Biodiversity Conservation at the Landscape Scale

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

Maya Biosphere Landscape Conservation Area, Guatemala

Annual Report
October 2005 – September 2006

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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 Biodiversity Conservation at the Landscape Scale 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 2006, the Maya Biosphere Living Landscape Program (MBLLP) executed its second year of full GCPII funding, continuing and building on the implementation of the landscape interventions designed during the previous year. As during FY 2005, a majority of our MBLLP interventions in the reserve focused on the following central goals: a) containing the advance of the Laguna del Tigre agro-pastoral frontier; and b) maintaining the comparatively intact eastern block of MBR forest being managed within community forest concessions and successful national parks such as Tikal and Mirador-Rio Azul. Serving as a strategic foundation for conservation planning, we furthered the landscape analysis and wildlife-focused planning by holding a workshop in Flores, Petén to solicit the input of regional experts and refine biological landscapes of key species such as jaguar, white-lipped peccary and Baird's tapir, and we updated the human threats landscape with a more precise threats model focused on human access. We initiated pilot species surveys on jaguar, white-lipped peccary and Central American river turtle. We also continued monitoring the distribution and success of scarlet macaw nesting in the central part of the reserve. In terms of tangible land-based results, the project succeeded in conserving the eastern Laguna del Tigre wetlands-forest matrix containing the important archeological site of La Corona, with the help of the Guatemalan Park Service, CEPF, USDOI, and USAID/Guatemala. Continued collaborations with archaeologists from Southern Methodist University and Yale University helped maintain a national focus on this vitally important cultural and natural site. In the eastern part of the reserve, collaboration with the Rainforest Alliance on an improved xate palm harvest regime, and with ACOFOP on community-based fire prevention, helped strengthen the outlook for the long-term viability of the community forest concessions. Additional details on activities undertaken are provided below.

b. Highlights:

- **Continued conservation of the eastern Laguna del Tigre ecosystem:** Continued support from USAID GCPII for the protection of macaw nesting sites was again strengthened by financial support from the Critical Ecosystem Partnership Fund (CEPF), US Department of Interior, and USAID/Guatemala. The "shield" strategy was continued in the Laguna del Tigre Biological Corridor, allowing permanent dry season field presence at the archaeological sites of La Corona and El Peru, in addition to the macaw nesting site of Peñon de Buena Vista. All areas east of the shield

escaped fire impact in 2006 as a result of field presence, and no macaw poaching was detected in any of the aforementioned sites.

- **Development of a broad alliance to strengthen community-based management in the MBR:** In conjunction with our national NGO partner Asociación Balam, WCS Guatemala signed a cooperative agreement with the Association of Forest Communities in Petén to promote strategic interventions required to improve the long-term social and ecological viability of the community forest concessions in the Multiple Use Zone of the reserve. This cooperation will result in a portfolio of projects to be presented for funding to a diverse array of donors in the hope of strengthening the weak links in the community concession process identified by landscape analyses and monitoring undertaken by the project thus far.

- **Successful development of a "falcon-proof" artificial nest to reduce natural predation of scarlet macaw chicks:** LLP biologists and field staff involved with macaw monitoring designed, constructed, and field tested a new "double chambered" artificial nest design at the macaw nesting site of El Peru. Much to our surprise, one of the new nests was inhabited this season by a breeding pair that had failed to fledge chicks every prior year due to falcon depredation. This year, the pair successfully fledged two chicks for the first time since monitoring began in the area.

- **Continued discoveries at culturally significant sites:** A grant from National Geographic and the support of Southern Methodist University and Yale University allowed archaeological investigators to return to the site of La Corona to continue mapping and reconnaissance of the area. New hieroglyphic panels were discovered, including a staircase covered with inscriptions. While these new discoveries portend continued field presence in La Corona by archaeological teams next summer, they also underscore the importance of conserving the cultural patrimony of Laguna del Tigre.

- **Discovery of an important population stronghold of Central American river turtle in the Maya Biosphere:** With the support of Mexican Biologist Veronica Espejel and funding from the Turtle Conservation Fund, MBLLP staff discovered an important population of the extremely threatened Central American river turtle (*Dermatemys mawii*) within Laguna del Tigre, at the site of El Peru. Field staff captured 78 *Dermatemys* in a 24 hour period, and used Mark-Recapture techniques to estimate that 202 turtles were in the pond during the dry season low water period. This is significant since no "large" populations of this nature currently exist in the downstream waters and adjacent areas of Mexico.

- **Success in conserving jaguars and other landscape species at Tikal National Park:** During an 8-week period in 2005, MBLLP staff worked with Tikal National Park to sample jaguars using remote detection cameras in the heart of the park. Seven distinct individuals were "captured" by photo in the area, including one female, one sub-adult and 5 males. Compared to visits in the remote area of Rio Azul, this session in Tikal yielded nearly twice as many jaguar captures, a remarkable statistic given the far greater amount of human pressure around Tikal. In addition, photographs revealed white-lipped peccaries and numerous photographs of Baird's tapir within Tikal, suggesting that the significant economic income and nation pride generated by the park have indeed helped to conserve wildlife in a highly anthropogenic landscape.

c. Table of Activity Status

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Objective 1	**Develop an adaptive and participatory strategy to address threats to the wildlife in the Maya Biosphere Landscape**		4
1.1	Develop an updated and participatory strategy for the conservation of macaws	On track	4
1.2	Refine biological models and produce conservation landscapes for species	On track	5
1.3	Estimate the financial investments needed to ensure the long-term conservation of the Maya Biosphere Reserve	Completed	6
1.4	Develop an institutional partnership to promote biodiversity conservation and protection within the Multiple Use Zone of the Maya Biosphere	On track	6
Objective 2	**Develop and implement sustainable and adaptive mechanisms to strategically address threats across the Maya Biosphere Reserve landscape**		6
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2.3	Surveys for macaw nests in timber concessions	Completed	8
2.4	Test and evaluate xate management alternatives	On track	8
2.5	Monitor trends in landscape cover	On track	10
2.6	Monitor trends in precipitation and climate (assessing fire risk)	On track	10
2.7	Monitor trends in macaw populations	Completed	11
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2.9	Initiate contact with the private sector to promote conservation initiatives	On track	13
2.10	Over flights of the Maya Biosphere	Completed	14
Objective 3	**Learn and teach best practices for conservation of the Maya Biosphere Landscape and beyond**		14
3.1	Evaluate the effectiveness of pilot projects promoted	Completed	14
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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**		16
4.1	Provide technical assistance to site-based conservation	On track	16
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4.3	Catalyze cross-site and cross-organizational learning, and communication	On track	17
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II. Detailed Description of Progress

a. Key short and long-term program objectives for the reporting period (October 2005 – September 2006)

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 an integral 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 third year of MBLCP activities, our efforts continued to follow 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*

This year, our short-term goals included the refinement of biological landscape analysis for selected species, testing pilot sampling of these same species, and continuing the conservation of the eastern, intact section of Laguna del Tigre.

Mid-term goals included the continued development of conservation landscapes for selected species by unifying biological and human landscapes, and cultivating stronger linkages with other stakeholders, including communities, local organizations, international institutions and the Guatemalan government. In some cases this involved the development of cooperative agreements for proposal development and information exchange. In other cases we focused on ensuring the financial stability of the project's counterpart, including obtaining resources for the Centro de Monitoreo y Evaluación de CONAP/WCS (CEMEC) monitoring institute and other local partners.

Work towards long-term goals during FY06 included continued efforts to refine and disseminate information to decision makers, donors, and other important actors in the MBR landscape. In addition, we provided input into processes such as ongoing discussions about the future of the El Mirador area, the Emergency Protection Law for Laguna del Tigre National Park, the soon-to-be-approved Debt-for-Nature Swap with the Government of Guatemala, IDB and GEF-IDB investments planned for the Maya Biosphere, and other institutional proposals capable of affecting the local dynamics of the reserve. Throughout, biological and spatial data have been made available to better orient these large-scale planning processes, and to better position current MBLLP interventions for long-term sustainability.

