



Darwin Initiative Main 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
Contract holder institution	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 2017 – Mar 2018) and number (e.g., Annual Report 1, 2, 3)	1 April 2017 – 31 March 2020 Annual Report 2
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**

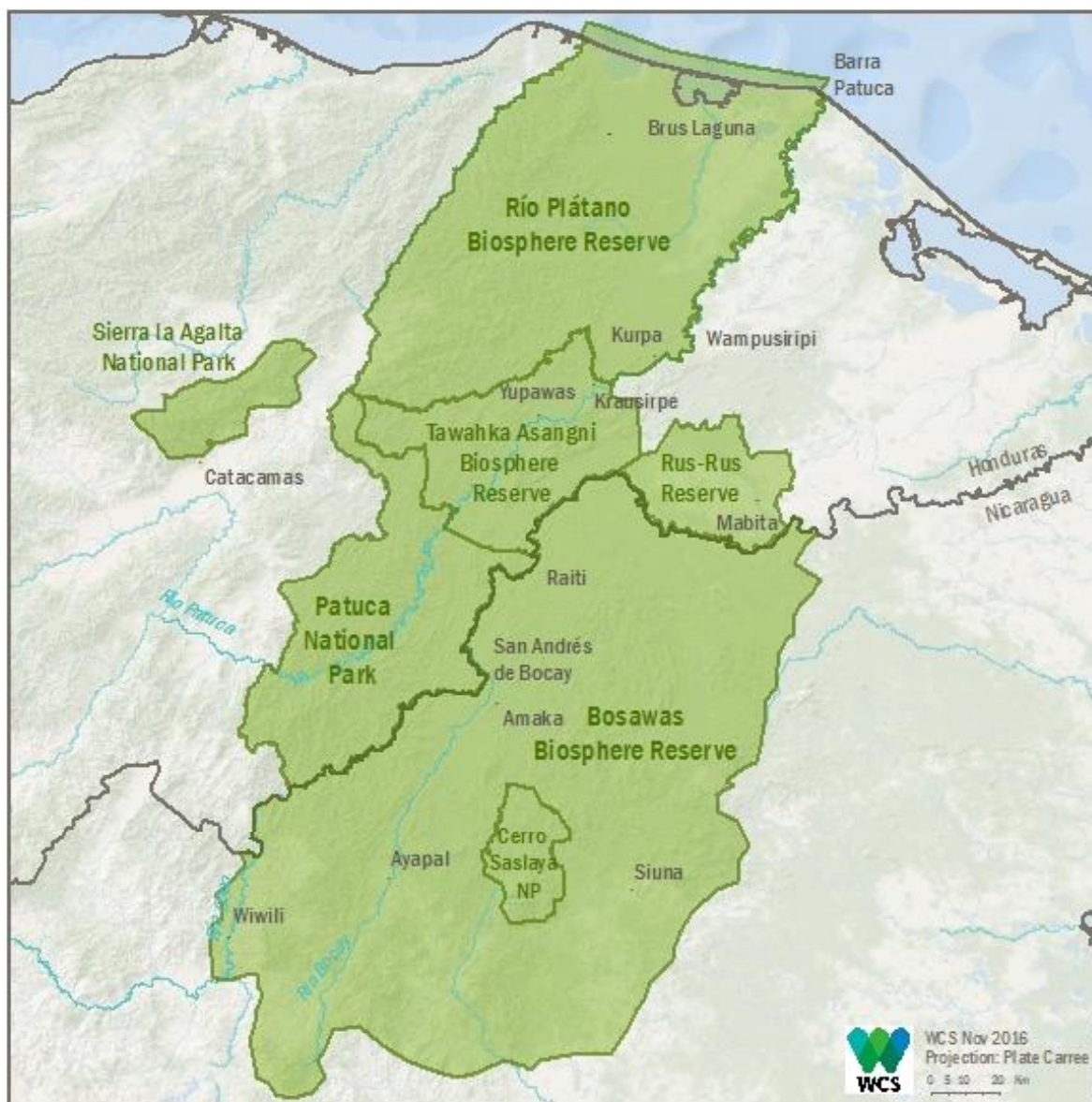


Figure 1. Map of project location.

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 2 to plan and propel project activities forward.

