Atlantic Flyway Disturbance Project

ATTENTION
RESTRICTED AREA
ENDANGERED SPECIES HABITAT
APRIL 1 - LABOR DAY
DOGS ON LEASH ONLY

• Social Science Report •
Part III: Dog Zoning and Regulation Development

Executive Summary

Background

As the population of people along the East Coast of the United States grows, recreational activities at beaches, such as dog walking, continue to threaten shorebirds. Off-leash dogs can have indirect impacts on shorebirds and cause direct mortality. Leashed dogs can also have indirect impacts on shorebirds by causing an increase in shorebirds' time spent alert and a decrease in time spent foraging, which can impact shorebirds' ability to gain energy. As a result of the impacts that dog-related recreation can have on shorebirds, managers and biologists implement dog-related regulations such as zones, closures, and leash laws; however, there is limited research on the steps taken to successfully develop and implement these regulations. Through interviews with beach managers and biologists, we sought to understand types of site regulations; the process of developing, implementing, and enforcing regulations; the outcomes of implementing regulations; lessons learned from implementing regulations; and resources needed to have successful dog-related regulations. This research provides agencies and organizations with information about the process of implementing dog-related regulations for the protection of shorebirds.

Methods

We conducted open-ended, semi-structured interviews via Zoom from May to July of 2020. We interviewed land managers and biologists who were involved in developing, implementing, and/or involved in the revision of dog-related regulations along the U.S. portion of the Atlantic Flyway. Interview topics included understanding regulations pertaining to dogs; how and why regulations were developed and implemented; methods of enforcement; and the outcomes and evaluation of regulations. We audio recorded each interview and automatically transcribed them using Zoom. Afterward, we manually edited the transcripts for accuracy using InqScribe while listening to the recordings. We then qualitatively analyzed the transcripts for common themes using Dedoose.

Results

We interviewed 27 individuals from 11 states along the East Coast. Many interviewees managed multiple sites with diverse types of land ownership such as local, state, federal, and non-profit organizations. Site regulations included year-round and seasonal closures (for dogs or more generally), and leash or voice control regulations based on the time of day. Regulation development was largely facilitated by partnerships, biological science justifications, and laws that require protecting threatened and endangered species. Interviewees reported on how they effectively considered stakeholder views through public comment, meetings, and workshops. They described educational programs carried out by staff and volunteers who tailored messages to their target audience. Information was disseminated through a variety of

sources including one-on-one education, brochures and postcards, social media, websites, TV, newspaper, and signage with universal symbols. Educational signs were used to appeal to visitors and regulatory signs were used to enforce regulations.

Regulations were enforced largely by issuing warnings, also by ticketing non-compliant beach users. Public compliance and public response to regulations differed by site. Some non-compliant visitors and residents were either unaware of regulations or believed to knowingly disobey regulations. Interviewees noted that a lack of enforcement presence due to other law enforcement priorities was a challenge. A lack of enforcement may result in an increase in dogs on beaches and a decrease in compliance with regulations. But when enforcement is successfully executed, disturbance is reduced. Interviewees noted that training law enforcement on the benefits of their presence and maintaining consistent enforcement and regulations could be beneficial for future managers.

Consistent, full year closures were perceived to be the most beneficial regulations for shorebirds and were associated with the highest levels of compliance; however, many interviewees described compromise as a valuable tool and one that should not be overlooked when seeking public and government approval of regulations. Interviewees noted that instead of compromising on when regulations are implemented, managers could zone some portions of the beach for recreational use and other portions as disturbance free areas. Interviewees also noted that zoning may be an effective way to gain public acceptance, simplify regulations, and reduce disturbance.

Future Directions

This research offers an extensive look into the management of dogs on beaches for the benefit of shorebirds. Managers and biologists who are interested in creating or implementing dog-related regulations can use this document to learn from the experiences of managers who have already gone through this process. Although the strategies found in this study cannot be universally applied to all sites, our study includes land manager and biologist experiences from a variety of sites along the East Coast. We recommend sites consider these insights as they establish new regulations to reduce dog disturbance. As sites implement and evaluate new regulations, it may be beneficial to share successes and failures with the shorebird community looking to also implement regulations to reduce disturbance of shorebirds.

Introduction

Dogs can negatively impact shorebirds during all portions of the annual cycle (Burger, 1986; Lord et al., 2001; Mengak et al., 2019; Gibson et al., 2018). Yet, dog walking continues to be a widespread threat at sites across the U.S. and Canada portions of the Atlantic Flyway (Comber & Dayer, 2019a). In an effort to mitigate the impacts of dogs on shorebirds, managers implement various types of regulations such as seasonal or year-round closures and distinct zones for dogs and shorebirds. Research shows that such regulations can be beneficial for the protection of threatened shorebirds (Stigner et al., 2016; Maguire et al., 2019; Schneider et al., 2020; Weston et al., 2012). But studies generally lack details on the overall process for developing and implementing regulations. Specifically, there is little information on the types of regulations that exist, why and how regulations are developed, how regulations are implemented and enforced, the outcomes of regulations, lessons learned from developing and implementing regulations, and support needed.

Knowing information about the development and implementation process is essential for managers and biologists who are looking to enhance or improve the effectiveness of regulations at their sites. If key steps in the development or implementation process are omitted, such as communication with stakeholders, management efforts can fail (e.g., Giakoumi et al., 2018). Failure can manifest in the form of low compliance (Agardy et al., 2011) or human-human conflict, which can impede future conservation efforts by instilling resentment towards target species (e.g., Dayer et al., 2017).

Additionally, knowing how regulations are effectively enforced can also be essential for managers and biologists who are looking to implement management techniques for the first time. The effectiveness of management techniques, such as various enforcement approaches, can be ascertained through evidence-based practice. Evidence-based practice is the act of making decisions and taking actions based on information obtained through a systematic analyses of practitioners' experiences, independent expert assessment, and local and indigenous knowledge on a specific conservation topic (Salafsky, et al., 2019). Evidence-based practice from other sites or past efforts can inform managers and biologists about what approaches work and what approaches do not work. Evidence-based practice can also mitigate ecologically damaging outcomes, loss of financial resources, and enlighten managers and biologists about positive and negative outcomes of management (Sutherland et al., 2004). Such insights could help managers and biologists anticipate challenges and minimize human-human conflict.

To understand the process of developing and implementing dog-related regulations, as well as effective enforcement approaches and outcomes from past management efforts, we elicited expert knowledge from experienced shorebird managers and biologists. Expert knowledge is "information on a particular topic that is not widely known by others…[and] may be the result of training, research, and skills, but could also be the result of personal experience" (Martin et al., 2012, p. 30). Eliciting knowledge is important for effective conservation practice and research (Fazey et al., 2005) and can be used to inform management approaches elsewhere (Runge et al.,

2011). Furthermore, collating the experiences of individuals can form a body of evidence to inform future management decisions (Sutherland et al., 2004). Therefore, we sought to the use expert knowledge from shorebird managers and biologists across the Atlantic Flyway to understand the following research questions:

1. What are the regulations for dogs at sites along the Atlantic Flyway?
2. Why and how do managers and biologists develop regulations for dogs?
3. How do managers and biologists implement regulations for dogs?
4. How do managers and biologists effectively enforce dog regulations?
5. What are the outcomes of dog regulations?
6. What are the lessons learned and what support is still needed?

Methods

Participant Solicitation

Participants included land managers and biologists with previous experience developing and implementing dog zoning and closure policies and other dog regulations at shorebird sites along the Atlantic Flyway. Individuals who lacked experience in the initial development process but had experience with continuing the implementation of successive regulations were also interviewed. We developed the sampling frame based on suggestions from participants at the 2020 Least Tern and Piping Plover Workshop and the list of participants from a previous Atlantic Flyway land manager survey by Comber and Dayer (2019a) who responded that they had leashed or unleashed dog walking at their sites, either legally or illegally in the last five years.

Interview Construction

We developed an interview script to engage land managers and biologists in an investigation of dog-related regulations at sites along the United States portion of the Atlantic Flyway. Interviews were semi-structured, ensuring all scripted questions were asked and answered, while also allowing for flexibility in conversations. We covered the following topics: site specific regulations pertaining to dogs such as beach zoning, temporary or full closures, daytime regulations, and leash laws; reasons and methods for regulation development; strategies for implementing regulations, approaches for enforcing dog regulations, overall outcomes of regulations, and what is still needed for managers and biologists to have successful regulations. We sent the interview script to the Atlantic Flyway Shorebird Initiative (AFSI) group for review. This research was approved by the Virginia Polytechnic Institute and State University Institutional Review Board (#19-1167).

Interview Implementation

We conducted interviews from May to July 2020. Recruitment emails contained a Qualtrics survey link (Qualtrics Version 1.0.0, 2009) that included a consent form, screening to ensure candidate eligibility, and an option for candidates to list available and preferred dates and times for their interview. If participants met the requirements, we sent a confirmation email containing their personalized Zoom call-in information for their desired date and time for the interview. We administered interviews via Zoom (Zoom Version 5.0.2, 2020) and audio recorded using Zoom and a Sony IC recorder as a backup. The Zoom audio recording feature saved and transcribed all interviews automatically. Researchers manually corrected all interview transcription errors using InqScribe software (InqScribe Version 2.2.4, 2018). Participant names were replaced with numbers and dates in which the interview took place to ensure anonymity and to protect the identities of the participants. After each interview, we sent a follow-up email within 24 hours, thanking interviewees for their participation and asking to provide documents, web links, and/or outreach materials related to individual site regulations.