Over the next 3 years of GCPII funding, we will continue to consolidate the eastern Laguna del Tigre landscape, strengthen Asociación Balam and conservation efforts in Mirador-Rio Azul National Park, and expand the community-based initiatives currently being advanced within this project under the aegis of the newly obtained cooperative agreement with the Association of Forest Communities in Petén and other local partners. And, as detailed in the previous annual report, the attainment of additional long-term funding sources remains fundamental to ensuring the viability of our diverse field-based interventions, 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

WCS biologists developed a draft scarlet macaw conservation strategy as the initial input to be provided to partner organizations for review. WCS staff incorporated information compiled during our last 4 years of effort with the species, as well as historical information available from previous studies. Additional input will be provided through participatory consultation with the leadership council and macaw guards from the village of Paso Caballos (see Activity 3.1). In August

2006, a working draft was provided to members of the Guacamayas sin Fronteras consortium. Members will meet on a monthly basis to collaborate in the development of the conservation plan. Other members of the initiative are ARCAS (Asociación para el Rescate y la Conservación de los Animales Silvestres), FDN (Defensores de la Naturaleza) and CONAP (Consejo Nacional de Áreas Protegidas). These institutions previously joined WCS in producing the document "Protocol for handling confiscated macaws in the Maya Biosphere Reserve". This document will constitute one of the sections of the macaw conservation strategy since it stipulates guidelines to be followed when determining the fate of confiscated specimens, and also summarizes the necessary requirements for successful liberation of captive born chicks.

Following the tense incidents at the macaw nesting site of Lo Veremos/La Corona in 2005, WCS was pleased to be able to return to the area during the 2006 nesting season. This year 3 active nests were discovered in the area during collaborations with archaeologists returning to investigate the ancient Maya site of La Corona. These field collaborations in the protection and monitoring of the area included support from CONAP[1], *Proyecto El Peru-Waka*[2], and DIPRONA[3]. Financing provided by USDOI and USAID/Guatemala also permitted members of the Paso Caballos community to be employed to strengthen fire prevention activities and improve infrastructure in the area.

As during the previous year, the entire macaw protection strategy was supported by the Critical Ecosystem Partnership Fund. This support allowed WCS to synchronize field monitoring efforts (to provide protection via human presence) with the programmatic focus on law enforcement. CEPF funds greatly facilitated the continued collaboration of DIPRONA. In addition, CEPF support also helped strengthen MBLLP program goals including the installation of infrastructure such as camps and access roads, as well as covering the costs of field supplies and communications.

One key management challenge related to this project involves the pending termination of CEPF funding for the protection and monitoring of the eastern Laguna del Tigre area, scheduled for termination in October 2006. Another relates to the challenge of continuing to incorporate other social actors in participatory conservation efforts. For example, WCS Guatemala was recently visited by the concession leaders of Asociación Forestal Industrial de San Andrés, Petén (AFISAP), who requested technical and financial support to allow them to collaborate in the detection, monitoring, and protection of macaw nests in their forest concession. Yet we currently lack the funds to expand activities.

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

In November 2005, WCS Guatemala hosted a workshop with experts from Guatemala, Belize and Mexico to review and refine the preliminary habitat suitability (i.e. biological) models for jaguar, Baird's tapir and white-lipped peccary produced in the document "The Maya Forest Living Landscape: A Conservation Strategy based on Wide ranging Species". Prior to this collaborative exercise, Victor Hugo Ramos of CEMEC/WCS[4] developed improved vegetation and water layers for the entire reserve as crucial inputs for the biological models. The workshop focused on explaining the landscape species methodology to participants, and on revisiting the key variables used to model (i.e. predict) habitat quality for each species across the entire lowland Maya Forest area. Experts were asked to independently rank their familiarity with each species, and then assess variables used to estimate each species' landscape needs and threats. A final report on the workshop is available as Appendix A1.

Advances in the human landscape analysis included a refinement of the human access model, again performed by Victor Hugo Ramos of CEMEC/WCS. This new layer for the threats model included several roads and trails that were not incorporated into previous threats landscapes (Appendix A2). Final conservation landscapes for the main landscape species are in production. Generating conservation landscapes that accurately capture present population distributions of landscape species and related threats from human activities remains a challenge. This is largely because, given available resources, we have adaptively allocated our limited available funds to threats abatement and not to biological sampling in areas that face few if any threats. As a result, our population distribution maps are, in places, based on extrapolation, not sampling data. That said, our confidence in the maps will increase over time as we are able to conduct biological surveys in more areas.

[1] The National Park Service.
[2] Archaeological project led by Dr. Hector Escobedo, Dr. David Freidel, with collaboration by Dr. Marcelo Canuto.
[3] National police force dedicated to the enforcement of environmental laws and protection.
[4] CEMEC/WCS is the landscape monitoring and mapping institute maintained via a collaboration between the National Park Service and WCS Guatemala.

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

The final version of the updated Laguna del Tigre Master Plan was produced by Bayron Castellanos of WCS as the leader of a multi-institutional team including members of CONAP, IDAEH[5], CECON[6], Conservation International and local governmental organizations. This plan was presented to the National Park Service in Guatemala and is awaiting final approval. The plan contains a section on the financial investments required to conserve the remaining intact areas of the park and foster the collaboration of communities permitted to remain within the area. A copy of the draft version of the plan is available from WCS Guatemala upon request. Continued challenges include obtaining approval of the plan by the National Park Service (CONAP), still pending due to an internal debate about the "legality" of recognizing existing settlements in the updated plan. Nevertheless, one hopeful note is that Laguna del Tigre National Park was included by CONAP in the emerging Debt-for-Nature Swap being negotiated between the Guatemalan Government and the United States Government, with the support of Conservation International and The Nature Conservancy. Once approved, we are hopeful that the financial incentives section of the plan will serve as a blueprint for future investments to be made by the Debt Swap.

Activity 1.4 Develop an institutional partnership to promote biodiversity conservation and protection within the Multiple Use Zone of the Maya Biosphere

In June of 2006, WCS Guatemala, Asociación Balam[7], and ACOFOP[8] signed a cooperative agreement to strengthen the capacity of local managers of the community forest concessions within the Maya Biosphere Reserve. Since the initial agreement, Rainforest Alliance and Counterpart International have pledged their support for the effort. Advances in the first month of cooperation include the identification of priority projects to be presented for financing as a unified group. Under the agreement, each organization will make a contribution in strengthening the Multiple Use Zone by developing the capacity of community-based managers. Focal areas for capacity development include protection and management of natural resources, prevention and control of forest fires, administrative and financial management, tourism, and education, among other aspects. The main challenge facing this collaboration is the identification of appropriate donors for the activities proposed, and the development of mechanisms for financial sustainability over the long run. Appendices A3 and A4 depict the press article and the details of the cooperative agreement.

In addition, WCS helped coordinate and administer a donation provided by the Plant Family Foundation to strengthen community-based fire prevention and protection activities in five community management units within the Maya Biosphere Reserve. In alliance with ACOFOP and CONAP, Plant Family funds were used by village organizations to prevent forest fires and demarcate management areas in four community forest concessions (Carmelita, AFISAP, La Colorada, and Uaxactún), as well as the community polygon of Paso Caballos in Laguna del Tigre National Park. This collaboration laid the foundation for the expansion of the alliance mentioned above.

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

Scarlet macaw nest protection activities continue to be one of the most successful activities of the work plan. Field technicians prioritized the nest protection activities based on early season surveys for nesting activity and the existence of additional field projects that provided presence in key sites. For example, the presence of the El Peru-Waka archaeological project at the scarlet macaw nesting stronghold of El Peru served as a strong deterrent to poaching due to the accompaniment of security forces and the constant vigilance of archaeological workers in the area. This allowed WCS to focus efforts in the other three main nesting sites: Peñon de Buena Vista, La Corona and El Burral.

[5] Instituto de Antropología e Historia
[6] Centro de Estudios para la Conservación, Universidad de San Carlos, Guatemala.
[7] WCS' Guatemalan NGO partner in the conservation of the Maya Biosphere Reserve
[8] Asociación de Comunidades Forestales de Petén

Following this adaptive strategy, WCS subsequently administered funds provided by CEPF and USDOI to strengthen the combined protection efforts of CONAP and DIPRONA, with occasional participation of the Guatemalan army on remote patrols. As in the previous year, five key control bases were established (El Peru, El Burral, Guayacan, Lo Veremos and Peñón de Buena Vista) to control the spread of invaders, and to facilitate access to remote areas by combined patrols. Continuing with the lessons learned from previous years, Light Hawk over flights were used to identify threats such as forest clearing and colonization on the outskirts of nesting foci, and the remote detection of fires via the CEMEC monitoring laboratory was used to constantly evaluate the strategy as the nesting season progressed.

