

Southeast Coast Network

National Park Service
Inventory and Monitoring Division



Standard Operating Procedure 2.3.09

Coastal Shoreline Monitoring Annual Reporting—Version 1.1

Please cite this as:

Baron, L. C. 2021. Coastal shoreline monitoring annual reporting—Version 1.1. Southeast Coast Network Standard Operating Procedure NPS/SECN/SOP—2.3.09. Southeast Coast Network, Athens, Georgia.

Summary

The following standard operating procedure (SOP) outlines the generation of products included in the annual shoreline report. This SOP addresses the topics included in the annual reports, including the annual report contents and the creation of maps and summary tables. These procedures are adapted from the *Northeast Coastal and Barrier Network Geomorphological Monitoring Protocol Part I—Ocean shoreline position* (Psuty 2010). This SOP assumes the user has at least an intermediate understanding of Geographic Information Systems (GIS).

Revision Log

Revision Date	Author	Changes Made	Reason for Change	New Version #
28 July 2020	Lisa Cowart Baron	Updated SOP with quality control information to be included in annual report	This step is performed to check the data during data processing was not previously reported. Now it will be included in the report.	1.1

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Required Equipment and Data List

- Desktop or laptop computer running ArcGIS 10.x
- Results from DSAS analysis previously conducted using SOP 2.3.11 *Coastal Shoreline Monitoring Annual Change Analysis—Version 1.0* (Baron 2018)

Procedure

The purpose of this SOP is to provide information regarding the content and generation of the shoreline annual reports. The shoreline annual reports are created for each park and include analysis of the shoreline change over a one-year period, using a minimum of two or more shorelines. Each annual report covers the following topics:

1. Contents
2. Figures
3. Tables
4. Summary and Key Findings
5. Introduction
6. Study Area
7. Methods
 - a. Shoreline Data Collection
 - b. Shoreline Change Analysis
8. Water Levels
9. Protocol Changes
10. Results
 - a. Shoreline Data
 - b. Annual Shoreline Change Analysis
11. Literature Cited
12. Appendix A: Transect shoreline distance change data

The information below includes instruction on the maps, tables, and materials created for the shoreline annual reports. The following content addresses the topics of (1) shoreline map generation and (2) summarizing results. Within these sections the following items will be generated: shoreline

map; shoreline distance change map; shoreline distance from the baseline and distance change data table; and areas of interest table. One report is generated for each park. The following steps are used to create the park specific annual shoreline change reports.

Shoreline Map Generation

For each report, a map template is used to generate a map displaying the shorelines included in the analysis. The map templates are located on the SECN server in the following location:

INPSECNS01\GIS\projects\CoastalShoreline\ShorelineMaps

Figure 1 shows an example of what the shoreline data map should look like. Each shoreline should be a different color and should be listed in the legend. For some parks, shoreline analysis is divided into different sections. Each section should be displayed in its own map. The shoreline maps will be exported with the following filenames and saved on the SECN server in the location below:

YYYY_ZZZZ_PARK_Shorelines.PNG

INPSECNS01\GIS\projects\CoastalShoreline\Shoreline_PARK\Shoreline_PARK_Maps

Where:

- YYYY is the four digit year of the earliest shoreline in the map
- ZZZZ is the four digit year of the most recent shoreline in the map
- PARK is the four letter park code

