# Atlantic Flyway Disturbance Project

• Social Science Report •

*Part IV: Understanding Beach Walkers*

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# Executive Summary

## *Introduction*

Beach walking is a seemingly harmless activity, but it can have negative consequences on the survival and fitness of shorebirds. Managers attempt to reduce disturbance from beach walking by limiting public access. Although limited access, such as partial or full beach closures, has been shown to reduce disturbance, it can negatively impact local economies and lead to conflict between managers and the public. Additionally, closures are not always able to protect mobile shorebirds who go beyond closed areas. To reduce shorebird disturbance in the situations where closures are not possible, we sought to use a community-based social marketing (CBSM) approach aimed at encouraging beach recreationists to voluntarily walk around shorebird flocks on the beach. We specifically explored beach recreationists' social norms (informal rules of behavior that are shared by a group of people), personal norms (a person's expectations of their own behavior), behavioral intentions, and perceived benefits and constraints to walking around shorebird flocks.

Our research questions were:

1. What do beach recreationists perceive as benefits and constraints to walking around shorebird flocks?
2. Do beach recreationists intend to walk around shorebird flocks when they encounter flocks on beaches?
3. How do norms, benefits and constraints differ among beach recreationists who intend to walk around shorebird flocks and beach recreationists who do not intend to walk around shorebird flocks?

## *Methods*

We used a mixed methods approach to address our research questions (RQs). For RQ1 (benefits and constraints to walking around shorebird flocks), we conducted phone interviews with beach recreationists who had experience walking on East Coast beaches along the Atlantic Coast in the last year. For RQ2 (intention to walk around flocks) and for RQ3 (differences in norms, benefits and constraints among beach recreationists who intend and do not intend to walk around shorebird flocks), we conducted an online survey using a sample of participants obtained from an online survey vendor, Qualtrics. The interview data collected for RQ1 was qualitatively analyzed for themes related to benefits and constraints. The survey responses related to RQ2 and RQ3 were analyzed using independent samples t-tests.

## *Results*

From the interview data, we uncovered several benefits and constraints to walking around shorebird flocks. Benefits to walking around shorebird flocks pertained to beach users themselves (e.g., enjoyment of watching birds) as well as shorebirds (e.g., reduces disturbance to shorebirds). Constraints to walking related to the physical environment (e.g., not enough space due to high tide) and personal factors (e.g., beach

recreationists' attitudes about shorebirds, knowledge about shorebird , and skills related to recognizing shorebirds to walk around).

Our survey data indicated that approximately half of beach recreationists were extremely likely to walk around shorebird flocks. But most beach recreationists reported they were not willing to walk more than 40 feet around the birds. Further, only 14% were willing to walk "over 200 feet or whatever distance was needed to keep shorebirds in a flock from changing their behavior or location."

Beach recreationists who intended to walk around shorebird flocks had stronger personal and social norms than beach recreationists who did not intend to walk around shorebird flocks. Further, beach recreationists who did not intend to walk around flocks were, on average, neutral about all benefit statements. In contrast, beach recreationists who intended to walk around shorebird flocks agreed more strongly, on average, with all of the benefit statements. In particular, beach recreationist who intended to walk around flocks had the highest mean agreement with benefit statements related to satisfaction in knowing that they were not bothering shorebirds, being able to watch shorebirds in their natural state, and reduced disturbance while shorebird eat, nest/raise chicks, and rest.

Additionally, beach recreationists who intended to walk around shorebird flocks and those who did not intend to walk around shorebird flocks were, on average, slightly below neutral agreement for most constraint statements. Compared to those with an intention to walk around flocks, beach recreationists who did not intend to walk around flocks perceived the following items to be greater constraints: "I don't understand why there is a need to walk around shorebirds", "I don't think there is a need to walk around shorebirds", and "I don't know which birds are shorebirds".

## *Discussion*

As an alternative to beach closures, sites might consider encouraging recreationists to walk around flocks of shorebirds rather than through them. Many of our respondents reported being willing to walk around flocks, and those who intended to walk around flocks perceived higher benefits and lower constraints to doing so. Further, they held stronger personal and social norms about doing so. Yet, the distance they reported being willing to walk around shorebird flocks was generally not enough to prevent shorebirds from flushing. Our findings about the benefits, constraints, and norms recreationists experience related to walking around flocks could be applied to develop a CBSM campaign to encourage more people to walk farther around walks..

## *Next Steps*

The findings from this research, along with research from the other biological and social science components of our human disturbance project, were used to inform a co-production workshop with our research team and shorebird managers and biologists along the U.S. and Canada portions of the Atlantic Flyway. During this workshop, participants brainstormed strategies to leverage the benefits and address the constraints to walking around shorebird flocks. The ideas generated through the workshop are being collated into a guidance document that will be used to outline potential campaign strategies that can be implemented in the next phase of the Atlantic Flyway Human Disturbance Project.

# Introduction

Disturbance to shorebirds can result from a variety of human activities. Specifically, research shows that "active" beach activities such as walking are more likely to cause disturbance than passive activities such as sunbathing (Burger, 1981; 1986; Lafferty, 2001; Mayo et al., 2015; Althouse, 2016). Walking can impact shorebirds by decreasing foraging rates (Burger & Gochfeld, 1991), initiating flight responses (Burger, 1986; Mayo & Paton, 2015), and reducing nesting success through various mechanisms (Flemming et al., 1988). To reduce the impact of people walking near shorebirds, researchers often suggest management actions that focus on limiting access or prohibiting people from using important shorebird habitats (Sabine et al., 2008; Burger & Niles, 2013; 2014). Such limits to public access include full or partial closures or buffer zones (separated distances between important shorebird habitats and people), which can be informed by the flight-initiation distance (FID) or distance at which shorebirds move away from perceived threats (Blumstein & Fernández-Juricic, 2010). The use of closures has been shown to reduce disturbance to shorebirds from people walking on beaches (Forys, 2011). However, Koch and Patton (2014) caution that delineating closed areas can be challenging due to the mobile nature of birds and people. They assert that it might be impractical to create closed areas if the areas are not used on a daily basis by foraging shorebirds. Concerns about the practicality of management efforts have also been raised by stakeholder groups who question if the benefits of management for shorebirds outweigh the negative impacts that management has on recreation (Walters et al., 2020). More generally, if recreational activities are restricted and people are not able to access beaches, tourism can be limited, which can negatively impact local economies (Lyon et al., 2018) and lead to conflict over shorebird management (Dayer et al., 2017).

