



Biodiversity Conservation at the Landscape Scale

A Program of the Wildlife Conservation Society
Supported by the USAID/EGAT Global Conservation Program

Maya Biosphere Landscape Conservation Area, Guatemala

Annual Report

October 2004 – September 2005

I. Summary of Activity Status and Progress

a. Introduction/Summary:

The Maya Biosphere Reserve (MBR) is the largest protected area complex in Mesoamerica, accounting for one-seventh of the surface area of Guatemala. Increasingly under threat, it forms the core of a tri-national system of protected areas in Guatemala, Belize, and Mexico, an area known as the “*Selva Maya*” (Maya Forest). To ensure conservation of the MBR’s biological diversity, the Living Landscape Program in Guatemala works with local, national, and international organizations to develop adaptive and participatory strategies to reduce threats to wildlife, develop and monitor sustainable mechanisms to reduce threats to wildlife and ecosystems, and disseminate best practices for conservation of the MBR landscape and the entire Maya Forest.

During FY 2005 the Maya Biosphere Living Landscape Program executed its second year of GCPII support, making important progress towards accomplishing our conservation goals in the MBR landscape. In general terms, most of our MBLLP interventions in the reserve were focused on one of two main goals: a) holding back the eastwardly advancing Laguna del Tigre agro-pastoral frontier; and b) maintaining the excellent ecological integrity of the eastern, intact block of MBR forest, being managed within community forest concessions and successful national parks such as Tikal and Mirador-Rio Azul. We developed preliminary conservation landscapes for our six selected landscape species, expanding the coverage of these models to the adjacent areas of Mexico and Belize. With the assistance of GCPII and other donors, we were able to continue our essential forest fire and deforestation monitoring activities, and provide this information to numerous stakeholders and national actors, including the Guatemalan government. Community-based efforts in Uaxactún, Paso Caballos, and other villages continued yielding positive results, such as a decrease in the impacts of forest fires in their respective areas, and an increase in economic income at the village level. Last but not least, Maya Biosphere Living Landscape Project personnel have become widely recognized as among the best field technicians in the MBR; in general WCS is commonly acknowledged as *the institution in the field* that is most familiar with local trends, and that WCS is able to provide accurate data on the current state of biodiversity and conservation efforts in the area.

That said, a number of challenges remain. For example, from 2003-2004, 22,913.63 hectares of forest loss were recorded in the 2.1 million hectare Maya Biosphere Reserve (*see Activity 2.6*), primarily along an invasion frontier on the western edge of Laguna del Tigre National Park. Given these dire conditions and their association with the insidious forest fires and land invasions, our general programmatic strategy has been to invest the greatest possible amount of funds in field-based interventions and other activities that serve as deterrents to habitat destruction in the sizable and still largely intact eastern block of the Maya Biosphere. For this reason, we have not focused as much as desired on some of the biological aspects of the project, specifically those related to attaining/developing data on wildlife (landscape) species. In such a pressured

landscape, many priority interventions are readily evident. One of the most preoccupying aspects of our project is that we lack the vehicles to reach the remote sites reliably. In addition, other “external conditions” continue to limit the effectiveness of our conservation efforts. Among them, the lack of governance, an anemic legal system, extensive narcoactivity, organized land invasions, forest fires, and corruption all converged to require us to adaptively manage our operations over time. For example, this year we have not been able to execute a point count study of macaws to get a first estimate on how many exist in the MBR due to insecurity in the western section of the landscape (i.e. Laguna del Tigre). Despite the significant challenges however, GCPII activities have resulted in some important and desired steps forward for the Maya Biosphere Reserve, as well as an expansion of the foundation for the subsequent years of the project.

b. Highlights:

- **Protection of the eastern Laguna del Tigre Ecosystem:** Support from USAID GCPII was aimed at the protection of macaw nesting sites, while their dense forest habitat was strengthened by financial support from the Critical Ecosystem Partnership Fund (CEPF), and subsequently by USAID Guatemala in conjunction with the US Department of Interior. The combination of funding from the aforementioned donors permitted the implementation of a WCS-CONAP promoted strategy known as “the shield”: referring to a north-south line of protection located within Laguna del Tigre National Park and the adjacent biological corridor. Though this eastern section of the Laguna del Tigre ecosystem continued to face great pressure, nearly all of the areas east of the shield escaped fire impact in 2005 as a result of the presence of WCS, CONAP, archaeologists, and IDAEH personnel. Very importantly, the fire combatants hired from local villages played a key role in controlling fires along this invasion frontier.
- **Alliance building with conservation partners:** Substantial inroads were made in garnering support among local, national, and international stakeholders for conservation actions. Among the allies already involved or interested in developing conservation alliances are: the village of Paso Caballos, the community forest concession of AFISAP, the village of Buen Samaritano, the village of Pipiles, the community forest concession of Carmelita, and the community forest concession of La Colorada. In terms of international support, WCS Guatemala has developed an important new partnership with Rainforest Alliance to promote the management of a xate processing house in Uaxactún. In addition, a strong partnership has emerged with the Critical Ecosystem Partnership Fund (CEPF) to conserve and protect the remaining areas of the Laguna del Tigre Ecosystem (see above). CEPF has at this point funded two grants to WCS Guatemala, including the development of the Laguna del Tigre Master Plan (in process), and a project entitled “emergency protection and conservation of the eastern Laguna del Tigre ecosystem”.
- **Discovery of culturally significant sites and relics:** WCS efforts in Laguna del Tigre and other areas continue to produce important contributions for the conservation of the cultural patrimony of Guatemala. In April of 2005, proyecto Arqueológico Waka’-El Perú and WCS Guatemala co-sponsored a joint expedition to the ancient Maya site of La Corona, in the Laguna del Tigre Biological Corridor. Two years of WCS efforts to protect the site and construct a guard camp were rewarded during the expedition by the discovery of two pristine and highly significant glyphic panels dating to the seventh century AD. Lead expedition archaeologist, Dr. Marcello Canuto of Yale University, spotted the panels in a looters’ trench as he assisted surveyors mapping the site. The significance of the panels lies in their relationship to 8 other panels known to have been looted from Guatemala during the 1970’s; yet archaeologists never could determine their place of origin. With this discovery, the 8 panels (all in the USA and Europe) can be linked to La Corona. In addition, the panels are also extremely significant due to their narratives, which recount the struggles for supremacy between Tikal and Calakmul, the two most powerful Maya city-states during the apogee of the Maya. The two panels were rescued from the field and deposited with the national archaeological institute, IDAEH, where they are now protected. A major announcement on the find will be forthcoming by the Guatemalan Government when the site can be adequately protected. It is also expected that National

Geographic will highlight the discovery as soon as the Guatemalan Government provides authorization. (See Appendix 7, photo of panel), thereby helping to attain more interest in conserving the area in the future.

- Advances in updating the Laguna del Tigre Master Plan:** In Guatemala, perhaps no more challenging conservation task exists than the stabilization of Laguna del Tigre (LdT) National Park and the consolidation of important conservation targets in its area of influence. Despite this enormous challenge, the conservation coalition lead by WCS, and including CONAP, IDAEH, Tropico Verde, CALAS, ProPeten, and the CEPF have advanced in updating the Master Plan to the point of developing a preliminary proposal for zoning based on group consensus. Inevitably, large sections of the (former) park will be left in the hands of illegal communities through cooperative agreements and modifications of the internal zoning of the park. Nevertheless, given the Guatemalan Government’s understandable trepidation towards strict enforcement of the law under the current conditions, this type of “compromise” holds the only promise for saving the eastern LdT areas important for scarlet macaws, and other dense forest habitat. Without this social “readjustment” (i.e. updating) of the Master Plan, the entire Laguna del Tigre ecosystem would be lost. A first draft of the complete 2006-2010 Laguna del Tigre Master Plan will be available for public and governmental review in November, 2005. Parallel to the “compromise” inherent in the Laguna del Tigre Master Plan, CONAP, the Critical Ecosystem Partnership Fund, and archaeologists are planning continued investments in the eastern, yet intact section of the park. This joint strategy of compromise in western Laguna del Tigre, and continued strengthening of the eastern section of the park provide the Guatemalan park system with the most realistic option for conserving the east of the park, while also avoiding the negative consequences of doing nothing, “compromising” without preventing the replication of continued land grabs in the eastern section of the park, or entering into a bloody civil conflict in an attempt to apply the law.
- Appearance of a harpy eagle in the Maya Biosphere Reserve:** Peregrine Fund staff contacted WCS staff and CONAP to inform us that a reintroduced harpy eagle released in the Rio Bravo Conservation Area of NW Belize has migrated some 90+ kilometers to the SE, and is currently located in the El Zotz Biotope adjacent to Tikal National Park. WCS Guatemala will attempt to support the Peregrine Fund Project by monitoring the bird periodically, and including the species within future Landscape Species analyses.

