Formative Evaluation of Massachusetts Audubon Society's Coastal Waterbird Program

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ABSTRACT

I conducted a formative evaluation of the Massachusetts Audubon Society's Coastal Waterbird Program (CWP). Specifically, I used document analyses, interviews, and a mail census of CWP staff to assess the appropriateness and adequacy of CWP design and implementation actions. I identified that the Theory of Planned Behavior (TPB) could be used as an appropriate social science foundation to improve the program design and the identification of additional implementation actions. Most implementation actions seemed to focus on the monitoring of nest success and fledging rate of protected bird species that nest on beaches and reacting to public behaviors that are disturbing to these birds. According to TPB, additional benefits likely could be achieved by developing implementation actions focused on proactively engaging the public to prevent disturbing behaviors before they occur. Survey results indicated that field staff already engage in proactive actions despite not being trained extensively to do so. In addition, staff held substantially more positive evaluative beliefs about proactive interactions than reactive interactions. Rather than identifying problems confronting the CWP, these results identify opportunities that can be built on to improve the program.

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CHAPTER ONE

THESIS INTRODUCTION

Challenges of Shorebird Conservation in a Human-Dominated Landscape

Many species of shorebirds nest on beaches and dunes along the coast of southeastern Massachusetts and Cape Cod (Mass Audubon 2006). One of these species, the Piping Plover (*Charadrius melodus*), is listed as threatened under the U.S. Endangered Species Act. These birds nest in shallow depressions on flat stretches of beach, and in doing so, compete for space with hundreds of thousands of beachgoers every summer. Conflicts arise when people use areas of the beach near nest sites because federal and state laws prohibit disturbance of the birds or their eggs, nests, or chicks. The birds face the constant threat of disturbance or accidental destruction from any passers-by, especially when many people are unaware of the existence of these often well-camouflaged birds or eggs. Dogs are an even larger threat because they are more likely to chase a bird or investigate a nest closely, in the process accidentally crushing the eggs or causing the adult birds to abandon the nest.

A clear need for a conservation strategy exists for Piping Plovers in particular because Cape Cod accounts for one-third of the total breeding habitat for the Atlantic coast population of this species (Mass Audubon Website 2003). One organization addressing this need is the Massachusetts Audubon Society (Mass Audubon). In 1987, Mass Audubon initiated the Coastal Waterbird Program (CWP) with the goal of increasing the Atlantic Coast population of Piping Plovers.

Overview of the Coastal Waterbird Program

Based in Marshfield, Massachusetts, the CWP protects and monitors nesting populations of Piping Plovers, as well as Least Terns (*Sterna antillarum*), Common Terns (*Sterna hirundo*), Roseate Terns (*Sterna dougallii*), and American Oystercatchers (*Haematopus palliatus*). The most critical management need identified by Mass Audubon is to reduce human disturbance of nesting and fledgling birds (Mass Audubon 2006). To meet this need, Mass Audubon hires seasonal field staff each summer to implement CWP actions on mainland Massachusetts, along the north and south coasts of Cape Cod, and on Martha's Vineyard and other offshore islands (Mass Audubon 2006). During the 2006 breeding season (May through August), CWP staff included 2 full-time employees, and an additional ~30 seasonal staff comprised of about 25 experienced field staff and 5 interns.

Seasonal staff members are responsible for protecting nests and fledglings of the aforementioned species by monitoring breeding pairs or colonies, protecting nests from potential threats, disseminating educational material, and conducting ecological research (Coastal Waterbird Program Resource Manual, 2006). Responsibilities of staff vary from beach to beach because the type and degree of disturbance differ. Some beaches are public, or publicly accessible, and some are private or have restricted access. Sizes of beaches range from several hundred feet long to several square miles, and some are barrier beaches with tidal flats. Some beaches have few natural predators, but others have a wider range of predators, including skunks, foxes, coyotes, owls, hawks, and opossum. Depending on the site, staff members may walk miles between nesting pairs of Piping Plovers or tern colonies, or cover only a short distance. The number of breeding pairs and colonies that each staff member monitored also varied. Thus, the overall field experience varied greatly from staff member to staff member.

Need for Program Evaluation

Since its creation in 1987, the CWP has implemented a variety of management actions to protect nesting birds and increase survival of chicks to fledging. Despite some success in fledging chicks of Piping Plovers, Least Terns, and other species of concern (Mass Audubon 2006), no formal evaluation has been conducted of the CWP. In 2006, an opportunity to evaluate some aspects of the program arose when I was hired as a CWP intern, and worked with the CWP interim director, Ellen Jedrey, and Jody Enck, my senior thesis advisor at Cornell University, to develop a project focused on program evaluation.

Program Evaluation Overview

The most helpful evaluations improve the entire program and ensure the achievement of program objectives. There are two types of program evaluations: summative evaluations and formative evaluations (Knuth and Nielsen 2001; Decker 1988). The most commonly performed type is a summative evaluation, which assesses only the outcomes of a program to gauge the program's effectiveness. A summative evaluation can be compared to an end-of-term exam (Wiliam and Black 1996). This type of test takes place at the course's conclusion and focuses only on the evaluation of the student's knowledge of a limited list of topics. In addition, there is no opportunity to know whether those topics being tested are relevant, and the exam tests only the final outcome of a class. A more extensive type is formative evaluation, which provides information useful for designing and implementing a program that has the greatest chance of meeting the program's objectives. In a class setting, formative evaluation would appraise all who are involved—students and teachers—in order to improve the entire course (Wiliam and Black 1996).

There are advantages and disadvantages to the use of formative program evaluation over summative evaluation. Formative evaluation can be used while a program is ongoing for the purpose of program improvement (Smith 1989). Once areas of improvements have been identified within a program, immediate actions can be taken because the program is still operational (Smith 1989). Formative evaluation also helps distinguish between program failure and evaluation failure, and between theory failure and implementation failure (Smith 1989). Formative evaluation increases the probability of successful program replication, and permits the estimation of the success of long-term programs.

In contrast, summative evaluations focus entirely on program outcomes, and may therefore overlook deficiencies not evident in the outcomes, or misinterpret the cause of a deficiency (Smith 1989). These so-called "black box" evaluations are able to show that certain effects have or have not occurred, but since they lack information on the nature of the program being evaluated, decision-makers cannot determine whether a failure was the cause of inadequate theory or inadequate implementation, or, in the case of a success, how to replicate the program on a larger scale (Smith 1989). However, summative evaluations tend to be smaller-scale and easier to undertake because they explore only program outcomes, whereas formative evaluations require in-depth examination of theory, design, implementation, and outcomes, and may therefore require more time, effort, and money.

A formative evaluation consists of four phases (Decker 1988): (1) theory application evaluation, (2) program design evaluation, (3) program implementation evaluation, and (4) program outcome evaluation. In brief, theory application evaluation assesses the degree to which an appropriately sound theory was selected as a foundation for designing a program. Program design evaluation assesses how well planned actions take into account both the

theoretical foundation and logistical considerations. Program implementation evaluation determines how well the plan was followed when actions were undertaken, and determines any reasons for deviation from the plan. Program outcome evaluation is much like a summative phase in that it assesses the degree to which objectives were met, and identifies the reasons why they were or were not met.

Study Purpose

The purpose of this study is to conduct a formative evaluation of the CWP with an eye toward improving program effectiveness. The focus will be on program implementation evaluation because I was heavily involved with implementing actions. However, I also will evaluate theory application and program design as a basis for describing and evaluating implementation actions. A program outcome evaluation is beyond the scope of my study.

Evaluation Objectives:

My study objectives are as follows: (1) determine an appropriate theoretical foundation from the social sciences for those aspects of the CWP involving staff-public interactions, (2) assess the link between the program's design and its theoretical foundation, (3) determine the degree to which conservation actions planned to reduce human disturbance of shorebirds were implemented as designed, and (4) identify any reasons why planned actions were not implemented as designed.

Research Hypotheses:

My research hypotheses all focus on theory implementation evaluation: (1) staff with positive beliefs concerning the outcomes of public engagement will have more positive attitudes toward engaging the public than those with negative beliefs, and (2) staff with positive attitudes

toward engaging the public will have engaged the public more frequently than staff with ambivalent or negative attitudes.

Thesis Statement:

CWP staff will have more positive attitudes toward reactive implementation actions than proactive implementation actions because the program design and training focuses on reactive actions.

CHAPTER TWO

THESIS METHODS

Theory Application Evaluation

I conducted a document analysis (Patton 1990) to determine whether any theoretical foundations were explicitly used during the program. First, I identified the broad goals of the CWP to determine the degree to which ecological and social science theories would be appropriate foundations for the program design. Next, I organized CWP actions into (1) disturbance-prevention and (2) monitoring activities. Because the monitoring efforts involved well-established ecological protocols, I focused on identifying the most appropriate theories on which the disturbance-prevention-activities might be based (e.g., Theory of Planned Behavior [Ajzen 1991], expectancy disconfirmation theory [Oliver 1980]).

Program Design Evaluation

Based on my document analysis, I determined the degree to which all program goals were adequately and appropriately addressed by specific actions in the program design. I linked

designed actions to the theoretical foundation I identified in the theory application evaluation to determine appropriateness.

Program Implementation Evaluation

I focused on disturbance-prevention methods for the program implementation evaluation. I did not develop a standardized method for assessing whether all monitoring activities were implemented or the degree to which they were implemented appropriately. Monitoring activities assess the degree to which program outcomes are achieved, and they are not directed as much at protecting the birds from disturbance.

I assessed the types and number of disturbance-prevention-activities carried out by field staff through a self-administered mail questionnaire. Specifically, I conducted a census of all the 2006 CWP staff to assess implementation actions in which they engaged, as well as their attitudes and beliefs about those actions. I implemented the survey on 8 December 2006 by sending each staff a cover letter and questionnaire. On 25 January 2007, I mailed nonrespondents a reminder letter.

