Understanding migration to protected area buffer zones in Costa Rica utilizing cultural consensus analysis

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ABSTRACT. Human migration to the world’s protected areas’ (PA) buffer zones is widely seen as a significant threat to conserving biodiversity. Research since 2005 has demonstrated some evidence for global migration trends but also highlighted the simultaneous need to understand the local, contextual factors that drive migration around individual PAs. Investigation into human migration patterns to these buffer zones has frequently relied on methods that do not accurately capture the calculus used by migrants in their decisions. The research presented here uses a mixed-methods, cognitive anthropological approach to assess the motivations of Costa Rican migrants to the buffer zones of three national parks. Employing cultural consensus analysis methodology in combination with a demographic analysis based on the Costa Rican census, this study was able to develop important insights into Costa Rican migrant motivations. Importantly, the research finds that there is not a single cultural model among the migrants surveyed regarding conditions driving their decisions. However, data collected indicate significant trends in migrants’ evaluation of critical variables driving decisions, how they relate to one another, and their significance to these migrants. Thus, migrant assessments of the conditions of these variables in both previous and current communities reveal a more complex, contextual picture. This work demonstrates the potential of cognitive anthropological methods to help unpack migrant decision making and help conservation managers understand the factors that drive migration to surrounding communities. The analysis provides further evidence supporting calls for methods that help managers and communities understand the particularities of migration behavior in PA contexts.

Key Words: buffer zones; conservation; Costa Rica; cultural consensus theory; cultural domain; migration; national parks; protected areas

INTRODUCTION

The relationship between population growth in protected area (PA) buffer zones and its potential impacts upon biodiversity is a concern for conservation biologists, practitioners, policy makers, and social scientists (Ypsilantis 1992, Harmon and Brehin 1994, Scholte 2003, Hoffman 2017, Ogletorpe et al. 2007). The negative effects of habitat fragmentation on biodiversity resulting from population-induced pressure on resources within and outside PAs is a primary concern (Hansen and Rotella 2002, DeFries et al. 2005, Hansen and DeFries 2007). Fragmentation in human-dominated landscapes outside PAs can increasingly isolate plant and animal populations with concomitant impacts on genetic flow, decrease species resilience to changing environments and the effects of climate change; and lower species richness both outside PAs and inside PA borders (Sherbinin and Frankenberger 1998, Hansen and DeFries 2007, Estes et al. 2012, Bamford et al. 2014). Another issue derived from increasing human populations on the borders of PAs is the threat of direct consumption and trade in plants, trees, and wildlife (Bamford et al. 2014). It is, therefore, critically important for biodiversity conservation and conservation practitioners to understand the processes that drive population growth in PA buffer zones.

As with all human population growth there are two possible explanations of PA buffer zone population increases: localized birth rate increases or the arrival of new populations via migration. This paper engages the latter causal mechanism with the specific aim of investigating the ways that PAs and PA policies are linked, or not, to migrant decision making. George Wittemyer and colleagues’ seminal paper in Science (2008) shows that excessive population growth measured on PA edges is rooted in migration, not natural population growth. Their study, based on 306 PAs in Africa and Latin America, showed population growth in PA buffer zones exceeding that of comparable rural areas (Wittemyer et al. 2008). Further, Wittemyer et al. (2008) hypothesized that this migration was the result of the socioeconomic benefits created by the dominant conservation praxis of the late 20th century, specifically conservation and development projects. They suggested that migration-based growth is encouraged by PAs because conservation and development policies provide economic incentives (e.g., employment opportunities), ecosystem services (e.g., natural resources), and infrastructural benefits (e.g., roads) not present in similar rural locations, which “pull” migrants to PA buffer zones.

The Wittemyer et al. (2008) article is widely cited, often uncritically (Hoffman 2017). An analysis conducted in June 2020 showed over 350 citations according to Scopus and over 620 citations according to Google Scholar. That said, the findings and hypotheses from the article have been critiqued from several angles. First, some explicitly question the methods and analysis upon which their hypotheses are based (Joppa et al. 2008, 2009, 2010, Joppa 2012). Others caution that the hypothesized connection between PAs, conservation and development policies, and human migration to buffer zones is not fully supported when specific conservation contexts are examined (Davis 2011, Fay 2011, Hoffman 2011, Hoffman et al. 2011, Estes et al. 2012, Zommers and MacDonald 2012, Bamford et al. 2014, Salerno et al. 2014, Gupta 2015, Hartert et al. 2015, Ament and Cumming 2016, Brambilla and Ronchini 2016, Cripps and Gardner 2016). To their credit, Wittemyer et al. (2008) suggested that the hypothetical explanations based on their meta-analysis needed to

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be analyzed in specific contexts. Attempts have been made to produce explanatory models on the relationship between PAs and migration based on the synthesis of contextual, anecdotal information, or both (Oglethorpe et al. 2007, Scholte and De Groot 2010).

Since its publication, some work has explicitly explored the veracity of Wittemyer et al.’s hypotheses on the relationship between PAs and migration (Hoffman 2011, Levang et al. 2012, Guerbois et al. 2013, Baird 2014, Bamford et al. 2014, Salerno et al. 2014, Gupta 2015, Hartter et al. 2015). Most analyses are based upon a combination of demographic, geospatial, and interview / survey methods to determine the following: (a) demographic changes and migration patterns; (b) locations of demographic and ecological change; and (c) attitudes and/or motivations of migrants in communities within the buffer zones of PAs. The social science methodologies are dominated by focus group, survey, and oral history approaches, and only a few studies exclusively focus on understanding migrant perspectives. At regional or PA-level scales, these authors find some evidence to support Wittemyer et al.’s (2008) “attraction model,” but state that refining the scale of analysis illuminates variation based upon demographics, environmental factors, and political-economic history. Yet, none of these studies explicitly utilize cognitive approaches to determine whether migrants to PA buffer zones think similarly about the relationship between migration and specific, contextual factors.

Thus far, the research on PAs, population growth, and migration has not demonstrated a singular pattern, and testing Wittemyer et al.’s hypotheses in relation to cognitive data explicitly derived from migrant perspectives and motivations was not yet attempted. In order to fill this gap in knowledge and test the hypothesized drivers or PA-buffer zone migration, we examine Costa Rican migrants’ motivations for relocating to the 10-km buffer zones of three Costa Rican National Parks: Carara, Arenal, and Barra Honda. Ten km buffer zones were intentionally chosen in order to replicate the limits employed by Wittemyer et al. (2008). We combine cognitive anthropological methods, particularly cultural consensus analysis (CCA), to examine the relationship between PAs, human migration, and population growth in PA buffer zones. CCA tests the shared knowledge of a societal sub-group regarding a particular cognitive realm or “domain,” in this case Costa Rican migrants and their motivations for migrating to PA buffer zones. It is important to note that this study specifically focused on the internal migration of Costa Ricans and not that of foreigners. By applying these methods to three different national park contexts in Costa Rica, we test whether a general cultural model of migration can be built and whether Costa Rican buffer zone migrants’ motivations reflect the hypothesis proposed by Wittemyer et al. (2008).

METHODS

Rationale for parks selected
We intentionally selected Carara, Arenal, and Barra Honda national parks (see Fig. 1) out of the 26 national parks and the 160 PAs in Costa Rica for several reasons. First, it was important to maintain consistency by only investigating national parks. Costa Rica has various categories of PA ranging from those that do not allow resource use (i.e., national parks) to those that integrate resource exploitation into its mandate (i.e., protected zones). Standardizing the park category ensured consistency and removed spurious correlations related to the potential for legal resource use within PA borders. Second, all three parks were included in the data set that formed the basis for Wittemyer et al.’s (2008) original analysis. Third, this approach differs from Wittemyer’s indiscriminate use of PAs that failed to create a consistent and comparable sample for which they were already critiqued (see Hoffman 2011). Finally, earlier published research showed very divergent characteristics leading to different migration patterns in these parks (Hoffman 2011).

Carara is characterized by a buffer zone with explosive population growth due to internal migration, but this is largely unrelated to the park in itself and could be characterized as “incidental.” Carara is located on the central Pacific coast and very close to several growing beach communities such as Jacó and Playa Herradura. Arenal was seen as the best fit for Wittemyer et al.’s “pull” model and potentially provided insight into migration to buffer zones that fit an idealized conservation and development paradigm. Arenal is famous for its picturesque namesake volcano and the ecosystem services it provides, such as hot springs, along with a diverse set of conservation and tourism development initiatives within a 40-km radius. Thus, the Arenal region supports a robust ecotourism-based regional economy in addition to strong agricultural production. Last, Barra Honda had virtually no population growth and very little internal migration to its buffer zone that enabled it to function as a “control” in which the link between development, migration, and the park is largely non-existent. Barra Honda offers its unique cave system for exploration, but there is little
other tourist attraction to the area, and the surrounding communities are characterized by a rural economy in decline for decades. It is precisely because of these marked variations in context that they were chosen.

Cultural consensus analysis

Cultural consensus analysis (CCA) allows social scientists to test whether a group of people has a set of knowledge or perceptions upon which there is agreement / consensus (Miller et al. 2004, Bernard 2017). CCA is a statistical method that grew out of cognitive anthropology and cultural consensus theory (CCT), which views culture as sets of knowledge that are shared by members of a society. From this perspective, it is the sharing of and consensus about this knowledge that forms the basis for what is commonly referred to as culture (d’Andrade 1984, Dressler et al. 2005, Copeland 2011). CCT assumes that groups share a single cultural model and that social scientists can determine the degree to which there is consensus in a group about a certain cultural domain via mathematical testing (Romney et al. 1986, 1987, Borgatti 1994). A domain is an organized set of words, concepts, sentences, all on the same level of contrast, that jointly refer to a singular conceptual sphere (Weller and Romney 1988). Thus, CCA allows researchers to probe variation within groups and to decipher cultural “truths” and the degree to which these truths are shared in a statistically meaningful, reliable, and replicable way (Strong and White 2020). By acknowledging informants’ given answers as being probabilistic rather than inherently true, CCA searches for cultural truths not in individual responses but in the degree of sharing of these responses (Strong and White 2020).

