



Conserving Bañados del Quirquincho: a key area for threatened species

Province of Salta, Argentina



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Overall aim: To contribute in the long-term conservation of threatened species of a wetland involving local people.

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Table of Contents

Acknowledgements	4
Section 1	4
Summary	4
Introduction	5
Project members	6
Section 2	7
Aim and objectives	7
Methodology	8
Objective 1	8
Objective 2	8
Objective 3	9
Objective 4	12
Outputs and Results	13
Population status	13
Anthropogenic threats to focal species	14
Conservation education campaign	15
Threats effect on focal species	16
Achievements and Impacts	17
Population status (objective 1)	17
Anthropogenic threats to focal species (objective 2)	17
Conservation education campaign (objective 3)	17
Priority areas for conservation (objective 4)	18
Section 3	19
Conclusions	19
Problems encountered and lessons learnt	20
In the future	21
Section 4	22
Appendices	22
Bibliography	26

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Section 1:

Summary

The Bañados del Quirquincho is one of the few wetlands in the Dry Chaco of Argentina, it harbors many threatened species such as Chacoan peccary, Lowland tapir, Giant armadillo, White-lipped peccary, Giant anteater, and Greater rhea. Our overall aim was to delineate priority areas for these threatened species, determine the species population status, and, through a conservation campaign, raise local community awareness of the wetland importance as a refuge for focal species, and focal species role to maintain ecosystem dynamics and structure. To determine focal species frequency and distribution we set 17 to 20 camera traps for 30 days in five habitat types. We obtained 80 records of three of the focal species. We also developed 24 interviews to local people to assess the intensity and distribution of the main anthropogenic threats (logging, hunting and overgrazing). We developed a conservation education campaign through workshops and design and distribution of an informative brochure, posters and T-shirts. Finally, we determined three conservation priority areas (1°: *bañadero* forest, 2° *quebrachal* forest, and 3° protected palm forest) based on focal species and human threats distribution. These areas will be included in the zoning scheme of the Integrated Land Management Planning Los Palmares.

Introduction

This project was developed to assess the conservation status of six threatened species: Chacoan peccary (*Catagonus wagneri*), Lowland tapir (*Tapirus terrestris*), Giant armadillo (*Priodontes maximus*), White-lipped peccary (*Tayassu pecari*), Giant Anteater (*Myrmecophaga tridactyla*) and Greater rhea (*Rhea americana*) in different habitat types of the Bañados del Quirquincho wetland. The focal species chosen are threatened in the area mainly by habitat loss, unsustainable hunting and cattle ranching, and are Conservation Values in the Integrated Land Management Planning (ILMP) Los Palmares. However, this Plan lacks scientific information about the distribution and threats for fauna species. Another conservation problem is the lack of knowledge of local people on the human activities that jeopardize the native fauna. To address these problems, we collected scientific information about native fauna and livestock, developed an education campaign and elaborated management recommendations and a map with priority areas for conservation to offer to the Secretary of Environment of Salta (SES) and to local organizations at the wetland. Thereby, the conservation value of this project work was to involve different actors with a common goal, i.e., to conserve the wetland's fauna.

The Bañados del Quirquincho is one of the few and largest wetlands in the Dry Chaco of Argentina, refuge for threatened and migratory species and Important Bird Area (AR042, *Harpyhaliaetus coronatus* Endangered, 11 endemics to biomes). This wetland includes Los Palmares Provincial Reserve (10,000 ha-LPPR) and is part of a protected and buffer area, the Los Palmares ILMP and proposed as core area in the Yungas-Chaco ecoregional corridor. The conservation of this wetland is crucial to maintain the connectivity between two forest ecoregions and to sustain many ecosystem goods and services it offers to the local people (wood, grass for livestock, clean water, bushmeat, etc.).

Through this project we identified and interacted with many stakeholders. There are two key stakeholders to whom we owe the success of achieving our objectives. The first one is the SES staff: from the beginning they showed a lot of interest in the project, offering advice and logistic support through the participation of the Rangers Corp of Salta. The contribution of the rangers is invaluable, from the beginning, Nicéforo, Marcelo and Federico introduced us to the local people at field, helped us searching for the best places to set the camera traps, guided us through the wetland and the different habitat types and spread the invitation to the workshops.

The second main stakeholders were the local people: some of them, as Diego Herrera, Alberto Martínez and his wife Dina, Julián Cuéllar and his family, got very committed with the project, they helped us as local guides and offered their family houses and food to us, and of course, their emotional support, helping to spread a message of conservation to their neighbours and friends. Other people from the Bañados, both rural and town inhabitants were very participative during the workshops, and their pro-conservation opinions, as some of them are local leaders, were listened and spread.