As an alternative to creating closed areas, some managers use information campaigns to educate people about the impacts of human disturbance. Yet, information campaigns are not always effective for creating behavior change (McKenzie-Mohr, 2000) because campaign creators often assume that knowledge alone will lead to action and fail to apply strategic communications best practices like understanding their audiences before developing campaigns (Kidd & Dayer, 2020). A more strategic approach that can be used to change behavior is community-based social marketing (CBSM). In the CBSM process, McKenzie-Mohr (2011) suggests that campaign developers identify a behavior to promote that has a high level of impact, a high probability of engagement by the target audience, and a low level of penetration (i.e., degree to which behaviors are already completed). In a study of land managers along the Atlantic Flyway of the US and Canada, Comber & Dayer (2019) examined these characteristics of various behaviors using expert opinion and found that "walking or running around a flock of shorebirds rather than through them" would have the greatest impact on reducing shorebird disturbance. As the next step in the CBSM process,

McKenzie-Mohr (2011) recommends that campaign developers identify constraints[1] (obstacles that prevent people from engaging in a behavior) and benefits (advantages that people receive from engaging in a behavior). Based on findings of CBSM research related to shorebird disturbance, Comber and Dayer (2021) also recommend that campaign developers explore norms in this next step. Therefore, this study focuses on understanding the norms, benefits, and constraints to walking around shorebird flocks. With an understanding of norms, benefits and constraints to walking around shorebird flocks, managers can develop campaigns with strategies that apply behavior change tools (e.g., commitment, norms, prompts, incentives, communication, social diffusions, and convenience) outlined by McKenzie-Mohr (2011) to reduce disturbance from beach walkers.

Because behavior change campaigns can be resource-intensive, it is important to assess the likelihood that people will engage in the desired behavior. The likelihood of behavior change can be ascertained by understanding behavioral intention, or "the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior" (Warshaw & Davis, 1985, p. 214). Therefore, this research also focuses on understanding beach recreationists' intention to walk around shorebird flocks.

Here, we conduct research to inform a CBSM campaign by examining the following research questions:

1. What do beach recreationists perceive as benefits and constraints to walking around shorebird flocks?
2. Do beach recreationists intend to walk around shorebird flocks when they encounter flocks on beaches?
3. How do norms, benefits and constraints differ among beach recreationists who intend to walk around shorebird flocks and beach recreationists who do not intend to walk around shorebird flocks?

# Methods

To uncover benefits and constraints, McKenzie-Mohr (2011) suggests a mixed methods approach that involves 1) reviewing literature 2) observing individuals engaging in the desired behavior 3) conducting focus groups or interviews and 4) conducting a survey with a random sample of the target audience. Therefore, we applied this mixed methods approach to our study by conducting interviews with beach recreationists to understand the perceived benefits and constraints to walking around shorebird flocks (RQ1) and by conducting a survey aimed at understanding the

[1] Although the term "barrier" is traditionally used in the CBSM literature (McKenzie-Mohr 2011), we refer to constraints instead because we believe the term is more appropriate. Constraints are factors or psychological constructs that influence a person's ability or intention to engage in a behavior (Tanner, 1999), and thus are unique to each individual. Barriers are physical impediments faced by all individuals. Therefore, the term constraint is more appropriate for the scope of this study.

behavioral intentions of beach recreationists (RQ2) and the differences in norms, perceived benefits, and constraints among beach recreationists who intended to walk around shorebird flocks versus those who did not intend to walk around shorebird flocks (RQ3). Due to restrictions and safety concerns related to COVID-19, we could not conduct the interviews or the survey in-person, but we were still able to conduct this study using a mixed a methods approach that encompassed phone interviews and an online survey with beach recreationists. We determined that using an online survey panel (and following best practices) was the most appropriate approach for collecting research on human subjects during the global pandemic (Wardropper et al., 2021). All human subject research in this study was conducted with approval from, and in accordance with, the Virginia Tech Institutional Review Board (Protocol #19-1167).

### *Interview Recruitment*

Interviews were conducted with beach recreationists who had experience walking on Atlantic Coast beaches. In May 2020, we recruited 27 participants on Facebook (https://www.facebook.com) using 16 public Facebook groups associated with coastal areas or beach communities on the Atlantic Coast in Florida, Georgia, South Carolina, North Carolina, Virginia, and Maryland (Appendix A). To find groups, we used search terms such as “beach” and “island,” or the names of popular coastal areas such as “Outer Banks.” On each group page, we posted a message explaining the project objectives and requested individuals to contact the lead author via email to schedule an interview (Appendix B). In some cases, individuals expressed interest using the comment section of the post or through a private message. In those situations, we communicated using the Facebook messenger application to set-up an interview date and time.

### *Interview Implementation*

We conducted interviews via phone, and with the permission of participants, audio-recorded the conversations to ensure that we fully captured the content of the interview. During the interview, we asked participants open-ended questions that addressed: 1) walking behavior near shorebird flocks; 2) benefits and barriers to walking around shorebird flocks; 3) knowledge of shorebird species; 4) thoughts on population trends of shorebirds; 5) behavioral intentions to walk around shorebird flocks; and 6) social norms about walking around shorebird flocks. To protect the identity of the participants, we did not ask for any personally identifying information.

### *Interview Analysis*

A researcher manually transcribed the audio-recorded interviews and a second researcher reviewed them for quality control. We used a deductive approach (process in which predetermined codes are based on literature, theories or the research question; Gale et al., 2013) to analyze the transcripts using Dedoose (Version 8.3.35). We created a codebook organized by our main research topics. As we coded the transcripts, additional topics emerged and were added to the codebook. After the first iteration of coding was completed by a researcher, a second researcher reviewed the codebook definitions to ensure clarity and replicability. During the second and third

iterations of coding, we recoded the transcripts based on clarified codes and emergent patterns in responses.

### *Survey Construction*

The survey explored behavioral intentions, benefits, and constraints through closed-ended questions, consisting of a 5-point Likert scale and check-all-that-apply items. At the beginning of the survey, we included photos (and in some cases follow-up questions) of shorebirds, shorebird flocks, birds that are not considered shorebirds that might be seen in coastal areas, and a visual representation of "walking around shorebird flocks" versus "walking through shorebirds flocks." These photos and associated questions were included to verify that the participants understood the terms used throughout the questionnaire and recognized the difference between shorebirds and other bird species often confused for shorebirds. In an effort to reduce social desirability bias, we also included a preamble to some questions. The preamble emphasized that that "there are many different feelings" and "there are no right or wrong answers."

After constructing the questionnaire, subject matter experts from the Atlantic Flyway Shorebird Initiative Human Activities Committee and other conservation social scientists reviewed it to ensure clarity. Following review, we purchased a survey panel from Qualtrics (Qualtrics, Provo, UT) consisting of 50 beach walkers with experience walking on East Coast beaches in the last 12 months. We piloted the survey with this group of beach recreationists and made minor adjustments to the survey based on issues that arose during the initial pilot phase.