A detailed description of the theoretical foundation that guided development of the survey and specific items used to measure various concepts in the survey can be found starting on page 14. Briefly, I categorized disturbance-prevention activities as either passive or active. Passive activities are those intended to protect Piping Plovers in the absence of field staff. Active methods are those that require the presence of a staff member. Within the active category, some actions can be classified as *reactive* in terms of field staff's response to an observed disturbance of a bird or the imminent threat of disturbance. *Proactive* actions strive to prevent disturbance before it occurs.

I designed the survey to assess the number of reactive and proactive encounters each staff member had with the public, their intention to engage the public proactively in the future, their attitudes toward both reactively and proactively engaging the public, and antecedents to those attitudes. During the time I spent with the CWP I collected newspaper articles regarding Piping Plovers to ascertain public perception of the birds and the efforts of the CWP. I also gained supplemental information regarding program implementation through informal interviews with another intern and by documenting my own experiences as a CWP staff member.

Program Outcome Evaluation

As noted previously, program outcome evaluation is beyond the scope of this study. One indicator that might be used to evaluate success of the CWP is the monitoring data showing nest success and numbers of chicks fledged year-by-year since the inception of the program. However, this would be an imperfect indicator given the variation in human use among beaches in any given year and year-to-year differences in weather conditions and predator occurrence.

CHAPTER THREE

RESULTS AND DISCUSSION FOR DOCUMENT ANALYSIS

Theory Application Evaluation

A program's theoretical design is the underlying structure and operation that describes the program's general nature and functioning (Shadish 1987). A good program theory describes how a program is supposed to work (Bickman 1987), systematically delineates cause-and-effect

relationships (Conrad and Miller 1987; Shierer 1987), and provides the rationale for a program intervention (Smith 1989). Identifying program theory increases the effectiveness and efficiency of program staff, and thus the program's probability success (Smith 1989).

I found no explicit mention of a theory on which the CWP was based in any documents available to me. That being said, it is rare that an original hard copy of a program's implementation plan is available or even exists. Many program designers have little expertise in program design or evaluation, and seldom incorporate behavioral or ecological theory into program design.

In the absence of an explicit description of a theoretical foundation, I looked for a statement of the purpose and main goals of the CWP. According to the CWP staff manual (Mass Audubon 2006:5), the "recovery goal" for the Atlantic Coast breeding population of Piping Plovers is 2000 breeding pairs. This recovery goal was established by the U.S. Fish and Wildlife Service (USFWS 1996), and is the target for coordinated action by all East Coast state, federal, non-government agencies interested in Piping Plover conservation. As stated on the Mass Audubon website (Mass Audubon Website 2003), the mission of the CWP is:

> [T]he program advocates for the protection of the entire coastal ecosystem [of Massachusetts] in as natural a state as possible. The program, therefore, works to protect the natural quality of the state's coastal beaches, salt marshes, and tidelands, which serves as habitats to 49 species of breeding birds and 112 species of migratory or wintering birds.

To that end, "[t]he CWP was launched in 1987 in response to declining populations of Piping Plovers and terns in Massachusetts, with the primary objective of protecting these species' nesting areas throughout the state" (Mass Audubon Website 2003). Despite calling this a primary objective, I interpret this as being a statement of the purpose of the Coastal Waterbird

Program. I found no other explicit statement of purpose for the program, nor any explicitly stated goals in either the staff manual or the CWP website.

However, the need to protect Piping Plover nesting areas is directly related to the main threats to achieving the recovery goal of 2000 breeding pairs. These threats are (1) habitat loss, (2) increases in predator populations, (3) off-road vehicles on beaches, (4) erosion control practices, (5) human disturbance, and (6) over-harvesting of Horseshoe Crabs (*Limulus polyphemus*) (Mass Audubon Website 2003). It is conceivable that program goals could be established to address each of these threats, but I did not find any explicit goals pertaining to any of these threats. I found 14 "objectives for each site visit" described in the staff manual (Mass Audubon 2006:14). Logically, field staff would not be expected to implement actions linked to some of the threats, such as habitat loss, erosion control practices, and over-harvesting of Horseshoe Crabs. Those threats likely would be more appropriately dealt with through policy actions rather than any action that field staff would be expected to accomplish.

Field staff more appropriately dealt with potential predation of Piping Plovers, off-road vehicles on beaches, and other kinds of human disturbance. The need to prevent predation arose from assumptions about predator-prey relationships (e.g., Berryman 1992). The basic concept is that if predation is an additive form of mortality, reducing that mortality should result in an increasing population of Piping Plovers.

Both the use of off-road vehicles and disturbance by beachgoers as threats to Piping Plovers suggest the need to understand and prevent certain forms of human behavior. A useful social science theory pertaining to understanding and altering human behavior is the Theory of Planned Behavior (TPB), first proposed by Ajzen (1991, 2002, also see Bamberg et al. 2003). TPB states that a person's specific, future behavior can be predicted best from his/her intention

to engage in that behavior (Figure 1). Behavioral intention is influenced by a combination of attitude toward the behavior as well as subjective norms pertaining to the behavior and perceived behavioral control over the behavior (Bright and Manfredo 1996; Rossi and Armstrong 2000). Furthermore, a person's past behavior can influence any of these latter 3 components.

Attitude toward a behavior refers to the degree to which a person has a favorable or unfavorable evaluation of that behavior (Pierce et al. 2001). Attitudes can both predict and influence behavior if attitudes about specific referents are directly linked to specific behaviors. "Short-term behavior change will not usually become permanent unless underlying attitudes and beliefs change" (Pierce et al. 2001:42).

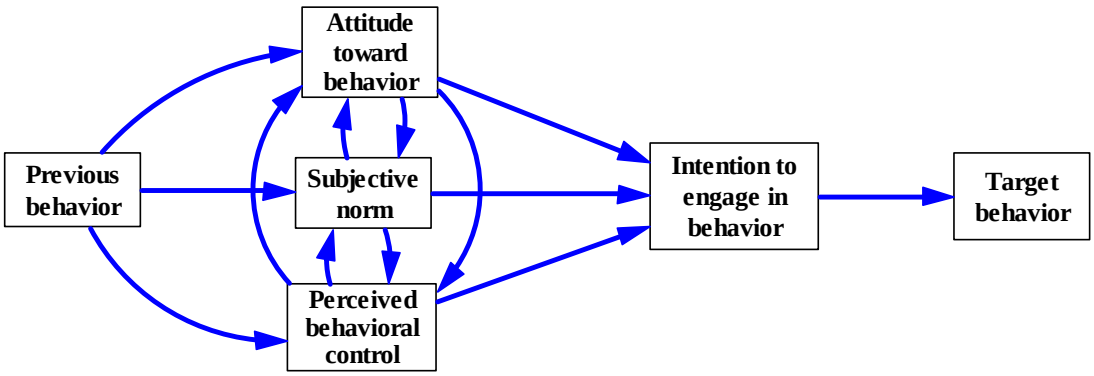

Figure 1. General relationships in the Theory of Planned Behavior, showing factors affecting long-term, sustained behaviors (adapted from Rossi and Armstrong 2000).

Subjective norms are perceived social pressures that encourage or discourage the performance of a certain behavior (Ajzen 1991). Norms can directly influence behavior if one understands the range of tolerable behaviors, acceptable intensity of behaviors, and amount of societal agreement about what is acceptable. Norms also can be used to predict behavior, if one

investigates what people believe others think they should do. According to Pierce et al. (2001:45), "making people aware of the norms for a situation can affect their actions...That approach has been applied in studies attempting to influence negative behaviors." For example, pointing out the presence of litter can affect their own littering behavior (Cialdini et al. 1990).

Perceived behavioral control is the perceived degree of difficulty in performing a behavior (Ajzen 1991). Factors that might influence this perception include: available time, money, other material resources, permission from superiors, skill, and expected cooperation from others. Perceived behavioral control is a formal category of constraint that is included in the TPB to recognize that constraints can limit participation in a behavior even when attitudes toward the behavior are positive.

Application of Theory of Planned Behavior to the Coastal Waterbird Program:

A major unstated assumption of the CWP is that the public is largely unaware of either the conservation needs of Piping Plovers or that their own behaviors might disturb the birds. Thus, prevention of potentially disturbing behaviors by the public could be accomplished through either passive or active approaches (refer to page 13 for definitions of these approaches). However, sustained, long-term cessation of potentially disturbing behaviors on the part of the public will require that the public develops a negative attitude toward disturbance of Piping Plovers and an associated positive attitude toward Piping Plover conservation (Figure 2). Additionally, development of appropriate attitudes will be most likely if the public believes that disturbance is socially unacceptable (social norms), that changing their (disturbing) behavior is within their own control (perceived behavioral control), and that some of their behaviors have negative conservation consequences (cognitive evaluative beliefs).

In the context of the CWP, existing passive and active forms of staff communication with the public provide opportunities for the development of positive attitudes toward plover conservation and subsequent behavior change. TPB provides a tool for evaluating the adequacy of these passive and active staff implementation actions (see Program Design Evaluation for more details, p. 14). Briefly, passive approaches always will be necessary to prevent disturbance when staff cannot be present, and active approaches involving staff "reacting" to some immediate threat also will be required to keep disturbance and mortality to a minimum. However, TPB posits that passive and reactive actions on the part of staff will be insufficient by themselves to protect the birds in the long-term. 4

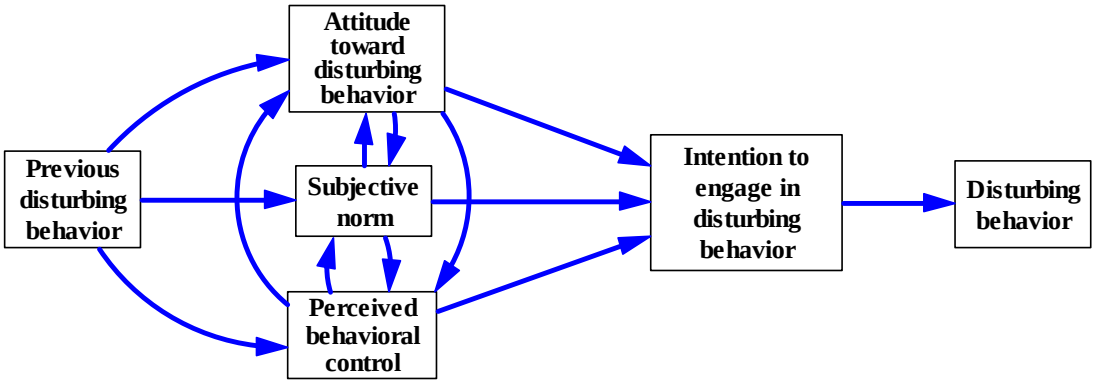

Figure 2. Application of the Theory of Planned Behavior to the notion of the Coastal Waterbird Program preventing behaviors by the public that may be potentially disturbing to Piping Plovers.