Statistically, CCA works from a correlation matrix of respondents to estimate a linear function summarizing the similarities in their ratings (Dressler et al. 2018). There are two general approaches to operationalizing CCT theory in the form of CCA, the formal and informal model. This work uses the informal model, which is essentially a factor analysis (principal components analysis) of people (Weller 2007). In the informal model, each participant is given a competence score that tells the researchers how well each individual’s responses correspond with those of the group. The informal model is, therefore, a set of statistical procedures that estimates both the answers to questions and respondent accuracy for answering those questions, which is calculated as a competence score (Weller 2007). A competence score is a measure of the degree to which participants’ individual knowledge fits to that of the overall model developed from the entire group (Romney et al. 1986, Dressler et al. 2005, Copeland 2011). The correlations of individuals to the linear function provides their cultural competence, or the degree to which their understanding of the domain corresponds to the aggregated knowledge (Dressler et al. 2018). Individuals’ responses can then be combined in a weighted average (weighted by each respondent’s competence), which is referred to as the culturally correct answer key that is, in essence, how a culturally competent member of that society would answer those questions (Dressler et al. 2018). In sum, CCA facilitates the determination of the existence of a cohesive cultural domain, the cultural competence of each respondent, and the culturally “correct” answer key to the survey (Strong and White 2020).

Whether the data demonstrates a shared cultural model is dependent on several results from the analysis, which are processed using software packages. In this study, we utilized Anthropac (4.98) for our CCA analyses. CCA literature consistently states that the standard thresholds and minimum requirements to indicate strong consensus are the following: (1) a 3:1 ratio of the first factor eigenvalue to the second factor eigenvalue; (2) an average competence score of 0.6 or greater; (3) no negative competence scores; (4) at least 20 questions or “factors”; and (5) a minimum number of 30 participants, although this last point can be surmounted by a higher average competence score indicating model validity (Weller 2007, Bernard 2017). There is broad agreement regarding these thresholds, but others note that they are merely “rules of thumb” and that their strict use for indicating consensus within a group can be challenged mathematically (Purzycki and Jamieson-Lane 2017). As long as the other requirements are met, an average competence score of 0.5 already indicates consensus and that anything above 0.66 indicates strong consensus among the group (Weller 2007). Last, it is “by custom” that we use the first eigenvalue being three times larger than the second to determine that shared culture is driving the answers (Weller 2007).

Ultimately, CCA provides researchers with the ability to systematically verify whether there is a shared set of knowledge, and how well that knowledge is shared, amongst a group (Gatewood 2012). It was precisely CCAs capability to detect shared knowledge that drove our decision to employ it in our analysis of human migration to the buffer zones of Costa Rican national parks. The thought was that we could prove or disprove the “attraction” hypothesis put forth by Wittemyer et al. (2008) by eliciting a set of core driving concepts / conditions and testing them for agreement using CCA. In so doing, CCA would help to identify whether there is a single set of factors driving migration to all three parks, or whether specific contextual factors specific to each park could be identified in migrants’ thinking.

This study followed a three-staged research procedure commonly applied in CCA research (Boster 1986, Romney et al. 1986, Bernard 2017). First, we conducted free-listing to establish the domain. Second, we used pile-sorting to understand participants’ categorization of terms within the domain. Third, we gathered ratings data on each of the terms within the domain to determine if there was consensus.

Freelisting

Freelisting is a common, proven, and statistically powerful way of establishing a group’s shared knowledge or cognitive domain (Berlin 1992, Brewer 1995, Quinlan 2005). Successive freelisting is also a proven technique for eliciting explanatory models (Ryan et al. 2000). Freelisting with informants provides the “domain” of terms upon which the consensus analysis was subsequently based. Freelisting was conducted during a one-month research trip in May/June 2012. The primary author used convenience sampling and the snowball method to encounter migrants in the main communities in the 10 Km buffer zones of each of the three parks selected. However, during this stage there was neither an attempt to find more specific areas where migrant households were concentrated nor a method for identifying areas more likely to have recent migrants. In total, thirty migrants to each of the buffer zones (N = 90) were interviewed. In that group 55 were men and 35 were women, the average age was 44.4 years old, and they ranged from 21 to 77 years old with a standard deviation of 15.2. Participants had spent average of 11.7 years in their current community. Participants provided a free list of words or phrases
in response to the following questions concerning characteristics of previous and current communities, ideal communities, and why people would choose to relocate:

1. What are the characteristics of this place that are attractive or are positive for migrants?
2. What are the characteristics of this place that are not attractive or are negative for migrants?
3. What are the characteristics of the town from which you migrated that are attractive or positive for migrants?
4. What are the characteristics of the town from which you migrated that are not attractive or are negative for migrants?
5. What factors (of the place) does a migrant take into account to migrate to a place?
6. What factors (of the place) does a migrant take into account to migrate away from a place?
7. What are the characteristics of your ideal community?

These freelists resulted in thousands of terms and concepts, which were re-coded by hand to reduce the number of unique terms and facilitate the analysis of salience and frequency of terms. For example, if multiple terms were used to describe the concept of work (jobs, employment, work, work opportunities), they were condensed to a single concept (work). Appendix 1 shows an example of this transformation for a sample of 30 migrants’ responses to the first question. After recoding, the resulting terms for each question were analyzed for salience using Smith’s S in Anthropc (4.98). Salience is a measure that combines the frequency of a term in participants’ lists and the rank order of the term in the freelist to determine the most relevant terms across the sample (Borgatti 1999, Ribeiro 2012). All terms from each of the questions with a Smith’s S result of 0.2 or higher were included in the final domain for the next stage of analysis. In addition, we also used simple frequency of terms to determine whether there was a clear “break” point where responses belonged to a core set of ideas frequently found across participants’ freelists (Borgatti 1994). In this case, an “elbow” in data indicating this break appeared at 10% frequency, so all terms found in 10% of participants’ freelists were added to the domain. The truncated results of the freelist analysis are available in Appendix 2. As a result of these two steps, we identified an overall domain of 55 terms (see Table 1) deemed to be the most salient in migrants’ assessments of community conditions driving movement to the buffer zones of Carara, Arenal, and Barra Honda National Parks.

**Pile-sorting and ratings**

The next step in the process was to conduct pile-sorting and ratings activities with a new set of participants. Unlike free-listing, our sampling strategy for this stage of data collection refined our focus with the intention of providing a more accurate picture of recent migration trends. The Development Observatory (Observatorio de Desarrollo, OdD) at the University of Costa Rica utilized the 2011 Costa Rican Census to determine the location of recent migrants and provide a sampling strategy for our fieldwork. To do this, the OdD needed to map the park boundaries, map 1 km concentric rings out to 10 km, determine the geostatistical minimum units (GMU, akin to a census tract) included in each ring, and analyze the population growth in each

| Number assigned | Terms |
|-----------------|-------|
| 1               | La seguridad (Security) |
| 2               | La gente (People)       |
| 3               | La tranquilidad (Tranquility) |
| 4               | El trabajo (Work)       |
| 5               | El clima (Climate/Weather) |
| 6               | La playa (Beach)        |
| 7               | El ambiente social (Social Environment) |
| 8               | El turismo (Tourism)    |
| 9               | El parque (The Park)    |
| 10              | Los animales silvestres (Wild Animals) |
| 11              | La calidad de vida (Quality of Life) |
| 12              | El volcán (Volcano)     |
| 13              | La paz (Peace)          |
| 14              | Los ríos (Rivera)       |
| 15              | Limpio (Cleanliness)    |
| 16              | Lugar Bonito (Beauty)   |
| 17              | La inseguridad (Insecurity) |
| 18              | Sano (Healthiness)      |
| 19              | La violencia (Violence) |
| 20              | Los servicios (Services) |
| 21              | La cultura (Culture)    |
| 22              | La educación (Education) |
| 23              | Las drogas (Drugs)      |
| 24              | El desempleo (Unemployment) |
| 25              | Los precios (Prices)    |
| 26              | Los servicios médicos (Medical Services) |
| 27              | El alcoholismo (Alcoholism) |
| 28              | El gobierno (Government) |
| 29              | La basura (Garbage)     |
| 30              | La contaminación (Contamination) |
| 31              | El agua (Water)         |
| 32              | La prostitución (Prostitution) |
| 33              | Ser céntrico (Centrality) |
| 34              | La familia (Family)     |
| 35              | Las comodidades (Amenities) |
| 36              | El transporte (Transportation) |
| 37              | El ruido (Noise)        |
| 38              | Las áreas deportivas (Sports facilities) |
| 39              | La agricultura y la ganadería (Agriculture and Livestock) |
| 40              | El comercio (Business)  |
| 41              | La comida (Food)        |
| 42              | La delincuencia (Delinquency) |
| 43              | Sobrepoblación (Overpopulation) |
| 44              | Las carreteras (Roads)  |
| 45              | La pobreza (Poverty)    |
| 46              | El campo (Countryside)  |
| 47              | El transito (Traffic)   |
| 48              | Los robos (Robberies)   |
| 49              | La economía (Economy)   |
| 50              | La superación (Improvement / overcoming) |
| 51              | La recreación (Recreation) |
| 52              | La luz (Electricity)    |
| 53              | El Banco (Bank)         |
| 54              | La naturaleza (Nature)  |
| 55              | El Supermercado (Supermarket) |

**Table 1. Freelist terms determined to be salient and belonging to the cultural domain and then used in rating and pile sorting exercises.**
Table 2. Number of migrants and percentage of migrants in each buffer zone ring in each park based on the 2011 census.

| Kilometers from PA border | Arenal | Barra Honda | Carara |
|--------------------------|--------|-------------|--------|
| N (%)                    |        |             |        |
| 1 km                     | 90     | 2.60        | 57     | 2     | 72   | 2   |
| 2 km                     | 195    | 5.60        | 69     | 3     | 165  | 4   |
| 3 km                     | 168    | 4.80        | 122    | 5     | 181  | 5   |
| 4 km                     | 488    | 14.00       | 125    | 5     | 175  | 5   |
| 5 km                     | 296    | 8.50        | 96     | 4     | 173  | 5   |
| 6 km                     | 328    | 9.40        | 106    | 4     | 743  | 20  |
| 7 km                     | 468    | 13.40       | 232    | 9     | 359  | 10  |
| 8 km                     | 180    | 5.20        | 235    | 9     | 491  | 13  |
| 9 km                     | 483    | 13.80       | 628    | 25    | 677  | 18  |
| 10 km                    | 796    | 22.80       | 837    | 33    | 691  | 19  |
| Total                    | 3492   | 100.00      | 2507   | 100   | 3727 | 100 |

