THE NATURE CONSERVANCY

Coastal Georgia Recreational Use Mapping Project

Photo Credit: Greg McFall, Grays Reef National Marine Sanctuary (NOAA)

SUMMARY REPORT

The Nature Conservancy
South Atlantic Whole System
May 2019

May 7, 2019

Robert L. Crimian and Mary F. Conley. 2019. Coastal Georgia Recreational Use Mapping Project: Summary Report. The Nature Conservancy, South Atlantic Seascape.

Please cite as: Crimian, R.L. and M.C. Conley. 2019. Coastal Georgia Recreational Use Mapping Project: Summary Report. The Nature Conservancy, South Atlantic Seascape.

Acknowledgments:

This project would not have been possible without the support, expertise, skill, hard work and patience of many people. An immense amount of gratitude goes to the follow individuals:

The Nature Conservancy:

Christi Lambert, Ian Rossiter, Jessica Thompson, Melissa Strickland

Georgia Department of Natural Resources:

Jill Andrews, Sonny Emmert, Kelly Hill, Pat Geer, Kathy Knowlton, Dawn Franco

Georgia Institute of Technology:

Tony Giarrusso, Jeremy Nichols

National Oceanic and Atmospheric Administration (NOAA):

Adam Bode

Data Providers:

The 350-400 coastal Georgia stakeholders who shared their recreational use

Funding:

Turner Foundation, Inc.

Introduction:

More than ever before, the world is looking to the ocean to provide food, energy, new medicines, recreation opportunities, and a host of other products and services. Balancing the diverse and growing uses of the ocean's resources with long-term economic and ecological health is challenging and requires innovative planning processes that integrate the best available data in new ways. At a time of immense pressure and competing needs for marine environments, The Nature Conservancy (TNC) is working to bring a comprehensive, multi-stakeholder approach protecting marine resources in the South Atlantic region while enabling growing use. Starting in Georgia and building on lessons learned from ocean planning processes across the globe, the Coastal Georgia Recreational Use Mapping Project is an effort to improve coastal and marine management through engaging stakeholders and filling a recognized data gap. The information collected through this project will provide a better understanding of recreational uses in this coastal region, helping inform management decisions to better protect coastal Georgia ecosystems and improve the coastal user experience. The following report provides a summary overview of the project, including the methods used, results of the recreational use mapping, and ways the data can be used by coastal resource managers.

Background – Ocean Planning

Ocean planning is a bottom-up, science-based process that regions can use to address ocean management challenges and advance the joint goals for economic development and conservation. Although there are various names for this work (marine planning, marine spatial planning, etc.), the requirements are similar and one of the biggest challenges is the gaps in ocean use data. When new ocean uses or policies are being considered, these approaches must be available in public forums that intentionally engage people who rely on the ocean for their livelihoods and enjoyment. Like land use plans, ocean plans help communities understand the fuller picture of the economic and natural values provided by the ocean, so that constituents can determine where activities should take place to minimize conflict and meet agreed upon goals (UN Environment 2018). For example, ocean plans can help commercial and recreational fishing remain productive, cargo ships avoid collisions with right whales, smart energy siting proceed, and critical marine habitats be protected.

In 2010, President Obama issued an Executive Order that established the first-ever national ocean policy, providing a solid case for ocean planning with ecological goals. Federal and state agencies were increasingly investing in ocean planning as a process for coordinating across authorities and engaging multiple stakeholders in policy decisions. Examples of this investment took place in the Northeast and Mid-Atlantic regions of the US through establishment of regional planning bodies (RPBs) leading to data portals and marine spatial plans (Northeast Ocean Plan (2016); MARCO (2016)). These efforts, in which TNC played an integral role, produced new and innovative human use data products that built the foundation for creating regional/state ocean plans (e.g. Rhode Island Ocean Special Area Management Plan (SAMP) (2013)). These examples helped inform regional staff about how to start this work in the South Atlantic.

In the early 2010s, North Carolina, South Carolina and Georgia had each identified ocean planning as coastal zone management (section 309) enhancement areas. The Conservancy, through the South Atlantic Whole System (SAWS) program, identified this as an opportunity to proactively plan for conservation and development. Across the southeastern US, it would shift current practices around managing coastal and ocean waters from single to multiple uses. Ideally, we can conserve and restore the ocean, reduce conflicts, and foster sustainable resource use and development. The Conservancy's history of data (e.g. South Atlantic Bight Marine Assessment (SABMA) (Conley et al. 2017), Governor's South Atlantic Alliance (GSAA) data portal (GSAA 2015)) led to a marine planning strategy that seeks to accomplish this shift by developing improved regional spatial data that can be used in ocean management decisions, building stakeholder engagement, and advocating for multi-objective ocean planning policies at the state and federal level.

Why Georgia?

Within The Nature Conservancy's regional approach to marine conservation are pilot projects that enable us to focus efforts in smaller areas in order to demonstrate effectiveness. For implementing our marine planning strategies, Georgia proved to have the strongest enabling conditions due to its relatively small coastline and partner interest. Georgia's coast stretches for about 100 miles and features some of the nation's most pristine beaches, remote salt marshes and protected maritime forests. A string of 14 barrier islands, most only accessible by boat, remain largely untouched, offering a sanctuary for migrating birds and a home to many endangered or threatened species. Coastal recreation (and associated tourism) is a significant economic sector for the state, contributing over 15,000 jobs and over $500 million for the state's GDP (NOAA 2017). With over 200,000 saltwater fishing anglers (GADNR 2016), much of the coastal region's recreational use and economic gain comes from fishing. In addition to strong enabling conditions, the Georgia Department of Natural Resources' Coastal Resources Division

(CRD), along with the Georgia Institute of Technology (GT), were willing partners in conducting a pilot project for mapping recreational uses (an identified data gap for CRD) in Georgia's nearshore and offshore waters. In fact, the Georgia Coastal Atlas and Mapping Project (GCAMP), which creates a Georgia coastal and ocean data portal and addresses policy gaps related to management of ocean resources, was a great opportunity to collaborate to improve the ocean planning process through collecting recreational use data from Georgia ocean stakeholders. Much of the human use that is not known to CRD are recreational and other uses revolves around recreational activities, especially those that take place offshore.

The Nature Conservancy – South Atlantic Whole System (SAWS)

Much of The Nature Conservancy's (TNC) work crosses political boundaries, and one of those programs is the South Atlantic Whole System (SAWS), which is made up of the North Carolina, South Carolina, Georgia, and Florida (east coast) state chapters. The SAWS includes the nearshore and offshore waters of these states, representing approximately 56% of the United States' Atlantic shoreline and a population of over 11 million people. The area contains over 17,000 miles of tidal coastline, and on the continental shelf extensive hard bottom habitats that distinguish this section of the shelf from other areas of the Atlantic (Figure 1, Appendix A). The program has a vision to conserve, maintain, and restore coastal and ocean habitats and natural resources across the region to sustain a diverse range of native species, protect vulnerable coastal communities, support commercial and recreational activities, and foster a vibrant coastal economy. Fitting within in this vision is the program's work on ocean planning, including this project. The SAWS program strives to help sustain the economic and ecological values of the South Atlantic region by working with governments and stakeholders in siting new and expanding ocean and coastal activities in a manner that protects sensitive habitats and species, and balances ocean uses (like recreation).

Objectives

The Coastal Georgia Recreational Use Mapping Project, a collaboration with TNC, GADNR-CRD, and GT, is designed to collect critical information on recreational activities in and offshore coastal Georgia. The two main objectives of this project are to 1) collect recreational use data for Georgia's estuarine, nearshore and offshore waters and 2) directly engage Georgia recreational stakeholders using a participatory approach and 3) share recreational use data and provide access to mangers. This data will help improve the understanding of where and how frequently key recreational activities occur in this area, while setting the stage for stakeholders to understand the benefits and importance of ocean planning. The project is intended as a step to improving coastal/marine management and the coastal user experience, which will help inform management decisions to better protect coastal Georgia ecosystems and help maintain those resources for people's enjoyment.

Methods:

Building the Core Team

A core team made up of TNC, CRD, GT staff was assembled to design the various phases of the pilot project. A Memorandum of Understanding (MOU) signed between TNC and CRD in Spring 2014 and served as a binding agreement between the parties to accomplish the assigned roles and tasks.

Project Partners	
Organization	**Role**
The Nature Conservancy (TNC) - South Atlantic Whole System	Project Lead; Identify key stakeholders to survey and interview; Hold participatory mapping sessions to develop spatial recreational use data; Data collection and processing
Georgia Department of Natural Resources - Coastal Resources Division (CRD)	Identify recreational use data gaps; GIS technical support; Georgia Coastal Atlas and Mapping Project (GCAMP) data portal development and management
Georgia Institute of Technology (GIT)	GIS technical support; online application technical support; GCAMP data portal development and management

A National Oceanic and Atmospheric Administration (NOAA) geospatial analyst was added to the core team to bring mapping and participatory method expertise to the project.

Stakeholder Identification and Prioritization

Stakeholder identification began by interviewing partner organizations, groups, and specific individuals working in and around Georgia ocean use issues (commercial harvest, ports, recreation, etc.). Focus was on current and future use of Georgia ocean waters. Initial meetings and interviews in Fall 2014 introducing the concepts of multi-objective ocean planning was key to creating context to consider the main uses of the Georgia coast, impacts (positive and negative) on natural resources and economies, and a desired future for Georgia's coast.

These conversations provided the foundation to decide which human use spatial data to collect and what stakeholders to engage in data provision.

