

# Assessment of the South Carolina Sea Grant Extension Program's Rip Currents Awareness Program



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## Introduction

Rip currents are channeled currents of water that flow away from shore (NOAA, 2010). Rip currents can occur on any beach with breaking waves and are responsible for approximately 80% of all beach rescues in the United States and result in roughly 100 deaths every year. They are dangerous because they pull swimmers away from shore, can vary in intensity and location, can sweep even the strongest swimmer out to sea, and can cause swimmers to become tired and potentially drown. In North and South Carolina, rip currents are responsible for more deaths than any other natural hazard (e.g., flooding, hurricanes, lightning) (Pfaff, personal comm.). Due to the high potential risks to beach users throughout the Carolinas and the United States, Rip Currents Awareness has become a primary focus of coastal and beachfront managers.

The National Oceanic and Atmospheric Administration (NOAA) and the United States Lifesaving Association (USLA) have been instrumental developing Rip Currents Awareness educational programs. Educational efforts include, but are not limited to: rip currents forecasts broadcasted via the internet, television, and radio; a national Rip Currents Awareness Week; a green, yellow, and red flag system used by USLA lifeguards; and a national “Break the Grip of the Rip” sign and brochure campaign (see Figure 1) that alerts swimmers about rip currents, how to escape should a swimmer get caught in a rip current, and additional safety tips. If caught in a rip current, a swimmer should not fight the current, swim parallel to shore then to shore, float or tread water if they can’t escape, and call or wave for assistance if needed (NOAA, 2010). Key safety tips are to know how to swim, never swim alone, swim near a lifeguard if possible, and “if in doubt, don’t go out.” While rip currents are often not easily identified, there are some clear signals that rip currents are present. Some possible clues include a channel of churning or

choppy water, a difference in water color, a break in the incoming wave pattern, or a line of debris (e.g., seaweed, sediment) moving away from shore. Rip currents are often located in breaks in a sandbar and along groins and jetties, but can occur along any beach.

Rip Currents Awareness has been a major focus of the Coastal Processes sub-program within the South Carolina Sea Grant Extension Program (SCSGEP) for the past several years. The program was initiated with a Rip Currents Awareness workshop in 2007 at Coastal Carolina University (Figure 2).

Over 50 people representing the National Weather Service (Charleston, SC, Wilmington, NC), NC and SC Sea Grant, Georgetown and Horry County (SC) Beach Patrol, Lack's Beach Service, Midway Fire Department, Debordieu Colony, City of Myrtle Beach Beach Patrol, North Myrtle Beach Lifeguards, U.S. Coast Guard (Georgetown, SC), and local television stations attended. The goal of the workshop was to develop a coordinated Rip Currents Awareness group in South Carolina and to increase Rip Currents Awareness.

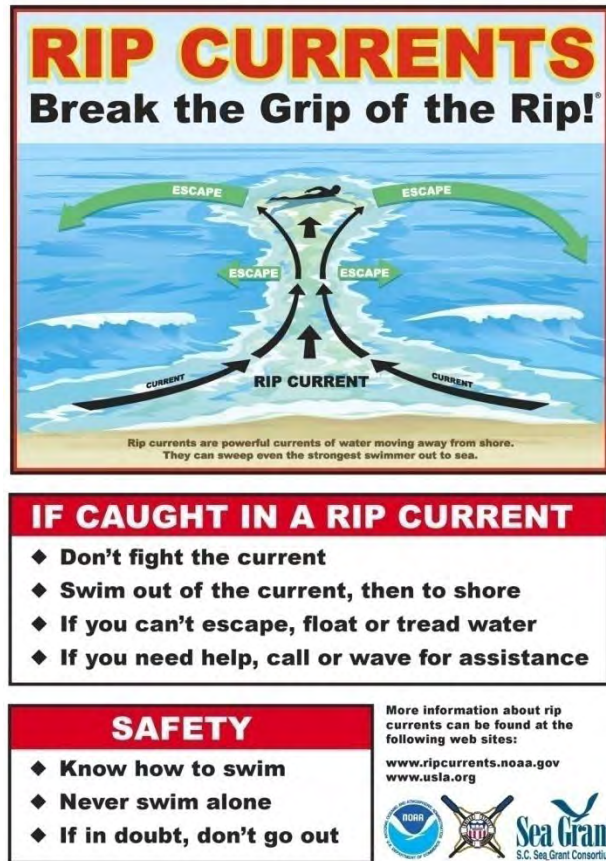


Figure 1. Image of the “Break the Grip of the Rip” signs located at public beach access locations throughout South Carolina.



Figure 2. Clay McCoy (SCSGEP) giving a presentation at a Rip Currents Awareness Workshop at Coastal Carolina University, SC, 2007 (left), and the Jacksonville, FL American Red Cross Volunteer Life Saving Corps where McCoy gave an invited presentation for the USLA Regional Meeting, 2008 (right).