c. Table of Activity Status

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II. Detailed Description of Progress

a. Key short and long-term program objectives for the reporting period (October 2004 – September 2005)

The overall goal of the Maya Biosphere Landscape Conservation Project (MBLCP) is to conserve wildlife species and their habitat in the Maya Biosphere Reserve while maintaining the economic productivity of renewable natural resources. With this goal in mind, project activities are geared towards the development of solutions to the conservation problems resulting from a lack of field presence and protection, as well as those inherent in “sustainable use” initiatives, including activities such as tourism, NTFP harvesting, and logging. Community participation is seen as an integral, if still developing, aspect of landscape conservation in this approach. Furthermore, monitoring of the reserve and continuous feedback from partners are seen as crucial for developing and reformulating interventions when threats change in severity or when new threats emerge, in essence permitting us to pursue our overall goal using a strategy of “adaptive management”.

In the second year of MBLCP activities, our efforts were guided by three general Objectives:

Objective 1: Develop and adopt a participatory strategy to reduce threats to wildlife in the MBR landscape

Objective 2: Develop and implement sustainable and adaptive mechanisms to strategically address threats across the Maya Biosphere Reserve Landscape

Objective 3: Learning and teaching best practices in the Maya Biosphere Reserve landscape and beyond

More specifically, our principal short-term goal this year was to contribute to the stabilization and protection of Laguna del Tigre, one of the most threatened ecosystems in Mesoamerica. Additional short-term goals included the refinement of information and models on landscape species needs and the development of the first spatially-explicit species “conservation landscapes” (defining the areas sufficient for viable populations of these species) as a foundation for conservation strategies.

Mid-term goals for this year included the strengthening and diversification of working relationships with other stakeholders, including communities, local organizations, international institutions, and the Guatemalan government. In addition, mid-term goals also included the diversification of the funding base for the keystone activities underway. These include our efforts to conserve the eastern sections of Laguna del Tigre, our community-based initiatives, our biological investigations, and most importantly our biological monitoring efforts in conjunction with the CEMEC-CONAP/WCS remote sensing laboratory.

Long-term goals over the next 3 years of GCPII funding include the consolidation of the eastern Laguna del Tigre landscape, the strengthening of Asociación Balam and conservation efforts in Mirador-Rio Azul National Park, and the consolidation of community-based initiatives currently being advanced within this project. Last but not least, the attainment of additional long-term funding sources (i.e. 3-5 years of funding) will be fundamental to ensure the viability of our diverse field-based efforts, as well as the sharing of lessons learned within the national context and beyond.

b. Activity Descriptions

OBJECTIVE 1: Develop an adaptive and participatory strategy to address threats to the wildlife in the Maya Biosphere Landscape

Activity 1.1. Develop an updated and participatory strategy for the conservation of macaws

We continue our association with the Guacamayas sin Fronteras consortium; the other members of this initiative are: ARCAS (Asociación para el Rescate y la Conservación de los Animales Silvestres), FDN (Defensores de la Naturaleza) and CONAP (Consejo Nacional de Areas Protegidas). These institutions jointly elaborated the document “Protocol for handling confiscated macaws in the Maya Biosphere Reserve” (Appendix 1). This document constitutes the guidelines that CONAP will follow to decide the fate of confiscated specimens and also summarizes the necessary requirements for successful liberations. With an estimated annual recruitment of 20-30 fledglings, the possibility of adding another 10 fledglings to the population annually could be critical to the recovery of the species over the short term.

A collaboration with ARCAS to release captive born macaws in Laguna del Tigre was cancelled, fortuitously, because results of the blood tests performed in 2004 by Dr. Moore of the WCS Field Veterinarian Program showed that the captive birds were infected with pathogens that could have infected wild stock. Numerous captive macaw samples taken from the ARCAS facility tested positive for pathogens, including Polyoma Virus, Psittacine Herpesvirus, Aspergillus, Paramyxovirus 1, and Salmonella. In contrast, all wild macaw chicks sampled (in El Peru) received perfect bills of health, making the liberation of a few potentially unhealthy chicks a threat to the integrity of the wild population. The timely intervention of the WCS field vet program helped us avoid what was a well intentioned but in retrospect undesired release of captive birds. At the moment, the project remains on standby while alternative methods for supplementing the wild macaw population are being developed. Among these, two important possibilities are advancing. The first builds on the identification of four macaw nests that have failed to successfully fledge a single chick in the last five years of nest-site monitoring, despite the production of numerous eggs and chicks. The possibility in this case involves the removal of eggs/chicks early on in their development, and their subsequent release following a period where they would be raised in captivity, *in situ*. The second possibility involves replicating the ARCAS breeding experiment for the production of chicks with a private sector individual containing another pool of potential breeders who has approached WCS Guatemala expressing interest in such a project. More details on this possibility are provided in Activity 2.10.

In these communities we also carried out house-to-house awareness-raising and attitude/knowledge assessments, using a poster-book presentation to explain behavioral and ecological aspects of the macaws. We

also inquired as to the local perception of their natural resources, especially the scarlet macaws. In the future, feedback from these consultations will be woven into the Strategy for Macaw Conservation currently under development.

In the northern-most macaw nesting site of Lo Veremos/La Corona, we involved technicians from CONAP and IDAEH¹ in the monitoring of nests and field protection activities. Unfortunately, the insecurity in the area and the kidnapping of several WCS field technicians in May of 2005 prevented us from continuing this activity midway into the nesting season. Although forced to abandon the area, we were dealt an excellent opportunity to inform the public at large about the severe threats to the important natural and cultural resources that exist in the area, namely: the archaeological site known as “Site Q”, which was recently rediscovered by WCS staff and confirmed by a field expedition by Dr. Marcello Canuto of Yale University, and the matrix of wetlands and forest that contain healthy populations of species such as jaguar, white-lipped peccary, Baird’s tapir, Morelet’s Crocodile, and scarlet macaws. Identification of these threats are providing information for adaptation of our program’s conceptual model, and thereby adapting our work to these newly identified areas of concern.

As noted above, the entire macaw protection strategy was supported by the Critical Ecosystem Partnership Fund. This support allowed WCS to synchronize field monitoring efforts (that provide protection via human presence) with protection efforts focused on law enforcement. CEPF funds in many cases allowed the collaboration of the national army and SEPRONA², in addition to CONAP and IDAEH. In addition, CEPF support also helped strengthen LLP program goals such as the installation of infrastructure such as camps and access roads, as well as covering the costs of field supplies and communications. Hopefully, this crucial collaboration by the CEPF will continue in the future.

Activity 1.2. Refine biological models and produce conservation landscapes for landscape species

The spatial requirements of each landscape species (scarlet macaw, jaguar, white-lipped peccary, Baird’s tapir, Morelet’s crocodile, and Central American River Turtle) were mapped in “Biological Landscapes” and overlaid with human activities, or “Human Landscapes”, to determine spatial priorities for conservation in a final “Conservation Landscape”. This evaluation establishes conservation priorities for the contiguous Maya Forest of Guatemala, Belize, and Mexico based upon six landscape species, and assesses the utility of the Landscape Species Approach for conservation in an area of high human pressure.

Habitat suitability models, or “biological landscapes”, were developed for each species. In most cases, models were based upon expert opinion and literature, and related habitat suitability to some combination of other, related landscape parameters such as habitat type, distance to water, elevation, slope, fragmentation, etc. Experts assigned some value of habitat quality to every category of each of these parameters, and then developed rules for ordering and weighting different parameters depending on the biology of the species. In some cases, empirical data from field studies or casual observations were available to validate models or to convert habitat suitability models into true density models.

Of course, wildlife species no longer inhabit their entire potential habitats to full capacity, due to the effects of humans. Changes in habitat quality lower the carrying capacity of the landscape. Increases in mortality or emigration rates lower population sizes and change demographics. In order to better manage the current and future status of wildlife, these anthropogenic threats must be understood. Threats were therefore divided into current threats and future threats. Current threats are those that presently affect the carrying capacity or habitat quality for landscape species: fires, subsistence hunting, extraction of wildlife products, conflict with

¹ National Institute of Anthropology and History

² Nature Protection Service of the National Civil Police

livestock/domestic animals, conflict due to human mortality. Future threats were defined as those that may depress carrying capacities within the next five years.

