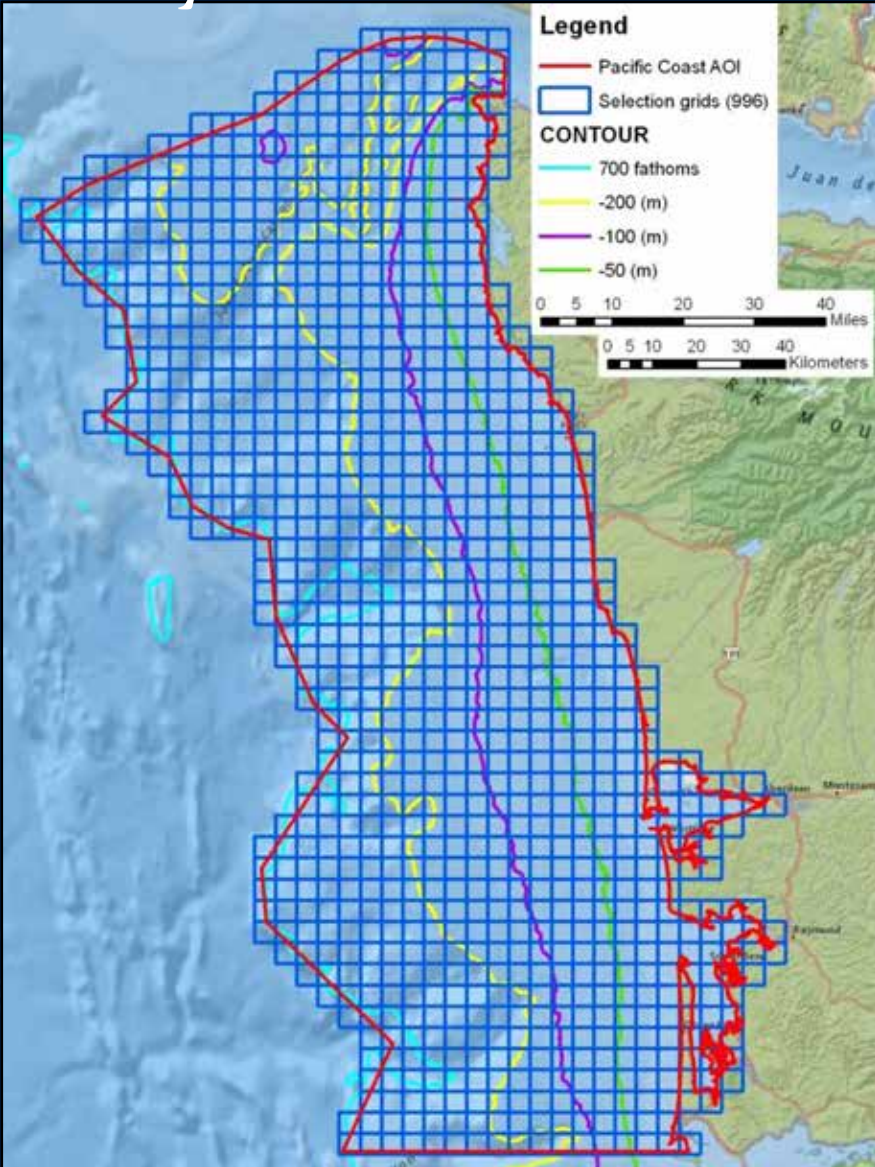
- Project AOI defined by WA Marine Spatial Planning study area.
- 700 fathoms to shoreline "zone".
- Based Standard OCS blocks of 4.8 x 4.8 km (3 x 3 mi)
- 996 grid cells

Digital Atlas
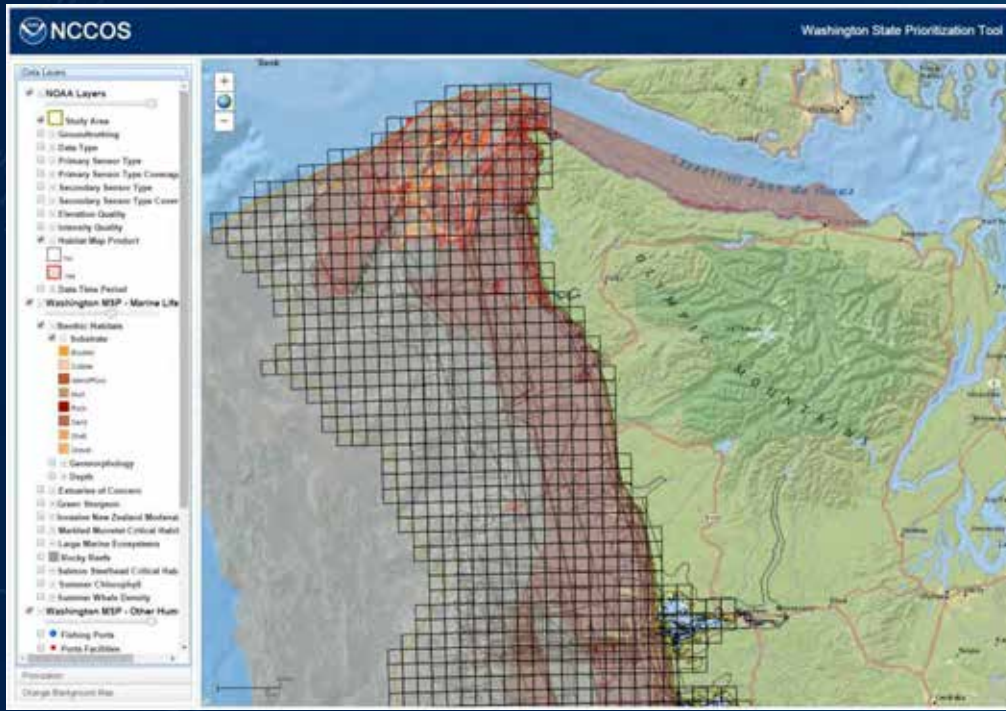
Use relevant WMS:

- TNC Regional Data
- MarineCadastre.gov
- WA Marine Spatial Planning Portal

- Project Boundary and Grid
- Marine Infrastructure
- Critical Habitat
- Managed Areas

- Survey Extents
- Interpreted Geological Surfaces
- Hydrography

Prioritization Approaches

1. Token

- 100 Coins
- Semi-quantitative
- More specific
- "If I had a hundred dollars..."
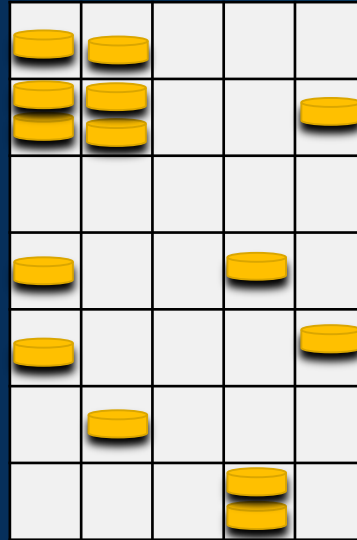
RULE: 10 coin maximum in a cell

2. Categorical

- Qualitative
- More general
- H needed in 1-2 years
- M needed in 3-5 years
- L needed eventually
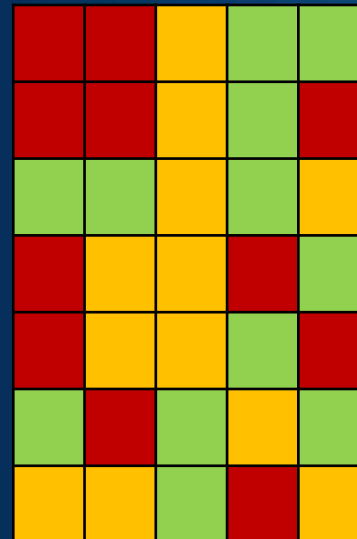
RULE: 1/3 of cells must be in each category

Respondent Input

Set Categories + Forced Input Constraint Approach:

Priority:

- A relative measure of the need for seafloor mapping information for a grid cell.
- (High, Medium, Low, or None)
- Limited High and Medium votes (1/3 ea.)

Management Issue:

- Overarching management issue (by grid cell) driving the "Priority" designation.
- 11 Set choices. Must choose one.

Ranking Criteria:

- Describes the Management Issue further.
- 8 Set choices. Must Choose one.
- Optional Ranking Criteria 2 and 3.
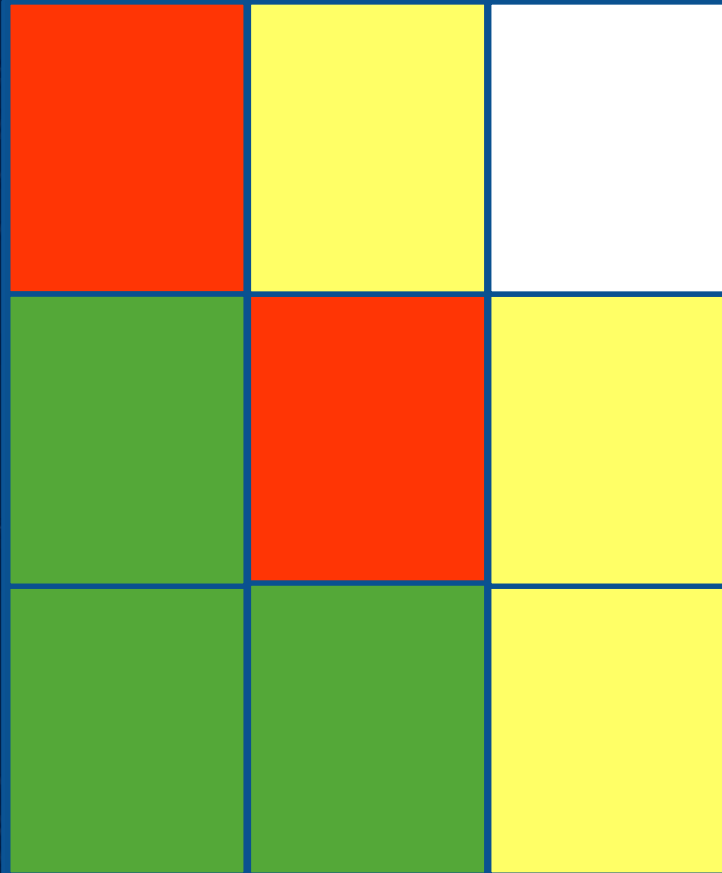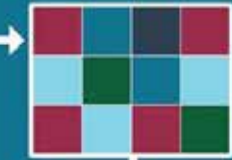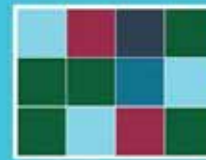
Web AppBuilder for ArcGIS

Frequency of Selection

This map was generated by looking at data generated by all mapping prioritization respondents. For each "Management Issue" that was identified as being a "High Priority" more often than expected, a map of the total number of times each point was identified as such was developed (*i.e.*, a cumulative frequency of "high priorities" map).

With 18 respondents, these maps could range from 0 (no one identified it as high) to 18 (everyone identified it as high). The results were then classified into 5 percentile groups (0-20, 20- 40, 40-60, 60-80 and 80-100) to view the resulting spatial pattern.

Legend:
- Lowest 20%
- 20-40%
- 40-60%
- 60-80%
- Highest 20%

Frequency of Selection
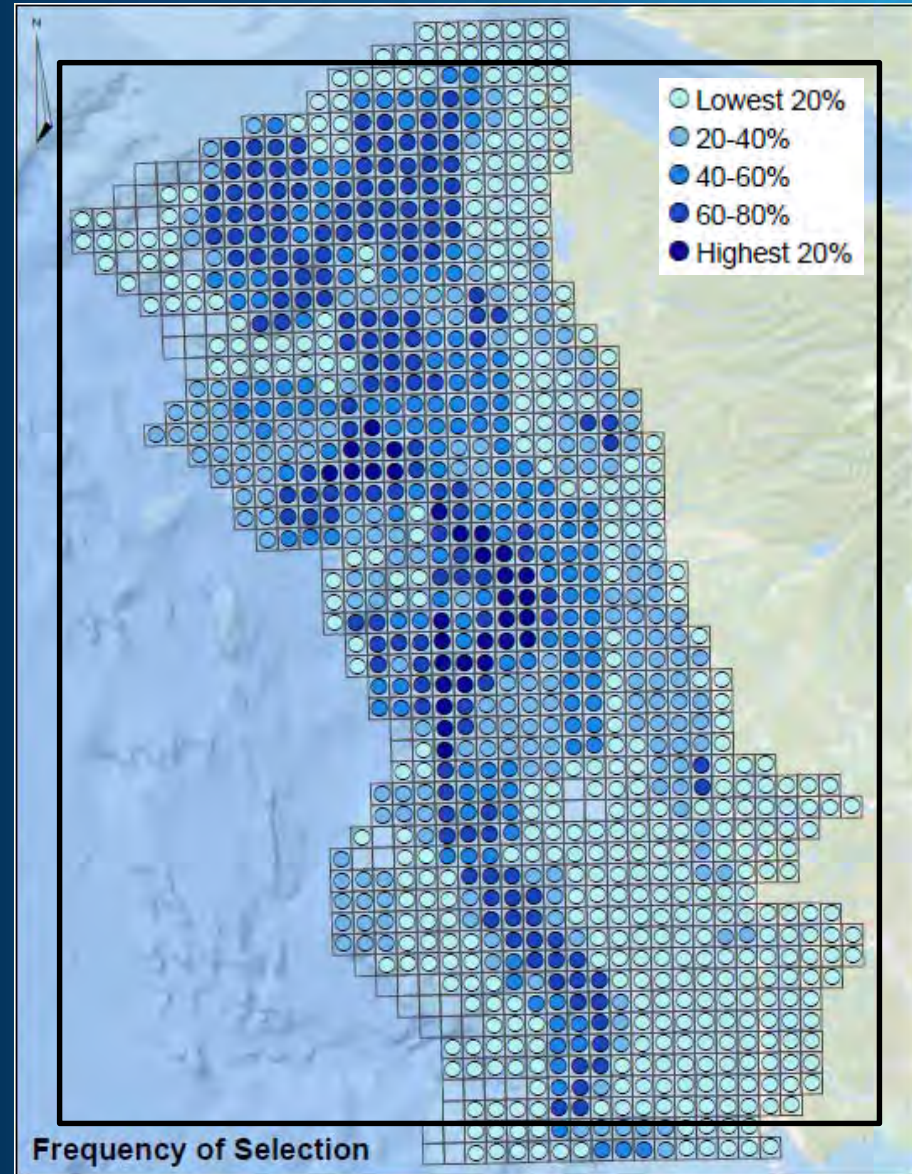
Hot Spot Analysis – Significant Management Issue
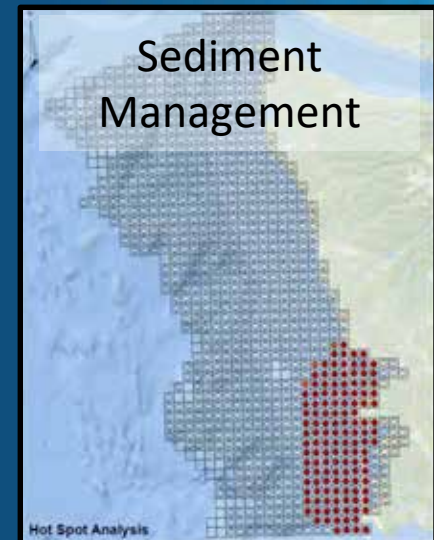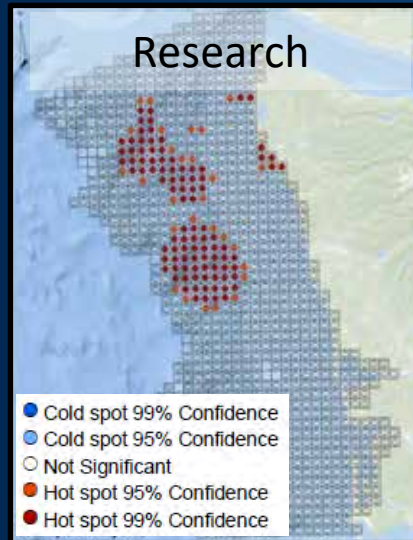
Hot Spot Analysis – Combined Significant Management Issue

Using the same input data as the previous map, the combined hotspot frequency data were then modeled to provide a "heat map" of the cumulative hotspots. The heat map shows red where hotspot frequencies were high and blue where hotspot frequencies were low. This map was generated to better visualize the patterns in our area of interest.