Table 1. Research questions, associated survey items, and measurement scales

| Concept | Survey Item | Measurement |
|---|---|---|
| RQ2. Do beach recreationists intend to walk around shorebird flocks when they encounter flocks on beaches? | | |
| Intention to walk around shorebirds | If you encountered a flock of shorebirds when you were walking on the beach, how likely would you be to walk around the flock? | 5-point scale:<br><br>1 = "Extremely unlikely"<br>2 = "Somewhat unlikely"<br>3 = "Neither likely nor unlikely"<br>4 = "Somewhat likely"<br>5 = "Extremely likely" |
| Distance willing to walk to avoid a flock of shorebirds | Now we are interested in knowing how far you are willing to walk around a flock of shorebirds (if at all), in order to keep them from changing their behavior or location. To help you visualize the distance, we suggest you think about the average length of a car. An average car is 10 feet long.<br><br>What is the longest distance that you are willing to walk around a flock of shorebirds? | Binary scale:<br><br>Check all that apply<br>0 ft. I am not willing to avoid a flock of shorebirds.<br>1-20ft<br>21- 40ft<br>41-60ft<br>61-80ft<br>81-100ft<br>101-120ft<br>121-140ft<br>141-160ft<br>161-180ft |

| | | |
|---|---|---|
| | | 181-200ft<br>Over 200ft. I am willing to walk whatever distance is needed to keep shorebirds in a flock from changing their behavior or location. |
| RQ 3. How do norms, benefits and constraints differ among beach recreationists who intend to walk around shorebird flocks and beach recreationists who do not intend to walk around shorebird flocks? | | |
| Norms<br>(Personal and social) | Next, we would like to know your thoughts about walking on the beach in the presence of shorebird flocks. There are many different feelings on this subject, and there are no right or wrong answers.<br><br>Please indicate the extent that you agree or disagree with the following statements.<br>• I would feel guilty if I walked through shorebird flocks<br>• My friend and family expect me to walk through shorebird flocks | 5-point scale:<br><br>1 = "Strongly disagree"<br>2 = "Disagree"<br>3 = "Neither agree nor disagree"<br>4 = "Agree"<br>5 = "Strongly agree" |
| Attitudes towards walking around shorebird flocks (Constraints) | Walking around shorebird flocks could be challenging because:<br><br>• There is not enough space on the beach due to the number of people<br>• There is not enough space on the beach due to the need to social distance from people<br>• There is not enough space on the beach due to large groups of shorebirds<br>• There is not enough space on the beach because the beach is too narrow<br>• There is not enough space on the beach because the tide covers the beach with water<br>• I don't understand why there is a need to walk around shorebirds<br>• I don't think there is a need to walk around shorebirds<br>• I don't know which birds are shorebirds | 5-point scale:<br><br>1 = "Strongly disagree"<br>2 = "Disagree"<br>3 = "Neither agree nor disagree"<br>4 = "Agree"<br>5 = "Strongly agree" |
| Attitudes towards walking around shorebird flocks (Benefits) | Walking around shorebird flocks could be beneficial because it:<br><br>• Reduces disturbance to shorebirds while they nest and raise chicks<br>• Reduces disturbance to shorebirds while they eat<br>• Reduces disturbance to shorebirds while they rest<br>• Allows me to watch shorebirds in their natural state<br>• Prevents shorebirds from attacking me | 5-point scale:<br><br>1 = "Strongly disagree"<br>2 = "Disagree"<br>3 = "Neither agree nor disagree"<br>4 = "Agree"<br>5 = "Strongly agree" |

| | | |
|---|---|---|
| | • Prevents shorebirds from attacking my dog<br>• Prevents shorebirds from pooping on me<br>• Gives me satisfaction to know that I am not bothering shorebirds | |

### *Survey Implementation*

We purchased an additional survey panel from Qualtrics consisting of 1,046 valid responses from beach walkers with experience walking on East Coast beaches in the last 12 months. We chose this sample size because it allows estimates of the population within a ± 3% margin of error at a confidence level of 95% (Dillman et al., 2014 as cited in Vaske, 2019). Qualtrics distributed the questionnaire to survey takers within their system from October 22 – 26, 2020. The questionnaire was closed when we obtained a minimum number of respondents. We targeted a quota of 50:50 gender split. The incidence rate was 38%, which was calculated by dividing the total number of valid responses by the total number of valid responses combined with any non-targetable terminates (i.e., people who did not qualify for the survey). Following Wardropper et al. (2021) we cleaned our data for those who failed the attention check, straight-lined certain sections of the survey (e.g., benefits, constraints, and norm statements), or had nonsensical comments that made us question the legitimacy of their responses.

### *Survey Analysis*

We analyzed RQ2 and RQ3 using IBM SPSS Statistics (Version 26). We used independent samples *t*-tests to compare the benefits and constraints of walking around shorebird flocks from the perspective of individuals who intended to walk around shorebird flocks and individuals who did not intend to walk around shorebird flocks.

## Results

### *Interview Respondent Profile*

The twenty-seven interviews ranged from 6-23 minutes, with the average interview lasting 12.8 minutes. Interviewees were both residents and vacationers within beach communities along the East Coast of the United States. Some interviewees went to the beach nearly every day whereas others spent just a few days per year at the beach. The length of time in a day that interviewees spent at the beach on average ranged from one hour to over nine hours.

### *Benefits and Constraints to Walking Around Shorebird Flocks*

Through the interviews, we learned that the benefits to walking around shorebird flocks were related to beach users themselves and also to shorebirds. For example, some benefits to shorebirds included reduced disturbance while shorebirds feed, nest, and rest. Benefits to people included personal satisfaction to know they were not the cause of disturbance to shorebirds, being able to watch shorebirds birds in their natural state, avoiding bird aggression, and avoiding being defecated on.

We also explored constraints to walking around shorebird flocks and learned that constraints related to the physical environment and space constraints within beach settings. For example, the geography of some beach or the presences of high tides can reduce space on the beach and inhibit people from walking around flocks. Additionally, we found that constraints related to personal factors such as beach recreationists' attitudes, knowledge, and skills. For example, some interviewees confused shorebirds for gulls and often associated negative feeling about gulls towards shorebirds. Further, when asked about certain shorebirds, interviews were unable to recall the names of them or identify them. For more information on the codes and code descriptions, see Table 2 and 3. We used the codes shown in Table 2 and 3 to inform the construction of the questionnaire. Because some codes were rarely expressed in interviews, we did not include them in the questionnaire, and we excluded them from Table 2 &3.

Table 2. Codes, code descriptions, and example quotes of constraints to walking around shorebird flocks. Constraints are perceptions about what prevent people from going around shorebird flocks.

| *Code* | *Description* | *Example Quotes* |
|---|---|---|
| Limited space to walk due to people | Respondents describe being less likely to walk around flocks when space on the beach is reduced because there are too many people being on the beach | "I've seen beaches so packed that the only option in the summer is to walk through them [shorebirds] because there really is no other space around to go around." |
| Limited space due to birds using the beach | Respondents e cite limited areas on the beach because the birds take up too much space as an obstacle to walking around shorebird flocks. | "Sometimes, yes, they're [shorebirds are] across the whole beach and your only option tends to be to go into the water it can be difficult to actually get around them." |
| Limited space to walk due to beach geography | Respondents describe being less likely to walk around flocks when space on the beach is reduced because of the beach geography | "Maybe if we were in a really thin area where it was you know it meant we had to walk through the water to avoid them [shorebirds] but that's not typical." |
| Limited space due to water/ high tide | Respondents describe being less likely to walk around flocks when space on the beach is reduced by the high tide | "Only if like it's maybe high tide then I may walk through [a flock of shorebirds]… but it's usually like a high tide and I don't like to walk in. I don't like to go over the water if I can't see bottom." |
| Not aware of the need to walk around shorebird flocks | Respondents cite that they are unaware of the need to walk around flocks | "As far as just flocks on the beach, I don't know why I would walk around." |
| No benefits to walking around flocks | People do not feel there are any benefits to walking around flocks | "Not that I know of" (in response to "do you feel there are any benefits to walking around shorebird flocks?) |
| Not knowledgeable about birds | Respondents appear to lack knowledge about shorebirds or do not know what birds are considered shorebirds | "I would kinda disrupt shorebirds if they were coming into our bags like seagulls get really brazen down here and they will you know go into people's bags." |

