



## 1. Darwin Project Information

Project Reference	17-022
Project Title	Conservation of the lowland savanna ecosystem in Belize.
Host Country	Belize
UK Contract Holder Institution	University of Edinburgh
Host country Partner Institution(s)	Environmental Research Institute (ERI) of the University of Belize, Belize Botanic Gardens (BBG), Programme for Belize (PFB), Government of Belize Forest Department (FD) and Belize Tropical Forest Services (BTFS)
Other Partner Institution(s)	Royal Botanic Garden Edinburgh (RBGE)
Darwin Grant Value	£ 287,951
Start/End dates of Project	1st April 2009 – 31st March 2012
Reporting period (1 Apr 200x to 31 Mar 200y) and annual report number (1,2,3..)	1st April 2010 – 31st March 2011. Second Annual Report.
Project Leader Name	Dr Neil Stuart
Project website	<a href="http://www.eeo.ed.ac.uk/sea-belize">http://www.eeo.ed.ac.uk/sea-belize</a>
Author(s) and main contributors, date	Dr Neil Stuart (UofE); Zoe Goodwin (RBGE); Dr Elma Kay and German Lopez (ERI); John Pixler (BBG). Jan Meerman, (BTFS). 30 <sup>th</sup> April 2011.

## 2. Project Background

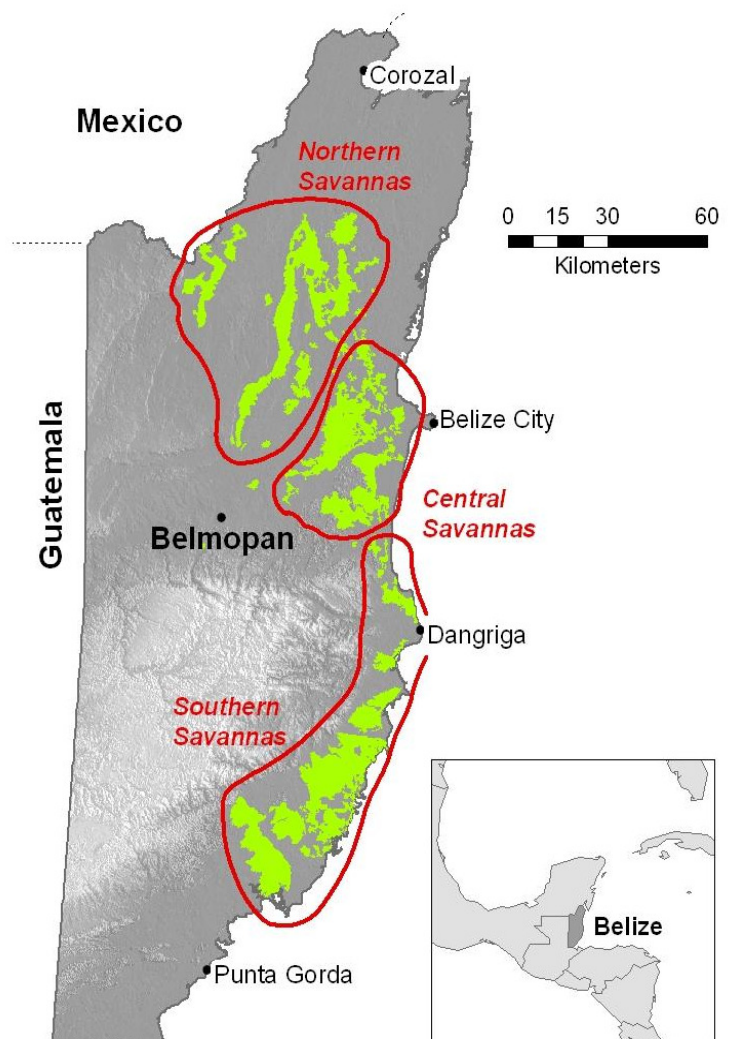
The savannas of Belize occupy about 10% of the country's land area, providing distinctive landscapes of ecological and economic value. Despite this, Belize's lowland savannas remain neglected in comparison with forests in terms of botanical research and land cover mapping. Gap analysis in 2005 suggested that savannas may be under-represented in the National Protected Areas System, because savannas are experiencing an increasing variety and severity of threats. There is pressure to burn and clear savannas for settlements, to create shrimp farms and for new roads. Despite their unsuitability, some savanna areas are being converted for agriculture. The Forest Department seeks to harvest pine, palms and other plant resources from savannas, but presently lacks the botanical information needed to ensure that harvesting does not negatively affect areas of high conservation value.