Interview Analysis

All coding was conducted by Jillian Everly who also conducted and transcribed the interviews. We used Dedoose Version 8.3.35 (2016), initially coding deductively based on our main research topics: site regulations, development, implementation, enforcement, and regulation outcomes. Additional codes were created inductively as they emerged in the interviews. Co-authors reviewed and edited codes and the code book definitions to ensure clarity, consistency, and replicability. Jillian Everly then re-coded to adjust for revised code book definitions and clarifications.

Results

Interview Respondents

We contacted ninety-one individuals to request an interview if they met our criteria for inclusion. Twenty-five individuals were ineligible because they lacked the necessary dog zoning or closure experience. Twenty-eight individuals agreed to participate but one of these individuals did not have adequate experience with zoning or closures, making our final sample size twenty-seven. Our overall response rate was 40.9%. Individuals interviewed included land managers and biologists involved in beach management (from here on, interviewed individuals will be referred to as interviewees) from eleven different states along the East Coast. Interviewees worked for many different organizations including local, state, and federal agencies, non-government organizations (hereafter, NGOs), and universities. Many interviewees managed multiple sites with various regulations depending on the site. Individual interviewees were involved in developing dog-related regulations at 1-25 different sites with diverse types

of ownership such as local, state, federal, and NGO. Interviews lasted between 19.5 and 72.5 minutes with an average time of 44.1 minutes.

RQ 1: What are the regulations for dogs at sites along the Atlantic Flyway?

Interviewees reported their experiences with site specific restrictions pertaining to dogs. Specifically, interviewees noted a variety of restriction types such as full year closures, seasonal or temporary closures, zones, leash requirements, restrictions that changed based on the time of day. and voice control or command regulations.

No Public Access

Sites closed year-round were the most restrictive and few interviewees had experience with this regulation type. One interviewee described their site's policy as closed year-round to all users except a few days a year during hunting season when hunters and their dogs are permitted access to retrieve waterfowl. Another interviewee reported that their site allowed a limited number of visitors per year through pre-arranged appointments only.

Full Year Dog Closures

A majority of interviewees described at least one of their sites as closed to dogs year-round due to shorebirds' use of beaches during all seasons. One interviewee explained that, in addition to the breeding season, shorebirds use beaches during the migration season:

> I was under a lot of pressure to make this just a spring and summer thing. My argument is in the fall and winter we have birds that are migrating through and having a safe beach for them to rest and feed undisturbed is literally a matter of life or death. So, I think it's absolutely essential that the area be closed year around.

Seasonal Closures

The most common regulations discussed among interviewees were seasonal or temporary closures. A majority of interviewees noted that their sites or portions of their sites were temporarily closed based on the needs of shorebirds. Many noted that temporary closures were created in response to nesting, breeding, migrating and/or wintering seasons. Although seasonal dates were fairly predictable, according to interviewees, certain regulations have been adapted to better align with bird arrival and/or departure dates. One interviewee explained, "We post [regulations] in anticipation of the bird's arrival so there's not a hard posting date." At some sites, temporary closures were not specific to dogs, as one interviewee described, "the closure isn't specifically toward dogs, but it's including dogs...when we have these beaches closed, no one is supposed to go on."

Zoning

Zoning was described as the creation of beach areas for public use balanced with off-limit areas for the protection of shorebirds and other target species. An interviewee explained that zoning is as a method for creating a high disturbance area in one portion of ab each in order to preserve the rest of the beach:

> We have created an off-leash zone, the concept being most people want to go to the beach and not have their dog on a leash. I would say that's a concept almost anywhere and as a dog owner I do appreciate that. So, the concept is by offering them about a quarter mile to a half mile of beach right in front of the parking area where we have developed an off-leash zone, people will stay there and not walk the rest of the beach with their dog on a leash. So, we're trying to reduce the level of disturbance from even dogs on a leash on the rest of the beach.

Zoned areas were described as either permanent or temporary based on management needs. One interviewee defined their precautionary zone (or buffer zone) and their protected zone as closed seasonally to dogs, "the way the beach management plans work is they are split into three different zones: a protected zone, a precautionary zone, and a recreation zone, and we start restricting dog access on March 15 in those protected zones."

Leash Laws

Sites that allowed dogs sometimes required leashing. While leash laws were commonly considered to be a solution to disturbance, some interviewees expressed concern that leashed dogs still contributed to shorebird disturbance:

> We don't allow leashed dogs and I don't see us changing that. Having a dog on the leash has a lot of its own issues for shorebirds, just because they're on the leash doesn't mean they're avoiding them. And then for nesting piping plovers coming down to the water's edge, that doesn't really help us with disturbance to foraging birds.

Voice Control

A few interviewees had experience with voice control regulations as a means of limiting disturbance; however, many others commented that voice control was not part of their site regulation or that it was insufficient. An interviewee described how municipalities in one state followed different regulations--including voice control--based on local government decisions:

> A lot of these municipalities have voice control elements to their ordinances. They try in some cases to define what voice control or voice command is but we really have never seen that work well.

Another interviewee also explained that voice control regulations were mandated by the local government. Building on voice control, dogs could also be restrained and controlled through an e-collar.

Variation by Time of Day

Beach regulations that changed throughout the day were rare among the sites managed by the interviewees. As an example, one site closed the beach to dogs from 9am to 5pm from June 15 to Labor Day. A few interviewees also referred to National Wildlife Refuge regulations that required the closure of beaches to all visitors at night as a general policy, separate from regulations to restrict dogs.

RQ 2: Why and how do managers and biologists develop regulations for dogs?

Interviewees described why dog-related regulations were developed, how long the development process took, challenges and support experienced during development, and the role of public involvement in developing zoning and closures.

Reasons for Regulation Development

Regulations for dogs are put in place for a variety of reasons including disturbance to shorebirds and other wildlife, presence of species, visitor preferences, human health and safety, and specific events or situation

Disturbance

A majority of interviewees described disturbance as the main reason for developing regulations. As one interviewee described, "the biggest push for us was just seeing the population boom. That was a big impetus for us to start coming up with regulations, just the intense pressure that these places are getting from recreationalists." As referenced by many interviewees, birds perceive dogs as predators on the beach no matter how well behaved they might be. One interviewee explained the threat of dog disturbance:

> So many people have dogs and they all think, gee, my dog is a good dog and of course just saying, you know, Jillian, my dog is a good dog. But even if the dog isn't going to intentionally hurt something, they're going to cause a bird that needs to rest and needs to feed to expend energy.

Specific Species

Nearly all interviewees considered shorebird species as a primary concern and the reason for developing regulations. Only a few interviewees noted that regulation development was not specific to shorebirds, but was generally aimed at preserving beach property.

Half of the interviewees described visitor preferences and opinions as an important component of regulation development, while the other half did not. One interviewee expressed interest in public opinion and considered visitor viewpoints during the development of regulations:

> There is an expectation from our visitors that they are allowed to bring their dogs. So, I think that's part of why we haven't approached the subject of eliminating dogs from the refuge altogether or seasonally. I think there is quite a bit of social pressure not to do that.

Other interviewees agreed, but with the stipulation that regulations be based on their own guidance in determining which sites are permitted to have more lax restrictions and which cannot afford such leniency:

> We preserve for public use and enjoyment. So, for us it's very important to have public access. We know about forty percent of our members are dog owners and walkers. So, it's an important user group for us. But we wanted to be able to provide some better guidance on that, so have places where they can go [and] places where perhaps it's a little more sensitive and we're going to have to restrict them.

In contrast to visitors favoring dog access, a few interviewees explained that some visitors preferred dog restrictions at certain sites. Negative public perception of dogs was a driving factor in regulation development at some locations, as one interviewee reflected, "so many people have commented since we started enforcing the ordinance that they are just so glad not to have dogs running around, running across their blankets, and so on. So, yeah definitely visitor preference."

Health and Safety

Some interviewees discussed the significance of health and safety in regulation development, but interviewees generally dismissed it as an initial reason for regulation development, "I don't think this was something that was top of mind back in the 70s when things were being developed. But we've been really interested in how the connection to nature is related to human health." In other instances, health and safety were top priorities as described by one interviewee:

> Now from [a] zoning point of view, they did not want to have any dogs on a section of the beach that ends up near the mouth of a river and that was particularly for dog waste contaminating the shellfish beds. It was a community vetted effort that took into account not only the wildlife, but also public health concerns related to water quality [and] fecal matter that can contaminate the clam flats.

Along with human health and safety, pet safety was considered when creating regulations. One interviewee described alligators on the property as a threat to pet safety:

> There's also a public safety issue with people not being able to control their dogs. We have a very healthy population of alligators and we don't want the dogs that are running loose [and] uncontrolled [to be] eaten by an alligator. That would cause some serious issues with us in terms of, we could get sued or whatever.

Event or Situation

An event or situation such as "take," or the killing of a threatened or endangered shorebird species was discussed in many interviews; however, only a few interviewees described such an event sparking the development of regulations. An interviewee recalled officials finally taking action after the second killing of a plover, "another dog killed a plover a few years prior, and this second event, sort of effectively triggered the town to take action."

Regulation Development Process

The interviewees shared insights about the original development of regulations and the continuation or renewal of already existing regulations. The length of time needed to develop regulations varied by site as did the extent to which each interviewee was involved in the development process. Interviewees recounted the development process lasting between one to three years. Here we describe challenges that hindered the process and factors that facilitated and supported the implementation of regulations. We also review the sites' strategies for involving the public in the development process.

Challenges to Regulation Development

Nearly all interviewees experienced challenges during the development process. In many cases, certain groups slowed development. Among those groups presenting challenges, dog owners were consistently mentioned. As in this quote, many interviewees described dog owners' perceptions and attitudes towards dog-related regulations as obstacles:

> Immediately a vocal minority of dog owners organized themselves to oppose any changes in the dog ordinance. They inserted themselves into the media and so there was sort of a real division within the town about those who felt that we should be protecting piping plovers and protecting public health, and then those who felt that dogs have rights and people have rights to have dogs on the beaches. So, that was the most difficult of all our ordinances that we've developed with towns.