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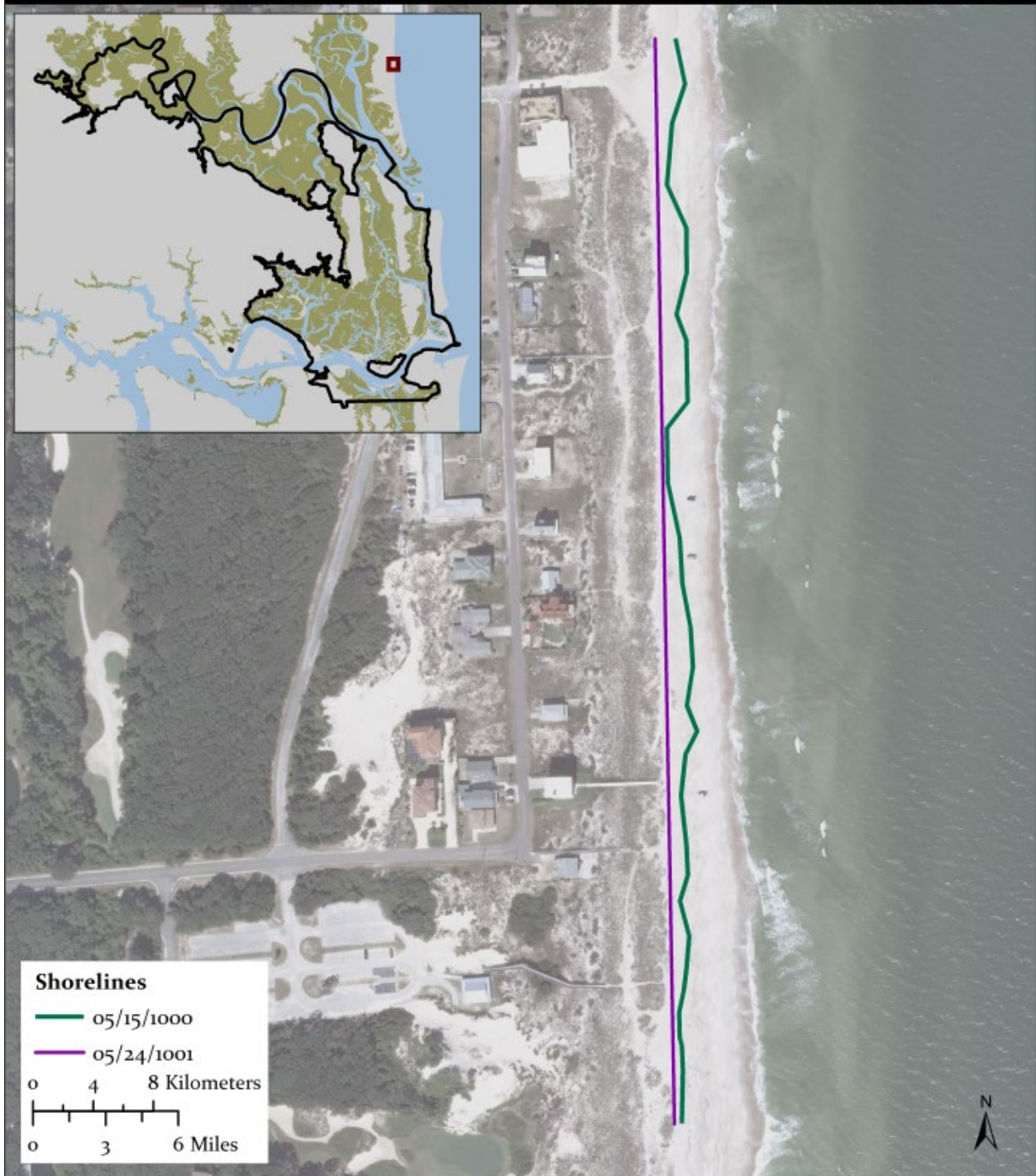


Figure 1. Shoreline map displaying two shorelines for analysis. This map was generated using mock shoreline data at Timucuan Ecological and Historic Preserve.

Summarizing Results

Results of the Digital Shoreline Analysis System (DSAS) analyses will be summarized in two ways—maps and tables. The following sections describe how to make the maps and tables used in the reports.

Create Shoreline Change Map

To create a map for the reports, first configure the shapefile created in SOP 2.3.11 (Baron 2018). The file is named:

PARK_Transect_X_FFFFF_ZZZZZ_rates_YYYYMMDD_hhmmss.shp,

Where:

- PARK is the four letter park code;
- X: is the transect number;
- FFFFF is the first letter of the season ('S' for spring and 'F' for fall) followed by the four digit year for the oldest shoreline analyzed;
- ZZZZZ is the first letter of the season ('S' for spring and 'F' for fall) followed by the four digit year for the most recent shoreline analyzed;
- YYYY is the year the run was conducted, taken from the corresponding table name;
- MM is the month the run was conducted, taken from the corresponding table name; DD is the day the run was conducted, taken from the corresponding table name;
- hh: is the hour the run was conducted; mm is the minute the run was conducted; and
- ss is the second the run was conducted.

Below is the information on how to display the shapefile and create a map for the annual reports:

Setting the Transect Layer Properties

This section describes how to set the symbology and labels of the transect layer.

Transect Symbology

PARK_Transect_X_FFFFF_ZZZZZ_rates_YYYYMMDD_hhmmss.shp, select the following as described in Figure 2:

