

Recreational SCUBA Diving Areas  
Northeast United States  
September 2015

Prepared for:  
Northeast Regional Ocean Council  
Northeast Ocean Data Portal  
[www.northeastoceandata.org](http://www.northeastoceandata.org)

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## 1. INTRODUCTION

The Recreational SCUBA Diving Areas layer depicts activity areas mapped by participants in the [Northeast Coastal and Marine Recreational Use Characterization Study](#), which was conducted by [SeaPlan](#), the [Surfrider Foundation](#), and [Point 97](#) under the direction of the [Northeast Regional Planning Body](#) (NE RPB). In order to fill a regional need to better understand the spatial patterns of important recreational activities in New England, the study was focused on collecting information on commercial whale watching, SCUBA diving, sailing races and regattas, competitive board and paddle events, beach going, wildlife viewing, surfing, and non-motorized boating sports. This document describes the processes for developing the SCUBA diving data component of the study. Additional information can be found in the study's [final report](#).

Shore- and boat-based recreational SCUBA diving is a popular activity occurring at various sites throughout the Northeast, primarily focusing around historical shipwrecks, interesting benthic habitat communities, and popular wildlife viewing areas. Despite the relatively cool water temperatures, diving activity in the Northeast occurs year-round but is concentrated in the months of May through October, and is clustered around regions with attractive underwater topography. Much diving activity occurs from private boats or from the shore, while groups may also charter diving excursions through professional dive boats. Characterization of recreational SCUBA diving was a priority for the NE RPB and this study, since SCUBA divers are impacted by economic and environmental forces and because of the high potential for interaction between SCUBA diving and other ocean uses.

The team collaborated with SCUBA diving experts, such as dive club members, dive shop owners and instructors, and charter operators to help guide the development, execution, and review of the study components. Based on the input from diving experts and guidance from an NE RPB project steering committee, initial data collection efforts began in the spring of 2015.

### *Data collection*

This study was an attempt to compile data from multiple sources by using a single methodology to characterize SCUBA activity on a region-wide scale. Data collection took place using both online tools and in-person workshops, as well as by researching publicly-available online and print sources of information for regional diving locations.

The first phase of data collection took place using an online survey tool. Dive club members, dive shop owners and employees, tour and charter operators, and other diving experts were invited to register for the online survey, and received a unique link to the survey via email. The survey was live from March 31<sup>st</sup> – May 25<sup>th</sup>, 2015 and utilized Google Maps and a nautical chart interface which allowed users to map polygons depicting highly-used recreational dive sites. After mapping a diving area, survey users were asked to provide details on the site, including:

- The features of interest at the wreck (e.g., man-made structure, habitat, or wildlife)
- Whether the area was a wreck site
- The name of the wreck (if applicable)
- The age of the wreck (if applicable)
- The type of vessel of the wreck (if applicable)
- Whether the area was considered sensitive
- The number of divers that typically visit the site in a year
- Types of activities that typically took place at the site (e.g., exploration, photography, fishing)
- Site access (i.e. shore or boat)
- Amenities at shore-based access point (e.g., parking, dive shop, restrooms)
- Water visibility at site
- Season when site is most frequently visited
- Best moon phase at which to visit site

While the survey was live, the team used SeaSketch, a web-based platform that allows registered users to view and interact with mapped ocean data, to vet interim data with industry experts in order to identify data gaps and strategize additional outreach opportunities. Once survey data were analyzed, the team presented the data at four dedicated meetings in the study

area. These meetings took place in Portland, ME, Nahant, MA, West Sayville, NY and East Lyme, CT during Summer 2015.

At these meetings, industry representatives had the opportunity to view and provide feedback on the data collected using the online survey and SeaSketch, and were also able map new sites or provide additional detail on existing sites, if known; however, for the sake of time, workshop participants were not asked to provide as many site-specific characteristics (e.g. water visibility, ideal moon phase) as were requested in the survey. Additional mapping was conducted using the eBeam tool. The eBeam tool consists of a wireless electronic stylus, a receiver, and computer software, and utilizes a projector to project a computer screen onto a flat surface (such as a whiteboard or wall) onto which a stylus is used by participants to draw areas of activity. With this implementation of the eBeam tool, participants digitized polygons on the projected GIS-based map which allowed the features to be automatically saved and then attributed with information the participants shared during the concurrent discussion.