Another interviewee reported their attempt to work with dog owners in the development process:

> Some of the public hearings are on closed circuit television and we tried our best to educate folks about piping plovers, their needs, our standards, why having dogs on leash is important, and why voice control doesn't work. So, that's what I think we tried to do, to open dialogue with the dog owners. But, I would say that was sort of unsuccessful because they just didn't want to talk with us at all about birds and piping plovers. They were very focused on what they thought were their rights to have their dogs on beaches with them.

In addition to dog owner groups, many interviewees experienced challenges with educating and notifying the general public about regulations. One interviewee described how providing compelling data and objective information was difficult:

> I think we could assume that yes, dogs are not necessarily good or dogs can disturb wildlife and have negative impacts. But, the challenge was for me and others to demonstrate that. So, we literally had to figure out the best science [and] best management practices, collect all that information, and present it in a manner that was compelling. So, for me as an ecologist, the biggest challenge was providing actual data from studies demonstrating the impact of dogs on wildlife and shorebirds in particular.

Garnering public and local government support was a recurring challenge according to many interviewees. In some cases, the public harbored negative perceptions towards regulations and as a result, local governments were opposed to establishing regulations at certain sites. One interviewee explained how the initial development process was straightforward; however, the reapproval process was taxing:

> This regulation has to be reapproved every five years, so periodically we have to go back to the legislature. The original one was not entirely difficult to get passed [but] each time we have to go back, it becomes increasingly difficult. The last time we had it renewed, the main push was for beach access for the public and that was from the politicians and the local governments.

Another interviewee detailed the regulatory challenges and confusion in designating a Critical Wildlife Area on a site with an unknown property owner. A government organization, the supposed property owner, rejected proposed protection on spoil islands. However, once the state came forward as the true owner, protection was approved the following year.

Factors that Support Regulation Development

Biological Data

According to many interviewees, biological data was used to support the development of regulations and was not only applied during the initial development

phase, but was also used to adjust closure dates to better align with shorebird biology. One interviewee explained how data informed changes to the timing of regulations:

> Yeah, basically on arrival dates of the nesting shorebirds, some of that data definitely played a part as far as the start date [of] April 1. Since then we realized that our plovers returned in early March and so we changed our dates to March 15 for the dog ordinance with all the new management plans we've been developing.

Interviewees did not recall specific journal articles or data sources during the interview; yet, a few interviewees explained their reliance on affiliations with local universities and professors in obtaining pertinent data to help form management decisions. An interviewee explained, "there's one particular professor that we work a lot with. He has really advised us on a lot of our bird disturbance issues."

Social Science Data

Many interviewees expressed interest in integrating social science data into regulations; however, limited access to resources and knowledge about social science prevented the use of social science data. When asked whether or not interviewees used social science data for creating regulations, one interviewee acknowledged how social science methods might be valuable but they did not have such expertise, "I don't think we've really used any social science techniques to help us with that. That might be a good idea, but being a wildlife biologist, I don't have access to that type of method." One interviewee admitted they would not have considered social information were it not called for by other divisions of their agency:

> Folks in the [redacted] Division want to bring in the public opinion and that's why there's this media campaign to get people involved in this decision process. If it was up to us, we would say, "no we manage for the biological resources not for people." They need to bring the social aspect in and so that's why we are having to consider it.

Laws

A majority of the interviewees stated wildlife-related laws helped facilitate the development of regulations, particularly the Endangered Species Act (ESA). In addition, a few interviewees stressed the importance of documenting species status levels because of the protections it affords, as one interviewee explained:

> Municipalities said that they would not close the beach, so we're using the State Statute for endangered and threatened species to close the beaches that it's illegal to harass migratory birds. The red knot is now a federally listed species, so that also gives us a little more ability to close the beaches.

Other interviewees noted that the Migratory Bird Treaty Act (MBA) supported the development of dog regulations, while others felt that the MBA only played a minor role.

One interviewee explained the law's role as, "probably very minimal as far as [the] MBA because it's just not strongly enforced unless I'm shooting birds and posting that on Facebook." The National Environmental Policy Act (NEPA), the Refuge Protection Act, and the Organic Act were among other laws listed by interviewees. The Organic Act of 1916, used in the National Park Service was described as, "what the National Park Service runs on, [the] preservation of natural and cultural resources."

Partnerships

The value of partnerships was described by many interviewees as very beneficial to the development and continuation of regulations, as they provided sites with resources and support through all stages of regulation development. Not only did partners provide financial support to sites, but they also aided in regulation enforcement.

State governments facilitated development at a majority of the sites. One interviewee credited state parks for being a reliable partner:

> I just want to make sure that it's clear. There are state parks who've been working slowly, getting all of their plans done. And those aren't attached to any kind of legal or permit requirement, it's more just good partnerships.

NGOs, shorebird alliances, local governments, and federal government agencies were less commonly mentioned but still valued. Colleges, universities, and the faculty and student researchers were also cited as aiding in regulation development. For sites with financial constraints, limited resources, and possible budget cuts; nonprofits such as the Nature Conservancy and local Audubon chapters provided the resources and materials necessary for community involvement. One interviewee advised contacting local Audubon groups for additional help:

> Land managers should reach out to their local partners like Audubon [and the] State Fish and Wildlife [agency]. That's been a great resource for park managers to have additional resources, staffing, [and] volunteer help. That has been a very fruitful partnership for us.

Shorebird working groups have also supported regulation development. The same interviewee attributed their advancement of regulations to both Audubon and State Shorebird Alliance groups:

> Audubon helped to craft those protections that are in place right now. The state has limitations of budget and manpower, so those nonprofit organizations are important as partners. There's working groups all up and down the coast. The [redacted] [is] a working group of land managers and we get together and share ideas and strategies and cry on each others' shoulders and share resources.

The importance of diverse partnerships was further stressed by another interviewee:

Building partnerships is critically important. Grants and financial support are also crucial. [The] Fish and Wildlife Service paid for the shorebird buoys [and] [state agency name redacted] paid for the energizer for the electric fence. We wrote a grant with our local Audubon last year that enabled us to buy two spotting scopes. So, we can now feasibly do a school program focusing on shorebirds.

Public & Stakeholder Involvement in Development

Nearly all interviewees had experience with public involvement during the process of developing regulations. Some were required to include the public, for example, due to the National Environmental Policy Act. Others felt public involvement was important to consider even if not required. One interviewee described the importance of including all groups regardless of their stance, "I always think it's important to include people no matter what their opinions are. They have a platform to share that, regardless of which way the final decision goes." Others sought to resolve differences among the public to promote regulation acceptance and success. One interviewee explained:

> I think it's absolutely necessary to involve the public that are using those places. If you can include that face-to-face education and get the visitors and users to help champion some of those protections, they're much more effective than if you go in with hard closures, no explanation.

In addition to reasons for public involvement, many interviewees described reasons why the public was not included in regulation development. Interviewees indicated political pressure discouraged public involvement due to concerns about public pushback; and a lack of time, resources, and support were also constraints to public involvement. Some interviewees stated they have not had the opportunity to incorporate public feedback; however, they acknowledged that it is important and plan to incorporate it in the future, despite the overwhelming number of responses that may come with seeking input.

Impact of Public Involvement

Many interviewees described the positive impact that public involvement has had on enhancing the acceptance and success of regulations. One interviewee described the benefits of public input in bringing in voices in support of shorebird conservation:

> ...you take public comment not just to take it and say you're taking it, but hopefully to get an idea of what the public wants. And while there's quite a large amount of people that want to have dogs on the beach everywhere, there's also a very large population that cares about birds and doesn't want to see natural resources impacted.

Others described the role of public involvement as less consequential, for example, "the public review comment maybe gives us a feel of where people stand or think about

certain issues, but I think we're going to come back to our management policies and mission and try to make science-based decisions."

Strategies for gaining public support. Often gaining support from the public and impacted stakeholders is a process that requires patience over time, as one interviewee explained, "we could always improve our public view. But that's the tricky part with all partnerships, you have to nurture it over time for it to be respected." Common methods used to gain public acceptance included seeking public comment and conducting formal public meetings. In addition, interviewees reported integrating both methods into their strategies for public engagement. One interviewee described hosting a series of statewide stakeholder meetings with the option for attendees to submit their feedback and comments post-meeting. Another interviewee described future plans to include stakeholders in the decision-making process:

> We're going to do a series of webinars and I do see us soliciting feedback. I do think it would increase the support if it was also receiving comments from municipalities, other agencies, and beach users. And I guess we'll kind of have a product or some information to be seeking feedback on.

An interviewee described how they reached stakeholders, "we talk to surfers and fishermen. I think having a visitor center and having people interact with people regularly so we can communicate the policies are helpful in that way." A multi-faceted community involvement effort, as indicated by this interviewee, helped garner support for shorebirds and an understanding from multiple groups.

RQ 3: How do managers and biologists implement regulations for dogs?

Interviewees described the role of communication and outreach, alternative recreational areas, staff and stewards, and physical barriers as factors that contributed to the success of regulation implementation at many sites.

The Role of Outreach & Communication in Implementation

Timing Outreach and Communication

Many interviewees noted that it was essential to use outreach before new regulations were implemented. Some interviewees simply posted public notices before the regulations went into effect whereas other interviewees implemented outreach and communication techniques well in advance, using an extensive approach such as this interviewee's step-by-step process:

> Once the plan was approved, the signs were in development. And we have our own communications department, and there were a number of communications out to the local media, whether it was print or TV, special meetings, whether it was through our ED center or myself. And then in the first of May, we put the signs out to let everybody know

here's the new rules and then we posted the boundary of the preserve
so that they knew when they were in the preserve.