During Year 2 we were also in close communication with the Honduran national and field coordinators of a GIZ project entitled “Conservation of Biological Diversity and Local Development in the Mesoamerican Biological Corridor”, a large-scale initiative with complementary objectives and overlapping project sites. 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 such as the Honduran Secretariat of Energy, Natural Resources, Environment and Mines (MiAmbiente), 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 challenges from externalities. The series of delays in Honduras in Year 1 included a student strike that closed the university, resulting in administrative delays totalling several months. We submitted a change request form to use Year 1 funds for Honduras in Year 2, which was approved, and progress was vigorously resumed. We also submitted a request for a no-cost extension for one year to ensure adequate time to complete the tasks. Later in Year 2, widespread national turbulence associated with a contested election resulted in a new round of administrative delays of several months. Due to the obstacles in Honduras the approved one year no cost extension will be vital for fully achieving project outcomes (**Annex 2**).

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 had 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. We produced a socio-economic report of the established baseline knowledge, attitudes, and practices regarding farming, livestock condition, livestock management and challenges, nutritional status

in households, economic priorities, human-wildlife conflicts pertaining to agriculture and sources of livestock losses, preferred game meat, hunting locations, and spatial trends in game distribution (**Annex 3**). In Honduras, similar questionnaires were delivered to 72 ranchers in Year 2 and summarized and analysed in a socio-economic report (**Annexes 4 & 5**).

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, with participation from 58 people in the three territories. We engaged 47 project beneficiaries in constructing fences, initiating nurseries for nitrogen-fixing live fences, and obtained grass seed to improve pastures, with the goal of improving production of livestock in smaller areas while simultaneously increasing health and nutrition (**Annex 6**). During Year 2, we reviewed the performance of each individual system 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 also assessed progress in five annual meetings held across six communities, involving 79 people, 42% female, 58% male.

In Honduras, we 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) (**Annexes 7, and 8**). A five-member project committee was formed in each community to ensure continuity (**Annexes 7 and 8**).

In August materials for improvements were delivered to 66 farms managed by 83 families, and conservation agreements signed for all. The sum from the two countries is 47 families in Nicaragua and 83 in Honduras, making a total of 130 families involved in 21 communities (**see Annexes 9, 10, 11 for Conservation Agreements Nicaragua**).

In December veterinarian training was delivered to the following four communities: Krausirpe (10 people), Nueva Esperanza (7), Tukrun (6), Kurhpa (16), for a total of 39 (**Annex 12**)

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 9,10,11**). 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, and 130 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 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.

In Year 1 and 2, we primarily focused on project initiation and implementation, establishing the socio-economic and biological baselines to record impacts the project will make and initiating

the interventions. The baseline questionnaires described in Output 1, above, will measure impact in livestock practices, and poverty reduction. The baseline has been summarized and analysed for both countries. In Nicaragua we have also followed up with personal visits to all improved systems, and taken photographs and coordinates to map and assess progress over the project's duration (**Annex 6**).

Below we describe some of the biological baselines:

Activity 3.1: In both countries, baseline biological evaluation for mammals were established through 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 (**Annex 1**) A total of 12 such lines, involving 34 camera traps radiated out from farming systems. In Nicaragua 25 species of large/medium sized mammals were registered. The data were 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. In total there were eight jaguar observations, six in areas of high human disturbance and two at medium-level (**Annex 13**). These results, while somewhat counter-intuitive, provide testimony to the effectiveness of the indigenous territories in defending forests and wildlife. Political instability delayed complete retrieval of cameras and analysis of the data from Honduras, but preliminary analyses indicate that wild carnivores became more diverse and large herbivores more abundant farther from the communities and livestock management systems (**Annexes 14 & 15**). 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.

Avian evaluations in Nicaragua included seven areas where livestock management improvements are taking place, with sampling between November and March (to include over wintering migratory species) during Year 1 through mist netting and point count stations in three habitats: pasture regenerating secondary vegetation and tall forest. During Year 2 in Honduras, three stations were established along similar gradients in November, but remarkable instability ensued due to a hotly contested national election, and more stations could not be established during the period when migratory birds are present. Despite that, 10 avian sampling stations were established between the two countries, and we have initiated a large bi-national grant with American Bird Conservancy, with funds assigned to avian monitoring in Patuca and another opportunity to establish more stations. 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. Analyses for Nicaragua have been completed, and 9 avian indicator species selected (**Annexes 16 & 17**). Currently a pooled analyses of avian data from both countries is underway.

