The Global Conservation Program

Achievements and Lessons Learned from 10 Years of Support for Threats-based Conservation at a Landscape and Seascape Scale

Maya Biosphere Reserve Living Landscape (Guatemala)

WILDLIFE CONSERVATION SOCIETY

Maya Biosphere Reserve Living Landscape

Key achievements, impacts and lessons learned attained with GCP funding 2
Maya Biosphere, Program Highlights 2
Box 1: Development of the Mesa Multisectorial 3
GCP Program Background 9
Location, Global Importance and Key Threats to this Landscape 10
The Wildlife Conservation Society's Historic and Current Roles in this Landscape 11
WCS's Approach to Threats-based Conservation at a Landscape Scale 19
Implementing Conservation at a Landscape Scale: Overcoming Challenges, Grasping Opportunities and Managing Adaptively 21
Sustainability 22
Measures of Success 23
Value of the GCP Program 24

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Key achievements, impacts and lessons learned attained with GCP funding

The Maya Biosphere Reserve (MBR), the largest protected area complex in Mesoamerica, forms the core of a tri-national system of protected areas in Guatemala, Belize, and Mexico known as the Selva Maya (Maya Forest). The MBR is a stronghold for many wide-ranging and iconic species and is one of the last remaining rainforest strongholds in the region. However, the threats facing the MBR are numerous. These threats include rapid deforestation due to illegal colonization and agricultural expansion, forest fires and wildlife poaching, among others. To best ensure the conservation of the wide-ranging target species within the MBR, interventions were largely 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. Specific conservation activities have focused on three objectives:

- the implementation of a participatory strategy to reduce threats to wildlife in the MBR landscape;
- the development of adaptive mechanisms that strategically address threats across the landscape; and
- the dissemination of best practices across the reserve, and beyond.

Maya Biosphere, Program Highlights

- **Building and Strengthening Alliances with Conservation Partners**. From the beginning of WCS's involvement in the landscape, community participation has been an integral aspect of the conservation approach implemented across the Maya Biosphere. Over the course of GCP funding, substantial inroads were made in garnering support among local, national, and international stakeholders. Among the allies involved in developing conservation alliances are: the village of Paso Caballos; the community forest concession of AFISAP; the village of Uaxactún; the village of Pipiles; and the community forest concession of Carmelita. WCS Guatemala also developed an important partnership with the Rainforest Alliance to promote the management of a xate processing house in Uaxactún and forged a strong partnership with the

Box 1: Development of the Mesa Multisectorial

After several years of planning and consultation, a roundtable group called the "Mesa Multisectorial para el Area Natural y Cultural de Mirador-Rio Azul" was brought to life in FY07 with an initial seed grant of $5,000 by WCS. Subsequent support from the Critical Ecosystem Partnership Fund consolidated an effective alliance between Asociación Balam, WCS Guatemala, the Association of Forest Communities of Petén (ACOFOP), Consejo Nacional de Areas Protegidas (CONAP), Instituto de Antropología e Historia (IDAEH) and the office of the Executive Secretary of the Presidency to encourage dialogue and build consensus on the future of the Mirador-Rio Azul National Park and surrounding areas. The Mesa Multisectorial was formally launched in late October 2006, with the participation of representatives of numerous sectors of society[1]. Fourteen ordinary sessions of the Mesa have subsequently been convened, in addition to two sessions presided by Presidents Berger and Colom of Guatemala (see Figure 1, below). Tangible results of the process include: increased participation by local actors who were formerly wary of all efforts to conserve and develop the ecotourism potential of the site of El Mirador; formal recognition of the Mesa by the full CONAP Council; improved coordination of long-term US investments by the US Department of Interior and international donors planned for Mirador-Rio Azul National Park and the area of Carmelita; development of a social outreach program to local communities as a result of a grant provided by the Flora Family Foundation; establishment of participatory commissions designed to evaluate future access to the area; and collaborations on jaguar research, among many others. In 2008, the direct involvement of incoming President Ing. Alvaro Colom and other governmental personnel helped ensure the Mesa's impact through another four-year period. Securing Presidential support for the Mesa Multisectorial was an enormous step toward ensuring that the Area Natural y Cultural de Mirador-Rio Azul is effectively managed into the future, providing long-term natural resource protection and sustained economic contributions to the people of Guatemala. In 2009, the Mesa Multisectorial continues to function as a unique forum where community representatives, NGO practitioners, donors and governmental leaders (including Ministers and Presidents) sit together and share and debate ideas in a search for consensus regarding the possibilities for conservation and development of the Mirador-Rio Azul Natural and Cultural Area, the true heart of the tri-national Maya Forest of Belize, Guatemala, and Mexico.

1 These included the president of Guatemala, UNESCO, national and international NGOs, local community groups and their representative organizations, private sector groups, donors, ministers of relevant governmental agencies, the executive secretary of CONAP, the director of INGUAT (Instituto Nacional Guatemalteco de Turismo), the director of IDAEH, and the delegations of various embassies in the country. USAID Guatemala participated on several occasions.

Critical Ecosystem Partnership Fund (CEPF) which, in addition to their support for the protection of the remaining areas of the Laguna del Tigre Ecosystem (see below), has funded two grants to WCS Guatemala for the development of the Laguna del Tigre Master Plan and a project entitled "emergency protection and conservation of the eastern Laguna del Tigre ecosystem". In FY06, in conjunction with national NGO partner Asociación Balam, WCS Guatemala signed a cooperative agreement with the Association of Forest Communities in Petén to promote strategic interventions that improve the long-term social and ecological viability of the community forest concessions in the Multiple Use Zone of the reserve.

- **Protection of the Eastern Laguna del Tigre Ecosystem**. In Guatemala, perhaps no more challenging conservation task exists than the stabilization of Laguna del Tigre National Park and the protection of important conservation targets (including scarlet macaw nesting sites and extensive freshwater wetlands) in its area of influence. Despite this enormous challenge, a conservation coalition led

Roundtable Events

Year	Date		Event	Principal Themes
2006	October	25	Inauguration	Public act w/ President Berger
	November	2	Meeting I	Roundtable rules of engagement
		28	Meeting II	Statutes approved
	December			
2007	January	17	Meeting III	BID proposal, access methods
	February			
	March	2	Meeting IV	CONAP progress
	April	25	Meeting V	Tourism Infrastructure
	May	23	Meeting VI	Master Plan, Commissions
	June			
	July	5	Extraord. I	Presentation to President Berger
	August	29	Meeting VII	Access, Governance
	September			
	October	12	Meeting VIII	Environmental Security
	November			
	December	11	Meeting IX	Work Plan/ Transition Plan
2008	January			
	February			
	March			
	April	10	Meeting X	Roundtable presentation to new gov.
	May	12	Extraord. II	President Colom, "Cuatro Balam"
	June			
	July			
	August			
	September			
	October	3	Meeting XI	Presentation of Master Plan
	November			
	December			
2009	January			
	February	20	Meeting XII	IDB loan, Public Use Plan
	March			
	April			
	May			
	June			
	July	30	Meeting XIII	Presentation of Public Use Plan
	August			
	September			
	October	23	Meeting XIV	Governance, IDB loan
	November			
	December			

Figure 1. Timeline of Mirador roundtable events and related public policy initiatives.

by WCS and including Consejo Nacional de Areas Protegidas (CONAP), Instituto de Antropología e Historia (IDAEH), Tropico Verde, Centro de Acción Legal Ambiental y Social de Guatemala (CALAS), ProPeten and the Critical Ecosystem Partnership Fund (CEPF) collaborated to update the park's Master Plan, developing a zoning proposal based on group consensus. Although it was inevitable that, over the short-term, significant sections of the park would be left in the hands of illegal communities through cooperative agreements and modifications of the internal zoning of the park, given the Guatemalan Government's understandable trepidation towards strict enforcement of the law under the current conditions, this type of compromise held the best promise for saving the remaining intact habitat, including the eastern areas important for scarlet macaws, without entering into a bloody civil conflict in an attempt to apply the law; without this readjustment of the Master Plan, it was likely that the entire Laguna del Tigre ecosystem would be lost. A first draft of the complete 2006-2010 Laguna del Tigre Master Plan was available for public and governmental review in November 2005 and the final version was completed in 2006. Concurrent to the revision of the master plan, CONAP, CEPF and archaeologists planned continued investments in the eastern, intact section of the park. This joint strategy of compromise in the western Laguna del Tigre and continued strengthening of the eastern section of the park provides the Guatemalan authorities with the most realistic option for conservation in the park. Funding from CEPF and USAID/Guatemala (in conjunction with the US Department of Interior) permitted the implementation of a CONAP-WCS strategy known as "the shield" – a north-south line of protection located within Laguna del Tigre National Park and the adjacent Laguna del Tigre Biological Corridor. The "shield" strategy promoted permanent dry season field presence at the archaeological sites of La Corona and El Perú, in addition to the macaw nesting site of Peñon de Buena Vista. Though the eastern section of the Laguna del Tigre ecosystem continued to face great pressure, fire crews hired from local villages were able to successfully control fires along this invasion frontier in 2005 and no macaw poaching was detected in any of the patrolled sites. In 2007, 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. CEPF, USAID/Guatemala, Guatemala's Combined Protection Forces, Asociación Balam, CONAP, and the Guatemalan Government's Fire Prevention Agency (SIPECIF) collaborated to strengthen the "shield" strategy in Eastern Laguna del Tigre, installing a 47-kilometer fire break[1] along the western limit of the intact forests of Laguna del Tigre, a massive undertaking that involved cutting a 6-8 meter wide swath into the forest. The entire fire break was installed by the end of the fire season in 2007 and, although some resistance from illegal colonizers continued, the lack of new "brechas" (i.e. demarcation lines cut into the forest) in and around the La Corona area indicates that organized invaders no longer consider it viable to colonize the area. In 2009, the shield strategy was consolidated by a USAID Guatemala grant to WCS for strengthening CONAP and Guatemala's Sistema de Prevención y Control de Incendios Fortestales (SIPECIF) activities in the area. This key protection strategy continues, and has thus far remained extremely effective at protecting the economically productive forest concession areas in the eastern MBR, while also recuperating approximately 50,000 hectares of ecologically important habitat.