Several reasons may exist for this insufficiency. First, passive actions may not convey enough information to change public behaviors, especially if they are used to behaving in a certain way and derive enjoyment from it (e.g., walking dogs on beaches). Second, reactive

interactions with the public often result from the need to prevent an immediate threat, and the most important outcome is to prevent the behavior, not to develop more positive attitudes toward Piping Plover conservation. In my experience, these reactive interactions sometimes resulted in negative attitudes toward the attitudes because the focus was on stopping a person's behavior, not taking the time to put the behavior in the context of conservation.

As noted previously, sustained, long-term behavior change on the part of the public will require the development of an understanding that some of their behaviors may be potentially disturbing and that Piping Plovers need protection from that disturbance. To accomplish sustained behavior change likely will require staff to proactively engage the public. Therefore, one of the greatest needs relative to evaluating the CWP is to assess staff's intention to engage the public proactively in addition to reactively and passively. The TPB thus provides both a foundation for designing implementation actions with respect to changing or preventing potentially disturbing behaviors by the public, and also can be used to understand and reinforce the most useful proactive behaviors of staff in terms of their interactions with the public (Figure 3). Whereas evaluating the public's attitudes and behaviors is beyond the scope of my research, application of the TPB with respect to staff's attitudes toward, and intentions to, engage the public proactively to prevent plover disturbance is a main focus of my evaluation research.

Program Design Evaluation

Evaluation of the Coastal Waterbird Program Staff Manual:

The most detailed description of the design of the CWP I had available to me was the staff training manual (Mass Audubon 2006). The role of staff members is described on the welcome page: "By acting as field biologists, collecting data, and recording behavioral

observations, and as educators to the public, you will play an important part in the continued breeding success of these [bird] species" (Mass Audubon 2006:2). Clearly indicated are implementation actions focused on monitoring birds and broadly interacting with the public (i.e., "as educators to the public"). This brief description is augmented in later sections describing in more detail the various actions intended to minimize disturbance of the birds.

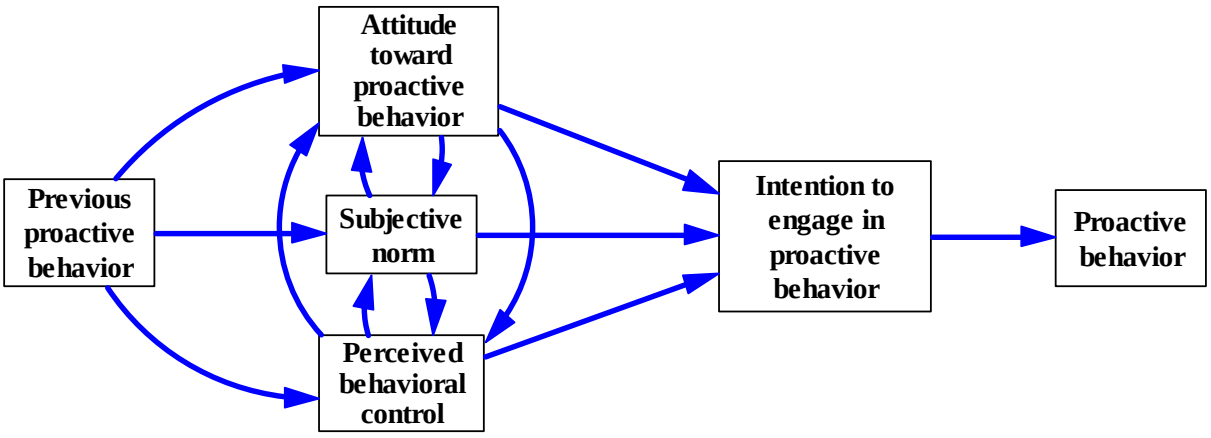

Figure 3. Application of Theory of Planned Behavior to the notion of staff from Massachusetts Audubon's Coastal Waterbird Program proactively engaging the public in an effort to prevent behaviors by the public that are potentially disturbing to Piping Plovers on beaches.

Following the welcome is an overview of the Coastal Waterbird Program detailing the logistics and structure of the CWP (Mass Audubon 2006:4). Included here is the history of the CWP, the management need, and the extent of the CWP's jurisdiction on the Massachusetts coast. Also included is this description of staff tasks: "monitor colonies, protect nests from potential threats, disseminate educational material, and conduct ecological research…erect fences and patrol nesting areas, construct tern nest boxes, carry tern decoys, and act as the program's advocates at town meetings" (Mass Audubon 2006:4). Appropriately brief for an

overview, this description explicitly mentions monitoring actions, passive actions (e.g., erect fences), at least the possibility of reactive actions (e.g., protect nests from potential threats, patrol nesting areas), and proactive actions (e.g., disseminate educational material, act as the program's advocates at town meetings).

Next, the manual includes 2 sections on the Piping Plover, one regarding its natural history and another concerning locating its nest, eggs, and chicks in the field. The natural history section (Section 1) contains this description of the Atlantic Coast Population recovery goal: "This population increased from 790 in 1986 to 1,668 pairs in 2004, for which the recovery goal is 2,000" (Mass Audubon 2006:5). This section also details the historical and modern causes of nest loss, including those attributed to human disturbance: "the abandonment of nests from *recreational disturbance*, the crushing of nests by *off-road vehicles*, and the death of eggs by the sun when unleashed dogs or beach goers disturb the adult plovers for prolonged periods during incubation…" (Mass Audubon 2006:7, emphasis in original).

Section 2 especially pertains to implementation actions to be carried out by field staff. The first several pages describe how to locate a Piping Plover or its nest, how to mark and monitor nests, how to calculate expected hatch date, and how to monitor chicks and fledglings. At the end of Section 2 is a list of 14 relatively specific "objectives for each site visit" (Mass Audubon 2006:14). Here, "site" refers to each beach visited to locate and monitor plovers. I categorized each of these objectives according to the framework of activities I described earlier: monitoring activities, passive disturbance-prevention-activities, reactive disturbance-prevention-activities, or proactive disturbance-prevention-activities (Table 1). Most (57%) were categorized as monitoring. Among the actions involving staff-public interactions, 36% were reactive and 7% (1 objective) were proactive. Based on this document analysis, the focus of much of the staff-

Table 1. Specific implementation actions listed in the staff training manual for Mass Audubon's Coastal Waterbird Program, categorized by type of action, compared with six types of threats to Piping Plovers that are surrogate objectives for the program.

Type of Action	*Action Listed as Objectives for Each Site Visit in Staff Training Manual*	*Threat Addressed*[1]
Monitoring	On foot, cover as much of the nesting habitat as possible.	none
Monitoring	Locate new plover and oystercatcher pairs/nests	none
Passive	Make sure plovers, oystercatchers and terns are adequately protected by signage and roping.	3, 5
Monitoring	Locate and plot on master map all nest locations and sightings of plovers, oystercatchers and terns.	none
Monitoring	Conduct exact counts of plover and oystercatcher chicks and identify by pair number.	none
Passive	Check and maintain all symbolic fencing and exclosures. Make sure that they are neat and secure.	2, 3, 5
Monitoring	As time allows, spend approximately an hour observing an individual pair with chicks to document foraging habitats and reaction to disturbance.	none
Monitoring	Fill out information on all CWP forms: Daily Observation Forms, Nest Attempt Summaries and Nest Loss Forms. Please use pencil. Sample forms are found in the back of the manual.	none
Monitoring and Reactive	Document (camera, video, and/or notes) any type of disturbance to the birds, their nests or eggs. Try to prevent such disturbance before it happens.	3, 5
Reactive	On holidays or other particularly busy days (especially in hot weather), "baby sit" the group to intervene if necessary. ***If you see anything that you feel may be substantially increasing the threat of nest/chick loss*, i.e. beach raking, vehicular driving or kite surfing, *contact your supervisor*** (emphasis in original).	3, 5
Reactive	If you witness flagrant violation, call the local beach management and/or the CWP staff. If someone has destroyed a plover nest, egg, chick, or adult, **call your supervisor immediately** (emphasis in original).	3, 5
Reactive	Approach people with dogs and inform them that dogs must be leashed and kept out of habitat areas where plovers are nesting. Check with CWP staff as to town or private beach regulations regarding dogs on the beaches where plovers are present.	3, 5
Proactive	Show beachgoers the birds and explain the importance of protection. Be available to answer questions about plovers and the Coastal Waterbird Program. Carry CWP brochures and postcards to hand out to the public.	3, 5

[1] Threats: (1) habitat loss, (2) increases in predator populations, (3) off-road vehicles on beaches, (4) erosion control practices, (5) human disturbance, and (6) over-harvesting of Horseshoe Crabs.

public interaction is reactive, perhaps because of the need to ensure imminent danger to Piping Plovers is averted whenever possible. I also found that each of these actions were linked to preventing potentially disturbing public behavior through some physical means or by simply asking the public to cease their behavior.