Using remote sensing we determined that the baseline 2005/6 – 2016 deforestation rate between the two countries over a 10.75-year period was 667ha per year. In order to achieve a 30% reduction, as we promised in the proposal would require no more than 467 ha deforested during our project period. We conducted this analyses based upon 2.6km radius buffers around key communities (**Annex 1, Figures J & K**) that sum to 41,000ha. Out of curiosity we also evaluated buffers of 6km radius (length of our camera trapping transects) that covered a total of 136,000 ha. Baseline annual average over 10.75 years was 1,350ha and to achieve a reduction of 30%, the annual average during the project cannot be over 945ha.). Proportionally there is more area in buffers in Nicaragua, since there are 16 communities in Nicaragua compared to 5 in Honduras, but deforestation rates in the pooled buffer of 41,000ha are similar in the two countries (24% both, 18.4% Honduras, 24.6% Nicaragua). On a smaller scale, based upon questionnaires in Nicaragua, 97% of the farmers have forest in their farms, and the averages are 66% forest, 20% tacotal/guamil (second growth), and 14% pasture.

3.2 Progress towards project Outputs

Output 1. Improved livestock management:

In two years, we delivered training in how to establish silvopastoral systems, improve pastures and diagnose and treat cattle health issues conditioned on community 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 (**Annexes 1, 3,4,5,6,7,8, 12**).

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. Next year we will start to measure impacts.

Output 2. Community Conservation Agreements:

During the last two years we developed and signed explicit conservation agreements with 130 families, 21 communities, three protected areas, four ethnic groups, and two countries (**Annexes 9,10,11**). 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 two 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 30 meetings with leaders and communities, 18 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 logistically 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 through 15 meetings and workshops to deliver expertise in agroforestry/silvopastoral systems, materials for improvements, and conservation agreements. Project beneficiaries (farmers) assisted with placement and protection of camera traps for biological baselines. The local Tawahka, Miskitu, and Mayanga associations across the two countries have been intimately involved in project development and execution. 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. This project has 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.

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 has been 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.

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 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. Avian data from Honduras is being added to the Nicaragua avian analyses, which identified 9 bird species as indicators of forest conservation and recovery. In a similar manner, the mammal data from camera traps will be combined across the countries, for one combined bi-national analysis. Post-election turbulence and associated administrative delays resulted in less intensive avian sampling than desired in Honduras, but we will be able to compensate with avian sampling supported by the American Bird Conservancy. Despite the challenges in Honduras, we have established a solid quantitative baseline. 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 (**Annex 13**). Nine species of birds were selected as indicators of recovery, six via mist nets, three via point counts (**Annex 16**).

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 for 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 higher. It is too early to assess trends in reduced attack on cattle.

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 we have 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. (ANNEXES 3, 4, & 5). This is a solid baseline, and we believe that production and conservation trends can be assessed during the next two years. 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.

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 design).* 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 measureable 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, measureable 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, developed agreements, and enabled us to secure additional, complementary funding for critical on-the-ground needs, including patrols along territorial boundaries (through the Department of State CAFTA-DR grant), and biological surveys (through the Liz Claiborne and Art Ortenberg Foundation). We have leveraged this work to explore opportunities to strengthen and expand our impact, including work in other areas of Bosawas on migratory birds, cacao, cattle, and connectivity, ecotourism possibilities, and additional protected area law enforcement efforts through a joint approved project with ABC to the U.S. Fish and Wildlife Service that we are about to launch. We also 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.

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 use; strengthen local capacity for territorial planning and management; and enhance the benefits of water provision services for vulnerable rural livelihoods. Through technical assistance conditioned on conservation agreements we aim to reduce pressures in biodiversity and promoting 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 130 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. This is the end of Year 2 of the project, which now extends 4 years, and we

expect to evaluate and document our impact either at before project conclusion or at project end.

7. Project support to gender equality issues

Despite our goal of 40% women involvement in the project, 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.