- **Advances in Scarlet Macaw Conservation**. WCS has undertaken many interventions to protect the reserve's scarlet macaws, the most threatened of the MBR Landscape Species, whose populations have declined due to habitat loss and poaching for the pet trade. Scarlet macaw nesting success has declined in the Maya Biosphere Reserve, but surveys determined that humans were not the only suspects since scars from poacher's climbing spikes were not always seen on the trees where chicks had disappeared. To determine the source of this chick loss, WCS Guatemala biologists, in collaboration with Wildland Security, installed miniature, low-light video cameras and infrared (IR) light sources in 5 nest cavities in El Perú, Laguna del Tigre National Park. These cameras sent video continuously to video recorders located on the ground, which recorded the predation of three macaw chicks by collared forest falcons (*Micrastur semitorquatus*). This new information

1 This fire break also served to demarcate the intact forests and wetlands to be protected.

will help WCS biologists to increase nesting success in the future by refining the design of falcon-resistant artificial nesting boxes and improving natural nesting cavities to reduce predation of chicks by falcons. In FY06, WCS biologists and field staff designed, constructed and field-tested a new double-chambered "falcon-proof" artificial nest at the macaw nesting site of El Perú. In the very first season of use, one of these new nests was inhabited by a breeding pair that had failed to fledge chicks every prior year due to falcon depredation and the pair successfully fledged two chicks for the first time since monitoring began in the area. In FY07, the first two satellite collars ever placed on free-flying psittacines were deployed on scarlet macaws in eastern Laguna del Tigre. The movements of the two adult macaws fitted with satellite collars were 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. This data provided the first complete seasonal record of scarlet macaw habitat use in the Maya Forest, allowing WCS to refine the scarlet macaw Biological Landscape models and improving the current knowledge of macaw migration patterns and seasonal habitat use. In FY08, WCS Guatemala, recognizing that it was critical to ensure an integrated scarlet macaw conservation strategy among the various stakeholders working in the MBR, organized a Scarlet Macaw Conservation Strategy Workshop with local, national and international participants (including those with expertise in psittacine research, veterinary science and conservation). Participants discussed scarlet macaw population recovery protocols and evaluated how different management activities contribute to population recovery. This process enabled the completion of a consensus-based strategy enriched with comments and experiences from partners. Finally, a surprising new development in community-based macaw conservation was the April 2009 discovery of an active macaw nest within the community forest concession of Carmelita, at the site of Chuntuqui. This discovery was significant for a number of reasons: 1) this new nest currently ranks as the most eastwardly located active nest within the Maya Biosphere Reserve, thereby expanding the known macaw nesting habitat by tens of thousands of hectares[2]; 2) the discovery of this nest was useful in promoting conservation of the forest in general and scarlet macaws in particular; and 3) the biological monitoring work that resulted from this discovery provided an opportunity to build local pride and increase village cohesion in Carmelita.

- **Discovery of an Important Population Stronghold of Central American River Turtle in the Maya Biosphere**. In FY06, WCS staff working in MBR discovered an important population of the extremely threatened Central American river turtle (*Dermatemys mawii*) within Laguna del Tigre, at the site of El Perú. Field staff captured 78 of these turtles within a 24 hour period, and used mark-recapture techniques to estimate that 202 turtles were in the pond during the dry season's low water period. This is significant since no other populations this large currently exist in the downstream waters and adjacent areas of Mexico. This discovery led to the turtle's addition to the suite of MBR Landscape Species, and the conservation of this river turtle "hotspot" has been incorporated in discussions with the neighboring village of Paso Caballos as WCS, CONAP and Conservation International advance in negotiations to initiate Guatemala's second community incentive conservation agreement (See "Conservation Agreement in Uaxactún").

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Central American River Turtle

2 The healthy chick that successfully fledged from this nest was one of the few chicks that was not below the expected weight curve for its age. This suggests that the unburned and totally intact landscape of Carmelita may be able to provide higher quality habitat than the nesting sites further west, and that, if macaw nesting sites are lost at El Perú and La Corona due to illegal colonization, the species may be able to shift its nesting sites eastward.

- **Recovery of La Colorada Concession**. In March 2009, LightHawk overflights coordinated by WCS and Balam detected a massive, 920-hectare clearcut in the La Colorada concession. Shortly afterwards, Balam staff flew over the area with members of the national press and the governor of Petén, resulting in a front-page story detailing the destruction the next day. As a result of this publicity, the Guatemalan government took over the La Colorada concession, sending in army, police and CONAP guards, and cancelling the concession in May 2009. Powerful ranchers linked to the drug trade were ejected and their houses occupied by law enforcement agents, cattle were confiscated and illegal colonists notified that all people will be peacefully removed from the concession. CONAP's future plans include maintaining protection field staff in the area and, in due time, assigning the area to a community group interested in sustainable management with a focus on reforestation/carbon capture as a possible source of financial sustainability.
- **The Development of Checkpoints and Road Barriers across the Eastern MBR**. WCS-led analyses identified uncontrolled access as one of the primary threats affecting the eastern MBR Landscape; as a result, WCS staff and CONAP partners have long promoted improved control of access to the reserve. As of 2009, four key checkpoints have been built to restrict access to vulnerable sections of the reserve. The important Achiotal checkpoint, on the border of the Carmelita and AFISAP community forest concessions, was installed in 2005 and has subsequently limited colonizers' access to eastern Laguna del Tigre while helping to prevent the spread of colonization from collapsing community concessions[3] into more successful community concessions. Due to its success, the government and other actors have begun replicating this intervention at other sites, while maintaining the CONAP personnel and police required to ensure the Achiotal checkpoint's functionality. Additionally, two new checkpoints were slated for construction in 2007 at the sites of Pescaditos and Manantial. The formal checkpoint at Manantial was constructed by community-based forest concession leaders, with assistance from WCS, the Plant Family Foundation, ACOFOP and the Rainforest Alliance, 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 five community forest concessions located in the area, as well as the Rio Azul area that had previously been protected by a pilot road barrier that was twice destroyed. The construction of the checkpoint at Pescaditos was propelled by the massive amount of uncontrolled hunting and Maya tomb looting that a WCS La Gloria and Lechugal camera-trapping study identified. WCS staff presented this evidence to the Mesa Multisectorial, who reacted with a strong declaration in favor of improved control of access to the area, and a petition was quickly sent by their Executive Board to the President of Guatemala. Local stakeholders, including the Governor of Petén, CONAP, IDAEH, Asociación Balam, Baren Industrial, S.A., ACOFOP and the Mirador Basin Initiative (FARES), collaborated to develop the foundations of a checkpoint at the site of El Pescaditos, a crucial crossroads within the forest which is capable of controlling the majority of traffic entering the area. The checkpoint remains unfinished, as CONAP later decided to invest in the San Miguel checkpoint along the road to Carmelita. Support from CONAP, WCS, USAID Guatemala, US DOI and the UK's Department of International Development (DFID) has made that checkpoint an extremely functional control post along the major access route into the MBR. Finally, the above institutions joined with ACOFOP and Rainforest Alliance and, in 2009, the El Tigre checkpoint was made operational. This checkpoint controls access into the Arbol Verde community forest concession, the eastern section of Tikal National Park and Yaxha-Nakum-Naranjo National Park.

3 Of the twelve community-based forest concessions in the Maya Biosphere, two have already been cancelled due to mismanagement, and two more 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 "collapsing" community concessions have lost significant amounts of forest cover which has been 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. The two cancelled concessions are San Miguel and La Colorada, whereas La Pasadita and Cruce la Colorada remain at risk. Of these, Cruce la Colorada offers the best hope for stabilization.

- **Advances in Jaguar Conservation**. During an 8-week period in 2005, WCS and Tikal National Park staff sampled jaguars using remote detection camera-traps in the heart of the park. Seven distinct individuals in the area were captured in photos: one female, one sub-adult and five males. Remarkably, given the amount of human pressure around Tikal, this session yielded nearly twice as many jaguar photos as did initial studies in the much more remote area of Rio Azul, suggesting that the significant economic income and national pride generated by parks such as Tikal can indeed help to conserve wildlife within highly anthropogenic landscapes. In FY07, WCS investigators faced an enormous challenge in undertaking another camera-trapping study in the La Gloria-Lechugal Multiple Use Zone area of the reserve since the area was known to be full of human activity (legitimate timber concession personnel, non-timber forest harvesters, hunters, looters and poachers), and a previous WCS jaguar study done in the heart of a very well-protected area of the Tikal National Park using the same methodology had nonetheless resulted in the loss of 6 camera traps. WCS biologists took several steps to maximize the viability of the study, including enlisting the help of the village of Carmelita, the industrial forest concession Baren Industrial, S.A., and the financial support of the Global Heritage Fund. Carmelita village community technicians were employed 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 explained the objectives of the study to other individuals who appeared in the forest and helped them to understand that the cameras were not designed to capture photos of humans for law enforcement purposes. In 2008, WCS investigators successfully completed another jaguar camera-trapping study in the Carmelita Forest Concession, using the same community approach used in La Gloria-Lechugal concession the previous year, employing four Carmelita village community technicians to set up, monitor, and protect the cameras during the 45-day field study. The Carmelita study, carried out in the areas where timber had been harvested between 2000 and 2007, indicated an estimated density of 11.28 (±3.51) jaguars per 100 km^2; the highest jaguar density estimate to date in Guatemala. In FY08, WCS Guatemala secured further support for jaguar conservation from a national donor – a remarkable occurrence in Guatemala, where philanthropy is uncommon. Christian Rossell, a young gourmet chef, Guatemalan businessman and passionate advocate for the conservation of jaguars, opened a new pizzería in Guatemala City. Rossell pledged to donate profits from the sale of "jaguar" pizzas to projects that protect jaguars and their habitat, with a 1-to-1 match from the Panthera Foundation on all funds donated to WCS Guatemala.
- **Discovery of Culturally Significant Sites and Relics**. WCS efforts in Laguna del Tigre and other areas have produced important archeological discoveries which underscore the importance of conserving the cultural patrimony of Laguna del Tigre. For example, in April 2005, Proyecto Arqueologico El Perú-Waka' and WCS Guatemala co-sponsored a

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A jaguar couple captured by a camera trap during a jaguar survey in the Maya Biosphere Reserve

joint expedition to the ancient Maya site of La Corona, in the Laguna del Tigre Biological Corridor, which resulted in the discovery of two pristine and highly significant glyphic panels dating to the seventh century AD[4]. The two panels were rescued from the field and are now protected by the national archaeological institute (IDAEH). In FY06, archaeological investigators returned to La Corona and discovered additional hieroglyphic panels, including a staircase covered with inscriptions. The archaeological programs at the sites of El Perú-Waka' and La Corona have subsequently helped consolidate "the shield" protection strategy by making crucial contributions to a growing national awareness about the cultural significance of Laguna del Tigre, and by establishing permanent base camps that have helped motivate national leaders to protect the area.

