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 ***What do you want to achieve for the audience?***	**INDICATORS** ***What is the evidence that you have achieved the impacts for the audience?***
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 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

[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. 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.

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 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 individuals' 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).

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

[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 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.**

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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 provides a vague or general example of its value to them or all humans.	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 specific connections between the river and how it influences species, including humans. When probed to expand on the human connection, he/she provides a specific example, story, or anecdote that illustrates its value for him/her personally.	4 %	10 %

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 but does not say how.	20 %	18 %
Level 2: Beginning The interviewee provides vague or general examples of how humans impact the river (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 specific example of how humans impact the river (i.e., describe a specific issue, area). 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 does not relate those tasks to a larger conservation effort.	36 %	67 %
Level 3: Developing The interviewee describes his/her contribution as relating to a larger conservation effort but does not provide a specific example of how he/she will (or did) contribute.	40 %	15 %
Level 4: Accomplished The interviewee describes his/her contribution as relating to a larger conservation effort and provides a specific example of how he/she will (or did) contribute.	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**.

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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 in 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

Interviewer
Today, we are talking about your experience in Citizen Science. Do you mind if I record our conversation? Remember, I do not work for the Trust and your comments are confidential. Your honest thoughts and opinions are appreciated.

First, I would like to confirm that you are: (1) 16 years or older; (2) have never participated in the Citizen Science program?

Thank you. [Press record and announce ID#]:

1. What was your primary reason for signing up to participate in Citizen Science? Was there anything else about Citizen Science that made you decide to participate?

2. What (if anything) do you expect to contribute as part of your participation in this project? Can you give me an example?

3. The Citizen Science projects are all designed to explore the Rio Grande of Manati river. What do you know about the Rio Grande of Manati river? How would you describe it?
    a. What (if anything) do you think is influenced by the river? Can you give me an example?
    b. What (if anything) do you think influences the river? Can you give me an example?

4. Based on your personal experience, what (if any) connections do you see between yourself and the river? Can you give me an example?

5. You described some things you think influence the river. Of the things you mentioned, which things (if any) do you think people in the community can control? Can you give me an example?
    a. What (if anything) could they do? Can you give me an example?
    b. What do you think the result would be? Can you give me an example?

6. The activities you participate in are part of a research project. I'd like to ask about your past experience with these kinds of activities. On a scale from 1 ("not at all comfortable") to 7 ("very comfortable"), please rate how comfortable you are:

    [For any ratings 4 to 7, ask:] Can you give me an example from your past experience?

a. Observing details in your environment.
b. Identifying plant or animal species.
c. Organizing and entering data.
d. Using tools and equipment to collect data.
e. Analyzing (comparing, measuring) data.
f. Interpreting or drawing meaning from data.
g. Communicating research findings to others.
h. Applying what you have learned to real-world situations.

7. In what ways (if any) do you feel science is relevant to your everyday life? Can you give me an example?
    a. Have you ever used science knowledge or data to make a decision related to your everyday life? (If yes) Can you give me an example?

8. What (if anything) do you do on a regular basis that you would relate to conservation? Can you give me an example?

9. Do you currently have any curiosities or questions about a conservation issue that affects your community? (If yes) Can you tell me more about that (or provide an example)?

10. Have you ever advocated for or acted on a conservation issue affecting your community? (If yes) Can you tell me more about that (or provide an example)?

11. Is there anything else you would like to share about the Citizen Science program?

APPENDIX B: CORE PARTICIPANT INTERVIEW GUIDE

You may have already participated in an interview for this project but I have some different questions to ask you about how the Citizen Science program has affected the surrounding communities. Do you mind if I record our conversation? Remember, I do not work for the Trust and your honest thoughts and opinions are appreciated.

Press record and announce ID#:

1. Which Citizen Science Program do you spend most of your time participating in? What types of activities have you done for that program (probe for concrete, specific examples)?

2. Why did you choose to participate in the Citizen Science Program at the level of a core participant? Can you tell me more about that? Are there any other reasons?

3. Through your participation, have you begun to explore your own questions about a conservation issue that is relevant to your community?

   [If so] Can you tell me more? What questions are you exploring? How is that related to conservation?

   How (if at all) does that (those) question(s) differ from (or expand on) the research question that is being explored through the [name of the program] you participate in?

4. How (if at all) does the community play a role in the research you are doing in the program? Can you give me a specific example?

   How (if at all) does the research you do affect the community? Can you give me a specific example?

5. Have you done anything to share the research you have been doing in the Citizen Science Program with the communities around the Rio Grande of Manati Watershed?

   Can you tell me more about that? What specifically have you done (or are you doing)?

   Who (what types of community members) have you shared with?

   What was (or has been) their reaction? Can you provide a specific example?

6. What, if anything, has been challenging about trying to communicate with the community?

Can you tell me more about that? Can you provide a specific example?

7. Who else (outside of the program – family, friends, colleagues, etc.) have you talked with about the research you are doing in the program?

   What specifically have you told them?

   What has been their response? Can you provide a specific example?

8. Is there anything else you would like to mention that would be important for me to know about how the program is affecting the community? Why is that important?

APPENDIX C: CASE STUDY INTERVIEW GUIDES

ONSITE CASE STUDY INTERVIEW GUIDE – PROJECT PARTICIPANT

Today, we are talking about your experience in Citizen Science. Do you mind if I record our conversation? Remember, I do not work for the Trust and your honest thoughts and opinions are appreciated.

Press record and announce case study ID# and date:

1. How many times have you participated in Citizen Science activities since the program began (in the Summer of 2013)? What Citizen Science programs and activities have you participated in (clarify the individual programs and activities within those programs)?

2. What was your primary reason for participating in Citizen Science? Was there anything else about Citizen Science that made you decide to participate?

   What motivated you to continue participating?

3. What experience did you have with science before participating in Citizen Science?

   What experience did you have with [program topic—example, crabs] before participating in Citizen Science?

4. What have you most enjoyed about participating in Citizen Science? Why? (probe for concrete, specific answer)

5. What has been most difficult/challenging about participating in Citizen Science? Why? (probe for concrete, specific answer)

6. Overall, how would you characterize what you do in Citizen Science? How would you describe your role in the program?

   What (if anything) do you feel that you contribute by participating? What do you see as the result of what you do?

7. Now I am going to ask you some specific questions about that program.

   What do you see as the purpose of that program? Anything else?
   Describe some of the specific things you do. Why do you think you do those things?
   What (if anything) have you discovered? How did you figure that out?

8. What (if anything) do you feel you have learned from participating in programs overall? Did you know any of that before you participated? Can you tell me more? (probe about knowledge, skills, attitudes, etc.)

What (if anything) have you learned about "doing" science? Did you know any of that before you participated? (probe about scientific method and rigor)

9. How (if at all) has the program affected the way you see or do things in your everyday life? Has anything changed? Can you tell me more?

10. Talk briefly about the reserve as it relates to you and your community. How (if at all) does it factor into your everyday life?

ONSITE CASE STUDY INTERVIEW GUIDE – PROGRAMPROJECT LEADER

Today, we are talking about your experience in Citizen Science. Do you mind if I record our conversation? Remember, I do not work for the Trust and your honest thoughts and opinions are appreciated.

Press record and announce case study ID# and date:

1. In what ways have you participated in Citizen Science activities since the program began (e.g., what programs and activities have you participated in? What roles have you taken on)?

2. What was your primary reason for participating in Citizen Science? Was there anything else about Citizen Science that made you decide to participate?

3. Overall, how would you characterize what you do in Citizen Science? How would you describe your role in the program?

   What do you see as the result of what you do (both in the Manati community and in the scientific community)?

4. What experience did you have with citizen science before participating in the Conservation Trust's Citizen Science program?

5. What have you most enjoyed about participating in Citizen Science? Why? (probe for concrete, specific answer)

6. What has been most difficult/challenging about participating in Citizen Science? Why? (probe for concrete, specific answer)

7. Now I am going to ask you some specific questions about that program.

   What do you see as the purpose of that program? Anything else?
   Describe some of the specific things you have participants do during the program activities.
   What (if anything) have you think program participants have discovered by taking part in the activities? What makes you say that?

8. What (if anything) do you feel you have learned from participating in programs overall? Can you tell me more? (probe about knowledge, skills, attitude, etc.)

   What (if anything) have you learned about "doing" science? How (if at all) have your thoughts about "doing" science changed due to your participation in the Citizen Science programs? (probe about scientific method and rigor)

9. How (if at all) has the program affected the way you see or do things in your work? Has anything changed? Can you tell me more?

10. Talk briefly about the reserve as it relates to you and your community. How (if at all) does it factor into your everyday life?

ONSITE CASE STUDY INTERVIEW GUIDE – SUPPORT STAFF

Today, we are talking about your experience in Citizen Science. Do you mind if I record our conversation? Remember, I do not work for the Trust and your honest thoughts and opinions are appreciated.

Press record and announce case study ID# and date:

1. In what ways have you participated in Citizen Science activities since the program began (e.g., what programs and activities have you participated in? What roles have you taken on)?

2. What was your primary reason for getting involved with the Citizen Science program? Was there anything else about Citizen Science that made you decide to participate?

3. Overall, how would you describe your role in the program? How would you characterize what you do in Citizen Science?

   What (if anything) do you feel that you contribute through your involvement in the program? What do you see as the result of what you do?

4. What experience (if any) did you have with citizen science before participating in the Conservation Trust's Citizen Science program?

5. What have you most enjoyed about your involvement in Citizen Science? Why? (probe for concrete, specific answer)

6. What has been most difficult/challenging about your involvement in Citizen Science? Why? (probe for concrete, specific answer)

7. What (if anything) do you feel you have learned from being part of the Citizen Science program? Can you tell me more? (probe about knowledge, skills, attitude, etc.)

   What (if anything) have you learned about "doing" science? Did you know any of that before you became involved? (Probe about scientific method and rigor)

8. How (if at all) has the program affected the way you see or do things in your work? Has anything changed? Can you tell me more?

   How (it at all) has the program affected the way you see or do things in your everyday life? Has anything changed? Can you tell me more?

9. Talk briefly about the reserve as it relates to you and your community. How (if at all) does it factor into your everyday life?

APPENDIX D: SCORING RUBRIC

RUBRIC #1

Outcome 5. Participants believe their work in the project is relevant to their community and gain a sense of responsibility to protect the watershed.				
Indicator	**1 – Below Beginning**	**2 – Beginning**	**3 – Developing**	**4 – Accomplished**
a. Participants feel that their project participation helped with the conservation efforts of the Rio Grande of Manati watershed. [Q2]	The interviewee does not feel that they contributed to the project or cannot articulate a way in which they contributed.	The interviewee describes his/her contribution to the project in terms of isolated tasks, such as contributing knowledge, collecting data, identifying species but does not relate those tasks to a larger conservation effort.	The interviewee describes his/her contribution as relating to a larger conservation effort but does not provide a specific example of how he/she will (or did) contribute.	The interviewee describes his/her contribution as relating to a larger conservation effort and provides a specific example of how he/she will (or did) contribute.
Examples:		"I hope to help with the collection of data you're doing, and I hope to achieve personal growth by means of acquiring new knowledge regarding archeology and these findings in the area."		"Hopefully, if it in were in my hands, if there's an archeological find in the field, I could identify and document it. And, it can be protected."

RUBRIC #2

Outcome 1. Participants will understand connections and inter-relationships that occur within the Rio Grande of Manati river.				
Indicator	**1 - Below Beginning**	**2 - Beginning**	**3 - Developing**	**4 - Accomplished**
a. Participants will know that everything that lives in or along the river, including people, is inter-related and dependent on one another. (Q3a, Q4)	The interviewee does not describe the connections between the river and other species, including humans.	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, they again provide a vague or general example of its value to them or all humans.	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 or her personally. One example is specific; the other is vague. For the second example to be specific, h/she should describe how or why the river is valuable to him or her personally and not humans in general.	The interviewee describes specific connections between the river and how it influences species, including humans. When probed to expand on the human connection, he/she provides a specific example, story, or anecdote that illustrates its value for him/her personally.
Examples:		"There's the weather and vegetation of the area, and the animals found in the area and are going into the ocean [that are influenced by the river]. . . . Some of the water we use comes from the river."		"The river provides water which is essential to many species. The river transforms ground contour. . . . I've always liked areas where the river discharges. I've always been fond of it and remember when I was a student, we would look for invertebrate species."

