

# Ain't no river wide enough, citizen scientists explore the Río Grande de Manatí

Yogani Govender,  
yogani@paralanaturaleza.org  
Lee Ann Rodriguez,  
leeann@paralanaturaleza.org

The Conservation Trust of Puerto Rico (CTPR) has adopted the citizen science model of the Center for Advanced Informal Science Education (CAISE) as a tool to obtain their goal of protecting 33% of Puerto Rico's lands by 2033. Based on lessons learned from a prior NSF grant, CTPR is engaging underserved and underrepresented Hispanic citizens living within the Río Grande de Manatí watershed in the discovery and exploration of its natural resources. Our goal is to take project participants through three phases of informal science education (ISE): participatory, collaborative and co-creative, (Bonney et al, 2009), by means of five ecological studies that address issues relevant to their everyday lives and to the management of natural resources.

## Organization Structure

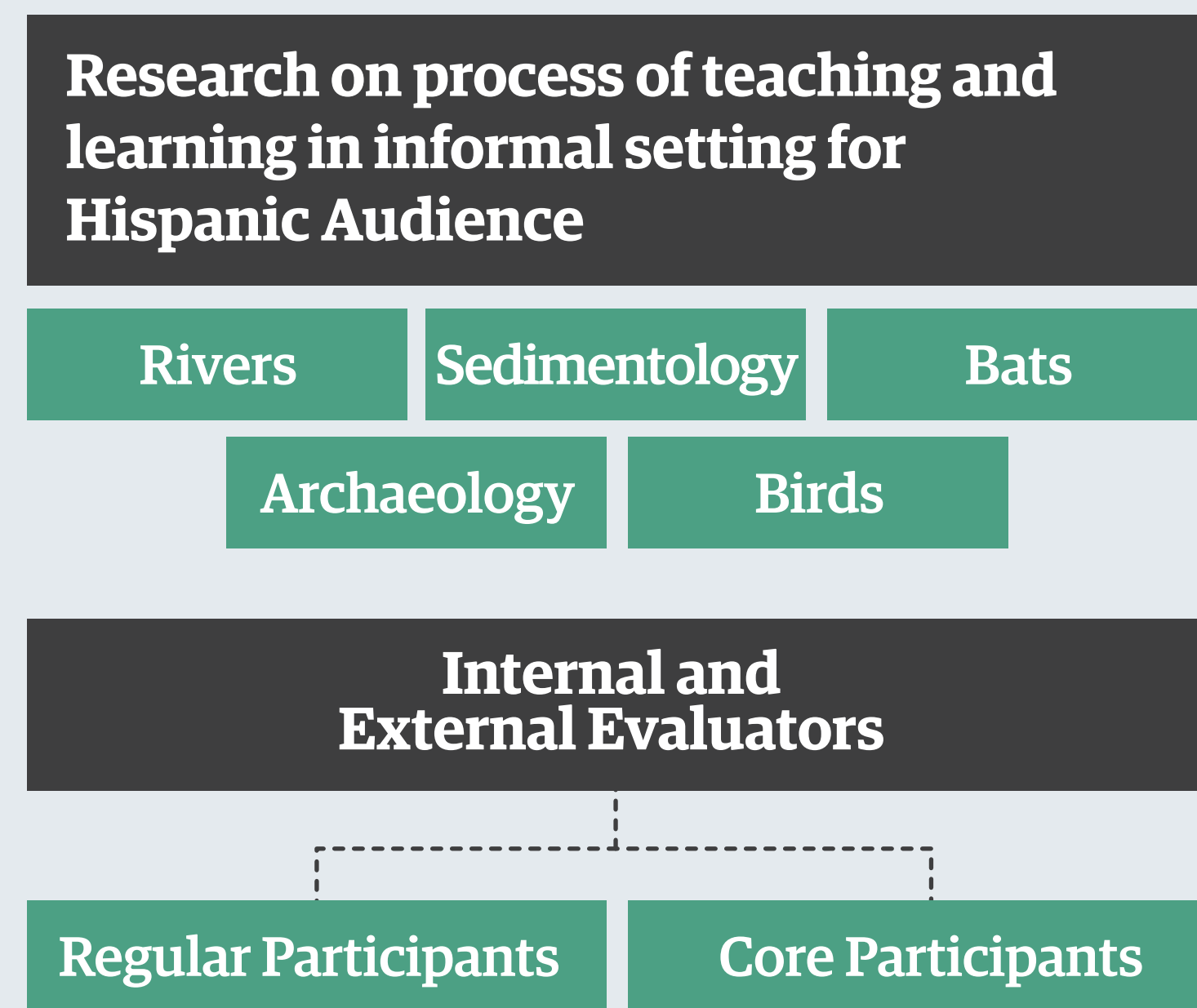


Figure 1: Project Design

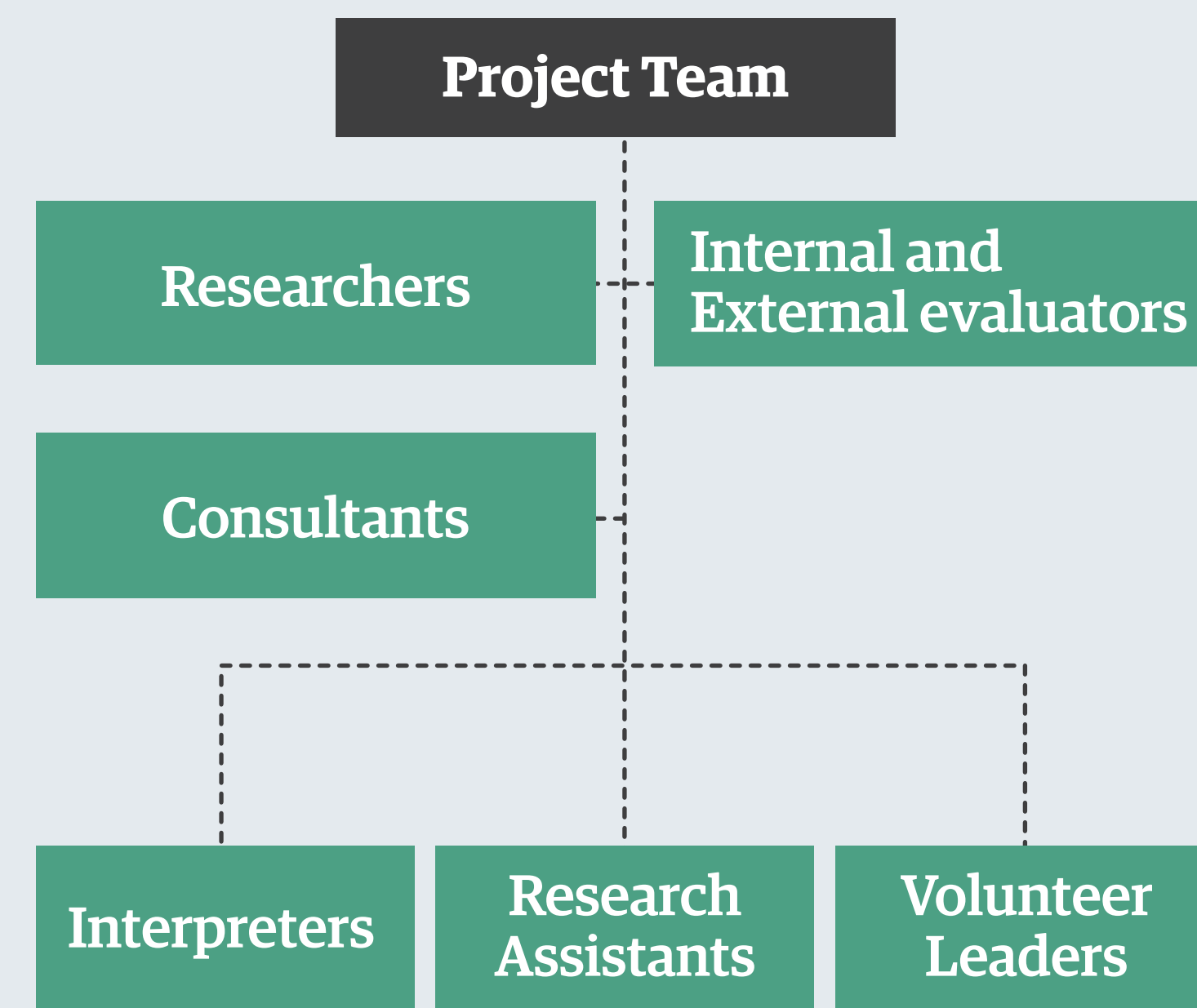
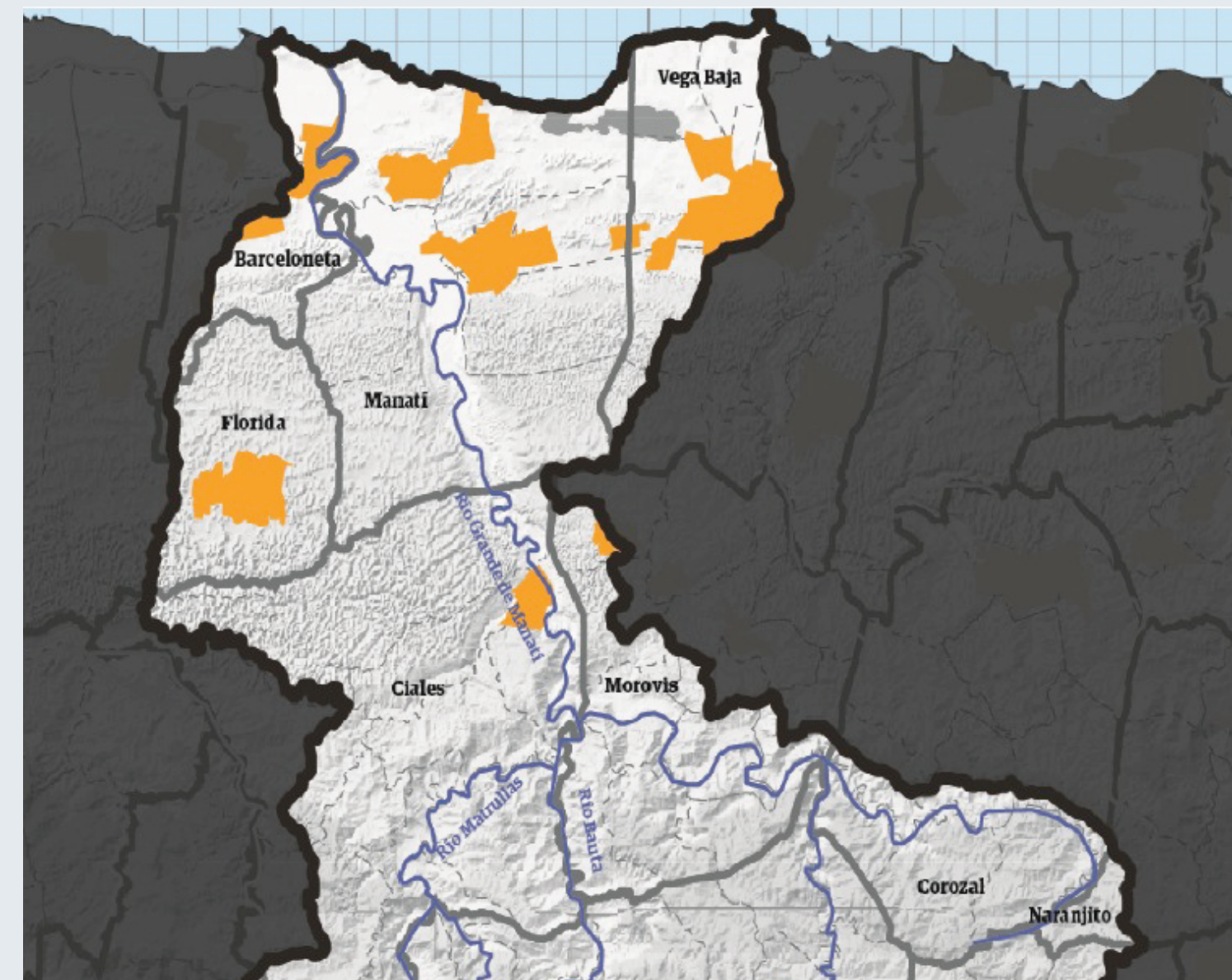