- **Conservation Incentives Agreement in Uaxactún**. The Uaxactún conservation agreement, signed on June 16, 2009, implemented a conservation incentives program that will provide Uaxactún concession managers with $43,000 annually to strengthen control and vigilance activities, fire management and prevention, education and sustainable xate management activities. The program involves the participation of CONAP, Rainforest Alliance, ACOFOP, OMYC and the community development council (COCODE) of Uaxactún, as well as technical guidance from WCS and initial funding (for the first two-year agreement) from CI's Conservation Stewards Program. In return, the community reaffirmed its commitment to the obligations established in the forest concession contract signed in 1999 and agreed to ban the entry of cattle to the concession, protect non-game species such as jaguar and tapir, prevent forest fires and deforestation and promote the development of a continuous buffer of vegetation along the access road to Uaxactún from Tikal. The first agreement of its kind in Guatemala, it will hopefully be replicated in other MBR management units, such as Paso Caballos and Carmelita.
- **Establishing Sustainable Xate Management**. A collaboration between WCS Guatemala, Organización Manejo y Conservación (OMYC) of Uaxactún village and the Rainforest Alliance yielded a pilot project to develop an alternative, certified commercial harvest of the understory palm frond known locally as xate. This project[5] focused on two central objectives: 1) to increase the sustainability of one of the villagers' most vital economic resources; and 2) to increase the available opportunities for the women of the village to be engaged in employment and natural resource management. To increase the harvest's sustainability, the OMYC management plan calls for the planting of nursery-raised plants[6] in the forest, to enrich the wild xate population, and the establishment of a Control and Vigilance Committee tasked with monitoring reforested areas and ensuring they are not impacted until mature, that forest harvesting camps are clean after harvesting and that no fire threats exist in the area. Meanwhile, WCS biologists developed a method to survey the condition of populations of the three main commercially harvested wild xate species in the reserve[7]. One economic challenge is ensuring that an adequate market exists for the harvest; for this reason the Rainforest Alliance and OMYC have collaborated to incorporate a greater percentage of the xate flowing out of Uaxactún from the bodega into the marketplace, while OMYC's Smartwood certification further serves to expand OMYC's general

4 The significance of the panels lies in their relationship to 8 other panels known to have been looted from Guatemala during the 1970s; yet archaeologists were never able to determine their precise place of origin. With this discovery, by Dr. Marcelo Canuto (Director of Tulane University's Middle America Research Institute), the 8 panels (all in the USA and Europe) can be linked to La Corona. The panels are also extremely significant due to their narratives, which recount the struggles for supremacy between Tikal and Calakmul, the two most powerful Maya city-states during the apogee of the Maya.

5 Under the management system promoted by this project, xate harvested in the Uaxactún area is sold at a premium price to Continental Greens Ltd. of Houston, Texas, who agreed to this arrangement to stimulate the ecological and social sustainability of the enterprise. This project relies on collaboration between RA and WCS, with RA focusing on the market side of the enterprise and WCS focusing on the day-to-day operations of the xate bodega in Uaxactún where the fronds are sorted and bundled for shipping.

6 During 2008, over 18,000 xate plants were planted within the concession by community *xateros*. This activity was financed by a tax on all xate being exported from the area that does not flow through the xate bodega.

7 When the word "xate" is used here, it refers to these three species: Xate Jade (*Chamaedorea oblongata*), Xate Hembra (*C. elegans*) and Xate Cola de Pescado (*C. ernestii-augusti*). Results from the wild xate population survey contributed to the National Strategy for the Management, Conservation and Exportation of Xate developed by CONAP in 2008.

xate market. Finally, WCS supported the creation of a Department of Administration within OMYC, increasing the local capacity to responsibly manage the bodega's finances and ensuring that fiscal responsibility remains a primary objective for the administration of the entire forest concession.

- **The Inauguration of Las Guacamayas Biological Station (EBG)**. In July 2009, the Las Guacamayas Biological Station (managed by Asociación Balam) was officially inaugurated, with a public presentation of the station's infrastructure, tours and services. The EBG links the village of Paso Caballos directly to conservation activities within Laguna del Tigre National Park and is expected to allow the Paso Caballos community to obtain greater conservation opportunities through tourism. At the event, the mission and vision of the EBG were presented, its social and conservation programs were explained, and the Q'eqchí young artists organization (Organización Juvenil de Artistas Q'eqchí, OJAQ) gave a presentation. OJAQ artists exhibited their work and sold wild animal images made from natural materials, raising nearly $500 for their families and for education savings accounts set up from these initial sales. At the inauguration, for the first time in nearly a decade, the atmosphere surrounding Laguna del Tigre was overwhelmingly positive, evoking the vision of a phoenix rising from the ashes of the largest park in Mesoamerica.

GCP Program Background

The goal of the Wildlife Conservation Society's Biodiversity Conservation at the Landscape Scale (BCLS) Program is to ensure conservation of biological diversity in regions of global importance, using a landscape- (or seascape-) and species-based approach. For the past 10 years, the WCS Living Landscapes Program (LLP) has been developing and testing wildlife-focused strategies to resolve the conflicts between people and wildlife that threaten biodiversity found in these important wild places. The LLP-developed Landscape/Seascape Species Approach (LSA) is threats-based and highly participatory; it promotes conservation of landscapes (and seascapes) by focusing efforts on key animal species found within that landscape/seascape. The conservation of these Landscape Species offers a focused and cost-effective way to retain a full complement of biodiversity and overall ecological integrity.

While WCS recognizes the integral role that protected areas play within national biodiversity conservation plans, we also realize that parks and reserves are seldom sacrosanct and are always embedded in larger, human-dominated landscapes. Regardless of how large or small a protected area may be, the plants and animals it contains are often threatened by human resource use, whether directly or indirectly. Therefore, the management of parks and reserves cannot occur in isolation from the surrounding landscape; rather, management plans must take into account where and how human activities conflict with biodiversity conservation as well as where conservation activities might adversely impact human welfare. As human populations continue to expand, the incentive for over-exploiting natural resources within and outside protected areas will increase and, therefore, the need for biodiversity conservation tools that address human-wildlife conflict will become even more important. In our efforts to conserve Landscape Species that frequently move beyond protected area boundaries, we recognize that parks and reserves must be integrated into the broader landscape, a landscape in which, realistically, people will continue to exploit natural areas and wild species to meet their socio-economic needs.

The Wildlife Conservation Society's BCLS Program was designed to ensure biodiversity conservation in a selection of globally significant sites, by identifying actions to conserve Landscape Species and by increasing the capacity of local and national organizations to implement such actions. Over the course of Cooperative Agreement LAG-A-00-99-00047-00, the WCS GCPII/USAID portfolio has included 7 sites:

- **Glover's Reef Living Seascape** (Belize)
- **Greater Madidi Landscape Conservation Area** (Bolivia)
- **Ndoki-Likouala Landscape Conservation Area** (Republic of Congo)
- **Greater Yasuní-Napo Moist Forest Landscape Conservation Area** (Ecuador)
- **Maya Biosphere Reserve Living Landscape** (Guatemala)
- **The Eastern Steppe Living Landscape** (Mongolia)
- **Southern Sudan Transboundary Living Landscape** (Southern Sudan)

Location, Global Importance and Key Threats to this Landscape

Park management in Mesoamerica did not begin in earnest until the 1970s, after a great deal of important wildlife habitat had already been lost to farms and plantations. Fortunately, some large forests, several of which straddle international boundaries, survived this early agricultural expansion. Mesoamerican broadleaf and flooded forest habitats support a multitude of wildlife species including jaguars, pumas, tapirs, peccaries, howler and spider monkeys, jabiru storks and scarlet macaws.

Conservation work in Guatemala must contend with the dichotomy of a nation whose largest protected area, the Maya Biosphere Reserve (MBR), contains more than 100 species of mammals and 400 species of birds yet is the most populated country in the region, with rapid population growth in impoverished areas of rural communities and urban centers. The northern Guatemalan department of Petén absorbs both national and regional immigration, and is highly impacted by illegal agricultural encroachment by powerful ranching interests. However, the MBR is also the epicenter of a vast lowland tropical forest (the Selva Maya), and contains the cradle of the ancient Maya civilization.

At 8,100 square miles, the Maya Biosphere Reserve is the largest protected area complex in Mesoamerica, accounting for one-seventh of the surface area of Guatemala (see Figure 2). It includes ten "nuclear zones" or national parks[8] in which no human settlement, logging, or extraction of resources is allowed. Increasingly

8 These include four "Biotopes" managed by the University of San Carlos, the El Pilar Natural Monument, and the national parks of Laguna del Tigre, Sierra del Lacandón, Mirador-Río Azul, Yaxha-Nakum Naranjo, and Tikal.