Based off the introductory interviews, a list of stakeholders was created. Stakeholders included government organizations, civic/environmental groups, resource users, and private sector. A prioritization process was implemented to refine the list. A matrix was used to evaluate level of importance and influence (Figure 2, Appendix A), based on amount of interaction with the coast/ocean and effectiveness in sharing information about use patterns (importance), and communicating ocean planning to others along the Georgia coast (influence). Using the stakeholder matrix, core team members decided to focus the project around recreational uses and corresponding stakeholders. Once this decision was made, a finalized stakeholder list was created in the winter of 2015.

Six broad water-based recreational categories were defined and used to engage people in mapping recreational activities: boating, birding, diving, ecotours, fishing, and paddling. To help define the study area, it was determined that all activities needed to occur within the six ocean-adjacent coastal counties and in saltwater (estuarine, nearshore, offshore waters). State waters were defined as estuarine and nearshore waters (within 3 miles), and federal waters were defined as offshore water (outside 3 miles) (Figure 3, Appendix A). The core team agreed that from a management perspective, mapping broad categories that are comprised of more specific activities (ex. kayaking within the paddling category) was sufficient.

Data Collection

A series of data collection methods were used over a two-year period (May 2015 – July 2017): participatory mapping exercises, an online mapping survey, in-person surveys (using online mapping tool), and collecting secondary data sources (Figure 4, Appendix A).

Participatory Mapping Workshops

Participatory mapping is a group-based qualitative research method that gives participants freedom to map and generate understanding of the connections between people and places over space and/or time. Nine participatory mapping workshops were conducted throughout coastal Georgia. These workshops focused on collecting data and facilitating conversation about location and frequency of key recreational use within Georgia's estuarine, nearshore, and offshore environments. To recruit participants for workshops, a snowball method was used; contacts made during preliminary interviews were used to recruit future participants from their own contacts.

During each workshop, a process facilitator, GIS facilitator, and note taker were used, along with a series of materials (see Protocol for full process details in separate document). Workshops followed a consistent format. An introductory presentation provided an overview of the project and workshop objectives. This led into a purposely free flowing discussion, allowing participants to generate their own conversations. The main activity during workshops was participants drawing (either digitally or on paper-based map) their recreational use areas. Five specific questions were asked to allow for consistency in data across workshops and data collection method types:

1) What is your primary activity within this recreational use?

2) If applicable, what is your secondary activity within this recreational use?

3) On average, how many days per year do you partake in this activity?

4) If not participating in this activity alone, how many people are participating with you in this activity (on average)?

5) Was this activity taking place from a motorized vessel?

At the end of each workshop, the facilitators and note-taker debriefed and confirmed the accuracy of the notes.

Fifty-six (56) people participated in the nine workshops. An additional six individual mapping exercises were completed with prioritized recreation experts. Ten people provided information at six tabling events; these events also served to recruit participants for workshops. In total, 72 stakeholders were engaged in in-person participatory mapping (Table 1, Appendix A).

Online Mapping Application

To increase stakeholder participation in the project, the core team agreed to create an online mapping platform. A crowdsourcing application platform through ESRI ArcGIS Online was used to create a customized mapping tool for the Coastal Georgia Recreational Use Mapping Project (see Setup Guide for detailed description in separate document). The Recreational Usage Reporter tool created primarily by GT and finalized in spring 2017 by a series of TNC interns, was used in two ways.

1. In – Person Surveys: TNC staff used this tool with an Ipad to conduct in-person surveys at public water access locations (boat ramps, marinas, etc.) throughout coastal Georgia from March 2017- July 2017.

a. Recreators were intercepted coming in and out of the water and asked to voluntarily draw their recreational use areas and answer corresponding questions for each recreational category.
b. Participants spent 5-7 minutes filling out an individual report (one use area per report) and were invited to submit as many reports as desired.

After visiting 30 of the more highly used public water access locations within 6 ocean adjacent Georgia counties (Table 2, Appendix A), 118 stakeholders participated and provided their recreational use information.

2. <u>Online Distribution</u>: The online mapping tool was distributed via email to those who signed up at tabling events and a DNR listserv.
   a. TNC staff worked with DNR's Division of Marine Fisheries (within the Coastal Resources Division), to send the online mapping tool to over 344,000 Georgia saltwater fishing license holders (part of their Saltwater Information Program).
      i. This was the first time CRD shared a survey on behalf of a partner organization to its license holders to acquire data for a conservation project.

   Although there was no option to track how many individual people submitted recreational use information, 370 submissions were recorded from email distribution (Figure 5, Appendix A for more details).

Combining participatory mapping and online application methods used to engage stakeholders, it is estimated that between 350-400 people participated in showing their recreational use areas.

Secondary Data – eBird

Finally, throughout the entire data collection time-period secondary data sources were gathered to see if they could be incorporated into the recreational use dataset. Multiple sources were evaluated, including Savannah State University Dolphin Sciences Lab's Boat data, GA DNR Shrimp Trawler Survey data, North Atlantic Right Whale Consortium (NARWC) Aerial Survey data, and eBird data. However, only eBird met scaling and sampling effort requirements (eBird is an online database of bird observations (a record of species in space and time) (ebird 2017)) collected by the public represented as points). To access data, a profile was created along with a brief description of the project. Once access was granted, bird observation data from the six ocean adjacent counties in Georgia from 2014 to June 2017 were downloaded (see Protocols for full processing steps in separate document). After full processing, there were over 11,000 data points added, bolstering our original birding dataset.

Data Processing

Data collected throughout the project (participatory mapping workshops, online mapping application, in-person surveys, and eBird) was processed to create a dataset of recreational use areas in Georgia's estuarine, nearshore, and offshore environments (see Protocols for full description of processing methods in separate document, and Table 3, Appendix A for a table of data processing methodologies for each source). All raw data (data that has not been modified since data collection) was copied and recorded in a Master Data Spreadsheet. Certain polygons/points were duplicated if they met certain criteria (i.e. participant submissions to boating, paddling, or diving who indicated they fished, duplicate feature(s) in fishing were created). Notes were merged and joined with the geospatial data, and data was then "cleaned" by modifying the polygons to most closely represent the intent of the participant. Over 1150 workshop and online submissions (Table 4, Appendix A) were processed combined with over 11,000 from eBird data points. Data are represented using a 1sqkm grid system. This scale was chosen to help ensure the concealment of any specific recreational use area (someone's "spot") if a participant provided point data (Figure 7, Appendix A). Furthermore, a grid system has been consistently used by other recreational use mapping efforts, and has shown to be useful for management needs.

To visually display frequency of frequently recreational uses, we calculated a recreation value (number of recreation days X number or participants = 'Reaction Value A') and scaled the frequency from very low use to very high use. The analyzed data and spatial maps were shared with stakeholder participants to review and provide feedback. After receiving three comments back (two specifically about the boating data), edits were made as appropriate. One comment stated the large polygons along the coast and offshore seem to overrepresent the use occurring in that location. Recreation value A included both points and polygons but did not effectively account for polygon area. To better account for polygon area, we calculated 'Recreation Value B' ((number of recreation days X number or participants)/polygon area). In calculation, 'Recreation Value B' point data was emended to 1sqkm in area using the grid system. To ensure the data was normalized, we calculated Z-scores and Ranked Z-scores for both 'Recreation value 'A' and 'B' (see Protocols for Z-score methods in separate document).

Furthermore, each use category and overall use were analyzed to show estuarine/nearshore recreational use and offshore recreational use. The areas that were submitted within 3 miles from the shoreline were separated and processed in the various ways described above ('Recreational value 'A' and 'B', Z-scores, Ranked Z-Scores); the same was done for all areas submitted outside of the 3 miles. This was done due to account for the significantly larger polygon areas that were drawn outside of state waters (3 miles). See Appendix B (Figures 1- 7) for a series of maps showing the recreational use data layers in various forms.

Final Products

A geodatabase and a series of recreational use data layers were created showing the location and frequency (very low – very high) of individual recreational use categories (boating, birding, diving, ecotours, fishing, paddling) and total recreational use (combination of all six recreational uses). Layers are available representing 'Recreational Value A', 'Recreational Value B', or their associated Z-scores or Ranked Z-scores, for all data, only nearshore data (within 3 miles), and only offshore data (outside 3 miles).

Key Results:

Depending on whether the data is displayed with each individual recreational use or all recreational use, and whether the data is displayed with all use or just estuarine/nearshore use or offshore use, different analyses are more indicative of the true frequency of use. For all scenarios, there was little to no different between Z-scores and Ranked Z-scores regardless if the displayed frequency was with "Recreational Value 'A' or 'B'. Additionally, even after the data was normalized by calculating Z-scores and Ranked Z-scores, there was little to no difference when compared to the standard Recreational Values 'A' and 'B'. 'Recreational Value A' is the purest data display in that it most closely represents the raw data received from participants (average number of days and average number of participants). However, not considering variable size of polygons can misrepresent the data, especially when looking at fishing, boating, overall recreational use and offshore use where there are several very large polygons included in the datasets. 'Recreational Value B' does consider polygon area, so for those datasets it is suggested using 'Recreational Value B' is best.

The data shows that more than 90% of estuarine/nearshore waters have recreational activity occurring. For offshore waters, greater than 75% of the area out to 70 miles is seeing recreational use activity. The recreational us activity level decreases further from shore, but 100 miles from the coast activities were noted (birding and fishing). However, it is important to keep in mind that several very large polygons designating boating and fishing activities cover significant portions of the offshore waters. These polygons are a very general representation of a use area, whereas most other polygons are more specific about the location of recreational activities (e.g. around a single artificial reef).