Also presented at the end of Section 2 in the training manual is a "Field Equipment Checklist" containing both useful personal items and field equipment recommended for site visits (Mass Audubon 2006:15). Personal items pertain to individual safety and comfort of the staff facing long hours out in various kinds of weather. The 17 pieces of equipment listed pertain to monitoring (53%), reactive activities (24%), passive disturbance-prevention-activities (18%), or proactive activities (6%). Only one of the 17 items, literature on Piping Plovers and terns, would be particularly useful for engaging the public proactively (Mass Audubon 2006:15).

Section 3, "Signage and Exclosures," describes the purpose, maintenance, and correct placement of symbolic fencing and predator exclosures. Described are detailed, step-by-step instructions on building predator exclosures, differentiating among several locations in Massachusetts where differing diameters and materials are required to prevent the most common specific type of predation (Mass Audubon 2006:17-18). Signage, fencing, and exclosures are passive disturbance-prevention-methods, and erecting and maintaining these structures sometimes requires a great amount of time on the part of staff to address.

Section 4, "Predation and Predators," describes actions to be taken in the event of nest abandonment or missing eggs, as well as behaviors of common predators of terns and Piping Plovers. The section describes possible causes of abandonment and missing eggs, instructions on how to document the loss, a list of common predators of coastal Massachusetts, and a collection of general tips on how to identify the type of predator involved in the predation event.

Also included are two pages describing the tracks, habits, and mode of egg consumption of ten common predators to aid in their identification as the egg predator, and brief instructions on how to prevent and react to an exclosure failure (Mass Audubon 2006:19-24).

The next several sections detail the natural history of the various species that field staff are to monitor. Section 5 pertains to Common, Roseate, Arctic, and Least Terns. Section 6 describes the natural history of American Oystercatchers. Section 7 details the management history of the Least Tern and Piping Plover in Massachusetts, including steps taken over the years by state agencies and non-government organizations to protect and manage both species.

Section 8, entitled "Terns, Plovers and the Law," summarizes the federal, state, and local laws that pertain to the conservation of Piping Plovers and terns. This section directly informs the design of some reactive interactions between staff and the public, as it details behaviors that are illegal concerning the disturbance of protected species, what laws are violated by public disturbance of these birds, and what actions can be taken following a disturbance. Laws pertaining to the conservation of the species under CWP protection are the Massachusetts Wetlands Protection Act (MGL, Chapter 131, §40), the Federal Endangered Species Act of 1973 (Federal ESA), the Massachusetts Endangered Species Act (MGL, Chapter 131A), and the Migratory Bird Treaty Act (18 USC 703-712). Section 8 of the manual also describes how to document evidence and interact with law enforcement officials. This section concludes with a list of "Enforcement Contacts" such as the local USFWS Special Agent and Environmental Police.

This section pertaining to pertinent laws, specifically actions associated with enforcement of laws, provides a useful focus for the design of reactive interactions with the public – those aimed at preventing an imminent human threat to the protected species. Information in the

section is less useful as a foundation for the design of proactive interactions with the public. Indeed, in its current form, the program design seems to lack information about the benefits of, and the methods for, communicating with the public before they engage in potentially disturbing behaviors.

Program Design as a Specific Form of Natural Resource Decision-making:

Decision-making in any natural resource context is a dynamic process involving continuous consideration of questions like "what is the right thing to do" and "how can it best be accomplished" (Decker et al. 2001). One of the most important decisions with respect to the CWP is how to design the most effective program. Decker et al (2001) described natural resource decision-making as a cyclical process containing interdependent components that provide a useful framework for informing program design. The process starts with a broad, overarching policy. The broad policy guiding the CWP is described in its mission statement: "the protection of the entire coastal ecosystem [of Massachusetts] in as natural a state as possible" (Mass Audubon Website 2003). This broad policy then can help inform development of goals for the program (Decker et al. 2001:78), which I did not find explicitly stated in the documents I examined.

According to Decker et al., specific program policies provide administrative guidelines about why a program might be needed, and emerge from the broad goals. In the context of the CWP, the "primary objective" of protecting the breeding habitat of Piping Plovers and terns in Massachusetts (Mass Audubon Website 2003) can be considered a specific policy. A second specific policy relates to the "most critical management need" identified on the Mass Audubon website, which is to "reduce human disturbance of nesting and fledgling birds" (Mass Audubon Website 2003).

It is at this point in the decision-making process where program designers can benefit from considering appropriate ecological and social science theories on which to base the program. As noted previously, the CWP seems to appropriately build on ecological theory regarding predator-prey relations. My evaluation findings are that the Theory of Planned Behavior is an appropriate social science theory, especially related to public behaviors as well as staff behaviors. By explicitly acknowledging the theoretical foundations for the program design, specific measurable objectives can be developed.

These measurable objectives, emerging from the specific policies and theoretical foundation, define how the goals will be accomplished within an expected time frame (Decker et al. 2001:82). I interpreted the CWP's "recovery goal" of 2000 breeding pairs for the Atlantic Coast population of Piping Plovers as an objective. However, measurable objectives pertaining to habitat protection or prevention of human disturbance are not specified.

Even when measurable objectives are explicitly stated, achievement of those objectives can be hindered by various challenges, or can be enhanced if opportunities are known (Decker et al. 2001). Some potential challenges identified in the CWP documents relate to the 6 specified threats to Piping Plovers: habitat loss, erosion control practices, human disturbance, off-road vehicles, the increase in non-native predators, and the decline in Horseshoe Crabs (Mass Audubon 2006). It seems clear that CWP designers recognized these threats as potential problems negatively affecting the achievement of unstated objectives because many of the designed actions focus on addressing them. However, I did not find mention of opportunities that might be taken advantage of to achieve program objectives. One potential opportunity could be to change the attitudes that underlie public behaviors that disturb these birds. Development of more positive attitudes toward Piping Plovers and their conservation likely would result in fewer

disturbing behaviors in the future. Many of the program's actions seem directed at short-term disturbance prevention rather than long-term solutions; reactive interactions stop the behavior today, but it will likely occur again tomorrow.

In the decision-making model described by Decker et al. (2001), actions to be implemented in a program should pertain to the measurable objectives. Implementation actions are the operational nuts and bolts of any program. They describe what staff are expected to do and how they should do it. In the context of the CWP, the 14 "objectives for each site visit" described in the staff manual (Mass Audubon 2006) are the most clearly described implementation actions for staff. As noted previously, some of these actions describe very clearly how staff are to accomplish monitoring efforts. Other actions describe what staff should do to react to imminent threats of disturbance from the public. What seem to be lacking from this list are actions that have the greatest likelihood of reducing public disturbance in the long-term, namely proactive actions like education about the birds and their conservation needs. These proactive actions would be the operational guidelines for how to prevent the negative behaviors in the first place instead of having to react to them.

According to Decker et al. (2001), specific program actions undertaken result in a response. In relation to the CWP, the response is most likely to be seen in the increase or decrease in the population of Piping Plovers and terns in Massachusetts or other variable relative to population such as the rate of successful fledging. Evaluation tasks can, among other things, document the success or failure of program actions (Decker et al. 2001), and are an important part of program design, as noted previously. During the peak of the breeding season, the CWP undertakes censuses of Piping Plovers and terns in Massachusetts in coordination with other state and local agencies to determine the total number of nesting birds in the state. These numbers are

then added to those gathered along the East Coast, and contribute to the final estimate of the Atlantic Coast breeding population of these birds. This population census is one evaluation action within the CWP. This census also is an example of a research action, which, according to Decker et al.'s (2001) decision-making model, informs many other decisions in the cycle.

Other research projects focus on the ecology of Piping Plovers (USFWS 1996). These data, in conjunction with the information on breeding shorebirds gathered over the 100 years that the Massachusetts Audubon Society has been established, contribute to the information base available for program design. This information base informs many of the components of Decker et al.'s (2001) decision-making model. For example, it helps determine the feasibility of objectives and provides information that aids in the identification of opportunities or challenges to the accomplishment of objectives. The CWP is fortunate to have such an extensive information base available and the opportunity to continue to increase its breadth with every research project undertaken.

Program Implementation Evaluation

Qualitative findings and insights about program implementation emerged from my own experiences as a CWP field intern in 2006 and informal interviews with another CWP intern.

The formal training I received at the beginning of the field season followed the staff manual closely. The training placed the same amount of emphasis on reactive and monitoring actions as the manual, and was helpful as an overview of the resources and people that were at the disposal of the staff in performing their duties. Very little was mentioned on the topic of proactive or educational activities, as was the case with the staff manual. Most of the information presented dealt with handling emergencies where the individual staff member

required support from their supervisor or law enforcement. These situations, although predicted to be rare, merited emphasis during the training because training was the only time during the summer that all staff members could review emergency procedures together. The overall understanding was that most site-specific training would be provided by seasoned field staff, a supervisor, or a more experienced field partner, and through trial-and-error in the field.

My day-to-day field experiences generally followed what was verbally described to me by my supervisor at the time of my arrival in Massachusetts. The 14 objectives for each site visit described in the staff manual did indeed provide a general outline for tasks that were completed daily. But priorities changed weekly, and daily tasks oftentimes reflected the current priority, as was the case with Fourth of July, when the focus shifted from monitoring the birds to erecting additional fencing and constructing reinforced barriers to prevent the additional number of beachgoers from overflowing into nesting areas.

The construction and maintenance of symbolic fencing, post-and-string fencing placed around breeding areas of terns and Piping Plovers to exclude the public, was a large part of the daily responsibilities of the CWP staff. As new nests were discovered and storms washed away posts, fences had to be extended and repaired. Other than weather, humans were a major cause of fence destruction. Perhaps as a result of what the public perceived as restrictions placed upon their summer enjoyment, these physical representations of Piping Plover conservation often bore the brunt of beachgoers' frustrations. Signs and fencing were often broken, removed, or burned, and the ropes joining them cut. Often, staff would spend several hours repairing and replacing fencing on beaches, especially following high-traffic weekends and holidays, as these physical barriers were the only structures standing between the public and fragile breeding habitat.