In the following months, the Rip Currents Awareness group met several times to develop effective and cost-efficient strategies to increase awareness along the beaches of South Carolina. The initial efforts included public service announcements (PSAs), placing 200 “Break the Grip of the Rip” signs at public beach access locations throughout the state, distribution of “Break the grip of the Rip” brochures to local beach communities, and providing presentations and materials to local fire departments and emergency personnel for distribution in local schools. WPDE 13, a local television station, provided three PSAs free of charge which featured personnel from Horry County Midway Fire Department, Horry County Beach Patrol, and Midway Fire Department. The PSAs were routinely played on WPDE 13 and were distributed to hotels and resort communities throughout Georgetown and Horry counties for play on closed-loop television. Response from local communities about the PSAs and especially the signs was very positive with nearly all communities requesting additional signs to place at public beach access locations. Most communities believe the most effective method of Rip Currents Awareness is signage at beach access locations, but the volume of signs required to provide the resource was prohibitive for both the SCSGEP and local communities.



In order to evaluate the effectiveness of the Rip Currents Awareness Program and outreach methods, a survey of beach users was conducted at multiple beach communities in South Carolina with varying levels of Rip Currents Awareness efforts. The survey was administered to beach users at Myrtle Beach (MB), Pawleys Island (PI), and two sites in Hilton Head (Figure 3). Hilton Head and Myrtle Beach are the largest coastal tourist destinations in South Carolina and Pawleys Island is the largest public access location in Georgetown County.

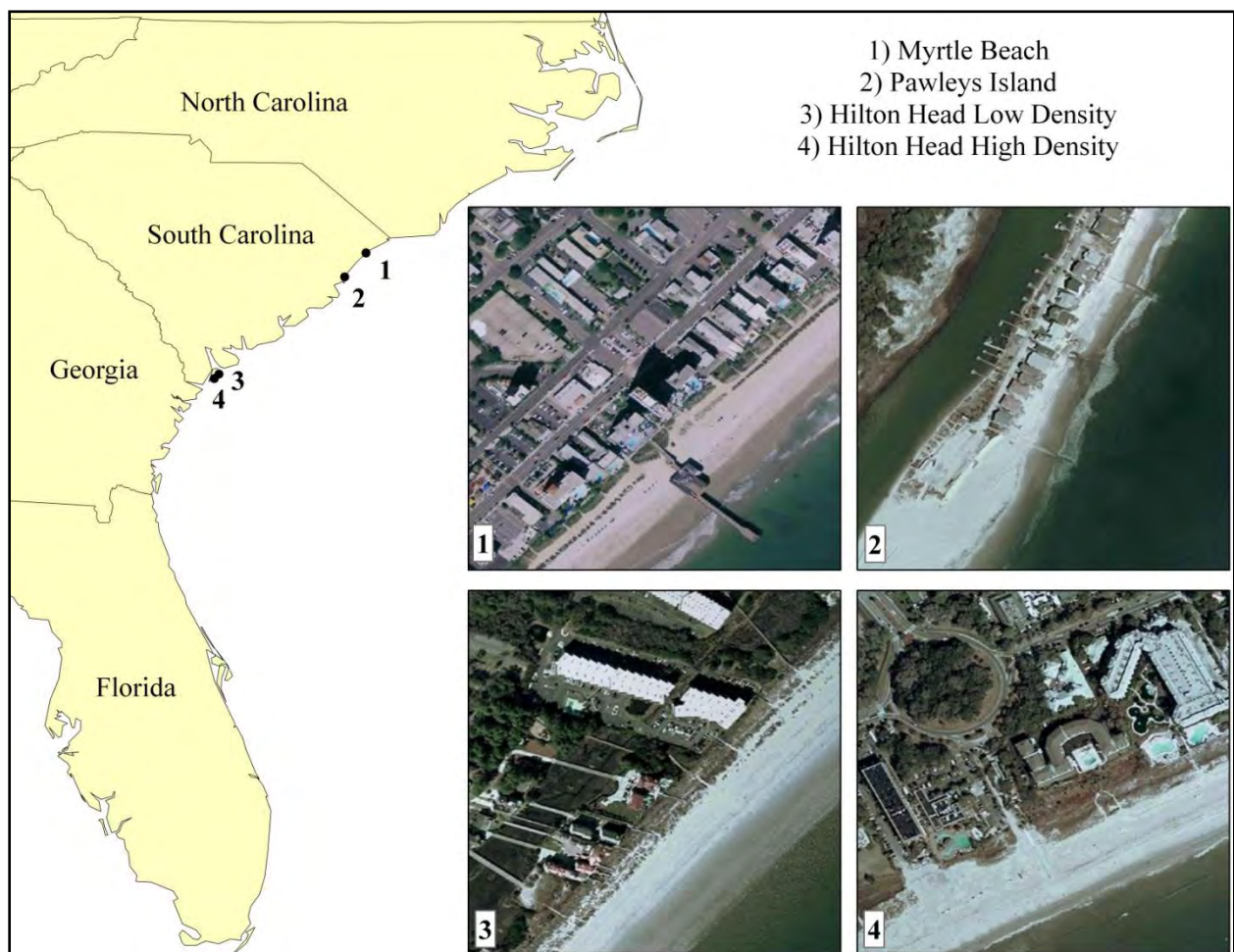


Figure 3: Map indicating the locations of Rip Currents Awareness surveys conducted in summer 2010.

Myrtle Beach is a highly developed tourist destination with extensive oceanfront hotels and condominium complexes along its 10 miles of shoreline. Myrtle Beach hosts approximately 14 million visitors annually, with 90% visiting the beach (MBCC, 2009).

