

# *¿Niños Maestros?*

Environmental education and knowledge  
transmission in two rural communities of the  
Panama Canal Watershed



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## 1. Executive Summaries

### *1.1 Executive Summary- English*

#### **¿Niños Maestros? Environmental education and knowledge transmission in two rural communities of the Panama Canal Watershed**

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Fondo Peregrino- Panamá, a branch of The Peregrine Fund U.S.A., is a non-governmental organization working for the preservation of the endangered Harpy Eagle and for the conservation of eagle habitat in Panama and Central America. As a part of their Neotropical Environmental Education Program (NEEP), they also seek to provide raptor and general environmental education to local Panamanians, especially focusing on rural communities situated near Harpy Eagle populations.

For Fondo Peregrino, classroom visits are the most popular method of disseminating educational material, as school children are a readily available audience. Reaching adult populations in rural communities, however, poses larger challenges. Therefore, as an alternative to adult presentations, Fondo Peregrino is investigating the possibility of transmitting knowledge through the children of a community. In this study specifically, we examined whether lessons conducted with school children during several short classroom presentations, combined with assignment of a homework exercise that required parent participation, was an effective means of transmitting environmental knowledge to adult community members.

To identify the presence of intergenerational knowledge transfer, we administered knowledge-testing surveys to adult residents before and after conducting classroom activities in one small and one large community in the Panama Canal Watershed. Surveys were administered to both parents and other adults who did not have children participating in our activities. Opinion-based questions were also included in the surveys for the purposes of gathering recommendations for improvement of the current environmental education approach in the communities.

Survey scores reflected that though there was a significant level of improvement between the first and the second survey, effective learning was minimal. Of the fifty-two adult respondents only several demonstrated they had concretely learned from a child and from the homework exercise given. Adults who were not parents of participants in our activities or adults who did not see the homework exercise demonstrated no learning. Both the larger and smaller community generated similar results in our analysis.

Results and recommendations gathered indicate that though classroom visits are an important and locally valued method of environmental education, they are not an

effective means of educating the adult population in general. Adults recognize the importance of environmental education for their children and for themselves, but without more intensive classroom and homework-based exercises, and without continued education initiatives targeted specifically towards adults, they will not effectively learn environmental lessons. Therefore, continued efforts on the part of Fondo Peregrino-Panamá need to be made to contact and teach adults in rural communities.

### *1.2 Executive Summary Spanish*

#### **¿Niños Maestros? Environmental education and knowledge transmission in two rural communities of the Panama Canal Watershed**

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El Fondo Peregrino-Panamá, una rama del Peregrine Fund U.S.A., es una organización no-gubernamental (ONG) que trabaja por la preservación del Águila Arpía y la conservación de su hábitat en Panamá y Centro América. En su programa de educación ambiental neotropical (NEEP), el Fondo Peregrino Panamá quiere transmitir conocimientos sobre las rapaces y el ambiente en general, en comunidades rurales cerca de poblaciones de Águilas Arpías en Panamá.

Para la organización, el método de educación el más popular es de visitar niños en la escuela, porque es una audiencia disponible y fácil de acceso, mientras reunir los adultos por ese tipo de presentación es un desafío más grande. Por lo tanto, como alternativa a las presentaciones con adultos, Fondo Peregrino está investigando la posibilidad de transmitir conocimientos a través de los niños de una comunidad. En ese estudio específicamente, examinamos si lecciones enseñadas a los niños de cuarto, quinto y sexto grado durante algunas presentaciones en la escuela, junto con una tarea que necesita la participación de padres, son herramientas eficientes de transmisión de conocimientos ambientales a los adultos de una comunidad.

Con el objetivo de identificar si existe una transferencia intergeneracional de conocimientos, administramos un sondeo a un adulto de cada casa en dos comunidades, una grande y una pequeña, antes y después de dar clases a los niños. Para recoger recomendaciones para mejorar el enfoque actual de educación ambiental, los sondeos no solo evalúan los conocimientos acerca del ambiente, pero también contenían preguntas de opinión.

Los resultados de los sondeos mostraron que aunque notemos una mejoría significativa entre la primera y la segunda encuesta, aprendizajes efectivos son mínimos. De los cincuenta y dos adultos que respondieron a nuestros sondeos, solamente algunos demostraron haber realizados aprendizajes verdaderos a través de los niños o de la tarea.

Adultos que no tenían niños presentes a nuestras presentaciones o que no hicieron la tarea no demostraron ningún aprendizaje. Las dos comunidades, la pequeña y la grande, generaron resultados similares en nuestro análisis.

Los resultados y las recomendaciones hechas consecuentemente, indican que aunque las visitas en la escuela sean una herramienta importante y localmente apreciada, no son una manera eficiente de educar los adultos en general. Los adultos reconocen la importancia de la educación ambiental para sus hijos y para ellos mismo. Sin embargo, más actividades con los niños incluyendo tareas y iniciativas continuas de educación dirigidas hacia los adultos serían necesarias para que asimilen eficazmente lecciones ambientales. Por lo tanto, Fondo Peregrino-Panamá necesita continuar sus esfuerzos para enseñar a los adultos en comunidades rurales.

## 2. Introduction

### 2.1 *Fondo Peregrino-Panamá*

Fondo Peregrino-Panamá, a branch of the United States based Non Governmental Organization, The Peregrine Fund, works to conserve and promote Harpy Eagle (*Águila Arpía*) populations in Panama through captive breeding and release programs, scientific research and environmental education (The Peregrine Fund 2005). The latter goal of environmental education in Panama and other Central American Countries is achieved through initiatives of the Neotropical Environmental Education Program (NEEP). This program was created in 2001 by The Peregrine Fund to work towards their goal to “change human attitudes towards birds of prey, especially Harpy Eagles, to reduce persecution and help conserve their habitat and the biodiversity it contains” (The Peregrine Fund 2005).

Fondo Peregrino-Panamá has been working since 2001 to effectively reach rural Panamanian communities situated near Harpy Eagle populations. They strive to inform them of the characteristics of the Harpy Eagle and to encourage locals to promote their conservation, while also attempting to cultivate a sense of pride in the continued existence of Panama’s national bird (Fondo Peregrino-Panamá 2005).

Beyond solely focusing on the Harpy Eagle, Fondo Peregrino-Panamá has also extended its vision for education, hoping that through the eagle, information pertaining to general environmental protection and conservation can also be disseminated. A read-aloud guide for teachers and students entitled “The Nature of Harpy Eagles” has been created, though has not yet been published, which treats the important components of ecosystems and their functioning, illustrating general environmental concepts and raptor ecology with the aid of a story of a pair of Harpy Eagles (Curti and Middleton 2005). The goal is for this guide to reach every primary school in Panama. With initiatives such as the guide, along with continued community visits and teacher workshops, Fondo Peregrino-Panamá hopes to improve overall environmental knowledge and awareness in the country (The Peregrine Fund 2005).

### 2.2 *Environmental Education*

The importance of environmental education is paramount in Latin American Countries, which harbour some of the highest biodiversity in the world (Condit et al. 2001). It is well accepted that environmental education has an essential role in fostering general scientific knowledge, improving the state of local environments and developing ecologically conscientious citizens (Vaughan et al. 1999; Ballantyne et al. 2001; Jenkins 2003; Skanavis and Sari 2004; Storey and De Oliveira 2004). In areas where many people have not been supplied with formal education opportunities, where they rely heavily on their land for subsistence purposes, and where they live in conjunction with potentially endangered species, environmental education should be of the utmost priority.

Environmental education can reach citizens through many different forums, from formal classroom activities presented by trained education professionals, to informal experiences with both children and adults conducted in a casual manner. For the purposes of this study the latter form of education will be focused upon, as we as researchers are not trained educators, nor were the activities created as a part of a larger school curriculum. Non-formal education has several aspects and goals. According to the North American Association for Environmental Education's guidelines for excellence (2005), non formal education should: address identified environmental, educational, and community needs, support and complement the parent organization's goals, and should define and measure results in order to improve education programs, among others (NAAEE 2006).

In addition to the diverse forms environmental education can take, this education can be disseminated to any number of community groups, from school age children to adults. A debate continues in the field of environmental education as to the most appropriate target age group. Some experts state that environmental education must start at an early age, as experiences as a young child, "play a critical role in shaping life-long attitudes, values, and patterns of behavior toward natural environments" (Wilson 2000). Others, however, argue that adults must be targeted, as they are the ones who construct and enforce environmental policy, and at the same time act as role models for their children (Vaughan 1999). Fondo Peregrino-Panamá has traditionally focused education initiatives on both children and adults through classroom visits, community outreach programs, and seminars targeted towards adults. They have encountered difficulty, however, in attracting and reaching the adult population, as adults of campesino communities in rural Panama are rarely able to attend lectures with both work and familial obligations, or choose not to make the effort to do so (Marta Curti, personal communication). Nevertheless, the rural adult population remains a large demographic with minimal environmental knowledge and a maximum potential for altering their environment, especially when considering how their treatment of the Harpy Eagle can have a direct impact on the survival of the species in Central Panama.

An alternative to presenting environmental information directly to adults in these rural communities is to attempt to transmit education through their children. This is an attractive option for Fondo Peregrino, as classroom presentations are the most efficient method of education for an NGO with limited time, money and personnel. Fondo Peregrino staff are unsure, however, how well the information will be transmitted through the generations, and how much environmental knowledge, if any, will reach the parents in a correct form.

### *2.3 Past Studies*

Few studies have been conducted on the transmission of knowledge through generations and communities as a result of childhood environmental education (Vaughan et al. 1999). Through research of existing literature, however, we have identified two examples for further examination.