Excellent results were also forthcoming via the pilot project developed last year involving members of the adjacent Q'eqchí Maya community of Paso Caballos in the conservation of macaws and their habitat. This year, six members of Paso Caballos were employed as the guards of the Peñón de Buena Vista nesting site. Community members now versed in the use of GPS and macaw monitoring techniques executed field activities including the preparation artificial nests, macaw nest monitoring (consisting of climbing and inspecting nests on a regular basis), demarcation of the area to establish field presence, and the search of areas for new conservation elements including macaw nests, important wetlands, and archaeological sites. In January of 2006, Paso Caballos guards detected an illegal occupation of land by 20 armed individuals adjacent to the Peñon de Buena nesting site and quickly alerted authorities, resulting in the immediate apprehension and removal of the invaders without incident. Guards also detected one inactive nest scaled by macaw poachers at the Peñon site.

Thankfully, the 2006 nesting season was a low-pressure year due to the above average amount of rainfall recorded. For this reason efforts focused on developing fire lines and patrolling the most vulnerable sections of the nesting range, including a strong focus on the La Corona area. The kidnapping of WCS and CONAP staff at La Corona in 2005 forced us to abandon the area until January 2006, when we returned to find the area abandoned. Nevertheless, some of the infrastructure developed in the previous year (the archaeological camp) had been destroyed and burned. In 2006, with the support of USDOI and CEPF it was quickly rebuilt, and the archaeological site was cleaned to facilitate the entry of the investigative team during a 3-week stretch in April 2006.

Final results reported to the CEPF for this activity included no macaw nests poached by humans or burned within the area of project influence. In our opinion, the great decrease in the number of poachers/invaders captured reflected the strategy of maintaining field presence, eliminating the misconception that the area is "open for the taking", and working to consolidate the conservation potential of these crucial macaw nesting sites. However, 2006 was a very "wet" year, suggesting that next year could bring a new set of conditions -- and greater difficulty -- if drought and other political factors (i.e. next year is an election year in Guatemala) come into play.

Activity 2.2 Enforcement of protective regulations – road barriers

As reported in the previous MBLLP annual report, the initial road barrier built in the Mirador Río Azul National Park was destroyed shortly after being built. In late 2005 Asociación Balam and CONAP rebuilt a stronger, permanent barrier with the support of the MBLLP. Unfortunately, this road barrier was also subsequently destroyed by traffickers of human migrants within 6 weeks of reconstruction, reportedly by attaching a grenade to the steel and concrete structure. With this lesson in mind, the proposed construction of a similar "unmanned" road barrier at the Caobitas forest outpost was cancelled due to news that AFISAP forest concession personnel would not maintain permanent presence at the site.

As planned in Activity 3.1, in late July 2006, personnel from MBLLP, CONAP, and Asociación Balam held a participatory session to evaluate this pilot project with members of the Municipality of Melchor de Mencos and the adjacent community forest concession, Laborantes del Bosque. A copy of the results of the consultation is attached as Appendix A5. In conclusion, all members of the group recognized that they had been duly consulted about the project and clearly understood its objectives, yet additional efforts would be required in the future to ensure the success of efforts to control the flow of people into and through the park. Specifically, members of the Laborantes del Bosque conceded their preoccupation with the danger involved in attempting to control the flow of supposedly "dangerous and well armed" individuals. Although all those consulted indicated they would like to see continued WCS support to address the problem of open access through the area, they asked that the following recommendations be taken into account if the project

continues with this activity: a) avoid relying on one barrier and develop a second barrier at the army outpost located along the same road 25 kilometers to the south; b) rebuild the barrier, even stronger next time; c) place signage along the entire road about the restricted access within the park; and d) man the barrier at the park's entry with police and army personnel whenever possible.

Surprisingly, on the 6th of August 2006, the informal and under-manned CONAP checkpoint established at the site of El Achiotal was burned to the ground by unidentified arsons. WCS MBLLP in conjunction with Asociación Balam, ACOFOP, and other actors working in the area had long been imploring CONAP to install and man this checkpoint. Its strategic position on the only route into the western forest concessions of AFISAP and Paxbán, as well as the area of La Corona made the checkpoint ideal for reducing uncontrolled access into the western part of our target landscape. Unfortunately, up to the recent burning of the post, CONAP had manned the checkpoint with only two unarmed guards, resulting in no effective change in the control of well-armed individuals entering the area. In response to the arson, on August 13th CONAP manned the post with Guatemalan army, DIPRONA natural resource police, and 4 CONAP technicians. They are practicing strict control of all vehicles and people entering the area, as evidenced by a letter from CONAP requesting that all legitimate conservation and management personnel carry institutional identification when planning to pass through the checkpoint on the way to the field (see Appendix A6).

The fact that explosives were used to destroy a very solidly constructed steel and concrete barrier suggests that unmanned barriers may not be an effective approach to controlling access to Mirador Río Azul National Park. Based on our discussions with local people, Asociación Balam, and CONAP, we will explore the feasibility of promoting the development of manned checkpoints.

Activity 2.3 Surveys for macaw nests in timber concessions

During FY06 we again conducted searches for additional scarlet macaw nests in AFISAP and in La Colorada. We were also able to search for nests in the Carmelita concession for the first time this year with the help of community members who believed there was nest activity in the area. Through the environmental education team led by Geovani Tut and Victor Mendez, WCS held meetings with teachers, local concession leaders, and parents to explain the objectives of these macaw conservation efforts and also to ensure greater awareness of the dire decline of the species across the reserve. Despite a significant search effort, no new nests were discovered in either AFISAP or Carmelita, whereas the macaw monitoring program yielded two active nests in the Colorada concession. Continued monitoring of these nests throughout the nesting season revealed the presence of chicks, yet none fledged due to predation by natural predators. No new nests were found in the timber management areas of either concession.

Drawbacks of this activity include the significant amount of time and resources required to access these remote sites, climb trees, and survey areas. In order to reduce the costs of extensive field surveys in areas where local forest management groups may be working, we are now considering working with local managers to offer a modest financial incentive for any new nest detected during the harvest year. Most field activities related to timber harvests occur during the dry season, coinciding with the macaw nesting season and also, unfortunately, with the time of greatest fire threat. The adoption of such a financial strategy to locate new nests in places occupied by timber field crews would allow us to focus efforts in other sites until information is forthcoming, and then send technicians to the areas to develop a strategy for monitoring and protection.

Activity 2.4 Test and evaluate xate management alternatives

Since late July, 2006, Organización Manejo y Conservación (OMYC) of Uaxactún village, the Carmelita Cooperative, WCS Guatemala, and the Rainforest Alliance have collaborated to implement a pilot project focused on the development of an alternative, certified xate harvest with Continental Greens Ltd. of Houston, Texas. After one year, the project continues operation and appears to be gathering steam despite a number of obstacles encountered thus far. MBLLP efforts have focused on monitoring the quality of the xate extracted in the Uaxactún and Carmelita forest concession, while WCS Guatemala and Rainforest Alliance have focused on providing technical and financial support to the initiative during this initial stage.

First year results include a number of lessons learned. Among the most important is that both communities are capable of producing a constant flow of quality leaf for the market, yet local capacities to maintain regular weekly volumes wax and wane depending on a number of highly unpredictable variables including the weather, the number and quality of alternative sources of employment for harvesters, and the immediate availability of cash required to pay harvesters upon the receipt of product. As a result of these factors, Uaxactún and Carmelita both have had periods of high leaf production, followed by periods of very low production sometimes lasting several weeks or more. Luckily, however, thus far when Uaxactún has faltered, Carmelita has increased production, allowing these two groups who are currently exporting their xate together (under the export permit of OMYC) to maintain their market commitments, and subsequently, the business of Continental Greens.