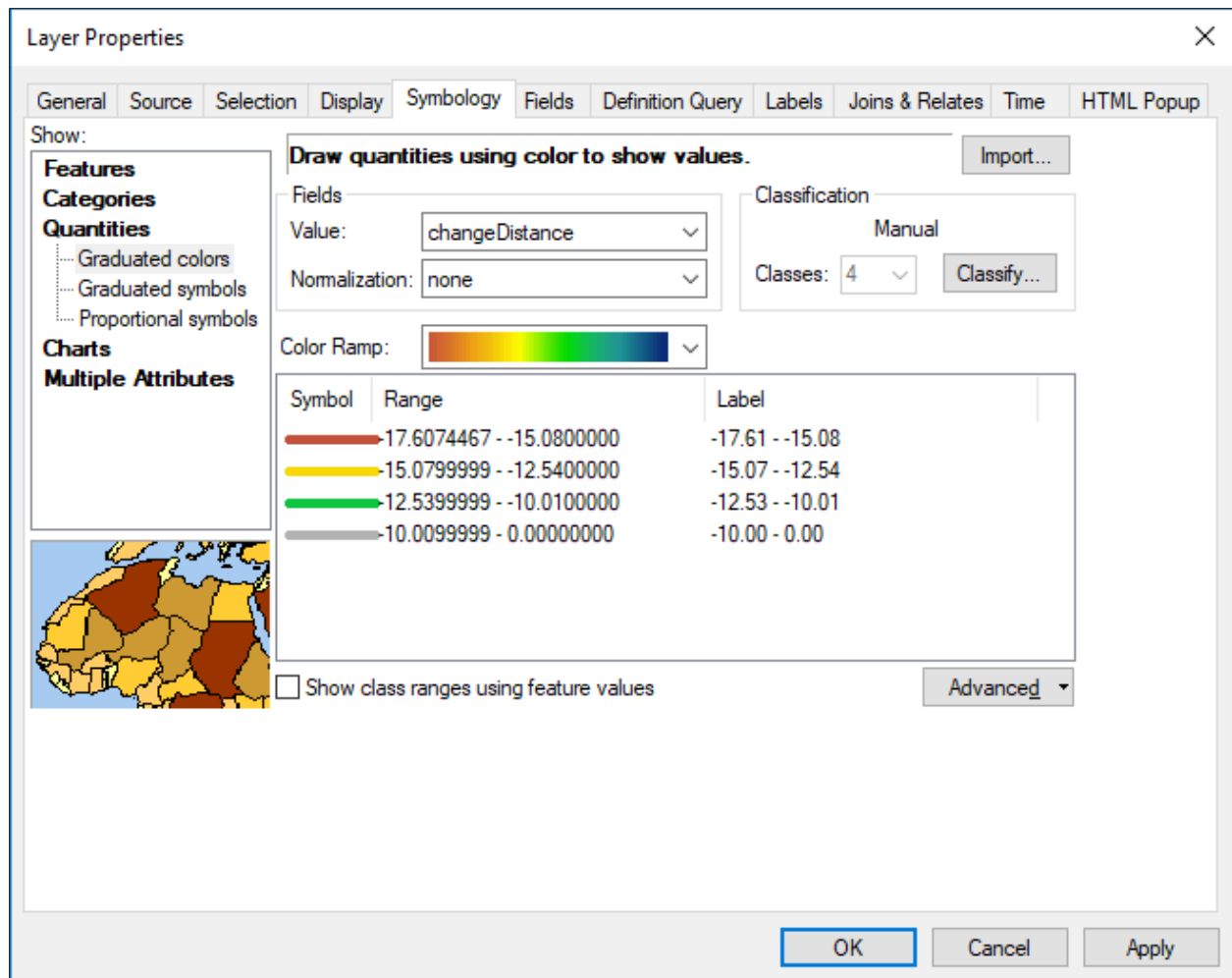


Figure 2. Screen shot of layer properties.

Quantiles: Graduated colors

- Fields
 - Value: changeDistance Normalization: none
- Color ramp: Use the color ramp shown in the Figure 2 that includes the colors red, orange, yellow, green, light blue, dark blue.
- Classification
 - Method: Manual
 - Classes: 4 Breaks

The breaks will be defined based on the data set. The distance change within the uncertainty (± 10 meters or 32.8 feet [ft]) is denoted as grey (Figure 2). If both erosion and accretion have occurred,

then the erosion and accretion should be represented in the data breaks. If only erosion or only accretion occur, the remaining distance change is grouped equally into three intervals (Figure 3). Since the uncertainty range for the distance change is ± 10 meters (32.8 feet), for the data set in Figure 3, the uncertainty range is -10 to -2.95 meters (-32.8 to -9.68 ft) The other three classes represent equal intervals of the remaining data set.