In Queensland, Australia, Ballantyne et al. (2001) suggest that students respond well to informal environmental education programs and recount interesting portions of such education to their parents, with 73 % of students discussing the program in the home, and just over half of them bringing home “action” suggestions for improving the environment. Educational initiatives were best received when they addressed local environmental problems and involved students in field work where they could directly measure pollution close to home. The results gathered by Ballantyne et al. (2001) suggest intergenerational transfer is possible, though the study did not directly test knowledge levels before and after the programs through formal testing. They rather relied on children and parents to report learning or describe intergenerational encounters, which may not accurately reflect true knowledge transmission. Furthermore, the study was focused on children from grades 5-12, an older demographic than Fondo-Peregrino-Panamá’s target primary school students, and was conducted in a more affluent area than rural Panama.

An additional study by Vaughan et al. (1999) was conducted in conditions more similar to those found in the Panama Canal Watershed, and promising results were also reported. The program was delivered in a rural Costa Rican community and focused on characteristics and conservation issues related to the Scarlet Macaw, an important environmental and economic resource in the area. In total, four, 2-hour classroom sessions were held with third and fourth grade students. The lessons were based on an 80-page colouring book that taught Scarlet Macaw natural history and conservation concepts. Homework consisted of students having to read and colour the books with their parents, while also completing question-based worksheets. The answers to the questions were located within the colouring books. Knowledge levels of students, parents and other community members was tested before, immediately after, and eight months after the program. Comparing results of pretests to posttests showed that students demonstrated the most marked increase in learning from the program, improving scores on 71 % of the questions, but parents also significantly increased their knowledge of Scarlet Macaws, showing improvement on 38 % of questions on the first posttest, and 52 % on the posttest eight months later. Interestingly, community members without children in the program did not initially improve test scores significantly, but after eight months elapsed time their scores also increased, suggesting information was eventually disseminated beyond the home. This study suggests that intergenerational knowledge transfer in small, Latin American communities is a distinct possibility. During our study, we will attempt to verify these findings.

A final imperative element to any educational program is a portion devoted to evaluation (Bennett 1987; Adams and Tenneson 2004). While our study is mainly focused on identifying the potential for information transmission, it will also serve the purpose of a qualitative evaluation of educational techniques in the town, and allow us to make suggestions to Fondo Peregrino on how to most effectively continue education initiatives in rural Panama.

### 3. Our Study and Objectives

Based on the findings of Ballantyne et al. (2001) and Vaughan et al. (1999) and the necessity for continued evaluation measures for any ongoing education program, we designed a study particular to the needs of Fondo Peregrino in order to assess the transmission of environmental knowledge from children to adults. Our specific objectives are:

- 1- To analyze whether information presented in two short classroom presentations for primary school children will effectively be transmitted to parents and to other adults in two rural communities in the Panama Canal Watershed.
- 2- To qualify any differences seen in the effectiveness of knowledge transmission in a smaller as compared to a larger community in the Panama Canal Watershed.
- 3- To use information gathered through surveys, observation and experiences in both communities to formulate recommendations for the continuance of the environmental education program of Fondo Peregrino-Panamá.

It was our hypothesis that while not all environmental knowledge will be passed from the younger to the older generation, some information will be disseminated directly to parents while to a lesser extent knowledge will also reach adults who did not have children involved in the education activities. Due to the social characteristics of the communities where our study took place, we also hypothesized that knowledge will be more effectively transmitted in the larger community as compared to the smaller, but recognize this may not be the case for all instances of rural environmental education.

#### *3.1 Site Description:*

Our study will take place in two communities in the Panama Canal Watershed, each of which is located close to the Parque Nacional Soberania (appendix 1). Due to their proximity to a national conservation area and to populations of Harpy Eagles, education in the communities is a priority for Fondo Peregrino. Both communities have previously had Fondo Peregrino staff conduct educational workshops with students and interested adults, thus establishing relations between the community leaders, students and the NGO. Furthermore, McGill students have visited and conducted surveys in the communities in past years.

##### *Community #1: Santa Rosa and Guaybalito*

Santa Rosa and Guayabolito is the larger of the two communities. Though it is officially comprised of two smaller villages, for social functions, education and community organization, they effectively function as one. The two will be hereon referred to as Santa Rosa. The community is located directly on the shores of the Chagres River, and is comprised of approximately 60 inhabited houses, several small stores selling basic necessities, two churches, three outdoor “salons” or covered meeting areas, and one

primary school. Houses are located within visual distance of one another with many extended families situated as neighbours. The majority of citizens practice agriculture as means of subsistence, while the second most frequent source of livelihood is salaried jobs outside of the community (Ghomeshi et al. 2005). Most adults appeared to have a basic level of education, either to grade 3 or 6 of primary school, and know how to read and write, though older members of the community may not have this ability. A group of approximately 20 women, with several key members, form 'La Asociación de Mujeres de Ecoturismo de Santa Rosa y Guaybalito', which has a strong role in organizing town events and coordinating individuals. Overall the town seems to have a powerful sense of community and cooperation, with neighbours frequently interacting with each other, and many individuals acting as care givers to children.

#### Community #2: *Aguas Claras*

Aguas Claras is the smaller of the two communities and is not located directly on the shores of the Chagres River. It is, however, immediately bordering El Parque Nacional Soberania. Aguas Claras is approximately an hour by road on foot from Santa Rosa. The community is centered around the public buildings of a small church, school, and public meeting house. Approximately 10 dwellings are located nearby, while another 4-6 houses are located up to a thirty minute walk from the community center. The community is more disperse, does not have as many modern amenities (telephone, television, street lights), and does not appear to have the community organization or unity of Santa Rosa. Again, adults appeared to have basic literary skills, though this was not verified, and some elderly community members may not know how to read and write. There is no central association with which Fondo Peregrino maintains contact, but instead relies on the school teacher as a general liaison. Most community members here also practice agriculture for their livelihood though do not have fields close to their dwellings due to their proximity to the national park and several reforestation projects. Several community members have jobs in the forest plantations while others have temporary or permanent salaried employment outside of the community (Ghomeshi et al. 2005).

#### **4. Methods**

In order to evaluate the possibility of inter-generational transmission of information from children to adults, our project was divided in three major parts. The first was the creation and administration of a preliminary survey to the adults of the communities to evaluate their actual knowledge on the subjects we later approached with the children. The second portion was to conduct classroom activities with children addressing several environmental concepts. The last was to conduct a second survey to evaluate how effectively knowledge was transferred from the students to their parents and to other adult members of the community.

To determine knowledge gain, ten questions were repeated across the first and the second surveys (marked with an asterisk in Appendices 2 and 3). The answers for these questions were later analyzed for improvement of scores. Additional questions were interspersed throughout the survey in order to put the interviewee at ease, provide variation between

the two surveys, and to gather adult opinions related to the environment and our environmental education initiatives.

Our methods were loosely based on those employed by Vaughan et al. (1999), though due to time and logistical constraints, we did not analyze the knowledge gain by students in a formal manner. We therefore have made a large assumption that the children initially learned the correct information during the classroom activities. Oral verification during presentations and communication with students outside the school suggested that students generally learned the material well. Furthermore, we did no long-term evaluation of knowledge gain several months after the activities were conducted as they had done in the Costa Rican example.

The three portions of our field work are described in detail below:

#### *4.1 Survey # 1- Preliminary Evaluation of Knowledge*

The first survey comprised 24 questions that began by addressing parental status, continued with knowledge based inquiries, and finished with several open-ended, opinion based conversation topics (Appendix 2). Before proceeding to conduct the surveys, a pretest was conducted with 6 houses in Santa Clara de Arraijan to verify we, the two individual researchers, were presenting the survey in identical fashions, and to verify survey clarity. In Santa Rosa, Guayabalito and Aguas Claras we preceded from door to door in each community, interviewing one adult from each household. A total of 58 surveys were conducted in the two communities (48 in Santa Rosa and 10 in Aguas Claras) between February 6<sup>th</sup> and 8<sup>th</sup>, 2006. Before each survey we provided an informal introduction, describing the purpose of the survey and the overall project, and asking for voluntary participation (Appendix 4). Each survey took approximately 10-15 minutes to complete depending on the amount of conversation and level of comprehension on the part of the interviewee. We did not provide correct answers to the questions at this time, nor did we indicate if the respondent had scored well on the knowledge testing questions.

During free time in the communities, we attempted to integrate into community activities, meet children and parents, and disseminate information pertaining to why we were present.

Upon return to Panama City, questions that were to be used for statistical analysis were graded, and additional comments were noted.

#### *4.2 Activities*

On March 20<sup>th</sup> and 21<sup>st</sup>, 2006 the initial presentations were given to students of Aguas Claras and Santa Rosa. The presentations were designed to address students in grades 4, 5 and 6, though were presented to all available students. In Aguas Claras the presentation was delivered within the one room schoolhouse to eight children, grades 1-6, with the teacher present. In Santa Rosa and Guayabalito, due to difficulties with securing teachers for the school, there were no classes the week of April 20<sup>th</sup>. Given that this was the only

time for us to present to the students, we informally gathered fifteen local students from grades 4, 5 and 6 and taught them the same lesson, but in a more casual manner, in a covered area behind the local store. Both presentations took approximately an hour and a half to complete.

