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 2006 – September 2007

Living Landscapes Program- Guatemala/Maya Biosphere
Wildlife Conservation Society
30 September 2007

USAID EGAT/NRM/Biodiversity
Leader with Associates Cooperative Agreement Award LAG-A-00-99-00047-00

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 1, 2006 – September 30, 2007

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 (and monitor) adaptive and participatory strategies and sustainable mechanisms that reduce threats to wildlife and ecosystems, and to disseminate best practices for conservation of the MBR landscape and the Maya Forest.

The period from October 2006-September 2007 constituted the fourth year of the project, and the third year of full GCPII funding for Maya Biosphere Living Landscape Program (MBLLP) activities[1]. GCPII funds provided to the MBLLP provided crucial base funding for nearly all of the activities reported herein, whether invested in technical personnel that helped design and implement the activities, or in the direct costs of field activities themselves. Over this last year we focused considerable effort on gathering the biological information required to incorporate the needs of key landscape species into landscape planning and the design of interventions. We also continued building on many of the landscape interventions designed during the previous year. As during FY06, a majority of our MBLLP interventions in the reserve focused on two central goals: 1) containing the advance of the Laguna del Tigre agro-pastoral frontier; and 2) maintaining the comparatively intact eastern block of MBR forest comprised by community forest concessions and successful national parks such as Tikal and Mirador-Rio Azul.

The strategic foundation for our conservation planning was improved through the production of updated versions of the Conservation Landscapes for our two most important Landscape Species (jaguar, scarlet macaw), as well as the Central American river turtle. We updated the Human Landscape with a more precise threats model taking into account increased human access across the reserve and an improved map of trails and roads. We continued species surveys on jaguar, white-lipped peccary and Central American river turtle, and we laid the foundation for a groundbreaking study of scarlet macaw seasonal habitat and landscape use, via the deployment of two Platform Terminal Transmitter (PTT) satellite collars. As in previous years, we monitored the distribution and success of scarlet macaw nesting in the central part of the reserve. Tangible results included the installment of a 47 kilometer fire break to delimit and protect the eastern section of Laguna del Tigre National Park from invaders and forest fire. For the 4th year in succession, the project led field efforts and succeeded in conserving the eastern Laguna del Tigre wetlands-forest matrix containing the important archaeological and macaw nesting site of La Corona. Participants included the Guatemalan Park Service (CONAP), the Guatemalan Archaeological Institute (IDAEH), the National Fire Prevention Service (SIPECIF), the Critical Ecosystem Partnership Fund, and USAID/Guatemala. Continued collaborations with archaeologists from Southern Methodist University and

[1] We initiated a reduced set of activities in October of 2003, preferring to defer resources to years 2-6 of the GCPII-BCLS Program while WCS Guatemala terminated an extensive biological monitoring project funded by USAID Guatemala.

Yale University helped maintain a national focus on this vitally important cultural and natural site. In the eastern part of the reserve, continued collaborations with the Rainforest Alliance on an improved xate palm harvest regime, and with the Plant Family Foundation on community-based fire prevention helped improve the long-term viability of select community forest concessions. Last but not least, continued WCS Guatemala support for the multifaceted activities of Asociación Balam produced important advances for the future of Mirador-Rio Azul "Cultural and Natural Area", and indeed the entire Eastern Maya Biosphere Reserve. Additional details on activities undertaken are provided below.

b. Highlights:

- **Development of the "Mesa Multisectorial":** After several years of planning and consultation, the "***Mesa Multisectorial para el Area Natural y Cultural de Mirador-Rio Azul***" was brought to life by an alliance including our national NGO partner Asociación Balam, WCS Guatemala, the Association of Forest Communities of Petén (ACOFOP), CONAP, IDAEH, and the office of the Executive Secretary of the Presidency. The "Mesa" or "Roundtable" was convened with the objective of establishing a forum for dialogue and the development of consensus regarding the future of the area of influence around Mirador-Rio Azul National Park, including the park itself. The need for this forum resulted from a lingering lack of confidence regarding some of the proposals for conserving and developing the area put forth by various actors, and was due to the need for increased clarity and consensus regarding plans for the area over the long-term. The Mesa Multisectorial was launched in late October 2006 with the participation of representatives of numerous "sectors" of society, including the President of Guatemala, Ministers of relevant governmental agencies, the Executive Secretary of CONAP, the Director of INGUAT- Instituto Nacional Guatemalteco de Turismo, the Director of IDAEH, UNESCO, National and International NGOs, local community groups and their representative organizations, private sector groups, donors, the delegations of various embassies in the country, including USAID Guatemala on several occasions. Seven ordinary sessions of the Mesa have subsequently been convened, in addition to one extraordinary session presided by President Berger of Guatemala (held on July 5th 2007). Tangible results of the process include increased participation by local actors formerly leery of all efforts to conserve and develop the ecotourism potential of the site of El Mirador; growing participation in the Mesa as it advances; formal recognition of the Mesa by the full Council of the Consejo Nacional de Areas Protegidas (CONAP); promotion of a Presidential Decree by President Berger to institutionalize the Mesa to ensure its continuity after the change in government planned for January 2008; improved coordination of the long-term US Department of Interior and Global Heritage Fund investments planned for Mirador-Rio Azul National Park and the area of Carmelita; improved Mesa facilitation and development of a social outreach program to local communities as a result of a grant provided by the Flora Family Foundation; development of participatory commissions designed to evaluate important aspects such as future access to the area; collaborations on jaguar research; and a collaboration to improve the protection of the area (described below), among many others.

- **Improved institutional support for eastern Laguna del Tigre:** Continued financial support from the Critical Ecosystem Partnership Fund (CEPF) and USAID/Guatemala was combined with increased support from Asociación Balam, CONAP, the Guatemalan Government's Fire Prevention Agency (SIPECIF), and the increased presence of Guatemala's Combined Protection Forces to strengthen the "shield" strategy in Eastern Laguna del Tigre. Paso Caballos community members continued to play an active role in preventing and controlling forest fires in La Corona, El Burral, and Peñon de Buena Vista. The aforementioned groups collaborated to design and implement a joint strategy to install a 47-kilometer fire break along the western limit of the intact forests of Laguna del Tigre. This massive undertaking consisted of a 6-8 meter wide swath cut into the forest with the intent of demarcating intact forests and wetlands to be protected, and also as a fire break. Prior to installing the fire break, negotiations were undertaken with the illegally located communities west of the break to ensure that they understood that squatters located to the east of the break would be warned, and then captured and sent to jail if insistent on illegally colonizing the area. The entire fire break was installed by the end of the fire season. Some resistance from illegal colonizers continued, as fire was used to sabotage habitat in two sections of the demarcation. However, follow up continues by the governmental authorities responsible for the area, and additional activities to ensure that the new demarcation is respected in the future are now in the planning stages. The most encouraging evidence of the consolidation of eastern Laguna del Tigre was the lack of new "*brechas*" (i.e. demarcation lines cut into the forest) in and around the La Corona area, for the first time in the life of this project. This indicates that organized invaders no longer consider it viable to colonize the area.

- **Successful deployment of two PTT satellite collars on scarlet macaws:** With the help of Loro Parque Foundation, Amigos de los Aves-USA, Dr. Donald Brightsmith of the Schubot Exotic Avian Health Center of Texas A&M University, and Northstar Science and Technology LLC, the first two satellite collars ever placed on free-flying psittacines were deployed on scarlet macaws in eastern Laguna del Tigre. The movements of two adult macaws fitted with satellite collars are now broadcast via satellite to the Centro de Monitoreo y Evaluación de CONAP/WCS (CEMEC) office located in Flores, Petén, with new point locations coming in via email every three days. The data collected will provide the first complete annual record of scarlet macaw habitat use in the Maya Forest. These data will in turn allow WCS to improve our scarlet macaw Biological Landscapes used to determine the most effective conservation interventions required to conserve the species over the long-term. We expect to obtain improved knowledge of macaw migration patterns and seasonal habitat use. We also expect this technological breakthrough to allow for improvement of this technology and eventual replication with smaller avian species, and especially other psittacines, across the globe.

- **Collaboration in the development of checkpoints/road barriers across the eastern MBR:** Previous MBLLP analyses identified uncontrolled access as one of the primary threats affecting the eastern Maya Biosphere Landscape. After years of promoting improved control of access to the reserve, the MBLLP project is ecstatic to report the following advances:
  - **Construction of the Pescaditos checkpoint:** In April 2007, a WCS jaguar camera trapping study was executed in the Multiple Use Zone areas of La Gloria and Lechugal, with the help of the village of Carmelita, the industrial forest concession Baren Industrial, S.A., and with the financial support of the Global Heritage Fund. During the course of the study, jaguar investigators and Uaxactún village Control and Vigilance personnel independently revealed a massive amount of uncontrolled hunting and Maya tomb looting occurring in the area as a result of totally unrestricted access to the area. The evidence gathered by both sources was subsequently presented to the Mesa Multisectorial by WCS staff, and contrasted with the spectacular photographs of jaguars and other species produced by the study. The Mesa reacted with a strong declaration in favor of improved control of access to the area, and a petition was quickly sent by the Mesa Multisectorial Executive Board to the President of Guatemala. Two crucial advances subsequently occurred. The first was that local stakeholders interested in the area agreed to collaborate to construct a checkpoint at the site of El Pescaditos – a crucial crossroads within the forest, capable of controlling a majority of the traffic entering the area. Collaborators included the Governor of Petén, CONAP, IDAEH, Asociación Balam, Baren Industrial, S.A., ACOFOP, and the Mirador Basin Initiative (FARES). Following this, President Berger announced a Q5,000,000 fund ($660K) to construct and implement 6 checkpoints to control access to the eastern Maya Biosphere Reserve. As of July 25th 2007, the Pescaditos checkpoint is manned and under construction, and we expect it to be fully built by October 2007.
  - **Construction of the Manantial checkpoint:** With the help of WCS, the Plant Family Foundation, ACOFOP, and Rainforest Alliance a formal checkpoint was constructed by community-based forest concession leaders on the access road entering the community forest concessions located within the extreme eastern Multiple Use Zone forests of the Municipality of Melchor. This checkpoint is intended to control access to 5 community forest concessions located in the area, as well as the Rio Azul area that was previously the focus of a MBLLP pilot road barrier that was twice destroyed. The reformulation of this project as an intervention responding to local needs and dependent on community leadership has allowed for the remarkable advance in this strategic objective.
  - **Continued implementation of the Achiotal checkpoint:** The Achiotal checkpoint continues functioning on the border of the Carmelita and AFISAP community forest concessions. This important outpost has continued limiting access to eastern Laguna del Tigre by colonizers, while also helping to prevent the spread of colonization from the collapsing community concessions of La Colorada, Cruce la Colorada, and La Pasadita[2] into the successful community concessions mentioned above. Most importantly, as the government and other actors have begun replicating this intervention at other sites, this checkpoint has continued to function normally without decreasing the CONAP personnel and police required to ensure the checkpoint's functionality.

[2] Of the 12 community-based forest concessions in the Maya Biosphere, 4 run serious risks of being revoked by the National Park Council (CONAP) due to land sales and usurpation, in many cases with the participation of local concession leaders. These 4 concessions are San Miguel, La Pasadita, Cruce La Colorada, and La Colorada. Of these 4, La Colorada offers the best hope for stabilization. These "collapsing" community concessions have lost significant amounts of forest cover – converted to cattle pasture via a process of slash and burn clearing that also affects intact, adjacent forests due to the proliferation of forest fire during the dry season.