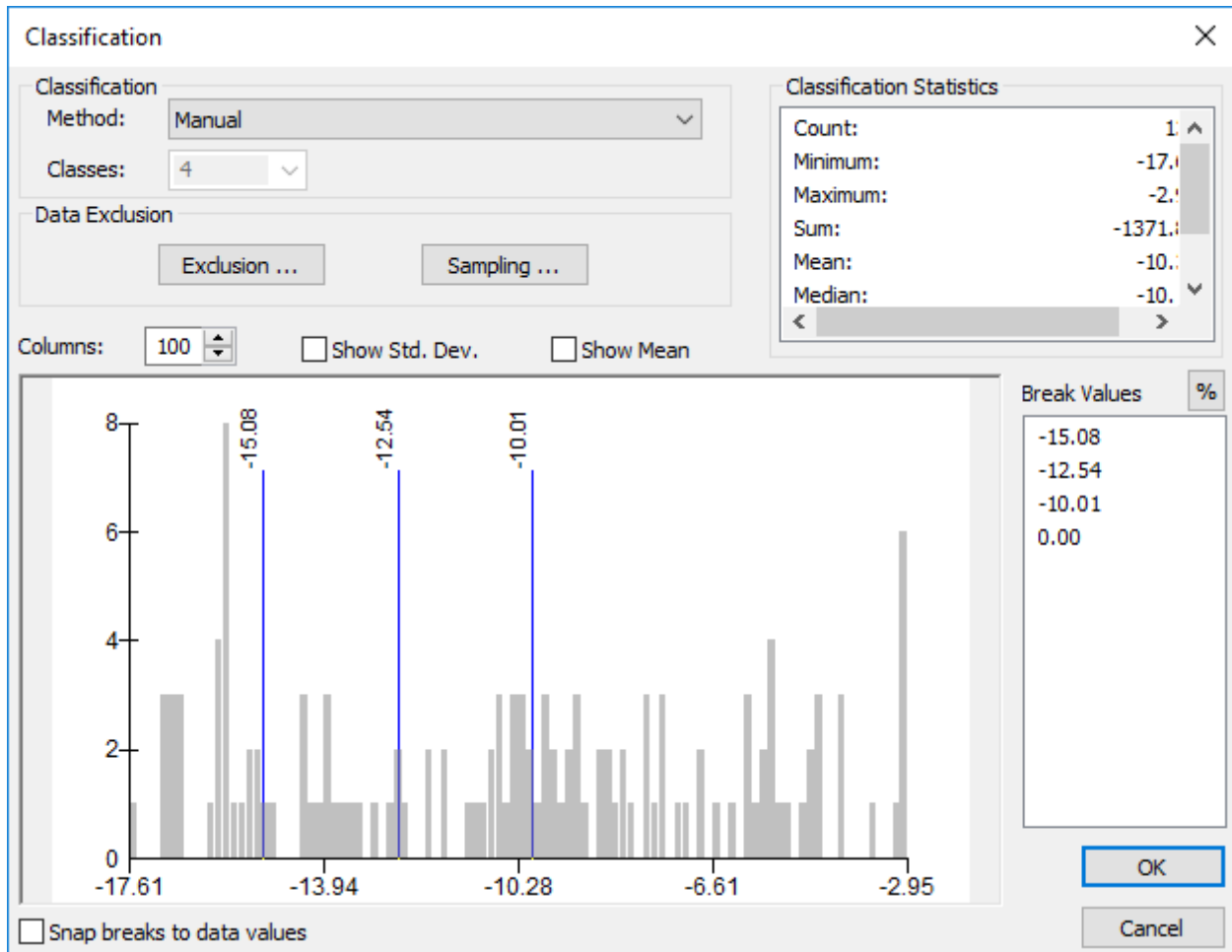


Figure 3. Screenshot of 'Classification' window with the settings for the changeDistance field.

Symbol: red denotes the highest erosion rate range and the green denotes the lowest erosion (or highest accretion) rate range. Denote the uncertainty range as grey. Set width to 3 (Figure 4) and number format to numeric with two decimal places (Figure 5).

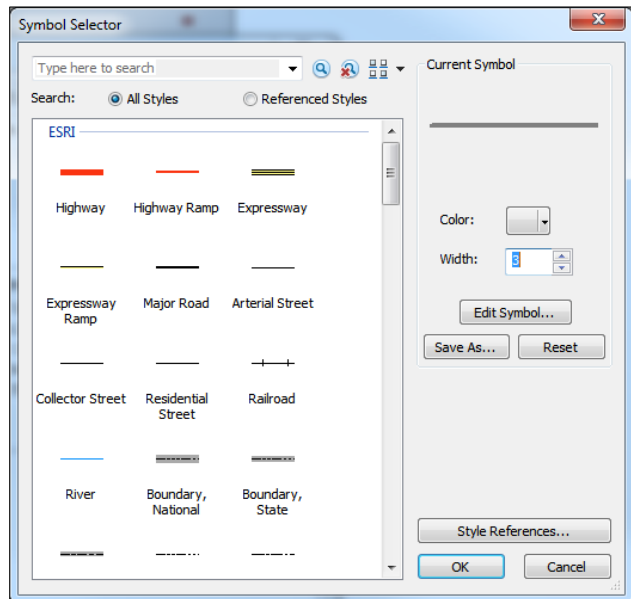


Figure 4. Screenshot of 'Symbol Selector' window with the width set to '3.'

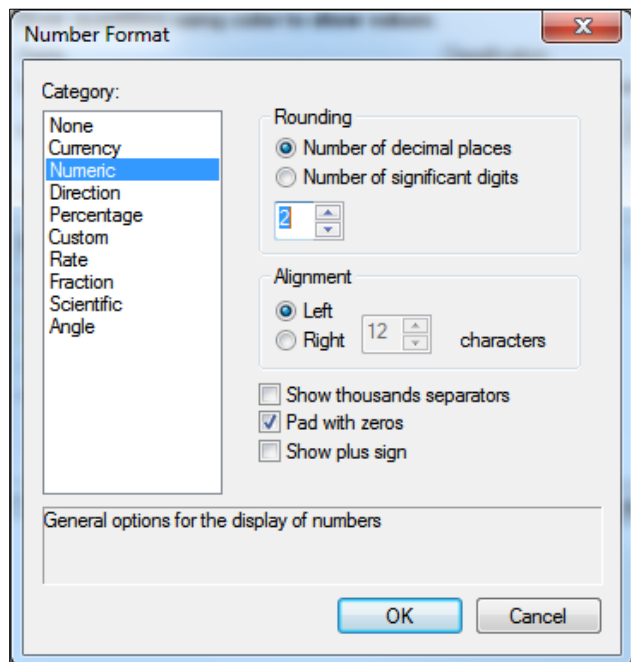


Figure 5. Screenshot of 'Number Format' window displaying the decimal places set to '2.'

