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Biodiversity Conservation at The Landscape Scale

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Northwestern Bolivian Andes Landscape Conservation Area, Bolivia
Semi-Annual Report
April 2002 – September 2002

I. Summary of Activity Status and Progress

a. Introduction/Summary:

The Northwestern Bolivian Andes Biodiversity Conservation at the Landscape Scale (BCLS) Program aims to ensure conservation of the wildlands and wildlife of the greater Madidi area through a landscape conservation approach, working with other conservation and sustainable development projects active in the region. The landscape approach is designed to determine the needs of key wildlife species, assess human activities across the same landscape, and use the intersection of these to focus efforts on those areas and actions which emerge as key conservation conflicts or opportunities. To accomplish the long-term goal of biodiversity conservation at the Northwestern Bolivian Andes Landscape Conservation Area (LCA), we focus on four interrelated objectives: establish baselines and monitor landscape species and the landscape context in which they are found; strengthen local, on-site protection and management of biological resources across the landscape; promote the development of national policies that support the landscape conservation approach; and elaborate a participative, integrated landscape conservation action plan.

The Northwestern Bolivian Andes Landscape Program remains on track. Our community natural resource management component has grown rapidly with more than twenty communities now working with the program either through individual agreements or through municipal initiatives. The fact that many communities are now moving into a second phase activities, often involving management decisions and actions is testament to the effectiveness of our community approach.

Perhaps this commitment to participation with local people through communities, grass roots organizations and municipalities is best demonstrated by the development of the natural resource strategy with the Tacana people and CIPTA (its governing body) for the proposed Tacana TCO (indigenous territory). This project has raised the bar on participation at a local scale and has also been recognized by the national indigenous representative body as a model for TCO management and titling. Indeed, in many ways the quality of information available for the TCO has been the benchmark for the ongoing Madidi National Park management plan and will also be a model for updates to the Apolobamba and Pilon Lajas protected area management plans scheduled for late 2003.

In addition, our success at placing environmental issues on the local government agenda will assist in the realization of an integrated conservation planning process at the landscape scale. Building on our preliminary success will be a major challenge for the program, and the interest of key partners, particularly SERNAP (the national park service) and CIPTA, will help this process to be institutionalized.

Nevertheless, local politics and economic interests are delaying the development of municipality relationships in certain areas of the landscape, particularly in the lowland municipalities of San Buenaventura and Ixiamas. Fortunately, this situation appears temporary and points out the advantage of a landscape approach that recognizes a long-term commitment (at least 20 years) to a region. It also underlines the importance of marrying a strategic approach to project development and resulting interventions with recognition of the importance of considering organic opportunity-based decision-making processes.

In terms of research, we have certainly been at the forefront of conceptualizing the landscape approach and developing useful landscape species tools that can be applied at an international level within landscape conservation initiatives. A combination of commitments to other thematic areas of the landscape program and the fact that landscape species by definition are a tough group of animals to study, however, has led to a dearth of spatial data for management and monitoring of landscape species. In September 2002 and in coordination with the Wildlife Conservation Society's Field Veterinary Program we hired a full time wildlife veterinarian to assist in animal immobilization and subsequent radio-tracking.

Finally, the release of a first draft of a Landscape Conservation Action Plan for the region represents the consolidation of a SERNAP vision of the northern La Paz landscape. This represents a significant step in the development of an integrated conservation plan for this region and will hopefully further stimulate inter-institutional collaboration and coordination.

b. Highlights:

- Principles and criteria for community-based sustainable natural resource management within the Tacana TCO were developed by CIPTA and representatives from the member communities. These criteria and principles will provide the basis for developing community-based regulations for natural resource management including a discussion of benefit distribution. This participative process represents another ground-breaking step for the work with CIPTA and the Tacana.
- Three Tacana communities decided to continue self-monitoring activities within the context of community hunting studies and will intensify activities in the coming dry season (April-November 2003) by conducting line transect based surveys in order to estimate population densities of principal target species.
- Three Quechua communities are implementing community proposed solutions to address wildlife related damage to corn fields. The communities also report considerable reduction in damage levels in the second year of this community-based project. These same communities have decided to continue the project for a third year, and additional requests for support on crop damage have been received from neighboring communities.
- The Landscape Priorities and Actions Plan for the Northwestern Bolivian Andes Landscape was published. This joint SERNAP and WCS activity represents a working conservation vision for the region and is a critical step toward implementing an integrated planning process that involves all major governmental and management units.
- Comprehensive databases developed by the BCLS team for birds and mammals across the landscape have provided the baseline for the Madidi protected areas biodiversity database. Within the framework of a much needed management plan for this protected area, this database has been a critical element used in the process of zoning Madidi. Indeed, the zoning process has also embraced the landscape conservation concept as a means of determining priority connections among various areas.
- Population density estimates for jaguar generated for the Tuichi and Hondo river basins represent some of the first statistically robust density estimates for this species anywhere across its global

range. These estimates will now provide a baseline for ecological monitoring in the two valleys and for evaluating the effects of the booming local eco-tourism business.

- Preliminary 'biological landscape models' were completed for each landscape species as well as a 'human landscape model' based on a spatial representation of the number and intensity of threats across the landscape. The BCLS team also began the process of developing a standard methodology for combining these models to produce a priority landscape for conservation interventions.

c. Table of Activity Status

Activity Number	Activity Title	Status	Page Number
Obj. 1	**Establish baselines and monitor landscape species and the landscape context in which they are found.**		
1.1.	Biodiversity Surveys	On track	4
1.2.	Candidate Landscape Species Research	On track	5
1.3.	Landscape Species Distribution Questionnaire	On track	6
1.4.	Human-Animal Conflicts	On track	6
1.5.	Complementary Ecological Studies	On track	7
Obj. 2	**Strengthen local on-site protection and management of biological resources across the landscape.**		
2.1.	SERNAP Institutional Strengthening	On track	8
2.2.	Protected Area Staff Training	On track	9
2.3.	Community Wildlife Management Projects	On track	9
2.4.	Community Wildlife Workshops	On track	11
2.5.	Wildlife Management, Conservation and Ecology Unit (IE)	On track	11
2.6.	Schoolyard Ecology Education	On track	12
2.7.	Monitoring Strategy Design	On track	12
2.8.	Tacana Land Titling and Management	On track	13
Obj. 3	**Promote the development of national policies that support the landscape conservation approach.**		
3.1.	Technical and Policy Report	On Track	14
3.2.	Financing Mechanisms	On Track	14
3.3.	Threats Assessment Working Group	On Track	15
Obj. 4	**Elaborate a participative, integrated, landscape conservation action plan.**		
4.1.	Cooperative Agreements	Completed	15
4.2.	Landscape Stakeholder Workshop	Delayed	15
4.3.	Land Use Plan	On Track	16
4.4.	Municipal Development Plan	On Track	17
4.5.	Landscape Conservation Priorities and Action plan	On Track	17

II. Detailed Description of Progress

a. Key short and long-term program objectives for the reporting period (April 2002 – September 2002)

In one of the most biologically diverse landscapes on the planet, WCS continues to develop and implement long term conservation measures at a landscape scale by working with key national, regional

and local partners to address threats and opportunities, and by focusing efforts on ensuring the conservation and management of wide-ranging and vulnerable 'landscape species'. We aim to successfully implement and refine the landscape approach within the Northwestern Bolivian Andes Landscape, thereby establishing a model to be applied in other biologically critical Bolivian landscapes and in the rest of the world.

In the short term our objectives are to capitalize on our working relationships with the plethora of other actors in the region, promoting the development of a landscape approach through the production of a participatory landscape conservation action plan. We also intend to add more detailed environmental planning experiences to the document, thereby creating a 'living' library of relevant landscape conservation planning tools. This process and the accompanying document will explore mechanisms to integrate spatially distinct land-use planning initiatives into an overall landscape conservation strategy: for example, community and inter-community zoning, TCO land-use plans, protected area management plans, local government development proposals, multiple municipality planning, private lands and forestry concession management. These landscape planning initiatives will allow a more strategic and collaborative approach to conservation intervention design, and subsequent monitoring and surveillance activities between different actors working in the region.

We also intend to continue gathering and interfacing the biological and socioeconomic information necessary to begin implementing spatial priority-setting at the landscape scale. In turn this will permit the identification of priority interventions and the earmarking of management strategies that will address the most important threats and opportunities that effect the conservation and integrity of conservation areas within the landscape.

b. Activity Description

OBJECTIVE 1: Establish baselines and monitor landscape species and the landscape context in which they are found.

Activity 1.1. Biodiversity Surveys
On track

Between June and September 2002 we extended our large and medium sized mammal surveys along the Tuichi river to include the Hondo river in the Natural Area of Integrated Management portion of the Madidi protected area. Apart from providing additional data from a more remote site, as well as adding to our now considerable Tuichi river database, this campaign has also provided sufficient line transect information for density estimates of many of the lowland tropical species, such as tropical ungulates and primates, cracids, and large rodents, as well as activity pattern information through camera trap data for most tropical forest terrestrial species, such as white-lipped peccaries, jaguar, tapir, red brocket deer, short-eared dog, giant anteater, ocelot and crab-eating raccoon. Four scientific manuscripts are in review as a result of this work and another six are in preparation for publication in ecological journals. This data will also be a key element in our efforts to develop sustainable hunting management systems with local communities in the region, as well as assisting the protected area administration in zoning, managing, and monitoring the protected areas biodiversity, existing threats, and specific management activities such as tourism.

The BCLS also continued to support surveys of birds within the Madidi protected area. During the course of the project the consultanting ornithologist, Bennett Hennessey, has registered over one hundred additional bird species for the park, including at least four new species for Bolivia, and the official Madidi bird list now stands at 867 species. This clearly demonstrates that Madidi is indeed one of the most biodiverse protected areas in the world and the project generated Madidi bird data base is being used by

the Madidi Protected Area Management Plan Project during the preliminary zoning phase of this planning process. Hennessey also developed a bird database for the entire landscape, including the Apolobamba and Pilon Lajas protected areas and the Tacana TCO, and this reveals that a total of 1008 bird species have been confirmed for this spectacularly rich region.

The BCLS mammalian database now stands at 170 species for the landscape, and has been recently boosted thanks to BCLS staff using bat detector equipment (ANABAT) and analytical techniques following a collaborative visit by Dr. Bruce Miller of WCS-Belize. These data will help identify habitats and management units that are important for bat conservation in Madidi and elsewhere in Latin America. Bats may also provide a relatively quick and cost effective means of biodiversity monitoring for landscape conservation purposes, and the BCLS project aims to assess this potential over the next six months through a Bolivian undergraduate thesis student project. These biodiversity data will also provide empirical data for testing the landscape species umbrella function.

These studies are generating information on biodiversity and relative abundance in a largely undocumented region threatened by imminent petroleum exploration activities by Petrobras - set to begin in the next six months in the Tuichi and Hondo river valleys as well as in the Pilon Lajas reserve. In addition, in the longer term they will also help assess the impact of ecotourism ventures. The studies will contribute baseline data on a number of mammalian and avian species that will provide management information to the Madidi protected area administration, including information for future monitoring programs. Indeed, the Madidi management plan team is using the entire landscape project biodiversity database for use in the development of the first management plan, particularly for zoning purposes, for this flagship protected area.

Activity 1.2. Landscape Species Research

On track

Following the completion of the Landscape Species Selection Criteria, with accompanying scientific manuscripts currently under review in both Spanish and English, the BCLS technical team have moved on to develop appropriate research plans for the five species selected: Andean condor, jaguar, white-lipped peccary, spectacled bear and surubí catfish. Over the last six months the BCLS team, in coordination with NY based Living Landscapes staff completed the first step towards consolidating these research programs with the production of preliminary 'biological landscape' models for each landscape species, in combination with a 'human landscape' model based on a spatial representation of the number and intensity of threats across the landscape.

This represents a new step for the Living Landscapes Program and the process is currently being written up as a general methodology for landscape conservation at other sites. This process was revealing and underlined the need for a sixth landscape species in the Northwestern Bolivian Andes Landscape – in the resulting models the high Andean plains were not represented by the previous five landscape species thereby defining the need to add the vicuña and its habitat needs to the landscape.

Between June and September 2002, the project team completed a camera trap campaign for jaguars and other individually recognizable large mammals between the Tuichi and Hondo rivers. This campaign represented a second attempt to estimate jaguar densities using robust methodologies and analytical techniques developed by WCS for tigers in Asia. This extended campaign effectively sampled a much larger area than similar efforts last year and was conducted at what the team considers the optimal time of year for such activities – that which coincides with predictable jaguar use of riverine beaches in association with river turtle predatory behavior during egg laying and birth. These studies have permitted jaguar density estimates across the entire sample area (2.8 jaguars per 100km^2), as well as separately for

the two river basins (1.7 and 3.6 jaguars per 100km^2 for Tuichi and Hondo respectively). This is a critical finding and will allow us to begin to assess the effectiveness of the protected areas for jaguar conservation and provide a monitoring baseline for this landscape species.

In addition Hugo Aranibar digitally photographed tracks from ten captive jaguars at the La Paz public zoo using a standard technique developed by Dr. Carolyn Miller of WCS-Belize. Over the coming months these photographs will be analyzed by Dr. Miller as part of a data set including captive jaguars from Bolivia and Ecuador and wild camera trapped jaguars from Belize. The intention is that individual jaguars can be identified and distinguished by their tracks, thereby providing a more cost-effective methodology for jaguar density estimation in long term study sites.

With regards to white-lipped peccaries, the transect work that has been conducted at the Tuichi river site over the last year has provided a preliminary density estimate for this landscape species (XX peccaries per km^2), although the data also underline the need for large-scale transect campaigns conducted across seasons for this extremely wide-ranging species. The field team has also mapped a number of salt-lick locations (n=7), at least four of which will be suitable as future capture sites. The precise location of the long-term study site in the Madidi lowlands is being discussed with the Madidi park administration and will form part of the discussion regarding the zoning of the protected area within the Madidi Management Plan project.

Over the last six months the BCLS spectacled bear ecological research team has sampled a total of 13 additional sites between 4000 and 1000m a.s.l. to bring the total to 28 sampled sites over the last two years. Frequency of bear sign at these sites in combination with habitat and vegetation characteristics will provide the team with a means of assessing spectacled bear habitat preferences across the landscape This information is essential in the sound design of management recommendations and activities . In addition, BCLS staff member Humberto Gomez was able to spatially assess priority areas of study and intervention for this species, producing a species-specific 'conservation landscape'. Over the next six months, the Bolivian team will complete this process for the other five landscape species, and the combination of these 'conservation landscapes' will define the overall 'landscape of intervention' for the project.

Ecological information regarding landscape species will help to determine their spatial needs, which in combination with spatial data on human activities and threats will enable us to define the extent and location of the landscape in which conservation efforts should focus, as well as identify priority conservation actions in areas of critical conservation importance and conflict.

Activity 1.3. Landscape Species Distribution Questionnaire

On track

During this reporting period the BCLS team has concentrated on other activities following the completion of an initial map of landscape species distribution across the. Interestingly, this exercise has revealed large areas of the landscape where no local information exists. These could be considered the 'wild cores' of the landscape. Nevertheless, it is worth stressing that this is an adaptive exercise, and park guards are now carrying out interviews with local communities that will further refine these maps.

Activity 1.4. Human-Animal Conflicts

On track

Between April and September 2002 a local biology thesis student (Andrea Morales) completed her final thesis document concerning crop damage by wildlife, especially spectacled bears, in the Pajan region of Apolobamba. Morales also continued her studies with the three communities in a second corn season, this time concentrating on testing some of the community proposed solutions to the problem. In the first

sample year (FY2001), between 10 and 30% of the corn production was lost to wildlife, particularly spectacled bears and parrots. WCS convened workshops with the following groups: men, women, workers, managers…etc. Working with WCS as a facilitator, the communities identified and implemented the following interventions: vigilance of cornfields by community members including the acquisition of materials such as tents, flashlights and waterproofs to facilitate this activity, use of firecrackers, and use of mousetraps and subsequent use of carcasses to attract raptors to the cornfields. During the second season, the damage was dramatically less (between 0.47 and 1.08% as opposed to 6.07 and 29.1% the previous year) and the communities attribute this reduction to the tested solutions.

BCLS staff, Humberto Gomez, Rodolfo Naller, Rob Wallace, Andrea Morales and Herminio Ticona and staff from the Apolobamba protected area, SERNAP, and the Direccion General de Biodiversidad (DGB) have also continued studies regarding the critical problem of livestock loss in the highland portion of the landscape. In May 2002, Adrian Treves of the CI-CABS office visited the Apolobamba site with Wallace and Nallar to assess the possibility of collaborative efforts in the study of human-animal conflict in the region. Treves and Wallace are currently co-developing proposals for human-animal conflict studies and management. Over the next six months the challenge will be to develop rigorous and participative studies of this problem with these local communities, as the first step to an informed analysis of possible solutions to this problem.

Activity 1.5. Complementary Ecological Studies

On track

Over the last six months the BCLS project has continued to conduct complementary ecological studies on key elements of biodiversity across the landscape, selected because of their interaction with a particular threat or opportunity, or a unique ecological characteristic. A Bolivian undergraduate student, Ninon Rios, completed her thesis and study concerning the population status and potential for sustainable harvest of spectacled caiman in the lowland portions of the Tacana Indigenous Territorial Demand. The results of this study will help to prepare the Tacana for the anticipated forthcoming change in legal status for caiman harvesting in La Paz Department in 2003. The DGB (Direccion General de Biodiversidad) has already permitted the sustainable harvest of this previously fully-protected species in the Beni Department during the 2001 season.

Pamela Avila successfully defended her thesis on lowland tapir habitat preferences in lowland tropical forests. Hugo Aranibar also completed his thesis fieldwork on cracid distribution and relative abundance across the landscape and has completed a first draft of the thesis document. Scientific publications regarding both of these studies are currently in preparation. Finally, the BCLS team has continued to collect dietary and ecological information on other species including the puma and Andean fox, both associated with livestock loss. Two undergraduate student projects that analyzed spectacled bear and Andean fox diet using scats collected to date by the BCLS team have recently been completed. These studies will allow us to assess the natural diet of these ‘problem’ carnivores, thereby allowing us to determine if livestock loss correlates with natural prey density. Increasing information from lowland areas in Bolivia and beyond indicate that livestock loss problems with jaguar are often associated with unnaturally low prey densities due to excessive hunting and persecution.

Finally the BCLS team has remained vigilant regarding the possible taxonomic status of species registered by the project over the last three years. For example, both the Titi monkey found in the foothills of the Madidi protected area and the swallow-tailed cotinga in the Apolo region are likely to be new species for science and endemic to the protected area. Apart from the scientific and conservation importance of these discoveries, it is also important to stress the resulting opportunities for positive local and international publicity for the Madidi protected area and surrounding region.

OBJECTIVE 2: Strengthen local on-site protection and management of biological resources across the landscape.

Activity 2.1. SERNAP Institutional Strengthening

On track

Over the last six months Imke Oetting and the BCLS staff have continued the implementation of an institutional strengthening plan for the National Protected Area Service (SERNAP). During this reporting period the Landscape Priorities and Actions Document (see Activity 4.5) was published by SERNAP following an extensive review by key SERNAP staff. The BCLS team have been formally invited to comment on the SERNAP/GTZ technical manual on protected area management plan development in Bolivia. Specifically, SERNAP has also requested that the team explore the potential for adding sections to include the landscape conservation approach within the document. BCLS staff have also continued to review various drafts of the provisional monitoring strategy for the national protected area system, with commitments to assist in a final version of the strategy.

The team has also responded to technical requests regarding human-animal conflict issues within Apolobamba (see Activities 1.4 and 2.4), including preliminary discussions regarding protected area policy on this subject. SERNAP has also requested assistance in municipality participation in protected area management based on our preliminary experiences in Apolo, Charazani, Curva and Pelechuco. The BCLS team has supported SERNAP and the three protected area administrations (Apolobamba, Madidi, and Pilon Lajas) during the recent change of directors of the three protected areas. This support included spatial and technical information to the incoming directors, as well as accompanying the newly appointed Director of Madidi in his initial field trips to the area, thereby introducing him to community representatives.

Again, the BCLS project has provided constant technical backup to the Madidi protected area management team, particularly on biodiversity and GIS issues. The bird and mammal biodiversity databases developed by the BCLS for the landscape as a whole have provided the backdrop and the model for the biodiversity databases now in place for the Madidi protected area. These databases have been spatially formatted and analyzed in order to identify the priority biodiversity regions within the protected area, and these analyses, in combination with community use areas, will provide the basis for the zoning of Madidi within the management process (scheduled for early October 2002). Finally, BCLS staff Humberto Gomez and Renata Tejada, in coordination with Lilian Painter have provided critical supervisory support to the Spatial Analysis Center within the Institute of Ecology regarding the development of GIS based maps and databases for the Madidi management plan. These maps and databases are compatible with those already produced for the Tacana TCO and the Apolobamba protected area, the latter completed during this reporting period (see Accompanying Documents).

The BCLS project also provided financial support for a music CD dedicated to the Madidi protected area by a series of Bolivian popular music groups. The plan is that proceeds from the sale of this CD will finance the purchase of a boat, motor and accompanying accessories for the protected area. The production of the CD has also helped to raise the national profile of the area. Finally, the BCLS has provided financial and technical support to the Madidi protected area administration during a series of conflicts that have arisen in the area. The main portion of this support has been the co-financing with Conservation International of a salary for an administrative assistant for the park based in San Buenaventura.

Activity 2.2. Protected Area Staff Training

On track

The project team has continued follow-up contacts with park guards from the Pilon Lajas, Madidi and Apolobamba protected areas regarding the monitoring and investigation projects they developed during the park guard monitoring workshop in June 2001. Progress has been variable although the purchase of monitoring equipment in the last reporting period has galvanized park guard efforts in all three protected areas. BCLS researcher Humberto Gomez also held a workshop on the use of GPS technology within the Apolobamba protected area, with 75% of park guards attending the course. Although considered useful one critical finding of the 2-day course was the need for refresher courses at regular intervals. The project team will build this into planned activities in the next Implementation Plan. In the future, park guards who are trained in GPS and data entry techniques will be able to digitally register their patrolling activities and begin designing strategic and integrated vigilance, monitoring and surveillance activities. In addition the project team continued coordination with park guards regarding the ongoing human-animal conflict studies in the Apolobamba protected area.