- **Development of socially viable methods for evaluating jaguar abundance using camera traps:** WCS investigators faced an enormous challenge in undertaking the recent jaguar camera trapping study in the La Gloria-Lechugal Multiple Use Zone area of the reserve. How could they possibly sample the jaguars in this area, known to be full of legitimate timber concession personnel, non-timber forest harvesters, hunters, looters, and poachers, without having all the camera traps stolen or vandalized? Worse, a previous WCS jaguar study done in the heart of Tikal National Park using the same methodology had resulted in the loss of 6 camera traps, and this in an area with excellent protection! The challenge did indeed loom large. WCS biologists responded by taking the following steps to maximize the viability of the study:

  1. Employment of Carmelita village community technicians to set up, monitor, and protect the cameras during the 46-day field study. Once recruited, trained, and convinced of the importance of the study, Carmelita technicians were effective at explaining the objectives of the study to other individuals who appeared in the forest and helping them to understand that the cameras were not designed to capture photos of humans for law enforcement purposes.
  2. Development of a MOU with Baren Industrial, S.A. the timber concession managers of the La Gloria area. This involved numerous conversations with Baren Industrial personnel about the objectives of the study, and an agreement on data sharing and future collaborations.
  3. Involvement of CONAP, including a study site visit by CONAP personnel responsible for both xate management and wildlife research activities. CONAP personnel subsequently sent letters of support to all the xate "*contratistas*" or middlemen, who typically purchase the xate from forest harvesters. According to CONAP personnel, all xate contratistas working in the area promised to collaborate with the study and inform their harvesters that they should co-exist with the jaguar researchers.
  4. Outreach about the study and material collaborations with the xateros in the field. When visiting xate camps WCS technicians would take time to explain the objectives of the study. When possible, we collaborated with the xateros by providing them with modest amounts of medicines and some food supplies such as vegetables and other perishable items.

  The net result of these activities was that the 46-day study was able to run its course without a single camera (of 66 placed in the field) being stolen or vandalized.

c. Table of Activity Status

Activity No	Activity Title	Status	Page No
Objective 1	**Develop an adaptive and participatory strategy to address threats to the wildlife in the Maya Biosphere Landscape**		7
1.1	Develop an updated and participatory strategy for the conservation of macaws	On track	7
1.2	Improve conservation landscapes for landscape species	Completed	7
1.3	Consolidate an institutional partnership to promote biodiversity conservation and protection within the Multiple Use Zone of the Maya Biosphere	Completed	8
Objective 2	**Develop and implement sustainable and adaptive mechanisms to strategically address threats across the Maya Biosphere landscape**		9
2.1	Scarlet macaw nest protection	Completed	9
2.2	Improved control of access via monitoring and checkpoints	Completed	10
2.3	Surveys for macaw nests in timber concessions	Completed	11
2.4	Test and evaluate xate management alternatives	Completed	12
2.5	Monitor trends in landscape cover	On track	13
2.6	Monitor trends in precipitation and climate (assessing fire risk)	Completed	14
2.7	Monitor trends in macaw populations	Completed	14
2.8	Develop methodologies to monitor trends in selected landscape species	On track	15
2.9	Increase economic sustainability of WCS conservation management	On track	16
2.10	Over flights of the Maya Biosphere	Completed	17
2.11	Inclusion of Laguna del Tigre within the Debt-for-Nature Swap	Completed	18
Objective 3	**Learn and teach best practices for conservation of the Maya Biosphere Landscape and beyond**		19
3.1	Evaluate the effectiveness of pilot projects promoted	Completed	19
3.2	Strengthen the Maya Biosphere and global conservation initiatives	On track	20
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**		20
4.1	Provide technical assistance to site-based conservation	On track	21
4.2	Design, implementation, and testing of decision support tools	On track	21
4.3	Catalyze cross-site and cross-organizational learning, and communication	On track	23
4.4	Application of Living Landscapes Program tools beyond core sites	On track	25
4.5	Ensure coordination and communication services for the program	On track	26

II. Detailed Description of Progress

a. Key short and long-term program objectives for the reporting period (October 2006 – September 2007)

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. In FY07 our project activities were geared towards the development of solutions to 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 remained an integral aspect of our conservation approach across the eastern Maya Biosphere focal areas. Monitoring of the reserve and continuous feedback from partners allowed us to develop and reformulate interventions when threats changed in severity or when new threats emerged. Combined, these elements comprised the core of our "adaptive management" conservation strategy.

In the fourth year of MBLLP activities, our field activities 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*

Short-term goals over the last year included the termination of Biological Landscape development for our two main Landscape Species, increasing databases and testing pilot sampling of these same species, and continuing the conservation of the eastern, intact section of Laguna del Tigre. An additional and extremely important short-term goal was the initiation of the Mesa Multisectorial for the Mirador-Rio Azul Natural and Cultural Area.

As in previous years, 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.

FY07 work towards long-term goals 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 through the Mesa Multisectorial, the Emergency Protection Initiative for the eastern Maya Biosphere supported by the President, the soon-to-be-approved Debt-for-Nature Swap with the Government of Guatemala, InterAmerican Development Bank (IDB)and Global Environment Facility (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 remaining year of implementation 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 continue to support community-based initiatives with local partners. Lastly, guidance provided by our Conservation Landscapes, developed for key species, and from lessons learned during the past 4 years will increasingly be used to focus resources on key interventions in the field.

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

In FY07, due to the rigors of managing a very extensive field project, MBLLP staff was unable to culminate the development of the scarlet macaw conservation strategy, focusing instead on important field activities that comprise the foundation of the plan (e.g. habitat protection and nest monitoring). Nevertheless, a first draft of the scarlet macaw conservation strategy was provided to partner organizations for initial review. Given the ongoing research on scarlet macaw movements and habitat use across the landscape, we expect that the final strategy will be amended once the satellite collar data are fully collected, analyzed, and presented to CONAP personnel and partner organizations. As part of the strategy's development, another participatory consultation was undertaken with the village leaders of Paso Caballos and participants in the Peñon de Buena Vista macaw conservation program, allowing us to obtain valuable feedback from community members. They indicated that the conservation of scarlet macaws was a goal supported by the community; however, they also indicated the importance of working with the community to develop basic infrastructure, alternative sources of income, and educational opportunities for village youth to lessen local dependence on slash and burn agriculture (see Activity 3.1).

In the field, those key components of the macaw conservation strategy already in motion were continued, such as the involvement of Paso Caballos villagers in the protection of the sites of La Corona and El Burral during the fire season. These field collaborations in the protection and monitoring of the area included support from CONAP[3], DIPRONA[4], and SIPECIF[5]. Financing for these activities, provided by GCPII (technical oversight, mapping, etc.), USAID/Guatemala and the Critical Ecosystem Partnership Fund, permitted the employment of members of the Paso Caballos community to strengthen fire prevention activities and improve infrastructure in the area.

Through a grant for Biological Monitoring from USAID/Guatemala, four AFISAP community forest concession members were trained to locate and monitor scarlet macaw nests, build artificial macaw nests to increase the availability of nesting cavities, and collaborate with macaw monitors located at the adjacent site of La Corona. AFISAP members joined WCS technicians at La Corona to receive training in nest building and tree climbing prior to engaging in nest searches throughout the AFISAP concession during the 2007 nesting season. (For additional details, see Activity 2.3.)

A persistent challenge related to this project involves the significant resources required to maintain field crews and community participants in the field during the nesting season, which sometimes lasts for up to 8 months. In addition, the announced termination of CEPF funding for the protection and monitoring of the eastern Laguna del Tigre area, now postponed to March 2008, will decrease the funding available to WCS for these activities. Yet, as in the case of the recent grant for Biological Monitoring obtained in 2007, we will continue to procure funding for this project that is fundamental to consolidating the western limit of the intact block of forest of the eastern Maya Biosphere Reserve. Indeed, as depicted in Activity 2.11, the inclusion of Laguna del Tigre in the Debt-for-Nature Swap bodes well for continued support for macaw-related conservation activities in the future.

Activity 1.2 Improve conservation landscapes for landscape species

Victor Hugo Ramos of CEMEC/WCS[6] and WCS Biologist Rony Garcia developed significantly improved Conservation Landscapes for jaguar, scarlet macaw, and Central American river turtle. Results from the Biological Landscapes workshop conducted in Flores during FY07 were enriched by the additional collection of field data on jaguars, macaws, and river turtles of jaguars to develop improved Biological Landscapes. The updated models provide more precise

[3] "Consejo Nacional de Áreas Protegidas" = The Guatemalan National Park Service.
[4] National police force dedicated to the enforcement of environmental laws and protection.
[5] SIPECIF is the Guatemalan Government's Forest Fire Prevention Service.
[6] CEMEC/WCS is the landscape monitoring and mapping institute maintained via a collaboration between the National Park Service and WCS Guatemala.

estimates of the carrying capacity (K) for each species, human induced reductions in abundance, current populations and target populations, thereby setting the stage for the development of improved Conservation Landscapes. Biological Landscapes were subsequently joined with improved Human Landscapes. These improved Human Landscape models contain an updated human access layer for the reserve and improvements in the "efficacy of protection layer" used to describe each management unit's ability to mitigate discrete threats such as fire and hunting.

Refinements and evaluations have also been made to our models as a result of the production of new data and information on landscape species. For example, a jaguar population density estimate recently obtained for the northern La Gloria-Lechugal forest concession areas helped to fill a large gap in the model in an area where the Biological Landscape predicted a low jaguar density. As the model predicted, the jaguar density recorded for the area was found to be quite low (i.e. 1.50 jaguars/100km^2, as compared to Tikal National Park = 6.60 jaguars/100km^2). This raises our confidence that the model does indeed allow us to map jaguar abundance across the landscape; though it still begs the question as to why jaguar numbers within the forest concession are ¼ that found in Tikal. In addition, empirical models using historical records of presence for our principal Landscape Species have been constructed. These will help us evaluate our Biological Landscapes (models of habitat richness), which depict the potential of the habitat absent human-induced threats (therefore, historical records from periods when the human population was much lower may help gauge the precision of the Biological Landscape models).

Final Conservation Landscapes for jaguar and macaw were presented at the 5th Annual Living Landscapes Meeting in the Adirondacks, NY, in May 2007. These final products were reviewed by LLP staff and considered advanced enough to serve as potent heuristic tools for identifying the threat localities of greatest concern; and, in turn, designing appropriate interventions designed to conserve the species and their habitats. A preliminary report of the final version of Conservation Landscape models is provided as Appendix A1.

However, as we reported in 2006, generating Conservation Landscapes that depict the precise, present population distributions of Landscape Species and all related threats remains a challenge. We feel that, at this point in the process, we have an excellent understanding of the most important interventions required to conserve jaguars and macaws, and we will thus continue to prioritize threat abatement in most cases, and ensure that biological investigations yield secondary benefits for wildlife whenever possible. These secondary benefits can include: occupying space and thereby preventing poaching and land invasions, sharing information on key species and threats detected, and working with communities and other local stakeholders to increase their economic participation in conservation initiatives and their awareness about the plight of key species in the MBR.