In addition, we plotted a line around the top 25th percentile of the model to serve as a starting point for our preliminary priority mapping area discussions. This line is shown as a yellow feature around the "hot" areas.

N

0   40 Kilometers

Cumulative hotspot
- Low
- Medium
- High

Top 25th percentile of cumulative hotspot model
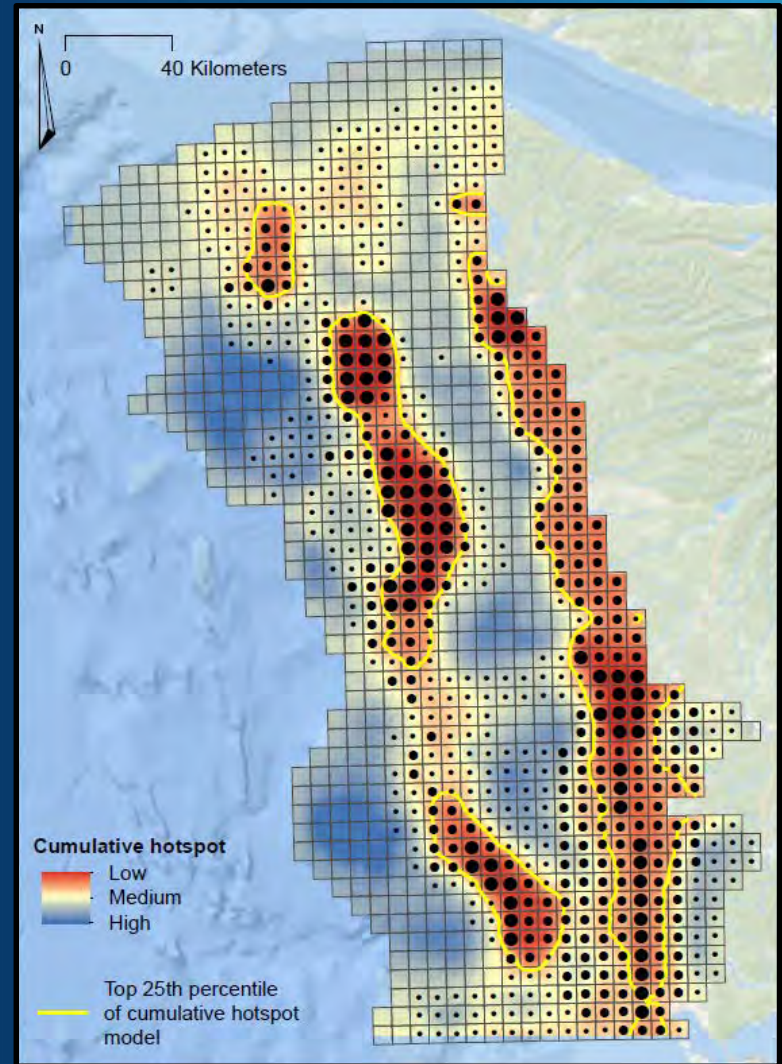
WA Prioritization Results

Area of Interest = 8,964 square miles | 23,220 square kilometers
Preliminary Area = 2,601 square miles | 6,737 square kilometers
Minimum depth = 0 feet | 0 meters
Maximum depth = 4,800 feet | 1,465 meters

Offshore Area 1

Nearshore Area 1

Nearshore Area 2

Offshore Area 2

Offshore Area 3

N

0   40 Kilometers

Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors
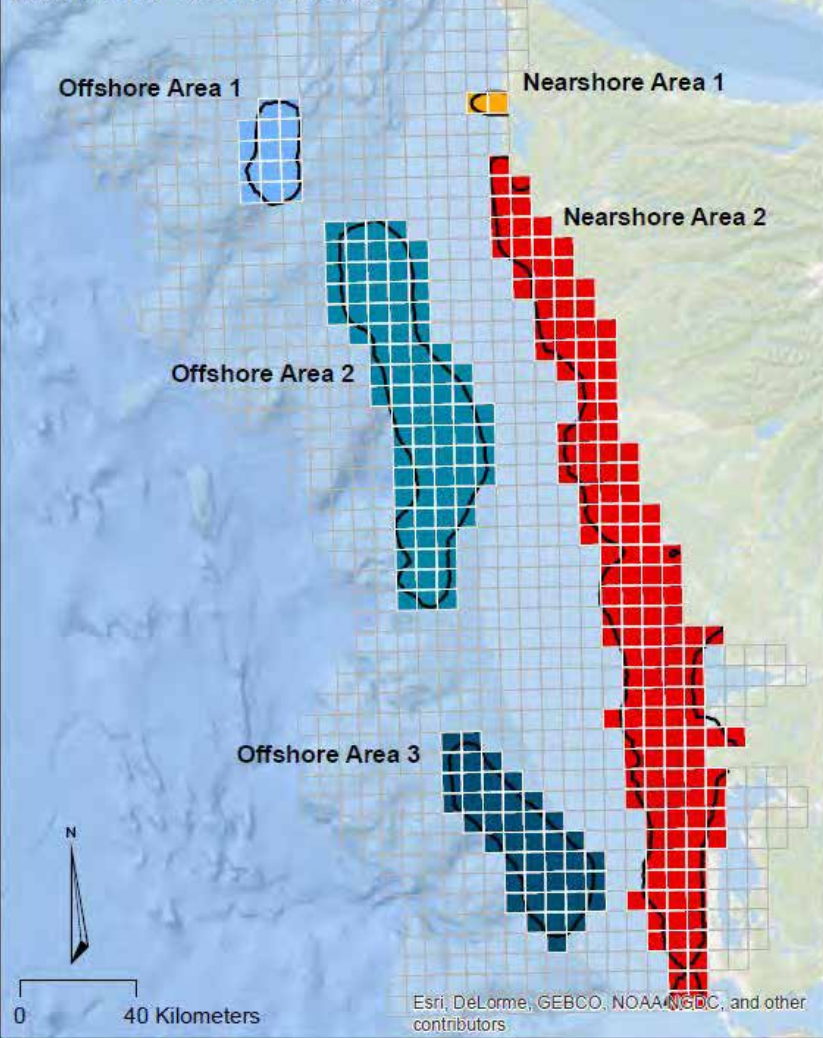
This map identifies all of the cells in the original area of interest that intersect – or that are contained within – the 25th percentile boundary of the cumulative hotpot model.

From which can conduct Participatory GIS (PGIS) to refine areas further.

Develop Support Narrative for each Priority Area

Summary Statistics | Offshore Area 1

Issue	# Responses	% of Responses	Listed Criteria 1
Ecosystem based management	62	34.6%	Multiple use, *managed areas, knowledge gap, significant natural areas*, potential infrastructure
Living resource management	51	28.5%	*Knowledge gap, Significant natural area*
Coastal inundation	28	15.6%	*Other important areas*
Safety and Navigation	14	7.8%	*Multiple use*
Other	13	7.3%	*Other important areas*
Research	10	5.6%	*Knowledge gap*
Other regulatory	1	0.6%	*Potential infrastructure*
TOTALS	**179**	**100.0%**	

Area = 126 square miles | 326 square kilometers
Minimum depth = 361 feet | 110 meters
Maximum depth = 2,428 feet | 740 meters
Represents 1.5% of entire area
Captures 2% of all high priority selections
Captures 4% of high priority selections for Living Resource Management

Individual Agencies

Quileute Tribe Response

Priority and Management Issue / Priority and Primary Criteria
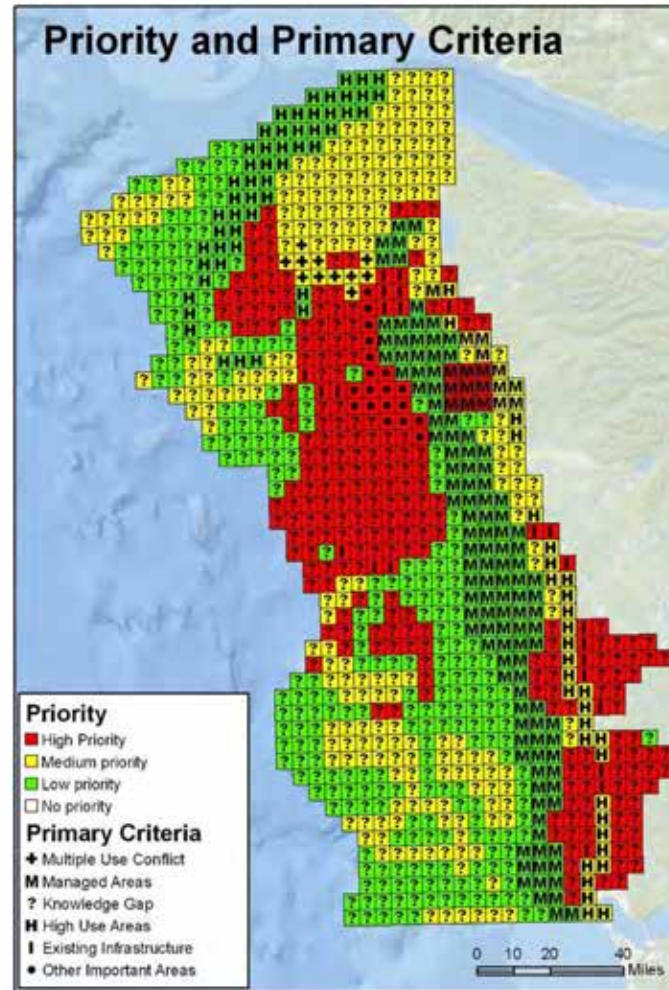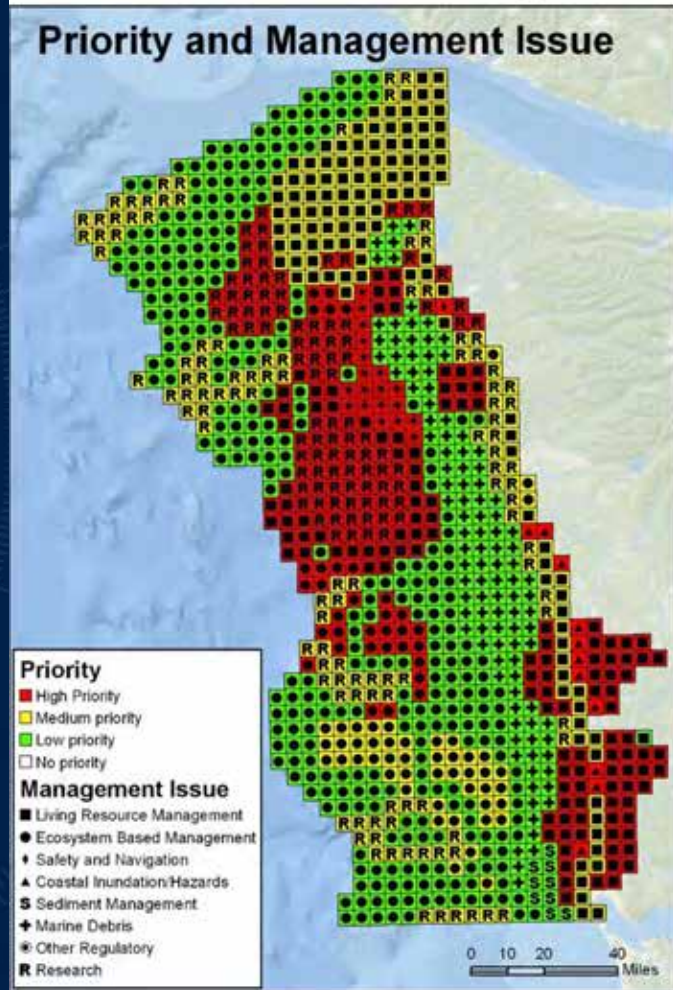
2016/17 Nautilus – 5 DAS
2016/17 *Rainier* – 20 DAS
2018 *Rainier* – ? DAS
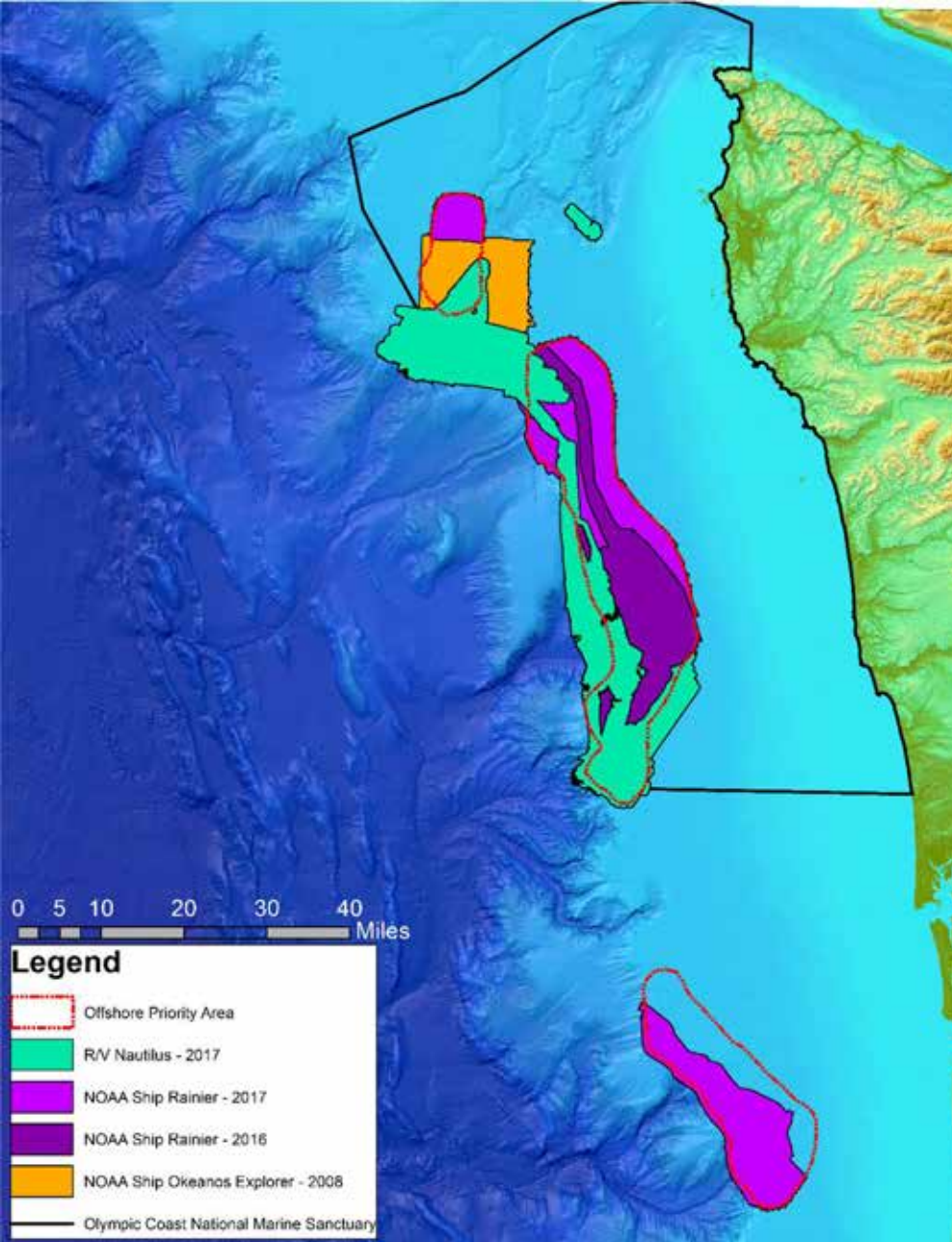
Develop Production Process