CWP staff often dealt with situations of nest predation. The increased number of non-native predators are one of the primary threats to Piping Plovers. Predators are dealt with most commonly by enclosing nests that are particularly at-risk to predation. "Predator exclosures," or "exclosures," were generally circles of large-gauge chicken wire placed around a nest and buried 6 inches deep. The holes in the fence were large enough for adult Piping Plovers to pass through, and the only predators able to enter were snakes, which were uncommon. Exclosures could be tailored to specific predators; for foxes and coyotes, "wings" were placed perpendicular to the exclosure to prevent the circling behaviors exhibited by these animals; netting could be added to the top of the exclosure to discourage aerial predation from owls, hawks, and crows. By law, these exclosures must be built and in place in under twenty minutes to minimize the stress on the flushed adult birds.

Inevitably, confrontations between staff members and the public would escalate to the point where third-party intervention was necessary. While each staff member was briefed during training on the laws and regulations governing Piping Plover conservation, the default option when faced with a confrontational beachgoer was to call a supervisor. In the interim, staff were instructed to emphasize how a beachgoer's actions were opposed to conservation efforts, and to reserve talk of regulatory violations for especially belligerent individuals or serious offenses, and then if at all possible in the company of a supervisor or law enforcement official. Although rare, serious offenses by the public that required the help of law enforcement did occur during the 2006 season.

During the summer I was employed with the CWP, I attempted to collect every article published in the local newspaper pertaining to Piping Plovers. Nine articles about Piping Plovers were written in the *Cape Cod Times* between the last week of May and the first week of August

2006. Of the nine, four were in defense of the birds, but were most often small opinion pieces inside the newspaper. Another four articles were front-page, full-color stories detailing restrictions placed on beaches where the birds nested. One article was informational and did not present an opinion on the situation. Taken together, these articles presented both sides of what becomes a local controversy every summer when popular beaches are inevitably closed to recreational vehicles or to the public entirely. This past summer, when officials in Orleans County restricted access to a large section of the Cape Cod National Seashore to protect two nesting pairs of Piping Plovers, residents and tourists made their opinions known. One recreational-vehicle owner proclaimed the closure "environmentalism run amok" (Lord 2006).

Over time, repeated occurrence of negative articles could contribute to a negative attitude toward CWP staff and Piping Plover conservation (Gore et al. 2005). Members of the public may perceive the birds as nuisances, without ever disturbing, or even encountering, a bird themselves. My experience as staff member interacting with the public on these beaches was that the media played a large role in public perceptions of Piping Plovers and any actions taken toward their conservation. The fact that the public may be predisposed to having a negative attitude toward Piping Plovers is indeed a daunting concept. Thus, actions must be taken to counteract negative behaviors, such as the use of proactive actions by the CWP.

Because CWP sites varied among locations, I conducted interviews with another intern to gain insight into how implementation actions may have differed. My interviews revealed that varying amounts of emphasis were placed on the use of proactive actions to protect Piping Plovers, and that there may have been alternate interpretations about what constituted a proactive action. Furthermore, she stated that although she knew that beachgoer education was part of her

responsibilities, monitoring activities took priority, and education was often the first activity to be skipped in favor of more "direct" disturbance prevention methods (reactive actions).

Program Outcome Evaluation

Program outcome evaluation was beyond the scope of my research.

CHAPTER 4: RESULTS FROM THE MAIL SURVEY

Application of the Theory of Planned Behavior to staff-public interactions in the context of Massachusetts Audubon's Coastal Waterbird Program[2]

Introduction

The Massachusetts Audubon Society (Mass Audubon) initiated a Coastal Waterbird Program (CWP) in 1987 (Mass Audubon 2006) to address natural and human-caused threats to nesting and fledging success of several rare or imperiled bird species, including Piping Plover (*Charadrius melodus*), Least Tern (*Sterna antillarum*), Common Tern (*Sterna hirundo*), Roseate Tern (*Sterna dougallii*), and American Oystercatcher (*Haematopus palliatus*). These species nest in shallow depressions on flat stretches of beach, and compete for space with many thousands of beachgoers every summer. A clear need for conservation action exists for Piping Plovers, in particular, because Cape Cod accounts for one-third of the total breeding habitat for the Atlantic coast population of this species (Coastal Waterbird Program Website).

The most critical management need identified by Mass Audubon (2006) is to reduce human disturbance of nesting and fledgling birds. To meet this need, Mass Audubon hires

[2] This manuscript was co-authored with J. W. Enck, and will be submitted to Journal of Environmental Education following additional, preliminary review.

seasonal field staff each summer to implement CWP actions on mainland Massachusetts, along the north and south coasts of Cape Cod, and on Martha's Vineyard and other offshore islands (Mass Audubon 2006). During the 2006 breeding season (May through August), CWP staff included two full-time employees, and an additional ~30 seasonal staff comprised of about 25 nest monitors and five interns.

Since its creation in 1987, the CWP has implemented a variety of management actions to protect nesting birds and increase survival of chicks to fledging. Despite some success in fledging chicks of Piping Plovers, Least Terns, and other species of concern (Mass Audubon 2006), no formal evaluation had been conducted of the CWP as of 2006. This paper reports results from a survey of staff conducted as part of an evaluation focused largely on the design and implementation of the CWP.

Major threats identified by Mass Audubon to beach-nesting birds are: (1) habitat loss, (2) beach erosion, (3) over-harvesting of Horseshoe Crabs (*Limulus polyphemus*), (4) predation, (5) use of off-road vehicles on beaches, and (6) other forms of human disturbance (Mass Audubon Website 2003). The first three kinds of threats listed above are dealt with by CWP administrators through policy actions rather than actions to be implemented by field staff. Predation is addressed mostly through passive actions by staff – intended to be effective even in the absence of field staff – such as the use of exclosures. Use of off-road vehicles and other forms of disturbance by beachgoers as threats to protected bird species highlight the need for CWP staff to understand and prevent specific human behaviors.

A useful social science theory pertaining to understanding and altering human behavior is the Theory of Planned Behavior (TPB), first proposed by Ajzen (1991). The Theory of Planned Behavior states that a person's specific, future behavior can be predicted best from his/her

intention to engage in that behavior. Behavioral intention is influenced by a combination of attitude toward the behavior as well as subjective norms pertaining to the behavior and perceived behavioral control over the behavior (Bright and Manfredo 1996, Rossi and Armstrong 2000). Further, a person's past experience or behavior can influence any of these latter 3 components.

Attitude toward a behavior refers to the degree to which a person has a favorable or unfavorable evaluation of that behavior (Pierce et al. 2001). Attitudes can both predict and influence behavior if attitudes about specific referents are directly linked to specific behaviors. "Short-term behavior change will not usually become permanent unless underlying attitudes and beliefs change" (Pierce et al. 2001:42).

Subjective norms are perceived social pressures that encourage or discourage the performance of a certain behavior (Ajzen 1991). Norms can directly influence behavior if one understands the range of tolerable behaviors, acceptable intensity of behaviors, and amount of societal agreement about what is acceptable. Norms also can be used to predict behavior, if one investigates what people believe others think they should do. Perceived behavioral control is the perceived degree of difficulty in performing a behavior (Ajzen 1991). Factors that might influence this perception include: available time, money, other material resources, permission from superiors, skill, and expected cooperation from others. Perceived behavioral control is a formal category of constraint that is included in the TPB to recognize that constraints can limit participation in a behavior even when attitudes toward the behavior are positive.

Application of Theory of Planned Behavior to the Coastal Waterbird Program:

A major assumption is that the public largely is unaware of either the conservation needs of plovers or that their own behaviors might be disturbing to the birds. Thus, prevention of potentially disturbing behaviors by the public could be accomplished through either passive (i.e.,

in the absence of staff) or active approaches (i.e., involving direct staff-public interactions). However, sustained, long-term cessation of potentially disturbing behaviors on the part of the public will require that the public develops a negative attitude toward disturbance of protected birds and an associated positive attitude toward bird conservation (see Figure 2). Additionally, the public is most likely to develop appropriate attitudes if they believe that disturbance is socially unacceptable (social norms), that changing their (disturbing) behavior is within their own control (perceived behavioral control), and that some of their behaviors have negative conservation consequences (cognitive evaluative beliefs).

The Theory of Planned Behavior is a useful foundation for two reasons. First, it provides a basis for evaluating the adequacy of designed, passive and active actions to be implemented by staff. Briefly, passive approaches always will be necessary to prevent disturbance when staff cannot be present, and active approaches involving staff "reacting" to some immediate threat also will be required to keep disturbance and mortality to a minimum. In addition, TPB provides a basis for the development of proactive staff-public interactions aimed at altering the public's intention to engage in behaviors that are potentially disturbing to protected birds, because the combination of passive and reactive actions on the part of staff will be insufficient by themselves to protect the birds in the long-term.

Study Purpose and Objective:

The purposes of this study were to: (1) assess the degree to which CWP field staff interacted with the public in reactive and proactive ways with respect to preventing disturbance of protected bird species, and (2) determine the potential of having staff place greater emphasis on proactive interactions in an effort to change public attitudes and behaviors. My objectives were to: (1) determine the number and kinds of CWP staff-public interactions occurring on

beaches during the field season (June-July), (2) assess staff attitudes toward both reactive and proactive interactions with the public, and (3) determine the influence of social norms, perceived behavioral control, and past experience on those attitudes.

Methods

Sampling and Data Collection:

I assessed staff-public interactions and associated staff attitudes and beliefs with a self-administered, mail survey of persons who worked for the CWP during summer 2006 (Appendix A). First, I obtained from staff administrator Ellen Jedrey e-mail or telephone contact information for the 31 CWP staff. Twenty-five of these staff provided me with a mailing address, and I mailed a survey to all 25. I implemented the survey on 8 December 2006 by sending each staff member a cover letter and questionnaire. On 25 January 2007 I mailed nonrespondents a reminder letter.