Activity 1.3 Consolidate an institutional partnership to promote biodiversity conservation and protection within the Multiple Use Zone of the Maya Biosphere

Lines of action under this activity yielded excellent advances during FY07, building off the momentum generated by last year's cooperative agreement signed between WCS Guatemala, Asociación Balam[7], and ACOFOP[8]. This agreement was signed with the intent of strengthening the capacity of the local managers of the community forest concessions within the Maya Biosphere Reserve. Focal areas targeted for capacity development include: protection and management of natural resources, prevention and control of forest fires, administrative and financial management, tourism, and education. With the help of WCS, Asociación Balam and ACOFOP developed a proposal (Appendix A2) to the Inter-American Foundation (IAF) to strengthen community-based management with a focus on two crucial aspects: 1) community-based fire prevention and protection; and 2) improved management of natural resources, including improved financial management of concessions and seed funds for innovative projects.

[7] WCS' Guatemalan NGO partner in the conservation of the Maya Biosphere Reserve
[8] Asociación de Comunidades Forestales de Petén

During FY07 WCS also continued coordinating and administering donations 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. Once again, in alliance with ACOFOP, CONAP, and this year with Asociación Balam (per the agreement signed above) Plant Family funds were used by village organizations to prevent forest fires, demarcate management areas, and strengthen community-based Control and Vigilance activities in community forest concession areas (Laborantes del Bosque, Impulsores Suchitecos, El Esfuerzo, Custodios de la Selva, Arbol Verde, Uaxactún, Carmelita, AFISAP, and La Colorada), as well as the community polygon (i.e. management area) of Paso Caballos in Laguna del Tigre National Park. All activities funded by these donations were considered successful, with the possible exception of those slated for the La Colorada community concession, as this is one of the 4 community forest concessions considered at risk of collapse (revocation) by CONAP. A final report to the Plant Family Foundation will be submitted.

In addition to the support provided by the Plant Family Foundation, WCS provided technical and financial support to the Melchor block of community concessions for the development of the Manantial checkpoint (see Activity 2.2 and the Highlights section at the beginning of this report).

Last but not least, and in conjunction with a number of partners, the Mesa Multisectorial for the Mirador-Rio Azul Natural and Cultural Area was developed, representing the greatest advance towards the consolidation of (myriad) institutional partnerships designed to increase the sources of support for the MBR's Multiple Use Zone communities, and their crucial forested areas. Major advances of the Mesa are detailed in the Highlights section, and as further evidence of the advancing consolidation of the eastern MBR we provide a copy of a multi-institutional request sent to the President of Guatemala entitled "Estrategia de Seguridad Ambiental" (Appendix A3). This proposal, now funded, will permit the full implementation of 6 checkpoints across the Maya Biosphere Reserve, three of which are focused on protecting community concessions within the Multiple Use Zone.

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

Activity 2.1 Scarlet macaw nest protection

Scarlet macaw nest protection activities continued at the sites of La Corona, El Burral, El Peru, and Peñon de Buena Vista in FY07. As in other years, 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. We thus focused our nest protection activities on the other main nesting sites: Peñon de Buena Vista, La Corona and El Burral.

As in previous years, WCS received additional funding from CEPF and USAID/Guatemala to protect the eastern section of Laguna del Tigre National Park, with the prevention of fire and colonization being the central foci of activities. With the support of CONAP, we subsequently joined forces with SIPECIF to install a 47-kilometer fire break that also served to delimit the intact, uncolonized section of the park, as well as the Laguna del Tigre Biological Corridor. During the installation of the fire break, CONAP coordinated the participation of the DIPRONA natural resource police, as well as the Guatemalan army. Both of these institutions supported the installation of the fire break, while also providing protection to WCS, CONAP, and Paso Caballos villagers participating in field activities. CONAP, DIPRONA, and army personnel occasionally patrolled the area to dissuade potential invaders from entering into the area. In conjunction with these ground activities, over-flights with LightHawk, CAVU (pilot David Smith), and local pilots helped to identify fire outbreaks and illegal settlements for follow-up by ground forces. Lastly, as in past years, the remote detection of fires via the CEMEC monitoring laboratory was used to constantly evaluate the effectiveness of the strategy as the nesting season progressed.

At the Peñon de Buena Vista, we continued to involve members of the adjacent Q'eqchí Maya community of Paso Caballos in the conservation of macaws and their habitat. This year, four members of Paso Caballos were employed as the guards of the Peñon de Buena Vista nesting site; two of those were paid by CONAP as we move towards ensuring the sustainability of this effort (now being permanently employed). As in FY06, in March 2007, Paso Caballos guards detected 15 families illegally occupying land at the Yala lagoon next to the Peñon de Buena nesting site and quickly alerted authorities. CONAP and DIPRONA police responded immediately, removing the invaders without incident.

In terms of fire, land invasions, and nest poaching, the 2007 nesting season was subject to a medium level of pressure. Fire hot points recorded on the SERVIR satellite monitoring system facilitated by NASA revealed approximately twice the number of hot points as in 2006 (a very low pressure year), but only half as many as during 2005 (a very high pressure year). Rainfall lasted into late March, with the driest months being April through mid-May. Illegal land colonization continued across many parts of Laguna del Tigre; but, for the first time since WCS has worked in the La Corona, area the "*brechas*" or demarcation lines opened by invaders to delimit their land grabs were not maintained. We interpreted this as a sign that invaders no longer consider the La Corona area to be "up for grabs", recognizing the presence of macaw conservation field staff, CONAP, DIPRONA, and the army as impediments to the advance of the illegal cattle frontier.

Nest protection activities successfully prevented any macaw nests being poached by humans or burned within the El Peru and El Burral areas. Preliminary remote sensing analyses indicated the absence of direct fire impacts on the major known macaw nesting sites in Guatemala (Appendix A4) , although it appears that fire came as close as 1 km of some nests in the La Cariba area (south of La Corona). This conclusion is based on fire scar mapping using MODIS reflectance data from late May 2007. Verbal confirmation from field crews was obtained to confirm that no known nests in key protection areas were lost to fire during 2007.

Near La Corona, a very low macaw nest that had been poached in previous years – as evidenced by the spike marks left on the tree in the past – was again poached this year. Also, one nest at the Peñon de Buena Vista site was assumed to be poached, with chicks absent from a nest and a pile of feathers found below. In total, of the 31 active nests detected and monitored during the breeding season, 2 were poached within the project area. In comparison, CONAP guards informed WCS field staff that within the Laguna del Tigre colonized areas near an illegal settlement (La Florida, outside of our key protection areas), villagers felled one tree with two active macaw nests, and another tree with one active macaw nest in order to poach the chicks. Unfortunately, neither CONAP nor WCS personnel can work effectively in those areas. It is our hope that, with their traditional cavities destroyed, those breeding pairs will re-locate to the La Corona-Burral areas where protection is having a measurably positive conservation impact.

Activity 2.2 Improved control of access via monitoring and checkpoints

Significant advances occurred in this activity during FY07. Having learned during two years of pilot testing that unmanned barriers are not viable as a tool for controlling access to the MBR, MBLLP staff began to re-focus our efforts on the development of manned checkpoints in conjunction with other local stakeholders. WCS and CEMEC played an important role throughout the year by constantly monitoring the condition of roads across the reserve as we updated our GIS "access layer" used to improve our Human Landscape model. During this process, we informed governmental authorities and local managers of evidence of illegal access and resource use, helping us to reach critical mass in terms of social support for the participatory checkpoint interventions obtained. The following three examples provide more detail on the significant advances obtained:

Construction of the Pescaditos checkpoint

In April 2007, a WCS jaguar camera trapping study was executed in the Multiple Use Zone areas of La Gloria and Lechugal, with the help of the village of Carmelita and the industrial forest concession Baren Industrial, S.A., and with the financial support of the Global Heritage Fund. During the course of the study, jaguar investigators and Uaxactún village Control and Vigilance personnel independently found evidence of substantial illegal hunting and Maya tomb looting occurring as a result of the totally unrestricted access to the area. The evidence gathered by both sources was subsequently presented to the Mesa Multisectorial by WCS staff, and contrasted with spectacular photographs of jaguars and other species produced by the study. The Mesa reacted with a strong declaration in favor of improved control of access to the area, and a petition was quickly sent by the Mesa Multisectorial Executive Board to the President of Guatemala. Two crucial advances subsequently occurred. First, interested local stakeholders, including the Governor of Petén, CONAP, IDAEH, Asociación Balam, Baren Industrial, S.A., ACOFOP, and the Mirador Basin Initiative (FARES), agreed to collaborate to construct a checkpoint at the site of El Pescaditos– a crucial crossroads within the forest capable of controlling a majority of the traffic entering the area. Following this, President Berger announced a Q5,000,000 fund ($660K) to construct and implement 6 checkpoints to control access to the eastern MBR. As of July 25th 2007, the Pescaditos checkpoint was manned and under construction, and we expect it to be fully operational by October 2007.

Construction of the Manantial checkpoint

With the support of WCS, the Plant Family Foundation, ACOFOP, and Rainforest Alliance, a formal and impressive checkpoint was constructed by community-based forest concession leaders on the access road entering the community forest concessions located within the extreme eastern Multiple Use Zone forests of the Municipality of Melchor. This checkpoint will control access to 5 community forest concessions located in the area, as well as the Rio Azul area where an unmanned road barrier was destroyed twice during the pilot phase. The remarkable advance in this strategic objective can be attributed to our adaptively learning from the pilot phase, responding to local needs and fostering community leadership.

Continued implementation of the Achiotal checkpoint

The Achiotal checkpoint continues to function on the border of the Carmelita and AFISAP community forest concessions. This important outpost limits colonizers' access to eastern Laguna del Tigre while helping to prevent the spread of colonization from the collapsing community concession of La Colorada, Cruce la Colorada, and Pescaditos. Most importantly, even as the government and other actors have begun replicating this intervention at other sites, this checkpoint has continued to function normally and has not had essential staff reassigned to support another area.

On-going challenges include providing assistance to governmental personnel when defining the exact mandate of checkpoint staff in remote areas and ensuring that checkpoints are not left unmanned during changes in personnel. WCS and our partners will also have to monitor the functionality of these new posts, as the election of a new administration may affect the willingness of the government to continue investing resources in the protection of the country's patrimony.

Activity 2.3 Surveys for macaw nests in timber concessions

In FY07, we made important steps forward with this activity. A modest grant for Biological Monitoring provided by USAID Guatemala allowed us to employ two AFISAP forest concession members to help WCS field technicians scour the AFISAP concession for macaw nests. In addition, the AFISAP leadership decided to cover the costs of two additional AFISAP members, allowing us to train 4 concession members and expand our macaw nest searches across the 51,939 hectare concession. Prior to initiating the project, a presentation was provided by Jeovani Tut to AFISAP's Executive Council, explaining the objectives of the collaboration and how WCS hoped to strengthen the sustainable management of AFISAP's concession. In addition, the environmental education team led by Jeovani Tut and Victor Mendez held meetings with teachers, local concession leaders, and parents in both San Andres and La Colorada to explain the objectives of these macaw conservation efforts and to ensure greater awareness of the dire decline of the species across the reserve.