RUBRIC #3

Outcome 1. Participants will understand connections and inter-relationships that occur within the Rio Grande of Manati River.				
Indicator	**1 - Below Beginning**	**2 - Beginning**	**3 - Developing**	**4 – Accomplished**
b. Participants will identify negative impacts of construction and urban development on the Rio Grande of Manati river. (Q3b)	The interviewee does not identify negative human impacts on the river. OR The interviewee says that humans have a negative impact on the river but does not say how.	The interviewee provides vague or general examples of how humans impact the river (pollution, development, etc.). They use words that allude to a negative impact but its vague ("damages," "hurts").	The interviewee provides a specific example of how humans impact the river (i.e., describe a specific issue, area). The resulting impact is not clear or the "how" of the impact is still vague or general.	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.
Examples:		"I guess pollution is damaging the lakes and rivers in Puerto Rico. People throwing garbage, dumping liquid waste such as oil, those types of things in the river."	"In the area of San Jose at Toa Baja, there were some ponds where we use to bathe when we were children and then they built a neighborhood and covered the ponds."	

RUBRIC #4

Outcome 1. Participants will understand connections and inter-relationships that occur within the Rio Grande of Manati River.				
Indicator	**1 - Below Beginning**	**2 - Beginning**	**3 - Developing**	**4 – Accomplished**
c. Participants will describe solutions to maintaining the functionality of the Rio Grande of Manati River. [Q5]	The interviewee does not pose solutions for maintaining the functionality of the river.	The interviewee poses solutions and/or describes the resulting effect of that solution on the functionality of the river; both descriptions are vague/general.	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.	The interviewee poses solutions and describes the resulting effect of that solution on the functionality of the river. Both descriptions contain specific examples.
Examples:			"We could have meetings to clean up the rivers. Each group could choose a river, get together, clean it up, get to know it and teach others, especially children who will be the ones in charge of conserving the future. . . . The outcome would be positive because if we conserve rivers, the water will be cleaner and everything will be better."	"People are used to throwing out trash in the river. When it's overflowing, people will throw in refrigerators, cars. . . . I think teaching children in school about the importance of the river, how it's not for trash, water is a limited resource that will be gone at some point. . . . If we were more careful and we took better care of the river, the population of organism would grow. . . . Sometimes we can see that some areas you would expect a higher population of [prawns and river shrimp]."

RUBRIC #5

Outcome 6. Participants will perceive science as relevant to their everyday lives.				
Indicators	**1 - Below Beginning**	**2 - Beginning**	**3 - Developing**	**4 – Accomplished**
a. Participants will see that they can use science to make changes (connection between science and activism). [Q7]	The interviewee cannot articulate a way that he or she has applied scientific knowledge or data to everyday life.	The interviewee provides an example of how he or she has applied science to everyday life. The example is vague or general.	The interviewee provides an example of how he or 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 or she has applied science to everyday life and relates it to conservation/activism.	The interviewee provides an example of how he or she has applied science to everyday life. The example is specific and related to conservation/activism.
Examples:		"Science helps us correct the mistakes we've committed. It also helps us improve the future. . . . If we have a disease right now, science will help us fight it, whether it's in nature or in humans."	"If it's cloudy that will help me make decisions as far as what clothes to wear, if I should carry an umbrella. If the car breaks down, the scientists that created it, determined that certain parts are fixed certain ways." "Almost every day I use Google to find information to help me identify birds or information on the sea or fauna found in a certain area and how to conserve it. Marine turtles, sea horses, whales …"	"I learned something new—how ecosystems grow here in the hills and wetlands, what that has to do with birds, where they grow—With the knowledge I've acquired there, I've been able deal with horses there, I haven't been able to think that it would affect it—I if go with people, that we pollute as little as possible, affect them as little as possible, if people take weed-killer, so I can tell them not to do it in a certain area, since there is water there."

RUBRIC #6

Outcome 7. Through behaviors and actions, participants demonstrate an increased sense of ownership over the Rio Grande of Manati watershed.				
Indicators	**1 - Below Beginning**	**2 – Beginning**	**3 - Developing**	**4 – Accomplished**
a. Participations demonstrate actions or behaviors (individual, Trust, community) related to maintaining the functionality of the Rio Grande of Manati watershed. [Q8]	The interviewee cannot name any conservation-related behaviors they engage in regularly.	The interviewee describes conservation-related behaviors at the individual or family level (recycling, conserving water, etc.)	The interviewee describes behaviors that relate to the Trust's conservation programs or activities (research programs, special events, volunteering with like-minded organizations).	The interviewee describes behaviors that relate to advocacy in his or her community (communicating with neighbors, at community meetings).
Examples:		"I'm a mechanic and I know that you can't throw waste out anywhere, you have to recycle it. That's very important. Any waste that's man-made such as oil is dangerous and can't be thrown away."	"I belong to a sea turtle conservation group as a volunteer and I monitor the beach. They include tours for other people to expose them to the environment and I volunteer at the Conservation Trust in all areas."	"Horse waste is being used for the soil. Here in the farm, we use it for grass. . . . We're making compost and we can make tierra santa, which we can commercialize, or we can sell to other workers that need compost. I've talked with others to see if we can use that, rather than throw it away, and we're using it here in the farm for the soil, where we cultivate for horses. Part of the paddock is used for composting and for the use of other people working in agriculture."

RUBRIC #7

Outcome 3. Participants will develop critical thinking skills that allow them to use science to act on conservation issues.				
Indicator	**1 - Below Beginning**	**2 - Beginning**	**3 - Developing**	**4 - Accomplished**
a. Participants will ask their own questions about a conservation issue relevant to their life and community. [Q9]	The interviewee does not have or cannot think of a question related to a conservation issue in his or her community.	The interviewee describes a concern related to a conservation issue in his or her community or elsewhere in Puerto Rico. The example/question is vague or general (i.e., he/she doesn't discuss a specific issue or area).	The interviewee describes a concern (not a question to explore) related to a conservation issue in his or her community or elsewhere in Puerto Rico. The example/question is specific and concrete (i.e., he/she discusses a specific issue or area).	The interviewee articulates a question to explore related to a conservation issue in his or her community or elsewhere in Puerto Rico. The example/question is specific and concrete (i.e., he/she discusses a specific issue or area).
Examples:			"Trash on the ground. The river has a bunch of trash thrown in there. The badly cut and mistreated trees. . . . When I pass by Penuelas, and I see those monsters that are deteriorating, the ones with the petrochemicals and things there, that makes me feel bad."	"I would like to know how the quality of air changed in the area of Catano and Guaynabo. The economic situation has caused a change in the type of fuel used. . . . The Environmental Quality Board would take those samples and analyze the quality of air at different times. That would be a good question, evidence of acid rain in the area. I live near a power plant."

RUBRIC #8

Outcome 5. Participants believe their work in the project is relevant to their community and gain a sense of responsibility to protect the watershed.				
Indicators	**1 - Below Beginning**	**2 - Beginning**	**3 - Developing**	**4 – Accomplished**
b. Participants feel compelled to act on (or pay attention to) other conservation issues affecting them and their community. [Q10]	The interviewee has not advocated for a conservation issue in their community or elsewhere in Puerto Rico.	The interviewee says he/she advocates for conservation issues affecting them or their 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.**	The interviewee describes advocating for conservation issues affecting them or their community. His or her example is vague or general (i.e., he/she does not specify a particular issue or area).	The interviewee describes advocating for conservation issues affecting them or their community. His or her example is concrete and specific (i.e., he/she specifies a particular issue or area).
Examples:			"Signing petitions."	"Well, at Paseo Caribe, right by the Caribe Hilton, I participated there at the manifestations (protests). Yes, to avoid constructions. There was an archeological site and the marine habitat was also endangered, the marine habitat there."

APPENDIX E: FORMATIVE EVALUATION CITIZEN SCIENCE PROGRAM

Impact Planning, Evaluation & Audience Research

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Formative Evaluation: Citizen Science Program

Prepared for the
Conservation Trust of Puerto Rico
Manati, PR

TABLE OF CONTENTS

SUMMARY AND RECOMMENDATIONS

The goal of formative evaluation is to reveal successes and challenges toward program improvement. This summary highlights the strengths and challenges of the Citizen Science Program as demonstrated by formative evaluation findings. Based on these strengths and challenges, RK&A has provided concrete recommendations for improving program implementation moving forward.

PROGRAM STRENGTHS

Findings reveal many strengths of the Citizen Science Program. First, those who participate are highly motivated by and interested in the program activities. Interviewees frequently cited a high level of existing interest in project-specific content and research, such as a personal or professional interest in archeology and past civilizations. Most interviewees were repeat participants in the research project activity they attended, and several had participated in other research projects and activities. Second, while the number of participants at each activity ranged from 1 to 17, a high level of engagement was observed across project activities. RK&A observed few barriers to program implementation, and participants actively participated during most activities. This engagement took many forms from asking questions of scientists to performing a variety of data collection tasks to conversing with their like-minded peers. Further, facilitators across projects were observed actively supporting participants' engagement. For instance, facilitators encouraged participants to assume a variety of data collection roles and take ownership of their individual tasks. Facilitators also consistently demonstrated data collection tasks and provided participants with encouragement when they were hesitant to take the lead. Most facilitators also asked and answered open-ended questions throughout the activity. In most activities, interviewees described a collaborative atmosphere created by the facilitators and other participants that they truly appreciated.

A strong alignment between what facilitators and participants perceive as most rewarding about program participation is evident. Facilitators described participating in real scientific research and gaining knowledge about project topics and scientific research as most rewarding for participants. Likewise, many participants also described their active role in the scientific process as very rewarding and sometimes unexpected (which they found pleasantly surprising). For instance, during *Murciélagos: Conócelos en Persona*, participants were surprised by how close they were able to get when observing the bats that were captured.

Lastly, from participants' perspectives, the overall program logistics were handled very well. No interviewees encountered any great challenges with logistics, such as registering for the program or traveling to the sites. Participants registered in a variety of ways—in person, by e-mail, and by phone—and all methods were described as easy and straightforward. Further, in all instances, interviewees described receiving clear and reliable communications from Trust staff with maps, directions, and project descriptions and expectations.

PROGRAM CHALLENGES

Participants perceived very few challenges to their participation (and this was corroborated by observations where very few barriers were observed and participants' level of engagement was high). However, interviews revealed that participants' understanding of how the individual activity they

participated in relates to the overall purpose of the Citizen Science Program is inconsistent. For example, while some interviewees had a very clear understanding of how participating in "collecting and analyzing sediment" linked to the overall goal of maintaining a healthy watershed, others had vague notions of how the activity linked to a larger research goal. On the other hand, the majority of participants understood that their participation in the activity was linked to a larger goal of encouraging citizens' participation in research. Further, observations showed that facilitators were also inconsistent in their descriptions of the overall goals of the program and research projects, which may have contributed to the inconsistencies experienced among participants.

Facilitators described challenges from broad (overall program recruitment) to specific (personal logistical challenges). The three primary challenges that facilitators perceived are: (1) participants' knowledge gap; (2) recruitment and sustaining participation; and (3) program logistics. First, facilitators described challenges with the constant need to adjust the research activities to accommodate different levels of participant knowledge. Not always knowing the prior knowledge of participants makes it difficult to predict how efficiently they can collect data during any given activity (which is an overall concern for the fidelity of the research). Interestingly, discomfort with their lack of knowledge or skills did not emerge as a challenge for participants. In fact, participants often spoke highly of the facilitators' ability to explain complex concepts and skills so they could understand them. Overall, participants appreciated the active role they were given and the consistent support of facilitators.

A second challenge discussed by facilitators is recruiting participants and sustaining their participation. While facilitators describe repeat participation as a positive result of the program, they also said that recruitment across the different projects has been inconsistent, with at times, very low participation levels in certain activities. Some facilitators said that confirming an individual's participation is a challenge and that the number registered does not always align with the number of participants. A few participants echoed the concern of low participation levels, expressing disappointment that an activity they find worthwhile is not better attended.

Last, while participants perceived very few logistical challenges, facilitators described several that they deal with consistently. For instance, facilitators expressed a great deal of concern about the amount of paperwork that participants are asked to complete. This particular concern did not emerge among participants who were interviewed (and it was not observed as a barrier to program participation). Facilitators also noted the level of effort to ensure programs run smoothly (from scheduling to setting up activities) is a constant challenge, mostly due to the time involved. Several facilitators suggested a need to meet more often to reflect on what is and is not working about program logistics and implementation.

