



IMPACT PLANNING • EVALUATION • AUDIENCE RESEARCH

**CITIZEN SCIENCE PROJECT:
SUMMATIVE EVALUATION**

Prepared for the
Conservation Trust of Puerto Rico
Manati, Puerto Rico

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IMPACT FRAMEWORK

As part of its National Science Foundation (NSF) grant, the Conservation Trust of Puerto Rico hired Randi Korn & Associates, Inc. (RK&A) to conduct an evaluation of its Citizen Science Project. Evaluation is different than research, which is used to generate and test theories and often uses a conceptual framework. Instead, evaluators measure the impact of a project against its intended outcomes and use an Impact Framework, the organizing framework NSF requires for evaluation (Clewell & Fortenberry, 2009). One key difference between a conceptual framework and the Impact Framework is that the former articulates and tests a formal hypothesis while the latter articulates the intended impact of a project. More specifically, during the life of the project, the Impact Framework serves multiple functions, including (1) articulates the goals of the project to NSF in the proposal; (2) is a roadmap for the Trust to align project practices with the impact it intends to achieve on specific audiences; and (3) serves as the framework by which the evaluators measure success. The Impact Framework for this project was developed through collaboration between RK&A and The Trust. During a two-day initial meeting, RK&A used inquiry to facilitate conversations among staff, which resulted in a draft Impact Framework at the end of the first day of convening. On day two, staff reviewed this draft and further revisions were made, resulting in the final Impact Framework that guided the project evaluation. To arrive at the final Impact Framework, staff answered questions, such as “Who are the primary audiences?”, “What is the intended result of the project on the audiences served?”, and “What is the evidence that those results have been achieved” (i.e., “What will you see and/or hear during participation that lets you know the intended result has been achieved?”). The Impact Framework for this project is provided on the following page.

**CONSERVATION TRUST OF PUERTO RICO
CITIZEN SICNECE IMPACT FRAMEWORK**

IMPACTS <i>What do you want to achieve for the audience?</i>	INDICATORS <i>What is the evidence that you have achieved the impacts for the audience?</i>
1. Participants understand connections within the Rio Grande of Manati River.	a. Participants know that everything that lives in or along the river, including people, is inter-related. b. Participants identify negative impacts on the Rio Grande of Manati River and describe solutions.
2. Participants develop science process skills.	a. Participants develop skills: observation, organizing data, analysis, etc.
3. Participants develop critical thinking skills to apply to conservation issues.	a. Participants apply process skills to real-world situations. b. Participants ask conservation-related questions about their life and community.
4. Participants believe their actions affect the watershed.	a. Participants name ways they helped with the conservation efforts of the watershed. b. Participants intend to act on (or pay attention to) other conservation issues affecting them and their community.
5. Participants see science as relevant to their life.	a. Participants name ways they can use science to make changes (connection between science and activism).
6. Participants demonstrate ownership of the Rio Grande of Manati Watershed.	a. Participants demonstrate actions or behaviors (on a continuum from individual-Trust-community) related to maintaining the functionality of the Rio Grande of Manati Watershed.

EXECUTIVE SUMMARY

As part of its National Science Foundation (NSF) grant, the Conservation Trust of Puerto Rico hired Randi Korn & Associates, Inc. (RK&A) to evaluate its Citizen Science Project. This report presents results from the summative evaluation that measured the project's success against the Impact Framework. In the following executive summary, we have described key findings from the study by methodology. This organization is meant to demonstrate how triangulation of key findings from the three methods—control and treatment interviews, case studies, and core participant interviews—contributes to the analysis and recommendations provided in this report. Findings from each method are fundamental to understanding the conclusion of results in the next section, which interprets the results within the context of the Impact Framework.

The findings presented here are among the most salient. Please read the remainder of the report for a more comprehensive presentation of findings and explanation of the methodology.

METHODOLOGY

RK&A employed a mixed methods approach to the summative evaluation, including.

1. Control and Treatment Interviews
2. Case Studies
3. Core Participant Interviews

In the three findings sections that follow, we describe the methodologies and the results.

CONTROL AND TREATMENT INTERVIEWS

RK&A conducted 141 interviews with project participants; participants comprise two groups:

1. Control Group – 55 participants who were interviewed before participating in the Citizen Science Project. These participants had never participated in citizen science activities.

2. Treatment Group – 85 participants who were interviewed within a few weeks of participating in the Citizen Science Project. This group comprises first-time and repeat participants in project activities.¹

Interviews were open-ended and audio-recorded and transcribed to facilitate analysis. The interviews were then scored on a rubric (see Appendix D) in order to measure differences between groups.

FINDINGS

Findings from these interviews can be looked at through two lenses. First, we can compare control and treatment groups to measure impact. Unfortunately, there is only one statistical difference between control and treatment groups, which favors the control group. That is, control participants scored higher than treatment participants in their ability to name ways they helped with the conservation efforts of the watershed. There are no statistical differences on any of the other measures.

Second, we can look at how participants score on the measures to explore where along the rubric participants scored. If participants score low on a measure, this indicates that there is potential for growth in this area. If participants score high on a measure, this indicates that participants are coming to the program with a high level of achievement, and thus, we are unlikely to see growth. For the following measures, participants scored low, and thus there is room for growth and the projects could better support participants to:

- ◆ Identify relationships among everything that lives in or along the Rio Grande of Manati River.
- ◆ Identify negative impacts of construction and urban development on the Rio Grande of Manati River.
- ◆ Describe solutions to maintaining the functionality of the Rio Grande of Manati River.
- ◆ Ask their own questions about a conservation issue relevant to their life and community.
- ◆ Feel compelled to act on (or pay attention to) other conservation issues affecting them and their community.
- ◆ Demonstrate actions or behaviors (individual, Trust, community) related to maintaining the functionality of the Rio Grande of Manati Watershed.

Two areas where participants are scoring high, indicating there is little room for growth, is in support of participants to:

- ◆ See that they can use science to make changes (connection between science and activism).
- ◆ Develop science process skills and apply those process skills to real-world situations.

¹ RK&A initially divided the treatment group into two groups—first-time participants (those who only participated one time) and repeat participants (those who participated two or more times). However, no statistically significant differences were found between these two groups and the control group so, as is standard practice, RK&A collapsed the two groups to provide a more robust treatment sample.

FINDINGS: CASE STUDIES

Trust staff purposefully selected six case study participants to represent six key roles in the Citizen Science Project—core participant, volunteer leader, scientist, scientist assistant, consultant, and interpreter. Each individual case study was selected to represent a best-case-scenario for each project role, providing a holistic picture of what is possible to achieve through project exposure and participation. Each case study includes interviews with the case study participant at different points during his/her project participation, interviews with those who have worked with and know the participant well (i.e., family/friend, staff, scientists), and observations of the case study participant during the project. Data were collected during Fall/Winter 2014, Spring 2015, and Summer 2016.

FINDINGS

The case studies include staff as well as participants who serve different roles in the project and, thus, help demonstrate how each role may have contributed to project implementation. As such, the case studies were selected to reveal the successes and challenges of project implementation rather than to demonstrate project impact. Case study findings are not generalizable so please see the case study section of the report for results from individual cases. However, note that the following trends emerged:

- ◆ Most case study participants were motivated to participate in the project because they have a love of nature and want to share those interests with others towards improving the environment of Puerto Rico through scientific research efforts.
- ◆ Most case study participants had self-reported growth in the following areas: knowledge/skills related to scientific research, ability to communicate their knowledge and passion to others in the project or community, and appreciation for nature.
- ◆ Most case study participants encountered two main challenges with project implementation—integrating citizens or being integrated into the formality of the scientific research process; and project logistics (program times, length, conditions, etc).

FINDINGS: CORE PARTICIPANT INTERVIEWS

RK&A interviewed 13 core participants of Citizen Science projects about how these projects have affected the surrounding communities. Core participants are those who have committed to a high level of participation, including data collection, analysis, and reporting, usually for a single research project. Several interviewees reported participating in multiple Citizen Science projects over the course of their involvement with the Trust. Of the projects specifically mentioned during interviews, interviewees participated in seven projects: Shoreline ($n=6$); Birds ($n=4$); Archaeology ($n=3$); Bats ($n=3$); Botany ($n=3$); River Quality ($n=2$); and Crabs ($n=1$).²

FINDINGS

The following trends emerged:

² Total sum exceeds 13 because some individuals mentioned participating in more than one project.

- ◆ **Motivation for participation.** Nearly all interviewees referenced their prior interest in nature and/or conservation issues when asked about their motivation for participation.
- ◆ **Personal Research.** About two-thirds of interviewees mentioned that they have started or plan to explore their own research questions related to nature or conservation.
 - Most interviewees have chosen topics that broaden or expand on the research questions they are exploring in the Citizen Science project.
 - Many interviewees exploring their own research questions believe their research will involve or impact their local community.
- ◆ **Role of local communities.** One-half of interviewees said the local community plays a key role in managing the natural and cultural resources “in their backyard.”
 - A few interviewees noted that the community also can be integral in reporting on local conditions in between Citizen Science project visits.
- ◆ **Impact of Citizen Science.** Almost all interviewees mentioned that a primary impact of the Citizen Science Program is to “raise awareness” in the community about local natural resources and conservation issues.
- ◆ **Sharing Information.** All interviewees reported sharing information about their involvement with Citizen Science with their family, friends, and/or colleagues.
 - About one-half of interviewees said they have shared the research conducted through Citizen Science with the community and about one-half have not.

CONCLUSIONS AND RECOMMENDATIONS

This section focuses on achievement on the Impact Framework for the Citizen Science Project, which is the organizing framework for project impact produced for the National Science Foundation and by Trust staff with the assistance of RK&A during a two-day initial meeting. The Impact Framework guided the development of all data collection instruments (which were pre-approved by project staff), data analysis, and reporting. To see the Framework in its entirety, see page 5. To draw conclusions and provide recommendations, findings from the three data collection methods are triangulated. This section also places findings in the context of citizen science more generally and cites relevant and recent literature in the field.