The presentation given began with an introduction to water, its importance, its phases, and the water cycle. We then addressed issues of water contamination and potential contaminants. We concluded by discussing the importance of plants in the ecosystem, mostly stressing concepts of what plants need to live, and in turn, how they help us survive. To encourage student participation throughout the presentation, we often asked questions or conducted demonstrations that required students to be involved. We used several visual aids such as posters, props and the black board to reinforce concepts (Appendix 5). The visual aids we brought were left with the teacher or students when we departed. Additionally, we concluded by leaving behind one experiment with the children to demonstrate the water cycle, the results of which we analyzed during the second visit. Homework was also assigned at the conclusion of the first class.

In Aguas Claras only the students in grades 4, 5 and 6 were asked to complete the homework, while younger students who received the presentation were simply asked to colour the pictures (Appendix 6). All students were assigned the homework in Santa Rosa. The homework consisted of both information and questions for completion. The answers to the questions could either be found within the homework itself, or had been supplied during the presentation. Activities within the homework all asked for adult participation, either by asking the student to interview an adult, to tell an adult a story, or to explain a concept to an adult. In class we also emphasized the importance of completing the homework with a parent, older sibling or another adult member of the community.

On Friday, April 25<sup>th</sup>, we returned to both Aguas Claras and Santa Rosa to meet with the students once again, correct the homework, reinforce concepts covered, verify results of the experiment, and give certificates to the students, recognizing their participation in our project (appendix 7). This took approximately half an hour to forty-five minutes in each community. In Aguas Claras, all students had completed the homework, even the younger students who appeared to have been helped by parents or other students in the class to answer the more difficult questions. Not all the students had correct answers, however, and thus they were asked to modify their answers, and share the corrected homework with their parents once again. In Santa Rosa, not all students who had attended our first presentation returned for the second. Of the eleven who did come back, nine had completed their homework, while only six said they had done it with an adult. Two new children joined us only for the second visit, to whom we gave a copy of the homework and invited them to follow the session with us. Nevertheless, the homework was reviewed with all students, and the correct answers verified. Again, students were encouraged to take the exercises and correct answers home and share them with their parents.

#### *4.3 Survey # 2 – Evaluation of knowledge gained*

We returned to Aguas Claras, Santa Rosa and Guayabolito approximately one week after we had visited the schools to survey adults in the communities for the second time. The second survey (Appendix 3) was slightly altered from the first, eliminating one ambiguous question, thus leaving a total of 10 analyzable questions (Question 18, Appendix 2). We also included several open ended, opinion-based questions aimed at identifying how they thought Fondo Peregrino could best educate community members. Of the 58 houses originally surveyed, we were able to return to 52. In general, we were able to talk to the same adult, or group of adults who had originally answered our first survey. We verified with each adult if their children had attended our presentations and if they had seen, or helped a child to complete their homework. At the end of the survey, adults, if they expressed interest, were supplied with an extra information sheet providing the correct answers to the survey questions we had asked (Appendix 8), and were encouraged to ask us further questions.

#### *4.4 Analysis*

Both surveys were marked out of a total of ten points, counting only those 10 questions repeated in both surveys. Ambiguous questions or options were eliminated from the analysis, and each question was weighted evenly. Only the surveys completed by the 52 respondents who answered both the first and second surveys were used for analysis. Scores were totaled for each household and further qualified according to in which community the house was located, whether the adult respondents were parents of children who attended our presentations, and if the adults had indicated that they had seen the homework given. Statistical analyses were then run, using one-tailed t-tests to examine whether there was an overall improvement of scores among the entire population of both communities, and among the abovementioned subsections.

Open-ended and discussion questions were then read and qualified according to the subject they treated. Analysis focused on how adults believed knowledge could be transmitted through the community, and how Fondo Peregrino could improve environmental education initiatives in Aguas Claras, Santa Rosa, and other rural communities in Panama.

#### *4.5 Ethical Considerations*

We completed our study in concordance with the norms and ethics regulations of McGill University. No names of adults or children were taken during data collection. Houses surveyed were identified and kept track of by numbers. An explanation of the project was given to each survey respondent before beginning questioning. We made sure to introduce ourselves, Fondo-Peregrino, and the goals of the study, as well as mention that participation was completely voluntary (See appendix 4). Children were supplied with similar information before the teaching sessions. Results will be returned to the

community upon completion of the project in the form of an information sheet to be distributed in the schools and at local stores (Appendix 9).

## 5. Results

### 5.1 Knowledge Transmission and Gain

In both Aguas Claras and Santa Rosa, mean scores achieved on the second survey were slightly higher than those on the first. In total, the 52 adults who completed both surveys achieved an average score of 5.35/10 on the second survey as compared to 4.81/10 on the first. The maximum score recorded was 8.67/10 on the second survey (Table 1). A statistical analysis of their improvement revealed that adults on average improved scores by 0.54 points, a significant result (one-tailed t-test,  $\alpha = 0.05$ ,  $p = 0.014$ ; table 2), with those who saw a student’s homework most significantly improving their scores (one-tailed t-test,  $\alpha = 0.05$ ,  $p = 0.017$ ; table 2). Parents also demonstrated significant learning (one-tailed t-test,  $\alpha = 0.05$ ,  $p = 0.048$ ; table 2). The most marked improvement on the second survey was achieved by a parent who increased her score by 4.20 points. Non-parents and those who did not see the homework did not significantly increase scores from the first to the second survey (table 2), though several individuals still showed improvement.

There was no significant difference in learning between Aguas Claras and Santa Rosa ( $p = 0.514$ ), with both towns exhibiting similar trends of parents and those who saw the homework learning more than non-parents or those who did not see the homework.

Table 1. Raw Scores Achieved on Surveys Conducted in Santa Rosa and Aguas Claras

	Santa Rosa				Aguas Claras				Total			
	N	Max (/10)	Min (/10)	Mean (/10)	N	Max (/10)	Min (/10)	Mean (/10)	N	Max (/10)	Min (/10)	Mean (/10)
Survey 1	44	7.38	2.02	4.76	8	6.43	3.97	5.08	52	7.38	2.20	4.81
Survey 2	44	8.67	1.15	5.29	8	8.43	4.52	5.70	52	8.67	1.15	5.35

Table 2. Improvement of Survey Scores in Santa Rosa and Aguas Claras

	Santa Rosa	Aguas Claras	Total	P Vaule ( $\alpha = 0.05$ )
Mean Improvement (/10)	0.53	0.61	0.54	p = 0.014*
Mean Improvement of Parents (/10)	0.72	1.3	0.84	p = 0.048*
Mean Improvement of Non-Parents (/10)	0.43	-0.07	0.37	p = 0.146
Mean Improvement of those who saw homework (/10)	1.09	1.3	1.14	p = 0.017*
Mean Improvement of those who did not see homework (/10)	0.314	-0.07	0.27	p = 0.25

\* Statistically significant learning demonstrated

## 5.2 Attitudes towards environmental education

Question 23 to 28 in the second survey (Appendix 3), asked for qualitative data addressing what people thought about environmental education and what would be the best ways to achieve it. As shown in Figure 1, all adults surveyed felt that environmental education activities in their communities are valuable (100 %), while the majority also thought that children learn from these activities (79 %). While most reported that they believed adults could learn from what the children were taught (73 %), many commented that educational initiatives directed to adults were also important (64 %). Concerning the homework, 42 % considered it an adequate means for learning and for transmission of educational information. However, only a minority of interviewees believed that adults are likely to share newly acquired environmental knowledge with other members of the community (27 %).

In terms of general propositions for improvement for community based environmental education, respondents suggested activities needed to be conducted more often, the activities had to be done within the school (reported in Santa Rosa where school was not in session), and presentations should be done in high schools as well. A final suggestion was that activities could be most effective if targeted towards the family, where parents and kids learn together.

As many adults reported a need for adult environmental education initiatives in their communities, they were further asked how to attract adults to these normally under-attended events. We received many suggestions. A considerable number of people told us that if they do not attend these activities it is because they are not aware where and when they take place, so this information should be available as early as possible. They recommend publicity at local stores, messages transmitted by the school teacher and

passing door to door as efficient means to announce the activities. There was also an emphasis given to the importance of adults having fun in these presentations in order to raise their interest, make them talk and share their learning, and come back the next time. An additional suggestion was to present the talks at the school on Sunday afternoon, as this is the time people do not work and have time for social events. Presenters also must be sure to take into consideration that some elders are illiterate. For Fondo Peregrino, bringing the eagle is also an excellent incentive for attendance to the activities. Despite the expressed interest of many adults for increased adult-targeted educational talks in their communities, several people acknowledged that attracting adults to such presentations is hard, no matter the incentives employed. However, as one respondent pointed out, adult presentations should definitely be continued for those who are interested and want to continue to educate themselves.