The above symbology settings will create transects as shown in Figure 6.

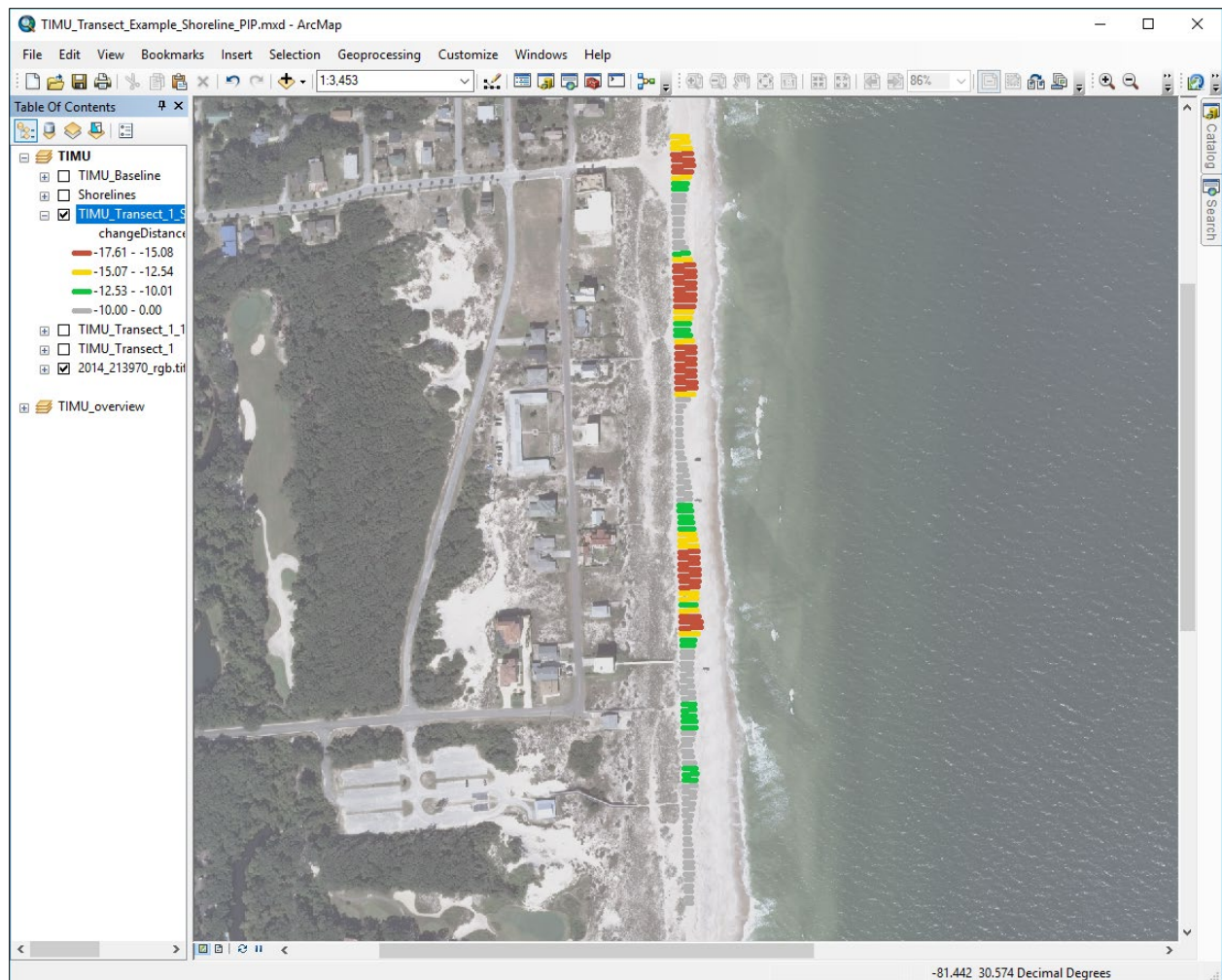
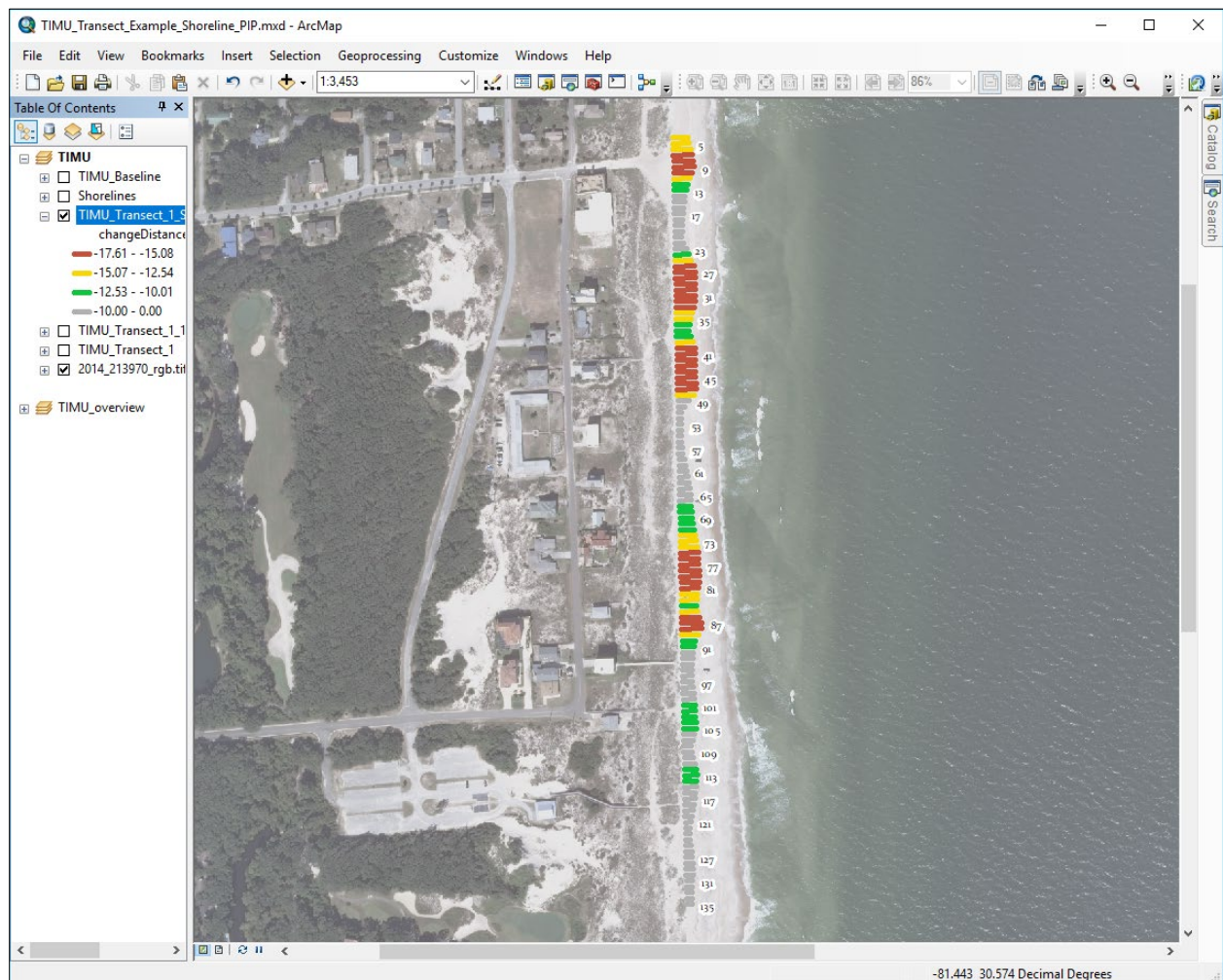


