

INVOKING CITIZEN SCIENCE IN MARINE CONSERVATION: AN ASSESSMENT OF  
VOLUNTEERS IN THE NORTH CAROLINA SEA TURTLE PROJECT

by

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## ABSTRACT

Citizen science and the concept of surrogate species have become integral components to wildlife conservation, and resource agencies and scientists alike have benefited greatly from the work of volunteers in conservation programs. Although academia has extensively examined the ecological merit of surrogate species in conservation, little attention has been devoted to examining their effects on volunteer engagement with the environment. Volunteers in the North Carolina Sea Turtle Project (NCSTP) enthusiastically seek out opportunities to work with the North Carolina Wildlife Resources Commission (NCWRC), the agency responsible for the NCSTP, to monitor the state's beaches for sea turtle nesting activity. Based on a survey of the state's 700 volunteers, this research interrogates the efficacy of sea turtles—a flagship species—to cultivate ocean and coastal stewardship, and the extent to which they motivate volunteers to participate in marine conservation. The findings of this study exposed significant differences in motivations between environmental volunteers and volunteers in the health and human services. Responses showed that sea turtle volunteers were highly motivated by the belief that their work is directly contributing to sea turtle conservation; while social motivations, which serve as the primary factors motivating citizens in social services, were statistically less significant. Regarding the use of flagships in conservation, sea turtles proved essential to attract citizens into the NCSTP; however, once immersed into the organization, volunteers acquired greater appreciation for the coastal and ocean environment. Similarly, sea turtle volunteers demonstrated the use of a flagship species in conservation imparts positive benefits to participants, as many volunteers became more active participants in conservation outside of their volunteer beach organizations.

Given the rise in environmental volunteerism and the increasing dependence of conservation managers on in-kind, citizen contributions and labor, additional interrogations of volunteer motives in conservation are necessary. As this research reinforced the utility of flagship species in conservation, further exploration of surrogate species use in volunteerism should be carried out to assist resource managers and scientists gain a better understanding of the ways in which they can structure their organizations to empower participants, and encourage advocacy for ecosystem conservation.

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## **Introduction**

### *Citizen science*

Citizens are not merely inhabitants of geographically or politically demarcated spaces, with formal rights to partake in top-down regimes of governance; instead, they are thinking, knowing and ingenious beings whose contributions to government and roles in decision-making have been underutilized (Jasanoff 2004). Due to the professionalization of science from fieldwork to the laboratory setting (Naylor 2000), sentiment has emerged where only by “wearing a white coat,” does the public feel their accounts will be granted as legitimate science by government agencies and policymakers (Ellis and Waterton 2004). Furthermore, too often citizens have been prohibited from questioning the politics and nature of science altogether (Wynne 2007); the result being a ubiquitous distrust between the public and institutions of science.

Concerning environmental conservation however, the need has arisen for citizens to transition from the role of passive witness to interactive participant. Citizenship has emerged as a concept of concern not only to citizens; but professional groups, private corporations, and the state (Jasanoff 2004). Similarly, questions regarding what constitutes science and how it should be used are answered not just by scientists, but also by citizens working for government agencies, nongovernmental organizations (NGOs) and other groups (Jasanoff 1990; Forsyth 2003). Citizens are becoming progressively more involved in environmental volunteerism, and they are intrinsically linked to science and politics in three ways that highlight their roles as citizens: (i) as a generator and consumer of knowledge; (ii) by knowingly exercising the consumer’s purse to promote normative ends; and (iii) in work of politically relevant knowledge production, in which citizens are vital in supplementing contributions of professionals (Jasanoff 2004).

A new form of engagement with science is evolving that allows citizens to perform these roles and integrate knowledge-making with broader visions of coexisting with the nature (Martello 2004). This concept of citizen science, “evokes a science which assists the needs of and concerns of citizens,” while at the same time it “implies a form of science developed and enacted by citizens themselves” (Irwin 1995). Although citizens are becoming actively involved in science, they cannot simply enter into cognitive decision processes from which they were previously excluded (Martello 2004). Scientists, resource managers and policymakers therefore, must begin to acknowledge the merit of citizen acumen, and make certain to inform citizens of the institutional and scientific processes pertinent to their discipline. If a reciprocated appreciation is established and volunteers are properly trained, then citizens become imperative contributors of knowledge to the institution of science.

### *Volunteerism and Motivation*

The environmental sector has been the beneficiary of a marked proliferation in volunteerism over the past three decades. Ryan et al. (2001) asserted that, “The environmental movement would not exist without the help of thousands of dedicated volunteers,” as public and private environmental organizations alike rely on the in-kind contributions of volunteers to further the cause of protecting the imperiled natural environment. Volunteers have long collected much of the information used by conservation biologists and resource managers to inform decisions concerning the resources they are attempting to understand and protect (Bildstein, 1998). Establishing a monitoring program at a scale adequate to monitor the target species is often an impediment to effective management (Pattengill-Semmens and Semmens, 2003); this especially holds true in the marine environment. One solution is to call upon citizen science to help collect information. Many resource agencies lack sufficient funds to hire a staff

large enough to carry out their work; thus, volunteer data collection has become a widespread alternative for scientists and managers to gather information (Ryan et al., 2001). If volunteers do not receive sufficient training prior to performing field work however, inconsistencies in data collection can occur; but, if adequately trained and asked to perform straight-forward tasks, the quality of data recorded by volunteers can be comparable to those data collected by scientists (Foster-Smith and Evans 2003). Provided volunteers can replicate the quality of data collection performed by trained scientists, invoking citizen science in marine conservation allows a portion of monitoring costs to be assumed by volunteers while yielding a sampling effort and geographic coverage much larger than would otherwise be feasible (Pattengill-Semmens and Semmens 2003).

Citizen science provides gains not only to conservation scientists and resource managers, but also imparts a range of benefits to its participants. Social science research has investigated volunteer motivations in the social services and medical sector (Harrison 1995; Clary et al. 1998); however, little attention in has been given to citizens participating in environmental organizations. This gap in knowledge is troublesome considering that natural resource agencies have become increasingly dependent on volunteer contributions. Because many environmental organizations are understaffed and possess unsatisfactory funding, the volunteer work of citizens is necessary for resource agencies to restore damaged habitats and to meet threatened species mandates established by the Endangered Species Act (ESA). The annual Breeding Bird Survey conducted by the United States Geological Survey (USGS), which relies on the volunteer observations at local levels to synthesize a national picture of breeding bird behavior, is one example of this dependency. Nickens et al. (1997) estimated that volunteer contributions saved the USGS \$US 500,000 annually.

Ensuing from the lack of research conducted on volunteers in environmental organizations, researchers have been left to posit potential motivations driving citizen participation in conservation. Kaplan and Kaplan (1989) theorize that, “being in nature offers an opportunity to get away from one’s regular routine, to be in a world that one connects with, to feel that one’s environment is supportive, and to be fascinated—all of which can leave one in a state of mind that allows for quiet reflection.” The satisfaction of making a difference, accomplishing something, and doing something meaningful; have often been associated with volunteer participation (Miles et al., 1998). A study by Bradford (2003) found that sea turtle volunteers in Florida possessed multiple motives for participation, the most common being a desire to aid and protect sea turtles and a sense that volunteering was the right thing to do. Additionally, it seems plausible that volunteers may also experience a sense of personal growth resulting from their contributions to sea turtle conservation. Advocates of conservation volunteerism have identified volunteering as one way to educate the public about natural areas; Grese et al. (2000) demonstrated that volunteers themselves are motivated to learn more about the natural environment as part of their volunteer activities. Understanding these motivations has been widely recognized as a valuable component of volunteer management (Cnaan and Goldberger 1991); and a major focus of this study is to expand upon the existing body concerning the motivations of citizens engaged in conservation.

### *Flagship species*

The current political climate and scarce availability of resources (i.e. finance, scientific research, etc.) have yielded progressively more claims that the scope of conservation management must be expanded to achieve economies of scale and efficiency. When funds are allocated to preserve one species, those funds are inevitably denied to other species (Myers

1983). This means that conservation resources are distributed by necessity to certain species in preference to others; ultimately, assigning priority. Resource managers and conservation biologists therefore, must determine the most efficient way to apportion sparse resources that will maximize conservation objectives. One popular shortcut is to focus conservation efforts on a relatively small number of focal or surrogate species (Simberloff, 1998); the fundamental assumption being that if surrogates are protected, so too will their corresponding ecosystem and its associated species (Andelman and Fagan, 2000).

Surrogate species are those used as proxies for broader sets of species when the number of threatened or endangered species is too great to allow each to be managed individually. Keystone species, indicator species, and umbrella species are all surrogate concepts that can, and have been employed to, direct conservation efforts towards protecting large tracts of habitat or vital ecological processes of the surrogate species. In contrast, a flagship species—normally a large charismatic vertebrate—is one that can be used to anchor a conservation campaign because it fosters public interest and sympathy (Simberloff, 1998). Unlike the former surrogate concepts which are chosen based on their ecological role, a flagship species needs only to garner public awareness and financial support; often chosen based on charisma, historical precedent, or ease of management (Caro and O’Doherty 1999).

Sea turtles’ inhabitance of all the world’s oceans and their global recognition as iconic, marine species, accentuate their potential to advance citizen awareness for marine conservation. The World Wildlife Fund (WWF) recognizes all seven species of sea turtles as flagship species, and they are frequently used as emblematic species for conservation initiatives around the globe (Frazier, 2005). Their flagship status is recognized worldwide and annually, twenty million dollars is spent on sea turtle conservation (Troeng and Drews 2004). Sea turtles are large,



charismatic vertebrates and all seven species are listed as threatened or endangered under the ESA. Campbell and Smith (2006) suggest that sea turtles are perhaps the largest endangered species that can be approached with ease, and are among only a few marine species through which the public can physically interact; consequently, managers often feel obligated to monitor them regardless of their conservation mandates (Simberloff, 1998). Amalgamating these factors with the general public's infatuation with sea turtles; citizen science is becoming increasingly common in sea turtle conservation. Despite their importance to scientists and managers however, conservation volunteers in general have received relatively little attention in academic literature. Volunteer contributions to sea turtle conservation raise awareness to this importance, and this research serves as an empirical examination of the North Carolina Sea Turtle Project (NCSTP), as a case study to explore citizen science and the degree to which the flagship status of sea turtles' facilitates public engagement in marine conservation.