Table 3. The Development Observatory (Observatorio de Desarrollo, OdD) sampling strategy used for pile-sorting and ratings exercise. This was based on analysis the 2011 census for migration-based population growth. OdD provided a target number for each 1-km buffer ring at sample sizes of 45, 60, and 100 interviews. 100 interviews was selected.

| Buffer (m km) | Sample Size 45 | Sample Size 60 | Sample Size 100 |
|---------------|----------------|----------------|-----------------|
| Arenal        | Barra Honda    | Carara         | Arenal          | Barra Honda | Carara |
| 4             | 3              | 2              | 0               | 3            | 2     | 0     |
| 6             | 0              | 0              | 11              | 0            | 15    | 0     |
| 7             | 3              | 0              | 5               | 0            | 8     | 0     |
| 9             | 4              | 3              | 3               | 5            | 4     | 4     |
| 10            | 9              | 4              | 4               | 11           | 5     | 6     |
| Total sample  | 18             | 8              | 19              | 24           | 11    | 25    |

This “hot spot” approach enabled our small research team to focus fieldwork efforts on areas where it was likely for us to encounter recent migrants. Once we arrived at these hot spots, we often began our search with the proprietors of local stores, pulperias, to help us identify migrant households. Once identified and confirmed, we conducted the interview if they were willing as was indicated by prior, informed oral consent. To find more participants we used a snowball or “chain reference” approach by asking interviewees to identify other potential participants. Pile-sorting and scalar rating interviews were conducted over four weeks in May and June of 2013. The interviews were conducted primarily at places of residence and in Spanish. We interviewed 41 migrants in the buffer zone of Carara, 41 in that of Arenal, and 18 in that of Barra Honda. The demographic characteristics of our sample for each park and all three parks together can be seen in Table 4.

Interviews varied in length, but averaged approximately 30–45 minutes. The first task in the interview was an unconstrained pilesort. All participants were presented with 55 laminated notecards for each of the terms from the domain. To reduce bias from the interviewers or previous participants’ sorting, the terms were randomized and assigned a number and each of the participants received the notecards in the same order. In order to be “unconstrained,” participants were asked to put the cards into piles/groups in any way that made sense to them, that there was no right answer to the number of piles or how the piles should be organized. Once the participants were satisfied with their sorting, the numbers for the terms in each pile were recorded and the cards were returned to numerical order.

For the second task of the interview, participants were asked to rate the conditions / state of each of the 55 terms (Likert scale of 1–5) first for the community from which they had moved (hereafter referred to as the “previous” community) and then again for their current location within the buffer-zone of the national park (hereafter referred to as the “current” community). The number 1 represented very poor conditions, 3 average conditions, and 5 indicated very good conditions. Respondents were asked to rate each term for both their previous and current community. For example, we asked “How would you rate the people there (here)’” “¿Como calificaría la gente allí (aquí)?” This wording was somewhat confusing for participants and they were at times unclear if we were asking for how they personally saw the conditions, or how the conditions were perceived in general. Because we were aware that CCA is dependent on general answers and not individual, personal opinion, we clarified that we sought out ratings “in general” (por lo general).

ANALYSIS AND RESULTS

Pile sorting: MDS and consensus

Pile sort data were compiled and entered into Visual Anthropac and were analyzed using multi-dimensional scaling (MDS), clustering and consensus. The MDS analysis produces a visualization, often referred to as a “cognitive map,” of the collective pile-sorting of a sample. Because the research team was interested in attempting to construct a cognitive model of migration for the entirety of migrants to all three parks’ buffer zones, MDS was performed on all 100 of the interviewees’ pile-sorts. The resulting images (see Fig. 3 for MDS by number and Fig. 4 for MDS by term) provide a two-dimensional representation of participants’ pile-sorting; the closer together terms are on the MDS the more frequently they were piled together and vice-versa. In addition, hierarchical clustering demonstrates the ways in which participants clustered items in their pile-sorting. As can be seen on the MDS images, five clusters were established: (1) negative / urban (blue); (2) government and business services (pink); (3) essentials for improving oneself (orange); (4) social/community conditions (black); and (5) natural resources and amenities (green).

Because pile-sort data must be converted from its multiple dimensions to fit into a two-dimensional rendering, MDS runs the risk of misrepresenting the data. Anthropac provides a “stress” value to indicate how well the image represents the original data; the closer to zero the stress value the more accurate the map is (Copeland 2011). In addition, acceptable maximum values for stress have been standardized based on the number of
Fig. 2. Each parks’ 10-km buffer zones, minimum geostatistical units (GMU), and those GMU determined to be hot zones (zonas calientes) for recent migration highlighted in green. From left to right the parks are: Barra Honda National Park, Arenal Volcano National Park, and Carara National Park.

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items to be sorted (Sturrock and Rocha 2000). For our MDS, the stress value was 0.151, which is well below the threshold of 0.372 for a domain of 55 terms as established by Sturrock and Rocha (2000).

Further, Anthropac enables users to test pile-sorting data for consensus by comparing each participants’ pile sorts against all others via a factor analysis. As discussed above, the eigenratio should be 3:1 to indicate strong consensus. In our case, the pile sort data produced an eigenratio of 11.647, which indicates a strong fit to the consensus model. This means that there was strong agreement amongst our participants regarding how these terms are related to one another cognitively, and thus it can be assumed that the group shares a cultural understanding about how the terms within the specific domain relate. Put simply, our informants indicated a shared understanding of how to group these terms.

Rating task: consensus analysis
To further test consensus, we used Anthropac (4.98) to analyze the 100 participants’ ratings of 53 terms within the domain for both the previous and current community. Upon realizing that the terms “beach” and “volcano” were not found in or relevant to many participants’ previous or current location we removed those ratings and conducted our analysis on the remaining 53 terms. We tested for consensus on various subsets of the data in order to understand whether the contexts of individual parks, and/or how the communities from which participants migrated, potentially impacted consensus. First, we tested all of the ratings data for all three parks and for both the previous and current community together. Second, we analyzed the ratings of just the previous and just the current communities for all three parks combined. Third, we conducted analyses on previous, current, and the combined data sets for each of the parks separately. By parsing the analysis in this way, we intended to differentiate whether these sub-groupings differed in terms of the existence and/or strength of consensus. In so doing, we intended to test the ratings data for the following: (a) consensus around an overall cultural model for the entire sample; (b) consensus around a model for each individual park context; and (c) differences in consensus on ratings of previous versus current communities for both the total sample and for each individual park’s buffer zone. The consensus results are shown in Table 5, which also includes
Table 4. Basic demographic and migration history data of the 100 participants in our pile sort and rating exercises.

|                      | Arenal (N = 41) | Carara (N = 41) | Barra Honda (N = 18) | Total (N = 100) |
|----------------------|----------------|----------------|----------------------|----------------|
| Age                  | 43.7           | 41.2           | 43.4                 | 42.6           |
| Years in previous    | 21.8           | 23.5           | 17.8                 | 21.8           |
| Years in current     | 7.8            | 5.2            | 6.2                  | 6.4            |
| Median               | 42             | 40             | 41.5                 | 41             |
| Mode                 | 41             | 33             | 42                   | 33             |
| Max                  | 78             | 72             | 76                   | 78             |
| Min                  | 20             | 18             | 20                   | 18             |
| Years in previous    | 2               | 0.0055         | 0.66                 | 0.0055         |
| Years in current     | 0.0055         | 0.0055         | 0.019                | 0.0055         |

Fig. 3. Multi-dimensional scaling (MDS) and clusters for all 100 participants' pile sorting. Numbers correspond to numbers assigned to each term found in Table 1.

In brief, consensus analysis performed on the ratings data from all three parks combining both previous and current communities fails to meet the standards for consensus, which means there is not a single, shared cultural model for the entire data set. As well, there is no consensus in our data when results for the entire sample from all three parks are parsed and analyzed by previous or current community (e.g., "All Parks Previous" or "All Parks Current" in Table 5). When the data is broken down by individual park, there is also no consensus when both previous and current community ratings are combined (e.g., "Carara combined"). In addition, all of these analyses have at least one negative competence score, and some of them have many negative scores, which further demonstrates the lack of a single cultural model. When the individuals with negative scores were identified, there were no obvious or discernable patterns amongst them (e.g., age, occupation, gender). Although most of the negative scores were found in the 1 km rings furthest from the parks (km 9 and km 10), each parsing contained several individuals at the same distance that had positive competence scores. Put simply, our results indicate that there is little agreement and not a single cultural model of migration to national park buffer zones amongst our sample of migrants in Costa Rica.

However, our analysis does indicate that there is evidence for consensus amongst our informants in their ratings of conditions in their current community within the buffer zone of Carara. In addition, the current community ratings for Arenal National Park are very close to meeting standard thresholds discussed above. With an average competence score of 0.49, Arenal informants' ratings come very close to the threshold of 0.5, but they do not quite meet 3:1 eigenvalue ratio expected. It is tempting to say that the Carara results are approaching the standards for consensus. However, they do not because of the more stringent standards required for a sample size below 30 individuals (Weller 2007). In sum, the ratings data indicate that, for one out of three parks, there was a shared cultural model among recent migrants regarding their current community.

**Ratings tasks: statistical comparison of previous and current**

The lack of consensus was somewhat surprising considering the consistency in explanations the research group knew qualitatively from discussions with migrants. Thus, we subjected the ratings data to a separate statistical analysis to see whether there were identifiable and significant trends in migrants’ assessments of these 53 terms for previous and current communities. In order to determine which ratings demonstrated statistically significant differences between prior and current communities, we compared the previous and current ratings data of the 53 terms for the entire sample. In this analysis, we used the non-parametric Wilcoxon signed-rank test (Wilcoxon 1945). Because this approach involves multiple comparisons, we applied a Bonferroni correction (Bonferroni 1936) to the significance level, which reduces the probability of a Type I error.

We found that 23 of the variables had a statistically significant change in rankings (marked with a * in Table 6). Overall, this analysis shows that many terms that are associated with the negative realities of urban living were not only improved, but in a statistically significant way. Thus, migrants indicated significant improvement in conditions like insecurity, contamination, delinquency, traffic, contamination, noise, violence, and overpopulation. The same can be said for most terms associated with the ability to live life with peace, tranquility, beauty, and security. Third, terms associated with rural life and livelihoods (nature, beauty, animals, rivers, agriculture and livestock, tourism, and the park) are also significantly improved.