In the long run we view the park guards of the three protected areas as a key monitoring resource for the protected areas as well as the broader landscape. Nevertheless, current understaffing due to financial constraints of SERNAP, particularly in the case of Madidi, means that while monitoring and investigation are recognized as important in the longer term, they are understandably not a priority for the protected area managers at the moment. Thus, a major challenge for the conservation community of northern La Paz will be to secure long term significant funding for adequate levels of core staffing of the trio of protected areas. In the meantime we hope to work with park guards to develop a series of monitoring and surveillance activities that can be achieved with minimal additional effort and link to priority issues affecting the protected areas.

Activity 2.3. Community Wildlife Management Projects

On track

During this reporting period we have continued our supervision and technical support to eleven communities that were already involved in wildlife management projects within the landscape. Three of these communities (Santa Fe, San Pedro and Carmen Pecha) are conducting projects on the feasibility of sustainable native honey production as an alternative livelihood to current agro-pastoral practices, documenting ecological interactions between native bees and the tree community. In April 2002 Villagers from Carmen Pecha decided to abandon their community natural resource management project. Although this decision was partly for political reasons in the community, BCLS project staff have not made intensive efforts to tempt the community back into the program. This decision was taken as we believe such efforts would be counter to the philosophy of our community natural resource management approach given that it would detract, perhaps even negate the fundamental concept that community projects must be community owned and thus communities must demonstrate their own initiative. Thus the community has left the program, although ironically at least some individuals are still using the hives and looking to produce honey.

Conversely, Santa Fe and San Pedro remain committed to the project and the first large-scale experimental harvest is scheduled for mid-October 2002. Santa Fe are interested in continuing their community initiatives to study the ecology of native bees and are also looking to build a community shelter for native bee hives in an effort to increase production and facilitate monitoring and supervision of existing hives. It is important to recognize that native bee honey production underlines the value of the forest to local communities and also encourages communities to take participatory community decisions

regarding natural resources, a critical prerequisite for wider scale and more diverse natural resource management. This approach has been vindicated with the informal request from San Pedro for the BCLS project to assist the community in the management of its subsistence hunting. Over the next six months the project team will be working with the community to develop these ideas further.

Maria Copa and the BCLS project team also continued community wildlife management projects with four Tacana communities situated along the Beni River. Carmen del Emero, Cachichira and San Miguel are conducting self-monitoring programs for hunting, with almost complete hunter participation from the communities. Carmen del Emero and Cachichira completed one year of monitoring in July 2002 and in September analyzed the results with BCLS staff Humberto Gomez and Maria Copa. The result of this workshop was a formal request from the communities for second phase technical assistance in the documentation of large mammal abundances in their communal hunting grounds as well as in neighboring unhunted sources. Significantly this work implies a much greater commitment from the community and the hunters, but will not begin until April 2003 due to the imminent wet season. It also demonstrates that the communities are understanding management concepts. Meanwhile, San Miguel has requested assistance in the development of an integrated faunal management plan for the lower Tuichi river that considers traditional subsistence hunting needs as well as those of the booming local eco-tourism - which is as yet unregulated. This plan would be framed within the protected area regulations, and preliminary discussions have included a strategic management and monitoring alliance with the Madidi protected area.

Cachichira, San Antonio de Tequeje and San Miguel are conducting self-monitoring programs for fishing, again with almost complete fisherperson participation from the communities. As mentioned in the previous report, the communities have all recognized that a reduction of fishery potential in the Beni river has taken place over the last twenty years. This is an extremely complicated issue, as large-scale commercial fishing based downstream (from Riberalta and from Brazil) was probably largely to blame for the current situation. Commercial fishing interests in Rurrenabaque and San Buenaventura also complicate matters. Nevertheless, if local communities are to have any say in the future management of the river, then being able to present the results of their own monitoring will strengthen their hand in negotiations.

Similarly, Eyoyoquibo, a recent Esse Eja settlement on the Beni River, has continued a self-monitoring program of fishing with technical support from Neyda Coca (an undergraduate Environmental Management student at the UTB University in La Paz) and the BCLS team. The Esse Ejas form a riverine indigenous group that live and primarily fish along the Beni, Heath and Madidi rivers of the landscape, as well as in neighboring areas of Peru. Historically, they have been marginalized politically and economically. They are perhaps the poorest social group in the landscape. This extreme situation has provided a major test of our approach to community natural resource management. Many of the community do not speak Spanish, few can read or write, alcoholism is rife and racism is a real issue for this indigenous group. This combination of factors makes the encouragement of community decision making an extreme challenge, and in the longer term may warrant the consideration of other approaches.

During this reporting period BCLS staff also continued community wildlife management projects with three highland valley communities in the Pajan region: Pajan, Sanachi, and Huayrapata (see Activity 1.4.). At the request of the communities, these projects are focusing on one of the major human-animal conflicts in the highland portions of the landscape: crop raiding by assorted wildlife species. During the second year of study the project team again assisted the community in data collection, and also facilitated the implementation of a series of community proposed solutions. Specifically, the projects measured crop damage to the corn fields of the local communities, with a Bolivian undergraduate student accompanying community representatives to measure the number of stems affected by each wildlife species on a monthly basis.

The three communities all implemented vigilance systems for their corn fields, where members of the communities took turns descending to the corn fields to guard them. In addition, fire crackers were used sporadically in order to scare away potential crop raiders. As mentioned above (Activity 1.4), between 10 and 30% of production was lost to wildlife in 2001, with damage more intense in fields close to forest borders and far from villages. Spectacled bears and local parrot species were the biggest offenders, with skunks and deer also important. In 2002 damage dropped to an average of 0.67% and community members attribute this change to the mitigation actions they undertook. Again, all three communities have decided to continue studies this year with financial and technical support from the BCLS. This year an economic analysis of the problem will be conducted and communities will be expected to increase their economic contributions to proposed solutions - probably in the form of time. The team will also facilitate meetings beyond these three participating communities in order to communicate the project's findings.

In addition, as described in Activity 1.4., the BCLS team has expanded its highland community program to include communities of the Curva municipality that are interested in discussing, studying, and developing appropriate mitigation actions for human animal conflict issues, specifically with respect to livestock loss. As mentioned above, during this reporting period the team facilitated the visit of Adrian Treves of the CI-CABS office to the Apolobamba site. Treves and BCLS director Wallace are currently co-developing proposals for human-animals conflict studies and management. Over the next six months the challenge will be to develop rigorous and participative studies of this problem with the Curva communities as the first step to an informed analysis of possible solutions to this problem.

These natural resource management community projects are fundamental to the landscape approach as they encourage community-planning processes and also provide a hands-on opportunity for environmental education at the community level. They are also the start of a long-term strategy to encourage a regional program of community- based sustainable natural resource management and production. A success in applying this approach would result in a powerful conservation model for use in other regions and landscapes across Bolivia.

Activity 2.4. Community Wildlife Workshops

On track

Over the last six months an invitation from the Villa Alcira Tacana community on the Beni River was followed up with a community wildlife workshop that resulted in the community formally requesting self-monitoring projects of both fishing and hunting. In addition, Asuncion de Quiquibey, a Moseten community in the Pilon Lajas Biosphere Reserve and Indigenous Territory, also requested technical assistance in the continuation of their self-monitoring efforts. This request is related to their concern about sustaining their nascent community-based ecotourism venture in the area.

Although the project has received informal requests for assistance from other communities across the landscape, for example five Tacana communities (Cachichira, Bella Altura, Buena Vista, Tres Hermanos and Altamarani) interested in integrated zoning related to eco-tourism efforts around Laguna Moa, we have concentrated on consolidating our existing program during this reporting period.

Activity 2.5. Wildlife Management, Conservation and Ecology Program (Institute of Ecology)

On track

In coordination with the Coleccion Boliviana de Fauna, a division of the Institute of Ecology (IE), BCLS project staff have consolidated the establishment of the Wildlife Management, Conservation and Ecology

Program. This program aims to strengthen the ability of this national research body to conduct focused research on the ecology of vulnerable wildlife species, as well as applied studies concerning wildlife conservation and wildlife management issues. The BCLS team has provided the IE with an electronic copy of its extensive library on wildlife management, begun a weekly academic journal discussion seminar open to all interested students and BCLS staff, and scheduled a program of introductory seminars on wildlife issues. In September 2002, the CBF/BCLS team held an open and participatory workshop within the Institute in order to further define the role, objectives and immediate actions of the Wildlife Management, Conservation and Ecology Program. Encouragingly this workshop was attended by over 60 biology students, young professionals as well as representatives of other institutions associated with the Institute of Ecology. Although immediate actions will continue to focus on the professional development of students, professors and professionals, there was a clear recognition from the attendees that joint proposal development and resulting actions were also a need, as well as better diffusion, communication and public relations with regard to wildlife management (See Accompaying Document for a summary of priority actions). This Wildlife Management, Conservation, and Ecology Program will also assist other branches of the IE to develop their capacity to serve as technical advisors to natural resource management initiatives throughout the country.

In addition, the CBF/BCLS team have developed a Wildlife Conservation and Management undergraduate course proposal for the biology department of the university where the Institute of Ecology is based. In order for this proposal to be workable, the team also revised the Ecological Methods, Population and Community Ecology, Animal Behaviour, and Statistics II courses. These will be prerequisites for the Wildlife Conservation and Management course. Over the next six months BCLS staff will collaborate with CBF staff and Dr. Peter Feinsinger in the development of these frameworks into working undergraduate courses with associated practicals, reflecting a more participative and demanding teaching philosophy.

Activity 2.6. Schoolyard Ecology Education

On track

During this reporting period Beatriz Parra, a BCLS consultant, conducted follow-up EEPE (School Yard Ecology Education) workshops and outreach work in the Tumupasa and San Buenaventura region. This follow-up strategy was ultimately a success, with several local key and enthusiastic individuals identified in the Tumupasa region committed to implementing and promoting the EEPE approach. Given the BCLS program's commitment to CIPTA, based in Tumupasa, more regular follow up support for the EEPE approach should be feasible. Nevertheless, a major challenge for this program remains the raising of funds for a more considerable program that would allow for more significant investment in follow-up activities. Importantly, this activity raises awareness about protected areas and the importance of ecosystem services for the human population around them.

Activity 2.7. Monitoring Strategy Design

On track

Imke Oetting and the BCLS staff have drafted a monitoring and surveillance strategy for the Northwestern Bolivian Andes Landscape Conservation Program, which is currently under review by New York-based staff (see attached document). The strategy attempts to distinguish between activities and indicators that are realistic in the short term and those activities and indicators that will require significant additional investment. Monitoring at a landscape scale will be a major challenge for several reasons that are discussed in the draft strategy: for example, lack of sufficient baseline information, requirement of high-level inter-institutional coordination, and financial and personnel commitments required to achieve a truly robust monitoring strategy. Imke Oetting and Rob Wallace are now beginning the process of institutionalizing the monitoring and surveillance strategy in the form of a comprehensive database

structure for the BCLS project. The next challenge will be to fill the database out and then distribute this product to partners institutions across the landscape.

One of the reasons that monitoring is such a complex task is apparent when one broadens the monitoring discussion to the conservation status of the landscape as a whole. This will require a monitoring strategy that includes all other major intervention actors across the landscape. For example, in northern La Paz this includes SERNAP, the protected area administrations, CIPTA, DGB, IE, as well as other institutions working in the landscape such as CARE, CI, WWF, CE (Spanish Cooperation) and AMNH (American Museum of Natural History). Given the above, over the last six months the BCLS team has held preliminary discussions regarding a monitoring strategy for the landscape with several of the relevant actors - particularly SERNAP. As a first concrete step toward this goal, the BCLS team has decided to assist in the development of an integrated monitoring strategy for the Madidi protected area. This initiative is intended to provide the launching pad for broadening the strategy to address the landscape as a whole.

As mentioned in Activity 2.1, over the last six months we have continued to assist SERNAP in the design of a process to define a monitoring strategy for the protected area system of Bolivia. This has taken longer than anticipated, mainly due to the SERNAP pace. The project team will continue to assist SERNAP in this objective over the next six months. A major challenge will be to ensure that the plan remains realistic in terms of personnel and financial requirements. Balancing this necessity with a strategy that accurately measures intervention effectiveness and reliably monitors the integrity of Bolivia's protected areas will be challenging.

Activity 2.8. Tacana Land Titling and Management

On track

Members of all communities within the territorial demand have continued to receive legal advice by the legal team supported by BCLS, composed of one lawyer and three Tacana counterparts. The first and largest portion of the Tacana TCO land-titling process is now at the final stage in the courts of the nation's nominate capital, Sucre, before receiving approval from the Bolivian government. Over 350,000 hectares will initially be titled with a final decision expected in the next three months. Subsequently, a smaller section that represents disputed lands will go through the same process, and finally the Bolivian government will complete the process with an expected compensation of around 100,000 additional hectares to the Tacana. Although some local political resistance to the TCO remains (mainly due to controversy regarding illegal tourism lodges owned by EcoBolivia, as well as other third parties with unclear land titles in the region), recent developments suggest that a period of consilience with several institutions such as local government authorities is on the horizon.

Closer coordination between CIPTA and the Iturralde Campesino Federation (FESPAI), has continued during this period. The FESPAI has requested assistance from WCS, CARE and CI to develop their own strategic environmental management strategy, and preliminary conversations are underway. The proposal for a Supreme Decree legalizing the zoning methodology as an alternative to the spatial requirement studies is still under discussion between CIDOB and the Bolivian government. The latter methodology only considered the total hectares awarded as opposed to the zoning methodology that also considers the specific spatial locations of current use and subsequent demand. This zoning then forms the basis of the indigenous land management plan and thus this methodology contributes at a relatively early stage to the management of the land.

Finally, the BCLS supported the Annual General Meeting of CIPTA, held in Carmen del Emero in July 2002. This meeting provided an opportunity for project staff to inform the Tacana people regarding progress in the implementation of the management plan for the Tacana TCO. Critically, elected members

of the CIPTA directorate together with INRA representatives were able to inform the communities regarding the process for the legal consolidation and titling of the Tacana TCO. This allowed a space for community representatives to express their frustration regarding the delays in the process and INRA an opportunity to clarify the legal process.

OBJECTIVE 3: Promote the development of national policies that support the landscape conservation approach.

Activity 3.1. Technical and Policy Support

On track

During this reporting period BCLS staff have continued support to SERNAP (see Activity 2.1) and its internal policy initiatives, including technical advice and support in the development of a monitoring strategy for the protected area system of Bolivia. Through participation in various meetings, BCLS staff also continued to support the Inter-institutional Committee and Management Committees of both the Apolobamba and Madidi protected areas. The inter-institutional meetings ensure that activities conducted by various institutional stakeholders within the protected areas are coordinated under the umbrella of the protected area and are framed within an annual work plan. These meetings also encourage collaborative initiatives in the design and implementation of activities, as well as assistance in every day logistics. The Management Committee meetings provide a means of ensuring that local people's needs, opinions and aspirations are reflected in the management of the protected area, including in annual work plans.

Activity 3.2. Financing Mechanisms

On track

The preliminary financial investment analysis for conservation in the Northwestern Bolivian Andes Landscape was published in late September 2002, as part of the Landscape Conservation Priorities and Actions document (see Activity 4.5). This first step included a thorough finance history of direct funding for the three protected areas within the landscape, as well as projected funding until the year 2006. Precise financial information from the non-governmental institutions operating in the region is not yet available and it is hoped that this will be a feature of a second version of this analysis to be developed by December 2003.

In addition, Elvira Salinas and Zulema Lehm have been working on a concept paper for the development of a rolling fund for Natural Resource Management efforts within the Tacana TCO. Ideally, this fund would not only generate financial support for community-based natural resource efforts, but would also help CIPTA centralize project evaluation and management efforts for the TCO. In addition, Lilian Painter has begun preliminary conversations regarding the development of a trust fund for the Madidi protected area.

The project team also finalized proposals dealing with various aspects of the landscape conservation approach with the MacArthur Foundation, the Moore Foundation, the Whitley Award for Birds, and Zoos Go Wild, and is awaiting the results of these proposals. One of the proposals submitted to the Bolivian USAID Mission was successful in raising an additional $125,000 for our work with the SERNAP and CIPTA.

Activity 3.3. Threats Assessment Working Group
On track

During this reporting period, the BCLS team has continued to monitor immediate infrastructure development projects in the landscape that represent serious threats to conservation and natural resource management initiatives. Spontaneous and mass-organized colonization along the San Buenaventura to Rio Madidi road is now an imminent reality and petroleum exploration within both Madidi and Pilon Lajas is also being seriously considered by the Bolivian government. These threats are being monitored through our excellent relations with SERNAP staff, and issues are also discussed within the Inter-institutional committees of Apolobamba and Madidi. These inter-institutional committees have already collaborated in joint lobbying for support to the legal land titling process in and around the Madidi area in the face of threats from private interests. They were also important in generating alternative press coverage of the region during the Bala Dam crisis in 2000 and 2001.

In September 2002 this activity was intensified with launch of a project on Conflict Analysis and Management, jointly implemented by WCS, SERNAP, CIPTA, and Conservation International. . While one element of this project aims to summarize conflicts occurring within the entire protected area system of Bolivia, the main thrust of the project focuses on the northern La Paz region, particularly the Madidi and Pilon Lajas protected areas and the Tacana TCO. One aspect of the project aims to assist SERNAP in developing informed and politically reasonable stances regarding key issues: for example, petroleum exploration, directed colonization and unregulated ecotourism. This project is seen as a critical opportunity by senior SERNAP staff, and reinforces the threats and conflict-based approach being accepted by SERNAP as a key landscape planning and conservation tool.

Finally, an updated version of the threats and opportunities analysis was included in the published Landscape Conservation Priorities and Actions document (see Activity 4.5).

OBJECTIVE 4: Elaborate a participative, integrated, landscape conservation action plan.

Activity 4.1. Cooperative Agreements
Completed

The finalization of the cooperative agreements with the government of Bolivia, SERNAP, IE, CIPTA and CARE in previous fiscal years render this activity complete, although negotiations regarding formal cooperative agreements are ongoing with four municipalities at the local government level, as well as Conservation International and the Direccion General de Biodiversidad (DGB) of the Bolivian government.

Activity 4.2. Landscape Stakeholder Workshop
Delayed

Unfortunately, this activity has again been postponed due to delays in necessary and desired SERNAP input regarding this workshop and the accompanying document (see Activity 4.5). Nevertheless, given that the accompanying document has now been published (see Activity 4.5), we are scheduling a first Landscape Stakeholder Workshop for November 2002. Invitations to this workshop will be distributed along with the Landscape Conservation Priorities and Action Plan in early October 2002.

The central theme of the workshop will focus on mechanisms to integrate conservation and natural resource management with the needs of local governments. Members of all international, national and grass roots institutions working in the landscape will be invited, as well as relevant national and local

government officials. This workshop will also provide an excellent opportunity to further update the landscape threats and opportunities analysis by consulting local government bodies and grass roots organizations. We will also be able to draw on the pilot experience with the Apolo and Apolobamba Multiple Municipality (Charazani, Curva and Pelechuco municipalities - see Activity 4.4). One product of this meeting will be considerable additional material for the second edition of the Landscape Conservation Action Plan for northern La Paz Department (see Activity 4.5).

Activity 4.3. Land Use Plan

On track

During this period CIPTA and the BCLS team have begun in earnest the lengthy process of implementing the Natural Resource Management Strategy for the Tacana TCO, published in August 2002 (see Accompanying Document). One critical aspect of this challenge will be to administer and supervise supra-communal natural resource management initiatives within the Tacana TCO. Here, the idea is to strengthen communal and supra-communal organizational capacities and reach agreements with user groups for appropriate natural resource access in order to prevent, mitigate, mediate and resolve conflicts at this level. For example, many of the conflicts regarding land tenure within the TCO demand have arisen because of disputes over timber resources. This problem is heightened because rights of access to this common resource have not been defined within the TCO, and other stakeholders do not recognize the validity of the Tacana claims.

Therefore, in this reporting period we have focused on timber produced in the TCO areas allocated to local 'timber associations' as a case study for the management of inter-communal conflicts about the access to and use of common resources. In this light a forester was contracted to CIPTA in order to carry out the work. Intensive forest inventories have been carried out in the communal forestry areas around Tumupasa and San Pedro and three communal forestry management plans have been prepared with additional assistance from BOLFOR. Two of these 'timber associations' are now extracting timber in line with the management plans. Therefore a major focus for discussion will be the distribution of benefits, as well as the determination of practical forestry regulations specific to the Tacana TCO and within the confines of the forestry law.

These initiatives will also serve as models for future supra-communal management initiatives with additional products., and we intend to conduct economic analyses of these 'timber associations' in the near future. This strategy will necessarily consider a series of elements including conflict management and associated factors such as natural resource use regulations, benefit distribution, community control mechanisms and monitoring programs. Candidate resources for subsequent supra-communal management include chocolate, vanilla, chamairo, spectacled caiman harvesting as well as hunting and fishing management. Critically, we will continue to use a participatory approach in the development of strategies pertaining either to the management of the TCO or the strengthening of CIPTA as an institution.

Finally, BCLS staff Elvira Salinas, Zulema Lehm and Rob Wallace designed and conducted a workshop on natural resource management with multiple community representatives from twenty five northern La Paz Tacana communities, including all twenty within the Tacana TCO. This workshop focused on the development of principles and criteria for sustainable natural resource management within the TCO, a necessary prerequisite for more sensitive discussions regarding benefit distribution, norms and regulations pertaining to natural resource management, as well as community control and accompanying sanctions. The workshop was extremely productive and the resulting principles and criteria represent a Tacana vision for natural resource management. In the coming months the team will further develop this process by focusing on appropriate norms and regulations as well as benefit distribution.

Activity 4.4. Municipal Development Planning

On track

During this reporting period both the Apolo municipality and the Apolobamba multi-municipality environmental planning documents were published (see Attached Documents). The BCLS team had hoped to run a second workshop in the Apolo municipality in September, however, a major change in local government personnel in Apolo prevented this and efforts have now temporarily switched to the Apolobamba multi-municipality with a second workshop now planned for early December 2002. It is hoped that this environmental planning process will provide municipality staff with a key to the doors of funding for environmental issues in the Apolobamba region.

These initial experiences are providing a model for further municipality development planning processes in a landscape that includes ten municipalities. These secondary workshops will aim to reach concrete agreements regarding proposal development for the environmental issues facing the region, as well as strengthen the spatially explicit element of planning processes within local governments. Preliminary conversations with the newly opened municipality office at SERNAP have been extremely positive, and SERNAP staff are assisting in the design of the second workshop and are already considering the process as a potential model for integrating local government planning with protected area administrations for other parts of the country.