LIS Prioritization Results

LIS Priority Areas (smoothed)

Priority

- High
- Medium High
- Medium Low
- Low
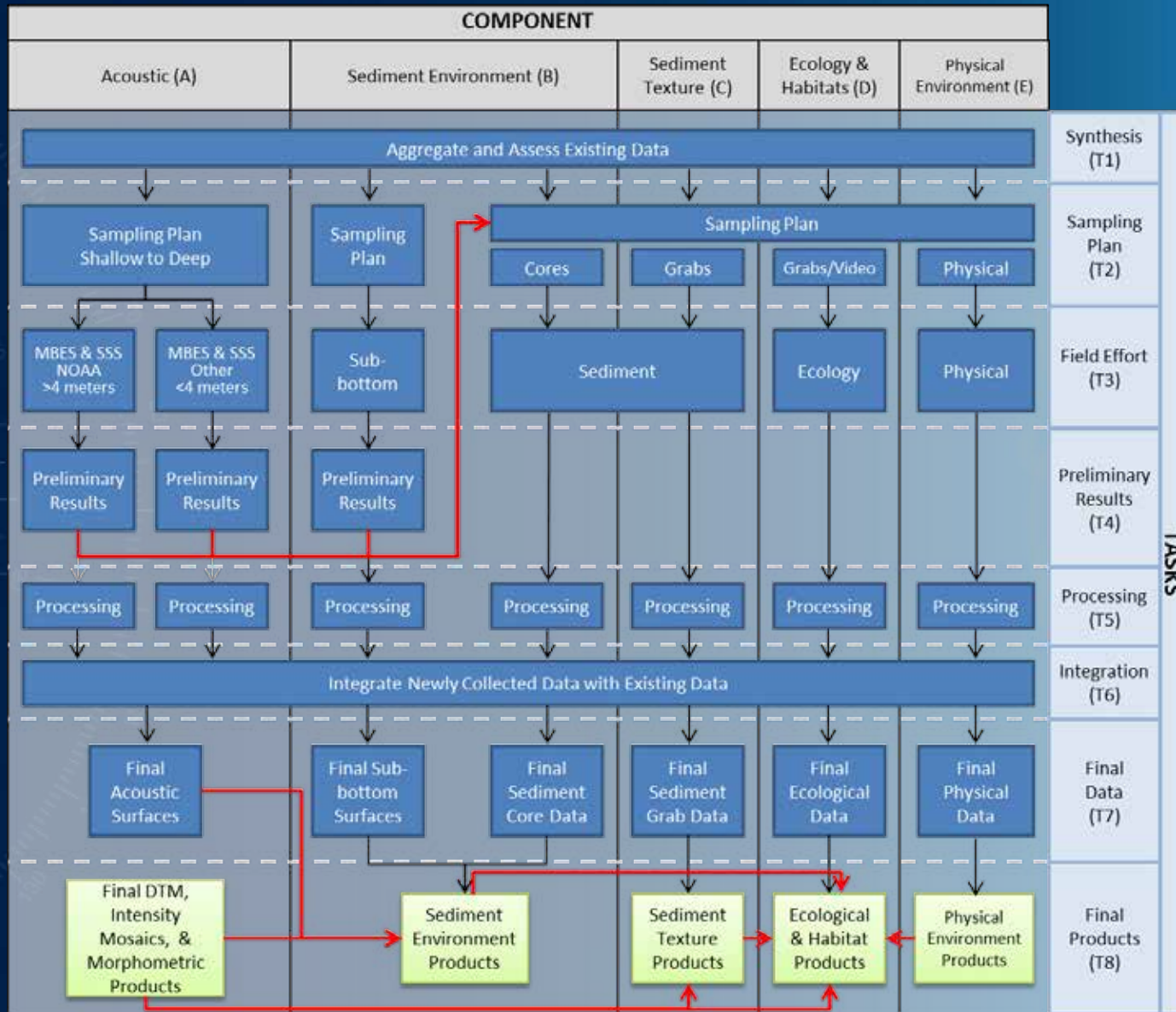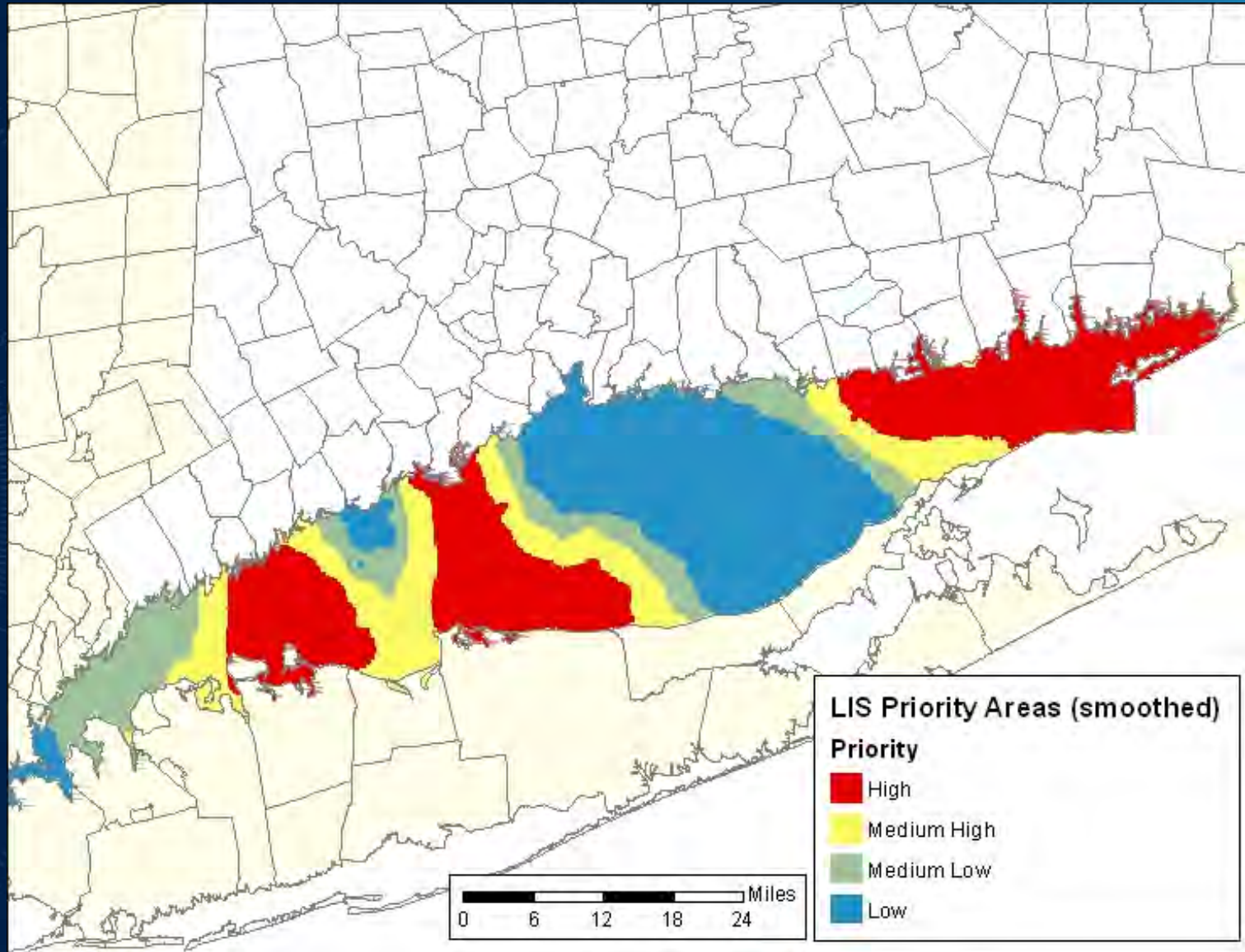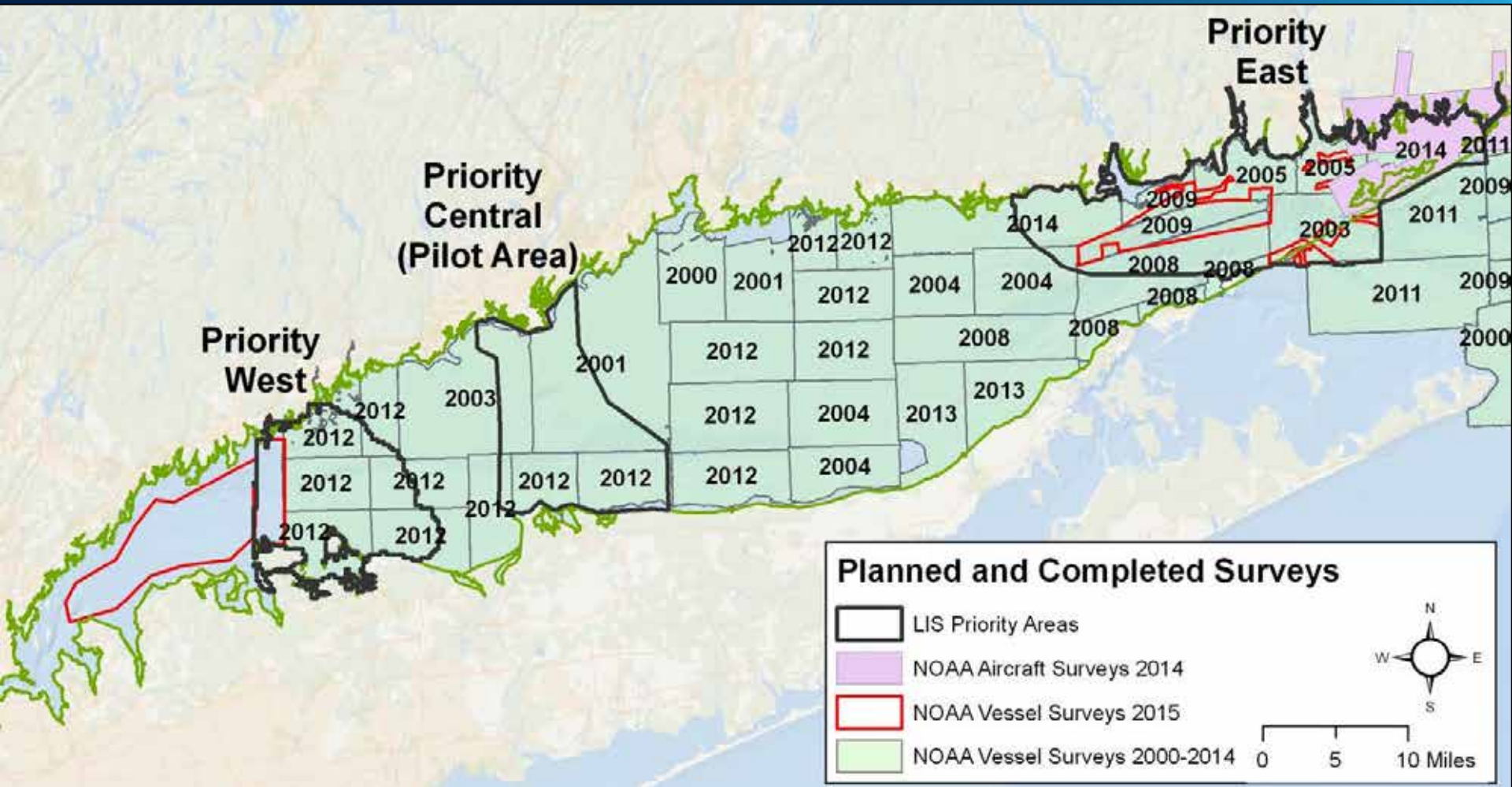
2015 *Nancy Foster* – 25 DAS

2014 *Thomas Jefferson* – 72 DAS

2014 Twin Otter – 24 DAS

2013-14 NRT 5 – 92 DAS

2013 *Thomas Jefferson* – 35 DAS

2012 *Thomas Jefferson* – 56 DAS

LIS Cost & Survey Planning

East Block Survey Estimate	
Total area (sq.km.)	1.5
Depth Min (m)	1.4
Depth Max (m)	5.6
Average Depth (m)	3.2
Line Angle	174.7
Line spacing Min (m)	4.0
Line spacing Max (m)	13.0
Number of lines	232
Length of lines (km)	191
Survey time w/o turns (h)	14.7
Turn time (h)	11.6
Tie Lines Count	9
Tie Lines Total Length (km)	8
Tie Lines Survey Time (h)	0.6
Transit Time (h)	4.3
SVP Time (h)	1.3
Overall Survey Time (h)	32.54
Overall Survey Time (days)	3.25

East Block 1 to 3 Fathom LIS Survey Estimate

Line Plan
Proposed Survey Block
1 to 3 Fathom Depth Zone
Data Gaps
Area of Interest

Coordinate System:
UTM Zone 18N,
WGS84 horizontal datum,
MLLW vertical datum.

Esri, DeLorme, GEBCO, NOAA NGDC, and other

0   0.25   0.5   1 Km

Figure 2. Survey estimate of a sample block on the eastern side of the AOI within the 1 to 3 fathom depth zone

4

Demonstration

Washington
https://maps.coastalscience.noaa.gov/wasp/wasp.html

Lake Michigan
https://maps.coastalscience.noaa.gov/wil
m

Thank You!