Interestingly, a number of terms that were generally rated as improved when looking simply at their means were not different in a statistically significant way. Many of these are related to social ills that are not unique to urban settings such as poverty, drugs, prostitution, and alcoholism. As well, the lack of a significant
Fig. 4. Multi-dimensional scaling (MDS) and clusters for all 100 participants’ pile sorting labeled with the actual terms from Table 1.

difference between ratings on terms like garbage and roads indicates that the perception is that these government services are poorly managed across the country. Last, the lack of a statistical difference in their ratings of healthiness, cleanliness, social environment and people indicates that migrants see these socio-environmental conditions as stable across the country, that buffer zones of national parks do not provide a difference in these areas. However, the fact that there is a statistically significant difference in ratings on the overall quality of life indicates that park buffer zones do provide an overall sense of improved life conditions that are attractive to Costa Rican migrants.

Our results show that only four terms were perceived as significantly worse in buffer zone communities (see Table 6). These negative ratings for three of these terms are found in services that are impacted by geographic isolation and/or the integration of these communities with tourism-based economies. First, prices were seen as significantly worse, which is a phenomenon that is frequently associated with tourism-based economies and isolation. Further, migrants perceived that access to transport was significantly worse in the buffer zones. Third, migrants rated medical services as significantly poorer, which is again the reality for rural Costa Rica especially in comparison to the facilities and treatments available in urban and suburban San José. Last, climate was the one term that was rated as significantly poorer. This is attributable to the fact that all three parks were in warm, lowland climates that were being compared to the urban, highland, and cool areas like the capital of San José from which many migrants had moved.

DISCUSSION

The findings uncovered via our work in Costa Rica contribute important, migrant-centered, contextual data that illuminates what factors drive migration decisions to PA buffer zones. Our research was designed to use a CCA approach to see whether there is consensus amongst migrants’ motivations, which could be further used to test the singular “pull” model put forth by Wittemyer et al. (2008). In so doing, our work adds the following to the conversation regarding PAs and human migration: (1) CCA results further complicate the hypothesized direct links between PAs, integrated conservation and development, and population growth proposed by Wittemyer et al. (2008); (2) results contribute to the numerous studies that highlight the importance of understanding local contexts, as well as concerns regarding scale, representativeness of sample populations, and accuracy of conclusions; (3) we add new methods and resulting insights into what role PAs play in driving migration to the existing literature on human migration to PA buffer zones; and (4) a unique demographic methodology that supports existing critiques of the Wittemyer et al. methodology and findings.

As was stated at the outset of this paper, some studies have criticized the methods by which Wittemyer et al. (2008) derived their evidence, as well as their hypothesized, generalizable, worldwide drivers for the results they observed (Joppa et al. 2009, 2010, Hoffman et al. 2011, Joppa 2012). Because of the lack of consensus in our study, we join others in demonstrating that, even within a single country, the social, political, economic, and ecological contexts surrounding every park are unique and must be taken into account when explaining the patterns of human population growth found there (Fay 2011, Hoffman 2011, Guerbois et al. 2013, Hartter et al. 2015, 2016). Importantly, our deployment of cultural consensus analysis offered a unique perspective from which to assess migrant motivations. Disagreement shown in the lack of cultural consensus for previous and current community conditions across the entire sample suggests that a singular explanation or causal mechanism for migration to PA buffer zones is unlikely. In fact, the lack of
Table 5. Consensus analysis results on ratings data. The minimum requirements for consensus are (1) a 3:1 eigenvalue ratio; (2) average competence of 0.6 or greater; (3) no negative competence scores; (4) at least 20 items; and (5) a minimum number of 30 participants.

| Park and community          | Number of interviewees | Number of items | Eigenvalue ratio | Average competence score | # of negative competence scores | Negative scores            |
|----------------------------|------------------------|----------------|------------------|--------------------------|---------------------------------|------------------------------|
| All parks combined         | 100                    | 106            | 2.68             | 0.43                     | 12                              | (-0.13, -0.18, -0.17, -0.28, -0.08, -0.10, -0.01, -0.20, -0.12, -0.13, -0.22, -0.14) |
| Carara combined            | 41                     | 106            | 2.52             | 0.45                     | 5                               | (-0.10, -0.20, -0.15, -0.24, -0.01) |
| Arenal combined            | 41                     | 106            | 2.05             | 0.42                     | 5                               | (-0.07, -0.12, -0.06, -0.02, -0.18) |
| Barra Honda combined       | 18                     | 106            | 4.24             | 0.52                     | 2                               | (-0.08, -0.02)               |
| All parks previous         | 100                    | 53             | 2.46             | 0.43                     | 18                              | (-0.13, -0.03, -0.49, -0.13, -0.42, -0.39, -0.52, -0.19, -0.07, -0.07, -0.22, -0.04, -0.23, -0.34, -0.22, -0.01, -0.51, -0.27) |
| Carara previous            | 41                     | 53             | 3.32             | 0.43                     | 8                               | (-0.19, -0.08, -0.01, -0.53, -0.17, -0.46, -0.39, -0.52) |
| Arenal previous            | 41                     | 53             | 1.85             | 0.42                     | 6                               | (-0.13, -0.01, -0.20, -0.13, -0.28, -0.14) |
| Barra Honda previous       | 18                     | 53             | 2.88             | 0.57                     | 1                               | (-0.14)                      |
| Carara current†            | 41                     | 53             | 2.70             | 0.49                     | 2                               | (-0.03, -0.22)               |
| Arenal current†            | 41                     | 53             | 2.94             | 0.53                     | 0                               |                              |
| Barra Honda current†       | 18                     | 53             | 3.29             | 0.47                     | 1                               | (-0.23)                      |

1 Meets standards.
† Approaching standards.

Consensus within almost all our analytical subsets, apart from the Carara “current” community, can be seen as evidence that singular explanations are unhelpful.

The lack of consensus for the combination of both previous and current communities is likely due, in part, to the variation in previous communities from which migrants arrived to the parks’ buffer zones. Although there were a few locations that “sent” multiple migrants, both our overall sample for each park and for individual parks showed incredible diversity in sending communities. Clearly, the diversity of previous communities impacted the consensus results for the “previous”-only analyses. This same variation in ratings of their previous communities is what likely lead to the lack of consensus for the “combined” analyses. Ultimately, the near complete lack of ratings consensus shows that despite some level of agreement among migrants (seen in the free listing, pile sorting, and comparison of means results), migration to PA buffer zones is complex and contradictory. The statistical analysis of respondents’ ratings illuminates those terms found within the domain that are seen by migrants as notably different between their previous and current communities. First, a number of the negative elements usually associated with urban living like overpopulation, noise, violence, delinquency, poverty, and insecurity are rated as improved. Second, themes associated with the ability to live life with peace, tranquility, beauty, cleanliness, and security are all seen to be improved in their current communities. Not surprisingly, many of these themes are the opposite of negative conditions that our participants frequently associated with their previous, often urban, communities. Third, terms associated with the rural life and livelihoods based on natural resources (nature, beauty, animals, rivers, agriculture and ranching, tourism) were rated as significantly better. Statistical analysis shows that those terms with positive improvement can be interpreted as “pull” conditions in the current buffer zones, especially when seen in relation to their previous communities and the “push” conditions found in those locations. Overall, this provides insight into the conditions that migrants have sought out and support the earlier conclusion particular to Costa Rica (Hoffman 2011, Hoffman 2020) that, despite some sacrifices in convenience and services, the peace, security, natural amenities, and overall quality of life in the buffer zones play an important part in the attraction of migrants to their current communities.

Overall, the statistical analysis of the overall ratings between previous and current conditions shows migrants saw some elements typically associated with conservation and development projects (i.e., tourism) as a draw to their current community. However, a large number of the significant terms have little to do with the opportunities directly provided by PA-based development and, therefore, contradicts the explanation put forth by Wittemyer et al. (2008). Thus, our work further supports the conclusion of Guerbois et al. (2013), that it is critical to approach this question with methods and analyses that document people’s livelihoods, histories, education, perceptions of conservation and PAs, and the natural resources used in each context. Thus, we reinforce the need to combine census and demographic data with social science methods such as surveys, interviews, and focus-groups to disentangle the localized complexity of migration (Salerno et al. 2014, Hartter et al. 2015). We add to this by not only combining geospatial and demographic analyses with traditional social science research methods but also providing insight into the viability of employing consensus analysis as a tool for understanding and uncovering migrants’ motivations.

The consensus data derived from our targeted sampling strategy for pile sorting and rating tasks supports the suggestion that selecting an appropriate scale of analysis is critically important because of the high levels of variability within all of these potential drivers that exist in the buffer zones of individual parks (Salerno et al. 2014, Salerno 2016). The collaboration with OdD and targeted “hot spot” methodology allowed us to focus our interviews in the places where migration was most prevalent rather than being distracted by existing population centers or anecdotal evidence. By answering Salerno et al.’s call for employing appropriate scales as determined by a combination of geospatial and demographic analyses as the basis for our work, we were able...
Table 6. Results of Wilcoxon signed-rank test. This test compared all 100 participants’ average ratings of conditions in their previous and current communities for each of the salient terms.

