



Darwin Initiative Main and Post Project Annual Report

To be completed with reference to the “Writing a Darwin Report” guidance:
(<http://www.darwininitiative.org.uk/resources-for-projects/reporting-forms>). It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

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Darwin Project Information

Project reference	23-104 ref 3206
Project title	Improving livestock management for economic-environmental stability in Mesoamerica's Mosquitia
Host country/ies	Nicaragua, Honduras
Lead organisation	Wildlife Conservation Society
Partner institution(s)	National University of Agriculture, Honduras
Darwin grant value	£299,700
Start/end dates of project	1 April 2016 – 31 March 2020
Reporting period (e.g., Apr 2018 – Mar 2019) and number (e.g., Annual Report 1, 2, 3)	1 April 2018 – 31 March 2019 Annual Report 3
Project Leader name	John Polisar
Project website/blog/Twitter	
Report author(s) and date	John Polisar

1. Project rationale

Spanning 22,568km² the bi-national “Heart of the Mesoamerican Biological Corridor” of Nicaragua and Honduras is the second largest wild area in Central America, harbouring intact forests, high biological diversity, and regionally at risk wildlife including jaguar, harpy eagle, green and scarlet macaw, white-lipped peccary, and migratory birds. This remote area is occupied by indigenous groups (Miskitu, Mayangna, Tawahka, and Pech) and ladino settlers whose subsistence lifestyle has been transitioning into the cash economy and increasingly involves domestic livestock. While much of the area’s difficult mountainous terrain is still wild, this complex of protected areas and indigenous territories has experienced increasingly rapid forest loss (the highest in Central America) and forest degradation due to unsustainable cattle ranching. Deforestation for low-productivity pastures is the region’s primary threat to biological diversity. Poverty and malnutrition create incentives for raising cattle. However, malnourished and weak cattle do not optimally alleviate poverty and poor cattle management is a threat to the environment. Recognizing the desire and right of local people to raise beef and dairy cattle for local consumption and even sale in sections of protected areas where it’s permitted, we aim to improve livestock management and production, including silvopastoral systems, improved pastures, and better animal health, directly linked to forest, wildlife, and biological diversity conservation through conservation agreements. We partner with territories that are sincerely interested in ecosystem conservation, providing technical expertise in environmentally responsible and productive livestock management techniques, and developing conservation agreements. This project intends to reduce deforestation in specific project areas, maintain

existing wild forest blocks, and help communities elevate their standard of living while protecting biodiversity and conserving the ecosystems they inhabit.

The primary project areas are communities along main rivers of Nicaragua and Honduras. This includes 16 communities along the Coco, Bocay, Amak, and Lakus rivers in Nicaragua's Bosawas Biosphere Reserve, and 5 communities along the Rio Patuca in the Tawahka Asangni and Rio Platano Biosphere Reserves in Honduras. These areas are centrally located in the map that constitutes Figure 1, with close ups in **Annex 1**.



Figure 1. Map of project location.

2. Project partnerships

The project area in Nicaragua lies in the Bosawas Biosphere Reserve, where we work closely with the Territorial Indigenous Government (GTI) of the Region of the Upper Rio Coco and Bocay (Region Especial de Alto Wangki Bocay), which is comprised of three separate indigenous territories, Mayangna Sauni Bu (MSB), Kipla Sait Tasbaika (KST), and Miskitu Indian Tasbaika Kum (MITK). We also work with the Ministry of Environment and Natural Resources (MARENA) and collaborate with the environmental protection arm of the Nicaraguan military, the Batallón Ecologico, in territorial patrols. We originally planned to work through the Nicaraguan National University of Agriculture, but found it more efficient to work directly with the territories. Our activities and progress in Nicaragua were planned and executed in collaboration with the three indigenous territories, with the Presidents of the

GTIs to the individual farmers, and includes indigenous field coordinators and parabiologists, some of whom we have worked with for 13 years. The territories are intrinsically linked with project execution, and communication with them occurs nearly every month. Meetings with MARENA have taken place approximately quarterly.

In Honduras, our formal partner is the National Agricultural University (UNAG) for the Convenio (agreement). Through them, we have linked with the Federación Indígena Tawahka of Honduras (FITH) based in the community of Krausirpe in the Tawahka Asangni Biosphere Reserve, a ladino community in Nueva Esperanza, Miskitu farmers in Tukrun and Kurhpa, and a Miskitu cattlemen's association in Wampusirpe. The latter three areas are in and near the Rio Platano Biosphere Reserve (**Annex 1**), and project participants include members of the Miskitu territorial council Butuka Awayala Mayaralwi Idianka Asla Takanka (Organización de los Indígenas de Patuca Medio/Middle Patuca Indigenous Organization – BAKINASTA). The PI has met with UNAG five times during year 3 to plan and propel project activities forward.

During Year 3 we were also in close contact with Institute of Forest, Protected Area and Wildlife Conservation (ICF) central staff that oversee the section of the Rio Platano Biosphere Reserve in which the project is located. We conducted additional meetings with key actors ICF field personnel, FITH leadership, and leaders of the regional Miskitu indigenous organization Miskitu Asla Takanka (MASTA), which is the umbrella Miskitu political organization within which BAKINASTA falls – to discuss the project and forest connectivity issues in the project area. Thus far, we have not engaged directly with the Network of Management of Broadleaf Forests/Red de Manejo de Bosques Latifoliada de Honduras (REMBLAH), with execution taking place primarily through a linkage of UNAG faculty, alumni technicians (some are indigenous youth from the project area) and local community members.

Our partner in Honduras, UNAG has ~ 20 years of experience in the Honduran Mosquitia and has provided satisfactory links with communities, and field capacity for execution, but with recurrent external and internal challenges. There were a series of delays in the first three years due to student strikes and national turbulence associated with a contested election, among other issues, which resulted administrative and field delays. We are grateful to Darwin for the approval of a no-cost extension to enable us to effectively and adequately complete the proposed tasks (**Annex 2**). That is particularly the case because in Year 3, additional internal administrative obstacles impeded field execution. Thus in Year 3, the Nicaragua side of the project has completed all Year 3 objectives, while the Honduran side has completed some, but not all with the remainder of Year 3 pending for early Year 4.

3. Project progress

3.1 Progress in carrying out project Activities

Output 1: Improved livestock management and community conservation techniques adopted by at least 200 families in seven communities across four ethnic groups in four protected areas and two countries. Due to approved change request (**Annex 2**) the revised output became 130 families in 19 communities, across four ethnic groups, in four protected areas.

We are now working with 16 communities in Nicaragua, 5 in Honduras, for a total of 21 communities of four ethnic groups, in three protected areas, and two countries.

Activity 1.1: In Nicaragua's Bosawas Biosphere Reserve, our indigenous coordinators in each territory conducted project questionnaires in Year 1. In Year 2, we summarized and rigorously analysed the results of the participatory diagnostic of livelihoods, standards of living, economic priorities, and livestock management of 75 families in 19 communities. In Honduras, similar questionnaires were delivered to 72 ranchers in Year 2 and summarized and analysed in a socio-economic report. These questionnaires will be repeated in the next, and final Year 4 of the project.

Activity 1.2: During Year 1 in Nicaragua, we reviewed the specific challenges in managing livestock, and tailored interventions to the highest priorities. We delivered training on how to conduct livestock health diagnoses and treatments. During Year 2, we reviewed the

performance of the 45 individual systems of installed fences, live fences, improved pastures, and nurseries and transplanted forage producing trees, taking photographs of each beneficiary, their installed system of improvements and recording locations with GPS coordinates. We repeated some of that in Year 3. The silvopastoral systems are progressing (**Annex 3**). In year 3, 43 beneficiaries have maintained active, functioning and growing silvopastoral systems. This bodes well and there is continuity, the performances of the three different tree species differs depending on local micro-site conditions in pastures. In year 2 we assessed progress in five annual meetings held across six communities, involving 79 people, 42% female, 58% male. In year 3 we assessed progress in annual meetings held across three communities (**Annex 4**). Despite a number of potential participants in the meetings being drawn away by the need to plant beans on those exact dates, total attendance was 82 people, 62% females, and 38% males. One of the most surprising elements of the Year 3 annual meetings was the changes in attitudes about jaguars, from distrust and antipathy related to potential livestock losses, to actual appreciation as a result of the project. The efforts to assist better livestock management, and especially the photographs farmers who participated in the camera trapping obtained of jaguars and white-lipped peccaries near their production systems, were key to this success.