Pawleys Island is a significantly less densely populated barrier island consisting of approximately 500 houses, many of which are

rentals capable of housing >10 people. Hilton Head is a barrier island with approximately 14 miles of private and public access ocean shoreline consisting of a combination of private homes, condominiums, and hotels. The Hilton Head High Density (HHHD) site is the largest public beach access point on Hilton Head Island with a large hotel and condominium complexes in the immediate vicinity. The Hilton Head Low Density (HHL D) site was located at a public beach access point accessible through a county park. A few houses were located to the south of the access point and a condominium complex was located to the north.

## Methods

Beach user surveys (Appendix 1) were administered at four beach locations in South Carolina (Figure 3) to assess user knowledge of rip currents and to determine their knowledge sources. Both MB and PI have “Break the Grip of the Rip” signs at public beach access locations while the two sites on Hilton Head Island do not. The Hilton Head Island sites were



Figure 4. (Left to Right) Coastal Carolina University students Carrie Wein, Lindsay Harmon, John Ledoux, Matt Howe, and Chris Ellis (NOAA) conducting surveys at Hilton Head, July 2010.

identified as control sites because while they do have beach lifeguards and display NOAA surf zone hazards flags, they do not have “Break the Grip of the Rip” signs at public beach access locations. Due to the relative sizes and additional Rip Currents Awareness efforts by Midway Fire Department, the density of signage at PI is significantly greater than MB. The survey design and delivery were modeled after a similar project conducted by NC Sea Grant (Herstine et al., 2008). Four surveyors walked evenly spaced parallel lines from the dune line to the water’s edge and solicited every third person/group encountered to participate in the survey. A total of 60 surveys were completed at HHLD, HHHD, and MB and 56 surveys were completed at PI. Surveys were administered at Hilton Head on July 28<sup>th</sup>, 2010 and at MB and PI on August 11<sup>th</sup>, 2010. All surveys were administered between 9:00 am and 5:00 pm. Chi-square (categorical data) and ANOVA (quantitative data) analyses were performed on the data to determine statistical significance.

## **Results**

### *Demographics and Visit Information*

Approximately 98% of all people surveyed were white and the remaining 2% percent were split between other categories of race. Sixty one percent of all survey participants were female and thirty nine percent were male. The ratio of male to female survey participants were similar to the overall ratio at HHHD, MB, and PI; however, the ratio at the HHLD site was more evenly distributed with 54% female and 46% male. The average age of beach users surveyed

was  $38 \pm 14$  years old,  $44 \pm 11$  years old,  $49 \pm 15$  years old, and  $46 \pm 10$  years old for MB, PI, HHHD, and HHLD, respectively.

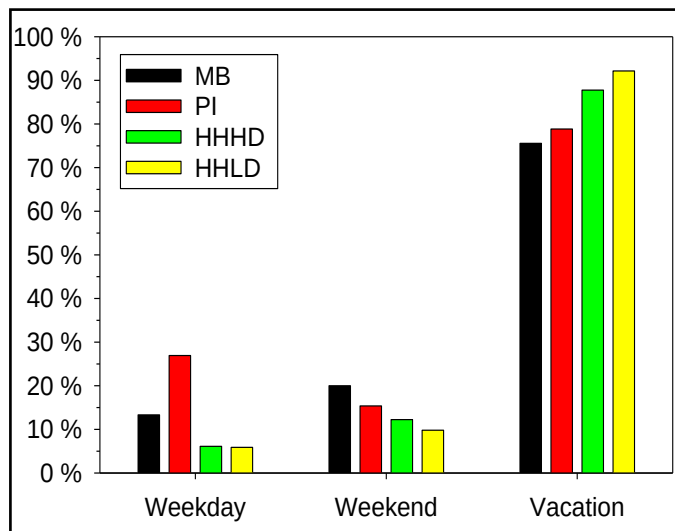


Figure 4. Time survey participants typically visit the beach. Over 70% at each site visited during vacation.

The majority of people surveyed visited the beach during vacation (Figure 4). Beach users came from 17 states (Figure 5) and five countries (Canada, Cape Verde, Great Britain, Ireland, and Russia). The majority of beach users surveyed came from South Carolina, North Carolina, Georgia, and Ohio and only six beach users resided in an

oceanfront zip code. The spatial distribution of home zip codes indicates most people surveyed from Georgia visited the beaches of Hilton Head and most people from coastal South Carolina outside of Hilton Head visited PI.

The primary purposes for surveyed peoples' visits to the beach were not significantly different between the beaches. Generally, people went to the beach to swim, relax, read, tan, and lie in the sun. On average, people visiting MB had been visiting for 21 years while beach users at PI, HHHD, and HHLD had visiting for 16, 11, and 9 years, respectively. There was no statistical correlation between type of lodging and beaches; however, general trends are indicative of available lodging types at each beach. Most MB visitors stayed in hotels/motels, PI visitors stayed in houses, and HH visitors stayed in rented or non-rented condominiums and houses and hotels.