8. Monitoring and evaluation

We are currently at the mid-point of what is now a four-year project. Detailed diagnostics have been conducted, summarized, and analysed in both countries, which stand as solid baselines to measure project impacts (**Annexes 1, 3,4,5, 13,14, 15, 16 17**). Detailed expert driven avian and mammal sampling is 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, with the sole exception that we did not sample as many bird stations in Honduras as preferred. Despite this setback, which was due to post-election turbulence, we still had 10 bird sampling stations across the bi-national area, 12 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 and things are going well.

9. Lessons learnt

One challenge in Year 2 in Honduras was administrative delays associated with a hotly contested national election in Honduras. The transition to new key administrative personnel was delayed several months which did reduce our ability to conduct January-March avian sampling at the desired depth.

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

In response to annual report reviewer feedback, we provided: 1) an explanation for the shift in project outcome indicator targets; and 2) requested a one-year extension of the project, following the reviewer recommendation (Annex 2). The adjustment of the outcome indicator targets was to more accurately reflect the project outcomes from 200 to 130 project beneficiaries, but an increase in communities from 7 to 19 (Annex 2), now 21, and increase in hectares in conservation agreements from 40,000 to 280,000 hectares. Although the number of direct beneficiaries was slightly reduced, through collaboration with community leaders and selection of committed participants, we expanded the number of communities and the area impacted, which will increase the overall biodiversity and conservation agreement output targets of the project. Following the recommendation of the annual report reviewer in response to an overview of issues encountered in Honduras (described in the last Annual Report), we submitted a request for a one-year, no cost extension (Annex 2). We also secured additional leveraged resources, from donors including U.S. Department of State and U.S. Fish and Wildlife Service, that align with the revised project timeline and will help us achieve Darwin targets.

In ARR1, the AR1 reviewer inquired why only the National University of Honduras (UNAG) was listed as the sole official partner in AR1. The reviewer asked for an explanation of the

difference in that relationship from the other partners listed in the original proposal. The distinction is that technically, in the original proposal budget, UNAG is the partner organization, budget is allocated and we report on that budget. The direct funding and reporting relationship that we have with the UNAG makes it somewhat unique from other partners.

However, we do actively partner with the three Nicaraguan indigenous territories listed in the proposal, work with the Ministry of Environment and Natural Resources (MARENA), and collaborate with the environmental protection arm of the Nicaragua military, the Batallón Ecologico. In addition, we maintain contact and communication with MiAmbiente in Honduras, and through UNAG, liaison with indigenous and cattlemen's associations in Honduran Mosquitia (there are five committees of five, one established in each community).

As questioned by the AR1 reviewer, we have not been, according to original expectations working directly with the Honduran Red de Manejo del Bosque Latifoliado de Honduras (REMBLAH) or the Nicaraguan National University of Agriculture, both in the original proposal. In both cases we found we had adequate technical expertise, and carried through with the other partners but not with those two. That is some of the nature of starting a large project as it evolves and additional new working relationships evolve. For example, when submitting the proposal did not include letters from FITH (a Tawahka organization), or BAKINASTA (a Miskitu organization), but we are working closely with them.

The ARR1 Reviewer inquired how relationships with the partners are managed? How often meetings take place, how relationships and maintained and decisions made.

We supervise and maintain relationships with partners using a nested hierarchy of communication, ranging from in-person liaisons and management in field to phone/WhatsApp to for project execution in each country. Project Director Polisar communicates directly with field director Fabricio Diaz Santos in Nicaragua who in turn communicates with partners and field personnel. Project Director Polisar communicates with Juan Pablo Suazo in Honduras who communicates with UNAG alumni and field collaborators working with them. Project Leader Polisar has been with UNAG five times in Year 2, and WCS has advised UNAG personnel technically, remote, in town, and in field. We met with MiAmbiente in their headquarters one time in Year 2, and have met with sister agency ICF personnel two times in Olancho, and one time in Tegucigalpa. Communication with indigenous partners in Nicaragua is frequent, in the territories and in Managua.

The reviewer inquired about our falling short of the 40% inclusion women in the project (we reached 15%). We noted that comment and significantly increased the percentage of women participants in Nicaragua in Year 2 to 42% in meetings that evaluate the project's impact, and in training in human-wildlife conflict reduction.

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. This Darwin project provided the platform to build out a holistic programme.