Figure 6. Screen capture of ArcMap showing the symbology of the transects.

Label Transects

Display the transect numbers with a mask to the right of transects in a specific order, such as every five transects (e.g., 5, 10, 15). The transect number order will depend on the number of transects displayed in the map, i.e., if a large number of transects is presented, the transect order will have a larger range, such as every 10 transects labeled. If a smaller number of transects are displayed, then a smaller range of transect labels can be displayed, such as every three transects. The transect labels should appear as shown in the screen capture below (Figure 7).



Export the Map

Once the transect properties have been modified as desired and the map has been formatted in the map view window with a scale bar, north arrow, legend, and location data frame insert, export the map using the criteria below:

1. File Name: Use the following filename format for the map
 - a. PARK_Shoreline_Change_YYYYY_ZZZZZ
 - b. Where:
 - i. PARK is the four letter park code
 - ii. YYYYY is the first letter of the season ('S' for spring and 'F' for fall) followed by the four digit year for the oldest shoreline analyzed
 - iii. ZZZZZ is the first letter of the season ('S' for spring and 'F' for fall) followed by the four digit year for the most recent shoreline analyzed
2. Save as Type: PNG
3. Options
 - a. General
 - i. Resolution: 600 dpi
 - ii. Width: Automatically populates when the resolution is changed
 - iii. Height: Automatically populates when the resolution is changed
 - b. Format
 - i. Leave the default settings

An annual analysis map using mock data is shown below (Figure 8).