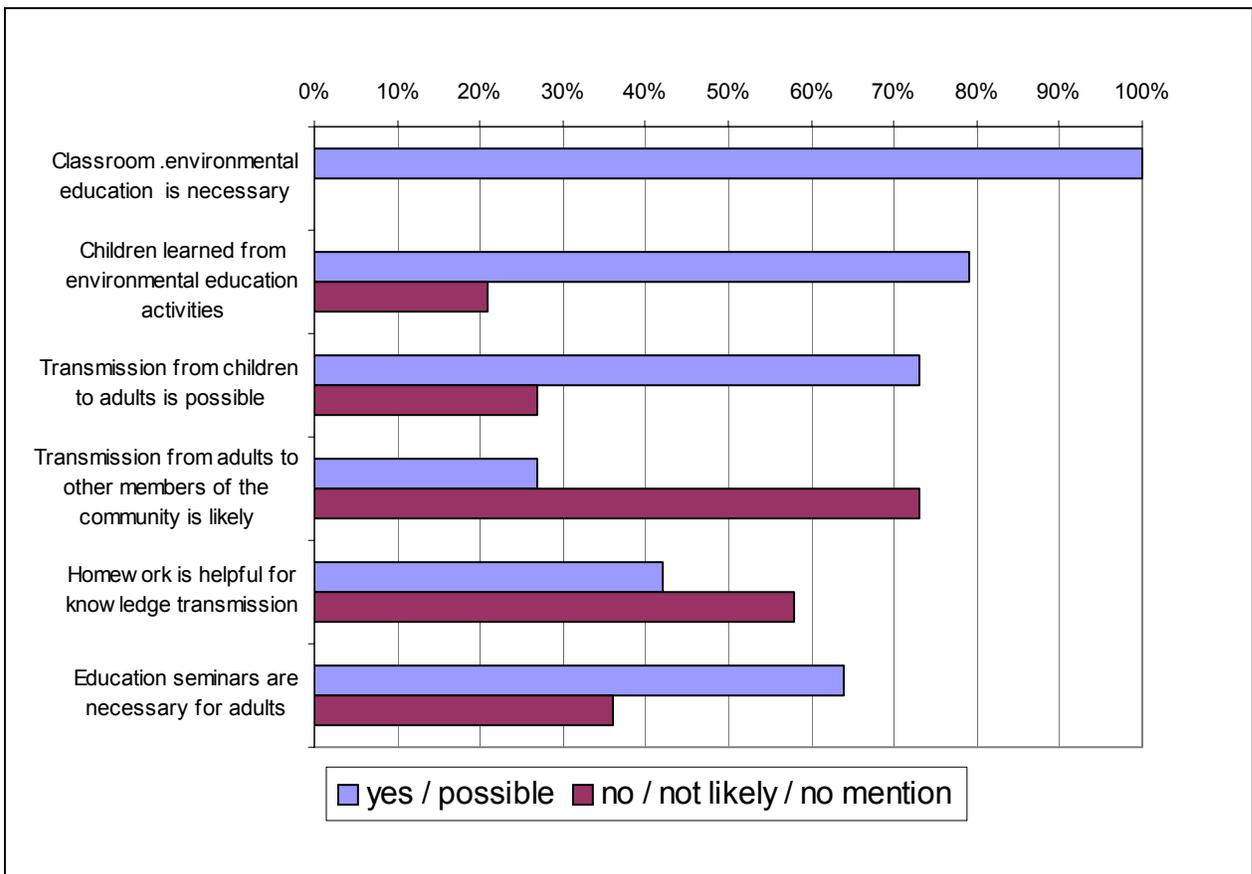


Figure 1: Community’s opinion concerning environmental education practices and processes.

**6. Discussion**

*6.1 Knowledge Transmission*

Though the above results indicate parents and those adults who saw a child’s homework demonstrated significant learning, on average these groups only scored another 1.3 points on the second survey as compared to the first. As several respondents who were

completely unaware of our school visits improved their scores by two to three points, we cannot conclude from the statistical results that there was widespread learning among the adults in Santa Rosa or Aguas Claras. We suspect that improved scores of less than three points were more attributable to improved delivery of survey questions on our part, and better understanding on the part of the interviewee. As surveyors, we can only confidently report witnessing significant recognition of the homework, obvious learning, and a noticeable increase in knowledge among four adults of four different households. These adults were all parents, had all actively participated in helping their child complete their homework, and had expressed interest in learning more about subjects treated in the homework.

Participation of adults in a child's homework does not, however, guarantee learning. Many adults reported seeing the homework, helping with the homework, or even learning from the homework, but did not improve their scores on the second survey. Additionally, we suspect that many students, instead of teaching their parents with the aid of the homework, asked their parents questions and took the parent's answers as more accurate or reliable than those they had received from us. Understandably, children have generally been taught that adults are correct, and therefore may be hesitant to contradict a parent and inform them that they are mistaken. Children may also have a higher tendency to believe what their parents, a constant presence in their lives, are saying as compared to what two foreigners, who have visited their school only for an hour, have said. Nevertheless, for any knowledge transmission to occur, homework that requires involvement of parents is a must. There certainly remains potential for parents to learn by participating in children's homework, as most students did an excellent job of involving their parents and using them as resources to answer the questions.

In general, though the goal was to transmit knowledge easily from children to adults, without requiring significant extra effort on the part of the adult, success ultimately still relies on adult initiative. If a parent is involved in their child's schooling, is willing to take time out of their day to learn with their child, and is interested in the subject matter treated, the parent has an excellent potential to learn. Passive dissemination of information from children to parents to the community at large, however, appears to be an unrealistic goal.

## *6.2 Comparison of communities*

Comparing a smaller (Aguas Claras) to a larger (Santa Rosa and Guayabalito) community did not reveal any significant differences in learning between adults of either community. Our comparison, however, remains inadequate, as not only were the two towns different sizes, but they had different social dynamics, and experienced slightly different approaches to our study.

Most notably, our educational presentations in Aguas Claras took place within a school, with a teacher present, whereas in Santa Rosa the presentations were much more informal. This resulted in a higher level of attention paid among students of Aguas Claras, a higher rate of return of students to our second presentation, and a much higher

rate of students completing their homework. Though increased learning was not noted among adults in Aguas Claras, we feel as presenters that our activities were more effective in the Aguas Claras school, therefore making direct comparisons of learning between the two towns inappropriate.

Several other confounding factors have influenced our comparison of the two communities. First, we were unable to survey as high a proportion of houses in Aguas Claras as in Santa Rosa due to absence of adults, thus limiting sample size in the town and placing constraints on the accuracy of conclusions we can draw from Aguas Claras results. Furthermore, we believe that town dynamics may noticeably influence community learning. Aguas Claras was a much more disperse, less socially organized community than Santa Rosa, leaving us to predict that there is a lower potential for dispersion of knowledge through the community. We have concluded, therefore, that it is not the size of the town that determines the potential for dissemination of knowledge, but rather quality of presentations, town dynamics, and most importantly, individual and family qualities. Ultimately, it appears that it is individual and family dynamics that will determine whether an adult will learn from a child and will continue to disseminate this knowledge through their household and community.

### *6.3 Local attitudes towards environment and education*

Comments received during the surveying process revealed that community members are conscious of environmental problems such as water and air contamination, see the benefits of environmental education in their community, and recognize education is needed for improvement of the quality of their environment. Accordingly, the majority of them are in favour of environmental education activities with children and adults in their communities.

In regard to an education program for children, our observations and parent comments reinforced that the presence of a homework exercise is imperative to facilitate the transmission of knowledge. Homework including educational information and involving parents is the most effective means of relaying information presented in the classroom to the adult population. However few parents said that they would converse with other adults outside their home about what they learned from their child's homework, thus limiting the potential for community-wide dissemination of knowledge. Parents agreed with our conclusion that presentations should be done in the classroom instead of conducted in an informal manner such as we did in Santa Rosa. Moreover, frequent visits are needed to reinforce and review the concepts treated, therefore leading to a greater assimilation. The increased presence of Fondo Peregrino in school, and in the community in general, would increase children and adult interest and learning. Finally, several high school students and parents suggested visits to high schools would be helpful, as high school students are more able to grasp complex environmental concepts, may better influence their parents, and are the adults of tomorrow.

Recognizing that school activities can not replace adult education in communities, but considering that it is difficult to attract adults to educational seminars, better publicity and

incentives are needed. Advertisement at local stores, messages transmitted by the school teacher and by visits door to door, are all required as early as possible. Being aware of the presentation in advance will give adults the opportunity to plan their participation. We found that personal communication both with community leaders and heads of households was the most effective means of publicizing our presence but realize the difficulties associated with advanced logistical planning in an isolated rural community. We also observed while in Santa Rosa that the adult attendance to parent meetings at the school appeared high, so the idea of using a similar framework and conducting adult presentations in schools could be a good alternative. Also, choosing an appropriate time for maximum adult attendance is imperative. Several adults suggested Sunday afternoon, when people have free time, could be a good option. As with children's educational activities, for successful participation and learning, activities have to be fun and stimulate interest to attract adults and to encourage adults to share the experience with other community members. Talking about concrete problems that relate to everyday life is definitely a way to do so. The idea of having familial activities, for adults and children at the same time, could also be a successful strategy for educating both parties. In the interview process adults placed a large emphasis on the importance of education for their children. Therefore, in an attempt to better educate their children, parents may be more motivated to accompany them to family-targeted seminars.

Finally, from the general comments we received during the time we were in these two communities, we noted a great interest and curiosity toward the Harpy Eagle. After the eagle's visit to the Santa Rosa festival, many people inquired about the bird and when it would be returning to the community. The presence of the eagle stimulates widespread community interest among adults and children alike and would definitely be an incentive for attending an educational seminar.

#### *6.4 Limitations and Challenges*

Though in general our study proceeded as planned and we feel the results gathered are both accurate and reliable, unforeseen bias and obstacles encountered throughout the four months of our fieldwork must be considered.

Most notably, we must remember that activities with children were not conducted in a classroom setting in Santa Rosa. This resulted in a lower number of children attending the sessions, fewer children completing their homework, and even fewer involving an adult in their learning process. We predict that future formal classroom presentations will result in slightly higher rates of learning among children and adults in Santa Rosa. Our examination of Aguas Claras, however, suggests that increased learning among adults will not be especially significant even with classroom presentations, and these cannot replace adult education initiatives.