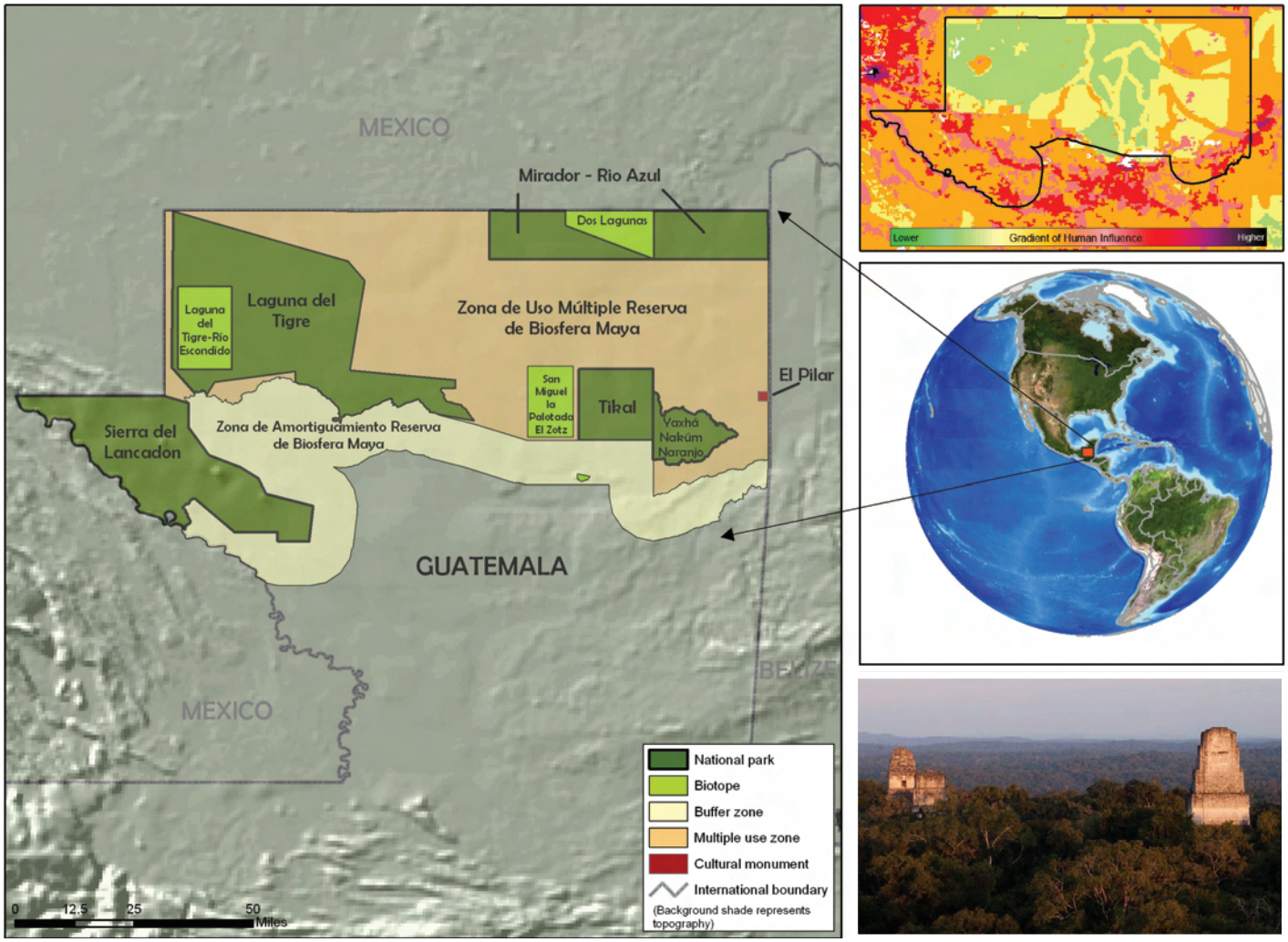

Figure 2. The Maya Biosphere Reserve. The insets show, from top: the Human Footprint in this area, the global location of the MBR, and the Central Plaza Temples in Tikal (bottom photo © R. McNab).

under threat, it forms the core of a tri-national system of protected areas in Guatemala, Belize, and Mexico known as the Selva Maya (Maya Forest). Securing the future of the reserve is a Mesoamerican conservation priority; it is a stronghold for many wide-ranging and iconic species (including jaguar, white-lipped peccary and scarlet macaw), is one of the last remaining rainforest strongholds in the region, and is part of the largest block of broadleaf forest north of the Amazon. The human-caused threats facing the MBR are numerous – forest fires, agricultural expansion, wildlife poaching, and poor planning of development projects, among others. In combination, these threats are leading to rapid deforestation, with fire in particular acting as the principal cause of forest degradation within the MBR[9]. The western section of the MBR, in particular Laguna del Tigre and Sierra del Lacandón National Parks, is severely threatened by illegal colonization. In addition to increasing the threat of fire, this colonization results in forest clearing and the unsustainable hunting of wildlife, as roads that are built for timber and petroleum extraction provide access to remote sections of the forest that were previously inaccessible. Conservation work in the reserve is further complicated because many of the local communities, national NGOs and government agencies that are responsible for management in specific areas of the MBR lack the necessary skills and financial resources to effectively govern the region's natural resource use and respond to these growing threats. To ensure the conservation of the MBR's biological diversity in the face of these threats, the Living Landscape Program in Guatemala has worked with local, national, and international organizations to develop adaptive and participatory strategies and sustainable mechanisms to reduce threats to wildlife and ecosystems.

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An aerial view of El Peñon de Buena Vista, Laguna del Tigre National Park

9 Fires spread into the forest when colonists clear small patches of forest, using fire to create nutrient-rich ash. Climate change scientists predict that the future will bring more dry years, which suggests that fire will play an even more destructive role in this landscape in coming years.

The Wildlife Conservation Society's Historic and Current Roles in this Landscape

The Wildlife Conservation Society (WCS) has a permanent field office in Flores, Petén, focused on the Maya Biosphere Reserve as one of WCS' long-term conservation sites. WCS began working in Guatemala in the late 1980s, supporting wildlife research in Petén in 1988, two years before the establishment of the MBR. This work was followed by studies of prey species in Tikal National Park and the Uaxactún community forests. Since the beginning, WCS has partnered with multiple local organizations and the Guatemalan government to integrate conservation and development within the reserve and to improve local governance of natural and cultural resources. To this day, WCS remains committed to building the necessary local capacity for the long-term viability and ecosystem health of the Maya Forest. As one of seven USAID-funded WCS projects dedicated to Biodiversity Conservation at the Landscape Scale (BCLS), the Maya Biosphere Landscape Conservation Project (MBLCP) aimed to conserve wildlife species and their habitat while maintaining the economic productivity of the area's renewable natural resources. WCS was extremely fortunate that MBLCP staff were able to build upon a strong foundation of local research from the start, using this background to inform the initial design of conservation interventions (see Figures 3-5 and Tables 1 and 2 for more information on the site's three main objectives and priority interventions).

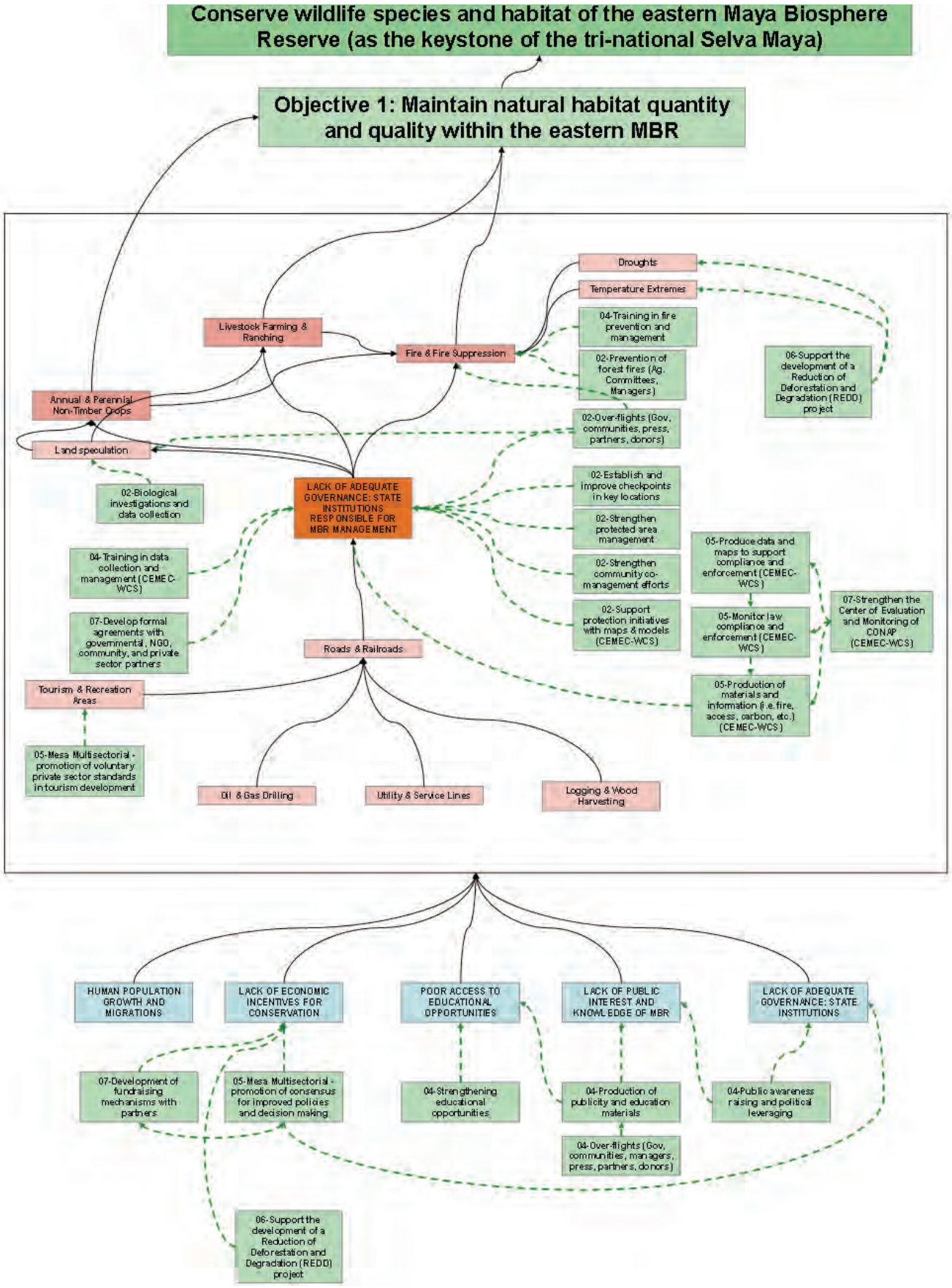

Figure 3. The conceptual model for Objective 1 of the Maya Biosphere Landscape Conservation Project (MBLCP), illustrating the links between interventions (green), contributing factors (formerly called "indirect threats", blue) and direct threats (orange).