In the early spring, WCS personnel collaborated with the AFISAP members to construct a lookout tower at the Maya site of El Achiotal. Although primarily constructed to provide a vantage point from which to view macaw movements, this lookout was also used throughout the fire season to search for forest fires within the AFISAP concession (which fortunately escaped fire impact this year). AFISAP members also collaborated to install 5 artificial macaw nests[9] with the double-chambered design[10] at the site of La Corona, as part of an emergency intervention in that area (macaws appeared to be fighting over nesting cavities), and as part of their training to allow future nest building and installation in the AFISAP area. A report on the design and testing of a new type of artificial nest is provided as Appendix A5.

Results included the discovery of 2 previously unknown nests, 1 in the AFISAP forest concession, and 1 located just meters outside of the AFISAP area, just inside the community forest concession of La Colorada. All of the nests were located outside of the timber management areas of the concessions. Final results for these nests include 2 active nests in the AFISAP area, with 3 eggs and 3 chicks detected, and 2 successful fledges through August 1st. Upon the completion of all nesting activity in these nests, a final report (Appendix A6) and "certification letter" will be provided to the AFISAP concession by WCS for the first time, detailing the organization's important contribution to scarlet macaw conservation. It

[9] Two of these nests conserved the double chambered design, but were adapted from large plastic barrels, a material suggested by Dr. Janice Boyd. Three of these nests were constructed with double-chambered design from local tree limbs per our standard methodology.

[10] Double-chambered macaw nests were developed by MBLLP project personnel over the last few years, and have proven effective in reducing the risk of falcon predation on wild chicks. See the MBLLP FY06 Annual Report for additional details.

is our hope that this letter will serve AFISAP in their next annual inspection by SmartWood, helping them to maintain their forest certification.

As reported last year, the challenges related to this activity include the significant amount of time and resources required to access these remote sites, climb trees, and survey areas.

Activity 2.4 Test and evaluate xate management alternatives

For the last 26 months Organización Manejo y Conservación (OMYC) of Uaxactún village, WCS Guatemala, and the Rainforest Alliance have collaborated to implement a pilot project focused on the development of an alternative, certified harvest of an understory palm frond known locally as "*xate*". The project is focused on two central objectives: 1) increase the sustainability of one of the most vital economic resources for the villagers of Uaxactún, and 2) increase the opportunities for employment and participation in natural resource management by the women of the village.

Under the new management system promoted by this project, xate harvested in the Uaxactún area is sold to Continental Greens Ltd. of Houston, Texas, who has agreed to pay a premium price for the product to stimulate the ecological and social sustainability of the enterprise. This project has developed on the ground as the result of an excellent collaboration between the Rainforest Alliance (RA), which has focused on obtaining and maintaining the market side of the enterprise, and WCS, which has focused on the day-to-day operative details of the xate bodega in Uaxactún. Second year results of the project include the following advances:

Improved administration: In last year's report we detailed how the first two management committees of the xate bodega were unable to manage the bodega responsibly. Despite support from WCS, RA, and others, the villagers elected to management positions tended to manage the finances of the bodega informally, eventually leading to financial losses. The bad news is that 6 successive administrative committees were assigned to the bodega by the OMYC leadership council and the Committee of Xateros (i.e. harvesters), who insisted that local villagers manage the enterprise. Finally, in November of 2006, after the 6th administration resigned, OMYC leadership requested support from WCS to "rescue" the administrative aspect of the project. WCS subsequently provided a sub-grant to OMYC, allowing them to hire a recent university forestry graduate, Mr. Julio Zetina, as the OMYC/WCS administrator of xate activities in Uaxactún. In December 2006, Julio produced the first comprehensive analysis of the economic viability of the bodega. His work revealed that in December, instead of making money, the bodega actually lost a total of $650. Nevertheless, with the help of OMYC personnel, WCS and RA, Mr. Zetina set to work managing the bodega based on solid income figures for the first time. Expenditures were reduced, and by the end of January the bodega reported its first month with a positive income. In late June, Julio Zetina provided a complete 6 month report to the OMYC General Assembly, updating villagers on the economic progress of the xate bodega with a report covering December 2006-May 2007 (Appendix A7). Happily, Mr. Zetina received a warm round of applause from villagers who recognized his collaborative spirit and his ability to improve the management of the bodega. He continues in the management of the bodega, with two new goals identified: 1) work with a local OMYC counterpart to develop local capacity to manage the finances of the bodega responsibly, and 2) begin a xate reforestation scheme with the xateros of the village to recuperate areas which were previously overharvested.

OMYC audit: With the help of WCS, the OMYC leadership hired Mr. Nigland Paz to perform an audit of the financial management of OMYC covering the period from September 2003 through December 2006. This "financial revision" (as opposed to a State-ordered "audit") can be considered the first such voluntary revision of its kind ever practiced by a community forest concession in the MBR. As in the case of the xate bodega, great concern existed among OMYC members that the OMYC administration was not taking financial criteria into account when making important decisions. Results of the financial review indicated that when the current OMYC administration was elected, OMYC's total debt was Q1,500,000 (i.e. $200,000). This vast sum resulted primarily from capital investments in equipment required to harvest and process timber, such as vehicles, a skidder, and a modest sawmill, among other investments. Nevertheless, the review indicated that by December 2006, the total outstanding Debt of OMYC had dropped to Q900,000 (i.e. $120,000), thereby helping to pacify some of the growing tensions in the village. This financial review also detailed the investments OMYC had undertaken to insure the viability of the xate bodega, covering losses with timber income when management had been inadequate, as well as how the new management had helped to "stop the financial bleeding" of the bodega.

Collaborations/Xate Management Plan: WCS, OMYC, and Rainforest Alliance continued following up with CONAP Guatemala until the OMYC Xate Management Plan was fully approved by CONAP headquarters in Guatemala. In April 2007, CONAP finally notified OMYC leaders that the management plan had been approved, thereby giving the green light for initial application of the guidelines in the document. However, the implementation of the norms suggested to convert xate extraction into a "certified", sustainable activity will not be an easy task since a number of the approved management norms would affect the traditional "open-access" system of xate management long employed in Uaxactún. One clear example involves the stipulated rotation of harvest areas, allowing for, at most, three annual harvests in each harvesting camp. Application of this norm will require not only the involvement of the xate bodega (controlled by OMYC), but also the full participation of the other "*contratistas*" (i.e. middlemen) who purchase and transport xate harvested in Uaxactún. It will also require the full participation of the Control and Vigilance Committee to ensure that if an area is designated for recovery, no xate harvesters are allowed to enter the area, and that penalties are applied to those who do not cooperate. As of August 2007, OMYC has just begun to contemplate how to apply these new norms. As part of this process the CEMEC/WCS mapping institute has provided OMYC and the xate bodega with maps of all the forest camps used as bases for harvesting, helping them to envision the rotations that may be viable in the future. With the help of the Plant Family Foundation, we have also continued to support the consolidation of the Control and Vigilance Committee, a necessary part of the checks and balances essential for successful future community-based management.

Monitoring of xate waste: WCS biologists have continued to collect data on the quality of the xate harvest at the improved management bodegas located in Uaxactún and Carmelita, as well as to collaborate with CONAP to obtain comparative samples (used to evaluate product quality) at xate sorting houses that are not involved in the project. A report on the trends identified at the xate bodega of Uaxactún is included as Appendix A8. Notable conclusions include the observation of a tendency to increase the quality of xate harvested among individual xateros when they began working in the bodega, as well as a minimal amount of annual variation in harvest quality (i.e. 82%-95% quality), that never approaches the low level of quality associated with the traditional harvest (i.e. as low as 30% quality, or sometimes even less).

As in FY06, a participatory evaluation of the project was undertaken with harvesters, female xate sorters, OMYC leadership, and other interested parties. Further details on the participatory evaluation are provided under Activity 3.1.

Also as reported last year, a major challenge still facing the project consists of the lack of clear leadership shown thus far by local CONAP officials who could harness the potential of this innovative pilot project to actively promote a sea change in the way xate is managed across the reserve. While CONAP did in fact approve the xate management plan for OMYC and Uaxactún, they have done little to control the rampant misuse of the resource across the reserve in other sites. In fact, the poor management of xate in Guatemala, and the lack of control of harvest permits, has become so rampant that xateros now penetrate as far as 25 kilometers inside the Belizean border to extract huge bundles of xate to be exported to Guatemala by clandestine mule trains. In association with the xate harvest, immense hunting pressure and tomb looting has impacted the previously rich Belizean forests of Chiquibul. In comparison, the situation in Uaxactún is far more manageable. But the main point here is that the new national xate norm (law for the management of xate) recently developed by CONAP as a result of pressure by WCS, Rainforest Alliance, and other partners, must be enacted and enforced for the resource to stand a chance in the long run. Meanwhile, our main challenge in the "oasis" of Uaxactún will involve attempting to incorporate the independent contratistas within the bodega sorting mechanism, while our outside efforts focus on helping CONAP to bring the new national legislation regulating xate harvests to fruition.

Activity 2.5 Monitor trends in landscape cover

Since 2001, WCS and CEMEC/CONAP have been collaborating to monitor natural landscape cover across the MBR. This activity allows the Guatemalan Government and partner organizations to evaluate the conversion of forest cover to agricultural and pastoral uses, and provide information on these "killer threats" to facilitate improved management decisions and evaluate the success of conservation interventions across the reserve. Because there is typically a lag period involved between the acquisition of satellite images and processing, the final results of the 2005-2006 period is provided as Appendix A9.

The monitoring period for this year's data set (still being processed) will span a 13-month period from May 2006 to May 2007. 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, 2001-2006 by CEMEC/CONAP, WCS, FIPA/AID, and 2005 by CEMEC/CONAP/WCS.

LANDSAT (Enhanced Thematic Mapper+) satellite images in SLC-off mode from 2007 are being used and compared with 2006 scenes to analyze changes in primary vegetation as a consequence of transformation to agriculture, cattle pasture, and other miscellaneous uses.

Currently there are no preliminary results for the 2006-2007 deforestation analysis due to the fact that the necessary imagery was only recently obtained. A final report containing specific deforestation figures from May 2006 to May 2007 for each management unit in the MBR will be ready in late October 2007.

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

Between 2003 and 2006 we used fire pixels derived from the MODIS sensor to monitor daily forest fires in near-real time. This monitoring continued in 2007, allowing us to produce weekly, seasonal predictions, daily updates, and detailed weekly reports covering the fire pixels detected, as well as the results of LightHawk overflights across the reserve. The weekly reports also included information on precipitation trends taken from data of the National Weather Service (INSIVUMEH) and the TRMM rainfall products. All updates were made available via the web (http://servir.nsstc.nasa.gov/fires/cemec.html), and provided regularly for CONAP, WCS, SIPECIF, community groups, and other institutions fighting and/or preventing forest fires in the field.

Preliminary results: The final report on areas affected by forest fires during the 2006 dry season is attached as Appendix A10. The 2007 fire season revealed a higher occurrence of fire pixels than in 2006, although the number of pixels was vastly lower than that in the 2003 and 2005 fire seasons when extensive fires burned large portions of the MBR. This year, Laguna del Tigre National Park, the Rio Escondido Biotope in Laguna del Tigre and the reserve's Buffer Zone were the management units most affected by fire in the MBR (Appendix A11), following the trend of earlier fire seasons. Preliminary estimates indicate that at least 100,000 hectares were burned in central and western Laguna del Tigre National Park, making it the management unit most affected by fire. A lower incidence of fire occurred in Sierra del Lacandon National Park; and the Multiple Use Zone and the rest of the MBR protected areas were only marginally affected.