Future threats were constructed to predict the most likely scenarios that will face wildlife five years into the future (year 2010). Thinking about the future is important for strategic conservation planning. In some currently intact areas, threats are inevitable in the near future. These areas may provide an opportunity for quick consolidation before they are too costly to conserve. In other cases, future threats may be too daunting to tackle, and investments may be avoided.

The current abundance of wildlife was modeled as a function of carrying capacity (within their biological landscapes) reduced by current threats (as mapped in the human landscapes). To create maps of estimated current abundances, we weighted all threats in terms of their ability to reduce the carrying capacity for each species. The percent reduction in carrying capacity caused by each threat was evaluated in places where it was most severe, and then linearly related to the threats models across the landscape (Appendix 3).

Slow but steady progress has been made in the Laguna del Tigre Master Plan. Project leader Bayron Castellanos teamed up with CALAS to produce an analysis of the legal status of the park and the implications for the Master Plan. In coordination with CEMEC and the LLP biologists, the human and biological landscapes of the park were assembled in preparation for the Master Plan zoning workshop. At this workshop (June 2005), a preliminary proposal for the (new) internal zoning of the park was developed by consensus by a multi-institutional working group in Petén. In essence, the new zoning proposes to focus conservation efforts in the eastern and northern sections of the park, and establish corridors for connectivity across the northern wetlands of the park, westwards towards the Rio Escondido Biotope. The plan also proposes to incorporate the macaw nesting sites of the adjacent Biological Corridor into the park.

Activity 1.3. Estimate the financial investments needed to ensure the long-term conservation of Laguna del Tigre National Park

Castellanos and CALAS also produced a financial analysis of the current investments in the park. The zoning being outlined in the LdT Master Plan accepts the continued presence of a majority of the colonist communities in the park, which itself has implications for the financial costs of future park management. CEPF support has been extended for the development of the Master Plan through September. By October we expect to have a preliminary version of the white paper including the annual costs of management per each zone of the park, and a preliminary long-term budget and financial strategy for Laguna del Tigre.

Activity 1.4. Raise awareness about the successes and challenges of forest management and biodiversity conservation within the Multiple Use Zone of the Maya Biosphere

We made public presentations of the final results of the Biological Monitoring Project funded by USAID from 2001-2004 to the principal stakeholders in the MBR: GO, NGOs, the academic sector and community organizations. The presentation in Guatemala City was convened by the United States Agency for International Development and the National Council of Protected Areas – CONAP - (Appendix 4), representatives of Central CONAP, FIPA, the Ministry of Environment, San Carlos University, del Valle University, the Guatemalan Environmental TrustFund, Rafael Landivar University and the Organization of Biology Students attended this event. In Petén, the presentation was convened by the Multiple Use Zone director of CONAP-Petén, with the presence of representatives of all the community and industrial forest concessions including ACOFOP, and members of CONAP-Petén.

We were surprised by the interest of the concession members in the results from monitoring the effects of timber extraction on biodiversity and ecological integrity.; Many of them expressed their interest in the continuation of the project and suggested that it be incorporated in the timber certification audits that the

government demands from logging concessions. We also discussed the results of the xate palm extraction study in the MBR and as a result, agreed to schedule a new meeting to have a more detailed discussion on the measures that CONAP and the concessions should take to reduce the current and future threats to this resource.

In conjunction with Asociación Balam, ACOFOP³ and ONCA⁴, we undertook a workshop aimed at discussing a newly-passed national Hunting Law and its regulations. This hastily passed law affects the rights of concessionaires to monitor, manage, and restrict national hunters that attain hunting licenses and species permits in the capitol city. Unfortunately, several high profile examples already exist where communities have seen hunters enter their areas with no controls whatsoever. At the workshop, discussions centered on educating the participants about the Articles of the new law and their implications, and then sharing local perceptions of the law among the concessions and cooperatives of the Multiple Use Zone in the MBR, NGOs, with CONAP representatives also present. As a product of this workshop, a movement emerged to legally challenge Articles 19 (hunting calendar) and 32 (precautionary principle) because they contradict rights and obligations previously established in the concession contracts signed by the State, and to propose a socially and scientifically informed alternative. WCS believes that the proposed alternatives to the new law will enhance national and local capacity to effectively manage wildlife within the MBR.

On a different front – awareness of biodiversity in the communities – we have made presentations on macaws at the local schools of Paso Caballos, Buen Samaritano, Carmelita, Uaxactún, and Pipiles. In Paso Caballos elementary school, students participated in a field trip to monitor nesting macaw success in El Peñon de Buena Vista. Some children climbed the nesting trees with pulleys, aided by WCS field technicians; the children who climbed the nesting tree took pictures of the chicks and later shared these with classmates and others. In all our activities with the children we used the coloring book that was elaborated by WCS field technicians (Appendix 2). This book was published in Spanish and Qeqchí (the Maya dialect of Paso Caballos and many new immigrants to the Petén).

Presently, WCS acts as representative of the NGOs in the National Biodiversity Monitoring Committee promoted by CONAP.

OBJECTIVE 2: Develop and implement sustainable and adaptive mechanisms to strategically address threats across the Maya Biosphere Reserve landscape

Activity 2.1. Enforcement of species conservation regulations – scarlet macaw nest protection

The protection of macaw nests was one of the most successful activities of the work plan this year. WCS established protection plans for 77 active and potential macaw nests distributed across an area of approximately 50,000 hectares. In order to implement these plans, WCS staff subsequently administered funds provided by CEPF (\$68,000) and DOI (\$110,000) to strengthen the combined protection efforts of CONAP and SEPRONA, with participation of the Guatemalan army. Five key control bases were established (El Peru, El Bural, Guayacan, Lo Veremos and Peñón de Buena Vista) to control the spread of invaders, and to permit access to remote areas by combined patrols to capture macaw poachers. LightHawk overflights were used to identify threats, and the CEMEC satellite image and GIS analysis lab detected fires that threatened macaw nests. WCS technicians familiar with the distribution of nesting sites across the landscape guided these combined forces on routine patrols as well as tactical patrols to capture law breakers. Several captures of timber poachers were made, including confiscations of two vehicles, weapons, munitions, and illegal fishing equipment. Besides this, 27 people (land invaders and hunters) were detained and charged with violations.

³ Forest Community Association of Petén

⁴ National Organization of Environmental Conservation

In 2004, the lack of manpower and the resulting lack of information on the nesting success of macaws in El Peñon presented us with the opportunity to involve the community of Paso Caballos in the conservation of this important nesting site. A pilot project was developed to protect the nesting site while training guards selected by the COCODES of Paso Caballos. A total of four men from the Paso Caballos community were instructed in artificial nest construction and installation methods using natural tree trunks. A total of 5 new nests were installed and monitored, in addition to monitoring the other known natural nests of the area. Community members received training on the use of GPS units and the biological monitoring of macaws, among other field activities which included the preparation of remote camps for patrols, the demarcation of the area to establish conservation presence, and the search of areas for new conservation elements including macaw nests, important wetlands, and archaeological sites. On several occasions the community guards raised an early alarm to the presence of macaw poachers, fires and potential land invaders in the area under their custody. They also encountered one unregistered (new) macaw nest. Furthermore, during the fire season the CEPF assisted with funds to hire four additional guards to protect the area from fire and poachers.

With funding from the Critical Ecosystem Partnership Fund, basic infrastructure maintenance was developed in the El Bural and Lo Veremos areas to facilitate future protection efforts. This included maintenance to access routes, field houses, bathrooms and boat docks. Guardhouses for CONAP, SEPRONA, and the military were built at El Perú. These basic facilities, including kitchens, toilets, sleeping areas, and bathing houses, helped to maintain the desire of protection staff to work hard under trying conditions. WCS built the house in Perú in record time in order to avoid the removal of security forces to Zacatal (a campsite on the edge of the San Pedro River), because El Perú's position presents a strategic advantage for the protection of sites of key conservation interest.