In Honduras, in Year 2, we had delivered training in silvopastoral systems in August to 67 people in the following five communities: Krausirpe (18 people), Nueva Esperanza (8), Tukrun (12), Kurhpa (14), and Wampusirpe (15) A five-member project committee was formed in each community to ensure continuity (In August of Year 2, materials for improvements were delivered to 66 farms managed by 83 families, and conservation agreements signed for all. The present sum from the two countries is 43 families in Nicaragua and 83 in Honduras, making a total of 126 families involved in 21 communities . In Year 3, we accomplished biological evaluations for Honduras with more than twice as many avian sampling stations than Year 2 (**Annex 5 & 6**). Due to funds processing delays at the university, individual farm evaluations and annual meetings, have been delayed and will be completed in early Year 4.

Output 2: Explicit agreements through which project beneficiaries commit to conservation outcomes adopted by at least 130 families in seven communities across four ethnic groups, four protected areas, and two countries.

Activity 2.1: In Year 1 in Nicaragua, prior to delivering training and materials, we obtained conservation agreements at two levels; 1) territorial agreements (3 territories totalling approximately 2,800km²) and 2) agreements with individual project beneficiaries (47 total) (**Annexes 7, 8, 9**). The technical assistance in livestock production has been conditioned upon commitments by communities to control deforestation and ensure the following rules are abided by: zoning (including agriculture, hunting, and conservation zones), no hunting of white-lipped peccaries and spider monkeys, reduced hunting of slow-reproducing specialist species (versus fast reproducing generalist species), restriction of tapir hunting for purposes of crop damage control only, and managed livestock to reduce human-jaguar conflicts. In Year 2 in Honduras, similar agreements were signed by all participating farmers: 18 in Wampusirpe, 14 in Kurhpa, 13 in Tukrun, 7 in Nueva Esperanza, and 16 in Krausirpe for 66 agreements involving 83 families in Honduras, with now 43 in Nicaragua, 126 families in total between the two countries.

Activity 2.2: In Year 1 in Nicaragua, obtaining the conservation agreements and planning the interventions entailed 12 meetings in the capital with indigenous leaders, and was reinforced during 12 meetings in the territories, for a total of 24 meetings. The efficacy of those Conservation Agreements was reviewed during annual meetings held in six communities in Nicaragua in Year 2. In Year 3, efficacy was reviewed in 3 meetings that indicated that silvopastoral systems were proceeding well and the people were more tolerant and appreciative of large cats (**Annex 4**). In Honduras, we obtained conservation agreements and planned conservation interventions over the course of 17 meetings held between Years 1 and 2.

Output 3: Report on the impacts of improved livestock management practices, evaluating and comparing forest cover, biodiversity, and poverty reduction impacts across the spectrum of cultural contexts. Dissemination of methods and lessons learned to nearby communities, agricultural and protected area agencies, and across the entire NGO, Multilateral, and government community.

Below we describe some of the biological baselines:

Activity 3.1: In Year 3, we conducted an evaluation in both countries that followed the same lines as the initial baseline biological evaluation for mammals that was established. This included sampling lines traversing three distinct bands: 1) within and nearby the edge of areas with direct livestock management improvements (200-2,200m); 2) between 2,200 and 4,200 m from interventions; 3) between 4,200 and 6,200 m from the system. This provides a comparison between the direct project impact area and more natural forest in both pre- and post-sampling periods, providing a way to assess trends in time across anthropogenic gradients in relation to the conservation agreements. A total of 12 such lines, involving 34 camera traps, radiated out from farming systems during the baseline. The same lines were used for the Year 3 evaluation, adding 1 in Honduras and 2 in Nicaragua for a total of 15 camera trap lines across a gradient of near-system to far-from-system/natural forest gradients (**Annex 6 & 10**).

The camera traps installed in both countries in Year 3 remain in the field at time of writing. During the baseline, in Nicaragua 25 species of large/medium sized mammals were registered and 16 in Honduras. The data have been examined with multivariate analyses and conventional statistical tests with no significant differences for most species between the three areas with different levels of disturbance except for the jaguar, which appeared more frequently closer to the systems and communities (**see foto in Annex 1**). In total there were eight jaguar observations, six in areas of high human disturbance and two at medium-level. These results, are somewhat counter-intuitive. Often game is depleted near villages and large mammals scarce in proximity to communities, but these data provide testimony to the effectiveness of the indigenous territories in defending forests and wildlife. Preliminary analyses of Honduran camera trap data in year 3 indicated that wild carnivores became more diverse and large herbivores more abundant farther from the communities and livestock management systems. Jaguar and puma were not photographed near the communities, rather only in the farthest band of camera trap stations (one jaguar photographed in a camera with the lowest level of human disturbance). Based upon robust sampling, tapirs are suggested as a reasonable indicator species that combine sensitivity with adequate sample size to detect statistically significant changes over time.

In Year 3, all biological data collection has been conducted according to standardized protocols, including a specific data sheet for camera traps, and specific sampling instructions for avian sampling. The seven avian stations in Nicaragua and nine in Honduras mean that a total of sixteen areas of contrasting vegetative cover were sampled in proximity to the farming systems that were being improved (**Annex 5 and 10**).

In Year 2, using remote sensing we determined the baseline 2005/6 – 2016 deforestation rate between the two countries. Another round of remote sensing and detailed questionnaires will be conducted in the final Year 4 (**baseline figures can be seen in Annex 1**).

3.2 Progress towards project Outputs

Output 1. Improved livestock management:

In three years, we delivered training on how to establish silvopastoral systems, improve pastures, and diagnose and treat cattle health issues conditioned beneficiaries signing conservation agreements across four ethnic groups (as promised), 21 communities (compared to our commitment to engage 7), 130 families (exactly per change requested and approved), in three protected areas (compared to four protected areas, which was too ambitious) in two countries. As part of the baseline we conducted 147 questionnaires across both countries. We analysed the questionnaires, and the results guided our technical assistance for better cattle nutrition, better cattle health, and fencing to contain cattle. We tailored the interventions to those priorities, initiating silvopastoral systems for better forage, live fences, improved pastures, and veterinarian training.

Additional project baselines to measure conservation impact include the avian surveys (completed), data from camera traps (completed), and forest cover trends up until this year. In Year 3, we have conducted expanded avian sampling (analysis pending) and expanded camera

trapping (analysis pending) to gauge the project's impact. Multivariate analyses have been run several times on the Nicaraguan mammal data and a manuscript is nearly complete.

Output 2. Community Conservation Agreements:

During the first two years we developed and signed explicit conservation agreements with 130 families, 21 communities, three protected areas, four ethnic groups, and two countries (**Annexes 7,8,9**). These agreements include conditions on forest clearing, strict conditions on human-wildlife conflict, specifically with jaguars and tapirs, and include complete bans on hunting white-lipped peccaries and spider monkeys, making it clear that livestock production is being improved not only for economic benefits, but also to facilitate and ensure conservation.

Output 3. Learning and outreach

During the last three years, we have completed the pre-intervention measurements of livestock management, knowledge, attitudes, and practices, productivity, biodiversity, wildlife conflict, and livelihoods at the household and community level. In Nicaragua, we conducted a total of 33 meetings with leaders and communities, 218 of them in the territories planning the project activities, and we delivered veterinarian training workshops to 58 people. Three indigenous field coordinators and three members of an indigenous logistics crew received intensive on-the-job training in project logistics, conducting interviews, and coordinating river logistics under supervision until they were fully trained and qualified to lead independently. Five indigenous parabiologists who had previous experience mist-netting birds and setting camera traps were engaged in systematic cross-gradient biological sampling. Three territories pulled together to execute a logically challenging project in Nicaragua. In Honduras, alumni and students of the National University of Agriculture in Honduras, mostly of local origin, including the project area, have been key in the execution of 17 meetings and workshops to deliver expertise in agroforestry/silvopastoral systems, materials for improvements, discuss advancements and conservation agreements. Project beneficiaries (farmers) assisted with placement and protection of camera traps for biological baselines. The local Tawahka, Miskitu, and Mayangna associations across the two countries have been intimately involved in project development and execution. In Year 3, six additional local indigenous youth worked as parabiologists and in Nicaragua an additional student from that country's National Agricultural University was trained and participated in bird sampling methods. In Nicaragua, results of livestock management modifications and biological baselines and compliance with conservation agreements were reviewed in the first annual meetings, which were held in six communities with participation by 79 people, 42% female, 58% male. The second round of annual reviews included 82 people, with 62% participation female. By the end of year two this project had been included in presentations to the government of Nicaragua on 3 occasions, to universities in Nicaragua on 2 occasions, and in a regional Congress on saving Mesoamerica's largest remaining forests and their inhabitants.