Tim Battista – NOAA's Ocean Service
National Centers for Coastal Ocean Science
Silver Spring, MD
Tim.Battista@noaa.gov
240-533-0379
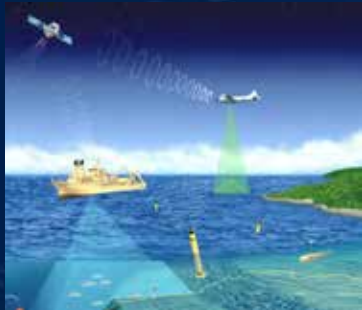
What is IOCM

IOCM is *planning, acquiring, integrating, and managing* **ocean and coastal geospatial data and derivative products for easy access and use by the greatest range of users.**

Three primary tasks:

**1. Data Acquisition
2. End-to-End Data Management
3. Maximum Use and Re-Use of data**

Coordinate & Collaborate:

- Avoid costly duplication of effort

- Maximize survey time

- Meet multiple science & mission requirements

- Enables & promote cross-agency collaboration
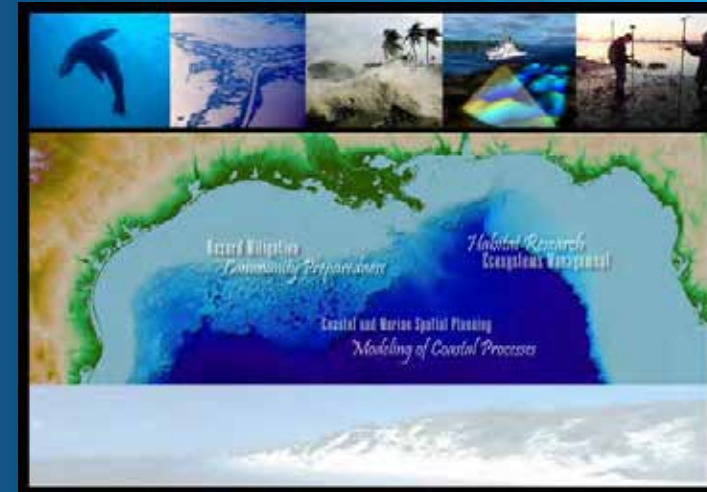
IOCM General Update:

- OCS, RSD plans incl hurricane supplemental
  - Increased water column data acquisition – *where/when possible*
- 3D Nation Study update, Seabed 2030
- External Source Data, Crowd-source Bathy
- Working with OMAO to incorporate an IOCM section into the OMAO Project Instructions for FY19
- Re-designed NRT Mission Focus
- Regional Mapping Workshops: WA State, FCMP, GOMA, SE, and NE
  - Mapping Prioritizations

NOAA Coast Survey
and
NGS Remote Sensing Division
Plans

HSD Story Map

NOAA's NATIONAL OCEAN SERVICE

Mapping a 3D Nation: Requirements and Benefits Study Goals

- Refresh NEEA for the years beyond the initial 8-year acquisition program
- Understand inland, nearshore, and offshore bathymetric data requirements and benefits
- Understand how requirements and benefits dovetail in the coastal zone
- Sensor agnostic/Technology Neutral
- Focused on need for, and value of, elevation data
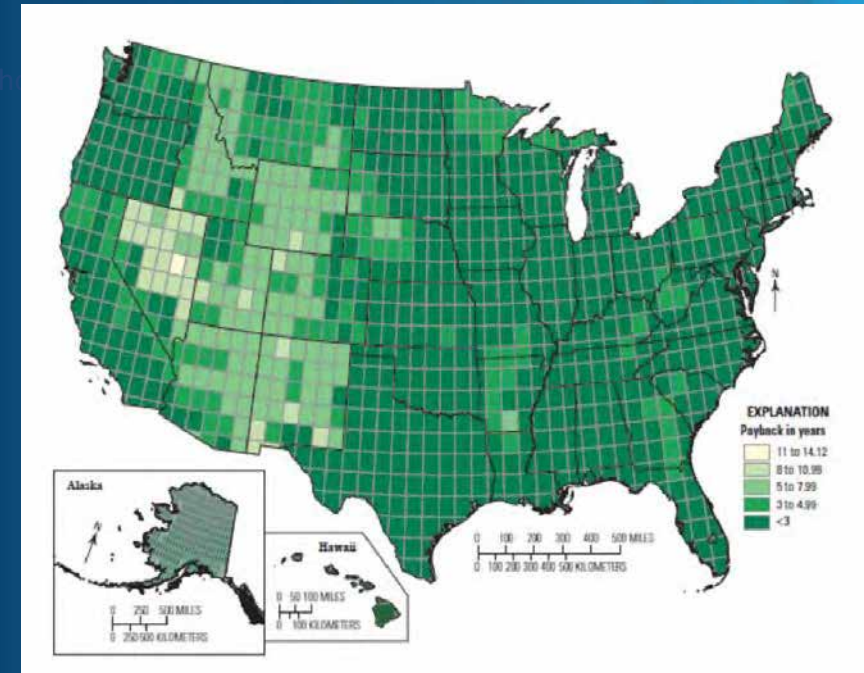
A comprehensive inventory of user requirements and benefits for elevation data

Seabed 2030 Initiative

Global initiative led by The Nippon Foundation and the General Bathymetric Chart of Oceans (GEBCO) Guiding Committee to facilitate *the complete mapping of the ocean floor by the year 2030*.

NOAA's Bathymetric Data
Gap Analysis for Seabed 2030

Target Resolutions:

Depth range	Grid-cell size	% of World Ocean
0-1500 m	100 x 100 m	13.7
1500-3000 m	200 x 200 m	11
3000-5750 m	400 x 400 m	72.6
5750-11000 m	800 x 800 m	2.7
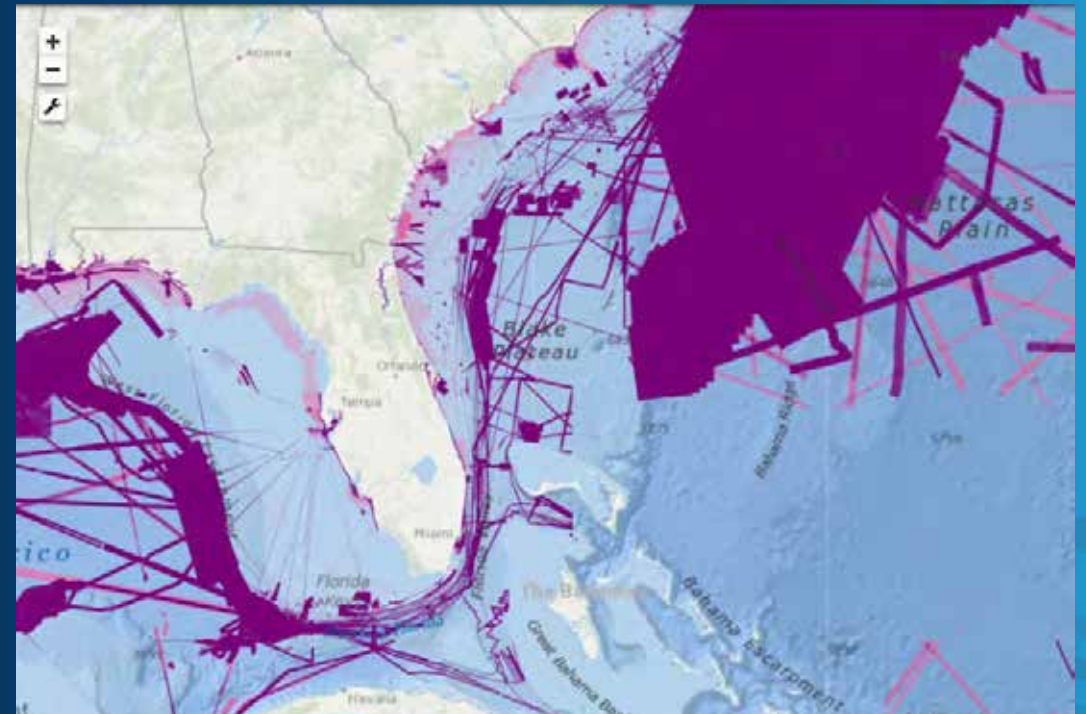
Seabed 2030
How you can contribute

U.S. Mapping Agencies and Partners will be KEY

- U.S. is responsible for U.S. waters – EEZ, shelf
- 24 govt/research institutions, universities, businesses already participating, and this number is growing
- **First big step – Discovery, sharing of existing data to fill gaps**
- Anything not already at NCEI or other accessible site
- Agency, partner, stakeholder data with good metadata
- Agreement on, and use of, common standards
- **Sharing of plans at FEDMAP and collaborative mapping campaigns to fill more gaps**
- IHO Crowdsourced Bathymetry initiative

IHO Data Center for Digital Bathymetry

Recognized IHO repository for all deep ocean bathymetric data (greater than 100 m) collected by hydrographic, oceanographic and other vessels.

Data are sent to the IHO DCDB, where NCEI provides long term archive and data management.
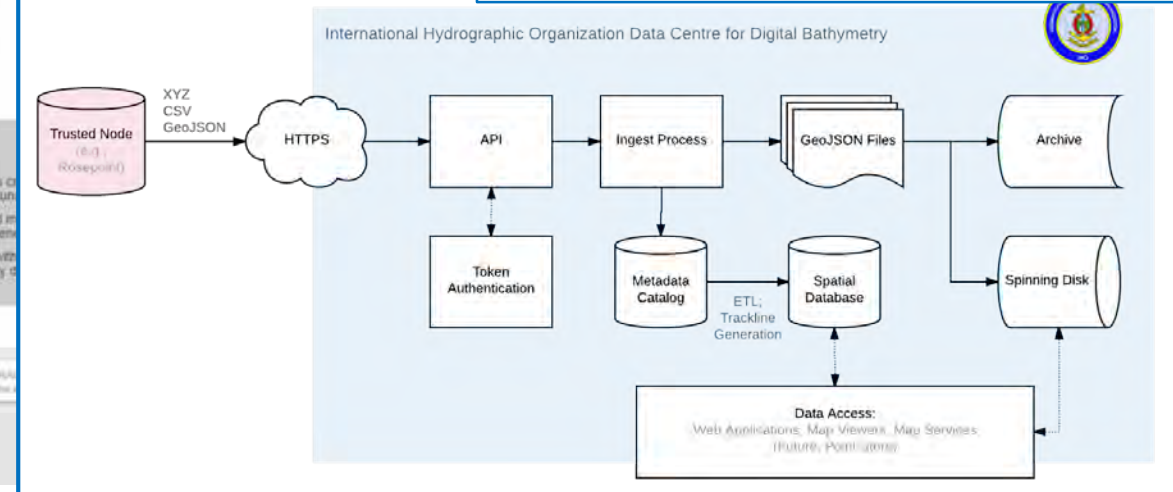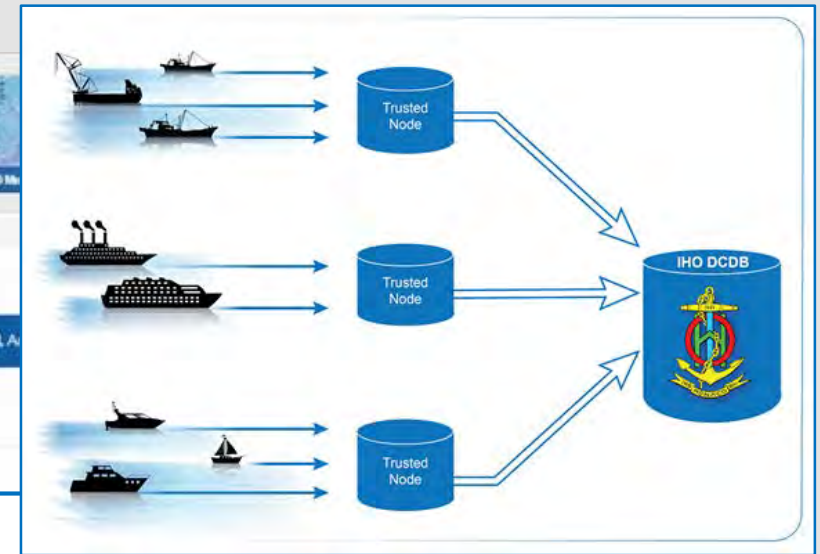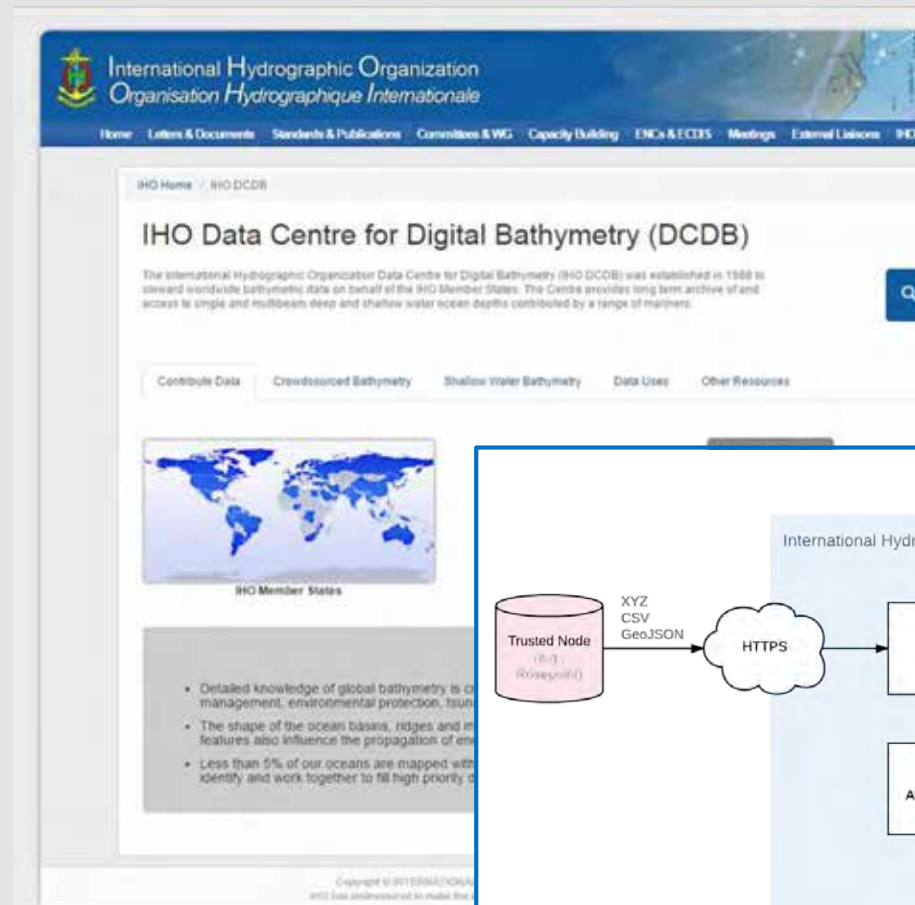
U.S. Federal Mapping Coordination Site
fedmap.seasketch.org
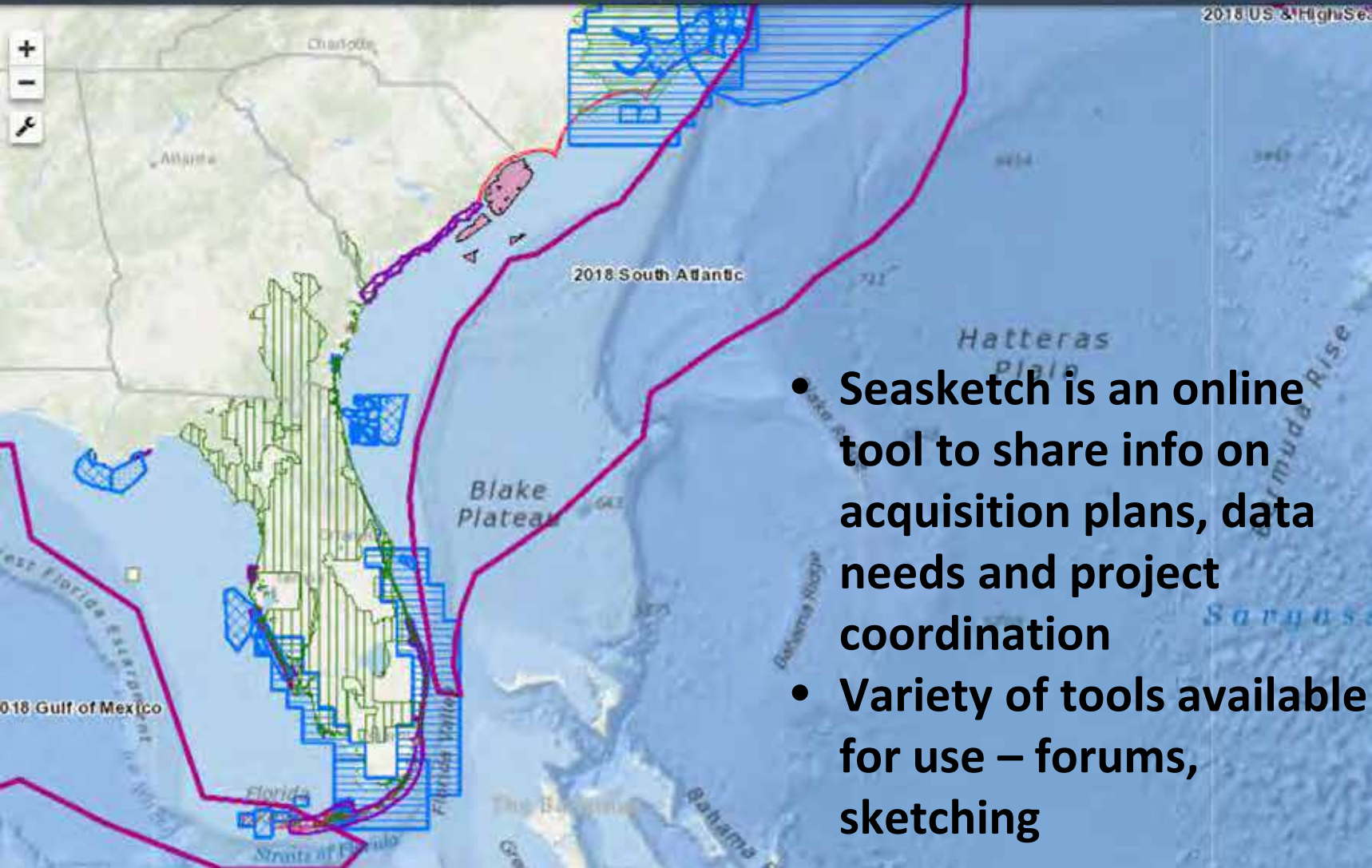
- **Seasketch is an online tool to share info on acquisition plans, data needs and project coordination**
- **Variety of tools available for use – forums, sketching**