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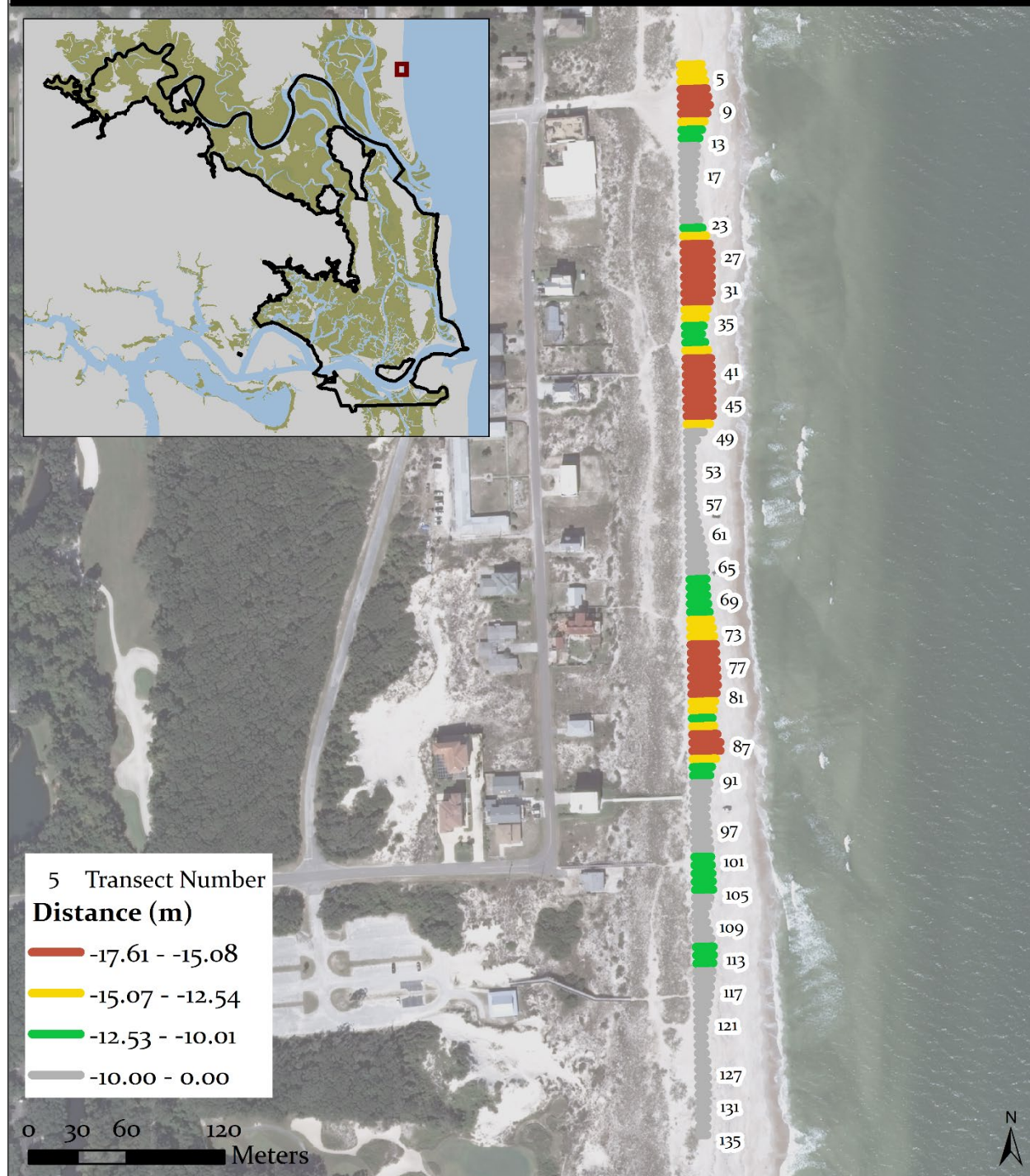


Figure 8. An example mock analysis map displaying the transects colored and labeled as described above.

Create Tables and Figures

The shoreline change rate data will also be viewed in table and graph formats. The data are located in the PARK_ShorelineChange personal geodatabase, where PARK refers to the four letter park code.

The data are in the Transect_Run_X_rates_YYYYMMDD_hhmmss and Transect_Run_X_intersect_YYYYMMDD_hhmmss tables. The intersect table has the distance from the baseline to each shoreline and the rate table contains the distance change between the two shorelines.

Where:

- X: Run number, which is automatically generated starting with '1'
- YYYY: Year the run was conducted
- MM: Month the run was conducted
- DD: Day the run was conducted
- hh: Hour the run was conducted
- mm: Minute the run was conducted
- ss: Second the run was conducted

Table

Shoreline Change Table

Create the shoreline change tables for the reports by exporting the shoreline change data as a Microsoft Excel workbook and open in Excel. Save the excel file as:

PARK_ShorelineChange_FFFFF_ZZZZZ

Where:

- PARK is the four letter park code
- FFFFF is the first letter of the season analyzed ('S' for spring and 'F' for fall) followed by the four digit year of the earliest shoreline analyzed
- ZZZZZ is the first letter of the season analyzed ('S' for spring and 'F' for fall) followed by the four digit year of the most recent shoreline analyzed

Then, create a table that looks like Table 1 below to include in a report. Calculate the mean, standard deviation, minimum, and maximum for the shoreline change statistics. The summary statistics information will be included in the report.

Table 1. Example annual report shoreline distance table.

