

Evaluating the Effectiveness of Children's Signs at Reducing the Threat of Human Disturbance to Coastal Birds



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Background

To protect coastal beach nesting birds from human disturbance, managers often restrict human recreation by closing portions of beaches with signs and symbolic fencing (Ikuta & Blumstein, 2003; Lafferty, Goodman, & Sandoval, 2006). Several studies have suggested that signs are the most effective method for reaching beach users (Ormsby & Forsys, 2010) and for reducing the impact of human disturbance on coastal birds (Medeiros et al., 2007). However, other studies have suggested that providing passive information (e.g. brochures, signs, and posters) may not be sufficient for improving awareness, attitudes, and compliance (Jorgenson & Brown, 2015; Hamilton, 2014). In particular, Jorgenson and Brown (2015) found that participants who lacked prior knowledge about piping plovers at Lake McConaughy, Nebraska felt that the use of signs, posters, and brochures was not effective in capturing their attention and that these materials were overlooked.

Although research is inconclusive regarding the effectiveness of signs for reducing disturbance, it is commonly suggested that signs have more utility when they capture the attention of beach recreationists (Hamilton, 2014). Relaying an interpretive message about shorebird conservation requires first that a beach user notices the sign and reads it (Bitgood, 2000). To capture the attention of the target audience, it is best to limit the number of messages in the sign, use a clear, non-cursive font choice (e.g. sans serif) with high contrast design, employ primary and subthemes using stories that provoke the audience, use color and conversational style to attract attention, minimize the number of words on the sign, and present information in a unique manner (Hamm, 1992; Jacobson, 1999; Moscardo, Ballantyne, & Hughes, 2007).

One program that focuses on using innovative and compelling signs to convey messages about shorebird conservation is Audubon New York's "Be A Good Egg" outreach program. Elementary school children create signs that foster the "share the shore" message, as part of an outreach initiative with an Audubon educator. Rather than using hostile tones that create resentment and noncompliance (Trapp, Gross, & Zimmerman, 1991), the signs use friendly hand-drawn images with limited text, bright colors, conversational style, displaying concepts in novel ways to promote shorebird awareness. These signs are then posted near shorebird nesting sites with high visitation in an attempt to reduce shorebird disturbance by beach recreationists.

The use of children's artwork to carry shorebird conservation messages has not been well studied to our knowledge; however, McArdle & Wong (2010) suggest that children's artwork in general can evoke various responses in adults. To some, they are meaningless scribbles (Montessori, 1965); to others, they are considered charming and dynamic (McArdle & Wong, 2010). Such child drawn signage may also be successful because beach recreationists prefer signs that focus on education and persuasion over signs that detail regulations (Rimmer, Maguire, & Weston, 2013). Regulatory signs, stating "Keep Out" and "Do Not Enter," are commonly posted at nesting sites that continue to experience noncompliance. In this study, we examined the effects of "Be a Good Egg" (BGE) signs at reducing human disturbances to shorebirds and the knowledge gap that currently exists on the use of children's signs as a tool for promoting shorebird conservation.

The specific research questions are:

1. Do beach recreationists observe BGE signs, spend more time looking at the BGE signs, and recall content from the BGE signs more than traditional government signs?
2. Does seeing BGE signs minimize beach recreationists' intentions to cause disturbance more than traditional government signs?
3. Does seeing BGE signs influence beach recreationists' shorebird conservation attitudes and norms more than traditional government signs?
4. Does seeing BGE signs influence beach recreationists' awareness of consequences for entering closed areas more than traditional government signs?

Methods

Two methods (i.e. observation and an intercept survey) were used to address our research questions during a two-week field season in June 2018 on Long Island, NY at Sunken Meadow State Park.



Map of Sunken Meadow State Park on Long Island, NY

During the first week, 25 “Do Not Enter” (DNE) signs were posted around a 100ft by 1000ft nesting area with an active least tern (*Sternula antillarum*) colony and an active pair of breeding piping plovers (*Charadrius melodus*).



Do Not Enter signs posted around the nesting area at Sunken Meadow State Park

After one week, 50 BGE signs created by elementary school children were added. Due to regulations, the DNE signs could not be removed during the second week, therefore, the BGE signs were posted concurrently with the DNE signs and dispersed approximately 30-50 ft apart from each other around the nesting area. All research was conducted by a Virginia Tech graduate student and technician during peak recreation hours (10am to 6pm).



A Do Not Enter sign (left) and a Be A Good Egg sign (right) posted around the nesting area

When beach recreationists approached within 100ft of the nesting area, the observer began recording their behaviors for three minutes. After recording observations of the beach recreationists, the observer sent a message to the interviewer via cell phone text, described the beach recreationist and instructed the interviewer to approach the beach recreationists for the survey.



A beach recreationist observing a BGE sign (left) and an interviewer approaching the beach recreationists (right)

Observational Study

An observer was positioned within 100ft of the fenced nesting area and dressed as a beach recreationist to ensure that the observed behaviors were not influenced by the presence of the researcher. The observer delineated a 100ft radius around the nesting area and recorded the activities of each beach recreationist to enter within that radius for three minutes after they initially entered it. For each person who entered within the radius, the researcher recorded if the person had a conversation with someone about the signs or birds, if the person walked into the fenced area, if the person looked in the fenced area, the type of sign(s) that the person visually acknowledged or looked at (or if they did not look at any sign), the amount of time each person spent looking at the different types of signs, the gender of the person, their approximate age, the number of people with the person (i.e. group size), and the predominate activities conducted by each person observed.



The observer (under the black and white umbrella) recording observations of beach recreationists within 100ft of the nesting area

Observational Study Analysis

The presence or absence of the various behaviors during the observational study were analyzed using descriptive statistics in Statistical Package for the Social Sciences (SPSS). Data were analyzed based on those who were observed looking at the DNE signs only and those who were observed looking at the BGE signs only. Since there were 1-4 BGE signs spaced ~20-50 ft apart between the DNE signs, there were very few situations where someone was observed looking at both DNE and BGE signs (n=5). As such, these people were excluded from this analysis.



Four BGE signs on the western portion of the nesting area

Survey Construction

The survey measured the knowledge, attitudes, norms, and behaviors of beach recreationists related to staying out of closed areas for coastal beach nesting birds through a mix of open and closed-ended questions. To ensure clarity, the survey was reviewed by subject matter experts who have experience interacting with beach recreationists as well as social scientists who have experience with conducting surveys. After review, the survey was implemented with 8 beach recreationists during the first two days. Minor adjustments to survey wording and length were made to adjust for issues that arose during this initial implementation.