Throughout the interpretation of our results, we also assumed that the children of the community originally learned the material well and accurately from the activities. Though we can generally be confident this was the case due to post-presentation communication with children, this was not tested or confirmed. If the child did not

originally learn the material well, this markedly decreases any possibility of adult learning. We also assumed that all students who did their homework involved an adult, and all adults who reported to have seen the homework, did in fact do so. We must recognize that this was probably not always the case. Furthermore, statistical analysis does not identify if respondents who improved their scores did so by learning from a child, or by simply better understanding the questions posed. As researchers we suspected many improvements in score due to a clearer delivery of questions on our part, or a better understanding of the questions on the part of the respondent.

Inaccurate survey results were also likely gathered due to bias we created as young, foreign researchers with limited Spanish skills. This was especially evident with the open-ended, opinion based questions. No respondent wished to express to us negative feelings towards environmental education in schools, the role of Fondo Peregrino in their town, or the presence of foreign researchers in their community. Adults may have also demonstrated more interest in learning about the environment and attending adult education programs than what they realistically feel. Furthermore, due to a language barrier, we may not have accurately interpreted or reported true sentiments conveyed by the interviewee. Some interviewees also may have felt threatened recognizing that the second survey had similar questions to the first, leading them to feel nervous or agitated, knowing their knowledge was being tested. Equally, several respondents obviously felt uncomfortable when faced with questions that they could not answer, thus possibly decreasing the amount of thought they dedicated to answering each question fairly and to the best of their knowledge, and limiting the potential for conversation during or after the open-ended questions.

Finally, it was difficult to be present in these small communities without creating expectations among residents that our study was the beginning of a new, more active environmental education program in their community. Though we aspired to convey that we, as university students, were simply conducting a study and would not be returning for further classroom activities, we felt this was not completely understood. Our presence left many to ask when we were returning to the school and when adult presentations may be next scheduled in their communities.

## **7. Recommendations to Fondo Peregrino**

From our surveys, classroom presentations, results, casual conversations and experiences in Santa Rosa, Guayabalito and Aguas Claras, we have formulated several recommendations for Fondo Peregrino-Panamá. We recognize that Fondo Peregrino is already employing several very effective educational techniques. Along with the current classroom presentation programs, teacher education programs, and community outreach initiatives, we feel that consideration of the following may help to improve the success of environmental education initiatives in rural communities near Harpy Eagle populations.

### *7.1 To maximize knowledge transmission*

1. Classroom presentations are an effective and imperative component of any community based environmental education initiative. If possible, frequency of school visits should increase, as it was evident that continued reinforcement was needed for effective student, and adult, learning. This could also be achieved through long-term coordination with local teachers.
2. A homework activity requiring the involvement of an adult is an essential part of community education if any knowledge transmission is to be accomplished. Oral transmission of knowledge was rarely a means for knowledge transmission in our study, and few adults identified this as a possible means for effectively learning new concepts from their children.
3. Homework activities should display educational information along with requiring participation from an adult.
4. A shorter term, but more intensive education program within schools may be an effective means of transferring knowledge to children and adults. The Costa Rican example involving colouring book exercises for children to complete with adults over a period of a month (Vaughan et al. 1999) is a good example of how knowledge can be effectively transferred to adults and the larger community through classroom activities.
5. For effective environmental education, as mentioned in Ballantyne et al. (2001), students need to be involved in experiencing, studying and actively measuring their environment. Student participation in activities, and creation of a fun and stimulating ambiance will result in increased enthusiasm and increased sharing of knowledge to adults and other community members. We recognize that this is already a large part of Fondo Peregrino's educational initiatives.

### *7.2 To maximize community learning*

6. Classroom presentations cannot replace adult education. Though some parents may learn environmental concepts from their children, our results indicate that widespread learning among adults and the community will not occur. Both Santa Rosa and Aguas Claras adults expressed interest in attending adult seminars given by Fondo Peregrino.
7. To increase adult participation, talks must be well publicized in advance through local town authorities, door to door visits, and advertising at public gathering areas such as local stores. Classroom presentations and homework given by Fondo Peregrino in the schools may also increase adult interest and motivate them to pursue their own environmental education further.

8. Bringing the eagle to communities is a huge attractant and markedly increases interest and enthusiasm for learning. Whenever possible, it should be used as an educational tool.
9. To increase overall community knowledge, techniques such as Sunday afternoon presentations, classroom visits in secondary schools, and activities targeted at families may be effective and may warrant further investigation.
10. Locally relevant environmental information stimulates the most interest. Beyond raptor ecology, survey respondents appeared most interested in river ecology and water contamination in Santa Rosa, two subjects that affect the lives of community residents everyday. In Aguas Claras, forest ecology and forest plantations were often a subject of discussion and interest. Global subjects such as the world's oceans and fresh water sources stimulated little interest, as any knowledge gained on the subject did not apply directly to local, everyday life.
11. As researchers treating environmental issues, we could not ignore the presence of the cement company extracting rock from the Chagres River, directly opposite the town of Santa Rosa. Most everyone in the community mentioned this as an ongoing problem and environmental threat, though knowledge levels concerning the project were low. Ethically, as outside researchers, we feel that to adequately 'give back' to the community, education concerning river ecology, contamination, and tools for improving environmental awareness and action are necessary parts of any environmental education initiative in Santa Rosa.
12. Though our presence, as foreign research students, was welcomed and appreciated in the communities we visited, we felt that in some cases our education initiatives would have been more successful if presented by local Panamanians. This would have encouraged people to ask more questions without being intimidated, eliminated problems associated with language barriers, and generally increased understanding, on the part of ourselves and the participants. Therefore, when possible, Panamanian educators may be the most effective in rural communities.
13. Though raptor education initiatives have already occurred in Santa Rosa and Aguas Claras, many people, (children and adults), did not attend past seminars, or had trouble recalling information they knew had been presented in information sessions. Therefore, more raptor education should occur in both communities.
14. Accurate knowledge concerning general, environmental principles addressed in our study was minimal in both communities. Basic environmental principles need to be taught to community members for increased understanding and stewardship of their natural surroundings, and subsequently Harpy Eagle habitat. Both the interest and the possibility for increased learning in Santa Rosa, Guayabalito and Aguas Claras is present. Continued environmental educational initiatives from Fondo Peregrino are needed, and will surely be welcomed by local children and adults alike.

## **8. Conclusions**

Though our formal study found little transmission of knowledge from children to adults in Aguas Claras and Santa Rosa, we did encounter a high level of interest and potential for successful education initiatives. The child and adult populations are aware, interested, and open to learning more about the Harpy Eagle and the environment in general. We believe more environmental knowledge can reach rural Panamanian communities with increased intensity of classroom visits, administration of homework exercises, and continued persistence to directly educate adult residents. Fondo Peregrino's already successful education program will only become more influential with time, as an increasing number of people are becoming aware of their initiatives, and more and more children are being reached each year. There is no doubt that with the continued dedication of the staff and volunteers at Fondo Peregrino- Panamá, environmental and raptor knowledge will only increase.

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**10. Appendices**

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## APPENDIX 2: First survey

### Fondo Peregrino-Panamá



10.\* ¿Cuál es el océano más grande del mundo?

- Océano Pacífico                       Océano Ártico  
 Océano Atlántico                       Océano Indico

11. ¿De dónde viene el agua que beben aquí?

\_\_\_\_\_

12.\* ¿Es posible que una gota de agua en el Rio Chagres pudiera viajar en el futuro a los siguientes lugares?

- Los océanos  
 Las nubes  
 La lluvia en Canadá  
 El agua bajo del suelo

13. ¿Tiene un huerto o una plantación?  Si  No.

Si tiene, ¿qué siembra? \_\_\_\_\_

14.\* ¿Qué necesitan las plantas para vivir? Dígame sí, no o no sé después de cada opción.

- el oxígeno                               las piedras  
 el azúcar                                   el dióxido de carbono  
 el agua                                       nutrientes del suelo  
 el sol

15. ¿Puede decir tres cosas que come el Águila Arpía?

- 1) \_\_\_\_\_  
2) \_\_\_\_\_  
3) \_\_\_\_\_

16.\* Una sustancia contaminante es algo que interrumpe los procesos normales de los sistemas naturales o un ecosistema. ¿Cuál de las siguientes cosas pueden considerarse como sustancias contaminantes en el río? Diga si, no o no sé.

- el Jabón                                       la hierba  
 el abono/ fertilizante                       el estiércol de vacas  
 las hojas de las plantas                       un cartón de leche

17.\* ¿Si hubiese sustancias contaminantes en el río ¿qué o quién puede ser afectado?

- nadie ni nada por que se quedan en el agua  
 las plantas del río, bajo el agua               las plantas en las orillas del río  
 los peces                                       los cocodrilos  
 las aves

18.\* ¿Quiénes de los antes mencionados son los más afectados?

- Todos igualmente                               las plantas del río, bajo el agua  
 las plantas en las orillas                       los peces  
 los cocodrilos



## APPENDIX 2: First survey

Fondo Peregrino-Panamá



19. \*¿Por cuánto tiempo piensa que las sustancias contaminantes pueden permanecer en el agua del río?

- Desaparecen inmediatamente       Algunos días  
 Aproximadamente una semana       Pueden permanecer por meses o años

20. ¿Cuál de las siguientes opciones representa una amenaza para las Águilas Arpías?

- nadie       los hombres  
 animales como el puma o el ocelote

21.\* De los siguientes materiales, ¿cuáles se descomponen más lentamente?