Table 3. Codes, code descriptions, and example quotes of benefits to walking around shorebird flocks. Benefits are reasons that people choose to walk around shorebird flocks.

| *Code* | *Description* | *Example Quotes* |
|---|---|---|
| Reduce disturbance to shorebirds while nesting | Respondents walk around shorebird flocks to reduce disturbance to shorebirds while nesting | "Yes. For a lot of birds, at least from my understanding, if you get too close to their nesting habitat sometimes the parents will actually abandon the eggs and a lot of shorebirds are species with concern. So it's pretty good to just kinda avoid them and overall it's just a good philosophy to not really insert yourself into nature." |
| Reduce disturbance to shorebirds while feeding | Respondents walk around shorebird flocks to reduce disturbance to shorebirds while feeding | "I think there is a benefit because it's, you know that's, their [shorebirds'] natural setting and they're trying to you know do their daily activities whether that's eating or what have you." |
| Reduce general disturbance | Respondents walk around shorebird flocks to reduce disturbance to shorebirds (not specific to a shorebird activity) | "I don't like to disturb them [shorebirds]. I think that the benefit would be to them, not necessarily me" |
| Enjoyment of watching birds in natural state | Respondents walk around shorebird flocks because they enjoy watching the flocks | "It's more fun to watch them doing what they're doing than it is to disturb them so that would be a benefit you know to them and to me to get to see it." |
| Avoid aggression of birds towards people | Respondents cite that they can avoid being attacked by shorebird if they walk around flocks | "I've had some experiences growing up on the shore when I was little with having food with me and then birds coming towards me. So, I'm not comfortable making them agitated in anyway so that's why I choose to just avoid them entirely, go around." |
| Avoid aggression of birds towards my dogs | Respondents cite that they can avoid shorebird aggression towards their dogs if they walk around flocks | We also bring our dog to the beach and he even knows. He's afraid of shorebirds because when he was a puppy a seagull attacked him. He actually steers clear. He's a golden retriever so he's a big dog...He absolutely ignores all the shorebirds. So even when he's with us, we make sure we don't we don't disturb them. |
| Avoid defecation of birds | Respondents cite that they can avoid defecation by shorebirds if they walk around flocks | "I go around because I don't want them to poop on me because seagulls are disgusting." |
| Personal satisfaction | Respondents cite personal satisfaction as a benefit to avoiding shorebird flocks | "I, just satisfaction" |

### *Survey Respondent Profile*

Our sample of people who had experience walking on East Coast beaches in the last 12 months consisted of 1,046 respondents 18 years or older. Respondents were 49.5% male and 50.2% female, to match a 50:50 quota. They reported their race and ethnicity as 12.9% Hispanic, 4.4% Native American, 7.1% Asian, 15.7% Black, 1.2%% Pacific Islander, and 75.6% White respondents. Of all the respondents, 59.8%

vacationed in a beach community, 21.7% were full-time residents, and 18.5% were part-time residents. Mean age of respondents was 35 years ± 12.79 and ranged from 18 – 90 years old. Participants with some high school or less were uncommon (3.4%) and 18.89% of participants had a high school degree or GED. Most participants had either some level of higher education such as college education with no degree (18.5%), an associate degree (10.7%), a bachelor's degree (27.2%), or a graduate or professional degree (21.3%). The survey participants reported going to beaches in the following states in the last year in the following East Coast states (Figure 1): Maine (12.1%), New Hampshire (9.0%), Massachusetts (11.7%), Rhode Island (11.3%), Connecticut (7.8%), New York (32.8%), New Jersey (19.3%), Delaware (6.9%), Maryland (12.6%), Virginia (21.7%), North Carolina (18.7%), South Carolina (18.5%), Georgia (17.1%), and Florida (42.7%). Almost a quarter of participants did not consider themselves birders at all and almost a quarter of participants "slightly" considered themselves birders. Nearly one third of participants "somewhat" considered themselves birders. Only 17% "very much" identified as birders and even less (10%) considered themselves to be "extreme" birders.

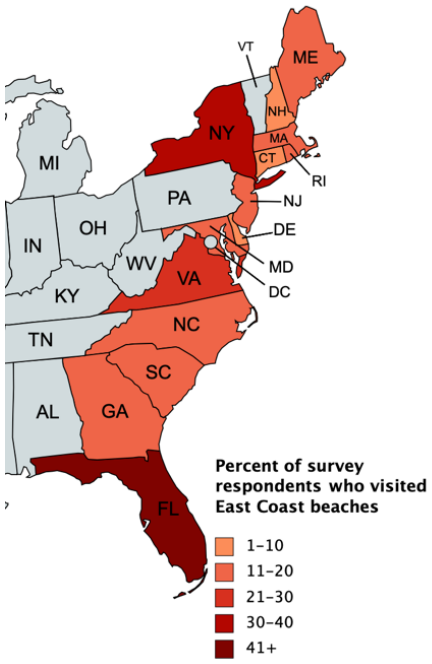


Figure 1. The percent of survey participants who visited East Coast beaches within states along the Atlantic Coast of the United States.

### *Behavioral Intentions of Beach Recreationists*

Approximately half of beach walkers (55.8%) were extremely likely to walk around shorebird flocks and 27.9% were somewhat likely to walk around flocks. A small portion of respondents (16.3%) were neither likely nor unlikely to walk around shorebird flocks, were somewhat unlikely, or were extremely unlikely to walk around shorebird flocks (Figure 2). When respondents were asked about the specific distance that they were willing to walk around flocks, only 13.8% were willing to walk "over 200 feet or whatever distance is needed to keep shorebirds in a flock from changing their behavior or location." Respondents were most willing to walk between 1-20 feet (29.1%), followed by 21-40 feet (19.4%). Respondents' willingness to walk around shorebird flocks declined as distance increased from 1 to 200 feet. Some respondents (3.1%) were not at all willing to walk around shorebird flocks (Figure 3).