| Term                          | Average rating | Difference | P-value  |
|-------------------------------|----------------|------------|----------|
| Previous                      | Current        |            |          |
| Tranquility*                  | 3.05           | 3.96       | 0.91     | 6.835E-06  |
| Security*                     | 2.7            | 3.41       | 0.71     | 0.000828   |
| Peace*                        | 2.99           | 3.88       | 0.89     | 5.907E-07  |
| Quality of life*              | 3.13           | 3.78       | 0.65     | 8.935E-06  |
| Insecurity*                   | 2.39           | 3.14       | 0.75     | 0.0002703  |
| Contamination*                | 2.62           | 3.16       | 0.54     | 0.0004219  |
| Delinquency*                  | 2.17           | 2.82       | 0.65     | 0.0001636  |
| Overpopulation*               | 2.52           | 3.17       | 0.65     | 0.0005139  |
| Traffic*                      | 2.69           | 3.33       | 0.64     | 0.000374   |
| Robberies*                    | 2.27           | 2.84       | 0.57     | 0.001102   |
| Noise*                        | 2.67           | 3.56       | 0.89     | 0.000245   |
| Violence*                     | 2.5            | 3.16       | 0.66     | 0.0003866  |
| Agriculture and livestock*    | 3.09           | 3.77       | 0.68     | 0.000256   |
| Park / protected area*        | 3.26           | 4.21       | 0.95     | 6.2E-08    |
| Beauty*                       | 3.7            | 4.23       | 0.53     | 0.0006063  |
| Countryside*                  | 3.36           | 4.06       | 0.7      | 0.000564   |
| Wild animals*                 | 2.89           | 4.06       | 1.17     | 9.6E-09    |
| Nature*                       | 3.29           | 4.2       | 0.91     | 1.575E-06  |
| Tourism*                      | 2.7            | 3.9        | 1.2      | 1E-10      |
| Rivers*                       | 2.86           | 3.65       | 0.79     | 0.0001143  |
| Poverty                       | 2.28           | 2.6        | 0.32     | 0.02063    |
| Drug problem                  | 2.04           | 2.4        | 0.36     | 0.01951    |
| Prostitution                  | 2.53           | 2.97       | 0.44     | 0.01072    |
| Alcoholism                    | 2.15           | 2.44       | 0.29     | 0.03408    |
| Garbage                       | 2.65           | 3.06       | 0.41     | 0.008153   |
| Roads / highways              | 2.82           | 2.97       | 0.15     | 0.3513     |
| Cleanliness                   | 3.1            | 3.52       | 0.42     | 0.006371   |
| Healthiness                   | 3.21           | 3.52       | 0.31     | 0.03887    |
| Social environment            | 3.36           | 3.55       | 0.16     | 0.1069     |
| People                        | 3.52           | 3.68       | 0.16     | 0.2781     |
| Prices*                       | 2.92           | 2.34       | -0.58    | 0.00003631 |
| Medical services*             | 3.55           | 2.91       | -0.64    | 0.0003871  |
| Climate*                      | 3.83           | 3.23       | -0.6     | 0.0001793  |
| Transport*                    | 3.74           | 2.99       | -0.64    | 0.0009053  |
| Comforts                      | 3.6            | 3.29       | -0.3     | 0.3377     |
| Economy                       | 2.98           | 2.93       | -0.05    | 0.4342     |
| Ability to improve oneself    | 3.21           | 3.07       | -0.14    | 0.3565     |
| Water                         | 3.66           | 3.72       | 0.06     | 0.827      |
| Sports areas                  | 3.38           | 3.23       | -0.15    | 0.3893     |
| Recreation                    | 3.26           | 3.29       | 0.03     | 0.9237     |
| Electricity                   | 3.84           | 3.63       | -0.21    | 0.0279     |
| Bank services                 | 3.66           | 3.31       | -0.35    | 0.04136    |
| Commerce                      | 3.74           | 3.31       | -0.43    | 0.000953   |
| Food                          | 3.71           | 3.69       | -0.02    | 0.2781     |
| Supermarkets                  | 3.65           | 3.26       | -0.39    | 0.7834     |
| Centrality                    | 3.5            | 3.15       | -0.35    | 0.02678    |
| Family situation              | 3.87           | 3.84       | -0.03    | 0.7789     |
| Government                    | 2.68           | 2.68       | 0        | 0.9802     |
| Services                      | 3.55           | 3.22       | -0.33    | 0.01815    |
| Culture                       | 3.48           | 3.42       | -0.06    | 0.5733     |
| Education                     | 3.77           | 3.49       | -0.28    | 0.01877    |
| Jobs                          | 3.09           | 3.04       | -0.05    | 0.8372     |
| Unemployment                  | 2.6            | 2.63       | 0.03     | 0.9574     |
| Beach                         | not analyzed   |            |          |            |
| Volcano                       | not analyzed   |            |          |            |

* Statistically significant.

There are important differences in migrants’ evaluations even within a single park’s buffer zone communities.

Furthermore, the methodology employed here provides rare insight into the specific mindsets of recent migrants that further illuminates the contextual complexities of the PA-migration nexus. Our study is relatively unique in its explicit focus on recent migrants to the PA buffer zones (cf. Salerno 2016). Many studies survey or interview all groups living on the edges of PAs (e.g., Guerbois et al. 2013, Bamford et al. 2014) and/or use interview data from elders to elicit thoughts on how buffer zones have changed over longer periods of time (e.g., Hartter et al. 2015). Others, such as Levang et al. (2012) used targeted methods to find areas that are likely to have new migrants, but deployed interviews and questionnaires among both recent and longer term, second-generation immigrants to PA buffer zone. Although there is no doubt that these studies were able to elicit important information regarding the conditions within PA buffer zones and their relationship to population growth and in-migration, they do not concentrate specifically on relatively recent migrants and their perceptions of buffer zone social, economic, political, and environmental conditions.

Our work joins Salerno (2016) in engaging migrants via mixed field methodologies with the explicit intent of eliciting a model to understand, as well as potentially predict, what motivates migrant decisions. The fact that our data point to factors such as tranquility, safety, and factors outside of resources typically associated with the natural or development-induced resources corroborate Salerno’s findings that migrant decision making to PA buffer zones is driven by a complex mix of factors that go beyond simplistic anecdotes about the attraction of land and natural resources. Our work parallels Salerno (2016) in the use of free-listing with actual migrants to elicit the primary categories driving migrant decisions. Salerno’s (2016) findings offer a very different picture of migration drivers for the radically different context of western Tanzania, which further demonstrates the need for the types of studies we have conducted.

Last, the demographic and mapping work carried out by the OdD supports the critiques of the demographic methods and data sets used by Wittemeyer et al. (Joppa et al. 2009, 2010, Hoffman et al. 2011, Joppa 2012). We did not set out with the specific intent of analyzing the spatial relationship between population growth and PA borders, but the OdD analysis further supports Joppa et al.’s (2009) critical re-analysis of the demographic and spatial data in regard to the relationships between parks and migration-driven population growth. As Joppa et al. (2009) point out, if the park and its resources / development were the main draws for population growth one would expect that the areas of greatest population growth would be in closer proximity to the park boundaries. Joppa et al.’s (2009) re-analysis observed that growth could more likely be an outgrowth of the population expansion of nearby towns and urban centers. Our finer scale census analysis based on GMU supports this position by showing that immigration numbers and “hot spots” are not located within the first few kilometers of the park boundaries (see Table 2 and Fig. 2) for the chosen Costa Rican parks. Instead, the areas of greatest migrant growth were located between 3–5 km and 9–10 km from the park boundaries. This is in part driven by the conditions of the buffers closest to the parks in that they tended to be the least
to disentangle the context-dependent relationship between PAs and migration. In so doing, our work further supports Gupta’s (2015) point that conclusions about migration and PAs are dependent on the scale at which data is analyzed. Our analysis concurs with her suggestion that even when a 10 km-scale shows growth, localized analyses show more variability. Indeed, the lack of consensus on current community conditions points out that
developed, had fewer public services, and were likely to be highly sloped lands unattractive for agriculture. Ultimately, this further complicates the notion that it is access to the parks’ resources, natural or infrastructural, that drives migration.

CONCLUSION

Overall, our research adds further evidence to existing discussions of how to measure the effects of PAs on migration and what evidence would be expected if PAs and their resources were the primary driver of migration decisions. The analyses presented contribute to larger discussions about PAs, human migration, and the effectiveness of conservation and development policies as a strategy for biodiversity conservation. Costa Rican migrants’ perceptions of conditions in the buffer zones of three Costa Rican National Parks both supports and contradicts the connections between PAs, conservation and development, and human migration put forth by Wittmer et al. (2008). Certain conditions in buffer zones were consistently and significantly rated higher by migrants and could be interpreted as conditions that attracted migrants. However, it is critical to note that it seems as if migration decisions were often related to conditions and resources that are not directly produced or provided by the PA or conservation and development policies. Thus, our analyses supports existing qualitative work in these contexts that question whether conservation and development in Costa Rica creates population growth in buffer zones due to in-migration (Hoffman 2011, Dehler 2015, Arends 2017, Hoffman 2020). In so doing, this work provides important contextualization of the relationship between PAs, migration, and population growth, as was suggested by Wittmer et al. (2008). More specifically our work provides empirical data in response to the call for “more real-world examples of immigration to protected areas ... along with information on the reasons for the migration and the benefits that may be provided by the protected area, such as income or natural resources” (Bamford et al. 2014:504).

This study reinforces the conclusions of many scholars regarding the need to base conservation policies upon the specific and varying social-ecological conditions found within the buffer zones of individual PAs. We concur with the others that there is a need to base conservation decisions on the political ecology, policy, and socioeconomic factors and history of individual PA development (Bamford et al. 2014, Levang et al. 2012, Salerno et al. 2014, Hartter et al. 2015). Unfortunately, many PA administrators, national conservation authorities, and NGOs often do not have the skills or the resources, especially time and labor, to conduct such fine-grained analyses in order to understand the ways in which PAs (and other local factors) affect migration and have potential impacts upon the biodiversity they are established to protect. Instead, they are forced to rely on generalizations and anecdotal information to guide policy decisions.

In sum, our work further stresses the need to engage with and understand the impacts of conservation efforts upon local people as has been repeatedly emphasized by social scientists (West et al. 2006, Büscher and Fletcher 2019, Agrawal et al. 2021). This is particularly relevant in light of the forceful debates about creating more extensive conservation efforts to combat the continued decline of global biodiversity such as the Half Earth (Wilson 2016) or protecting 30% for nature proposals (Waldron et al. 2020). Our methods provide another potential pathway (cf. Salerno 2016) for analyzing how PAs interact with local social, economic, and political conditions to impact migrant decision making that are critical for understanding the trade-offs necessary for attending to the needs of both biodiversity and local human populations.

Responses to this article can be read online at: https://www.ecologyandsociety.org/issues/responses.php/13529

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Hoffman, David M.: Conceptualization, methodology, formal analysis, investigation, writing-original draft, writing-review & editing, supervision, project administration, funding acquisition. Gomez, Agustin: Methodology, formal analysis, investigation, writing-review & editing, visualization, supervision. Arends, Jessica: formal analysis, investigation, writing-review & editing. Dehler, Sallie: formal analysis, investigation, writing-review & editing. Miller, D. Shane: formal analysis, writing-review & editing.