Additionally, the areas where there is no use data does not mean that there is no recreational use happening in those areas in reality; it simply wasn't captured in this project. Locations within the study area where there is no data indicating use include the most inland parts of estuarine creeks/rivers within the six ocean adjacent counties, the outer continental shelf (particularly the northern parts within the study area), and a triangle of space offshore in the middle of the coast. These areas likely have recreational use occurring, potentially from people who do not live near or do not use public access points (e.g. have private docks). This could be especially true for the triangle of space in the middle coast due to the lower amount of access points around Sapelo Island.

Looking across all data sources, birding was one of the two recreational uses with the most information. Incorporating eBird data significantly increased the total numbers. Although there were less direct participants that gave birding locations, those locations from direct participants matched very well with the locations from the abundant amount of eBird data points, indicating there was consistency in which areas were used for birding. Future projects should consider combining data collection methods, such as direct reporting and secondary source reporting, to gain more data and validation.

Fishing accounted for the greatest amount of direct participation data (53.5%). This correlates with both general understanding of this marine recreational activity along coastal Georgia and the direct outreach to CRD's saltwater fishing license email listserv for the online mapping application. Many anglers indicated they used a motorized boat, creating overlap between the fishing and boating data. Most of the estuarine and nearshore water ranked high in use, and many of the artificial reefs offshore were high use areas for fishing (and therefore also for boating). Some fishing was captured along the continental shelf, primarily in the southern section of the study area.

The two use categories with the least data are diving and ecotours. Although much effort was put towards engaging divers and ecotour outfitters, there was not a lot of participation from these two groups in this project. There is also a more limited range these activities can and often do take place compared to other recreational activities, making it appear there is less diving and ecotour activity taking place in Georgia waters. Furthermore, divers often pointed out that while there are great locations to dive in Georgia waters, people drive to South Carolina or Florida where there are more well-known sites and often better diving conditions.

The data revealed certain areas where multiple uses are taking place at a high frequency. In the estuarine/nearshore waters, the sounds and main rivers/creeks leading to the sounds had the highest frequency of use, from all six recreational categories. The sounds around major urban areas like Savannah and Brunswick were higher than the rest of the coast. This was expected given there is a higher diversity of potential activities with larger population centers, increasing access and use. In offshore waters, artificial reefs and “structures” (ex. navy towers) had the highest frequency of use, relating to fishing, boating, diving, and birding. This was also expected given many recreationalists use structures as reference points when they travel into open water. There were no paddling or ecotour use areas indicated in offshore waters.

Discussion:

The Coastal Georgia Recreational Use Mapping pilot project collected spatial data on coastal and ocean recreational uses using a combination of flexible, cost-effective, and participatory tools. The results provide an important spatial baseline that will be used to inform the Georgia’s current and future ocean planning and management efforts. Recreational use data was a gap CRD identified within their coastal management, and with this information they are better situated to make more informed and inclusive decisions about how Georgia marine environments are used and monitored.

Links to Coastal and Ocean Management

There are several ways this data can be used by coastal and ocean managers. Since there are a variety of recreational uses included in this project (even within the six broad use categories), there are too many to all name, so below are three examples of how the data can be applied.

Fisheries Areas

Natural and artificial structures were some of the higher use areas. Many of the artificial reefs that were created by GADNR stand out primarily for their high fishing value, but also boating, diving, and birding value. This shows that there are added recreational benefits (besides fishing opportunities) to adding artificial structure offshore. It hasn’t been determined whether adding artificial structure is creating additional fish, which in turn would enhance fishing opportunity. However, it appears that having designated offshore areas easily navigable for the average recreator drives where high use occurs. Known natural hardbottom areas, such as the

"Snapper Banks" off the northern coast of Georgia and Grays Reef National Marine Sanctuary, also have higher fishing, boating, and diving use than surrounding waters (Figure 8, Appendix B). This adds evidence to the notion that designated areas (or well-known, "named" areas) offshore allow for more recreators to comfortably find and use these areas, opposed to more obscure marine areas. With these data gaps now filled, resource managers can be more strategic in their management of marine resources. Examples could include targeting high use areas for monitoring the resources (oyster reefs, hardbottom, etc.) impacted by recreational activities and prioritizing funding for maintenance and/or expansion of artificial reefs. However, even with these filled gaps, challenges remain.

Single Use Decision-Making

There is no single management entity responsible for comprehensive, integrated management of our oceans. Responsibilities for ocean management are distributed among numerous federal, state, and tribal entities and include hundreds of laws, regulations, and policies. This distributed system poses challenges to managers striving for efficient, informed, and coordinated decision making. These challenges are increasing as society seeks to accommodate new and expanding ocean uses while simultaneously protecting the health of a rapidly changing natural system. A first step in combating these challenges if to have ocean use data available to coastal managers, which is what the Coastal Georgia Recreational Use Mapping Project accomplished for recreational activities. However, improved coordination among the different agencies is needed, along with increased engagement in ocean stakeholders to increase their support for multi-objective ocean planning.

Transferability

Before this pilot project concluded, there was little data about the location and frequency of recreational activities in Georgia's estuarine, nearshore, and offshore waters (let alone the entire south Atlantic region). This is the first time the location and frequency of several major marine recreational activities has been spatial mapped in the southeast, and the methods used in this pilot can certainly be replicable in areas outside of Georgia. Similar methods conducted in the Mid-Atlantic and Northeast US were the inspiration for this pilot project; using participatory mapping exercises not only facilitated data sharing among stakeholder and ocean managers, but it garnered support for multi-objective ocean planning principles to balance natural resources and economies. This support is a crucial piece towards successful management.

Importance of Building Diverse Relationships

This project included a strong stakeholder outreach and participatory component to enlist help from state managers, ocean recreational business leaders, and recreational users to provide data and information that addresses a critical gap for Georgia. Participants submitted over 1150 polygons and points representing their recreational use areas - collectively creating the state's first comprehensive maps for ocean recreation. This participatory approach has helped build awareness of and investment in ocean planning efforts among recreational users, groups, and associations. A large and diverse group of recreational stakeholders were engaged in the development, outreach, and review of the project's results and we believe that as a result, they will now be more likely to participate in ocean planning activities and processes. This is an important achievement and as planning efforts move forward, it will be important to continue to engage these key groups of recreational stakeholders.

Lessons Learned

While the Coastal Georgia Human Use Mapping Project was a success in generating baseline recreational data for Georgia's estuarine, nearshore, and offshore waters, this was a pilot project for the Conservancy's South Atlantic program to learn which methods/processes worked best and which ones need modification.

1. <u>Methods to Collect Data:</u> Originally participatory mapping workshops were the intended method to collect all recreational data; however, limited staff coupled with a rural and dispersed coastal population, limited workshops effectiveness. The online mapping application was a great addition to the project, increasing the amount of collected data by 32%.
2. <u>Data Management:</u> A dedicated GIS technician to work on processing the data (opposed to having multiple technicians work on various stages of data processing) would allow for a smoother project flow.
3. <u>Capacity Needed:</u> Face-to-face engagement through the participatory mapping workshops and in-person surveying proved effective in collecting data. Face-to-face contact requires staff capacity and effective technology, and although the creation of a small volunteer group was attempted to help increase the number of workshops and surveying, limited technology and an unwillingness of volunteers to use their own technology inhibited this group.
4. <u>Coordination with Other Related Activities:</u> During the project's collection period, several other surveying/mapping projects with other organizations took place; reaching out at

first notice to other researchers to better coordinate mapping efforts to limit the amount of survey fatigue would benefit all projects.

Where To Go Next?

After the National Ocean Policy of 2010, there was a growing effort to manage human interactions with marine systems using a comprehensive approach. To account for ecological and economic systems this frequently means shifting toward cross-boundary management at a regional scale. The Northeast and Mid-Atlantic's federally recognized regional planning bodies (RPBs) provide a model for how the South Atlantic could start moving towards regional multi-objective ocean planning. Although the south Atlantic did not have an active RPB, the Governor's South Atlantic Alliance (GSAA), established in 2009 before RPBs were created, served as a collaboration to sustain the region's environmental, natural resource, economic, public safety, social and national defense missions. This structure was developed to support RPB-like activities however the large scale of the region and individual state coastlines, along with no critical large scale new use (e.g. offshore wind energy), limited movement.

At the start of this pilot project, the GSAA was in a bit of transition, and therefore TNC thought it would be best to start with a state that had the best enabling conditions (Georgia). Once the first pilot state was complete, TNC would plan a large regional effort. At the beginning of 2017, the GSAA dissolved and combined with concerns from stakeholders and a lack of a clear driver to undertake multi-objective ocean planning (e.g. offshore wind energy), the region's interest has significantly lessened. However, the importance and desire to collect recreational use information still exists and there are opportunities to continue this work in other south Atlantic states.

Conclusion:

The Coastal Georgia Recreational Use Mapping Project succeeded in providing CRD with baseline recreational use data for six major recreational activities within the state's estuarine, nearshore, and offshore marine environments. Using a mixed methods approach (participatory mapping workshops, an online mapping application, and a secondary data source), over 1150 data submissions were processed from over 350 participants. The newly collected data was augmented with over 11,000 data points from eBird, to generate Georgia's first marine recreational use maps. This data has been provided to CRD and will be housed on their Georgia Coastal Atlas and Mapping Project (GCAMP) data portal, where coastal/ocean managers and other stakeholders can have access and distribute information. This project provided insight into how this type of human use data mapping could work and be improved, which could be transferred to other areas in the South Atlantic region.

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Appendices:

Appendix A – Background Information and Results

Figure 1: Map of the South Atlantic Whole System project area.