Survey Implementation

When the interviewer approached beach recreationists, she asked for their consent to participate in the survey. Then the interviewer administered the survey verbally using an iPad with the Qualtrics app. Before beginning the survey, the interviewer asked participants if they were over 18. If beach recreationists were under 18, then the survey did not continue. When beach recreationists declined to take the survey, the interviewer recorded the number of individuals who declined to participate, their gender, age, the number of people who were with them (if any), and their recreational activity.

Survey Analysis

Open-ended responses from the survey were qualitatively coded for themes relating to content recall about the signs, the importance of staying out of nesting areas, and behavior changes associated with the signs. Data from the survey were analyzed in SPSS using descriptive statistics, frequencies, and mean comparisons (e.g., ANOVA of those who self-reported seeing the DNE signs only ($n=40$), those who self-reported seeing the BGE signs only ($n=15$), and those who reported not seeing any signs ($n=56$). People who reported seeing both signs ($n=5$) and people who reported seeing signs but were not clear about the signs that they saw ($n=12$) were excluded from the analysis.

Results

Observational Study

We spent approximately 88 hours observing beach recreationists over 11 days. Of the total individuals observed during the study ($n = 546$), more people were seen looking at the BGE signs than the DNE signs ($n_{\text{BGE Obs.}} = 22$; $n_{\text{DNE Obs.}} = 13$; Table 1). The people who looked at the at the DNE signs spent between 2 to 14 seconds viewing the signs with the average time being 7.8 seconds. The average time spent looking at the BGE signs was 4.67 seconds and the time that people spent looking at them ranged from 2 to 8 seconds. People who looked at the BGE signs were more likely to look in the fenced area compared to people who we observed looking at the DNE signs. People who looked at the DNE signs were more likely to talk about the signs and go in the fenced area than people who looked at the BGE signs (Figure 1). Most conversations about the signs were in English, however we noted that there were many non-English speaking beach recreationists who spoke Spanish, Italian, Algerian, Polish, and a variety of other

languages that we could not identify. Interestingly, we observed two people duck under the symbolic fence and later found that they were non-English speakers when we asked them to take the survey. In total, we observed 9 people go into the fenced area; one person was observed looking at the BGE sign; 2 were observed looking at the DNE signs; and 6 were not observed looking at any signs. It appeared that the majority of people who entered the fenced area were walking through it as a short-cut to get to the board walk or to the water.

Table 1. The data from the observational study reflects the sign(s) that the researcher observed beach recreationists looking at; the self-reported survey data reflects the signs that beach recreationists who took the survey reported seeing. The self-reported survey data was determined by qualitatively coding the responses to the survey questions that asked participants to describe the signs that they saw. Since some responses were vague, we were not able to determine what sign(s) were seen by some participants (n=12).

| | Observational Data | Self-reported Survey Data |
|--------------------------------------------------------------------|--------------------|---------------------------|
| Total # of people who looked at BGE signs only | 22 | 15 |
| Total # of people who looked at DNE signs only | 13 | 40 |
| Total # of people who looked at both sign types | 5 | 5 |
| Total number of people who it was unclear what sign they looked at | 0 | 12 |
| Total # of people who did not look at signs | 506 | 56 |
| Total People | 546 | 128 |

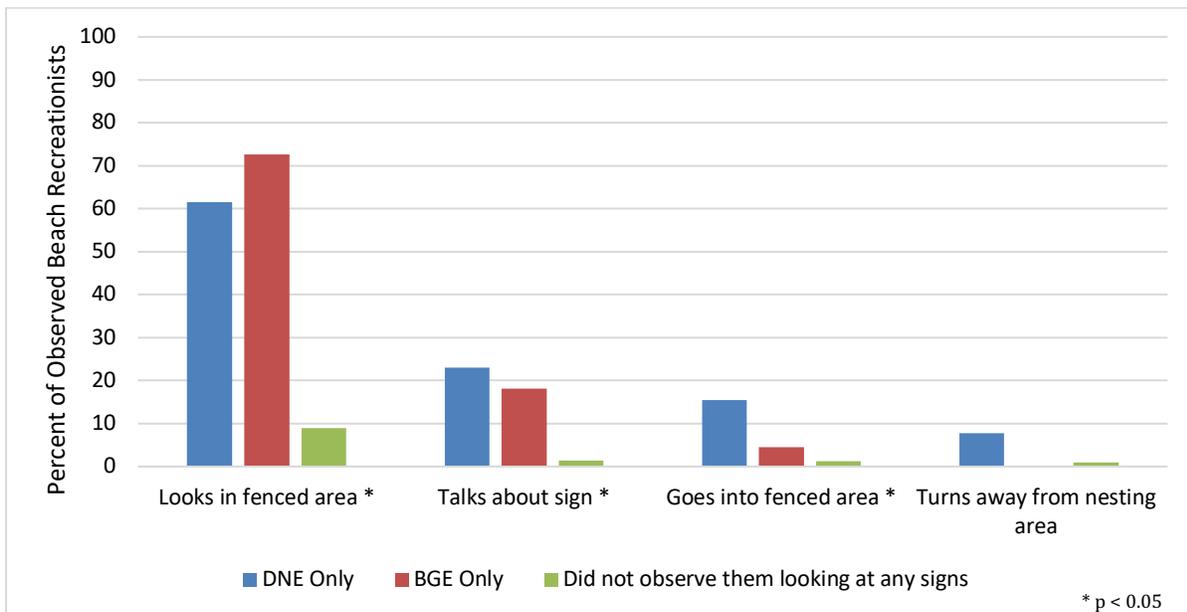


Figure 1. The percent of beach recreationists who were observed looking at the different sign types (based on observational data) and their associated actions.

Survey Response

Out of the 546 beach recreationists in 127 groups, 128 people agreed to participate in the survey. 129 people declined to take the survey and 5 individuals could not be located for the survey. Since 53 observed people were in one of the 127 groups with a person who already took the survey, those individuals did not take the survey. We also observed 231 individuals under the age of 18, but due to human ethics approval, we were unable to survey those individuals. Therefore, the adjusted response rate for the survey is 50%.

Respondent Demographics

We compared the demographics of those who saw the DNE signs, BGE signs, and no sign. There were no significant differences in gender distribution, parent/caregiver status, and the average age among the groups (Figures 2,3, & 4). The average age of participants who saw the DNE signs was 43, the average age of participants who saw the BGE signs was 40, and the average age of participants who did not look at the signs was 42 (Figure 4).