Activity 4.5. Landscape Conservation Priorities and Action Plan

On track

After considerable delays due to required SERNAP review and input, this document has been published (see Attached Document). This SERNAP-published guide will serve to identify key gaps that must be addressed in order to achieve effective conservation in the landscape, and will be a useful planning tool for SERNAP, local government offices such as municipalities, other conservation organizations, and the donor community. In order for our landscape conservation actions to be sustainable in the longer term and replicable across other landscapes centered around protected areas, it is critical to involve SERNAP personnel in all aspects of the project – but especially those concerned with planning and policy. Furthermore, as government representatives, their perspective and input will help ensure that project ideas and initiatives are realistic and workable in the Bolivian context.

We intend to update this living document on an annual basis, and the BCLS team is already working on the content of the second edition that we hope to publish in the fall of 2003. In future versions of the document, we also intend to include local case studies in land-use and environmental planning as examples of, or guidelines for, how to go about achieving landscape conservation. These case studies will include BCLS activities such as community natural resource management success stories, municipality environmental planning, indigenous territory planning, and protected area management decision making processes, as well as examples from other projects working in the region: for example, protected area management plans (see Section 6 in the published version for details of forthcoming sections).

III. Success Stories and Appendices

Three communities conducting studies related to the sustainability of subsistence hunting have decided to cement their commitment, broaden their perspectives and intensify their activities within their community-based natural resource management projects. This represents a major achievement for the BCLS technical team. Specifically, our community approach and general philosophy with regard to working with communities has proven yet again to be successful. We strongly adhere to the concept of

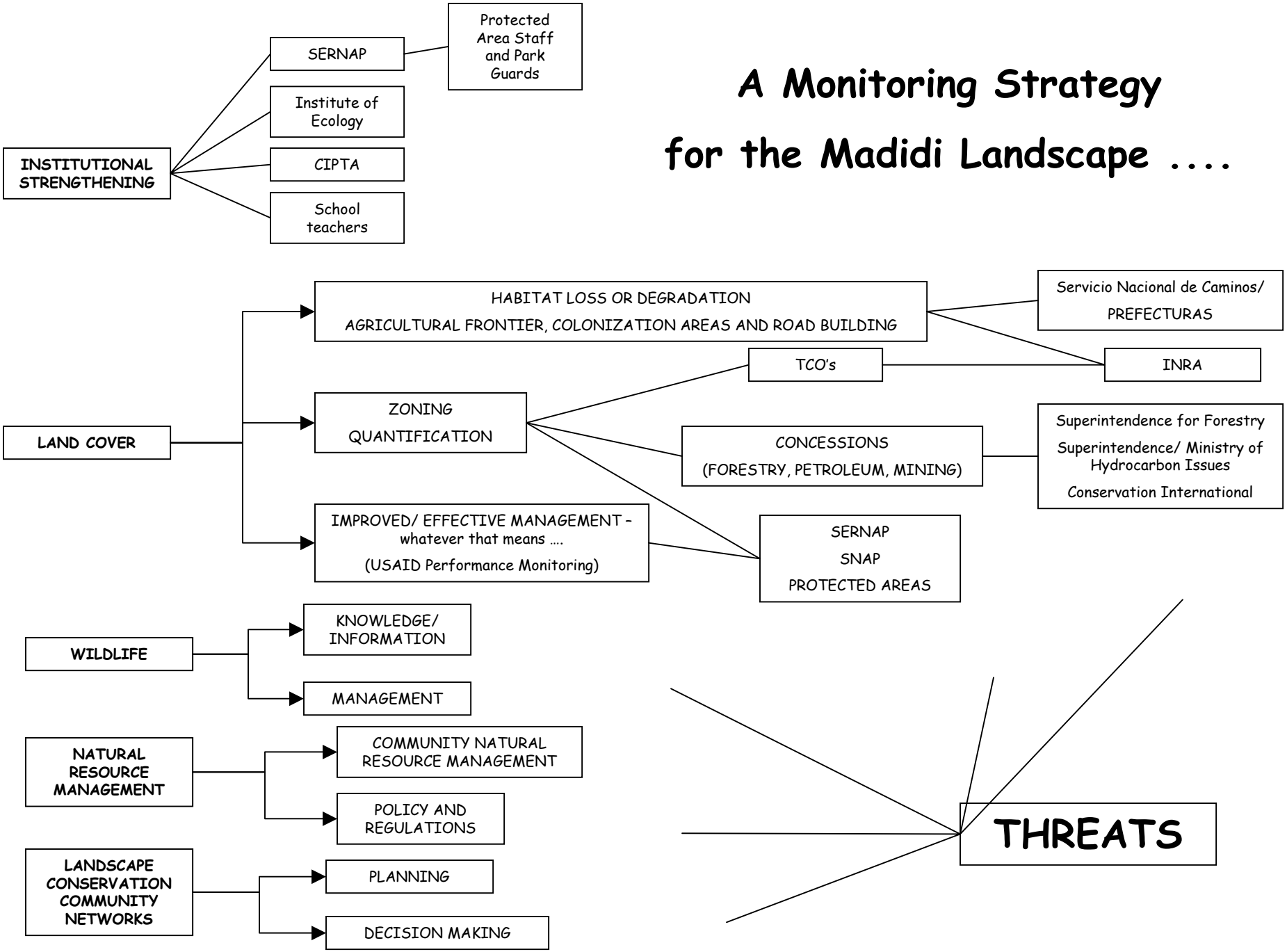
‘community ownership’ of projects and believe that community-based natural resource management projects will only work in the long term, and therefore be truly sustainable, if the project is conceived and executed to a significant degree by the community itself. Our role is to technically advise community-based initiatives and facilitate resulting projects through additional technical follow-up, as well as financial and logistical support. At this time, yet another community, Ascencion de Quiquibey in the Pilon Lajas Indigenous Territory and Biosphere Reserve, has joined the program and two more Tacana communities are also inquiring about possible sustainable hunting projects.

Nevertheless, the sustainability of subsistence hunting is a complex issue, and it has taken a year of self-monitoring accompanied by regular refresher workshops from the BCLS team for the communities to absorb the technical and information requirements necessary to manage hunting. Our perseverance has paid off with community-based decisions (Carmen del Emero, Cachichira, San Miguel) to continue and refine existing activities, as well as begin estimating wildlife population densities. The latter represents a much greater investment from the community and the hunters themselves, and underlines the importance of subsistence hunting to tropical lowland rural economies, particularly in terms of indigenous groups. The next major question will provide the ultimate test of our community approach: once information is available and hunting sustainability can be accurately assessed, will communities decide to take necessary management actions?

Appendices

1. Published Tacana TCO Natural Resource Management Strategy
2. Published Municipal (Apolo) Environment Plan
3. Published Municipal (Charazani, Curva, Pelechuco) Municipal Environment Plan
4. Published Landscape Priorities and Conservation Plan – 1st Edition
5. BCLS Monitoring Framework Draft
6. Wildlife Conservation and Management Program – Priority Actions Document
7. Apolobamba Protected Area Vegetation and Basis Maps

A Monitoring Strategy for the Madidi Landscape ....



Monitoring Framework (Project Interventions & Conservation Objectives) 1

Threats Addressed under Objective 1:
Habitat degradation or loss
Decline in wildlife population
Oil exploration, Road construction and Colonization
Lack of biological baseline information
Lack of conservation information
Lack of national capacity to conduct and implement research
Weak protected area administration
Lack of Management Plan for PNM and AIM
Hunting of problem animals
Human – animal conflict (crop raiding)
Human – animal conflict (livestock loss)
Hunting
Fishing
Lack of national and regional capacity to conduct sustainable natural resource use programs
Weak appreciation of conservation and its benefits
Lack of alternative sustainable income for local people
Lack of land use planning

Objective 1:
Establish baselines and monitor landscape species in the landscape context in which they are found (Research)

TARGET
Increase information
Use information for better decision making

TREND DATA NEEDED
Up to date information
Applicability and actual use

MONITORING ACTIVITY
Inventory of existing data base and annual review of produced/ published documents

INDICADOR
No. of entrances in the data base
No. of persons and institutions that consult data base
No. of produced/ published documents each year
% of produced/ published documents that respond to identified (spatial) gaps

Threats Addressed under Objective 2:
Weak protected area administration
Lack of Management Plan for PNM and AIM
Lack of conservation information
Weak extractive sector regulatory framework
Conflicts between local development plans and conservation plans
Decline in wildlife population
Hunting
Fishing
Non-timber forest product exploitation
Lack of national and regional capacity to conduct sustainable natural resource use programs
Weak appreciation of conservation and its benefits
Lack of alternative sustainable income for local people
Lack of national capacity to conduct and implement research
Lack of biological baseline information
Lack of long term vision of sustainable development
Land tenure disputes
Lack of land use planning
Lack of strategy for financial sustainability

Objective 2:
Strengthen local, on-site protection and management of biological resources across the landscape (Programmatic Management Objectives)

TARGET
Management effectiveness increases (criteria ….)

TREND DATA NEEDED
Gaps in issues that are not addressed or dealt with are being filled

MONITORING ACTIVITY
Scorecards (TNC/ SERNAP) ….

INDICADOR
Design and implementation of management plan and responding Annual Work Plan
Biodiversity Inventory
Protection Plan
Monitoring Strategy
Internal Zoning (for natural resource management)

Threats Addressed under Objective 3:
Weak local and regional communication framework
Weak local government administration
Weak protected area administration
Conflicts between local development plans and conservation plans
Lack of long term vision of sustainable development
Lack of strategy for financial sustainability
Conflicts between local development plans and conservation plans
Petroleum exploration
OTHER SECTORS (proposed) Bala Dam

Objective 3:
Promote the development of national policies that support the landscape conservation approach (Policy)

TARGET
More specific policies that close the gaps

TREND DATA NEEDED
Quantity and quality of policies

MONITORING ACTIVITY
Annual review of documents (SERNAP)

INDICADOR
No. of documents and outreach

Threats Addressed under Objective 4:
Colonization
Road building
Conflicts between local development plans and conservation plans
Weak local government administration
Lack of long term vision of sustainable development
Lack of strategy for financial sustainability
Lack of land use planning
Lack of regional capacity to conduct sustainable natural resource use programs
Lack of long term vision of sustainable development

Objective 4:
Elaborate a participative, integrated landscape conservation action plan (Landscape Species Conservation Strategy)

TARGET
Living reference document for management decisions

TREND DATA NEEDED
Up date frequency
Quantity and quality of consultations and input from stakeholders

MONITORING ACTIVITY
Annual questionnaire together with the information up date

INDICADOR
No. of consultations
No. of input from stakeholders
No. of stakeholders involved in the document

Monitoring Framework (Project Interventions & Conservation Objectives) 2

Direct Threats Addressed:

1. Habitat degradation or loss
2. Decline in wildlife population
3. Petroleum exploration
4. (Gold) Mining
5. Proposed gas pipeline
6. Road construction
7. Other sectors (Bala Dam Project)
8. Spontaneous and directed colonization
9. Hunting of problem animals
10. Human – animal conflict (crop raiding)
11. Human – animal conflict (livestock loss)
12. Hunting
13. Fishing
14. Non-timber forest product exploitation
15. Forestry
16. Agriculture
17. Livestock production
18. Unregulated tourism
19. Soil compression and/or erosion
20. Aquatic and soil pollution
21. Urban source pollution
22. Disease
23. Fire

Indirect Threats Addressed:

a. Weak protected area administration
b. Lack of conservation information
c. Lack of biological baseline information
d. Lack of Management Plan for PNM and AIM
e. Conflicts between local development plans and conservation plans
f. Weak extractive sector regulatory framework
g. Lack of alternative sustainable income for local people
h. Lack of national capacity to conduct and implement research
i. Land tenure disputes
j. Lack of land use planning
k. Lack of national capacity to conduct sustainable natural resource use programs
l. Lack of regional capacity to conduct sustainable natural resource use programs
m. Weak local and regional communication framework
n. Weak local government administration
o. Weak appreciation of conservation and its benefits
p. Lack of long term vision of sustainable development
q. Lack of strategy for financial sustainability

CONSERVATION OBJECTIVE

To conserve as many **JUCUMARI** and as much **JUCUMARI** habitat as we can in the landscape

TARGET

Maintain or increase JUCUMARI populations until the end of the project.

TREND DATA NEEDED

Number of JUCUMARI or a proxy remains stable or increases in the landscape over five years.

MONITORING ACTIVITY

Register of JUCUMARI.. encounters and footprints by park guards in pre-established forms

INDICADOR

Presence/ Absence in areas with and without tourism

Density estimates

CONSERVATION OBJECTIVE

To conserve as many **JAGUAR** and as much **JAGUAR** habitat as we can in the landscape

TARGET

Maintain or increase JAGUAR populations until the end of the project

TREND DATA NEEDED

Number of JAGUAR or a proxy remains stable or increases in the landscape over five years.

MONITORING ACTIVITY

Baseline with camera trapping.

Register of JAGUAR.. encounters and footprints by park guards in pre-established forms

INDICADOR

Presence/ Absence in areas with and without tourism

Density estimates ....

CONSERVATION OBJECTIVE

To conserve as many **WHITE-LIPPED PECCARY** and as much **WHITE-LIPPED PECCARY** habitat as we can in the landscape

TARGET

Maintain or increase WHITE-LIPPED PECCARY populations until the end of the project

TREND DATA NEEDED

Number of WHITE-LIPPED PECCARY or a proxy remains stable or increases in the landscape over five years.

MONITORING ACTIVITY

Register of WHITE-LIPPED PECCARY encounters by park guards in pre-established forms

INDICADOR

Presence/ Absence in areas with and without tourism

Density estimates ....

CONSERVATION OBJECTIVE

To conserve as many **CONDOR** and as much **CONDOR** habitat as we can in the landscape

TARGET

Maintain or increase CONDOR populations until the end of the project

TREND DATA NEEDED

Number of CONDOR or a proxy remains stable or increases in the landscape over five years.

MONITORING ACTIVITY

Annual mapping of CONDOR nests and nesting/ shelter areas in areas with and without tourism

INDICADOR

Number of CONDOR nests/km² in the landscape.

CONSERVATION OBJECTIVE

To conserve as many **SURUBI** and as much **SURUBI** habitat as we can in the landscape

TARGET

Maintain or increase SURUBI populations until the end of the project

TREND DATA NEEDED

Number of SURUBI or a proxy remains stable or increases in the landscape over five years.

MONITORING ACTIVITY

Community-based monitoring of SURUBI quantity and sizes extracted in a pre-established protocol

INDICADOR

Number of SURUBI eggs flowing down the river per year

Change in SURUBI quantity and sizes extracted per year

Monitoring Framework (Project Interventions & Conservation Objectives) 3

Objective 1:
Establish baselines and monitor landscape species in the landscape context in which they are found (Research)

Threats Addressed:
Habitat degradation or loss
Decline in wildlife population
Oil exploration, Road construction and Colonization
Lack of biological baseline information
Lack of conservation information
Lack of national capacity to conduct and implement research
Weak protected area administration
Lack of Management Plan for PNM and AIM

Threats Addressed: Assessing biodiversity in areas threatened by oil exploration, road construction and colonization will enable us to identify particularly fragile habitats and species in order to suggest mitigation measures. The biodiversity assessments will also represent the baseline for monitoring the success of any intervention designed to address the threat. Building this information into conservation plans and management for Madidi National Park and the Apolobamba ANMI will help to address weaknesses in both the capacity to conduct research and the administration of protected areas.

Threats Addressed:
Habitat degradation or loss
Decline in wildlife population
Hunting of problem animals
Human – animal conflict (crop raiding)
Human – animal conflict (livestock loss)
Hunting
Fishing
Lack of conservation information
Lack of biological baseline information
Lack of national capacity to conduct and implement research

Threats Addressed: By gathering information on the specific ecological needs of bears, jaguar, white-lipped peccaries, condor and SURUBI we will be able to identify key habitats and resources and hence guide our actions to address those human activities which are most likely to affect them and the biodiversity they represent as a whole, such as various forms of habitat degradation or loss, hunting, and fishing. Furthermore, increasing our understanding of these species will enable us to make better predictions of possible solutions to conflicts between these species and specific human activities, such as livestock predation and damage to crops. The information gathered will also contribute to a better understanding of the biodiversity and conservation issues in the region as well as building national capacity to conduct applied conservation research.

Intervention 1.1.: Biodiversity Surveys

TARGET
Increase information focused on management needs

TREND DATA NEEDED
Identified (spatial) information gaps
Identified research projects
Application of results for management decisions

MONITORING ACTIVITY
Register of identified (spatial) information gaps and identified research projects
Annual review of produced/ published information and application for management and decision making

INDICATOR
Number of produced/ published documents each year
% of produced/ published documents that respond to identified gaps
No data zones decrease

TREND DATA NEEDED
Species richness and abundance in largely undocumented regions, as well as accessing on-the-ground information and opinions regarding the status of threats.

MONITORING ACTIVITY
Preliminary assessment of species richness and abundance of tree, avifaunal and large mammal communities

INDICATOR
Updated bird and mammal databases for the landscape

Intervention 1.2.: Landscape Species Research

TARGET
Increase information on landscape species (ecological and habitat needs at population and individual levels, ranging behavior)
Spatial prioritization of the biological landscape according to the five landscape species, including maps

TREND DATA NEEDED
Resource availability and habitat use by jaguars, white-lipped peccaries, and spectacled bear
Information on condor and SURUBI populations across the landscape

MONITORING ACTIVITY
Register of identified (spatial) information gaps and identified research projects
Annual review of produced/ published information
Annual mapping of the biological landscape

INDICATOR
No. of produced/ published documents each year
% of produced/ published documents that respond to identified gaps
Prioritized landscape

THREATS
Colonization, Road building, Agriculture, Cattle raising, Natural resource exploitation, Unregulated tourism

THREAT
Habitat loss

TARGET
Annual percentage of lost JUCUMARI/ JAGUAR/ WHITE-LIPPED PECCARY/ CONDOR/ SURUBI habitat is reduced by x % at the end of the project.

TREND DATA NEEDED
Reduction of JUCUMARI/ JAGUAR/ WHITE-LIPPED PECCARY/ CONDOR/ SURUBI habitat loss by x%, every two years..

MONITORING ACTIVITY
Comparison of satellite images.

INDICATOR
% of JUCUMARI habitat lost every two years....

TARGET
Diminish the extension and intensity of **Colonization, Road building, Agriculture, Cattle raising, Natural resource exploitation, Unregulated tourism**

TREND DATA NEEDED
Availability of natural prey versus problem prey (threat: agriculture)
Extension and intensity of threats (human landscape)

MONITORING ACTIVITY
.Mapping of extension and intensity of threats (human landscape)

INDICATOR
Change in extension and intensity of threats (human landscape)...

THREAT
Habitat degradation

TARGET
Maintain or improve JUCUMARI/ JAGUAR/ WHITE-LIPPED PECCARY/ CONDOR/ SURUBI habitat quality by the end of the project (wildness levels) ....

TREND DATA NEEDED
Ecological studies on habitat conditions
Trees, DAP, palm trees with and without fruits

MONITORING ACTIVITY
Community based monitoring
Transects in long-term sites.

INDICATOR
Proxy: CONDOR eggshells, SURUBI meat contamination, etc.....

THREAT
Decline in wildlife populations

TARGET
Maintain or increase JUCUMARI/ JAGUAR/ WHITE-LIPPED PECCARY/ CONDOR/ SURUBI populations until the end of the project.

TREND DATA NEEDED
Number of JUCUMARI/ JAGUAR/ WHITE-LIPPED PECCARY/ CONDOR/ SURUBI or a proxy remains stable or increases in the landscape over five years..

MONITORING ACTIVITY
Annual mapping of CONDOR nests and nesting areas
Study on catfish populations, including SURUBI. and fishing industry.

INDICATOR
Number of CONDOR nests/km² in the landscape
Population density estimates for JUCUMARI/ JAGUAR/ WHITE-LIPPED PECCARY/ CONDOR/ SURUBI

Monitoring Framework (Project Interventions & Conservation Objectives) 4

Objective 1:
Establish baselines and monitor landscape species in the landscape context in which they are found (Research)

Threats Addressed:
Lack of conservation information
Lack of biological baseline information
Lack of national capacity to conduct and implement research

Threats Addressed: Distribution maps of landscape species combined with spatial analyses of existing and potential threats to the landscape will enable the identification of critical areas for their conservation. These maps will also provide a distributional baseline for administrations of the two protected areas, and the indigenous territory. By incorporating the park guards into this activity we are also providing a series of training and motivational opportunities for protected area staff. Similarly, Tacana community representative training will build the interest and capacity for further Tacana participation in conservation efforts. The information gathered will also contribute to a better understanding of the biodiversity and conservation issues in the region as well as building national capacity to conduct applied conservation research.

Intervention 1.3.:
Landscape Species Distribution Questionnaire

TARGET
Increase in information density/ cover on landscape species distribution

TREND DATA NEEDED
Tendencies of consolidation between the density/ cover of observation/ encounter and research or other exploration activities
Identified (spatial) information gaps

MONITORING ACTIVITY
Annual questionnaire to be filled in by park guard
Annual review of maps and identified focal areas for additional research or exploration

INDICATOR
Number of observations or signs per species per area
No data zones decrease

TREND DATA NEEDED
Tendencies of consolidation between the density/ cover of observation/ encounter and research or other exploration activities
Identified (spatial) information gaps

MONITORING ACTIVITY
Questionnaire - based analysis of landscape species distribution by park guards and Tacana community representatives
Annual review of resultant maps of the distribution of landscape species

INDICATOR
Number of observations or signs per species per area

Monitoring Framework (Project Interventions & Conservation Objectives) 5

Objective 1:
Establish baselines and monitor landscape species in the landscape context in which they are found (Research)

Threats Addressed:
Decline in wildlife population
Hunting of problem animals
Human – animal conflict (crop raiding)
Human – animal conflict (livestock loss)
Hunting
Fishing
Lack of conservation information
Lack of biological baseline information
Lack of national capacity to conduct and implement research
Lack of national and regional capacity to conduct sustainable natural resource use
programs
Weak appreciation of conservation and its benefits

Intervention 1.4.:
Human-Animal Conflicts

TARGET
Reduce number of livestock or crop loss blamed on wildlife
Increase the local capacity to identify and implement possible solutions to the conflict

TREND DATA NEEDED
Change in number of complaints
Change in the number of livestock/ crop losses

MONITORING ACTIVITY
Community - based investigation and monitoring
Register of conflicts by park guards (questionnaire, form)

INDICATOR
No. of verified losses caused by wildlife/ month
No. of registered complaints on livestock/ crop losses caused by wildlife/ month
No. of successfully applied and documented solutions to the conflict

Threats Addressed: An evaluation of the true extent and distribution of crop damage, as well as of their perception by local people will be the basis from which to propose possible solutions to this problem. By demonstrating an interest in these conflicts and working towards sustainable solutions, it is hoped that local peoples' perception towards wild places and protected areas will shift to a more positive stance, thereby reducing habitat destruction and corresponding declines in wildlife populations and biodiversity in general. Again, the information gathered will also contribute to a better understanding of the biodiversity and conservation issues in the region as well as building national and local capacity to conduct applied conservation research and natural resource management programs.