### *North Carolina Sea Turtle Project*

Whereas in many organizations managers use multiple recruitment tools to appeal to the needs of potential volunteers, sea turtle volunteers actively seek out opportunities to participate. By understanding the motivating factors driving volunteer participation, volunteer supervisors can better accommodate the needs of their volunteers and consequently, improve the efficiency of their organization. Combining the coveted nature of sea turtle conservation with the widely recognized *flagship status* of sea turtles, the NCSTP is ideally positioned for researchers to expand upon the existing literature regarding citizen science, and the effectiveness of surrogate species to cultivate citizen advocacy for conservation.

The NCSTP incorporates approximately 700 volunteers in 23 self-organized Volunteer Beach Organizations (VBOs), to monitor the state's coastline for nesting activity. The North

Carolina Wildlife Resources Commission (NCWRC), the agency responsible for the NCSTP, lacks sufficient resources to adequately monitor sea turtle nesting activity in the state. Mandated by Section 6 Agreements in the ESA, North Carolina is required to implement a management plan that rehabilitates sea turtle populations above the threshold of endangerment; a responsibility delegated to the NCWRC. Due to the vast amount of coastline and the limited resources available to the NCWRC—only two full-time sea turtle biologists—the in-kind monitoring activities performed by citizens, which the State currently estimates at \$US 250,000 per year (M. Godfrey pers. comm., 2009), are necessary for the NCWRC to comply with the mandates set forth by the ESA.

Volunteers are formerly mandated by the NCWRC to perform an array of data collection services that directly aid sea turtles, including beach patrols to check for signs of nesting activity, marking new nests, and relocating nests that are in danger of washing away during storms. Responsibilities also include calculating hatch success rates (i.e. the number of hatchlings that successfully emerge and the development status of those that do not) (L. Campbell pers. comm., 2009); data which assists NCWRC biologists gain a better understanding of sea turtle reproductive biology. Some volunteers participate on stranding teams that rescue stranded or injured turtles and report any deaths of turtles that have washed ashore to the NCWRC. With respect to sea turtle education, volunteers form an important bridge between scientists and the general public, especially tourists, through on-the-beach education and formal presentations regarding sea turtle conservation.

Operating under names such as the Network for Endangered Sea Turtles (N.E.S.T), Emerald Isle Sea Turtle Protection Program, Topsail Turtle Patrol, and Sunset Beach Turtle Watch Program (SSBTWP); many VBOs exceed the mandates set forth by the NCWRC. Most

VBOs hold regular meetings, conduct extensive fundraising events, and advocate sea turtle protection via public outreach and conservation campaigns. Additionally, two sea turtle hospitals in North Carolina—the Karen Beasley Sea Turtle Rescue and Rehabilitation Center (KBSTRRC) and the Outer Banks Sea Turtle Hospital—are organized and operated exclusively by NCSTP volunteers. These organizations not only assist in rescuing and rehabilitating sick, injured, and cold-stunned turtles, but they are also politically active in lobbying for lighting and beach driving ordinances, fishing restrictions, and critical habitat designation. All VBOs are mandated to promote public awareness about sea turtles, to distribute information, and to report violations that infringe upon regulations protecting sea turtles. In November 2009, the KBSTRRC went beyond this mandate and filed a 60-day notice of intent to sue the North Carolina Division of Marine Fisheries (DMF) and Marine Fisheries Commission (MFC), claiming both organizations violated Section 9 of the ESA by authorizing and issuing licenses allowing the use of gill nets, which have resulted in significant “takes” of multiple species of endangered and threatened sea turtles. Such actions suggest that sea turtle volunteers are empowered by their involvement with the NCSTP; however, the extents to which these activities affect change have not been studied.

Although volunteer participation in the NCSTP varies in size and scope between VBOs, their decision to engage in citizen science requires them to forfeit opportunities to utilize time in other ways. Examining the motivations that cause volunteers to sacrifice these opportunities is therefore warranted; and has been a standard approach in research on volunteerism. In addition to this approach, a major component of this study was to explore the relationship between volunteers participating in conservation science—specifically sea turtles—and the institutions to which they contribute that information. Unlike environmental groups that organize in opposition

to an environmental concern, volunteers in the NCSTP work collaboratively with scientists and state resource agencies to benefit sea turtle conservation. Thus, this research is uniquely situated to examine the benefits imparted to volunteers engaged in citizen science. Similarly, conventional studies have shown ‘flagship’ species effectively garner public support for the targeted species. This study sought to continue the surrogate species dialogue, by examining the efficacy of a flagship species to change volunteers’ attitudes towards the larger environment.

The specific questions governing this research were:

- 1) What factors motivate citizens to volunteer in the North Carolina Sea Turtle Project?
- 2) Do sea turtles—a flagship species—successfully cultivate awareness for marine conservation in citizens volunteering in the North Carolina Sea Turtle Project?

## **Methods**

### *Survey Design and Implementation*

We surveyed volunteers of the North Carolina Sea Turtle Project (NCSTP) via a mail based survey. Wendy Cluse, an Assistant Sea Turtle Biologist with the NCSWRC, provided a complete list with the names of all 701 registered volunteers in the NCSTP. To ensure the survey was received by as many volunteers as possible, volunteers were informed of the questionnaire at North Carolina’s 2009 Sea Turtle Permit Holders Meeting held at Hammocks Beach State Park in Swansboro, North Carolina. Following the principles outlined in Dillman’s Tailored Design Method (TDM) which draws upon social exchange theory to develop “survey procedures that create respondent trust and perceptions of increased rewards and reduced costs for being a respondent” (2000), we mailed paper copies of the survey to all 701 registered volunteers in the NCSTP, dispersed among 23 VBOs. A mail based survey was determined to be most appropriate survey instrument because it gave NCSTP volunteers the option to complete

the survey at their convenience. Having a list of sea turtle volunteers' names and addresses available also made it the most practical choice.

Accounting for the high number of volunteers whose mailing addresses were summer or vacation residences, a multiple-wave mailing strategy was used to minimize non-response error. Multiple mailings have demonstrated response rates at least 20 percentage points higher than surveys that contacted respondents a single time (Dillman 2000). Including the pre-notice given to volunteers at the Sea Turtle Permit Holders Meeting, a system of four contacts was used to reach volunteers. On 8 July 2009, a survey packet was sent via first class mail to the 701 NCSTP volunteers. Volunteers' addresses were handwritten on the survey packets and Duke University Marine Lab return address labels were applied to distinguish the mailings from bulk mail. The contents of the packet included a cover letter, questionnaire, and a stamped return envelope (Appendix A); each element designed according to the TDM (Dillman 2000). The cover letter explained the purpose of the survey, the scientific institutions involved with the research, and procedures for responding. First-class postage was affixed to both survey packets and return envelopes, as research implies using stamps rather than metered-postage increases response rates (Dillman 2000).

Approximately one week (17 July 2009) after the questionnaire was sent, a postcard (Appendix A) was sent to volunteers whose questionnaires had not been returned. Postcards were affixed with first-class postage; however, printed address labels were used instead of handwriting volunteers' addresses. The postcard thanked recipients for their participation in the survey and urged non-respondents to complete their surveys and mail them back at their earliest convenience.

Three weeks after the initial questionnaire mailing (August 3, 2009), a second survey packet was sent to nonrespondents. This package, like the first, contained a cover letter, questionnaire, and stamped return envelope. The difference between the two packets was a revised cover letter (Appendix A) that emphasized our desire to ensure each volunteer had every opportunity to include their views in our research; at the same, we made it clear that we respected the choice to not participate.

The survey, which included questions about sea turtle volunteers' motives for participation and the role sea turtle volunteerism plays in increasing awareness for marine conservation as a whole, was informed by analysis of interviews with scientists, focus groups with VBO coordinators, and through dialogue with Dr. Matthew Godfrey, head sea turtle biologist at the NCWRC and supervisor of the NCSTP. The NCWRC was interested in soliciting the views of its volunteers, as well as gathering information on them. Considering the delicate balance between the public and scientific institutions, careful attention was devoted to ensure survey questions did not cause volunteers to feel as though they were being tested on their understanding of science or sea turtle biology. The survey comprised mostly closed-ended and Likert scale questions, although open-ended questions elicited more extensive responses pertaining to the research questions.

### *Data Analysis*

The first section of the survey asked respondents to answer questions indicating which reasons were most important for volunteering in the NCSTP. During the survey design phase, eighteen items about reasons for volunteering were categorized as six primary motivation factors: social, turtles, environment, volunteerism, science, and sea turtle conservation. To compare motivation scores, an index value was created for each factor group by summing the

answers to the items, and then dividing by the number of items within each factor group. This standardized the scores and allowed them to be evaluated using the same Likert-type scale that was used in the questionnaire (motivation scale: 1, unimportant motivation factor; 3, neutral; 5, important motivation factor). A one-way analysis of variance was performed to compare mean scores, followed by Tukey's HSD test to assess significance between motivation factors.

The effectiveness of flagship species, specifically sea turtles, to foster awareness for ecosystem-scale conservation, was evaluated through short answer responses inquiring whether volunteers' involvement in sea turtle conservation had changed the way they thought about ocean issues and marine conservation. The dataset generated from the open-ended responses was analyzed in Nvivo, a computer assisted qualitative data analysis software, using a theory to data approach. A grounded theory approach was concluded to be inappropriate because of the researcher's familiarity with the data, and predetermined ideas regarding coding schemes.