RECOMMENDATIONS

While so many aspects of the Citizen Science Program are successful, RK&A suggests the following recommendations for program improvement.

- Consider regularly scheduling a time to reflect on successes and challenges. There are two key aspects to successful reflection—scheduling time to do so and preparing an agenda that guides the reflection so it remains focused and useful. For example, choose one aspect of program implementation to address at each reflection session (e.g., recruitment) and generate a list of no more than three questions that address the associated challenges. Documenting this reflection is also of the utmost importance so facilitators can build on what they discuss.

- During a scheduled reflection, consider the challenges of recruitment, listing aspects that may be within (marketing, confirming participation) and outside (no shows, late arrivals) the Trust's control; then, systematically address those items that are within the Trust's control.
- If participants' understanding of the larger research and participation goals are high priorities, consider being very explicit about these goals in a formal introduction and conclusion to each activity. Also, consider assigning this task to the same type of facilitator (scientist, volunteer leader, and/or Trust interpreter) so it is consistently implemented.

INTRODUCTION

The Conservation Trust of Puerto Rico (the Trust) contracted Randi Korn & Associates, Inc. (RK&A) to conduct formative evaluation of their National Science Foundation-funded Citizen Science Program, a program that recruits and trains local Puerto Ricans to conduct scientific research about the Rio Manati watershed alongside Trust scientists, staff, and interpreters. RK&A is contracted to conduct two rounds of formative evaluation; this report provides detailed findings from the first of two rounds.

The objectives of the evaluation are to explore:

- the evolution of each activity from beginning to end (orientation, roles/tasks, conclusion);
- scientists', staff's, and participants' roles during the activity;
- participants' level of engagement in the activity (successes and challenges);
- barriers to successful completion of the activity (within and outside of staff's control);
- participants' experiences with and opinions of program logistics (including: registration, transportation, preparatory materials and information);
- participants' motivation for participating; and
- participants' understanding of project and activity goals (including connections among projects).

METHODOLOGY

RK&A employed three methodologies in the formative evaluation: naturalistic observations of Citizen Science program activities, short-answer interviews with participants following their program experience, and in-depth interviews with scientists and other facilitators.

NATURALISTIC OBSERVATIONS AND SHORT-ANSWER INTERVIEWS

Naturalistic observations are useful because they are an objective account of the Citizen Science program experience. In naturalistic observations, the observer looks at the entire activity experience, taking handwritten notes on scientist, facilitator, and participant behaviors and conversations. RK&A developed an observation instrument to guide the observations (see Appendix A). RK&A and bilingual data collectors observed a variety of Citizen Science program activities October 3 to 6 and October 19, 2013. Following each observation, bilingual data collectors interviewed up to three participants who participated in the activity. Data collectors took notes in Spanish using an open-ended interview guide (see Appendix B).

IN-DEPTH INTERVIEWS

RK&A proposed in-depth telephone interviews with scientists, staff, interpreters, and volunteer leaders to explore the successes and challenges of the Citizen Science program from their perspectives. Through in-depth interviews, RK&A was able to probe interviewees about their experiences for clarity. The Trust presented RK&A with a list of all scientists, staff, interpreters, and volunteer leaders. RK&A interviewed 11 individuals—two staff selected by the Trust onsite and nine randomly selected scientists, interpreters, and volunteer leaders to interview via telephone. Interviews were conducted on October 4 and in November 2013 at interviewees' convenience. Interviews were audio recorded with interviewees' permission to facilitate analysis. See Appendix C for the interview guide.

DATA ANALYSIS AND REPORTING METHOD

Observations and interviews produce descriptive data that are analyzed qualitatively, meaning that the evaluator studies the data for meaningful patterns and, as patterns and trends emerge, groups similar responses. Where possible, participants' verbatim language (edited for clarity) is included to exemplify trends.

SECTIONS OF THE REPORT:

1. Observations and short-answer interviews
2. Facilitator interviews

OBSERVATIONS AND SHORT-ANSWER INTERVIEWS

INTRODUCTION

Between October 5 and October 19, 2013, RK&A attended all five research projects: Rio, Arqueología, Aves, Murciélago, and Costa. Each research project is comprised of multiple activities, such as collecting data in the field or entering data in the lab, and RK&A sometimes observed more than one activity taking place as part of the same research project. For this section of the report, data for multiple activities within the same research project were aggregated for analysis, and data for individual research projects were analyzed separately. Findings in this section of the report are based upon onsite observations and participant interviews.

RIO

RK&A observed the Rio activity *Conoce Tu Río: Camarones, Buruquenas y Calidad de Agua* at two site locations, visiting Barrio Pozas, Ciales on Saturday, October 5 and the Yuyú (Frontón), Ciales on Sunday, October 6. The scientist, an assistant, a volunteer leader, and a Trust interpreter were present on both days. The two activities attracted a total of three male participants, ages 38, 54, and 60.[1] Two of the three participants had attended a Rio activity before; the third participant attended the activity on both days, the first day as a first-time participant and the second as a repeat participant.

IMPLEMENTATION OF THE ACTIVITY

OVERVIEW OF THE ACTIVITY

Participants met at 7:30 AM and used their own vehicles to follow the facilitators to the activity site. At the site, the Trust interpreter handed out life jackets and went over safety-related hand signals.[2] The scientist then described the purpose of the Rio research project—to involve citizens in scientific research and collect shrimp and water quality samples. Participants divided into shrimp and water quality groups and the groups worked independently for most of the day. The water quality group was led by the scientist and volunteer leader who explained the reason for collecting the samples and showed the participant how to use the proper instruments. Over the course of an hour, the participant worked with facilitators to collect samples and report readings. Concurrently, the assistant leading the shrimp group explained the sampling procedures and type of samples the participants would collect. The two participants worked together to collect the samples as they alternated roles of agitating the riverbed and using a net to collect dislodged organisms. The shrimp group also collected river water to take an inventory of insects.[3] Around noon, the facilitators concluded the activity. On Saturday the conclusion was more formal, and the scientist conversed with participants about river conservation efforts. On Sunday, the assistant ended the activity by inviting participants to return to another Rio activity in the future.

SUCCESSFUL ASPECTS

The scientist, her assistant, and the volunteer leader facilitated an experience that kept participants active and engaged. Participants were observed attentively listening to the facilitators, asking questions about

[1] On Sunday, one of the Trust evaluators attended the activity and acted as an informal participant; demographic information for this individual is not included as he was not a formal participant.
[2] On Sunday, the Trust interpreter did not go over safety-related hand signals.
[3] On Saturday, the water quality and shrimp groups came together to do this activity, but on Sunday the insect sampling was handled only by the shrimp group.

the activity and conversing with facilitators and each other on topics related to the research. The scientist, assistant, and volunteer leader took on informal teaching roles, providing guidance as participants collected nearly all data themselves. These facilitators also reflected with participants about the importance of the sampling procedures in the context of the overall activity goals. For example, in the water quality group, the scientist described the importance of checking the oxygen levels of a water sample first, as the levels can be affected by organisms present in the water sample. Facilitators further provided encouragement to the participants, with the assistant commenting to participants in the shrimp group, "You guys are pros; I've never found so many samples!"

Participants conversed with each other and with the facilitators, expressing interest in and asking questions about the activity. For example, participants in the shrimp group showed particular excitement when organisms were found, asking questions about the shrimp they had captured. They also exchanged humorous comments throughout the activity, often joking about how many shrimp they needed to collect for their asopao (a traditional Puerto Rican stew). Similarly, in the water quality group, participants' conversation revolved around their passion for the activity and interest in exploring where the river at that activity site originated. Participants also asked questions, with one participant inquiring if a certain method of shrimp sampling might interfere with future samples downstream.

BARRIERS TO EFFECTIVE IMPLEMENTATION

Participants were attentive, engaged, and inquisitive throughout the entire four-and-a-half-hour-long activity. While there were no perceived barriers to implementation of the activity, interviewees did describe some disappointment in the low attendance, described further below.

PARTICIPANTS' EXPERIENCES

MOTIVATIONS FOR ATTENDING THE ACTIVITY

Both interviewees were motivated to attend because of an overall appreciation for nature as well as a specific interest in river sites near their homes. In addition, interviewees were also motivated by the opportunity to learn more about scientific methods—such as developing a research question and designing studies—and applying these methods to start research projects in their own communities.

OPINIONS OF ACTIVITY LOGISTICS

Interviewees said they met with few logistical challenges when getting information about the project and registering for the activity. Both interviewees learned about the project through a Conservation Trust presentation in their community and had received a follow-up phone call or email to register. In one case, an interviewee was initially provided an incorrect start time for the activity in a confirmation call, but later received a call with the correct start time. Interviewees described receiving promotional information about the purpose of the project, either through e-mail and/or handouts provided at the presentation. Logistical information about the activity was also provided, including a Google map with directions to the site and a description of what to wear and bring. Though neither interviewee experienced problems with transportation to the site, one suggested that he would not have been able to get to the activity if he had not owned a car.

MOST SATISFYING ASPECTS OF THE ACTIVITY

Both interviewees appreciated the camaraderie of the group and the learning environment the facilitators created. One described the excitement and satisfaction he felt when he found shrimp in the net during sampling, as only a few organisms had been found earlier that day. Another interviewee enjoyed learning how the water quality instruments used for sampling were used to gauge the health of the river.

DIFFICULT OR CHALLENGING ASPECTS OF THE ACTIVITY

Interviewees said they had no difficulties or challenges when participating in the activity, but both said they were disappointed by low attendance at the activity. As one interviewee stated, "It's not very enjoyable to come to something that you consider very important and find that there are only two volunteer persons." Both interviewees suggested the Conservation Trust make a greater effort at media and social media marketing. One interviewee further hypothesized that the early start time might be a barrier to participation.

PARTICIPANTS' UNDERSTANDING

UNDERSTANDING OF THE PURPOSE OF THE ACTIVITY

Interviewees made connections between the part of the activity they had participated in (shrimp or water quality sampling) and greater notions of conservation. For example, an interviewee from the shrimp group described how monitoring fauna led to an understanding of the river's health and ecological balance. An interviewee from the water quality group associated the activity with helping people understand how they can resolve water quality problems.

UNDERSTANDING OF THE PURPOSE OF THE CITIZEN SCIENCE PROGRAM

During the orientation, the scientist mentioned that the activity was part of the Citizen Science Program and described the importance of citizens participating in scientific activities. Yet, interviewees found it challenging to link the Rio research project activity to the greater purpose of the Citizen Science Program. One interviewee mentioned he was aware of some of the Program's other research projects, naming the Aves and Arqueología research projects. He described his participation in the Rio activity as a way of involving citizens in science. Another interviewee was unable to explain the relationship between the activity and the Program.

ARQUEOLOGÍA

On Saturday, October 19, 2013, RK&A observed the Arqueología activity *Trazando el Pasado: Brújula, Prospección y GPS*. The activity took place at Tierras Nuevas, Manati and was led by the scientist, two assistants, and a Trust interpreter. 10 participants took part in the activity, including seven males and three females; participants range in age from 11 to 62. Among the three participants who were interviewed, all had attended prior activities related to the Arqueología research project, and two had attended other research project activities through the Citizen Science Program.

IMPLEMENTATION OF THE ACTIVITY

OVERVIEW OF THE ACTIVITY

Participants gathered at noon at the Hacienda La Esperanza, where the Trust interpreter went over some safety guidelines before everyone boarded a trolley to go to the activity site. Onsite, the scientist explained the goals of the activity and the overall purpose of the research project—to investigate how people historically used the watershed. Over the course of an hour, the assistants taught participants how to use a GPS and compass. Participants practiced using the instruments and taking meter-long measured steps so they could accurately mark transects. After a half-hour snack break, participants divided into three groups, each led by an assistant or the scientist. The group's leader[4] invited participants to take on different roles, such as using the instruments to mark transects and way points, making surface observations, or filling out a standardized observation form.[5] Each group conducted surface observations at two sites and came back together at 3 PM to discuss their findings. To conclude the activity, the scientist summarized the work the groups had done and shared her insights about the

[4] The group leader observed for this activity was the scientist.