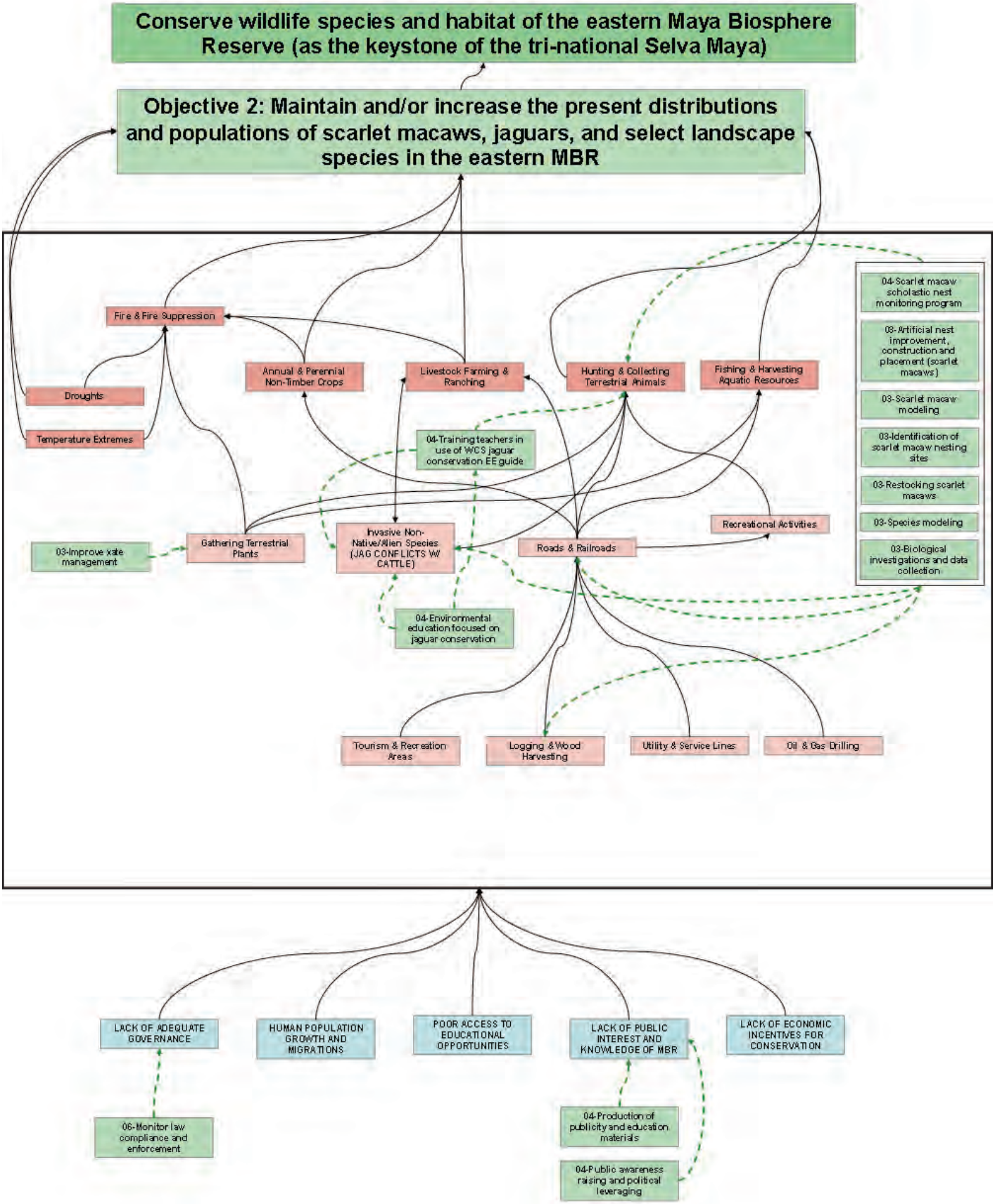

Figure 4. Conceptual model for Objective 2 of the MBLCP, illustrating the links between interventions (green), contributing factors (blue) and direct threats (orange).

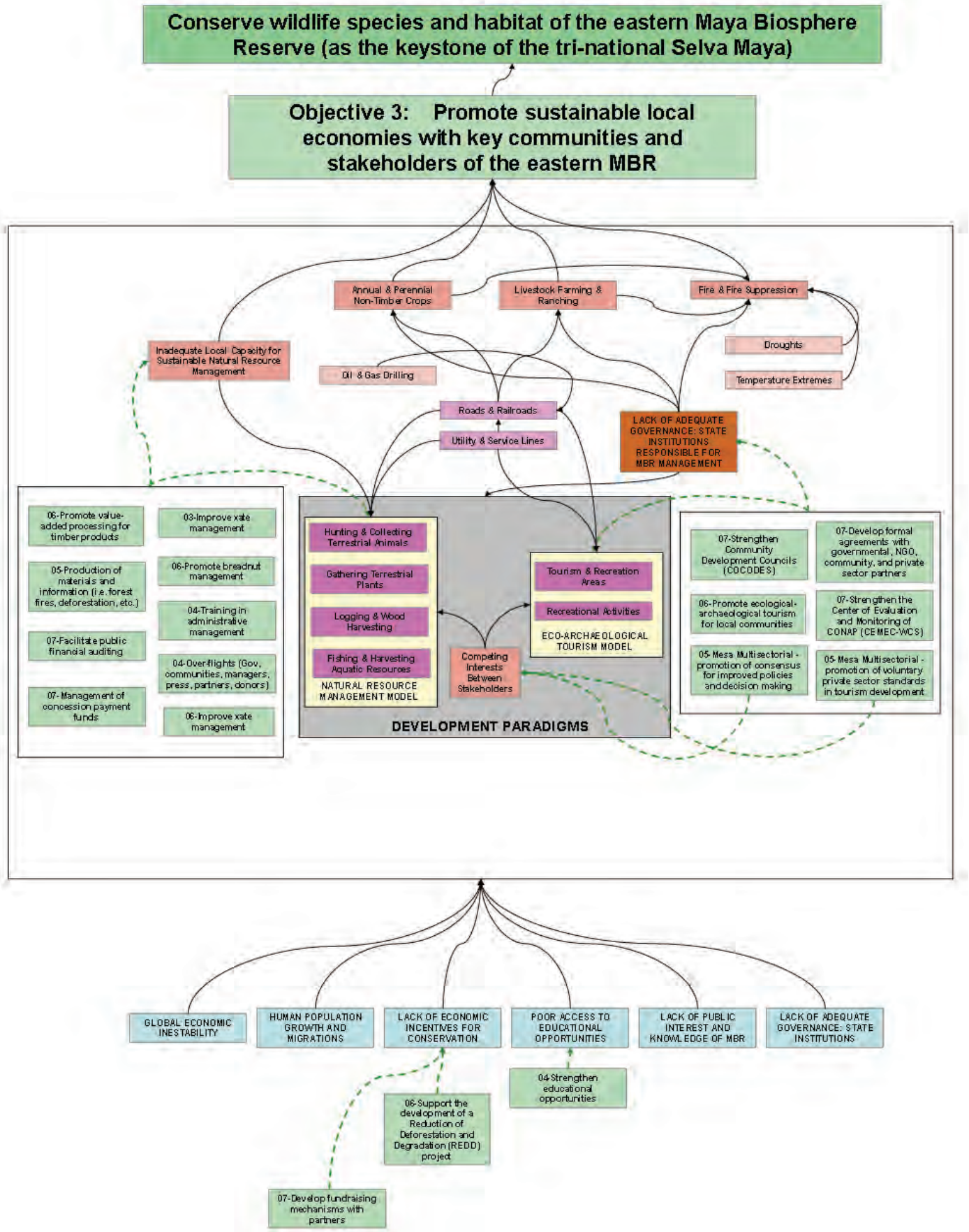

Figure 5. Conceptual model for Objective 3 of the MBLCP, illustrating the links between interventions (green), contributing factors (blue) and direct threats (orange).

Table 1. IUCN-CMP Unified Classification of Threats (from the Conceptual Model shown in Figures 3-5).

(DT/CF = *Direct Threat* or *Contributing Factor*; Mag. = *Magnitude* of the Threat; P/F = *Present* or *Future* Threat)

	OBJ 1			OBJ 2			OBJ 3		
	DT/CF	Mag.	P/F	DT/CF	Mag.	P/F	DT/CF	Mag.	P/F
1. *Residential & Commercial Development*									
1.3 *Tourism & Recreation Areas*[1]	CF	6	F	CF	2	P	DT/O[5]	5	P
2. *Agriculture & Aquaculture*									
2.1 *Annual & Perennial Non-Timber Crops*[2]	DT	8	P	DT	7	P	DT	9	P
2.3 *Livestock Farming & Ranching*	DT	8	P	DT	7	P	DT	9	P
3. *Energy Production & Mining*									
3.1 *Oil & Gas Drilling*	CF	7	F	CF	4	F	CF	7	F
4. *Transportation & Service Corridors*									
4.1 *Roads & Railroads*	CF	7	P	CF	4	P	CF/O	8	P
4.2 *Utility & Service Lines*	CF	7	F	CF	4	F	CF/O	8	F
5. *Biological Resource Use*									
5.1 *Hunting & Collecting Terrestrial Animals*	N[4]	0	N	DT	9	P	CF/O	5	P
5.2 *Gathering Terrestrial Plants*	N	0	N	DT	8	P	CF/O	5	P
5.3 *Logging & Wood Harvesting*[3]	CF	6	P	CF	6	P	CF/O	5	P
5.4 *Fishing & Harvesting Aquatic Resources*	N	0	N	DT	9	P	CF/O	5	P
6. *Human Intrusions & Disturbance*									
6.1 *Recreational Activities*	N	0	N	CF	2	P	CF/O	5	F
7. *Natural System Modifications*									
7.1 *Fire & Fire Suppression*	DT	10	P	DT	10	P	DT	10	P
8. *Invasive & Other Problematic Species & Genes*									
8.1 *Invasive Non-Native/Alien Species* (jaguar conflicts w/cattle)	N	0	N	CF	7	P	N	N	N
11. *Climate Change & Severe Weather*									
11.2 *Droughts*	CF	9	P	DT	6	P	CF	5	P
11.3 *Temperature Extremes*	CF	9	P	DT	6	P	CF	5	P

Table 1 Footnotes:

1. Non-participatory and/or unsustainable tourism
2. Unsustainable local agriculture and mechanized agriculture
3. Illegal logging
4. N = "*Non-factor*" (does not qualify in any significant way for that particular objective)
5. O = *Opportunity* (e.g., while tourism could be a threat it could also represent an opportunity for income, a positive impact).