2019 Potential Collaborative IOCM/OCNMS Mapping Project

- Seafloor Mapping Prioritization Heat Map for Washington's Coast
  - Nearshore and Offshore

- IOCM, OCNMS, WA State collaborative mapping project on NOAA Ship RA: 2016 – 2017

- Working with OCNMS for a potential 2019 or 2020 collaborative project in the nearshore area in Central WA.
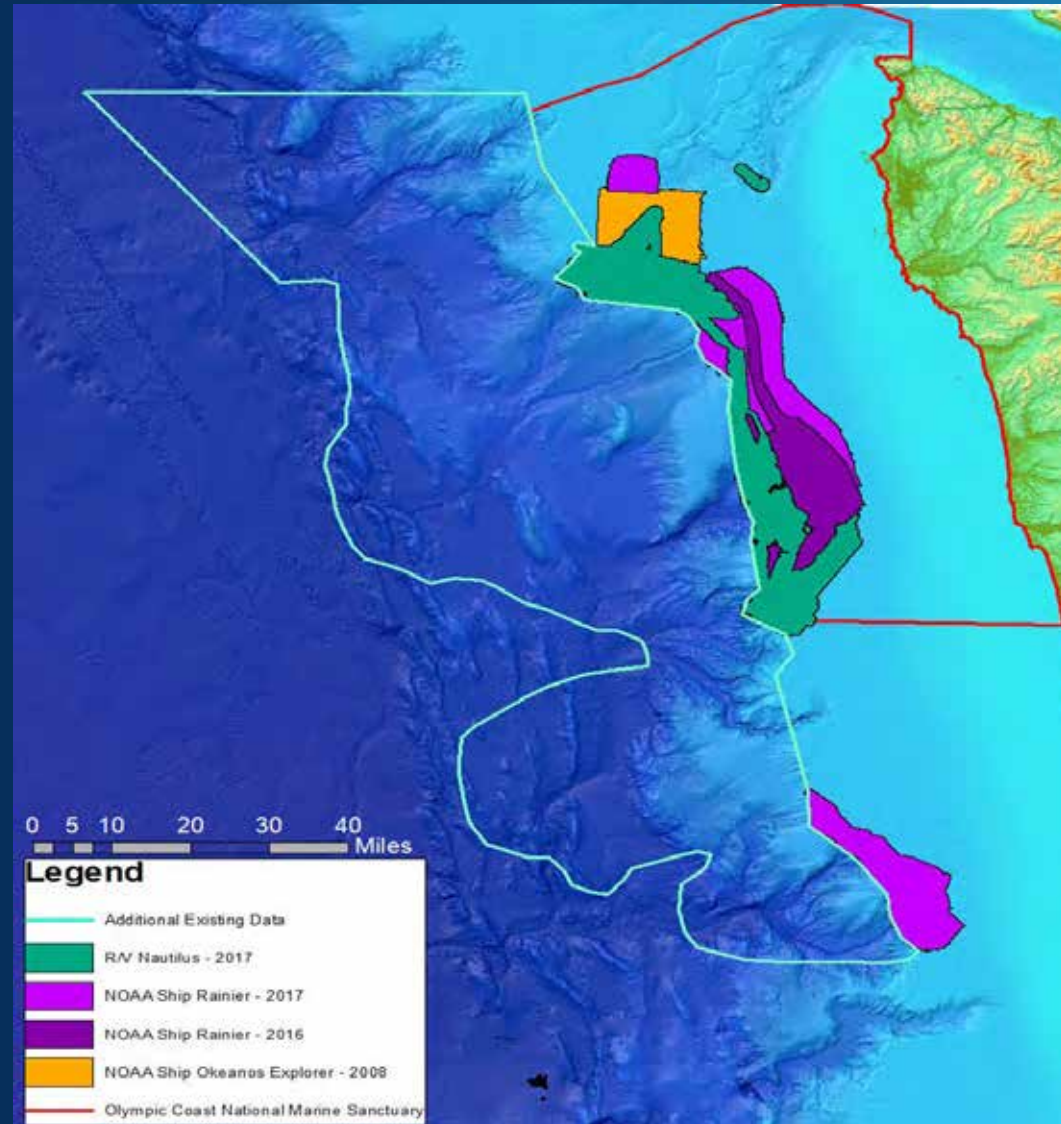
Hydro Health Survey Prioritization

- Goal: Identify project-sized survey areas, prioritized by worst Hydro Health

  - Apply depth-varying filter to smooth Hydro Health output

  - Identify areas of clustered poorest health

  - Expand area until reasonable project size is reached

  (note: preliminary results. Graphic illustrates desired end results for survey prioritization)
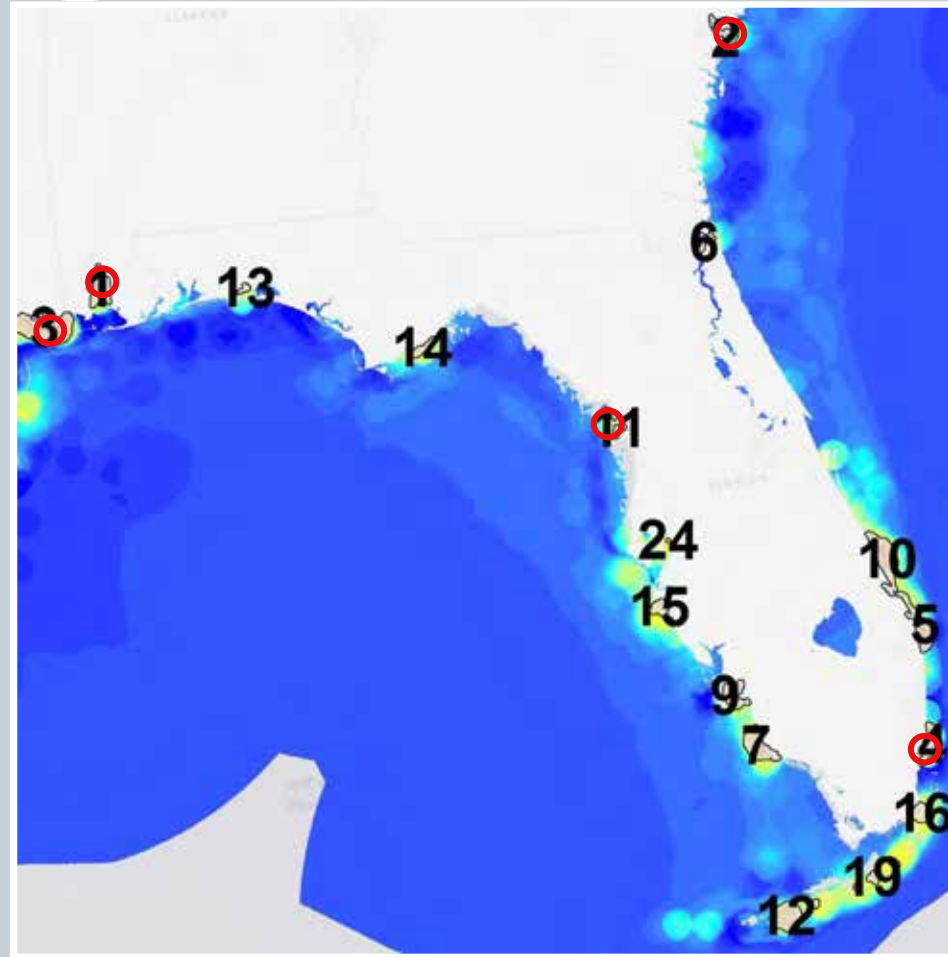
Okeanos Explorer 2018 Gulf of Mexico & Atlantic Exploration

- 2018 OER Mapping & ROV missions
  - 3 deep-water operation project areas
  - Submitted AOI for all 3 areas
  - GOM project is underway
  - Call for input technically closed for Atlantic project areas but…

C-SCAMP: West Fl Shelf Mapping Project

- Managed by FIO and USF
- High resolution mapping project to characterize and assess habitat and fish communities in the West Florida Shelf
- Attended steering community group meetings since 2015
- HSD incorporated the VMS as a layer into the HHM
- Data is acquired to meet NOAA's hydrographic data specifications
- Primary data products: MB, Backscatter and habitat classification maps coupled with imagery from towed camera array – CBASS

Overall Project Area

http://www.marine.usf.edu/scamp/index.php
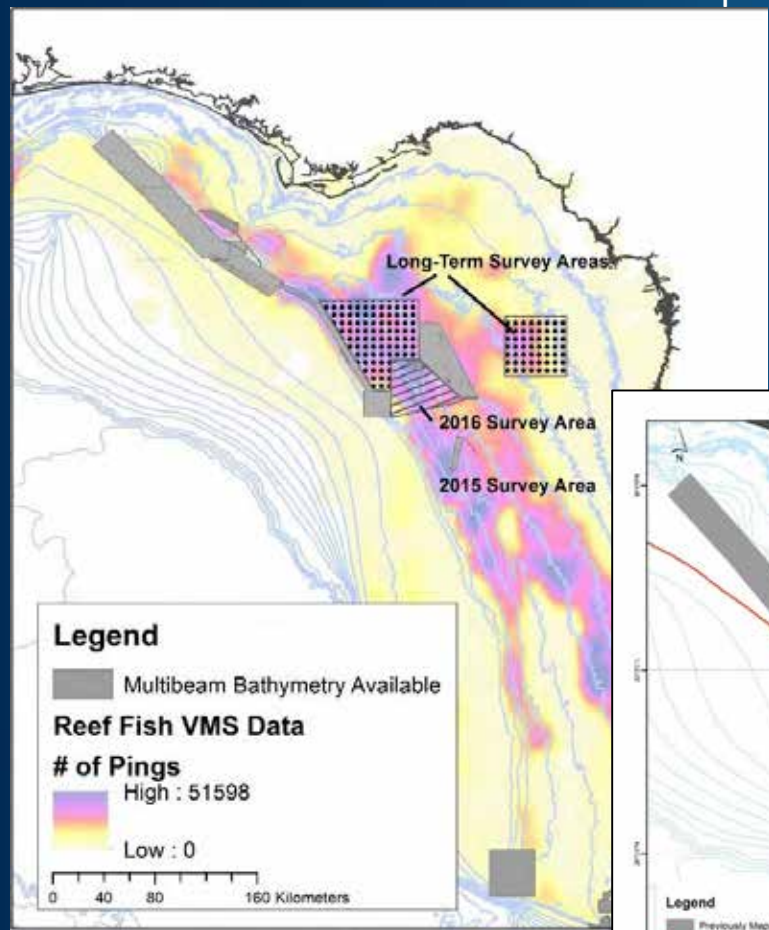
Mapping Progress
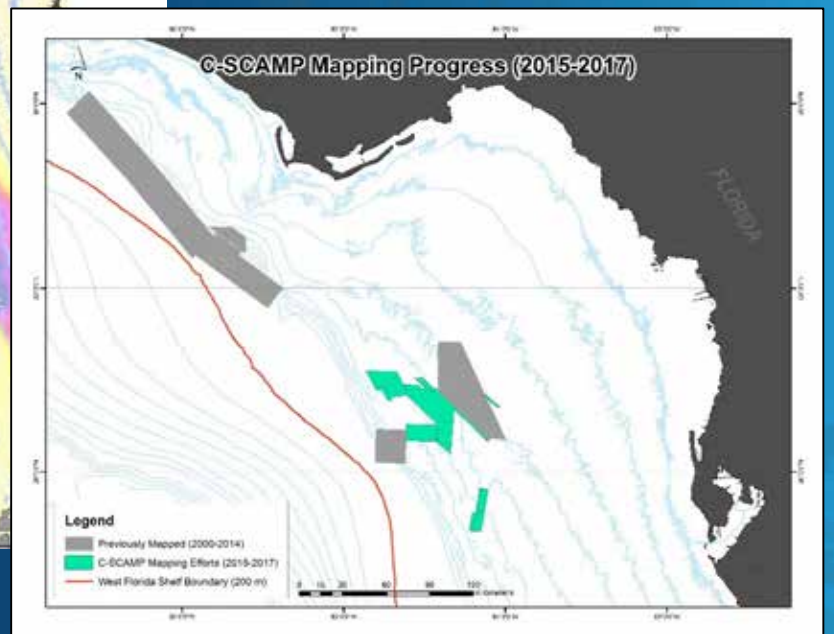
Big Bend (Florida) IOCM Project

External Project Partners & Contributions

This effort will include high priority areas identified in collaboration with NOS program offices (OCS, CO-OPS, NGS, IOOS/GCOOS, NCCOS), NMFS (Southeast Fisheries Science Center) and the following external partners:

USGS, USACE, USFWS, USFS, Florida Institute of Oceanography, FL FWC, FL DEP, USF College of Marine Science,

Estimated Project Length

Data acquisition and field operations not to exceed 2 years.

Data processing and final deliverable(s) computation not to exceed 1-2 years.

Full project duration of 3 years.

Florida Institute of Oceanography

- Partnering academic organization with two oceanographic survey vessels (for charter) equipment with full complement of ocean mapping survey equipment.
- In addition, FIO has collaborating scientists to contribute to data acquisition and processing and will be pivotal during stakeholder outreach in the working area.

Estimated Resources

Total funding request: $935,000

Broad funding requests for year 1 with follow-on funding for year 2

Florida Department of Environmental Protection

- Partnering academic organization with two oceanographic survey vessels (for charter) equipment with full complement of ocean mapping survey equipment. In addition, FIO has collaborating scientists to contribute to data acquisition and processing and will be pivotal during stakeholder outreach in the working area.

USACE & NGS

- Topo-bathy lidar surveys of the northern Gulf of Mexico coastline as part of its mission for shoreline mapping.