		Importance of Stakeholder (1-4)				
		Unknown (4)	Little/No importance (3)	Some importance (2)	Significant importance (1)	
Influence of Stakeholder (1-4)	Significant influence (1)					Want to be sure we reach the groups that fit in the green boxes
	Somewhat influential (2)					Please use the matrix (right) to rank how important and influential each of these groups are: **1** = most important/influential, **2** = some importance/influence, **3** = little or no importance/influence, **4** = unknown (N/A)
	Little/No influence (3)					
	Unknown (4)					

Figure 2: Stakeholder Matrix used to prioritize stakeholder groups.

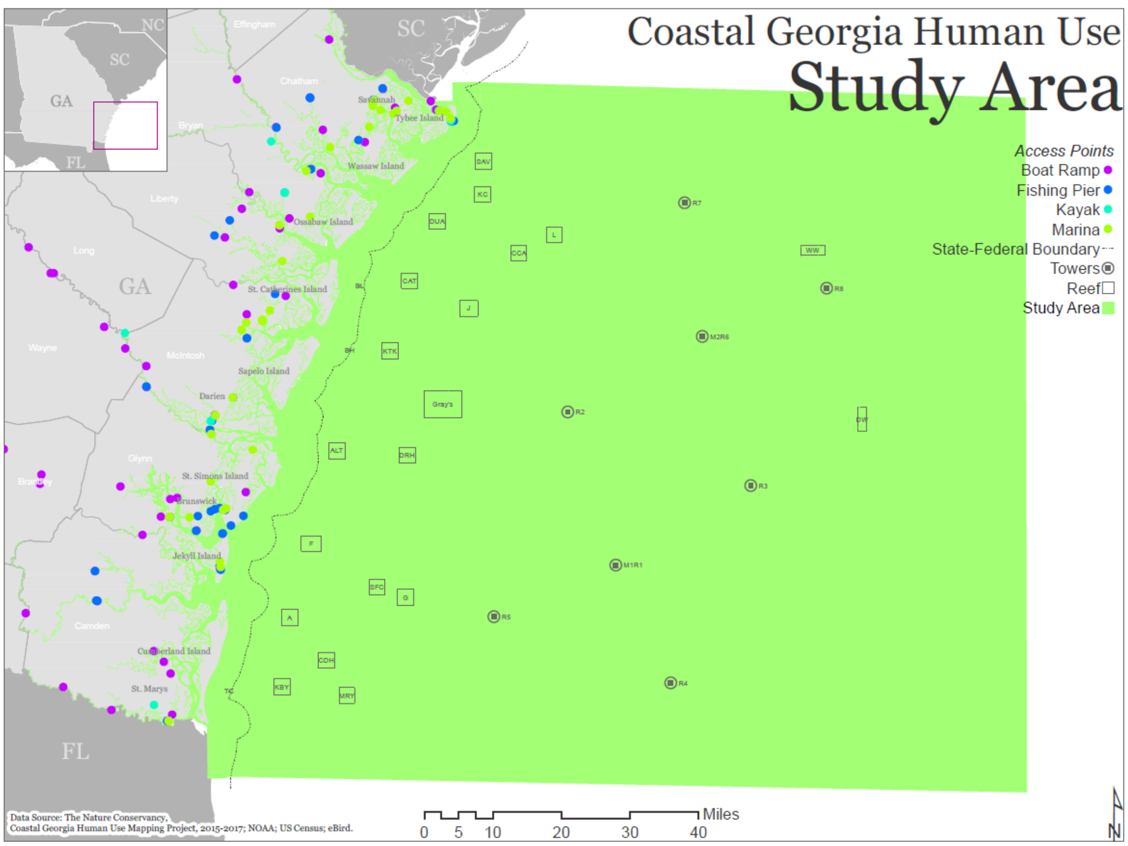


Figure 3: Map showing the study area of the pilot project. Included in the map are the public access points, State-Federal Boundary, artificial reef sites, and Navy towers.

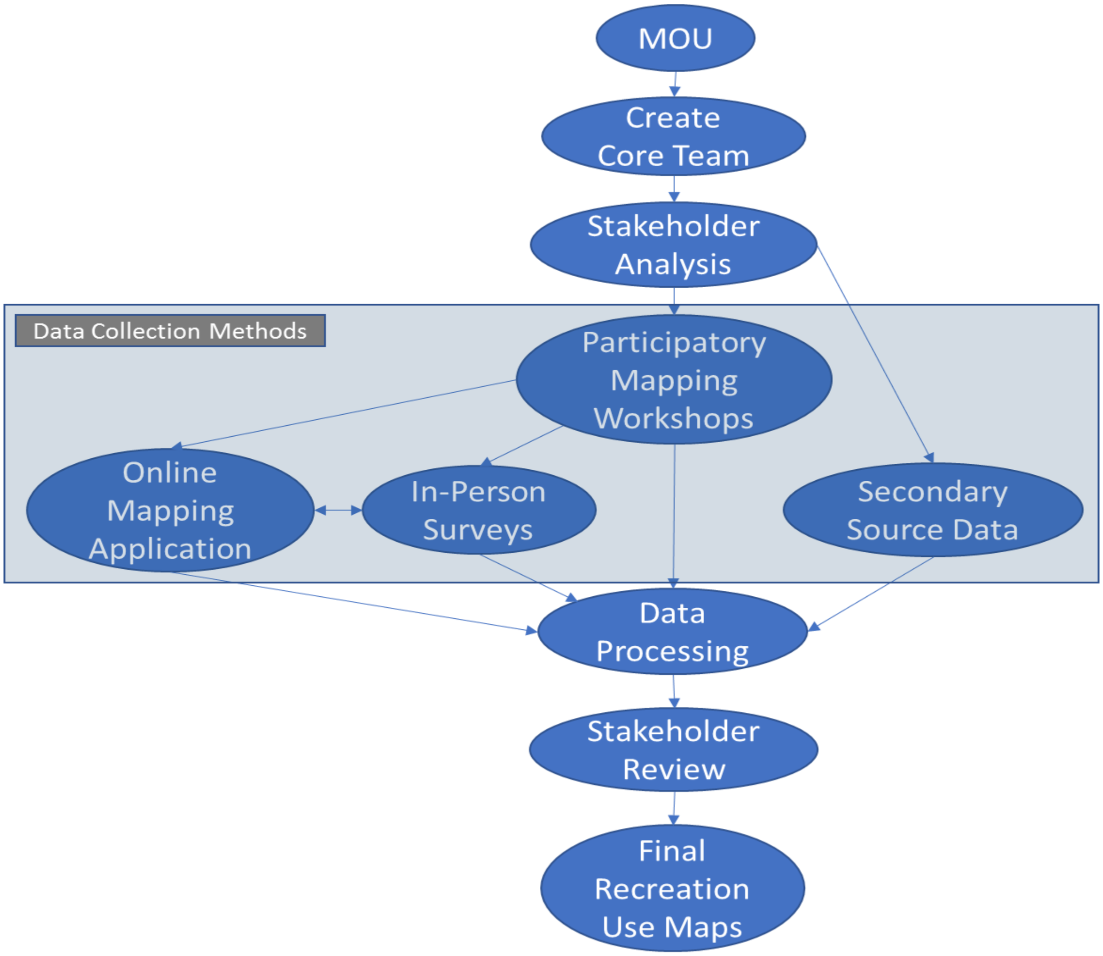


Figure 4: Flow diagram showing the connection of data collection and processing throughout the pilot project.

Table 1: Stakeholder engagement and participatory workshop participation.

Coatal Georgia Human Use Mapping Project - Engagement				
Workshops	**# of Participants**		**Comm. Events**	**# of Participants**
Grays Reef NMS	8		JI GreenScreen (2)	2
Skidaway Inst. of Ocean	4		GADNR Coastfeset (2)	2
Divers Den (paper)	6		St. Marys Fishing	5
GA DNR	7		Savannah Boat Show	1
GI Envi. Comm.	14			**10**
SSU 1	3			
SSU 2	3		**1-on-1 (6 people)**	
DNR Creel 1	5		Artifical Reef Expert	Expert Birder
DNR Creel 2	6		Recreational Angler	Expert Boater
	56		Creel Surveyor	Ecotour Guide
Highly Influential/Important Groups				
Chatham County		Coastal Conservation Assoc. (GA)		
Glynn County		Sapelo Sea Farms		
McIntosh County		Friends of Sapelo		
City of Brunswick		Georgia Conservancy		
City of Savannah		100 Miles		
City of Darien		Coastal GA Audobon Society		
Grays Reef NMS		Golden Isles Visitors Bureau		
Jekyll Island Authority		Fantasia SCUBA		
Sapelo NERR		Island Dive Center		
Surfrider (GA Chapter)		SouthEast Adventure Outfitters		
Georgia Ports Authority		Coastal Outdoor Adventures		
Skidaway Inst. of Ocean		GA Shellfish Growers Assoc.		
GA Sea Grant/UGA MAREX		Coastal GA Regional Commission		
Altahama Riverkeeper		Center for Sustainable Coast		
Satilla Riverkeeper		Various Fishing Charters		
Glynn County Envi. Coalition		Golden Isles International		
GA Dept of Natural Resources		US Army Corps of Engineers		
GA Nat'l Wildlife Refuges		Many Recreational Anglers		
Freedom Boat Club		Tybee Light and Sail Club		
Coast Guard Auxillary		Morning Star Marinas		

Table 2: List of 30 public access locations surveyed using the online mapping application.