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Data Availability:

The data/code that support the findings of this study are available on request from the corresponding author, DH. None of the data/code are publicly available because they contain information that could compromise the privacy of research participants. Ethical approval for this research study was granted by the IRB of Mississippi State University.

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Appendix #1: Freelist Conversion Example

| Original Responses                                      | Recoded Responses                                      |
|---------------------------------------------------------|--------------------------------------------------------|
| # Respondent1                                           # Respondent1                                           |
| turismo                                                 | el turismo                                             |
| montana arenal                                          | la montana                                             |
| la catarata                                             | la catarata                                             |
| aguas termales                                          | aguas termales                                          |
| # Respondent2                                           # Respondent2                                           |
| oportunidades de trabajo                                 | el trabajo                                             |
| mucho que ver                                           | mucho que ver                                           |
| muchas cosas que hacer                                  | muchas cosas que hacer                                  |
| el ambiente                                             | el ambiente                                             |
| ambiente sano                                           | ambiente sano                                           |
| # Respondent3                                           # Respondent3                                           |
| centro turistico                                        | el turismo                                             |
| belleza                                                 | la belleza escenica                                     |
| volcanes                                                | volcanes                                               |
| rios                                                    | el rio                                                 |
| canopy                                                  | canopy                                                 |
| andar en kayak                                          | la recreacion                                           |
| el lago                                                 | el lago                                                 |
| anda en bicicleta                                       | anda en bicicleta                                       |
| ir a pescar                                             | la pesca                                                |
| # Respondent4                                           # Respondent4                                           |
| trabajo                                                 | el trabajo                                             |
| el ambiente                                             | el ambiente                                             |
| me ha permitido vivir                                   | la calidad de vida                                      |
| pueblo lindo                                            | un pueblo lindo                                         |
| pueblo precioso                                         | pueblo precioso                                         |
| gente muy bonita                                        | la gente                                                |
| mi familia                                              | la familia                                              |
| hijos nacieron aqui                                     | hijos nacieron aqui                                     |
| turismo trae dolar                                      | el turismo                                              |
| # Respondent5                                           # Respondent5                                           |
| naturaleza                                              | la naturaleza                                           |
| facilidades laborales                                   | el trabajo                                              |
| gente amistosa                                          | la gente                                                |
| gente compartida                                        | gente compartida                                        |
| vivo tranquilo                                          | la tranquilidad                                         |
| no hay policia que molestan                             | no hay policia que molestan                             |
| la policia                                              | la policia                                              |
| un lugar tranquilo                                      | un lugar tranquilo                                      |
tender ropa en el patio
muy poca delicuencia

# Respondent6
turistas
dinero
pueblo lindo
pueblo encantador
todo comparta
pueblo pequeño
muchos servicios
3 bancos
6 supermercados
4 farmacias
un pueblo prospero

# Respondent7
seguro
abundancia en agua
muy lindo
pueblo pequeño
muy diferente
seguridad
naturaleza

# Respondent8
volcan
encontrar trabajo
pueblo turistico
personas diferentes
personas de otros paises
se relaciona con ellos
la relacion al pueblo
observar el volcan

# Respondent9
centros turisticos
mucho trabajo
la gente muy amable
la gente se relaciona mucho
somos muy amables
el parque
colegio deportivo
lugar recreativo
escuela muy buena

# Respondent6
turismo
dinero
un pueblo lindo
pueblo encantador
la gente
un pueblo pequeño
los servicios
el banco
el supermercado
4 farmacias
un pueblo prospero

# Respondent7
la seguridad
el agua
un pueblo lindo
un pueblo pequeño
muy diferente
la seguridad
la naturaleza

# Respondent8
el volcan
el trabajo
el turismo
personas diferentes
personas de otros paises
la gente
la relacion al pueblo
observar el volcan

# Respondent9
el turismo
el trabajo
la gente
la gente se relaciona mucho
somos muy amables
el parque
las areas deportivas
la recreacion
la educacion
educación muy buena
mucha vigilancia
casi no hay robos
pocos borachillos

# Respondent10
zona rural
espacio libre
agua potable
servicios
luz electrica
supermercados
centros deportivos
desparcimientito
turismo
fuente de trabajo
familia viene para pasear
compartimiento familiar
mi proyecto de retiro
vida tranquila
empresarios locales
apertura comercial
financiamiento bancario
buen manejo de basura
reciclan
desarrollo personal

# Respondent11
volcan
tours
caminatas
ríos
canopy
rafting
muy tranquilo
muchos turistas
muy bonita
muy calmdo
no hay mucha delincuencia

# Respondent12
oportunidad de trabajo
mercado que no esta saturado
posibilidad de innovacion
buen ambiente para vivir

buen ambiente para vivir
mucha vigilancia
los robos
el alcoholismo

# Respondent10
el campo
espacio libre
el agua
los servicios
la luz
el supermercado
las areas deportivas
desparcimientito
el turismo
el trabajo
familia viene para pasear
compartimiento familiar
mi proyecto de retiro
la tranquilidad
el comercio
la economia
el banco
limpio
reciclan
la superacion

# Respondent11
el volcan
el turismo
la recreacion
el rio
el turismo
rafting
la tranquilidad
muchos turistas
lugar bonito
muy calmdo
la delincuencia

# Respondent12
el trabajo
las oportunidades
posibilidad de innovacion
el ambiente social
no hay mucha delincuencia
es seguro
servicios primarios acesibles
poco tráfico de carros

# Respondent13
el turismo
aguas termales
el volcán
los tours
catarata
el río
sendero el silencio
el parque
rio del agua caliente

# Respondent14
la gente
el turismo
turismo de aventura
belleza escénica
gente amable
gente sonrian al turista

# Respondent15
volcán arenal
rio fortuna
rancho hostel la luna
amistades
finceros
lugar más sano
bonito
estar solo
ir a pasear
buscando aguacates
fruta
frutas de pan
cosecha
buena gente
le saluden

# Respondent16
el empleo
oportunidad diferente
prosperar
opciones variadas
propia empresaria
belleza escenica
hacer plata

# Respondent17
volcan
los hoteles
el parque
mucho turismo
mas posibilidades de empleo
la gente
la gente muy humilde
la gente muy tranquila
lugar muy tranquilo

# Respondent18
turismo
el volcán
aguas termales
naturaleza
cataratas
mucha verde
otras facilidades
la tranquilidad
no esta todo saturado
no hay tanto trafico
no hay tanto humo
no hay tanto ruido
no hay tanto urbanizacion
vivir con grandes areas verdes
vive mas sano

# Respondent19
seguridad
trabajo
salud
mejores condiciones de vida para la familia
belleza escenica

# Respondent20
los servicios basicos quedan cerca
salud
pagos de servicios
agua
luz
acesto al trabajo
limpio
el parque
bonito para salir

# Respondent21
volcan
la catarata
el lago
los souvenir
la iglesia
la gente
la gente muy carinosa
la gente muy amistosa
la gente confiable
desarrollo
se preocupa por el turismo
hosteles
restaurantes
aptos para turista
el clima
la tranquilidad
encontramos de todo
ropa
zapatos
comida
servicio de bus
servicio de agua
servicio de cable
fuente de trabajo
aqua pura

# Respondent22
montanas
rios
riqueza de la tierra
mucho extranjero
zona rica de ingreso de los dolares
paisaje

# Respondent23
la tranquilidad
la seguridad

la luz
cable
el trabajo
limpio
el parque
bonito para salir

# Respondent21
el volcan
la catarata
el lago
los souvenir
la iglesia
la gente
la gente muy carinosa
la gente muy amistosa
la gente confiable
desarrollo
el turismo
los hoteles
los restaurantes
aptos para turista
el clima
la tranquilidad
centrico
ropa
zapatos
comida
el transporte
el agua
servicio de cable
el trabajo
aqua pura

montanas
el rio
riqueza de la tierra
mucho extranjero
la economia
el paisaje

# Respondent23
la tranquilidad
la seguridad
no hay ladrones
limpio
organizacion
mejor organizado que muchos lugares en Costa
la pesca

# Respondent24
turismo
gente calida
naturaleza
campo

# Respondent25
volcan
muy concentrado
muy cerca
banco
bien organizado
hoteles y souvenires dueños son ticos
el clima
la gente
tranquilo
sano
buena gente
el trabajo
practica de ingles

# Respondent26
el paisaje
la riqueza de los suelos
la buena calidad de las aguas
la buena calidad de los suelos
facilidades para las comunicaciones
centro de comunicacion
gran centro
comunicaciones importante
muchas salidas
infraestructura buena
seguridad ciudadana buena
gente deseosa de crecer
gente deseosa de tener mejor calidad de vida
oportunidades para poder capacitar
oportunidades para mejorar
provechar los abilidades
la naturaleza
forma de ser de las personas
confianza
buen trato
costumbrosismo
humilde
seguridad ciudadana
seguridad turística
policía se trata muy bien
precios
variedad de clima
el clima calido
naturaleza con mucho cuidado
consciente de andar la basura
manejo de basura
tarifas no son muy caras
gente muy sana
el aire
bastante esta libre de contaminacion
se conserva flora
se conserva fauna
preparacion para turistas
conocimiento de flora y fauna
se tratan bien al turismo
volcan
playa artificial
paz
cordial
seguro

el ambiente
el turismo
el trabajo
las personas
tienen otra mentalidad
actitud positiva
anda feliz
anda tranquilo
un karma diferente
por lo tranquilo

fuentes de trabajo
lugar tienen mucho paz
la gente muy amable
muy productivo
muy natural
muchá naturaleza
el clima muy bueno
vive la familia
aquí conoci a Dios
hay oportunidades de estudio

# Respondent30
la vista escenica
panoramas
el volcan
la actividad con la gente
gente muy activa
mas ambiente
trabajo con personas
relacionar con la gente
los servicios
actividades
limpio
no es sucio
seguridad
confiado
comunidad organizada

# Respondent31
tranquilo
oportunidades desarrollarme
el ambiente
el clima
la ciudad como tal
cerca de playa
tengo de todo cerca
no estoy encerrada