Figure 2: Components that make up the research team

## Geographic location of study and characteristics of target audience



Map showing study area for ISE

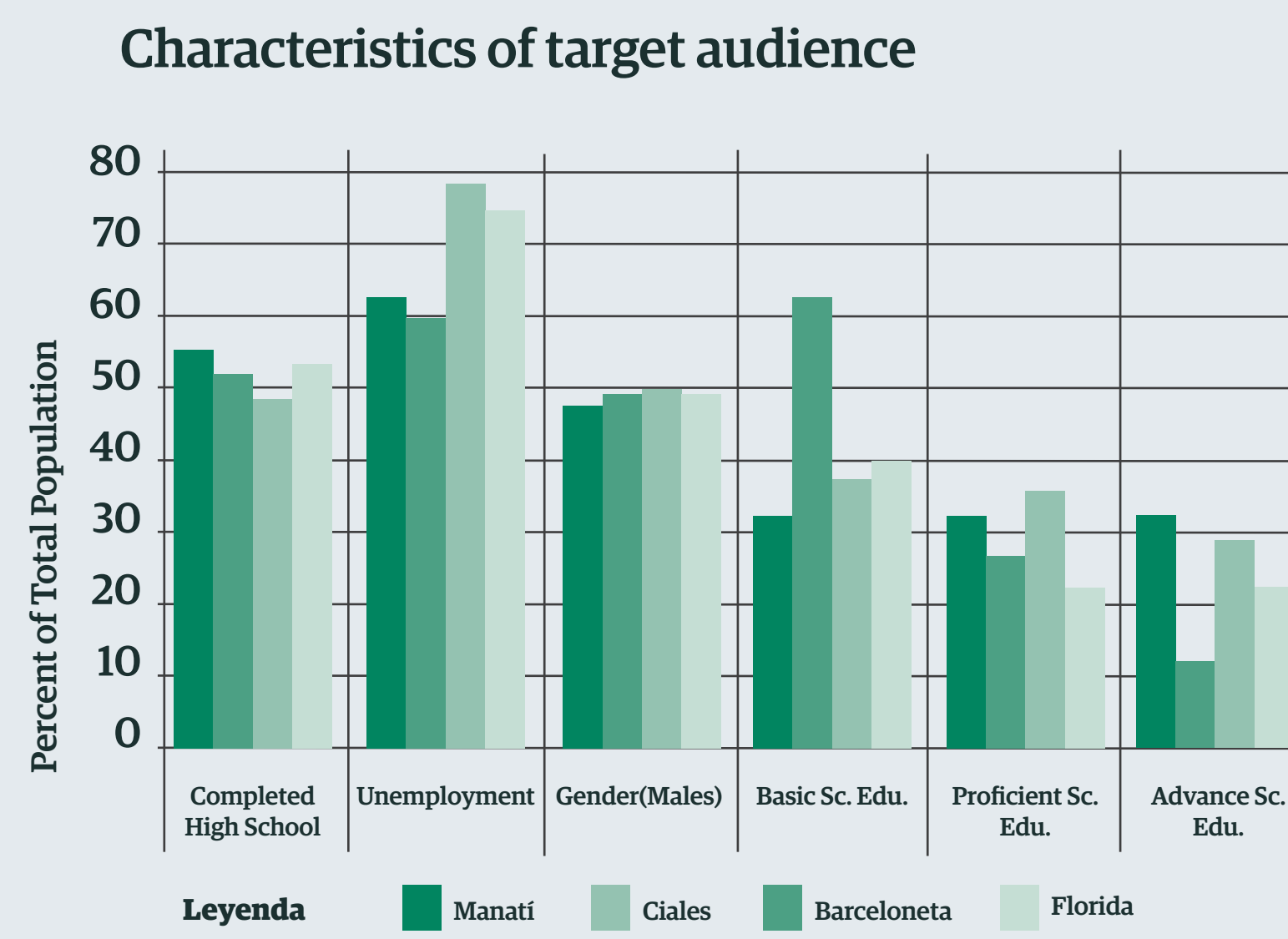
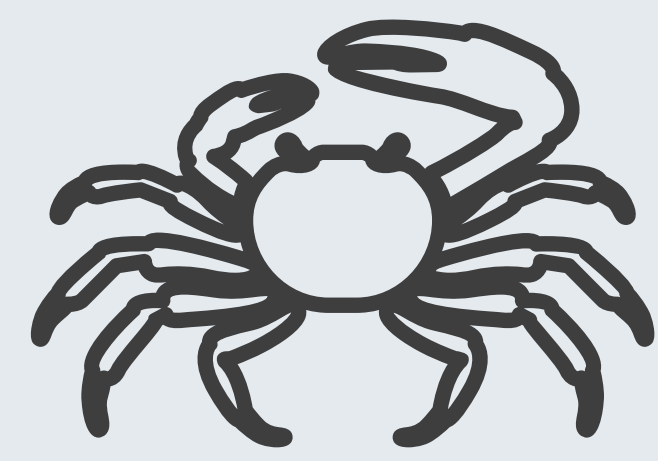


Figure 3: Characteristics of target audience

## Project Goals and Research Questions

**Objective 1:** To study if the proposed ISE model generates a gain in knowledge and skills, and change in attitude and behavior in participants to become co-creative citizen scientists.