In Uaxactún, management by two "xate management committees" failed to produce economically transparent and reliable administration of the financial resources of the project. The first elected administrators of the OMYC xate bodega (i.e. "*Comite de Xate*"), having received the right to manage the business via the delegation of such by the president of OMYC, managed the money without proper accounting, and made an inadequate effort to set cost levels based on projected income. This led to the quick squandering of available resources, and the election of a second *Comite*. Throughout this process, for a number of reasons, the technical help offered by WCS and Rainforest Alliance was not taken into account by the xateros responsible for the management of the project, frustrating both the NGO supporters of the project and OMYC alike. Following a repeat of this pattern with the second *Comite*, OMYC assumed responsibility for the administration of the project and the financial management has improved dramatically.

Future plans in Uaxactún include the involvement of a professional administrator to teach improved administrative management to the OMYC-assigned personnel. To facilitate such, WCS has provided a generator and computer to the project so that all xateros turning in leaf will receive formal vouchers of their volumes and earnings. Financial decisions will be increasingly made based on cost-benefit analyses, with an eye to increasing the working capital of the bodega as a short term goal, and developing a fund for health problems incurred by xateros in the field over the mid-term.

Despite the bumps in the road, a number of encouraging aspects have emerged. First, the project has received wide international recognition, with researchers coming from Costa Rica, Europe, and the United States to evaluate the use of a market-based approach by the project that has resulted in improved environmental management. Second, as evidenced in Appendix A7, WCS MBLLP monitoring of the quality of the xate being harvested in Carmelita and Uaxactún has revealed a vastly lower rate of waste as compared with the traditional "quantity-based" harvest. (Note: in this project, harvesters are strictly paid on a per frond basis, with local village women hired to sort through the leaf and eliminate poor quality fronds). Third, Continental Greens has praised the quality of the xate being produced, and is eager to obtain a greater volume as soon as possible. They also provided a no-interest loan to Carmelita and Uaxactún to help each village obtain a vehicle. Last, but not least, in a meeting of the general assembly of OMYC in Uaxactún village in July, OMYC members voiced their concern about the project, demanding that it continue despite some local resistance by the parallel, traditional quantity-based market that persists within the village. Further details on the participatory evaluation are provided in section 3.1.

Continued challenges facing the project include the remarkable disinterest shown thus far by local CONAP officials who could use the existence of this innovative pilot project to actively promote a sea change in the way xate is managed across the reserve. As reported by WCS in previous years, the current "quantity-based" xate harvest regime is destroying xate as a resource. (In some cases as much as 70% of the fronds harvested were being discarded.) The only hope for the persistence of xate as a local NTFP lies in a broad reform of the way it is harvested. To accomplish this, harvesters must be paid only for quality fronds. For the meantime, however, in Uaxactún the xate bodega has had to compete with the traditional market that accepts every leaf, no matter how bad: clearly an unsustainable situation. To address this, Rainforest Alliance, WCS, and local partners have begun to publicize the information available and to publicly request action by the park service. RA and WCS also teamed up with AGEXPRONT[9] to help develop a xate management plan for the Uaxactún management area requiring all xate removed from Uaxactún to be sorted in the bodega. Approval of this plan by CONAP Guatemala is pending.

[9] Agencia Guatemalteca para la Exportación y el Turismo

Activity 2.5 Monitor trends in landscape cover

Since 2001, WCS and CEMEC/CONAP have been collaborating to monitor natural landscape cover across the Maya Biosphere Reserve. This activity allows the Guatemalan Government and partner organizations to evaluate the loss of MBR forest cover to agricultural and pastoral uses, and use information on these "killer threats" to take management decisions and evaluate the success of conservation interventions across the reserve. A final report of the results of landscape cover monitoring for 2004-2005 is provided as Appendix A8, and area affected by forest fires in the dry season of 2005 as Appendix A9.

The monitoring period for this year's data set spans a 12-month period from May, 2005 to April, 2006. Comparative baselines exist for the previous periods: 1986-1990, 1990-1993, 1995-1997 by the University of Maine-Department of Forest Management, PROPETEN/CI, CONAP, NASA-MSFC, NASA-SSFC, between 1997-2000 by PROPETEN/CI, 2001-2004 by CEMEC/CONAP, WCS, FIPA/AID, and 2005 by CEMEC/CONAP/WCS.

LANDSAT (Enhanced Thematic Mapper+) satellite images in SLC-off mode from 2006 are being used and compared with 2005 scenes to analyze changes in primary vegetation as a consequence of transformation to agriculture, cattle pasture, and other miscellaneous uses.

Preliminary results suggest a slight decline in the overall deforestation rate for the Maya Biosphere Reserve as compared to the equivalent period from 2004-2005. In 2004-2005, an estimated 15,601 hectares were deforested across the 2.11 million hectare reserve, compared to 14,325 hectares in the most recent 2005-2006 period. We stress that these are PRELIMINARY results for 2005-2006. A final report on the specific deforestation figures for each management unit in the MBR will be ready in the first week of October 2006.

Activity 2.6 Monitor trends in precipitation and climate (assessing fire risk)

As background for this activity, between 2003 and 2005 we used fire pixels derived from the MODIS sensor to monitor daily forest fires in real time. This monitoring continued in 2006 and allowed us to produce daily updates and detailed weekly reports. These were made available via the web (http://servir.nsstc.nasa.gov/fires/cemec.html), and provided regularly for CONAP, WCS, SIPECIF, and other institutions fighting and/or preventing forest fires in the field. The weekly reports also included information on precipitation trends taken from data of the National Weather Service (INSIVUMEH) and the TRMM rainfall products.

Preliminary results, comparing the 2006 fire season with previous seasons, revealed a very low occurrence of fire pixels, particularly compared with 2003 and 2005, both years of intense fire activity. For example, regarding data for the entire Department of Petén, in 2005 we recorded 9488 accumulated fire pixels between the 1st of January and the 6th of May, while in 2006 we recorded only 2415 fire pixels during the same period. This great reduction in the occurrence of fire pixels was related to the pattern and volume of precipitation in 2006, specifically the absence of drought, defined as more than 3 weeks without significant rainfall.

In following our fire monitoring efforts during previous years, we also intend to assess the amount of habitat within the MBR affected during the 2006 dry season using LANDSAT and ASTER data. This assessment will subsequently be used to develop a detailed analysis of the relation between climate and the occurrence of fire. Furthermore, this analysis will be used as an input for a predictive fire model, currently under development. A working draft of this predictive model has already been assembled, and will be refined during the upcoming MBLLP work year.

For the 2006 fire season, we prepared an analysis of the outlook for fire during the upcoming dry season (Mar-June, 2006). This analysis, which predicted that the 2006 would be low threat fire year proved to be accurate. The analysis is presented as Appendix A10. Complementing these efforts, we are currently fine-tuning a network of Davis Instruments weather stations to help improve the coverage and precision of our data on climate. This network has been fully operational since February 2006. In the future, if we are able to improve our data transmission efficiency (many of these weather stations are in extremely remote sites, thereby allowing us to download data only once every 6 weeks), we will be able to use these data in real time to guide 2007 forest fire prevention efforts.

Final deliverables to be produced for this activity are: a report for the 2006 fire season; burn area assessment in the MBR for 2005-2006; cartographic outputs of the analyses; the fire risk assessment model; and a report on climate monitoring in 2006. We expect that reports will be ready between October 2006 and January 2007.

Activity 2.7 Monitor trends in macaw populations

A total of 23 active macaw nests were detected by WCS field staff during the 2006 nesting season, as compared to the 24 active nests detected during 2005. The site of El Peru accounted for 14 of these active nests. WCS field personnel were able to climb and investigate 10 of these, the remainder being inaccessible due to the presence of beehives or because they were located within rotten branches and/or the extremities of smaller branches. Within the 10 nests monitored, 25 eggs were laid, with 17 of them (68%) producing fledglings. Of the 17 chicks, only 7 fledged from the nest. The site of Peñon de Buena Vista yielded 3 active nests and 11 eggs. Of the 11 eggs, we detected 7 chicks, with 3 of these chicks flying from the nest. In the site of La Corona, although monitoring there was more sporadic, we detected 2 active nests in the same tree, with 5 eggs. Only one chick was found during a subsequent monitoring visit, and we assumed that this chick also flew from the nest since it was very close to fledging date. At the site of El Burral, 4 active nests were detected, yet we were unable to visit the site on a regular basis, precluding the possibility of more detailed monitoring at this site. Active nests were also monitored at the site of La Colorada (1), and Pipiles (1), although both nests failed to fledge chicks due to natural predation. A final report reviewing the nesting success of macaws at the site of El Peru from the 2003-2006 seasons is provided as Appendix A11.