# Respondent32
playas
costas
montanas
costumbres culinarias
la amabilidad
sencillez
cordialidad
dicharachos
forma de hablar
sus palabras
admiro gente vieja
solidaridad
gente ayudante
ayuda mucho
gente amable
nos ayuda mucho
hospitalidad

# Respondent33
familiar
tranquilo
la religion mas catolica
cultura
va la familia a actividades culturales
la tranquilidad

# Respondent34
campana
vida mas rural
mas tranquilo
menos hetero
calidad de vida
mas saludable
muy tranquilo
aislado
vivimos con mascote
libertad de movimiento
no hay preocupacion como en la ciudad

# Respondent35
el clima
la gente
la tranquilidad
mas despacio
menos congestionada
gente muy amable
gente muy sencilla
les gusta ayudar
les gusta colaborar

# Respondent36
la gente
gente amistad
gente acogedora
gente amistosa
playas
tipo de agricultura
forma de siembra
lugares atractivos
parques
caminar

# Respondent37
la tranquilidad
el no movimiento de carros
tipo de gente
gente amable
verde
arboles
playas
familiares

# Respondent38
poca poblacion
poca delincuencia
corto plazo todos los conocemos
gente bastante friendly
hay movimiento positivo sobre el cuidado del medio ambiente

# Respondent39
comercio
trabajo
las calles
hospital mas cerca
mas ambiente de fiesta
mas se puede socializar
mas gente

# Respondent40
playa
comercio
atraccion turistica
parques
reservas biologicas
mucho mas avanzado
mas trabajo
# Respondent41
- seguridad social
- la comunidad
- interacción comunal
- tranquilidad
- no hay polución
- no hay contaminación
- el clima
- estabilidad económica

# Respondent42
- tranquilidad
- poca chusma
- los ríos
- playas
- fiestas de toros
- carreras de cintas a caballo

# Respondent43
- pueblo cristiano
- tranquilo
- no es conflictivo
- la gente humilde
- la gente solidarios
- economía equilibrada
- cada quien tiene su manera de vivir
- es una zona comercial
- hay una educación pública
- se comparten la cultura
- gente son muy trabajadores
- la base es más sobre la agricultura

# Respondent44
- calma
- tranquila
- clima de invierno muy bonito
- fauna agradable
- flora
- las personas
- amigos
- vecinos con platos de comida
- río
- comidas de típico

# Respondent45
la seguridad
la calma
el rio

# Respondent46
la naturaleza
la gente le gusta el pueblo
la forma de pueblo
montanas
libre de contaminacion
libre de fabricas
libre de humo de vehiculos
aire puro
la relacion humana

# Respondent47
menos presion
menos contaminacion
menos problemas sociales
menos rinas
menos pleitos
solvente
respiran mejor
no esta contaminada la zona
paz
vitrinas turisticas
playas limpias
playas sanas
son personas que puede confiar
son personas amables
son personas respetuosas
son personas educadas

# Respondent48
la paz
la amabilidad
mas segura
menos violencia
tranquilidad

# Respondent49
tranquilidad
pueblo tranquilo
naturaleza que rodea
la gente muy amistosas

la seguridad
la tranquilidad
el rio
muy tranquilo
la gente muy cordial
la gente muy amable
lugar muy limpio
tienen sus patios muy limpios
tienen sus patios solar muy limpio
son muy trabajadores
pueblo muy organizado
reciben mucha ayuda del gobierno
reciben mucha ayuda de otras instituciones
reciben mucha ayuda de donaciones
la gente es muy longeva

la gente noble
la gente carinoso
pueblo de amistad
colegio
IVAIS
iglesia
calidades
agua potable
luz electrica
telefonica
todos los servicios
todo centrico
acceso a Nicoya
servicio de buses
el clima
invierno y verano
ventoso
bonito

muy amistoso
vive mi hija
participo en grupos
trabajo para adultos mayores
iglesia tambien
campo
la gente
colegio
IVAIS
farmacia
solidaridad

# Respondent53
la tranquilidad
poca delincuencia
se puede dejar cosas afuera
pueblo rural
paz
conoce todo el mundo
se logra vivir monetariamente
el clima agradable
costumbres
nadie se estresa
camina
anda
gente fiestera

# Respondent54
ganando salario
siembra teca
muy tranquilo
vivimos tranquilos
la gente estimo
la gente tranquila
no se meten en las cosas de vivir
pueblo tranquilo
no se ha metido con nos

# Respondent55
tranquilidad
buen ambiente
la calidad ambiental
comidan deliciosa
la cultura
el clima
la biodiversidad

# Respondent56
tranquilo
paz
dormir tranquilo
era mas barata
el barato
# Respondent57
la naturaleza
la cultura
la gente
humildad
el trabajo
las personas les ayuda mutualmente

# Respondent58
lo tranquilo
zona verde
parque
totalmente diferente
la tranquilidad
se come mas natural

# Respondent59
la naturaleza
su gente
gente alegre
gente buena
la paz
el clima
los animales
naturaleza

# Respondent60
la vegetacion
calidad humana
mas aire puro
menos contaminacion
animales
toda preciosa
servicio
amabilidad
trato con ser humano

# Respondent61
saludable
seguro
amigable
tranquilo
bonito
prospero
estable economicamente
desarrollable
crecimiento

# Respondent62
playa
buena gente
hay trabajo
familia

# Respondent63
se encuentra trabajo
mas tranquilo
ambiente
menos contaminacion
amable
se ayudan
colaborar

# Respondent64
tranquilo
bonito
alquileres son baratos
cerca de la playa

# Respondent65
tranquilidad
todo esta cerca
la escuela
IVAIS
policia
gente amable

# Respondent66
hay mucho trabajo
mas supermercados
playa
muchas montanas
animales
familia
tenemos casa
tiene trabajo

# Respondent67
bonito
intorno
montanas
parque que rodea
la paz
la tranquilidad
espiritualmente mas con uno mismo
trato de estar unido con mio mismo
dificil estresarse

# Respondent68
clima
la gente amable
la montana
la cercania animales
vivis en la natorleza
la aguas del rio limpios
sentirse mucho mejor una
confianza en la gente
respeto al propiedad privada
cercania a Jaco

# Respondent69
tranquilidad
la actividad social
el espacio
el rol diario de vida
la vida cotidiana
cambio de alimentacion
cambio de actividad trabajo
cambio total de forma de vida

# Respondent70
la naturaleza
el campo
terreno
sanitas
tranquilo
diversidad de aves

# Respondent71
el clima
la amplitud de terreno
la poca densidad
la tranquilidad
espacio
la idiosyncrasia de la gente
muchas lapas
los animales
viene turistas
el turismo
aves
los animales
manglar
cocodrilos
90 clases de aves
cerca del mar
la pesca
vivimos de la pesca
el parque
ecología
cosas indígenas
se esta cuidando
tranquilo
vive con confianza
negocio
muchas vías de comer

la paz
turismo
viajes de tur
ver los cocodrilos
ir a conocer carar
el parque
companionismo humano
acogedor
se preocupa por uno
se preocupa por ellos
plaza de deportes
futbol cinco parque
parquecito para niños
servicio de luz
servicio de agua
servicio de teléfono

la tranquilidad
el mar
la gente
mucha prosperidad
hay trabajo
mucho turismo

la tranquilidad
el mar
la gente
la calidad de vida
el trabajo
el turismo
esta centrico
mucha facilidad de escuela
las aves

# Respondent75
era la pesca
hotelera
turismo

# Respondent76
turismo
playas
vienen a ver las lapas
tucanes

# Respondent77
clima caliente
ambiente de pueblo
contacto con naturaleza
se vive con menos plata
tranquilidad

# Respondent78
ambiente bonita
la gente
el clima
bueno todo
zona de donde se saca fruta
bonito
tranquila la gente
muy sana
no roban
no matan
andar tranquilo
trabajo
gana poquito mejor
sale de todo

# Respondent79
trabajo de agriculutra
terreno
productiva
zona industrial
empresas
teca
somos unidos
hermitaneos
escuela bien
carretera
pueblo unido
trabajan
hay de todo

# Respondent80
cercania de la costa
la gente
la unidad

# Respondent81
centro economico
contro comercial
comunidades alrededor vienen a comprar
alrededor vienen a comprar
derrollado
seguro
termino medio entre ciudad y pueblo
seguridad
tranquilo
servicios muy cercanos
tiene lo basico
media sociables
todos tiene su independencia
gente amable

# Respondent82
clima
trabajo
ta va uno a turistear
turismo
entra comerciante
se queda y no se va
aguantan los que estan en licor

# Respondent83
el clima
su gente
la naturaleza
buenas vías de transporte
cercania con la capital
cercania con Jaco
gente amable
gente servicial
gente muy comunicativa

# Respondent84
lugar bonito
naturaleza
rios bonitos
playa
montana

# Respondent85
turismo
playa
embocador del rio Tarcoles
la pesca
el negocio
naturaleza
animales
mani gordo
mapuchin
lapas
cocodrilos
mueve mas el dinero

# Respondent86
zona esta llena de droga
muchas oportunidades
deportes
la gente comunitaria
la gente muy serviciales
hacen muchas actividades
centro diurno para gente de tercer edad
pueblo mas superado
los negocios ayuden a la gente
servicios
policia
municipalidad

# Respondent87
la playa
el tur de cocodrilo
el parque carara
la plaza de deportes
el trabajo
el parque
las fuentes de empleo
los servicios publicos
internet
transporte
vivienda

los cocodrilos
la playa
el rio
pesca
trabajan en hoteles
grup de jovenes de la iglesia catolica

comunidad segura
seguridad
no hay tanta delincuencia
tranquilo
suave
despacio
hay trabajo
necesitan mi servicio
clima
paisaje
el mar
el parque nacional
la selva
lo que no tenia
cambio de vida
mas calidad de vida
### Appendix #2: Truncated freelist frequency & Smith's S results

| Item                          | Frequency (%) | Average Rank | Salience |
|-------------------------------|---------------|--------------|----------|
| la_gente                      | 56.7          | 5.06         | 0.342    |
| la_tranquilidad              | 45.6          | 4.46         | 0.308    |
| el_trabajo                   | 32.2          | 4.72         | 0.216    |
| el_turismo                   | 26.7          | 3.42         | 0.212    |
| el_clima                     | 21.1          | 5.63         | 0.138    |
| la_playa                     | 18.9          | 4.76         | 0.123    |
| el_ambiente_social           | 17.8          | 6.25         | 0.088    |
| la_naturaleza                | 17.8          | 4.69         | 0.114    |
| la_seguridad                 | 16.7          | 5.8          | 0.102    |
| el_parque                    | 14.4          | 6            | 0.077    |
| los_animales                 | 14.4          | 6.15         | 0.075    |
| la_calidad_de_vida           | 12.2          | 6.27         | 0.068    |
| el_volcan                    | 11.1          | 3.9          | 0.097    |
| la_paz                       | 11.1          | 6            | 0.076    |
| el_río                       | 11.1          | 3.9          | 0.067    |
| limpio                       | 11.1          | 7.4          | 0.06     |
| lugar_bonito                 | 11.1          | 5.8          | 0.066    |
| los_servicios                | 10            | 6.89         | 0.054    |
| la_cultura                   | 10            | 6.78         | 0.05     |
| la_educacion                 | 10            | 9            | 0.04     |