Project members

Patricia Puechagut: she is MSc in Wildlife Management. For the last 5 years she has been participating in several conservation projects as field assistant, organizing field campaigns and as team leader, so she has gained experience in field work in the Northwestern Argentina. Now she is developing her doctoral thesis about dispersion and regeneration of palms with a scholarship from the National Council of Scientific and Technic Research. Also she is Secretary and field assistant at CEBIO NGO. During the project she leaded the field campaigns and organized the education campaign and helped in the design of the education material. She also developed the data analysis.

Estefanía Ruiz de los Llanos: she is MSc in Wildlife Management. She have been working in the Chaco and Yungas forests for the last 3 years while developing her doctoral thesis on ecology of an endangered tree species, the native oak, with a scholarship from the National Council of Scientific and Technic Research. She also has obtained a Rufford grant to finance her thesis. During this project, she participated in several field campaigns, organized the education campaign and designed the education material.

Sebastián Albanesi: is a Biologist highly experienced in fieldwork and camera trap surveys. He has been working in the Northwestern Argentina for the last 7 years in several conservation projects (Understory birds, Woodpecker and cavities nesting birds, Mammals surveys, etc.) and participated in education and conservation campaigns. Currently, he is a Master student on Engineering Sciences: Environmental mention, developing his thesis "Effect of forest management on bird assemblage in the Yungas, Argentina". During the project he participated in the field campaigns, collected photographs on the habitat to include in the education materials, and contributed with the data analysis.

Ramiro Carrizo: he is an undergraduate student in the third year of Biological Sciences at the University of Jujuy. He is currently participating in several conservation projects at CEBio NGO in the Yungas and the Chaco. He has been involved with the NGO projects as volunteer from the very beginning of his university studies and showed a real commitment on conservation. During the project he participated in the field campaigns and the organization and developing of the workshops.

Sonia Guerrero: she is an undergraduate student in the third year of Biological Sciences at the University of Jujuy. As Ramiro, she is involved in CEBio conservation projects since she started her undergraduate study. She helped in a lot of projects and thesis, gaining experience in the Chaco and Yungas forests and becoming a real conservationist with great commitment and principles. During the project she helped organizing the workshops and the design of the talks.

Section 2:

Aim and objectives

Conserve the Bañados del Quirquincho biodiversity, ecosystem processes and services and local people livelihood through the implementation of conservation actions focused on Conservation Values of the area and the involvement and capacity-building of local community.

1. Assess population status (specifying distribution and relative *frequency*) of focal species (i.e., rhea, tapir, peccaries, giant armadillo, *giant anteater*) in the five habitat types at Bañados del Quirquincho.

We changed *abundance* for *frequency* (pictures/day). We added the *giant anteater* as an endangered species (Vulnerable, IUCN) and Conservation Value.

2. Determine distribution and intensity of the main anthropogenic threats to focal species in the wetland.

3. Increase local people awareness of the wetland importance as a refuge for focal species, and focal species role to maintain ecosystem dynamics and structure.

We deleted *and involve them in long-term monitoring schemes* since we were unable to organize a Wetland Guardian Corp because the SES staff told us they will implement a “volunteer ranger program” and it could be confusing for locals. Nevertheless, we agreed to participate in the training for the volunteer rangers.

4. Delineate priority areas for conservation to assure the viability of the focal species populations and incorporate to the zoning scheme of the Los Palmares ILMP plan.

Methodology

Objective 1. To detect focal species presence we set 17 to 20 camera traps for 30 days in five habitat types: *bañadero* forest, *Copernicia alba* disturbed palm forest, protected palm forest (LPPR), *quebrachal* (dominated by *Aspidosperma quebracho-blanco* and *Schinopsis balansae*), and *palo-santal* (dominated by *Bulnesia sarmientoi*). The camera traps were separated at least 2 km (TEAM Network, 2011), set 40–50 cm above the ground, and programmed to take pictures during a 24 h cycle (Di Bitetti et al., 2013). We determined the capture rate (pictures /day) for all the native and domestic species. To compare the focal species frequencies (capture rates) among habitat types we performed GLMM analysis using Poisson error distribution (since the response variable is a count) and log link function (Quinn and Keough, 2002).



Sebastián and Patricia setting a camera trap.

Objective 2. To assess anthropogenic threats we conducted 24 formal interviews to local people to determine activities and location. We determined livestock relative abundance (through the camera traps survey), hunting and logging intensity. We also used GIS shapes provided by the SES to obtain the distance from each camera station to houses (*puestos*), towns, rivers, permanent wetlands, dams, roads and the LPPR. All the information gathered was used to develop GLMM regression models to understand the relationship between threats and focal species relative frequencies.