The Cornell University Committee on Human Subjects reviewed the study protocol, and determined it to be except from the Federal Regulation for the Protection of Human Subjects (45 CFR 46). The Committee gave my study the protocol identification number: 06-11-057.

Measurement of Concepts in the Survey:

First, I segmented field staff and administrators using a single yes-no item: "Did you work as field staff of the Coastal Waterbird Program during June and July 2006?" Those who answered "no" (i.e., administrators) were instructed to skip questions concerning the number of direct interactions they had with beachgoers because their administrators' responses (i.e., 0s) would bias the results for field staff.

Behaviors and Behavioral Intentions. I determined the number of reactive staff-public interactions by asking staff how many times they had each of three types of interactions of increasing severity with the public on beaches during June and July 2006 (Table 2). I summed all three types to determine the total number of reactive interactions for each staff member. I assumed that all staff intended to have reactive staff-public interactions as many of the CWP implementation activities involved these kinds of interactions.

Table 2. Indices and individual items used to assess behaviors, attitudes, and beliefs of staff who worked for Massachusetts Audubon's Coastal Waterbird Program during summer 2006, regarding staff-public interactions, determined from a mail survey of all staff conducted in 2006.

Indices and items used for construction of each index	Range used for index construction	Reliability coefficient
Reactive staff-public behaviors	sum behaviors of the following three levels of severity	NA
(low severity) You had to ask a member of the public to stop doing a behavior that was potentially disturbing to plovers, without having to call for assistance	actual number	NA
(moderate) You needed to call your supervisor for assistance, per your training, to prevent a behavior potentially disturbing to plovers	actual number	NA
(high severity) You needed to call a law enforcement official (e.g., EPO, animal control, town police) in addition to your supervisor because of actions of a member of the public	actual number	NA
Proactive staff-public behaviors How many times did you talk to a member of the public on the beach about the need to prevent disturbance to plovers before they did something potentially disturbing?	actual number	NA
General attitude toward reactive behaviors (single item) Would you say your general attitude toward talking with members of the public about something they are doing that is potentially disturbing to plovers is positive, negative, or neither?	-3 to +3	NA

Table 2. Continued.

Indices and items used for construction of each index	Range used for index construction	Reliability coefficient
General attitude toward proactive behaviors (single item) Would you say your general attitude toward talking with members of the public about the need to prevent disturbance to plovers before they do something potentially disturbing is positive, negative, or neither?	-3 to +3	NA
Attitude index toward proactive behaviors (average of following three items) Do you approve or disapprove of talking with members of the public on the beach about the need to prevent disturbance of plovers, before they do something potentially disturbing? Do you think the idea of talking with members of the public on the beach about the need to prevent disturbance of plovers, before they do something potentially disturbing is a good idea or a bad idea? Do you like or dislike the prospect of talking with members of the public on the beach about the need to prevent disturbance of plovers, before they do something potentially disturbing?	-3 to +3	0.797
Importance of proactively engaging the public (single item) How important is it to you personally to talk with members of the public on the beach about the need to prevent disturbance of Piping Plovers before they did something potentially disturbing to plovers?	0 to 3	NA
Social norms about proactively engaging the public (single item) To what extent do you agree or disagree that it is socially acceptable for you to talk about the need for plovers to be protected from disturbance with members of the public before they do something that is potentially disturbing to plovers?	-2 to +2	NA

Table 2. Continued.

Indices and items used for construction of each index	Range used for index construction	Reliability coefficient
Perceived behavioral control (three separate items)	-2 to +2	-0.155
To what extent do you agree or disagree that you could decide to talk with members of the public on the beach about the need to prevent plover disturbance before they did something potentially disturbing to plovers?		
To what extent do you agree or disagree that you have the ecological knowledge to talk with members of the public about the need to prevent plover disturbance?		
To what extent do you agree or disagree that you have the appropriate temperament to talk with members of the public about the need to prevent disturbance of plovers before they do something potentially disturbing?		
Evaluative beliefs about possible outcomes of staff-public interactions		
Strength of proactive beliefs More likely if I talk with them AFTER they disturb plovers (-1) Not a likely outcome (-1) Not sure (0) More likely if I talk with them BEFORE they disturb plovers (1) Equally likely BEFORE or AFTER disturbing plovers (1)	-1 to +1	NA
Strength of reactive beliefs (reversed coding from above)	-1 to +2	NA

Table 2. Continued.

Indices and items used for construction of each index	Range used for index construction	Reliability coefficient
Evaluations of outcomes	-2 to +2	NA
If any of the following outcomes of your interaction with the public happened, would it be good or bad?		
person will comply with CWP signs and fencing the next time they encounter these barriers		
you will have less time to complete your daily work responsibilities		
you will experience fewer confrontational interactions in the future in which you have to call your supervisor or law enforcement		
person will repeatedly disturb plovers in an attempt to get them to leave that area of the beach permanently		
person will say something supportive of your efforts to prevent disturbance of plovers		
person will say something sarcastic about plovers or otherwise un-supportive of your efforts, but will not express anger toward your efforts		
person will express anger toward beach restrictions aimed at protecting plovers from disturbance		
person will have a more positive attitude toward plover conservation		

Table 2. Continued.

Indices and items used for construction of each index	Range used for index construction	Reliability coefficient
person will have a more negative attitude toward plover conservation		
your job morale will improve		
you will have fewer interactions in the future in which you have to talk to members of the public after you see them disturbing plovers		
Belief index (sum of products of beliefs [-3 to +3] about 11 items listed above, times evaluations [-3 to +3] of those 11 items)		
For reactive behaviors	-25 to +13 for reactive	NA
For proactive behaviors	-14 to +14 for proactive	NA

To determine the number of proactive staff-public interactions, I first asked staff to indicate "yes" or "no" to the question: "During June and July, 2006, did you ever talk to a member of the public on the beach about the need to prevent disturbance to plovers before they did something potentially disturbing?" If they answered "yes," I asked them to indicate how many times (Table 2). If they responded "no," I assessed their behavioral intention to have proactive interactions by asking them the yes-no follow-up question: "Would you do so in the future if you had the opportunity?"

Attitudes toward reactive and proactive staff-public interactions. I assessed staff's general attitude about reactive staff-public interactions using a single, 7-point, bipolar scale ranging from "extremely negative" to "extremely positive," with "neither" as the center choice (Table 1). I used a similar item to assess staff's general attitude toward proactive staff-public interactions. Because single attitude items sometimes can be unreliable (Fishbein 1980), I also developed an attitude scale using 3 additional, 7-point, bipolar items (Table 2).

Beliefs about proactive staff-public interactions. I determined staff's perceptions of the importance of proactive interactions, social norms about these interactions, their perceived behavioral control to engage in the public proactively, and evaluative beliefs about possible outcomes of such interactions. I used a single, 4-point, unipolar item to determine importance, with response categories ranging from "not at all important" to "very important" (Table 2). I assessed social norms using the single, 5-point, bipolar item, with response categories ranging from "strongly agree" to "strongly disagree," with "neither" as the center response category. To assess perceived behavioral control, I used 3, 5-point, bipolar items (Table 2).

I determined evaluative beliefs (Fishbein 1980) about possible outcomes of engaging the public either reactively or proactively through a series of 11 items based on issues I became

aware of during my participation as a CWP intern during the summer of 2006. First, I asked if each possible outcome was more likely with a reactive interaction, a proactive interaction, equally likely, or if staff was unsure (belief strength). Then in a second question, I asked staff to evaluation each possible outcome from on a 5-point, bipolar scale from "extremely bad" to "extremely good," with "neutral" as the center point (outcome evaluation). When assessing beliefs toward proactive interactions, I coded the responses "more likely with proactive" and "equally likely" as 1 and "more likely with reactive" and "not likely" as -1. I reversed these codes when assessing evaluative beliefs about reactive interactions. An "unsure" response was coded as 0. Finally, I developed a belief evaluation index by multiplying belief strength by outcome evaluation for each possible outcome (Bright and Manfredo 1996).

For each respondent, the belief evaluation index for each possible outcome of a proactive interaction could be either positive or negative because of the manner in which the index is created by multiplying potentially positive and negative variables. A positive index for outcomes associated with a proactive interaction resulted if (1) the respondent agreed the outcome would result from a proactive interaction and would be good, or (2) if the possible outcome would be bad but the respondent disagreed that it would result from a proactive interaction. A negative index resulted if (1) the respondent believed the impact would be bad and agreed it would result from a proactive interaction, or (2) if the respondent disagreed that a good impact would result from a proactive interaction. These interpretations also apply for evaluative beliefs associated with reactive staff-public interactions.

Data Analysis:

I analyzed all survey data using SPSS-X (Version 15.0). As this was a census of the relatively few staff of the CWP during summer 2006, statistical comparisons (e.g., t-tests or Chi-

square tests) using significance thresholds (i.e., confidence levels) are not appropriate. When reporting averages for particular variables, I use median value, rather than mean, because the mean is particularly vulnerable to bias from respondents with extreme values.

Results

Of the 25 CWP staff for which I had mailing addresses, 20 responded, resulting in a response rate of 80%. Four respondents were administrators, and the other 16 were field staff whose duties included interacting with the public on beaches occupied by protected birds.

Behaviors:

Staff (excluding administrators) reported a median of 7.5 total reactive staff-public interactions during June-July 2006 (range = 1-40). The vast majority of those reactive interactions were of low severity (median = 7.5, range 1-25), with only a few of moderate severity (median = 1.0, range = 0-15) and high severity (median = 0.0, range = 0-10). All staff also engaged in proactive staff-public interactions (range = 1-35), but averaged fewer proactive interactions on average (median = 5.0) than reactive interactions. Indeed, most staff (60%) reported more reactive than proactive interactions. However, 33% reported more proactive interactions, and 7% reported the same number of reactive and proactive interactions. Given that all field staff engaged in $\geq$1 proactive interaction with the public, we assume all would intend to do so again in the future (i.e., all have a positive behavioral intention).