INDIRECT THREAT
Livestock loss

THREAT
CONDOR: Agriculture reduces natural prey and increases problem prey ....

DIRECT THREAT
Hunting of problem animals

TARGET
No. of livestock losses blamed on JUCUMARI/ CONDOR reduces by 30% at the end of the first phase of the program.

TREND DATA NEEDED
Change in the number of complaints related to JUCUMARI/ CONDOR attacks relative to the first survey in 2001/ 2002.

MONITORING ACTIVITY
Park guards register the complaints in a pre-designed form.

INDICATOR
Number of complaints related to bear attacks by month registered by the Madidi and Apolobamba park guards.

TARGET
Reduce livestock loss caused by wildlife by 25% by the end of the first phase of the program.

TREND DATA NEEDED
Change in the number of livestock losses.

MONITORING ACTIVITY
Park guards verify the complaints using a pre-designed protocol.

INDICATOR
Number of verified livestock deaths by wildlife species registered by the Madidi, Pilón Lajas and Apolobamba park guards.

TARGET
Reduce the number of people who want to hunt JUCUMARI/ CONDOR, foxes, etc.

TREND DATA NEEDED
Change in people's attitudes to wildlife relative to the first survey in 2001/2002.

MONITORING ACTIVITY
Pre - post questionnaire study.

INDICATOR
Number of people with negative attitude to wildlife

INDIRECT THREAT
Crop raiding

DIRECT THREAT
Hunting of problem animals

TARGET
Reduce agricultural loss blamed on bear reduces by 20 % at the end of the first phase of the program.

TREND DATA NEEDED
Change in the number of complaints related to bear attacks relative to the first survey in 2001.

MONITORING ACTIVITY
Park guards register the complaints in a pre-designed form.
Community based research (community projects).

INDICATOR
Number of complaints related to bear attacks by month registered by the Madidi, Pilón Lajas and Apolobamba park guards.

TREND DATA NEEDED
Change in the extension of crop losses (No. of hectares affected or lost quantity of corn harvest) .

MONITORING ACTIVITY
Manual evaluation of produced damage.
Pre-established protocols with community participation.

INDICATOR
Number of hectares affected or amount of corn (kg) lost to bears.

Objective 1:
Establish baselines and monitor landscape species in the landscape context in which they are found (Research)

Monitoring Framework (Project Interventions & Conservation Objectives) 6

Threats Addressed:
Habitat degradation or loss
Decline in wildlife population
Hunting of problem animals
Human – animal conflict (crop raiding)
Human – animal conflict (livestock loss)
Hunting
Fishing
Lack of conservation information
Lack of biological baseline information
Lack of national capacity to conduct and implement research
Lack of national and regional capacity to conduct sustainable natural resource use programs
Weak appreciation of conservation and its benefits
Lack of alternative sustainable income for local people
Lack of land use planning

Threats Addressed: Ecological studies on Puma and Andean Fox will allow us to propose possible solutions to the conflicts arising from livestock losses to these animals. Andean Cat and Yungas Brocket Deer both have very narrow habitat requirements and will provide information concerning the health of those habitats. Support to CIPTA to carry out their own investigations into natural resources increases their capacity to effectively manage the lowland portion of the landscape including land-use planning and the development of sustainable alternatives for local people. Investigations regarding the sustainability of incense production will provide a first step in developing a potentially beneficial local industry. The information gathered will also contribute to a better understanding of the biodiversity and conservation issues in the region as well as building national and local capacity to conduct applied conservation research and natural resource management programs.

Intervention 1.5.: Complementary Ecological Studies

TARGET
Complement ecological information in order to back the umbrella function of landscape species

TREND DATA NEEDED
Population status, habitat use and important resources for complementary non-landscape species

MONITORING ACTIVITY
Review of technical papers and their contribution to back or no the landscape species approach

INDICATOR
Birds

TREND DATA NEEDED
Distribution and habitat use of highland deer species present in the landscape: the globally threatened Andean deer and the white-tailed deer

MONITORING ACTIVITY
Analysis of taruka study results (base line information).
Register of Andean deer and white-tailed deer by park guards in a pre-established protocol

INDICATOR
Number of Andean deer and the white-tailed deer in the landscape

TREND DATA NEEDED
Dietary and ecological information on species like Puma, Andean fox, Andean Cat, and Yungas Brocket Deer

MONITORING ACTIVITY
Opportunistic collection of dietary and ecological information on species like Puma, Andean fox, Andean Cat, and Yungas Brocket Deer

INDICATOR
Presence/ Absence of these species
Density estimates

TREND DATA NEEDED
Distribution and abundance of Cracids in montane and cloud forest

MONITORING ACTIVITY
Bird surveys in unknown regions of the landscape
Cracid surveys in montane and cloud forest

INDICATOR
Presence/ Absence of bird species
Distribution and abundance of Cracids in montane and cloud forest

TARGET
Sustainability of the incense industry in the mid-elevation forests around the Pata region, an extremely important source of local income for these communities.

TREND DATA NEEDED
Distribution of incense and copal sites in the Pata region
Quantity estimates (resource versus harvest)

MONITORING ACTIVITY
Mapping of incense and copal sites in the Pata region (Master thesis)

INDICATOR
Incense and copal harvested per year

Monitoring Framework (Project Interventions & Conservation Objectives) 7

Objective 2:
Strengthen local, on-site protection and management of biological resources across the landscape (Programmatic Management Objectives)

Threats Addressed:
Weak protected area administration
Lack of Management Plan for PNM and AIM
Lack of conservation information
Weak extractive sector regulatory framework
Conflicts between local development plans and conservation plans

Threats Addressed: Will strengthen Park Administration by promoting the threats assessment approach as a critical tool for adaptive management strategies. In addition, the work will provide important contributions for the Madidi and Apolobamba protected areas' management plans.

Intervention 2.1.:
SERNAP Institutional Strengthening

TARGET
Increased motivation and larger scale perspectives considered by SERNAP
Support in structuring the Monitoring Strategy for the SNAP

TREND DATA NEEDED
SERNAP coordination mechanisms in finding advice or delegate specific issues (Monitoring, Natural Resource Management, Concessions, etc.)

MONITORING ACTIVITY
Annual review of signed agreements and complementarity of issues

INDICATOR
Products
Adoption of concepts in other areas

TREND DATA NEEDED
Draft versions of the Integrated Landscape Conservation Plan, the Monitoring Strategy for the SNAP

MONITORING ACTIVITY
Minutes of meetings and documentation of seeks for advice (Natural Resource Management, Hydrocarbon Sector legal regulations, etc.).

INDICATOR
Products
Adoption of concepts in other areas (e.g. Initiatives at the Landscape scale promoted by SERNAP or park directors)

Threats Addressed:
Weak protected area administration

Threats Addressed: Capacity building through training will strengthen Park Administration and the management and conservation of the protected areas. A better trained park guard corp will also provide an early warning system and monitoring tool for other more direct threats that concern habitat loss or declines in wildlife populations.

Intervention 2.2.:
Protected Area Support and Staff Training

TARGET
At least 20 protected area staff trained in a) the use of GPS technology and on how to report and utilize spatial information regarding biodiversity and GPS data, as well as basic data management issues, and b) human-animal conflict issues, particularly wildlife related livestock loss, and how to recognize and quantify this problem. (*for more detail, see Activity 1.4. Human-Animal-Conflicts*)

TREND DATA NEEDED
Training evaluation (exams, projects or event specific evaluation)
Profile and functions assumed by protected area staff (perception by park directors and SERNAP)

MONITORING ACTIVITY
Review of training evaluation (exams, projects or event specific evaluation)
Annual enquiry to head of guards or park director on the profile and functions of protected area staff (¿Is new capacity being assumed and used?)

INDICATOR
Number of participants
Profile and functions assumed before and after training
Number of Monitoring and research projects adopted and conducted by park guards

Monitoring Framework (Project Interventions & Conservation Objectives) 8

Objective 2:
Strengthen local, on-site protection and management of biological resources across the landscape (Programmatic Management Objectives)

Threats Addressed:
Decline in wildlife population
Hunting
Fishing
Non-timber forest product exploitation
Lack of regional capacity to conduct sustainable natural resource use programs
Weak appreciation of conservation and its benefits
Conflicts between local development plans and conservation plans
Lack of alternative sustainable income for local people

Threats Addressed: Support to local communities to carry out their own investigations into natural resources increases their capacity to effectively manage resources, including wildlife populations, within the lowland portion of the landscape. It is also important to find economic activities that demonstrate the forest's value, providing alternative sustainable incomes for local people. Frequently in the highland portions of the landscape before the forest or protected areas can be perceived as beneficial to local people there is a need to investigate, measure and develop solutions to key human-animal conflicts. The information gathered will also contribute to a better understanding of the biodiversity and conservation issues in the region as well as building national and local capacity to conduct applied conservation research and natural resource management programs.

Intervention 2.3.: Community Wildlife Management Projects

TARGET
14 communal research projects on natural resource use and management

TREND DATA NEEDED
Documentation of communal research projects on natural resource use and management

MONITORING ACTIVITY
Periodic communal meetings to discuss project advance and agree on next steps
Annual review of documentation on projects

INDICATOR
No. of communal research projects in continuous planning and response to community requirements
No. of decisions
Each community project needs a specific monitoring plan ....

TARGET
Reach community based decision making on natural resource management

TREND DATA NEEDED
Technical project documentation and evaluation:
Native bee honey (3)
Eco-tourism Laguna Moa (5)
Crop damage (3)
Community based monitoring of hunting and fishing (3)
Caiman .....

MONITORING ACTIVITY
Review and technical advice on research projects
To be specified for each community research project ....

INDICATOR
To be specified for each community research project, probably using the same criteria but with different specifications .....

THREAT
Hunting (Peccary - if this is the case)

TARGET
Reach decision making on what and how much to hunt at the community level.

TARGET
Reach sustainable levels of hunting in x communities in the landscape by the end of this project phase.

TREND DATA NEEDED
Quantity of meat/ animals extracted, what species and what for.
Reduction of total white-lipped peccary biomass consumed in the x communities in the landscape.

MONITORING ACTIVITY
Community based monitoring of hunting

INDICATOR
Kg of consumed white-lipped peccary meat per year per person.

INDICATOR
Total number of consumed white-lipped peccaries per year per person or family..

THREAT
Lack of alternative sustainable income for local communities

THREAT
Hunting (Commercial Jaguar hunting)

TARGET
Number of hunted jaguars in the landscape reduces by 70 %

TREND DATA NEEDED
Reduction of the number of hunted jaguars.

MONITORING ACTIVITY
Community-based monitoring of hunting.
Monitoring of jaguar skin products in Rurrenabaque markets.

INDICATOR
Number of hunted jaguars per year.

THREAT
Unregulated tourism

TARGET
Maintain or increase the abundance of jaguar populations in tourism areas by the end of the project.

TREND DATA NEEDED
Abundance of jaguar populations in tourism areas with major impact.

MONITORING ACTIVITY
Observation along the trail system for long-term research sites; camera trapping; footprints.

INDICATOR
Encounter rate in areas with and without tourism
Density estimates

TREND DATA NEEDED
Ecological studies on habitat conditions
Trees, DAP, palm trees with and without fruits

THREAT
Over-Fishing

TARGET
Reach decision making on what and how much to fish at the fishermen association level

TREND DATA NEEDED
Annual fish biomass extracted, what species, and what for

TREND DATA NEEDED
Community/ Association's rules for sustainable fishing

MONITORING ACTIVITY
Community based monitoring
Market surveys for fish in Rurrenabaque and San Buenaventura

INDICATOR
Kg of fish biomass extracted per species per year

TARGET
Reach sustainable levels of fishing by the end of the projects.

TREND DATA NEEDED
Annual SURUBI biomass consumed in the landscape.

MONITORING ACTIVITY
Community based monitoring
Market evaluations
Household evaluations

INDICATOR
Kg of SURUBI consumed per person per year.

INDICATOR
Measure the number of eggs flowing down the river .....

Objective 2:

Strengthen local, on-site protection and management of biological resources across the landscape (Programmatic Management Objectives)

Monitoring Framework (Project Interventions & Conservation Objectives) 9

Threats Addressed:
Lack of national capacity to conduct sustainable natural resource use programs
Lack of national capacity to conduct and implement research
Lack of conservation information
Lack of biological baseline information

Threats Addressed: This will increase in-country technical capacity to evaluate, support, propose and implement wildlife management, as well as contribute to the regional and national biodiversity databases.

Intervention 2.4.:
Wildlife Management Program (Institute of Ecology)

TARGET
Increased IE participation in teaching, research and wildlife conservation
Long term operational and financial strategy

TREND DATA NEEDED
Introduction of wildlife conservation and management theory and practice into the IE seminar program
Operational and financial perspectives ....

MONITORING ACTIVITY
Annual review of IE seminar program
Annual review of the operational and financial strategy

INDICATOR
Projects developed related to wildlife conservation and management
Students interested and involved in wildlife conservation and management
No. of related library hits
No. of consultancies to WCS staff

TARGET
Increased national capacity to conduct research and resource management programs and projects related to wildlife conservation and management

TREND DATA NEEDED
Register of new professionals for advice on wildlife conservation and management issues and to conduct research and natural resource management programs and projects

MONITORING ACTIVITY
Annual register of new professionals in wildlife conservation and management
Annual review of planned and conducted research and natural resource management programs and projects

INDICATOR
And rather long-term:
Number of new professionals for advice on wildlife conservation and management issues and to conduct research and natural resource management programs and projects

Threats Addressed:
Lack of national capacity to conduct sustainable natural resource use programs
Lack of national capacity to conduct and implement research
Weak appreciation of conservation and its benefits

Threats Addressed: Attitudes towards destructive land-uses and the sometimes negative perception of protected areas will be addressed by improving the ability of teachers to convey critical information regarding the costs and benefits of unplanned natural resource use to their pupils, in particular, and the population in general.

Intervention 2.5.:
Schoolyard Ecology Education

TARGET
At least 40 school teachers throughout the landscape with better understanding of conservation

TREND DATA NEEDED
Introduction of environmental and conservation issues into the school curricula

MONITORING ACTIVITY
Annual review of school curricula for environmental and conservation issues

INDICATOR
No. of teachers implementing EEPE
No. of curricula adopting EEPE ....

TARGET
Better understanding of conservation in school children, their families, communities, etc. ....

TREND DATA NEEDED
Attitudes towards destructive land-uses and the perception of protected areas

MONITORING ACTIVITY
Annual evaluation meetings at different levels (communities, municipalities, grassroots' organizations, etc.).

INDICATOR
% of the population in general positive about conservation and natural resource management initiatives (very long term though ....)

Objective 2:
Strengthen local, on-site protection and management of biological resources across the landscape (Programmatic Management Objectives)

Monitoring Framework (Project Interventions & Conservation Objectives) 10

Threats Addressed:
Weak protected area administration
Lack of conservation information
Lack of national and regional capacity to conduct sustainable natural resource use programs
Weak appreciation of conservation and its benefits
Lack of long term vision of sustainable development

Threats Addressed: A monitoring strategy is a critical tool for adaptive management and hence to the long-term future of the landscape, increasing the capacity of SERNAP, CIPTA, and IE to design and implement monitoring strategies. This will therefore improve protected area administration and natural resource management and contribute to a long-term vision of sustainable development for the region.

Intervention 2.6.: Monitoring Strategy Implementation

TARGET
Landscape monitoring strategy developed and adjusted according to input from other actors in the landscape
Monitoring strategy implemented at protected area and TCO site level
Monitoring strategy responds to the aspects mentioned in the introductory slide of this document

TREND DATA NEEDED
Degree to which monitoring strategy reports on threat reduction.

MONITORING ACTIVITY
Annual review and adjustment of protected area and SNAP monitoring strategy in response to landscape monitoring strategy and vice versa

INDICATOR
WCS and SERNAP staff find monitoring useful
Monitoring indicators are practical and working
Monitoring strategy and generated information are useful to other actors

Threats Addressed:
Land tenure disputes
Lack of land use planning
Conflicts between local development plans and conservation plans
Lack of regional capacity to conduct sustainable natural resource use programs
Lack of Management Plan for PNM and AIM

Threats Addressed: An inadequate determination of the spatial requirements of the Tacana communities results in unsustainable land-use practices. Legal tenure to these lands is a necessary first step toward sound natural resource management. One of the largest obstacles for appropriate management outside protected areas is the lack of clarity regarding limits and responsibilities over the management of a given area. This process is being launched to clarify land tenure and responsibility for wildlife and other natural resource management in the Tacana TCO, a critical region bordering the Madidi National Park.

Intervention 2.7.: Tacana Land-Titling

TARGET
Participation in titling process
Supreme Decree of the TCO Tacana zoning methodology
Mechanism for forest management in the Tacana TCO

TREND DATA NEEDED
Self-perception of participation
Draft versions and approval of Supreme Decree
Legal analysis of logging concessions and indigenous rights

MONITORING ACTIVITY
Evaluation of self-perception of participation at least in every Annual Assembly
Annual review of legal documents

INDICATOR
% of the Assembly that consider themselves as actively participating in the process ....
No. of legal documents that resolve specific conflicts (logging concessions and indigenous rights)

THREAT
Land tenure

TARGET
Increase the % of land with clear land tenure situation to x% by the end of the project.

TREND DATA NEEDED
Total number of hectares titled
% of land with clear land tenure situation

MONITORING ACTIVITY
Annual review of the land actually titled

INDICATOR
Total number of hectares actually titled
% of initial demand actually titled and after how many months or years

TREND DATA NEEDED
Lessons learned for future titling processes (Tacana II, although we are not going to be directly involved in the process)

MONITORING ACTIVITY
Annual evaluation of lessons learned and their application in future titling processes

INDICATOR
Application of lessons learned in future titling processes.

THREAT
Colonization, Agriculture

THREAT
Livestock raising

THREAT
Forest exploitation

TARGET
Reach sustainable levels of agriculture, livestock raising and forest exploitation

TREND DATA NEEDED
Number of hectares designated for colonization, agriculture, livestock raising, forest exploitation

MONITORING ACTIVITY
Annual review and mapping of hectares under colonization, agriculture, livestock raising, forest production

INDICATOR
Total number and % of hectares designated for colonization, agriculture, livestock raising, forest exploitation.

Objective 2:
Strengthen local, on-site protection and management of biological resources across the landscape (Programmatic Management Objectives)

Monitoring Framework (Project Interventions & Conservation Objectives) 11

Threats Addressed:
Land tenure disputes
Lack of land use planning
Conflicts between local development plans and conservation plans
Lack of regional capacity to conduct sustainable natural resource use programs
Lack of long term vision of sustainable development

Threats Addressed: A natural resource management strategy will promote productive alternatives that are compatible with the long-term sustainable management of the Tacana territory, thereby stabilizing the eastern boundary of Madidi The land-use plan will enable zoning that is necessary to avoid inappropriate uses. Approved internal control and regulation mechanisms will strengthen CIPTA and help ensure sustainable management. Benefit and profit distribution discussion will further encourage the notion of long-term financial planning.

Intervention 2.8.: Tacana TCO Management

TARGET
Participatory and representative natural resource management strategy
Community natural resource management projects underway

TREND DATA NEEDED
Documentation of communal research projects on natural resource use and management

MONITORING ACTIVITY
Periodic communal meetings to discuss project advance and agree on next steps
Annual review of documentation on projects

INDICATOR
No. of communal research projects in continuous planning and response to community requirements
No. of democratic CIPTA decisions to to with management regulations, resources managed

TARGET
Reach community based decision making on natural resource management

TREND DATA NEEDED
Technical project documentation and evaluation:
Native bee honey (3)
Eco-tourism Laguna Moa (5)
Crop damage (3)
Community based monitoring of hunting and fishing (3)
Caiman .....

MONITORING ACTIVITY
Review and technical advice on research projects
To be specified for each community research project ....

INDICATOR
To be specified for each community research project, probably using the same criteria but with different specifications .....

TARGET
Provide the basis for CIPTA to assess the potential of spectacled caiman as a TCO-scale managed natural resource.

TREND DATA NEEDED
Population status and potential for sustainable harvest of spectacled caiman in the lowland portions of the Tacana Indigenous Territorial Demand.

MONITORING ACTIVITY
Later: Community-based monitoring of spectacled caiman harvest activities and comparison to the recommendations of the study on sustainable harvest.

INDICATOR
Number of harvested spectacled caiman per year.

Threats Addressed:
Land tenure disputes
Lack of land use planning
Conflicts between local development plans and conservation plans
Lack of regional capacity to conduct sustainable natural resource use programs
Lack of strategy for financial sustainability

Threats Addressed: A democratic CIPTA and participatory natural resource strategy will enable CIPTA to begin implementing actions, counting on the support of its constituency. CIPTA's capacity to manage the TCO will be increased and their relationships with the local population and relevant national institutions strengthened in order to integrate CIPTA's land-use vision into the broader context, and thus promote the conservation of biodiversity at the landscape scale.

Intervention 2.9.:
CIPTA Institutional Strengthening

TARGET
CIPTA becomes a totally democratic and financially transparent Tacana representative body
Proposals developed for financial support to the Tacana TCO Management Strategy

TREND DATA NEEDED
Internal and external perception of democracy and financial transparency

MONITORING ACTIVITY
Quarterly expense and activity reports to all communities
Evaluation of internal perception of democracy and financial transparency at least in every Annual Assembly

INDICATOR
% of the Assembly that consider themselves as actively participating in CIPTA activities ....
No. of democratic CIPTA decisions to to with management regulations, resources managed, ...