The initial predictions of the severity of the 2007 fire season (Appendix A12) produced by CEMEC-WCS proved to be fairly accurate. We predicted a high risk of fire in the dry season given precipitation patterns and the presence of an El Niño event, which ultimately was a weak one. The weakening of the El Niño event reduced the projected damage of a stronger, longer El Niño, had it occurred. A detailed report on the final results of the 2007 fire season will be finished in late October 2007.

Results of our climate monitoring activities, based on a network of 10 Davis Instruments weather stations, have been very disappointing. The network has started to collapse due to frequent malfunctions, and in practically all cases the stations have been plagued by intermittent data collection or the collection of a reduced set of climate parameters. Urgent action needs to be taken to continue the operation of this network. It will be useful only if repaired and maintained, and if we are able to access the data more frequently. Funding will undoubtedly be needed to replace faulty equipment, perhaps with more robust instruments. If a priority, we recommend that the government and donors consider obtaining some new machines that permit data transmission in real-time, so that data can be used to forecast the risk of fire across the reserve.

Activity 2.7 Monitor trends in macaw populations

A total of 31 active scarlet macaw nests were detected by Peñon de Buena Vista, AFISAP, and WCS field staff during the 2007 nesting season at the sites of El Peru, El Burral, La Corona, Peñon de Buena Vista, AFISAP, La Colorada, and Pipiles. This represents a 40% increase in *known nests* as compared to the 23 active nests detected during the 2006 nesting season. This total does not include 3 active nests rumored to exist at the site of La Florida, in the conflicted part of central Laguna del Tigre. This year, El Peru accounted for only 9 of these active nests, although a few more located in precariously decayed trees may have been active. Within the 9 nests monitored, 31 eggs were laid, with 13 of them (42%)

producing fledglings. Of the 13 chicks, only 1 fledged from the nest. As during 2006, in 2007 the site of Peñon de Buena Vista yielded 4 active nests, this year producing a total of 15 eggs. Of these 15 eggs, we detected 11 chicks, with 2 of these chicks flying from the nest. At the site of La Corona during 2007 monitoring was more consistent compared to previous years, and we detected 7 active nests, and registered a total of 19 eggs produced. As of this writing, at least 4 chicks have fledged from La Corona, two each from two nests. More chicks may fledge later in the season due to several re-nesting events at the site. At the site of El Burral, 6 active nests were detected. Although we were able to visit the site more frequently than in previous years, in terms of logistics and threats El Burral was the most complicated site to work in. Nevertheless, this year we were able to detect 21 eggs laid at El Burral nests, and confirm that 2 chicks fledged from these nests, en extremely low success rate. (note: as of now, our field biologists can not yet explain the reason for such variable rates of fledging success between sites, or at the same site over time). One active nest was also monitored at the site of La Colorada and 2 at Pipiles. The good news was that, for the first time since WCS has engaged in this activity, 4 chicks fledged at these sites this year, 1 at La Colorada and 3 at Pipiles. A final report on the nesting success of macaws across the reserve from the 2003-2007 seasons is provided as (Appendix A13).

We continued our environmental education program to monitor macaws with the participation of local schoolchildren living near nesting areas. As during FY06, we strengthened contact with local community groups with influence in these areas, allowing us to raise awareness about the state of the species with the local stakeholders and officials. Presentations on macaws were provided at the local schools of Uaxactún, Paso Caballos, La Colorada, Carmelita, San Andres, and Pipiles, while the monitoring of nests with schoolchildren was conducted at these same sites, with the exception of Carmelita and Uaxactún due to the lack of macaws in the area. As during the last two years, Paso Caballos elementary school students participated in a field trip to monitor nesting macaw success, this time at El Peru. We are pleased to report that our education project with local children has drawn the interest of Rainforest Alliance, who recently sent a delegation to Petén to evaluate the best way to strengthen educational opportunities for Petén school children and US-based students alike, while also providing a sustainable stream of funding for field activities in Guatemala. Although in the initial stages, we are hopeful that this developing relationship will represent solid opportunities for students and macaws alike.

In summary, during the 2007 nesting season we detected 97 eggs within 31 active nests, with 15 successful fledges reported as of this writing (more fledges may occur). As in previous years, this year approximately 50% of the chicks detected were lost to natural causes (infestation by Africanized bees, health failure, and falcon predation). To better protect macaws against natural predators, we are investigating the possibility of developing a system of remote cameras that will help us pinpoint the cause of chick loss, be it predation or cavity competition, so that in the future we may better protect young chicks and breeding pairs. One additional evolution in our field methodologies this year was the initiation of a pilot program to test the use of small doses of innocuous repellents, noxious to scout bees. A protocol for continued testing of various repellent techniques has been developed and will be tested fully next year, beginning just prior to the nesting season. Most challenges encountered revolve around the logistical complexities and costs associated with monitoring the nests during the entire nesting season, and maintaining an adequate number of field personnel required to cover the distribution of nests over a 250,000 hectare area.

Activity 2.8 Develop methodologies to monitor trends in selected landscape species

During FY07, MBLLP monitoring activities focused on three species: jaguar, scarlet macaw, and Central American river turtle. As explained in the previous annual reports, other selected Landscape Species (Morelet's crocodile, Baird's tapir) were judged to be too costly to monitor reliably on an ongoing basis, primarily due to the lack of rigor provided by methods currently available at a reasonable cost.

Jaguar sampling continued this year as a result of a grant obtained from the Global Heritage Fund for sampling of jaguars around the El Mirador area of influence. This grant allowed WCS Guatemala to obtain 102 additional remote-detection cameras, one of our main goals for this year. Jaguar sampling occurred in the Multiple Use Zone forest concession of La Gloria, and the adjacent Multiple Use Zone management unit of Lechugal. A sampling protocol was designed specifically for this study due to the high amount of human pressure in the area, and field staff went to great lengths to ensure social awareness of the objectives of the project. Final results are reported in Activity 1.2, and additional details about the methodology employed are presented in the Highlights section.

MBLLP personnel also collaborated with WCS's Jaguar Conservation Program (JCP) in coordinating a Jaguar Symposium at the X Congress of the Mesoamerican Society for Conservation Biology (MSBC), held in Antigua Guatemala in November 2006. This congress provided an opportunity to share information about jaguar sampling methodologies with researchers working across Mesoamerica, as well as the opportunity to lead a workshop on camera-trapping techniques for students and researchers. However, WCS Guatemala personnel also supported JCP by delivering a workshop on camera-trapping techniques to FUNDAECO personnel at Morales, Izabal, in May 2007, and by participating in a jaguar workshop held at the Zamorano Biodiversity Institute, outside of Tegucigalpa, Honduras, in June 2007. During FY07, JCP and WCS Guatemala collaborated to finance and support a FUNDAECO jaguar sampling effort at Cerro San Gil National Park, located on the Caribbean coast in the Department of Izabal. Results of this study are still under preparation.

After several years of adaptive management, methodologies for scarlet macaw sampling have now been refined to the point where the monitoring of nesting success is more dependent on resource availability than on the development of adequate research tools. The exception to this rule involves our future plans to investigate the viability of remote mounted cameras (see Activity 2.7) to determine the source of chick loss/predation. As such, traditional methodologies involving terrestrial and aerial searches, tree climbing, and repeated visitations to nests comprised the bulk of our efforts.

One new advance in macaw monitoring methodologies involved the successful placement of two satellite Platform Terminal Transmitter collars on adult scarlet macaws nesting at the site of La Corona. This innovation was made possible by a technological breakthrough by NorthStar Ltd., a company specializing in the development of telemetry technologies used in wildlife research across the globe. Additional details on this advance are provided in the Highlights section.

Due to time and resource constraints, sampling of Central American river turtles was restricted to a few repeat visits to some previously sampled sites, with the addition of one more site in eastern Laguna del Tigre. This site was the lagoon located at the bottom of the rock outcrops of the Peñon de Buena Vista. The site was selected to help strengthen field presence during the dry summer months when the area is most vulnerable to poaching and fire. Researchers recorded very high river turtle densities at this small lagoon, suggesting that the area had long been free of commercial fishing pressure.

Unfortunately, planned research on white-lipped peccaries, one of our most important Landscape Species, did not proceed as planned. WCS and Asociación Balam researchers attempted to place radio-telemetry collars on peccaries several times without success. It is our hope that we will be able to continue with this planned research in the near future. Problems included the logistical challenge of collaring peccaries in Rio Azul (i.e. the most remote section of the Maya Biosphere Reserve), missed opportunities (darts fired to sedate the peccaries were deflected by vegetation and failed to hit their target), and a late start to the project (following the onset of the rainy season- when peccaries had already started to disperse to areas away from small water bodies frequently visited during the dry season). Next year, we hope to learn from this year's unsuccessful attempts and begin our efforts to capture and collar peccaries earlier in the dry season.

Outputs from this activity include a report on the jaguar sampling in La Gloria-Lechugal (Appendix A14), a report on the MSBC Jaguar Symposium held in Antigua (Appendix A15), a preliminary report on the placement of satellite collars on scarlet macaws (Appendix A16), a sampling protocol for Central American river turtle (Appendix A17), and a preliminary report on the results of Central American river turtle sampling in the Maya Biosphere Reserve (Appendix A18).

Activity 2.9 Increase Economic Sustainability of WCS Conservation Management

The relationship with Aviarios Mariano continued in FY07. Genetic samples of 8 captive scarlet macaws collected at the aviary were given to the American Museum for Natural History to be included within a study of the genetic variability of macaws across their range. Diagnostic screening, to determine the health of the species, has been on hold due to lack of personnel at the WCS Field Veterinary Center in New York, but the work was recently re-scheduled and will likely proceed during the remainder of 2007.

Sadly, no meeting was set up with Grupo Taca in El Salvador, apparently due to a lack of response on the part of Grupo Taca. Another sub-activity not executed this FY involved the planned meeting with the US Ambassador to Guatemala, Mr. James Derham, to ensure the ambassador is aware of our program's contributions to the stability of the Petén region.

Despite some disappointments, certain solid advances did occur. For example, as part of the Mesa Multisectorial, a WCS delegation led by Mr. John Calvelli and Dr. Archie Carr accompanied the President of Guatemala, Lic. Oscar Berger, the Deputy Coordinator for the Mission in Guatemala, Mr. David Lindwall, and the owners of Aviarios Mariano to the site of El Mirador. This two-day excursion offered WCS executives and the aforementioned participants an opportunity to discuss plans for the Maya Biosphere, and to consider WCS's future role in continued efforts to conserve the reserve. Aviarios Mariano owners Francois Berger and Nini de Berger generously supported WCS's visit into the site of El Mirador, covering both food and helicopter expenses. Following the visit, WCS NY headquarters issued a press release detailing a commitment to continue working in the MBR for the next 5 years, setting a goal of raising $3Million for our activities during that period. The statement also specified that the eastern MBR will be included as part of the recently launched WCS Capital Campaign.