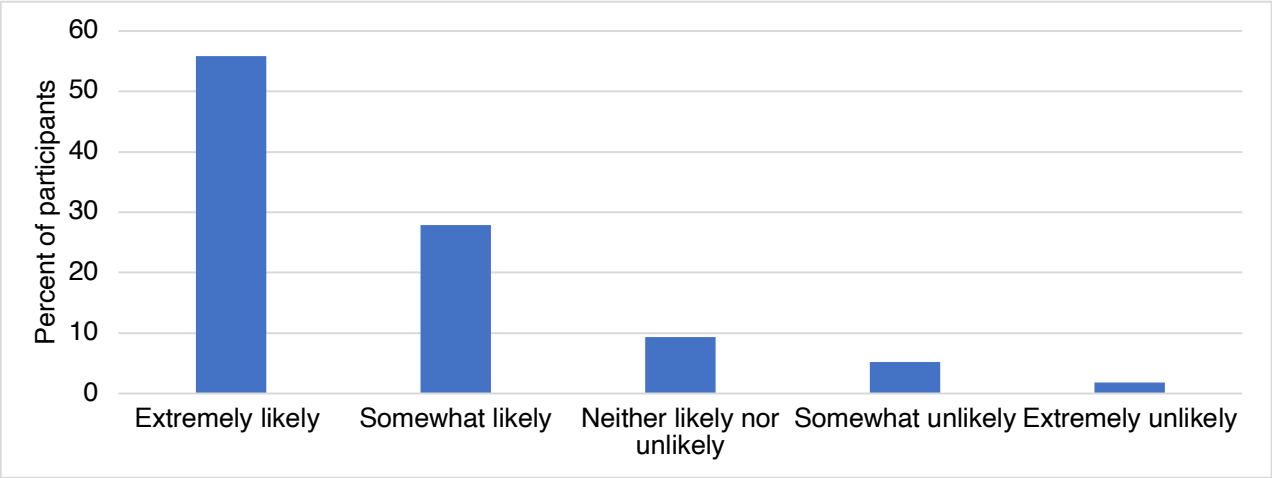


Figure 2. The likelihood that beach recreationists ($n$ = 1,046) are willing to walk around a flock of shorebirds.

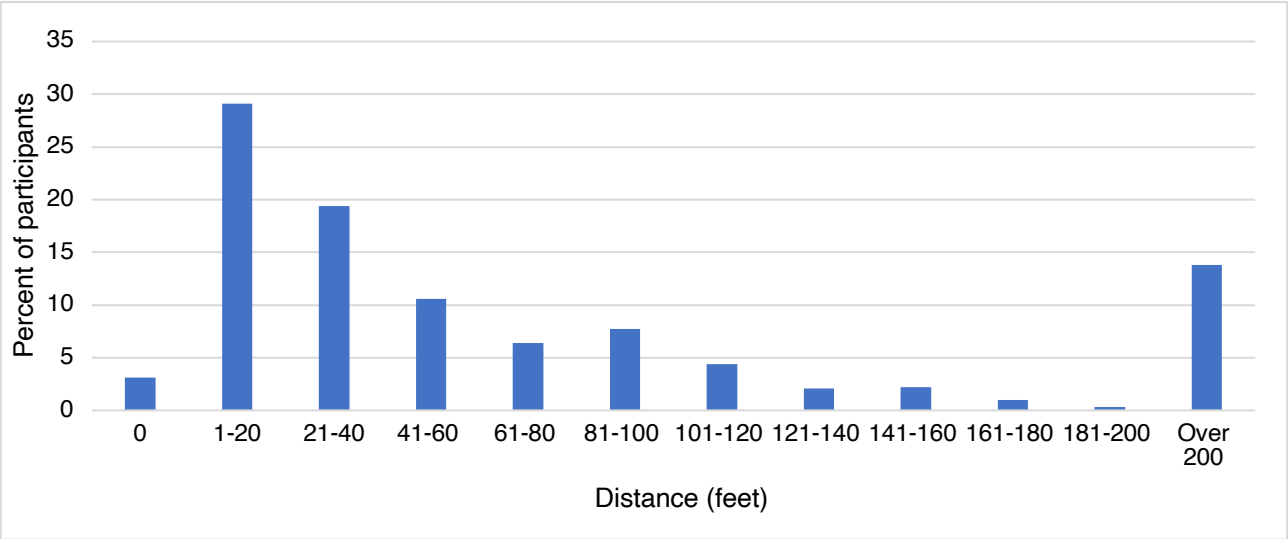


Figure 3. The distance (in feet) that beach recreationists ($n$ = 1,046) were willing to walk around a flock of shorebirds.

### *Norms of Beach Recreationists – Comparison by Intention*

For both personal and social norms, the mean difference between the group of participants who intended to walk around shorebird flocks and the group of participants who did not intend to walk around shorebird flocks was statistically significant ($p < .001$; Figure 4). Although both groups felt neutral on average about personal and social norms, the participants who intended to walk around shorebird flocks agreed more strongly about personal and social norms than participants who did not intend to walk around shorebird flocks.

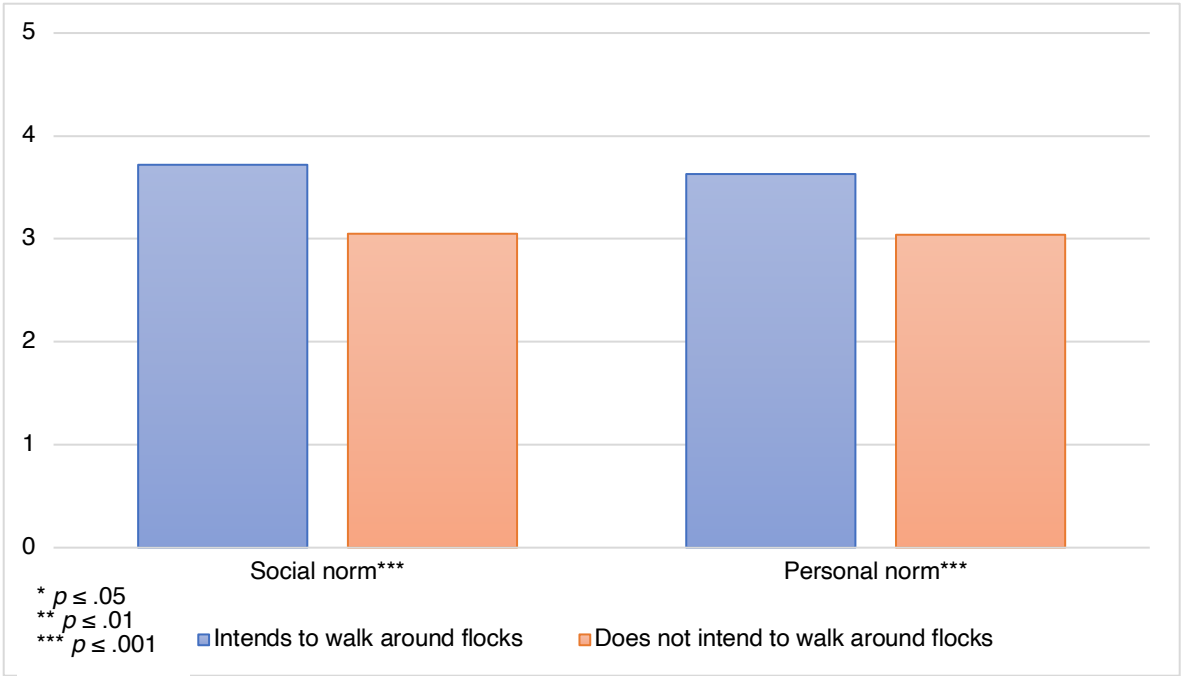


Figure 4. Independent samples t-tests of social and personal norms. We compared beach walkers who intended to walk around shorebird flocks ($n$ = 876) and beach walkers who did not intend to walk around shorebird flocks ($n$= 170). All item responses were measured from strongly disagree (1) to strongly agree (5). Statements that are statistically significant at .05 are denoted by a single asterisk (*), statements that are statistically significant at 0.01 are denoted by a double Asterix (**), and statements that are statistically significant at .001 are denoted by a triple asterisk (***).