Preliminary coding of data identified general topics regarding ocean issues. Data were sub-coded after subsequent readings until the data were organized into a logical, unambiguous coding structure. Data were reorganized a final time prior to interpreting the data to eliminate sub-codes that were redundant or inappropriate to answer the research questions posited.

Volunteer involvement independent from their VBOs was measured by asking respondents to check off activities they had performed since joining the NCSTP related to sea turtle conservation: a) invite someone to join their VBO; b) paid membership dues/donating to a sea turtle organization; c) joined a mailing list/listserv (e.g. seaturtle.org); d) spoke with media about sea turtles; e) sent a letter/email to state or local governments concerning sea turtles; and f) sent a letter to state/federal agencies regarding issues relevant to sea turtle conservation. The frequency that volunteers participated in each activity was calculated, and the activities selected

by each volunteer were added together to create an aggregate score for sea turtle activism. Comparing these results with analyses from the open-ended response, I hoped to more thoroughly understand the awareness that was generated by respondents, if any, for marine conservation through volunteering in the NCSTP.

The questionnaire concluded with questions regarding demographic characteristics, which allowed researchers to achieve a more comprehensive understanding of sea turtle volunteers in the NCSTP.

## Results

Out of 638 successfully delivered surveys, a total of 396 completed questionnaires were returned; a response rate of approximately 62%. Our response rate was lower than that recorded by Bradford et al. (2003) in a similar study of sea turtle volunteers in Florida. A substantially larger sample size and the high proportion of seasonal beach residences in our sample population, may explain this difference. The spatial distribution of volunteer residences is shown in Figure 1; nineteen volunteers are not represented because they resided outside of North Carolina. Sample size between questions varied because not all questions were answered by respondents.

### *Age and Gender*

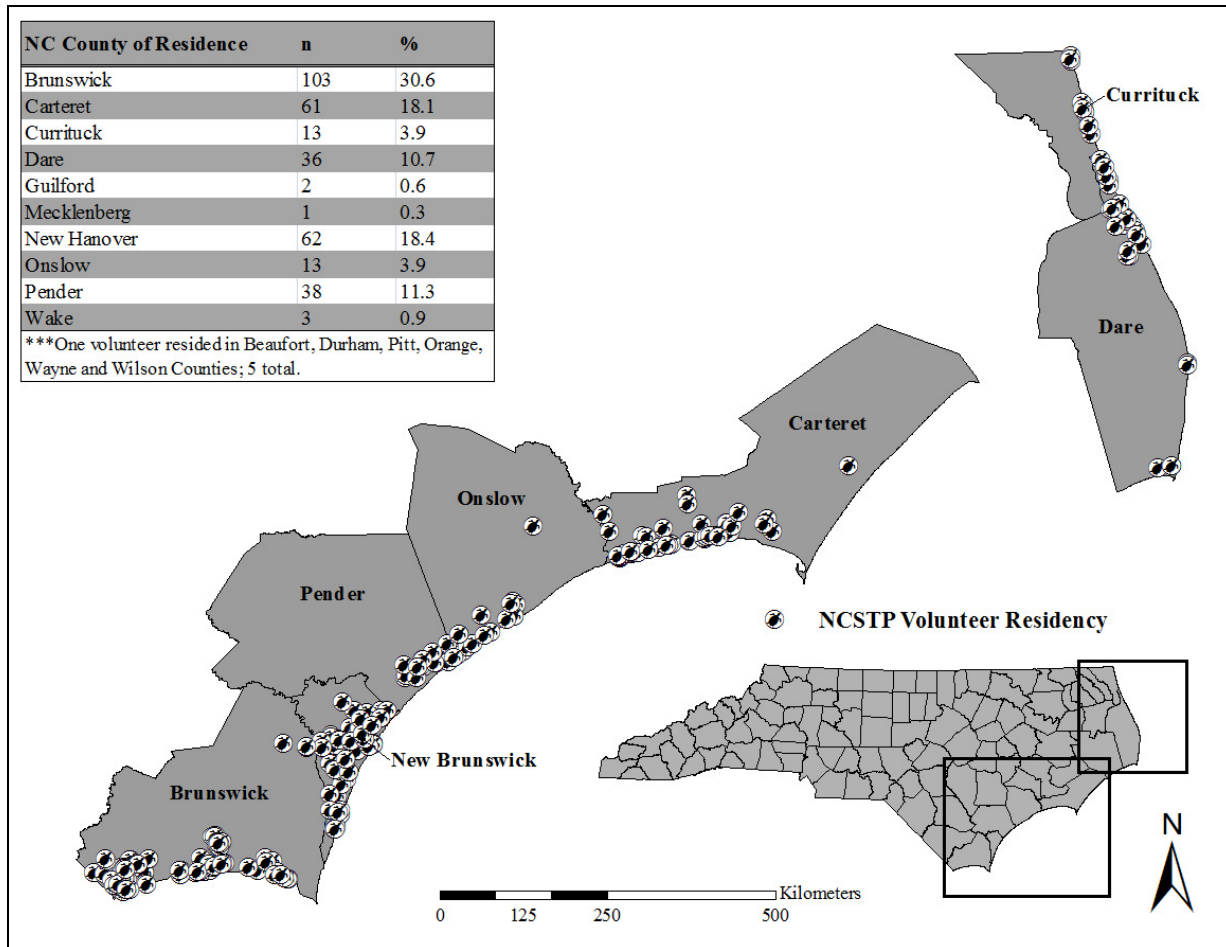
Of 390 responses to the question of gender, almost 71% of volunteers identified themselves as female (Table 1).

**Table 1. Gender characteristics of volunteers in the NCSTP.**

<i>Gender</i>	<i>n</i>	<i>%<sup>a</sup></i>
Male	114	29.2
Female	276	70.8

<sup>a</sup>Percent calculated using  $n = 390$





**Figure 1. Spatial distribution of NCSTP volunteer residences, by county, in North Carolina.**

Mean age of respondents was 59 years, and both modal and median age of volunteers was 62 years (Table 2). Some deviation was present in the ages of respondents, but they were skewed heavily toward higher values. Survey respondents ranged in age from 13 to 86 years; the middle 50% ranging between 55 and 67 years of age.

**Table 2. Age and gender characteristics of 390 volunteers in the NCSTP.**

Age	<i>n</i>	<i>SD</i>
Mean years	59	12.1
Modal years	62	
Median years	62	
Trimmed mean years (.10)	59.9	
Trimmed mean years (.20)	60.6	

### *Education, Employment, and Income*

Respondents were very well educated compared to the general American population, with more than 99% of volunteers having received a high school diploma or GED (Table 3). Approximately 18% of respondents had completed some education at an undergraduate institution, while 28.6% had earned college/university degree. Graduate education was equally as common for respondents with 11.3% having completed some graduate coursework, and 26.6% reported having earned a graduate or professional degree. Many volunteers who received graduate degrees were adamant about including their field of expertise adjacent to their closed-ended response, frequently stating how their academic background qualifies them as knowledgeable sea turtle biologists.

**Table 3. Education, employment and income characteristics of NCSTP volunteers.**

Variable	n	%
<i>Education</i>	391	
Undergraduate college/university degree	112	28.6
Graduate or professional school degree	104	26.6
Some undergraduate college/university	71	18.2
Some graduate or professional school	44	11.3
High school diploma or GED	28	7.2
Some technical/vocational school	19	4.9
Technical/vocational degree	10	2.6
Some high school	3	0.8

Employment status of NCSTP volunteers was indicative of age, as an overwhelming majority of respondents reported being retired (57.5%) (Table 3). Volunteers who were employed at the time of the survey reported being employed either full-time (18.2%) or part-time (8.7%), while 8.7% described being self-employed. Remaining respondents categorized themselves as a student (2.3%), homemaker (3.3%) or not-employed (1.3%).

Annual household incomes of volunteers reflected both the high-level of education and employment status, skewed heavily towards more affluent income categories. More than 60% of respondents exceeded the 2007 median household income of United States' citizens (U.S. Census Bureau), reporting annual incomes greater than \$US 60,000 (Table 4). Similarly, the middle 50% of respondents ranged in yearly incomes between \$US 40,000 and \$US 149,999. Approximately one-third of NCSTP volunteers reported annual household incomes exceeding \$US 100,000; with 12 respondents taking in over \$US 200,000, annually.

**Table 4. Employment and income characteristics of NCSTP volunteers.**

Variable	n	%
<i>Employment status</i>		
Retired	225	57.5
Full-time	71	18.2
Self-employed	34	8.7
Part-time	34	8.7
Homemaker	13	3.3
Student	9	2.3
Not employed	5	1.3
<i>Income</i>		
\$40,000 - \$ 59,999	75	24.3
\$100,000 - \$149,999	59	19.1
\$60,000 - \$79,999	53	17.2
\$80,000 - \$99,999	40	12.9
\$20,000 - \$39,999	39	12.6
\$150,000 - \$199,999	19	6.1
< \$20,000	12	3.9
>\$200,000	12	3.9

### *Volunteer Motivations*

Descriptive statistics of individual motivations driving volunteer participation in the NCSTP are listed in Table 5. Respondents indicated knowing “Sea turtle survival is important

for ocean health” was the most important ( $\mu = 4.74$ ) item motivating them to volunteer.

“Helping to ensure a safer future for sea turtles” ranked a close second ( $\mu = 4.72$ ), followed by “I want sea turtles to be around for my child/grandchild to see” as third-most important ( $\mu = 4.63$ ).