Objective 3:
Promote the development of national policies that support the landscape conservation approach (Policy)

Monitoring Framework (Project Interventions & Conservation Objectives) 12

Threats Addressed:
Weak local and regional communication framework
Weak local government administration
Weak protected area administration
Conflicts between local development plans and conservation plans

Threats Addressed: The Inter-institutional Committees that ensure coordination between different actors in the area will strengthen Park Administration. Adoption of the "Landscape Priorities and Actions Document", an internal process within SERNAP will prepare the institution to identify and address specific threats. This process will also strengthen local and regional communication frameworks and local government administrations, specifically in terms of land-use planning and conflict resolution.

Intervention 3.1.: Technical and Policy Support

TARGET
Technical and policy gaps close step by step (natural resource management, hydrocarbon sector regulation, etc.

TREND DATA NEEDED
Quantity and quality of policies

MONITORING ACTIVITY
Annual review of documents (SERNAP)

INDICATOR
No. of documents and response to identified gaps

TARGET
Inter - institutional committees and annual planning in coordination with protected area administration

TREND DATA NEEDED
Documentation of the functioning of Inter-institutional committees in the three protected areas in the landscape.

MONITORING ACTIVITY
Annual review of minutes of Inter - institutional committees` meetings, protected area annual work plans and reports

INDICATOR
Articulation of project interventions in minutes of Inter - institutional committees` meetings, protected area annual work plans and reports and vice versa.

Threats Addressed:
Lack of long term vision of sustainable development
Lack of strategy for financial sustainability
Conflicts between local development plans and conservation plans
Weak local government administration

Threats Addressed: Long-term financial stability is required in order to enable central government, municipalities and local organizations to implement landscape conservation activities. Strengthening these actors' financial stability is a necessary component of building their capacity to manage the area. Financial considerations are also a critical component to a long-term vision of sustainable development for the region.

Intervention 3.2.: Financing Mechanisms

TARGET
Long term financing mechanisms

TREND DATA NEEDED
Composition/ structure of funding between own efforts and external support

MONITORING ACTIVITY
Annual review of financing mechanisms

INDICATOR
% of own effort to operational and investment costs
Changes in financial strategy

TARGET
Tacana TCO Management Strategy

TARGET
Apolo Municipality and Apolobamba Municipality Association Environmental Planning

TREND DATA NEEDED
Financial gap analysis

MONITORING ACTIVITY
Annual review of financing mechanisms at each level (TCO, Municipality, Association of Municipalities, Protected Areas)

INDICATOR
Distribution of funding (% between external and internal, long term perspective, ….)

Objective 3:
Promote the development of national policies that support the landscape conservation approach (Policy)

Monitoring Framework (Project Interventions & Conservation Objectives) 13

Threats Addressed:
Petroleum exploration
OTHER SECTORS (proposed) Bala Dam
Conflicts between local development plans and conservation plans
Weak protected area administration
Weak local government administration
Weak local and regional communication framework
Lack of long term vision of sustainable development

Threats Addressed: The use of the Threats and Opportunities Analysis as a living document will permit SERNAP to coordinate the activities of different institutions in order to best address threats to the protected areas. It will also assist in the monitoring of direct threats and the development of a long-term vision of sustainable development for the region.

Intervention 3.3.:
Threats Assessment Working Group

TARGET
Spatial representation of the human landscape, including spatially explicit threats

TREND DATA NEEDED
Spatial distribution of critical sites that need immediate attention

MONITORING ACTIVITY
Ad-hoc meetings to agree on steps to be taken define responsibilities
Annual review of Threats Analysis Matrix and Maps

INDICATOR
No. of ad hoc meetings per year (Hm, less meetings do not necessarily mean less conflict ….)

TARGET
Threats are addressed or their intensity diminishes

TREND DATA NEEDED
Documentation and evaluation of steps taken to address threats (at what level, who is involved?!)

MONITORING ACTIVITY
Annual review of Threats Analysis Matrix and Maps

INDICATOR
Number and intensity of threats according to the Threats Analysis Matrix and Maps

THREAT
Mining

TARGET
Adequate mining practices

TREND DATA NEEDED
Inventory of mining activities and practices (CI/ Apolobamba).

MONITORING ACTIVITY
Annual review of mining activities and practices (CI/ Apolobamba).

INDICATOR
Number of mining concessions and cooperatives and % that are functioning

THREAT
Urban source contamination

THREAT
River pollution
ALTHOUGH WE ARE NOT DIRECTLY DEALING WITH MONITORING OF THIS THREAT, IT IS NECESSARY THAT IT IS ADDRESSED AT ALL

TARGET
Reach less or no poisonous levels of mercury concentration in SURUBI and other fish.

TREND DATA NEEDED
Water quality

MONITORING ACTIVITY
Periodic analysis of water quality

INDICATOR
Total of dissolved solids, pH, temperature and conductiveness, total nitrogen and phosphor concentration

TREND DATA NEEDED
Mercury concentration in fish (and people) in different areas of the landscape (ORSTOM, CI)

MONITORING ACTIVITY
Periodic analysis of mercury concentration in fish (and people?! ORSTOM, CI)

INDICATOR
Mercury concentration in fish (and people).

THREAT
Riverside deforestation

TARGET
Reduce the rate of riverside deforestation in 10 % by the end of the project..

TREND DATA NEEDED
Loss of forest cover reduces by x% along the rivers

MONITORING ACTIVITY
Evaluation of % of forest cover loss with satellite images.
Community or park guards based register of deforested land along the rivers.

INDICATOR
Total number of hectares and % of forest cover loss.

THREAT
Riverside based colonization

TARGET
No extension of surface affected by riverside colonization.

TREND DATA NEEDED
Affected surface (quantify)

TARGET
Reach whatsoever practices which do not negatively affect: deforestation, water (and soil) pollution ….

TREND DATA NEEDED
Water quality

MONITORING ACTIVITY
Periodic analysis of water quality

INDICATOR
Total of dissolved solids, pH, temperature and conductiveness, total nitrogen and phosphor concentration

Monitoring Framework (Project Interventions & Conservation Objectives) 14

Objective 4:
Elaborate a participative, integrated landscape conservation action plan (Landscape Species Conservation Strategy)

Threats Addressed:
Conflicts between local development plans and conservation plans

Intervention 4.1.: Landscape Stakeholder Workshop

TARGET
Increased participation, involvement, articulation
Refined Landscape Conservation Plan

TREND DATA NEEDED
No., characteristics, and focus of participation
Level of integration of input from the workshop in the document

MONITORING ACTIVITY
Workshop Presentation: and Workshop Evaluation Questionnaire
Dissemination and review of the document by all stakeholders

INDICATOR
Workshop Presentation: Name, Organization/ Institution, Expectations, and Workshop Evaluation Questionnaire
No. of input from stakeholders
No. of stakeholders involved in the document

Threats Addressed: Conflicts between local development plans and conservation plans will be identified as well as actors to address them. SERNAP's ability to promote biodiversity conservation outside protected area boundaries will be strengthened. It will also assist in the monitoring of direct threats and the development of a long-term vision of sustainable development for the region.

Threats Addressed:
Colonization
Road building
Conflicts between local development plans and conservation plans
Weak local government administration

Intervention 4.2.: Municipal Development Planning

TARGET
Increased participation of municipalities and municipality associations in landscape conservation planning
Models for an Integrated Landscape Conservation Plan

TREND DATA NEEDED
Planning and management documents and contents that include environmental issues (Programs, Projects, Staff, and Budget)

MONITORING ACTIVITY
Annual review of Work Plans and Development Plans (PDM)

INDICATOR
Programs and Projects that include environmental issues
Staff dedicated partially or exclusively to environmental issues (and technical capacity to do so)
% of the total budget planned and executed for environmental issues

TARGET
All planning and management documents in preparation or review consider environmental issues (Natural Resource Management, Natural Resource Exploitation, Protected Areas, Environmental Quality and Impacts, etc.)

TREND DATA NEEDED
Planning and management documents and contents that include environmental issues (Natural Resource Management, Natural Resource Exploitation, Protected Areas, Environmental Quality and Impacts, etc.)

MONITORING ACTIVITY
Annual review of planning and management documents

INDICATOR
Number and % of planning and management documents that consider environmental issues.

Threats Addressed: By strengthening the ability of municipalities to participate in landscape conservation planning we will promote appropriate land-use and avoid conflicts of conservation initiatives with municipal development plans such as roads and settlements. This will also assist in the monitoring of direct threats and the development of a long-term vision of sustainable development for the region.

Threats Addressed:
Lack of long term vision of sustainable development
Lack of strategy for financial sustainability
Conflicts between local development plans and conservation plans
Lack of land use planning
Lack of regional capacity to conduct sustainable natural resource use programs
Lack of long term vision of sustainable development

Intervention 4.3.: Integrated Landscape Conservation Action Plan

TARGET
Updated document that is useful to guide decision making and management

TREND DATA NEEDED
Annual Updates of the document

MONITORING ACTIVITY
Annual questionnaire together with the information up-date

INDICATOR
No. of consultations
No. of input
No. and characteristics of involved stakeholders

TARGET
Coordinated planning and decision making and synergetic and complementing effects between Protected Areas, Municipalities and Departmental Administrations, Communities, Governmental and Non Governmental Organizations/ Institutions

TREND DATA NEEDED
Agreements on and joint implementation of activities

MONITORING ACTIVITY
Annual review of Agreements and Annual Work Plans and Evaluation

INDICATOR
No. of Inter-institutional Agreements
% of activities in joint implementation of two or more partners or in delegation to a partner (environmental education, tourism, natural resource management, research)

Threats Addressed: The identification of key gaps in funding will help to enable all threats to the landscape to be properly addressed. This holistic view will essentially define a long-term vision of sustainable development for the landscape and help to identify and assess the conflicts between conservation and development plans.

MEMORIA DEL TALLER

DESARROLLO DEL PROGRAMA DE CONSERVACIÓN Y MANEJO DE FAUNA

Elaborado por:
Wildlife Conservation Society
Colección Boliviana de Fauna

Auditórium del Instituto de Ecología

Fecha: 16 de Septiembre de 2002

MEMORIA DEL TALLER

DESARROLLO DEL PROGRAMA DE CONSERVACIÓN Y MANEJO DE FAUNA

Desde marzo del presente año, la Wildlife Conservation Society y la Colección Boliviana de Fauna vienen realizando reuniones sobre como desarrollar un Programa de Conservación y Manejo de Vida Silvestre en el Instituto de Ecología. Es en estas reuniones que nació la idea de compartir esta inquietud con todos los miembros involucrados en el Instituto de Ecología y la carrera de biología, a través de un taller.

Producto de las reuniones de la comisión CBF - WCS y en la perspectiva de obtener insumos para el cumplimento de su primer objetivo se realizó el taller "Desarrollo y Implementación del Programa de Conservación y Manejo de Fauna" con la participación de investigadores de todas las unidades del Instituto de Ecología a través de una invitación abierta a docentes y estudiantes. Exceptuando a los Directores de FUNDECO, Instituto de Ecología y Carrera de Biología.

Invitación Abierta al TALLER de:

Implementación y Desarrollo del Programa de Conservación y Manejo de Fauna

Fecha: Lunes, 16 de septiembre del 2002

Objetivos

I. Promover la divulgación de trabajos y comunicación entre las instituciones involucradas en proyectos de conservación y manejo de fauna.
II. Informar sobre las actividades hasta la fecha de la Comisión de Conservación y Manejo de Fauna.
III. Evaluar los objetivos de la implementación del Programa de Conservación y Manejo de Fauna.

IV. Perspectivas de acciones futuras a largo y corto plazo del Programa de Conservación y Manejo de Fauna

Programa

08:30 Introducción al Taller (Francisco Osorio, Esther Pérez)
08:40 Historia de la Relación Interinstitucional entre IE y WCS (Mónica Moraes)

El Instituto de Ecología, la Conservación y el Manejo de Fauna

08:50 Resumen General (Mónica Moraes)
09:00 Programa de investigación en Tinamúes del altiplano boliviano para el aprovechamiento sostenible (Alvaro Garitano-Zavala)
09:10 Programa de coordinación y concertación con el Zoológico Municipal Vesty Pakos en temas de investigación, difusión y asesoramiento (Alvaro Garitano-Zavala)
09:20 Presentación de trabajos de ictiología (Soraya Barrera)
09:30 Presentación de trabajos de invertebrados (Jaime Sarmiento)
09:40 Presentación del programa integrado de plagas (Victor Churquina)
09:50 Frugivoría (Emilia García)
10:00 Ecología del cangrejo de río (Ninoska Vargas)
10:10 Estructura y funcionamiento trófico en ríos de montaña (Carlos Molina)
10:20 INTERVALO

La Biología Molecular, la Conservación y el Manejo de Fauna

10:45 Presentación de trabajos de Biología Molecular (Volga Iñiguez)
11:00 Recursos ícticos de la zona de Chapare, Caracterización genética y biológica de peces de interés para la piscicultura (Jesús Núñez)

La Wildlife Conservation Society, la Conservación y el Manejo de Fauna

11:10 La Historia de WCS en Bolivia y el Programa Paisaje en el Norte de La Paz (Rob Wallace)
11:30 Manejo y Conservación de Fauna a Nivel de Comunidades Locales (Humberto Gómez)
11:40 Manejo y Conservación de Fauna a Nivel Supra-Communal (Renata Tejada y Lilian Painter)
11:50 Investigación Aplicada para el Manejo y Conservación de Especies Amenazadas (Rob Wallace)

El Programa de Conservación y Manejo de Fauna

12:00 Objetivos Estratégicos (Esther Pérez y Humberto Gómez)
12:10 Acciones hasta la fecha (Francisco Osorio y Renata Tejada)
12:20 Metodología para la tarde (Rob Wallace)
12:30 INTERVALO
14:00 PLENARIA: Evaluación de los Objetivos y Dirección del Programa de Conservación y Manejo de Fauna
15:00 Grupos de Trabajo: Identificación y Priorización de Acciones Futuras del Programa de Conservación y Manejo de Fauna

Grupos:
1. Estudiantes de Biología y Postgrado
2. Profesionales del Instituto de Ecología
3. Profesionales de los Socios Claves del Instituto de Ecología

16:30 INTERVALO
16:45 Presentaciones de los Grupos de Trabajo
17:30 PLENARIA: Conclusiones y Comentarios Finales

DESARROLLO DEL TALLER

El taller se llevó a cabo en el Auditórium de la Carrera de Biología, del Campus Universitario de la calle 27 de Cota Cota. Del evento participaron cerca de 55 estudiantes (Anexo 1), 6 docentes de la carrera de Biología (Mario Baudoin, Emilia García, Francisco Osorio, Alvaro Garitano y Esther Pérez), dos investigadores de la CBF, Soraya Barrera y Jaime Sarmiento, además de personal de Wildlife Conservation Society (WCS).

DIVULGACIÓN DE LOS TRABAJOS QUE REALIZAN EL IE Y LA WCS

De acuerdo al programa y con el objeto de divulgar sus experiencias, se presentaron investigaciones que realizan las diferentes unidades del Instituto de Ecología, Instituto de Biología Molecular, IRD y de la WCS (Anexo 2).

ACTIVIDADES REALIZADAS POR LA COMISIÓN CBF – WCS HASTA LA FECHA DEL PROGRAMA DE MANEJO DE FAUNA

Se realizan reuniones mensuales, para tratar los temas que a continuación se explica:

Club de revistas y plan de seminarios

La iniciativa de realizar sesiones del Club de revistas fue en la WCS con el objeto de actualizar a estudiantes e investigadores con artículos científicos

recientes y desarrollar los análisis críticos a metodologías realizadas en las diferentes publicaciones.

En principio estas sesiones se realizaban en oficinas de la WCS. Debido a la creciente expectativa de estudiantes, se solicito un aula a la Carrera de Biología. El Club de revistas actualmente esta interrumpido por razones logísticas, sin embargo, se reanudará el 15 de noviembre, desde las 12:30 a 14:00, en el aula 2. La modalidad del Club de revistas estará combinada con un plan de seminarios de la siguiente manera:

Semana	Actividad	Tema	Expositor	Fecha
1	Club de revista	Tema libre	WCS	15/11/02
2	Club de revista	Tema libre	WCS, IE, Estudiante	22/11/02
3	Club de revista	Tema relacionado a la Charla	WCS, IE, Estudiante	29/11/02
4	Charla	Tema específico	WCS, IE	06/11/02
5	Club de revista	Tema libre	WCS, IE, Estudiante	13/12/02

La exposición de temas libres pueden realizarla estudiantes de biología como por el personal de WCS y/o IE. El tema a exponerse se publicará una semana antes, junto a artículos que se requerirán para ello. Los estudiantes podrán comprar fotocopias y así poder discutirlo con mayor fundamento en el Club de revistas.

Revisión de programas y diseño de nuevas materias optativas

Actualmente la comisión CBF - WCS esta revisando objetivos, contenido e implementación de las siguientes materias: Estadística II (EST 248), Ecología de Poblaciones y Comunidades (ECO 274), Laboratorio Ecología de Poblaciones y Comunidades (ECO 275), Métodos Zooecológicos (BIO 357) Laboratorio de Métodos Zooecológicos (BIO 358) y Comportamiento Animal (ZOO 376). Al margen de esta revisión, la comisión esta diseñando una nueva materia electiva para la Conservación y Manejo de Fauna Silvestre.

El próximo 2 de diciembre, llegará a La Paz el Dr. Peter Feinsinger, a través de un esfuerzo de la WCS. El colaborará con la revisión definitiva de los programas y con el diseño final de la nueva materia electiva. Su valiosa experiencia aportara

sobre todo en las metodologías que se aplicaran en todas las materias antes expuestas y en forma particular a la nueva electiva en Conservación y Manejo de Fauna Silvestre.

- Pasantías y tesis

Con el objetivo que los estudiantes adquirieran experiencia en diseño experimental, aplicación de nuevas metodologías, análisis de sus datos e interpretación de sus resultados. La comisión CBF - WCS convocan semestralmente pasantías para estudiantes de la carrera de Biología.

Una vez al año la WCS lanza una convocatoria para financiamiento de tesis, la cual es entregada para su publicación a la carrera de biología. A los tesistas no solo se les apoya con el financiamiento de sus tesis si no que también se les apoya con asesoramiento.

Anualmente la WCS convoca a tesistas para financiar su trabajo de tesis. La convocatoria es publicada a través de la Carrera de Biología. Los tesistas no solo reciben financiamiento también asesoramiento científico.

Biblioteca de WCS

La WCS ha puesto a disposición de la Carrera de Biología y del Instituto de Ecología su biblioteca en formato digital.

OBJETIVOS ESTRATÉGICOS DEL PROGRAMA DE MANEJO DE VIDA SILVESTRE

En plenaria se presentaron objetivos tentativos, los que fueron analizados, discutidos y replanteados, dando como resultado los siguientes objetivos y metas.

- **META:** Desarrollar la capacidad humana y técnica del Instituto de Ecología y otras unidades para alcanzar el manejo y la conservación de la vida silvestre a nivel nacional.

  - **Objetivo estratégico 1**: desarrollo de profesionales relacionados al manejo y conservación de la vida silvestre
  - **Objetivo estratégico 2**: desarrollo de la capacidad técnica para realizar investigación básica y aplicada, que lleve a mejorar la calidad de vida de las poblaciones locales y a promover la conservación de la vida silvestre.

- **<u>Objetivo estratégico 3</u>**: promoción de la disciplina del manejo de vida silvestre para cambiar la visión del público y los profesionales hacia esa actividad

La discusión de los objetivos y meta se presenta a continuación:

Mario: en los objetivos para cualquier país y cualquier sociedad, hay que incorporar de alguna manera el desarrollo de una mejor calidad de vida para poblaciones locales, beneficios para los que están manejando. En el objetivo 2 se debería incluir el discurso de "mejoramiento de calidad de vida".

Lilian: en el objetivo 2, no solo se debe desarrollar la capacidad técnica sino también proporcionar información que tenga un impacto sobre el manejo y desarrollar mecanismos para que la información sea usada en manejo. Debería ser un mecanismo estratégico para cambiar la información a acciones de manejo.

Cinthía: cómo se podría incluir la política?, Para aquellos profesionales con vocación legislativa también debería haber una preparación para éstos. Rob: está implícito dentro del objetivo número 1.

Jaime: cómo se integrará el programa en el IE con la Carrera de Biología, será un programa, una unidad, serán actividades dentro de una unidad?. Lamentablemente, no contamos con la presencia de docentes/investigadores para tomar este tipo de decisiones.

Lilian: la CBF es la unidad donde el programa podría operar, para no crear una nueva unidad, sin embargo, que pasa si es "manejo de vida silvestre" y ya no manejo de fauna?

Pancho: está funcionando como una comisión, y aún no está claro cómo irá a funcionar. No se sabe como se realizará este trabajo conjunto.

Jaime: podría ser desde la CBF hacia el IE en total, Lilian también cree lo mismo, o sea que deberíamos sacar del objetivo al IE?.

Mario: el desarrollo de las relaciones se aclararán a medida que se va avanzando en el programa y de acuerdo a los requerimientos del mismo.

Estudiante: en el objetivo 1, debería haber una integración con otros profesionales, la legislación y otros temas.

Interacción social: interactuar con la gente para que nosotros mismos busquemos la mejor manera de difundir el mensaje. Es más este objetivo debería estar dentro de los dos primeros.

Meta: debería estar siempre el IE pues la relación es más inmediata.

Alvaro: respecto a la meta, debería ser lograr "establecer el programa de manejo", el convenio es más implícito. La pregunta es ¿cómo integrarnos CBF-WCS?. Analizar como hacer real el programa de manejo, pues hay que cuestionarse algunos cambios.

Emilia: consolidar una investigación integrada entre WCS-CBF. Además interactuar con la sociedad, de acuerdo a las posibilidades.

Mario: armar un programa integral requiere fondos, de lo contrario hay que discutir qué podemos hacer con lo que tenemos. Cómo en este momento si de lo que se trata es estructurar un desarrollo paulatino que sea más integrado.

Lilian: meta --- implementar un programa de manejo de fauna?.
Pero cuales son los objetivos para implementar un programa de manejo de fauna?

Rob: uno de los requerimientos es ¿cómo nos vamos a integrar?

Una vez discutido y evaluado los objetivos, nos dividimos en grupos de trabajo para que en base a los objetivos se identificaran y priorizarán acciones futuras para el Programa de Conservación y Manejo de Fauna.

Se trabajaron en tres grupos, uno de ellos conformado por estudiantes, otro por docentes de la carrera de Biología y el tercer grupo por instituciones que apoyan al instituto de ecología.

RESULTADO DE LOS TRABAJOS POR GRUPOS

GRUPO: INVESTIGADORES DEL IE (DOCENTES-INVESTIGADORES Y ASOCIADOS).