Others felt most beach users were aware of the impending restrictions and therefore considered it unnecessary to have outreach before implementation. One interviewee explained that their advance communication was "basically, none. I think [it's] widely known that we don't allow dogs on the beaches, at least by the locals." Although residents may be aware of regulations, some interviewees noted visitors were usually unaware. In other cases, sites were relatively remote with little outside visitation. At these sites, interviewees believed limited outreach was an adequate approach.

Some interviewees described that once the rollout of regulations began, different tactics were employed. For example, "the news releases and public meetings and stuff that was before, but the postcards and stewards and enforcement [were] during." This sort of shift to more targeted outreach, as well as onsite programming, was common once implemented.

On-site Programs

Adult and youth programming was conducted at most sites, typically in-person. Interviewees saw in-person programs as a way to relate to the public and promote an awareness and understanding of shorebird conservation and the need for protection. Outreach promoted an awareness for dog regulations as well as an awareness of specific pro-shorebird conservation behaviors. For example, they encouraged dog owners to respect beach regulations, hold each other accountable, be responsible with their pets, pick up waste, leash dogs when required, keep dogs and beach users out of nesting areas, and carry out or dispose of all trash properly. Youth programs were also commonly conducted to more broadly promote interest in wildlife and shorebirds through family activities. One interviewee described the impact of their site's outreach:

One of the things that we do is we offer a free children's program for six weeks during the summer, run by two full-time teachers. It's completely free for children seven to fourteen. And I think it's a great way to get not only children connected to the environment, but to maybe get the families to share this feeling that this is precious, and it needs to be cared for.

An approach shared among many interviewees was to first develop an interest in wildlife and shorebirds among the public, and later, to promote public support and acceptance of dog-related regulations for the benefit of shorebirds.

Media

The majority of interviewees used some form of media and often multiple forms to notify the public about new and updated regulation information. One interviewee stressed the importance of understanding where communities access their information to better reach a wider audience, "we found out that most residents here get their news from the radio, from their neighbors, and the local paper. So, we have tried to take

advantage of that sort of quantified information to inform our outreach strategies." Additionally, the different forms of media were consistent with the decade in which regulations were implemented. Initial regulations, often developed in the 1970s, used newspaper, radio, and television as popular methods of information dissemination. As one interviewee explained the use of media has changed over the years, "this was pre-social media. So, at the time it was primarily through the press, print media and newspapers."

Interviewees with experience in more recent regulation creation or changes commented on how they deployed various media types including print materials, television news, websites, and social media--including Instagram, and Facebook. As one interviewee explained:

> We've always tried to call the local newspaper or a local TV station to come out and do a bird piece the month before we do a closure and maybe a follow up during season when the chicks are on the ground.

Some interviewees used informational brochures to build support for shorebirds as well. An interviewee explained their brochures as, "one with IDs of the different shorebirds, one that tells about the history, why it's important, and different viewing areas where people can go to see the shorebirds."

Dissemination

Along with a diversity of public outreach and communication methods, interviewees also described a variety of ways to disseminate information. They included bulletin boards, kiosks, fliers, postcards, and brochures. Many interviewees emphasized the benefit of providing information at different locations, including visitor centers, lighthouses, boat ramps, bait shops, and rental shops.

Other methods for communicating with the public included public gatherings, public meetings, open houses, and educational workshops. One interviewee described orchestrating open houses inside lighthouses. Another stressed the importance of educating nature guides who reach many beach goers themselves:

> [State agency redacted] has hosted a series of workshops for ecotourism groups because that's another problem: a lot of these people are taking people out to see the wildlife, but they don't even understand what they need and may actually be part of the problem. But, we've had plenty of conversations about who else we should be asking to the table at meetings or town hall efforts.

Signage

All interviewees used signage for regulation implementation. A majority of interviewees used regulatory signs to communicate site restrictions, some used educational or interpretive signage to convey messages, and others used both regulatory and educational signage. One interviewee described educational signage as useful in explaining, "some of the biology of the piping plovers and the least terns, some

of the interesting facts, [and] why dogs are disruptive to their nesting." Most interviewees agreed posting signage was an effective means of communication, while a couple interviewees did not. For some the effectiveness depended on the type of signs used. In particular some reported that educational signage was effective and regulatory signage was ineffective. However, a few interviewees noted posting detailed regulations was necessary for enforcing the regulations. One interviewee described how their views conflicted with the site manager's views:

> One of the difficulties we had was trying to get everybody on board with signage. So, at the time our [redacted] manager was very much into law enforcement and law code and so the first time we wound up with like 200 words. It was like a book that basically quoted all the law codes, of course nobody read it. One-hundred percent ineffective.

Another interviewee conveyed similar feelings toward regulatory signage and planned to transition to informational signage in the future:

> From my experience, putting regulations on a sign, nobody will read it. The public won't read it. Sometimes for law enforcement they want the code on the sign so that they can write the ticket for what that violation is. Otherwise, they don't know how to write a ticket, apparently. But I think we'll probably have more public friendly signage.

Others agreed that regulatory signs were necessary to enforce law codes and suggested it should coexist with educational signage on beaches, such as this interviewee:

> I think they're useful working together. I think these days, people are curious and like to know why things are happening and so for a lot of people they really appreciate wildlife, and they want to protect it. And if they understand that their pet is causing impacts, then for some people that helps them understand why they're being asked to change their behavior. So, I think they're both effective, but you definitely need the regulatory signs, you couldn't just have the educational side. I don't think that would be enough.

Many interviewees had different opinions regarding signage effectiveness, challenging the utility of both educational and regulatory signage types. However, many preferred simple, easy to understand regulatory signage that encompassed both symbols and pictures to portray messages rather than providing the language of ordinances. One interviewee advocated for signs with universal symbols:

> Most people on their way to the beach are not going to read text that's more than a couple dozen words. So, what was by far the most effective is actually just universal symbols. There's a sign with a dog [and] a big slash through it and it says, "no dogs" pointing to the left and

then a happy dog on a leash, or that says, "leash area" pointing to the right. Simpler is better when it comes to signage.

Despite attempts to deliver clear messages, there will always be visitors who do not comply, as one interviewee said:

It never ceases to amaze me how many people do not see the big red beach closed sign and they still try to walk around the gate and start to make their way to the beach and they're like, "I didn't even see the sign." How do you make it any [more] obvious? It's big and it's red.

In addition to large, simple signage, one interviewee advised omitting dates from signs to curtail oppositional visitors:

I would not put dates on the signs. Sometimes you might need to pre post a site, especially in a dynamic habitat like the barrier islands. You could have really good habitat in an area and cause the birds to come early and get down to business more quickly than you. And you might not want to be constrained by dates.

Regulation dates may need to be adjusted based on ephemeral habitat and unpredictable shorebird arrival times. To reduce conflict with the public, dates may be left off of signs.

On-site Staff and Stewards

Staff, interns, and stewards (volunteers who help protect the beach and shorebirds) aided in implementing, and in some cases, enforcing regulations through on-site interaction with the public. Typically, staff and stewards notified people about regulations and also fostered an appreciation for wildlife and shorebirds among visitors. One interviewee praised such engagement with beach users, "our staff is a great deterrent. A big part of our mission is, we expect our staff to engage with beachgoers, be a friendly presence, and really try to educate people."

Nearly all interviewees with experience with on-site staff and stewards considered them to be effective and essential to implementation. One interviewee described their influence on the public and their ability to stay calm despite sometimes overwhelming circumstances:

Oh, they're the best. I'm telling you, I have the best stewards. And I gotta say some of the retired people, a lot of them have been biologists or they're really good birders and they just really seem to be able to handle some of the people. They don't get too wound up. They [can] stay pretty calm and I think that's the big thing with being stewards.

For sites without on-site volunteer stewardship programs, some interviewees considered integrating them; however, ultimately decided against the option. As one interviewee explained, "we do not have any stewards. And I know a lot of places do and we talked about it, but again, we just don't really have enough public use to justify."

Others expressed the need for more staff and stewards; yet, site remoteness and limited methods for recruiting volunteers proved challenging as one interviewee explained, "recruiting and retaining volunteers to sit at the beach is always just a challenge for any sort of management program."

Interviewees sometimes had negative views about on-site stewards and staff, but these views did not result from concerns about the stewards, but rather from frustration with low public compliance with regulations. When questioned whether volunteers were effective, one interviewee replied:

> No, I mean, again I just hate to be so negative about it, but we have not seen anything that's actually been as helpful [as] law enforcement, that really seems to be the only thing that helps. So, our staff goes through a full training, they know what they're talking about. They are taught techniques to chat with people and to keep things positive and try to build relationships, like that is still ultimately always our goal, but I wouldn't say that we've made much progress on it.

Alternative Recreational Areas

To accommodate dog walkers, interviewees provided information on alternative dog recreation areas via signs, maps, and other outreach materials. One interviewee explained their rationale for promoting locations where dogs and people are permitted to recreate:

> We know about 40% of our members are dog owners and walkers. So, it's an important user group for us. But we wanted to be able to provide some better guidance on that, so have places where they can go and places where perhaps it's a little more sensitive and we're going to have to restrict them.