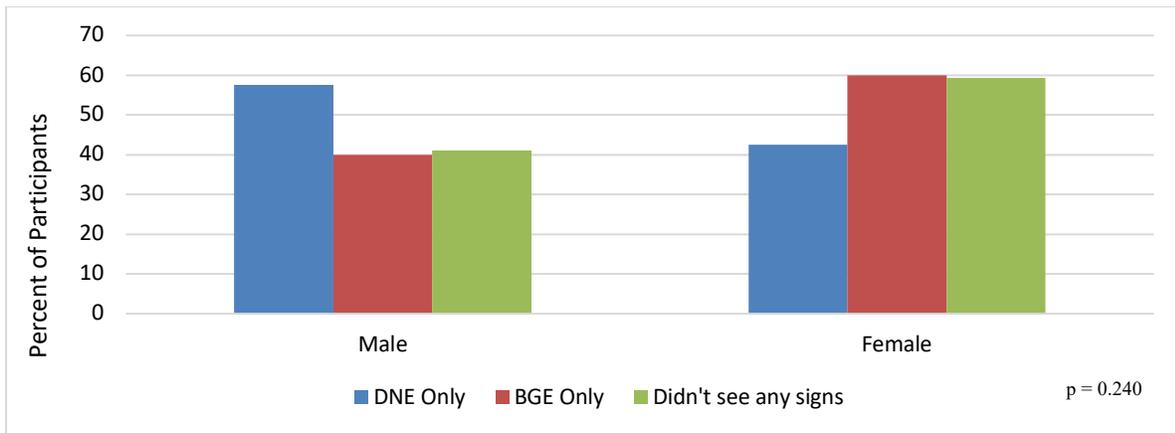


Figure 2. The percent of male and female participants who saw each type of sign (self-reported).

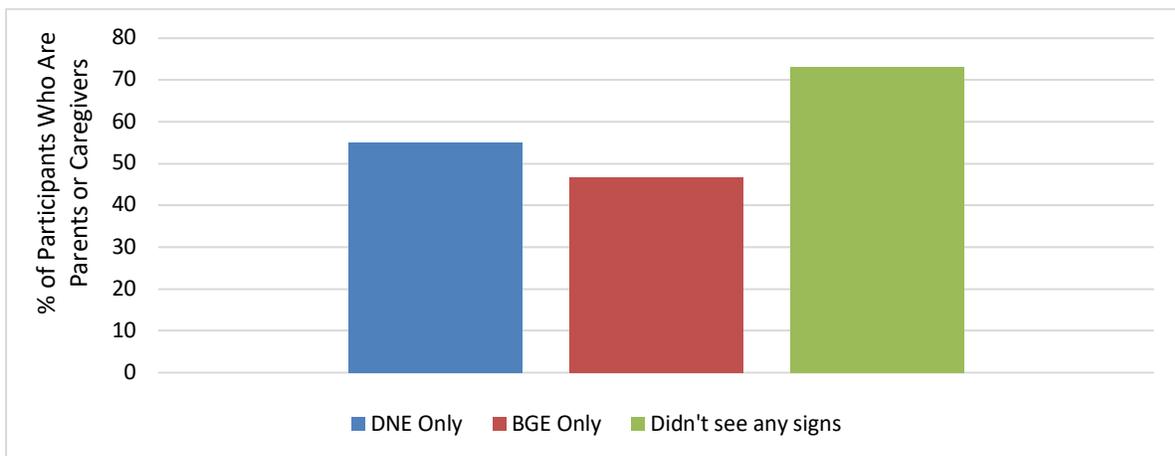


Figure 3. The percent of participants who saw each type of sign (self-reported) that are parents or caregivers.

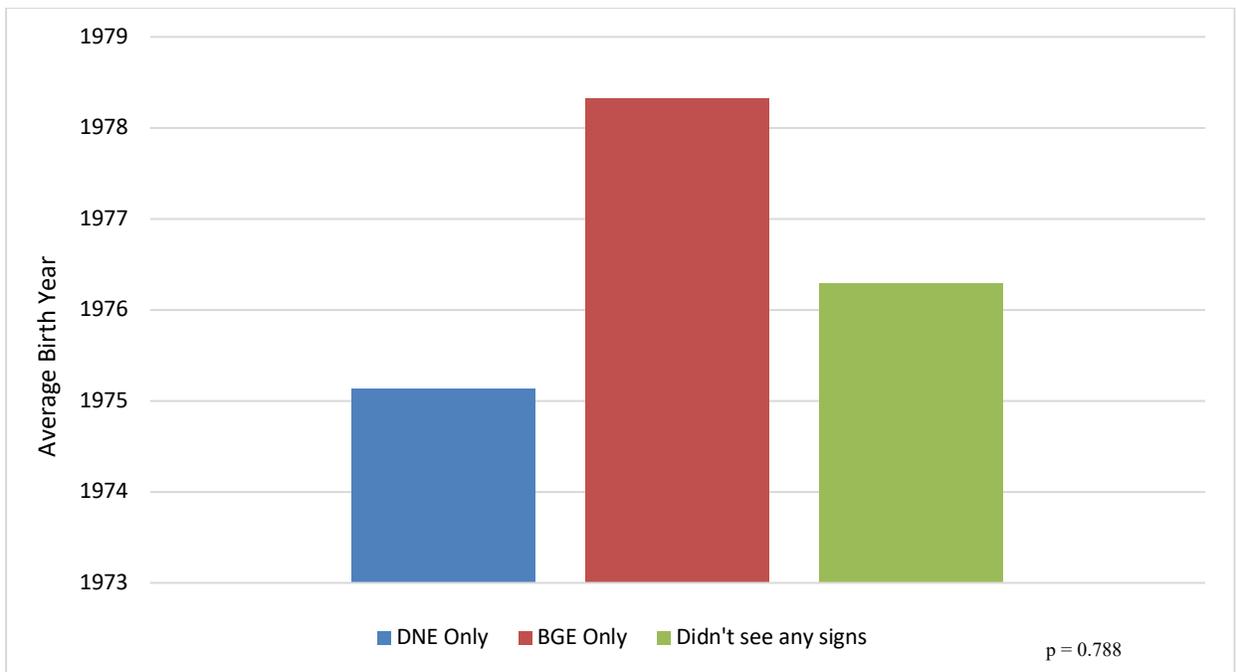


Figure 4. The average birth year of the participants who saw each type of sign (self-reported).

Content Recall of Signs

Participants in the DNE group recalled content about nesting areas slightly more than people who saw the BGE signs. Although piping plovers and least terns are both shown on the DNE signs, participants who viewed the DNE signs recalled piping plovers more frequently than they recalled least terns. After viewing the DNE enter signs, one participant recalled “endangered wildlife and piping plover nests and eggs. We can't go near it. There's another bird species too, I can't remember the name.” Participants who only saw the DNE signs described piping plovers and least terns more often than participants who only saw the BGE signs. Rather than the specific species, birds in general were mentioned more frequently by the participants in the BGE only group. One participant recalled “nesting and protecting the environment and really cute children drawings.” More viewers of the DNE signs described that the signs related to endangered wildlife while more viewers of the BGE signs mentioned that the fenced area was a protected area. Additionally, participants who viewed the DNE signs recalled that they should not bother or enter the nesting area more frequently than those who saw the BGE signs (Figure 5).