[5] In some groups, participants rotated roles, though in the observed group, participants engaged in the same role throughout.

site's importance as an ancient batey site (ceremonial plaza used as a ball court). The scientist then guided participants to a nearby beach where the group conducted more informal surface observations. Shortly after, the group boarded the trolley to return to the Hacienda La Esperanza. There, the scientist thanked everyone for participating and invited them to attend the next activity. She also encouraged those interested in helping with the research project to get trained to document areas near their own homes.

SUCCESSFUL ASPECTS

The activity successfully prompted dialogue between participants and facilitators, with facilitators answering questions and sharing their knowledge. In fact, this collegial learning environment was one of the aspects interviewees liked most about the activity. As part of this dialogue, the scientist sometimes posed questions to the participants, encouraging them to think about what their surface observations of a small area might mean in the greater context of the site. For instance, the scientist pointed out the different thickness and type of vegetation in one area and asked what it might indicate. Participants then hypothesized if the vegetation indicated the former presence of a home, crops, or an ancient batey.

In addition, participants were invested in their work. When learning how to use the instruments and collecting data onsite, participants checked in with the facilitators to make sure their GPS and compass techniques were sound. In response, the assistants engaged with participants and demonstrated how to hold the instruments to ensure accurate readings. Interviewees, too, were excited to use the instruments and have an active role in the data collection. As one interviewee commented, "They gave us the theory and then they actually showed us how to use [the instruments]. It was better because we were able to use it all; it wasn't like we could only observe." Facilitators also provided encouragement and support to participants. Assistants regularly checked in with participants during the instrument training session, answering questions and explaining the theory behind the techniques. The scientist further provided assurance to participants, particularly when a participant was concerned about the accuracy of her measured strides.

BARRIERS TO EFFECTIVE IMPLEMENTATION

There were no perceived barriers to implementation of the activity. Although the day was sunny and hot (a potential barrier), participants put on head coverings and sunscreen; regardless of the temperature, they remained actively engaged in the activity.

PARTICIPANTS' EXPERIENCES

MOTIVATIONS FOR ATTENDING THE ACTIVITY

All interviewees mentioned that they had taken part in prior Arqueología research project activities through the Citizen Science Program and expressed interest in the field. One person described his personal passion for connecting with past civilizations. Two others commented on their professional interest in archaeology, with one describing herself as a historian and the other noting his interest in studying archaeology. As the latter commented, "To be able to find this [opportunity] for free, for them to explain this to you and to be able to actually use the equipment, not just be told about it; it's something that you can't find any other place."

OPINIONS OF THE ACTIVITY LOGISTICS

Interviewees said they experienced no problems with the registration process or activity logistics. Each had communicated by e-mail or phone with staff from the Conservation Trust to confirm participation and found the staff accessible. One interviewee, in fact, said he had initially been waitlisted for the activity but had been contacted by staff when space became available. Interviewees received logistical information for the activity, including what to wear and bring, as well as specifics regarding the meeting location and time. Interviewees were particularly appreciative of the secure parking at the meeting point and the onsite transportation. All interviewees said they were aware of the age and activity-level

requirements and had been provided a description of what they would be doing onsite. In some cases the description was more general (observing and collecting surface samples) and in other cases it was more specific (using a GPS and compass).

MOST SATISFYING ASPECTS OF THE ACTIVITY

When asked about the most satisfying aspects of the activity, interviewees commented on the informative learning environment cultivated by the facilitators. Interviewees noted that facilitators treated participants equally and professionally and that facilitators genuinely wanted to share their knowledge. As one interviewee commented, "The volunteers [facilitators] help you with everything, if you have doubts, you can ask them, and they always give you the answers. There's always a dialogue." Interviewees also gained satisfaction from their ability to connect with nature and with other individuals interested in nature. In addition, one interviewee said he liked the ability to learn useful skills that he could apply to other areas of his life, such as navigating with a GPS or compass.

DIFFICULT OR CHALLENGING ASPECTS OF THE ACTIVITY

Based on RK&A's observations, participants took part in the activity without any difficulties, and interviewees' comments further suggest that they enjoyed all aspects of the activity. One interviewee did mention that she disliked the intense heat that day, but said the hot temperature was expected and was not anyone's fault.

PARTICIPANTS' UNDERSTANDING

UNDERSTANDING OF THE PURPOSE OF THE ACTIVITY

Interviewees spoke generally about the purpose of the activity, describing the importance of educating and involving citizens in archaeological work. One interviewee described the activity as learning the tools necessary to contribute to other Arqueología research project activities. The two other interviewees conflated the purpose of the Arqueología research project with the overall purpose of the Citizen Science Program, saying that all research projects incorporated citizen involvement in scientific and environmental work.

UNDERSTANDING OF THE PURPOSE OF THE CITIZEN SCIENCE PROGRAM

Interviewees had a strong understanding of the purpose of the Citizen Science Program, describing how the Program encouraged citizens to become more involved and knowledgeable about scientific studies and environmental research.

AVES

On Sunday, October 6, 2013, RK&A observed two different activities related to the Aves research project. *Sobre Aves y Bosques; ¡Observa, Escucha y Cuenta!* took place in the morning in Florida, and *Sobre Aves y Bosques: Datos y Patrones* took place in the afternoon at the Hacienda La Esperanza. A scientist, an assistant and a Trust interpreter led both activities. Participants in the morning activity included six males and one female, ranging in age from 33 to 55 years. At the afternoon activity, participants included three females, ages 15, 37, and 49; in addition, two males from the morning activity also took part. Among the three interviewees, all were repeat participants at Aves and had participated in other research projects as well.

IMPLEMENTATION OF THE ACTIVITIES

OVERVIEW OF THE SOBRE AVES Y BOSQUES; ¡OBSERVA, ESCUCHA Y CUENTA! ACTIVITY

At *Sobre Aves y Bosques; ¡Observa, Escucha y Cuenta!*, participants met at 6:15 AM and used their own cars to follow the facilitators to the observation site. Onsite, the assistant and the Trust interpreter welcomed participants and pointed out the two trail options. The Escalara 1 trail group (observed by RK&A)

stopped for 10 minutes at each of the eight stations to record weather data and bird observations. The scientist and participants listened quietly to the bird songs and used binoculars to observe birds nearby. During this time, people in the group made gestures when they heard a bird call and sometimes broke the silence to whisper the name of the bird they had heard or observed. Occasionally, the scientist gave clues to participants so they could guess which bird was associated with the bird song. The scientist also sometimes made bird calls, attracting birds to the area and prompting the birds to sing. The scientist recorded all the observations on his clipboard. The group concluded observations at the last station at 9:30 AM and casually observed birds until the other trail group arrived. Participants and facilitators informally shared their observations from the activity for about 15 minutes, but there was no formal conclusion to the activity.

OVERVIEW OF THE SOBRE AVES Y BOSQUES: DATOS Y PATRONES ACTIVITY

RK&A did not observe the beginning of *Sobre Aves y Bosques: Datos y Patrones*, as the activity began before the 1 PM indicated start time. During the activity, participants worked quietly and entered data in the new bird database, including information on climate as well as the species, behaviors, and routes of the observed birds. On occasion the scientist and participants talked about the activity, discussing the format of the new database, what data should be entered, and any problems with the data that arose. There was no formal conclusion to the activity, which was scheduled to end at 3 PM. Instead, participants stayed onsite until 3:45 PM, casually watching bird videos, talking about the data, and chatting amongst themselves about other topics.

SUCCESSFUL ASPECTS

Participants were focused on the activity, be it observing birds in nature or entering data generated from the observations. Due to the quiet nature of the work, participants and scientist did not converse extensively. When there was dialogue, the scientist posed questions to the participants and encouraged them to work out the answer. At *Sobre Aves y Bosques; ¡Observa, Escucha y Cuenta!*, the scientist asked, "Which one [bird] is that?" and at *Sobre Aves y Bosques: Datos y Patrones,* the scientist inquired, "How accurate is that temperature?" Interviewees described their interactions with the scientist and other facilitators as "excellent," with one interviewee commenting, "They try putting themselves at your level, and they know how to talk to you so that you understand." More so at the morning activity, participants also demonstrated a sense of camaraderie, informally comparing their knowledge of bird songs, laughing together at the scientist's bird calls, or making bird-related jokes.

In addition, at least two interviewees felt that their presence was important to the success of the activity; as one participant at *Sobre Aves y Bosques: Datos y Patrones* described, "They [the facilitators] were saying when they did the data entry on their own, it took longer and was more difficult. Now [that] we are doing [it] as a group, they said, 'Wow, you see the difference? It's faster with the group.'"

BARRIERS TO EFFECTIVE IMPLEMENTATION

Participants took part in the activity without any observable barriers. However, no conclusion was given at the end of either activity and interviewees also struggled to articulate the overall goals of the research projects and the Citizen Science Program.

MOTIVATIONS FOR ATTENDING THE ACTIVITY

Interviewees described a passion for nature as the motivating factor for their participation in the activity, with one specifically citing a personal interest in birds. All interviewees were repeat visitors and had taken part in multiple Citizen Science Program research projects; one had been a volunteer leader and another had taken part in other environmental activities through the Sierra Club. In addition, two of the interviewees liked that the activity was located near their home.

OPINIONS OF ACTIVITY LOGISTICS

No interviewees encountered problems when registering for the activity. In fact, interviewees described the process as "simple" and "easy," with one visiting the Conservation Trust in person to register and another signing up by e-mail. Most interviewees were informed in advance about the activity's goals. Logistical information was also provided to interviewees, with details on what to wear and any age restrictions for the specific activity. In addition, interviewees were appreciative of the offered transportation, though all lived near the activity sites and were familiar with the area.

MOST SATISFYING ASPECTS OF THE ACTIVITY

Immersion in nature was the aspect of the activities interviewees enjoyed most. At *Sobre Aves y Bosques; ¡Observa, Escucha y Cuenta!* , interviewees commented on the opportunity to spend time in the countryside, and at *Sobre Aves y Bosques: Datos y Patrones,* the interviewee liked learning the bird calls. Interviewees from both activities enjoyed the opportunity to meet people and the camaraderie created from participation in the activity.

DIFFICULT OR CHALLENGING ASPECTS OF THE ACTIVITY

Interviewees reported that they faced no challenges or difficulties with the activity itself. One interviewee commented that his least favorite aspect of the activity was the Gatorade provided as part of the snacks, but was otherwise happy with the activity.

PARTICIPANTS' UNDERSTANDING

UNDERSTANDING OF THE PURPOSE OF THE ACTIVITY

When asked to describe the purpose of the activity, interviewees from the *Sobre Aves y Bosques; ¡Observa, Escucha y Cuenta!* described the activity's goals as identifying birds, understanding the relationship between the vegetation and the birds, and gaining a greater understanding of the bird community year-round. The interviewee from *Sobre Aves y Bosques: Datos y Patrones* identified the goal of this activity as inputting data as well as becoming familiar with and learning how to differentiate bird calls.

Participants understood to varying degrees how the activity they participated in contributed to the overall Aves research project. One interviewee said data from the different Aves activity sites would be brought together at the end of the research project. Another interviewee said that the Aves research project activity sites were all connected to the Manati watershed.

UNDERSTANDING OF THE PURPOSE OF THE CITIZEN SCIENCE PROGRAM

Interviewees gave vague descriptions of the Citizen Science Program's purpose. Two interviewees described the Program as a framework for environmental work that has multiple branches (Aves being one of them). Another interviewee said that the Citizen Science Program's goal was to unite the community around environmental topics.

MURCIÉLAGO

RK&A observed two different Murciélago research project activities. *Murciélagos: Tras el Trabajo de Campo* took place in the afternoon on Friday, October 4 at the Hacienda La Esperanza and was facilitated by two assistants and a Trust interpreter. One male participant, age 36, attended the activity. *Murciélagos: Conócelos en Persona* was held on the evening of Saturday, October 5 in Yuyú (Frontón), Ciales. One assistant, a volunteer leader and a Trust interpreter facilitated the activity. Seven participants took part in the activity, including four females and three males; participants range in age from 19 to 30 years. Among the five interviewees, three had participated in other research projects.

IMPLEMENTATION OF THE ACTIVITIES

OVERVIEW OF THE MURCIÉLAGOS: TRAS EL TRABAJO DE CAMPO ACTIVITY

The activity was scheduled to take place between 1 and 4 PM. However, for the first hour of the activity, the two assistants entered data with one person dictating the data and the other typing it in. At 2 PM, the participant joined the activity, after filling out the necessary paperwork. During the activity, the participant alternated between entering data, conversing with the assistants about the Citizen Science Program, and observing the assistants prepare for the following day's *Murciélagos: Conócelos en Persona* activity. The participant asked many questions about the Murciélago research project and how the assistants had started working with bats.[6] The participant stayed at the activity until 3:30 PM.