Alternative areas included dog parks, designated dog beaches, and certain zoned sections on the beach. While zoned areas and dog beaches were typically viewed positively, dog parks were less accepted among dog owners. Interviewees who had experience with dog parks claimed dog parks were ineffective, and no interviewees recommended dog parks as a valid solution. Even if dog parks were near site locations, interviewees explained that most dog owners preferred beaches. Possible reasons may include to fulfill their own exercise needs and enjoy the scenic beach environment. In the words of one interviewee:

> We have tried the dog park angle, it is not met positively. People do not equate being able to go into a small fenced area with grass as the same as being able to have your dog run wild on the beach. They just don't think of it as the same experience. And we'll offer it to people, but I have not heard feedback [from] people like, "oh, that's really great to know thank you so much I'll go there instead." It's more like, "yeah I

know I don't want to go to the stupid dog park, I want to run my dog on the beach."

Physical Barriers for Protection

Barriers for protecting nesting shorebirds and other species, dune systems, and sensitive habitat, as well as demarcating areas of concern, were described in a majority of interviews. Typically, the physical barrier included some form of fencing with symbolic fencing, rope or twine barriers, and/or buoys as floating fences. One interviewee described symbolic fencing and its purpose: "we do have symbolic fencing that we put up annually. It's posts with signs on them, twine, and flagging between the signs. So, a dog could easily run under it, but it's more of a visual barrier." Another interviewee reported that the purpose of creating barriers and fencing is to reduce disturbance throughout multiple seasons, "as we start seeing migratory flocks come through, we intentionally leave up areas of symbolic fencing that were used for breeding birds and even make them larger to give the resting shorebirds some space."

Fencing and barriers were not utilized in a few interviews due to variable habitat conditions such as ephemeral nesting sites, changing and dynamic beach environments, and factors such as windy conditions that have the power to demolish constructed fences. Some interviewees described the difficulties of fencing: "you can't fence out there, it wouldn't last more than a couple of days. It'd be blown away." Another explained, "our geologist says fencing is not a good idea on a barrier that needs to move."

RQ 4: How do managers and biologists effectively enforce dog regulations?

Interviewees explained the different types of strategies for enforcement and which strategies were most effective at reducing dog-related shorebird disturbance. Often strategies employed and therefore the effectiveness of reducing disturbances were specific to each site. Challenges included a lack of enforcement presence and low public compliance, especially during the beginning of the Covid-19 pandemic.

Regulation Enforcers

Interviewees described various individuals with roles in dog zoning and closure enforcement, including staff, volunteers, police officers, and park rangers. The effectiveness of different enforcement types varied by site. Out of the interviewees who had experience with police officers, nearly all described them as ineffective due to their priorities focused on issues other than beach monitoring.

Staff and volunteers who do not officially have an enforcement position, played a key role in encouraging compliance--either through their presence discouraging violations or their education of people who may not otherwise follow regulations. Nearly all interviewees who had experience with staff and volunteers, affirmed staff and volunteers were effective in supporting regulations in this way, as one interviewee said, "if we did not have staff out there, there would be almost no compliance." Although

some interviewees found volunteers and staff to be more helpful than law enforcement, others found experienced law enforcement and their demonstrated authority to be more effective in ensuring regulations were followed.

Strategies to Promote Compliance

Many interviewees were in favor of an interpretive and educational approach to build awareness and increases compliance rather than a traditional law enforcement approach, as one interviewee explained, "face to face conversational protection that the volunteers [and] stewards provide is way more valuable than a guy with a gun in my opinion."

Another interviewee explained how angering non-compliant users does not promote future compliance:

> I think the educational aspect works best, personally. Every time I have lost my cool and yelled at somebody, I have lived with regret because if you make them mad, they're going to take that dog off the leash the second you're off the beach.

Another interviewee explained how they approach problem dog owners with humor and information:

> I'm amazed, almost every visitor we get has their dog off leash [and] the nicest dog in the world that would never ever chase a shorebird. Isn't that amazing? So, over time, because everybody's like that, I kind of try to use a little bit of humor. I approach them like, "I know you've got the nicest dog in the world that would never ever chase a shorebird but the thing is, the birds don't realize that. The birds see your dog running loose off a leash, they're not seeing a dog, they're seeing a coyote, a fox, a wolf, they're seeing a predator that's going to eat them. And so, what you have done is, you've closed this beach from the birds. And we have to share the beach."

Passive enforcement through patrolling the beach and the presence of law enforcement was considered beneficial by some, while other interviewees supported active enforcement that included issuing fines and removing non-compliant users from the beach area. One interviewee unsatisfied with enforcement explained, "we have one officer who's got the attitude that it doesn't help to write anybody a violation because they're just going to do it again. So, he doesn't write them and so there's absolutely no consequence there." Another interviewee in agreement, found compliance increased by immediately quelling bad behavior:

> If somebody has a dog on the beach, they need to get it off right then and there. They can't finish what they're doing, they can't come back next time [and] have the dog, they need to remove the dog from the beach right then.

Enforcement Challenges

Lack of Enforcement

Many interviewees described challenges with inadequate or ineffective support from law enforcement and linked compliance to the presence of law enforcement. When questioned about the level of public compliance, one interviewee noted during times of increased staff, compliance was high and the opposite rang true with less staff presence, "where we have staff presence, it can be high; where we do not have a staff presence or that presence is infrequent, the compliance declines." Less attention given to dog related regulations and the absence of enforcement officers have sparked situations of non-compliance, as one interviewee reported, "on the islands, we may only have a ranger patrolling once every two hours on an ATV, so a lot can happen in two hours." Often reduced enforcement was due to other priorities as one interviewee stated:

> We really don't get law enforcement. If I were to call my lead law enforcement person because there's a dog on the beach, they're going to be like, "I got [a] domestic battery over here or someone [is] illegally fishing, I'm not going to be able to get there." It has to be pretty egregious for us to call law enforcement. So, it's almost always an educational approach and asking someone to go to the proper dog beach.

Similarly, another interviewee concerned with the lack of enforcement understood dog non-compliance was a minor problem compared to visitor safety:

> When you have 1.6 million people coming through the gate that tends to suck up all the staff time and a dog running loose on a beach seems trivial compared to heart attacks, injuries, drownings, and all of those other things.

In addition to other pressing issues, budget cuts, constraints, and overall lack of funding were also discussed as reasons for reduced law enforcement presence. Two interviewees pointed out, "when we go through budget constraints, typically seasonal rangers can be one of [the] first things [to] get cut." And, "unfortunately my staff were laid off when we closed and our budget is [in] such terrible shape, I've not been able to hire them back."

A few interviewees also described law enforcement's lack of interest in shorebird disturbance as a reason for limited enforcement, as one interviewee explained, "the budget has been cut and to be honest with you, talking with our deputies, the [sheriff] doesn't see this as a high priority. He just doesn't think it's important, while the deputies take their job very seriously." A few interviewees reported that some high-ranking officers are not educated on the importance of disturbance-related issues and therefore considered infractions to shorebird-related regulations were considered trivial and not worth their time.

Overcoming Lack of Enforcement

In contrast, interviewees also talked about how enforcement challenges have been overcome. In particular, some officers have taken an interest in shorebird disturbance-related training and have become devoted to protecting the resource. Enforcement has increased in those areas.

One interviewee emphasized the importance of training and educating all law enforcement officers before enforcing regulations:

> We've also had a program with Audubon where they'll educate these guys on what they're looking for and they really like it. It's not just our sheriff deputies, it is all local law enforcement, whether it's [redacted name of wildlife agency] or any of the police departments. So, it's very helpful because we found that judges were just throwing this stuff out when issues would come up whether it was harassment or just completely destroying nests.

Covid-19

All interviewees discussed the effects of Covid-19 on enforcing regulations. A majority of interviewees reported an increase in people and/or dogs on beaches and a decrease in compliance, as one interviewee summed up, "we've seen more dogs so far and less ability to enforce it." Similarly, another interviewee explained:

> In March when everybody had to start staying home, it was just bananas. I've never seen that many dogs and if we approach[ed] people, we got a lot of, "it's a pandemic, I can't believe you're worried about birds right now," that kind of attitude. So, it's definitely been worse through Covid. I just think people are home a lot more. I've seen it in my own kind of social circles, people are just adopting the hell out of dogs right now. So, many people have gotten new pets and our beaches are just loaded with them.

The issues with more people and dogs on the beach were compounded by sites having less staff and being able to utilize volunteers due to safety protocols of their agencies and organizations during the pandemic, as one interviewee explained:

> We would love to address it, but we're having a lot of problems because we had the stay-at-home orders [and] we also have fewer staff [than] we usually have--we don't have our interns, we don't have our volunteers, so there's less of us.

With an increase in visitation and a decrease in staff and volunteers, non-compliance became more common and disrespect for beach regulations was apparent to some interviewees. One interviewee recalled their experience during the Covid-19 pandemic:

I've certainly let a lot of people know what the rule is and what the impact is. I can tell you just recently with Covid-19, [I] went out on a property that [is] clearly closed and I run into people there. I'm like, "I just need to remind you that this is a closed property" and they tell me, "oh, no, I know." They know I have no authority to do anything.

Other interviewees described ticketing as a solution to Covid-19's spike in visitors. One interviewee reported low compliance and the increase in tickets issued with the reopening of beaches:

[Compliance] was pretty bad because of Covid. [When] closing the beaches, our deputies were told not to enforce a lot of stuff. But as soon as they opened the beaches up a few weeks ago that was it, they're writing tickets for people having dogs. It's [a]118 dollar fine.

Another interviewee explained their strategy of controlling population numbers at their site, while visitation increased at surrounding beach sites:

All of the use patterns are changing. Right now we're under ordered reduced capacity. We have a physical gate that people drive through. We can control visitation there. But some of those other islands' visitation has grown from Covid because they can't go to the other beaches.