PR#	Estimated Physical and Financial Resources – Year 1	Est. $$ Amount
1	CO-OPS NWLON Operation & Maintenance	Base Funds
2	CO-OPS Temporary NWLON Gauge Installation	$50k
3	Project-wide Stakeholder analysis and outreach (mainly travel)	$10k
4	OCS – ASV Survey Operations	$25k
5	IOCM/OCS and FIO – Vessel of Opportunity and Survey Operations	$250k
6	GCOOS TBD	
7	Travel & Per Diem – inclusive	$40k
	Total for year 1	**$375k**

PR#	Estimated Physical and Financial Resources – Year 2	Est. $$ Amount
1	CO-OPS NWLON Operation & Maintenance	Base Funds
2	CO-OPS Temporary NWLON Gauge O&M	$20k
3	NGS or USACE Topo-bathy Lidar Operations in conjunction with hurricane recovery efforts	$200k
4	Project wide Stakeholder analysis and outreach	$10k
5	OCS – Offshore survey Operations — Pending w/ NSD	$50k/base funds
6	IOCM/OCS and FIO – Vessel of Opportunity and Survey Operations	$250k
7	GCOOS TBD	$XX?
	Total for year 2	**$530k -$560k**

Year 3 will involve data processing and product development using base funds.

Building and Maintaining a Comprehensive Database and Prioritization Scheme for Overlapping Benthic Habitat Data

USWTR Bottom Habitats and ROV Transects

W. Scott Chappell & Jonathan Crain

Supported Command

BACKGROUND & INTRODUCTION

The seafloor resource data used in the Phase II environmental compliance cycle (beginning in 2013) for Atlantic Fleet Training and Testing (AFTT) activities was:

1. Limited to regional or Navy source coverages (building on the Marine Resource Assessments); and

2. Combined such that broad-scale, lower quality data could override fine-scale, higher quality data

3. Used in developing mitigation areas for bottom-placed explosives, military expended materials, and seafloor devices.

Refinements for AFTT Phase III Cycle (beginning in 2018)

(1) Build and maintain comprehensive database of mapping sources;
(2) Combine maps such that fine-scale, higher quality data replaces broad-scale, lower quality data; and
(3) Update seafloor resource mitigation areas with new data.
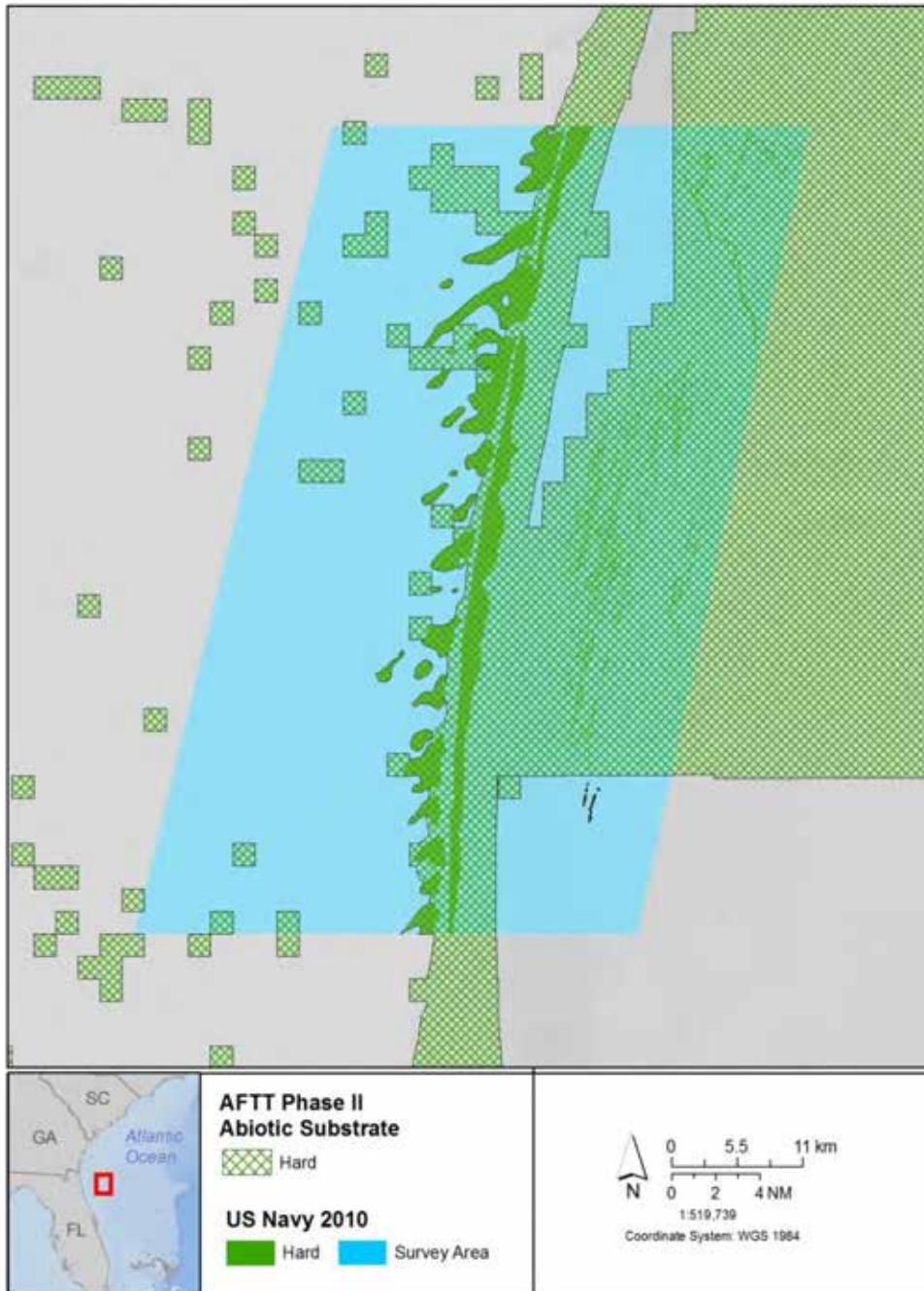
FOCUS OF PRIORITIZATION SCHEME AND HIERARCHY: ABIOTIC SUBSTRATE
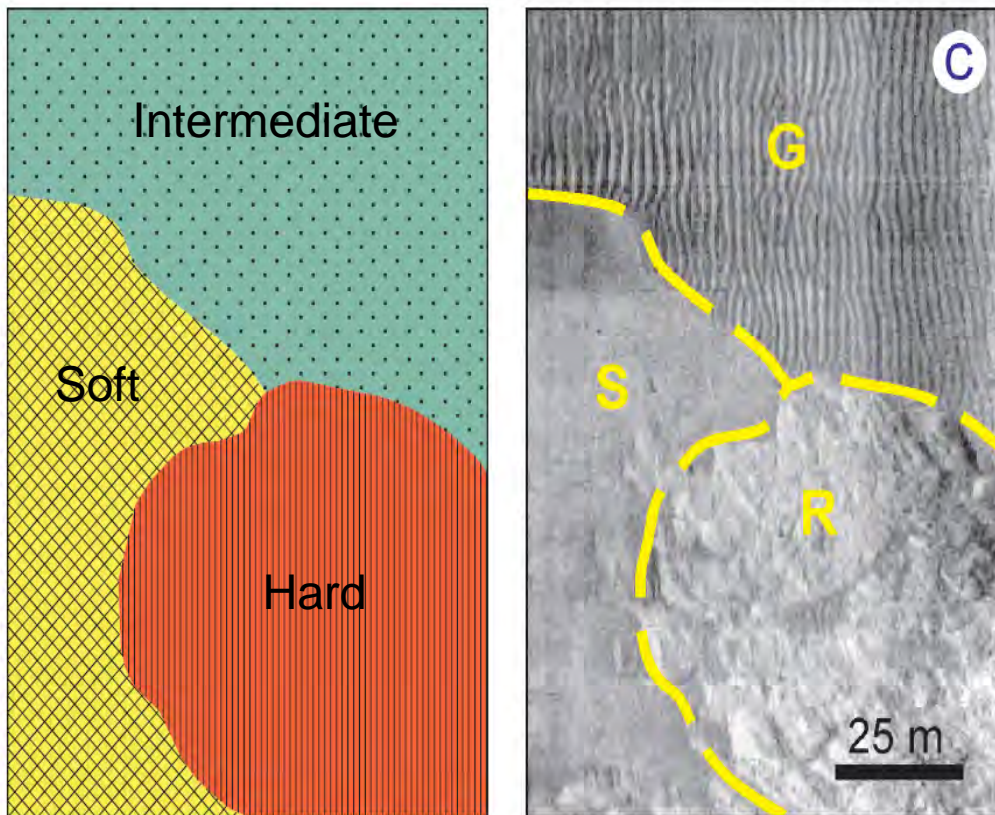
C. Side-scan sonar image (right) of **S, G,** and **R** with sharp boundaries and their interpretation (left). Ripples in the gravelly seabed produce alternating light and dark bands while the sandy surface is more uniformly gray. These ripples have a 2 m (6 ft) wavelength. The rocky outcrop rises above the surrounding seafloor.

Example Source: Barnhardt et al. (1996)

- <u>Water Flow/Quality</u> mapped from global satellite data in the EIS/OEIS(s);

- <u>Bathymetry/ Topography</u> from a single assemblage of sources for the EIS/OEIS(s); and

- <u>Biotic Feature Classes</u> were included in the database as mostly state-level, non-overlapping datasets for the AFTT EFHA only.

BENTHIC HABITAT DATABASE FOR RANKING MAPPING SOURCES
(Microsoft Assess Form)

DISTRIBUTION OF ABIOTIC SUBSTRATE DATA SOURCES IN THE SOUTH ATLANTIC
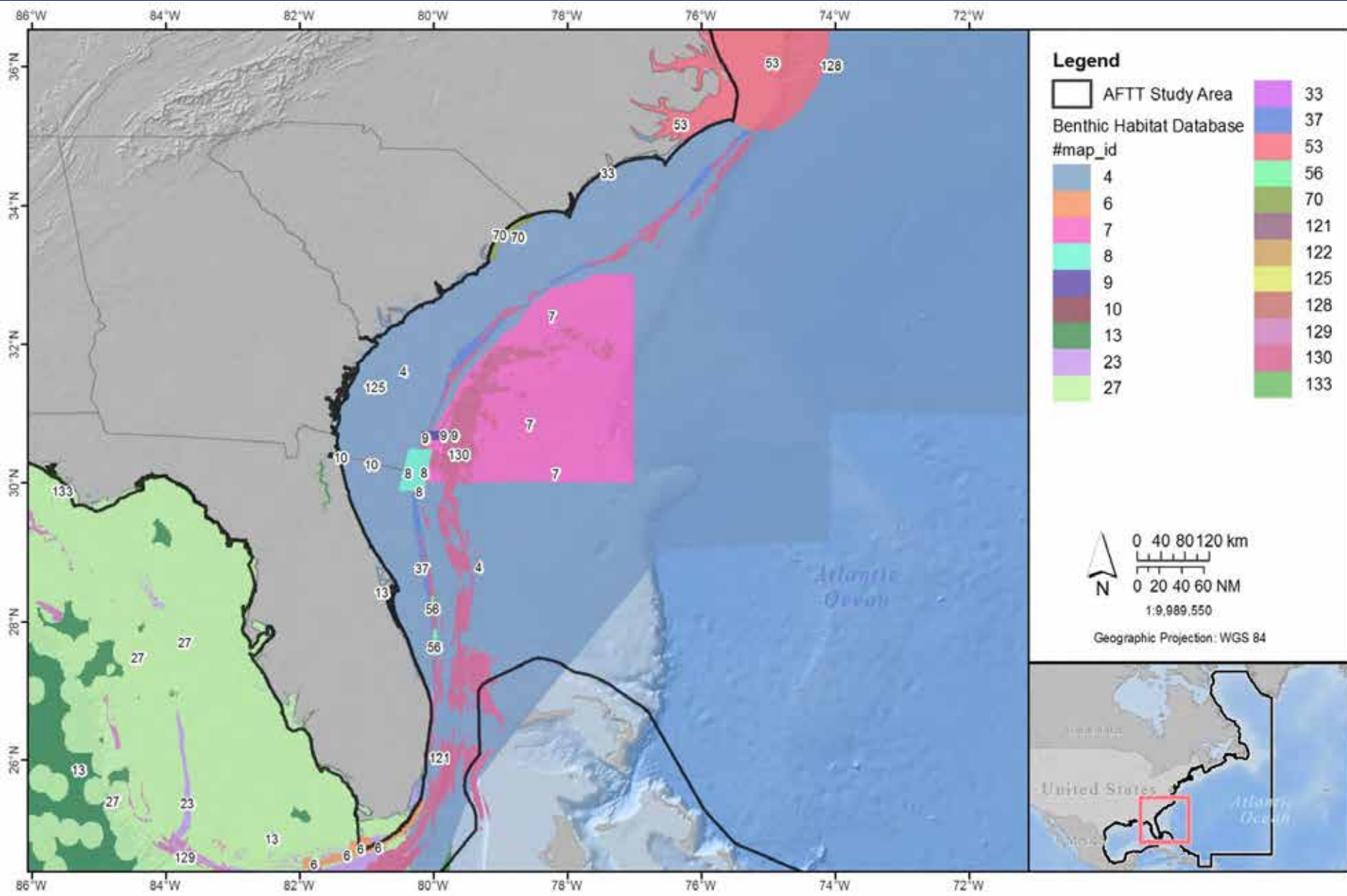
Navy Data Sources for the South Atlantic

(1) Naval Oceanographic Office

    a) Assemblage data: 500 – 3,000 m resolution interpolation of benthic grab samples & chart bathymetry (unclassified);

    b) High resolution ship track and survey area data from acoustic sensors with validation (classified);

(2) Project specific mapping

    a) Validated MBES mapping of USWTR and CC box in the Jacksonville Range Complex (unclassified but not publically available);

    b) Mapping of biological resources within installation waters using point and transect methods (unclassified but not publically available)

Multibeam Bathymetry Data at NCEI

(Scott Cross for)

Aaron Rosenberg

MB data manager
IHO CSB Project technical lead

aaron.rosenberg@noaa.gov

NOAA National Centers for Environmental Information (NCEI), Boulder, United States

Multibeam Data at NCEI - Snapshot

- Over 50 TB currently archived
- Roughly 17 TB online and available for download
- Over 2600 published cruises
  - 1980 to present
- 39 data providers
- 61 sonar instruments
- 100 collection platforms
- 127 data file types
  - multibeam, metadata, ancillary
- Data consist of more than 17 million km of along track coverage

NCEI Bathy Data Viewer

Multibeam Data Access

- Multibeam Bathymetry Database (MBBDB)
  - doi:10.7289/V56T0JNC
- NCEI map viewers
  - bathymetry viewer
- Text search
  - multibeam survey search
- Gridded products
  - AutoGrid
- Email requests – mb.info@noaa.gov
  - delivery via FTP or external hard drive

Multibeam Data Ingest

- Data submission

- Metadata scraping and trackline generation
  - MB-System

- Populate the database
  - Cruise level
  - File level

- ISO metadata generation

- Archive

- Publish

Contact

Aaron Rosenberg

MB data manager
IHO CSB Project technical lead

aaron.rosenberg@noaa.gov

Contributor: Rolling Deck to Repository (R2R)
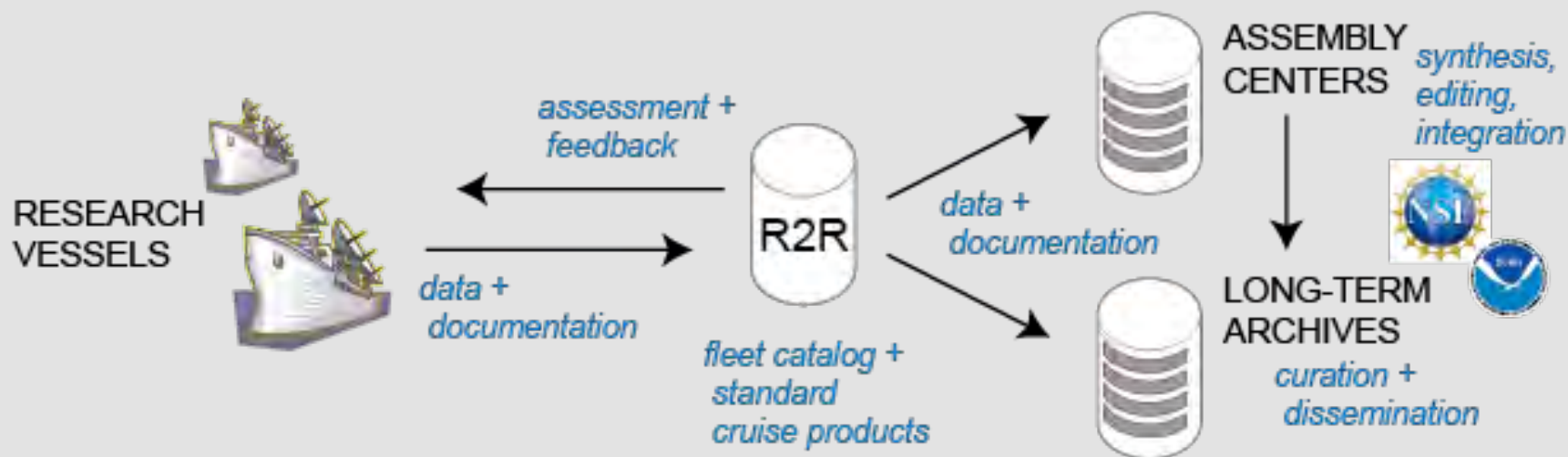
Data flow for University-National Oceanographic Laboratory System (UNOLS) - the U.S. academic research fleet - shipboard collected data (cruise catalog)

- Over 12 TB data
- 909 cruises contributed
- 11 contributing platforms

Contributor: NOAA Office of Ocean Exploration and Research (OER)

- The only U.S. federal organization currently dedicated to exploring our unknown ocean

- Manages data for the NOAA Ship *Okeanos Explorer*

- Has provided data from over 100 cruises (with more available through the OER Digital Atlas)

Florida Coastal Mapping Program

Vision

Accessible, high resolution seafloor data of Florida's coastal waters to support infrastructure, benthic habitat mapping, restoration projects, resource management, emergency response, and coastal resiliency and hazard studies for the citizens of Florida.