Analysis of the summative evaluation data collected by Randi Korn & Associates, Inc. (RK&A) indicates that the project did not have measurable impact on participants. Participants had low to moderate achievement for most impacts, with the exception of their comfort with science process skills, which they rated highly, although there is no statistical difference between the control and treatment groups (which refers to first-time or repeat participants; see the footnote).³ While this may seem discouraging, the notion of citizen science, and specifically its manifestation in this project, is relatively new, and informal science organizations, including the Trust, are still perfecting the implementation of the “contributor, collaborator, and co-creator” citizen science model employed in this project. Achieving measurable impact takes time (on the scale of years not months) and, it is not common for the initial phases of a project to detect changes in participants on a broad scale, unless participants are coming to the project as blank slates, which we know from the current literature on citizen science is often not the case. Rather, the majority of those participating in citizen science activities are already inclined towards nature and science, which creates a ceiling effect where the potential impact a project can have on these participants is minimized (Bell et al., 2009; Brossard et al., 2005). Even core participant interviews, which represent the thoughts and opinions of those who have committed to a high level of participation, including data collection, analysis, and reporting, demonstrate that these participants are in the beginning stages of exploring their own research questions and sharing their experiences with the community. Findings indicate that, at the time of our evaluation, these participants were more likely to have shared their experiences with friends and family than other members of the community. Here, we discuss the impact the ceiling effect may have had on this project in particular to help explain the absence of impact. However, findings also demonstrate that there are impacts specific to this project where there is potential for growth among participants.

³ RK&A initially divided the treatment group into two groups—first-time participants (those who only participated one time) and repeat participants (those who participated two or more times). However, no statistically significant differences were found between these two groups and the control group so RK&A collapsed the two groups to provide a more robust treatment sample.

Focusing on even just *one* of these impacts could be a positive direction for the Trust to move towards as the project continues.

IMPACT 1

Impact 1 states: “Participants understand connections within the Rio Grande of Manati River.” Two indicators serve as evidence of this impact:

- ◆ Participants know that everything that lives in or along the river, including people, is inter-related.
- ◆ Participants identify negative impacts on the Rio Grande of Manati River and describe solutions.

Findings reveal that interviewees scored low on their understanding of the connections among people and other life along the river, as well as their ability to understand what negatively impacts the river. In both cases, interviewees’ understandings were vague or general. For instance, interviewees knew that everything is interconnected but struggled to articulate what these connections are. Likewise, interviewees named general things like pollution and development that negatively impact the river, but could not provide specific examples of issues or describe which areas of Puerto Rico are affected. On the other hand, more interviewees had a slightly more developed understanding of the potential solutions that might improve the functionality of the river. In other words, they were able to provide a specific example of a solution or describe the effect of that solution (see below). Because achievement is low to moderate and there was no difference between control and treatment groups, there is potential to deepen participants’ understanding for all indicators—connections, negative impacts, and solutions—through project participation. The challenge with helping participants see connections could potentially be addressed through changes in project implementation; that is, finding effective ways to connect one individual research project to another and to the broader idea of the functionality of the Rio Grande of Manati River for those who are not participating at the fully integrated level of core participant. One recommendation is to consistently repeat the steps necessary to maintain functionality at the beginning, middle, and end of each program. While straightforward, repetition can be very effective at helping participants retain key messages (Serrell, 1996).

POTENTIAL SOLUTIONS TO MAINTAINING THE WATERSHED'S FUNCTIONALITY

“One of the most common things we use at our homes, detergents, is something so common that we can control very easily. The modifications that people make in their patios and in their houses, because they displace sediment, they move the terrain. Also, the vegetation they sow in their patios; all that has a direct impact on the things that are reaching the river, the minerals and [foreign] bodies that [are being] disposed in an inappropriate manner and reach the river. I think the result [of paying more attention] would be a healthier water body, a basin from which we could obtain much more benefits. Right now, a very simple benefit [of the river] that is not so evident, is the benefit of recreation. . . . [The river] could be used by many more without conflict with the health of the basin.” [Female 50; developing understanding]

IMPACT 2

Impact 2 states: “Participants develop science process skills.” Participants rated their comfort with 7 science process skills on a scale, 1 (“not at all comfortable”) to 7 (“very comfortable”):

- ◆ Observing details in the environment
- ◆ Identifying plant or animal species
- ◆ Organizing and entering data
- ◆ Using tools and equipment to collect data
- ◆ Analyzing (comparing, measuring) data
- ◆ Interpreting or drawing meaning from data
- ◆ Communicating research findings to others

Findings from the study show that interviewees’ perceived comfort with these skills is fairly high overall; however, this comfort was not affected by project participation, as there was no difference between control and treatment interviewees’ ratings of these skills. Studies of other citizen science projects found similar results. For example, Brossard et al. (2005) found no difference between control and treatment groups’ understanding of the scientific process when they explored participants’ experiences in The Birdhouse Network. Further, Bell et al. (2009) suggest a “ceiling effect” where participants’ prior interest and knowledge lessens a project’s potential to facilitate significant learning gains. Thus, individuals who choose to participate in citizen science or similar projects may already be inclined towards science or nature, and thus, may already have greater perceived comfort or proficiency with science process skills, leaving little room for gains—a likely scenario here.

While case study participants did self-report gains in their knowledge and skills over time as a result of project participation, these findings are not generalizable, as there are only six case study participants (only two of whom can be considered participants) and no comparison group. Case study findings can demonstrate what may be possible to achieve when an individual participates

at a high level but the broader sample of control and treatment interviews do not reflect this. This does not mean that, over time, this result is not possible to achieve. More likely is that significant impact may not be detectable until the project is able to include more core participants, those participating at a high level. In this evaluation, the goal of the core participant interviews was to explore community impact, thus, participants' individual gains were not explored in depth, and the sample is too small to discern any significant trends; however, interviews reveal that most core participants are exploring their own research questions in more depth, and there is reason to believe that this in-depth exploration may yield positive gains in science process skills (Bonney et al., 2009a).

IMPACT 3

Impact 3 states: "Participants develop critical thinking skills to apply to conservation issues." Two indicators serve as evidence of this impact:

- ◆ Participants apply process skills to real-world situations.
- ◆ Participants ask conservation-related questions about their life and community.

As with science process skills, interviewees rated their comfort "applying what [they] have learned to real-world situations" highly (mean = 6.5), though, again, there are no statistically significant differences between the control and treatment groups meaning the project did not affect participants' perceived comfort level with this skill. Further, findings reveal that interviewees scored low in their capacity to ask conservation-related questions about their life and community. That is, interviewees' descriptions of conservation issues were vague or general, lacking specificity as to the specific conservation questions, issues and/or areas of Puerto Rico (see below). Admittedly, the ability to ask conservation-related questions is more realistic for the core participant level (those with a high level of commitment and repeat participation), as first-time participants do not have the opportunity to explore their own questions in a single activity. For instance, several core participant interviewees have expanded the scope of their research with the Citizen Science Project to explore similar questions at alternative locations in and around Puerto Rico. However, because participants' overall capacity to ask conservation-related questions was low, regardless of participation level, there is room for growth in this area. Because core participant interviews show that these individuals have an interest in and are pursuing their own research questions, strengthening this impact is most likely with this group. And, literature shows that impacts on learning may be most significant with those who ask and answer their own questions (Bonney et al., 2009a). Thus, growing the number of core participants seems a worthy endeavor for the project.

VAGUE CONSERVATION-RELATED QUESTIONS

"Right now, my only concern would be if we didn't have water. When there is a drought, the big rains come afterwards that reestablish the system. . . . It's a natural process that we can't control."
[Male 52; beginning understanding]

IMPACT 4

Impact 4 states: “Participants believe their actions affect the watershed.” Two indicators serve as evidence of this impact:

- ◆ Participants name ways they helped with the conservation efforts of the watershed.
- ◆ Participants intend to act on (or pay attention to) other conservation issues affecting them and their community.

Findings reveal that interviewees scored low for both indicators listed above. That is, their description of how they helped with the conservation efforts of the watershed often centered around individual data collection tasks and was not linked to a larger conservation effort. Further, while participants generally stated an interest in conservation issues affecting them and their community, they struggled to provide examples of specific issues and how they would go about addressing them. Instead, their descriptions were vague or general (see below). Similar to Impact 3, it may be unrealistic to expect non-core participants to be able to describe specific conservation issues that affect them and their community when they may not have had the opportunity to explore the issues more deeply through project participation (as the core participants have). For example, one core participant who participated in the River project noted that the community can greatly impact river water quality, in terms of “toxic chemicals,” “pesticides,” and “human waste discharge,” as well as plastic pollution, which can affect aquatic life. Yet, the Trust does hope that all participants understand that their role as citizen scientists links to a larger conservation effort even if they only participate one time. Since participants struggled to make this connection, this is a point that may need to be emphasized more concretely through individual project activities. Again, this may be a challenge best addressed through repetition of these broader connections in the beginning, middle, and end of each program. Consistent mention of the connections may go a long way to helping participants retain them. Understanding the significance of their participation may also motivate participants to participate in additional programs and activities.

LITTLE INTENTION TO ACT ON CONSERVATION ISSUES

“I have been in activities, more accurately, to know the truth of all of it, and it has been about the incinerator and the transformation of plants from waste to energy. So I participated as an observer, not actively, but to absorb it and make decisions.” [Female 24; beginning understanding]

IMPACT 5

Impact 5 states: “Participants see science as relevant to their life.” One indicator serves as evidence of this impact:

- ◆ Participants name ways they can use science to make changes (connection between science and activism).

Findings show that interviewees had moderate achievement on this impact. The majority (51 percent) of interviewees had a developing or accomplished understanding of ways they can use science to make changes. For instance, they provided specific examples of how they could apply science to everyday life or related their descriptions to conservation/activism (see below). However, there are no differences between control and treatment, meaning the project did not deepen participants' understanding of science's relevance to their life. As discussed previously, participants may already be fairly science-minded and have a good handle on its relevancy to their lives. Thus, there may again be a "ceiling effect" preventing much deepening of participants' understandings (Bell et al., 2009). This effect can be viewed as a positive thing in that the Trust may not have to use additional resources to strengthen this impact since individuals already seem to be strong in this area. Instead, the Trust might want to focus efforts and resources on growing the other impacts and indicators it has articulated for the project.