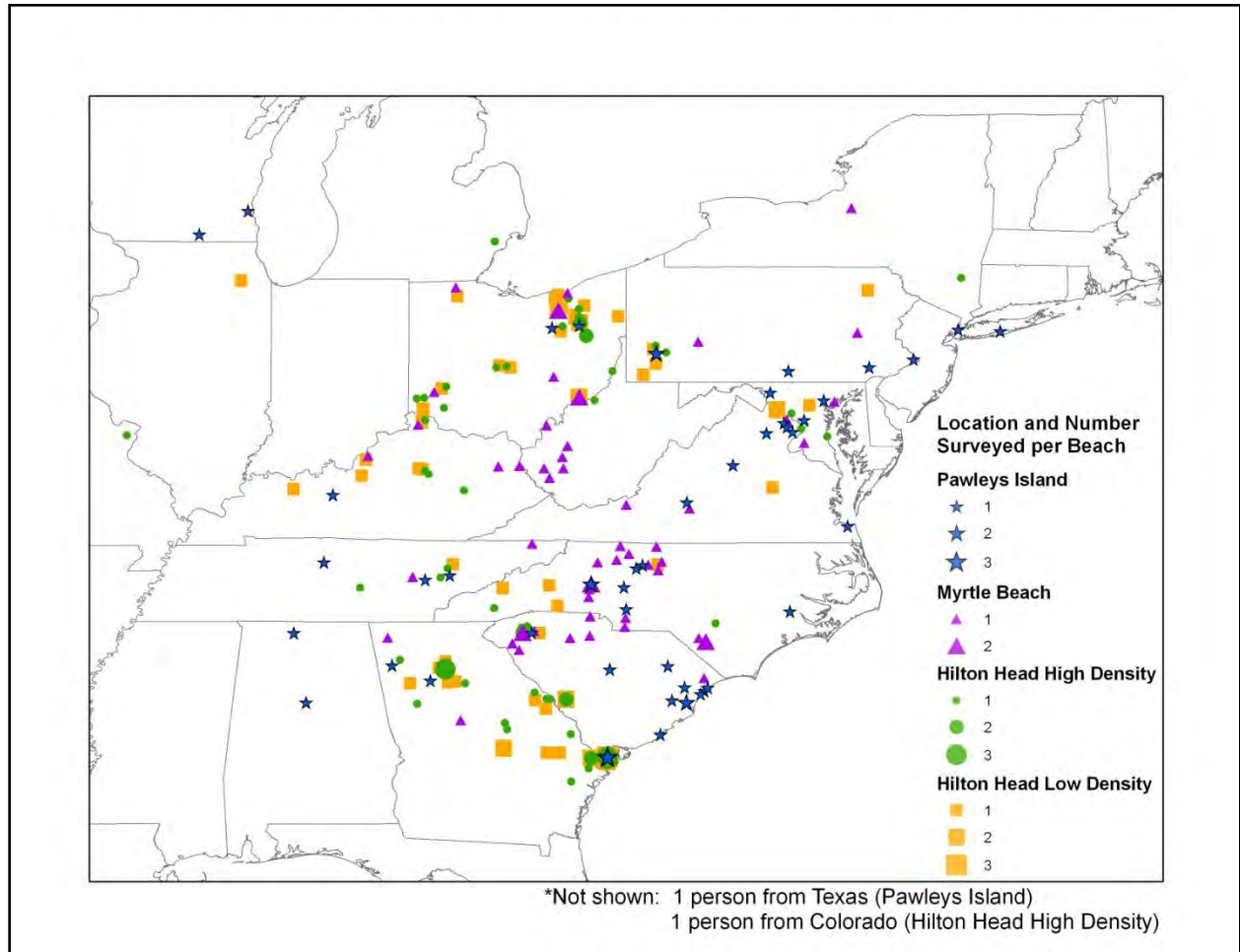


Figure 5: Spatial distribution of the home zip codes of beach users surveyed about rip currents awareness.

### *Rip Current Awareness*

The survey asked seven conceptual questions about rip currents (Appendix 1). The first question asked the participant if they knew what rip currents were. Overall, 83% of beach users surveyed indicated they knew what rip currents were. PI had the highest percentage (93%) of people that knew what rip currents were, followed by HHLD (85%), HHHH (78%), and MB (75%). The participant was then asked to describe rip currents and the majority said they were

channelized currents flowing away from shore and “other” (Figure 6). Common responses for “other” include: “undertow”, “pulls you under”, “caused by tides and waves”, and “very powerful currents.” Interestingly, PI beach users were more aware that rip currents typically form at breaks in sandbars or near structures and are commonly found on many beaches every day. When asked if rip currents exist along the South Carolina coast, 98% of participants answered yes, ranging from 96 – 100% at the individual beaches.