**Table 5. Importance of factor items in motivating volunteer participation in the NCSTP.**

<i>Factor</i>	<i>Item</i>	<i>Mean<sup>a</sup> (SD)</i>	<i>Mode</i>	<i>Median</i>	<i>n</i>
Social	My friends volunteer.	2.42 (1.42)	1	2	382
	Volunteering is a good opportunity to meet people.	3.08 (1.26)	3	3	390
	Volunteering is good exercise.	3.58 (1.32)	4	4	393
Science	Volunteering allows me to pursue my interests in marine biology and/or science	2.86 (1.38)	1	3	386
	I enjoy collecting data on sea turtles and participating in sea turtle research.	3.34 (1.26)	3	3	371
	As a volunteer, I help the state better understand sea turtle biology and behavior, and thus contribute to improved	4.19 (0.87)	5	4	378
Turtles	I am fascinated by sea turtles.	4.27 (0.85)	5	4	391
	Volunteering will teach me more about sea turtles.	4.31 (0.87)	5	5	391
	I want to see a sea turtle in its natural environment.	4.31 (0.94)	5	5	389
Volunteerism	Volunteering is very rewarding and provides me a feeling of self-worth.	4.16 (1.02)	5	4	391
	Volunteering gives me a chance to give back to my community.	4.30 (0.91)	5	5	393
	Volunteering makes me feel like I am making a difference.	4.43 (0.75)	5	5	392
Environment	Volunteering is a way for me to assist in ocean conservation.	4.31 (0.79)	5	4	389
	Volunteering allows me to experience the natural environment.	4.38 (0.82)	5	5	392
	Sea turtle survival is important for ocean health.	4.74 (0.57)	5	5	389
Sea Turtle Conservation	By volunteering, I feel I am compensating for harm placed upon sea turtles by humans.	4.08 (1.13)	4	5	384
	I want sea turtles to be around for my child/grandchild to see.	4.63 (0.83)	5	5	392
	I am helping to ensure a safer future for sea turtles.	4.72 (0.57)	5	5	394

<sup>a</sup> Scale used: 1, not important; 2, somewhat unimportant; 3, neutral; 4, somewhat important; 5, very important

Mean Likert-scale responses revealed 16 of the 18 (88.9%) items were at least of some importance ( $\mu > 3.00$ ) in motivating volunteers to participate (Table 5). Respondents attributed a friend’s involvement in the NCSTP or their own desire to pursue an interest in marine biology and/or science, as unimportant ( $\mu < 3.00$ ) motivations for becoming a sea turtle volunteer.

Composite means from the motivation index show that *sea turtle conservation* ( $\mu = 4.48$ ) and the *environment* ( $\mu = 4.38$ ) were the two most important factors motivating volunteer involvement in the NCSTP (Table 6). Sea turtle volunteers’ considered all six factors to be of greater importance than neutral ( $\mu > 3.00$ ); however, *social* motivation just exceeded this threshold with an index value of 3.03. *Science* ( $\mu = 3.46$ ) scored higher than *social* as a motivation factor, but its score remained within the neutral to somewhat important range on the index. *Turtles* ( $\mu = 4.29$ ) and *volunteerism* ( $\mu = 4.30$ ) indices were below those of *environment* and *sea turtle conservation*; however, all four factors were statistically significant ( $p < 0.0001$ ) from *social* and *science* motivations (Table 6).

**Table 6. Motivation summary index values for NCSTP volunteers.**

<i>Factor</i>	Motivation Index				<i>n</i>
	<i>Mean<sup>a</sup> (SD)</i>	<i>Mode</i>	<i>Median</i>		
Social	3.03 (1.41)	4	3		1165
Science	3.46 (1.31)	4	4		1135
Turtles	4.29 <sup>b</sup> (0.89)	5	5		1171
Volunteerism	4.30 <sup>b</sup> (0.84)	5	5		1172
Environment	4.38 <sup>b</sup> (0.84)	5	5		1174
Sea Turtle Conservation	4.48 <sup>b</sup> (0.91)	5	5		1170

<sup>a</sup> Index range: 1, not important; 2, somewhat unimportant; 3, neutral; 4, somewhat important; 5, very important

<sup>b</sup> Statistically significant at  $p < 0.0001$

Volunteers most frequently (46.3%) described the work they performed for the NCSTP as *conservation*; with *educating the public about sea turtles* was the second-most common description (Table 7). *Volunteering, scientific research, public relations* and *community outreach* were each reference by some volunteers; however, these responses were considerably less frequent.

**Table 7. Volunteer description of work performed for the NCSTP.**

<i>Description of work</i>	<i>Freq.</i>	<i>%</i>
Conservation	177	46.3
Educating the public about sea turtles	118	30.9
Volunteerism	35	9.2
Scientific research	25	6.5
Public relations for beach municipality	13	3.4
Community outreach	12	3.1

### *Ocean Issues*

A total of 348 open-ended responses were analyzed, from which 210 responses were coded for attitude changes regarding ocean issues and marine conservation; several responses were coded more than once. Volunteers' open-ended responses were categorized into five major codes indicating attitude changes regarding ocean issues (Table 8). Nineteen of the 210 volunteer responses (9.0%) suggested their involvement with the NCSTP had stimulated a *behavioral change*, causing them to partake in activities they previously had not. For example, 17 volunteers remarked that they are now adamant about picking up garbage and trash when walking on the beach, and are much more sentient to daily changes on the beach.

Now I pick up trash every time I visit the beach for any reason. I pay close attention to the changing dunes and beach erosion. (743)

A majority of these responses however, discussed this change with regard to sea turtles. Specific reference to sea turtles suggest that volunteers' *behavioral changes* may be attributed to their concern for sea turtles rather than an increased trepidation for the larger marine environment.

Select responses underscoring this notion are quoted below:

I understand better the impact of litter to sea turtles. Whenever I walk the beach, I pickup anything that might end up inside a turtle or endanger a turtle—especially balloons, plastic, string, etc. (102)

I think much more about fishing practices, beach debris-plastic bags, balloons, fishing line. I dispose of them & educate others of risk of turtles ingesting them or getting tangled in them. A very small part but on my level, it's a way I can help. (509)

Twenty-four volunteers (11.0%) remarked they had become far more involved in educating the public and advocating for marine conservation. Similar to responses noting *behavioral change*, 9 volunteers ascribed changes in *advocacy/education* directly mentioning sea turtles in their response while the majority of other responses indirectly alluded to them.

Dissimilar to *behavioral change*, even when volunteers cited sea turtles with regard to

**Table 8. Changes in perspective codes used in analysis of volunteer open-ended responses.**

<i>Change in Perspective</i>	<i>Criteria</i>	<i>No.</i>
Increased Awareness	Increased understanding on a particular matter regarding marine environment	141
Advocacy/Education	Engage people to inform them about sea turtles, beach debris, and advocate ocean conservation	24
Behavioral Change	Evoked a behavioral change in the everyday life of volunteers with respect to conservation practices	19
Fisheries' Impact	Impact of fishing practices on marine life and ocean ecosystems (e.g.- fishing nets, overfishing, etc.)	14
Preexisting Concern	Although no new changes have occurred, emphasized a strong preexisting concern for marine conservation	12

their increased participation in *advocacy/education*, they did so primarily within the context of the larger marine ecosystem.

My involvement has made me more aware of the fragility of not only sea turtle populations, but ocean ecosystems in general. Participation has also increased my desire to research, expand my knowledge and share info with others so they too will want to help protect and preserve the ocean. (225)

My involvement with the NCSTP has made me aware of the need to continuously inform the public of the value of their awareness of ocean issues and conservation. (565)

The responses of 14 volunteers (7%) revealed a greater understanding of *fisheries' impacts*. Fisheries in NC—particularly those that deploy gillnets—have historically evoked conflict between environmental groups and fishermen. The survey responses emphasized this contention; however, a majority of answers do not address fishing specifically, but instead list it among threats challenging sea turtle survival.

Increased my understanding of the need for more conservation efforts and limits on competing activities (e.g. beach driving, gillnetting). (223)

The overfishing of oceans by "factory" ships has and will continue to be a problem to turtle survival. (343)

By far the most frequently described change ensuing from NCSTP participation was *increased awareness* on one of eight issues related to marine conservation (Table 9). Twenty percent of the sub-coded responses credited the NCSTP with having increased their awareness regarding the *plight of sea turtles* or the *need for sea turtle conservation*, with 18 and 10 volunteers contributing responses respectively. Responses claiming an increased awareness of the *plight of sea turtles* were often coded in conjunction with another sub-code. Several responses expressed altruistic sentiments associated with their participation in the NCSTP, as exemplified by the following quote:

It's given me the awareness and understanding that even though I've had very few interactions (direct) w/ the turtles, that all the little things I do or teach others to do makes a huge diff in the long run. You never know "which" turtle you'll save. (526)



**Table 9. Sub-codes used to analyze volunteers' *Increased Awareness* open-ended responses.**

<i>Increased Awareness</i>	<i>Criteria</i>	<i>No.</i>
Trash/Pollution	Degradation that is occurring on our beaches and in our oceans from trash/pollution (e.g.- plastics, balloons, fishing line)	37
Conservation	Importance of incorporating conservation into everyday life	22
Human impacts	How human activities (excluding beach development) are negatively impacting the beach and ocean ecosystems	19
Plight of sea turtles	Contributing factors to the demise of sea turtles	18
Delicate balance	Delicate balance and fragility of ocean animals and our marine ecosystems	17
Ocean issues	Challenges and issues threatening our oceans	10
Sea turtle conservation	Necessity for sea turtle conservation	10
Beachfront development	Detrimental impacts associated with beachfront development and increasing human presence on the beach	8

Twenty-two volunteers stated they are now more aware of *conservation*. These responses were coded separately from remarks above because of the emphasis volunteers placed on the need to incorporate *conservation* into their everyday lives. One volunteer in particular, stressed the importance of practicing conservation to benefit future generations.