OVERVIEW OF THE MURCIÉLAGOS: CONÓCELOS EN PERSONA ACTIVITY

At 4 PM, participants arrived at a meeting point and filled out consent forms. They traveled in their own vehicles and followed facilitators to the observation site. Onsite, the assistant introduced the activity and led participants down an unlevel trail to where the nets would be set up. Participants assisted with unrolling the nets and attaching them to poles, before gathering for a snack break in an open area. During the break, facilitators answered questions about bats and handed out identification sheets, gloves, and flashlights for participants to use. For the next four hours, the group checked the nets every 15 minutes to see if a bat had been caught. When waiting to check the nets, the assistant shared facts about bats and showed participants an AnaBat device used to detect the sound waves of each bat. When a bat was captured, participants gathered around it to take pictures and ask general questions about bats (e.g., "How big are bats?" or "How many types of bats are there?"). The assistant also talked with participants about the other locations where the research project activity was taking place. By 10 PM, the activity began to wind down and participants started to engage in side conversations unrelated to the activity. The assistant and Trust interpreter concluded the activity at 10:40 PM by asking if participants had any other questions, handing out feedback forms to fill out, and encouraging them to check back for other activities.

SUCCESSFUL ASPECTS

Participants expressed an interest in learning more about bats at both activities as demonstrated by the number and types of questions asked. Participants were curious about everything from different species of bats ("How many kinds of bats are out there?") to bat behaviors ("Why do bats just come out at night?") and the assistant's experience with bats ("What is the bat that you get more or [capture] most often?"). In fact, much of the dialogue taking place at the activities consisted of participants asking questions and the assistant(s) providing answers as well as generally sharing their knowledge. Several interviewees expressed gratitude for the rich learning environment created by the facilitators. As one interviewee commented, "It has been a good experience. . . . Those who lead the program [activity] are very good at explaining all the details about bats and the Citizen Science activity." In some cases, participants' questions suggested misconceptions about bats and the assistant would clarify whether something was a myth or stemmed from actual bat behavior. For instance, one participant was concerned that a bat could get caught in her hair, but the assistant assured her this was a myth. Interviewees said they learned a lot about bats that they had previously not known and at least one interviewee reported that the activity changed his impression of bats, noting, "I now see bats in a different way, because I used to see bats as diseased creatures."

At *Murciélagos: Conócelos en Persona*, in particular, participants were very involved in the activity. Although no participant was assigned a particular role, all interviewees said they had opportunities to contribute to the activity in a way that was comfortable to them, such as lending a hand setting up the nets or untangling bats caught in the nets. Facilitators also directly invited more hesitant participants, those

[6] In addition to taking part in the activity, the participant was conducting interviews with scientists at the Conservation Trust for a podcast on the scientific research community in Puerto Rico.

who had not yet taken on an active role, to do so if they liked. In fact, the extensive hands-on nature of the activity exceeded a few interviewees' expectations. As one interviewee commented, "It was much more interactive than I was expecting. I could see them [the bats], touch them. It was very good."

BARRIERS TO EFFECTIVE IMPLEMENTATION

Participants took part in the activities with only a slight barrier arising in the *Murciélagos: Tras el Trabajo de Campo* activity. The participant in this activity spent longer than anticipated filling out necessary paperwork; however, it is important to note that the paperwork was related to recording interviews with scientists at the Conservation Trust and did not pertain to taking part in the activity itself. One interviewee at *Murciélagos: Conócelos en Persona* also suggested that the Conservation Trust advertise more and in non-internet-based ways to encourage greater participation.

PARTICIPANTS' EXPERIENCES

MOTIVATIONS FOR ATTENDING THE ACTIVITY

At *Murciélagos: Conócelos en Persona*, interviewees said they were intrigued by the idea of capturing bats and learning more about the animals. Two interviewees noted that they were inspired to attend the activity by a friend or relative; one mentioned a sister studying biology and another said his friend had attended previously and recommended it. One interviewee also was generally interested in learning more about the environment in Puerto Rico. At *Murciélagos: Tras el Trabajo de Campo,* the interviewee said he attended the activity out of general interest, but more so to conduct interviews with scientists at the Conservation Trust.

OPINIONS OF THE ACTIVITY LOGISTICS

Interviewees spoke positively about the activity logistics. Two registered for the activity by phone and two others did so online. Of those who registered online, one experienced a glitch in the Web site or Internet connection that prevented him from registering; however, he was able to do so by e-mail. The Conservation Trust's Web site was an asset to participants, as three interviewees mentioned it as their source for information about the activity. Many also described receiving e-mail confirmations from the Conservation Trust with activity logistics, such as the activity's start and end time, directions to the site or meeting point, and details on what to wear or bring. Interviewees also received information about the age requirements and the type of physical activity they might be doing (e.g., sitting for long periods of time or walking on rocky trails). In addition, interviewees said they had no problems using their own transportation to get to the activity site.

MOST SATISFYING ASPECTS OF THE ACTIVITY

Seeing the bats close up and watching them be removed from the net were the highlights for interviewees at the *Murciélagos: Conócelos en Persona* activity. Interviewees vocalized the excitement they felt when checking the nets or seeing a bat, with one interviewee commenting on how the novel experience gave him an "adrenaline rush." An interviewee at each activity also enjoyed the opportunity to learn more about the animals, with the participant from the *Murciélagos: Tras el Trabajo de Campo* activity commenting as well on the passion the assistants showed when sharing their knowledge of bats.

DIFFICULT OR CHALLENGING ASPECTS OF THE ACTIVITY

Each activity had its own minor challenges. Two interviewees at *Murciélagos: Conócelos en Persona* said they disliked how trails were scattered with horse droppings, and one other found the 15-minute wait time in between checking the nets to be challenging. One other interviewee suggested that the Conservation Trust advertise more, particularly through non-web-based media to encourage more participation. At *Murciélagos: Tras el Trabajo de Campo,* the interviewee said he liked everything about the activity; however, he noted the activity would have become tedious if it had been exclusively data entry and did not include interesting conversations with the assistants.

PARTICIPANTS' UNDERSTANDING

UNDERSTANDING OF THE PURPOSE OF THE ACTIVITY

When asked to describe the purpose of the activity they had participated in, interviewees said it was to educate people about bats and create more awareness about the animals. Specifically, an interviewee at *Murciélagos: Conócelos en Persona* said the purpose was to "educate citizens [about the] bat, myths and truths of bats, and get them acquainted more with this type of animal and its species [so to] help people in the conservation." The participant at *Murciélagos: Tras el Trabajo de Campo* also had a concrete understanding of the activity, describing the data entry as a "crucial part of the entire research process" which was necessary to be able to conduct analysis.

UNDERSTANDING OF THE PURPOSE OF THE CITIZEN SCIENCE PROGRAM

A couple of interviewees made connections between the Murciélago research project and the Citizen Science Program. One interviewee said that both were meant to encourage the public to protect nature and culture through scientific work. Another stated that both provided opportunities for conducting fieldwork and seeing how science is done. Among the remaining interviewees, two commented on the importance of creating awareness about bats, and one other said he did not know how the research project and Program related.

COSTA

RK&A observed two activities taking place as part of the Costa research project. *Historias Escondidas en la Arean: Aprende a Escucharlas*, took place on Saturday, October 5 at Playa Machuca, Barceloneta. The scientist, an assistant-in-training and a Trust interpreter facilitated the activity. Six participants attended the activity, including four males and two females, who range in age from 8 to 47 years. *Historias Escondidas en la Arean: Sus Bloques de Armar* was held at the Hacienda La Esperanza on Thursday, October 19. Facilitation was provided by the scientist, two assistants, and two volunteer leaders. In total, 17 participants attended the activity, including nine males and eight females; participants range in age from 14 to 47 years. Of the eight participants interviewed, seven were repeat participants; some had taken part in activities for multiple research projects (this year or in past years), and some had participated in multiple activities related only to the Costa research project.

IMPLEMENTATION OF THE ACTIVITY

OVERVIEW OF THE HISTORIAS ESCONDIDAS EN LA AREAN: APRENDE A ESCUCHARLAS ACTIVITY

At 7:30 AM, participants met with facilitators to fill out paperwork. During this time, the scientist provided an overview of the Costa research project, explaining that this is the first time research is taking place outside of the reserve. The group then drove to the site with participants following the facilitators in their own cars. Onsite, the scientist handed out reflective vests and led the group down a short but difficult trail to the beach. There, the scientist described the purpose of the activity as "to capture [the] sediments and the morphological characteristics of the beach" and went over data collection instructions and procedures. Participants took turns doing each task associated with the activity; only the Trust interpreter had a consistent role of taking notes. Throughout the data collection, the scientist pointed out things that participants may not have noticed and encouraged participants to share their own observations. After samples were collected at each site, the scientist gathered the participants and the group speculated about the environmental processes causing the high salinity readings. The scientist concluded the activity by posing questions about the project and inviting group discussion. Then, everyone helped pack up the equipment and returned to the parking lot.

OVERVIEW OF THE HISTORIAS ESCONDIDAS EN LA AREAN: SUS BLOQUES DE ARMAR ACTIVITY

As the participants arrived around 7:30 AM, the scientist and a volunteer leader welcomed them and provided guidance to participants as they filled out consent forms. Around 8:10 AM the scientist started

the activity by describing the history of the research project and how the data could be used by the community. Facilitators next explained the specific tasks that participants would be doing that day (using the sieves, weighing samples, and entering data) and noted that participants would have the opportunity to perform all roles involved in the activity. The participants divided into groups, with each group at a different lab station. A core participant at each station demonstrated the task, before participants set to work on their own. As participants worked, the scientist posed questions about the procedures and methodologies, encouraging participants to think about why certain techniques are used and what the findings might mean. Once participants completed a rotation performing a certain role, they switched roles with other participants at their station; later, participants changed stations so that everyone had the opportunity to perform each task. At 9:45 AM, some participants stopped for a 15-minute snack break, though others stayed in the laboratory and kept working. Over the course of the next hour, the scientist moved about the laboratory conversing with each group and summarizing the work they had done that day. This served as an informal conclusion to the activity. Participants continued to work until 11:15 AM, and some stayed to take part in a different Costa activity that afternoon.

SUCCESSFUL ASPECTS

The scientists and facilitators established an inquiry-based learning environment that engaged participants in the activity. The scientist, in particular, showed continual awareness of participants' potential needs and was attuned to their comfort levels. For example, she spent additional time guiding a family with minors through the consent form process. She also double-checked participants' profiles to see if it was necessary to adjust the procedures for participants' age and physical ability levels and made sure they felt at ease with their tasks. At the beginning of one activity, she stated, "It is very important that everyone feels comfortable where they are. If you do not feel okay in this group, you can move; there is no problem." The scientist also made connections between the work participants were doing and their personal interests, pointing out to one young participant the similarities between tools used at one activity and those used in the pharmaceutical field she had expressed interest in.

The scientist also continually referred to the purpose of the activity, providing contextual information about the research project and sharing potential next steps. The scientist then used an inquiry-based teaching style to engage and encourage participants to develop hypotheses based on their contextual knowledge and observations. For instance, the scientist would ask participants, "Why do we do this?" to get them to think about the methodology or "What would happen [to the sediment] if there is deforestation?" to encourage participants to consider how environmental changes might be observed onsite. In addition to her questions, the scientist regularly pointed out things that participants may not have noticed. At one activity, she showed participants how the angular edges of a sand particle indicated where the particle came from, and at the other activity, she pointed out how a type of wave indicated it was from the Atlantic Ocean.

BARRIERS TO EFFECTIVE IMPLEMENTATION

No barriers to effective implementation of the activities were observed. Participants were observed taking part in each activity without experiencing any difficulties or challenges and appeared engaged throughout.

PARTICIPANTS' EXPERIENCES

MOTIVATIONS FOR ATTENDING THE ACTIVITY

Interviewees had a variety of reasons for attending the activity. Many interviewees were motivated by a professional interest, including students of environmental biology, physical geography, and at least one member of the Future Biologists and Biotechnologists Association. Some of these interviewees also said the activity offered a unique learning opportunity and way to gain experience—or as one interviewee said, a way "to see theory in reality." A passion for nature stimulated some other

interviewees to participate, one of whom was a community leader with an interest in environmental conservation of the local coastline.