### Question #1

| Item                          | Frequency (%) | Average Rank | Salience |
|-------------------------------|---------------|--------------|----------|
| la_gente                      | 31.1          | 5.21         | 0.181    |

### Question #2

| Item                          | Frequency (%) | Average Rank | Salience |
|-------------------------------|---------------|--------------|----------|
| las_drogas                    | 34.4          | 2.87         | 0.271    |
| el_desempleo                  | 22.2          | 3.5          | 0.146    |
| el_clima                      | 21.1          | 3.11         | 0.164    |
| la_gente                      | 18.9          | 3.41         | 0.129    |
| los_precios                   | 17.8          | 4.38         | 0.113    |
| los_servicios_medicos         | 17.8          | 7.81         | 0.074    |
| la_educacion                  | 16.7          | 6.4          | 0.089    |
| el_alcoholismo                | 15.6          | 4.71         | 0.098    |
| el_gobierno                   | 13.3          | 3.5          | 0.098    |
| la_basura                     | 12.2          | 4.45         | 0.085    |
| la_contaminacion              | 12.2          | 4.82         | 0.075    |
| la_inseguridad                | 11.1          | 8.8          | 0.045    |
| la_prostitucion               | 11.1          | 5.3          | 0.047    |

### Question #3

| Item                          | Frequency (%) | Average Rank | Salience |
|-------------------------------|---------------|--------------|----------|
| la_gente                      | 31.1          | 5.21         | 0.181    |
| Item                                      | Frequency (%) | Average Rank | Salience |
|-------------------------------------------|---------------|--------------|----------|
| el_clima                                  | 26.7          | 3.88         | 0.192    |
| el_trabajo                                | 26.7          | 4.25         | 0.179    |
| la_tranquilidad                           | 22.2          | 3.65         | 0.162    |
| centrico                                  | 22.2          | 4.4          | 0.13     |
| la_familia                                | 21.1          | 4.79         | 0.121    |
| las_comodidades                           | 20            | 3.61         | 0.143    |
| el_transporte                             | 18.9          | 5.47         | 0.101    |
| la_educacion                              | 17.8          | 4.94         | 0.093    |
| la_agricultura_y_la_ganaderia             | 17.8          | 3.44         | 0.13     |
| el_comercio                               | 16.7          | 5.2          | 0.104    |
| lugar_bonito                              | 15.6          | 4.07         | 0.107    |
| la_cultura                                | 15.6          | 5.79         | 0.094    |
| la_comida                                 | 14.4          | 6.62         | 0.07     |
| los_servicios_medicos                     | 13.3          | 5.75         | 0.069    |
| los_servicios                            | 12.2          | 5.45         | 0.071    |
| el_supermercado                           | 10            | 5.44         | 0.048    |

**Question #4**

| Item                                      | Frequency (%) | Average Rank | Salience |
|-------------------------------------------|---------------|--------------|----------|
| las_drogas                                | 33.3          | 4.23         | 0.211    |
| el_trabajo                                | 26.7          | 2.96         | 0.194    |
| la_inseguridad                           | 26.7          | 4.08         | 0.195    |
| el_desempleo                              | 20            | 3.33         | 0.15     |
| la_contaminacion                          | 18.9          | 5.35         | 0.115    |
| la_delincuencia                           | 17.8          | 3.5          | 0.117    |
| la_sobrepoblacion                         | 16.7          | 4.33         | 0.101    |
| el_transito                               | 16.7          | 6.2          | 0.092    |
| las_carreteras                            | 16.7          | 5.8          | 0.078    |
| la_educacion                              | 14.4          | 4.54         | 0.099    |
| la_pobreza                                | 14.4          | 6            | 0.08     |
| los_robos                                 | 13.3          | 5.33         | 0.076    |
| el_alcoholismo                            | 12.2          | 3.64         | 0.086    |
| el_ambiente_social                        | 11.1          | 4.1          | 0.07     |
| la_gente                                  | 11.1          | 5.4          | 0.057    |
| el_transporte                             | 11.1          | 4.5          | 0.056    |
| el_gobierno                               | 10            | 4.44         | 0.061    |

**Question #5**

| Item                                      | Frequency (%) | Average Rank | Salience |
|-------------------------------------------|---------------|--------------|----------|
| el_trabajo                                | 71.1          | 2.03         | 0.62     |
| la_tranquilidad                           | 33.3          | 3.33         | 0.247    |
| la_educacion                              | 31.1          | 6.32         | 0.149    |
| la_gente                                  | 26.7          | 4.25         | 0.172    |
| Item                          | Frequency (%) | Average Rank | Salience |
|------------------------------|---------------|--------------|----------|
| los_servicios                | 25.6          | 5.26         | 0.153    |
| la_seguridad                 | 23.3          | 4.19         | 0.143    |
| la_superacion                | 17.8          | 4.88         | 0.115    |
| la_recreacion                | 17.8          | 6.56         | 0.086    |
| los_servicios_medicos       | 16.7          | 5.2          | 0.1      |
| la_economia                  | 16.7          | 4            | 0.107    |
| el_clima                     | 14.4          | 3.77         | 0.089    |
| la_familia                   | 13.3          | 5.92         | 0.078    |
| la_calidad_de_vida          | 13.3          | 3.5          | 0.1      |
| el_transporte                | 12.2          | 7.64         | 0.049    |
| la_paz                       | 12.2          | 4.91         | 0.078    |
| el_comercio                  | 11.1          | 4.7          | 0.067    |
| sano                         | 10            | 8.33         | 0.037    |
| centrico                     | 10            | 8            | 0.035    |
| la_luz                       | 10            | 7            | 0.043    |

**Question #6**

| Item                          | Frequency (%) | Average Rank | Salience |
|------------------------------|---------------|--------------|----------|
| el_desempleo                 | 51.1          | 1.93         | 0.436    |
| el_trabajo                   | 31.1          | 2.71         | 0.23     |
| la_educacion                 | 25.6          | 3.78         | 0.143    |
| la_inseguridad               | 23.3          | 3.14         | 0.166    |
| la_familia                   | 20            | 3.78         | 0.123    |
| la_economia                  | 15.6          | 4.29         | 0.089    |
| la_calidad_de_vida          | 15.6          | 4.36         | 0.093    |
| la_superacion                | 12.2          | 3.73         | 0.064    |
| las_drogas                   | 11.1          | 5.4          | 0.044    |
| la_gente                     | 11.1          | 3.7          | 0.069    |
| los_robos                    | 11.1          | 4.2          | 0.072    |
| el_ambiente_social          | 10            | 3.22         | 0.076    |

**Question #7**

| Item                          | Frequency (%) | Average Rank | Salience |
|------------------------------|---------------|--------------|----------|
| la_educacion                 | 55.6          | 6.38         | 0.359    |
| la_gente                     | 48.9          | 5.3          | 0.345    |
| el_trabajo                   | 43.3          | 5.59         | 0.248    |
| los_servicios_medicos       | 35.6          | 8.38         | 0.191    |
| la_seguridad                 | 26.7          | 5.92         | 0.169    |
| el_transporte                | 25.6          | 9.17         | 0.127    |
| las_carreteras               | 23.3          | 7.52         | 0.126    |
| el_agua                      | 22.2          | 9.35         | 0.113    |
| las_drogas                   | 20            | 6.61         | 0.137    |
| la_tranquilidad             | 20            | 4.94         | 0.144    |
| las_areas_deportivas        | 17.8          | 9.69         | 0.092    |
| Descripción          | Puntaje | Calidad | Importancia |
|----------------------|---------|---------|-------------|
| limpio               | 17.8    | 6.63    | 0.116       |
| los_servicios       | 16.7    | 6.13    | 0.103       |
| la_recreacion       | 15.6    | 8.21    | 0.081       |
| el_supermercado     | 13.3    | 10.83   | 0.06        |
| el_parque           | 13.3    | 8.17    | 0.072       |
| la_naturaleza       | 13.3    | 8.42    | 0.068       |
| la_luz              | 12.2    | 10      | 0.061       |
| el_clima            | 11.1    | 9       | 0.059       |
| el_banco            | 11.1    | 6.3     | 0.069       |
| el_comercio         | 11.1    | 9.3     | 0.048       |
| la_cultura          | 11.1    | 9.8     | 0.055       |
| el_gobierno         | 11.1    | 6.3     | 0.081       |
| centrico            | 10      | 8.67    | 0.04        |
| la_economia         | 10      | 6.22    | 0.06        |
Appendix #3: Culturally Correct Answer Key for Carara National Park Current Communities

People
- Tranquility
- Opportunities
- Tourism
- Climate
- Social Err.
- Nature
- security

Park/protected area
- Wild animals
- quality of life
- Encounter Peace

Rivers
- Continues
- Beauty
- Services
- culture
- education

drug problem

prices
- medical services
- Alcoholism
- Government
- Garbage
- Contamination
- Insecurity
- Prostitution
- Centrality
- Family situation
- Comforts
- Transport

Agriculture and ranching
- Commerce
- Food
- Supermarkets
- Delinquency
- Overpopulation
- Traffic
- Roads/highways
- Poverty
- Robberies
- Economy
- Ability to improve oneself

Water
- Sports Areas
- Recreational
- Electricity
- Bank Services
- Healthiness
- Noise
- Violence
- Countryside