A. Forma de implementación del programa de manejo de vida silvestre a nivel académico en la carrera de biología

- Se debe formar ya una especialidad de manejo de vida silvestre desde cuarto año con materias electivas de dictado permanente, que

permitan al estudiante el conocimiento global de manejo de vida silvestre, para esto los docentes de la carrera de biología deberán prepararse adecuadamente en estos campos y tender hacia la especialización en ciertas áreas de docencia.

- En estas materias deberá enfatizarse la formación en investigación, con la generación de investigación estudiantiles.
- Deberá motivarse a que la docencia en manejo de vida silvestre este íntimamente relacionada con la experiencia en investigación e interacción social.
- Para dar la capacidad integral de manejo de vida silvestre, deberá integrarse, entre ellas, manejo, áreas protegidas, gestión, legislación, materias sociales. Esto podría involucrar también la especialización de los profesores.
- Es urgente que la carrera de biología analice en primer lugar las áreas de especialidad que pueden responder actualmente al mercado, deberán ser pocas y concretas. Y que se traduzcan en una mención en el titulo académico.
- Las posibilidades de crear especialidades de formación, revisando además la pertinencia de materias troncales, materias electivas, pre-requisitos, inclusión de nuevas materias, los objetivos y contenidos de todas las asignaturas. Para esto se sugiere que la CBF y el LPB realicen propuestas hacia la carrera de biología para implementar las especialidades de "manejo de fauna" y "manejo de flora", para presentarlas en los talleres de revisión del pensum de la carrera de biología.
- Deseamos que en la discusión del pensum de la carrera de biología se incluya a otras personas e instancias (personas con experiencia de ejercicio en este campo, organizaciones gubernamentales, organizaciones no gubernamentales).
- Respecto a las tesis de licenciatura y pasantías que propongan WCS será bueno participar como docentes en el diseño de las mismas en los casos en que sea posible.
- Los puntos precedentes posibilitaran la formación de escuelas en la carrera de biología, con docentes lideres de campos de investigación y equipo de investigación formados y ligados a ellos.

B. Forma de implementación del programa de manejo de vida silvestre a nivel de investigación en la Carrera de Biología.

- Propuestas conjuntas con WCS dentro de las líneas de investigación de WCS en el Norte de La Paz y otras del país.

- Mantener nuestra respuesta de investigación hacía las demandas del mercado, coordinando nuestras iniciativas con WCS.
- Integrar la Estación Biológica Tunquini en los programas de investigación coordinados entre el IE y WCS.
- Mantener nuestras iniciativas de manejo de vida silvestre en otras áreas del país con el asesoramiento y coordinación con WCS.
- Fomentar fuertemente la inclusión de investigadores asociados en el IE para diversificar las líneas de investigación en manejo de vida silvestre.

C. Forma de implementación del programa de manejo de vida silvestre a nivel de interacción social.
   - Las investigaciones en manejo deben definirse desde el principio de las iniciativas de los potenciales beneficiarios, y que los resultados de las mismas se traduzcan en que los pobladores locales puedan ejecutar las estrategias de manejo. Para esto será bueno coordinar estas iniciativas con la WCS.
   - Para esto el IE deberá establecer alianzas estratégicas con las organizaciones locales.

GRUPO: PROFESIONALES DE LOS SOCIOS CLAVES DEL INSTITUTO DE ECOLOGÍA

¿Cómo operativizar la relación entre el IE, la carrera de biología y la WCS?

1. Revisión de POAs para incluir actividades conjuntas.
2. Boletín bianual o seminarios, a fin de divulgar el avance de las diferentes unidades e instituciones relacionadas. Incluyendo la invitación hacia otras Universidades.
3. Ampliación de la participación en las reuniones CBF-WCS para crear un grupo de trabajo más amplio para impulsar los proyectos que se deben desarrollar.

Objetivo 1

- Club de revistas y los seminarios
- Revisión de algunos de los programas y contenidos de materias
- Diseño y ejecución de las materias electivas (¿cómo los investigadores externos podrán participar?)
- Pasantías – Los trabajos de las pasantías se deberán publicar anualmente en un número especial de "Ecología en Bolivia". Para su publicación se presentarán las pasantías a un comité evaluador conformado por miembros de diferentes instituciones, quienes decidirán cuales de las pasantías se publicaran.
- Tesis – mayor apoyo en el proceso de diseño

Objetivo 2

- Matriz de compatibilización de coincidencias (objetivos y actividades actuales) entre el IE y otros socios estratégicos.
- Desarrollo de grupos de investigadores inter-instituciones para responder las preguntas y elaborar (y ejecutar) los proyectos.
- Requisito: participación de estudiantes en los proyectos.

Objetivo 3

- Crear material didáctico conjunto (basado en las experiencias de las instituciones) sobre diferentes temáticas relacionadas al manejo de vida silvestre en las áreas donde estamos trabajando.
- Crear espacios para promover la participación de otros interesados: gobiernos locales, organizaciones locales, organizaciones gubernamentales

y comunidades locales que se identificarán a través de la matriz de compatibilidad.

- Cada tipo de "público" necesitará un tipo diferente de acercamiento.

GRUPO: ESTUDIANTES DE LA CARRERA DE BIOLOGÍA

Objetivo 1

Crear una política interna de la carrera de biología

1. Revisar el pensum actual
    - Revisar cuales de las materias electivas deberían ser troncales y viceversa
    - Implementar materias de manejo y conservación de vida silvestre: Gestión ambiental, educación ambiental, leyes en general, áreas protegidas en extenso y otras.
2. Capacitar al plantel docente en manejo de vida silvestre
    - Invitar a gente con experiencia en conservación como ser ONGs, a seminarios, talleres, si se puede a dictar materias
3. Que se permita realizar trabajos de tesis que incluyan temas de educación ambiental, conservación, manejo y otros que sean de respuesta directa de las necesidades de la sociedad.
4. A partir de cuarto año se puede especializar académicamente en temas de conservación y manejo u otras que defina la política de la carrera

Objetivo 2.

1. Que los alumnos que realizan trabajos para instituciones puedan participar del trabajo de campo y del informe final.
2. Que los trabajos de investigación tengan un acápite donde se explique el alcance practico del mismo.
3. La carrera debería trabajar mas estrechamente con las instituciones que trabajan en conservación y manejo de vida silvestre, de manera de estar informados de la realidad.
4. La carrera de biología debería interaccionar con otras carreras (Antropología, sociología, economía, derecho, etc) para que la investigación aplicada sea mas completa.

Objetivo 3

1. Que la carrera participe en eventos públicos con información de lo que se realiza en la carrera en días festivos relacionados al medio ambiente (Día

de la tierra, día del medio ambiente, día del árbol, san roque, año de las montañas)

2. Los trabajos de investigación realizados en la carrera deberían estar documentados audiovisualmente, con el fin de poder editarlos para presentaciones publicas, ya sean mediante prensa o televisión (canal 13)
3. Para las defensas de tesis se podrían invitar mediante prensa (Sección cultural- gratuito) a la opinión publica.

Conclusiones del trabajo en grupos

El grupo de estudiantes y docentes coincidieron en que a partir de cuarto año pueda existir una especialización en manejo de vida silvestre y para esto es necesario que los docentes se capaciten en manejo de vida silvestre.

Ambos grupos también coincidieron en que se deberían implementar materias de manejo y conservación de vida silvestre de manera integrada con otros temas como gestión, áreas protegidas , legislación y otros.

Los tres grupos coincidieron que se revise el pensum de la carrera de biología, programas y contenidos de algunas materias y que se diseñe otras materias electivas, en colaboración con las instituciones con experiencia en el tema.

Para diversificar las líneas de investigación en manejo de vida silvestre en el IE, se debería fomentar la inclusión de investigadores asociados y para trabajar de una manera más coordinada y eficiente se debe compatibilizar las coincidencias entre las unidades del IE y sus socios estratégicos.

En las investigaciones que se realice tanto en el IE como en las instituciones debe existir una participación activa de los estudiantes en los proyectos que se realicen desde el inicio hasta la conclusión.

Debe existir una mayor difusión de los trabajos, tesis y proyectos que se vienen realizando en manejo de vida silvestre, a través de materiales didácticos escritos y audiovisuales, elaborados en conjunto entre IE y sus socios estratégicos.

CONCLUSIONES DEL TALLER

El taller del Programa de manejo de fauna concluyó con las siguientes propuestas:

- Que el Programa de conservación y manejo de fauna, no se restrinja solo a fauna y que más bien se convierta en Programa de conservación y manejo de vida silvestre.
- Elaboración de una matriz de compatibilidad entre instituciones y unidades del IE.
- Conformación de una Comisión para la elaboración de una encuesta de opinión sobre el pensum actual de la carrera de biología y sobre posibles especializaciones de la carrera.
- Centralizar opiniones sobre especializaciones en la carrera de biología en el LPB y la CBF y elaborar una propuesta a la Carrera de Biología (Comisión Académica y Consejo Técnico del Instituto).

Matriz de compatibilidad entre instituciones y unidades del IE.

La elaboración de la matriz de compatibilidad entre instituciones y unidades del IE estuvo a cargo de la WCS, quién se responsabilizará de hacer llegar a cada una de las unidades de investigación del IE y a las instituciones que trabajan con el IE.

Una vez llenada la matriz de compatibilidad entre instituciones y unidades del IE se analizara las coincidencias existentes entre instituciones y unidades para de esta manera unir esfuerzos y trabajar de una manera más coordinada.

La matriz de compatibilidad entre instituciones y unidades del IE, a ser llenada es la siguiente:

MATRIZ DE COMPATIBILIDAD ENTRE INSTITUCIONES Y UNIDADES DEL INSTITUTO DE ECOLOGÍA

INSTITUCIÓN O UNIDAD	META	OBJETIVOS	TEMAS DE INVESTIGACIÓN		SITIOS DONDE SE REALIZAN
			ACTUALES	FUTURAS	

Especialización en la carrera de biología en manejo de Vida silvestre

En el taller se eligió una Comisión para la elaboración, circulación y análisis de una encuesta para sondear la opinión de los estudiantes a cerca de una especialización en manejo de vida silvestre. La comisión estuvo conformada por las siguientes personas: Humberto Gómez y Andrea Morales de la WCS, Alvaro Garitano y Emilia García del IE y David Kopp, Kenia Pinto y Prem Vidaurre de los estudiantes de la carrera de biología.

En fecha 18 de septiembre la comisión se reunió en la CBF para elaborar una encuesta (Anexo 3). La encuesta se realizó a aquellos estudiantes que participaron en el taller del programa de manejo de vida silvestre. Se entregó a 53 estudiantes el día 19 de septiembre y se les dio un plazo de 3 días para su llenado y devolución. Solo el 20% devolvió las encuestas llenadas, la mayoría son estudiantes de los primeros años de la carrera. La comisión se reunió para analizar el resultado de las encuestas, teniendo como resultado lo siguiente:

1. El 100% de los encuestados desean que la carrera tenga una formación hacia especialidades, pero las líneas de especialización que proponen es muy amplia Esto se debe talvez a que los estudiantes confunden los contenidos con las líneas de especialización. Los temas de especialización más frecuentemente mencionados fueron Manejo de vida silvestre, Gestión Ambiental, Educación Ambiental, Biología molecular, ecología, zoología y botánica.
2. Respecto a las tareas de producción y servicio que desean que el especialista en manejo de vida silvestre cumpla, se cita también una gran cantidad de posibilidades. Esto esta relacionado a la gran cantidad de conocimiento y habilidades que los estudiantes consideran que deberían tener para cumplir la meta. De estos conocimientos y habilidades pocos son los que actualmente brinda la carrera y muchos son inclusive pertenecientes a otras profesiones.
3. El 90% considera que la carrera debiera influir en su nivel educativo además del instructivo, particularmente infundiendo valores éticos, de respeto a la naturaleza y respeto a los estudiantes.
4. El 100% considera que el actual pensum no cumple con la formación del profesional biólogo tal como lo visualizan los estudiantes.
5. Respecto a las propuestas sobre asignaturas y contenidos, existen muchas propuestas interesantes, pero en general se ha confundido los contenidos con las asignaturas, de modo que para la propuesta de nuevas electivas la lista es extensa. Se debe tener en cuenta que en realidad son contenidos.

6. Para el 83% de los encuestados la carrera no ha satisfecho sus expectativas de especialización.
7. El 75% de los estudiantes coinciden en que el pensum no esta estructurado para afrontar la realidad del país, ya que las materias que se dictan están enfocadas a realidades de otros países, casi no se tiene información sobre Bolivia y solo se dicta una materia con relación a la problemática de Bolivia (Realidad Nacional).
8. Los requisitos más mencionados por los estudiantes sobre que deberían tener los docentes para poder dictar materias de conservación y manejo de vida silvestre son: .que los docentes tengan una formación de maestría o doctorado, que tengan una basta experiencia de trabajo en el país, estar en constante actualización, que tengan experiencia en trabajo de campo y que las materias se más prácticas que teóricas.

ANEXO 1

LISTA DE PARTICIPANTES

PERSONAL DEL IE y CARRERA DE BIOLOGÍA	PERSONAL DE WCS
Emilia García	Robert Wallace
Mario Baudoin	Lilian Painter
Agr. Victor Churquina	Humberto Gomez
Soraya Barrera	Imke Oetting
Jaime Sarmiento	Renata Tejada
Alvaro Garitano-Zavala	María Copa
Lic. Esther Pérez	Hugo Aranibar
	Andrea Morales
	Miriam Mercado

ESTUDIANTES

1	Heidi López	31	Consuelo Campos
2	Cynthia Duran	32	Maria Rene Vacaflor
3	Freddy Flores	33	Wendy Tejada
4	Shirley Andrade	34	Gabriela Villanueva
5	Agustín Estivariz	35	Delmy Collazos
6	Cynthia Jurado	36	Roberto Daza
7	Pablo Justiniano	37	Mariana Villegas
8	Isabel Gómez	38	Diego Romero
9	Yóreme Gutiérrez	39	Jorge Ibáñez
10	Paula De la Torre	40	Yuri Ramírez
11	Oliver Ocampo	41	Nicaned De los Ríos
12	Cristian Garuia	42	Polo De la Riva
13	Rosember Hurtado	43	Kenia Pinto
14	Noemí Quispe	44	Alvaro Romero
15	Antonieta Mollo	45	Juan Carlos Butrino
16	Juan Miguel Limachi	46	Yara Higueras
17	Mirtha Velásquez	47	Monica Rivera
18	Karina Apaza	48	Marolyn Vidaurre
19	Alvaro Aguilar	49	Faviany Lino
20	Karen Asturizaga	50	Prem Vidaurre
21	Gabriel Zaballos	51	David Kopp
22	Pablo Blatt	52	Marcelo Otterberg
23	Héctor Odorera	53	Nohella Mercado
24	Alejandra Domic	54	Beatriz Zapata

25	Fabricio Miranda	55	Claudia Abanarmo
26	Ninoska Vargas	56	Hortensia Santander
27	Roberto Rivero	57	Gabriela Villalpando
28	Ana Antezana	58	Mariana Da Silva
29	Angela Arenas	59	Sarah Castellanos
30	Lincy Ugarte	60	Nancy Aranda
		61	Angela Nuñez

ANEXO 2

PRESENTACIONES TRABAJOS DE INVESTIGACIÓN

MANEJO DE FAUNA - DESAFÍOS PARA BOLIVIA Y NUESTRA COMUNIDAD

Por Mónica Moraes (Directora del Instituto de Ecología)

Pautas del avance científico

•Aportes taxonómicos de la fauna de Bolivia: Colecciones, catálogos, bases de datos

•Especialistas en diferentes grupos: mayormente vertebrados

•Publicaciones, informes y documentos de inventarios locales y regionales

•Crecimiento en equipo e infraestructura

Fauna de Bolivia

•Estrategia Nacional de Conservación de Biodiversidad (2002):

- Mamíferos:325 (12%)
- Aves: 1.379 (51%)
- Reptiles: 260 (10%)
- Anfibios: 186 (7%)
- Peces: 550 (20%)

Limitaciones

•Datos actualizados en taxonomía zoológica poco accesibles a sectores

•Insuficiente respuesta a demandas de sectores de la sociedad (alternativas, "recetas" de manejo, potencialidades de aprovechamiento)

•Débil interacción con otras disciplinas (antropología, economía, extensionistas)

Perspectivas

•Estudios taxonómicos (identidades)

•Estudios biológicos (poblaciones viables, regeneración, home-range, etc.)

•Pautas de manejo

Desafíos - Manejo

•Domesticación de fauna nativa

•Valoración de prácticas tradicionales

•Producción sostenida

•Innovación de productos y mercados

•Compatibilización entre conservación y explotación diversificada

Bases institucionales

•Formación de biólogos jóvenes: Carrera de Biología

•Convenio Colección Boliviana de Fauna – Museo de Historia Nacional Noel Kempff Mercado

•Acuerdos de cooperación Instituto de Ecología – Wildlife Conservation Society: programa de manejo de Vida silvestre

Qué falta?

•Definición de programa Manejo de Fauna (alcances regionales y nacionales)

•Consolidación de estudios en grupos poco estudiados (por ejemplo invertebrados): taxonomía y biología

•Diseño de plan de acción: grupos prioritarios e interesantes para manejo y conservación

PROGRAMA DE INVESTIGACIONES EN TINAMÚES DEL ALTIPLANO

Por Alvaro Garitano (Colección Boliviana de fauna)

Antecedentes y justificación

•Grupo neotropical (latinoamericano) muy poco estudiado.

•Uso milenario y actual, desordenado y no controlado.

•Potencial de aprovechamiento cinegético, (cotos de caza) y en crianza en cautiverio.

•Interés científico.

Objetivos

•Generar los conocimientos científicos en vida silvestre y en cautiverio, con el fin de conocer mejor la biología y ecología de las especies, de modo de plantear estrategias de aprovechamiento sostenible en el altiplano.

¿Qué avances hasta el momento?

•En 1995 estudio de la distribución general de las especies en el altiplano (Nothoprocta ornata, Nothura darwinii, Tinamotis pentlandii), historia natural y primera evaluación del uso actual.

•Entre 1995-2000, estudios en la ecología alimentaría, de la comunicación y microestructura de los cascarones en N. ornata y N. darwinii.

¿Qué avances hasta el momento?

•En 2000, evaluación de la información existente sobre una de las especies (Nothoprocta ornata)

•Desde octubre de 2000 hasta la fecha cría experimental de N. ornata en cautiverio en dos comunidades rurales.

¿Especies promisorias?

•Interesantes parámetros biológicos para su adaptabilidad a la cría en cautiverio, (dieta, crecimiento, consumo, parásitos), pero también aspectos problemáticos (comportamiento).

•Posibilidades no evaluadas de comercio de carne y huevos en el mercado.

•Interés de cazadores y comunarios.

Beneficiarios

•Comunidades rurales del altiplano.

•Empresarios a diferentes niveles.

•Comunidad científica.

Planes futuros (cría en cautiverio)

•Sistemas de reproducción en vida silvestre (radio-seguimiento).

•Experimentación de sistemas de agrupamiento en cautiverio.

•Evaluación de condiciones de reproducción en cautiverio.

•Optimización del sistema (alimentación y manipulación).

Planes futuros (cinegético)

•Estudios de distribución espacial, uso y preferencia del hábitat (radio-seguimiento).

•Fluctuaciones temporales de las poblaciones (cazadores?, programa de monitoreo?).

•Evaluación de la actividad (e interés) cinegética.

PROGRAMA DE TRABAJO CONJUNTO CON EL ZOOLÓGICO MUNICIPAL "VESTY PAKOS"

Por Alvaro Garitano (Colección Boliviana de Fauna)

OBJETIVOS

- Colaborar científicamente a que el Zoológico Municipal Vesty y Pakos (ZMVP) cumpla su rol social de educación en conservación a la ciudadanía.
- Colaborar a que el ZMVP participe en programas de conservación e investigación a nivel local e internacional, justificando la presencia de los animales en sus recintos.
- Generar mayor información científica, útil para los programas de manejo del ZMVP.
- Promover la profesionalización de biólogos en esta área de manejo de fauna silvestre.

ANTECEDENTES Y JUSTIFICACIÓN

- El ZMVP no está cumpliendo el rol en conservación de los zoológicos del mundo.
- El Reglamento Nacional de Zoológicos de Bolivia no está siendo cumplido.
- Existe un convenio con la Carrera de Biología e Instituto de Ecología con el ZMVP firmado en 1998, muy poco utilizado.

ACTIVIDADES PRECEDENTES

- Desde 1998 (y de forma discontinua) estudiantes de la CB realizaron prácticas y trabajos de investigación (pocos publicados).
- Programa de guías voluntarios en semestre II/2000 avalados por la CB.
- Semestre I/2002, inicio del proyecto de generación de propuestas para la optimización de la información y de la ambientación en los recintos.

PROBLEMAS

- El ZMVP resulta en una contraparte económicamente (y científicamente) débil, por sus características de administración.
- El ZMVP no asegura una gestión de manejo e investigación a mediano o largo plazo, lo cual imposibilita generar programas o planes de investigación, educación y conservación a mayor escala.
- Relativo poco interés de la comunidad científica local en realizar o coordinar estos programas con el ZMVP.

POTENCIALIDAES

- El ZMVP tiene características de espacio (superficie y naturales), así como colecciones de animales muy buenas.
- Muchas especies con algún grado de vulnerabilidad están representadas en el ZMVP.
- Existe una Fundación privada sin fines de lucro creada específicamente para apoyar al ZMVP.
- El volumen de visitantes es muy grande.
- Existen muchos estudiantes de la Carrera de Biología interesados en profesionalizarse en el manejo de vida silvestre en zoológicos.

BENEFICIARIOS

- Población urbana de las ciudades de La Paz y El Alto (y en general todo visitante).
- Animales mantenidos en el ZMVP.
- Ente administrador del ZMVP.
- Comunidad científica, particularmente estudiantes en su proceso de profesionalización.

ACTIVIDADES FUTURAS

- A corto plazo hacer efectiva la generación de resultados en el proyecto de optimización de ambientes e información.
- Intentar interactuar con la administración del ZMVP más efectivamente para poder asegurar la continuidad de programas de educación, investigación y conservación que puedan implementarse en el futuro.
- Mantener la relación de docencia universitaria en el ZMVP.