- la comida       las hojas  
 la madera       el plástico

22. ¿Piensa que el ambiente natural en su comunidad, está en buenas condiciones? ¿En una escala ascendente del uno al cinco, como evalúa su ambiente y por qué? (el uno es lo peor y el cinco es lo mejor)

\_\_\_\_\_

23. ¿Piensa que la salud de su ambiente puede afectar la salud de sus hijos? ¿Por qué?

\_\_\_\_\_

24. ¿Qué piensa de un programa de educación ambiental en su comunidad?

\_\_\_\_\_



APPENDIX 3: Second survey



Fondo Peregrino-Panamá



12. ¿Hay represa(s) en el río Chagres? ¿Si hay, cuantos hay?

\_\_\_\_\_

13.\* ¿Es posible que una gota de agua en el Río Chagres pudiera viajar en el futuro a los siguientes lugares?

- Los océanos
- Las nubes
- La lluvia en Canadá
- El agua bajo del suelo

14. ¿Cuando era niño/a, sus padres tenían un huerto o una plantación? En general, ¿piensa que personas cultivan más o menos productos agrícolas hoy en la comunidad?

\_\_\_\_\_

15.\* ¿Qué necesitan las plantas para vivir? Dígame sí, no o no sé después de cada opción.

- |                                     |  |
|-------------------------------------|--|
| <input type="checkbox"/> el oxígeno | <input type="checkbox"/> nutrientes del suelo  |
| <input type="checkbox"/> el azúcar  | <input type="checkbox"/> el dióxido de carbono |
| <input type="checkbox"/> el agua    |  |
| <input type="checkbox"/> el sol     |  |

16. ¿Ya viste una Águila Arpía en el área?

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_

17.\* Una sustancia contaminante es algo que interrumpe los procesos normales de los sistemas naturales o un ecosistema. ¿Cuál de las siguientes cosas pueden considerarse como sustancias contaminantes en el río? Diga si, no o no sé.

- |   |  |
|---|--|
| <input type="checkbox"/> el Jabón                 | <input type="checkbox"/> la hierba             |
| <input type="checkbox"/> el abono/ fertilizante   | <input type="checkbox"/> el estiércol de vacas |
| <input type="checkbox"/> las hojas de las plantas | <input type="checkbox"/> un cartón de leche    |

18.\* Si hubiese sustancias contaminantes en el río ¿qué o quién puede ser afectado?

- |   |   |
|---|---|
| <input type="checkbox"/> nadie ni nada por que se quedan en el agua |   |
| <input type="checkbox"/> las plantas del río, bajo el agua          | <input type="checkbox"/> las plantas en las orillas del río |
| <input type="checkbox"/> los peces                                  | <input type="checkbox"/> los cocodrilos                     |
| <input type="checkbox"/> las aves                                   |   |

19. \*¿Por cuánto tiempo piensa que las sustancias contaminantes pueden permanecer en el agua del río?

- |   |   |
|---|---|
| <input type="checkbox"/> Desaparecen inmediatamente | <input type="checkbox"/> Algunos días                       |
| <input type="checkbox"/> Aproximadamente una semana | <input type="checkbox"/> Pueden permanecer por meses o años |

20.\* De los siguientes materiales, ¿cuáles se descomponen más lentamente?

- |                                    |                                      |
|------------------------------------|--------------------------------------|
| <input type="checkbox"/> la comida | <input type="checkbox"/> las hojas   |
| <input type="checkbox"/> la madera | <input type="checkbox"/> el plástico |



Fondo Peregrino-Panamá



21. ¿Piensa que el ambiente natural en su comunidad, está en buenas condiciones? ¿En una escala ascendente del uno al cinco, como evalúa su ambiente y por qué? (el uno es lo peor y el cinco es lo mejor)

(comments from interviewer: \_\_\_\_\_)

22. ¿Piensa que la salud de su ambiente puede afectar la salud de sus hijos? ¿Por qué?

(comments from interviewer: \_\_\_\_\_)

23. ¿Qué piensa de nuestras visitas en la escuela? ¿Piensa que su(s) niño(s) aprendió / aprendieron mucho?

(comments from interviewer: \_\_\_\_\_)

24. ¿Qué piensa de la tarea que tuvieron los estudiantes? ¿Piensa que aprendieron mucho de esos ejercicios?

(comments from interviewer: \_\_\_\_\_)

25. ¿Piensa que usted aprendió algunas cosas sobre el ambiente también? ¿De la tarea o directamente de sus hijos?

(comments from interviewer: \_\_\_\_\_)

26. ¿Piensa que es posible que Ud. o su hijo(s) discutirían de lo que aprendieron con otros miembros de su familia, o con otra gente en la comunidad? ¿En que ocasión y por qué?

(comments from interviewer: \_\_\_\_\_)

27. ¿Si hay problemas ambientales en su comunidad, piensa que Ud. podría cambiarlos? ¿En caso afirmativo, que podría hacer, tiene un ejemplo? ¿En caso negativo, por qué no podría? \_\_\_\_\_

(comments from interviewer: \_\_\_\_\_)

28. ¿Tiene sugerencias para nosotros? ¿Cómo podríamos mejorar nuestro programa de educación ambiental? \_\_\_\_\_

29. ¿Tiene preguntas para nosotros?

## **APPENDIX 4: Introduction to the survey**

Introducción:

Disculpenos por importunarle, somos estudiantes de la universidad McGill en Canadá, y estamos trabajando con el Fondo Peregrino. ¿cree que sea posible contestarenos unas preguntas? ¿Tiene el tiempo?

Muchas gracias.

Como lo dijimos, trabajamos con Fondo Peregrino y hacemos un investigación para proyecto de la universidad y para el programa de educación ambiental del Fondo Peregrino. Queremos ver si la información enseñada a los niños esta siendo transmitida de manera correcta a la comunidad, entonces estamos haciendo un sondeo con los adultos de la comunidad hoy y los siguientes días.

El próximo mes vamos a hacer actividades con los niños dos veces y al final vamos a regresar para hacer otro sondeo. Los datos y los resultados van a ser tratados confidencialmente y su nombre o el nombre de su hijos nunca van a ser revelados.

También su participación en este sondeo es completamente voluntario.

Si quiere participar y está listo, vamos a empezar.

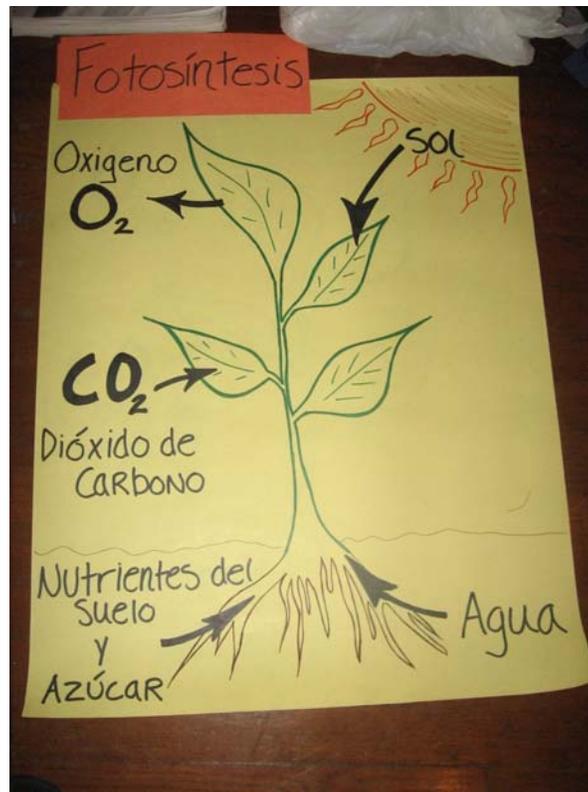
Si no sabe la repuesta a una pregunta, no hay problema, estamos aquí solamente para ver como podemos mejorar nuestro programa de educación ambital.

## APPENDIX 5: Educative material used for the presentations

Water cycle:



Photosynthesis :



## APPENDIX 6: Homework

Nombre \_\_\_\_\_

Fecha \_\_\_\_\_

# ¡El Agua es Importante!

Tres cuartos (3/4) del mundo están cubiertos por agua...

Mira como los océanos cubren la mayor parte de la superficie terrestre.

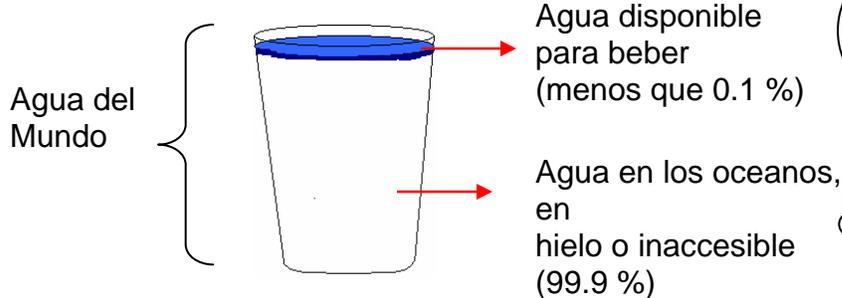


¿Cuáles son los océanos con los que limita Panamá?

1) \_\_\_\_\_ 2) \_\_\_\_\_

Y ¿Cuál es él más grande? \_\_\_\_\_

PERO... ¡de todo el agua, menos que **0.1 %** está disponible para beber!



97.5 % del agua del mundo es agua salada y el 2.5 % es agua dulce, 99% está en los hielos o en el suelo (agua subterránea y suspendida entre las pequeñísimas partículas del suelo).