I see conservation as more immediate and important, not as vague and generic. I value the ocean more and want my grandkids to be able to experience what I have seen. Want things to improve, not get worse! (476)

Nineteen survey respondents commented on a newly acquired awareness concerning the extent to which *human impacts* are altering beach and ocean ecosystems, while 8 volunteers commented specifically on the detrimental impacts associated with humans' increasing presence on the coast (*beachfront development*). Responses discussing *human impacts* were much broader in scope and focused on anthropogenic impacts on the oceans and beaches in general; where as volunteers discussing increased awareness of *beachfront development* specifically

addressed humans' encroachment on sea turtles and their nesting habitat. Two volunteers rationalized their heightened awareness by asserting:

I'm more aware of how we impact our environment. From my water use to use of chemicals outside, not using plastic grocery bags, not buying disposable items that go into landfills, leaching into water systems. Lessening my carbon footprint—now drive hybrids. (229)

The importance of new development being stopped, and lights and trash on beaches hindering turtle populations. (138)

Increased awareness of *trash/pollution* was alluded to by 37 volunteers (17.6%) as the change incurred from participation in the NCSTP. Within the *trash/pollution* responses, five volunteers described the need to discontinue the use of plastic bags because of the detriment they inflict on both the terrestrial and marine environment. A distinction was also made between marine and beach pollution; twelve responses expressed concern for impact of pollution in the oceans, while 20 volunteers acknowledged beach pollution as a serious problem. Divergent from responses in other categories, only 6 responses within the *trash/pollution* sub-code specifically alluded to sea turtles with regard to the problem of pollution; instead, their responses accentuated the calamitous effects of pollution in general to oceans and beaches.

Respondents demonstrated high levels of involvement in sea turtle activism outside their VBOs (Table 10). In three of the seven sea turtle-related activities, more than 50% of respondents indicated participation independent from their VBO: 69.4% invited someone to join their VBO, 69.2% spoke with media concerning sea turtle nesting season, and 54.0% paid membership dues or donated to a sea turtle organization. At least 15% of volunteers engaged in each of the remaining activities including litigious actions such as sending letters or emails to local government (17.9%), and sending letters or emails to state and/or federal agencies concerning sea turtle issues (23.7%).

**Table 10. Volunteer involvement in sea turtle activism.**

<i>Activity</i>	<i>Freq.</i>	<i>%<sup>a</sup></i>
Invited someone to join your VBO	275	69.4
Spoke with the media about sea turtle nesting season	274	69.2
Paid membership dues or made a donation to a sea turtle organization	214	54.0
Joined sea turtle mailing list/listserv	138	34.8
Attended a NC sea turtle permit holders meeting	110	27.8
Sent a letter or email to any state or federal agencies concerning issues relevant to sea turtle conservation	94	23.7
Sent a letter or email to your local government concerning issues relevant to sea turtle conservation	71	17.9

<sup>a</sup>Percent calculated using  $n = 396$ .

## **Discussion**

The high response rate of this study demonstrates both the eagerness and willingness of sea turtle volunteers to contribute information if it has the potential to expand or improve their conservation work. The length of time volunteers had participated, as well as the frequency in which they participate, also reflected this dedication. Volunteers' tenure in the NCSTP averaged almost five years, suggesting the benefits of volunteering outweigh the associated costs. This duration, coalesced with the 80% of volunteers who reported participating in sea turtle monitoring activities at least one to two days a week, indicates the dedication and fervor of sea turtle volunteers that persists beyond a single monitoring season. Bearing in mind all volunteers had at least one sea turtle encounter (i.e. false crawl, nest identification or excavation, etc.); it is also fair to presume that volunteers' aspirations to participate in the NCSTP extend beyond the desire to encounter a sea turtle.

As in other volunteer organizations, sea turtle volunteers in the NCSTP survey reported multiple motivations for volunteering. All respondents described being highly motivated by *turtles, environment, volunteerism, and sea turtle conservation* factors; however, *social* and *science* factors were deemed significantly less important reasons for volunteering. The Results suggest that volunteers were not particularly interested in building social networks, making friends, or fulfilling interests in marine science or sea turtle research; instead, responses spoke to their keenness to protect sea turtles.

The importance of protecting sea turtles was emphasized in volunteers' motivations as they identified *sea turtle conservation* as the most important factor (Table 6). Volunteers demonstrated this importance in scoring individual motivation items, as two items within the *sea turtle conservation* factor scored in the top three overall, most important items. Volunteers fervently agreed that the volunteer work they performed was helping conserve sea turtles. The majority of survey respondents demonstrated their enthusiasm for sea turtles by inviting others to join their VBO or by speaking to the media about sea turtle nesting season, and more than half reported paying membership dues or making a donation to a sea turtle organization. An equally impressive statistic is the number of volunteers (41.6%) that have written or emailed local officials or state and federal agencies in support of ordinances and laws to protect sea turtles and their nesting habitat. Advocating legal measures for sea turtle protection indicates a level of engagement greater than the previous actions measured, and the number of volunteers taking these actions indicates the confidence they have in their knowledge of sea turtles as well as the significance they place on their continued existence. A different measure of tendency further supporting the importance of *sea turtle conservation* were responses to a question asking volunteers to best describe the work they perform for the NCSTP. By explicitly asking

volunteers to convey these perceptions, researchers were able to compare these answers to results indicating motivation importance. The majority of volunteers explained their work as ‘Conservation,’ while ‘Educating the public about sea turtles’ was second; combined, these two responses accounted for more than 75% of the answers (Table 7). This overwhelming statistic revealed that volunteer’ perceptions of the work they perform was fairly unanimous; and, validates the results from the motivation index allowing us to state with certainty that *sea turtle conservation* was the most important motivation for NCSTP volunteers.

Volunteers considering *sea turtle conservation* the most important motivation may seem intuitive because of the species-specific focus of the NCSTP; however, the *turtles* motivation factor although significant, was the third lowest overall mean factor score. Evaluating this factor with respect to *sea turtle conservation*, it becomes apparent that volunteers do not participate in the NCSTP merely to have an encounter with a sea turtle, but rather to actively contribute to sea turtle conservation. Although one may have also expected volunteers to have been highly motivated by *science* through data collection and sea turtle research, each of the three *science* motivation items were among the lowest individual mean scores; consequently, the *science* index value was significantly less important than all other factors apart from *social* motivation.

*Environment* was highly regarded by volunteers as well, ranking as the second highest factor in the motivation index. Similarly, ‘Sea turtle survival is important to ocean health’ was considered the most important individual item motivating their participation; two potential explanations exist for such a high individual score. First, because the motivation item included the words sea turtle survival, it is fair to assume volunteers perceived the statement as pertaining to the importance of conserving sea turtles; in which case, the individual score would only reinforce the high level of worth volunteers placed on sea turtle conservation. A second

possibility however, is that volunteers are in fact aware of the ecological niche sea turtles occupy in ocean ecosystems, and maintaining the health of these ecosystems was genuinely their main concern. If the latter is correct, then the high importance of the *environment* may insinuate that the flagship status of sea turtles induces volunteer cognizance as to the importance of healthy, ocean ecosystems.

Social factors have been shown to be strong motivators for participation in volunteer organizations (Cnaan and Goldberg-Glen 1991; Miles et al. 1998). Similar to results found by Bradford (2003) however, this study revealed the relative unimportance of *social* factors to motivate sea turtle volunteers. This is perhaps because much of the work examining volunteer motivations has occurred in other sectors, predominantly the health and human services; only recently have motivations of environmental volunteers been interrogated. The relative unimportance of *social* factors in environmental volunteerism therefore, may prove to be common as more research is conducted. Motivation index values revealed that *social* motivation did not significantly influence volunteers when deciding to participate in the NCSTP. This sentiment was underpinned when volunteers described their work, as less than 10% of volunteers believe their efforts have *social* implications (Table 6). The low importance assigned to *social* motivations may attest to the charismatic appeal of flagship species to entice citizens into the NCSTP.

Determining what impact volunteering has on citizen participants, and whether the flagship status of sea turtles effectively changes volunteer perspectives on marine conservation, is complex. Grese et al. (2000) showed that volunteers are motivated to learn more about nature as part of their volunteer activities; results from this study partially contradict their theory. Evident from the Results section, volunteers had a difficult time discussing ocean issues unless

they were directly related to sea turtles; approximately 35% of responses directly alluded to sea turtles. Volunteers who ascribed making behavioral changes did so within the context of sea turtle conservation. The importance of picking up litter and beach debris was frequently mentioned because volunteers perceived this action to have positive corollaries for nesting sea turtles. In the same way, volunteers were generally unable to communicate the impact of fisheries outside their implications for sea turtle protection. Comments concerning the need for sea turtle conservation explicitly remarked on the need to conserve sea turtles; however, none of the recommendations offered conservation strategies that could be implemented. Respondents instead emphasized the necessity for sea turtle conservation, or the altruistic feeling that was associated with participating in conservation efforts. Collectively, these responses signify that although some volunteers gave thought to issues greater than sea turtles themselves, it was merely to identify how that specific issue impacted or threatened sea turtle survival.

In contrast, volunteers ascribing becoming more involved in *advocacy/education* because of their NCSTP involvement did so with regard to the larger marine environment, even when alluding to sea turtles. Likewise, volunteers who described an *increased awareness* revealed a learned understanding of challenges impeding marine conservation, many of which were unconnected to sea turtles (Table 9). Volunteers most frequently stated that they had derived an increased awareness of trash and pollution on beaches and in the ocean, yet very few of these responses expressly referenced sea turtles. Regarding conservation, volunteers identified it as something that should not be limited to a single species or habitat, but rather a way of life that needs to be incorporated into people's daily routines. Many volunteers (20%) stressed that their NCSTP involvement taught them that marine resources are finite, and that conservation efforts of ocean ecosystems are lacking.

*Human impact* and *beachfront development* were equally important products of volunteering, and emphasis was placed on the need to curb development that alters beach, ocean and estuarine habitats; as well as modify human behavior to avoid contributing to the imperilment of animals living in them (e.g. prohibiting plastic bags, disposing properly of chemicals). The attitudes expressed by volunteers are robust indications that while participation in the NCSTP fulfilled a desire to help conserve sea turtles, for many a greater appreciation for the marine environment was a major benefit from their involvement. This appreciation supports similar findings in social science literature regarding the ability for flagship species to effectively cultivate public awareness for large-scale ecosystem (Simberloff 1998; Caro and O'Doherty 1999; Eckert and Hemphill 2005).