The team also held several webinars in which SCUBA experts could identify and fill in data gaps. SCUBA experts who were unable to attend the meetings were allowed to review and add data in SeaSketch, or to add data remotely via webinar.

As part of the process of updating the Rhode Island Ocean Special Area Management Plan (RI OSAMP), Rhode Island Coastal Resources Center/Rhode Island Sea Grant (RI CRC/RI SG) held in-person meetings with stakeholder experts who identified additional, highly-used SCUBA diving areas in or near RI waters. During this process, the team collaborated closely with RI CRC/RI SG to determine how best to integrate these, as well as data from the existing OSAMP into the study data.

Background research and conversations with diving experts identified a number of both online and print sources that provided additional data on popular dive sites. This led to the creation of an additional spatial dataset depicting the point locations of popular dive sites, as identified on state-based geospatial data resources, diving websites, as well as published diving guidebooks. In general, data from these additional sources do not provide the level of detail on site characteristics (e.g. moon phase) as were requested from survey participants. As such, data from these sources focus on location and nearby landmarks.

### *Data processing*

In order to protect the location of potentially sensitive diving areas, such as historic or culturally important wrecks and other archeological resources, the team generalized the data of the more specific mapped sites from the online survey by taking the center point of each mapped polygon, and applying a 5 km buffer around each center point. Areas mapped during

the in-person workshops were either very small and site specific or very large and general. Small, site-specific data from the PGIS workshops were treated similarly to the site-specific data from the online survey, except the buffer distance used was 1 km. The justification for the smaller buffer distance stems from workshop participants assertions that the areas that they were mapping were not considered sensitive. Larger, mapped areas that may cover some sensitive sites were considered large and general enough to be kept as is. These data were edited to eliminate self-intersecting loops and other topological errors using ArcGIS editing tools.

In order to make these data geometrically compatible with the data collected from study participants, 1 km buffer was also added to the following, additional sources:

- Data gathered from the RI OSAMP meetings (buffer applied to center point of mapped area)
- Data gathered from print or online SCUBA guides (buffer applied to point location)
- Data gathered from other sources (e.g. phone calls or unpublished data sources) (buffer applied to center point of mapped area)

For the online survey data, the team also filtered mapped SCUBA sites based on the size of the mapped polygon. The size and spatial resolution of mapped polygons varied widely, with some users mapping polygons that covered extremely large areas, including one that spanned the majority of the Gulf of Maine. Because these large areas have limited utility from an ocean planning perspective, the team characterized all mapped areas larger than 100 km<sup>2</sup>, as general, rather than specific diving areas. These general diving areas are not included in maps and spatial data products because of their limited utility, but rather, are listed in the final report of the study.

## **2. PURPOSE**

This dataset fills a specific need identified by the Northeast Regional Planning Body to develop a better understanding of how and where humans use the ocean in the Northeast, inform regional ocean planning, and minimize ocean use conflicts. This dataset can also be used by recreational SCUBA divers to demonstrate the importance and location of the activity in the region.

## **3. SOURCES AND AUTHORITIES**

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#### 4. DATABASE DESIGN AND CONTENT

Native storage format: ArcGIS File Geodatabase – simple feature class

Feature Types:

Recreational SCUBA diving area polygons

Data Dictionary:

Line	Name	Definition	Type	Size
1	OBJECTID	Uniquely identifies a feature	OBJECTID	*
2	Shape	Geometric representation of the feature	geometry	*
3	siteName	Identifies the name of the site, if applicable	text	50
4	landmark	Identifies, if known and applicable, the nearest landmark or access point to the site	Text	50
5	siteChar	Identifies, if applicable, the type of feature(s) that can be found at the site	text	50
6	vesselType	Identifies, if known and applicable, the type of vessel found at the site (wreck sites only)	Text	50
7	siteActivity	Identifies, if specified, the activities that divers are known to take part in this area	text	100
8	siteAccess	Identifies, if known, whether the site can be accessed by shore or boat	text	50
9	waterVis	Identifies, if known, the typical water quality at the dive location (online survey data only)	text	50
10	moonPhase	Identifies, if known, the best moon phase at which to access the site (online survey data only)	text	100
11	season	Identifies, if known, the season(s) during which this site is most frequently accessed (online survey data only)	text	50
12	timesVisited	Identified, if known, the estimated number of visits the site receive per year (online survey data only)	text	50