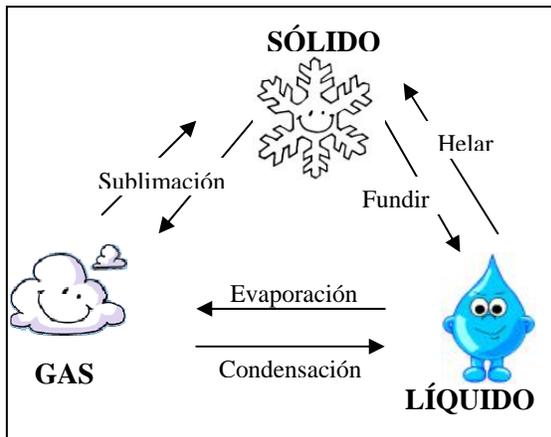
## APPENDIX 6: Homework

Nombre \_\_\_\_\_

¿Pero cómo viaja esta agua?  
¿Te acuerdas del ciclo del agua?  
El agua puede viajar por todo el mundo y puede estar en distintas formas o fases. Mire los esquemas para que recuerde.



## TAREA:



- 1- Explica a tus padres o a otro adulto el ciclo del agua.  
NOMBRE DEL ADULTO: \_\_\_\_\_
- 2- Con este adulto, lee la siguiente historia de una gota de agua.
- 3- Después de la lectura, escoge cuatro distintas situaciones de la gota en la historia que te hayan agradado y dibújalas.
- 4- En tus dibujos asegúrate que la gota pasa por todas formas del agua (sólido, líquido y gas).
- 5- Debajo de cada cuadro, describe en qué forma (o fase) está la gota de agua a ese momento.

### HISTORIA:

Una gota de agua está en las nubes en el cielo arriba del Océano Pacífico y viaja con el viento. Después de muchos días de viajar hay millones y millones de otras gotas que se **condensan** y se preparan a caerse. Pero luego de este gran viaje con la nube, la gota llegó a Canadá. En Canadá es invierno y hace mucho frío, como en un congelador. Cuando la gota se cae del cielo, ella se transforma en **nieve**. Se queda en las montañas de Canadá hasta la primavera cuando se **funde** y llega a un río.

El viaje de nuestra gota no se termina allí: la gota corre con el río y llega al Océano Atlántico y es llevada por la corriente que se dirige al mar Caribe. Con el sol muy fuerte que pega en el agua, la gota se **evapora** y se encuentra con las nubes de nuevo. Viaja una corta distancia antes de caer otra vez en forma de **lluvia**. ¡Esta gota aterriza sobre la cabeza de un niño Panameño!

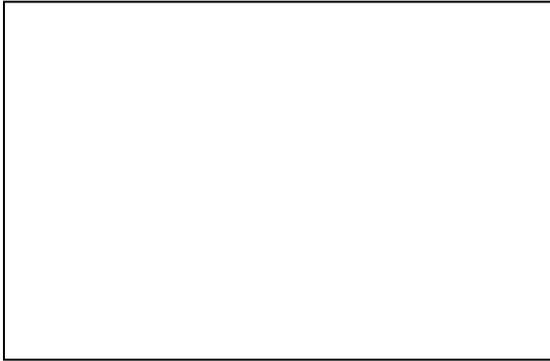
Aquí termina la historia pero es importante darse cuenta que la gota de agua va a continuar su viaje por la eternidad.

## APPENDIX 6: Homework

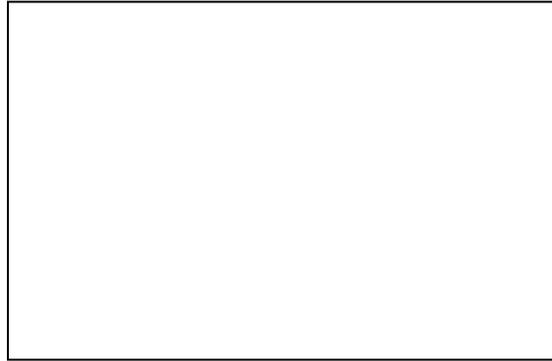
Nombre \_\_\_\_\_

Fecha \_\_\_\_\_

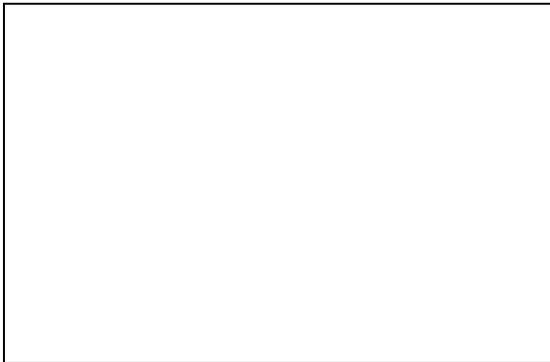
**Dibuje:**



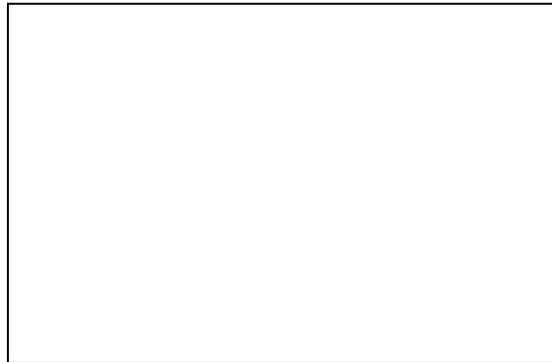
Fase: \_\_\_\_\_



Fase: \_\_\_\_\_



Fase: \_\_\_\_\_



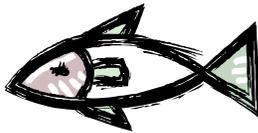
Fase: \_\_\_\_\_

### ¡CUIDE EL AGUA Y EL AMBIENTE!

Desafortunadamente, toda nuestra agua no está limpia a causa de la contaminación. Muchas cosas diferentes pueden ser sustancias contaminantes.

#### TAREA:

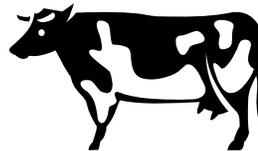
De los siguientes diagramas, colorea los que pueden considerarse como sustancias contaminantes si son vertidos al Río Chagres.



Peces



Gasolina



Estiércol de vacas



Químicos para la limpieza



Hierba



Jabón



Abono o fertilizante

## APPENDIX 6: Homework

Nombre \_\_\_\_\_

Fecha \_\_\_\_\_

\*\* No olvide que la contaminación no afecta solamente a los ríos sino a todo el ambiente y las especies que viven en él; ¡Incluidos los humanos, las águilas arpías y los cocodrilos! También, la contaminación puede quedarse en el ambiente por mucho tiempo... ¡aún por meses o años! \*\*

### COMPARACIÓN:

Ahora, hay cosas en su comunidad que son diferentes a cuando sus padres eran niños. Hable con un adulto e indique cuándo hay/había:

	<u>AHORA</u>	<u>EN EL PASADO</u>
Más casas en su pueblo:		
Más árboles en el bosque:		
Más animales silvestres cerca del pueblo:		
Más basura en su pueblo:		
Más contaminación en el río:		

### ¡PARA APRENDER MÁS!

Las plantas son importantes para nosotros porque las comemos y también producen el oxígeno que respiramos.

De las siguientes cosas que las plantas necesitan para vivir, encierre las que las plantas no reciben cuando están cubiertas con basura.



Azúcar



Nutrientes del suelo



Agua

$CO_2$

Dióxido de carbono



Sol

$O_2$

Oxígeno

**Experimentación Extra:** Si quieres hacer un experimento con tus padres, pon algunos pedazos de basura sobre la hierba o una planta pequeña afuera de tu casa. Deja esta basura allá por dos semanas. Después de este rato, mira las plantas. ¿Están vivas todavía?

Termina esta tarea y llévala a clase: \_\_\_\_\_(fecha)



# ¡Felicitaciones!

Has completado dos clases de educación ambiental con el Fondo Peregrino-Panamá y

---

de la Universidad McGill



Te queremos agradecer por tu participación y animarte a compartir tus nuevos conocimientos a cerca de las plantas, agua, y la contaminación con los otros miembros de su comunidad



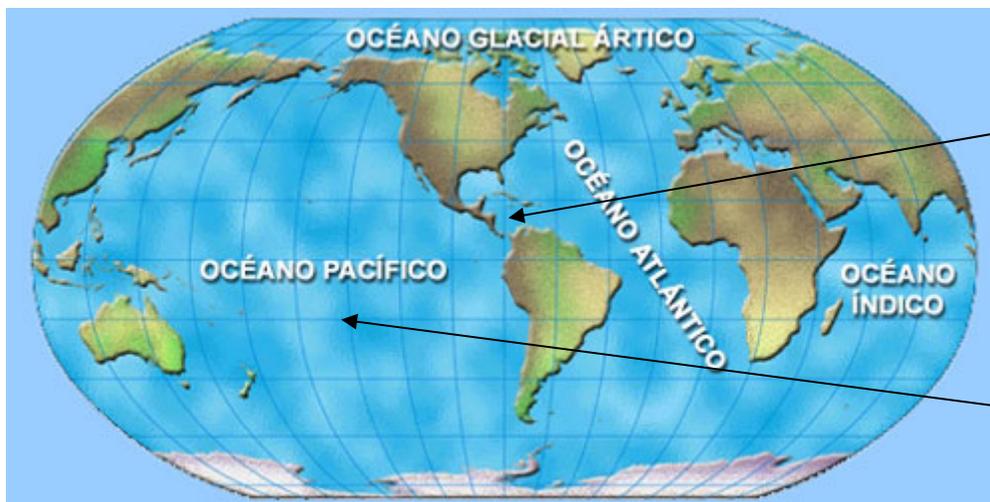
Fondo Peregrino-Panamá



# ¡Agua en el mundo!

Tres cuartos (3/4) del mundo están cubiertos por agua...