Public Access Locations				
Name	**County**	**Type**	**Number of visits**	**Number of people surveyed**
Tybee Island Marina	Chatham	Marina	2	4
Lazaretto Creek Boat Ramp	Chatham	Boat Ramp	2	7
Bull River Marina	Chatham	Marina	2	6
Hogan's Marina	Chatham	Marina	1	1
Turner Creek Boat Ramp	Chatham	Boat Ramp	2	4
Thunderbolt Fishing Pier	Chatham	Pier	2	3
Tybee Island Ocean Pier	Chatham	Pier	2	5
Isle of Hope Marina	Chatham	Marina	1	2
Coffee Bluff Marina	Chatham	Marina	1	1
Skidaway Narrows Boat Ramp	Chatham	Boat Ramp	2	5
Fort McAllister Boat Ramp	Bryan	Boat Ramp	2	4
Sunbury Boat Ramp	Liberty	Boat Ramp	3	6
Half Moon Marina	Liberty	Marina	2	3
BarBour Island River Landing	McIntosh	Marina	1	1
Dallas Bluff Marina	McIntosh	Marina	2	3
Shellman Bluff Fish Camp	McIntosh	Marina	1	2
Pine Harbor Marina	McIntosh	Marina	1	1
Blue-N-Hall Boat Ramp	McIntosh	Boat Ramp	2	6
Darien Boat Ramp	McIntosh	Boat Ramp	2	4
Butler River Fishing Bridge	McIntosh	Pier	3	3
Two Way Fish Camp	Glynn	Marina	1	3
Village Creek Boat Ramp	Glynn	Boat Ramp	3	4
St. Simons Island Fishing Pier	Glynn	Pier	2	6
Jekyll Island Pier	Glynn	Pier	2	6
MacKay River Boat Ramp	Glynn	Boat Ramp	3	5
Lanier Boat Ramp	Glynn	Boat Ramp	4	7
Jekyll Creek Boat Ramp	Glynn	Boat Ramp	4	6
Woodbine Community Park Boat Ramp	Camden	Boat Ramp	1	2
St. Mary's Waterfront Ramp	Camden	Boat Ramp	2	5
Harriett's Bluff Boat Ramp	Camden	Boat Ramp	2	3
TOTAL			**60**	**118**

Delivery Metrics - Details	
344,536	Total Sent
338,582 (98%)	Delivered
1,097 (0%)	Pending
4,857 (1%)	Bounced
336 (0%)	Unsubscribed

Bulletin Analytics	
52,200	Total Opens
39,207 (12%)	Unique Opens
2,145	Total Clicks
1,825 (1%)	Unique Clicks
11	# of Links

Delivery and Performance

Channel	Progress	Percent Delivered	Number of Recipients	Number Delivered	Opened / Unique	Bounced / Failed	Unsubscribed
Email Bulletin	Sending...	98.3%	343,740	337,786	39207 / 11.6%	4,857	336
SMS Message	Delivered	0.0%	0	0	n/a	0	n/a

Figure 5: Additional information regarding the use of the online mapping application emailed to Georgia saltwater fishing license holders. Online mapping application was delivered to 338,582 saltwater fishing license holders, 52,200 license holders opened the email, and 39,207 license holders clicked on the link to the online mapping application.

Table 3: Descriptions of overarching data processing methods for each data source.

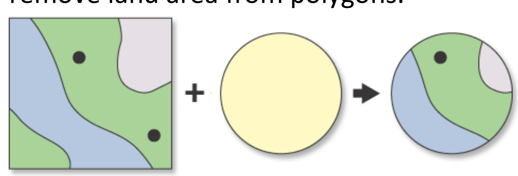
Recreational Use Mapping – Data Processing Methods	
Data Source	**Overarching Methods**
Paper-Based Workshop Data	Georeference paper maps, digitize use areas, enter attribute data, join to shapefiles
Digital Workshop Data	Clean polygons, verify attribute data, join attribute data with workshop notes
Online Mapping Application	Download data from ArcGIS online account, clean polygons, verify attribute data
Secondary Data - eBird	Download point data from eBird, georeference data, clip data to 1/8 mile buffer around water boundary

Table 4: Total data submissions for each recreational use and all uses from all direct stakeholder participation (showing percentages for each recreational use category).

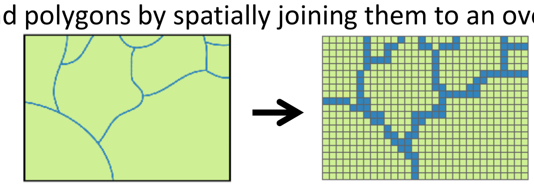
TOTAL SUBMISSIONS						% of total submissions
Fishing:	342 polygons	+	273 points	=	615 submissions	53.5%
Boating:	96 polygons	+	104 points	=	200 submissions	17.4%
Paddling:	129 polygons	+	23 points	=	152 submissions	13.2%
Birding:	50 polygons	+	20 points	=	70 submissions	6.1%
Ecotours:	57 polygons	+	7 points	=	64 submissions	5.6%
Diving:	36 polygons	+	13 points	=	49 submissions	4.3%
TOTAL:	710 polygons	+	440 points	=	**1150 submissions**	

The conceptual flow of our data analysis has been to:

1) Upload raw survey data to a map.
2) Clip data as appropriate to remove land area from polygons.



3) Tesselate these points and polygons by spatially joining them to an overlaid grid w/ 1 sqkm cells.



4) Combine tessellated data from each survey so that quantitative attributes (e.g. AveDays & AveParts) are summed together for overlaying cells. With this totaled data, we have represented the summed AveDays and AvePart variables independently to create quantile maps that represent of areas of high, medium, and low value.

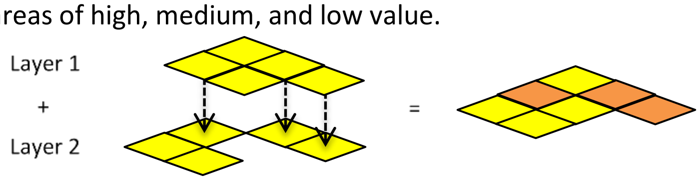


Figure 7: Conceptual Flow Diagram showing how the 1sqkm grid system was incorporated.

Appendix B – Final Maps

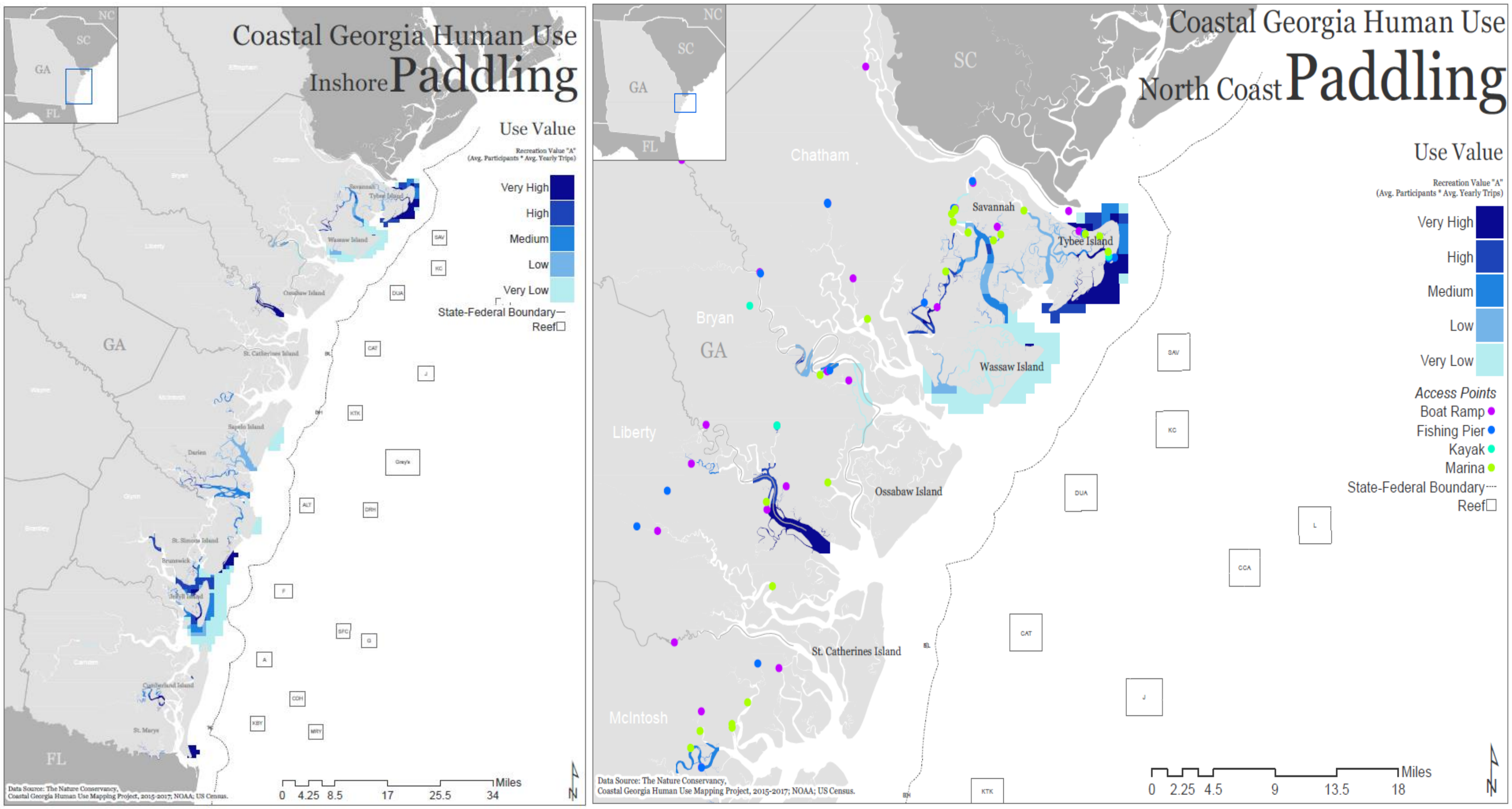


Figure 1: Maps of recreational paddling areas, displayed through showing frequency of use (very low – very high) using 'Recreation Value A' (number of recreation days X number or participants = 'Reaction Value A').