Residents

Many interviewees described residents as a user group that presented challenges during enforcement. An interviewee described locals' entitled attitude and their unwillingness to follow regulations: "a lot of locals feel like it's their God-given-right to go out there on the weekends with their kegs of beer and their dogs." Additionally, some local landowners living on the beach dismissed regulations. According to one interviewee:

Each individual landowner may own a strip down to the low tide line. And that makes it more difficult because private landowners may say, "I don't care what the ordinance is, this is my private property and I have a dog and we'll do whatever we want to do."

Existing residents caused issues; additionally, the sheer number of new residents moving south along the Atlantic Coast was also overwhelming for one interviewee, "there's so many new people coming to [redacted state name] every day that we have the same conversations over and over with dog owners about the importance of the closures and why they can't have dogs there."

Visitors

Conversely, interviewees described non-compliant visitors as unaware, rather than purposely dismissive of regulations. Nevertheless, visitors posed an additional

challenge to compliance. An interviewee discussed the issue of uninformed visitors renting houses on closed portions of the beach:

> We do have problems with places where there's houses on the beach and the people rent the houses and the person who's renting doesn't tell them the beach is closed. No matter [if] we talk to the rental companies, they don't have to disclose it. So, that's something we deal with every year.

Dog Walkers/Owners

A majority of interviewees described dog walkers as a group that presented challenges through uncooperative behaviors and/or negative attitudes. One interviewee described dog owner attitudes: "I love dogs [but] people have told me, 'Oh, you just hate dogs.' I was like, no, 'I have two dogs at home."

Many interviewees discussed dog owners' emotional response to restrictions, often leading to hostile reactions to authorities. An interviewee described a confrontation:

> There is a certain contingent out there who firmly believe that their dogs have all the rights that us humans do. I had an incident a couple months ago where I was trying to explain to this lady why she can't let her dog run loose. I always try to explain to people. I never yell at people. I try never to threaten anybody with a ticket. I want to get them on the bird side. So, [I] was trying to appeal to the animal lover in her and she just listened and her face grew redder and redder and then she just exploded on me. "My dog has a God-given-right to run free wherever he wants." I'm like, "no, ma'am, he does not." She just would not accept that.

Similarly, some dog owners were believed to be taking criticism personally, as one interviewee recounted:

> There's some places that [dogs] shouldn't be. The problem that really comes into play is it's such a personal issue for people. They get offended really easily, like you're saying that their dog is bad or misbehaved or they feel like something is being taken away from them. I always try to turn it to the birds' perspective. It's like, "it doesn't matter, your dog could be the best-behaved dog, it's the way these birds perceive dogs as predators. It's how they evolved. It's not not saying that you're a bad dog owner or anything. It's not a personal issue." But unfortunately, it becomes very emotional, people screaming and crying at these meetings when they are allowed. They just get so upset about it. And so, as a biologist [I'm] trying to lay out these facts about how it affects birds, but they're coming at it from a very emotional standpoint [with] the feeling that their rights are basically being taken away.

The conflict between shorebird conservation professionals and dog walkers weighed heavily on some of those interviewed, as one interviewee described:

> I am a dog owner. I've owned dogs my whole life but the amount of vitriol and misinformation and lack of caring about other people and other resources--I was accosted on the beach--it just has really made me realize that I don't want to have anything to do with this work.

Not all of the interactions with noncompliant dog owners are hostile; in some cases, they simply tried to hide from authorities, as illustrated by one interviewee's recollection:

> We'll either drive away or walk up the beach a little bit and then go hide and then come back out [and] you'll see that they brought the dogs back out. What happens is when you start heading back down there, they see you coming, so they take off for the boat. So, it's kind of a funny thing and we've actually caught a guy hiding in the dunes with a dog. It's just one of those things where once you explain to them and they comply, you may have to come back in a very short period of time just to see if they have followed through with the compliance.

Boaters

Boaters caused concern among many interviewees because they and their dogs access sites where it is hard to enforce regulations. One interviewee described, "boaters, despite saying no dogs allowed on the beach, will still unload their dogs from boats." Another interviewee described boaters having disregard for regulations: "we get blatant people just completely ignor[ing] the signage and just go and pull up their boat and sit right out in the middle of a nesting beach and let their dogs run loose on the beach." In reference to regulations, one interviewee described some boaters' lack of support and compliance during enforcement, "we had talked with them and said, 'you guys aren't abiding by the rules.' [We] kept telling them and nothing changed."

Level of Compliance

Despite the issues with enforcement, many interviewees felt compliance was generally adequate; however, some still felt compliance was poor or only somewhat satisfactory. One interviewee ascribed high levels of compliance at their site to controlled access with a single gated check point. Other interviewees reported, although compliance was unsatisfactory in the past, it has increased over time. Another interviewee described how their regulations were gradually accepted and understood in the community the longer they were in place:

> I think there is compliance over time. I think the first few years are difficult, especially when a place was open for so long. That switch definitely takes a little time, but word eventually gets out and at least the locals know to just keep moving on.

Some interviewees confirmed their sites tracked public compliance, "the boat operator takes the volunteers out there and tracks some of those metrics like compliance, visitation, and interaction with the public." Still many interviewees did not track compliance. One interviewee was unsure how to measure compliance, "the compliance, it's really hard to say, just because unless you had a game camera out there that was kind of recording what was going on all the time when somebody wasn't there, I don't think we would know."

Other interviewees lacked the capacity to track compliance and therefore relied on anecdotal evidence. As one interviewee explained, "we don't have the capacity to track compliance and also since [redacted site name] Island is 150 miles away from our closest staffed [location], it's really hard for us to get out there and keep an eye on it."

RQ 5: What are the outcomes of dog regulations?

Positive and negative impacts resulting from regulations were reported by interviewees and included both measured and anecdotal outcomes.

Positive Outcomes

All interviewees discussed at least one positive outcome as a result of dog regulations. For many, positive outcomes included a decrease in dogs and associated disturbance, and an increase in wildlife and shorebird reproductive success. One interviewee's description of outcomes was based on precise biological findings:

> We fledged 2.42 chicks per pair last year, which is crazy high. I think the recovery plan goal is 1.5. But if I had to highlight one metric of success, it would be that the plovers are just breeding like gangbusters on our site.

Other interviewees used anecdotal evidence to justify their success. For example, "we had more nests successfully fledge off of that island than some of the other islands that we didn't post. But I don't have any real concrete data to support that necessarily."

Another interviewee described their site's beach-nesting bird colony success since regulation enactment:

> The amazing thing is that the colony persists. It [has] been a stable colony for the last 15 years. And they're out there right now copulating and laying eggs and doing their thing and they keep coming back. That's an amazing thing to me.

Interviewees often commonly described sea turtle nesting success, shifts in visitor attitudes towards shorebirds, increased acceptance of regulations over time, positive behavior changes, and increased compliance and community involvement. One interviewee described community events and local pride of their [redacted shorebird species] population, "there's a birding festival [and] people come just to see the

[redacted shorebird species]. It's pretty neat. And I think most people who live here [are] like wow I'm lucky I live here."

Another interviewee described beach visitors' increased interest in shorebird protection:

> Over time, some of the dog advocates came over to the plover's side and now are real advocates of protecting plovers in addition to being able to have their dogs on the beach. So, there've been a few of them that were really vocal pro-dog and anti-plover five years ago that now are volunteering to monitor the beaches for piping plovers.

Economic success of ecotourism was also described as a result of increased abundance of shorebird populations:

> Ecotour groups paddle around and they're able to see terns feeding right at the water and black skimmers nesting up close. So, I think they've seen that as a positive to their business. Whereas, before the island was closed, there'd be like one laughing gull standing there and kind of nothing spectacular to look at.

Negative Outcomes

Many interviewees also described negative outcomes. In some locations regulations did not result in a decrease in shorebird disturbance. In others, interviewees noted a lack of human behavior change and/or blatant disregard for regulations. Finally at some beach sites, increased numbers of dogs prevailed despite educational efforts. As one interviewee explained, "we've put a lot of effort as well into educating people, but it's not necessarily translating into them choosing to do something different."

In other cases, insufficient regulations still resulted in disturbance:

> People are out walking their dogs, coming in off the beach at quarter past eight. They are coming off the beach in compliance, but if it's at a low tide and the birds have been out foraging, they still potentially cause disturbance.

Many interviewees expressed concerns with the effects dogs posed on vulnerable shorebird populations while understanding the importance of visitor preferences. Even leashed dogs caused concern among interviewees (see *Leash Laws*).

RQ 6: What are the lessons learned and what support is still needed?

Lastly, interviewees described lessons learned throughout the process of developing, implementing, and enforcing regulations. Specifically, interviewees explained the benefits of simple, standardized regulations that are both easy to follow and enforce. As well as the benefits of compromising and communicating with beach visitors to gain public and ultimately government support. Additionally, interviewees discussed what is still needed for their sites to have successful regulations.

Simple/standardized Regulations

Many interviewees explained how the development of simple and standardized regulations were easy to follow and enforce. Consistent regulations resulted in higher compliance and were considered integral to the establishment of successful regulations. Two interviewees described their standardized regulations as, "developed to be as easy as possible to adhere to and enforce," and has, "simplified management tremendously." Another interviewee further described the benefits of straightforward regulations:

> Certain areas should be restricted to dogs all the time. Then if you see a dog, you know they're in violation. They don't have to go back and refer to a set of rules. From [an] enforcement standpoint, you just really have to keep it as simple as possible so that it's kind of black and white, especially if you're going to be able to write a ticket.

One interviewee expressed gratitude for their site's standardized regulations:

> I'm not totally sure why [redacted state name] decided to completely ban dogs from Sandy beaches. I think it's a fabulous thing because dogs are incredibly impactful to shorebirds. Running after birds and causing disturbance that way, but just having a four-legged predator on the beach is highly impactful for species picking out nesting areas.