Estefania interviewing a local family.

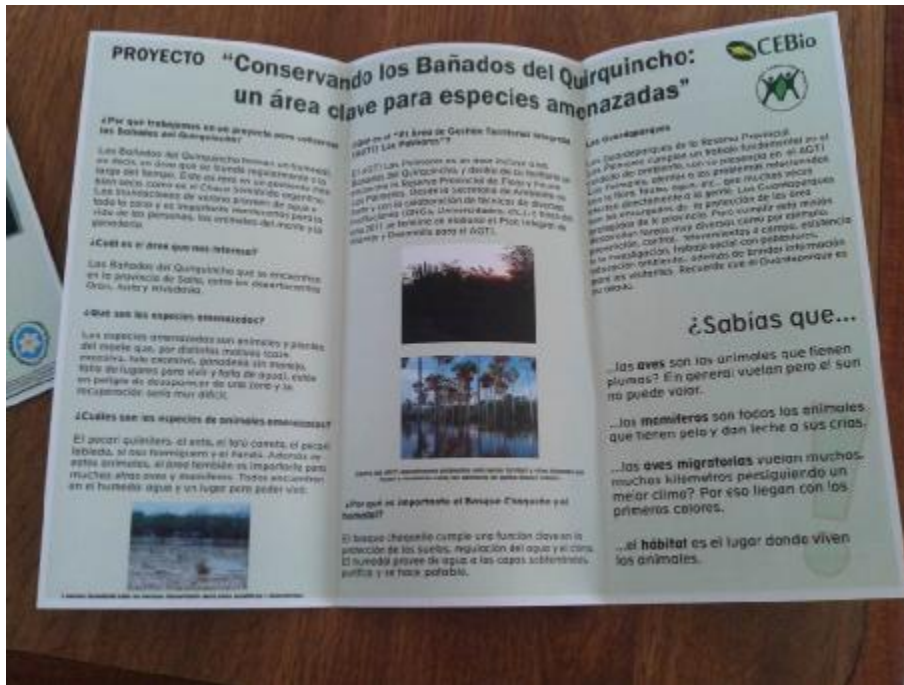
Objective 3. We conducted 29 formal interviews before the education campaign and the same people were interviewed after to determine a change in knowledge and awareness. We conducted two workshops in each of the main towns (La Unión and Manantial). In the first workshops (June 2013), we presented three talks to introduce the project, to explain the ecosystem goods and services, and to highlight the importance of the wetland conservation and consequences of unsustainable human activities. To attract people we elaborated a design with a camera trap picture to print t-shirts (Fig. 1) to raffle at the end of the first workshop, it really worked out. For the second workshop (October 2013), we developed and distributed a brochure with information on the wetland, focal species, the importance of a protected area, and the rangers' activities. We were more in a receptive mood; we gave two talks about the results of the field surveys and highlighted again the importance and benefits of conservation. Also, in a participative way, problems and possible solutions were identified and written in a poster, including "reduce cattle", "work together to stop poachers", "using media to spread the message", etc. There were designed two posters with conservation messages to set in the entrance to each town.



Sonia helping people to complete the interviews.



T-shirt back: The wetland is our home and water resource.



Brochure



Ramiro painting a poster for Manantial.



Poster at La Unión entrance: WELCOME "Unity is strength" Here We Protect Our Chaco. La Unión community.

Objective 4. We analyzed the layers with the threats intensities and focal species' frequencies to determine priority conservation areas where species are more frequent and the threats more intense. We conducted participative meetings with the SES to inform field and workshop results and promote the implementation of the priority areas, solutions for the threats and conservation actions needed, and the inclusion of the priority areas in the zoning scheme of the Los Palmares ILMP plan.

Outputs and Results

Population status

Through the camera traps survey we detected the presence of three focal species (Table 1). We weren't able to record the white-lipped peccary, the tapir or the giant armadillo.

Table 1. Records of focal species and livestock in each habitat type. * Highest capture rates ($p < 0,05$).

	<i>Bañadero</i>	Disturbed palm forest	Protected palm forest	<i>Quebrachal</i>	<i>Palo-santal</i>
Chacoan peccary	10	0	1	47*	1
Giant anteater	9*	0	0	4	4
Greater rhea	1	0	3*	0	0
Total	20	0	4	51*	5
Livestock	232	3827	829	167	64

We obtained 80 records of the focal species during 2336 days surveyed, with a total richness of 37 native species and five domestic species.