In year 3, the Darwin project was included in presentations to a jaguar range wide (Mexico to Argentina) review and strategic planning event in Bogata, Colombia, a symposium of transboundary mammal research and conservation in the North American Chapter of the Society for Conservation Biology Congress in Toronto, the Secretariat of the United Nations Development Program (UNDP) core staff in New York, a National University of Agriculture, Catacamas, Honduras biodiversity course, officials of the Honduran Institute of Forest Conservation, Protected Areas and Wildlife (ICF) and the Honduran Secretaria de Recursos Naturales y Ambiente (MiAmbiente), Tegucigalpa, Honduras, and the Honduran Monitoring Round Table, Tegucigalpa, and in recognition of Biodiversity Day, in Tegucigalpa. There was extreme socio-political turbulence in Nicaragua from April through to July 2018, which resulted in significant casualties, problems in the city, armed conflict, and inhibited presentations in Nicaragua though field work continued to progress as planned.

3.3 Progress towards the project Outcome

Outcome: Improved livestock management techniques are successfully implemented in ladino and indigenous farms in Mosquitia, leading to rigorously documented improved welfare of vulnerable communities, conservation of biological diversity, and forest cover

0.1 Forest cover: Rate of forest clearing in 40,000 hectares of target communities and household farms is reduced by 30% as compared to the 10-year historical average.

The baseline was established for 41,000ha of forest across the two countries, analysed over a 10.75-year period. Between 2005/06 and 2016, the annual rate of forest loss was 667 ha. In order to reduce that rate by 30% the annual forest loss in the 41,000 ha cannot exceed 467ha during the project period. At a slightly larger scale, of 136,000 ha surrounding target communities the annual rate of 1,350 ha forest lost per year would have to be reduced to 945ha. Progress towards those goals will be evaluated in Year 4.

0.2 Biodiversity: After three years, avian alpha diversity/ species richness in livestock systems and frequency of medium-sized and large mammals adjacent to livestock systems has increased, and species composition between specific livestock production systems and nearby intact forests have become significantly more similar according to the Sorenson quantitative /Bray-Curtis index.

We have established the baseline for avian diversity/species richness and mammal frequencies sampling across gradients from our interventions into the forest. This will provide a comparison between the direct project impact area and more natural forest in both pre- and post-sampling periods, and a way to assess trends in time across the gradients in relation to the conservation agreements. With the Nicaragua data we have conducted multivariate analyses to distinguish bird communities in open areas, second growth and intact forest. We have also conducted multivariate analyses to distinguish mammal communities at varying distances from livestock management systems. The avian analyses identified 9 bird species as indicators of forest conservation and recovery. The mammal data to date from camera traps has been combined across the countries, for one combined bi-national analysis. Post-election turbulence and administrative delays resulted in less intensive avian sampling than desired in Honduras in 2017-18, but we will compensate for this in 2018-19 with nine separate sites. Despite the challenges in these turbulent countries, we have established a solid quantitative baseline. Project impact assessment sampling for birds and mammals was recently conducted in both countries in Year 3. The results pend. Baseline patterns have also been evaluated. Notably, spatial trends with most mammals were not distinct in Nicaragua, but were in Honduras. Jaguars, white-lipped peccaries and tapirs will be the best indicators of improvements, the latter occurring in high enough numbers to run statistical tests. Nine species of birds were selected as indicators of recovery, six via mist nets, three via point counts. The data evaluations of ambitious Year 3 avian sampling pend. In both countries, camera traps are still obtaining data.

0.3 Human-wildlife conflict: Retaliatory killing of carnivores, particularly jaguars, reduced by 50% across project farms, households and communities.

We have established the baseline for general human-wildlife conflict and specifically human-jaguar conflict through the 144 detailed questionnaires. Attack rates are generally low. In Honduras 20% of respondents lost calves to jaguar and puma in the last five years. In Nicaragua only 6% has lost calves to large cats in the last five years, with rates for pigs and dogs being higher. It is too early to assess trends in reduced attack on cattle, but during Year 3 annual reporting, we ascertained that tolerance and appreciation of large cats among project participants seems to have increased markedly.

0.4 Local Livelihoods: At least 130 families will experience a 50% increase in livestock productivity due to integrated livestock management (including market value and availability for local consumption and subsistence).

It is too early to measure trends in livestock productivity, but in the baseline we delivered, collected, summarized, and analysed 144 questionnaires that included the following: family profiles, economic activities and priorities, monthly income and costs, health issues, basic necessity surveys, use of forest products, general human-wildlife conflicts, farming/ranching practices and challenges, knowledge and practices in cattle ranching and type and level of production and economic gains from cattle, frequency of losses to large cats, and perspectives on jaguars. This is a solid baseline, and we believe that production and conservation trends can be assessed next year. Approximately 80% and 92% of Honduran and Nicaraguan participants have less than 25 cattle. Hondurans lose 32% cattle to diseases, and 17% to poor nutrition. In Nicaragua the ratio is 61% to sickness and 24% to nutrition. Despite low numbers of livestock per participant, mortality (lost production) can be high. The 75 Nicaragua questionnaire respondents indicated the following level of losses per year: 3 lost 5-10 and 48 lost 1-3. Since much of the meat, milk, and cheese consumption is local and within families,

relative health, status, production, and survivorship of livestock will be a good indicator. Next year, Year 4, we repeat the questionnaires to assess impact.

3.4 Monitoring of assumptions

0.1 Forest cover: *Cloud-free and current scenes of project areas are available for remote sensing analysis.*

There were considerable issues with cloud cover in the 2006 scenes and it was necessary to pool 2005 and 2006 scenes but that has been done and we have established the baseline rates.

0.2 Biodiversity: *Relative frequency data reflect true population trends. Fluctuations due to weather, seasons, disease, and wildlife population dynamics remain within normal parameters, allowing detection of the effects of improved agriculture and reduced deforestation (To mitigate this risk we will standardize sampling and use robust experimental designs).*

Baseline biological sampling started first in Nicaragua, thus setting the stage for common protocols to use across both countries. In order to minimize sampling error, a standardized camera trapping design and data sheet was deployed for every station/camera. Similarly, the avian sampling and data collection protocol used in Nicaragua was shared with the Honduran field team. In Nicaragua, avian sampling was executed by an MS-level ornithologist with 20 years of experience who is also a MoSI coordinator. This has been assisted by a university level biologist with abundant experience and a local indigenous crew with previous experience in avian inventories, linear foot transects, and MoSI migratory bird monitoring. The camera trapping was supervised by a field coordinator with 10 years of experience and an indigenous parabiologist who worked on the first jaguar camera trap survey in Nicaragua. In Honduras, the particulars of camera trap sampling design were verbally communicated and a specialist with 12 years' experience accompanied field crews and trained them. Two MS biologists supervised Honduras avian sampling, according to protocols developed in Nicaragua.

0.3 Human-wildlife conflict: *Honest pre- and post- reporting by project participants.*

In Nicaragua, local trusted coordinators distributed the questionnaires about human-wildlife conflict, which was likely to generate honest results. In Honduras, we also integrated with local institutions and families, our main technicians are Miskitu and Ladino local graduates from UNAG, and similar dynamics have prevailed.