STRONG LINK BETWEEN SCIENCE AND EVERYDAY LIFE

"For me, what we learned in the activity helped me a lot, when they taught us to use the GPS and to identify, for example, some small holes in the land that could point to a settlement. I can apply that to my field study, because it benefits me, but there are other things we learned. The leaders that were helping us did not talk only about Archaeology, they told us about the different species, things we could do to protect the environment, instead of buying disposable cups, buying glasses that you can clean and don't have to throw them away, end[ing] up in [a] dumpsite. I [know this] because of scientific knowledge." [Female 22; accomplished understanding]

IMPACT 6

Impact 6 states: "Participants demonstrate ownership of the Rio Grande of Manati watershed." One indicator serves as evidence of this impact:

- ◆ Participants demonstrate actions or behaviors (on a continuum from individual-Trust-community) related to maintaining the functionality of the Rio Grande of Manati watershed.

Findings show that interviewees scored low on their achievement of impact 6. That is, interviewee's descriptions of the actions they take to maintain the functionality of the Rio Grande of Manati watershed are primarily at the individual or family level (e.g., recycling), and participation in the project did not broaden or deepen the conservation-related behaviors in which participants engage. Of all the impacts, Impact 6 is one of the more difficult to achieve, as it relates to behavioral change. While learning individual facts or concepts is a common outcome for citizen science participation (Brossard et al., 2005; Char et al, 2014; Garibay, 2015), changing behavior, especially through a one-time project experience, is much more difficult. Behavioral change often requires repeat exposure to a project and even core participants, who participate at

a deep level, may not be able to easily change how they live their daily lives outside of the project. For instance, although one-half of core participant interviewees said they have shared the research conducted through Citizen Science with the community, most of these have only done so informally (e.g., casual conversation). Literature suggests that strategies that engage participants on a deep, sustained level and use a sense of place to foster care for one's environment can be effective (Heimlich & Ardoin, 2008). While Trust programs can (and do) leverage a sense of place, without a deep, sustained participation, like that of core participants, behavior change may continue to be difficult. Thus, the Trust may want to consider this impact as realistic for core participants only.

IMPLICATIONS

While the study shows no measurable impact, findings are not unlike evaluations of other informal learning projects, including other citizen science projects. As stated previously, participants' existing interest, knowledge, and skills may create a "ceiling effect" that makes it challenging to deepen their learning. Further, because the majority of participants have only some degree of project exposure and this exposure tends to be limited to single data collection activities rather than interconnected experiences, achieving impact becomes even more difficult. However, since participants scored low overall for most indicators, there may be opportunities to achieve greater impact with those who participate at a high level—core participants. Core participants have repeated project exposure and their experiences are more holistic than more casual participants. This grant was the Trust's first opportunity to experiment with a project model that would have discernible impact on core participants. Further, the Trust had an opportunity to study the successes and challenges of this project model through a separate comprehensive evaluation. Applying lessons learned from that evaluation to the next iteration of the project model could lead to more discernible impact over time. Impact takes time, and this iteration of the project was just a first step. So, while findings may seem discouraging, it would actually be unusual to see great impact after a first attempt.

RECOMMENDATIONS

- ◆ Consider repetition as a simple yet effective strategy for communicating the main message(s) and connections that are important for participants to take away. For instance, choose one negative effect on the functionality of the river/watershed and one concrete solution that can be communicated in each program. Consistently repeat this throughout the program—beginning, middle, and end.
- ◆ Consider focusing on impacts where growth is possible and focusing fewer resources on areas where participants may already be strong, such as recognizing how science can be used to make changes.
- ◆ Likewise, consider certain impacts as primarily relevant to core participants, such as increasing conservation-related behaviors, as some impacts require deep, sustained participation to achieve.

- ◆ At the same time, consider increasing the pool of core participants to achieve the kinds of gains the Trust would like to see. This does not preclude others from participating on a more casual basis with the Citizen Science Project but instead focuses resources where they might have the most impact.

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STUDY BACKGROUND

The Conservation Trust of Puerto Rico (the Trust) contracted Randi Korn & Associates, Inc. (RK&A) to evaluate participants' experiences in its National Science Foundation-funded Citizen Science Project. The summative evaluation is part of a larger set of evaluations that have been conducted for this project. In 2014, RK&A conducted formative evaluation to evaluate the successes and challenges of project implementation with the goal of improving future implementation and strengthening impact (see Appendix E). In 2009 and 2011, RK&A also conducted formative and summative evaluations of the first iteration (and initial phase of NSF funding) of the Citizen Science Project. In the summative evaluation reflected in this report, RK&A used three methods to collect data—rubric-scored in-depth interviews, case studies, and community interviews. The conceptual framing of this study is guided by an Impact Framework (see page 4) which outlines impacts on audiences as well as indicators or evidence that those impacts have been achieved.

METHODOLOGY

RK&A selected three methodologies to capture participants' experiences in the Citizen Science project: (1) control and treatment interviews, (2) core participant interviews, and (3) case studies. Below is a detailed description of each methodology.

CONTROL AND TREATMENT INTERVIEWS

RK&A conducted 141 interviews with project participants; participants comprise two groups:

1. **Control Group** – 55 participants who were interviewed before participating in the Citizen Science Project. These participants had never participated in citizen science activities.
2. **Treatment Group** – 85 participants who were interviewed within a few weeks of participating in the Citizen Science Project. This group comprises first-time and repeat participants in project activities.

Data Collection Instrument: Interviews were conducted using an open-ended interview guide (see Appendix A). Open-ended interviews capture participants' thoughts, feelings, attitudes, and the language participants use to discuss their experiences.

Data collection process: Before participation, all participants signed a consent form allowing evaluator’s access to their contact information. Data were collected for control and treatment interviews as follows:

1. **Control interviews:** An RK&A data collector attended a random selection of programs each month from January 2014 until March 2015. At each program, the data collector conducted up to two interviewees with participants who had not yet participated in the program. The possible number of interviews conducted at each program was dictated by the amount of time available before staff began the program, as interviews had to be conducted before participation began to be considered a control interview.
2. **Treatment interviews:** The Trust maintains a comprehensive database of all individuals who participated in the project. Each month, from February 2014 until March 2015, Trust staff sent RK&A a list of all those who had participated during the prior month. RK&A randomly selected up to 8 participants from the list to participate in telephone interviews. Data collectors contacted each individual up to three times during different days and times (guided by the availability interviewees indicated in the database). If individuals were unreachable, RK&A randomly selected others from the list to take their place until the data collection period expired. The number of interviews conducted each month varied depending on potential interviewees’ availability. Individuals participated in interviews within 1-2 weeks of participation.

All interviews were audio-recorded (in Spanish) with interviewees’ permission and transcribed to English to facilitate analysis. At the end of each interview, the data collector captured relevant demographic information.

Data analysis: RK&A developed scoring rubrics—a set of criteria linked to learning objectives that is used to assess performance of knowledge, skills, etc. on a continuum—to measure control and treatment interviewees’ learning as demonstrated through interviews. Scoring rubrics are useful because they allow qualitative data to be measured in a quantitative way, thus allowing outcomes to be measured. For each item, interviews were scored on a four-level continuum from Level 1, “Below Beginning,” to Level 4, “Accomplished.” The scoring rubrics were developed based on the Trust’s intended impacts for participants’ experiences in the Citizen Science Project and trends that emerged from the interview data. See Appendix D for the final scoring rubric with exemplary quotations from the participant interviews.

Rubrics produce quantitative data that were analyzed statistically, using SPSS 2.0 for Windows, a statistical package for personal computers. A standard 0.01 level of significance was used to preclude relationships bearing little or no practical significance.⁴ RK&A initially divided the

⁴ When the level of significance is set to $p = 0.01$, any finding that exists at a probability (p -value) ≤ 0.01 is “significant.” When a finding (such as a relationship between two variables) has a p -value of 0.01, there is a 99 percent probability that the finding exists; that is, in 99 out of 100 cases, the finding is correct.

treatment group into two groups—first-time participants (those who only participated one time) and repeat participants (those who participated two or more times). However, no statistically significant differences were found between these two groups and the control group so RK&A collapsed the two groups to provide a more robust treatment sample.

1. Descriptive Statistics: Frequencies were calculated for most data, including demographics and rubric scores. Means were calculated to show a summary of participants’ achievement by rubric.

2. Inferential Statistics: To examine the relationship between two categorical variables, cross-tabulation tables were computed to show the joint frequency distribution of the variables, and the chi-square statistic (X^2) was used to test the significance of the relationship. For example, scores for Rubric 1 were compared by study group to determine differences by Control and Treatment groups.

Reporting method: Each rubric has a four-level continuum of achievement: Level 1, the “Below Beginning” level, describes participants at the very bottom of the continuum of achievement; scores at this level are completely off-the-mark or counter to what the Trust is trying to accomplish. By contrast, Level 4, the “Accomplished” level, describes the ideal participant response through the lens of the Trust’s intentions for the Citizen Science Project. In describing the results on rubrics, we have looked at the scores through three lenses:

- ◆ Percent of participants to score across the continuum – This will show us how participants score against the Trust’s ideal, which is the accomplished level. Seeing scores across all levels of the continuum is expected as participants are unique and have various experiences and understandings that inform their achievement.
- ◆ Differences in scoring among the two study groups – A statistical comparison of control versus treatment groups measures the effect of the Citizen Science Project on achievement. We have reported only those differences that have statistical significance (i.e., percents by group may *appear* very different since each group is a sample of at least 60 participants, but they may not be statistically different).
- ◆ Differences in scoring by demographics – We have looked at scoring against demographic variables, such as gender, age, and participation level to investigate common factors that may affect achievement.

CORE PARTICIPANT INTERVIEWS

RK&A conducted 13 interviews with core participants—those who committed to a high level of participation in the project and whose participation involved community outreach. These

Conversely, there is a 1 percent probability that the finding would not exist; in other words, in 1 out of 100 cases, the finding appears by chance.

interviews are not representative of participants as a whole; however, findings provide reasonable insight into core participants since one-half of all core participants were interviewed. At the same time, the reader should keep in mind that the purpose of these interviews was to explore core participants' perceptions and experiences with how the Project has impacted the community rather than an in-depth exploration of participants' individual experiences.

Data collection instrument: Interviews were conducted using an open-ended interview guide (see Appendix B). Open-ended interviews capture participants' thoughts, feelings, attitudes, and the language participants use to discuss their experiences.