WCS Guatemala scarlet macaw conservation initiatives were also selected as one of 23 conservation programs worldwide to receive funding from a BBC fundraising campaign called "Saving Planet Earth". Associated with the ongoing BBC television series entitled "Animal Ark", Saving Planet Earth intends to provide a way for BBC viewers to make contributions to conservation programs across the earth. As of now, we have been invited to submit a proposal for $40,000 annually, a significant sum capable of covering some crucial costs related to macaw conservation. More information is available at http://www.bbc.co.uk/savingplanetearth/more_projects.shtml.

Other advances noted in this report include the inclusion of Laguna del Tigre in the Debt-for-Nature-Swap (Activity 2.11), the hiring of Paso Caballos village macaw guards by CONAP (Activity 2.1), and the growing ability of our national NGO partner, Asociación Balam, to develop well-oriented proposals and obtain funding for activities that complement on-going WCS activities in the eastern MBR.

Our goal of achieving complete sustainability over the mid-term continues to be elusive although some promising advances have materialized. One reason for this, despite the increased concern with global warming and other environmental phenomena, is that overall conservation financing continues to wane as international funding is focused on economic development and security issues. Nevertheless, we feel that recent investments have strengthened our program, making it one of the terrestrial conservation initiatives in Mesoamerica that has demonstrated undeniable impacts, and ability for innovation in a crucially important site.

Activity 2.10 Over-flights of the Maya Biosphere

For the eighth year in a row, WCS Guatemala received the support of Light Hawk and Clean Air Visibility Unlimited (CAVU-Mr. David Smith) to execute over-flights of the reserve with governmental organizations, NGOs, community-based representatives, and members of the press. These over-flights are intended to educate a wide spectrum of local and international actors about the current state of the MBR landscape. Two private flights of the eastern Laguna del Tigre landscape were also chartered to facilitate important monitoring when the collaborative flights from Light Hawk and CAVU were not available. Over-flights occurred in February, March, April, and May with a total of 25.4 hours logged in the air by Light Hawk, and another 15 hours flown with the support of CAVU and private pilots. Flights were conducted for the following institutions and individuals:

- USAID Guatemala
- Wildlife Conservation Society
- Defensores de la Naturaleza
- Centro de Monitoreo y Evaluación de CONAP (CEMEC/WCS)
- Guatemala's Fire Prevention Service (SIPECIF)
- Consejo Nacional de Áreas Protegidas (CONAP)
- University of Florida
- Organización Manejo y Conservación (OMYC, Uaxactún)
- ProPetén
- Asociación Balam
- Trópico Verde
- Laborantes del Bosque (Melchor de Mencos)

- Ministry of Governance, Government of Guatemala
- Environmental Prosecutor's office, Ministry of Governance, GoG
- Instituto de Antropológia e Historía (IDAEH)
- Prensa Libre Newspaper
- Yale University
- Asociación de Reservas Privadas Naturales de Guatemala
- Centro de Estudios para la Conservación (CECON-USAC)
- Policía Nacional Civil
- WCS Jaguar Conservation Program

Over-flights were primarily focused on identifying threats to the Laguna del Tigre landscape, educating decision makers about the status of the area, and, most importantly, identifying viable interventions. For example, prior to initiating the installation of the 47-kilometer fire break designed to halt the advance of the pastoral frontier towards the intact nesting sites of La Corona and El Burral, over-flights were used to map existing holdings and monitor the spread of settlements on the western flank of the intact section of Laguna del Tigre. This allowed us to detect adequate water bodies for establishing temporary outposts, while avoiding direct contact with aggressive colonizers who have clashed with CONAP and DIPRONA police in the past. During the fire season (April-late May) flights also helped us obtain detailed information regarding the origin of significant forest fires. For example, in the El Burral area, some 5,000 hectares of land were burned as the result of fire set by colonizers located at a large "*finca*" (cattle ranch) 5 kilometers west of the El Burral camp. CONAP has subsequently prioritized this illegal "invasion" for resettlement. We were also able to pinpoint fire prevention and protection activities in Uaxactún, Melchor, Carmelita, and other community forest concessions, as well as Sierra del Lacandon National Park, Yaxha National Park, and other areas of the reserve.

As in FY06, in March 2007 we discovered clearings in the eastern section of Mirador-Rio Azul National Park. Follow-up flights in May revealed that the number of clearings had grown from 4 to 18. Detection by over-flights constituted the only viable means of detection since all clearings were strategically located in the most remote section of the MBR, far from footpaths and dirt roads, and also because most were so small so as to be difficult to detect using Landsat images (typically used to measure deforestation trends). Photographs and precise locations were provided to CONAP officials and subsequently presented to the Mesa Multisectorial for the Mirador-Rio Azul Natural and Cultural Area, helping to create momentum for the Presidential announcement to support the establishment of 6 checkpoints in the eastern MBR, one of which is to be located in Rio Azul.

No significant problems were encountered during FY07 over-flights. Appendix A19 provides a succinct report of the individual flights undertaken with Light Hawk during the 2007 season, including a map of the flight tracks recorded.

Activity 2.11 Inclusion of Laguna del Tigre within the Debt-for-Nature Swap[11]

The inclusion of Laguna del Tigre in the $27 million Debt-for-Nature Swap (DFNS) was one of our main priorities over the last year. The important biodiversity targets (e.g., scarlet macaws, numerous Landscape Species, important wetlands) within the eastern sector of the park, and the Maya sites, provided a strong incentive for continuing to build momentum for the "salvageable" eastern section of the park. We also focused on the inclusion of Laguna del Tigre in the DFNS to help ensure that the pastoral frontier did not spread into the economically productive forest concessions of the reserve, and due to the downward trend in conservation funding by the Critical Ecosystem Partnership Fund and other important donors to the area.

In January 2007, the long-awaited congressional approval of the DFNS was announced, with the eastern section of Laguna del Tigre included in the funding stream, along with two other areas of the MBR: Sierra del Lacandon National Park and the Multiple Use Zone. Successful inclusion of Laguna del Tigre in the DFNS was a result of extensive collaboration by members of Asociación Balam, Conservation International, Trópico Verde, CALAS, CONAP-Petén, IDAEH, and other collaborators in the area.

[11] The Debt-for-Nature Swap (DFNS) is financed by a $27 Million fund provided by: USAID-$24 Million, TNC-$2 Million, and Conservation International-$1 Million.

Although the exact DFNS budget available for field activities has not yet been specified, future challenges involve the preparation of a proposal designed to provide a solid funding base that will permit habitat management and protection activities and community outreach efforts to be established over the next two years.

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

As in past years, two keystone pilot projects conducted with communities were evaluated, using participatory consultations during group discussions. Discussions were guided by a general questionnaire designed to stimulate thought about some of the key issues involved. The five central questions remained the same as in previous years:

- 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?

In all cases, consultations occurred during a formal sit-down session with careful transcription of the results. FY07 projects evaluated using this methodology included:

a) *Paso Caballos macaw protection at the Peñon de Buena Vista*: The evaluation was carried out on July 17th 2007, with 9 key members of the community of Paso Caballos, including the Mayor (President of the Community Development Council, COCODES), members of tourism groups, local leaders, and members of the protection team working at the site. A majority of the participants (70%) revealed they had been consulted prior to the development of the project, although some were not aware of the specific responsibilities of the technical support provided by WCS. There was agreement that the objectives of the project are clear, and that the project has yielded important results. However, participants advised that the project's objectives and results should be disseminated more widely on a regular basis. In order to increase the success of the project, participants recommended that the tourism groups become more involved with the area, and that more resources be brought to bear to allow more guards to be employed. Lastly, they recommended that in order to conserve macaws over the long term, WCS should work with the community to develop a number of additional projects to help the community with basic needs, such as potable water, education, and the development of economic alternatives (see Appendix A20).
b) *Xate bodega at Uaxactún*: The evaluation was carried out July 16th 2007, with 10 members of OMYC and the WCS/OMYC administrator of the project, Mr. Julio Zetina. Participants included the OMYC President, the OMYC Treasurer, the coordinator for all of the female "xate sorters" (i.e. *seleccionadoras*), the coordinator of OMYC's Control and Vigilance Committee, and xate harvesters and *seleccionadoras*, among other members of the community. General consensus existed in regard to the community being consulted before the development of the project, with participants also reporting that the project has clear goals, among them the improvement of the economic, social (i.e. opportunities for women), and environmental conditions of Uaxactún. The project was also considered "successful", with over 1 Million Quetzales generated, and 52% of the income captured by the harvesters. Recommendations to increase the success of the project included the implementation of the recently approved xate management plan, the incorporation of middle men (*contratistas*) still working independently, and the incorporation of more independent harvesters in the village (see Appendix A21).

In general, participatory approaches have yielded positive benefits in terms of generating social support for conservation objectives that also serve to strengthen community standing. A key example is the reformation of the "road barrier" project previously undertaken to protect the Rio Azul protected area. Whereas previously the barriers were destroyed despite obtaining broad social support for the barriers prior to their construction, the new approach to controlling access in conjunction with community groups appears to be much more socially viable, at least over the short-term.

Activity 3.2 Strengthen the Maya Biosphere and global conservation initiatives

A preliminary report, including questionnaire results from 8 Living Landscape sites, was complied to evaluate the importance of natural resource protection initiatives among WCS-related personnel (Appendix A22). In general, program directors indicated that protection initiatives are among the most important interventions available to conservationists, and must be strengthened to meet the challenges expected in the future.

In addition, WCS Guatemala personnel have spent a considerable amount of time in workshops and field events designed to increase local capacities for diverse conservation-related activities. Examples include:

- Two fire-prevention workshops imparted by Luis Romero in El Salvador and Panama, in support of OFDA-USAID's regional fire prevention program;
- Dan Thornton, Rony Garcia, and Jose Moreira leading two camera trapping workshops (in Carmelita, MBR, and Morales, Izabal) to train local field staff and biologists in jaguar monitoring techniques;
- Roan McNab of WCS Guatemala coordinated the participation of a Guatemalan delegation including the Minister of the Environment and Natural Resources, Lic. Juan Mario Dary, and the Executive Secretary of CONAP, Arq. Sergio Veliz, at a Mesoamerica workshop convened by the WCS Jaguar Conservation Program. The objective of this workshop involved developing governmental priorities for jaguar conservation across the entire Mesoamerican isthmus. WCS played a key role in helping governmental personnel from 7 nations review the state of knowledge of jaguars in their countries, and define priorities for jaguar conservation, and eventually, the development of a "jaguar corridor" to ensure genetic flow across the isthmus.
- Roan McNab has conducted 3 public presentations reviewing the results of recent jaguar studies (with a focus on the La Gloria-Lechugal study), and the implications of such for jaguar conservation. On July 5th 2007, a final presentation of the La Gloria-Lechugal study was provided to the President of Guatemala and the Mesa Multisectorial for the Mirador-Rio Azul Natural and Cultural Area.