Mission

Coordinate across Federal and FL State agencies, and other stakeholders, to build a comprehensive understanding of the Florida coastal seafloor.

Who Benefits?

Fishermen
Researchers
Coastal residents
Environmental managers
Resource managers
Recreational boaters
Beach goers

Coastal cities and counties
Maritime transportation
Why Now?
Ports
- New technologies and processing tools allow for efficient
Surfers
mapping
Marine fisheries
- Increasing threats from storms and sea level rise
- Increasing pressure on marine resources and fisheries

Florida Coastal Mapping Program – Organizational Chart

Technical Team
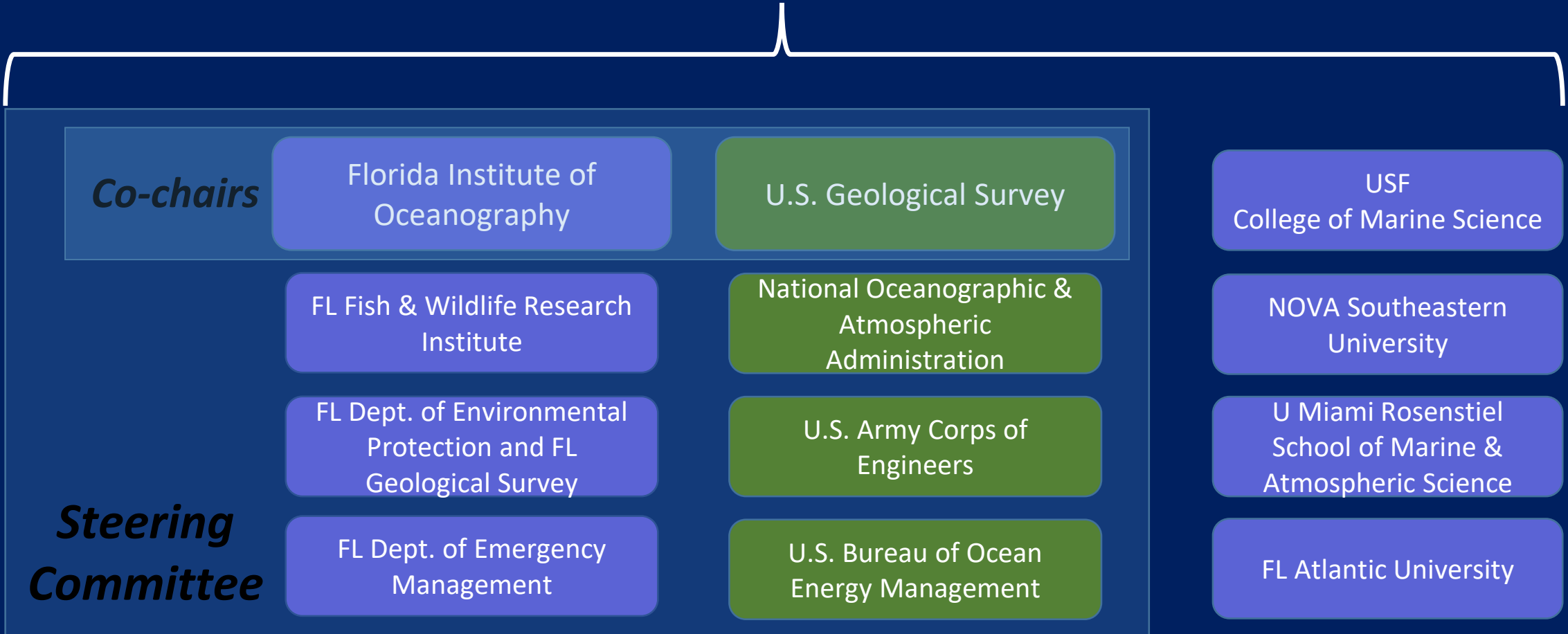
Co-chairs	Florida Institute of Oceanography	U.S. Geological Survey	USF College of Marine Science
	FL Fish & Wildlife Research Institute	National Oceanographic & Atmospheric Administration	NOVA Southeastern University
Steering Committee	FL Dept. of Environmental Protection and FL Geological Survey	U.S. Army Corps of Engineers	U Miami Rosenstiel School of Marine & Atmospheric Science
	FL Dept. of Emergency Management	U.S. Bureau of Ocean Energy Management	FL Atlantic University

Technical Team Data Inventory and Portal
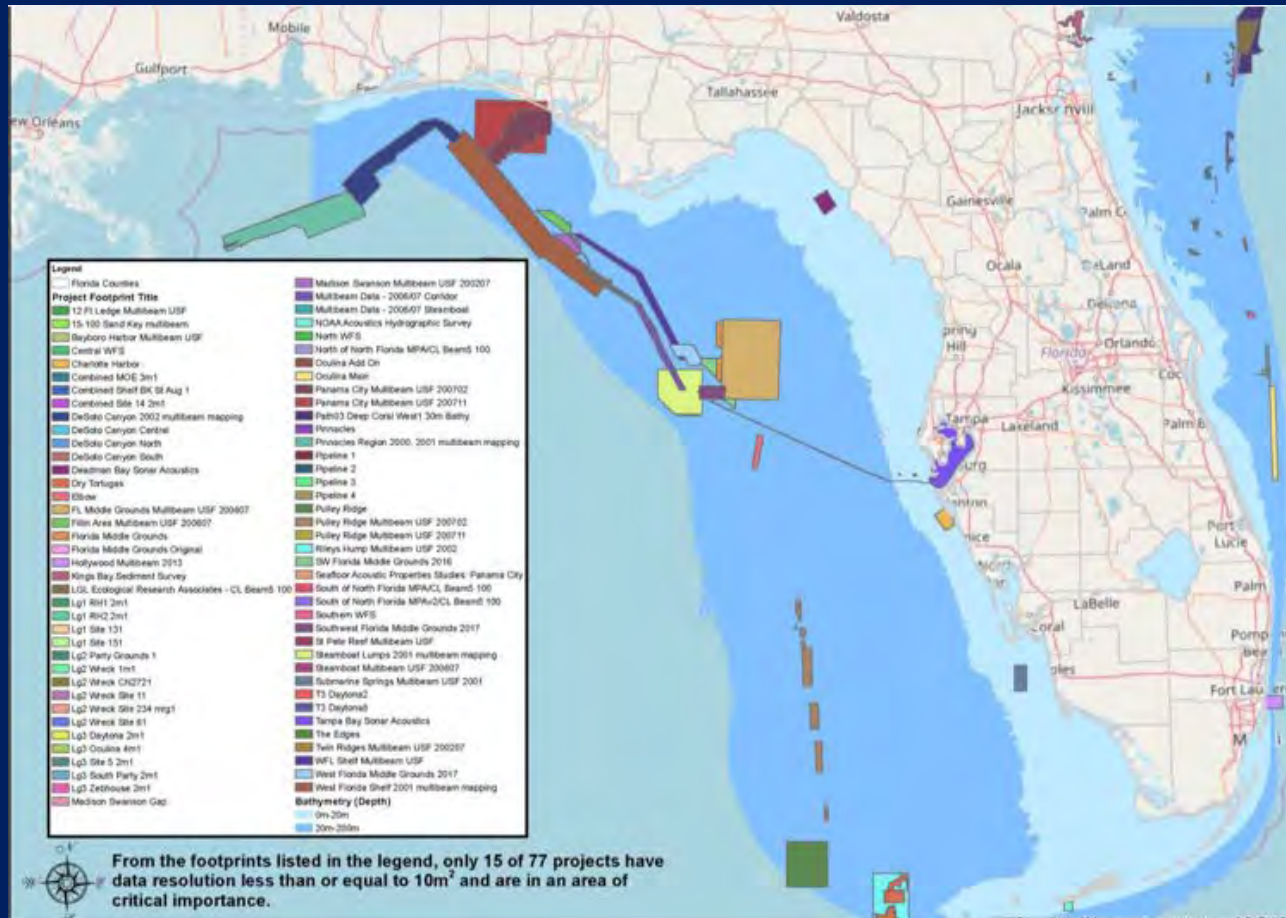
Acoustic data:
- Multibeam bathymetry (2-200 m)
- Sub-bottom Chirp (0-200 m)
- Side Scan Sonar (0-200m)
- Seismic Profiling (boomer)

Optical data:
- Bathymetric Lidar (seafloor bathymetry to 10m)
- Coastal Lidar (coastal elevation and very shallow water bathymetry)

6 Regions for Gap Analysis and Prioritization

- Panhandle
- Big Bend
- West FL Peninsula
- FL Keys
- SE Coast
- NE Coast

LiDAR & Multibeam Mapping Gap Assesment

Percentage Divided by Region and Depth Zone

Values are percent unmapped
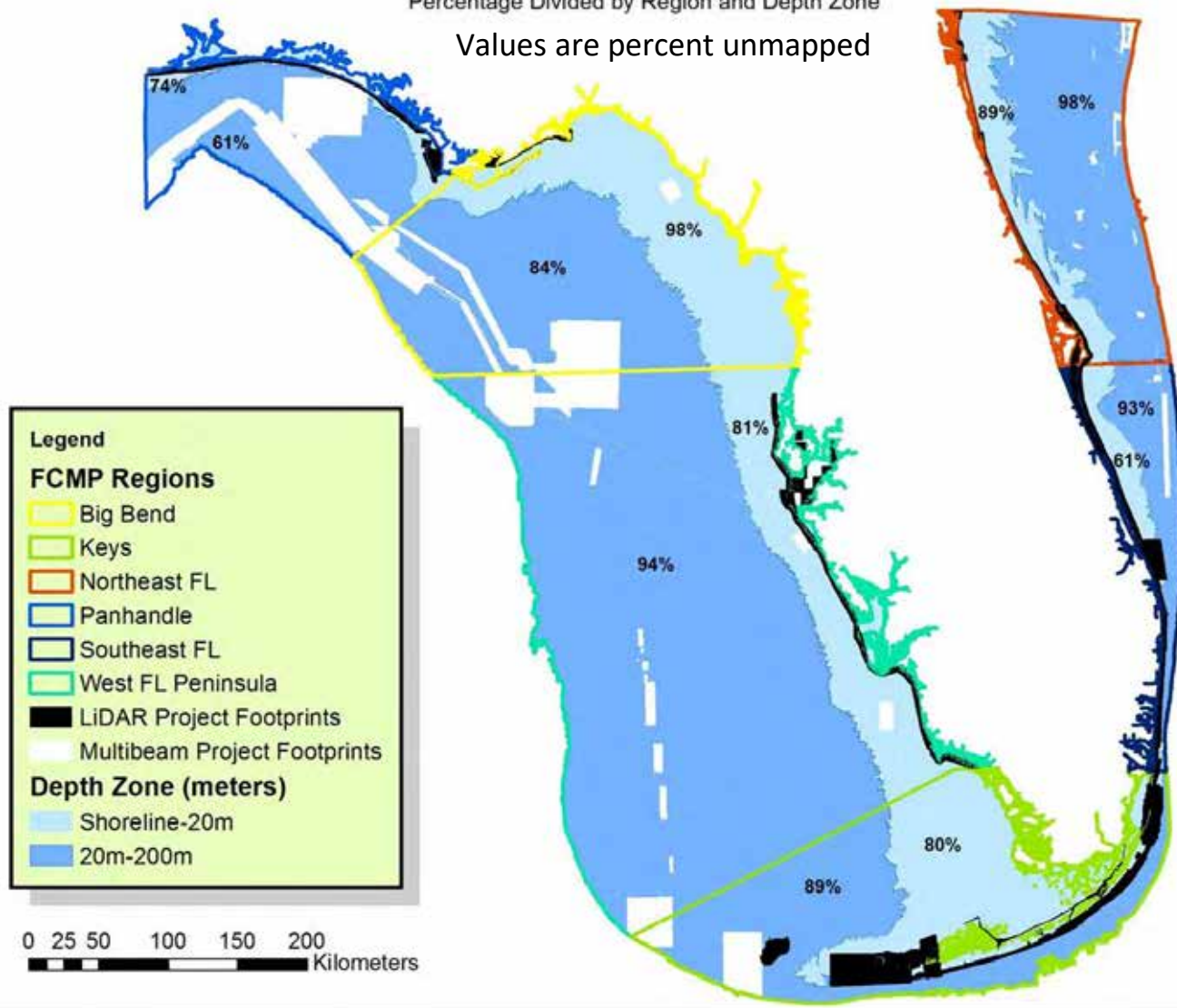
Workshop Outcomes

Over 75 attendees at workshop; next steps – report, prioritization, outreach, regional workshops, portal development, funding strategy

A collective understanding of the current state of coastal seafloor bathymetry of the State of Florida

Guidance for future mapping projects and funding priorities

The foundation to help inform a multi-year strategy to fill critical gaps

Suggested minimum mapping standards:
- 20-200 m: to IHO standards for future mapping (10m DEM)
- 0-10 m: lidar resolution to support 1m DEM
- 10-20 m: lidar or multibeam to support 1m DEM (ideally) or 3m (minimum)

Funding/Next Steps

- Immediate: Funding for a coordinator/technical position

- Develop a funding strategy for high-resolution bathymetry (HRB) that includes federal and state sources and an action plan for undertaking the required mapping within 10 years