Examining volunteer engagement in outside organizations before, during and as a result of joining the NCSTP, allowed us to evaluate if volunteering empowered citizens, causing them to become more actively engaged in their community. Prior to joining the NCSTP, 128 respondents indicated being active members of volunteer organizations. During their sea turtle volunteer work, 108 respondents reported joining new organizations while 31 volunteers attributed their involvement in the NCSTP for seeking out new service opportunities in their communities. Although some volunteers were involved in conservation before joining the NCSTP, many were participants in social services and human health organizations. Quite the opposite, of volunteers that joined either during or as a result of their participation in the NCSTP, 71% joined organizations directly contributing to conservation. Many volunteers increased their involvement in sea turtle conservation by assisting at hospitals or joining non-profit sea turtle organizations; further testament to the power of *sea turtle conservation* as a motivating factor. A large number of volunteers went beyond merely joining additional volunteer organizations;



instead, they founded organizations that work to promote shoreline protection, beach and ocean health, or marine conservation in general. One initiative that underscored the empowerment and ardor bestowed upon NCSTP volunteers was a project instigated by volunteer concern for the overwhelming amounts of trash on the beaches of one VBO.

Lacking recycling containers and adequate trash receptacles, three members of the VBO initiated a research project that collected and cataloged all the trash left on their community's beaches during the 2009 sea turtle nesting season. At the conclusion of the nesting season, volunteers had filled 475 garbage bags with beach trash and collected an unquantifiable amount of beach debris that was too large to fit into garbage bags (e.g. beach chairs, tents, coolers) (G. Taylor Pers. comm., 2010). Their efforts reached beyond the beach however, as they branched out to other states' beach recycling and waste removal programs to inform their beach municipality's government of possible solutions. As a result of the initiative, the disposal of plastic bottles in regular trash receptacles is now unlawful. Similarly, the municipality's newly elected mayor has campaigned relentlessly to prohibit local business owners from distributing plastic grocery bags, and recently has discussed a want to prohibit smoking on their beaches. Although the project initiated from within their VBO, the project has become its own entity and dialogues have taken place between the founders and community councilmen to discuss ways the project can be incorporated into the municipality's beach management plan. This initiative reflects upon the notion that flagship species can positively foster concern and awareness for larger ecosystems (Caro and O-Doherty 1999). Furthermore, the ingenuity and determination demonstrated by volunteers suggests that involvement in the NCSTP may promote environmental activism beyond the scope of sea turtle conservation.

## **Conclusion**

This study reaffirmed the notion that sea turtle volunteers are a dedicated group of individuals. Findings suggest that volunteers were driven to participate in the NCSTP by factors that may contradict studies on volunteer motivations. Unlike citizens in the social service sector, sea turtle volunteers were not motivated by social factors suggesting disparities in volunteer attitudes between the two disciplines. This may be attributed to the species-specific focus of the NCSTP, or a fundamental difference may exist in motivations driving citizen engagement in science. Results also revealed that the flagship status of sea turtles proved essential, and most effective, to attract volunteers to the NCSTP. Once immersed into the organization however, participants began to appreciate the coastal and ocean environment in which sea turtles live. Similarly, volunteers participating in the NCSTP revealed that the use of flagship species in conservation yields positive benefits, and citizens were empowered to become active participants in conservation outside of their volunteer organization.

This research marks the first time a single study has examined the impact of flagship species on citizens within the context of conservation volunteerism. Given the rise in environmental volunteerism and the increasing dependence of conservation managers on in-kind, citizen contributions and labor, further interrogation of environmental volunteer motivations is necessary. Considering the evidence found supporting the utility of flagship species in volunteer conservation, additional exploration of surrogate concepts in volunteerism is also warranted. Such exploration promises to assist resource managers and scientists gain a better understanding of the ways in which they can structure their organizations to empower its participants, and encourage advocacy for ecosystem conservation.

## **Acknowledgements**

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## APPENDIX A VOLUNTEER SURVEY AND CORRESPONDENCE

### North Carolina Sea Turtle Project – Volunteers’ Survey



July 8, 2009

Dear sea turtle volunteer,

We are researchers at Duke University, based at the marine lab in Beaufort, North Carolina. We are working in collaboration with the North Carolina Wildlife Resources Commission to better understand the role of volunteering in North Carolina’s efforts to conserve sea turtles. Our project is funded by the National Science Foundation.

You are receiving this package because we believe you are a sea turtle volunteer in North Carolina. If you have never been a sea turtle volunteer, please write ‘not applicable’ on this cover page and return the blank survey to us in the postage-paid envelop enclosed.

We are interested in your experiences as a volunteer, your motives, and your opinions on threats sea turtles face and how the State should deal with these, and on your contributions to better understanding sea turtle biology and conservation. We stress that we are interested in and value your opinions based on your experiences as a volunteer. This is not a ‘test’, and there are no wrong answers. We hope the results of this survey will improve our understanding of the role of volunteers in conservation in general, and inform the North Carolina Sea Turtle Project about the views of its volunteers specifically.

In completing the survey, please keep in mind the following:

- The survey takes approximately 15 minutes to complete
- Your participation is voluntary
- You may skip any questions you don’t want to answer and you may stop answering the survey at any time
- The information that you provide will be anonymous; we will not use your name or address in the reports we write. Neither staff of the North Carolina Wildlife Resource Commission nor other volunteers will have access to the data.

We ask that you please return the survey to us in the envelope provided by:

**Friday, August 14, 2009.**

### **How will the data be used?**

The data collected in this survey will be used by the researchers and students involved in this project. All data will be stored in a secure lab at Duke University, in perpetuity (or destroyed when no longer needed). Access to the data on lab computers (and backup drive) will require a password, shared only among the survey team.

The summarized results will be made publicly available and may be used by the North Carolina Wildlife Resources Commission, individual volunteer groups, media outlets, elected officials and government agencies. If you would like a copy of a summary of survey results, please include your email or mailing address on the last page of the survey. Your contact information will be detached from each completed survey prior to data entry.

### **Contacts**

For questions about the survey, please contact Nick Mallos.

Email: \_\_\_\_\_; Phone: \_\_\_\_\_

For questions about the project in general, contact Lisa Campbell.

Email: \_\_\_\_\_; Phone: \_\_\_\_\_

For questions about your rights as a research subject or complaints, please contact the Duke Office of Research Support (919-684-3030).

Feel free to detach this first page for your information.

**If you would like to participate in the survey, please continue to the next page...**

**Thank you for participating in this survey! Your responses are important and will provide valuable information on the role of volunteering in conservation, and on the North Carolina Sea Turtle Project specifically.**

**To ensure a common understanding of the questions in this survey, we provide definitions to clarify key terms used in this questionnaire.**

**Conservation-** a careful management of a natural resource to prevent its exploitation, destruction, or neglect, and to ensure its existence in the future

**Volunteer-** a person who is willing to undertake a service or work without pay; for the purpose of this study, **volunteering** includes any work on issues related to sea turtle conservation in North Carolina

**Science-** a system of acquiring knowledge; Scientific research involves asking and answering questions through a variety of means, including observation and/or experimentation

**NCSTP-** North Carolina Sea Turtle Project

**VBO-** Volunteer Beach Organization [i.e.- your beach's sea turtle monitoring program]

### **SECTION A: Volunteer participation in the North Carolina Sea Turtle Project**

**This section is designed to collect information regarding your involvement in and the satisfaction gained from volunteering in the NCSTP. This information (and all other information collected) will be anonymous, and never linked to your name or other personal identifiers in resulting reports or publications.**

1. How many years have you volunteered in the NCSTP? \_\_\_\_\_ years
  
2. During the 2008 NCSTP monitoring season, how often did you volunteer? (*Check only ONE*)
  - a) \_\_\_\_\_ Every day
  - b) \_\_\_\_\_ 3-5 days a week
  - c) \_\_\_\_\_ 1-2 days a week
  - d) \_\_\_\_\_ 1-2 days a month
  - e) \_\_\_\_\_ 1-2 days per monitoring season

3. Since you began volunteering with the NCSTP, please indicate your level of participation in each of the following volunteer activities? (Check only **ONE** box for each activity)

Volunteer Activity	Have Not Participated	Have Participated a Few Times	Participate Frequently
a) Patrolling the beach for nesting activity			
b) Identifying and/or marking turtle nests			
c) Relocating turtle nests			
d) Monitoring/sitting nests for hatchlings			
e) Excavating nests			
f) Assisting with stranded sea turtles			
g) Assisting with or observing a sea turtle necropsy			
h) Volunteering at a sea turtle hospital (NEST or Topsail Island)			
i) Educating tourists/public on the beach about sea turtles			
j) Formal presentations or educational programs about sea turtles			

4. Please rank the volunteer activities you enjoy participating in most. **RANK ONLY 5 activities in total, using each number only once.** (Rank 1= most enjoyable, 2= second-most enjoyable, 3= third-most enjoyable, 4= fourth-most enjoyable, 5= fifth-most enjoyable)

**Rank**

- a) \_\_\_\_\_ Patrolling the beach for nesting activity
- b) \_\_\_\_\_ Identifying and/or marking turtle nest
- c) \_\_\_\_\_ Relocating turtle nests
- d) \_\_\_\_\_ Monitoring/sitting nests for hatching
- e) \_\_\_\_\_ Excavating nests
- f) \_\_\_\_\_ Assisting live sea turtle strandings
- g) \_\_\_\_\_ Assisting dead sea turtle strandings
- h) \_\_\_\_\_ Performing/assisting a sea turtle necropsy
- i) \_\_\_\_\_ Volunteering at a sea turtle hospital (NEST or Topsail Island)
- j) \_\_\_\_\_ Educating tourists/public on the beach about sea turtles
- k) \_\_\_\_\_ Formal presentations or educational programs about sea turtles

5. Please indicate the importance of each factor in motivating you to volunteer in the NCSTP.  
(Please circle only **ONE** number for each reason.)