**Objective 2:** To explore STEM pedagogy with Hispanic populations in ISE settings, including how scientists' behavior and communication shift according to participant profile and environment settings; scientists' gain from the ISE experience; and scientists' commitment to further advance ISE.



**Crustacean / insect** monitoring tools assess the ecosystem quality in the watershed



**Bat assemblage** and bat dispersal routes in the karst area of the watershed



**Cultural resources** in the watershed area and cultural use of the region

## Methodology

In order to evaluate the transformation through teaching and learning of citizens scientists from participants to co-creators CTPR proposed to engage 3,254 participations, 1675 participants and develop 40 core participants (co-creators) in six science projects (Figure 2) with a team of administrators, researchers, consultants, interpreters, research assistants and volunteers leaders (Figure 2). Evaluation instruments such as questionnaire and self-assessments, pre and post questionnaires, rubrics, focal groups, participant observation and interviews.

## Literature cited

Bonney et al, (2009). Public Participation in Science Research, Defining the field and assessing its potential in informal science education. A CAISE Enquiry Report. Washington DC.

Estremera Ruben, (2014) external report to CTPR on process of learning in informal setting.  
Muniz, Carlos and Lopez, Annett, 2014 External report on process of teaching in informal setting  
Census data 2012

Randi Korn & Associates 2014: External Evaluation report for CTPR

## Acknowledgements

All researchers, assistants, volunteers and staff of Para la Naturaleza. NSF for funding of this ISE projects.