PRESENTACIÓN DE LOS TRABAJOS DEL ÁREA DE ICTIOLOGÍA

Desde el establecimiento de la CBF (MNHN-IE) en 1991, la sección de ictiología ha definido tres líneas de acción:

1. Conocer la diversidad ictiofaunística a través de estudios de sistemática y distribución de peces de Bolivia
2. Conocer las principales características de historia de vida a través de proyectos de ecología y biología
3. Identificar las principales formas de uso actuales y generar información para el manejo de ictiofauna.

De manera general en Bolivia existen muy pocos biólogos dedicados al estudio de los peces. La sección de la ictiología cuenta con dos investigadores permanentes y, ocasionalmente cuenta con el apoyo de estudiantes como ayudantes ad-

honorem. Sin embargo, las necesidades de generar información y promoción de acciones dirigidas a la conservación y manejo requieren de la participación de más profesionales.

1. Sistemática y distribución de peces de Bolivia

Tomando en cuenta la ausencia de colecciones y listas actualizadas de la ictiofauna, uno de los objetivos fundamentales ha sido (y es actualmente) el establecimiento de una colección de referencia de peces de Bolivia. Adicionalmente, los trabajos se dirigieron a obtener información sobre la distribución de las especies en las diferentes cuencas.

Aunque de manera general el objetivo era todo el territorio nacional, se consideraron de manera prioritaria los trabajos en áreas protegidas. Actualmente se tiene una buena representación de las principales cuencas, subcuencas y los principales ríos del país. Se puede considerar que la cuenca mejor representada en la colección es la subcuenca del río Mamoré y Madre de Dios de la cuenca del Madera y en los últimos años ha mejorado notablemente la representación de las subcuencas del Itenez , Beni, Pilcomayo y Bermejo. Varios años de trabajo en el lago Titicaca han dado como resultado una muy buena representación de la ictiofauna de la subcuenca endorreica del Altiplano.

Además, se cuenta con colecciones de referencia de la mayor parte de las áreas protegidas. La colección incluye aproximadamente 600 especies y unos 15000 lotes de peces que representan mas de 75000 individuos.

Los trabajos más importantes incluyen una actualización de los peces de Bolivia que será publicada preliminarmente en los próximos meses. Las lista incluye más de 620 especies, lo que representa un importante incremento respecto a las listas conocidas. Además se han realizado listas de AP's como Apolobamba, Noel Kempff, Amboro, Madidi, Tariquia, Cotapata, Estación Biológica del Beni, Isiboro Secure, Pilón Lajas y de regiones como la cuenca del Manuripi-Tahuamanu.

Además, las colecciones han sido utilizadas para revisiones sistemáticas y para la descripción de varias especies nuevas para la ciencia.

Actualmente están en preparación "reseñas" de diferentes familias de peces de Bolivia, en las que se incluye además de información sobre la sistemática de la familia y taxonomía de las especies, una clave de identificación de especies bolivianas, información sobre distribución e historia natural.

2. Investigación en ecología y biología

Tomando en cuenta la importancia de la información sobre aspectos de la biología y ecología de las especies, una segunda línea de acción fundamental de la Sección de Ictiología, ha sido la de desarrollar estudios que permitan generar información sobre la historia de vida de especies.

A pesar de las limitaciones de personal y, fundamentalmente de presupuesto, existen muchas dificultades para realizar esta clase de estudios. Sin embargo, se ha puesto en marcha algunos proyectos en las diferentes cuencas del país.

Entre las actividades ejecutadas, se encuentra el proyecto de actualización de la información sobre la ictiofauna del lago Titicaca. El trabajo se refería principalmente a especies nativas, pero se consideró también una introducida (el pejerrey), por su importancia económica y ecológica. El estudio estuvo concentrado en aspectos de biología como reproducción y sexualidad, alimentación etc.

Uno de los más importantes fue realizado en cooperación con la Prefectura del Departamento de Tarija. El proyecto incluía especies de la cuenca del río Grande de Tarija que formaban parte de las pesquerías en la zona. La región constituye el más importante centro de pesca deportiva en el país y existe captura de subsistencia y, por lo menos ocasionalmente, pesca comercial. Aunque el trabajo estuvo enfocado principalmente en el robal (**Zungaro zungaro**) se incluyeron otras especies en general de tamaño grande o mediano y que eran utilizadas con distintos fines. El estudio estuvo concentrado en aspectos de biología como reproducción y sexualidad, alimentación etc, aunque, se obtuvo importancia información sobre diferentes formas de uso.

En la cuenca del Amazonas, trabajos sobre diferentes aspectos de biología (principalmente reproductiva y alimentación) fueron realizados en la localidad de Espíritu, ubicada en las sabanas del Beni a orillas del río Yacuma. Los estudios incluyeron especies de diferentes sistemas acuáticos (lacustres, palustres y fluviales). Los estudios se concentraron en aspectos de distribución, reproducción, alimentación.

3. Uso de Ictiofauna

Tomando en cuenta la importancia de los peces como recurso de subsistencia y comercial, constituyen uno de los recursos más ampliamente utilizados. En

general se considera que la ictiofauna en Bolivia no presenta grandes problemas de conservación porque, a escala nacional el consumo de carne de pescado es muy bajo. Consecuentemente, existen planes para promover esta explotación, principalmente en la Amazonía donde, evidentemente, existe un importante potencial.

Desde este punto de vista, el tercer nivel de acción de la sección de Ictio de la CBF está dirigido a generar información sobre las diferentes formas de uso y de la identificación de alternativas para un manejo adecuado. Trabajos en este campo de acción se han desarrollado en el marco del proyecto, anteriormente mencionado, relacionado al uso de la ictiofauna en el río Grande de Tarija.

En la cuenca del Madeira, algunos estudios preliminares sobre el Uso de ictiofauna por comunidades del grupo originario T'simane, fueron realizados en el Parque Nacional Pilón Lajas.

TRANSFERENCIA DEL MANEJO ECOLÓGICO DE PLAGAS, IMPLEMENTACIÓN DE LABORATORIO COMUNAL DE HUARACO, PRODUCCIÓN DE ABONOS LÍQUIDOS Y CONTROLADORES BIOLÓGICOS DEL GUSANO BLANCO Y POLILLA DE LA PAPA

Ing. Victor Churquina (Investigador Asociado IE)

Las plagas agrícolas en los cultivos son cada vez más agresivas en cualquier ecosistema, debido a la predación y al mal uso que hace el hombre de su ambiente, ante esto convencionalmente gran parte de la población cree que solucionaría estos problemas empleando agrotóxicos inclusive prohibidos en el resto del mundo, con lo que agrava mucho más esta situación, pagando con su salud y vida el consumidor urbano y rural por la presencia de estas sustancias nocivas para la existencia de cualquier organismo y resto de componentes de la naturaleza.

Debido a esta problemática el Instituto de Ecología a través de la Unidad de Zoología y mediante Fundeco presento la propuesta ante el PPD del PNUD, con el fin de producir abonos líquidos y bioinsecticidas de plantas, Multiplicar los entomopatógenos Beauveria brongniartii y Baculovirus phthorimeae, Recopilar conocimientos ancestrales acerca del control de insectos plaga y manejo de cultivos, repensarlos valorizándolos y difundiéndolos hacia los beneficiarios de la comunidad de Huaraco en la provincia Aroma – La Paz y alrededores.

El proyecto se implementó en la comunidad Villa Esteban Arce – Huaraco – Antipampa, a 134 km hacia Oruro y 3860 m de altitud en la provincia Aroma del departamento de La Paz.

Entre los beneficiarios se tienen los agricultores de la región, y otras provincias de La Paz, Cochabamba y Potosí, consumidores de papa rurales y urbanos, profesionales vinculados al ambiente, Instituto de Ecología y Fundeco.

FRUGIVORIA

Por Emilia García (Herbario Nacional de Bolivia)

Es un tipo de relación mutualista entre plantas y animales. El objetivo del estudio es contribuir a la conservación de la vida silvestre y ecosistemas.

Temas de estudio

- Selección y uso del habitat por los animales
- Polinización y dispersión de frutos y semillas
- Estrategias de las plantas para sobrevivir a la alteración, colonizar espacios abiertos y a la vez competir con otras especies
- Ejemplos de coevolución y coincidencia entre abundancia y distribución de ambos grupos
- Sucesión vegetal

Información generada

- Diferencias en riqueza específica debidas a la relación entre géneros de plantas y frugivoros
- Análisis de tipo ecológico: son los frutos consumidos por una amplia variedad de frugívoros (generalistas)? O son consumidas por un numero reducido de ellos (especialistas)?
- Información de la variación de frutos de individuos o entre individuos por efecto de factores bióticos y abióticos
- Forma en que son consumidos los frutos por el tamaño: masticados o engullidos
- Dispersión de las semillas cerca o lejos de los parentales y su supervivencia
- Patrones de información de frutos y su influencia en la presencia y abundancia de dispersores o predadores.

Beneficiarios

- Beneficiarios 1: ciencia, manejadores, criaderos de fauna, jardines botánicos.
- Beneficiarios 2: Áreas protegidas, programas de investigación y manejo a nivel de comunidades y poblaciones.

Algunos trabajos realizados o en ejecución

- Polinización en cactaceas (2 especies), bombacaceas (1 especie), palmeras (1 especie)
- Frutos consumidos por monos, armadillos, jochis, aves
- Frutos de Rubiaceae y su relación con el gradiente altitudinal y otros factores abióticos
- Consumo y dispersión de Lorantaceas
- Banco de semillas del valle seco

Conclusión

La frugivoría es un tema que puede ser estudiado desde diferentes puntos de vista, tomando en cuenta a las fuentes de alimento, a los diferentes grupos de frugívoros y la influencia de factores bióticos y abióticos sobre las relaciones entre ambos.

Tema de confluencia de varias disciplinas: Botánica, zoología, clima, suelos, Centro de Análisis espacial.

ECOLOGÍA DEL CANGREJO DE RÍO

Por Ninoska Vargas (Estudiante de la carrera de Biología)

Antecedentes

- Distribución amplia
- Explotación minera en la región
- Recurso alimenticio nutritivo
- Situación socioeconómica (sobrepesca)
- No existen estudios sobre este tipo de crustáceos en Bolivia

Objetivos

Determinar y comparar la abundancia de Aegla sp

- Factores físico Químicos
  - Temperatura
  - PH
  - Conductividad
  - Oxigeno
  - Sales minerales y
  - Metales pesados
- Tipo de Habitat
  - Velocidad de la corriente
  - Profundidad del lecho
  - Granulometría del substrato
  - Vegetación

.

Vertientes:
Charaota, San Miguel y
Bolivar en Tupiza

Beneficiarios inmediatos

- La comunidad científica
- Las comunidades en estudio
- El Municipio de Tupiza

Beneficiarios futuros

La población en general ← Obtener base de datos y realizar proyectos de manejo y conservación

Generar ingresos económicos ← Formación de asociación de productores de criaderos de cangrejos

Si existe presencia de Contaminación ← Realizar proyectos de monitoreo y mitigación

Concientizar a la gente Sobre manejo, conservación Y desarrollo sostenible ← Talleres pilotos

Resultados esperados

- Se determinará y comparará la abundancia de Aegla sp en relación a la influencia de factores fisicoquímicos y tipo de habitat.
- Se obtendrán datos morfométricos y de sexo de los cangrejos de las diferentes vertientes.

- Se conocerá la especie o especies existentes.

Conclusión

Se obtendrán datos básicos sobre la ecología y biología d Aegla sp. para realizar futuros trabajos sobre manejo, conservación y desarrollo sostenible.

Perspectivas de involucrar otras unidades

- Presentación propuesta a la Alcaldía Municipal
- Aprobación del proyecto por el instituto de ecología
- El trabajo se desarrollara en la unidad de limnología
- La Colección Boliviana de fauna (muestras identificadas)
- Laboratorio de calidad ambiental (análisis químicos)
- Herbario Nacional de Bolivia (muestras identificadas)

ESTRUCTURA Y FUNCIONAMIENTO TRÓFICO EN UN RÍO DE MONTAÑA

Por Carlos Molina (Limnología I.E. – IRD)

Objetivo:
Estudiar la estructura y funcionamiento de la red trófico de los regímenes alimenticios de la comunidad de macroinvertebrados acuáticos y factores hidrogeomorfologícos de un río altoandino de la región de La Paz

Beneficios Inmediatos:
•Contribuir al estudio biológico (rasgos biológicos) y taxonómico - biodiversidad
•Caracterización de la fauna béntica – Altoandina
•Caracterización del hábitat acuático – Altoandina
•Bioindicación

Beneficios Futuros:
•Gestión y manejo de cuencas altoandinas
•Regeonalización de cuencas hidrográficas
•Concientización para reducir efectos de calentamiento global

Conclusión

•Escasez de este tipo de trabajo, fundamentados en una investigación pura, que posibilita herramientas muy importantes para proponer programas de manejo y gestión de cuencas hidrográficas altoandinas.

ESTABLECIMIENTO EN BOLIVIA DE LA UR* 081
Interacciones genoma, poblaciones, medio ambiente en los peces tropicales

INTERACCIONES GENOMA, POBLACIONES, MEDIO AMBIENTE EN LOS PECES DE LA AMAZONÍA BOLIVIANA

INFORME DE ACTIVIDADES 2002

Evocación de los objetivos generales del programa de establecimiento en Bolivia

El programa concierne a un número restringido de especies de Serrasalmidae, Pimelodidae y Cichlidae distribuidas en las principales cuencas de drenaje bolivianas, diferenciadas por su origen filogenético, por los grandes rasgos de su historia de vida y las cuales presentan un interés económico importante (pesca o acuicultura). El estudio concierne a las poblaciones de cuatro cuencas de drenaje del Alto Madeira: Madre de Dios, Beni, Mamoré e Itenez (Guaporé). De manera bimestral se realiza un seguimiento genético, así como de los ciclos de reproducción y de la ictioparasitofauna en una región de la cuenca del Guaporé (en la zona de inundación) y en dos regiones de la cuenca del Mamoré (en zona de inundación fuera de esta zona). La constitución de stocks experimentales permite hacer observaciones sobre la biología de las especies en medio controlado y someter a prueba, por medio de la experimentación, las hipótesis sobre el determinismo de las variaciones de los rasgos de vida. Por otro lado, estos stocks experimentales permitirán la puesta a punto del control de la reproducción y de la cría de estas especies de interés acuícola.

- Identificación de las estructuras metapoblacionales y filogeografía

En las especies seleccionadas, la pertenencia de los especímenes a diferentes poblaciones y la estructura genética de la especie son establecidas a través de análisis genéticos (ADN nuclear y mitocondrial) y morfométricos. Los resultados se fundan en el estudio de la composición de las poblaciones

* Unidad de Investigación.

parasitarias de los mismos especímenes. La filogeografía es establecida para todas las especies seleccionadas.

- Caracterización de los rasgos de vida y significado adaptativo de su variación

En el medio natural las características de crecimiento y las estrategias de reproducción (períodos de reproducción, edad y tamaño de primera madurez, fecundidad, tamaño y peso de los huevos…) son puestas en relación con los factores del medio (fotoperíodo, ciclo de las precipitaciones, temperatura y parámetros físico-químicos del medio ambiente ligados a la dinámica de la inundación). Las variaciones de estos rasgos de vida son confrontadas al origen geográfico de las poblaciones y a la estructuración genética observada.

- **Experimentación, tests de hipótesis**

A fin de someter a prueba el significado adaptativo de las diferencias fenotípicas observadas en los peces en función del origen poblacional de los individuos, son analizadas las modificaciones eventuales de los rasgos de vida anteriormente observados en las condiciones naturales, en condiciones controladas en la estación experimental piscícola de Pirahiba. La experimentación también permite estudiar la dinámica de las poblaciones de parásitos en relación con la biología de los hospederos, así como las posibilidades de infestaciones cruzadas entre especies o poblaciones de huéspedes.

- **Valorización**

Los protocolos necesarios para los tests de hipótesis llevados a cabo en la estación piscícola de Pirahiba necesitan el dominio del ciclo biológico en cautiverio de las especies estudiadas. El control de la reproducción (inducida o no) y las condiciones óptimas (alimentación densidades de cría, características físico-químicas del agua…) para el desarrollo de los primeros estadios de vida de estas especies serán determinados en laboratorio. En el ámbito de la piscicultura, los resultados contribuirán al mejoramiento de las técnicas de cría y al manejo razonado de los stocks de genitores de especies y poblaciones de peces de la Amazonía.

Composición del equipo implicado (2001-2002)

- **Jean François Renno**, CR1, responsable de la implantación, genetista, destinado a la UMSA, Bolivia,
- **Rémi Dugué**, TCN, zootécnico, destinado a la UMSA, Bolivia,
- **Jesus Nuñez Rodriguez**, CR1, ecofisiólogo, UMSA, Bolivia,
- **Fabrice Duponchelle**, CR2, ecólogo, UMSS, Bolivia,
- **Antoine Pariselle**, CR1, parasitólogo, UMSS, Bolivia,
- **Frédéric Mahé,** voluntario civil internacional, UMSA, Bolivia,
- **Marc Legendre**, DR2, fisiólogo, que interviene a partir del GAMET, Montpellier,
- **Laurent Pouyaud**, CR1, genetista, que interviene a partir del GAMET, Montpellier,

- Partenarios bolivianos

- Instituto de Biología molecular de "la Universidad Mayor de San Andrés" (**IBMB, UMSA**): Dra V. Iñguez y Lic. P. Torrico investigadores,
- Instituto de Ecología de "la Universidad Mayor de San Andrés" (**IE, UMSA**): Lic. J. Sarmiento, investigador,
- Unidad de limnología y recursos acuáticos de "la Universidad Mayor de San Simon" (**ULRA, UMSS**): Lic. V. Camacho y Lic. M. Brown, investigadores,
- Centro de Investigación sobre los Recursos Acuáticos de "la Universidad Técnica del Beni" (**CIRA, UTB**) : Dr. Lucio Torrez y Dr Jesús Jimenez, investigadores.

Colaboraciones externas

- **P. Berrebi**, UMR 5119, CNRS-UMII, Montpellier, Francia
- **F. Bonhomme**, UMR 5000, CNRS-UMII, Montpellier, Francia
- **J. Lazard** et **L. Dabbadie**, UR Acuicultura, CIRAD, GAMET, Francia
- **P. Volckaert** et **P. Van Damme**, Laboratorio de Ecología Acuática, Katholieke Universiteit, Leuven, Bélgica
- **INPA, Brasil**
- **IIAP, Perú**

Acciones realizadas o en curso para el año 2002

- Continuación del muestreo y su seguimiento,
- Primeras observaciones sobre la sistemática de los Monogenes branquiales,
- Puesta a punto de las técnicas de estudio del polimorfismo de los introns (EPIC),
- Puesta a punto de las técnicas para la lectura de edad del conjunto de las especies estudiadas,
- Puesta a punto de las técnicas de histología y citología del conjunto de las especies estudiadas,
- Desarrollo de las estructuras experimentales,
- Constitución inicial de stock de genitores en la estación de Pirahiba,
- Primeras reproducciones y cría larval de Piaractus brachypomus en la estación,
- Resultados científicos (algunos publicables) en genética (Cichla monoculus, Pseudoplatystoma tigrinum, P. fasciatum, Colossoma macropomum, Piaractus Brachypomus), biología de la reproducción (Pygocentrus nattereri), crecimiento (Pygocentrus nattereri, Cichla monoculus).

Resumen de los Resultados obtenidos

. Piaractus brachypomus y Colossoma macropomum

Las poblaciones de las dos especies, Piaractus brachypomus y Colossoma macropomum, morfológicamente cercanas, tienen rasgos de vida similares. Ambas especies realizan migraciones para la reproducción. En Bolivia P. brachypomus frecuenta más bien las aguas arriba de los ríos y C. macropumum las aguas abajo. Las distribuciones están, no obstante, soprepuestas.

La estructura genética a partir de isoenzimas estudiadas para muestras de los ríos Mamoré e Itenez, muestra una diversidad genética dos veces más fuerte en P. brachypomus que en C. macropumum. Además, el pool genético de P. brachypomus contiene en parte el de C. macropumum (ver figura). C. brachypomus sería un complejo de especies o formaría híbridos (teniendo una

morfología de C. brachypomus) con C. macropomum. Los primeros resultados deben ser fundamentados.

La época de reproducción de Piaractus brachypomus es conocida como de corta duración en medio natural (noviembre a febrero). Sin embargo los primeros seguimientos realizados en la estación de Pirahiba tienden a mostrar que es más amplia (septiembre a marzo).

. Pseudoplastytoma fasciatum y P. tigrinum

Las poblaciones de ambas especies Pseudoplastytoma fasciatum y P. Tigrinum, morfológicamente cercanas, tienen rasgos de vida similares. Ambas especies realizan migraciones tróficas y para la reproducción. En Bolivia P. tigrinum frecuentaría más bien aguas arriba de los ríos y P. tigrinum aguas abajo. Las distribuciones están, no obstante, superpuestas.

La estructura genética estudiada a partir de RFLP de fragmento de ADNmt de la Dloop y del Citocroma B, muestra una diversidad haplotípica media. Las dos especies están totalmente diferenciadas con una estructura intraespecífica, mostrando en la especie P. tigrinum una diferenciación genética muy significativa entre poblaciones del río Itenez por una parte, y la del los ríos Mamoré y Madre de Dios, por otra parte. P. fasciatum muestra una diversidad haplotípica más elevada en el río Itenez que en los otros, pero esta diferencia observada no es significativa según los tests sobre los estimadores de Fst . La estructura genética observada podría tener una explicación en la posición aguas arriba de P. tigrimum con poblaciones geográficamente más aisladas entre ellas (fuerte estructuración genética) que las de P. fasciatum aguas abajo, pudiendo circular más fácilmente de un río al otro a nivel de su confluencia (débil estructuración genética). Estos resultados serán objeto de una publicación cuando sean puestos en relación con la morfología y el crecimiento.

. Cichla monoculus

Las poblaciones de Cichla monoculus son sedentarias particularmente en las lagunas, y esta especie, como muchos cichlidés, forma parejas que vigilan sus huevos y sus larvas.

La estructura genética fue estudiada a partir del polimorfismo intrónico (EPIC), de las isoenzimas y los RFLP del ADNmt. El estudio de los EPIC, cuando se consideran muestras de los tres ríos, Madre de Dios, Mamoré e Itenez, no

muestra coherencia geográfica. No obstante, ciertos haplotipos de ADNmt son propios de individuos del Madre de Dios.