0.4. Local livelihoods: *Changes due to improved livestock management are measurable and observable within the 3-year time period.*

Considering an on-schedule start up in Nicaragua, we expected to meet this assumption. Given Year 1 delays, measurable livelihoods improvements were expected to be more challenging to observe in Honduras, since three years of work will need to be compressed into two years. However, following the recommendations delivered in the review of the report on Year 1, we submitted a change request form for a no-cost one-year extension, which was approved and make the assumption more likely to be true.

3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation

The project areas are the most underserved, neglected, and remote areas in Mesoamerica.

In both countries the project has generated enthusiasm and enabled us to secure additional, complementary funding for critical on-the-ground needs, including patrols along territorial boundaries (through a Department of State (DoS) Central American Free Trade Agreement (CAFTA-DR) grant, a DoS International Narcotics and Legal Affairs (INL) grant, funds through a U.S. Fish and Wildlife Service Cooperative Agreement, and biological surveys (through the Liz Claiborne and Art Ortenberg Foundation). We leveraged this work to expand our impact, including migratory birds, cacao, cattle, forest connectivity, and additional protected area law enforcement efforts through a joint project with American Bird Conservancy using U.S. Fish

and Wildlife Service Neotropical Migratory Bird Funds. We developed a collaboration with the Yale Environmental Protection Clinic to collect data on forest trends, threats, opportunities, actors, and mechanisms to strengthen bi-national forest connectivity in the project area. The latter resulted in a joint White Paper we publicized in news releases (We also joined a Rapid Ecological Appraisal Program expedition into a high profile archaeological site, alternatively known as the Lost City of the Monkey God, near our project area in Honduras The WCS Yale White Paper much supported by Darwin, imparted perspectives on large scale conservation needs in the bi-national Moskitia, that informed and amplified political momentums (**Annex 11 and 12**).

The newly discovered Ciudad Blanca/White City archaeological site, within the Río Plátano Biosphere Reserve, generated high-profile publicity and captured the personal interest of the President of Honduras, creating unprecedented momentum for conservation. WCS, in collaboration with key partners, supported the creation of the Kaha Kamasa Foundation (White City in local Pech indigenous language), an alliance of government, indigenous, and nongovernmental institutions, to raise visibility and funds for archaeological exploration and restoration, forest protection, and local economic development. The Honduran Government is now taking decisive steps to preserve archaeological sites and the forests that surround them, after decades of continuous uncontrolled illegal logging and cattle ranching. For example, improved enforcement to maintain forest habitat, control poaching through the construction and improvement of ranger stations and hiring new rangers for the region. This political interest provides a great opportunity for large-scale conservation action and positive biodiversity impact. There is also potential for the alleviation of poverty by job creation through increased tourism and more park guards (**Annex 11**).

Additionally, our projects have enabled us to identify opportunity to promote livelihoods that are compatible with conservation. WCS is exploring conservation-friendly agroforestry cacao systems, combined with conservation agreements among local landowners and community members, as an economic alternative to cattle ranching, with an emphasis in areas where deforestation is threatening connectivity

Beyond publicizing the project in range wide jaguar meetings, international congresses, with the Secretariat of UNDP, in press releases and a National Geographic Blog, we will be generating international refereed publications. Already, in the works are the following: 1) manuscript looking at mammal distribution and abundance across time and space solely in Nicaragua, analyses done, discussion in preparation; 2) manuscript looking at avian species that indicate forest status and recovery – Nicaragua, manuscript mostly done, in edits; 3) a manuscript examining patterns of mammal distribution and abundance across both countries – core reserve zones through riverside community edges, three biosphere reserves, three river valleys, four ethnic groups, 13,000 camera trap images ready for analyses 2006 to 2018. We will add the current camera trap surveys near communities, data already in hand from one more core zone, and initiate a massive analysis, of which Darwin provided the final and essential part, data from near communities and associated with agricultural initiatives.

4. Contribution to the Global Goals for Sustainable Development (SDGs)

Goal 1: End poverty in all its forms everywhere

Our program seeks to sustain natural ecosystems and the stocks of flows of goods and services that provide the basic necessities for people's lives. The project is working to ensure that poor and vulnerable forest-dwelling and riverine indigenous populations have formal access to and management authority over the land, waters, and natural resources on which they depend, including those that provide food, shelter, and medicine. Conserving natural systems and the ecosystem services they generate is necessary to protect the livelihood security and resilience to environmental shocks of these isolated, politically marginalized populations.

Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture

Our program works to promote sustainable agriculture as a way to provide nutrition and relieve pressure on forests, while conserving terrestrial wildlife and freshwater fisheries. These resources, if well managed, are essential for food security and can act as insurance to smooth consumption during economic, health and climatic shocks, helping to ensure year-round food security, as well as profit.

Goal 3: Ensure healthy lives and promote well-being for all at all ages

Recognizing that public health can be a benefit provided by relatively unmodified ecosystems, we help avoid potential public health costs associated with ecosystem alteration and degradation by working with both local communities and national agencies, to protect such natural ecosystems.

Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

The unsustainable use of natural resources undercuts the livelihoods and job security of people who depend on those natural resources, and the illegal trade in wildlife, timber, forest products and fish resources corrupts the staff of public and private organizations and ultimately undermines the jobs that depend on the long term management and conservation of natural resources. This project promotes sustainability and legitimate use of natural resources, and seek to create and shift jobs into legal occupations that conserve nature over the long-term.

Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

This project works diligently to conserve wildlife, wild places, biodiversity and ecosystem services in conjunction with governments, indigenous peoples and local communities. Our core focus is to conserve the full complement of native wildlife species and the vital ecological roles they play in maintaining healthy, productive and resilient ecosystems

5. Project support to the Conventions, Treaties or Agreements

This project addresses Aichi targets 1,2,3,4,5,7,12,14,15, and 19 and all five goals of the CBD. In particular, we will reduce direct pressures on biodiversity and promote sustainable resource use, strengthen local capacity for territorial planning and management, and enhance the benefits of water provision services for vulnerable rural livelihoods. Through pending conservation agreements, we aim to provide technical assistance that will reduce pressures on biodiversity and promote sustainable use. The project has already had a positive impact on territorial management. The goals of forest conservation and improved livestock management will help preserve clean and consistent water for communities.

6. Project support to poverty alleviation

We are benefitting 126 families from 21 communities in two countries with improved livestock management, such as conducting health diagnoses and treatments and constructing fences, and secured community conservation agreements. The technical assistance has the objective of sustainable economic gains in harmony with the conservation of ecosystem services. To ensure deforestation is reduced and rules are followed, livestock production assistance is provided only upon agreement of these conditions. Among notable achievements are that 43 farmers in Nicaragua have maintained active, functioning and growing silvipastoral systems. Visual demonstrations of the progress made with a subset can be seen in **Annex 3**.

This is the end of Year 3 of the project, which extends 4 years, and we expect to evaluate and document our impact at project end.

7. Project support to gender equality issues

Despite our goal of 40% women involvement in the project, in relation to Indicator 1.1, Year 1 saw only ~15% women involvement in the field. Vowing to work on greater inclusion in Year 2 in Nicaragua we achieved 42% participation by women in project evaluation meetings and human-wildlife conflict reduction trainings. In year 3, we continued to focus on this critical issue of addressing gender equality and obtained further increases with 62% participation by women in the annual project evaluation meetings in Nicaragua.

8. Monitoring and evaluation

We are currently three years through a four-year project. Detailed diagnostics have been conducted, summarized, and analysed in both countries, which stand as solid baselines to measure project impacts (Detailed expert driven avian and mammal sampling has been completed, summarized, and analysed, providing a solid baseline to measure project impacts). All three types of baseline were driven by a team that ranged from PhD level participants with decades of experience to local residents of indigenous territories with deep knowledge of the area. These baselines are very complete. In total we have 16 bird sampling stations across the bi-national area, 15 lines of camera traps radiating out from communities, and socio-economic/cattle management diagnostics completed by 144 people, which is a solid baseline upon which we can measure project impact.

Apart from the detailed diagnostic tools we have employed, and the detailed biological baseline that we have established, our indigenous coordinators visited 45 systems to verify progress made, taking photographs, linked with GPS coordinates, to serve as metrics of progress made. Project progress and commitments as far as farming systems and conservation agreements was reviewed in annual meetings in Nicaragua attended by 79 people in year 2 and 82 people in year 3, and things are going well there.