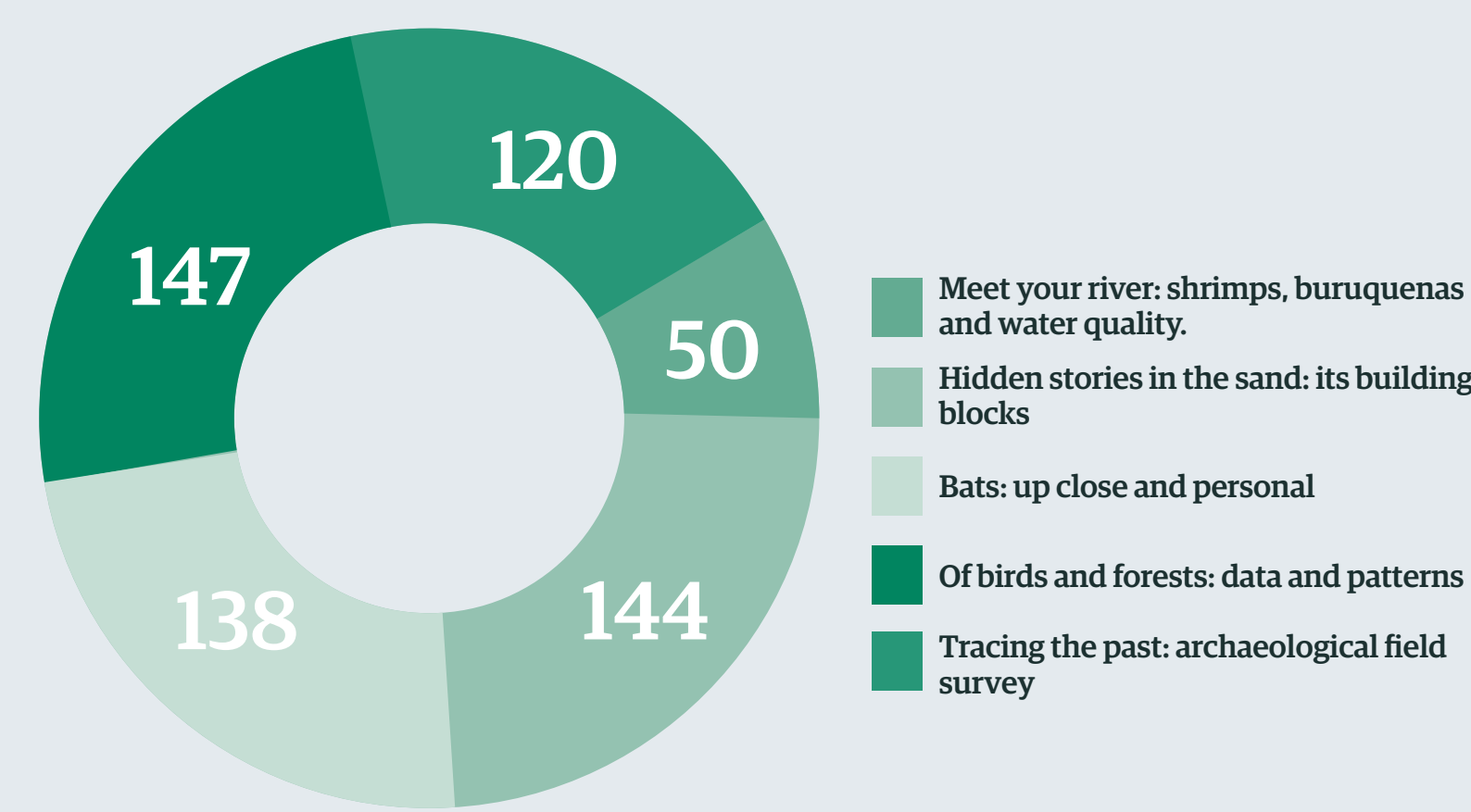


Figure 4: Number of auto evaluations administered (n=599) to participants to determine change in skills, attitude, behavior and knowledge in each ecological research project.