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 Living Landscapes Program (LLP) 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 or seascapes that encompass a diverse array of ecological features, land-uses, resource-use issues, and jurisdictional arrangements. The CU is charged with designing and managing the program to develop new approaches in close collaboration with WCS field-based staff, to facilitate and harmonize testing and implementation among these core sites, and to capture the synergistic benefits of their diverse experiences. It guides development of landscape-scale 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 FY07, the priority for the Coordination Unit continued to be working with field sites to promote adoption of best-practice tools for effective conservation at landscape scales. These efforts culminated at the LLP Annual meeting which took place in the Adirondacks, NY over May 2-8, 2007. During this meeting, all WCS/GCP funded and WCS/LLP volunteer sites presented and discussed their use of LLP/GCP tools in the development of their conservation landscapes. During this year we continued to refine and simplify the process for selecting landscape species, including revision of the software decision-support tool. Though the software uses context sensitive help, and is designed to be usable without training, we decided to further facilitate field adoption of landscape species selection (i.e., conservation target selection) by finalizing and disseminating a 'how to' manual (Appendix B1) to accompany the selection software. In addition, we continued working with our field staff and NY program and accounting staff to explore how best to integrate project strategic planning elements, such as conceptual models and monitoring frameworks, into annual operations planning and reporting.

Activity 4.1 Provide technical assistance to site-based conservation

Members of the NY Coordination Unit worked closely with field sites to provide targeted technical input (punctual advice and informal and formal training in strategic conservation planning, monitoring the effectiveness of conservation actions, 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 site-specific reports: Madidi (Bolivia), Maya (Guatemala), Glovers (Belize), and Eastern Steppe (Mongolia). As our LLP/GCP sites are at different stages of development or evolution, they have warranted (and requested) different levels of NY coordination unit assistance during this reporting period. This is to be expected and reflects our adaptive management approach to conservation investment.

Overall, LLP staff supported the 4 four sites through the following process:

- **Finalization of each site's suite of Landscape Species**. LLP-NY support included providing guidance on the candidate species and other data required for the target selection process, technical support for the software used to select Landscape Species, and review of draft Landscape Species suites in order to assist field staff in choosing the most appropriate conservation targets for their site.
- **Development of quantitative population targets for Landscape Species.** LLP-NY provided technical support and helped gather information from the literature. Setting appropriate population targets is pivotal to the strategic application of the Landscape Species Approach (LSA).
- **Creating draft Biological, Human, and Conservation Landscapes or Seascapes for Landscape/Seascape Species.** LLY-NY led on the development of several models and provided technical support to field staff to ensure the successful development of these models that are at the core of the LSA.

For example, the Eastern Steppe of Mongolia is the youngest LLP/GCP site. This year, Dr. Amanda Fine and her Mongolian team made huge strides in completing steps of WCS's conservation planning methodology, the Landscape Species Approach. LLP staff from New York provided substantial support and guidance to the Mongolia staff. Presentation and review of the results took place during a stakeholder workshop in Ulaanbaatar on October 3, 2006. During visits to Mongolia, Drs. Karl Didier and Eric Sanderson also participated in several meetings and discussions with The Nature Conservancy and the World Wide Fund for Nature (WWF-Mongolia and US) about collaborative conservation planning and implementation in the Eastern Steppe, now known as the Zuun Bus collaboration. Dr. Didier has also provided some spatial information and technical support to TNC as they proceeded through their conservation planning framework in Mongolia. Dr. Samantha Strindberg also assisted field staff in Mongolia to develop a sampling design and field protocol to collect information in order to obtain the first empirically based estimates of population size, distribution, and habitat use of the critically threatened Siberian marmot, a Landscape Species, across the Eastern Steppe.

Another highlight was that Janet Gibson and her team at the Glover's Reef Living Seascape (GRLS) made great progress this year with the seascape models for all seven of their Seascapes Species: hawksbill turtle, Nassau grouper, Caribbean reef shark, star coral, queen conch, *Diadema*, and osprey. Dr. Samantha Strindberg of LLP-NY traveled to Belize City in February 2007 to assist the Belize field team in refining their potential biological seascape and human threat seascape models and to create new models for current abundance, target abundance, conservation impact and benefit-cost for all species. This information is a key element of the Conservation Strategy document for GRLS.

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

Activity 4.2.1 Living Landscapes Program technical manuals

In FY07, we finalized and disseminated one technical manual, *Technical Manual 5: A quick reference guide to the Landscape Selection Software version 2.1* (Appendix B1), and had the LLP manuals and bulletins that were completed in FY06 translated into Spanish and French (Appendices B2-B9; Technical Manuals 3-6 in Spanish are currently being produced); these will be printed and will also be available online in PDF format. These publications are currently being disseminated to WCS projects, partners (government, NGO and local), and other conservation and development colleagues. The manuals are designed to provide clear and practical instructions to field practitioners on using a number of conservation tools. We also updated two of the older, English-language Technical Manuals (Appendices B10 and B11).

Activity 4.2.2 Landscape Species Approach progress

4.2.2.1 Building Conservation Landscapes and Seascapes

In FY07, LLP staff in New York finalized methods for building conservation landscapes and seascapes, based on the experience of our pilot implementation at GCP and LLP field sites. We drafted a Technical Manual on combining biological and threats landscapes into conservation landscapes, that will provide field practitioners with guidance as to where and what actions would have the greatest positive impact on wildlife conservation and natural resources management. We then worked with the field sites to pilot the use of the draft manual as a decision-support tool. Feedback from these pilot sites is helping us refine and revise the manual before it is finalized for publication as a hard copy and as a PDF on our website.

Substantial progress has been made during the year in the finalization and implementation of tools that are part of the Landscape Species Approach, including:

- **Selecting Landscapes Species.** Drs. Strindberg and Didier, with assistance from other LLP-NY staff, produced written guidelines as an addendum to the already published software that guides users through the process of selecting Landscape Species. The guidelines were published as a Living Landscapes Technical Manual (Appendix B1), which is provided online on the program's website. Over the past year, this decision-support tool was used by the Eastern Steppe of Mongolia and Madidi projects.
- **Setting Population Target Levels.** Dr. Sanderson with assistance from other LLP-NY staff finalized guidelines for setting quantitative Population Levels for conservation targets (e.g., Landscape Species). Guidelines were published as a scientific paper in the November 2006 issue of *BioScience* (Appendix B12). Over the past year, this tool was used extensively by all four GCP sites (the Eastern Steppe of Mongolia, Madidi, Glover's Reef, and Maya Biosphere Reserve projects), as well as by at least 7 other WCS projects (e.g., Western Forest Complex, Thailand; Northern Plains, Cambodia).
- **Building Biological and Human Landscapes.** Dr. Didier, with assistance from other LLP-NY staff, finalized guidelines for creating Biological and Human Landscapes, which were published as a LLP Technical Manual in FY06. Dr. Didier also began production of a scientific paper to overview these tools, which will be completed and submitted for review during FY08. Over the past year, these tools were used extensively by the four GCP sites as well as by at least 7 other WCS projects (e.g., San Guillermo, Argentina; Adirondacks, USA; Ruaha, Tanzania).
- **Building Conservation Landscapes.** Drs. Didier and Sanderson, along with assistance from other LLP-NY staff, finalized guidelines for creating Conservation Landscapes (i.e., maps of the possible impact of conservation action). Dr. Didier began development of a LLP Technical Manual on the tool, which will be published in FY08. Over the past year, this tool was used extensively by all four GCP sites, as well as by at least 7 other WCS projects (e.g., Nouabalé-Ndoki, Congo; Coastal Patagonia, Argentina; Nam Kading, Lao P.D.R.).
- **Monitoring Frameworks.** The Glover's Reef Living Seascape (GRLS) team has been dynamically updating and using their monitoring framework to effectively track their conservation actions, the ongoing threats in their landscape and the status of their conservation targets. They view it as a living document that allows them to see changes in the status of their indicators over time. This provides them with an incredible sense of both the ongoing challenges that they face and the progress they have made in conserving the GRLS. Similarly, like other LLP sites, the team in Guatemala is evaluating the effectiveness of their conservation actions in part by monitoring the status of their Landscape Species. That said, monitoring highly elusive species scattered across vast geographic areas is a huge challenge and Dr. Samantha Strindberg of LLP-NY provided technical support for the design and analysis of this type of monitoring. The second two-week LLP/WCS workshop on "Statistical Design and Analysis of Biological Monitoring Programs for Conservation Management", designed and led by Dr. Samantha Strindberg, significantly advanced the access of WCS field staff to the technical knowledge that they need to monitor elusive species. WCS field staff in attendance included Rony Garcia Anleu from Guatemala, along with Esteban Suárez (Yasuni-Napo Landscape, Ecuador) and Hugo Rainey (Ndoki-Likouala Landscape, Congo). Both the Ecuadorian and Congolese landscape sites were supported by the first round of USAID/GCP funding and are continuing to apply the tools and build upon the success of their previous conservation work.

Activity 4.2.3 Integrating strategic planning and project management

LLP-NY staff have continued to work with our field sites and WCS NY operations (i.e., regional program and accounting staff) to devise ways to integrate strategic planning with operations planning and reporting. LLP program staff contributed substantially during our WCS organization-wide strategic planning process. Drs. Amy Vedder and David Wilkie were both extremely active members of the Strategic Planning and Review Coordination (SPARC) committee – a group charged with revising the operations processes and protocols within WCS's international program. LLP staff was also key sources of technical input into our new organizational strategic plan, lead by Dr. Craig Groves. As a result of our efforts, LLP/GCP developed tools are now to be integrated into annual work planning, budgeting and reporting, starting in the FY09 budget cycle (i.e., December 2008). WCS will be the first international conservation NGO to integrate site-based strategic planning into annual operations planning. This fills a major gap in the adaptive management infrastructure that we need to truly measure our conservation effectiveness.

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

Activity 4.3.1 Annual meeting, cross-site and cross-organizational learning

Annual meeting of WCS/LLP staff

LLP organized and hosted an annual meeting to bring together WCS/GCP and LLP field site staff to share and capture lessons learned in the implementation of threats-based approaches to biodiversity conservation at landscape scales. The meeting took place in the Adirondacks, NY from May 2-8, 2007. Twenty WCS staff attended from ten field sites, including seven staff from the current USAID-funded sites. In the past these meetings have proven enormously fruitful for our field staff, as they provide a forum for serious, practical discussions about the challenges they face in effecting conservation in large, complex landscapes. GCP support to LLP offers us one of the few opportunities to bring WCS field staff from each of our Regional Programs together to share lessons learned and best practices. This is of enormous value to our field sites as it allows innovative and effective conservation practices to quickly spread across our organization, and thus enhances our ability to effect conservation across the planet.

This meeting was judged by attendees as the best since LLP's establishment and the first meeting in Madidi, Bolivia. Field staff were particularly excited because pilot development of the full suite of LLP strategic planning tools had been completed, allowing staff to see how the approach was implemented at different sites and to assess what strengths and weaknesses they found in the process. A series of Guidance Briefs is being developed based on the discussions at the meeting. These Briefs will be posted on the website to allow conservation practitioners to better understand what each tool is intended to achieve within a conservation project management cycle, what training resources are available, and what information, staff skills and time are required to use each tool.

Furthermore, LLP staff are working on a collection of case studies that will recount and capture our collective experience, over the last 9 years, in developing this unique and systematic approach to threats-based conservation at a landscape scale.

Cross-site learning

Former WCS GCP/LLP Program Director Dr. Amy Vedder traveled to Guatemala in the fall of 2006. She and Guatemala LLP project director Roan McNab undertook an overflight of the Maya biosphere reserve to view the broader landscape and visualize the many issues and conditions that influence forest resource conservation, and to discuss how WCS is using different strategies in distinct parts of the reserve to address these different challenges. Dr. Vedder also made a field visit to Paso Caballos and the macaw areas, and went to Tikal and Uaxactún village to meet with partners and see, first hand, how WCS is effecting conservation and livelihoods in the Maya Biosphere Reserve.