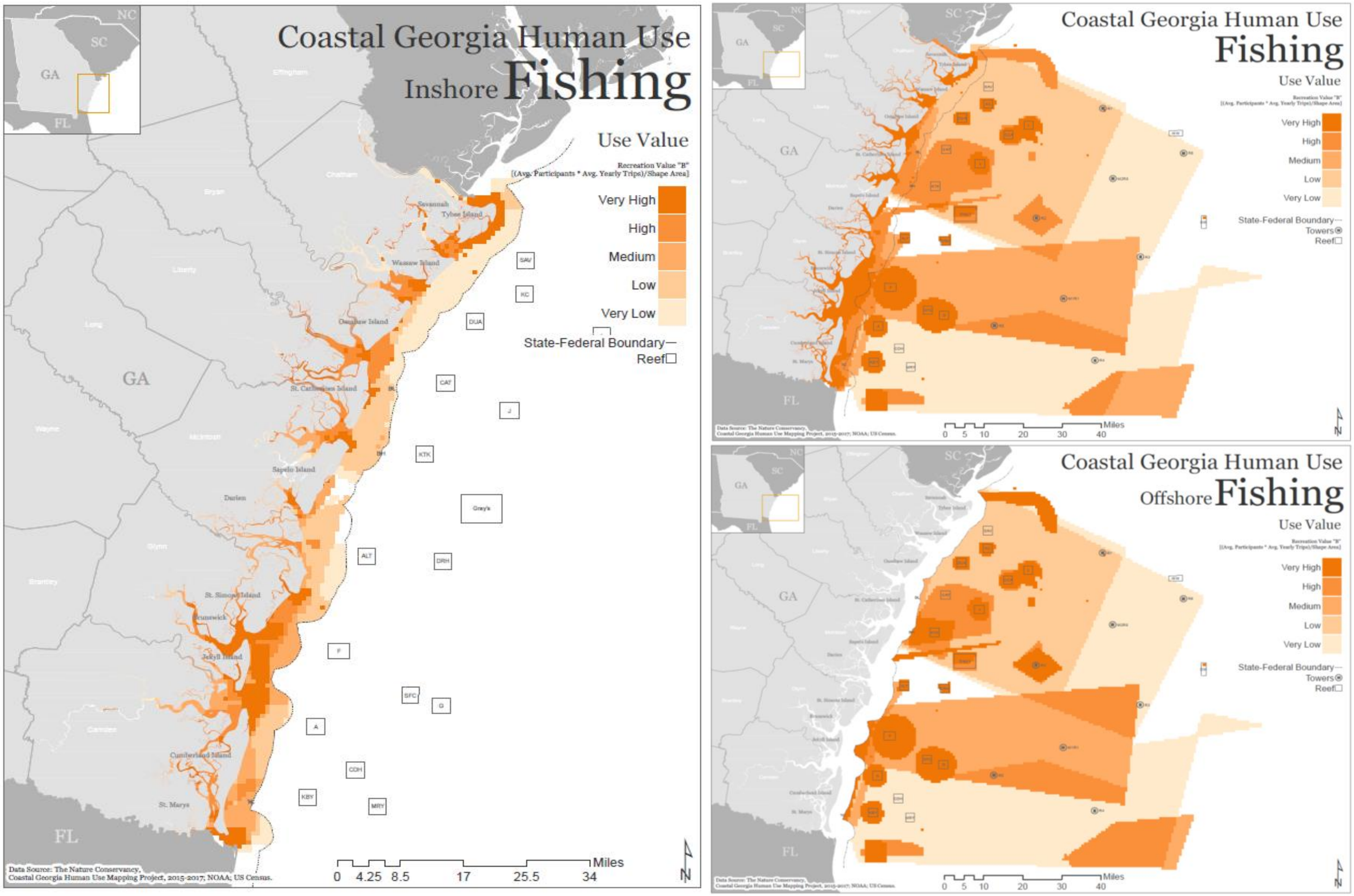


Figure 2: Maps of recreational fishing areas, displayed through showing frequency of use (very low – very high) using 'Recreation Value B' ((number of recreation days X number or participants)/polygon area = 'Recreational Value B').

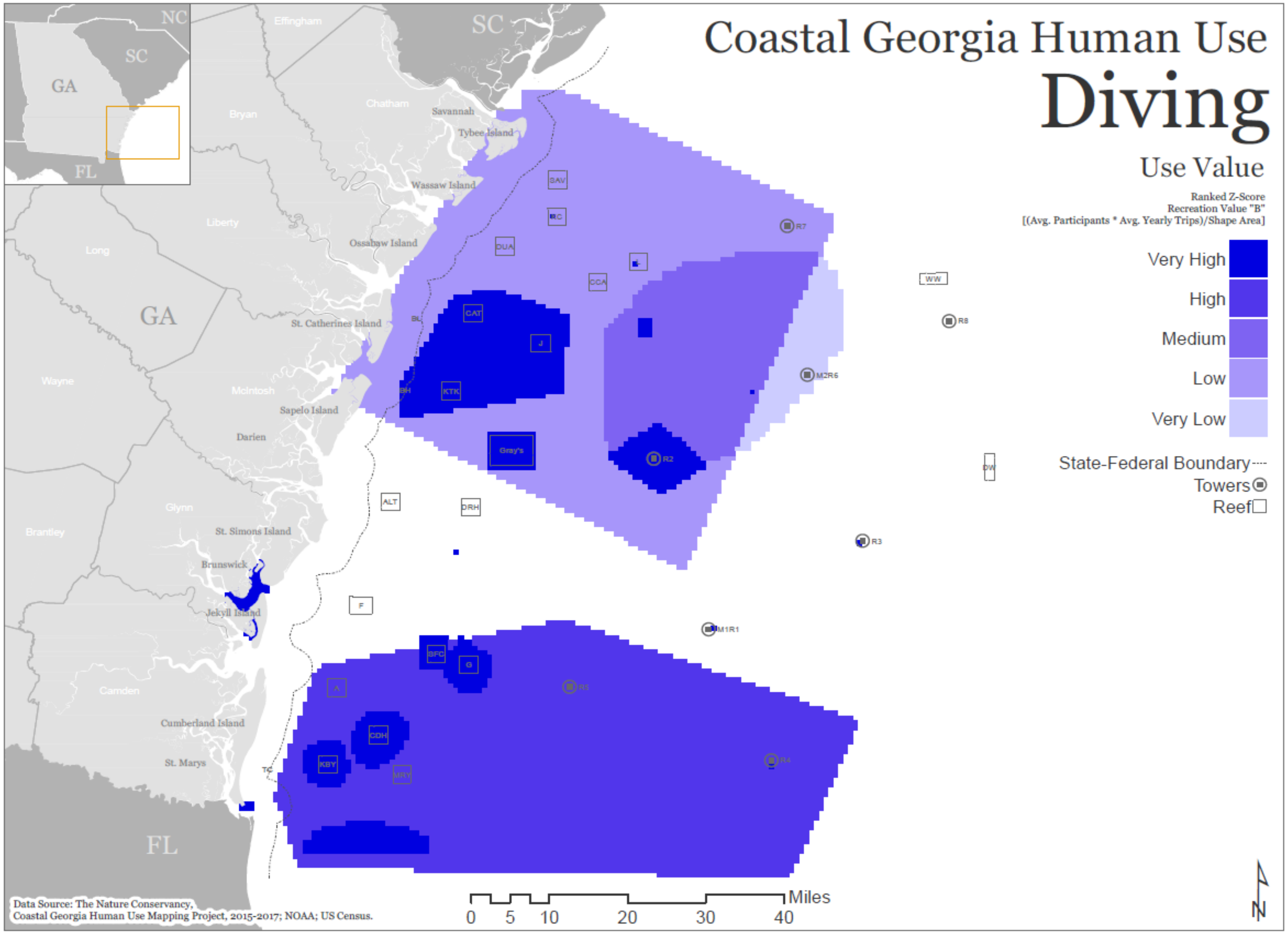


Figure 3: Maps of recreational diving areas, displayed through showing frequency of use (very low – very high) using Ranked Z-score 'Recreation Value B'.