Data collection process: The Trust maintains an updated list of all core participants in the project and sent this list to RK&A. In July and August 2016, RK&A-trained data collectors telephoned all core participants from the most up-to-date list provided by the Trust (26 participants in total) to try to secure up to 20 interviews. Data collectors contacted each core participant by telephone up to three times during different days and times. If individuals were unreachable, RK&A called the next individual on the list. Those who agreed to participate in an interview spoke about the impact of their project participation on the broader community.

All interviews were audio-recorded (in Spanish) with interviewees' permission and transcribed to English to facilitate analysis. At the end of each interview, the data collector captured relevant demographic information.

Data analysis and reporting: The core participant interviews produced descriptive data that were analyzed qualitatively, meaning that the evaluator studied the data for meaningful patterns and, as patterns and trends emerged, grouped similar responses. Where possible, partners' verbatim language (edited for clarity) is included to exemplify trends. Within quotations, the evaluator's comments appear in parentheses.

CASE STUDIES

RK&A conducted 6 case studies to examine the project's implementation at a micro level. Case studies typically examine the interplay of variables to provide as complete an understanding of one event or situation as possible. Case studies do not produce generalizable information.

Data collection instrument: Data were collected using naturalistic observations and in-depth interviews. Naturalistic observations provide important context and contribute to the evaluator's understanding of an individual's role in a project. During observations, the evaluator takes detailed, descriptive notes of the individual's behaviors and interactions. In-depth, qualitative interviews are open-ended and encourage interviewees to express their opinions, understandings, and meanings they construct. They are valuable because they allow partners to express themselves using language and words of their choosing (as opposed to the language of the evaluator or researcher). Additionally, the interviewer is able to ask probing or clarifying questions to better understand partners' experiences. See Appendix C for the observation and interview guides.

Data collection process: For this study, one case study was defined as an individual who contributed to the Citizen Science project. Trust staff selected six case studies to represent six key project roles—core participant, volunteer leader, scientist, scientist assistant, consultant, and interpreter. Data were collected between December 2014 and July 2015. One observation was conducted for context at some point during the case studies’ project experiences (typically towards the beginning of the project). In-depth interviews—which concentrated on case studies’ reflections of their project experience over time—were conducted in Fall/Winter 2014, Spring 2015, and Summer 2015; interviews were audio-recorded (in Spanish) and transcribed into English to facilitate analysis. Additionally, audio-recorded interviews with scientists, staff, and family/friends were conducted in Summer 2015 to provide a more holistic picture of each case study’s experience. Initial interviews were conducted in person and all subsequent interviews were conducted via telephone (in Spanish) and transcribed to English to facilitate analysis.

Data analysis and reporting: The case study observations and interviews produced descriptive data that were analyzed qualitatively, meaning that the evaluator studied the data for meaningful patterns and, as patterns and trends emerged, grouped similar responses. Where possible, partners’ verbatim language (edited for clarity) is included to exemplify trends. Within quotations, the evaluator’s comments appear in parentheses.

CONTROL AND TREATMENT INTERVIEW FINDINGS

INTRODUCTION

RK&A interviewed 141 participants in the Citizen Science Project. Participants were interviewed onsite or by telephone between January 2014 and March 2015.

STUDY GROUPS

The 141 participants interviewed comprise two study groups:

3. Control Group – 55 participants who were interviewed before participating in the Citizen Science Project. These participants had never participated in citizen science activities.
4. Treatment Group – 85 participants who were interviewed within a few weeks of participating in the Citizen Science Project. This group comprises first-time and repeat participants in project activities.⁵

In this section, all findings will be presented by study group for comparison. Any statistical differences by study group will be noted.

PARTICIPANT DEMOGRAPHICS

- ◆ Two-thirds of participants are female, and one-third of participants are male.
- ◆ Participants range in age from 16 to 71 years, with the median age being 30 years.
- ◆ The treatment sample is split evenly between first-time and repeat participants (one-third).

⁵ RK&A initially divided the treatment group into two groups—first-time participants (those who only participated one time) and repeat participants (those who participated two or more times). However, no statistically significant differences were found between these two groups and the control group so RK&A collapsed the two groups to provide a more robust treatment sample.

ACHIEVEMENT OF IMPACT ON CONTROL AND TREATMENT INTERVIEWS

The six intended impacts for the project were measured on nine indicators related to the interview findings. Overall, Treatment interviewees scored at the bottom of the continuum of achievement for most indicators. Please see the in-depth analysis of achievement on the next several pages.

KNOWLEDGE OF RELATIONSHIPS AMONG LIFE IN THE WATERSHED

This indicator explores whether **participants identify relationships among everything that lives in or along the river.**

ACHIEVEMENT

- ♦ Achievement was low to moderate, with two-thirds of participants scoring at the bottom half of the rubric, meaning they provided vague or general connections between the river and how it influences species (71 to 72 percent of each group scored at Levels 1 and 2).

Rubric Levels	Control	Treatment
Level 1: Below Beginning The interviewee does not describe the connections between the river and other species, including humans.	35 %	29 %
Level 2: Beginning The interviewee describes vague or general connections between the river and how it influences species, including humans. When probed to expand on the human connection, he/she again <u>provides a vague or general example of its value to them or all humans.</u>	36 %	43 %
Level 3: Developing The interviewee describes connections between the river and how it influences species, including humans; he/she expands on the human connection, providing an example of the river's value to all humans or him/her personally. One of the examples is specific but the other is vague or general. For the second example to be considered specific, he/she should describe how or why the river is valuable to him/her personally and not humans in general.	26 %	19 %
Level 4: Accomplished The interviewee describes <u>specific connections</u> between the river and how it influences species, including humans. When probed to expand	4 %	10 %

on the human connection, he/she provides a specific example, story, or anecdote that illustrates its value for him/her personally.

KNOWLEDGE OF NEGATIVE IMPACTS ON THE WATERSHED

This indicator explores whether **participants identify negative impacts of construction and urban development on the Rio Grande of Manati River.**

ACHIEVEMENT

- ◆ Achievement was low to moderate, with most participants scoring at the bottom half of the rubric, meaning they provided vague examples of how humans impact the river (84 to 85 percent of each group scored at Levels 1 and 2).
-

Rubric Levels	Control	Treatment
Level 1: Below Beginning The interviewee does not identify negative human impacts on the river. OR The interviewee says that humans have a negative impact on the river <u>but does not say how.</u>	20 %	18 %
Level 2: Beginning The interviewee provides <u>vague or general examples of how humans impact the river</u> (pollution, development, etc.). They use words that allude to a negative impact but it is vague (“damages,” “hurts”).	64 %	64 %
Level 3: Developing The interviewee provides a <u>specific example of how humans impact the river (i.e., describe a specific issue, area).</u> The resulting impact is not clear or the “how” of the impact is still vague or general.	13 %	9 %
Level 4: Accomplished The interviewee provides a specific of example of how humans impact the river (i.e., describe a specific issue/area). They describe the impact in specific and concrete terms.	4 %	6 %

KNOWLEDGE OF SOLUTIONS TO MAINTAIN WATERSHED'S FUNCTIONALITY

This indicator explores whether **participants describe solutions to maintaining the functionality of the Rio Grande of Manati River.**

ACHIEVEMENT

- ◆ Achievement was low to moderate, with the majority of participants scoring at the bottom half of the rubric, meaning they posed solutions and the result of those solutions on the functionality of the river that are vague and general (59 to 73 percent of each group scored at Levels 1 and 2).

Rubric Levels	Control	Treatment
Level 1: Below Beginning The interviewee does not pose solutions for maintaining the functionality of the river.	4 %	4 %
Level 2: Beginning The interviewee poses solutions and/or describes the resulting effect of that solution on the functionality of the river; both descriptions are vague/general.	69 %	55 %
Level 3: Developing The interviewee poses solutions and/or describes the resulting effect of that solution on the functionality of the river. At least one description (the solution or its effect) contains a specific example.	24 %	28 %
Level 4: Accomplished The interviewee poses solutions and describes the resulting effect of that solution on the functionality of the river. Both descriptions contain specific examples.	4 %	13 %

CURIOSITY ABOUT COMMUNITY-RELATED CONSERVATION ISSUES

This indicator explores whether **participants ask their own questions about a conservation issue relevant to their life and community.**

ACHIEVEMENT

- ♦ Achievement was low to moderate, with over two-thirds of participants scoring at the bottom half of the rubric, meaning their description of a conservation issue in their community or Puerto Rico is vague or general (68 to 75 percent of each group scored at Levels 1 and 2).

Rubric Levels	Control	Treatment
Level 1: Below Beginning The interviewee does not have or cannot think of a question related to a conservation issue in his/her community.	44 %	45 %
Level 2: Beginning The interviewee describes a concern related to a conservation issue in his/her community or elsewhere in Puerto Rico. The example/question is vague or general (i.e., he/she does not discuss a specific issue or area).	22 %	30 %
Level 3: Developing The interviewee describes a concern (not a question to explore) related to a conservation issue in his/her community or elsewhere in Puerto Rico. The example/question is specific and concrete (i.e., he/she discusses a specific issue or area).	22 %	18 %
Level 4: Accomplished The interviewee articulates a question to explore related to a conservation issue in his/her community or elsewhere in Puerto Rico. The example/question is specific and concrete (i.e., he/she discusses a specific issue or area).	11 %	8 %

INTEREST IN HELPING WITH WATERSHED CONSERVATION EFFORTS

This indicator explores whether **participants name ways they helped with the conservation efforts of the watershed.**

ACHIEVEMENT

- ◆ Achievement was low to moderate, with the majority of participants scoring at the bottom half of the rubric, meaning they were unable to link their participation to a larger conservation effort or goal (56 to 75 percent of each group scored at Levels 1 and 2).
- ◆ There is a statistically significant difference between study groups on this rubric: Control scored higher than Treatment—44 percent of Control participants scored at the top half of the rubric compared to 24 percent of Treatment participants.