The next three questions asked why are rip currents dangerous, what would the participant would do if they were caught in a rip current, and what are some clues rip currents may be present. The two most common answers for why rip currents are dangerous at all sites were that rip currents could pull people away from the shore and people could become tired and drown (Figure 7). The third most common response was “other” with the overwhelming

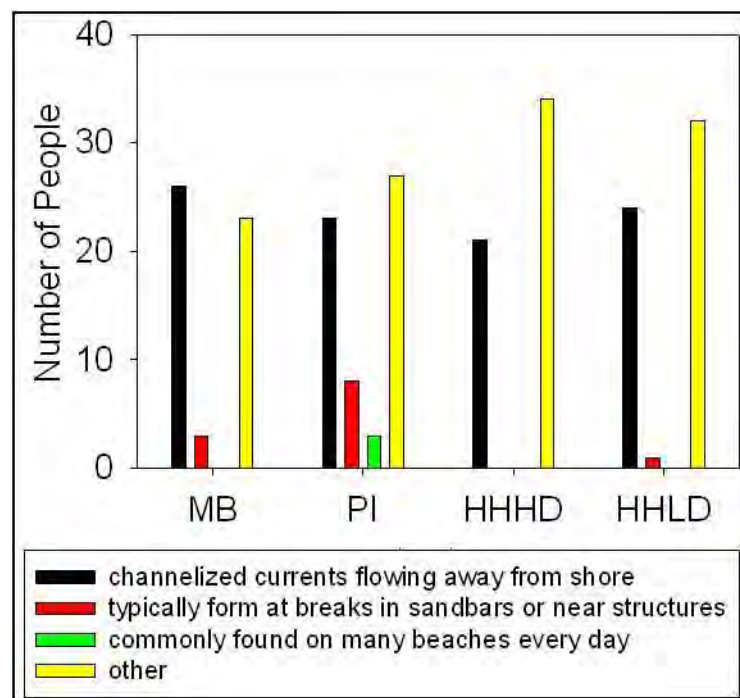


Figure 6. Responses from participants when asked to describe a rip current.

majority of participants responded that rip currents can “pull you under.” Again, a higher number of participants at PI responded correctly to the reasons rip currents are dangerous relative to all other sites. The participants were then asked what they would do if caught in a rip current, and the majority at all sites indicated they would swim parallel to shore until free of the current then swim to shore (Figure 7). The next most common responses were to stay calm and don’t

fight the current and other common responses were ~~“I don’t know”~~, ~~“panic”~~, and ~~“pray.”~~ None of the responses to the question were statistically different among the sites. While participants generally knew why rip currents are dangerous and what to do if caught in a rip current, the majority did not know how to identify a rip current. Overall, 35% of participants said they did not know how to identify a rip current and 35% responded ~~“other.”~~ The most common ~~“other”~~ responses were ~~“big waves”~~ and ~~“flags at the lifeguard stands.”~~ Approximately 15% of all participants said they could be identified by churning, choppy water and less than 7% indicated rip currents could be identified by a difference in water color, a line of foam or debris moving seaward, or a variation in the incoming wave pattern.

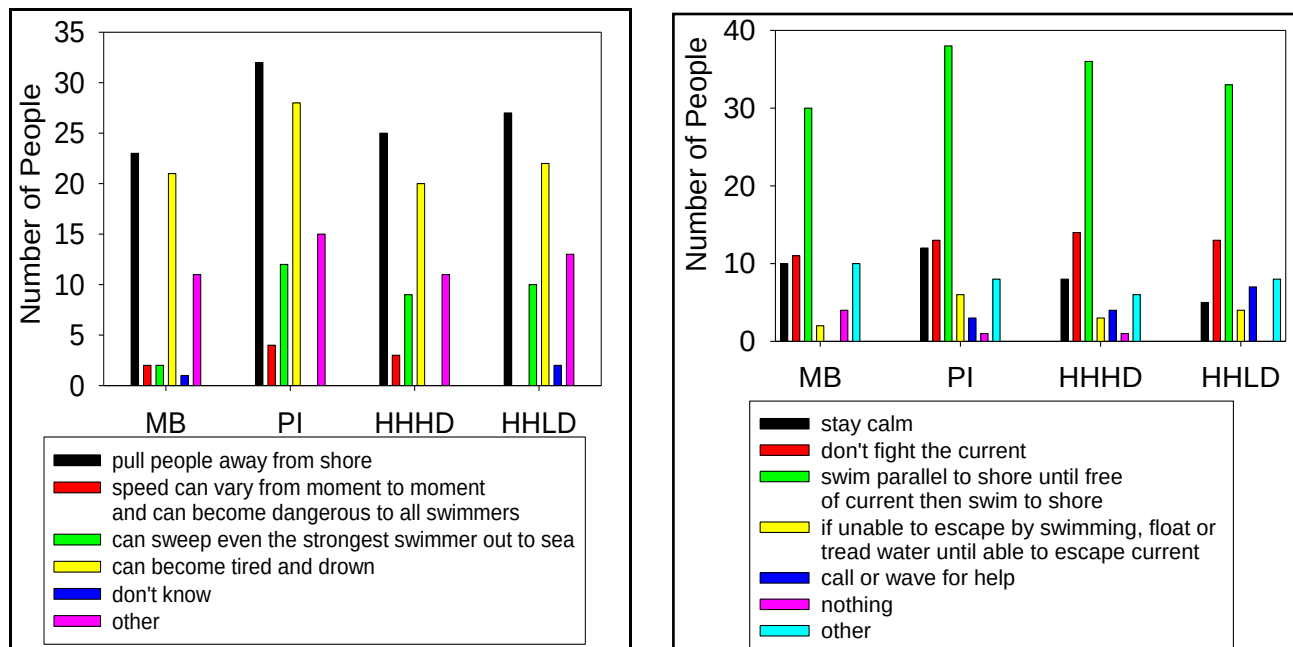


Figure 7: (Left) Responses given to the question “Why are rip currents dangerous?” and (Right) “What would you do if you were caught in a rip current?” for each of the four survey sites.