OPINIONS OF THE ACTIVITY LOGISTICS

Interviewees were generally positive about their experience registering and receiving logistical information for the activity. They reported success registering for the activity through the Web site, by phone, and in-person at a community workshop. In many cases, interviewees received confirmation e-mails or phone calls with details about the activity logistics including the activity meeting time and place, age restrictions, and what to wear or bring. A few others received information about the tasks they would be doing and the activity's overall purpose, with varying levels of detail. Interviewees who did not receive this information were generally repeat participants or those in groups where another person had completed the registration. Interviewees also were complimentary of the transportation provided through the Conservation Trust, describing it as "effective," "comfortable," and "easy."

MOST SATISFYING ASPECTS OF THE ACTIVITY

Some interviewees enjoyed the learning opportunities offered through their participation in the activity, with several particularly interested in learning related to science. As one interviewee described, "I learn from everything. I can see other points of view, not only from biotechnology that I am studying or biology that my friends are studying. Now I am with geographers, and I am looking at things that I didn't used to pay attention to." A few interviewees also liked the opportunity to spend time in nature, be it at the coast or at La Hacienda de Esperanza, and a few others said they generally liked "everything" about the activity.

DIFFICULT OR CHALLENGING ASPECTS OF THE ACTIVITY

Nearly all interviewees enjoyed the activity they had participated in and were unable to name something that was challenging, difficult, or that they did not enjoy. Among the remaining interviewees, one said she found the early morning start time to be challenging, and another said there had been more participants and daily activity options in past Citizen Science Programs.

PARTICIPANTS' UNDERSTANDING

UNDERSTANDING OF THE PURPOSE OF THE ACTIVITY

Interviewees generally said the purpose of the activity was to collect data and preserve scientific knowledge gained from the Costa research project. Several interviewees suggested that the knowledge gained would be used to educate participants and help local communities make informed decisions about the coastline's future. As one interviewee commented, "The information obtained can be preserved through the Trust so communities and ourselves, as future scientists, [can access it] if there is any environmental problem."

UNDERSTANDING OF THE PURPOSE OF THE CITIZEN SCIENCE PROGRAM

Interviewees drew connections between the knowledge gained from the activity they attended and the wider scope of research projects taking place through the Citizen Science Program. Interviewees described how the aims of the Costa research project contribute to the overall understanding of the ecosystem and how findings from the project might relate to the findings of other research projects. Several interviewees specifically mentioned possible connections between the Costa and Rio research projects, with one interviewee stating, "What is happening up the river is reflected here, that is why we measure water density and salinity, what materials the river carries . . . everything is linked."

FACILITATOR INTERVIEWS

INTRODUCTION

RK&A conducted 11 interviews with project stakeholders, which included interviews with Conservation Trust staff, volunteer leaders, staff interpreters, and researchers (scientists). Most interviews were conducted over the telephone in November 2013. Two interviews were conducted in person on October 4, 2013.

COMPREHENSION OF THE GOAL OF CITIZEN SCIENCE

Almost all interviewees agreed that the goal of Citizen Science is to provide opportunities for people to get involved in and learn about scientific research in an informal setting (see the quotation below). A few also said that the program is creating a model for involving citizens in scientific research.

> [The main goal of the project is] to involve mainly people from the area that are not necessarily from academia or researchers, people that live preferably in the area, so they can know and participate in investigations and in the long-term get involved so they can even conduct investigations or be involved even more in the protection of the area. [Researcher]

Additionally, a few interviewees said that the Program provides an opportunity for local scientists and The Conservation Trust to educate citizens about changes to the watershed and how to conserve resources in the Manatí area. In doing so, interviewees hoped that people would begin to understand how people can affect the watershed (see the first quotation below). A few interviewees, all researchers, also talked about the opportunity to teach people about scientific thinking and encourage people to see the ways they use science in their everyday lives (see the second quotation).

> I understand that the goal is to integrate people within the various investigations to know the great changes that have occurred over the watershed. [Staff interpreter]

> I hope that from that scientific knowledge [that people gain through the Program] they can start using it and apply it in their daily lives. . . . So they understand the power they have with the knowledge and can apply it to other areas. [Researcher]

STRENGTHS OF CITIZEN SCIENCE PROGRAM

Interviewees were asked a series of questions about the strengths and rewarding aspects of the Citizen Science Program, starting with top-of-mind thoughts about the Program overall and then moving more specifically to the point of view of participants and facilitators. In some cases, similar strengths or rewarding aspects were addressed for different audiences and therefore may be discussed more than once.

TOP-OF-MIND PROGRAM STRENGTHS

When asked about strengths of the Program overall, most interviewees discussed recruitment and scheduling of activities as well as more specific aspects of Program management such as the reminder e-mails and maps sent to participants prior to each activity (see the quotation below).

> In terms of the logistics, we let them know the meeting place, because some activities are held outside the Hacienda, and we send them a map via e-mail and, at least until now, they have not gotten lost. In terms of the map logistics, I understand that it is very easy to follow the directions that they receive through email. [Volunteer leader]

Several interviewees also said that Trust staff's and scientists' commitment to the Program is a strength of the Citizen Science Program, citing the willingness of scientists to share their time and resources and that staff ensure that everything is in place for data collection (see the first quotation below). Additionally, several interviewees said the participants provide a strong asset to the Program. These interviewees spoke about repeat participation and participation in multiple projects as signs of interest from the community; and they also talked about the sense of ownership that comes with having the tools to share and spread new knowledge after the project ends (see the second quotation).

> I can have the Trust staff go get the equipment, contact the people responsible for recruitment, make sure things are good when one arrives in the field, and they have the ability to reach the field. I have access to many diverse people and have the support so that I can carry the message from science to archeology, for instance. [Researcher]

> [We can] link what is tangible with the intangible and the person is able to say, 'well, this [place] is mine and I also need to be involved in this because it applies to me.' So we create an ownership sense through these tools, and I believe that is something very important within informal education. . . . The difference [between our Citizen Science Program and others] is that we are looking continuously to make that connection and that the person grows that sense of ownership. Not with the project, but with all this that is called conservation. . . . So we are moving now, not to create dependency on a project like this, but so they can have their own tools to spread and disseminate and duplicate, so they can replicate this in many areas. [Conservation Trust staff]

REWARDING ASPECTS FOR PARTICIPANTS

Many interviewees said that the most rewarding aspect of the Citizen Science Program for participants is the knowledge they gain about the project topics and the scientific process. Several also mentioned the hands-on aspect of the Program, saying that the Program gives participants the opportunity to see and do scientific work (see the quotation below).

> When you practice the things, you have to say to them, 'Just by hearing it is not enough.' They have to practice it, see it, do it in person to understand what is being said. . . . For everyone the reward is to discover something that [they] didn't realize was there. [Researcher]

Another rewarding aspect of the Program, according to several interviewees, is that it gives participants an opportunity to cultivate an interest in science, citing the researchers' willingness to teach and re-teach concepts to participants as a key part of this process of discovery (see the quotation below). A few said that the most rewarding aspect of the Program is the increased awareness participants take away regarding the human impact on nature and the enthusiasm to preserve what is around them (see the second quotation).

> People think they are going to come just to listen. When the activity is over they say, or we hear them saying, 'Wow, we went to the forest and we saw that bird.' Or that they were able to do something with their hands, or they have a completely different vision because they thought the scientist was only going to talk to them or show them some slides, but no, they are not aware

that they are going to be in contact with nature or with the whole study, and are amazed so much that sometimes they don't want to leave. [Volunteer leader]

The knowledge they are acquiring in terms of how human beings' activit[ies] affect, in one way or another, our environment. They might not have thought about that before. They might have seen that some development was removing soil at Ciales, but they have not known that might affect the beach, or to see that some trees were cut, and that there were birds on those trees, they might not have been aware of how these things affect the environment. [Volunteer leader]

REWARDING ASPECTS FOR FACILITATORS

Most facilitators said the most rewarding aspect of the Citizen Science Program is the opportunity to continue learning on a personal level. These interviewees—mostly staff interpreters and volunteer leaders—said that the Program offers opportunities to learn how to teach people difficult concepts, work with volunteers, and take leadership roles (see the first quotation below). They also talked about having the opportunity to learn from the researchers they assist and applying that knowledge to their own scientific research (see the second quotation). Many also said that a rewarding aspect of the Program is the connection between facilitators and participants. Several of these interviewees spoke about the reactions participants have to the Program, including the joy and appreciation they have for the opportunity to participate, and a few spoke more specifically about the bond created between the scientific community and the larger community.

We have some staff that have not studied anything related to science and that exposure to science opens another field of possibilities. . . . [Volunteer] leaders are receiving training, the experience with the volunteers, with people, the direct work with the interpreters also. We support them in delivery, how they have to talk, all that. [Conservation Trust staff]

I studied the amphibians, but here are investigations that are done with crabs, with bats, with archeology and botany. Then one acquires knowledge, knowledge that is not going away, because I am [an] environmental interpreter, and I give many tours and information that I capture from there, then I can apply to my reflection. [Staff interpreter]

A few interviewees said the most rewarding aspect of the Program is the field help offered by participants, acknowledging that data collection would take longer without the participants (see the first quotation below). A few also enjoyed the opportunity to expose new people to science and bridge the knowledge gap that currently exists between the Conservation Trust, its researchers, and the people of the Rio Grande watershed. Additionally, interviewees liked seeing how repeat participants share their knowledge with others and are touched by the projects in which they participate (see the second quotation).

That is why participation has become so important because, let's take a study protocol. If it would have to be done only by the scientist and the interpreter they would be [spending] three or four weeks completing the protocol, when you can segregate the activities and share and have a group of people doing up to five different activities. That makes a huge difference because it would take a lot more time if those activities had to be done without the participants. It would take too much time. [Volunteer leader]

The response of the volunteers [has been the most personally rewarding part of the project]. It is incredible, incredible, when you touch them through the Program, you touch so many people and you don't realize how much. . . . All these unselfish people that are positively touched by the project, it is an experience I never thought I would have. [Conservation Trust staff]

CHALLENGES OF CITIZEN SCIENCE PROGRAM

Interviewees were also asked a series of questions about the challenges of the Citizen Science Program, starting with top-of-mind thoughts about the Program overall and then moving more specifically to the point of view of participants and facilitators. In some cases, similar challenges were addressed for different audiences and therefore may be discussed more than once. Additionally, some aspects that were seen as strengths of the Program were discussed as personally challenging for facilitators.

TOP-OF-MIND PROGRAM CHALLENGES

When asked about challenges they face in implementing the Citizen Science Program overall, several interviewees spoke about the large amount of paperwork that must be completed by participants before (consent forms) and after (assessment forms) the data collection as a challenge, both because it can affect the amount of time that remains for the activity and because the paperwork can become tedious for participants (see the first quotation below). A few also spoke about the logistics of managing a large number of project activities happening on any given day as a challenge (see the second quotation). Additionally, interviewees mentioned other logistical factors such as finding suitable locations for activities and maintaining the budget as challenges. A few interviewees spoke about the difficulties of recruitment, although they spoke about this generally.

> The paperwork [is a challenge]. I know that it is necessary, but it is tedious, because it involves too much, like giving the release of liability and all that. [Staff interpreter]

> The most challenging [aspect] so far is, in my experience, a matter of having the staff when you have five or six activities running at the same time on the same day. . . . Being able to work with all that is going on, [with] work happening in all areas at the same time, for me is the biggest challenge, because of the staff and obviously because you need to arrange the time. It is a matter of logistics, so that nothing will conflict, to have all the staff there when you need it. [Staff interpreter]

Several interviewees also talked about the challenges of working with untrained scientists who are participating in the Program voluntarily. For example, a few spoke about the time commitment required from participants, stating that the activities can be long. A few also spoke about the difficulty in identifying times to train staff interpreters and volunteer leaders how to use field equipment, which is necessary when working with untrained scientists in the field. Another challenge of working with volunteer participants during the field work is the lack of continuity of participation on each project, which means that researchers must repeat important details at each activity and plan a flexible program, as it can be difficult to know how much can be completed in a three-hour period (see the quotation below). Additionally, participants can be uncertain about using equipment, particularly if they are first-time participants.