Rubric Levels	Control	Treatment
Level 1: Below Beginning The interviewee does not feel that he/she contributed to the project or cannot articulate a way in which they contributed.	20 %	8 %
Level 2: Beginning The interviewee describes his/her contribution to the project in terms of isolated tasks, such as contributing knowledge, collecting data, identifying species but <u>does not relate those tasks to a larger conservation effort.</u>	36 %	67 %
Level 3: Developing The interviewee describes his/her contribution as relating to a larger conservation effort but <u>does not provide a specific example of how he/she will (or did) contribute.</u>	40 %	15 %
Level 4: Accomplished The interviewee describes his/her contribution as relating to a larger conservation effort and <u>provides a specific example of how he/she will (or did) contribute.</u>	4 %	9 %

INTEREST IN ACTING ON COMMUNITY-RELATED CONSERVATION ISSUES

This indicator explores whether **participants feel compelled to act on (or pay attention to) other conservation issues affecting them and their community.**

ACHIEVEMENT

- ◆ Achievement was low to moderate, with two-thirds of participants scoring at the bottom half of the rubric, meaning they may be advocating for conservation issues in their community but are not able to discuss specifics (66 to 70 percent of each group scored at Levels 1 and 2).

Rubric Levels	Control	Treatment
Level 1: Below Beginning The interviewee has not advocated for a conservation issue in their community or elsewhere in Puerto Rico.	66 %	60 %
Level 2: Beginning The interviewee says he/she advocates for conservation issues affecting him/her or his/her community or an interest in doing so. He/she does not provide an example or say how/what method/strategy OR he/she may provide a vague/general example of something he/she would like to do but has not done.	4 %	6 %
Level 3: Developing The interviewee describes advocating for conservation issues affecting him/her or his/her community. His/Her example is vague or general (i.e., he/she does not specify a particular issue or area).	7 %	9 %
Level 4: Accomplished The interviewee describes advocating for conservation issues affecting him/her or his/her community. His/Her example is concrete and specific (i.e., he/she specifies a particular issue or area).	24 %	25 %

CAPACITY TO USE SCIENCE TO MAKE CHANGES

This indicator explores whether **participants see that they can use science to make changes** (connection between science and activism).

ACHIEVEMENT

- ♦ Achievement was moderate, with one-half of participants scoring at the top half of the rubric, meaning they had a developing understanding of how they could use science to make changes (48 to 51 percent of each group scored at Levels 3 and 4).

Rubric Levels	Control	Treatment
Level 1: Below Beginning The interviewee cannot articulate a way that he/she has applied scientific knowledge or data to everyday life.	24 %	22 %
Level 2: Beginning The interviewee provides an example of how he/she has applied science to everyday life. The example is vague or general.	29 %	27 %
Level 3: Developing The interviewee provides an example of how he/she has applied science to everyday life. The example is specific but not related to conservation/activism. OR The interviewee provides a vague/general example of how he/she has applied science to everyday life and relates it to conservation/activism.	42 %	45 %
Level 4: Accomplished The interviewee provides an example of how he/she has applied science to everyday life. The example is specific and related to conservation/activism.	6 %	6 %

DEMONSTRATION OF CONSERVATION-RELATED BEHAVIORS

This indicator explores whether **participants demonstrate actions or behaviors (individual, Trust, community) related to maintaining the functionality of the Rio Grande of Manati Watershed.**

ACHIEVEMENT

- ◆ Achievement was low to moderate, with most participants scoring at the bottom half of the rubric, meaning their conservation-related behavior is at the individual or family level (85 to 91 percent of each group scored at Levels 1 and 2).

Rubric Levels	Control	Treatment
Level 1: Below Beginning The interviewee cannot name any conservation-related behaviors he/she engages in regularly.	2 %	4 %
Level 2: Beginning The interviewee describes conservation-related behaviors at the individual or family level (recycling, conserving water, etc.)	89 %	81 %
Level 3: Developing The interviewee describes behaviors that relate to the Trust's conservation projects or activities (research projects, special events, volunteering with like-minded organizations).	9 %	13 %
Level 4: Accomplished The interviewee describes behaviors that relate to advocacy in his/her community (communicating with neighbors, at community meetings).	0 %	2 %

IMPACT ON SCIENCE PROCESS SKILLS

Interviewees rated their comfort level with eight science process skills on a 7-point scale from 1 (“not at all comfortable”) to 7 (“very comfortable”). Interviewees’ mean ratings of these skills are high.

COMFORT APPLYING SCIENCE PROCESS SKILLS

These indicators explore whether **participants develop science process skills and apply those process skills to real-world situations.**

ACHIEVEMENT

- ◆ Interviewees rated their comfort level with science process skills and application of those skills moderate to high (mean = 5.3 or higher).
- ◆ Interviewees are most comfortable observing details in their environment (mean = 6.7) and least comfortable identifying plant or animal species (mean = 5.3).

Science Process Skills	Control	Treatment
Observing Details	6.7	6.7
Real-world Application	6.5	6.5
Using tools/equipment	6.1	6.3
Communicating findings	5.9	5.9
Analyzing data	5.8	5.7
Organizing/entering data	5.7	6.0
Interpreting data	5.6	6.1
Identifying species	5.2	5.2

CASE STUDY FINDINGS

INTRODUCTION

Trust staff purposefully selected six case study participants to represent six key roles in the Citizen Science Project—core participant, volunteer leader, scientist, scientist assistant, consultant, and interpreter. Case studies are not generalizable. Rather, each individual case study was selected to represent a best-case-scenario for each project role, providing a holistic picture of what *may be* possible to achieve through project exposure and participation. Further, in the case of this project, the case studies are meant to reveal the successes and challenges of project implementation rather than demonstrate project impact.

Each case study includes interviews with the case study participant at different points during his/her project participation, interviews with those who have worked with and know the participant well (i.e., family/friend, staff, scientists), and observations of the case study participant during the project (for context). Data were collected during Fall/Winter 2014, Spring 2015, and Summer 2016 to capture the case study's experiences at different points in the project life cycle. Findings are presented by individual case study participant.

CASE STUDY A: SCIENTIST

Case Study A is a scientist who is leading one of the research projects for the Citizen Science Project. RK&A interviewed Case Study A on three occasions and observed him/her leading the research project once for context. In addition, RK&A interviewed a Trust staff member who works closely with the scientist, as well as a friend also involved in Citizen Science.

BACKGROUND AND MOTIVATION TO PARTICIPATE

Interviews revealed the Case Study A's motivation for participating was two-fold.

- ◆ **Research interest:** Case Study A was interested in participating in the original Citizen Science Project (which took place from 2008-10) to study an endangered species that is protected in the Manati area. This interest continues for the current iteration of the project and expanded to involve a study of the river quality that complements his/her original research.
- ◆ **Inspire people with science:** Case Study A also has an interest in working with people and, specifically, growing their curiosity about science and how it influences their lives.

PROJECT SUCCESSES

Throughout interviews, Case Study A, his/her friend, and Trust staff spoke of ways in which he/she has achieved success as a scientist in the Citizen Science Project.

- ◆ **Gaining new knowledge and skills:** Case Study A spoke of two main things he/she has learned during the course of his/her project participation: (1) how to teach science in an informal setting, using relevant entry points and engaging audiences with different levels of understanding; and (2) how to collect data in different ways, including ethnography and using new and more effective methods for animal capture (specifically those that community fisherman use). Trust staff confirmed that Case Study A has been open to integrating new, non-traditional data collection methods, which has enriched his/her research.
- ◆ **Sharing his/her passion with others:** Case Study A also spoke about how much he/she has enjoyed sharing his/her passion for science with others and enabling them to have “ah-ha” moments related to the animal species he/she studies. For example, he/she said participants often learn about the animal's life cycle and advanced age, which makes the species more interesting to them. His/her friend underscored this enjoyment by sharing a story about how Case Study A engaged his/her son in scientific study.
- ◆ **Meeting project objectives:** Case Study A shared that core participants in his/her research project—those who are interested in a high level of participation—had begun pursuing individual research questions as intended. One family was pursuing a question related to water quality and another individual was interviewing fisherman about the river.

PROJECT CHALLENGES

Case study A, his/her friend, and Trust staff spoke of one main type of challenge encountered by Case Study A throughout the project—the logistics of integrating volunteers into the research project. As one example, Case Study A said that his/her research design is slightly adapted for participant safety. And, his/her friend explained that sometimes finding enough volunteers to help with the research is challenging for Case Study A.

CHANGE OVER TIME

Throughout interviews, the main evolution that Case Study A and others spoke of was Case Study A's increased flexibility and openness to integrate non-traditional methods into his/her scientific research as well as a willingness to try the tools and strategies provided to him/her by the Trust to engage participants in informal science. Trust staff said that Case Study A was initially nervous but that his/her openness to embracing the project's informal science education model has led to great success for his/her research project as well as the project participants.

Motivation *"I like science, I like working with people and nature. . . . I see it [the program] as an opportunity to teach and make some participants realize new passions they didn't know before, possibly things that could make them observe, research, be more curious." -Case Study A*

New Knowledge *"When he/she applied traditional techniques used in the community, by the fisherman, he/she caught loads of [the animal species], and that's when her research took off. . . . His/her has left scientific restrictions behind, restrictions that wouldn't let him/her, in the beginning, be open to more traditional, research methods. . . . Now, the first thing he/she does is [talk to] participants, asking what they think, how they would do [something], before he/she integrates her tools." -Trust staff*

Research Design *"For this program, which is focused on the citizens, the [sites] weren't chosen at random because the safety of the citizens has great importance in this project. Accessible rivers were chosen so that they wouldn't represent much danger." -Case Study A*

Increased openness and flexibility *"She/he is still the brilliant researcher who keeps doing things and has very clear research goals, but, after incorporating traditional knowledge as she/he has done, she/he has enriched her/his investigation thoroughly, in all the fields possible. And, as a person too, because she/he has realized, 'Oh, investigations pose a natural question in all people.' That's the origin of research, the questions that people make to themselves. It does not come from science itself, it comes from the people, from curiosity in the human being. And, I think that she/he has been able to experience it and see it, because we have talked about this many times, and I understand that such experience has enriched her/his research work. -Trust staff*

CASE STUDY B: CONSULTANT

Case Study B is a consultant managing the website and research databases for the Citizen Science Project.

RK&A interviewed Case Study B on three occasions. In addition, RK&A interviewed a Trust staff member who works closely with the consultant, as well as a friend/assistant of the consultant.