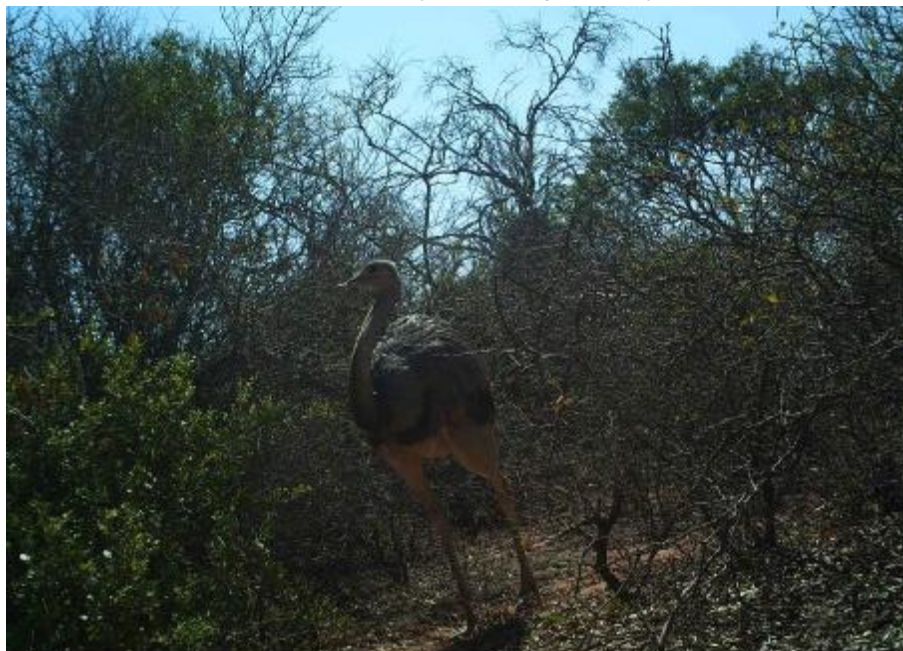
Chacoan peccay (*Catagonus wagneri*).



Bushnell

06-30-2012 15:49:19

Giant anteater (*Myrmecophaga tridactyla*).



Bushnell

06-23-2012 12:33:54

Greater rhea (*Rhea americana*).

Anthropogenic threats to focal species

We completed 24 interviews (Table 2) to local people. All of them are land owners since at least 22 years. We couldn't interview people from the *palo-santal* forest since they weren't at home

when we surveyed the area.

Table 2: Interviews results. Number of individuals of each livestock species, total, and percentage of families dedicated to each productive activity.

Habitat type	Ranching					Total	Agric.	Logging	Hunting
	% of families	Species					% of families	% of families	% of families
		Cattle	Goats	Porcine	Ovine				
<i>Bañadero</i>	100	156	230	90	120	596	34	17	85
Disturbed palm forest	100	170	100	43	110	423	50	100	25
Protected palm forest	100	130	50	60	80	320	0	100	0
<i>Quebrachal</i>	100	608	400	220	115	1343	-	50	50

About ranching, production is low yield and free ranging, with poor if any infrastructure. In all cases the livestock production is for local consumption and sale.

Logging is only developed for families for firewood for cooking and wood for building houses. Also agriculture (corn, pumpkins, etc.) is a subsistence activity.

Conservation education campaign

To the first workshops we had an audience of 44 adults and 30 kids, in the second one a total of 40 adults (37 attended the first workshop also) and several kids participated. We interviewed 29 adults at the beginning of the first workshops and 32 at the end of the last (Appendix 1). The main results after the education campaign are:

1. an increase of 8% in the percentage of people who know endangered wild animals.
2. an increase in the perception that ranching (30%), logging (7%) and hunting (20%) are activities potentially harmful for wild animals and the environment.
3. a huge increase (35 to 96%) in the disposition to change productive activities to conserve the wetland.
4. all of the interviewed wants to be part on the "wetland guardian corp."!



First workshop in La Unión

Threats effect on focal species

Focal species frequency is not affected by distance to water sources, LPPR, roads, towns or *puestos* ($p < 0,05$, data provided by the SES), but it is affected by hunting and livestock (camera trap data) intensities (Table 3):

Table 3: Focal species frequencies for each threat intensity (media \pm S.E.).

Threats/Intensity	Low	Medium	High	z	p
Hunting	0,05 \pm 0,03	0,03 \pm 0,02	0,01 \pm 0,01	-4,00	<0,01
Livestock	0,04 \pm 0,03	0,00	0,00	-5,36	<0,01

Achievements and Impacts

Population status (objective 1)

The endangered species of the Bañados del Quirquincho seem to be more threatened than we thought, of the six focal species we selected at the beginning of the project we were able to detect only three. This could indicate that the species we didn't find are rare or absent in the sites we surveyed, so their population status is 0.