> We [may] have a group with different interests that take all the time you have for the activity. As a volunteer, it is necessary to determine the types of activities that can be done in three hours, mainly. But due to the group's handicaps, because people come and are not duly prepared…they find it a bit difficult. . . . Some are very capable and enthusiastic and can do things, but when you have people in groups with different attitudes [toward the activity] among the group, then it is a bit more challenging. [Volunteer leader]

CHALLENGING ASPECTS FOR PARTICIPANTS

Many interviewees said that the most challenging aspect for participants is the knowledge gap that exists. In some cases, participants struggle to understand what the researchers are saying particularly when researchers use specific vocabulary and do not simplify their ideas (see the quotation below). In other cases, there is a knowledge gap among participants involved in a single activity. This is especially true of first-time participants who may be unsure of what to expect.

> Because this is science, it's really science, what happens is that it is done in a simple language and sometimes there are concepts that are complicated and then you have to teach them in an easier way, because there are sometimes people who have not studied science, so it's more difficult for them to understand. [Staff interpreter]

Several interviewees also talked about the struggle that participants face using equipment. According to these interviewees, participants are initially fearful of using the equipment, and there is not always sufficient time to train participants how to use all of the equipment (see the quotation below). Additionally, a few said that the physical terrain can pose a challenge to participants who may be unprepared for the hiking that is required to reach some activity sites.

> For participants, the lack of knowledge, although that has been taken care of with the workshops, but the instruments, for example the GPS, the instrument to measure pH in the river, the flow. . . the instruments in general [are] something more technical and young people sometimes find [learning about them] boring. . . . It is almost always the adults who do these tasks, but it is a challenge. We should continue offering these workshops so everyone can learn to use the GPS and the instruments. [Volunteer leader]

Overall, interviewees did address differences in experience that might exist between first-time participants and repeat participants, stating that repeat participants often felt more confident about what they are asked to do, whereas first-time participants are more hesitant. Additionally, one interviewee acknowledged that first-time and repeat participants come to the project for different reasons, and it is important to accommodate those differences when working with participants.

CHALLENGING ASPECTS FOR FACILITATORS

When asked about the most challenging aspects of the Program for facilitators including staff interpreters, volunteer leaders, and researchers, the responses fell into three broad categories: general program issues, differences in knowledge among participants, and learning the necessary skills and information to complete the job successfully.

Many interviewees talked about general program logistics as being personally challenging even though these same issues were seen as a strength of the overall Program, including time management, scheduling, and the number of people in each activity. Several—often volunteer leaders and staff interpreters—spoke about time management, specifically the challenge of balancing Program work with other professional and personal commitments (see the first quotation below). Additionally, a few talked about logistical concerns such as the scheduling of activities and the time required to prepare data collection materials prior to each activity (see the second quotation). One interviewee said that the uneven number of participants in each activity is a challenge that facilitators have to address each time because it can impact the amount of data that can be collected at a given activity.

> [The biggest challenge has been] time management, because there is a schedule for the interpreters, plus the [Citizen Science Program] activities. Often we find it a challenge to do an activity and then suddenly you get back and have to do another tour. [Staff interpreter]

> The preparation of activities, the materials, searching for the materials, that has always been a challenge that we have worked directly with the assistants and the scientists [to solve] and what they have done is that they are coming the day before and helping us leave everything ready, and the next day the interpreters just have to put up the materials [and] put them on the vehicle. [Conservation Trust staff]

Several interviewees also talked about the differences in knowledge among participants and how that can affect the project and activity. Not only do researchers have to re-state concepts to ensure all participants understand, but researchers must also address participants' prior knowledge (see the quotation below). Additionally, researchers have to ensure that the activities are interesting to a wide variety of participants who may be at different points in the citizen-science process.

> I think that sometimes [the researchers] have had trouble controlling some of the people that come with other habits from the get-go. In the bird activity, for example, you are not supposed to do phishing, imitating the sounds of birds, or use instruments that attract them, because the investigation is to count what you find within the perimeter and not to attract a thousand birds to your perimeter and then count them. So [the researchers] explain this once and again, but people continue disobeying. [Volunteer leader]

Several interviewees also talked about the challenge of finding time to learn new material and stay up-to-date on the information necessary to answer questions and provide support throughout the project. This encompassed both field-based learning and office-based learning about what works and what does not work in terms of managing the Program (see the quotation below). A few interviewees also talked about personal challenges, such as the fear of public speaking or frustration that they were unable to participate in more projects and activities.

> The greatest challenge continues to be learning how to do what I love most now. But the challenges are daily and different and very varied. That is why it is not tiring, because there is always a new different challenge, be it internal or external, there is always a different challenge. [Conservation Trust staff]

STRENGTHS AND CHALLENGES OF PROGRAM LOGISTICS

Interviewees were asked about the strengths and challenges of three specific logistical aspects of the Citizen Science Program: recruitment, registration and transportation. If interviewees did not have experience with one of the aspects, the interviewer moved on to the next question.

RECRUITMENT

Many interviewees had experience recruiting participants, either through the formal recruitment process or by more casually telling people about the Program. Interviewees who have been casually involved in recruitment talked about this experience in a positive, if general, way. They share the opportunity with interested people, but rarely run into challenges.

Formal recruiting has been more difficult. A few interviewees talked about the fact that recruitment has been uneven across the different projects and activities, and there is not a clear reason for this (see the first quotation below). One interviewee suggested that having a certain time by which participants have to confirm their registration may help, as interested participants on a waiting list would be able to register (see the second quotation).

> I think that in terms of recruitment, I don't think there is much fault in our part. . . . I don't know if [recruitment differences] have to do with logistic issues of the possible volunteers, but we have been having ads in radio and television and newspapers, but I do not know why I find that some activities, for example, in the bird activity, sometimes they have only two participants, sometimes none. The others almost always have more. [Volunteer leader]

> I believe that if people who sign up and have not confirmed participation by the next day, they should be dropped from enrollment. [The Trust] should make a process where the participant has to know that they have until a certain time to confirm, like they have 15 hours or the day before the activity to confirm, because a lot of people said they were coming, but they don't confirm and then, from an enrollment of 12 people, we ended up with only two, because then people that were willing to participate but didn't enroll on time are left out, when they could have participated had we had confirmations. [Researcher]

Interviewees identified a few challenges with the recruitment process. First, they said it is difficult to follow up and remind people of the Program because reaching people via phone or having them reply to an e-mail does not always work. Additionally, the Conservation Trust is interested in recruiting core participants from a narrow set of parameters and this makes it more difficult to find interested people who also meet the needs of the Program (see the first quotation below). Finally, one interviewee talked about the challenge of recruiting people to activities that take place at set (and sometimes inconvenient) times. This interviewee felt that the Conservation Trust might be able to recruit more participants if there was the flexibility to schedule activities at times when participants are most available (see the second quotation).

> In this case, the challenge has been greater [than the last Citizen Science project] because we have a very specific goal. Since we want to create a group of core volunteers that go through the stages of contributor, collaborator, and cooperator, and that come from the watershed, from the lower part of the watershed, it is more specific. . . . That is more difficult than before. [Conservation Trust staff]

> For me the biggest challenge [of recruitment] is a matter of the availability of activities for the availability of participants. . . . One goal is to engage the person the first time you call them, to book them and then many times the reality is that, no, that doesn't work out. The approach should not be, 'I have an activity on Saturday, want to come?' It should be more like, 'When can you come?' [Staff interpreter]

REGISTRATION

Most interviewees had experience with either the initial registration of participants or the onsite registration process that takes place at each activity.

As mentioned earlier as a challenge of the Citizen Science Program, many interviewees talked about the paperwork that participants need to fill out during the onsite registration process. Several of these interviewees said that there was too much paperwork required, although several also said that there was time built in to the schedule for participants to fill out paperwork at the beginning and end of each session (see the quotation below).

> The day of the activity, the interpreter that has been assigned is in charge of registering or taking attendance of the participants. From that point of view, we have not faced that much of a challenge, but the challenge is when we have to provide the assent and consent forms because it

> takes too much time. The process gets a bit more complicated because the participants take more time. [Conservation Trust staff]

Aside from the paperwork, interviewees also talked about the difficulty of confirming participants and how to handle participants who do not arrive at the designated time. This makes it challenging to know how many participants will be attending each activity. One way volunteer leaders have tried to address this problem is by calling confirmed attendees if they do not arrive at the designated time (see the two quotations below).

> People are very interested. [However,] what happens is that in the end, many people do not confirm and therefore they don't go to the activities. Today, I was running one of the Program's activities and had about nine people in the system, but only one of the nine confirmed, so that makes it hard. [Staff interpreter]

> Basically what we do, what I do, is that when I arrive to the activity I make sure that the people that were registered are there and if they are not, we give them a call to see if they are coming. [Volunteer leader]

Other interviewees offered idiosyncratic thoughts about registration, such as the fluctuation in registered participants between the summer and fall months and that sometimes parents bring children who do not meet the age requirement for participation.

TRANSPORTATION

The majority of interviewees felt that transportation was working well, both onsite and offsite. A few interviewees did identify challenges with the current transportation arrangement. Firstly, since participants meet at an offsite location and then caravan to the activity site, it is difficult to accommodate participants who arrive late, and at some activity sites, parking is not always sufficient for the number of cars present. Secondly, for staff interpreters and volunteer leaders who meet at Hacienda La Esperanza before heading to the offsite meeting site, travel might not be done in the most efficient way.

DESIRED EFFECTS OF THE PROGRAM ON PARTICIPANTS

Overall, when asked about the desired effects of the Program on participants, interviewees provided responses that closely resembled perceived rewards to participants. Most interviewees said that the desired effect of the Program is that participants learn about science and, particularly, that they learn science can happen outside a lab in an informal environment. These interviewees also talked about the desire for participants to learn research techniques and get involved in the research process (see the first two quotations below). Several interviewees also talked about the desire for local participants to continue in the Program (see the third quotation). Additionally, a few talked about the desire to have citizens take community ownership of the project. This idea was separate from the idea of repeat participation. Rather, it stemmed from the idea of people becoming guardians of their communities (see the fourth quotation).

> Well, [the participant impact is] knowledge, for them to know the investigations and, if some of them turn into a core participant, well excellent. . . . I would love that when this cycle of Citizen Science ends, we can say we have scientist assistants as scientists and core participants running research and for them to have results for their hypothesis. I hope not only one, two, or three, but a bunch. [Volunteer leader]

> We are going to impact the way they are encouraged to get involved in research and take over. Obviously you motivate them and develop parallel investigations with the scientists and everything else. [Staff interpreter]

> In practical terms, I imagine [the desired effect] is for the person to continue attending, and there [have] been moments that it has been informally expressed that there are people that are repeating as participants and that is stimulating, no? I think that impact has been already felt in the sense that people are being motivated to continue participating and visit all the sites and get more involved. [Researcher]

> [The Trust tries] to involve people from the same community so they turn into the guardians of the community. It's curious to see that the people that are participating are not from the area. It would be ideal if people from the area could be identified to participate and learn and understand the significance, the scope of the project. I think that would be beneficial for future generations. [Volunteer leader]

ACTIVITIES' ABILITY TO ACHIEVE IMPACT

Most interviewees believe that, in general, the activities are well-aligned with achieving the impacts described above. When asked to articulate the ways in which the activities were well-aligned, two main ideas came through: the ability to make changes as the projects progressed, and the knowledge gain that takes place through participation.

Several interviewees spoke about the fact that Trust staff and researchers work to make adjustments to the activities to ensure that people make a personal connection with the project. Also, a few talked about the "open forum" that researchers try to put in place so that participants feel comfortable sharing their ideas and asking questions (see the first quotation below). Additionally, one interviewee mentioned that researchers make sure that each participant has a hands-on experience, rather than simply watching the activity unfold (see the second quotation). Several interviewees also spoke about the fact that participants gain knowledge as they participate and this can allow participants to take ownership of the project. As participants become more involved in the project, they also have the knowledge and opportunity to work with newer participants and share their knowledge.