11. Other comments on progress not covered elsewhere

We are now midway 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 is proving critical to our ability to move towards successful project completion and future sustainability. In Nicaragua, project activities have proceeded on time, but approximately

50% of the participants experienced difficulty in establishing improved pastures. This was analysed and findings indicate it is due to technicalities of how to distribute grass seed. The one-year extension will provide the opportunity for a second round of seed distribution for the remaining ~ 50% of the participants, and will help ensure 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) It also enabled complementary 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 funds managed by the U.S. Department of State, and additional funds from the USFWS Wildlife without Borders Program 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 this year, WCS has selected and hired a Nicaragua-Honduras bi-national director, who will provide our organization administrative support and coordination with government agencies and indigenous representatives in both countries. This will provide additional support and increase field execution efficacy. We now have office space inside the national ICF compound in Tegucigalpa, the capital city in Honduras. 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.

13. Darwin identity

The role of Darwin in supporting this work has been shared with the indigenous territories and government agencies, and was publicized through inclusion of logo and verbal mention in the following presentations in which Darwin support was recognized as part of a comprehensive effort at forest and wildlife conservation and livelihood improvements.

- National Congress of the Giant Mother Earth of the Nicaraguan Ministry of Environment and Natural Resources (MARENA), Volcán Masaya National Park, Nicaragua, 22 April, 2017.
- Presentation of research, interventions, and critical connections for bi-national forest connectivity to Vice Minister and Director of Protected Areas, MARENA, May 9, 2017.
- Forum on Conservation of Biological Diversity in Protected Areas. National Agricultural University, Managua, Nicaragua, event at University coordinated by MARENA. May 24, 2017.
- Regional Mesoamerican Congress Saving the Future of Mesoamerica's Largest Forests and their Inhabitants. Organization of American States, U.S. Fish and Wildlife Service, Wildlife Conservation Society, Petén, Guatemala, 11-14 July 2017.
- Four presentations in Scientific Week, University of the Autonomous Regions of the Caribbean Coast of Nicaragua (URRACAN), October 26-27, Siuna, Nicaragua
- Congress of good practices for facing the climate change, November 2017. Nicaraguan Ministry of Environment and Natural Resources, Best Western/Las Mercedes Hotel, Managua.

Project Leader Polisar has given an interview for an article in the American Bird Conservancy's magazine, which is in development.

14. Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2017 – 31 March 2018)

Project spend (indicative) since last annual report	2017/18 Grant (£)	2017/18 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)			6%	
Consultancy costs			0%	
Overhead Costs			-22%	The variance in this category was due to the savings we were able to make on the Office Costs expense line, in order to compensate for the overspend in other categories.
Travel and subsistence			6%	
Operating Costs			-1%	
Capital items (see below)			0%	
Monitoring & Evaluation (M&E)			16%	The overspend in this category was due to currency exchange losses on the Partner Organisation's side.
Others (see below)			4%	
TOTAL				

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2017-2018

Project summary	Measurable Indicators	Progress and Achievements April 2017 - March 2018	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>0.4 Local Livelihoods: At least 200 families will experience a 50%</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. Avian baseline established with 10 stations combining mist-netting and point counts.</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</p>	<p>0.1 We will start to assemble and analyse current rates of forest change</p> <p>0.2 We will synthesize the bi-national avian baseline into one report. We will pool camera trap data analyses across the two countries and create one unified document. We also anticipate re-sampling – both birds and mammals during the next period, in both countries.</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>increase in livestock productivity due to integrated livestock management (including market value and availability for local consumption and subsistence)</p>	<p>executed by local coordinators with 144 people responding.</p> <p>0.4 Goal was changed to 130 families through a request change form and we have engaged that number with training and farm improvements. 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 have trained 130 families and obtained 42% participation of women in Nicaragua. This represents progress towards Indicator 1.2. Evidence is provided in Annex 6).</p> <p>1.2 We have worked directly with 21 target communities. This represents a 3 x expansion over the indicator. The project period is now 4 years, this report represents the mid-point and while we have documented progress in improved management techniques (Annex 6), 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 practices regarding livestock condition, livestock management, forest clearing, human-jaguar conflicts, sources of livestock losses, nutritional status in households, hunting practices and locations.</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, analysed with information from 147 respondents. Respondents were not 40% women, but recognizing that deficiency, we are rectifying and the first annual reviews held in Nicaragua included 42% women. During the next period, in Honduras we will review progress and challenges in the five communities, ensure greater engagement by entire family/household, including women. In both countries we will prepare for the final questionnaire based diagnostic to assess project impact.</p>