Traditional field activities focused on macaw conservation continued, including the monitoring of the nesting success of macaws in the eastern section of the Laguna del Tigre ecosystem. Sites involved in these efforts included El Peru, El Burral, La Corona, Peñon de Buena Vista, and sections of the AFISAP and La Colorada community forest concessions. A new site incorporated in the monitoring effort included the macaw nesting area of Pipiles, located south of the westernmost section of the Maya Biosphere Reserve on the banks of the Usumacinta River. WCS was alerted to this area by local community members interested in an environmental education program developed to monitor macaws with the participation of local school children living near nesting areas. Through this effort, we strengthened contact with local community groups with influence in these areas, allowing us to raise awareness about the critical state of the species with the local stakeholders and officials. Presentations on macaws were provided at the local schools of Paso Caballos, La Colorada, Carmelita, San Andres, and Pipiles, while the monitoring of nests with children attending the local school was conducted at these same sites, with the exception of Carmelita due to the lack of macaws in the area. As during the previous year, in Paso Caballos, elementary school students participated in a field trip to monitor nesting macaw success, this time at El Peru. This process involves local children climbing nesting trees with pulleys and the help of WCS field technicians; children selected to climb the nesting tree took pictures of the chicks and later shared these with classmates, teachers, and parents, while all children filled out data sheets. In all our activities we continue to use the coloring book previously developed by WCS field technicians. WCS is pleased to report that other institutions including the Ministry of Education and Rainforest Alliance have expressed interest in collaborating with the project in the future.

In total, during the 2006 nesting season we detected 47 eggs within 23 active nests, with 11 successful fledges reported. As in previous years, this year approximately 50% of the chicks detected were lost to natural causes (health, falcon predation). One bright spot in this regard was the successful fledging of chicks from a “new”, double-chambered artificial nest designed by WCS Guatemala as an adaptation against predatory raptors such as forest falcons (*Micrastur* sp.) and bat falcons (*Falco rufigularis*). One such nest, adopted this year by a breeding pair of macaws that had never successfully fledged a chick due to persistent falcon depredation, was able to successfully fledge two chicks at the site of El Peru. This event was very encouraging, and will help us to design a more consistent intervention strategy revolving around the construction of similar nests at sites where breeding pairs have been unsuccessful in recent years. Problems encountered in this activity center on the difficulty of accessing and monitoring the nests during the entire nesting season, and an inadequate number of field personnel required to cover the distribution of nests over a 150,000 hectare area.

Activity 2.8 Develop methodologies to monitor trends in selected landscape species

The WCS MBLLP carried out diverse activities designed to help us determine the most efficient ways to monitor trends in selected landscape species across the reserve. Support for sampling designs and data analysis was provided by Dr. Samantha Strindberg of the Living Landscape Project, who visited the field office in Flores to review our efforts thus far

and make recommendations for the future. Dr. Strindberg also assisted with the design of monitoring for some of the threats (illicit activities in the MBR), strategic planning (revising conceptual models and discussing the implementation of monitoring frameworks) and review of biological & human landscapes with options for building conservation landscapes). Additional support was provided by constant contact with conservation colleagues most familiar with the methodologies used with sampling the species in question in other sites. Specific advances with each of the species are detailed below.

Although initially included in the original set of landscape species selected, the MBLLP project decided to remove a focus on Morelet's crocodile as a result of field observations that revealed abundant populations distributed across the reserve. This species is evident wherever significant water bodies exist. Local inhabitants of the reserve also confirm that the species has made a significant recovery over the last 20 years as a result of a waning market for the skins. By following the principles of adaptive management we decided to refocus our resources on lesser-known and more threatened species.

WCS Guatemala received a grant from the Turtle Conservation Fund of Conservation International to support field investigations on the abundance of the Central American river turtle (*Dermatemys mawii*) within the reserve. Field efforts thus far focused on developing sampling methods for closed water bodies and rivers, and testing the amount of variation in capture rates during the high water and low water seasons. Sampling of *Dermatemys* was undertaken with the use of large seine and fyke nets developed with the advice of Mexican expert Verónica Espejel, who visited the site to teach WCS field staff how to make and use the nets. Sampling efforts have thus far been located in the El Peru lagoon, the Rio San Pedro, and Yaxha lake. Surprisingly, the smallest water body sampled, El Peru lagoon, yielded the greatest number of *Dermatemys* captured: 115 in three sampling sessions. Using Mark-Recapture population estimation techniques, the total population estimated for the El Peru lagoon during the dry season of 2006 was 202 (SE 13.7961), a phenomenal number of turtles for a water body of approximately 1 km^2. Unfortunately, sampling in the other two water bodies, Yaxha lake and the San Pedro river, have only yielded some 10-15 turtles per site, suggesting that this methodology will require additional experimentation before it can be used in these larger water bodies.

In September 2005, with the support of the WCS Jaguar Conservation Program, we held a workshop in Tikal National Park on the use of remote detection cameras for estimating the abundance of jaguars. Dr. Scott Silver, Dr. Eduardo Carrillo, and Leonardo Maffei provided training in theory and field methods to WCS Guatemala field staff and a diverse set of students and researchers from Mesoamerica. Following the workshop, in association with Tikal National Park, WCS Guatemala initiated a two-month camera trapping study of jaguar in the park. Results revealed 7 individual jaguars within the core central area of the park, by all means a surprise given the significant amount of human pressure in and around this protected area (see Appendices A12 and A13). A preliminary analysis using the program CAPTURE estimated abundance to be 11 jaguars (SE 3.57) within the effective sampling area of 108 km^2. A public presentation of the results is planned for the end of August, 2006. Camera sampling for jaguars was also executed in the remote, central section of Rio Azul. As in previous surveys in the area, a comparatively lower number of jaguars (N=4) was recorded. A final report on these activities will be available in November 2006.

WCS Guatemala also collaborated with the WCS Jaguar Conservation Program to investigate the relationship between cattle ranching and jaguars across the reserve. Lic. José Soto, a MSc. Student at the University of Florida, surveyed cattle ranchers along three routes within the reserve (Carmelita, Tikal, Yaxha) to compile data on the frequencies of attacks on cattle by jaguars under different pastoral conditions, and compare the attitudes of ranchers towards jaguars and their prey. This study revealed that, for the moment, conflicts between jaguars and cattle within the reserve are rare, while greater numbers of attacks seem to be occurring in the highly fragmented areas outside the reserve. Surprisingly, continued sampling of jaguar depredation events revealed that domestic animals (dogs and pigs) were common targets in the two "forest villages" of Carmelita and Uaxactún. This result suggests the need to develop a human-wildlife conflict strategy in these villages as one of the priorities for jaguar conservation in the Maya Biosphere.

Field sampling of white-lipped peccary in Rio Azul planned for the dry summer months of April and May was hampered by the unexpected amount of rainfall during these months. Peccaries were found to be absent for much of the period at a number of the waterholes where they traditionally appear during this period. Nevertheless, in the latter part of May peccaries returned and we were able to sample 12 water bodies concurrently using remote detection cameras. Final results reveal peccary captures at 2 of the 12 sampling sites. Of interest was the detection of peccaries affected by a plague (possibly pig scabies caused by Sarcoptes mites – *S. scabiei suis*) that has caused a great number of the individuals to lose

as much as 50% of their hair. Final results indicated that camera-based sampling may be of interest for some aspects of white-lipped peccary monitoring, yet the use of this methodology will not allow us to greatly refine our current biological model for the species, nor estimate population trends with statistical rigor over the long-run. Given this, with the support of Mexican peccary expert Rafael Reyna, we obtained 8 telemetry collars to be placed on white-lipped peccaries in the upcoming work year. This method will hopefully allow us to learn more about the habitat needs and resource use patterns of this enigmatic species.