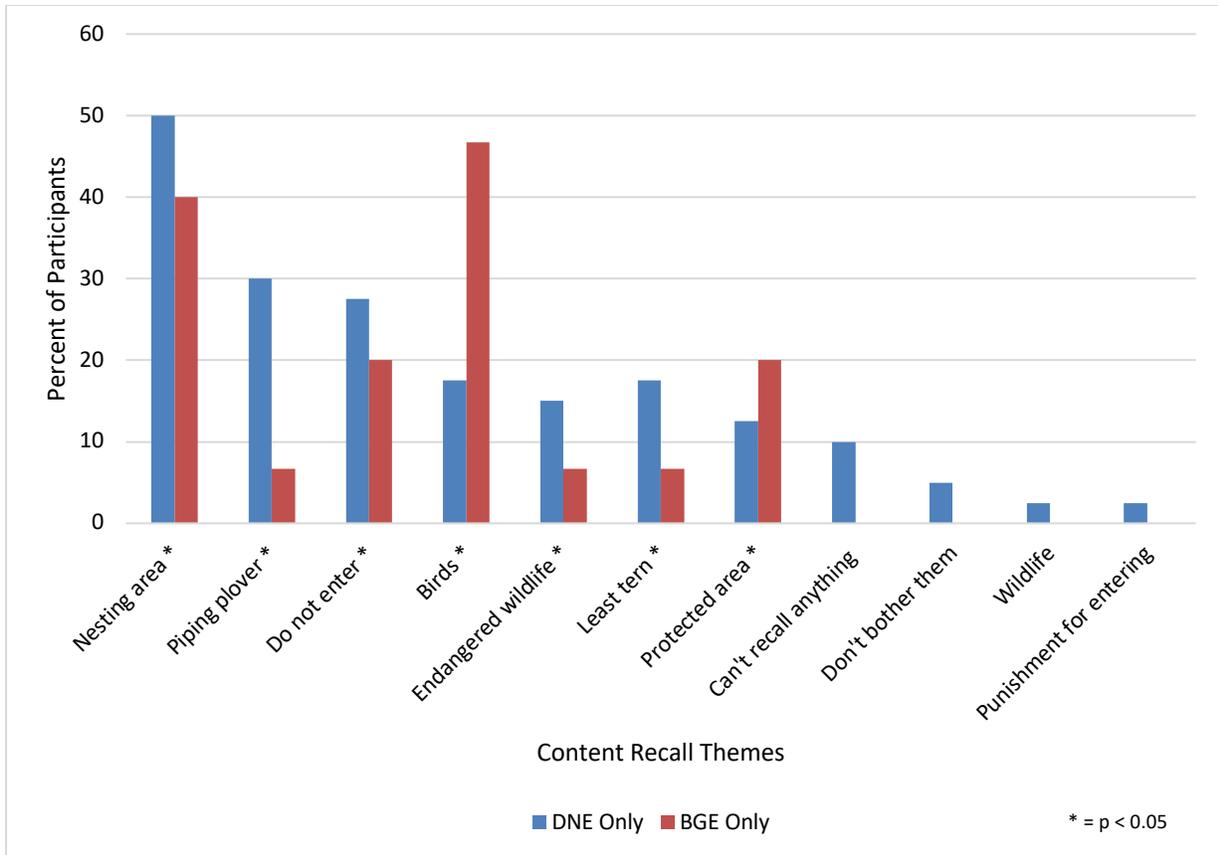


Figure 5. The percent of people who viewed each sign type (self-reported) and the content that they recalled from those signs. Note that this question was not asked to people who reported not seeing any signs.

Behavior Change After Seeing Signs

When participants were asked if they would change their behavior after viewing the different signs, 53% who viewed the BGE signs said that they would not change their behavior. Notably, several participants mentioned that they would not change their behavior because they already engage in shorebird conservation behaviors such as respecting the fenced areas and staying away from them. These individuals were grouped in a separate response theme from people who simply said they would not do anything different. Since these survey questions were open-ended, it is possible that many people who answered that they would not change their behavior reported this because they already respect the shorebirds; but it is not clear since they did not elaborate in their open-ended responses.

Participants who saw the DNE signs were more likely to state that they would do activities associated with avoiding the nesting areas such as “I’ll stay out of those areas.” Participants who saw the BGE signs noted that they would take part in shorebird conservation behaviors such as “I’ll pick up trash and not let it go in there” (Figure 6).