### *Benefits to Walking around Shorebird Flocks – Comparison by Intention*

For all benefit statements the mean difference between the group of participants who intended to walk around shorebird flocks and the group of participants who did not intend to walk around shorebird flocks was statistically significant ($p < .001$). Participants who intended to walk around shorebird flocks agreed more strongly, on average, with all of the benefit statements and noted the top personal benefits to for themselves were satisfaction to know that they were not bothering shorebirds and being able to watch shorebirds in their natural state (Figure 5). Participants who intended to walk around flocks also noted that the top benefits for shorebirds were reduced disturbance while shorebird eat, nest/raise chicks, and rest. Participants who did not intend to walk around flocks were on average neutral about all benefit statements.

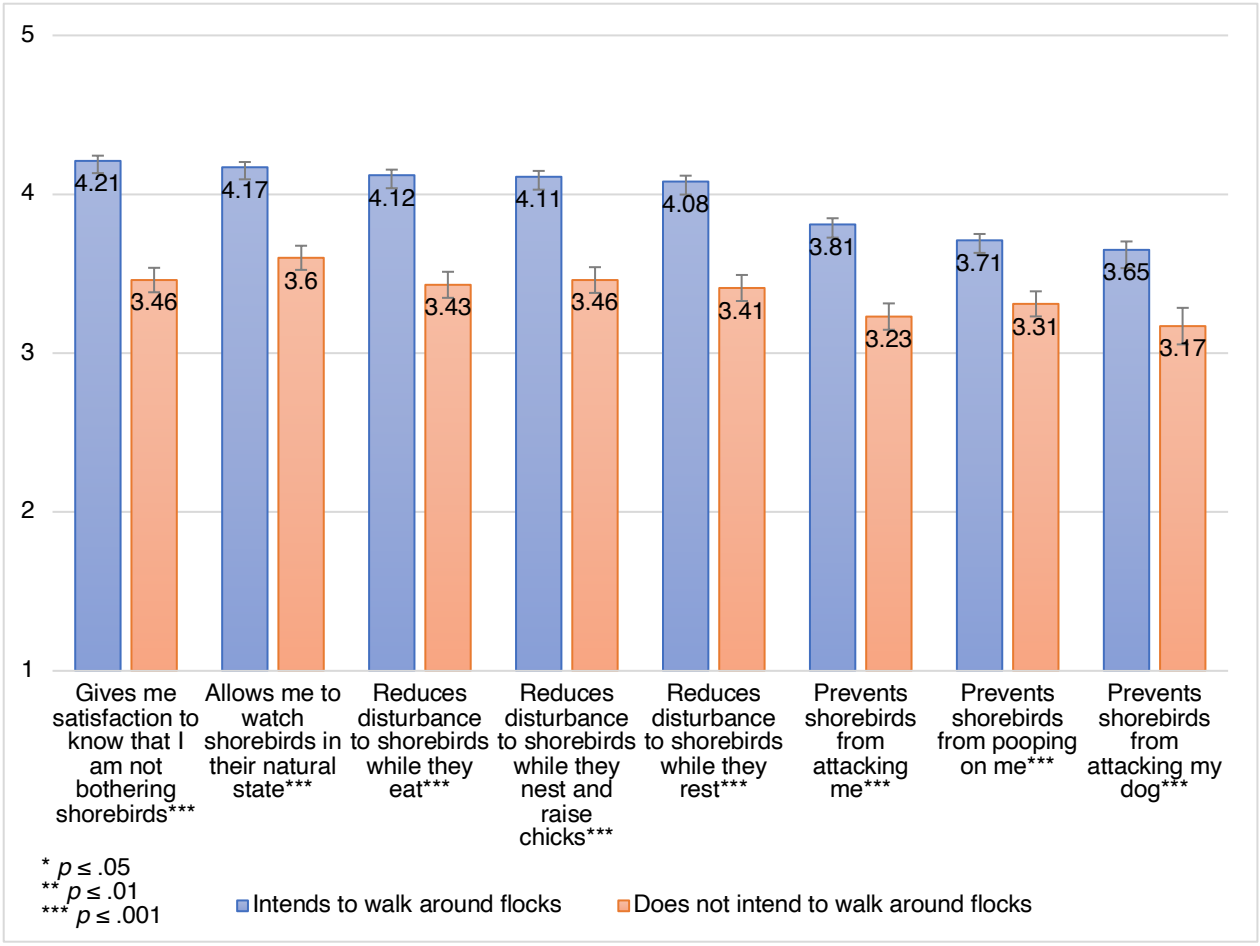


Figure 5. Independent samples t-tests of perceived benefits to walking around shorebird flocks. We compared beach walkers who intended to walk around shorebird flocks ($n$ = 876) and beach walkers who did not intend to walk around shorebird flocks ($n$= 170). For the statement, "Prevents shorebirds from attacking my dog", we removed the group of beach recreationist who do not have dogs ($n$ = 237) and the group of beach recreationists who do not take their dogs to the beach ($n$ = 209). All item responses were measured from strongly disagree (1) to strongly agree (5). Statements that are statistically significant at .05 are denoted by a single asterisk (*), statements that are statistically significant at 0.01 are denoted by a double Asterix (**), and statements that are statistically significant at .001 are denoted by a triple asterisk (***).

### *Constraints to Walking Around Shorebird Flocks – Comparison by Intention*

Beach recreationists who intended to walk around shorebird flocks and those who did not intend to walk around shorebird flocks were on average slightly below neutral for most constraint items. Beach recreationists who did not intend to walk around flocks perceived the following items: "I don't understand why there is a need to walk around shorebirds", "I don't think there is a need to walk around shorebirds", and "I don't know which birds are shorebirds" to be significantly greater constraints ($p < .05$) than beach recreationists who did not intend to walk around shorebird flocks.