Preliminary results on the development of an algorithm to allow the identification of individual Baird's tapir using digital photographs of tracks suggest that the methodology may work if additional refinements are successful. Zoe and Sky Walker, the developers of the methodology (WildTracks), reported that approximately 75% of the photographs provided were successfully identified by the algorithm. At this point, the Walkers suggest collecting additional digital photographs of tracks to allow further refinements of the algorithm before field sampling occurs. Given how difficult it is to survey tapirs, the success of this approach may have far-reaching implications for effective monitoring of tapir across all range states.

Activity 2.9 Initiate contact with the private sector to promote conservation initiatives

We continued developing our working relationship with Aviarios Mariano, a wild animal safari center containing a collection of 200+ captive scarlet macaws. With the help of the owner, Mrs. Nini de Berger, we collaborated with the collection's veterinarian to draw blood and feather samples to be used in preliminary diagnostic screening to determine the degree of inbreeding (endogamy), and exposure to pathogens that might preclude the release of chicks bred in captivity. This activity was supported by Dr. George Amato of the American Museum of Natural History, and PhD student Ms. Kari Schmidt of Columbia University. In addition, Mexican MSc student Luís Manuel García of the Institute of Ecology, University of Mexico, Xalapa, participated in the sampling, helping us to build a link to conservation colleagues working in Montes Azules, just west of the Maya Biosphere Reserve. Assuming the macaws in Aviarios Mariana are found to be healthy enough to serve as a source of captive born chicks, we are hopeful that assistance in underwriting the costs associated with breeding chicks and transporting them to the Petén will be provided by the aviary.

WCS Guatemala contacted Dr. Anne Dix of USAID/El Salvador to request assistance with establishing contact with Grupo Taca. Because the long-planned bi-national effort to solicit funding from Taca Airlines supposedly being led by SalvaNatura (in El Salvador where Taca is based) failed to yield results, we have decided to pursue this avenue directly.

WCS Guatemala also joined forces with the Guatemalan Ornithological Society and Cayaya Birding Tour Operators to develop and promote the first ever Audubon Christmas Bird Count in Tikal National Park. Planned for December 2006, this first event will hopefully help establish a tradition that continues on for years. This collaboration will help stress the importance of conserving Tikal's biological integrity, help monitor the avifauna in the park over time, and provide some modest funding to WCS and Asociación Balam for conservation activities in the future[10]. Please visit www.cayaya-birding.com for more details.

Lastly, WCS Guatemala received a visit by a BBC film crew interested in depicting our efforts to conserve scarlet macaws on a new television series being developed named "Animal Ark". The BBC proposes to use television as a medium for highlighting groups doing noteworthy environmental work, and subsequently to solicit funds from viewers to channel the resources to activities in the field. However, this first visit was only for reconnaissance, and unfortunately it rained non-stop during their visit to macaw nesting sites. The BBC later advised that they are considering the area for filming in 2007, to air the program in 2008, yet final confirmation is pending.

Unfortunately, among other factors (such as a strong field-based focus), the location of the WCS Guatemala Program in the Department of Petén leaves us with significant disadvantage because most of the major corporations and private charitable entities are located in Guatemala City, and because it is difficult for an international NGO to gain funding from a national corporation.

[10] The amount to be contributed per tour recipient is still being determined, with more income expected in future years.

Activity 2.10 Over flights of the Maya Biosphere

For the seventh year in a row, WCS Guatemala received the support of Light Hawk to execute over-flights of the reserve with governmental organizations, NGOs, community-based representatives, and members of the press to educate a wide spectrum of local and international actors about the current state of the Maya Biosphere landscape. Flights occurred this year in January, March and April, with a total of 65 hours logged in the air. Flights were conducted for the following people and/or purposes:

- Night-fire films
- The mayor of Pipiles (macaw nesting site), Mr. Mario García
- CONAP-Petén Regional Director: Vinicio Montero, in addition to numerous other CONAP staff
- Laguna del Tigre National Park Director: Julio Valle
- 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
- OMYC[11] Control and Vigilance Committee members
- Member of the village of Paso Caballos
- Defensores de la Naturaleza Sierra del Lacandón National Park Director: Javier Márquez
- Journalists from Prensalibre and El Periodico (Guatemalan newspapers)
- Tropico Verde-Parkwatch representatives: Carlos Albacete, Piedad Espinosa

Over-flights were used to support our research on landscape species by performing aerial searches for scarlet macaw nesting sites and closed water bodies for crocodiles, turtles, and tapirs, among other species. Flights also allowed us to pinpoint fire prevention and protection activities in the community forest concessions, Laguna del Tigre, and other areas of the reserve. One crucial discovery during over flights in March included the location of recent clearings in the previously pristine southeastern section of Mirador-Rio Azul National Park. Discovery of this area, presumed to be a marijuana cultivation patch, allowed Asocación Balam, CONAP, and IDAEH guards stationed in the area to avoid accidentally "running into" the area while on routine patrols and explorations, while also providing an opportunity to develop a wet season strategy for interdicting the threat with the support of governmental agencies responsible for such activities. Additional advances included digital aerial photography of settlements across the reserve that will be used by CEMEC/WCS to establish a reliable human population baseline for critical sections of the reserve.

Problems encountered during this activity included a scarcity of fuel during some of the planned over flights, despite repeated assurances that fuel would be available. If not for this, a greater number of over flights would have been possible. Appendix A14 provides a more detailed example of the results of one set of over-flights executed during the 2006 flight season.

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

Three pilot projects conducted with communities were evaluated, using participatory consultations based on group discussions. These discussions were guided by a general questionnaire designed to stimulate thought about some of the key issues involved. Questions included:

- Were you consulted prior to the initiation of the project?
- Are the objectives of the project clear?
- Up until now, has the project been successful? Why, or why not?
- What would be required for the project to be more successful?
- Do you desire that WCS continue supporting this project?

[11] The community forest concession management organization of Uaxactún village (Organización Manejo y Conservación).

Projects evaluated using this methodology included: a) the involvement of members of the community of Paso Caballos in the protection of the scarlet macaw nesting site of Peñon de Buena Vista, b) the pilot xate management project in Uaxactún, and c) the road barrier project in the Municipality of Melchor de Mencos. In the case of Uaxactún, the consultation was done in a general assembly of OMYC, while the others involved more discrete sit down session with careful transcription of the results.

In general, results indicated that the least successful project of the three has been the road barrier project. Significant hurdles exist due to the threat of force latent in the area, and the remoteness of the site. Participants in the evaluation also implied that for the project to be successful, additional resources would be required above and beyond those needed to merely reconstruct a barrier (i.e. such as the permanent presence of guards at the site). Though the project does not have the resources, at present, to financially support manned barriers, WCS Guatemala and the MBLLP will take this information into account when promoting this intervention to authorities and other funding sources in the future.

Regarding the xate management project in Uaxactún, participatory consultations revealed that the project has been moderately successful. In our estimation, the continued investment of resources in the effort is justified, both from the feedback received and due to the importance of this pilot effort for the future of this crucial economic resource. One key point emerging from the consultations is that greater transparency in the financial management of the bodega is fundamental to the success of the project. To this end, WCS has employed a financial administrator that will be assisting OMYC managers in strengthening this aspect of the bodega, and in preparing monthly reports on the bodega for the general assembly.

Our evaluations revealed that the most successful pilot project has been the community-based scarlet macaw protection effort. Local participants indicated strong support for the project and a clear understanding of the intended objectives. They also indicated a fair amount of pride in the results obtained thus far. Nevertheless, it is important to recall that this project does not yet have a long term economic base that will ensure its continued existence, above and beyond the employment of 3 of the local guards by the national park service, CONAP. This aspect is thus one of the crucial factors that should be addressed during the next 3 years of the MBLLP.

Activity 3.2 Strengthen the Maya Biosphere and global conservation initiatives

WCS Guatemala continued compiling information on the dynamics of natural resource protection efforts in conservation programs executed by WCS across the globe. The intent of this survey is to learn lessons about the ways in which projects across the globe operating within vastly different contexts are addressing protection-related issues, as well as record the opinions of conservation practitioners about protection interventions and their views on protection in the future. Five additional sites were invited to participate in the survey (Rungwa Ruaha, Tanzania; Chaco, Bolivia; Mamirua, Brazil; Adirondacks, USA; and Lak Teli, Congo). To date, three of these sites have returned the surveys. We hope to receive the two remaining surveys to begin analyses and present results in the upcoming year.