El estudio del polimorfismo enzimático de las muestras del río Itenez muestra una estructuración genética compleja. Una AFC y tests sobre los estimadores del Fst y Fis permiten distinguir tres entidades genéticas diferenciadas: una entidad que reagrupa individuos de diferentes lagunas (Sala y Larga) en la cual no se observa desequilibrio a la panmixia (!!!), y dos entidades sacadas en dos años diferentes (1999, 2000) en desequilibrio y muy diferenciadas una de la otra dentro de la misma laguna (Sala). Esta estructura sugiere la existencia, dentro de la misma especie, de comportamientos primero sedentarios que favorecen la constitución de grupos emparentados luego nómadas, o la existencia de varias especies en formación o nuevamente formadas (?) al interior de C. monoculus. Estos resultados seràn publicados.

En lo que concierne a la reproducción de esta (o estas ?) especie(s), la bibliografía existente (referente principalmente a Vénézuela y Brasil) tiene en cuenta una actividad de reproducción limitada al período de subida de las aguas, e indica que una misma hembra sólo se reproduciríía una sola vez en cada época de reproducción. Nuestros primeros resultados muestran que el periodo de reproducción sería mucho más largo y se extendería hasta al menos una parte del período de aguas altas. Asimismo, la presencia de varias oleadas de ovocitos en gónadas « maduras » y la captura de hembras en vitelogénesis avanzada guardando alevines en su nido, tenderían a probar que una hembra se reproduciría varias veces durante la época de reproducción.

Pygocentrus nattereri

La biología de la reproducción y el crecimiento de esta especie de primera importancia para la pesca de las poblaciones ribereñas fueron comparados entre muestras del río Mamoré y muestras del río Itenez. En las muestras de los dos ríos la madurez sexual de los dos sexos está entre 10-16 meses (120-130 cm). Los desoves se escalonan de septiembre a febrero, la fecundidad varía en función del peso, entre 8300 a 1900000 ovocitos para un peso respectivo de 300 y 700 g.. El crecimiento inicial hasta 3 años es más rápido en las poblaciones del Mamoré que en las de las muestras del Itenez. Los primeros resultados adquiridos sobre esta especie serán objeto de una publicación.

Formación

Los investigadores y ITA establecidos en Bolivia participan en la formación de estudiantes de Licenciatura, y Maestría de las Universidades UMSA y UMSS. Participan también en la implementación de formaciones conjuntas entre las Universidades bolivianas y las Universidades francesas, en particular la de Montpellier II. De esta manera, el laboratorio Genoma Poblaciones Interacciones (UMR 5000, CNRS-UMII) dirigido por el Dr. F. Bonhomme acogerá nuevamente en el 2002 en período de práctica a un colaborador boliviano, el Lic. JP Torrico, quien se beneficia de una beca del DSF dentro del marco de la formación continua.

Asesoramiento 2001-2002, asegurado por los miembros del equipo

Diploma de Licenciatura

- F. Lino (defensa prevista para octubre de 2002). Biología de la reproducción de las poblaciones de peces Pseudoplatystoma tigrinum y P. fasciatum de la cuenca amazónica boliviana. Licenciatura, Instituto de Ecología UMSA (Bolivia). Asesor J. Nuñez Rodriguez .

- R. Rivera (defensa prevista para noviembre de 2002). Estructura genética de las poblaciones de las especies migratorias Pseudoplatystoma tigrinum y P. fasciatum. Licenciatura, Instituto de Biología molecular y Biotecnología UMSA (Bolivia). Asesor J.F. Renno.

- C. Rodrigo (defensa prevista en 2003). Estructura genética de las poblaciones de las especies migratorias Piaractus brachypomus y Colossoma macropomum. Licenciatura, Instituto de Biología molecular y Biotecnología UMSA (Bolivia). Asesor J.F. Renno.

- C. Acevey (defensa prevista para diciembre de 2002) « Estructura de la población y hábitos alimenticios del pejerrey (Odonthes bonariensis) en el ecosistema de la laguna Alalay, Cochabamba, Bolivia». Unidad de Limnologia y Recursos Acuáticos, UMSS (Bolivia). Asesor F. Duponchelle y D. Castellón.

Diploma de maestría

- J. Barreta (en curso). Genética de las poblaciones de las especies migratorias Pseudoplatystoma tigrinum y P. fasciatum. Maestría, Instituto de Biología molecular y Biotecnología UMSA (Bolivia). Asesor J.F. Renno.

- J.P. Torrico (en curso). Filogeografía evolución comparada de especies amazónicas filogenéticamente alejadas: Pseudoplstystoma tigrinum, P. fasciatum, Piaractus brachypomus, Colossoma macropomum, Pygocentrus nattereri, Cichla monoculus, Astronotus crassipinis. Asesor J.F. Renno.

- H. Muñoz Saravia (defensa prevista para diciembre de 2002). Distribución, estructura de edades, reproducción y aprovechamiento del tucunaré (Cichla monoculus) en el río Paragua, Santa Cruz, Bolivia. Unidad de Limnología y Recursos Acuáticos, UMSS (Bolivia). Asesor F. Duponchelle y P. Van Damme.

- F. Marcello Carvajal Vallejos (defensa prevista para diciembre de 2003). « Comparación de las estrategias de reproducción de Cichla monoculus en las aguas blancas del río Mamoré y las aguas negras del río Itenez. ». Unidad de Limnologia y Recursos Acuáticos, UMSS (Bolivia). Asesor F. Duponchelle.

- L.Esther Maldonado S. (defensa prevista para diciembre de 2003). "Eco fisiología de la reproducción y crecimiento de Colossoma macropomum y Piaractus brachypomum en las Cuencas del Mamore e Itenez." Unidad de Limnología y Recursos Acuáticos, UMSS (Bolivia). Asesor Jesus Nuñez.

Diploma de DEA

- C. Ibañez (obtenido en septiembre de 2002). Genética de las poblaciones y ecología de Cichla monoculus en la cuenca de la amazonía boliviana. DEA ecología y evolución, Universidad de Montpellier II. Co-asesores J.F. Renno y P. Berrebi.

Diploma de doctorado

- N. Hubert (en curso). Genética de las poblaciones y comparación de la filogeografía del complejo de especies Serrasalmus rombeus, de Serrasalmus elongatus y Mylossoma duriventre. Tesis de doctorado MNHN co-asesores J.F. Renno y D. Paugy.

Acciones programadas para el año 2003

- Implementación de una red de encuestadores-pescadores en el Mamoré y el Guaporé para completar las capturas de especies raras y reducir el paso de tiempo de muestreo.

- Muestreo para el estudio genético y el estudio de crecimiento y parasitología sobre los ríos Beni y Madre de Dios
- Continuación de la caracterización genética (filogenias, filogeografía, estructuras de las poblaciones) y del seguimiento bimestral de los rasgos de vida de las poblaciones del Mamoré y del Guaporé para cada una de las especies.
- Secuenciación de la región de control del ADN mitocondrial a fin de establecer la filogeografía de las especies del programa y de compararla con su rasgo de historia de vida y la paleogeografía.
- Descripción morfológica de los Monogenes branquiales presentes en las diferentes especies huéspedes estudiadas y puesta en evidencia de la eventuales diferencias de poblaciones parasitarias entre poblaciones huéspedes geográficamente distintas.
- Identificación de la posición de las poblaciones en la cadena trófica y de la utilización metabólica de diferentes fuentes alimentarias a través del análisis de isótopos estables (^{13}C, ^{15}N).
- Terminar la constitución de los stocks experimentales en la estación de Pirahiba : captura y devolución de genitores de cada una de las especies desde el Mamoré y el Guaporé hasta la estación de Pirahiba.
- Prueba y mejoramiento de los circuitos cerrados en la estación de Pirahiba.
- Continuar con la puesta a punto de las técnicas de reproducción inducida y de cría larval en los Serrasalminae y si posible de los Pimelodidae en Pirahiba, y experimentos de reproducción y de cría de los Cichlidae seleccionados (Cichla monoculus, Astronotus crassipinis).

LA WILDLIFE CONSERVATION SOCIETY, LA CONSERVACIÓN Y EL MANEJO DE FAUNA

Por Robert Wallace (Director de WCS Madidi)

La Historia de WCS en Bolivia

•1895 – Creación de WCS en el Zoológico de Nueva York, EEUU.
•1960's – Primer trabajo en Bolivia de Dr. William Conway sobre Flamencos
•1980's – Financiamiento a proyectos pequeños sobre Ara rubrogenys, Cracidos, Siriono
•1991 – Llegada de Dr. Andrew Taber y el inicio de un Programa Nacional para Bolivia

El Enfoque del Programa Nacional I: Investigación

•Investigación – PNNoel Kempff Mercado, RVS Ríos Blanco Y Negro, Estancia de Larsson, PNANMI Kaa-Iya, PNAmboro, PNCarrasco, ANMI Apolobamba, PNANMI Madidi, TCO Tacana, RBTCO Pilón Lajas.
•Ungulados, Primates, Carnívoros, Cracidos, Relevamientos de Biodiversidad

El Enfoque del Programa Nacional II: Educación

•Alrededor de 100 artículos científicos sobre la vida silvestre de Bolivia
•Alrededor de 60 tesis de licenciatura y maestría supervisadas y financiadas
•Con fauna – Museo de Historia Natural Noel Kempff Mercado
•Practicas en el campo y cursos para más de 150 estudiantes
•Apoyo como docentes invitados en cursos de biología en Pando, La Paz, Cochabamba y Santa Cruz

El Enfoque del Programa Nacional III: Conservación

•A nivel de Áreas Protegidas (Kaa-Iya, Madidi, Apolobamba)
•A nivel de TCO's (Tacana, Izozog)
•A nivel de Comunidades Locales (Izozog, Norte de La Paz)
•Con concesiones forestales (BOLFOR)
•Con Reservas Privadas (Estancia de Larsson)

El Programa Paisaje en el Norte de La Paz

•1999 – Hasta el presente

•Apolobamba, Madidi y TCO Tacana (Pilón Lajas)

•Parte de un programa transversal de WCS que incluye también Yasuni en Ecudaor y Noubale Ndoki en Congo

•Enfocado en integrar el manejo de las área protegidas con sus alrededores

Objetivos del Programa

•Establecer líneas base y monitorear las especies paisaje y el contexto de paisaje en el que se encuentran.

Especies Paisaje: Concepto

Especies Paisaje: Norte de La Paz

Manejo y Conservación de la Fauna Silvestre con Comunidades Locales

INVESTIGACIÓN APLICADA PARA MANEJO Y CONSERVACIÓN DE LA FAUNA SILVESTRE

Por Robert Wallace (Director de WCS/Madidi)

Actividades realizadas: biodiversidad

•Relevamientos de biodiversidad: aves y mamíferos

•Descripción (cualitativa y cuantitativa) de la vegetación

•Documentación sobre la presencia de nuevas especies: Lagotrhrix

•Uso de hábitat de tapir, uso de hábitat y abundancia de taruka

Actividades realizadas: especies paisaje

•Jucumari: descripción del hábitat, evaluación de abundancia relativa, dieta. Futuro: telemetría satelital.

•Jaguar: estimación de densidad (trampas cámara). Futuro: telemetría satelital.

•Tropero: descripción del hábitat, evaluación de abundancia relativa. Futuro: radiotelemetría y telemetría satelital

Beneficiarios

•Administración y planificación de las áreas protegidas

•Comunidades locales

•Turistas

•Comunidad científica

Actividades Futuras

- Microzonificación TCO Tacana
- Zonificación de Madidi
- Reglamentos internos de uso de RRNN en la TCO Tacana
- Talleres de planificación municipal – Apolo II
- Aprovechamiento de lagarto en la TCO Tacana
- Aprovechamiento de incienso alrededor de Apolo
- Cóndor: evaluación del tamaño poblacional, telemetría satelital
- Vicuña: métodos de estimación de abundancia, capacidad de carga
- Surubí: uso por comunidades locales. Nada en ecología
- Municipios involucrados

Unidades del IE que podrían involucrarse

- CBF
- HNB
- CAE
- Limnología – ORSTOM
- (Biología molecular)

MANEJO Y CONSERVACIÓN DE LA FAUNA SILVESTRE CON COMUNIDADES LOCALES

Por Humberto Gómez (WCS)

El Enfoque de Trabajo

- Nuestro enfoque está diseñado para asegurar la participación de las comunidades y asegurar un sentido de propiedad del proyecto, y así también del manejo y conservación de los recursos naturales.
- Por eso, trabajamos con comunidades que nos invitan como apoyo técnico en sus actividades de manejo de los recursos naturales.
- El proceso del proyecto comunal es llevado a cabo bajo el enfoque de la investigación colaborativa

Investigación Colaborativa

•Premisa: para conservar hay que conocer, comprender y cuestionar.

•Usamos el "Ciclo de la Indagación" como una guía para la elaboración del proyecto y su diseño, así como para la discusión de los resultados. Una participación completa es requerida.

•Siempre está basada en las decisiones de la comunidad.

•El trabajo consiste de una serie de talleres y trabajo colaborativo entre la comunidad y un investigador.

•Fortalezas: relación e involucramiento de la comunidad

•Debilidades: ¿proceso lento?

Actividades Actuales

•Proyecto de aprovechamiento sostenible de miel de abejas nativas (Meliponidae)

•Monitoreo y manejo de cacería

•Monitoreo de pesca

•Evaluación de áreas potenciales para uso turístico

•Mitigación de pérdidas provocadas por vida silvestre a maizales

Beneficiarios

•Comunidades locales en la TCO Tacana, ANMI Apolobamba, ANMI Madidi

•Estudiantes de la Carrera de Biología – UMSA

•Comunidad científica

Actividades planificadas

•Evaluación de la sustentabilidad de la cacería a nivel de la TCO Tacana

•Compatibilización de la cacería y actividades turísticas

•Sustentabilidad del aprovechamiento de miel

•Medidas de mitigación para reducir los daños a maizales por vida silvestre

MANEJO Y CONSERVACIÓN DE LA FAUNA SILVESTRE A NIVEL SUPRACOMUNAL

Por Lilian Painter y Renata Tejada (WCS)

Objetivos

•Asegurar el manejo de la fauna a nivel regional

•Buscar intereses comunes entre diferentes actores en relación a la conservación y manejo de los recursos naturales

•Compatibilizar los "planes de manejo" de diferentes regiones en el paisaje

Actividades: estrategia TCO Tacana

- La TCO Tacana es estratégica para el manejo del PN y ANMI Madidi
- Interés común en la conservación y manejo de los recursos naturales
- Primera fase: diagnóstico general (población y uso de RRNN) de las 20 comunidades
- Segunda fase: planificación de la estrategia
- Tercera fase: zonificación preliminar de la TCO

Actividades: plan de manejo de Madidi

- Una de las áreas protegidas más importantes del país: biodiversidad
- Elaboración con alta participación de las comunidades que viven en y alrededor de las áreas protegidas
- La fase de diagnóstico ha sido finalizada
- Compatible con la zonificación de la TCO Tacana

Actividades: planificación municipal

- Talleres de planificación ambiental a nivel municipal – Apolo y Mancomunidad de Apolobamba
- Mitigación de daños producidos por vida silvestre: depredación de ganado

Beneficiarios

- Comunidades locales
- TCO Tacana
- PN Madidi

ACCIONES REALIZADAS HASTA LA FECHA EN EL PROGRAMA DE MANEJO DE VIDA SILVESTRE

Las acciones realizadas hasta la fecha para el Programa de Manejo de Vida silvestre entre la Colección Boliviana de fauna y la WCS son las siguientes:

- Reuniones mensuales para:
  - Club de revistas y plan de seminarios (a iniciar en noviembre 2002)
  - Revisión de programas y diseño de nuevas materias optativas (Laboratorio ecología de poblaciones, Estadística II, Comportamiento animal, Métodos zooecológicos, Manejo de vida silvestre
- Pasantías y tesis
- Biblioteca de WCS
- Este taller

ANEXO 3

ENCUESTA A ESTUDIANTES

Como participante del taller
"Implementación y desarrollo del programa de conservación y manejo de fauna"
Te solicitamos llenes el siguiente cuestionario.

Servirá para llevar una propuesta más elaborada a la comisión académica de la carrera.

El cuestionario deberá ser entregado el día lunes 23 de septiembre en la biblioteca de la carrera del instituto de ecología hasta las 12:00

PARTE I.

AYUDANOS A DEFINIR LOS OBJETIVOS DE LAS ESPECILIDADES DE "MANEJO DE VIDA SILVESTRE" EN LA CARRERA DE BIOLOGÍA

META: La sociedad boliviana (según su realidad y necesidades) requiere que la Carrera de Biología obtenga ciertas transformaciones en el modo de actuar, pensar y sentir del futuro profesional (conocimientos, habilidades, hábitos, actitudes, convicciones, sentimientos, ideales y valores). Esto define su "nicho ecológico" en la sociedad, donde debe interaccionar y no competir con otros profesionales.

¿Consideras que para el cumplimiento de esta meta el biólogo debería seguir líneas de especialización en la CB definidas con ciertas asignaturas electivas de especialización?
SI_____
NO_____

¿ Qué líneas de especialización cree que la carrera de Biología debería ofrecer?

1_____
2_____
3_____
4_____
5_____
6_____

Para lograr una meta nos planteamos objetivos, en educación existen dos tipos, los instructivos (transformación de los estudiantes a nivel de tareas de producción y servicios que como futuros profesionales realizarán) y los educativos (transformación de la personalidad de los estudiantes en respuesta a las aspiraciones de la sociedad).

AL NIVEL INSTRUCTIVO

¿Qué tareas de producción y servicio crees que deben cumplir los biólogos especializados en manejo de vida silvestre?

1_____
2_____
3_____
4_____
5_____
6_____
7_____
8_____
9_____
10_____

Para responder a estas tareas ¿qué conocimientos deben tener los biólogos especializados en manejo de vida silvestre?

1_____
2_____
3_____
4_____
5_____
6_____
7_____
8_____
9_____
10_____

Para responder a estas tareas ¿qué habilidades (métodos, procedimientos, técnicas de trabajo, etc.) deben tener los biólogos especializados en manejo de vida silvestre?

1_____
2_____
3_____
4_____
5_____

6_____
7_____
8_____
9_____
10_____

AL NIVEL EDUCATIVO
¿Consideras que la CB debe lograr una transformación de la personalidad de los estudiantes?
SI_____
NO_____

Si tu respuesta es afirmativa ¿qué hábitos, actitudes, convicciones, sentimientos, ideales y valores deberían tener los biólogos especializados hábitos, actitudes, convicciones, sentimientos, ideales y valores en manejo de vida silvestre?
1_____
2_____
3_____
4_____
5_____
6_____
7_____
8_____
9_____
10_____

¿Consideras que los objetivos y contenidos del plan de estudios (Pensum) y de las asignaturas están cumpliendo esta meta?
SI_____
NO_____

Si respondiste NO pasa a la segunda parte del cuestionario.

PARTE II.
AYUDANOS A REDEFINIR EL PLAN DE ESTUDIOS DE LA CARRERA DE BIOLOGÍA PARA IMPLEMENTAR LAS ESPECIALIDADES EN CONSERVACIÓN Y MANEJO DE VIDA SILVESTRE.

(Para responder este apartado, por favor no considerar necesariamente los actuales objetivos, contenidos, forma de enseñanza y docentes de las asignaturas, pues todos estos factores pueden también cambiarse si es necesario).
Es necesario considerar que los objetivos generales de la CB y sus especialidades se traducen en objetivos de cada asignatura, y estos objetivos se plasman en CONTENIDOS de las asignaturas. Discutir objetivos y contenidos de asignaturas rebasan esta encuesta. Pero para responder el siguiente cuestionario considera que en una asignatura se puede introducir varios contenidos con coherencia programática y que en total sumen una determinada carga horaria, y una carrera y sus especialidades deben tener un número fijo de asignaturas. Concretamente no deseamos que coloques contenidos como asignaturas o viceversa.

También recuerda que las troncales son asignaturas que deben llevar todos los fututos profesionales biólogos, es decir, sus objetivos y contenidos son de interés y utilidad para todos.
Las electivas tienen objetivos y contenidos de interés sólo para los estudiantes que deciden profesionalizarse en una de las líneas de especialización.

¿Qué asignaturas troncales crees que no deberían darse más en la CB?
1_____
2_____
3_____
4_____
5_____
6_____
7_____
8_____
9_____
10_____

¿Qué asignaturas troncales consideras que deberían pasar a ser electivas (como asignaturas completas o como contenidos) de la especialidad conservación y manejo de fauna silvestre?

Materia

¿Crees necesario que se debe revisar sus objetivos y contenidos?

1

SI_____ NO_____

2

SI_____ NO_____

3

SI_____ NO_____

4

SI_____ NO_____

5

SI_____ NO_____

6

SI_____ NO_____

7

SI_____ NO_____

8

SI_____ NO_____

9

SI_____ NO_____

10

SI_____ NO_____

¿Qué asignaturas troncales consideras que deberían pasar a ser electivas (como asignaturas completas o como contenidos) de la especialidad conservación y manejo de flora silvestre?

Materia

¿Crees necesario que se debe revisar sus objetivos y contenidos?

1

SI_____ NO_____

2

SI_____ NO_____

3

SI_____ NO_____

4

SI_____ NO_____

5

SI_____ NO_____

6

SI_____ NO_____

7

SI_____ NO_____

8

SI_____ NO_____

9

SI_____ NO_____

10

SI_____ NO_____

¿Qué asignaturas crees que deben pasar a ser troncales? (pueden ser asignaturas totalmente nuevas o asignaturas que actualmente son electivas)

Materia ¿Cuáles deberían ser los contenidos "clave"?

1_____

2_____

3_____

4_____

5_____

6_____

7_____

8_____

9_____

10_____

¿Qué asignaturas crees que deben crearse como nuevas electivas para la especialidad de conservación y manejo de fauna silvestre?

Materia ¿Cuáles deberían ser los contenidos "clave"?

1_____

2_____

3_____

4_____

5_____

6_____

7_____

8_____

9_____

10_____

¿Qué asignaturas crees que deben crearse como nuevas electivas para la especialidad de conservación y manejo de flora silvestre?

Materia ¿Cuáles deberían ser los contenidos "clave"?

1_____
2_____
3_____
4_____
5_____
6_____
7_____
8_____
9_____
10_____

Hasta tu semestre (especifica), la carrera ha satisfecho tus expectativas de especialización. Por qué?

SI_____

_____

NO_____

_____

¿Crees que el pensum actual está estructurado para afrontar la realidad del país? Explique por qué

_____
_____
_____
_____
_____

¿Qué requisitos consideras que deberían tener los docentes para poder dictar materias de conservación y manejo de vida silvestre?

_____
_____
_____