Transect ID	Spring '00*	Spring '01*	Annual Difference Spring '00–Spring '01**
13	-91.67	-102.32	-10.64
14	-93.11	-102.35	-9.24
15	-93.64	-102.39	-8.75
16	-94.16	-102.43	-8.26
17	-94.69	-102.46	-7.77
18	-95.21	-102.50	-7.29
19	-95.74	-102.54	-6.80
20	-96.26	-102.57	-6.31
21	-96.79	-102.61	-5.82
22	-95.15	-102.65	-7.50
23	-93.08	-102.68	-9.61
24	-91.01	-102.72	-11.71
25	-88.94	-102.76	-13.82
26	-86.87	-102.79	-15.92
27	-85.94	-102.83	-16.89
28	-86.03	-102.87	-16.84
29	-86.12	-102.91	-16.79
30	-86.21	-102.94	-16.73

*Distance from baseline (± 5 m uncertainty)

**Distance between shorelines (± 10 m uncertainty)

Quality Control Table

Create a table listing the distance from the survey benchmark locations to the reference benchmark locations. This table can be created in excel or in the word document and will look similar to Table 2 below. The table will include the latitude and longitude in decimal degrees of the survey benchmark location and the reference benchmark location, in addition to the distance measured in ArcGIS between the two points.

Table 2. Example table of quality control information for the benchmark locations used to check the shoreline data. The reference latitude and longitude, survey latitude and longitude, and distance between the two points is listed for the benchmark locations collected during the shoreline survey.

Benchmark	Reference Location Latitude	Reference Location Longitude	Survey Location Latitude	Survey Location Longitude	Distance (meters)
FOMA01	29.716705	-81.23299	29.716702	-81.232991	0.04
FOMA02	29.713442	-81.230369	29.713439	-81.230378	0.81

Graph

Create a histogram of the shoreline distance change data similar to Figure 9. The data are located in the excel file PARK_ShorelineChange_FFFFF_ZZZZZ created in the previous section, where:

- PARK is the four letter park code;
- FFFFF is the first letter of the season analyzed ('S' for spring and 'F' for fall) followed by the four digit year of the earliest shoreline analyzed; and
- ZZZZZ is the first letter of the season analyzed ('S' for spring and 'F' for fall) followed by the four digit year of the most recent shoreline analyzed.

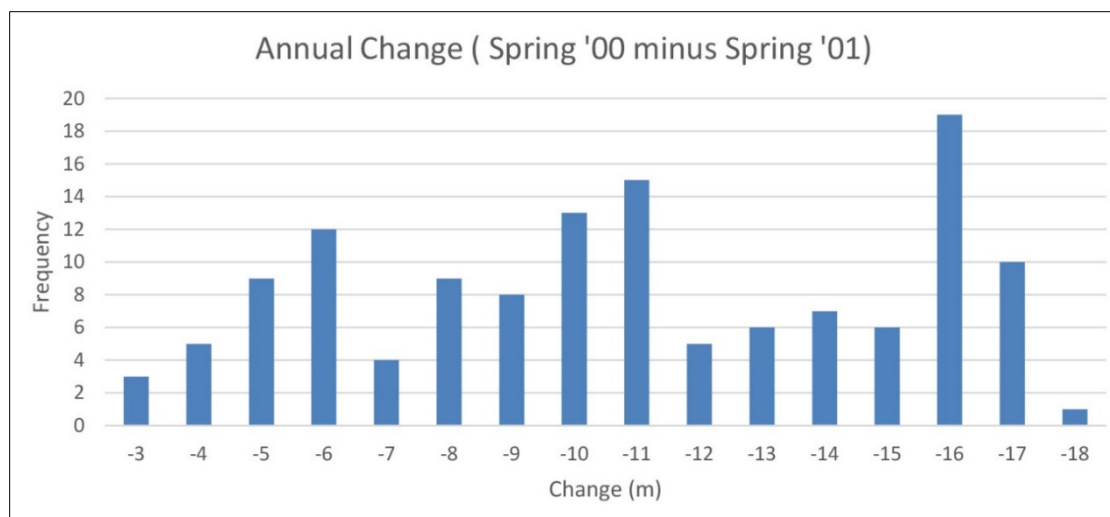


Figure 9. Histogram of the shoreline distance change (meters) showing the frequency, i.e.number of transects.

Areas of interest are park-specific areas identified by the park due to management needs, such as a culturally sensitive area, highly dynamic areas, i.e. spits, etc. These areas will be analyzed separately from the full dataset. The analysis will include basic statistics (mean, maximum, minimum, and standard deviation), maps, and figures of the park specific area of interest.

Literature Cited

Baron, L. C. 2018. Coastal shoreline monitoring annual analysis protocol. Southeast Coast Network Standard Operating Procedure NPS/SECN/SOP—2.3.11. Southeast Coast Network, Athens, Georgia. Available at: [https://irma.nps.gov/DataStore/Reference/Profile/ 2253897](https://irma.nps.gov/DataStore/Reference/Profile/2253897) (last accessed July 2018).

Psuty, N. P., M. Duffy, J. F. Pace, D. E. Skidds, and T. M. Silveira. 2010. Northeast Coastal and Barrier Network geomorphological monitoring protocol part I—ocean shoreline position. Natural Resource Report NPS/NCBN/NRR—2010/185. National Park Service. Fort Collins, Colorado.