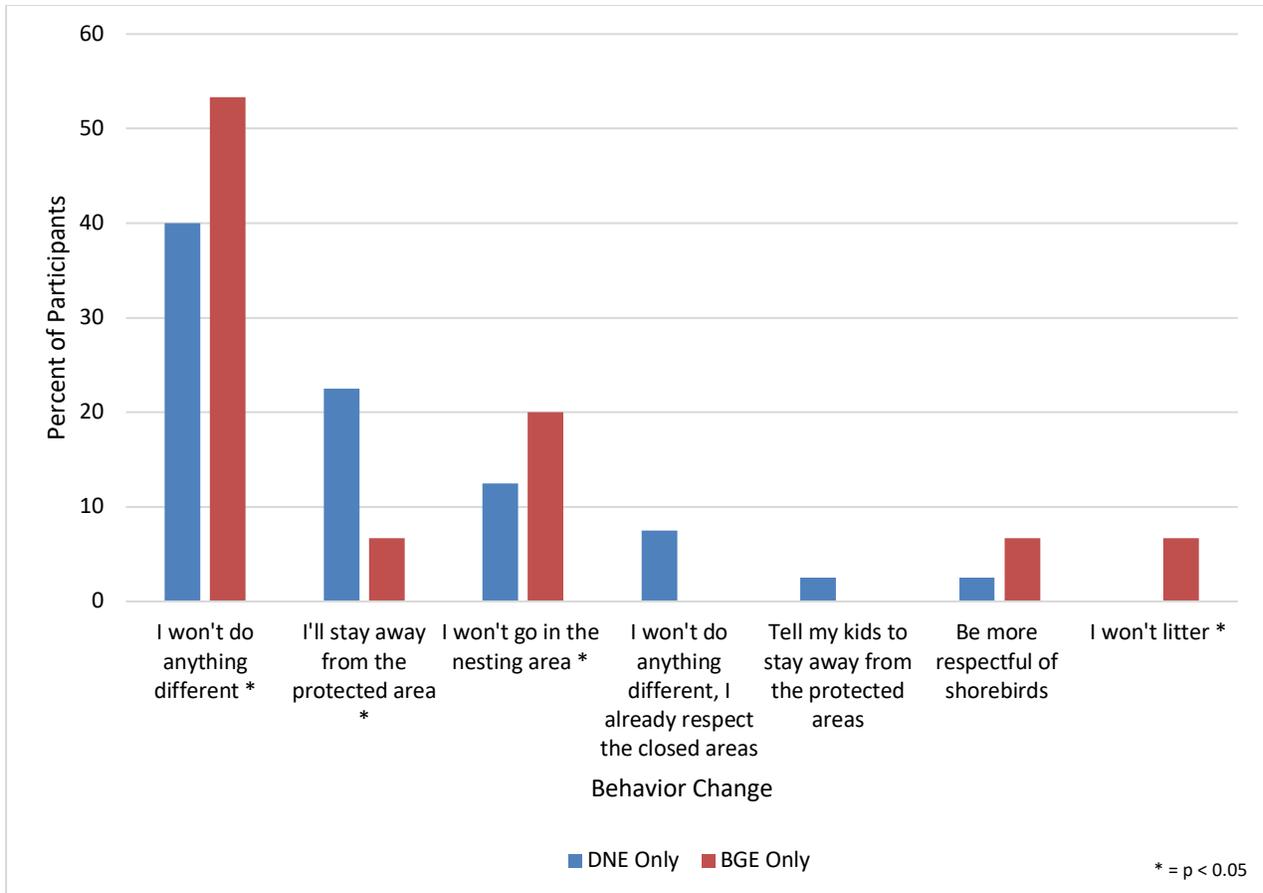


Figure 6. The percent of people who viewed each sign type (self-reported) and their associated behavior changes after viewing the signs. Note that this question was not asked to people who reported not seeing any signs.

Importance of Staying Out of Fenced Area

All participants, including those who did not see the signs, were asked why it was important to stay out of the fenced or marked areas at the beach. From the open-ended responses, eight themes were revealed. The most common reason why participants thought it was important to stay out of the fenced or marked areas at the beach was to protect wildlife. Over 46% of participants who saw either sign rated this as important compared to 29% of participants who reported not seeing any signs. Participants specifically stated that it is important “for conservation, because you can hinder the nesting animals, and so the species can survive.” Second mostly commonly described by participants who did not see the signs was a reasoning to protect people followed by it’s dangerous and unsafe (note: in these statements it was unclear as to who/what it is dangerous or unsafe for). In contrast, second most commonly described by those who saw the signs was that the fenced areas are important to protect nature or the environment. A handful of participants also noted that it is important to stay away from fenced or marked areas to enforce the law, to keep people away from something, it’s fenced for a reason, and it’s a private area (Figure 7).

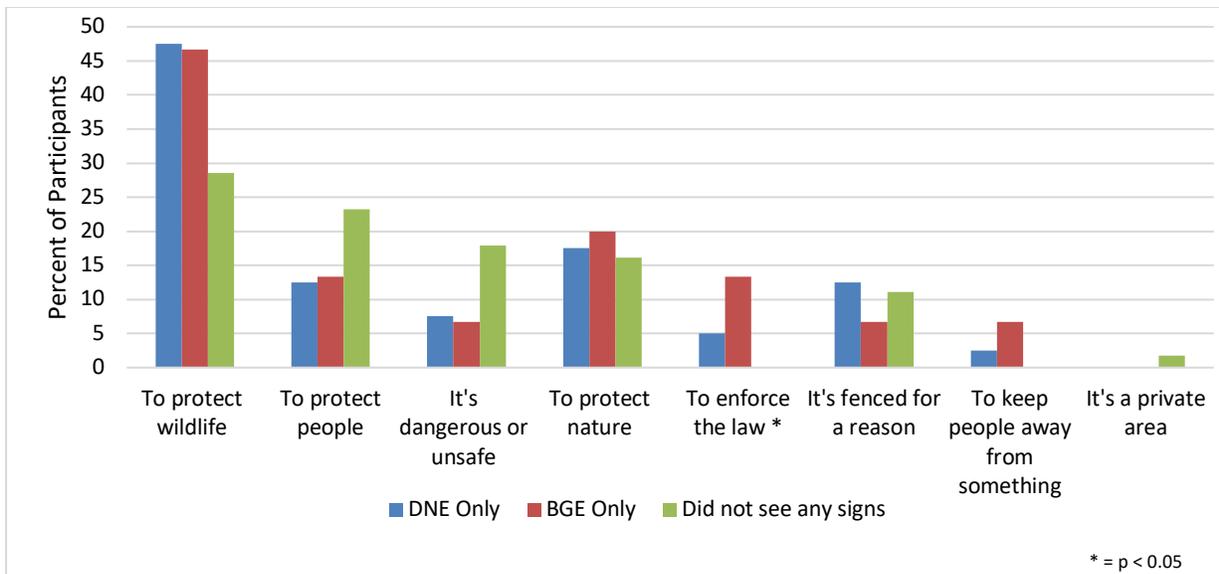


Figure 7. The percent of people who saw each sign type (self-reported) and their opinions on why it is important to stay out of fenced nesting areas.

Attitudes

Participants strongly agreed that it was important for people to stay out of coastal bird nesting areas, and they also strongly supported protecting coastal nesting birds by fencing off parts of the beach. There was no significant difference among the groups of participants who saw the different sign types (Figure 8).