Attitudes:

Findings for field staff (n = 16) and administrators (n = 4) are aggregated for this and subsequent sections for several reasons. First, whereas behaviors (i.e., staff-public interactions) could be expected to differ substantially between field staff and administrators, there is no *a*

priori reason to expect differences in their attitudes toward reactive or proactive interactions with the public. Second, reporting findings for the few administrators in the census potentially could violate confidentiality obligations. Also, preliminary analysis of the attitude data for both field staff and administrators revealed that attitudes of administrators fell well within the range of attitudes reported by field staff. Thus, aggregating administrators and field staff increases the size of the data set without introducing bias in the results.

On average, staff had positive general attitudes toward both reactive (median = 2.0) and proactive (median = 2.0) interactions. More staff held negative attitudes toward reactive interactions (23%) than proactive interactions (10%), with 12% being neutral toward reactive and 15% neutral toward proactive interactions. Three attitudinal groups of staff existed, with 41% reporting no difference in their attitude toward reactive vs. proactive interactions, 23% reporting more positive attitudes toward reactive interactions, and 36% reporting more positive general attitudes toward proactive interactions.

The three-item proactive attitude scale produced slightly different results from the single-item about general attitude toward proactive interactions. Only 5% of staff (one person) had a negative index toward proactive interactions, 10% had a neutral index, and the remainder had positive indexes.

Beliefs:

Importance of proactive interactions. The vast majority of staff believed that proactive interactions with the public were very (55%) or moderately (20%) important. Only 15% believed proactive interactions were not important at all.

Social norms. Most staff (55%) agreed that talking with members of the public before they engage in a behavior that is potentially disturbing to protected birds is socially acceptable

(40% strongly agree). Fifteen percent neither agreed nor disagreed that proactive interactions were socially acceptable, and 10% disagreed.

Perceived behavioral control. The three items I used to develop an index to perceived behavioral control produced an unreliable Cronbach's alpha (-0.155) due to negative average covariances among items. Removing the question about personal temperament from the scale only improved Cronbach's alpha to 0.434, and resulted in the highest scale variance. Therefore, I present results for each item individually, rather than averaging them into a single index.

A large majority (90%) of staff believed they could decide to engage the public proactively (only 5% disagreed that they could decide). Similarly, 95% believed they have the ecological knowledge to talk with the public about the need for conservation of protected birds before the public does something potentially disturbing to the birds (the other 5% was neutral). Finally, 90% of staff believed they have the personal temperament to engage the public proactively (10% were neutral).

The greatest constraint in terms of perceived behavioral control items seems to be staff's beliefs about whether they can decide to engage the public proactively (Table 3). Ten percent of staff believed they could not decide on their own to engage the public reactively, and 5% expressed neutral beliefs, probably indicating uncertainty. Neither lack of ecological knowledge nor poor temperament seems to be behavioral constraints with respect to proactive staff-public interactions. Most staff (70%) reported entirely positive perceptions about behavioral controls.

Evaluative Beliefs:

Overall, 78% of staff held negative evaluative beliefs about the possible outcomes of reactive staff-public interactions, whereas 63% held positive evaluative beliefs about possible outcomes of proactive interactions. Conversely, 22% held positive beliefs about outcomes of

Table 3. Relationships among three items representing possible perceived behavioral controls on staff with Massachusetts Audubon's Coastal Waterbird Program (CWP) engaging in proactive staff-public interactions to prevent public behaviors that are disturbing to protected bird species nesting on beaches, according to a mail census of CWP staff conducted in 2006.

Perceived behavioral controls			
Have ability to decide whether to engage public proactively	Have ecological knowledge to engage public proactively	Have temperament to successfully engage public proactively	Percent of staff with each perception
No	Neutral	Yes	5
	Yes	Yes	5
Neutral	Yes	Yes	5
Yes	Neutral	Yes	5
	Yes	Neutral	10
	Yes	Yes	70

reactive interactions, and 31% held negative beliefs about outcomes of proactive interactions. The mean evaluative belief products, which indicate both direction and strength of beliefs, were negative for nine of the eleven possible outcomes of reactive staff-public interactions (Table 4). Mean evaluative belief products were negative for only three of the same eleven possible outcomes of proactive staff-public interactions (Table 4), indicating that staff think more positive outcomes are possible, or negative outcomes less likely, with proactive interactions compared to reactive interactions.

Table 4. Evaluative beliefs held by staff of Massachusetts Audubon's Coastal Waterbird Program (CWP) regarding possible specific outcomes of REACTIVE staff-public interactions when the public already is doing something disturbing to protected bird species that nest on beaches, according to a mail census of CWP staff conducted in 2006.

Possible outcome of reactive interactions	Those with positive perception %	Of those with positive perceptions… Likely to occur, would be good %	Would be bad but is unlikely %	Those with neutral perception %	Those with negative perception %	Of those with negative perceptions… Likely to occur, would be bad %	Would be good but is unlikely %	Mean eval belief product[a]
Public will comply with signs and fencing next time they are seen	65	all	0	5	30	0	all	0.45
Staff will have less time to complete other duties	17	0	all	50	33	all	0	-0.78
Staff will have fewer confrontations with public requiring aid from superv. or law enforcement	15	all	0	15	70	0	all	-0.60
Public will repeatedly disturb plovers to get plovers to leave area	40	0	all	10	50	all	0	0.30
Person will express support of CWP efforts to prevent plover disturbance	35	all	0	10	55	0	all	-0.05

Table 4. Continued.

[a] Range = -6.00 to +6.00

Possible outcome of reactive interactions	Those with positive perception %	Of those with positive perceptions… Likely to occur, would be good %	Would be bad but is unlikely %	Those with neutral perception %	Those with negative perception %	Of those with negative perceptions… Likely to occur, would be bad %	Would be good but is unlikely %	Mean eval belief product[a]
Person will be sarcastic or un-supportive of CWP efforts, but will not express anger toward CWP	10	half	half	25	65	all	0	-1.65
Person will express anger toward beach restrictions to protect plovers	10	0	all	10	80	all	0	-2.50
Person will have more positive attitude toward plover conservation	25	25	0	10	65	0	65	-0.20
Person will have more more negative attitude re plover conservation	10	0	all	0	90	all	0	-2.80
Staff job morale will improve	20	all	0	30	50	0	all	-0.30
Staff will have fewer reactive interactions in the future	35	all	0	20	45	0	all	-0.25

[a] Range = -6.00 to +6.00

Table 5. Evaluative beliefs held by staff of Massachusetts Audubon's Coastal Waterbird Program (CWP) regarding possible specific outcomes of PROACTIVE staff-public interactions when the public has not yet done something disturbing to protected bird species that nest on beaches, according to a mail census of CWP staff conducted in 2006.

Possible outcome of proactive interactions	Those with positive perception %	Of those with positive perceptions… Likely to occur, would be good %	Would be bad but is unlikely %	Those with neutral perception %	Those with negative perception %	Of those with negative perceptions… Likely to occur, would be bad %	Would be good but is unlikely %	Mean eval belief product
Public will comply with signs and fencing next time they are seen	75	all	0	5	20	0	all	0.90
Staff will have less time to complete other duties	10	0	all	45	35	all	0	-1.06
Staff will have fewer confrontations with public requiring aid from superv. or law enforcement	75	all	0	15	10	0	all	1.05
Public will repeatedly disturb plovers to get plovers to leave area	50	0	all	10	40	all	0	1.20
Person will say something supportive of CWP efforts to prevent disturbance of plovers	90	all	0	10	0	0	0	1.15

Table 5. Continued.

Possible outcome of proactive interactions	Those with positive perception %	Of those with positive perceptions… Likely to occur, would be good %	Would be bad but is unlikely %	Those with neutral perception %	Those with negative perception %	Of those with negative perceptions… Likely to occur, would be bad %	Would be good but is unlikely %	Mean eval belief product
Person will be sarcastic or un-supportive of CWP efforts, but will not express anger toward CWP	10	half	half	25	65	all	0	-1.50
Person will express anger toward beach restrictions to protect plovers	35	0	all	10	55	all	0	-0.70
Person will have more positive attitude toward plover conservation	80	all	0	10	10	0	all	1.00
Person will have more negative attitude toward plover conservation	50	0	all	0	45	all	0	0.35
Staff job morale will improve	55	all	0	30	15	0	all	0.45
Staff will have fewer reactive interactions in the future	60	all	0	20	20	all	0	0.50

With respect to reactive interactions (Table 4), a majority of staff (65%) expressed positive beliefs only about the possibility that the public will comply with signs and fencing next time they are encountered. The possibility that the public would repeatedly try to disturb plovers in an attempt to get them to leave the area also was evaluated positively, but only in that 40% of staff believed that "bad" outcome was not likely to occur. Staff had negative evaluations of several "good," possible outcomes because they believed they were unlikely to occur, including: (1) staff will have fewer confrontations requiring assistance (70% indicated good but unlikely), (2) person will have a more positive attitude toward plover conservation, (3) person will say something supportive of CWP efforts (55%), (4) staff morale will improve (50%), and (5) staff will have fewer reactive interactions in the future (45%).

Three possible outcomes were evaluated particularly negatively: (1) person will have a more negative attitude toward plover conservation, (2) person will express anger toward beach restrictions aimed at protecting plovers, and (3) person will be sarcastic or unsupportive toward CWP, but will not express anger. For all three of these possible outcomes, majorities of staff believed that these would be "bad" and likely to occur as a result of reactive interactions.