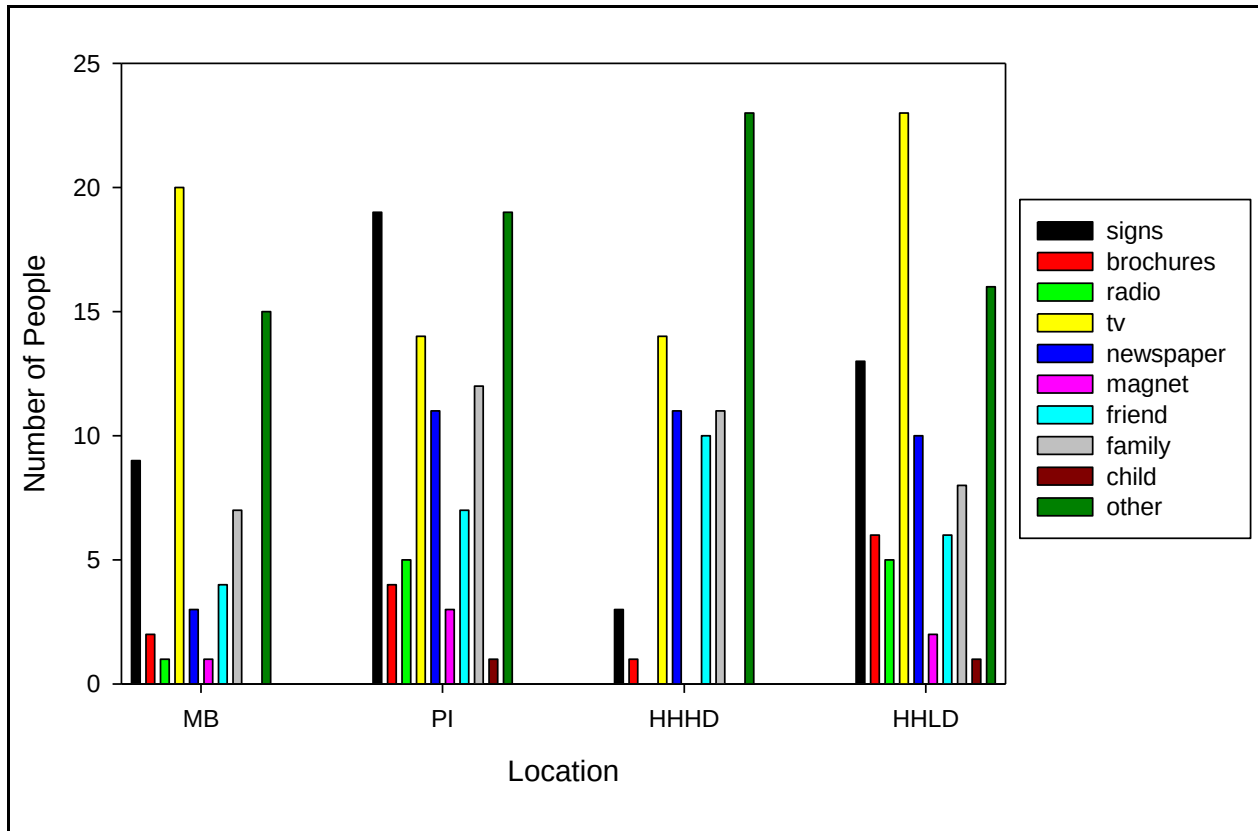


Figure 8: Responses to the question, “From which of the following sources of information did you become aware that rip currents exist along the coast?”

The final question asked the participant to provide their source of Rip Currents Awareness information. Overall, the most common responses were from television and “other” with experience accounting for the majority of “other” responses (Figure 8). The highest number of participants that received rip currents information from signs was at PI (19), followed by HHLD (13), MB (9), and HHHD (3). PI is the only site with Rip Currents Awareness signs at every public beach access location; however, HHLD, the site with the second highest total of participants that received information from signs, has no signs at public beach access locations. Data also suggests Rip Currents Awareness information is passed along through family and friends at all sites.

## Discussion

Survey data suggest visitors of the South Carolina coast generally come for vacation and the majority come from more than 100 miles away. While nearly all survey participants do not live in coastal communities, most have visited the same beaches on an annual basis for an average of 10 years or more and are familiar with the local beach community they visit. Based on this information, it appears the most effective method to educate South Carolina beach users about rip currents is during their beach visit.

The coastal communities of South Carolina provide Rip Currents Awareness information through numerous organizations and varying media. Local television and radio stations broadcast the daily rip currents forecast and provide tips about rip currents safety on a daily basis. NOAA websites and radio broadcast rip currents forecasts and safety tips as well. Local and county beach safety organizations (lifeguards, police, search and rescue, fire departments) display flags to indicate surf zone



Figure 9. A lifeguard stand at Hilton Head displaying a yellow flag indicating to beach users to use caution while swimming in the surf zone.

hazards at local beaches according to the NOAA forecasts (Figure 9). Based on survey responses, television was the most common source of Rip Currents Awareness information for most survey participants, followed by lifeguards (other) and communication with family and friends. In PI, where Rip Currents Awareness signs are located at every public access location as



a result of efforts by SCSGEP and Midway Fire Department, signs were the most common source of information.