Unfortunately, during the infrastructure construction and maintenance activities, four field technicians, including 3 from WCS and one from IDAEH, were kidnapped by land invaders from the communities of Santa Amelia and Nuevo Amanecer - two illegally established communities within Laguna del Tigre National Park. Thankfully, the field technicians were liberated after three days' of negotiation between government authorities and the invaders. The kidnapping was a manipulation ploy used by the Santa Amelia land invaders to demand land, including the region of Lo Veremos and a majority of the remaining macaw nesting sites thus far discovered by WCS.

We monitored and fought against several fires in the Laguna del Tigre National Park and the Central Biological Corridor with the support of SIPECIF⁵, CONAP, Proyecto Arqueológico Waká-Perú and IDAEH. We also provided technical assistance to the Fire Control Committee of AFISAP, Carmelita, Uaxactún and the Paso Caballos community, particularly with the use of backpack leaf blowers donated by Tom Plant and Rainforest Alliance.

Activity 2.2. Enforcement of protective regulations – road barriers

We installed and monitored a road barrier in the Mirador Río Azul National Park in October, 2004. Unfortunately, the road barrier was destroyed by traffickers of human migrants and has not been reinstalled. WCS and CONAP have decided to reconstruct it after making changes in its design to make it less vulnerable to destruction and vandalism. The road barrier had been approved by the municipality of Melchor de Mencos and the Laborantes del Bosque Association (Woodworkers Association).

The installation of the road barrier proposed for the Caobitas campsite is on standby, mainly due to the difficulties involved in transporting the materials to the area and the insecurity of the area (this is a temporary forest campsite installed to protect their forest concession at the limit between Laguna del Tigre National Park

⁵ Sistema de Prevención de Incendios Forestales (Forest Fire Prevention System)

and the AFISAP forest concession). The maintenance we provided to the access routes will soon permit the construction of the road barrier at this site. In addition, we have proposed the installation of another road barrier in the limit between the Paso Caballos community polygon and the Peñon de Buena Vista district.

Material support for the construction of a crucial road barrier at the Achiotal site was provided by WCS to CONAP-Petén in June 2005, and plans exist to initiate the construction of this guard post in August-September. This checkpoint is proposed to function as a manned checkpoint, incorporating guards from CONAP, SEPRONA, and members of the adjacent community concessions (AFISAP, Carmelita, la Colorada). In addition, the Industrial Timber Concession of Paxban (Gibor, S.A.) agreed to provide the timber needed for the construction of the checkpoint, as well as the transportation of materials needed for its construction. Via a grant provided by USAID-DOI for fire prevention, WCS is providing the tin roofing, nails, cement, and other miscellaneous supplies needed to outfit the post. This checkpoint will control the westward expansion of agricultural areas located in la Colorada, and will also help to reduce the pressure on the easternmost sections of Laguna del Tigre and the macaw nesting sites within the Biological Corridor.

Activity 2.3. Surveys for macaw nests in timber concessions

We conducted searches for unregistered nests in AFISAP with the help of community members. We held meetings with the concession leaders and expressed the importance of conducting an inventory of all the nests within the AFISAP concession area. Unfortunately, in previous years many of the nests known to exist in the AFISAP area had fallen or were burned by forest fires. Our proposal sparked the interest of the AFISAP directors who agreed to assist WCS field technicians to inventory all nesting sites in the concession. One impetus for their participation was the added value to the AFISAP concession in terms of demonstrating adequate management for maintaining their Smartwood certification seal.

On several occasions we met with the representatives of the AFISAP board of directors and they suggested the development of a community workshop for the identification of macaw nests. We are interested in this idea, but we are aware that we should be wary with the selection of the people we will train, because we run the risk of teaching unethical people how to locate macaw nests for poaching chicks.

We have also begun to search for nests in the La Colorada Concession, adjacent to AFISAP and Laguna del Tigre National Park. The searches in La Colorada have not been as extensive and we are still in the process of establishing contact with the directors to consult with all the stakeholders on other sites to look for the nests. AFISAP and La Colorada are the only two concessions with registered nests within their territories.

Activity 2.4. Development of a tree substitution protocol for timber concessions

The development of a tree substitution protocol has thus far not been needed. We continue to search for nests in timber extraction areas as noted above, however, the macaw nests are so scarce and hard to find that we have not been able to locate any in areas slated for timber extraction. Upon discovering a nest of any rare or threatened species in a tree slated for harvest, we will bring the discovery to the attention of the concessionaires, and develop a quick solution to the problem if it occurs. In the meantime, we will put this activity on hold until field searches indicate that we should include it again.

Activity 2.5. Test and evaluate xate management alternatives

Recent advances in a Rainforest Alliance pilot project to develop a certified xate market with Continental Greens Ltd. of Houston Texas have progressed to the point where the first official shipment of xate will be made on July 28th 2005. Prior to this in January 2005, WCS assisted Uaxactún's Organización Manejo y Conservación (OMYC) to sell xate to another purchaser interested in fishtail palms (*C. ernesti-augustii*), but the harvest failed to meet the purchaser's standards. OMYC recovered their funds invested in the venture, and fully

repaid a Q10,000 loan from WCS after negotiating partial payment from the first buyer (who rejected the xate), and then re-selling the xate to a second purchaser who accepted it despite the low quality. This experience convinced OMYC (and Rainforest Alliance and WCS) that they should focus on marketing their most abundant species, known commonly as “jade” or “macho” (*C. oblongata*). The new market for xate with Continental Greens via RA now focuses strictly on “jade”. Uaxactún has the potential to triple their marketable volume by October assuming the quality of the xate can be maintained. In order to maintain the quality of xate that exits Uaxactún, OMYC and WCS devised a system to pay harvesters per each marketable frond turned in to a selection “bodega” or sorting house. RA and WCS are collaborating to train women from Uaxactún to separate marketable quality from waste, thereby allowing incorporation of these village women in the distribution of project benefits. This system proposes to eliminate the unnecessary harvest of poor quality fronds thereby improving the sustainability of the xate harvest.

An interactive EXCEL spreadsheet developed by WCS was used to evaluate the economic viability of any xate offer, and later validated by Rainforest Alliance in conjunction with community members from Carmelita, Uaxactún, and San Andrés. The spreadsheet allowed participants to develop a preliminary business plan for the Uaxactún bodega, and most importantly to detail for the first time the price that could be paid to xateros for each frond they turn in. Throughout the remainder of the LLP project, WCS will continue monitoring xate waste, comparing Uaxactún to other sites with baselines throughout the reserve, and also comparing the percentage of xate waste in the OMYC bodega (if the bodega persists) with the waste in any traditional xate harvests that continue in Uaxactún.

Activity 2.6. Monitor trends in landscape cover

This component was designed with the objective of monitoring changes in the original forest cover of the MBR for agricultural and cattle ranching uses, as the basis for management decision-making. The monitoring period for this study was from 2003 to 2004, using as background information previous work carried out in the time periods: 1986-1990, 1990-1993, 1995-1997 (by the University of Maine-Department of Forest Management, Conservation International/ProPetén, CONAP, NASA-MSFC, NASA-SSFC), and between 1997-2003 (by CEMEC/CONAP, PROPENTEN/CI, WCS and FIPA/AID). This ongoing study will help us identify and evaluate the main threats towards biodiversity in the MBR and monitor the possible patterns of change they suffer and specifically guide our research and conservation efforts based on the living landscapes species.

LANDSAT (Enhanced Thematic Mapper+) satellite images in SLC off mode from 2004 were used and compared with LANDSAT ETM 2003 images in normal mode. Change analyses were carried out with the NDVI compound ISODATA classification method proposed by Hayes and Sader (2001) that was also used in the previous change evaluation studies. For this particular study we increased visual interpretation efforts and manual editing because of the difficulties presented when using LANDSAT data in SLC off mode.

Total annual change in the entire Maya Biosphere between 2003 and 2004 was estimated to be 22,913.63 ha. Using original forest cover in 1986 as the base value, this surface loss corresponds to a global deforestation value of 1.18% per year. This change value represents a difference of 4400 ha. in annual changes with respect to the 2002-2003 periods, which is interpreted as a 23% increase to the previous value and a difference of +0.23% with respect to the annual rate of the same period.

These increases in deforestation with respect to the previous period are mainly observed in four management units of the MBR: Laguna del Tigre Biotopo, Laguna del Tigre National Park, Sierra del Lacandón National Park and the Buffer Zone.

The work for this study was carried out by the Center for Monitoring and Evaluation of CONAP and Wildlife Conservation Society with the support of the FIPA/AID Project and financial backing from USAID. An

ongoing evaluation for the 2004-2005 period, and carried on under WCS/LLP, will be completed around September/October 2005.