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A sunset view of El Perú Lagoon, Laguna del Tigre National Park

© WCS/Guatemala

A photo of a male jaguar, captured on film during a jaguar survey in Carmelita Forest Concession

Table 2. IUCN-CMP Unified Classification of Conservation Actions ("Strategies"), arranged by importance. Each Strategy was ranked by members of the MBR project staff on a scale of 1-10 (1 = minimal impact, 5 = measurable impact, 10 = crucial for conservation), and these rankings of importance were averaged.

IUCN - CMP Unified Classification of Conservation Actions	Intervention (Strategy)	Location(s)	Mean Ranking of Importance
2.1 *Site/Area Management*	Prevention of forest fires (Ag. Committees, Managers)	PC, Uax, Carm, Col, Melchor, AV, AFISAP, Zotz, DL, Rio Azul, Mirador, LdTigre	9.6
5.2 *Policies & Regulations*	Mesa Multisectorial - promotion of consensus for improved policies and decision making	Area Mesa	9.6
2.1 *Site/Area Management*	Strengthening of protected area management	Eastern LdTigre, Rio Azul	9.4
4.1 *Formal Education*	Strengthening educational opportunities	Uax, PC	9.4
5.4 *Compliance & Enforcement*	Monitor law compliance and enforcement	Escudo, Rio Azul, ZUM, Penyon	9.4
7.3 *Conservation Finance*	Development of fund-raising mechanisms with partners		9
3.1 *Species Management*	Biological investigations and data collection	Eastern MBR	8.6
4.3 *Awareness & Communications*	Public awareness raising and political lever-aging		8.6
6.1 *Linked Enterprises & Livelihood Alternatives*	Promote ecological-archaeological tourism for local communities	Eastern MBR	8.6
7.2 *Alliance & Partnership Development*	Development of formal agreements with governmental, NGO, community, and private sector partners		8.6
4.2 *Training*	Training in administrative management	Uax, Carm	8.4
2.1 *Site/Area Management*	Strengthening of community co-management efforts	PC, Uax, Carm, Col, Melchor, AV, AFISAP	8.2
2.1 *Site/Area Management*	Biological investigations and data collection	Eastern MBR	8.2
4.2 *Training*	Training in fire prevention and management	Eastern MBR	8.2
5.3 *Private Sector Standards & Codes*	Mesa Multisectorial - promotion of voluntary private sector standards in tourism development	Area Mesa	8
6.4 *Conservation Payments*	Support the development of a Reduction of Deforestation and Degradation (REDD) project	MBR and Jaguar Corridor	7.8
3.1 *Species Management*	Identification of scarlet macaw nesting sites	AFISAP, Col, Carm, Pipiles, Escudo,	7.6
4.3 *Awareness & Communications*	Over-flights (Gob, comunidades, prensa, socios, donantes)	MBR and Peten	7.6
7.1 *Institutional & Civil Society Development*	Strengthening of the Center of Evaluation and Monitoring of CONAP (CEMEC/WCS)		7.6
2.1 *Site/Area Management*	Establish and improve checkpoints in key locations	Pescaditos, Arroyo Negro, Achiotal, Cedro, Ixcan, La Corona, Burral, Penyon	7.4

Table 2, continued. IUCN-CMP Unified Classification of Conservation Actions ("Strategies") from the MBR project's Conceptual Model (Figures 3-5)

IUCN - CMP Unified Classification of Conservation Actions	Intervention (Strategy)	Location(s)	Mean Ranking of Importance
5.4 *Compliance & Enforcement*	Produce data and maps to support compliance and enforcement	MBR and Peten	7.4
6.1 *Linked Enterprises & Livelihood Alternatives*	Promote value-added processing for timber products	Uax	7.4
7.1 *Institutional & Civil Society Development*	Facilitate public financial auditing	Uax	7.4
3.2 *Species Recovery*	Restocking scarlet macaws	El Peru	7.2
7.1 *Institutional & Civil Society Development*	Strengthening of Community Development Councils (COCODES)	Uax, Carm, PC	7.2
7.3 *Conservation Finance*	Management of concession payment funds		7.2
2.1 *Site/Area Management*	Over-flights (Gob, comunidades, prensa, socios, donantes)	MBR and Peten	7
3.2 *Species Recovery*	Artificial nest improvement, construction and placement (scarlet macaws)	AFISAP, Col, Carm, Pipiles, Escudo,	7
6.1 *Linked Enterprises & Livelihood Alternatives*	Improve xate management	Uax	7
2.1 *Site/Area Management*	Support protection initiatives with maps & models (access, etc.)	MBR	6.8
3.1 *Species Management*	Improve xate management	Uax	6.8
4.2 *Training*	Training in data collection and management	Eastern MBR	6.8
3.2 *Species Recovery*	Scarlet macaw modeling	Selva Maya (Guatemala, Belize, Mexico)	6.4
4.3 *Awareness & Communications*	Scarlet macaw scholastic nest monitoring program	PC, Colo, Pipiles	6.4
5.2 *Policies & Regulations*	Production of materials and information (i.e. fire, access, carbon, etc.)	MBR and Peten	6.4
3.1 *Species Management*	Species modeling	Selva Maya (Guatemala, Belize, Mexico)	6.2
6.1 *Linked Enterprises & Livelihood Alternatives*	Promote breadnut management	PC, Uax, ZUM	6.2
4.2 *Training*	Training teachers in use of WCS jaguar conservation EE guide	Jaguar Corridor, Uax, Carm, PC, Colorada, Pipiles	5.6
4.3 *Awareness & Communications*	Production of publicity and education materials		5.6
4.3 *Awareness & Communications*	Environmental education focused on jaguar conservation	Jaguar Corridor, Uax, Carm, PC, Colorada, Pipiles	5.4
3.2 *Species Recovery*	Xate restocking *in situ*	Uax	5.2
2.2 *Invasive/Problematic Species Control*	Reduction of conflicts between jaguars and livestock	Ruta Carm, Melchor, San Franc.	5

The Wildlife Conservation Society has long recognized that the unique mix of challenges present in the Maya Forest landscape requires that conservationists be prepared to address dual objectives – biodiversity conservation and sustainable economic development – while specifically tackling the two main goals mentioned above: 1) containing the eastwardly advance of the Laguna del Tigre agro-pastoral frontier; and 2) conserving the ecological integrity of the eastern MBR forest, which is under the management of community forest concessions and successful national parks like Tikal and Mirador-Rio Azul. Interventions that WCS staff have implemented include: strengthening local efforts to achieve sustainable forest management and conservation; training residents in field research, firefighting, and vigilance skills; assisting the Guatemalan Park Service (CONAP) in managing the Maya Biosphere Reserve; conducting wildlife surveys to quantify the impact of environmental threats such as habitat loss and poaching; conducting essential forest fire and deforestation monitoring activities (and providing the information gathered to numerous stakeholders and national actors, including the Guatemalan government); partnering with Lighthawk to conduct aerial overflights which assess illegal activities (and bringing these activities to the attention of those authorities best able to respond); supporting the formation of Asociación Balam, a national NGO conceived to co-administer Mirador-Rio Azul National Park but now active across the reserve; initiating and sustaining community-based efforts in Uaxactún, Paso Caballos, and other villages; providing support to community concessions to encourage sustainable management of forest resources; assisting with management to secure the western boundary of the eastern MBR; promoting dialog among various stakeholders in the landscape (including government, community and private-sector actors); conducting long-term landscape monitoring; and monitoring populations of the suite of Landscape Species (scarlet macaw, jaguar, white-lipped peccary, Baird's tapir, Morelet's crocodile and Central American river turtle).

© J. Moreira

A group of white-lipped peccaries having a mud bath in Mirador-Río Azul National Park

The efforts of WCS staff in the MBR have helped to reestablish the forest's wildlife habitat functionality by, among others: helping the Uaxactún community to develop sustainable practices for the harvesting and sale of non-timber forest products; significantly reducing the amount of burning around the Paso Caballos community management unit, an important habitat for scarlet macaws; contributing knowledge on jaguars to a broader WCS effort to document and monitor the species' populations across Mesoamerica; addressing the macaw population reduction with a multi-pronged approach that includes nest protection and awareness-raising initiatives; and working to decrease the rates of local forest loss despite significant population increases and local economic development. Of special note is the success WCS has achieved in helping the Guatemalan government and local communities stop the progression of seasonal fires from west to east, reducing the area burnt annually in select management units by more than 90%, by monitoring fires with satellite imagery and establishing and patrolling an effective 47-kilometer fire break. In the future, zoning and other land-use regulations are planned to allow ecotourism development, sustainable forest extraction and biodiversity protection to co-exist within this spectacular landscape.

It is important to note that, due to the extraordinary efforts outlined above, WCS's Maya Biosphere Living Landscape Project personnel have become widely recognized as among the best field technicians working in the MBR. In fact, WCS is commonly acknowledged as the institution in the field that is most familiar with local trends and the one that is in the best position to provide accurate data on the current state of biodiversity and conservation efforts in the area.

WCS's Approach to Threats-based Conservation at a Landscape Scale

The first year of GCP funding in the Maya Biosphere Reserve built upon the advances and lessons learned during a prior 3-year project to biologically monitor the reserve; this meant that, from the beginning, the work of the Maya Biosphere Landscape Conservation Project (MBLCP) was able to focus on the significant threats and opportunities that were identified during this prior work. From the outset, community participation was seen as an integral aspect of landscape conservation. Numerous stakeholder groups – including communities and forest concessionaires – had been contacted during these early monitoring activities, thereby providing a strong foundation for planned MBLCP cooperative activities. To this day, community participation remains an integral aspect of the conservation approach implemented across the focal areas in the eastern Maya Biosphere.