BACKGROUND AND MOTIVATION TO PARTICIPATE

Case Study B spoke of two primary reasons for participating.

- ◆ **Technology expertise:** Case Study B was involved in the first iteration of the Citizen Science Project (2008-10) where he/she fulfilled a similar role of managing the website and research databases. His/her role expanded for the current iteration to include facilitation of participant workshops about GPS and data visualization.
- ◆ **Sharing his/her knowledge with citizens:** Case Study B also has a keen interest in the Trust's work with citizens, and he/she wanted to share his/her technology expertise with citizens to help them when designing their own research projects.

PROJECT SUCCESSES

Throughout interviews, Case Study B, Trust staff, and his/her friend/assistant spoke of three primary successes of Case Study B's project participation.

- ◆ **Gaining new knowledge and skills:** Case Study B spoke of two main things he/she has learned during the course of his/her project participation: (1) how to effectively communicate with scientists and participants about their needs for data visualization (which has resulted in innovative research databases for the Citizen Science Project); and (2) how to teach individuals without technology expertise projecting and data visualization skills.
- ◆ **Facilitating new participant learning:** Case Study B spoke many times of his/her enjoyment for teaching participants how to apply technology to their research projects and interests. For example, he/she spoke of a core participant in the Bats project who was able to apply the skills he/she taught the participant to create a map of her research sites. Trust staff also spoke of Case Study B's obvious interest in working with participants to help them learn new skills.
- ◆ **Growing interest in nature and the environment:** Case Study B also spoke many times of his/her increased interest in nature as a result of participating in the project as a consultant. For example, increased knowledge of the scientist's research and its importance to protecting native flora and fauna has led him/her to be more observant of nature and to more actively engage his/her three-year-old daughter in nature as well.

PROJECT CHALLENGES

Case Study B, his/her assistant/friend, and Trust staff spoke of two main challenges related to Case Study B's project participation.

- ◆ **Creation of an innovative database:** Case Study B spoke of the difficulties he/she faced conceptualizing and creating databases from scratch that align with the needs of each individual research project. For example, he/she talked about how the birds project has a large amount of data that needs to be organized so it is useful to the scientist and participants. Trust staff also said creating up-to-date databases has been a challenge for Case Study B since they were being created from scratch and the logistical challenges were unknown.
- ◆ **Adapting content for novices:** All three interviewees said that adapting workshop content for individuals with little to no knowledge of technology was challenging for Case Study B. For example, Case Study B initially offered the workshops at an advanced level but quickly realized that three levels of offerings—beginning, intermediate, and advanced—were warranted to accommodate multiple skill levels.

CHANGE OVER TIME

Case Study B's primary evolution was related to his/her own information and database management skills; specifically, learning how to work collaboratively with scientists and participants to understand what their needs are for databases and data visualization, especially given that he/she was creating deliverables from scratch.

Motivation *"They initially contacted me to create the database. That was the first time we had contact. I also really like their work with volunteers and citizens, which obviously attracts me, besides the technical aspect of it. I fell in love with this project because of the volunteer work they carry out."* -Case Study B

Participant Learning *"I love offering workshops. I really enjoy them. I like the students' satisfaction when they are able to create a map, when they create a graph, etc. or when they do use the GPS in the field. . . . The role of being able to share what I've learned or what I've learned from the program and teach them, I think is what I most enjoy."* -Case Study B

Improved Communication Skills *"I pay closer attention to how people want to convey their message. . . . I've learned before intervening and giving them a solution or alternative to be more patient and listen and give them as much time as possible to define what they want to do, to be as specific as they can."* -Case Study B

CASE STUDY C: INTERPRETER

Case Study C is a composite of three interpreters who work for the Trust. This presentation of findings takes into account major trends across their collective experiences.

RK&A interviewed three interpreters for Case Study C, one onsite and two by telephone. In addition, RK&A interviewed a Trust staff member who works closely with the interpreters.

BACKGROUND AND MOTIVATION TO PARTICIPATE

Two interpreters have a science background while one has a tourism background. Regardless, all three interpreters had similar motivations for participating in the Citizen Science Project.

- ◆ **Helping communicate science:** All three interpreters spoke of their interest in helping others learn science in a fun and engaging way. Specifically, all three saw themselves as an important communication bridge between the scientists and the participants, ensuring that all participants have an active role, understand their purpose, and leave feeling fulfilled.
- ◆ **Love of nature:** All three interpreters also spoke of an interest in conservation and a love of nature. They all love to learn and were interested in knowing more about the research being conducted by the scientists.

PROJECT SUCCESSES

All three interpreters found similar aspects of their project experience to be successful and these thoughts were reiterated by the Trust staff member who works with them.

- ◆ **Creating engaging learning experiences:** All three interpreters said one of the most enjoyable aspects of their role as an interpreter is helping participants learn new things in an engaging environment. Specifically, the interpreters like to demystify the process of science and help participants see how it is relevant to them and their lives. Also important to all three interpreters is ensuring that participants enjoy themselves and want to return.
- ◆ **Building relationships:** All three interpreters also spoke about the importance of building relationships with the participants. They see these relationships as a mechanism for engaging participants fully in the research activities (when perhaps some are hesitant), making them feel comfortable enough to ask questions, and motivating them to return to participate in more activities with the Citizen Science Project or the Trust.
- ◆ **Deepening appreciation of nature and science:** All three interpreters said they love to learn and have deepened their understanding and appreciation for science. For example, one interpreter learned about bat vocalizations and their importance to humans. Another interpreter deepened his/her understanding of archeology and now views the coastline from a different perspective due to his/her role as an interpreter for that project.

PROJECT CHALLENGES

All three interpreters spoke of one main challenge they encountered through their role as an interpreter—logistics. Specifically, they said the hours they work are sometimes challenging, and they occasionally feel overextended. For example, some of the activities take place in the evenings, and there are not always enough interpreters to cover all the projects.

CHANGE OVER TIME

All three interpreters spoke about a growing understanding of how science permeates everything. They and Trust staff explained that removing the mystique of science is the role of the interpreter, and through doing so, they have come to appreciate each individual's ability to contribute something to the scientific process, even if he/she is not a scientist.

Being a Bridge *"I represent the organization; I welcome people. . . . [I'm] creating a bridge between the scientific aspect and the social aspect. . . . You teach people. . . . We reconcile people's knowledge with the real aspect, so it ties together with their surroundings." -Case Study C, an interpreter*

Creating Engaging Experiences *"I think the biggest contribution we make is to have people go home smiling after the activity and that they understood what was discussed, that the protocols made sense, and they left happy, that they felt they had a good experience. At the end of the day, they feel they want to return." -Case Study C, an interpreter*

Managing Logistics *"It's really been the hours. We don't have a stipulated time, and it can become conflicting. The activity I participated in was held most of the time at night. . . . We held on as much as we could but it was exhausting. . . . There were five interpreters, and although we were very sorry, we couldn't attend every one of the activities, we couldn't be with the volunteers all the time." - Case Study C, an interpreter*

Science is for Everyone *"Science is not for the people but by the people. It's the program that has taught me that it's always important to have people involved in the process of science. Seeing it from the perspective of making science with people, volunteers that have initiative, that are interested and maybe have never done anything scientific before, that's not an impediment to getting involved in an investigation and learning something new about a particular subject. Sometimes you learn that the importance in science is not always what is being studied; actually it's not. It's in having people learn, picking up those tools along the way, in investigating and making science. That to me is marvelous. - Case Study C, an interpreter*

CASE STUDY D: VOLUNTEER LEADER

Case Study D is a volunteer leader: someone who began in the project as a casual participant and eventually, because of his/her high interest and frequent participation, took on a leadership role guiding other participants in the Citizen Science Project. RK&A interviewed Case Study D on two occasions and observed Case Study D in the project for context. In addition, RK&A interviewed a staff scientist who works closely with the volunteer leader, as well as his/her son, who is also involved in Citizen Science.

BACKGROUND AND MOTIVATION TO PARTICIPATE

Interviews revealed three key reasons that Case Study D was interested in Citizen Science:

- ◆ **Passion for conservation:** Case Study D emphasized a strong interest in nature conservation issues, particularly the opportunity to “help conserve species and trees.” His/Her son noted that conservation issues have always been a hobby for his/her parent, and this was an opportunity to expand on that interest.
- ◆ **Personal relationships:** Case Study D’s son is also involved in the Citizen Science Project and invited Case Study D to become involved. In addition to a family tie to the project, Case Study D values the relationships built with other volunteers during his/her participation in the project and the opportunity to meet people with similar interests.
- ◆ **Impact on the future:** Case Study D is also motivated by the impact his/her work will have on future generations, both through the data collected and by educating younger generations about the importance of conservation. He/She understands that some of the research may not have immediate impacts but will serve local and scientific communities in the long term.

PROJECT SUCCESSES

Throughout interviews, Case Study D, his/her son, and a staff scientist spoke of ways in which Case Study D increased his/her knowledge of conversation and nature and grew as a leader in the project.

- ◆ **Gaining new knowledge and skills:** Case Study D’s son and a staff scientist remarked on how much Case Study D enjoyed learning about science and conservation issues, stemming from a lifelong interest in these subjects. His/Her son estimated that Case Study D grew significantly in expertise about birds (birdsong and visual identification) and leadership capabilities. Case Study D also mentioned the skills he/she has gained using new technology (e.g., pH-measuring devices, computer systems, cameras) and scientific techniques (e.g., bird and plant identification, data collection, forest measurement). Moreover, the staff scientist noted Case Study D gained a deep understanding of “scientific thought . . . from the time you start brainstorming ideas and presenting a hypothesis to the completion and handling of information and being able to present a story of opinions in the field.”

- ◆ **Leading and teaching others:** A staff scientist for the Citizen Science Project observed that Case Study D became “a great example” for others who may not have a background in science. Case Study D’s son noted that his parent often shares stories about “the impact on people after participating in the project,” and that his/her confidence about teaching and recruiting others to get involved with conservation issues has increased.
- ◆ **Understanding personal impact on the environment:** Case Study D also said that participation in the project has impacted his/her daily life because he/she is “more aware [that] all the waste we create has an effect on the environment.” This awareness has motivated him/her to be proactive about his/her personal impact on the environment, including “not throwing out waste in the street” or “picking up things that could be toxic for the environment.”