While participants generally did not know many specific details about why rip currents are dangerous, most knew that rip currents pull you away from shore. Participants were more aware of how to escape if caught in a rip current with most participants indicating they should remain calm, don't fight the current, and swim parallel to shore until free then swim to shore. Though sources of Rip Currents Awareness information varied among the survey sites, data suggests each method is effective at informing beach users about why rip currents are dangerous and what to do if caught in a rip current.

Results suggest Rip Currents Awareness efforts in South Carolina should focus on television, lifeguards/beachfront safety organizations, and signs. The efforts should also consider geographic and demographic information of the individual beachfront communities. For example, PI is a small barrier island consisting of large homes and a few condominiums with no day-to-day lifeguard service. Outreach in PI and other similar coastal communities with limited numbers of beach access locations should focus on signs at beachfront access locations and information on local television via nightly weather forecasts and PSAs. Similar communities in coastal South Carolina would include: North Litchfield, Debordieu Colony, Dewees Island, Sullivan's Island, and Edisto Beach.

In MB, which is dominated by hotels and numerous condominium complexes and several hundred beach access locations, providing signs at every access location may be cost prohibitive; however, efforts to place signs at major public access locations have shown to be effective. In MB and adjacent densely populated beaches (North Myrtle, Arcadian Shores, Surfside Beach, Garden City), the most effective outreach method is likely local lifeguards, local television and

to work with hotels, condominium complexes, and large resort communities to incorporate Rip Currents Awareness PSAs into the closed-loop television channels.

Other beachfront communities along the South Carolina coast consist of mixed developments of condominiums, houses, and hotels. Awareness efforts described above are a great starting point and should be effective based on our survey results. A coordinated effort by all beach safety organizations and strategic assessments of Rip Currents Awareness efforts should increase effectiveness and provide guidance for future efforts.

### **Acknowledgements**

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## References

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## Appendix 1: SCSGEP Rip Current Awareness Survey

Name of Interviewer: \_\_\_\_\_  
Date of Interview: \_\_\_\_\_ Time of Interview: \_\_\_\_\_  
Interview Location:  
MB (Myrtle Beach) \_\_\_\_\_  
PI (Pawleys Island) \_\_\_\_\_  
HHHD (Hilton Head High Density-hotel area) \_\_\_\_\_  
HHLD (Hilton Head Low Density- residential) \_\_\_\_\_

**Hello, I'm \_\_\_\_\_ from the South Carolina Sea Grant Program and we are conducting a study regarding individual's knowledge and awareness of rip currents. Your participation in this survey is entirely voluntary and will take less than 5 minutes. You may terminate this interview at any time. All answers will be kept confidential.**

**Q1** Would you be willing to answer a few questions? **Q1a** \_\_\_\_\_ Yes **Q1b** \_\_\_\_\_ No  
(If YES, go to **Q2**. If NO, thank them for their time and terminate the interview)

**Q2** Is the individual being interviewed: **Q2a** \_\_\_\_\_ Male **Q2b** \_\_\_\_\_ Female

**Q3** Is the individual being interviewed:

- Q3a** \_\_\_\_\_ White (Non-Hispanic)  
**Q3b** \_\_\_\_\_ Black (Non-Hispanic)  
**Q3c** \_\_\_\_\_ Hispanic  
**Q3d** \_\_\_\_\_ Asian/Pacific Islander  
**Q3e** \_\_\_\_\_ American Indian/Alaskan Native  
**Q3f** \_\_\_\_\_ Other (Please specify \_\_\_\_\_)

**Q4** In what year were you born? \_\_\_\_\_ Year (If under the age of 18, born 1988 or later, thank the individual, tell them you are only allowed to interview individuals 18 or older, and terminate the interview.)

**Q5** What is the zip code of your permanent residence? \_\_\_\_\_

**Q6** Do you know what Rip Currents are?

- Q6a** \_\_\_\_\_ Yes **Q6b** \_\_\_\_\_ No → skip to **Q13**

**Q7** Please tell me what are Rip Currents? (**Listen to the individual's response and mark all of the following responses that you hear**)

- Q7a** \_\_\_\_\_ Rip Currents are channelized currents of water flowing away from shore at surf beaches  
**Q7b** \_\_\_\_\_ Rip Currents typically form at breaks in sandbars and also near structures such as jetties and piers  
**Q7c** \_\_\_\_\_ Rip Currents are quite common and can be found on many surf beaches every day  
**Q7d** \_\_\_\_\_ Other (Please specify) \_\_\_\_\_

**Q8** Rip Currents exist along the South Carolina coast.

- Q8a** \_\_\_\_\_ Agree **Q8b** \_\_\_\_\_ Disagree → skip to **Q13**

**Q9** From which of the following sources of information did you become aware that Rip Currents exist along the South Carolina coast? (**Ask all and mark all responses that apply**)