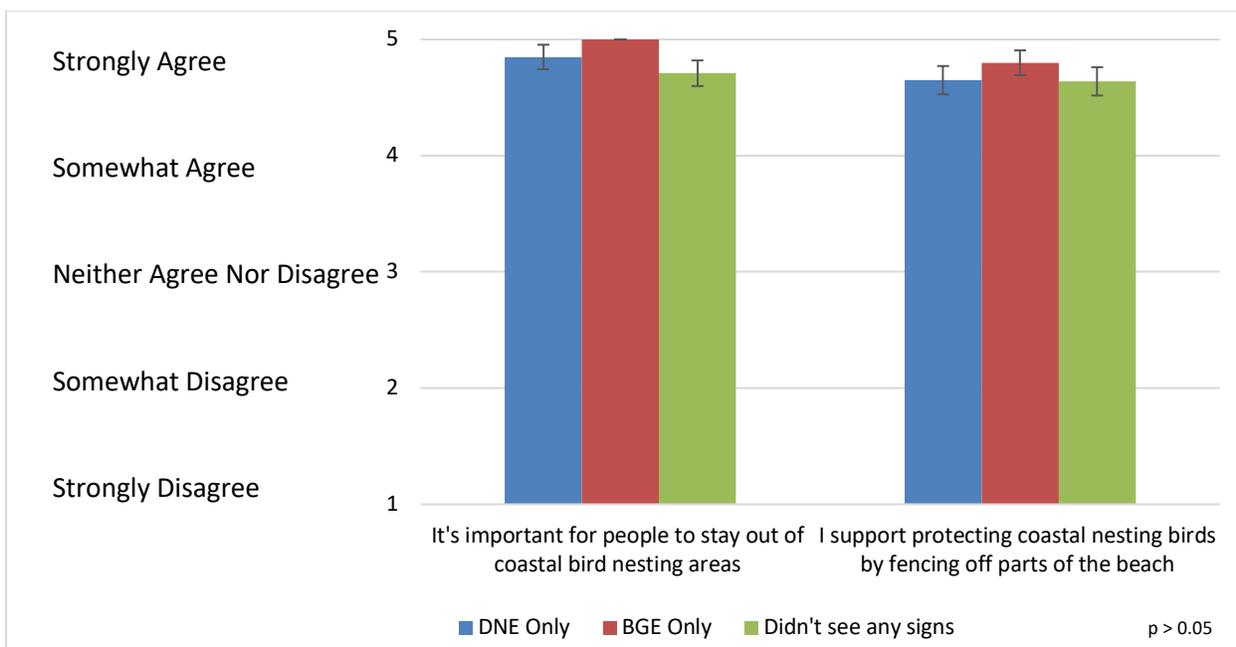


Figure 8. Attitudes about coastal nesting bird areas associated with the signs that participants saw (self-reported) at the beach and the standard error mean.

Norms

There were no significant differences among the sign groups when asked about the social (unwritten rules about how to behave in a situation) and personal norms (internal standards about right and wrong) for entering nesting areas. However, participants in all groups strongly agreed that it is important to stay out of coastal bird nesting areas and that they would feel guilty if they went into a nesting area. They also agreed that children expect them to stay out of coastal bird nesting areas, although they agreed slightly less with this statement than they did with the other statements pertaining to norms about entering nesting areas (Figure 9).

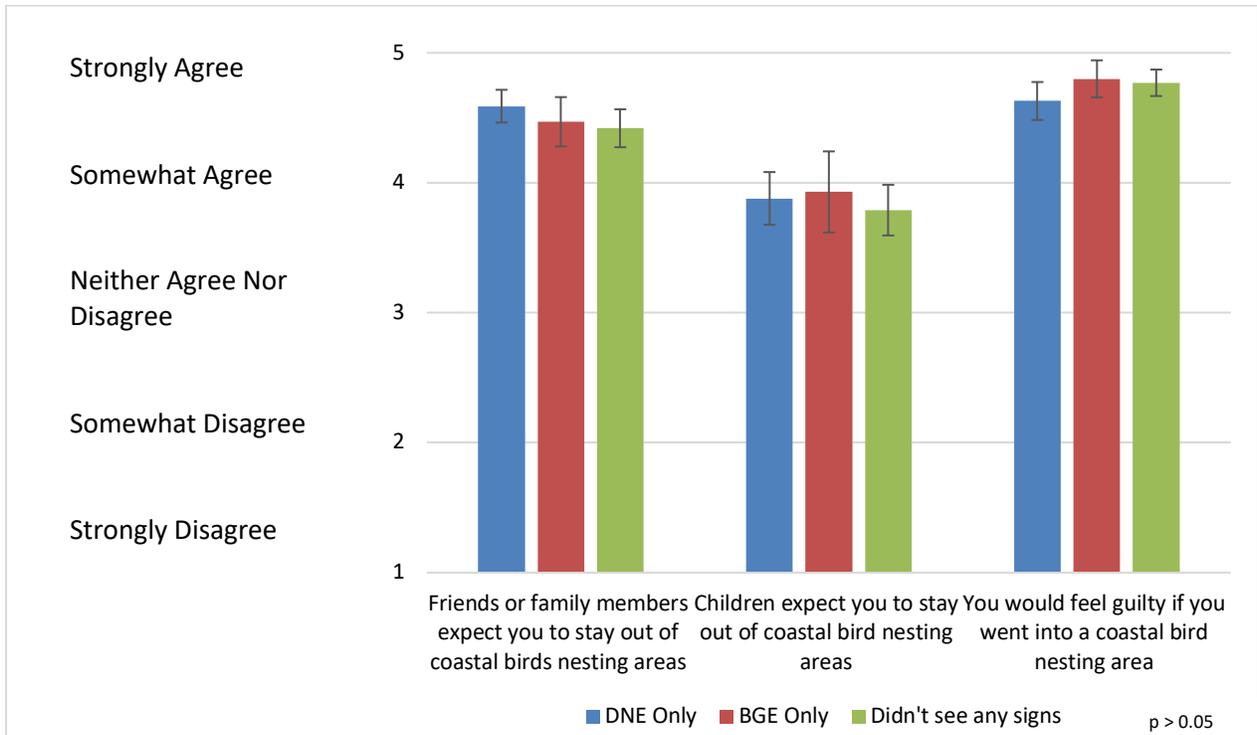


Figure 9. Social and personal norms after viewing the different types of signs (self-reported) and the standard error mean.

Awareness of Consequences

In general, participants neither agreed nor disagreed that they were unaware of the legal consequences for entering fenced areas, and there was no significant difference among the groups. There was also no significant difference among the groups when asked about the consequences to the birds if a person enters a fenced area (Figure 10).