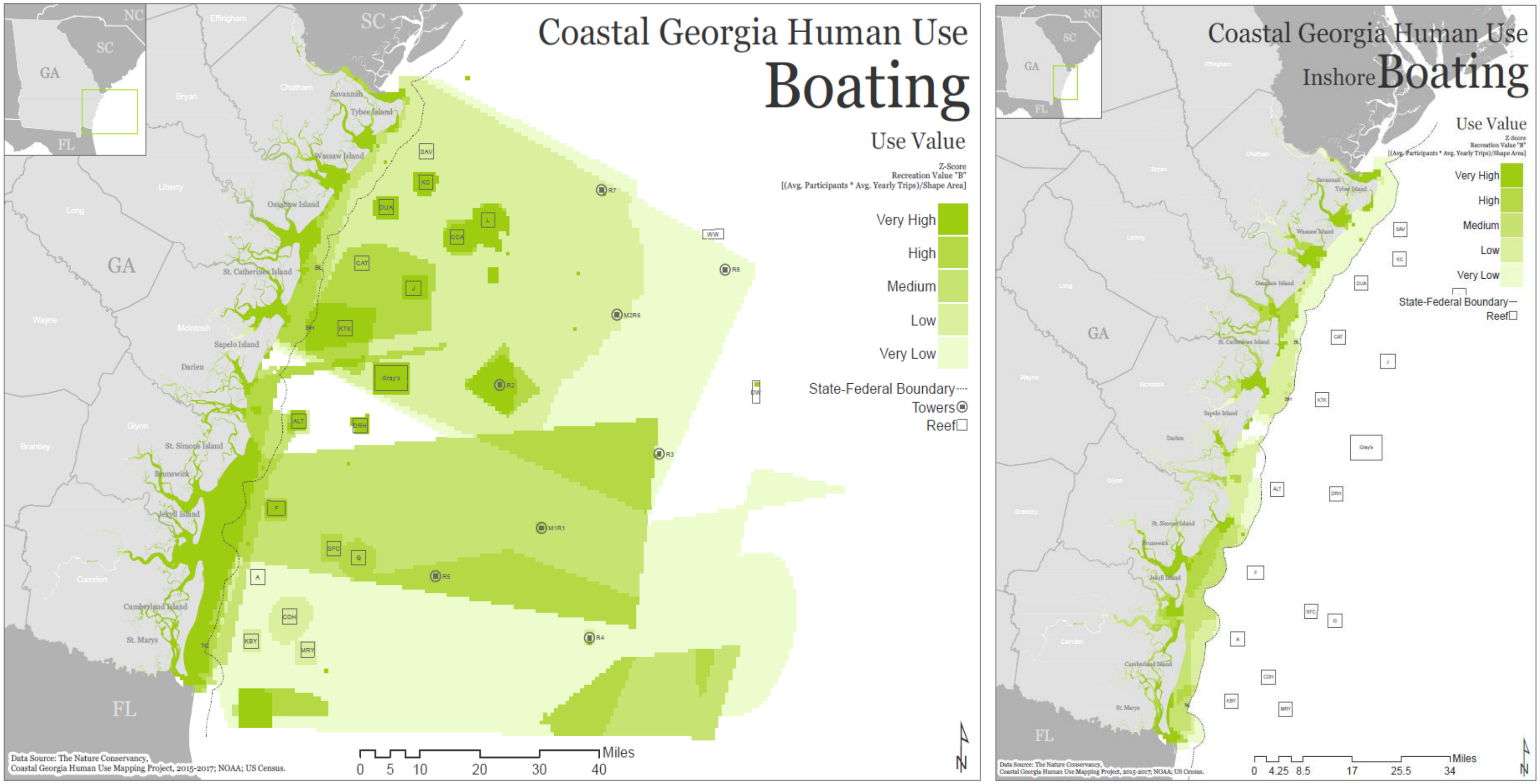


Figure 4: Maps of recreational fishing areas, displayed through showing frequency of use (very low – very high) using Z-score 'Recreation Value B'.

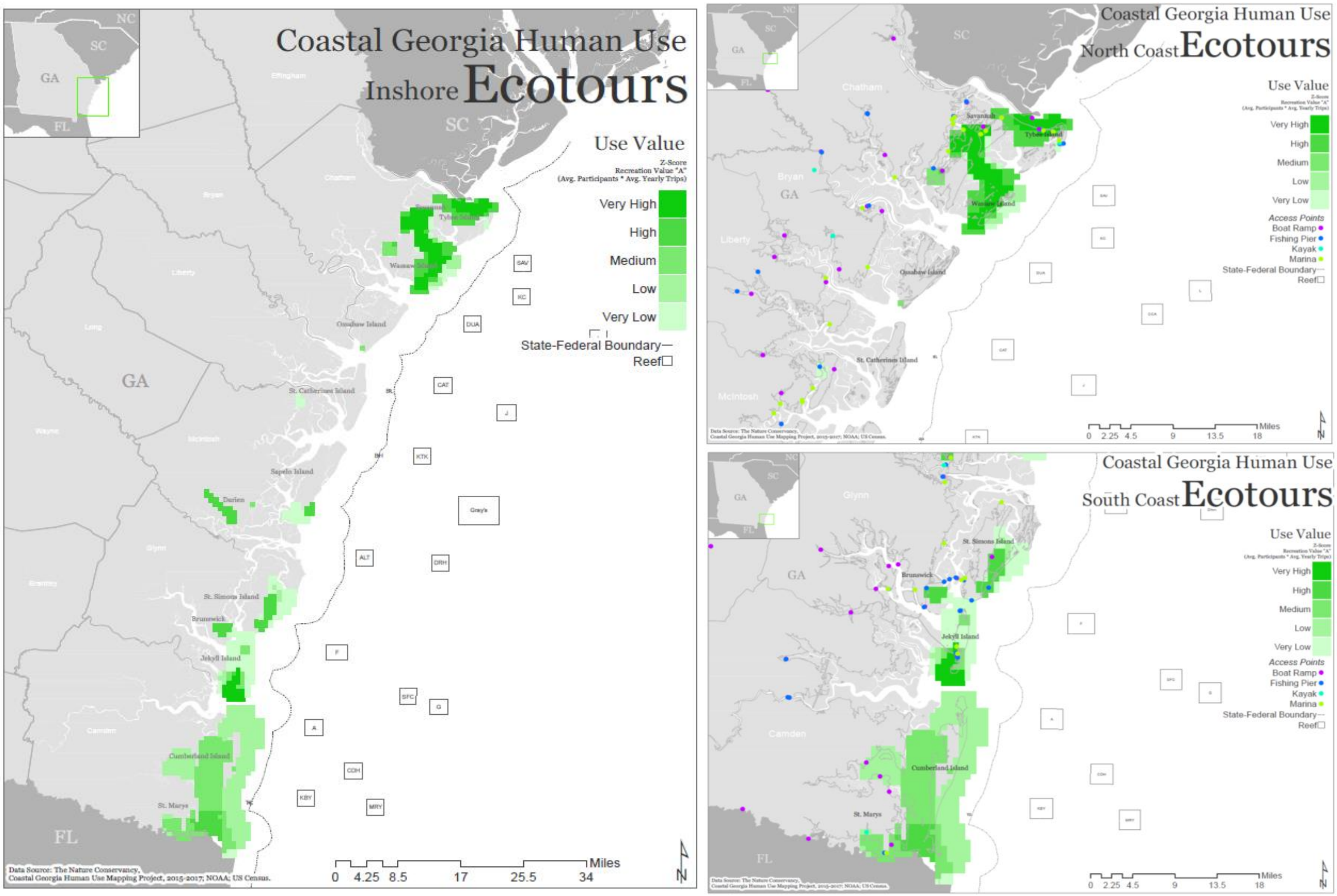


Figure 5: Maps of recreational ecotour areas, displayed through showing frequency of use (very low – very high) using Z-score 'Recreation Value A'.

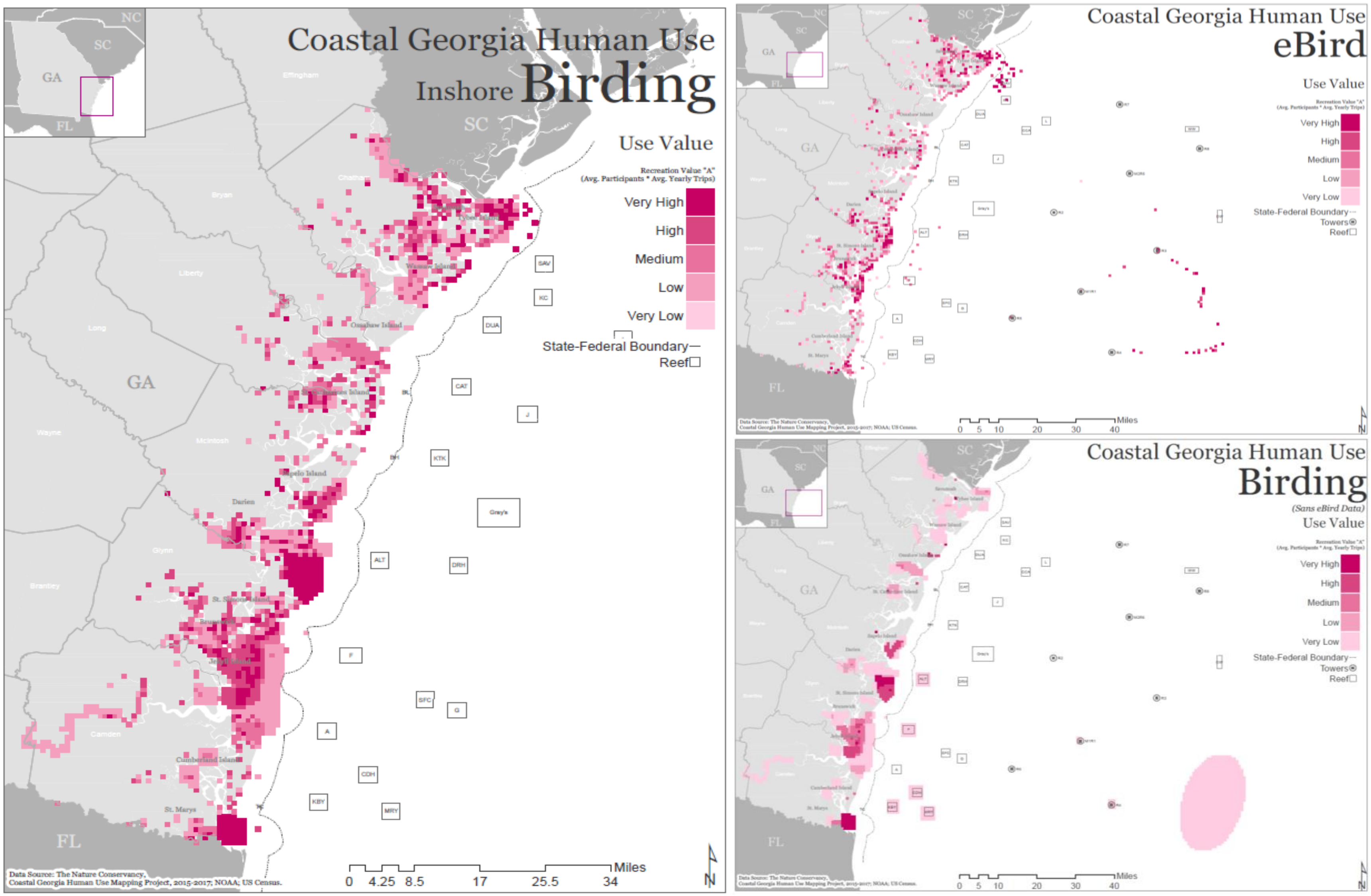


Figure 6: Maps of recreational birding areas, displayed through showing frequency of use (very low – very high) using 'Recreation Value A'. The top right map is only eBird data, the bottom right map is only direct participant data, and the left map is all birding data for inshore.