Activity 2.7. Monitor trends in precipitation and climate (assessing fire risk)

During 2003-2005, we have used fire pixels derived from the MODIS sensor to monitor daily forest fires in real time. This monitoring allows us to produce daily reports to CONAP, WCS and SIPECIF, all institutions with groups fighting and/or preventing forest fires in the field.

By the end of the fire season, the information obtained was compiled in a multi-annual database, to which spatial references of departments, counties and protected areas of the entire country were added. This database is used to analyze differences in number, frequency and temporal occurrence of fire pixels as the main indicator of fire activity.

Besides the fire pixel monitoring, burnt area assessments were conducted using LANDSAT data. This activity is not carried out every year because of constraints in the availability of high quality data, that have to comply with the condition of being collected in a post fire season or near post fire season date (late April-Early May) and also be reasonably cloud-free. One assessment of the amount of area burnt has been conducted in 2003, and one more is scheduled for 2005.

Parallel to the collection of data on fire pixels, we also acquired climate information from the National Weather Service (INSIVUMEH) network of weather stations. This climate information was used to monitor the effects of amount and distribution of rainfall in fire occurrence in order to compile enough information to make predictive fire models based on previously observed trends and correlations. Under this assumption, in early 2005 we produced a report on "Perspectives of the Fire Season for 2005" that mainly covered climatic issues that indicated that the 2005 season would be a bad one, as indeed it was. Partially based on this report, the Guatemalan Government declared an orange alert (Appendix 5) that, among other measures, increased the budget assigned to SIPECIF to fight fires.

In order to increase the information from the weather data collection system that is currently available, and with a donation from the US Department of Interior, we installed 9 weather stations in sites where we identified "gaps" in climate information between the end of 2004 and early 2005. These 9 weather stations will be added to the INSIVUMEH stations to become the "Petén Weather Network", that should be fully operational by the end of 2005. This new data will fill information gaps and will hopefully leverage our capacity to use weather data to make spatially-explicit early alerts on fire risk for the 2006 fire season.

Activity 2.8. Monitor trends in macaw populations

During the last three years of monitoring macaw nests in El Perú we have continuously reported 15 nests, yet surprisingly this year we only reported 10. We have yet to be able to explain decrease in nesting, though it may be associated with increased activity in the site resulting from the substantial archaeological investigation... Even though the number of chicks that fledged successfully was not equivalent to last year's total (2004: 13 chicks; 2005: 5 chicks), it is motivating to know that no chick was killed or poached by humans. We reported 5 active nests and 2 successful chicks for El Burreal, another important nesting site. Unfortunately, we could not fully document the nesting success in Lo Veremos due to the insecurity in the area and the events described in activity 2.1, but we did manage to report 4 active nests and 3 potentially successful chicks from this area.

For the last 2 years, we had not been able to consistently monitor the nests in el Peñón de Buena Vista. This changed with the support of the Paso Caballos COCODES (municipal leadership group). We hired four local men to train and monitor the natural nests and five artificial nests they built the previous year prior to the 2005 season. We registered 3 chicks that fledged successfully from the Peñón nests. In addition, WCS field

technicians were very excited by the discovery of a new nest in the area by the newly trained Paso Caballos monitors.

Field-based activities included the long-term monitoring of the nesting success of macaws in the eastern section of the Laguna del Tigre ecosystem. Sites involved in this effort included El Peru, El Bural, La Corona, El Peñon de Buena Vista, and some parts of the AFISAP community forest concession. These efforts put us in constant touch with community groups with influence over some of these areas, allowing us to begin to raise awareness among these important macaw and protected area stakeholders in Petén. We obtained the consent of authorities from the Community Development Committees (COCODES) of Paso Caballos, La Colorada, Pipiles and Buen Samaritano to carry out our socialization activities with the local people, consisting of visiting schools, households, and the village leadership to inform them of the plight of the macaw in Guatemala. Active macaw nests are located near these four communities; we are hopeful that in the future this will offer us the opportunity to involve local school children in monitoring the nesting success of macaws within their territorial boundaries.

One setback for our program aside from our abandonment of the Lo Veremos (La Corona) area was the temporary delay of a long-planned scarlet macaw population study using count points from emergent trees. This activity is still in discussion and under consideration, because many of the count points are located in high-risk areas close to the campsites of invaders or highly conflictive areas.

Activity 2.9. Develop methodologies to monitor trends in selected landscape species

Living Landscape Program biologists made important progress towards identifying methodologies for monitoring trends in the six main landscape species, and the understory xate palm as a special element. Crocodilian experts Dr. John Thorbjarnarson and PhD candidate Rogelio Cedeño visited the Petén to evaluate local habitat and provide input for future field efforts. WCS' Jaguar Conservation Program provided WCS Guatemala with constant support regarding the development of a field sampling plan to be initiated in 2006 that will provide the first baseline estimate for the size of the jaguar population in the eastern part of the reserve. Licenciado José Soto attained a grant to test a new field method to monitor white-lipped peccaries in the northeastern corner of the reserve. In collaboration with WildTrack, Jeremy Radachowsy and Lic. Rony García led a field crew effort to collect digital track samples of Baird's tapir in the hopes of being able to develop algorithms that allow individuals to be identified. Unfortunately, our plans to execute a treetop sampling scheme to provide a first estimate the size of the macaw population was called off due to the insecurity surrounding the site of La Corona. Lastly, information produced by our xate palm monitoring focused on the quality of harvested fronds was presented publicly in the Petén and in Guatemala City, and subsequently adopted by CONAP, Rainforest Alliance, and others to push publicly for the reform of the industry. For more details on these activities, please see Appendix 8.

Activity 2.10. Initiate contact with the private sector to promote conservation initiatives

We have been in contact with Mrs. Nini de Berger, long time macaw breeder and conservation supporter in Guatemala, to discuss her interest in using her 200+ captive macaws as a breeding source for chicks that could be released into the wild. In initial contacts, she implied that she is willing to cover many of the costs associated with such an initiative. Aside from being a positive contribution from the private sector, such support would also strengthen macaw conservation initiatives politically, as one of the greatest weaknesses of WCS Guatemala field efforts is our lack of support among influential people in Guatemala City.

The bi-national effort to solicit funding from Taca Airlines being led by SalvaNatura (El Salvador) has not yielded any results as of yet. SalvaNatura staff indicated that a pending meeting with Taca was due in mid 2005, yet no update has been forthcoming.

We have sent support petition letters to three of Guatemala's biggest film distributors (Kodak, Fuji Films and Quick Photo) so that they may donate film and batteries for our camera trapping studies. We have not received a response from them to date.

Activity 2.11. Overflights of the Maya Biosphere

With the support of LightHawk, WCS Guatemala coordinated and executed overflights with governmental, non-governmental, and community-based representatives, and with members of the press to educate people about the trends affecting the Maya Biosphere landscape. Some notable participants of the over flights included:

- CONAP-Petén Regional Director: Vinicio Montero
- Laguna del Tigre National Park Director: Julio Valle
- Petén SEPRONA Director: Commissioner Braulio Cardona
- Departmental Governor: Lic. Manuel Barquín
- Commander of Military Zone No. 23: General Carlos Peña
- Mirador-Río Azul National Park Director: T.U. Joaquín Bonilla
- Executive Director of Balam Association: Lic. Bayron Castellanos
- OMYC⁶ President: Sr. Manuel Fajardo
- Paso Caballos Mayor and members of the COCODES: Sr. Mariano Cholom and members
- CALAS⁷ Director: Dr. Yuri Melini
- Defensores de la Naturaleza Sierra del Lacandón National Park Director: Javier Márquez
- Guatevisión television journalist: Eric Salazar.
- Journalists from Prens Libre and El Periodico (Guatemalan newspapers)
- Tropico Verde-Parkwatch representatives: Carlos Albacete, Piedad Espinosa
- Madre Selva representative: Gerardo Paiz
- USAID-Guatemala representative: Lic. Roberto Morales

Flights were extremely useful for quickly identifying areas affected by fire during the peak of the burning season, thereby allowing us to prioritize protection and prevention activities in the community forest concessions and Laguna del Tigre alike. In addition, due to the high profile of the over flights (a result of the discovery of the numerous narco-trafficking aircraft in 2004), the government of Guatemala executed an "official" over flight during the peak of the burning season to demonstrate to members of Congress, Ministers, and the press that the government is indeed taking actions to combat the lack of control in the reserve. The overflights allowed us to search for areas that will be used in our research of landscape species activities; such as scarlet macaw nesting sites, closed water bodies for crocodiles, turtles and tapirs, among others.