9. Lessons learnt

A challenge in Year 2 in Honduras was National University of Agriculture administrative delays associated with a hotly contested national election in Honduras. The transition to new key administrative personnel was delayed several months.

However, we ran into additional challenges in Honduras in Year 3. Additional administrative obstacles delayed our direct collaborator's (faculty member at the University) ability to access funds in a timely manner. In order to overcome the administrative delays and avoid future obstacles, the PI developed direct relationships with administrative and financial personnel at the University and the National Secretariat of Finances, to ensure timeliness. WCS is in the process of becoming registered in Honduras, which will mean independent financial transfer and accounting pathways, more agility, and avoiding future administrative delays associate with the National University of Agriculture.

It merits mention that, on the Nicaraguan side, Year 3 saw some of the most violent social political disturbances in the last decade in the Western Hemisphere. Between April and July 2018 hundreds of people lost their lives in street protests, vehicle traffic was impeded by small walls erected as primitive forts on the streets, and altercations between authorities and protesters meant that our field teams needed to avoid Managua-to-river port travel May through August. Eventually armed authorities subdued the protests and the highways became safe for travel again. The social political situation did limit 1) presentations at universities and in government offices; 2) presentations at Congresses (the November Congress of the Mesoamerican Society of Biology and Conservation was switched to another country); 3) student engagements (youth were both heavily involved in the protests and also heavily targeted by authorities); and 4) meetings in general. Despite the tumultuous environment and safety concerns, our Nicaragua crew was able to make significant progress. Things are stable now, even if underlying issues remain.

In Honduras, the main impediment to execution, despite challenging field environments, has been administrative delays associated with the Honduran National University of Agriculture in being able to access funds transferred for timely execution in the field. In Year 3, those issues

delayed: 1) conducting the individual farm level evaluations; 2) the annual community meetings in Honduras. Both activities are now priority activities for these first few months of Year 4. The PI has already made progress by corresponding with the Honduran National Director of Monitoring and Control of External Financing in the National Headquarters of the Secretary of Finances.

10. Actions taken in response to previous reviews (if applicable)

In Year 1, we had fallen short of the >40% participation by females, a metric of success and goal stated in Indicator 1.1. However, we increased that to over 40% in Nicaragua in Year 2 and now to over 60% in Year 3.

In general, this project is recognized as part of a larger programme. Among other things, it has provided a platform upon which we have been able to leverage additional funds. We have secured nearly an equivalent amount of funds, dedicated to more work on productive landscapes for bird conservation, promotion of sound sustainable cattle and cacao production, conservation commitments and patrols. New sources that were obtained or manifested in Year 3 include, USFWS Neotropical Migratory Bird Conservation Act funds through the American Bird Conservancy, USFWS Cooperative Agreement, the Department of States (DoS) Bureau of Oceans and Environmental and Scientific Affairs Central American Free Trade Agreement (CAFTA DR) and the DoS Bureau of Narcotics and International Law Enforcement (INL). This Darwin project provided the platform to build a holistic programme.

11. Other comments on progress not covered elsewhere

We are now three quarters through a project that spans four years. It originally was planned for three, but delays in Honduras due to an extended student strike and associated administrative delays, were impetus to submit a change request for a one year no-cost extension, which was approved. In Honduras we expedited work, but then encountered additional delays due to a turbulent and hotly contested national election and administrative issues, and the one-year extension has proved critical to our ability to move towards successful project completion and future sustainability. In Nicaragua, project activities have proceeded on time. In Year 2, approximately 50% of the participants experienced difficulty in establishing improved pastures. This was rectified in Year 3 through additional training and materials. Extreme socio-political turbulence in Nicaragua in Year 3 reduced the number of meetings and presentations, though field work stayed on track. Honduras National University/Secretariat of Finances system inefficiencies impeded some Honduras progress in Year 3, though we have made significant effort to address those impediments. The prior one-year extension granted by Darwin has been critical in ensuring project success.

12. Sustainability and legacy

A key piece of his project is collaboration with local partners to ensure they are integral members of the team, which will help ensure sustainability and build long term capacity. It merits mention that in Nicaragua our field efforts are executed by indigenous coordinators. That direct capacity building will contribute to sustainability. Similarly, in Honduras, our field activities are coordinated by UNAG alumni from the region, and their families, and the local territorial leaders and a Miskitu ranching association. Interest is high, the projects base actually is local people, boat operators, respected elders, presidents of associations, all of which may contribute to sustainability.

In addition, the foundation provided by this bi-national project enabled us to secure complementary funding from USFWS Neotropical Migratory Bird Conservation Funds in a joint proposal submitted with the American Bird Conservancy (ABC), jaguar and prey focused funding from the Liz Claiborne and Art Ortenberg Foundation, substantial continued wildlife law enforcement funding for territorial patrols through Central America Free Trade Agreement and International Narcotics and Law Enforcement funds managed by the U.S. Department of State, additional funds from the USFWS for territorial patrols and defence of forests and wildlife. In Nicaragua, we have met with MARENA, indigenous leaders, and have presented the project on

five occasions. In Honduras we have discussed our activities with ICF national and local staff, MiAmbiente national staff, and colleagues working in NGOs focused on Mosquitia

During Year 3, WCS hired a Nicaragua-Honduras bi-national director and a Financial Manager. Both of these positions are critical to overcoming administrative bottlenecks encountered in the National University of Agriculture and providing additional support and increasing field execution efficacy. We now have office space inside the national ICF compound in Tegucigalpa. These national commitments on the part of Honduras, and the coordination between WCS and local and national institutions in both countries, will facilitate our sustainable impacts and long-term presence and dedication in both countries.

WCS has leveraged current political interest in the White City to create unprecedented momentum for conservation and ensure long-term sustainability. By supporting the creation of the Kaha Kamasa Foundation, an alliance of government, indigenous, and nongovernmental institutions, we will raise visibility and funds for forest protection, and local economic development.

Funding from the Darwin project was a solid contributing factor in enabling WCS to engage in this work.

13. Darwin identity

Project Leader Polisar gave an interview for an article in the American Bird Conservancy's magazine, and drafted an article for the Darwin Newsletter, both coming out in Year 3.

In Year 3 findings and material from this project with credit given to Darwin was given in the following venues: Range wide multi-institutional strategic planning workshop jaguar conservation, Bogata, Colombia; Final presentation in a symposium of transboundary carnivore research and conservation, Society for Conservation Biology's North American Congress, Toronto; presentation to lead staff of United Nations Development Program Secretariat, New York; presentations to several courses at the National University of Agriculture, Catacamas; staff and technicians ICF in Honduras and Secretariat Natural Resources and Environment (MiAmbiente) Tegucigalpa. Our partners from the National University of Agriculture presented at the Honduran Monitoring Round Table, Tegucigalpa, and a collaborator involved in camera trapping and bird sampling presented at a National Biodiversity Day event in Tegucigalpa, and a University hosted half day event with the Center for Tropical Agricultural Research and Training (CATIE).

14. Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2018 – 31 March 2019)

Project spend (indicative) since last annual report	2018/19 Grant (£)	2018/19 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)			-13%	Throughout this project year, more time and effort dedication was required from our WCS staff experts, replacing the need for some previously budgeted external consultancies. This explains the variance in both the Staff and Consultancy Costs categories.
Consultancy costs			20%	Draft. The Partner Organization (UNAG) received the entirety of their budget amount in the form of advance payments, as per our agreement, prior to the end of this reporting period (March 31, 2019). However, they have yet to issue final payments for expenses in this category and deliver us the receipts, so their portion is being considered a draft amount. Throughout this project year, more time and effort dedication was required from our WCS staff experts, replacing the need for some previously budgeted external consultancies. This explains the variance in both the Staff and Consultancy Costs categories.
Overhead Costs			7%	Draft. UNAG received the entirety of their budget amount in the form of advance payments, as per our agreement, prior to the end of this reporting period (March 31, 2019). However, they have yet to issue final payments for expenses in this category and deliver us the receipts, so their portion is being considered a draft amount.
Travel and subsistence			-20%	Draft. UNAG received the entirety of their budget amount in the form of advance payments, as per our agreement, prior to the end of this reporting period (March 31, 2019). However, they have yet to issue final payments for expenses in this category and deliver us the receipts, so their portion is being considered a draft amount. There is an overspend in this category due to intensive field campaigns that took place over the past project year. However, this variance was compensated with lower expenditures in Overheads, Operating Costs and Monitoring & Evaluation.
Operating Costs			12%	Draft. UNAG received the entirety of their budget amount in the form of advance payments, as per our agreement, prior to the end of this reporting period (March 31, 2019). However, they have yet to issue final payments for expenses in this category and deliver us the receipts, so their portion is being considered a draft amount. A slight underspend from the Lead Organization in this category compensated for overspends in the Travel Category. UNAG expects to have an underspend in this category as well, but as noted, their portion of the expenses included here is a draft amount.
Capital items (see below)			0%	
Monitoring & Evaluation (M&E)			7%	Draft. UNAG received the entirety of their budget amount in the form of advance payments, as per our agreement, prior to the end of this reporting period (March 31, 2019). However, they have yet to issue

				final payments for expenses in this category and deliver us the receipts, so their portion is being considered a draft amount.
Others (see below)			-4%	Draft. UNAG received the entirety of their budget amount in the form of advance payments, as per our agreement, prior to the end of this reporting period (March 31, 2019). However, they have yet to issue final payments for expenses in this category and deliver us the receipts, so their portion is being considered a draft amount.
TOTAL	80,974	80,974		

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2018-2019

Ran into formatting issues with modifying blank they provided, will start all over copy paste from Year 2 then edit. Then delete the other one.

Project summary	Measurable Indicators	Progress and Achievements April 2018 - March 2019	Actions required/planned for next period
<p>Impact: Environmentally sustainable livestock management practices are successfully adopted across the bi-national Heart of the Mesoamerican Biological Corridor, leading to biodiversity protection and improved welfare of vulnerable communities.</p>		<p>Progress includes 144 pre-project diagnostics completed, training and livestock improvements initiated with 130 families spanning 21 communities, three reserves, two countries. Biological baselines established, summarized, analysed. Live fence and pasture improvements assessed and documents in 45 farms with evidence of improvements.</p>	
<p>Outcome: Improved livestock management techniques are successfully implemented in ladino and indigenous farms in Mosquitia, leading to rigorously documented improved welfare of vulnerable communities, conservation of biological diversity, and forest cover.</p>	<p>0.1 Forest cover: Rate of forest clearing in 40,000 hectares of target communities and household farms is reduced by 30% as compared to the 10-year historical average.</p> <p>0.2 Biodiversity: After three years, avian alpha diversity/ species richness in livestock systems and frequency of medium-sized and large mammals adjacent to livestock systems has increased, and species composition between specific livestock production systems and nearby intact forests have become significantly more similar according to the Sorenson quantitative /Bray-Curtis index.</p> <p>0.3 Human-wildlife conflict: Retaliatory killing of carnivores, particularly jaguars, reduced by 50% across project farms, households and communities.</p>	<p>0.1 Forest cover change 2005/06 to 2016 was 667 ha of forest lost each year over a 10.75-year period in the targeted 41,000 ha bi-national area. To achieve a reduction of 30% the rate can be more than 467ha per year 2017-2020.</p> <p>0.2 Avian baseline established across the two countries with ten stations of mist nets and point counts, data summarized and analysed for comparison with projects conclusion. Mammal baseline established with 12 lines, 34 camera traps. The mammal and avian baselines document species composition, distribution, abundance along the intervention sites to natural forest gradients.</p> <p>Subsequent avian sampling included 16 stations, analysis pending, and 15 lines of camera</p>	<p>0.1 We will start to assemble and analyse current rates of forest change</p> <p>0.2 We have pooled all camera trap data thus far and will conduct a large scale bi-national analysis. Preliminary avian analyses have been completed.</p> <p>0.3 We will continue to execute improvements in livestock that will lead to reduced jaguar attacks.</p> <p>0.4 We will continue to work with participating families to ensure effective improvements in livestock management, through personal visits to farms and annual reviews. We will also prepare to conduct a second round of comprehensive questionnaire based diagnostics to measure advances in cattle production and livelihood improvements.</p>

	<p>0.4 Local Livelihoods: At least 200 families will experience a 50% increase in livestock productivity due to integrated livestock management (including market value and availability for local consumption and subsistence</p>	<p>traps in 45 stations, which are still out in the field.</p> <p>0.3 Baseline for human-wildlife conflicts, human-jaguar conflicts, livestock losses due to jaguars, and control of jaguars established through detailed questionnaires executed by local coordinators with 144 people responding.</p> <p>Goal was changed to 130 families through a request change form and we have engaged that number with training and farm improvements. We are actually now at 126. It is too early to measure changes in livestock productivity but changes are underway.</p>	
<p>Output 1 Improved livestock management and community conservation techniques adopted by at least 200 families in seven communities across four ethnic groups in four protected areas and two countries.</p> <p>Please note, we submitted an approved change request form to reduce the number of families to 130. We are working with 16 communities in Nicaragua, 5 in Honduras, for a total of 21 communities, of four ethnic groups, in three protected areas, and two countries.</p>	<p>1.1 At least 130 Miskitu, Mayangna, Sumo, and campesino families identified and trained in management techniques (with >40% of participants' women) by year 1.</p> <p>1.2 Improved management techniques adopted and established in seven target communities by year 3.</p> <p>1.3 At least 50 farmers from nearby communities are invited to tour farms with improved techniques, exposing them to the concepts and practices in a participatory fashion with challenges and successes openly discussed by year 3</p>	<p>1.1 Secured approved change requests to use Year 1 funds for Year 2 in Honduras and reduce the number of families to 130. In Year 2, we trained 130 families and obtained 42% participation of women in Nicaragua. In Year 3, we obtained 62% participation by women in Nicaragua. We did also have 2 families drop out so we are down to 126 families.</p> <p>1.2 We have worked directly with 21 target communities. This represents a 3x expansion over the indicator. While we have documented progress in improved management techniques, it is too early for a comprehensive impact assessment.</p> <p>1.3 Planned for year 4 of the project.</p>	
<p>Activity 1.1 <i>Conduct participatory diagnostics of livestock management and forest conservation challenges</i> in each community and determine interventions tailored to each target community/household, ensuring at least 40% participants women. Participatory diagnostic of livestock and farm management challenges, will include questionnaires and meetings to assess knowledge, attitudes and</p>	<p>Comprehensive participatory diagnostics of livestock and farm management challenges, including questionnaires and meetings to assess knowledge, attitudes and practices regarding livestock condition, livestock management, forest clearing, human-jaguar conflicts, sources of livestock losses, nutritional status in households, hunting practices and locations – completed, summarized,</p>		