As the Maya Biosphere Landscape Conservation Project aimed to conserve wildlife species and their habitat in the reserve while maintaining the economic productivity of renewable natural resources, project activities have been geared toward the development of solutions to conservation problems which result from a lack of field presence and protection, as well as those inherent in so-called "sustainable use" initiatives such as tourism, NTFP harvesting and logging. From the outset, the project recognized the importance of monitoring the reserve and collecting continuous feedback from partners to best develop interventions and reformulate these interventions when threats change in severity or when new threats emerge. This approach comprised the core of the project's conservation strategy, emphasizing the use of adaptive management from the beginning. Once the full extent of the insidious forest fires and land invasions became apparent, this adaptive management process led project staff to prioritize investments in field-based interventions and other activities that serve as deterrents to habitat destruction in the eastern part of the reserve.

Those species that range widely and rely on different parts of the forest are especially jeopardized by the severe and widespread human activities which threaten the reserve. Therefore, one priority of the project has been the maintenance of intact habitat for jaguars, scarlet macaws and other Landscape Species, with the intention of conserving other forest-dependent species which fall under their conservation "umbrellas", utilizing the Landscape Species Approach (LSA) developed by the WCS Living Landscapes Program. To set priorities for conservation in the Maya Biosphere Reserve, this approach requires the selection of the most appropriate suite of Landscape Species from across the eastern Maya Biosphere Reserve, with input from conservation colleagues working in the adjacent forests of Belize. Five MBR species were selected from a pool of 17 candidate species: jaguar (*Panthera onca*); tapir (*Tapirus bairdii*); scarlet macaw (*Ara macao*); Morelet's crocodile (*Crocodylus moreletii*); and white-lipped peccary (*Tayassu pecari*). A sixth species, the Central American river turtle (*Dermatemys mawii*), was later added. These species received high ranks on the five selection criteria for Landscape Species (they are area-demanding, display habitat and socio-political heterogeneity, are vulnerable to threats, provide ecological functionality and are socio-economically significant) and on their complementarity to one another[10]. Biological Landscape maps were then built using expert knowledge of each of the Landscape Species' habitat requirements to derive habitat associations. WCS field staff, using personal knowledge and consulting the relevant literature, created five data layers to inform the habitat quality models: vegetation, distance to water, precipitation, slope and elevation. Each data layer was individually evaluated for each species. These individualized data layers were then merged to produce a Biological Landscape map for each species (the Central American river turtle model was completed later).

Colleagues at CEMEC (Centro de Monitoreo y Evaluacion del Consejo Nacional de Areas Protegidas) worked with the WCS-NY Coordination team to create a preliminary Human Landscape map based on the severity, urgency, probability of occurrence and estimated time for recovery for each of the following threats: subsistence hunting, petroleum extraction, new roads, human settlements, fire, poaching for the pet trade, logging, pollution, trophy hunting and commercial hunting. Next, for each species, a matrix was created to express the effects of each threat on that species and a threats map was created. Preliminary Conservation Landscape

10 This selection process was undertaken using the Landscape Species Selection software developed by the Living Landscapes Program.

models, with expanded coverage to the adjacent areas of Mexico and Belize, were developed for the six selected Landscape Species by overlaying each species' Biological Landscape map with its Human Landscape map. The resulting Conservation Landscape depicts both the biological importance and the level of threat present in different areas for each species, allows the subsequent completion of a Landscape Species conservation strategy that highlights those areas where important efforts should be expended in the future and informs the methods that should be implemented to address the threats. The strategic foundation for conservation work at the site was later improved by updating the Human Landscapes with a more precise threats model that considers increased human access across the reserve and utilizes an improved map of trails and roads, and subsequently revising the Conservation Landscapes for the two Landscape Species most effective at mobilizing political leaders and conservation constituencies to act on behalf of the reserve (jaguar and scarlet macaw).

Improvements were constantly made to the design of interventions, and overall landscape planning, using the information obtained from Landscape Species population monitoring via jaguar, scarlet macaw, white-lipped peccary and Central American river turtle surveys conducted collaboratively with local partners and communities. WCS has fought to save declining scarlet macaw populations from regional extirpation through this strategy of research and management, and has begun to play a leading role in greatly reducing macaw poaching at Laguna del Tigre and elsewhere in the reserve with a multi-pronged approach that includes nest protection, artificial nest construction, veterinary monitoring and awareness-raising initiatives. In addition to monitoring the distribution and success of scarlet macaw nests in and around the Maya Biosphere Reserve, the project team executed several groundbreaking studies on scarlet macaws, initiated pilot interventions to prevent macaw chick predation by forest falcons and nesting cavity infestation by Africanized bees and supported local partners in their efforts to protect Laguna del Tigre macaw nesting areas from fire and colonization.

© WCS/Guatemala

Macaw chicks in La Cariba nest located in La Corona, Central Biological Corridor

An emergent continuing focus of MBLCP activities was improving governance across the landscape by developing specific solutions to protection challenges, building networks, and establishing and enhancing strategic working relationships and alliances with other stakeholders in the landscape (e.g., communities, local organizations, international institutions and the Guatemalan government) by building confidence and opening the necessary lines of communication. This process involved: refining and disseminating information to decision makers, donors and other important actors in the MBR landscape; increasing communications with community-based groups in the priority landscape areas; initiating a participatory process for developing conservation strategies (e.g., macaw conservation strategy, financing strategy) for the reserve; disseminating spatial data to better orient large-scale planning processes; disseminating biological data to encourage the long-term sustainability of project interventions; and, in some cases, developing cooperative agreements or providing financial stability to project counterparts[11]. This work yielded the Mesa Multisectorial's ongoing discussions about the future of the El Mirador area, the coordination of seasonal over-flights to monitor illegal activities and fire, the Emergency Protection Law for Laguna del Tigre National Park, the Emergency Protection Initiative for the eastern Maya Biosphere, the Guatemalan government's Debt-for-Nature Swap, and other institutional proposals capable of affecting the local dynamics of the reserve. A final goal is to share lessons learned within the national context and beyond, raising awareness about threats to the reserve and publicizing annual trends in habitat and fire. To this end, WCS, in collaboration with CONAP and The Nature Conservancy, created a new forum for the MBR, the Biological Monitoring Roundtable, which was established to ensure that

11 This type of financial support has included obtaining resources for the Centro de Monitoreo y Evaluación de CONAP (CEMEC) monitoring institute and other local partners.

all conservation-related data trends in the reserve are made available to all institutions involved. Based on the advances achieved by the project, and in line with the focus on adaptive management, additional conservation interventions will be identified and implemented in the future.

Project interventions have helped contain the advance of the Laguna del Tigre agro-pastoral frontier and maintain the comparatively intact eastern block of MBR forest, including the installment of the 47-kilometer fire break mentioned earlier. For more than five consecutive years, and despite a change in national administration which contributed to a significant increase in pressure in the area, the MBLCP led field efforts that succeeded in conserving the eastern Laguna del Tigre wetlands-forest matrix containing the important archaeological and macaw nesting site of La Corona, while maintaining a national focus on this vitally important cultural and natural site. In the eastern part of the reserve, 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. Continued WCS Guatemala support for the multifaceted activities of Asociación Balam, a national NGO that strengthens the management of Mirador-Rio Azul National Park, produced important advances for the future of this "Cultural and Natural Area", and indeed the entire Eastern Maya Biosphere Reserve. WCS support encouraged government and NGO leadership of the Mirador Rio Azul Roundtable, utilizing this Mesa Multisectorial to help develop an "incentives program" to address the urgent need for improved protection of the Multiple Use Zone and to consider the development of ecotourism in the area. The incentives program, initially implemented in the Uaxactún forest concession, aims to conserve the reserve's natural resources through rural development incentives that strengthen communities' capacity for vigilance, control and self-management.

The MBLCP addressed emerging opportunities and challenges with the launch of a new Guatemalan government project called Cuatro Balam. This initiative focuses on public and private sector participation in the development of tourism, rooted in the natural and cultural patrimony of the MBR, that generates profits to support the ongoing conservation of the reserve. The project's appraisal (and subsequent protection) of the Maya Biosphere Reserve's natural and cultural patrimony required the participation of the government and the private sector in the promotion of sustainable practices that are compatible with conservation. Meanwhile, additional community-based initiatives (i.e., those that improve the local capacity to conserve habitat and promote alternative livelihoods) in Uaxactún, Paso Caballos, Carmelita, and other villages have yielded many positive results, including a decrease in the impact of local forest fires and an increase in economic stability at the village level. To date, WCS has led fire prevention programs in eight community forest concessions and provided education programs to five key communities to provide incentives for habitat conservation. Of special note is the official inauguration of the Las Guacamayas Biological Station (managed by Asociación Balam) that links the village of Paso Caballos directly to conservation activities in Laguna del Tigre National Park. Though just an initial step, this advance portends more good things to come as partners are engaged to link wide-ranging species such as the scarlet macaw to the ecosystems and social systems that surround them, and continue to search for solutions that offer resilience and hope in one of the most threatened, yet biologically important, landscapes of the Americas.

Implementing Conservation at a Landscape Scale: Overcoming Challenges, Grasping Opportunities and Managing Adaptively

The overall goal of the Maya Biosphere Landscape Conservation Project (MBLCP) has been to conserve wildlife species and their habitat in the Maya Biosphere Reserve while maintaining the economic productivity of renewable natural resources. Over the last year of funding, project activities focused on continuing to fill the gaps left by lack of national agency field presence and promoting "sustainable use" initiatives such as tourism and harvesting of NTFPs. The social complexity of the MBR landscape has required that community participation remain an essential aspect of conservation work across the entire focal area. Monitoring the reserve, and soliciting continuous feedback from partners, has allowed for the development and reformulation of interventions in the face of changing threats through adaptive management of the conservation strategy.

In spite of many successes, a number of conservation challenges remain. One constant challenge that the project has faced is a lack of the vehicles required to reach remote sites reliably. Other external conditions have also limited the effectiveness of conservation efforts in the area, and have converged to require adaptive management of operations. These include: lack of governance due to a variable number of law enforcement personnel available as corrupt agents have been purged; an anemic legal system; extensive narcotics-related activity; organized land invasions; and forest fires. For example, regional insecurity made a point-count study of macaws impossible in the Laguna del Tigre section of the landscape. One of the main challenges facing the scarlet macaw recovery plan is obtaining the sustained funding necessary to undertake management activities and maintain the necessary presence in nesting areas to promote habitat protection.