Objective 3: Learn and teach best practices for conservation of the Maya Biosphere Landscape and beyond

Activity 3.1. Evaluate the effectiveness of pilot projects promoted

The effectiveness of a number of pilot projects is constantly evaluated by WCS staff and conservation partners, with a focus on disseminating lessons learned and adjusting projects to improve their chances of success. In most cases, feedback from community members is critical, allowing us to develop WCS' program strategies and

⁶ Forest Community Organization of Uaxactún (Organización Manejo y Conservación)

⁷ Centro de Acción Legal

adjust projects. For example, in the case of Paso Caballos, WCS staff maintain constant contact with local leaders who are consulted regarding the macaw protection and monitoring project in Peñon de Buena Vista in order to ensure the social viability of the project. But the project is also evaluated in terms of biological results, for example, based on the number of hectares affected by fire and the number of hectares of forest converted, and on the number of chicks that fledge successfully from the site. Based on these two sets of factors, the project is considered effective: social support is strong; the area was unaffected by fire in 2005; there were no land invasions in the area; and three chicks fledged from the site during the 2005 nesting season. Similar evaluations are conducted constantly for all the projects we promote. In review of the major pilot projects:

- a) Community-based protection efforts: both in Paso Caballos and in Uaxactún these projects have been evaluated as highly effective, though at this point they require constant accompaniment and strengthening.
- b) Road barriers: the road barriers constructed in Rio Azul were failures, being quickly destroyed by traffickers of illegal migrants through the area. Conclusions include rebuilding the barriers as permanent road blocks with buried footers to make them indestructible, and building other barriers in sites where guards can be present a majority of the time.
- c) Xate management: given the recent advances with this pilot project, an evaluation of the effectiveness of this project will be forthcoming when the bodega has been in operation for at least a 6 month period. At this moment the promotion of this possibility and the collaboration of Rainforest Alliance has yielded an excellent opportunity for the villages of Uaxactún and Carmelita.
- d) Proyecto pavo: has been evaluated by CONAP, the communities of Uaxactún and Carmelita (via presentations and feedback from the General Assemblies of the villages), and by WCS and NWTf. The project is thus far a great success, to the point where it has drawn modest support from USAID Guatemala (that supported the project with a \$10K grant for equipment and supplies this year).

Activity 3.2. Strengthen the Maya Biosphere and global conservation initiatives

Lessons learned by WCS in the Maya Biosphere Reserve were shared in the following venues during FY2005:

- A final CD of the results of the 3-year Biological Monitoring Project (2001-2004) supported by AID Guatemala was produced, and the results disseminated in Guatemala at two public presentations. Copies of this CD have also been made available to conservation colleagues at the University of Florida, in Washington DC, and at WCS/New York. The information available on the CD makes a strong case for the urgent need for a more effective long-term strategy for conservation in the MBR.
- WCS Biologist Jeremy Radachowsky participated in the LLP Annual Meeting held in Tanzania in May, 2005 to share lessons learned in building the first draft of site conservation landscape, as well as other conservation planning and implementation experience from Maya.
- Roan Balas McNab visited New York and Washington DC to update USAID, Conservation International, The Nature Conservancy, and Rainforest Alliance on the current state of the MBR, as well as the challenges and opportunities that lie ahead.

Request for Assistance

WCS Guatemala would greatly appreciate follow-up from USAID staff in Washington regarding the possibility of presenting the Maya Biosphere Living Landscape Project in Guatemala to the incoming US Ambassador, and the incoming director of natural resources at USAID/Guatemala, Mrs. Jill Kelly.

The development of a regional USAID conservation strategy that weaves together joint conservation incentives for Mexico, Belize, and Guatemala would be a great step forward for the area. One possibility includes the

strengthening of a “sistering” initiative, which is currently being developed by Mexican and Guatemalan authorities with the assistance of Asociación Balam, to improve the collaboration between Calakmul Biosphere Reserve and its southern neighbor, the Maya Biosphere Reserve.

Objective 4: New York Coordination Unit Strategy: Guide the design and testing of wildlife-focused planning, implementation, and evaluation tools for effective conservation at a landscape scale, and promote learning across sites and beyond

The NY-based Coordination Unit (CU) of the program is designed to develop and test wildlife-focused, landscape-scale approaches to biological conservation across multiple sites. To ensure the widespread utility of these new conservation approaches, the program is testing them within landscapes that encompass a diverse array of ecological characteristics, land-uses, resource-use issues, and jurisdictional arrangements. To develop new approaches, facilitate and harmonize testing and implementation among these core sites, and capture the synergistic benefits of diverse experiences, a central coordination unit is charged with designing and managing the program. This unit guides the development of landscape-scale conservation strategies, tools and techniques; assists in the design and development of cost-effective intervention and monitoring programs at these sites; promotes cross-site learning; and ensures communication among the sites, WCS staff (central and field), USAID (DC and missions), and the larger conservation community.

During FY 2005, the Coordination Unit accomplished most of its planned programmatic, technical, and administrative goals. The CU worked with field sites to design conservation landscapes for the Glover’s Atoll, Maya Biosphere, and Madidi sites (design for the Eastern Steppe of Mongolia will be completed in FY06). CU staff refined and simplified the process for selecting landscape species, including development of software as a decision-support tool for analysis. The concept and rationale for using landscape species to focus conservation planning and monitoring at a landscape scale was disseminated to the conservation community through a peer-reviewed publication.

Activity 4.1 Provide technical assistance to site-based conservation

Members of the WCS/NY Coordination Unit worked closely with field sites to provide targeted technical input (help desk, and informal and formal training) throughout the year. In some cases this involved trips to sites as reported in the previous section of this report.

Activity 4.2 Design, implementation, and testing of decision support tools

Activity 4.2.1 Living Landscapes Program Technical Manuals

The Living Landscapes Program produced two new brief how-to guides, called Technical Manuals, after field testing and fine-tuning the methods at several WCS/BCLS field sites: one concerning participatory spatial assessments of human activities, and another one focusing on how to build conceptual models for a project. The manuals were also translated into French and Spanish, distributed to field staff, and made available on our website for wider use. We responded to requests from program staff of TNC, WWF and AWF and distributed copies of the threats assessment and conceptual modeling manuals, each of whom now have projects that have applied these techniques in the field. We have also made available our bulletins (brief conceptual guides on strategic approaches and tools) and technical manuals for the USAID Mission and Washington staff during their Agriculture, Environment and NRM training held in August 2005. These were enthusiastically received. In addition, we have written three additional manuals that are currently in review and will be published within the next few months. The three draft manuals are: Developing a monitoring framework from conceptual models; Building biological and human landscapes; and conducting household surveys. Enthusiastic uptake of the LLP

bulletins and manuals continues to demonstrate the utility of the lessons we are learning under BCLS and are sharing with the larger conservation community.

Activity 4.2.2 Landscape Species Approach progress

4.2.2.1 Landscape Species Selection Software

Revisions to the landscape species selection software were completed, and version 2.0 was released and distributed to BCLS sites, other WCS sites, and conservation practitioners at large. The new version includes refinements of criteria used to rank candidate species for selection (e.g., heterogeneity of habitat use), provides more user-control of selection criteria, and includes an overhaul of the process of selecting species to maximize their complementarity.

4.2.2.2 Conservation Landscapes

As one of the priorities for this year, LLP staff worked closely with sites to design conservation landscapes that map conservation priorities within larger, undefined landscapes. During the last Living Landscapes Program Annual meeting, presentations were given from 7 sites where staff have conducted a preliminary round of designing conservation landscapes (Ndoki-Likouala (Congo); Madidi (Bolivia); Northern Plains (Cambodia); Adirondack Mts (NY-USA); Glover's Reef (Belize); Madison R. Valley (MT-USA); and Maya (Guatemala). For each, identification of priority areas within the landscape was based on: (1) spatially-explicit needs of selected landscape species (biological landscapes), and (2) mapped threats (human landscapes). Analytical methods for determining a set of priority lands that are sufficient for long-term conservation, while efficiently addressing threats, were described using several different methods, including MARXAN and C-Plan software. We were therefore able to compare such methods, and will be applying these to further landscape designs. Decisions were also made on population target levels that should be incorporated into final analyses, aiming at a minimum for populations that are demographically sustainable. Plans for finalization of conservation landscapes have been outlined for each of the 7 sites over the following year.