Cross-organizational learning

Drs. Didier and Wilkie continued their involvement with a GCP learning project to evaluate the different approaches that conservation NGOs use to select conservation targets (e.g. WCS's Landscape Species Approach). To follow up on an FY06 workshop attended by the GCP partners, Drs. Didier and Wilkie have been working closely with Madeleine Botrill (formerly with WWF) and other GCP partners to publish a scientific paper which reviews and compares the target selection procedures of the WCS, TNC, WWF, CI, and AWF. The paper was submitted to the journal Conservation Biology during FY07 (Appendix B13). Although the paper was not accepted for publication, the authors were invited to resubmit given some revisions. Dr. Didier and Ms. Botrill have begun revisions and plan to resubmit in FY08.

Recently, LLP-NY has begun leading an effort to publish much of our progress and the progress of other NGOs on landscape-scale conservation planning. We plan to secure agreement from a journal to publish a special section on the spatial aspects of landscape conservation planning used by the GCP partners (WCS, TNC, WWF, CI, and AWF). The WCS contribution will likely include an overview of the Landscape Species Approach, and possibly several case study applications of the approach from our project portfolio, including case studies from the Eastern Steppe of Mongolia, Glovers Reef in Belize, Adirondack Park in the US, Nouabalé-Ndoki in Congo and Nam Kading in Laos. We hope to have all papers for the special section submitted by the end of FY08.

Activity 4.3.2 CMP: leadership, design, writing and audits

CU staff continues to play a leadership role in the identification, design and implementation of Conservation Measures Partnership activities. We work closely with all CMP members to identify best-practice tools to use as models for development of eAdaptive-Management (now named Miradi) software modules. We provide CMP with ongoing lessons from our efforts to integrate project strategic planning and annual financial management, and offer recommendations as to how this experience can help guide future updates of Miradi.

LLP NY staff conducted, and ten WCS/LLP site field staff participated in, a 1/2 day practical test of the Miradi adaptive management software developed by the Conservation Measures Partnership. As the software is designed on the TurboTax model (i.e., can be used straight out of the box without any training), neither expatriate nor national project staff where provided any guidance on how to use the software, they were only told briefly the range of tasks that the software was designed to help field staff undertake. By the end of the 4 hour test run, all staff reported that the software was indeed easy to use and the help files were exceedingly useful - though often more difficult for non-English speakers. Primary feedback was a desire for short Video Tutorials for each step in the process showing how to use the software, as this would reduce the need to read the detailed help files.

LLP NY staff continued to contribute to activities being undertaken by the Conservation Measures Partnership. Specifically, we provided guidance to Elizabeth O'Neill as she prepared a review of CMP experience undertaking conservation audits.

Activity 4.3.3 Local engagement in conservation survey

In FY07, we extended the reach of a synthesis of field-based practice, published as a WCS working paper: "Casting for Conservation Actors: People, Partnerships and Wildlife" (Appendix B14).

Activity 4.3.4 Preliminary assessment of the human welfare impacts of establishing national parks

Dr. David Wilkie shared lessons-learned and best practices from the WCS-Boston College People and Parks project in Gabon during a 2-day workshop at the UNEP World Conservation Monitoring Centre (WCMC) focused on the integration of livelihood measures into protected area management effectiveness monitoring and assessment. In addition, he shared WCS experiences on the use of monitoring frameworks and livelihood assessment tools in a 2-day workshop on methods for assessing the livelihoods impact of conservation activities, organized by Fauna and Flora International and the African Wildlife Foundation. Christopher (Kit) Kernan of Conservation International has asked that we train a social science team in Equatorial Guinea on the methods developed during the People and Parks project, so that he can meet his CARPE obligations for enhancing the participation of local people in conservation programming and assessing the positive and negative impacts of USAID conservation spending on local economies. In addition, information gleaned by

Dr. Wilkie during the latter meeting encouraged us to revise our LLP Technical Manual 4 (Appendix B11) to incorporate a very clever and simple poverty assessment tool developed by Rick Davies – The Basic Necessities Survey (BNS). This tool continues to promote the use of a standard basket of assets to assess household wealth.

Activity 4.4 Application of Living Landscapes Program tools beyond core sites

Activity 4.4.1 Training workshops and technical assistance in the use of LLP tools

LLP NY staff continued to provide assistance to WCS and reserve staff of the Amazon Andes Conservation Program in Brazil, Peru, Ecuador, and Bolivia during a week long workshop in Brazil.

LLP NY staff designed and delivered a 2-day conceptual modeling and monitoring framework training for program staff in the WCS regional programs (about 40 people), plus 14 staff from WCS field sites. The training was held at WCS's headquarters in NY. The fourteen field participants who benefited from this workshop included staff from other LLP design and demonstration sites. Both the Ecuadorian and Congolese landscape sites were supported by the first round of USAID/GCP funding and are continuing to apply the tools and build upon the success of their previous conservation work.

Dr. Didier worked closely with several non-core WCS sites to implement the program tools, including most prominently the Adirondacks, USA and the San Guillermo Biosphere Reserve in Argentina. The LSA tools have also contributed greatly to Dr. Didier's work on landscape scale planning projects in Samburu-Laikipia, Kenya and Argentine, Patagonia.

Dr. Wilkie used strategic planning tools developed by LLP and financed by USAID/GCP to help the WCS Democratic Republic Congo program to select conservation targets around which to focus their conservation effort at a national level, to identify critical landscapes to conserve these targets within DRC, and to begin the development of conceptual models for each critical landscape. Dr. Wilkie leveraged GCP support to help develop a strategic plan for conservation of Asian and African elephants.

Dr. Strindberg worked closely with Dr. Emma Stokes in Congo to build landscape models for two of their Landscape Species, namely elephants and chimpanzees, in the Ndoki-Likouala Landscape (supported by the previous round of USAID/GCP funding), thus building on USAID/GCP prior investments.

Dr. Strindberg and Gosia Bryja leveraged GCP support to LLP by helping our WCS Lao team to apply the Landscape Species Approach to conservation planning in the Nam Kading National Protected Area in the Bolikhamxay province of Lao. These LLP activities were part of a multi-stakeholder Integrated Ecosystem and Wildlife Management Project (IEWMP), and led to the generation of species conservation landscapes that illustrate the areas where human use of the landscapes and animal habitats intersect (i.e. areas where potential threats to animal populations exist). The results of the analysis have already been adopted by the Lao government to develop interventions for the new management plan for the Nam Kading National Protected Area.

Gosia Bryja of LLP-NY traveled to Argentina in October 2007 to provide support to the Sea & Sky project as they implement LLP/GCP tools in their marine conservation planning initiative. She worked with Valeria Falabella to build biological models for their previously selected seascape species: Magellanic penguins, Black-browed albatrosses, Squid, Common hake and Southern Right whale. Leveraging GCP support to pilot the use of our landscape-scale conservation planning tools within vast, complex, 3-dimensional seascapes is an important but challenging new direction for LLP.

Activity 4.4.2 Technical Manuals

We continued 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 now available in English, French and Spanish.

Activity 4.5 Ensure coordination and communication services for the program

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

Throughout the year, the Coordination Unit has assisted field staff in completing annual Implementation Plans, reporting on Performance Monitoring forms, and submitting Annual Reports. The program director and assistant director and other staff have continued to contribute significantly to USAID/GCP quarterly and annual meetings in Washington DC and continue to provide regular reporting and updates to USAID.

IV. Appendices

A1. Preliminary report on conservation models of three landscape species in the MBR
A2. Proposal by Asociación Balam to the Inter-American Foundation the strengthen the Multiple Use Zone
A3. Estrategia de Seguridad Ambiental/Mesa Multisectorial
A4. Map of macaw nesting sites and areas affected by fire-2007
A5. Report: Testing Double-Chambered Artificial Barrel Nests
A6. Macaw Nest Monitoring in the AFISAP Community Forest Concession
A7. Bi-annual Financial Report: OMYC Xate Bodega, Uaxactún
A8. Report: Trends in xate quality processed at the Uaxactún Xate Bodega 2007
A9. Final report on deforestation across the Maya Biosphere Reserve, 2005-2006
A10. Final report on impacts of fire across the Maya Biosphere Reserve, 2006 dry season
A11. Preliminary map of MBR areas affected by fire, 2007 dry season
A12. Preliminary predictions of the severity of the 2007 dry season
A13. Report on the nesting success of scarlet macaws across the Maya Biosphere Reserve during 2007
A14. Report on jaguar sampling in La Gloria-Lechugal, Multiple Use Zone, Maya Biosphere Reserve
A15. Report on Jaguar Symposium at Mesoamerica Society for Conservation Biology, Antigua, Guatemala, Nov, 2006
A16. Preliminary report: satellite collar deployment on scarlet macaws in the Maya Biosphere Reserve
A17. A sampling protocol for the Central American river turtle (*Dermatemys mawii*) in the Maya Biosphere Reserve
A18. Report: distributions of Central American river turtle in the Maya Biosphere Reserve
A19. Report: Light Hawk/WCS over flights in the Maya Biosphere Reserve, 2007
A20. Participatory evaluation of WCS pilot projects: Peñon de Buena Vista Macaw Protection
A21. Participatory evaluation of WCS pilot projects: OMYC Xate Bodega
A22. Preliminary Report – protection activities at WCS sites across the globe
B1. LLP Technical Manual 5- *A quick reference guide to the Landscape Species Selection Software version 2.1*
B2. LLP Manuel Technique 3- *Mesurer l'efficacité - cadre de suivi*
B3. LLP Manuel Technique 4- *Les enquêtes sociales – un outil de conception, d'action et de suivi pour la conservation*
B4. LLP Manuel Technique 5- *Guide de référence rapide au logicel Landscape Species Selection version 2.1*
B5. LLP Manuel Technique 6- *Bâtir le Paysage Biologique et celui des Menaces : une approche pas à pas*
B6. LLP Bulletin 8- *Mettre en Place des Objectifs Demographiques pour la Conservation de la Faune : Combien d'Animaux Doit-on Conserver ?*
B7. LLP Bulletin 9- *Se Partager des Paysages Convoites : La Conservation à Travers les Yeux des Animaux*
B8. LLP Boletín 8- *Estableciendo Tamaños Poblacionales Meta para la Conservación de la Vida Silvestre: ¿Cuantos Animales Debemos Salvar?*
B9. LLP Boletín 9- *Compartiendo Paisajes Valiosos: Conservación a Través de los Ojos de la Vida Silverstre*
B10. LLP Technical Manual 2- *Creating Conceptual Models - a tool for thinking strategically*
B11. LLP Technical Manual 4- *Household Surveys – a tool for conservation design, action, and Monitoring*
B12. Sanderson, E. (2006). How Many Animals Do We Want to Save? The Many Ways of Setting Population Target Levels for Conservation. *BioScience* 56(11): 911-922.
B13. *Comparing Landscape-Scale Target Selection Procedures of Five International Conservation Organizations*
B14. WCS Working Paper- *Casting for Conservation Actors: People, Partnerships and Wildlife*