practices regarding livestock condition, livestock management, forest clearing, human-jaguar conflicts, sources of livestock losses, nutritional status in households, hunting practices and locations.	analysed with information from 147 respondents. Respondents were not 40% women, but recognizing that deficiency, we are rectifying. The first annual reviews held in Nicaragua included 42% women and the second 62% women.	
<p>Activity 1.2 Deliver capacity-building training in participatory livestock management improvements. Initiate expert delivery of hands-on participation training in field schools, generating a cohort of future leaders in each target community, working in site specific increasing productivity in target farms, diversification of food sources for livestock sites, elevating nutritional status, effecting protection of water sources, and training in diagnosis of diseases and basic veterinary medicine, as well as education on methods to reduce human-carnivore conflicts.</p>	<p>In Nicaragua we delivered veterinarian and improved pasture management training to 58 people in Honduras we delivered silvopastoral and agroforestry and animal health training to 66 people, representing 83 farms. During annual meetings and outreach, methods to reduce human-carnivore conflicts have been shared and discussed. In Honduras there is a five-person committee in each of the five communities. In Nicaragua, we work with three indigenous coordinators. In Honduras locally based alumni of the UNAG coordinate in the field.</p>	
<p>Activity 1.3 Conduct exchange visits to participating farms, inviting and supporting at least 50 farmers from nearby communities to tour farms with improved techniques, exposing them to the concepts and practices in a participatory fashion, and openly discussing challenges and successes.</p>	<p>This activity is planned for year 3 or 4.</p>	
<p>Output 2. Explicit agreements through which project beneficiaries commit to conservation outcomes adopted by at least 200 families in seven communities across four ethnic groups, four protected areas, and two countries</p>	<p>2.1 Explicit agreements with 130 families with clear commitments to conservation outcomes in exchange for support with livestock management developed, signed, and implemented by year 2. 2.2 A total of 21 meetings (one in each of seven communities annually for 3 years) held to present and discuss results achieved, and challenges of conservation agreements by 2019.</p>	<p>2.1 At end of Year 2, we have obtained conservation agreements with 130 families in three protected areas, in two countries. 2.2 During Year 1 we conducted a total of 15 meetings between the two countries. During Year 2 we conducted 14 meetings in Nicaragua and 9 in Honduras, for a total of 21. During Year 3 we conducted 3 meetings in Nicaragua and 2 in Honduras for a total of 5.</p>
<p>Activity 2.1. Generate conservation agreements with target communities through a participatory process, linking technical assistance in livestock management to explicit community commitments to forest and biodiversity conservation outputs that are congruent with protected area conservation objectives.</p>	<p>Conservation agreements were signed prior to delivery of materials. They were linked to the technical assistance and required specific commitments to forest and biodiversity conservation with an emphasis on maintaining forests, moderating hunting of resilient game species, ceasing hunting of less resilient and threatened species, implementation of human-jaguar conflict reducing measures, and tolerance of carnivores.</p>	
<p>Activity 2.2. Hold annual assembly meetings in each community implementing a conservation agreement to present and discuss results achieved, challenges, and lessons learned (a total of 21 meetings, or one in each of seven communities annually for 3 years).</p>	<p>We completed the first annual reviews in Nicaragua in 6 meetings, with representatives from 16 communities and the second annual reviews in Nicaragua in 3 meetings, with representatives from 6 communities. Due to delays in Honduras, we have thus far not conducted any annual review meetings.</p>	

		Between the two countries, we conducted 21 meetings in Year 2, and 5 meetings in Year 3.
Output 3 Learning and Outreach: Report on the impacts of improved livestock management practices, evaluating and comparing forest cover, biodiversity, and poverty reduction impacts across the spectrum of cultural contexts. Dissemination of methods and lessons learned to nearby communities, agricultural and protected area agencies, and across the entire NGO, Multilateral, and government community.	<p>3.1 Pre- and post- intervention measurements of livestock management knowledge, attitudes, and practices, productivity, forest cover, biodiversity, wildlife conflict, and livelihoods at the household and community level by years 1 and 3, respectively.</p> <p>3.2 Working paper rigorously evaluating the effectiveness of sustainable ranching interventions on conservation and development impacts drafted, presented to participating communities for feedback, and article submitted for publication in a peer-reviewed scientific journal by year 3.</p> <p>3.3 Written reports delivered to relevant actors and four presentations are given to local and national leaders by year 3.</p>	Activity planned for Year 4.
<i>Activity 3.1. Pre / post monitoring of livestock management practices and livelihoods indicators and biodiversity and forest conservation indicators including knowledge, attitudes, practices, and productivity of livestock management, forest cover, avian diversity and abundance, medium and large sized mammals, and human-jaguar conflicts.</i>	The pre-intervention diagnostics scheduled for Year 1 were completed, summarized, and analysed in Year 2. These are quite comprehensive and will serve as a solid baseline. The post-project summary will be done in during the final year (Year 4)	
<i>Activity 3.2. Working paper rigorously evaluating the effectiveness of sustainable ranching interventions on conservation and development impacts drafted, shared with all participating communities for feedback, and one article completed and submitted for publication</i>	Activity planned for Year 4.	

in a peer-reviewed scientific journal by year 3.	
<p><i>3.3 Disseminate informational material</i> highlighting results and lessons learned to share with institutions working in and impacting the Mosquitia. Share information about conservation agreements more widely in electronic form on social networks, websites, and through partner institution networks and deliver written reports to relevant actors, including four separate presentations delivered to relevant local and national leaders.</p>	<p>Activity planned for Year 4.</p>

Annex 2: Project's full current logframe as presented in the application form (unless changes have been agreed)

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact: Environmentally sustainable livestock management practices are successfully adopted across the bi-national Heart of the Mesoamerican Biological Corridor, leading to biodiversity protection and improved welfare of vulnerable communities.			
Outcome: Improved livestock management techniques are successfully implemented in ladino and indigenous farms in Mosquitia, leading to rigorously documented improved welfare of vulnerable communities, conservation of biological diversity, and forest cover.	<p>0.1 Forest cover: Rate of forest clearing in 40,000 hectares of target communities and household farms is reduced by 30% as compared to the 10-year historical average.</p> <p>0.2 Biodiversity: After three years, avian alpha diversity/ species richness in livestock systems and frequency of medium-sized and large mammals adjacent to livestock systems has increased, and species composition between specific livestock production systems and nearby intact forests have become significantly more similar according to the Sorenson quantitative /Bray-Curtis index.</p> <p>0.3 Human-wildlife conflict: Retaliatory killing of carnivores, particularly jaguars, reduced by 50% across project farms, households and communities.</p> <p>0.4 Local Livelihoods: At least 130 families will experience a 50% increase in livestock productivity due to integrated livestock management (including market value and availability for local consumption and subsistence).</p>	<p>0.1 Forest cover: Comparisons between long-term trends and project impacts using remote sensing, validated by on-ground reconnaissance and interviews.</p> <p>0.2 Biodiversity: Results of pre- and post- intensive avian sampling in and adjacent to implemented systems and in nearby forest. Results of medium and large mammal sampling adjacent to pilot projects and in nearby forests, using block design.</p> <p>0.3 Human-wildlife conflict: Baseline information on attacks from questionnaires compared to frequencies during the project.</p> <p>0.4 Local Livelihoods: Project participant surveys; livestock mortality; calving rate; time to market; records of livestock sales from rancher logs (improvements will be disaggregated by gender).</p>	<p>0.1 Forest cover: Cloud-free and current scenes of project areas are available for remote sensing analysis. (This is one of the reasons we will also employ on-ground verification).</p> <p>0.2 Biodiversity: Relative frequency data reflect true population trends. Fluctuations due to weather, seasons, disease, and wildlife population dynamics remain within normal parameters, allowing detection of the effects of improved agriculture and reduced deforestation. (To mitigate this risk, we will standardize sampling and use robust experimental design.)</p> <p>0.3 Human-wildlife conflict: Honest pre- and post- reporting by project participants.</p> <p>0.4 Local Livelihoods: Changes due to improved livestock management are measurable and observable within the 3-year project lifetime.</p>
Output 1 Improved livestock management and community conservation techniques adopted by at least 130 families in seven communities	1.1 At least 130 Misquito, Mayangna, Sumo, and campesino families identified and trained in management	Number of households/ farms implementing integrated systems; number of people trained in ranch management plans and methods; notes	Ranchers and vulnerable communities will be interested and incentivized to participate in project activities.