About the species not found, we saw tracks of peccaries on the *bañadero* forest and the protected palm forest that might have been of white lipped peccary, but since tracks of peccaries are very similar we cannot confirm the species presence. People also told us there was a tapir near the disturbed palm forest but we couldn't find evidence for this. People say the elusive giant armadillo is present near the site we surveyed, but the land owner (rich men from Salta city) didn't allow us to access their property.

We shared these results with the local communities during the second workshop, through showing them camera trap pictures of the three species we found and talking about the species we couldn't record. An agronomic engineer from the Agricultural Technology National Institute (INTA) was present in the workshop, and she proposed to share these results in a weekly radio show she has, we sent them this report in Spanish for reaching the people who didn't participate of the workshops. Also, this report was sent to the Secretary of Environment of Salta and to the local rangers. The local rangers, who helped us a lot during this project, are main stakeholders since they are relatives and friends to most of the people in the wetland and they spread the results and the conservation message with everyone in the study area.

Anthropogenic threats to focal species (objective 2)

Ranching is the most developed activity of the area, all the families we interviewed raise cattle for consumption and some of them to sell. This activity is harmful for the native fauna, indirectly (by competition for resources) and directly (people hunt predators to avoid they eat domestic animals). Hunting is also a very harmful activity; it is carried out by locals at low intensity for local consumption. However, some locals informed about hunting tours by foreign hunters to the sites with more animals and less control to hunt a lot of preys for "recreation" or to sell in the cities. Sport hunting does not have the approval of the local people, because it is considered a threat by decreasing food resources and because animals are important from an ethical point of view.

We don't consider logging and agriculture as dangerous activities since most of the families just take dead wood as firewood for cooking or heating and none of them commercialize timber. Also, the wetland is located in a very dry ecosystem where it only rains in summer, when the soil floods, making the environment unsuitable for agriculture, just small corn or pumpkin farming.

We also shared these results in the second workshop, highlighting the effect of unmanaged ranching and hunting on the focal species. Also, we developed a scientific paper on the mammal species that were recorded or not in five habitat types of the wetland, the effects of high loads of livestock and other human activities, and a proposal of some conservation strategies for the Bañados del Quirquincho. One of the technicians of the Secretary of Environment of Salta is co-author of this paper since he was involved in the study of the threats to endangered species. This paper was reviewed by the Secretary of Environment of Salta staff and submitted to the scientific journal *Animal Conservation*.

Conservation education campaign (objective 3)

We ended the education campaign incredibly happy since we found out that, after the first workshop, many of the people who participated continued thinking about our talks and discussions on human activities. For the second workshop, 92,5% of them participated again and showed a lot of interest in improving the way they develop productive activities to help in the conservation of the fauna. They raised the need of reduce livestock by themselves!!

People also were able to better realize the contribution of the wild animals in their everyday life, not just as food resources, but as ecosystem engineers helping to maintain the flooding cycle, the happiness they experiment by seeing an anteater or any wild animal, the pest control by animals, etc. Even when we weren't able to develop the "wetland guardian corp.", we think we fully accomplished the objective of increase local people awareness and their commitment to contribute to the conservation of the wetland and to become "volunteer rangers".

Priority areas for conservation (objective 4)

Through the camera trap surveys and the interviews we are able to reach the 4th objective, to delineate priority areas for conservation.

The first priority area for conservation is the *bañadero* forest because:

- we detected three focal species (greater rhea, chacoan peccary and anteater),
- we found the greater capture rate of the giant anteater,
- the detected livestock intensity is: the 3° through camera trap survey (after both the palm forests); and the 2° through interviews (after the *quebrachal* forest)
- most of the families hunt or reported foreign hunters, and
- it is very close to the LPPR.

The second priority area is the *quebrachal* forest because:

- we detected the presence of two focal species,
- the greater capture rate of the of the three focal species as a whole,
- the greater capture rate of the chacoan peccary,
- the greater livestock intensity declared in interviews, and

- half of the families hunt or reported foreign hunters.

The third priority area is the protected palm forest because:

- the presence of two focal species,
- the highest capture rate of the greater rhea,
- the second livestock intensity surveyed by camera traps, and
- it is a protected area (LPPR), so management strategies should be taken to ensure the control of the human activities and the continuity of the native fauna species.



Habitat types, ILMP Los Palmares limits (red) and LPPR (blue). Conservation priority areas (white).