> We always tell participants that if they have any preoccupation, if they have any question regarding one of the investigations, to say, not to keep that information for themselves. . . . We always tell them that if they have any doubt to share them, not to keep doubts or questions to themselves. [Volunteer leader]

> If what we want is for participants to evolve, our second goal, and go through the three stages, it is important for us to make sure that the activities are designed to allow their participation and that they learn what they are supposed to learn. . . . We can't pretend that a participant evolves if he or she is coming to activities just to look. No, he or she has to pick up the GPS, write the data, know how the samples are stored, how the information is filed, take notes, know what the data mean, why are they taken? [Conservation Trust staff]

SUGGESTIONS FOR PROGRAM IMPROVEMENT

Very few interviewees felt that any aspects of the activities are not well-aligned to achieving the desired impacts; however, they did offer suggestions for improvement. These suggestions varied widely. For example, a few interviewees suggested that researchers and assistants meet periodically and assess the individual projects together, to ensure that all of the projects are working to achieve the Program goals.

This meeting also would provide an opportunity to share experiences and learn from each other (see the first quotation below). One interviewee suggested a comprehensive seminar for participants that allows them to understand how the projects work together to achieve greater impact (see the second quotation). One interviewee suggested limiting the number of activities offered each day to decrease the amount of competition between activities and projects.

> Another element that we found interesting was that we can meet with all of the researchers and possibly their assistants to exchange experiences because they can identify things or techniques that have proven effective for some and that others might not know of. [Researcher]

> If there could be a comprehensive seminar given to all the participants of the difference disciplines, some sort of workshop to show how the different studies will mix at the end and contribute to a common purpose, [that would be helpful]. We are watching shrimps at the river, perfect, but what does this shrimp have to do with the lizards hiding in the forest? How do I connect both? How do we explain the particular purposes of each investigation? It would be good to see at the end of the road how all of them got to be interrelated. [Volunteer leader]

APPENDICES

APPENDIX A: OBSERVATION GUIDE

FORMATIVE OBSERVATION GUIDE (CHEAT SHEET)

Date/time:
Name of program/activity:
Scientist/scientist's assistants (their students):
Trust interpreter:
Volunteer leader:
Other Trust staff present (if applicable):
Number of participants by gender and ages (e.g., M43, F16):
Brief description of overall activity:
    Orientation start/stop time:
    Activity start/stop time(s) (note all):
    Conclusion /reflection start/stop time:

****NOTE: You will need to provide at least two specific examples (i.e., specific behaviors or verbatim conversations) to support responses to observation guide questions.**

OBJECTIVES (WHAT TO LOOK FOR)

The formative observations will explore:

- The evolution of the activity from beginning to end (orientation, roles/tasks, conclusion);
- Scientists' and other staff's roles during the activity (including what they say to and ask participants);
- Participants' roles during the activity (including what they say to and ask scientists and staff);
- Participants' level of engagement in the activity (successes and challenges);
- Barriers to successful completion of the activity (within and outside of staff's control); and
- Whether the activity is linked to the larger research goals and Citizen Science project.

KEY POINTS TO REMEMBER

- Capture all background information before the program begins; ask for exact ages of program participants; please do not estimate.
- If you don't know who is who among staff, please ask at the beginning of the program. Do not guess people's roles and/or names.
- Note the approximate timeline of major transitions during the activity (see above).
- Note specific interactions and verbatim conversations between staff and participants (avoid vague language and generalizations).
- Note exactly what you see and hear NOT an interpretation of what you see and hear (the observation guide will ask you to provide some interpretation).

FORMATIVE OBSERVATION GUIDE (COMPLETE VERSION)

Date/time:
Name of program/activity:
Scientist/scientist's assistants (their students):
Trust interpreter:
Volunteer leader:
Other Trust staff present (if applicable):
Number of participants by gender and ages (e.g., M43, F16):
Brief description of overall activity:

****NOTE: Please provide at least two specific examples (i.e., specific behaviors or verbatim conversations) that support your responses to the questions in this observation guide.**

1. **Describe how the session begins:**

   a. Describe the orientation provided. What does the scientist or other staff say? Where does it happen? How do participants respond (i.e., what do they say/ask)?

   b. What (if any) purpose or goal does the scientist articulate for the activity that day? How (if at all) does the scientist tie the activity to larger goals of the research or project?

      How do participants respond (i.e., what do they say/ask)?

   c. In what ways (if any) are participants reminded that they are part of the team/contributing to the research? How do participants respond (i.e., what do they say/ask)?

   d. How does the scientist test for participants' previous knowledge? How do participants respond (i.e., what do they say/ask)?

   e. How do scientists inform participants of their role during the activity (i.e., what expectations do they describe)? How do participants respond (i.e., what do they say/ask)?

      Are participants assigned specific roles at the beginning? If yes, please describe these roles (in particular, note any roles given to children and their ages).

   f. How organized does the beginning of the session appear? Be specific/provide examples.

2. **Describe the activities that occur throughout the entire session:**

   a. Describe the instructions that are given. By whom (scientist, scientist's assistant, interpreter, volunteer leader, etc.)? How often? What do they say?

      How do participants respond (i.e., what do they say/ask)?

   b. What questions do participants ask? Who asks these questions?

Who responds (scientist, scientist's assistant, interpreter, volunteer leader, etc.)? What do they say/ask)?

c. What questions do the scientist and others ask? Who asks these questions (scientist, scientist's assistant, interpreter, volunteer leader, etc.)?

   How do participants respond (i.e., what do they say/ask)?

d. In what ways do participants seem to struggle? Who struggles (all or some)?

   Who (if anyone) responds to these struggles (scientist, scientist's assistant, interpreter, volunteer leader, etc.)? What do they say/ask)?

e. In what ways do participants seem most competent (or best prepared)? Who (all or some)?

   How does the scientist and others (scientist's assistant, interpreter, volunteer leader, etc.) respond? What do they say/ask)?

f. In what ways do participants seem to enjoy themselves? Who (all or some)?

   How does the scientist and others (scientist's assistant, interpreter, volunteer leader, etc.) respond? What do they say/ask)?

g. Are participants given the opportunity to do more than one task or do they remain on the same task during the entire session? Please describe whose roles change and how.

   How do the scientist and others (scientist's assistant, interpreter, volunteer leader, etc.) facilitate any changing of roles?

h. Describe any differences observed between core participants and first-time participants? How (if at all) do these participants work together?

   How do the scientist and others (scientist's assistant, interpreter, volunteer leader, etc.) work with the different participants? Who and in what ways?

i. Identify any barriers to proper implementation (may be within or outside of scientists' and others' control).

3. Describe the activities that occur at the end of the session (if you are still there):

a. Describe the activity's conclusion. Is there a summary and reflection period? Who says and does what? Does the summary take the form of a lecture or discussion?

b. In what ways are participants reminded that they are part of a team and contributing to real research?

   Who (scientist, scientist's assistant, interpreter, volunteer leader, etc.) and what do they say/ask? How do participants respond (i.e., what do they say/ask)?

c. How (if at all) is their participation linked to a larger research/project goal or purpose?

   Who (scientist, scientist's assistant, interpreter, volunteer leader, etc.) and what do they say/ask? How do participants respond (i.e., what do they say/ask)?

d. Are participants invited to participate in other activities? If yes, please describe who invites them and which activities.

   How do participants respond (i.e., what do they say/ask)?

4. Describe your overall interpretation of the activity and the scientist's and others' roles.

a. Please describe your top-of-mind responses to what you observed (should be written within a day or two of the observation).

b. Overall, what was the scientist's primary role during the activity (i.e., what did he/she spend the majority of his/her time doing)? What was his/her secondary role?

c. Overall, what was the scientist's assistant's primary role during the activity (i.e., what did he/she spend the majority of his/her time doing)? What was his/her secondary role?

d. Overall, what was the Trust interpreter's primary role during the activity (i.e., what did he/she spend the majority of his/her time doing)? What was his/her secondary role?

e. Overall, what was the volunteer leader's primary role during the activity (i.e., what did he/she spend the majority of his/her time doing)? What was his/her secondary role?

f. Was there other staff present for the majority of the activity? If yes, what was his /her primary and secondary role during the activity?

APPENDIX B: SHORT-ANSWER INTERVIEW GUIDE

Date/time:
Name of program/activity:
Scientist/scientist's assistants (their students):
Trust interpreter:
Volunteer leader:
Other Trust staff present (if applicable):
Participant's gender and age (e.g., M43, F16):

I am going to ask you some questions about your program experience. I do not work for the Trust; they appreciate your honest thoughts and opinions so they can improve the program experience.

1. Is this your first time to participate in Citizen Science? (if no) What other Citizen Science activities have you participated in?

2. Why did you decide to participate in this activity? (Probe: Can you tell me more? Anything else?)

3. Can you tell me about the process of registering for the program? Did you experience any problems or difficulty registering? (If yes) What were they?

4. During the registration process, were you informed of any age requirements or of the age-appropriateness of the activity? (If yes) What were you told?

5. After registration, what materials, if any, did you receive about today's program? Where did you access those materials? Who did these materials come from?

   [Probe for specifics]

   What (if any) information did you receive about the activity or project goals?

   What (if any) information did you receive about what you would be expected to do?

   What (if any) information did you receive about what to wear and bring with you?

   What (if any) information did you receive about logistics—when to arrive, directions, length?

6. When you arrived today and throughout your experience, how would you describe your interactions with program staff and volunteers? Can you give me an example?

   Did the program start/end on time? (if no) How (if at all) did that affect your experience?

7. Overall, how do you feel about transportation in the program, both your personal transportation and transportation onsite? What (if any) challenges did you encounter?

   [Probe about distance to the site, logistics of parking their vehicle, onsite transportation]

8. What role or task(s) were you assigned during the program today? How (if at all) did that role/task align with your expectations and interests?

   Did you help with more than one task? (If yes) Which ones?

   [If they are participating with children, ask about the age-appropriateness of tasks]

   If you had not been here today, do you think it would have made a difference in terms of the success of the activity? Can you tell me more about that?

9. What did you find most enjoyable about the program? Why is that?

10. What did you find least enjoyable about the program? Why is that?

11. How would you describe the purpose of the activity? Why do you say that?

    What can you tell me about how this activity fits into the rest of the research project? Why do you say that?

    What can you tell me about how this research project fits into the rest of the Citizen Science program? Why do you say that?

12. Is there anything else that you would like to say about the program?

APPENDIX C: IN-DEPTH INTERVIEW GUIDE

Today, we are talking about your experiences with the Citizen Science programs at the Hacienda. Your honest thoughts and opinions are appreciated. This interview is confidential.

1. In your own words, what do you see as the primary goal of this project? Anything else?

2. First let's discuss the overall strengths of the program. What aspects of the program (from logistics to research activities) have been most successful so far? Can you give me an example?

3. Now, let's discuss the overall challenges of the program. What aspects of the program (from logistics to research activities) have been most challenging so far? Can you give me an example?

4. I'd like to ask you about specific aspects of the program now—strengths and challenges. If you have not had experience with any of the following, let me know and we can skip it.

   [For each item, ask: What has worked well? Why? What has been challenging? Why?]

   a. What has been your experience with participant recruitment so far?
   b. What has been your experience with participant registration so far?
   c. What has been your experience with participant transportation so far?

   [Refer back to challenges:] What (if any) ideas do you have for addressing that challenge?

5. Based on what you've seen and heard so far, what has been most beneficial or rewarding for participants? Why is that?

   What has been most challenging or the greatest struggle for participants? Why is that?

   [Probe about different participant levels—first-time, repeat, core participants]

6. So far, what do you think has been most beneficial or rewarding for program facilitators (scientists, staff assistants, interpreters, and volunteer leaders)? Why is that?

   What has been most challenging or the greatest struggle for facilitators? Why is that?

   [Probe about different roles—scientists, staff assistants, interpreters, volunteer leaders]

7. The overall project has participant impacts (in other words, desired effects of the program on participants). What can you tell me about these impacts (or the desired effects on participants)?

   In what ways (if any) do you think the current research activities are well-aligned with achieving those impacts? Can you give me an example to clarify what you mean?

   In what ways (if any) do you think the current research activities are not well-aligned with achieving those impacts? Can you give me an example to clarify what you mean?

   What (if any) suggestions do you have for how those activities could be better aligned?

What more, if anything, do you think participants can or should take away from their experiences? How could the program make that happen?

8. Finally, let's talk about your specific role in this program. You may have already mentioned some of these successes and challenges. If so, we can skip to the last question.

   What has been your primary project role so far?

   What has been most rewarding for you? Why?

   What has been most challenging for you? Why?

   What, if anything, has been frustrating about your role in the program? Why?

9. Those are all my questions. Is there anything else you would like to tell me?