4.2.2.3 Testing the landscape species approach

Ad hoc assessments to-date have informed us that field projects use the Landscape Species Approach (LSA) tools with some variation, depending on the circumstances at different sites. Some have dedicated a great amount of time to landscape species selection and have done threats assessment with wide participation, while others have carried out both these exercises within a relatively short amount of time and with a handful of project staff. We would like to be able to draw some principles from these variations and be able to advise others on the utility of the approach, its individual steps, and the conditions under which it may or may not provide advantages to conservation.

With this in mind, LLP has engaged non-LLP WCS staff to work with us (both field-based and central) in reviewing the use of LSA at twelve sites that constitute the core LLP portfolio (including all BCLS/GCP sites – both past and present), and in assessing users' and other WCS' staff perception of its utility for site based conservation. The assessment will mainly be questionnaire based with some follow-up interviews with field staff. LLP intends to use the findings to better adapt our program and LSA tools for site-based planning. This assessment has begun, and will be completed in the first half of FY06.

Activity 4.3 Catalyze cross-site and cross-organizational learning, and communication

Activity 4.3.1 Living Landscapes Program Annual Meeting

The Fourth Annual Meeting of the Wildlife Conservation Society's Living Landscapes Program (LLP) took place from May 24- June 1, 2005 in Ruaha River Lodge, Ruaha National Park, Tanzania. A total of twenty-five WCS field and New York-based staff attended the meeting, including representatives of all but one of the BCLS/GCP-funded sites⁸ and from other WCS regional programs (Marine and Africa). Participants spent five days in a formal meeting setting and one day on a project field trip. In addition to continued group work on LSA tools, the group spent significant time discussing field topics identified both prior to and during the meeting. Topics included those centering on local socio-economic contexts (community-based wildlife management, addressing socially diverse landscapes, economic incentives as conservation tools, measuring the impact of outreach efforts), power & governance issues (dealing with national political instability, analysis of stakeholder power relationships), zoning as a conservation tool, and economic valuation of natural resources/wildlife. In addition to sharing experiences, ideas and perspectives on each topic, we agreed to distribute contacts and/or relevant literature as a follow-up to many of the discussions. Particular interest was raised in conducting stakeholder power analyses and economic valuation of ecological goods and services, and possibly undertaking direct payments to communities for conservation compliance. Report of the meeting has been distributed to meeting participants, and is available upon request.

Activity 4.3.2 CMP: leadership, design, writing and audits

David Wilkie and Craig Groves continued to represent WCS within the Conservation Measures Partnership. Groves and Wilkie contributed directly to the analysis of lessons learned during the pilot audits conducted in FY04-05 and are currently helping to draft a protocol for conducting multi-partner peer-reviews of conservation projects. Wilkie worked closely with other CMP partners to assess the feasibility of developing software to guide field staff through the steps in the 'Open Standards' for conservation planning and adaptive management. This CMP activity resulted in development of a business plan for software development. Wilkie and Groves will continue to provide technical guidance as tool modules are developed for the Adaptive Management software. The eAdaptive Management software is an attempt to integrate best-practices of conservation planning into a simple to use software package. The software will guide practitioners through the steps in effective planning and project adaptive management and provide a system for tracking conservation progress over time. WCS staff worked with TNC to ensure that our institution process for cataloging our field projects is compatible with the TNC Project Inventory website. In the next 3 months, WCS will complete a review of WCS efforts to implement activity-based cost accounting within the Gabon and Bolivia programs. This review is eagerly anticipated by a number of donors, including the USAID Congo Basin Forest Partnership program.

Activity 4.3.3 Cross-organizational Learning Initiative

At the beginning of September, the Landscape Ecologist and socio-economic monitoring specialist participated in a multi-partner workshop organized by WWF on Landscape Planning. They presented the Landscape Species Approach and participated in the process of applying different landscape planning tools, used by the different NGO partners, to the Samburu Heartland in East Africa.

4.3.4 Synthesis of Lessons from site-based conservation

4.3.4.1 Local engagement in conservation survey

After testing the survey design for the study on engaging local people to promote effective conservation of wildlife and wildplaces, the survey instrument was refined and finalized. Completion of the survey has been postponed for late 2005, and will be completed during the first quarter of 2006. Analysis of the survey results

⁸ The following BCLS/GCP sites were represented: Ndoki-Likouala (Congo); Yasuni (Ecuador); Eastern Steppe (Mongolia); Glover's Reef (Belize); Maya (Guatemala). Madidi (Bolivia) was not represented due to insecurity problems in Bolivia prior and during the meeting.

will be compiled and written up for publication in a peer-reviewed journal and as an LLP bulletin that outlines a set of guiding principles for engaging local people in conservation.

4.3.4.2 Survey of “protection” as a conservation strategy at sites

The WCS Maya Biosphere Reserve Project conducted the survey of protection measures used by a number of WCS sites. However, response rates were limited, and due to other pressures at the project site, the finalization of the survey results analysis has been postponed until FY06.

4.3.4.3 Preliminary assessment of the human welfare impacts of establishing national parks (Parks and People project)

With funding provided by the John D. and Catherine T. MacArthur Foundation, LLP staff in collaboration with the WCS Gabon program and the Ministry of Forest Economy in Gabon conducted a baseline household welfare survey of 1,000 households living close to the borders of 4 national parks in Gabon, and an additional 1,000 control households living outside the influence of the parks. This survey is the first of three surveys planned over the next 5 years to assess the income, health, consumption, natural resource use, and family function impacts of establishing protected areas on local families. Results of the baseline survey will be analyzed within FY06 and will allow us to assess the role that market access plays in the welfare status of families proximal to and distant from the parks. Additional funds were secured from the National Science Foundation to support the Gabonese social science teams working on the Parks and People Project, and to assess the role that individual time preference (discount rates or patience) plays in investment in health care, education, savings, and sustainable use of natural resources. An article on the Parks and People project was accepted for publication in *Conservation Biology*.

Activity 4.4 Application of Living Landscapes Program tools beyond core sites

4.4.1 Training workshops in the use of LLP tools

Staff conducted a number of workshops to train field practitioners in the use of conservation planning tools throughout the year. In addition to holding in-service WCS training workshops on building conceptual models for conservation projects and using these as the foundation for monitoring conservation success, staff held such workshops for project partners in Madagascar (May 2005) and Gabon (March 2005).

In response to increasing demand for training in the conservation tools, the socio-economic monitoring specialist also ran a training of trainers workshop for WCS directors and program managers in August 2005. As demand for training opportunities exceeds the staff time available in LLP, we envision that participants from these workshops will in turn train and work with field staff and partners in different parts of the world. Such staff will be able to follow up with post-workshop support to interested partners, e.g., protected area staff in Madagascar and Gabon.

4.4.2 The World Conservation Congress

As part of the World Conservation Congress in Bangkok, Thailand in November 2004, the program director led a symposium titled “Applying Ecosystem Management for Biodiversity Conservation: A Wildlife-focused Approach”. The aim of the symposium was to draw out principles and, using case studies, outline the utility of wildlife-focused strategies and management that are integrated within complex environments of human influence. Emphasis was placed on current work from active conservation initiatives, and included a case-study presentation from the Madidi, Bolivia project – a USAID/EGAT funded project. The workshop was well-attended, and highlighted the value of wildlife targets for landscape-scale conservation planning and management.

Activity 4.5 Ensure coordination and communication services for the program

LLP Coordination Unit staff periodically met with staff from the core sites and other WCS large-scale conservation sites to discuss the development of the program, on-the-ground implementation of the Landscape Species Approach, and further development of tools relevant to the approach. The Outreach Coordinator and others continued to meet with collaborators, NGOs, governmental officers, and representatives of other stakeholder groups to promote use of BCLS-derived strategies and tools, to assess their utility, and to determine whether additional tools would be of use to field practitioners.

CU staff worked with field staff in the preparation and review of annual reports and implementation plans. The CU staff also organized the annual GCP meeting in May 2005 where we presented the Landscape Species Approach and project cycle used by WCS. We feel that this was a particularly focused and useful GCP meeting.