This map was shared to the Secretary of Environment of Salta staff and they are including these results in the zoning scheme of the Integrated Land Management Planning Los Palmares. This contribution to the Management Plan of the area needs to be shared by the Secretary of Environment of Salta in workshops with the local communities for approval so they will have access to all the information we gathered after the second workshop through a deeper data analysis.

Since all the information and management proposals are included in this report and the research paper, the Secretary of Environment of Salta is committed to include the results in the Management Plan of the area and to make management decisions that contribute to the conservation of the Bañados del Quirquincho and the endangered species.

Finally, the rangers of the wetland have a close relationship with our team and CEBio NGO (we meet them in several workshops every year of other projects and Management Plans), and we shared with them all the results of this project (and many of these results were observed during the fieldtrips with them). Through them, the people who live in the Bañados del Quirquincho are receiving permanent updates on the conclusions of this project, the additions to the Management Plan, and the management strategies needed to ensure the conservation of the species and the goods and services they receive from the wetland.

Section 3:

Conclusions

- Threatened species at the Bañados del Quirquincho, besides being ecosystem engineers, are important for people since they are appraised and a food resource. But these species have low population numbers and are patchily distributed. Therefore, the conservation of the species and its habitat contributes to the conservation of the Dry Chaco and the outstanding biodiversity it harbors.
- Human activities like cattle ranching may affect threatened species if developed without any management. It is perceived by local people of the wetland, who realized that a depleting in the livestock is happening because of lack of water and food, and this affects native species also.
- Hunting affect endangered species directly and it is perceived by local people as a threat to species they estimate.
- Most people are unaware of the role of the threatened species in the ecosystem and the benefits of conserving the environment to maintain the wetland goods and services. With the information we provided through the education campaign we could increase people and stakeholder's awareness and involve them in the conservation of the threatened species and their habitat, since they recognized some of the impacts of their activities and showed willingness to change.

Problems encountered and lessons learnt

The project activities that went well were:

1. the camera trap surveys: we were able to survey each habitat type and with the priceless help of the rangers and local people who collaborate in every survey travel.
2. the workshops: the organization was made with a lot of anticipation and coordination to get the right places and dates. Local rangers and people helped us a lot distributing the invitations and spreading the message. The active participation of the attendees helped to achieve the objectives and improve the education campaign. The T-shirt raffle was a really good way of engage people to the first workshop.

A problem we had at field was that three cameras were stolen and one of them broke. We overcome this problem by replacing the missing cameras with some from other project and analyzing data considering the differences on sampling effort. Another problem was the NGO's truck broke down. Nevertheless, we continue going to field by bus and renting vehicles and adjusting other expenses.

A deviation to the original project was the creation of a "wetland guardian corp." We needed to cancel this activity because of the suggestion of the SES staff. The SES is planning to implement a "volunteer ranger program". Nevertheless, we agreed to participate in the training.

We carried out a sampling technique (camera traps) used to survey mammals and large birds in many research papers from all over the world. Also, the statistical and GIS methods are the most used in research papers. The interviews to assess threats were based on Mariana Altrichter research papers, who also collected data on human activities in the Chaco, and in information of a previous project developed by SES staff. Nevertheless, we think that we may simplify the questionnaire design to ensure the understanding of every reader.

Throughout the project development we realized that the support of the local rangers on all activities was essential to contact local people, get access to the study area and spread the conservation message. The media was also very important, for the first workshop we called the local radio and they published the message, and for the second one the local media interviewed us, increasing the participation.

We also learned that human activities are not easy to assess, what people told us in the interviews about ranching do not match with camera trap surveys, so it looks like we made no interviews enough or we couldn't get accurate answers. So we have to find new ways to record the anthropogenic activities more accurately. Since the "wetland guardian corp." was canceled, we also need to find ways to assess changes in the conservation status of the focal species and its habitat.

Undoubtedly, the most important lesson we learned was that taking time to strengthen relationships with government agencies and local people is essential to develop a conservation project. You can learn a lot from people who lives in your study area and they can be so generous and kind, improving a lot the usually extreme survey conditions.

In the future

The workshops, the education material, and the technical report helped to reach our main objective of improving the conservation of the focal species and the wetland. Through these outputs we have ensured that local people who live in the Bañados del Quirquincho are aware that they live inside a protected area (ILMP Los Palmares) and of the management strategies that need to be taken for the conservation of the native fauna and the integrity of wetland. We will continue with the education campaign, and we will remind the SES the commitment to implement the ILMP Management Plan, specially the “volunteer rangers” program.

We are also planning a new project to sample the same habitat types but in other sites to validate the conclusions of this survey and to determine if there was a change as a result of management. We are applying this year for the Conservation Follow-up Awards to carry out a better survey of human activities, and to make a stronger education campaign to include schools and children, expanding the broad of the campaign to the whole Semiarid Chaco conservation, other endangered species and the relevance of the goods and services they offer.