Conversely, one interviewee explained how their complicated regulations resulted in low compliance, "in some respects the failure to follow [the rules] is just because they're so hard to follow, they're hard to understand and they're random and so [compliance is] pretty low." A further issue noted with these complex regulations was that they do not meet U.S. Fish and Wildlife Service standards:

> All the other [sites] have local dog ordinances and they're, I would say, overall complicated. They're all different and most of them have evolved to a point where at least during part of the piping plover nesting season, they close the beach to dogs during part of the day. So, that is not ideal. It doesn't meet our Fish and Wildlife Service standard.

Compromise

Full year closures and regulations that banned dogs from beaches were reported as the most beneficial to shorebirds; however, such unyielding regulations were not always possible. Local governments, for instance, heavily considered public preferences when determining regulations. Inconsistent and confusing regulations that change based on the time of day were a result of political compromise as described by one interviewee:

> The town frankly enacted kind of a kooky ordinance. Dogs are not allowed on the beach after eight in the morning or before six at night.

> [In] the off time, they are allowed on the beach, leashed. So, really the ordinance doesn't make a whole lot of sense. But when it was enacted, it was my understanding that the feeling was to take whatever we could get at that point.

Another interviewee described their frustration with varying regulations that attempt to compromise, "we have this very complicated ordinance, but that was all an attempt to try to compromise and to make both sides happy. And I think in the end no one was happy." Interviewees explained that variable regulations were sometimes created in an attempt to satisfy the majority. However, these compromises were perceived by some to result in unsatisfied members of the public and ongoing issues of disturbance.

While some interviewees stressed their initial frustration with compromising on regulations, many others understood that compromise can lead to benefits for the public and shorebirds. Instead of compromising on the time-of-day dogs are allowed on the beach, which can lead to confusion, interviewees discussed the benefit of compromising through zoned beach areas. One interviewee described setting aside separate zoned areas for shorebird protection and areas for dog recreation:

> As a compromise, we were able to pick an area that we thought would have the least impact from a species point of view primarily for shorebirds and sea turtles and designate that as a public access area. So, we were able to compromise by allowing use in that restricted area but prohibiting use on the vast majority of the beach. I do think looking back, that the public use area was an idea that initially was not very popular with some of our biological staff, but in the long run, I think that the good sentiment that it built locally allowed us to keep the vast majority of the area closed and it allowed us to pick where we want people to go as opposed to them going wherever they wanted.

Another interviewee explained how they came to understand compromise as a valuable tool:

> I guess one of the biggest things I've learned is that you have to compromise and for somebody to buy into something they have to get something that they want as well. Some people, they're like, "oh, there should be no dogs on beaches." Well, that's not the reality. So, if you draw that line in the sand and you're adamant about that, you aren't going to get anywhere."

Understanding Traditional Recreational Use

Some full year regulations were standardized, and due to the long tradition of closures at these sites, people accepted the regulations, as indicated by one interviewee, "nine of our twenty-five beaches are closed to dogs and that's pretty simple and straightforward. Some of those have a long tradition of being closed to dogs like our state parks and people are used to that." According to some interviewees, if beach users were familiar with regulations and took pride in shorebird and other wildlife

successes, less conflict emerged. One interviewee explained the relative ease of continuing protections due to public acceptance of past regulations:

> Even the old timers as far back as they could remember, that island had historical use and it was just kind of one of those things that they expected and were used to. And I think for a lot of people they want to continue to protect that. It's something that [they've known] throughout their lives and they're supportive in protecting it .

Conversely, if regulations were established after beach visitors became accustomed to open beaches, conflict arose. Revoking traditional beach use was not widely accepted among the public as one interviewee noted, "each town has their unique character and their unique traditions, and some of them have long traditions of wanting to be dog friendly and others don't. So, whenever you want to change, that's a real challenge." Understanding the culture, historical land use, and interests of a town is necessary before development of regulations.

Recently enacted regulations on already existing beach sites have the potential to disrupt historical use patterns. Therefore, if possible, one interviewee recommended enacting regulations on new beaches early before the establishment of visitor use patterns. Opportune times include directly after renourishment projects of newly created beach areas as one interviewee described:

> The law enforcement officer said, "now is the time to establish these expectations because this beach is brand new." So, it was really just about establishing that expectation of that's just what we do from early on. It's not like we had to disrupt a historic use pattern, we were just able to say new beach, new rules, this is what we're doing.

Being proactive with communications. In addition to establishing regulations early, communicating site regulations with the public in advance can also decrease conflict and encourage support for regulations. One interviewee described intolerant visitors in the beginning when they were unaware of site regulations and how that has changed with efforts to notify beach visitors earlier, "there was some initial frustration of people showing up, not realizing that it was going to be closed and that wasn't communicated as thoroughly as it could have been that first year."

Support Needed

Communication—Signage & Targeted Outreach

Many interviewees described their need for better communication including education, targeted outreach, and improved signage. As previously indicated, effective messaging and communication requires an understanding of the target audience and their preferred methods of communication. Future concerns focused on tailoring messages to all beach user groups as one interviewee emphasized, "we need to figure out better ways to get the message out and that's difficult because there's multiple

audiences. I think we all agree we're open to better improved messaging informed by social science."

Similarly, interviewees described signage needs and called for educational or interpretive signage to better target and communicate with beach goers. Other interviewees noted a need for larger, easy to see signs with simple, easy to understand messages. Interviewees also called for improvement in sign placement, for example a few interviewees reported the need for signs on buoys as an advanced warning system for boaters who may be hauling out on a beach.

Enforcement

A majority of interviewees emphasized the need for more effective law enforcement at their sites. One interviewee described enforcement as, "the biggest missing piece to that protection package." One interviewee specifically described the need for a more organized method of tracking repeat offenders; however, limited resources and management of an extensive site have prevented enforcement officers from consistently tracking the level of compliance.

Another interviewee stressed their desire to educate enforcement officers on the significance of dog disturbance. The interviewee described enforcement officers as:

> Very top down, whatever their captain says they do. It has to come from the higher ups in law enforcement. So, definitely working towards making connections with our own officers and why these resources need to be protected, but it's definitely a hard communication between our division and the law enforcement division.

Many of the interviewees stressed the importance of patrolling during hours of high dog and public use, particularly in the morning and/or afternoon when the number of dogs on beaches was highest. One interviewee explained, "[it's] been really helpful to have a uniformed officer show up at five o'clock in the morning when most of the infractions take place or late in the evening when [on] many of these beaches dogs can be off leash."

Summary and Interpretation of Key Findings

Interactions with dogs can negatively impact shorebirds (Mengak & Dayer, 2019). Given the impacts that dogs can have on shorebirds, biologists and land managers often implement regulations to minimize disturbance. Through in-depth interviews, we sought to understand how managers and biologists establish and ensure compliance with regulations. Based on our findings, we offer key insights on 1) types of dog-related regulations at sites along the Atlantic Flyway; 2) why and how managers and biologists develop regulations; 3) how managers and biologists implement regulations; 4) how do managers and biologists effectively enforce regulations; 5) the outcomes of regulations; and 6) lessons learned and current needs for regulating dogs.

Regulations

Our results showed that there are several types of regulations for minimizing dog-related disturbance. Sites have no public access, full year dog closures, seasonal dog closures, dog walking zones/wildlife zones, and/or leash requirements that can vary throughout the day. Some sites also allow off-leash dogs as long as they are under voice control. Because these regulations exist on a spectrum, from strictly prohibiting dog access to providing open access at times and in places where their impact on birds would be the least, there are many options for sites looking to minimize disturbance. Therefore, **we suggest that managers consider these options and choose an approach that meets their site goals**, will be feasible to implement and enforce, and will be appealing to stakeholders.

Regulation Development

Dogs are a primary source of disturbance to shorebirds (Lafferty, 2001a). As such, the majority of interviewees noted that **the main reason for regulation development was to minimize disturbance from dogs**. However, we also found that **visitor preference, human health and safety, and situations such as "take" were also reasons for regulation development.**

Factors that Facilitate Regulation Development

Our findings suggest that laws (e.g., the Endangered Species Act) and biological data related to disturbance from dogs can support regulation development and can be used to inform decisions about dog-related regulations. Additionally, interviewees were also interested in using social science data to support decisions about dog-related regulations; however, interviewees noted that they seldom did so because they have limited access to resources and knowledge about social science. **To overcome this obstacle, we recommend that social science expertise be made more available to sites.** This might be accomplished through webinars, trainings, and/or collation of relevant social science for shorebird management decisions. Additionally, funders or organizations or agencies with social scientists could prioritize funding relevant research.

Despite this limitation, interviewees noted that their partner organizations and agencies have been beneficial for providing sites with other resources and support through all stages of regulation development and implementation process. For example, partners have provided financial support, staffing, signage, and innovative outreach materials. Because partnerships can be beneficial, **we recommend that agencies and organizations form partnerships with various organizations and agencies for successful development and implementation of dog-related regulations.** Additionally, shorebird professionals can take advantage of the Atlantic Flyway Shorebird Initiative, especially the Human Activities Committee that brings together a variety of organizations and agencies with such interests. Some partners that have provided interviewees with resources and funding to continue shorebird projects include

the U.S. Fish and Wildlife Service, the National Park Service, state agencies such as the departments of natural resources, local and municipal governments, and non-profit organizations such as Audubon, The Nature Conservancy, the Trustees of Reservations, and shorebird initiatives (e.g., Florida Shorebird Alliance).