Appendices

Appendices

Appendix 1: Document in Spanish “Protocol for handling confiscated macaws in the MBR”

Appendix 2: Coloring Book *La Guacamaya Roja*

Appendix 3: Document “The Maya Forest Living Landscape; a conservation strategy based on Wide-ranging species”

Appendix 4: Invitation to the presentation of the Maya Biosphere Reserve Monitoring results

Appendix 5: Guatemalan Government declaration of orange alert

<http://www.prensalibre.com.gt/pl/2005/marzo/15/109971.html>

Appendix 6: Spatial Design for the camera-trap study in Tikal National Park

Appendix 7: Photograph of glyphic panel discovered in La Corona, April 2005.

Appendix 8: Methodologies to monitor trends in selected landscape species

Appendix 8: Methodologies to monitor trends in selected landscape species

Morelet's crocodile, CA River Turtle and closed water bodies

Crocodylian expert Dr. John Thorbjarnarson of WCS NY and PhD candidate Rogelio Cedeño visited our WCS Guatemala program. Renowned world-wide, Dr. Thorbjarnsen is interested in helping WCS Guatemala to develop a methodology for the estimation of Morelet's crocodile in closed water bodies (small ponds and lakes). Currently, tested methodologies exist for estimating populations along river banks while good methods of estimating populations in closed water bodies have not been developed. Since rivers are scarce in the eastern MBR, most crocodiles inhabit ponds and lakes. Therefore, the monitoring of crocodiles in small bodies of water will be important for periodic evaluations of the stability of the species across the landscape.

Using Mark-Recapture models, we have been carrying out several experiments with reflective marks placed on crocodile heads and turtle shells in various closed water bodies in the MBR. Using previously established reflective mark codes, we will "recapture" individuals by spotlighting them to identify them by their unique reflective patterns in subsequent sampling sessions without having to physically recapture them. To ensure the reflective marks would remain attached to the animals long enough to carry out all the sampling methods, we placed several marks on individuals in captivity in ARCAS. The marks stayed on longer than required for the surveys.

Jaguar camera trapping workshop in Tikal National Park and Mirador-Río Azul National Park

With the support of the Jaguar Conservation Program (JCP) of WCS International, we are organizing a camera-trapping workshop designed to train WCS-Petén field technicians, Guatemalan university students, and other guests in the correct use and application of remote detection cameras to study large vertebrates. Course instructors include WCS experts Ph.D. Scott Silver and Ph.D. Eduardo Carrillo. Immediately following the workshop, we will implement a pilot project to estimate jaguar density with remote detection cameras in Tikal National Park (TNP), with logistical and field support from the Biology Unit of TNP, Asociación Balam, San Carlos University of Guatemala and WCS field technicians.

We have been preparing and organizing this workshop for the last 4 months, as well as planning for the pilot study. We have completed the spatial design of the study (Appendix 6) and at the moment we are conducting the field work to scout the area mapped and identify ideal locations for the camera traps. Aside from this we will place false camera traps to estimate the potential vandalism percentage that may affect the equipment and study.

Jaguar density estimate in Mirador-Río Azul National Park

During the months of April and May, 2004, we carried out the first bi-national (Belize, Guatemala) jaguar density estimate using remote detection cameras for the Selva Maya along with our WCS Belize counterparts and with logistical and personnel support from Asociación Balam, our national partner. We placed the cameras for 60 days in the easternmost section of Mirador-Rio Azul National Park. The study was designed in such a way as to cover a contiguous area in both countries. In total we covered an area of 290 km² (195 km² in Belize and 95 km² in Guatemala). To identify individuals based on their distinct pelage patterns, we placed two cameras per site (one on each side). The sites were chosen based on jaguar detection probability (wide trails near water in high forest with plenty jaguar prey species sign). For our side of the border we obtained a total of 21 jaguar pictures of 7 adult individuals, 6 males and 1 of undetermined sex. Jaguar density for the Selva Maya was estimated at 9.66 individuals per 100 km². Though consisting of only one sample, this is the highest density estimate for jaguars thus far registered. Interesting results that raised new questions and may help guide our future research and conservation efforts were obtained from this study, specifically: no individuals were photographed on both sides of the border and no females were "captured" on the Guatemalan side of the border.

Other important results from this study include encounter rates for large vertebrates (i.e. ocelots, pumas, grey fox, great curassow, etc.), and the first confirmed reports of elusive species like tayra (*Eira Barbara*), skunk (*Conepatus semistriatus*) and porcupine (*Coendu mexicanus*).

This year, Lic. Jose Soto, and Asociacion Balam were awarded a research grant to replicate this study. This grant was awarded by CONCYT (the National Council for Science and Technology) and includes other components like comparison of large vertebrate capture rates, a white lipped peccary population study and an evaluation of the importance of water holes to wildlife. Unfortunately, the grant was finally awarded in June this year, making it too late to carry out the study this year due to the rainy season. The study will be implemented next year, however. With the follow up study we will determine whether jaguar densities have changed since last year, if the same individuals are still present in the area and whether this methodology will work to monitor jaguar populations over the long term. Placing remote detection cameras in the park and using the same camera trapping sites and design methodology as last year, we will again cover an area of 95 km² on our side of the border. We will also estimate large vertebrate capture rates to compare with last year's data to detect population changes.

Evaluation and implementation of a monitoring program for white-lipped peccary in the Maya Biosphere

Reserve

With this study, we will gather information such as density, herd size, sex and age ratios, and diet and habitat use of this animal. We will study the peccary herds by placing remote detection cameras and observation platforms in the waterholes they visit daily to take mud baths. We will evaluate both methodologies to determine their effectiveness. If the methodologies prove successful, we will apply them in other important peccary areas identified in the Maya Biosphere Reserve (MBR) and begin to develop baseline estimates for populations to allow monitoring over the long-term. The information gathered from replicating this study in other areas of the MBR may also be used to carry out population viability analyses and generate population models to predict population trends under different levels of pressure.

At the moment we are seeking support to also include a radio telemetry study of peccary herds to determine average home ranges and habitat use. To do this we plan to place radio collars on one animal per herd.

To date we have begun scouting the areas and waterholes to produce a map with most frequently visited waterholes. Peccary presence or sign in the waterhole determines frequency of visit. 10 waterholes have been visited around the park, half of them with peccary presence. We have observed numerous herds, including one of at least 62 individuals and another of 89 individuals.

Track identification of Tapirs

With the aid of WildTrack we are developing an algorithm that we will use to identify individual tapirs through their tracks. We are in charge of collecting tracks of as many individuals as possible using digital cameras, while WildTrack will develop the algorithm for us. We have photographed 220 tracks of 22 specimens in captivity with the support of various Guatemalan zoos (La Aurora, IRTRA and AutoSafari Chapin) and the Belize Zoo. We have also photographed tracks of various specimens in its natural habitat in Corcovado, Costa Rica.

Scarlet Macaw surveys and statistical methods for estimating populations

We were not able to implement point counts for estimating scarlet macaw populations in the MBR due to security reasons.

Impacts of jaguars and pumas on livestock and domestic animals in the Maya Biosphere Reserve

We initiated a jaguar / rancher conflict investigation with the support of the Jaguar Conservation Program (JCP) of WCS International. Our objectives for the first phase of the project are: to determine the impacts of jaguars and pumas on livestock and domestic animals in the Maya Biosphere Reserve, to characterize jaguar and puma depredation on livestock and domestic animals in the MBR, to determine local perceptions of jaguars and their conservation and willingness to participate in jaguar conservation programs and to establish contact with cattle ranchers and local people in order to initiate a jaguar conservation program in the MBR. With these objectives in mind we will carry out surveys among local people and cattle ranchers about recent and past attacks. The same people will be asked to notify us when there is an attack so that we can visit recent attack sites to gather relevant information. Remote detection cameras will be placed at the carcass sites to determine the identity and characteristics (species, age, sex, physical condition) of the attacker. This project will be carried out under direct guidance from Dr. Howard Quigley who is working as a consultant for the JCP and has worked in jaguar-rancher conflict studies and programs for many years, and is scheduled to visit us to discuss the project during the month of August.

We have begun to visit cattle ranchers in three principal areas: Carmelita forest concession, San Andres forest concession and Yaxhá-Nakum-Naranjo National Park. During our visits, we explain the goals of the project and inquire about the frequency of attacks to their cattle, take pictures of the sites and register principal characteristics of the ranches and area. Most cattle ranchers have demonstrated interest in the project and have implied that they are willing to cooperate in future surveys and possible conservation programs. For the moment we have visited and talked to 7 cattle ranchers.