- Update Portal with missing data & planned/funded federal efforts

- Determine minimum habitat resolution standard for derived products

- Prioritize coastal seafloor mapping by region

- Take-away: Map once, use many times

Linking FCMaP to Other Mapping Efforts
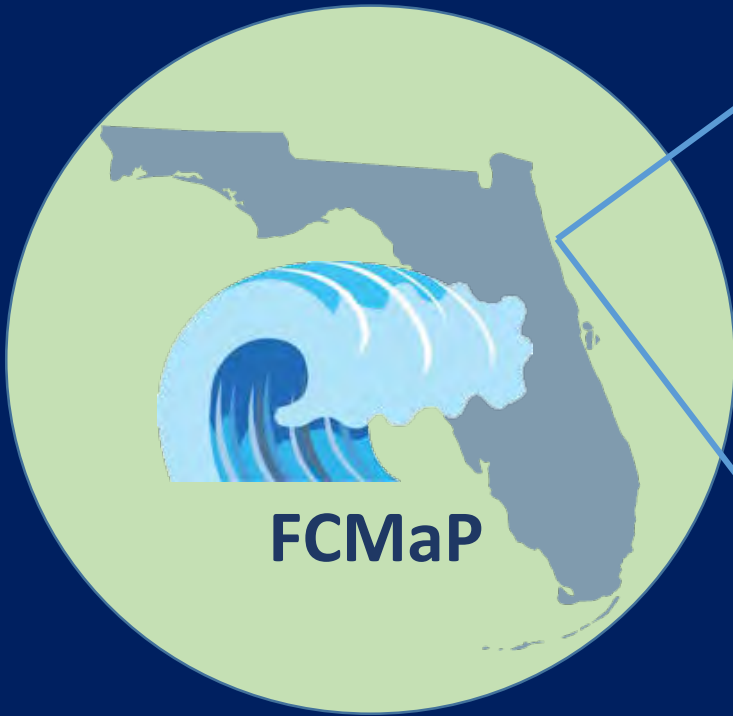
MMIM	BOEM
GOMOSES Benthic Habitat Workshop	GOMA
FL DOI RESTORE	USGS
Gulfwide DOI RESTORE	FWS
IWG-OCM	NOAA
IWG-OCM	USGS
3D Nation	USGS FL Liaison
3D Nation	FL State Champion
Southeast Comprehensive Study	USACE - Jacksonville
SEACART	NOAA
CMAP	NOAA
HSRP	NOAA
2017 Storm Supplemental	NOAA
2017 Storm Supplemental	USACE
MMP	FWRI
Monitoring Community of Practice	GOMA

FCMaP

SeaSketch: FCMaP Partners Project

Big Bend Demonstration Study

- Multi-mission, multi-agency demonstration of capabilities of FCMaP members to address coastal priorities

- In alignment with CMAP and MMP, develop and implement a 3-tier approach for establishing a workflow for Gulfwide RESTORE projects:
    1. High resolution baseline elevation data
    2. Derivative products (e.g. benthic habitat maps)
    3. Visualization and outreach

- Multibeam, topobathy lidar, sidescan sonar, subbottom, ground-truthing

- 1-day workshop during GOMA All-hands (June 2018); stakeholder workshop in Cedar Key (late summer 2018) to include prioritization

USGS

Outline

Mission

Area of Responsibility

Our Data

Data Availability

Our data (mostly) coming from:

- Navigation Mission
  - Dredging
  - Condition surveys

- Disaster Response Mission
  - pre/post storm surveys

USACE SAC Area of Responsibility

- Little River Inlet to Port Royal Harbor

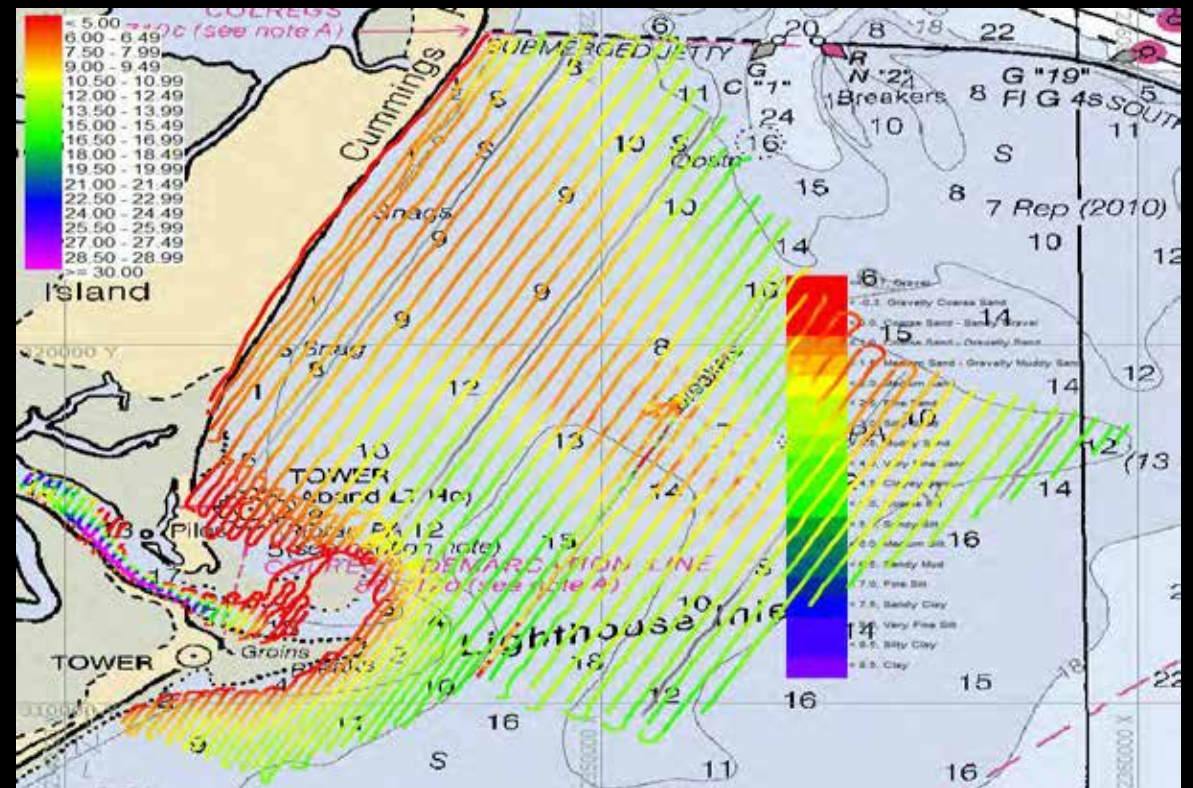- 15 navigation projects (300 miles of channel)

Survey Data
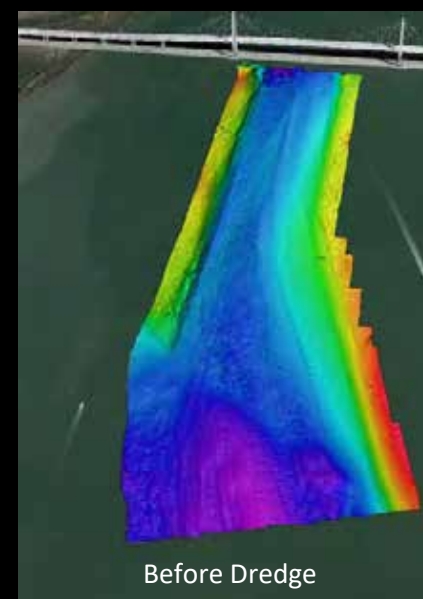
Survey Data- hydrographic

Singlebeam Sonar

- Condition surveys and some shallow water areas
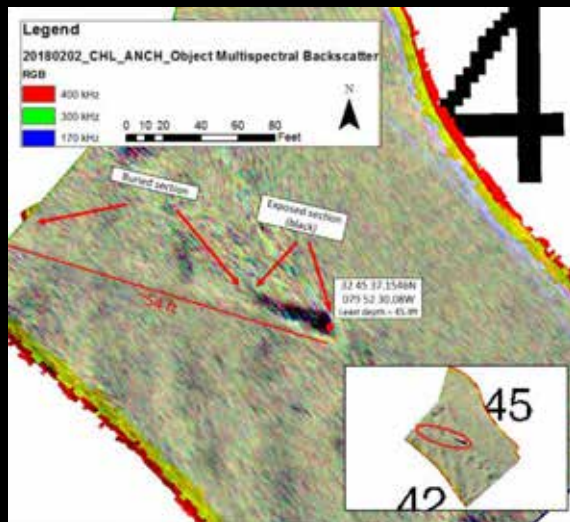- Required accuracies see EM110-2-1003 3-1 **no uncertainty- collected with POS MV
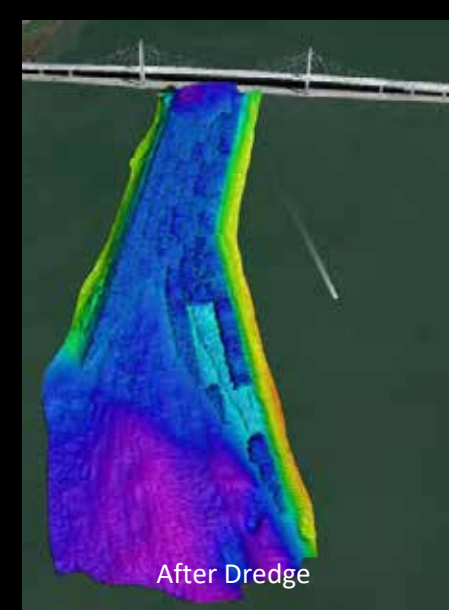- "Original density" mosaics

Survey Data- hydrographic

Multibeam sonar

- Full coverage 3x3ft mosaics
- Mainly used to compute dredge volumes
- 170-700 kHz range but contracts in 400kHz or 200kHz

Dredge Contract
Hog Island Reach
Charleston
Harbor

Before Dredge

After Dredge

*backscatter snippet data is collected as .R2S using Hypack for every survey (not always processed)

*some multifrequency data available and some multispectral backscatter datasets available (have been used for object detection and identification on special occasions)

Submerged dredge pipe in multispectral backscatter
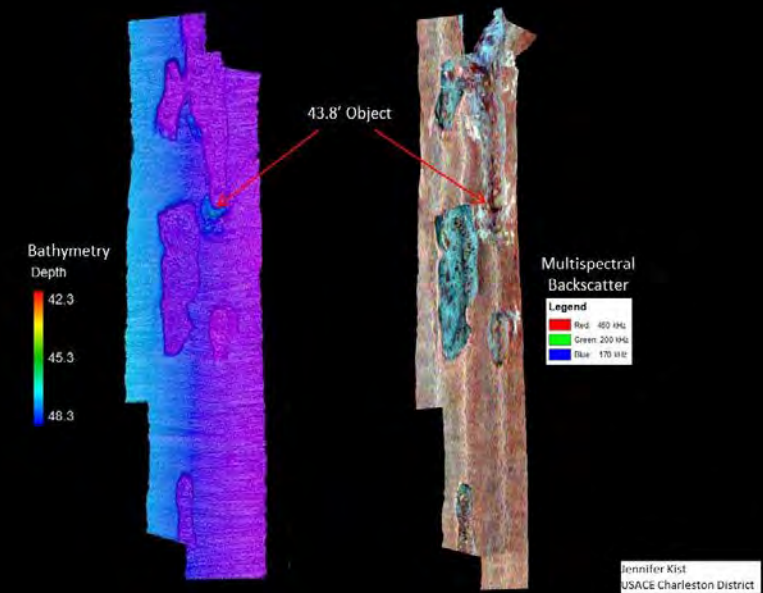
Offshore object investigation multispectral backscatter/bathymetry

*Multispectral backscatter
ERDC Research and Technical Report
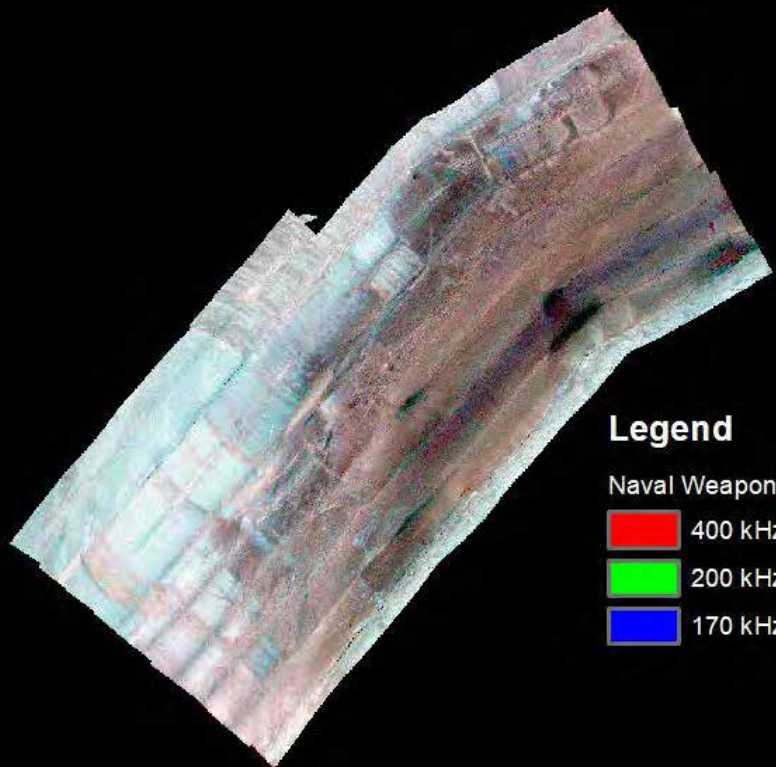
Legend
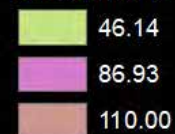
Naval Weapons Station

🔴	400 kHz
🟢	200 kHz
🔵	170 kHz
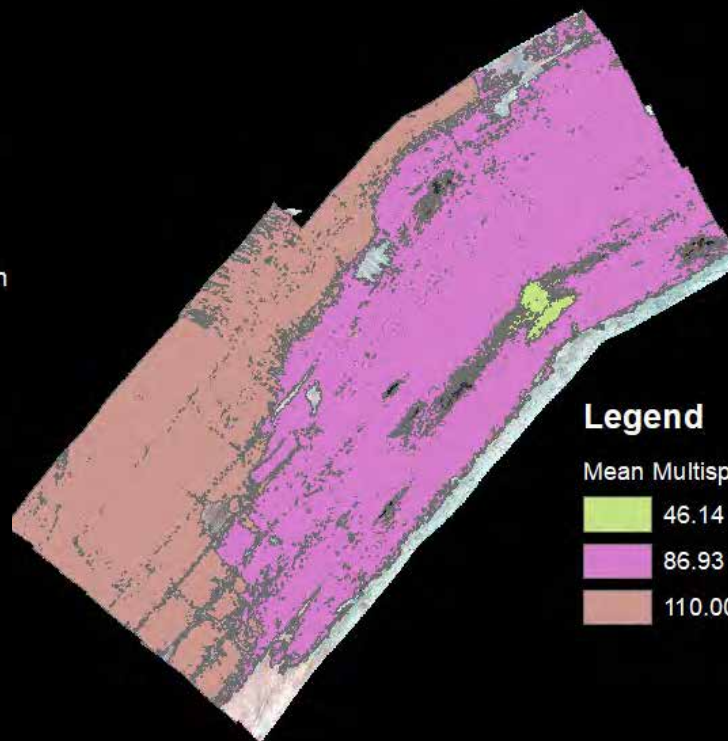
Legend

Mean Multispec value (dB)

🟡	46.14
🟣	86.93
🟤	110.00

Survey Data- hydrographic

Side Scan Sonar

- Object investigations (rare)
- Klein 5000

Magnetometer

- Archaeological studies (for channel realignment