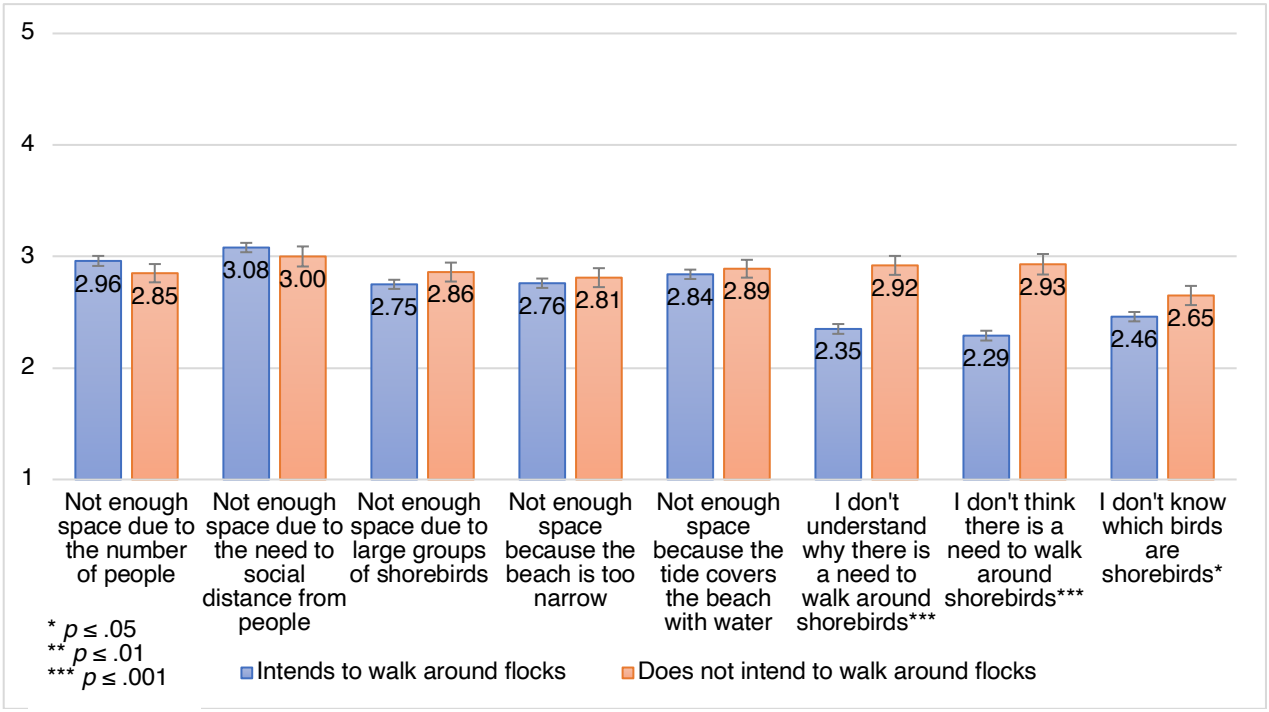


Figure 6. Independent samples t-tests of perceived constraints to walking around shorebird flocks. We compared beach walkers who intended to walk around shorebird flocks ($n$ = 876) and beach walkers who did not intend to walk around shorebird flocks ($n$= 170). All item responses were measured from strongly disagree (1) to strongly agree (5). Statements that are statistically significant at .05 are denoted by a single asterisk (*), statements that are statistically significant at 0.01 are denoted by a double Asterix (**), and statements that are statistically significant at .001 are denoted by a triple asterisk (***).

## Discussion

Our findings show that beach recreationists are willing to walk around shorebird flocks. However, the distance that the majority of recreationists are willing to walk (1 – 40 feet) is not enough space to prevent most shorebird species from flushing. According to the literature, the mean flight initiation distance (FID) for red knots is 21 meters or about 69 feet (Weston et al., 2012) and the FID for American oystercatchers and piping plovers is 50 meters or about 164 feet (Koch & Paton, 2014; Jorgensen et al., 2016). Some beach recreationists may not be willing to walk the necessary distance because they may not perceive the benefits to this behavior, they may not recognize social norms, or constraints might be impeding them from walking around flocks. We found that these factors predict willingness to walk around flocks generally. Constraints to walking around shorebird flocks included being unaware of the need to walk around

flocks (knowledge-deficit), not knowing which birds were considered shorebirds (lack of skills), and disbelief that there is a need to walk around flocks (negative attitudes).

In some cases, we found that beach recreationists appeared to have negative attitudes about shorebirds due to their inability to recognize the difference between shorebirds and other coastal birds such as gulls. During the interviews, some recreationists cited negative past experiences of "shorebirds" attacking them. For example, one participant specifically referenced their dog being afraid of shorebirds because a "seagull" attacked the dog when it was a puppy. Notably, some interviewees did not distinguish between gulls and shorebirds, and gulls' undesirable behaviors were thought to be those of shorebirds. When negative attitudes towards a rare or little-known species exist, conservation practitioners can focus outreach efforts on developing positive attitudes as a means for achieving behavior change and avoiding harm from humans (Perry-Hill et al., 2014). Further, evaluation studies have shown that the more exposure people have to outreach and education activities and materials, the more likely they are to have positive attitudes about rare or little-known species (Bentlage & Prokopy, 2016). Therefore, we recommend that agencies and organizations develop education and outreach campaigns focused on messages that emphasize aspects of shorebirds that might make people form more positive attitudes about them. For example, messages with universal themes (ideas that are generalizable to all people and thus help interpreters affect the audience by evoking a sense of meaning and connection to the resource; Larsen, 2001) could help people to better relate to shorebirds and be more inclined to engage in pro-shorebird conservation behaviors.

Often, education and outreach campaigns try to change behavior by increasing knowledge (McKenzie-Mohr, 2011). But research shows that increasing knowledge about an issue is rarely sufficient for changing behavior (Kotler & Lee, 2008; McKenzie-Mohr, 2011). Rather than increasing knowledge about disturbance issues faced by shorebirds, we suggest that campaign developers use an education and outreach approach that incorporates techniques recommended in the CBSM literature because these techniques have been shown to lead to sustainable behavior change in past studies (McKenzie-Mohr, 2011).

In particular, a communications approach such as guided walks, could be used to simultaneously change knowledge, attitudes, and skills. Guided walks with binoculars and spotting scopes can allow beach recreationists to view shorebirds from a safe distance for the birds. While recreationists view shorebirds, beach stewards can emphasize the benefits of reducing disturbance to shorebirds while they rest, nest, and raise chicks and also enhance recreationists' shorebird recognition skills and knowledge by using interpretive techniques (Ham, 1992). Because interpretive techniques go beyond providing facts and information, it can be an effective approach for increasing knowledge and building appreciation, which ultimately can lead to a desire to protect (Tilden, 1957).

Interpretative techniques aimed at changing knowledge, attitudes, and skills can also be applied to signs because signs are an effective way for reaching beach users (Ormsby & Forys, 2010) and thought by managers to be one of the most effective methods for reducing human disturbances to shorebirds (Comber & Dayer, 2021). In

particular, signs at beach access points could act as **prompts** to remind people about the benefits of walking around flocks as well as tips on how to recognize different shorebirds.