13	source	Indicates how the source of the spatial data	text	700
14	sourceType	Indicates the type or format of the source	text	50
14	notes	Provides additional details or descriptors about the use area, if applicable	text	254
15	Shape_Length	Length of polygon in spherical coordinates	double	*
16	Shape_Area	Area of polygons in spherical coordinates	double	*

Feature Class Name: RecreationalSCUBADivingAreas

Total Number of Unique Features: 1103

Dataset Status: Complete

## 5. SPATIAL REPRESENTATION

Geometry Type: vector polygon

Reference System: GCS North\_American 1983

Horizontal Datum: North American Datum 1983

Ellipsoid: Geodetic Reference System 1980

XY Resolution: XY Scale is 1000000000.0000001

Tolerance: 0.0000000089831528411952117

Geographic extent: -74.04 to -64.93, 38.99 to 44.98

ISO 19115 Topic Category: environment, oceans, biota, economy, society

Place Names:

Bailey Island; Block Island Sound; Buzzards Bay; Cape Ann; Cape Cod Bay; Fishers Island Sound; Folly Cove; Great South Channel; Gulf of Maine; Hudson Canyon; Isle of Shoals; Jeffreys Ledge; Long Island Sound; Massachusetts Bay; Milford Harbor; Nantucket Shoals; Nantucket Sound; Narragansett Bay; Race Point; Rhode Island Sound; Stellwagen Bank

Recommended Cartographic Properties:

(Using ArcGIS ArcMap nomenclature)

30% transparency; solid fill, outline, 214-100-100 (HSV)

Scale range for optimal visualization: 100,000 to 4,500,000

## 6. DATA PROCESSING

Processing environment: ArcGIS 10.2, Windows 7 Ultimate SP5, Intel Xeon CPU

	Process Steps Description
1	Polygons were drawn in an editing session or imported from outside sources into ArcMap; points were imported from a table using latitude/longitude coordinates
2	In an ArcGIS editing session, drawing errors such as self-intersecting loops were eliminated from drawn polygons
3	Polygons over 100 km <sup>2</sup> from the online survey data were identified and deleted
4	For remaining survey data; a 5km BUFFER was applied around all polygon centerpoints <5 km <sup>2</sup>
5	For data collected during PGIS workshops, a 1 km BUFFER was applied around the centerpoints of all polygons <5km
6	A 1 km BUFFER was applied around all points derived from outside research
7	Polygons from survey data, PGIS workshops, and outside research were combined using MERGE
8	Areas that overlapped with land were eliminated using NOAA Medium Resolution Shoreline dataset and the ERASE tool
9	In an editing session, attributes and polygons were edited for accuracy and consistency and supplemented by notes from PGIS workshops

## 7. QUALITY PROCESS

**Attribute Accuracy:** Attribute information for SCUBA diving areas were provided by a combination of online survey participants, workshop participants, and guidebook information. While all effort was made to collect data from experts and authoritative sources, attribute information is dependent on the individual knowledge and experience of the data provider.

**Logical Consistency:** Polygons are topologically consistent. Self-intersections were removed. Areas may overlap where they represent data derived from multiple sources.

**Completeness:** While the data is thought to provide a thorough representation of where SCUBA diving is likely to take place in the region, it does not purport to represent every location where SCUBA diving could take place. While man-made structures such as wrecks and artificial reefs are finite in number, there are likely to be enumerable sites that, while important to divers, may lack specific boundaries and/or which might not be known by many divers. The diving locations depicted in this dataset are limited to those shared by stakeholders or in publically-available SCUBA guides.

**Positional Accuracy:** Locations were generalized as described in the processing steps. SCUBA sites do not necessarily have exact boundaries. Many divers will explore a loosely



defined area, the extent of which can be determined by tides, currents, visibility, access, or other factors. Even man-made structures, such as wrecks, may shift over time depending on oceanographic conditions. Participants were asked to map SCUBA areas using the highest spatial resolution that they were willing or able to employ; however, time constraints and knowledge of a site's precise location could also affect the precision with which an area was mapped. Precision also depends on the scale at which the area was mapped and the survey participant's level of comfort with the survey tool.

**Timeliness:** This dataset represents data collected during spring of 2015.

**Use restrictions:** Data are provided as is. NROC, the Northeast Regional Planning Body, Point 97, the Surfrider Foundation, and SeaPlan are not liable for any interpretations, assumptions, or conclusions based on these data. This data set must be cited on all electronic and hard copy products. This data set is not intended for navigation purposes.

**Distribution Liability:** All parties receiving these data must be informed of these restrictions.