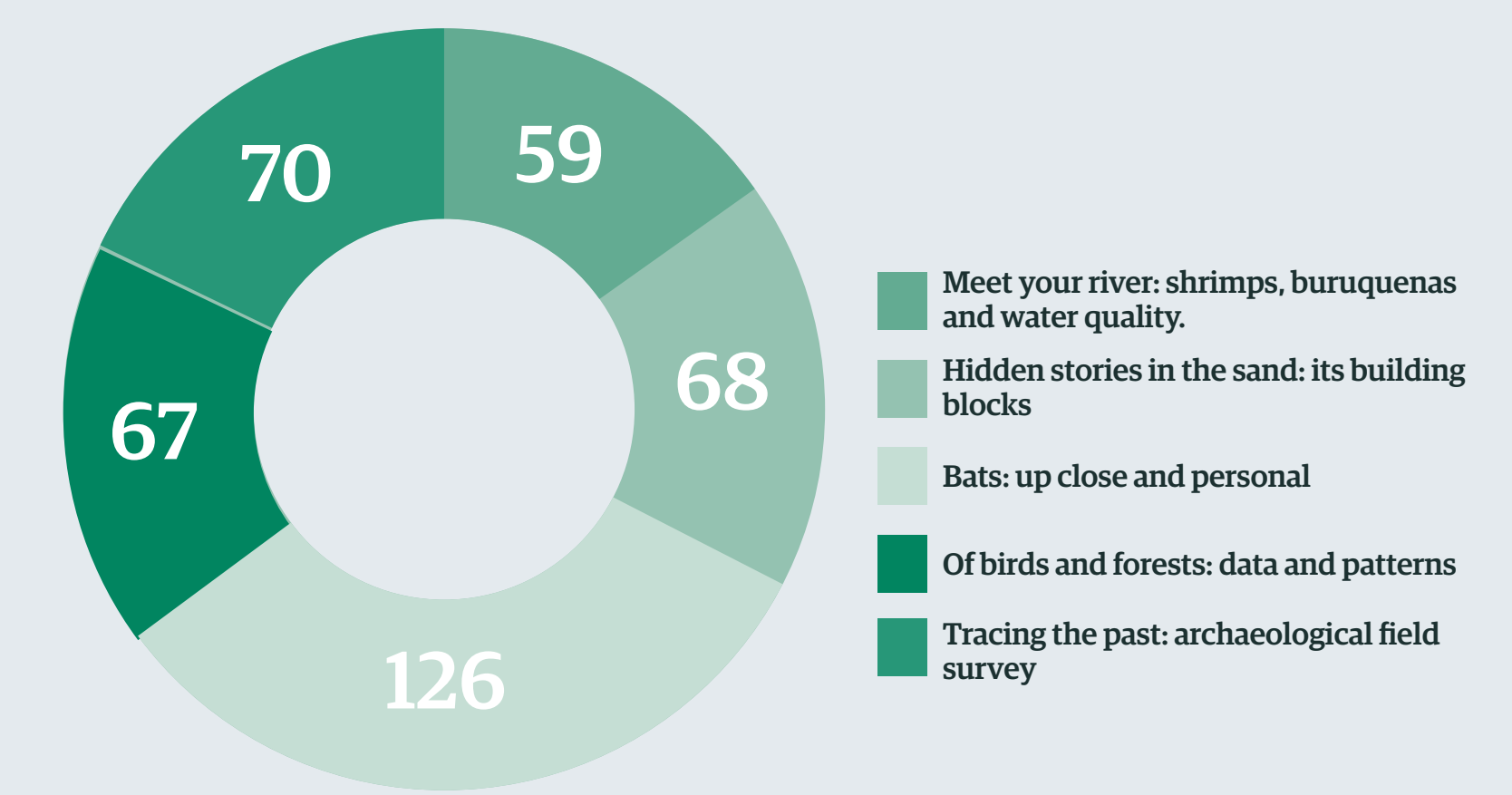


Figure 5: Number of questionnaires administered (n =399) to demonstrate that participants gained knowledge about the concepts, methods and scientific process in each ecological research project.

## Results

**Auto evaluations administered** to participants in the 5 ecological studies to determine change in skills, attitude, behavior and knowledge,

- 80-100% of the participants indicated they were able to understand the most important ideas of the scientific project, able to summarize the ideas and or apply what they learned during the activity.
- More than 90% indicated they participated actively in the project and felt they had significantly contributed to it.