Strategies for Involving the Public in the Regulation Development Process

We found that some sites were required to include the public in the regulation development process, whereas others included the public because they felt it was important despite it not being required. Alternatively, some interviewees noted that they were discouraged from involving the public due to concerns about public pushback and a lack of time and resources. Despite some difficulties, interviewees noted that including the public can have a positive impact by garnering greater public acceptance of regulations, greater support for shorebirds, and by minimizing public disapproval and conflict. Similarly, Voyer et al. (2012) noted that including public opinion before management decisions are implemented can reduce conflict. Therefore, **managers who are seeking to implement regulations in the future could engage stakeholders in the regulation development process whenever possible.** Some common methods that have been used to engage stakeholders include the public include seeking public comment, conducting formal public meetings or webinars, or a combination of these approaches. Regardless of the approach, interviewees noted that patience and time is needed.

Challenges that Hindered the Development of Regulations

Our results showed that certain groups can be challenging to work with during the regulation development process. In particular, dog owners are a challenge because they may feel that their dogs have rights to the beach. This sentiment might be because many dog owners consider their pets to be like family (Albert & Bulcroft, 1988) and they generally do not believe that their dogs would pose a threat to shorebirds (Comber and Dayer, 2019b). Additionally, interviewees reported that the general public can be challenging to work with in the regulation development process because they need to be notified and educated about regulations in a way that is compelling to them. Also, receiving local government support was considered a challenge by many interviewees because local governments generally aimed to make their constituents happy. Therefore, they often opposed regulations that would upset the general public or dog owners.

Regulation Implementation

Communication and outreach, alternative recreational areas, staff and stewards, and physical barriers were described as factors that contributed to the success of regulation implementation. Here we outline the key insights pertaining to each factor.

Outreach & Communication

Many interviewees noted that **it was essential to use outreach before new regulations were implemented**. **Different approaches for communication may be needed** such as bulletin boards, kiosks, fliers, postcards, brochures, public gatherings, public meetings, open houses, and educational workshops. Beach users can also be reached through signage at various locations so a larger audience of beach users can be reached. We also found that, when using signs, content may be more important than the presence of a signs alone. Specifically, we found that **using signs with short and straightforward messages, in addition to pre-existing regulatory signs, was most useful for conveying information about regulations and the need for keeping dogs away from shorebirds.** Although interviewees noted that most beach visitors do not read long, lengthy, law ordinances with confusing terminology, some noted that the the addition of regulatory signs may be necessary for regulation enforcement. Therefore, **our findings suggest that, in addition to simple regulatory signs, educational signs may increase interest in shorebirds and improve the way messages are received among dog walkers**.

Alternative Recreational Areas

Interviewees noted that one approach to minimize dog-related disturbance is to provide dog walkers with information about alternative dog recreation areas such as nearby dog parks or designated dog beaches. Interviewees shared information about alternative areas through signs, maps, and outreach materials. Although interviewees provided information about dog parks, they noted that dog parks were not viewed by dog walkers as acceptable alternatives to beaches. To provide alternative recreational areas that are acceptable to dog walkers, **managers can create separate shorebird and dog walking zones on beaches.** For more information on dog walking zones on beaches, see *Guide to Applying Science and Management Insights and Human Behavior Change Strategies to Address Beach Walking and Dog Disturbance Along the Atlantic Flyway.*

Staff and Stewards

Education and outreach are primary components of the implementation process. Although some interviewees felt that educational staff and stewards were not as effective as law enforcement, many other interviewees described staff and stewards as being integral for promoting compliance with dog regulations. **The ability of staff and stewards to educate visitors, perform biological monitoring, and communicate regulations makes them useful in reducing shorebird disturbance at sites with high public use and low budgets.**

Physical Barriers for Protection

Interviewees described using physical barriers to protect nesting shorebirds. Physical barriers included fencing with rope or twine, and/or buoys as floating fences. Although a majority of interviewees described using fencing, some noted that it was not possible to use due to nesting habitats constantly changing, beach environments

changing, and factors such as windy conditions that can destroy constructed fences. Due to the challenges associated with fencing, **managers can consider the use of outreach approaches in addition to physical barriers for protecting shorebirds from dog-related disturbance.**

Enforcing Regulations

Our results showed that ensuring compliance with regulations required traditional enforcement as well as voluntary compliance approaches. Law enforcement officers and police officers instilled a sense of authority and could also facilitate compliance through passive enforcement (patrolling the beach and exhibiting a law enforcement presence) and active enforcement (issuing fines and removing non-compliant users from the beach). Most sites found that they could not rely fully on enforcement though as officers were stretched thin, not often present, and had other priorities (e.g., human safety) preventing them from responding to shorebird related incidents. Some sites had success with training and working with law enforcement to build their understanding of shorebird conservation issues. As an alternative approach to foster compliance, many sites employed interpretation and education. Interviewees noted that **staff and volunteers (often called stewards) played a key role through interactions with the public and through simply being present.** Yet, **COVID-19 further exacerbated many of the challenges of enforcing regulations**. A majority of interviewees reported an increase in people and/or dogs on beaches and a decrease in compliance. Having more people and dogs on the beach has been problematic because sites have less staff to enforce regulation and managers are not able to use volunteers because of COVID restrictions.

To assess compliance, some sites have volunteers track metrics through visual observation. But many interviewees noted that their sites do not track compliance because they either are not sure how to measure compliance or lacked the capacity to track compliance and therefore relied on anecdotal evidence. **We recommend** sites consider how they can develop a comprehensive approach to fostering compliance with dog-related regulations. This includes **empirically tracking compliance through protocols** such as that developed in this project by Hunt et al. (2019), **as well as proactively working with the law enforcement community to leverage their involvement** in enforcement and simultaneously building voluntary compliance of dog walkers through outreach or stewardship programs.

Outcomes of Regulations

Based on our findings, interviewees reported positive and negative outcomes resulting from regulations. **For some interviewees regulations resulted in a decrease in dogs and an increase in shorebird productivity at their sites**. Similarly, Medeiros et al. (2007) found shorebird nests were up to 34 times more likely to succeed when protective measures were established. Additionally, **as shorebird abundance improved** at sites with regulation, **interviewees noted an increase in ecotourism**, resulting in economic success. Still, **some sites experienced an increase in dogs**

despite efforts to increase public compliance. This was in part **due to** anecdotal evidence of **an increase in visitors** and lack of compliance with regulations **during the COVID-19 pandemic, as well as complicated regulations** that changed frequently.

Lessons Learned and Support Needed

Make Simpler, Standardized Regulations

We found that most managers prefer standardized regulations over complicated, inconsistent regulations. Because **simple, consistent regulations make enforcement easier** at large beach areas, standardizing regulations can limit the inconsistency and uncertainty of regulations that change based on the time of the day. **One way to standardize regulations is to provide dog owners with recreational zones in areas with relatively unsuitable shorebird habitat.** Dog zones could allow opportunities for dogs to exercise and socialize while removing the threat of dog-related shorebird disturbance from wildlife zones on the beach. This example of a simple, standardized regulation can satisfy both the public and shorebirds. Biological data and professional opinion may be beneficial for deciding which areas should be zoned for dogs and which areas should be zoned for wildlife.

Compromise with Zones

Many **interviewees described compromise as a method for limiting disturbance, reducing conflict, and ensuring public compliance.** Compromise can be achieved by creating separate dog zones and wildlife zones. Zones can be established based on observational data of dog walkers, biological data on shorebird use, and key habitat features (Stigner et al., 2016; USFWS, 2015). Furthermore, **we suggest that zones be created using empirical data and/or expert knowledge from managers and biologists** who can determine alternative recreational areas based on biological and recreational use knowledge of sites.

Understand Traditional Use

Understanding the culture, historical land use, and interests of a town is necessary before developing or implementing regulations. Recently enacted regulations on already existing beach sites have the potential to disrupt historical use patterns. Therefore, **managers may have less resistance to regulations if they create them on new beaches before visitor use patterns are established,** for example, directly after renourishment projects that create new beach areas.

Be Proactive with Communication

The importance of communicating with the general public was apparent throughout all stages of regulation development, implementation, and enforcement. Based on our findings, future **communication efforts need to focus on effective messaging based on social science research.** Communicating dog-related policies prior to implementation can decrease conflict and may even encourage support for new

regulations. Therefore, **we recommend that managers and biologists actively communicate dog-related policies to the public well in advance** of implementation Furthermore, **educational and interpretive signs that target various audiences are needed.** Specifically, interviewees cited the need for signs that are larger and have simple messages.

Enhance Enforcement Approaches

Interviewees described the need for enforcement during peak hours of dog recreation on beaches, such as the morning and afternoon hours. Furthermore, **interviewees described the need for an organized method to track repeat offenders** in an effort to improve enforcement effectiveness and quell non-compliance.

Next Steps

In this report, we synthesize the expertise of managers and biologists to create a body of knowledge pertaining to experiences with dog-related regulation development and implementation along the US portion of the Atlantic Flyway. Specifically, we provide insights and recommendations for managers considering regulations. The findings from this study have already been used to inform a co-production workshop in December 2020 aimed at reducing human disturbances to shorebirds. During the workshop, managers and biologists used the findings from this report, as well as insights from other biological and social science components of our research, to brainstorm strategies for reducing disturbance. The strategies are currently being integrated into a strategy document that will be shared broadly across the Atlantic Flyway. Through the strategy document, a community of practice will be established, which will allow managers and biologists to learn from and support each other as they continue to manage disturbance issues in the future. As sites implement new strategies to reduce disturbance, it will be essential for managers and biologists to evaluate successes and failures using standardized methods so improvements for reducing shorebird disturbance may be evaluated and shared with other sites, informing the adaptation of the guidance/strategy/best practices document.

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National Fish and Wildlife Foundation
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The Atlantic Flyway Shorebird Initiative
https://atlanticflywayshorebirds.org