Roan McNab of WCS Guatemala participated in two workshops designed to help WCS consolidate lessons learned from field projects, and influence the broader conservation community. The first was convened by the WCS Living Landscape Program and focused on how projects identify and build alliances with appropriate actors and institutions to promote effective and socially-viable conservation programs in varying contexts. The second, also convened by WCS, provided a forum for discussing the linkages between conservation programs and the displacement of local communities and other actors with claims to natural resources in areas brought under protection. A broad array of experts participated in the workshop, including representatives of the other major international NGOs, WCS directors and field staff, and leading academics familiar with the issue. This input was compiled to help WCS develop an institutional policy on the issue, and to publish an academic paper on the effect of conservation on human displacement, including a chapter on displacement in 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, also known as the Living Landscapes Program: LLP) 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 in landscapes that encompass a diverse array of ecological features, land-uses, resource-use issues, and jurisdictional arrangements. To develop new approaches, facilitate and harmonize testing and implementation among these core sites, and to capture the synergistic benefits of diverse experiences, the central coordination unit is charged with designing and managing the program. This unit guides 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 FY06, the Coordination Unit continued working with field sites to further develop their conservation landscapes, and provided assistance to the process of building monitoring frameworks from conceptual models. We have now refined and simplified the process for selecting landscape species, including revisions of landscape species selection software as a decision-support tool for analysis, and have drafted an accessible 'how to' quick reference guide that will complement the more comprehensive online help system that accompanies the selection software. We have also formally compared the Landscape Species Approach with landscape planning approaches of other international conservation organizations, with support from the Learning component of the USAID/GCP LWA. In addition, with complementary support, we assessed our field staff's strategies for identifying and promoting effective local actors in conservation.

Activity 4.1 Provide technical assistance to site-based conservation

Members of NY Coordination Unit worked closely with field sites to provide targeted technical input (punctual advice and informal and formal training in conservation planning, monitoring, geographic and quantitative analysis, and specific conservation issues) throughout the year. In a number of cases this involved trips to sites as reported in the previous sections of this and the other three site-specific reports: Madidi (Bolivia), Maya (Guatemala), Glovers (Belize), and Eastern Steppe (Mongolia).

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

Activity 4.2.1 Living Landscapes Program technical manuals

Based on field work to date, the Living Landscapes Program (LLP) continued to generate brief how-to guides, called Technical Manuals, after field testing and fine-tuning the methods at several WCS field sites. In FY06, we finalized and disseminated three technical manuals: *Measuring our Effectiveness- A Framework for Monitoring*; *Household Surveys- a Tool for Conservation Design, Action and Monitoring*; and *Building Biological and Threats Landscapes from Ecological First Principles, a Step-by-Step Approach* (see Appendices B1-B3) We also produced a further technical manual on selecting landscape species that is currently in review (see Appendix B4). These manuals are designed to provide to field practitioners clear and practical instructions on implementing a number of conservation tools. The manuals will also be translated into Spanish and French, and disseminated to WCS projects, partners (government, NGO and local), and other conservation colleagues.

In FY06 we also produced a WCS Working Paper based on a field staff "writers' workshop" that was conceived and organized by LLP and supported, in part, by a grant from the Tinker Foundation. The working paper is titled *Casting for Conservation Actors: People, Partnerships and Wildlife* and characterizes a framework developed through adaptive management by our field staff to identify the most appropriate mix of actions and institutions needed to effect conservation within any landscape or seascape (currently in production, for draft see Appendix B5). Lastly, in FY06 we produced two new LLP bulletins stimulated by the field work of our GCP portfolio: 1) *Setting Population Target Levels for Wildlife Conservation: How Many Animals Should We Save?* (Appendix B6), and 2) *Sharing Valued Landscapes: Conservation Through the Eyes of Wildlife* (Appendix B7).

Activity 4.2.2 Landscape Species Approach progress

4.2.2.1 Building Conservation Landscapes
LLP staff working at several sites in our portfolio continued to refine methods for setting geographic conservation priorities within a landscape, a process known as designing conservation landscapes. Design elements that were completed this year included: (1) using existing decision-support software such as Marxan, Sites, and C-plan to facilitate priority setting; (2) including the impact of potential future threats on conservation planning; (3) building potential activity costs into conservation landscape design, thereby leading to realistic and efficient strategies for conservation; and (4) developing a logic for setting wildlife population targets (i.e., how many animals do we want to conserve?) and incorporating these targets into geographic priority setting to assure that landscapes are large enough to conserve population targets. For this latter design element, we have developed a 4-tier system for setting population targets (for more on this approach, see Appendix B6).

We have reached the end of the design stage for building conservation landscapes, and are now pushing for sites to implement the procedures and produce products. Overall lessons learned from pilot tests at the GCP sites are being compiled into a technical manual that will be published early in FY07.

4.2.2.2 Review of the Landscape Species Approach
A preliminary review of the utility of the Landscape Species Approach (LSA) for conservation priority-setting was completed (for an excerpt from the conclusions of the review, see Appendix B8). Findings are being used to better adapt our program and LSA tools for the practice of site-based planning and implementation.

Activity 4.2.3 Develop monitoring frameworks at sites

Creation of monitoring frameworks from project conceptual models continues to expand within LLP test sites and more broadly across WCS. A relational database that integrates conceptual modeling, monitoring, workplan, budgets, and reporting has been drafted by LLP and will be tested in FY07.

Activity 4.2.4. Develop rules of thumb for intervention planning

Based on further input from LLP field sites, the LLP coordination unit reassessed the need for an intervention prioritization tool. Field staff felt that the challenge was not so much in choosing among intervention options; rather, it was in identifying interventions that had a high probability of success in a given context. Field staff asked LLP central staff to explore how to make available a catalog of best-practice conservation interventions cross-referenced with indirect and direct threats and ecological and socio-political systems. To move this activity forward, LLP staff worked with the Conservation Measures Partnership to finalize a typology of conservation actions and to explore with The Nature Conservancy how using a standard approach to describe conservation projects might help create a distributed database that could be used as a catalog of cross-referenced actions and threats. This work will continue to evolve in FY07.

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

Activity 4.3.1 CMP: leadership, design, writing and audits

LLP/CU staff continued to play a leadership role in the identification, design, and implementation of Conservation Measures Partnership (CMP) activities. This was particularly important this year as there were several changes in organizations' representatives to the CMP. We continued to work closely with Foundations of Success to identify best-practice tools to use as models for development of eAdaptive-Management modules. We also continued to provide technical input for specifying measurable Global Indicators of Biodiversity status both within CMP and more broadly in support of CBD through collaboration with the Zoological Society of London and the Cambridge Conservation Forum. In FY06 we completed a brief analysis of WCS experience with activity-based accounting (see Appendix B9). Drs. David Wilkie and Craig Groves participated in the first CMP meeting (in Gland) that included IUCN as a member. This meeting

provided a valuable opportunity to share CMP lessons learned with a large number of conservation practitioners. Drs. Wilkie and Groves also participated in a ½ day presentation of CMP products to WWF International staff.

LLP also participated in another USAID GCP supported learning project to compare the landscape planning approaches of 5 conservation NGO's. We participated in 2 workshops, which compared how the conservation target selection procedures of the organization worked in a case-study landscape. We played a central role in producing and editing the report from the workshop, and are now working closely with a smaller group to produce a publishable manuscript.

Activity 4.3.2 Local engagement in conservation survey

LLP conceived and organized a 5-day writers' retreat for several senior WCS field staff. The retreat was designed to capture experience integrating local people into the successful practice of landscape scale conservation. This retreat followed up a more widely distributed questionnaire that was used to frame the theoretical and practical issues associated with effectively integrating local people into the practice of conservation. The report generated during the writers' retreat is being published as a WCS International Program Working Paper and will soon be available both as a PDF on our website and as a hard-copy document (see Appendix B5).