PROJECT CHALLENGES

Case Study D, his/her son, and a staff scientist all noted that one of the biggest challenges for Case Study D has been the scheduling. Case Study D noted that he/she sometimes receives very short notice for upcoming assignments and might have to work “challenging hours” from the early morning until late at night during a project. Case Study D’s son also observed that sometimes when a project concludes, the volunteer leaders have to find another way to continue participating.

CHANGE OVER TIME

Interviews with Case Study D, his/her son, and a staff scientist indicated that Case Study D significantly increased his/her knowledge of the scientific process, including the use of specific scientific tools, and he/she gained confidence in teaching others about these processes. The son explained that, “he’s/she’s always been a leader, but this helped him/her to organize his/her views about environmental protection,” to gain expertise, and to become more confident in leading others as a part of the Citizen Science Project.

New Knowledge and Skills *“If we’re talking about expert knowledge, my parent had like 35 percent of expert knowledge about birds before starting in the program, and now when the program has concluded, I’d say he/she has a solid 70 percent of expertise regarding bird research either by listening to them, observing them, or photographing and looking for them alive, which is a huge improvement.” -Case Study D’s son*

Teaching Others in Simple Terms *“I’ve learned that science, as explained by professors, with a foreign language and Latin words. . . . I’ve learned how to understand the purpose of what is being done in a simpler way, without having to make up or learn strange or complicated names. I think that way you can reach people better, in a more informal way.” -Case Study D*

CASE STUDY E: SCIENTIST ASSISTANT

Case Study E is a scientist assistant, typically a graduate student who works alongside a scientist in the Citizen Science Project. RK&A interviewed Case Study E on three occasions and observed Case Study E. In addition, RK&A interviewed a staff scientist who supervises the project in which Case Study E participates, as well as a friend who has interacted with Case Study E throughout his/her participation in the project.

BACKGROUND AND MOTIVATION TO PARTICIPATE

Case Study E was a student at the university where a lead scientist for the Citizen Science Project also teaches classes. After seeing a job posting for a project assistant for the Citizen Science Project, Case Study E interviewed with his/her professor and was selected for the position. In addition to his/her interest in archaeology, he/she was particularly motivated by one of the project's goals—to increase a sense of “patrimony” or “heritage” in the community about the archaeological resources in the area.

PROJECT SUCCESSES

Throughout the interviews, Case Study E, his/her friend, and the project's lead scientist highlighted his/her project successes along two main themes:

- ◆ **“Breaking down barriers” between the public and science:** Case Study E believes one of the most important project impacts has been increasing communication with the community about archaeology and presenting research in a way that is accessible to the general public. She/he also feels that Citizen Science presents a unique opportunity for him/her as a student to be able to “reach the public,” and “they actually come and listen to the message.” Moreover, volunteers have discovered that science is not an abstract or distant process and come to realize “they too can do archaeology and they're not limited.” Case Study E has helped volunteers explore their own research questions, and some have gone on to present their research at international conferences.
- ◆ **Professional development:** Case Study E also emphasized that his/her role as an assistant in Citizen Science has allowed him/her to take on leadership responsibilities and learn skills he/she would not have the opportunity to do otherwise. He/she and other assistants now “know the ropes,” and this experience has positioned them to succeed in their graduate studies and future professional careers. Case Study E feels he/she has been more than “just an assistant” and has become “part of the research” and “the scientific process.”

PROJECT CHALLENGES

Overall, interviewees could think of few major negative experiences or challenges for Case Study E with the project.

- ◆ **Gaining communication skills:** Both Case Study E and the lead scientist noted the primary project challenge was for Case Study E to gain confidence in his/her knowledge and learn how to present this information to different audiences (i.e., academics, volunteers, and the public). Though initially challenging, Case Study E and the lead scientist both view this growth as one of the biggest successes of Case Study E's participation in the project.
- ◆ **Raising awareness about the project:** Case Study E wished he/she had known about the opportunities available through Citizen Science at a younger age. He/she "didn't know this existed" until his/her professor advertised the assistant position online.
- ◆ **Travel to the site:** Case Study E mentioned that traveling to the site can be challenging at times but the project is well coordinated to minimize this issue.

CHANGE OVER TIME

The most significant change that Case Study E has experienced over the project is an increased ability to comfortably interact with volunteers and the public and to communicate complex scientific ideas in laymen's terms. Interviews indicated that while this was initially a challenge for Case Study E, he/she has found it to be one of the most rewarding parts of his/her participation in the project.

Case Study E also mentioned that his/her participation in the project has changed his/her perceptions of his/her own limitations for conducting scientific research. He/she said, "I thought I was limited to a certain academic level, and through this project, I've come to realize that I'm not. Any person can do science and that's what the project has taught me." According to Case Study E's friend, he/she has since been accepted to a graduate project in community archaeology, motivated by his/her experiences in the Citizen Science Project.

Motivated to Increase Community Heritage *"I went into the interview, and she told me more about her research, that she worked with nature, and all the processes dealing with volunteers, as well as the sense of patrimony. . . . The main goal of the investigation, although it raises questions on how human beings have changed the lands around the Manatí river basin, we also want to create a sense of patrimony in people, so that they come in contact with archaeology."* -Case Study E

Making Science Accessible *"It [the project] creates a sense of heritage. . . . In a scientific sense, we're opening the doors of the academy to a group that has always been an outcast, the community, because we always thought that academics were left to certain groups or certain educational centers, and it didn't have anything to do with the community, but this incorporation affects everything."* -Case Study E

Building Communication Skills *"In the beginning, overcoming the embarrassment of having to speak in public [was challenging], but it's something that she/he completely masters now. But, in the beginning, being able to trust her/his knowledge and assume responsibility and realizing that*

she/he knows what she/he's talking about, being able to answer the questions from the public at first was a little challenging.” -Trust Scientist

CASE STUDY F: CORE PARTICIPANT

Case Study F is a core participant in the Citizen Science Project. Core participants are individuals who are committed to a high level of participation over the course of a project—including data collection, analysis, reporting, and workshops—and are given the opportunity to explore their own research project related to their work in Citizen Science.

RK&A interviewed Case Study F on three occasions, observed Case Study F for context, and also interviewed a Trust scientist about Case Study F's participation in the Citizen Science Project.

BACKGROUND AND MOTIVATION TO PARTICIPATE

Case Study F, recruited by another community member already involved with the Citizen Science Project, cited two main factors that have influenced his/her involvement with the project:

- ◆ **Proximity to the river:** Case Study F lives in a community near La Esperanza Reserve and the river where Citizen Science holds its river project, “Know Your River.” As a member of the nearby community, he/she is concerned for “the river’s health” and desired to learn more about “the structure of caring for the river.”
- ◆ **Lifelong interest in science:** Case Study F also mentioned that “since I was very young, I like everything regarding science.” Although he/she did not formally study science in college, he/she maintained an interest in the scientific method and experimentation later on in life.

PROJECT SUCCESSES

Case Study F has achieved success in the Citizen Science Project in a number of ways that relate to both personal and project goals:

- ◆ **Raising community awareness:** Case Study F believes that his/her work with the river project through Citizen Science has increased the community’s awareness about the relationship between the community and the river. Case Study F also expressed plans to apply his/her knowledge gained from participation in the project to “work on issues affecting the community here and in other places.”
- ◆ **Increasing knowledge of the river ecosystem and species:** The scientist observed significant growth in Case Study F’s ability to apply scientific knowledge to his/her research on the river, including identifying different species of shrimp, measuring water quality, and applying the scientific method.
- ◆ **Exploring personal research questions:** During the first interview with Case Study F, he/she noted that he/she had begun to conduct his/her own study, similar to the

Citizen Science river project, at another location upstream on the river. Later, the scientist noted that Case Study F has discontinued this project, but is creating a documentary about fishing in the rivers of Puerto Rico as an extension of his/her work with Citizen Science.

PROJECT CHALLENGES

Interviews revealed two main challenges that Case Study F faced during his/her participation in Citizen Science, with both tied to the administration of the project:

- ◆ **“Bureaucracy” of signing up:** The scientist noted that Case Study F was initially uncomfortable with the process of having to sign up far in advance to participate, or having to follow particular protocols like wearing a life vest on the river. However, Case Study F eventually adjusted to these processes.
- ◆ **Completing paperwork and reports:** Case Study F also expressed frustration with the process and time needed to complete reports on the research.

CHANGE OVER TIME

Case Study F believes that he/she is “better prepared” to address conservation issues in his/her own community after participating in the project. The scientist added that Case Study F has become “more aware” and “more alert” to things happening on the river. Furthermore, as a community leader in his/her neighborhood, Case Study F is in a position to initiate change in his/her community based on the things he/she has learned as a core participant in the Citizen Science Project. The scientist said that the “community is very organized because of the great effort he/she [has] made.”

Scientific Knowledge

“I’ve learned a lot about the river’s ecosystem because I live on the shore of the river where the activities take place. . . . I’ve been able to learn about the organisms that live in the river, the cycles, everything having to do with water quality, indicators of pollution, etcetera here in my own surroundings.” -Case Study F

Lack of Guidance with Paperwork/Reporting

“I think it might be good to provide some sort of direct assistance as far as the paperwork. . . . For example, they could say, ‘Let’s get together one day, and we’ll explain how to fill out this form in the simplest way possible.’ And obviously that entails having the forms be as user-friendly as possible.” -Case Study F

CORE PARTICIPANT INTERVIEW FINDINGS

INTRODUCTION

RK&A interviewed 13 core participants—those who committed to a high level of participation in the project and whose participation involved community outreach—of Citizen Science projects about how these projects have affected the surrounding communities. Several interviewees reported participating in multiple Citizen Science projects over the course of their involvement with the Trust. Of the projects specifically mentioned during interviews, interviewees participated in seven projects: Shoreline ($n=6$); Birds ($n=4$); Archaeology ($n=3$); Bats ($n=3$); Botany ($n=3$); River Quality ($n=2$); and Crabs ($n=1$).⁶ Findings in this section provide reasonable insight into the experiences of core participants but not participants as a whole. At the same time, the reader should keep in mind that the purpose of these interviews was to explore core participants' perceptions and experiences with how the Project has impacted the community rather than an in-depth exploration of participants' individual experiences.