With respect to evaluations of these same possible outcomes, but of proactive interactions, majorities of staff believed that 6 "good" outcomes were likely (Table 5). These possible outcomes included development of more positive attitudes among the public, better compliance with signs and fences, fewer confrontations or even reactive interactions, and better job morale. Majorities of staff did believe that two "bad" outcomes were likely to occur: (1) person will be sarcastic or unsupportive of CWP efforts (65% said bad and likely), and (2) person will express anger toward CWP efforts (55%).

Discussion

Staff reported more reactive interactions with the public (i.e., reactive behaviors) than proactive behaviors as expected given the implementation actions described in the staff training manual (Mass Audubon 2006). However, it was unexpected that all staff would report having had proactive interactions, and that the median value for the number of those interactions was only slightly less than for reactive interactions (5 vs. 7). Given that all staff reported having had proactive interactions, I assume their behavioral intention to perform those interactions was positive. Furthermore, I have no reason to assume that new field staff hired next summer would exhibit any different behaviors or intentions.

Staff members had positive attitudes toward both reactive and proactive interactions, and were split about whether they were more positive toward reactive interactions, proactive interactions, or neither. The three-item scale I created to assess a richer definition of attitude toward proactive interactions was highly reliable and revealed strongly positive attitudes toward this kind of interaction. However, discussions with other field staff and examination of the "like-dislike" item included in the scale revealed that some staff did not enjoy interacting with the public either reactively or proactively. Comments included with returned questionnaires revealed reasons for disliking acting proactively, such as a greater interest in research and data collection, and that proactive interactions could be interpreted by the public as "preachy." One respondent suggested that an employee be hired for the sole purpose of public education concerning Piping Plovers.

The three items I intended to use to measure perceived behavioral control produced a highly unreliable scale (Cronbach's alpha = -0.155). One reason for this low reliability may be that the distribution of the responses was concentrated toward the positive end. Another reason

may be that the questions addressed both internal (ecological knowledge and temperament) and external (ability to make decision on own) aspects of perceived behavioral control. Respondents reported the greatest variation for this external aspect, from strongly agreeing that they could decide to disagreeing. If this decision-making ability is a constraint to staff interacting proactively with the public, it probably is relatively easily overcome in training sessions.

The Theory of Planned Behavior posits that a person's behavior is a function of their attitudes and various beliefs (Azjen 1991). Thus, a person's negative behavior toward Piping Plovers may be a result of a negative attitude toward Piping Plover conservation or the efforts of the CWP. Survey respondents believed that the public would develop more positive attitude toward Piping Plover conservation following proactive actions, but that they were unlikely to develop a positive attitude following reactive interactions. For example, a respondent commented about how the public can react to being told they are disturbing birds: "[A beachgoer's] immediate reaction is often a factor of how much the visitor is embarrassed…"

It is plausible that the public may have or develop negative attitudes toward Piping Plover conservation or the efforts of the CWP after reactive interactions, and these negative public attitudes could be manifested as confrontations with CWP staff. Confrontations could reinforce negative public attitudes, decrease public compliance with fencing and signs, and lead to damaged relationships between the CWP and the public. Evaluative beliefs of staff indicated that confrontations would best be prevented using proactive, as opposed to reactive, actions. The majority of staff believed that using proactive actions would be less likely to result in confrontations than reactive interactions.

Overall, survey results indicated that the consequences of proactive staff-public interactions could be more beneficial and less harmful than the consequences of reactive

interactions. These results demonstrate staff support for more implementation actions to be focused on proactive approaches that may have longer-term effects on public behavior and thus plover conservation. Further, these results indicate an important opportunity for enhancing CWP effectiveness.

Summary and Conclusions

The results of the staff survey upheld both hypotheses: (1) staff with positive beliefs concerning the outcomes of public engagement will have more positive attitudes toward engaging the public than those with negative beliefs, and (2) staff with positive attitudes toward engaging the public will have engaged the public more frequently than staff with ambivalent or negative attitudes.

In addition, staff acted reactively more frequently than proactively, although almost one-third of respondents engaged in proactive actions more than was the average for reactive actions. The majority of staff reported proactive actions as being important and socially acceptable. Most staff had positive attitudes toward undertaking proactive actions, and believed they have the temperament, ecological knowledge, and permission to undertake proactive actions.

The majority of staff believed that the use of proactive actions would (1) reduce the need for reactive actions, (2) reduce the number of future confrontations between beachgoers and staff, (3) increase public support of the CWP, and (4) build positive public attitudes toward Piping Plovers.

Contrarily, the majority of staff believed that (1) the use of reactive actions would not reduce public confrontations, and (2) that the public was more likely to express anger following

reactive actions than proactive. The vast majority of staff thought that a negative attitude was likely to be created following reactive actions when compared to proactive actions.

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CHAPTER FIVE
THESIS CONCLUSIONS AND IMPLICATIONS

The mission of CWP generally is to protect and enhance populations of several imperiled species of shorebirds. Accomplishing this mission necessarily involves focusing on "big-picture" conservation issues like habitat loss from erosion and conversion of beaches for human uses, as well as decreasing food availability. These are policy-level issues to be addressed most appropriately at the organizational level and by actions of administrators. However, almost all the actions of CWP staff seem appropriately to focus on addressing imminent day-to-day threats to the birds' survival, especially from predators and various forms of human-caused disturbance.

Designing a program to address these threats adequately requires a clear understanding of both what implementers should do (implementation actions), and constraints that will prevent staff from effectively and efficiently carrying out those actions. My theory application evaluation revealed that understanding of both of these could be enhanced by making more explicit the program purposes and goals relative to field staff. From an evaluation perspective, lack of explicitly stated program purposes and goals made it challenging to evaluate the CWP because it was not entirely clear to me why particular program actions should be implemented and how success could best be determined. Perhaps even more important to the CWP, lack of explicitly stated goals makes it hard to design the best possible program.

By analyzing all available documents and especially having worked as a staff member, I believe the Theory of Planned Behavior (TPB) is the most pertinent social science foundation for the CWP.

Theory Application Evaluation

As noted by Decker et al. (2001) various problems and opportunities can affect the achievement of program objectives. My research uncovered several important opportunities with respect to staff's beliefs about engaging the public proactively for long-term prevention of disturbing behaviors. First, all 2006 field staff engaged in at least one proactive interaction, and there is no reason to believe that newly-hired staff would act any differently. Based on staff's likely positive intentions to engage the public proactively, a great opportunity exists to provide staff with additional information in training in how to do this most effectively. Second, 2006 field staff held substantially more positive evaluative beliefs about proactive interactions than reactive interactions. This opportunity could be enhanced by providing staff with additional training about what to do in these proactive encounters and how to do it.

Program Design Evaluation

Program design could be improved greatly if TPB was explicitly considered as the social science foundation for the program. Behaviors of two important groups are vitally important to the success of the CWP. First, public behaviors that disturb protected bird species clearly need to be addressed. TPB provides a foundation for understanding how to achieve long-term behavior change based on the development of positive attitudes toward Piping Plovers and their conservation. Second, staff behaviors are the keystone to the implementation of the CWP. My evaluation clearly identified some opportunities on which to build, including staff's engagement in proactive interactions without being trained extensively to do so, and their overwhelmingly positive evaluative beliefs about the outcomes of proactive interactions. This is not to say that

reactive staff public interactions should necessarily be de-emphasized. Clearly, there always will be a need to have staff react to imminent threats of disturbance when the situation warrants.

Program Implementation Evaluation

Many implementation actions seemed to focus appropriately on the monitoring of nest success and fledging rate of protected bird species that nest on beaches and on preventing predation. These necessary, day-to-day staff responsibilities could be enhanced to provide added benefits in terms of public education. For example, the construction of exclosures is a common task associated with the monitoring and protection of Piping Plovers. Exclosures, however, can become conspicuous targets on an otherwise flat beach, and may attract curious beachgoers directly to a Piping Plover nest, as in one situation where a photographer caused the abandonment of four, nearly full-term eggs. Thus, educating the public on the purpose of these exclosures and the need to avoid them is another important step that can be taken to prevent public disturbance of Piping Plovers. If members of the public are present during the construction of an exclosure, staff could explain the purpose of the exclosure in the context of Piping Plover conservation. Such an explanation could take place during the actual building of the structure, and suspended during the necessarily hurried installment of the exclosure around the nest, when members of the public should be instructed to retreat in the interest of protecting the birds. In addition, a sign could be designed and placed at a respectful distance but still appropriately near a conspicuous exclosure that explains the exclosure's purpose and the need to avoid approaching it. The sign would act as a passive disturbance prevention action in the absence of CWP staff. By pairing a passive action (e.g. a predator exclosure) with a proactive

action (e.g. public education), the overall effect can be much greater than the sum of each action done separately.

Other implementation actions focus on reacting to public behaviors that are disturbing to these birds. According to TPB, additional benefits likely could be achieved by developing implementation actions focused on proactively engaging the public to prevent disturbing behaviors before they occur. Field staff is logical implementers of these actions because of their everyday contact with the public.

In addition, CWP administrators could contribute to the development of positive public attitudes toward Piping Plovers and their conservation by continuing to work with the local press to present positive articles about the need to prevent human disturbance of these birds. The most noticeable media reports from last summer about Piping Plovers focused on beach closures and restrictions placed on recreational vehicles. If the media contributed to the development of negative public attitudes concerning Piping Plovers is beyond the scope of this study. However, TPB would suggest that these articles could negatively affect the public's evaluative beliefs about Piping Plovers and their conservation. In the same way, positive articles about Piping Plovers and their conservation needs could have a positive influence on the public's evaluative beliefs.

Survey Conclusions:

The results of the staff survey upheld both hypotheses: (1) staff with positive beliefs concerning the outcomes of public engagement will have more positive attitudes toward engaging the public than those with negative beliefs, and (2) staff with positive attitudes toward engaging the public will have engaged the public more frequently than staff with ambivalent or negative attitudes.

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