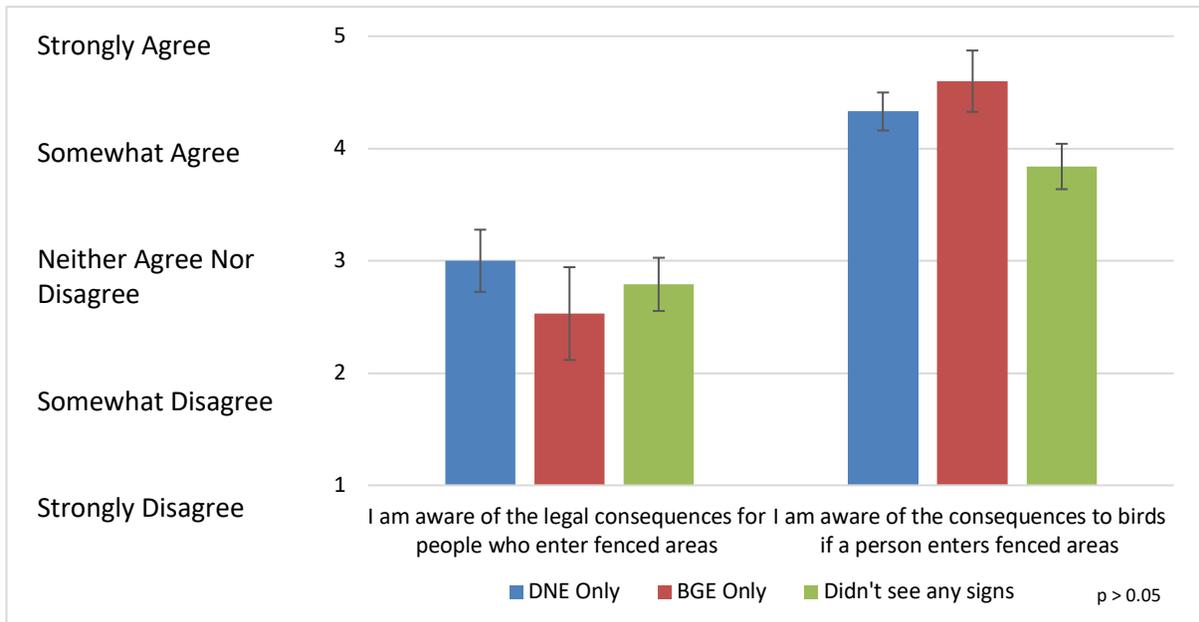


Figure 10. The mean awareness of consequences for entering nesting areas after viewing the different types of signs (self-reported) and the standard error mean.

Summary and Interpretation of Key Findings

RQ1: Do beach recreationists observe BGE signs, spend more time looking at the BGE signs, and recall content from the BGE signs more than traditional government signs?

The BGE signs illustrated by elementary school students did in fact draw people’s attention to the nesting area. On several occasions, beach recreationists who were exposed to the BGE signs pointed out the birds to other group members as they walked passed the BGE signs and looked in the fenced area more often than people who saw the DNE signs. Although we observed people looking at the BGE signs more often than the DNE signs, more people self-reported seeing the DNE enter signs, spent more time reading the DNE signs, and had greater recall of piping plovers, least terns, and endangered wildlife as well as messages about staying out of the closed area. It’s not clear if this is because the messages on the DNE signs are longer and more detailed than the BGE signs or if beach recreationists are already familiar with the DNE signs since they have been used for several years at Sunken Meadow State Park and along the Atlantic Coast. Nevertheless, these findings show that, although the BGE signs are impactful, they do not necessarily engage more observers or elicit greater content recall than the DNE signs.

RQ2: Does seeing BGE signs minimize beach recreationists’ intentions to cause to disturbance more than traditional government signs?

Based on their self-reports in surveys, BGE signs do not reduce beach recreationists’ intentions to cause disturbance more than DNE signs. In fact, half of the people who saw the BGE signs and just under half who saw the DNE signs said the signs would not cause them to do

anything different. As explained by some of the participants, this may be due to beach recreationists already following the closures, so they do not perceive the need for more behavior change. It could also be due to social desirability bias in which participants may want to appear positive by saying that they stay out of closed areas. Still, the BGE and DNE signs do appear to encourage some recreationists to stay away from or out of the closed areas. While these intentions were stronger for those who saw DNE signs, those who saw BGE signs were also encouraged to engage in other positive actions such as not littering or generally being more respectful of shorebirds. This suggests that the specific messages of the DNE signs may be more convincing for keeping people away from the nesting area, while the more diverse content of the BGE signs may have more diverse (although more limited) impacts on intentions.

RQ3: Does seeing BGE signs influence beach recreationists' shorebird conservation attitudes and norms more than traditional government signs?

The social and personal norms as well as the attitudes about protecting coastal nesting birds were similarly high among all groups, which may suggest that the BGE signs do not have a greater influence over people's norms or attitudes about nesting birds because beach recreationists are already acting in accordance with the desired impacts of the signs (Mengk, Dayer, & Stern, 2019). While the BGE signs don't appear to influence beach recreationists' shorebird conservation attitudes and norms more than the DNE signs, it can be said that the presence of signs can impact beliefs about the closed areas. Participants who did not see any signs were less familiar with the importance of staying out of the fenced area and thought that it was to protect people or that it was an unsafe and dangerous area. This may be because birds in the least tern colony would dive-bomb people who approached the nesting area.

RQ4: Does seeing BGE signs influence beach recreationists' awareness of consequences for entering closed areas more than traditional government signs?

People who saw both sign types were unaware of the legal consequences for entering fenced areas, despite the fact that the DNE signs describe the consequences for harassing, killing or taking piping plovers and least terns. This lack of awareness may be due to a lack of information about the legal consequences on the BGE signs and potentially too much information on the DNE signs which might deter people from reading the entire sign. Both groups were also strongly aware of the consequences to birds if a person enters the closed areas, therefore BGE signs do not necessarily influence beach recreationists' awareness more than the DNE signs. But it appears that the presence of signs in general can have an impact since participants who did not see any signs were less familiar with the consequence to birds for entering a closed area.

Recommendations

Addressing limitations

This study was constrained by the legal requirement to keep DNE signs on the beach at all times. Ideally, we would have studied just the DNE signs, just the BGE signs, and then both of the signs together so we could isolate the effects of the BGE signs. Instead, we could only compare the first and the last sign set-ups. Yet, because the BGE signs are never actually

displayed alone our approach did reflect how they are typically displayed. Another limitation to this study was that the entrance from the boardwalk to the beach near the nesting area was closed to the public during the weekdays and open only on the weekends. Since the nesting area was about ¼ mile from the open entrance during the weekdays, the number of people near the nesting area was very limited on the weekdays for the first week of the study, which led to a small sample size.



The nesting area in relation to the swimming area and board walk entrance that was closed during the weekdays of this study.



The concentrated crowd of beach recreationists near the open swimming area (near parking lot 1) led to less human activity near the nesting area on the weekdays, when the boardwalk entrance was closed (near parking lot 3)



Human activity near the nesting area increased on weekends when the boardwalk entrance and adjacent swimming area near parking lot 3 were open to the public.

Our sample size was further reduced because many beach recreationists were non-English speakers and we were unable to translate the survey to them. We recommend further study of these signs over a longer period of time when more beach recreationists are passing by them. When people took the survey administered verbally by our researchers, they may have been influenced by social desirability bias (an inclination to answer survey questions in a way that depicts themselves positively rather than truthfully). Notably, we found positive attitudes and strong norms towards shorebirds in both groups, which may be due in part to social desirability. Yet, they did largely tell us they would not change behavior as a result of the signs, which could have also been a socially desirable response. Lastly, we observed 231 beach recreationists under the age of 18 but due to IRB regulations, we were not able to include them in the survey, and therefore this age group is not represented by this research.