<b>Reason</b>	<i>Not Important</i>		<i>Neutral</i>		<i>Very Important</i>	<i>Don't Know</i>
<b>a)</b> My friends volunteer.	1	2	3	4	5	X
<b>b)</b> Volunteering will teach me more about sea turtles.	1	2	3	4	5	X
<b>c)</b> Volunteering gives me a chance to give back to my community.	1	2	3	4	5	X
<b>d)</b> Sea turtle survival is important for ocean health.	1	2	3	4	5	X
<b>e)</b> Volunteering allows me to pursue my interests in marine biology and/or science.	1	2	3	4	5	X
<b>f)</b> I am helping to ensure a safer future for sea turtles.	1	2	3	4	5	X
<b>g)</b> Volunteering allows me to experience the natural environment.	1	2	3	4	5	X
<b>h)</b> By volunteering, I feel I am compensating for harm placed upon sea turtles by humans.	1	2	3	4	5	X
<b>i)</b> I am fascinated by sea turtles.	1	2	3	4	5	X
<b>j)</b> Volunteering makes me feel like I am making a difference.	1	2	3	4	5	X
<b>k)</b> As a volunteer, I help the state better understand sea turtle biology and behavior, and thus contribute to improved management.	1	2	3	4	5	X
<b>l)</b> Volunteering is a good opportunity to meet people.	1	2	3	4	5	X
<b>m)</b> Volunteering is a way for me to assist in ocean conservation.	1	2	3	4	5	X
<b>n)</b> I enjoy collecting data on sea turtles and participating in sea turtle research.	1	2	3	4	5	X
<b>o)</b> I want to see a sea turtle in its natural environment.	1	2	3	4	5	X
<b>p)</b> Volunteering is very rewarding and provides me a feeling of self-worth.	1	2	3	4	5	X
<b>q)</b> Volunteering is good exercise.	1	2	3	4	5	X
<b>r)</b> I want sea turtles to be around for my child/grandchild to see.	1	2	3	4	5	X



6. What is the **most** rewarding part of being a volunteer in the NCSTP? (*Check only ONE*)
- a) \_\_\_\_\_ Feeling as though my efforts will aid the survival of sea turtles
  - b) \_\_\_\_\_ Making a contribution to my community
  - c) \_\_\_\_\_ Meeting new people with whom I can share my interest in sea turtles
  - d) \_\_\_\_\_ Seeing a sea turtle (nesting or hatching)
  - e) \_\_\_\_\_ Getting to spend time on the beach, near the ocean
  - f) \_\_\_\_\_ Knowing my work contributes to sea turtle science
7. Please indicate the approximate number of times you have witnessed each of the following events during your time as NCSTP volunteer. (*If you have not witnessed one or more of the events write N/A*)
- a) \_\_\_\_\_ False crawl
  - b) \_\_\_\_\_ Sea turtle nest (Do not count the same nest more than one time)
  - c) \_\_\_\_\_ Female sea turtle nesting/depositing eggs
  - d) \_\_\_\_\_ Hatchlings emerging from their nest
  - e) \_\_\_\_\_ Live sea turtle stranding
  - f) \_\_\_\_\_ Dead sea turtle stranding

**SECTION B: Sea turtle science as viewed by “Citizen Scientists”**

**We are interested in how you learn about sea turtles, and in what you’ve learned while working in the NCSTP. There are no incorrect responses; we are interested in your views on sea turtles’ status and threats to the species, as well as what information and skills are important to volunteering.**

8. How would you classify the current conservation status of the loggerhead sea turtle? Please classify the conservation status for both the Northwest Atlantic population and for the population nesting on **your** beach? (*Check only ONE for each population*)

	Conservation Status			
Loggerhead Population	DECLINING	STABLE	INCREASING	DON'T KNOW
A) Northwest Atlantic population				
B) Population nesting on your beach				

9. Please indicate your level of agreement with the following statement:  
(Circle **ONE** number that most closely matches your response)

**“Having a thorough understanding of sea turtle biology is necessary to be an effective NCSTP volunteer”**

Completely disagree	Neutral			Completely Agree	Don't know
1	2	3	4	5	X

10. For sea turtles in North Carolina and globally, please rank the THREE most serious threats jeopardizing their survival? (Rank **1= most serious**, **2= second-most serious**, **3= third-most serious**)

Threat to Sea Turtle Survival	North Carolina	Globally
a) Beach nourishment	_____	_____
b) Artificial lighting from buildings, streetlights and beach front properties	_____	_____
c) Increase in global temperatures	_____	_____
d) Human use of sea turtles for meat, eggs, and other products	_____	_____
e) Competition from invasive, non-native plant and animal species	_____	_____
f) Beach activities [e.g. umbrellas, beach chairs, large holes]	_____	_____
g) Commercial and recreational boat strikes	_____	_____
h) Dogs not on leash	_____	_____
i) Beach driving	_____	_____
j) Disease [Fibropapillomatosis tumors]	_____	_____
k) Natural predation [e.g. ghost crabs, foxes, fishes, sharks]	_____	_____
l) Beach armoring [e.g. sea walls, sand bags, groins, jetties, etc.]	_____	_____
m) Ingestion of marine debris [e.g. plastic bags, plastics, lost fishing gear]	_____	_____
n) Water pollution	_____	_____
o) Bycatch in fisheries	_____	_____
p) Loss of in-water-habitat	_____	_____
q) Loss of nesting habitat	_____	_____
r) Beachfront development	_____	_____

11. Please rank the top THREE methods you use most frequently to learn about sea turtles [e.g. biology, behavior, etc.]? **RANK UP to 3 methods in total, using each number only once.** (Rank 1= *used most*, 2= *used second-most*, 3= *used third-most*)

**Rank**

- a) \_\_\_\_\_ I learn from attending the NC sea turtle permit holders meeting
  - b) \_\_\_\_\_ I learn from on the beach experience
  - c) \_\_\_\_\_ I learn from literature provided by the NCSTP
  - d) \_\_\_\_\_ I learn from working with other volunteers
  - e) \_\_\_\_\_ I learn from general literature available on sea turtles [e.g. Internet, library, etc]
  - f) \_\_\_\_\_ I learned from training provided by my beach's volunteer group coordinator
12. What is your primary method of learning NCSTP volunteer protocols? (*Check only ONE*)

- a) \_\_\_\_\_ I learn from attending the NC sea turtle permit holders meeting
- b) \_\_\_\_\_ I learn from on the beach experience
- c) \_\_\_\_\_ I learn from literature provided by the NCSTP
- d) \_\_\_\_\_ I learn from working with other volunteers
- e) \_\_\_\_\_ I learn from general literature available on sea turtles [e.g. Internet, library, etc]
- f) \_\_\_\_\_ I learned from training provided by my beach's volunteer group coordinator

13. Please rank the most important characteristics of being a sea turtle volunteer. **RANK ONLY 3 characteristics in total.** (Rank 1= *most important*, 2= *second-most important*, 3= *third-most important*)

**Rank**

- a) \_\_\_\_\_ Showing up every day (dependability)
- b) \_\_\_\_\_ Ability to work and get along with other volunteers
- c) \_\_\_\_\_ Physical fitness
- d) \_\_\_\_\_ Good communication skills, e.g. to speak to the public on the beach (includes enforcing rules, as needed)
- e) \_\_\_\_\_ Care and compassion for sea turtles
- f) \_\_\_\_\_ An understanding of sea turtle biology
- g) \_\_\_\_\_ An understanding of threats facing sea turtle survival

**SECTION C: Views and perceptions of volunteering and volunteer contributions to the NCSTP**

**This section is designed to collect information regarding volunteers’ contributions to, and interactions with, the NCSTP.**

**For the following questions, please indicate your level of agreement with the following statements.**  
*(Circle ONE number that most closely matches your response)*

Statement	<i>Completely disagree</i>		<i>Neutral</i>		<i>Completely agree</i>		<i>Don't Know</i>
<b>14)</b> “The state values the in-kind labor I provide the NCSTP.”	1	2	3	4	5	X	
<b>15)</b> “The state and other agencies use the data collected by NCSTP volunteers.”	1	2	3	4	5	X	
<b>16)</b> “I am aware of the way sea turtle data are used by the state and other agencies.”	1	2	3	4	5	X	

**17.** In your opinion, which word or phrase most accurately describes the work performed by NCSTP volunteers? *(Check only ONE)*

- a) \_\_\_\_\_ Scientific research
- b) \_\_\_\_\_ Public relations for your beach municipality
- c) \_\_\_\_\_ Conservation
- d) \_\_\_\_\_ Community outreach
- e) \_\_\_\_\_ Volunteerism
- f) \_\_\_\_\_ Public education about sea turtles
- g) \_\_\_\_\_ Other: \_\_\_\_\_.

**18.** What do you **personally** believe should be the primary objective of the NCSTP? *(Check only ONE)*

- a) \_\_\_\_\_ Get as many sea turtle hatchlings into the water as possible
- b) \_\_\_\_\_ Educate public on sea turtle biology and conservation
- c) \_\_\_\_\_ Minimize impacts on the natural order of sea turtle reproduction
- d) \_\_\_\_\_ Ensure volunteer experience is positive, and program is functional
- e) \_\_\_\_\_ Rescue and rehabilitate sick or injured sea turtles
- f) \_\_\_\_\_ Contribute to research on sea turtle biology and conservation
- g) \_\_\_\_\_ Other: \_\_\_\_\_.