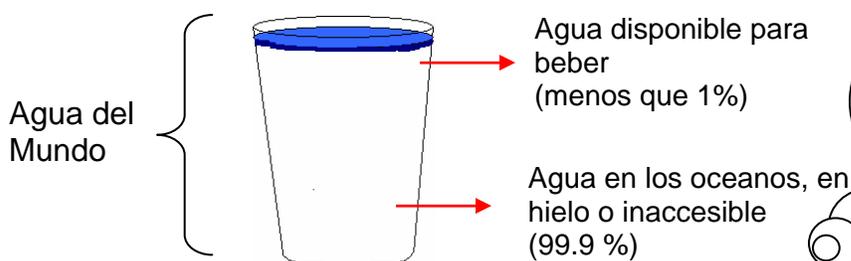
Mira como los océanos cubren la mayor parte de la superficie terrestre.



Panamá

De los cuatro océanos del mundo, el **Océano Pacífico** es el **más grande**.

PERO... ¡de todo el agua, **menos que uno por ciento (1%)** está disponible **para beber!**

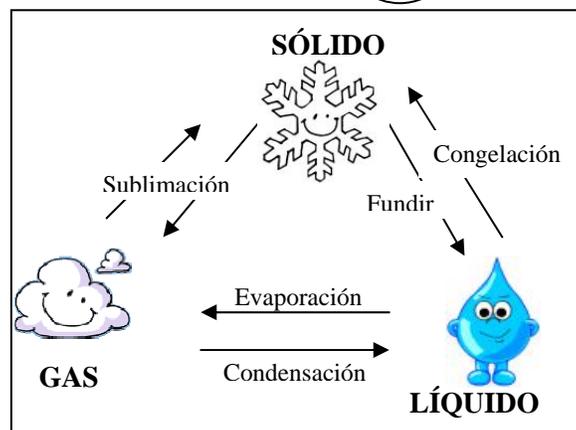


97.5 % del agua del mundo es agua salada y el 2.5 % de agua dulce, 99% está en los hielos o en el suelo (agua subterránea y suspendida entre las pequeñísimas partículas del suelo).

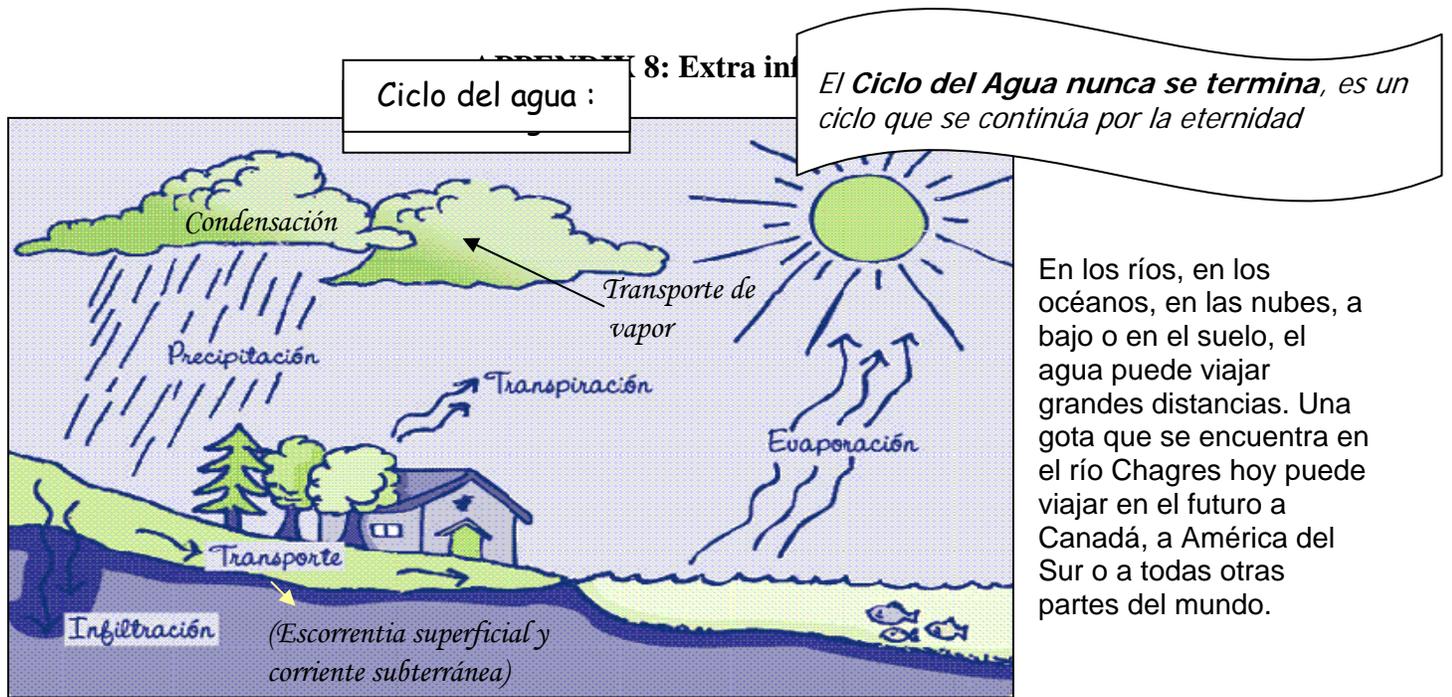
Toda el agua se encuentra en tres (3) formas (o fases):

- **Líquido** como el agua en los ríos, los océanos, los lagos, el agua que bebemos, etc.
- **Gas** (o vapor) como en las nubes o cuando el agua hierve y se evapora.
- **Sólido**, como nieve o hielo

Y cambia de formas naturalmente con los procesos en el esquema.



Con los cambios de fases, el **agua viaja en todo el mundo** en un ciclo que se llama el **Ciclo del Agua**.



## ¡LA CONTAMINACION Y LA BASURA!

Una sustancia contaminante es algo que interrumpe los procesos normales de los sistemas naturales o un ecosistema.

Los **contaminantes frecuentes** son:

- La gasolina
- El estiércol de vacas
- Los químicos para la limpieza
- El abono/fertilizante
- Jabón
- La basura

Los **contaminantes** tienen impactos importantes por que:

- **Afectan a todos los seres vivos de la tierra:** plantas, animales y humanos.

Por ejemplo, si hubiese sustancias contaminantes en el río Chagres, los peces, los cocodrilos, las plantas del río bajo el agua y en las orillas del río, las aves y los humanos van a ser afectados.

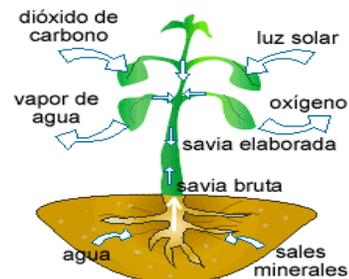
- **Permanecen mucho tiempo:** la mayoría de los contaminantes duran por **meses o años** en el ambiente. Hay contaminantes que pueden permanecer por más que 100 años.

- Hay productos como el **plástico** que son fabricados de **químicos** que **dura mucho tiempo** y que deteriora el ambiente.

## ¡LAS PLANTAS!

Las **plantas son muy importantes** por dos razones:

- 1- Son una **fuentes de comida** para muchos animales y para nosotros
- 2- **Producen oxígeno** que necesitamos para respirar y para vivir.



Para vivir, las plantas hacen un proceso que se llama fotosíntesis. Necesitan agua, sol, azúcares y nutrientes del suelo (sales minerales) y producen oxígeno y materiales orgánicos para crecer.

### ¿Niños Maestros?

Educación ambiental y transmisión de conocimientos entre generaciones en dos comunidades rurales en la Cuenca del Canal, Panamá

Del análisis de los dos sondeos que hicimos en su comunidad y con todos sus comentarios, las conclusiones de nuestra encuesta y las recomendaciones que hicimos al Fondo Peregrino-Panamá son las siguientes.

1. Las actividades con los niños en la escuela son primordiales para un buen programa de educación ambiental y visitas más frecuentes son aconsejables.
2. La transmisión de conocimientos de los niños a los adultos es posible, pero no es eficiente, ni suficiente para educar los adultos de la comunidad sobre el ambiente. Entonces, charlas con adultos son necesarias.
3. Para ayudar a aumentar la transmisión de informaciones de los niños a los adultos, una tarea que requiere la participación de los padres es una herramienta útil.
4. Frente a una población consiente de los problemas ambientales y que tiene el deseo de recibir más actividades educativas, es importante hacer una buena publicidad (la fecha, el tiempo y el lugar) de las actividades para informar todos que pueden estar interesados.
5. Para aumentar la participación y el interés hacia las charlas y también aumentar la difusión de conocimientos en la comunidad, las presentaciones tienen que ser divertidas, tratar de problemas concretos y ser relacionados a la vida cotidiana.
6. El águila suscita mucha curiosidad y interés, entonces sugerimos de traerlo a comunidades cuando posible.



Sin su participación, nuestro proyecto no hubiera sido posible. *Muchas gracias* por su hospitalidad, por la generosidad de su tiempo, por su ayuda y por su amabilidad. *¡Fue un placer para nosotros!*

Gracias otra vez,

Anna y Maude

## **APPENDIX 10: Days of work**

Number of full days working in Panama City: 34

Number of full days in the field: 11

Total days for project completion = 45 days