<p>Activity 1.2 <i>Deliver capacity-building training in participatory livestock management improvements.</i> 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 (Annexes 7,8,12). During annual meetings and outreach, methods to reduce human-carnivore conflicts have been shared and discussed (Annex 6). 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 <i>Conduct exchange visits to participating farms,</i> 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 (Annexes 3,4,5,6,7,8,12).</p>
<p>Activity 2.1. <i>Generate conservation agreements with target communities</i> 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. <i>Hold annual assembly meetings</i> 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 have just completed the first annual reviews, which was a total of 6 meetings, with representatives from 16 communities. Due to delays in Honduras, we launched this Year and have thus far not conducted any annual review meetings. Between the two countries, we conducted 21 meetings in Year 2.</p>	
<p>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</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</p>	<p>Activity planned for Year 4.</p>

<p>lessons learned to nearby communities, agricultural and protected area agencies, and across the entire NGO, Multilateral, and government community.</p>	<p>community level by years 1 and 3, respectively. 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. 3.3 Written reports delivered to relevant actors and four presentations are given to local and national leaders by year 3.</p>	
<p>Activity 3.1. <i>Pre / post monitoring of livestock management practices and livelihoods indicators and biodiversity and forest conservation indicators</i> including knowledge, attitudes, practices, and productivity of livestock management, forest cover, avian diversity and abundance, medium and large sized mammals, and human-jaguar conflicts.</p>	<p>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)</p>	
<p>Activity 3.2. <i>Working paper</i> rigorously evaluating the effectiveness of sustainable ranching interventions on conservation and development impacts drafted, shared with all participating communities for feedback, and <i>one article completed and submitted for publication</i> in a peer-reviewed scientific journal by year 3.</p>	<p>Activity planned for Year 4.</p>	
<p>3.3 <i>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</p>	<p>Activity planned for Year 4.</p>	

through partner institution networks and deliver written reports to relevant actors, including four separate presentations delivered to relevant local and national leaders.

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.			
<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>0.4 Local Livelihoods: At least 130 families will experience a 50% increase</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>

	in livestock productivity due to integrated livestock management (including market value and availability for local consumption and subsistence).		
Output 1 Improved livestock management and community conservation techniques adopted by at least 130 families in seven communities across four ethnic groups in four protected areas and two countries.	<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>	Number of households/ farms implementing integrated systems; number of people trained in ranch management plans and methods; notes 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.	Ranchers and vulnerable communities will be interested and incentivized to participate in project activities.
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>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>	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.
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	<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</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.	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).

NGO, Multilateral, and government community.	<p>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>		
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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		4 camera trap installation and bird evaluations			4	15
5	Number of people to receive at least one year of training (field work and analysis one year)		Nicaragua and Honduras	53 Nicaraguans, 6 people project operations, 47 farmers	66 people Hondurans			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 parasitologists Nicaragua				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 Hondurans, 6 mammals via			14	12

					camera traps				
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 present/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 during project and continued after Darwin fundig has ceased.			23 Nicaragua, 16 camera traps, 7 bird sites	21 Honduras, 18 camera traps, 3 bird sites			44	48
23	value of resources			Secured \$43,000 Liz Claiborne and	Secured ~ \$35,000 CAFTA DR			\$213,000	

raised from other sources (e.g. in addition to Darwin funding) for project work				Art Ortenberg Foundation; in-kind contribution Yale Environmental Protection Clinic \$10,000 \$5,000 prime donor Tom Plant	administered by DOS, secured ~ \$109,000 Miragtor y Bird Conservation Funds USFWS via American Bird Conservancy, secured \$6,000 Southern Wings funds via American Bird Conservancy, received \$5,000 Tom Plant Private Donor				
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In Table 2, provide full details of all publications and material produced over the last year that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Mark (*) all publications and other material that you have included with this report.

Table 2 Publications

Title	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. weblink or publisher if not available online)

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.	
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.	