The main challenge to the 2.1 million hectare Maya Biosphere Reserve continues to be habitat loss; from 2008-2009 alone, nearly 25,000 hectares of forest were lost, primarily along an invasion frontier on the western edge of Laguna del Tigre National Park and within the MBR's unmanaged Buffer Zone. In such a threatened landscape, priority interventions rapidly become evident. During the very first year of the project, it quickly became clear that planned interventions needed to evolve to best respond to the critical conditions affecting the landscape. Therefore, the project reprioritized efforts to "rescue" the still intact eastern part of Laguna del Tigre and its adjacent Biological Corridor. This critical work quickly superseded many other efforts due to its urgency, although certain interventions, such as macaw protection and monitoring, were immediately recognized to yield important conservation gains and were therefore prioritized in subsequent years. Given the dire conditions that result from insidious forest fires and land invasions, the project's general strategy has been to invest the greatest possible amount of funds in field-based interventions that serve as deterrents to habitat destruction in the sizable and largely intact eastern block of the Maya Biosphere Reserve, at the expense of some biological aspects, specifically those related to attaining data on wildlife (to be used to update and improve the Biological, Human and Conservation Landscapes). However, the adaptive focus on illegal land clearing paid off in 2009, when a quick reaction to the detection of a massive 920-hectare clearcut in the La Colorada Concession led to rapid results. Lighthawk overflights with members of the national press facilitated the publication of this information in national newspapers, compelling CONAP's presiding council to take immediate action and cancel the La Colorada concession, clearing the area of illegal ranchers and colonizers.

© R. McNab

Baird´s tapir

Despite the significant challenges that the project has faced, however, GCP-II funded activities have resulted in some important and desired steps forward for the Maya Biosphere Reserve, and provide a strong foundation for MBR projects in subsequent years.

Sustainability

Over the course of GCP funding, the Wildlife Conservation Society has built a conservation constituency in the eastern MBR that encourages the sustainable management of forest concessions, control of forest fires and engagement with local NGOs. WCS has also worked to build the capacity of the government so that it is able to effectively manage protected areas; to this end, WCS personnel have leveraged resources to improve the capacity of the Guatemalan National Park Service (CONAP). As a result of the work accomplished under GCP funding, the WCS Maya Biosphere project team now has the knowledge, experience and vision required to effect conservation over the coming months and years. The overarching objective is to support forested parks teeming with wildlife, in a well-managed landscape where fire is controlled and resource extraction is conducted legally and sustainably.

Achieving the long-term conservation of the Maya Biosphere Reserve will require a complex mix of activities and a network of local partners to successfully implement regional initiatives. Additional funds will be required to achieve the objectives that have been set, including:

- Increasing local capacity for fire prevention and hunting patrols; providing support and expertise to community-based efforts to effect conservation in the landscape.
- Strengthening the management of protected areas by continuing to build the capacity of CONAP and Asociación Balam; providing technical advice for management planning and supporting other partners in protecting the eastern MBR.
- Ensuring that habitat and Landscape Species trends are analyzed, compiled and disseminated for timely use in adaptive management systems; using the results of biological studies to inform management of the eastern MBR.
- Ensuring that partners can rely on continued support from WCS; this includes providing GIS analysis and reporting assistance to the technical arm of the Guatemalan Park Service (CEMEC) and providing the requisite support for LightHawk to continue conducting overflights.

An initial investment of approximately $17.25 million over the coming decade is predicted to leverage many millions more from NGO, community and government partners. Several projects initiated during the GCP funding cycle were aimed towards securing future fiscal sustainability of project activities. For example, in FY06, WCS Guatemala and national NGO partner Asociación Balam signed a cooperative agreement with the Association of Forest Communities in Petén to promote strategic interventions which improve the long-term social and ecological viability of the community forest concessions in the Multiple Use Zone of the reserve, with the goal of creating a portfolio of projects to be presented for funding to a diverse array of donors, thereby strengthening the concessions' fundraising process. Another agreement, with CI's Conservation Stewards Program, is intended to provide Uaxactún concession managers with economic support for conservation actions such as fire management and prevention, control and vigilance efforts, and sustainable xate management activities. Procuring the necessary investments from public and private donors to leverage continued partner collaboration will allow WCS to serve the leadership, scientific and convening role needed to help reach the conservation targets that have been set, and help to ensure an eastern MBR teeming with wildlife into the future. The procurement of additional sources of support to establish more effective networks and to increase the reach of project interventions is an ongoing goal. To this end, the program is happy to report the receipt of a 5-year, $2 million DFID grant that was obtained, at least in part, due to the support of GCP-II. This money will be used to strengthen governance in the Eastern MBR, the same focal area of the LLP program.

Measures of Success

Moving forward, and learning from the work completed in the past 5 years, WCS has developed a 10-year vision for the eastern MBR that includes: the protection and management of over 3,300 square miles of the intact eastern MBR; the preservation of a stable and ecologically functional population of jaguars in the eastern MBR; and the protection of scarlet macaw breeding areas so that their population can remain robust. To maintain intact habitat for the suite of Landscape Species (and therefore for the host of other species which rely on the forest), WCS has focused on: ensuring that protected areas are effectively managed by government and other stakeholders; providing training and support to communities so that they are better positioned to manage the forest concessions; and tracking species and landscape trends

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Scarlet macaw taking flight

that indicate success (or the need for adaptive management). The conservation objectives for this program will be met when the MBR includes forested parks teeming with wildlife and effectively managed protected areas and forest concessions where fire is controlled, resource extraction is legal and sustainable, and the following set of management programs are in place:

- Community forest concessions are managed locally to reduce forest fires, deforestation and illegal colonization.
- Protected areas of the eastern MBR are well-managed by government and NGO partners.
- Habitat and Landscape Species trends are used by government and national institutions to adapt and improve the management of the eastern MBR landscape.

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Nakum Temple,
Yaxha-Nakum-Naranjo National Park, east MBR

Value of the GCP Program

GCP-II funds provided the MBR project team with crucial funding for nearly all of the activities reported herein, whether invested in technical personnel that helped design and implement the activities or covering the direct costs of field activities themselves. A revised focus of the project evolved as the result of social and ecological feedback, entailing collaborations and networks aimed at improving the governance of the Maya Biosphere Reserve, especially the eastern section. Though still developing, the ability to engage with partners on governance issues has been made possible by the six years of USAID GCP-II investments, as well as recent investments by DFID-UK, USAID-Guatemala and the US Department of Interior, among others. Local linkages with national NGO partner Asociación Balam have continued to ensure greater national adoption of conservation strategies and more effective leveraging of Guatemalan government investments. The foundation of the project's approach to conservation in the Maya Biosphere has been to develop and test innovative solutions to specific conservation problems and to link viable solutions to networks of actors working to improve governance; this approach will continue to provide a strong foundation for future conservation in the region.

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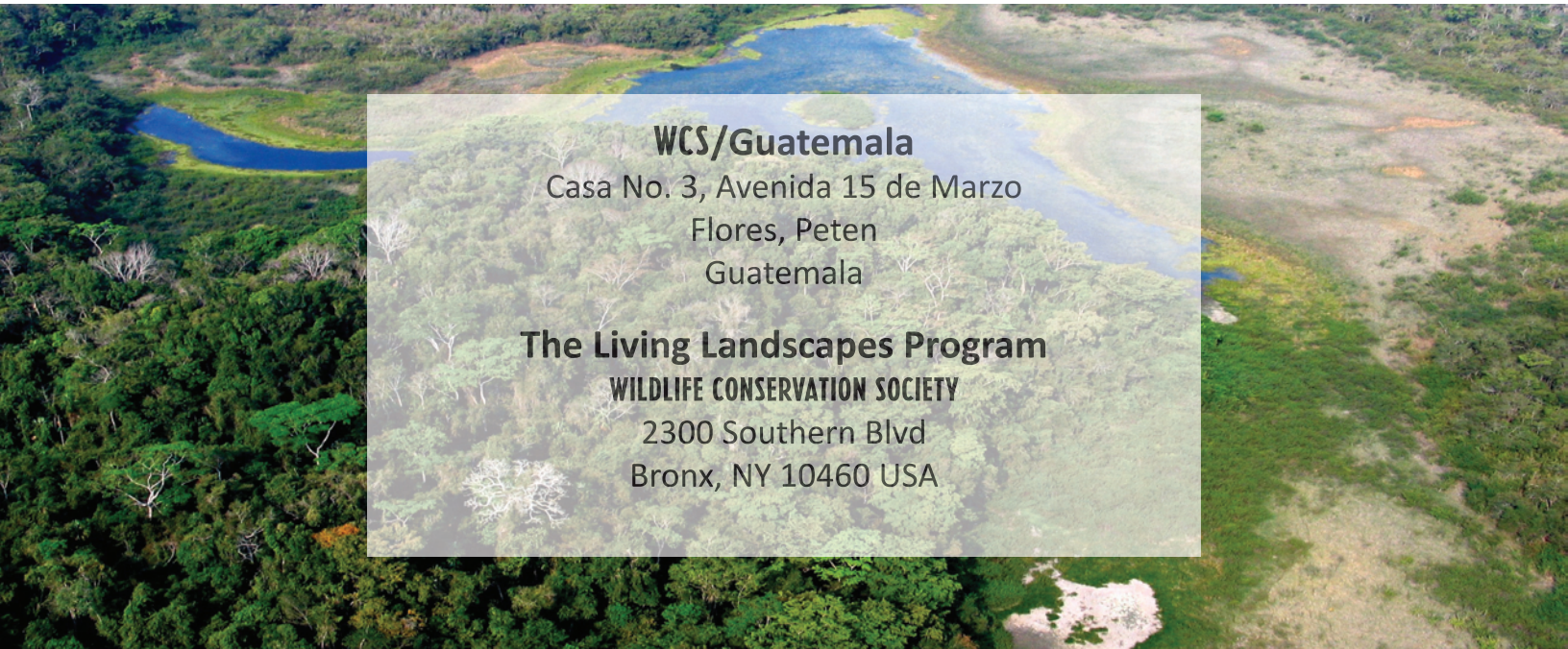

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