Section 4:

Appendices

Appendix 1: Frequency (pictures/day) of livestock and the three endangered species: *Catagonus wagneri*, *Mirmecophaga tridactyla* and *Rhea americana*, in the five habitat types. PPF= Protected palm forest, DPF= disturbed palm forest.

Habitat type	Latitude - Longitude	Livestock	<i>C. wagneri</i>	<i>M. tridactyla</i>	<i>R. americana</i>
Bañadero	S24 02.697 W63 22.904	0,29032258	0	0,032258065	0
Bañadero	S24 03.019 W63 22.102	0,15	0	0	0
Bañadero	S24 03.209 W63 23.098	0,16129032	0	0,064516129	0
Bañadero	S24 03.973 W63 23.039	0,13333333	0,06666667	0	0
Bañadero	S24 03.838 W63 23.851	0	0	0	0
Bañadero	S24 04.448 W63 22.671	0,33333333	0	0	0
Bañadero	S24 04.847 W63 22.758	0,06666667	0	0	0
Bañadero	S24 05.444 W63 22.070	0,4	0	0	0
Bañadero	S24 05.526 W63 23.473	0,13333333	0	0	0
Bañadero	S24 05.209 W63 24.362	0	0,06666667	0,06666667	0
Bañadero	S24 05.919 W63 24.246	0,03333333	0	0,06666667	0
Bañadero	S24 06.950 W63 25.001	0,96666667	0	0	0
Bañadero	S24 06.880 W63 24.076	0,75	0,05	0,05	0
Bañadero	S24 07.539 W63 25.152	0,13333333	0	0	0
Bañadero	S24 05.928 W63 22.401	0,3	0,1	0	0
Bañadero	S24 05.487 W63 21.402	0,44	0,08	0	0,04
Bañadero	S24 04.620 W63 21.057	0,03333333	0	0	0
Bañadero	S24 04.652 W63 21.911	0,03333333	0	0	0
Bañadero	S24 02.949 W63 21.120	0,7	0	0,033333333	0
Bañadero	S24 03.721 W63 21.428	3,03333333	0	0	0
PPF	S24 16.130 W63 23.059	20,4	0	0	0
PPF	S24 16.733 W63 22.947	3	0	0	0
PPF	S24 16.953 W63 23.608	18,1923077	0	0	0
PPF	S24 16.444 W63 22.262	12,6666667	0	0	0
PPF	S24 15.861 W63 21.850	17,2	0	0	0
PPF	S24 16.413 W63 23.951	16,2885662	0	0	0
PPF	S24 16.951 W63 24.392	43,625	0	0	0
PPF	S24 15.870 W63 26.103	0,46153846	0	0	0
PPF	S24 17.072 W63 25.157	16,1052632	0	0	0
PPF	S24 17.121 W63 25.826	0,34615385	0	0	0
PPF	S24 15.297 W63 21.140	11,4	0	0	0
PPF	S24 15.597 W63 22.464	4,61290323	0	0	0
PPF	S24 17.437 W63 27.476	21,7083333	0	0	0
PPF	S24 16.833 W63 28.352	4,1	0	0	0