For the following questions, please indicate your level of agreement with the following statements.  
 (Circle **ONE** number that most closely matches your response)

Statement	<i>Completely disagree</i>		<i>Neutral</i>		<i>Completely agree</i>	<i>Don't Know</i>
19) "The amount of training provided by the NCSTP allows me to feel confident and comfortable when monitoring sea turtle activities."	1	2	3	4	5	X
20) "The training provided by the NCSTP is <b>very important</b> to being a successful sea turtle volunteer."	1	2	3	4	5	X

21. What do you think is the single most important thing the NCSTP does towards conserving sea turtles?

Comment \_\_\_\_\_  
 \_\_\_\_\_

22. Is there anything you think the NCSTP should be doing that it's not currently doing to conserve sea turtles?

Comment \_\_\_\_\_  
 \_\_\_\_\_

23. Is there anything you would do to improve the NCSTP?

Comment \_\_\_\_\_  
 \_\_\_\_\_

**SECTION D: NCSTP influence on external activities and interest**

This section is designed to determine whether or not, and how, your involvement in the NCSTP has influenced your decision to engage in activities and interests outside the sea turtle project.

24. Have you ever attended the International Sea Turtle Symposium? If **YES**, please specify the number of times.

\_\_\_\_\_ Yes; Number of times attended \_\_\_\_\_  
 \_\_\_\_\_ No

25. Since you began volunteering in the NCSTP, have you performed any of the following activities related to sea turtles? (*Please check ALL that apply*)

- a) \_\_\_\_\_ Invited someone to join your VBO
- b) \_\_\_\_\_ Paid membership dues or made a donation to a sea turtle organization
- c) \_\_\_\_\_ Joined mailing list/listserv [e.g. NC-CTURTLE, CTURTLE, seaturtle.org, etc.]
- d) \_\_\_\_\_ Attended a NC sea turtle permit holders meeting
- e) \_\_\_\_\_ Spoke with the media about sea turtle nesting season
- f) \_\_\_\_\_ Sent a letter or email to your local government concerning issues relevant to sea turtle conservation [e.g. beach lighting, beach driving, beach nourishment, etc.]
- g) \_\_\_\_\_ Sent a letter or email to any state or federal agencies (e.g. NC Division of Marine Fisheries, NOAA) concerning issues relevant to sea turtle conservation [e.g. water quality, fishing practices, development, etc.]

26. Please list any sea turtle, environmental or volunteer organizations in which you participate? For each organization, please check whether you began volunteering *Prior to...*, *During...*, or *As a Result of* your volunteering in the NCSTP.

Name of Organization	Prior to...	During...	As a result of...
a.			
b.			
c.			
d.			
e.			

27. Has your involvement with sea turtle conservation changed the way you think about ocean issues and conservation? If **YES**, please use the space provided to explain.

\_\_\_\_\_ Yes, Please explain: \_\_\_\_\_

\_\_\_\_\_ No \_\_\_\_\_

\_\_\_\_\_

**SECTION E: Demographic information**

**In this last section, we would like to ask you some questions about your background. This information will help us describe our survey respondents. We stress that ALL of your answers will be kept strictly confidential.**

28. Are you?      \_\_\_\_\_ Male      \_\_\_\_\_ Female

29. What is your current age?      \_\_\_\_\_ years of age

30. What is the highest level of education that you have achieved? (*Check only ONE*)

- |   |  |
|---|--|
| a) _____ Some high school                 | e) _____ Some undergraduate college/university   |
| b) _____ High School diploma or GED       | f) _____ Undergraduate college/university degree |
| c) _____ Some technical/vocational school | g) _____ Some graduate or professional school    |
| d) _____ Technical/vocational degree      | h) _____ Graduate or professional school degree  |

31. In what county is your primary residence? If you are not a North Carolina resident, please indicate your state of primary residence.

\_\_\_\_\_ County      \_\_\_\_\_ State

32. What is your current employment situation? (*Check only ONE*)

- |                             |                       |
|-----------------------------|-----------------------|
| a) _____ Self-employed      | e) _____ Student      |
| b) _____ Employed full-time | f) _____ Homemaker    |
| c) _____ Employed part-time | g) _____ Not Employed |
| d) _____ Retired            |                       |

33. What was your approximate annual household income before taxes last year? (*Check only ONE*)

- |                               |                                 |
|-------------------------------|---------------------------------|
| a) _____ Less than \$20,000   | e) _____ \$80,000 to \$99,999   |
| b) _____ \$20,000 to \$39,999 | f) _____ \$100,000 to \$149,999 |
| c) _____ \$40,000 to \$59,999 | g) _____ \$150,000 to \$199,999 |
| d) _____ \$60,000 to \$79,999 | h) _____ Greater than \$200,000 |

**Voluntary Contact Information**

**This portion of the survey will be detached and stored separately from the information it contains. Your name and address will not be linked to any of the responses that you provided.**

**34.** Would you like to receive a copy of the survey results when they are available?

\_\_\_\_\_ YES

\_\_\_\_\_ NO

*If you answered **YES** to the question above, please write your contact information below:*

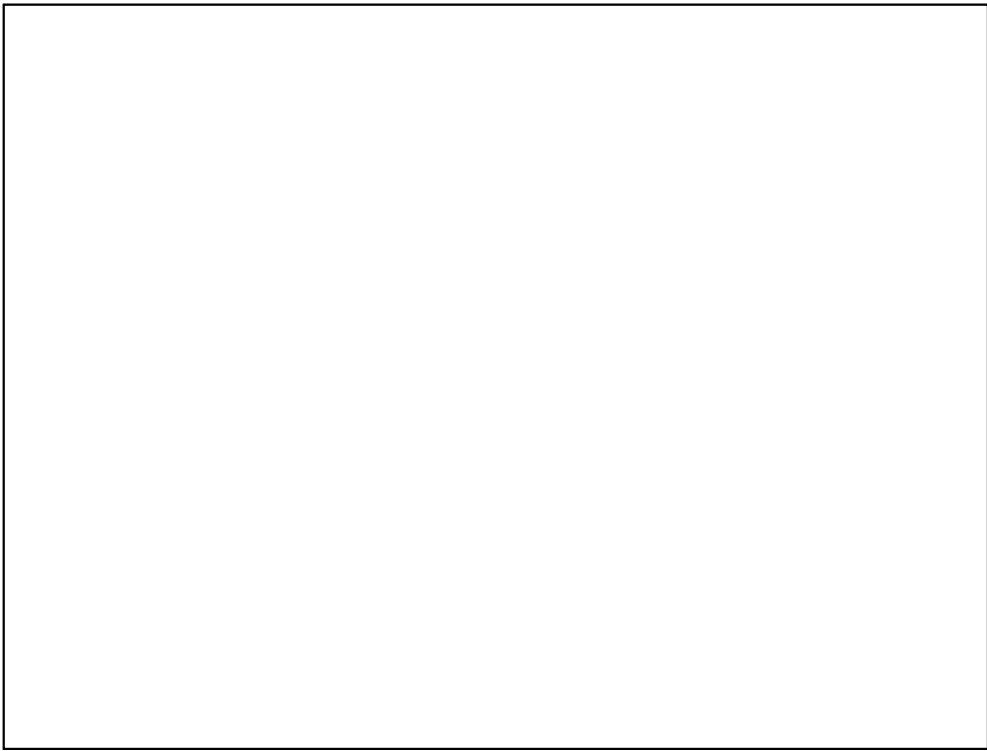
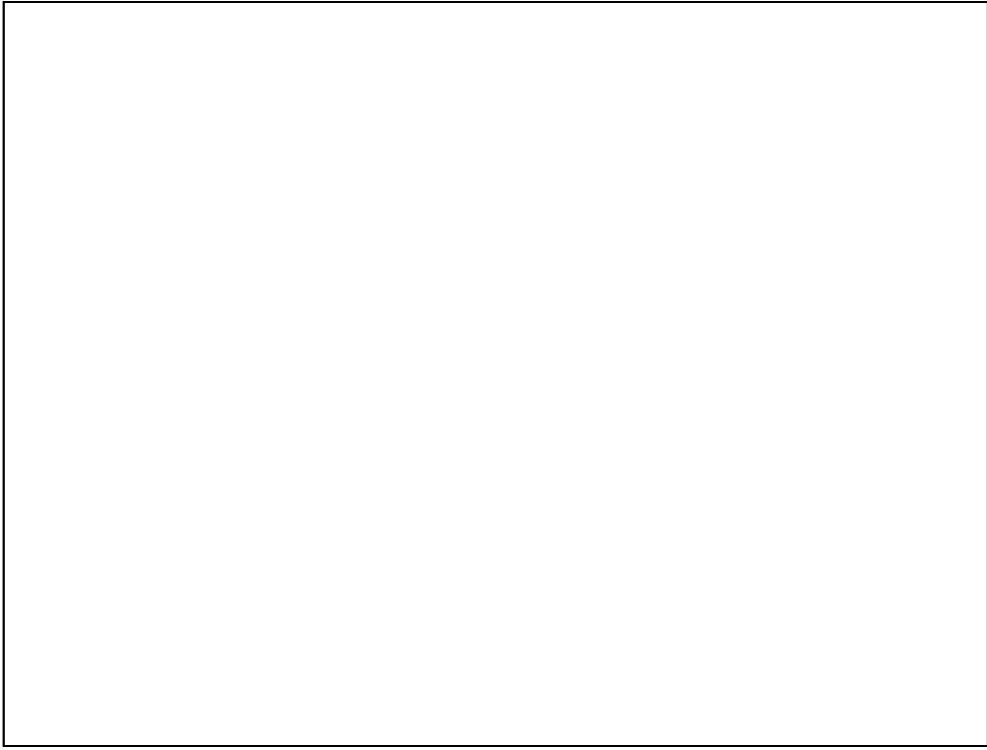
Name: \_\_\_\_\_

Phone number: \_\_\_\_\_

E-mail address: \_\_\_\_\_

Mailing address: \_\_\_\_\_





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