- Q9a** \_\_\_\_\_ Signs at local beaches  
**Q9b** \_\_\_\_\_ Brochures available at local place of residence (hotel, condo, rental home)  
**Q9c** \_\_\_\_\_ Radio  
**Q9d** \_\_\_\_\_ Television  
**Q9e** \_\_\_\_\_ Newspaper  
**Q9f** \_\_\_\_\_ Refrigerator magnet  
**Q9g** \_\_\_\_\_ Friend  
**Q9h** \_\_\_\_\_ Family member

**Q9j** \_\_\_\_ Other (Please specify) \_\_\_\_\_

**Q10** What would you do if you were caught in a Rip Current? (**Listen to the individual's response and mark all of the following responses that you hear**)

**Q10a** \_\_\_\_ Stay calm

**Q10b** \_\_\_\_ Don't fight the current

**Q10c** \_\_\_\_ Escape the current by swimming in a direction following the shoreline (parallel to the shoreline).  
When free of the current, swim at an angle—away from the current—toward shore

**Q10d** \_\_\_\_ If you are unable to escape by swimming, float or tread water when the current weakens, swim at an angle away from the current toward shore

**Q10e** \_\_\_\_ If at any time you feel you will be unable to reach shore, draw attention to yourself: face the shore, call or wave for help

**Q10f** \_\_\_\_ I would do nothing at all

**Q10g** \_\_\_\_ Other (Please specify) \_\_\_\_\_

**Q11** Why are Rip Currents dangerous? (**Listen to the individual's response and mark all of the following responses that you hear**)

**Q11a** \_\_\_\_ Rip Currents pull people away from shore

**Q11b** \_\_\_\_ Rip Current speeds can vary from moment to moment and can quickly increase to become dangerous to anyone entering the surf

**Q11c** \_\_\_\_ Rip Currents can sweep even the strongest swimmer out to sea

**Q11d** \_\_\_\_ People become tired and can drown

**Q11e** \_\_\_\_ I don't know why Rip Currents are dangerous

**Q11f** \_\_\_\_ Other (Please specify) \_\_\_\_\_

**Q12** What are some clues that a Rip Current may be present?

**Q13a** \_\_\_\_ A channel of churning, choppy water

**Q13b** \_\_\_\_ A difference in water color

**Q13c** \_\_\_\_ A line of foam, seaweed or debris moving seaward

**Q13d** \_\_\_\_ A variation in the incoming wave pattern

**Q13e** \_\_\_\_ I don't know any clues that a Rip Current may be present

**Q13f** \_\_\_\_ Other (Please specify) \_\_\_\_\_

**Q13** How many individuals, including yourself, normally live in your household? \_\_\_\_\_ People

**Q14** How many adults (18 or older) traveled with you to the beach today? \_\_\_\_\_ People

**Q15** How many individuals under the age of 18 traveled with you to the beach today? \_\_\_\_\_ People

**Q16** Have you had a discussion with these individuals under the age of 18 about Rip Currents?

**Q16a** \_\_\_\_\_ Yes

**Q16b** \_\_\_\_\_ No → skip to **Q19**

**Q17** What have you told these individuals under the age of 18 about Rip Currents? \_\_\_\_\_  
\_\_\_\_\_

**Q18** How many years have you been coming to this beach? \_\_\_\_\_ Years

**Q19** When do you typically come to this beach?

**Q19a** \_\_\_\_ During the week

**Q19b** \_\_\_\_ On weekends

**Q19c** \_\_\_\_ Vacations and days off



- Q20** What is the primary purpose of your trip to the beach today?  
**Q20a**\_\_Sun/tan  
**Q20b**\_\_Relax/read  
**Q20c**\_\_Walk/jog  
**Q20d**\_\_Swim  
**Q20e**\_\_Surf/board  
**Q20f**\_\_Fish  
**Q20g**\_\_Socialize/date/meet people  
**Q20h**\_\_Entertain kids  
**Q20i**\_\_Other (Please specify\_\_\_\_\_)
- Q21** Are you an overnight visitor?  
**Q21a**\_\_\_\_\_Yes **Q21b**\_\_\_\_\_No → skip to **Q24**
- Q22** How many nights are you staying? \_\_\_\_\_Nights
- Q23** Which type of lodging are you using at night?  
**Q23a**\_\_Hotel/motel  
**Q23b**\_\_Rental cottage/house  
**Q23c**\_\_Rental condo/apartment  
**Q23d**\_\_Non-rental cottage/house  
**Q23e**\_\_Non-rental condo/apartment  
**Q23**\_\_Other (Please specify\_\_\_\_\_)
- Q24** What is your highest level of education completed?  
**Q24a**\_\_\_\_\_Less than high school graduate  
**Q24b**\_\_\_\_\_High school graduate  
**Q24c**\_\_\_\_\_Some college / not a college graduate  
**Q24d**\_\_\_\_\_Associate degree / community college graduate  
**Q24e**\_\_\_\_\_Bachelors degree / college graduate  
**Q24f**\_\_\_\_\_Masters degree  
**Q24g**\_\_\_\_\_PhD degree  
**Q24h**\_\_\_\_\_Law school graduate  
**Q24i**\_\_\_\_\_Medical school graduate

**This concludes our interview. Thank you very much for participating!**