When implementing a strategy that uses signs, managers should be mindful that not all signs are equal and sometimes, signs alone are not enough to change a person's behavior (Everly et al., 2021). Therefore, we suggest that campaign developers combine a sign-based strategy with additional behavior change strategies such as a **commitment** strategy. A commitment strategy could encourage beach users to commit to walking an adequate distance around shorebird flocks by signing a pledge at beach access points. The language in the pledge could include phrases with universal themes such as family. For, example, "I pledge to protect the shorebird families on this beach by walking around flocks" Through the use of relatable themes, people may form more positive attitudes about shorebirds and overcome constraints based on negative attitudes. Furthermore, beach stewards can show beach recreationists photos of shorebirds when they sign the pledge, giving beach recreationists the opportunity to enhance their shorebird recognition skills by seeing what birds they should walk around.

Beach stewards can also use an **incentive** strategy by rewarding beach recreationists who sign the pledge with incentive items. Incentives are particularly beneficial for engaging people who lack intrinsic motivation; therefore, incentives could be useful for drawing in the group of beach recreationists who do not intend to walk around flocks. Because our research showed that intention to walk around flocks is associated with norms, a **norm strategy** could be used by putting norm-based messages such as "I protect shorebirds by walking around flocks" on incentive items. Doing so, campaign developers can enhance the visibility of norms and increase the likelihood of shifting beach recreationists' intentions so that they are more likely to walk around shorebird flocks in the future.

## Next Steps

This research uncovered benefits and constraints to walking around shorebird flocks, as well as norms and behavioral intentions. These findings were presented to managers and shorebird conservation professionals from along the Atlantic Flyways at a co-production workshop in December 2020. In this workshop, managers and researchers discussed the feasibility of strategies aimed at changing beach walking behavior, the needs for management, and possible strategies that could be realistically implemented at sites across the Atlantic Flyway. Based on this workshop, along with our understanding of the CBSM and human dimensions of shorebird conservation literature, we developed a menu of CBSM strategies for sites applying these results. The recommendations above are further fleshed out in that document, which can be found on the Atlantic Flyway Shorebird Initiative website later in 2021. The next phase of this shorebird human disturbance project will focus on pilot testing these strategies and adapting them so we can provide recommendations and a toolkit to support sites across the Flyway in effectively managing human disturbance from beach walkers.

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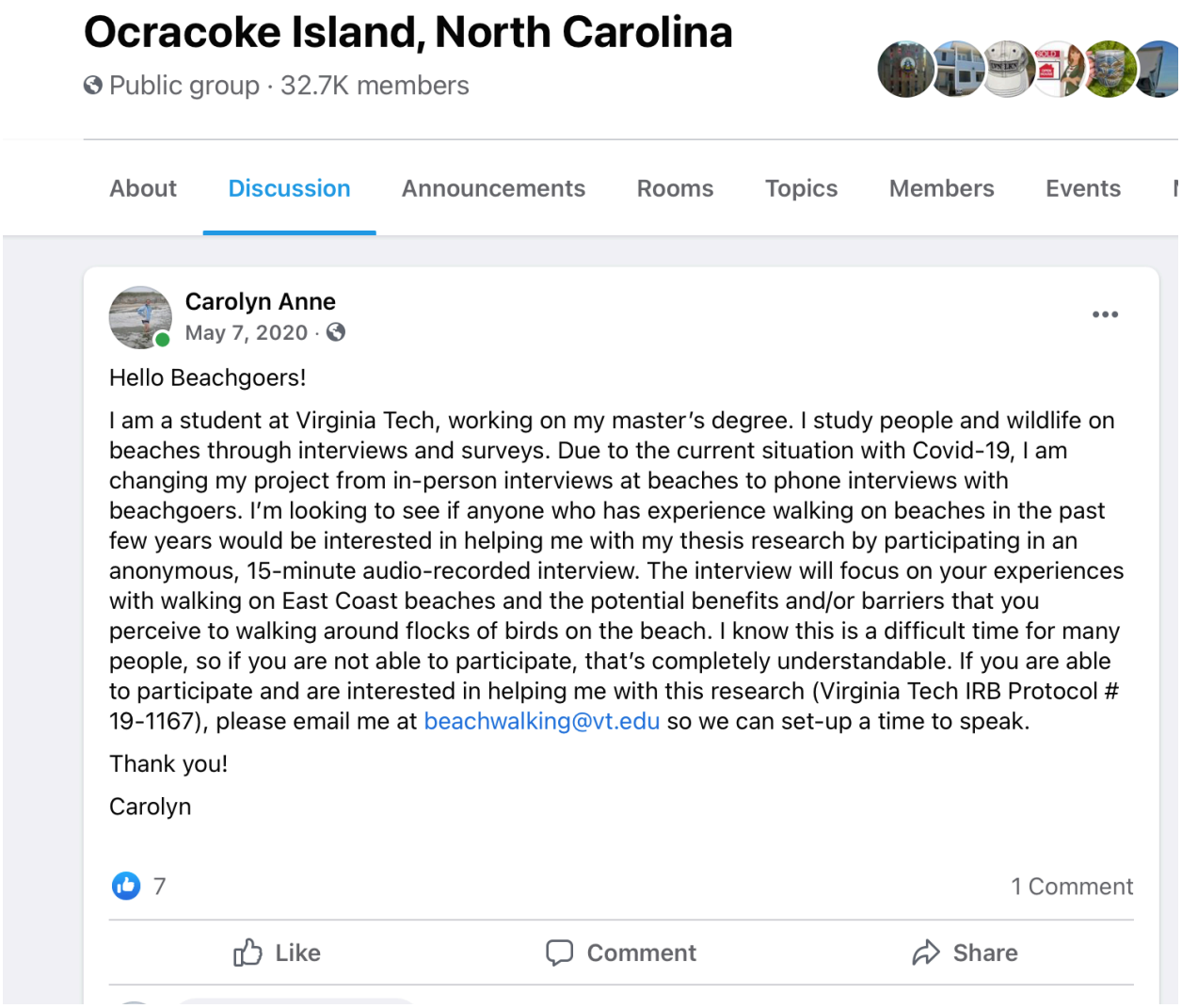
## Appendix A: Public Facebook Groups Used to Recruit Interviewee Participants

1. Delmarva Beaches Daily and Beyond
2. Tybee Island, Georgia - Savannah's Beach
3. Virginia Beach
4. I Love Folly Beach SC
5. Shelly Island OBX
6. Hilton Head, SC
7. Carolina Beach & Kure Beach Locals
8. Chincoteague Island Locals and Guests
9. St. Simons Island Getaway
10. Ocracoke Island, North Carolina
11. This is Oak Island, NC
12. Myrtle Beach
13. Chincoteague Island Locals and Guests prime
14. Outer Banks - Outsiders, OBX, NC
15. Outer Banks Fan Club
16. Friends Of Assateague Island National Seashore

## Appendix B: Facebook Recruitment Message



# Would you like more information about the collaborators and funders?

National Audubon Society
www.audubon.org

Dayer Human Dimensions Lab
http://www.dayer.fishwild.vt.edu/

Virginia Tech Shorebird Program
http://vtshorebirds.fishwild.vt.edu

National Fish and Wildlife Foundation
www.nfwf.org

The Atlantic Flyway Shorebird Initiative
https://atlanticflywayshorebirds.org

Manomet
https://www.manomet.org

U.S. Fish and Wildlife Service
https://www.fws.gov