Program Recommendations

1. The BGE signs are a unique and novel way to share information, but providing consistent messages is also important for increasing recall of information. Therefore, it would be optimal to continue using both the DNE signs and the BGE signs together. Adding the BGE signs might reduce sign fatigue while keeping the DNE signs might provide cues to beach recreationists who recognize them as a symbol for protected bird nesting areas.
2. Although the signs are visually captivating, the written messages are only accessible to English speakers. During our surveys, we found that there was a diversity of non-English speaking beach recreationists. In two cases, recreationists were seen walking in the nesting area and when asked to take the survey, they responded that they did not speak

English. To effectively reach all audiences, and to prevent harm to nesting coastal birds, it would be beneficial for the BGE signs to be in other languages that are commonly spoken at Sunken Meadow State Park, such as Spanish.

3. Students making the BGE signs could be encouraged to use certain phrases or words on their signs to make the messages more consistent. For example, if each sign mentions specific species at Sunken Meadow such as piping plovers and least terns, then viewers may have greater recall of those messages. Additionally, when creating messages, it's important not to call attention to common undesirable behaviors (i.e. walking dogs near shorebirds) because this can create the illusion that the undesired activities are common.
4. Through consistent messaging, beach recreationists can better recall the content of the signs. During the survey, we saw that people were able to recall the protected species better after viewing the DNE signs, which had the same two species listed and labeled.
5. Since beach recreationists reported that it is a common practice to stay out of fenced areas and it is a societal expectation, Audubon NY could use these social norms as leverage in their outreach programs to enhance their messages on the BGE signs. For example, messages can use second person language (e.g. "you") to increase a sense of responsibility in beach recreationists or highlight desired activities as being common and undesirable activities as rare.
6. Since beach recreationists are generally not aware of the legal consequences for disturbing birds, future BGE signs could emphasize messages pertaining to this if sharing information about the legal consequences of disturbance is a goal for the outreach program. However, if the laws are not well enforced, this strategy may be counterproductive.
7. The beach recreationists who were observed cutting through the nesting area appeared to be doing this as a short cut to get to the boardwalk or water. During the first week, of the observational period, a pathway was maintained in the middle of the nesting area to allow access through the nesting area, but since bird nests were later found here, the pathway was closed. When possible, structural changes such as creating a safe pathway for people to traverse without disturbing the birds would be ideal, but if this is not feasible, as in situations where birds eventually nest in the pathway, BGE signs could emphasize messages about walking around the nesting area rather than through it. Since it is a common attitude that protecting the nesting birds is important, it is likely that a message reinforcing how to do this would be well embraced by the public.
8. Since many people reported not seeing signs, it would be beneficial to position the BGE signs in areas that are highly visible such as the entrance to the boardwalk. This could provide a unique opportunity to display the BGE signs without the presence of the DNE signs. This could also minimize disturbance to the nesting birds by preventing people from walking up to the signs near the nesting area.

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Appendix A: Chi Square of Characteristics, Observations, Behavior Intentions, Importance, and Content Recall of Beach Recreationists

| Parameter | Cramer's V | p-value |
|-------------------------------------------------------------------|------------|---------|
| <i>Beach Recreationists Characteristics</i> | | |
| Gender | 0.160 | 0.240 |
| Parent/Caregiver | 0.219 | 0.070 |
| <i>Observational Study</i> | | |
| Goes into fenced area | 0.073 | 0.877 |
| Looks in fenced area | 0.375 | 0.001 |
| Walks next to signs | 0.352 | 0.002 |
| Talks about the signs | 0.266 | 0.034 |
| <i>Behavior Change</i> | | |
| I won't do anything different, I already respect the closed areas | 0.222 | 0.065 |
| I won't go in the nesting area | 0.296 | 0.008 |
| I'll stay away from the protected area | 0.362 | 0.001 |
| Tell my kids to stay away from the protected areas | 0.127 | 0.408 |
| I won't do anything different | 0.511 | 0.001 |
| I won't litter | 0.241 | 0.040 |
| Increase respect for birds | 0.168 | 0.208 |
| <i>Importance of Staying out of Fenced Areas</i> | | |
| To protect wildlife | 0.193 | 0.127 |
| To protect people | 0.137 | 0.355 |
| It's dangerous or unsafe | 0.160 | 0.243 |
| To protect the environment/nature | 0.035 | 0.935 |
| To enforce the law | 0.240 | 0.041 |
| To fulfill the needs of wildlife | 0.075 | 0.731 |
| It's fenced for a reason | 0.059 | 0.824 |
| To keep people away from something | 0.168 | 0.208 |
| It's a private area | 0.094 | 0.609 |
| <i>Content Recall from Signs</i> | | |
| Piping plover | 0.432 | 0.001 |
| Least tern | 0.310 | 0.005 |
| Birds | 0.472 | 0.001 |
| Wildlife | 0.127 | 0.408 |
| Endangered wildlife | 0.283 | 0.012 |
| Protected area | 0.296 | 0.008 |
| Nesting area | 0.563 | 0.001 |
| Do not enter | 0.390 | 0.001 |
| Don't bother them | 0.180 | 0.164 |
| Punishment for entering | 0.180 | 0.461 |
| Can't recall anything | 0.201 | 0.107 |

Appendix B: ANOVA for Attitudes, Norms, Awareness of Consequences, and Characteristics of Beach Recreationists

| Parameter | F Statistic | Eta Value | p-value |
|---------------------------------------------------------------------------------|----------------|--------------|---------|
| <i>Attitudes</i> | | | |
| It's important for people to stay out of coastal bird nesting areas | 1.100 | 0.141 | 0.336 |
| I support protecting coastal nesting birds by fencing off parts of the beach | 0.245 | 0.067 | 0.784 |
| <i>Awareness of Consequences</i> | | | |
| I am aware of the legal consequences for people who enter fenced areas | 0.424 | 0.088 | 0.655 |
| I am aware of the consequences to birds if a person enters fenced areas | 2.773 | 0.221 | 0.067 |
| <i>Norms</i> | | | |
| Friends or family members expect you to stay out of coastal birds nesting areas | 0.375 | 0.085 | 0.688 |
| Children expect you to stay out of coastal bird nesting areas | 0.079 | 0.039 | 0.924 |
| You would feel guilty if you went into a coastal bird nesting area | 0.440 | 0.090 | 0.645 |
| <i>Beach Recreationists Characteristics</i> | | | |
| Birth Year | 0.845 | 0.581 | 0.724 |
| Number of people per group | 1.149 | 0.153 | 0.321 |

Appendix C: Additional Photos



Beach recreationists near the nesting area with BGE and DNE signs posted (top and bottom)



Beach recreationists near the nesting area with BGE and DNE signs posted (top and bottom)



A black skimmer using the nesting area (with BGE and DNE signs) as a stopover location



Be A Good Egg signs posted at the nesting area