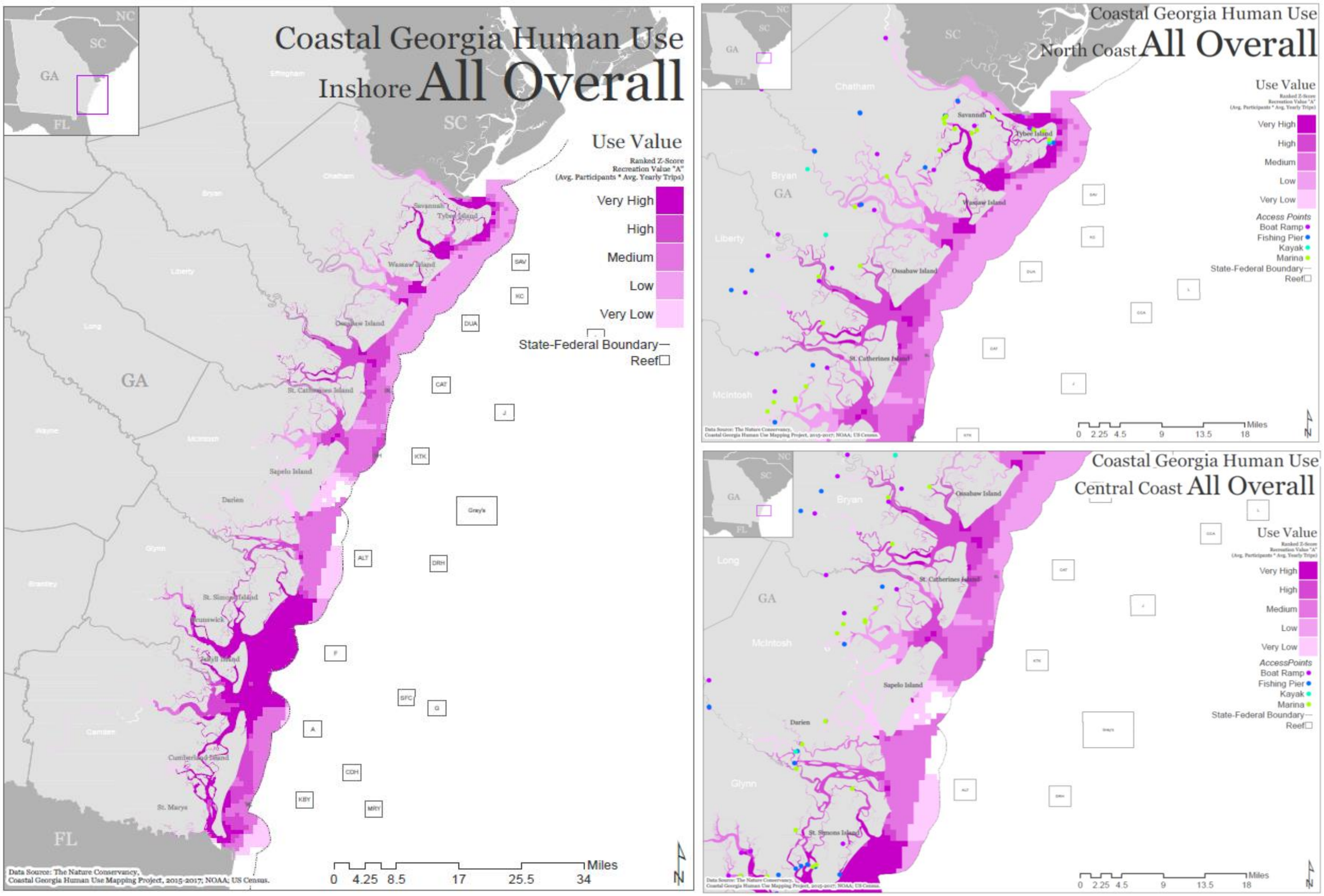


Figure 7: Maps of overall recreational use areas, displayed through showing frequency of use (very low – very high) using Ranked Z-Score 'Recreation Value A'.

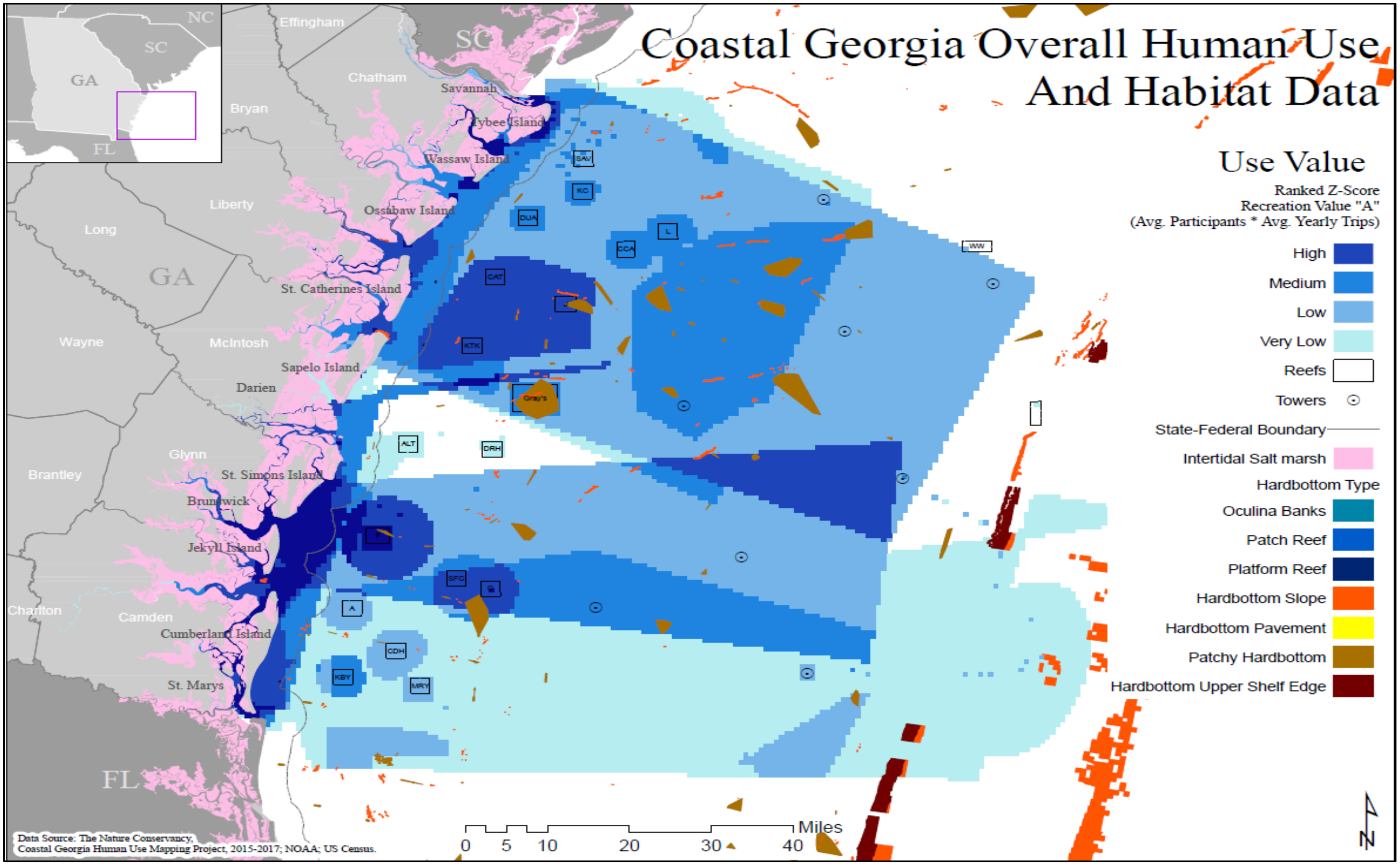


Figure 8: Map of overall recreational use areas, displayed through showing frequency of use (very low – very high) using Ranked Z-Score 'Recreation Value A'. This data is overlayed with natural hardbottom data (from TNC's South Atlantic Bight Marine Assessment (SABMA) (Conley et al. 2017)) to show which areas of hardbottom have high frequencies of recreational use occurring (primarily fishing, diving, and boating).