PPF	S24 17.505 W63 26.396	39,3333333	0	0	0
PPF	S24 16.549 W63 25.958	0	0	0	0
PPF	S24 16.513 W63 25.384	0,41666667	0	0	0
PPF	S24 16.561 W63 24.845	26,8333333	0	0	0
PPF	S24 16.469 W63 24.455	7,51851852	0	0	0
DPF	S24 07.849 W63 29.548	0	0	0	0
DPF	S24 07.224 W63 28.346	0,83333333	0,125	0	0
DPF	S24 05.031 W63 30.068	15,2857143	0	0	0
DPF	S24 02.094 W63 25.643	0,42857143	0	0	0
DPF	S24 03.114 W63 28.775	0	0	0	0
DPF	S24 07.404 W63 29.021	0,45833333	0	0	0,041666667
DPF	S24 07.864 W63 28.513	0	0	0	0
DPF	S24 07.083 W63 31.797	0,25	0,03571429	0	0
DPF	S24 02.431 W63 26.285	0,5	0	0	0
DPF	S24 02.720 W63 28.144	2,03571429	0	0	0
DPF	S24 04.216 W63 30.251	2,89285714	0	0	0
DPF	S24 04.295 W63 29.544	0,78571429	0	0	0
DPF	S24 02.350 W63 26.985	1,75	0	0	0
DPF	S24 02.613 W63 27.682	3,71428571	0	0	0
DPF	S24 05.212 W63 30.655	0,82142857	0	0	0,071428571
Quebrachal	S24 08.966 W63 11.394	0,25	0	0	0
Quebrachal	S24 09.094 W63 12.232	0,90625	0	0	0
Quebrachal	S24 09.753 W63 12.629	0	0	0	0
Quebrachal	S24 09.932 W63 11.875	0,125	0	0	0
Quebrachal	S24 10.264 W63 13.021	0,29032258	0	0	0
Quebrachal	S24 10.694 W63 12.324	0,1875	0	0,03125	0
Quebrachal	S24 10.185 W63 11.620	0,09375	0,65625	0	0
Quebrachal	S24 10.593 W63 10.969	0,28125	0,15625	0	0
Quebrachal	S24 09.906 W63 10.777	0,09375	0,0625	0	0
Quebrachal	S24 09.247 W63 10.909	0,71875	0	0	0
Quebrachal	S24 08.446 W63 10.759	0,625	0	0,03125	0
Quebrachal	S24 10.724 W63 11.599	0,13636364	0,59090909	0	0
Quebrachal	S24 11.242 W63 11.392	0,16129032	0,16129032	0,064516129	0
Quebrachal	S24 10.390 W63 10.384	0,35483871	0	0	0
Quebrachal	S24 09.922 W63 10.079	0,74193548	0,03225806	0	0
Quebrachal	S24 09.476 W63 10.401	0,06451613	0	0	0
Quebrachal	S24 08.886 W63 10.502	0,35483871	0	0	0
Palo-santal	S24 07.517 W63 36.344	0,16129032	0	0	0
Palo-santal	S24 07.653 W63 36.819	0	0	0	0
Palo-santal	S24 06.798 W63 36.100	0	0	0	0
Palo-santal	S24 06.904 W63 36.410	0,22580645	0	0,032258065	0

Palo-santal	S24 06.082 W63 36.156	0,12903226	0	0	0
Palo-santal	S24 06.229 W63 36.932	0,03225806	0	0	0
Palo-santal	S24 06.616 W63 35.480	0,1	0	0,033333333	0
Palo-santal	S24 05.916 W63 35.817	0,03333333	0	0	0
Palo-santal	S24 07.830 W63 35.559	0,5	0	0	0
Palo-santal	S24 07.446 W63 35.115	0,46666667	0	0,033333333	0
Palo-santal	S24 06.194 W63 33.558	0,06666667	0	0	0
Palo-santal	S24 06.635 W63 34.283	0,03333333	0,03333333	0	0
Palo-santal	S24 05.791 W63 33.095	0,1	0	0,033333333	0
Palo-santal	S24 05.053 W63 31.943	0	0	0	0
Palo-santal	S24 05.530 W63 32.567	0,23333333	0	0	0
Palo-santal	S24 04.810 W63 31.407	0	0	0	0
Palo-santal	S24 05.958 W63 32.929	0,03333333	0	0	0

Appendix 2: Percentage of affirmative (Y) and negative (N) questions before the first and after the second workshop and the positive (+) or negative (-) change (Δ). The questions have been translated and abbreviated to fit the table.

Resumed questions	1° worksh.		2° worksh.		Δ	Observations
	Y	N	Y	N		
Have you heard about conservation before?	83	17	75	25		People who answered N came just to the second workshop.
Do you know any wild animals?	100	0	97	3		
Do you consider there are important wild animals for the environment?	93	7	90	10	(-)	Anteater, foxes, cats, puma, peccaries, armadillos, etc.
Do you know any endangered wild animal?	79	21	87	13	(+)	Anteater, peccaries, tapir, rhea, giant armadillo, etc.
Do you think ranching can affect wild animals?	38	62	58	42	(+)	N: they have few animals. Y: overgrazing and competence for food and space.
Do you think ranching can affect the environment?	30	70	71	29	(+)	N: they have few animals. Y: trampling, affect regeneration
Do you think logging can affect wild animals?	100	0	100	0		Lack of food and refuges.
Do you think logging can affect the environment?	93	7	100	0	(+)	Affect O2 production and rains, lack of water, stronger winds, and deforestation.
Do you think hunting can affect wild animals?	93	7	92	8		N: hunt because of the damage on cattle. Y: lack of food and reproduction.
Do you think hunting can affect the environment?	81	19	100	0	(+)	Y: lack of seed dispersers and land renewal.
Would you be willing to modify the way you develop productive activities for conservation?	35	65	96	4	(+)	Productive activities.
Are you interested in being part of a "Wetland Guardian Corp"?	36	64	100	0	(+)	

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