Activity 4.3.3 Preliminary assessment of the human welfare impacts of establishing national parks

LLP staff, in collaboration with the WCS Gabon program, the Gabon National Parks Authority, and Boston College, conducted the baseline household welfare survey. This was supported by the John and Catherine T. MacArthur Foundation and the National Science Foundation. LLP staff surveyed 1,000 households with traditional claims to natural resources within 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 planned over the next 5 years to assess the impacts of establishing protected areas on local families' income, health, consumption, natural resource use, and family function.. An extensive cross-sectional survey of over 2,000 households was completed in FY06, as was the first of two intensive surveys of household consumption. The 2nd household consumption survey will be completed in the first half of FY07 and will be analyzed soon thereafter. A manuscript from the project was published (Wilkie, D. S., Morelli, G. A., Demmer, J., Starkey, M., Telfer, P. & Steil, M. (2006) *Parks and People: assessing the human welfare effects of establishing protected areas for biodiversity conservation*. **Conservation Biology**, 20, 247-249, see Appendix B10).Detailed methods with a blank database and data dictionary were made available to the public (see Appendix B11). A second article on the topic of human welfare impacts of establishing protected areas is in press (Wilkie, D. S., Redford, K. H. & McShane, T. O. (2006) *Taking of rights for natural resource conservation: a discussion about compensation*. **Journal of Sustainable Forestry**, in press, see Appendix B12). With the leadership of our LLP staff, the Wildlife Conservation Society is in the process of drafting a "Code of ethics for the practice and science of conservation" and a policy statement on physical and economic displacement associated with conservation actions.

Activity 4.4 Application of Living Landscapes Program tools beyond core sites

Activity 4.4.1 Training workshops in the use of LLP tools

With WCS and other non-USAID support, a number of workshops were undertaken throughout the year to train field practitioners in the use of conservation tools that have been developed by WCS/GCP field sites and LLP/CU staff. We feel that GCP should be proud of increasing adoption of these tools across the globe.

- The LLP associate director held a 3-day workshop to train Zoological Society of London program staff in the use of LLP conservation planning tools.
- In January of 2006, we helped local and international partners in the Samburu-Laikipia Landscape in north-central Kenya to use LLP Landscape Species planning tools to come to a common vision for wildlife conservation in this complex dry savanna landscape.
- In December 2005, the LLP program director organized and facilitated a workshop for reserve staff, government authorities, and university experts on conservation planning for Huai Kha Khaeng/Thung Yai Biosphere Reserve in Thailand. A conceptual model was designed by the group, based on landscape species targets, and a monitoring framework design initiated. The work was completed and recently presented by Thai staff to a large

wildlife conference, at which the Director of Thai Wildlife Services indicated an interest that all his departmental programs use the techniques.

- In March 2006, an LLP staff member traveled to Lao PDR to facilitate a successful Landscape Species selection workshop using the custom landscape species selection software. The process was completed during a three day Biodiversity Conservation Strategy meeting in Paxsan, the capital of Bolikhamxay Province, in collaboration with provincial counterparts. The goal of the subsequent visit of another LLP staff member in May was to continue the implementation of LSA tools by training WCS Lao staff in concepts and methodology of building biological and human landscapes and initiating their development for the selected species. Preliminary results of the landscape analysis were received with great enthusiasm during the meeting with provincial stakeholders. Landscapes will be finalized in Fall 2006 and will guide a new management plan for the Nam Kading National Protected Area in Bolikhamxay Province. The government of Lao counterparts expressed an interest in using LSA tools to guide their conservation planning at other sites. This activity therefore demonstrates both local and national interest in adopting LLP tools derived with support from GCP.
- Four LLP staff conducted a 5-day training workshop in Brazil to support adoption of conceptual models and monitoring frameworks by landscape scale projects in Brazil (Mamiraua, and Piagacu Purus), Peru (Yavari Mari), Ecuador (Yasuni), and Bolivia (Gran Chaco). These projects are supported by funds from The Gordon and Betty Moore Foundation.
- In July 2005, the LLP program director held a training workshop for conservation projects as part of the WCS Marine Regional Program Meeting. These projects are adopting conceptual models as the basis for their strategic planning.

Activity 4.4.2 Technical Manuals

We continue to make our series of technical manuals available to conservation practitioners and decision makers on our website, as hard-copy booklets and on CD. Manuals are available in English, French and Spanish (see 4.2.1 above).

Activity 4.5 Ensure coordination and communication services for the program

The LLP program director and program coordinator regularly meet 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. Program staff also met with collaborators, NGOs, governmental officers, and representatives of other stakeholder groups to promote use of the strategies and tools.

Throughout FY06, the LLP Coordination Unit assisted field staff in completing annual Implementation Plans, reporting on Performance Monitoring forms, and submitting Annual Reports. The program coordinator attended quarterly USAID/EGAT meetings in Washington DC and ensured regular reporting and updates to USAID. The program coordinator and associate director attended the GCP annual meeting organized by WCS at Cool Font, West Virginia. During the meeting, LLP staff gave presentations on: proposed learning topics for FY07, progress with FY06 learning activities, and Evaluations and Conservation Audits.

Branding and Marking

WCS followed USAID's most recent guidance on new branding requirements for documents and materials funded in all or in part with USAID assistance (see Technical Manuals, Bulletins, and Working Paper, in Appendices B1-B7 as examples). WCS also ensured that all LLP staff and sites gave proper recognition to USAID for its critical support to all LLP-related workshops.

III. Requests for Assistance

WCS Guatemala would greatly appreciate assistance from USAID to develop links with the private sector sources of support to strengthen the long-term financial sustainability of the project. Among these, it may be possible to develop links with Grupo Taca airlines in El Salvador via the USAID regional office in San Salvador, El Salvador.

IV. Appendices

A1. Final Report on the Workshop on Biological Models for Three Species within the Maya Forest Living Landscape
A2. Human Threats Model Layer - Human Access Map
A3. Press Article: “Cuidan recursos”
A4. Details of the Cooperative Agreement between WCS Guatemala, Asociación Balam, and ACOFOP
A5. Results of the Joint Evaluation of the Road Barriers Pilot Project
A6. A Letter from CONAP, re: Carrying Institutional Identification when Passing Through the Checkpoint
A7. WCS MBLLP Report on the Monitoring of the Quality of Xate Harvested in Carmelita and Uaxactún, 2005
A8. Final Report of the Results of Landscape Cover Monitoring 2004-2005
A9. Report on the Area Affected by Forest Fires during the Dry Season of 2005
A10. Slideshow of the Prediction for the 2006 Fire Season (March-June 2006)
A11. Final Report of the Nesting Success of Macaws at El Peru Site during 2003-2006 Seasons
A12. Results/Bulletin of the 2-month Camera-Trapping Survey of Jaguars in the Tikal National Park
A13. Press Article: “Analizan y protegen al jaguar petenero”
A14.Flight Report for the Maya Biosphere Reserve Over-Flights (March & April 2006)
B1. LLP Technical Manual 3- *Measuring our Effectiveness- A Framework for Monitoring*
B2. LLP Technical Manual 4- *Household Surveys- a Tool for Conservation Design, Action and Monitoring*
B3. LLP Technical Manual 6- *Building Biological and Threats Landscapes from Ecological First Principles, a Step-by-Step Approach*
B4. LLP Technical Manual 5 (DRAFT)- *A Quick Reference Guide to the Landscape Species Selection Software version 2.1*
B5. WCS International Program Working Paper- *Casting for Conservation Actors: People, Partnerships and Wildlife.*
B6. LLP Bulletin 8- *Setting Population Target Levels for Wildlife Conservation: How Many Animals Should We Save?*
B7. LLP Bulletin 9- *Sharing Valued Landscapes: Conservation Through the Eyes of Wildlife*
B8. Excerpt from the Conclusions of the Review of the Landscape Species Approach
B9. *Activity-based cost accounting - two brief case studies within WCS*
B10. Wilkie, D. S., Morelli, G. A., Demmer, J., Starkey, M., Telfer, P. & Steil, M. (2006) *Parks and People: assessing the human welfare effects of establishing protected areas for biodiversity conservation.* **Conservation Biology**, 20:247-249
B11. Detailed methods, a blank database and data dictionary for *Parks and People*
B12. Wilkie, D. S., Redford, K. H. & McShane, T. O. (2006) *Taking of rights for natural resource conservation: a discussion about compensation*. **Journal of Sustainable Forestry**, in press.