across four ethnic groups in four protected areas and two countries.	<p>techniques (with >40% of participants' women) by year 1.</p> <p>1.2 Improved management techniques adopted and established in seven target communities by year 3.</p> <p>1.3 At least 50 farmers from nearby communities are invited to tour farms with improved techniques, exposing them to the concepts and practices in a participatory fashion with challenges and successes openly discussed by year 3</p>	<p>of meetings with ranchers; field visit reports and photos; rancher logs documenting use of improved practices. Participant lists of inter-community exchanges, tours, and presentations; Changes in knowledge, attitudes, and practices, ascertained through pre- and post questionnaires.</p>	
<p>Output 2 Explicit agreements through which project beneficiaries commit to conservation outcomes adopted by at least 130 families in seven communities across four ethnic groups, four protected areas, and two countries</p>	<p>2.1 Explicit agreements with 130 families with clear commitments to conservation outcomes in exchange for support with livestock management developed, signed, and implemented by year 2.</p> <p>2.2 A total of 21 meetings (one in each of seven communities annually for 3 years) held to present and discuss results achieved, and challenges of conservation agreements by 2019.</p>	<p>Signed conservation agreements, photos, annual reports, final external report, meeting minutes.</p> <p>Meeting minutes, photos, annual reports.</p> <p>Informational materials produced, list of institutions reached.</p>	<p>Institutional support and legal framework remain favourable to the implementation of community conservation agreements. Communities are able to reach consensus and maintain an adequate amount of cohesion regarding their participation in community agreements.</p>
<p>Output 3 Report on the impacts of improved livestock management practices, evaluating and comparing forest cover, biodiversity, and poverty reduction impacts across the spectrum of cultural contexts. Dissemination of methods and lessons learned to nearby communities, agricultural and protected area agencies, and across the entire NGO, Multilateral, and government community.</p>	<p>3.1 Pre- and post- intervention measurements of livestock management knowledge, attitudes, and practices, productivity, forest cover, biodiversity, wildlife conflict, and livelihoods at the household and community level by years 1 and 3, respectively.</p> <p>3.2 Working paper rigorously evaluating the effectiveness of sustainable ranching interventions on conservation and development impacts drafted, presented to participating communities for feedback, and article submitted for publication in a peer-reviewed scientific journal by year 3.</p>	<p>Monitoring databases; working paper draft; minutes of meetings with communities and other stakeholders; submission or acceptance letter of peer-reviewed article; 1,000 copies of report printed and delivered and copy of four separate presentations, one local and one national, for each of the two countries.</p>	<p>External factors do not significantly change the socioeconomic or ecological context in a manner that confounds the attribution of impacts of livestock management implementation or conservation agreements (e.g. El Niño impacts on forest fires).</p>

	3.3 Written reports delivered to relevant actors and four presentations are given to local and national leaders by year 3.		
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Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)

Output 1: Improved Livestock Management

1.1 *Conduct participatory diagnostics of livestock management and forest conservation challenges* in each community and determine interventions tailored to each target community/household, ensuring at least 40% participants women. Participatory diagnostic of livestock and farm management challenges, will include questionnaires and meetings to assess knowledge, attitudes and practices regarding livestock condition, livestock management, forest clearing, human-jaguar conflicts, sources of livestock losses, nutritional status in households, hunting practices and locations.

1.2 *Deliver capacity-building training in participatory livestock management improvements*. Initiate expert delivery of hands-on participation training in field schools, generating a cohort of future leaders in each target community, working in site specific increasing productivity in target farms, diversification of food sources for livestock sites, elevating nutritional status, effecting protection of water sources, and training in diagnosis of diseases and basic veterinary medicine, as well as education on methods to reduce human-carnivore conflicts.

1.3 *Conduct exchange visits to participating farms*, inviting and supporting at least 50 farmers from nearby communities to tour farms with improved techniques, exposing them to the concepts and practices in a participatory fashion, and openly discussing challenges and successes.

Output 2: Community Conservation Agreements

2.1 *Generate conservation agreements with target communities* through a participatory process, linking technical assistance in livestock management to explicit community commitments to forest and biodiversity conservation outputs that are congruent with protected area conservation objectives.

2.2 *Hold annual assembly meetings* in each community implementing a conservation agreement to present and discuss results achieved, challenges, and lessons learned (a total of 21 meetings, or one in each of seven communities annually for 3 years).

Output 3: Learning and Outreach

3.1. *Pre / post monitoring of livestock management practices and livelihoods indicators and biodiversity and forest conservation indicators* including knowledge, attitudes, practices, and productivity of livestock management, forest cover, avian diversity and abundance, medium and large sized mammals, and human-jaguar conflicts.

3.2. *Working paper* rigorously evaluating the effectiveness of sustainable ranching interventions on conservation and development impacts drafted, shared with all participating communities for feedback, and *one article completed and submitted for publication* in a peer-reviewed scientific journal by year 3.

3.3 *Disseminate informational material* highlighting results and lessons learned to share with institutions working in and impacting the Mosquitia. Share information about conservation agreements more widely in electronic form on social networks, websites, and through partner institution networks and deliver written reports to relevant actors, including four separate presentations delivered to relevant local and national leaders.

Annex 3: Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Gender of people (if relevant)	Nationality of people (if relevant)	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	Total to date	Total planned during the project
Established codes									
4a, 4b	Number of undergraduates receiving training		Honduras	4camer a trap installation and bird evaluations	1 undergraduate student Nicaragua's National Agricultural University		4	15	
5	Number of people to receive at least one year of training (field work and analysis one year)		Nicaragua and Honduras	53 Nicaragua, 6 people project operations, 47 farmers	66 people Honduras			119	119
6a, 6b	Number of people receiving training in diagnosis and treatment of health issues in livestock		Nicaragua	58 people in workshops			58	80	
6a, 6b	Number of people getting additional training and capacity building systematic sampling of fauna		Nicaragua and Honduras	12 people, 7 beneficiaries and 5 parabiologists	6 parabiologists Honduras			12	24
6a, 6b	Number of people receiving training in the management of silvopastoral systems and improved pastures		Nicaragua	47				47	58
6a, 6b	Number of people receiving training in diagnosis and treatment of health issues in livestock		Honduras		39 people			39	67

6a, 6b	Number of people getting additional training and capacity building systematic sampling of fauna		Honduras		8 birds Honduras, 6 mammals via camera traps			14	12
6a,6b	Number of people receiving training in the management of silopastoral systems and improved pastures		Honduras		67			67	67
9	Number of species/habitat plans produced for governments, public authorities, or other implementing agencies in the host country		Nicaragua		3			3	3
9	Number of species/habitat plans produced for governments, public authorities, or other implementing agencies in the host country		Honduras						2
12a	Number of computer based data bases to be established and handed over to the host country								2
14s	Number of conferences/seminars/workshops to be organized to preset/disseminate findings		Nicaragua and Honduras		4 formal presentations in Nicaragua, 1 informal albeit with Vice Minister			5	4 territorial and national conferences to present results
14b	Number of conferences/seminars/workshops to be attended at which findings from Darwin project work will be presented/disseminated								3
22	Number of permanent field plots and sites to be established			23 Nicaragua, 16 camera	21 Honduras, 18 camera			44	48

	during project and continued after Darwin funding has ceased.			traps, 7 bird sites	traps, 3 bird sites			
23 value of resources raised from other source s (e.g in additio nl to Darwi n fundin g) for project work				Secured \$43,000 Liz Claiborn e and Art Ortenbe rg Foundat ion; inkind contribu tion Yale Environ mental Protecti on Clinic \$10,000 \$5,000 private donor Tom Plant	Secure d ~ \$35,000 CAFTA DR adminis tered by DOS, secured ~ \$109,00 0 Migrato ry Bird Coinser vation Funds USFWS via Americ an Bird Conser vancy, secure \$6,000 Souther n Wings funds via Americ an Bird Conser vancy, receive d \$5,00 Tom Plant Private Donor	Secured ~ \$157k DoS INL - both countrie s, Secured >\$19.8k addition al WCS personn el DoS CAFTA DR Hondura s, also spent ~ \$28k CAFTA DR Nicarag ua, Also spent USFWS \$5k both countrie s	\$213 ,000	

Table 2: Publications

Please see Annex 11

Annex 4 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

Please find attached in a zip file the following supporting material:

- Annex 1 Figures A-H maps of bi-national project location intervention sites and a jaguar photo
- Annex 2- 23-014 Darwin change request Oct 2017, 7 communities to 19, and one year NC extension
- Annex 3 Silvopastoral Systems Nicaragua
- Annex 4 annual meetings Nicaragua
- Annex 5 avian evaluations Honduras
- Annex 6 mammal evaluations Honduras
- Annex 7 KSTBeneficiaries_Conservation_Agreement_signed
- Annex 8 MITKBeneficiaries_Conservation_Agreement_signed
- Annex 9 MSBuBeneficiaries_Conservation_Agreement_signed
- Annex 10 maps of biological evaluations mammals and birds Nicaragua
- Annex 11 list of publications.

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	X
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	X
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number. However, we would expect that most material will now be electronic.	
Have you involved your partners in preparation of the report and named the main contributors	X
Have you completed the Project Expenditure table fully?	X
Do not include claim forms or other communications with this report.	