- Between, 78% and 95% stated they learned new ideas and more about the theme they participated in.

**Pre and post questionnaires** in the five ecological studies.

- 75% of the participants had little or no prior knowledge or skills on the themes they participated in.
- Majority (> 75%) stated they were confident to talk about the theme they participated in after the activity.
- It was also observed that while 54% to 63% of participants were able to describe the scientific process, only a limited number were able to describe the scientific process in logical order.

Number of times participated	Count
1 time	582
2 to 10	582
10 to 15	5
16 to 50	4
21 to 25	3
26 to 35	4

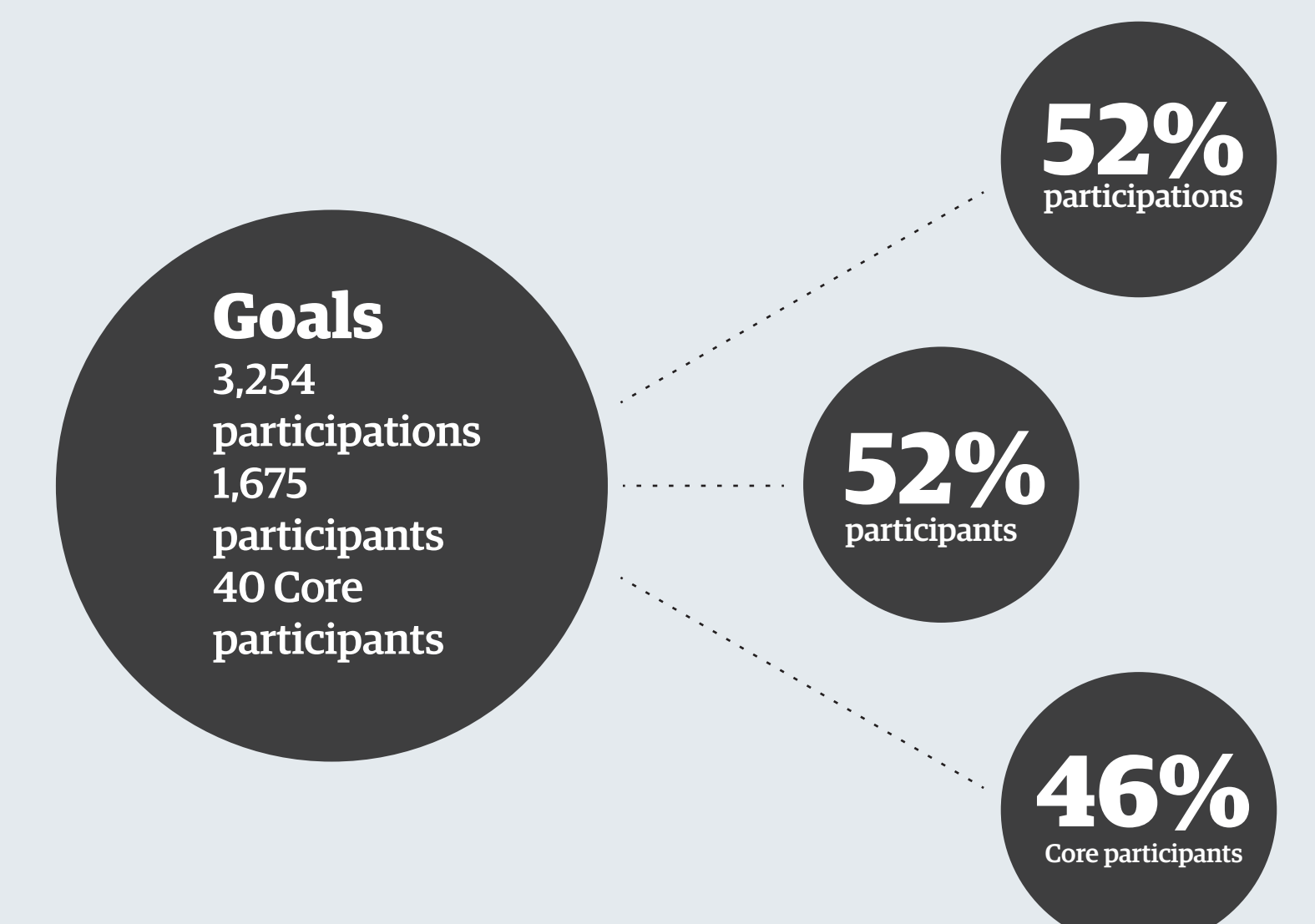
Table 1: Number of times participants have participated in the various ISE activities