MOTIVATION FOR PARTICIPATION

When asked their primary reason for participating in the Citizen Science Project, nearly all interviewees referenced their prior interest in nature and/or conservation issues. A few interviewees mentioned they were studying a related subject at university and were recruited to participate in the project by their professor. Two interviewees were recruited by friends or family members to participate.

About one-third of interviewees also mentioned that community engagement was a motivating factor to participate in the project. These individuals were excited about the opportunity to “help others” or “teach others” about conservation issues and appreciated that the project was accessible to “non-experts.”

⁶ Total sum exceeds 13 because some individuals mentioned participating in more than one project.

RESEARCH RELEVANCE TO CORE PARTICIPANT

As a core participant in the Citizen Science Project, individuals are encouraged to explore a personal research question that broadly relates to their research with Citizen Science or its impact on the community. Interviewees were asked whether they had begun to explore their own questions about a conservation issue relevant to their community. If so, they were also asked how their research differed or expanded on the research they conducted through the Citizen Science Project.

About two-thirds of interviewees mentioned that they have started or plan to explore their own research questions related to nature or conservation.

- ♦ **Expanding on Citizen Science research questions:** Most interviewees have chosen topics that broaden or expand on the research questions they are exploring in the Citizen Science Project. Several interviewees, for example, have expanded the scope of their research with the Citizen Science Project to explore similar questions at alternative locations in and around Puerto Rico.
- ♦ **Research will involve/impact community:** Many interviewees exploring their own research questions believe their research will involve or impact their local community. For example, some said they would “pass on” the knowledge from their research to the community through presentations and meetings. Two interviewees have plans to increase their involvement with local conservation initiatives: for example, one plans to write a letter to the Department of Natural Resources to propose alternative land management strategies to preserve the flora and fauna in a local gorge.

About one-third of interviewees did not report exploring a personal research question. These interviewees either stated they had not pursued their own research outside the project or just reiterated their research experience within the Citizen Science Project.

Exploration of Independent Research Questions

“As a collaborator, I was allowed to choose an area of interest to study, and I chose Culebra, because I thought that Culebra is a very visited area. It's an island that has as many tourists as locals, and there wasn't much knowledge about the beach dynamic and how it works. . . . I think it expands the [Citizen Science Shoreline project] more and gives another perspective on it.” -Core participant, Shoreline project

RESEARCH RELEVANCE TO COMMUNITY

Interviewees were asked about the role the community plays in the research conducted by the Citizen Science Project. Furthermore, they were asked how these research projects affect the community.

ROLE OF THE COMMUNITY

When asked about the role of the community in Citizen Science research projects, about one-half of interviewees mentioned the importance of the community to land and heritage stewardship. About one-third spoke about the role of the community as participants in the research process, either as project volunteers or as sources of information about local conditions.

- ◆ **Land and heritage stewardship:** One-half of interviewees said the local community plays a key role in managing the natural and cultural resources “in their backyard.” Particularly, interviewees from the Shoreline project recognized the significant role of the community in acting as stewards in coastal areas to prevent erosion, keep beaches clean, and monitor frequently changing local conditions. Two interviewees spoke about the community’s stewardship role in the abstract; for example, one noted that “if more people from the community went,” this would improve natural resource management, and another stated that generally, “if you don’t communicate [with the community], basically you’re wasting your time.” While these interviewees recognized the significance of the community’s role in stewardship, they had not observed much community participation in the project to date.
- ◆ **Volunteering in the project:** One-third of interviewees spoke about the role of the community as participants in the Citizen Science Project. For example, one interviewee noted the general impact of community volunteers for research projects with limited budgets, where hiring personnel may not be feasible. In these cases, community volunteers “provide valuable help” to scientists that would not otherwise be possible.
- ◆ **Monitoring local conditions:** A few interviewees noted that the community also can be integral in reporting on local conditions in between Citizen Science project visits. For example, within the Shoreline project, two explained the role of residents who live near local beaches in monitoring changes in erosion and other environmental phenomena.

Engaging Community in Resource Stewardship

“The community is supposed to take care of their materials and heritage, so by including them, working together, we help them to protect their community, their area. . . They learn about what’s in the area, in order to protect it.” -Core participant, Archaeology project

IMPACTS ON THE COMMUNITY

Almost all interviewees mentioned that a primary impact of the Citizen Science Project is to “raise awareness” in the community about local natural resources and conservation issues. In addition, two interviewees mentioned potential safety impacts on the community, and two others mentioned observing an increased connection between family members and friends, as well as between communities and the environment.

- ◆ **Raising awareness:** Many framed their discussion of community impacts in terms of how increasing knowledge in the community would improve land and resource management and conservation. For example, one interviewee explained that humans are interconnected with nature, and human actions “affect the whole ecosystem.” With a better understanding of the project goals and rationale, interviewees said the local community may be more engaged in conservation practices. They also said that increasing community awareness could happen directly through community participation in projects, or indirectly, by the community observing other’s participation.
- ◆ **Safety impacts:** Two interviewees noted that research conducted through the Citizen Science Project could affect the community by mitigating specific health and safety concerns. For example, one who participated in the River project noted that the community can greatly impact river water quality, in terms of “toxic chemicals,” “pesticides,” and “human waste discharge,” as well as plastic pollution, which can affect aquatic life. Again, this interviewee recognized the importance of educating the community so it recognizes how human actions affect the environment.
- ◆ **Fostering connections:** Two interviewees mentioned they observed increased connections in the community between family members and friends, as well as between communities and the environment. Both interviewees noted that the project brings together different generations, whether parents and children or community members, who are all “fascinated by nature conservancy” and want to work together to “make a difference.”

COMMUNITY COMMUNICATION EFFORTS

Interviewees were asked whether they have done anything to share the research conducted through the Citizen Science Project with the communities around the Rio Grande of Manati Watershed, and what the community's response to this information has been. They were also asked if they have shared their research with others outside the project, such as family, friends, or colleagues.

BROADER COMMUNITY

About one-half of interviewees said they have shared the research conducted through Citizen Science with the community and about one-half have not.

- ◆ **Have shared research with community *informally*:** Most of those who have shared information with the community have done so informally, typically by striking up conversations with people they meet or who have approached them with questions about a project in progress. Most often, interviewees shared general information about conservation, aspects of their research project, or the range of opportunities available at the Trust. A few also noted that they direct community members, family, and friends to the Trust's website or Facebook page to find information about how to get involved.
- ◆ **Have shared research with community *formally*:** A few interviewees mentioned more formalized settings where they have shared their research with the community. For example, one interviewee said the Trust has an annual "open house, and we take advantage and provide the community with information regarding all of the things being done by the Trust." Another one plans to work with his/her child to create informational posters for a local school and library.
- ◆ **Have *not* shared research with community:** Slightly less than one-half of interviewees indicated they had not shared information about their research with the community. Two interviewees said they believed that the research would be shared through a presentation to the community once the research project was concluded. Others were unsure how information about Citizen Science projects would be shared with the community.

Educating the Community

"I talk about the Trust and Citizen Science. I don't know if they've heard about it, a lot of people say they haven't. I tell them to go. [Citizen Science] has educated me in some way, aside from my work, in a way that I can relate [some knowledge] so that people have a good concept regarding conservation." -Core participant, Shoreline project

FAMILY AND FRIENDS

All interviewees reported sharing information about their involvement with Citizen Science with their family, friends, and/or colleagues. Generally, interviewees experienced “positive” responses from family and friends about the Citizen Science Project; however, many noted that most people they talk to are surprised to hear about the project and are generally unfamiliar with conservation issues. Several also noted general misconceptions about the mission of the Trust or how the community can get involved.

Family and Friends Unaware of Project

“A lot of them [friends and family] have been surprised because they didn’t know that this program existed or that these types of studies were being done. They didn’t know that you could become a volunteer. They thought that the process was a lot more complicated. . . . They thought that it was a selection process.” -Core participant, Shoreline project

CHALLENGES TO COMMUNICATION

Most interviewees indicated that when they have been able to share information about Citizen Science projects with the community or their family and friends, the overall response has been “positive.” For example, when asked about his/her family and friends’ responses to his/her sharing information about the Citizen Science Project, one interviewee replied, “Oh, excitement, yes. They’re interested, and they like it. They have participated.” However, as noted above, interviewees said that many people were not previously aware of the projects before their conversation with a project participant.

While the majority experienced positive feedback from the public, most interviewees also recognized challenges in communicating with the public about Citizen Science research.

- ◆ **Disinterest or too busy to participate:** About one-third of interviewees indicated that the public is not interested or will not “dedicate the time” to learn about conservation or volunteer with the project. Some said the community is “too busy” to prioritize volunteering with Citizen Science among their other interests and responsibilities. Activity schedules may present another barrier for some; for example, one interviewee noted that “getting up early” to volunteer was off-putting for some friends and family.
- ◆ **Negative perception of the Trust:** Two interviewees also noted that some of the public has a “negative perspective” of the Trust or its projects. For example, one interviewee said this negative perception is the “biggest challenge” for public outreach, and that it seems to stem from misinformation or misconceptions about the goals of these projects or the Trust.
- ◆ **Community believes they are unqualified:** Another misconception about the Citizen Science Project is that it requires “expertise,” or that scientific studies are “too complicated” for the public to understand and engage with. Two interviewees found

that friends and family had the perception that they were not qualified or skilled enough to participate in the Citizen Science Project.

Disinterested or Busy Community

“(What has been challenging in trying to communicate with the community?) Going to their homes and trying to take their time away from home to talk to them about subjects they perhaps don’t consider important.” -Core participant, Shoreline project

APPENDICES

APPENDIX A: RUBRIC-SCORED INTERVIEW GUIDE

Removed for proprietary purposes.

APPENDIX B: CORE PARTICIPANT INTERVIEW GUIDE

Removed for proprietary purposes.

APPENDIX C: CASE STUDY INTERVIEW GUIDES

Removed for proprietary purposes.

ONSITE CASE STUDY INTERVIEW GUIDE – PROGRAMPROJECT LEADER

Removed for proprietary purposes.

APPENDIX D: SCORING RUBRICS

Removed for proprietary purposes.

APPENDIX E: FORMATIVE EVALUATION CITIZEN SCIENCE PROGRAM

Removed for proprietary purposes.