## Challenges of this ISE citizen science project

- Retention of Participants**
  - Marketing and communication via virtual media
  - Increase in the number of citizen science activities in CTPR and other organizations
- Logistics and administration of five ecological research**
  - Calendar
  - Equipment
  - Field Trips coordination out of CTPR properties
  - Time of day
  - Geographic restriction
  - Excluding cases studies of co-creator by focusing on citizens of the 4 municipalities only
- Research with human subjects**
  - IRB
  - Implementation of evaluation instruments
  - Time consuming
  - Insurance, waivers

## Successes of this ISE citizen science project

- Teaching**
  - Scientists reflect and adapt
  - Facilitate the transformation
  - Create opportunities for citizen scientists to transform from participatory to co-creators
  - Feedback cycle/retro information
  - Formal introduction and conclusion to projects
- Learning**
  - Direct interaction or intervention by scientists
  - Inclusive and empathic conversations provided materials to participants
  - Collaborative dialogue/open informal dialogue
  - Hands-on practice
  - Open and inviting environment providing trust and equality to all participants
  - Learning was by democratic process
- Multi-sectoral Collaborations**
  - Universities
  - Community organizations
  - State and Federal Agencies



This project provides tools and instruments required to evaluate ISE both teaching and learning science in an informal setting to Hispanic audiences. CTPR is identifying and documenting the key roles of the different participants within this ISE model.

## Formative Assessment

- Strengths**
  - Motivated and passionate
  - High level of engagement
  - Actively supporting participants (asking questions, data collection, engaging participants in process)
  - Take ownership
  - Strong alignment between facilitators created a collaborative atmosphere
  - Logistics were handled very well

## Target areas that need more work

- Participants**
  - Overall purpose of research project in relation to Citizen Science was inconsistent throughout the projects
  - Facilitators were inconsistent in explaining the overall goal of the CC project.
- Facilitators** (researchers, assistants and interpreters)
  - Participant's knowledge gap
  - Recruitment and sustaining participation
  - Program logistics (paperwork) (but participants did not express concern)

## Recommendations

- Frequent team meetings to reflect on successes and challenges
- Schedule time for meetings
- Preparing agendas that guide reflection e.g. choose one theme from challenges to discuss solutions and create a work plan
- Consider a work plan of marketing, recruitment and address items within team control
- Better communication about what is the Citizen Science Project among all researchers
  - Be very explicit about the goals
  - Have formal introduction and formal conclusion to each activity

## Literature cited

Bonney et al, (2009). Public Participation in Science Research, Defining the field and assessing its potential in informal science education. A CAISE Enquiry Report. Washington DC.

Estremera Ruben, (2014) external report to CTPR on process of learning in informal setting.  
Muniz, Carlos and Lopez, Annett, 2014 External report on process of teaching in informal setting  
Census data 2012

Randi Korn & Associates 2014: External Evaluation report for CTPR

## Acknowledgements

All researchers, assistants, volunteers and staff of Para la Naturaleza. NSF for funding of this ISE projects.



para la Naturaleza

Este programa es auspiciado por la Fundación Nacional de Ciencias (National Science Foundation) a través de la beca número 1223882, y por la nueva unidad Para la Naturaleza del Fideicomiso de Conservación de Puerto Rico.