A key problem has been the insufficient information available on which to base a conservation strategy for savannas. There has never been a comprehensive botanical checklist of savanna species and information about species distributions was based on only a few main areas of plant collecting. Little was known about nationwide plant distributions of e.g. endemics, because prior to this project many savanna areas, particularly in the south, were unexplored botanically. Although a national herbarium had existed in the Forest Department for many years, it was under-resourced, with the result that specimens had not been correctly curated, named or data-based and so were of restricted value.

Belize's National Self-Assessment for UNDP (2005) had highlighted limited skills in plant identification and in monitoring and mapping as factors constraining local organisations from addressing Belize's responsibilities under the CBD to conserve the resources of this ecosystem.

The report to UNDP recommended the strengthening of in-country capacities in taxonomy, field botany and plant collection, together with the use of GPS/GIS technology to identify areas for conservation and to recognise gaps in the present National Protected Area System.

This project is responding to these needs by undertaking baseline botanical surveys, by producing an updated comprehensive mapping of the extent and condition of savannas and by providing training that will enhance the capacity of local organisations in Belize to maintain and continue this scientific research in the future.



Remaining savannas, identified from new satellite data were grouped into 3 regions for botanical survey.

### 3. Project Partnerships

#### 3.1 Existing Partnerships (refer to <http://www.eeo.ed.ac.uk/sea-belize/team.html>)

Our partners in Belize are the Environmental Research Institute (ERI) of the University of Belize (UB); Belize Botanic Gardens (BBG); Programme for Belize (Pfb), Belize Tropical Forest Services (BTFS) and the Government Forestry Department (FD). In the UK, the University of Edinburgh (UoE) co-ordinates the project and undertakes the savanna mapping work, whilst our partner organisation the Royal Botanic Garden Edinburgh (RBGE) leads the botanical surveying and training. This year the project employed one member of staff at RBGE (Zoe Goodwin, the UK Darwin Botanist) and one member of staff at the ERI in Belize (German Lopez, the Belize Darwin Botanist). Both these staff members were employed full time from 1st April 2010 – 31st March 2011. In addition, the project's GIS Specialist Iain Cameron continued to work full-time until 31<sup>st</sup> May 2010 to complete the production of the digital mapping. He was then employed on an ad-hoc basis during the remainder of the year to complete the

documentation and reporting of the mapping and to upgrade the project website to enable downloading of the mapping, documentation and other educational materials that were developed this year.

UB is our lead partner in Belize and specifically Dr Elma Kay and her colleagues at the ERI. The ERI was established during this Darwin project (January 2010) and seeks to undertake environmental research and monitoring to support conservation initiatives and CBD obligations in Belize. During this foundation period, the ERI has one staff member supported by this Darwin project (German Lopez - the Belizean Darwin Botanist) and another supported by Darwin project 17012. ERI acts as both a recipient and a provider of training, co-ordinating our training events in Belize and recruiting participants using its nationwide network. It hosts our project management meetings in Belize. The ERI will be the recipient of the botanical data collected by the project. The intention is for German Lopez to be trained sufficiently in plant collecting and curation that he will be able to give training, continue plant collecting and to maintain the collections in the national herbarium after the end of this project. During the project, ERI will assume responsibility for maintaining and disseminating botanical data and will incorporate project outputs into their Biology and Natural Resources Management programmes.

BBG is the most established botanical garden in Belize, with an education centre and the largest set of botanical reference material in the country. BBG's role in years 1 and 2 has been to establish a new attraction, the *Darwin Savanna Trail* at the Garden, which school groups and the general public will visit to learn about the savanna ecosystem. In year 3, BBG will develop educational materials to be given out to school children who visit this attraction and materials for use by school teachers.

PfB manage the largest area of protected lowland savanna in Belize and were the first NGO to develop a management plan for their savannas. This plan was informed by previous botanical collections made by RBGE and mapping from satellite data generated by UoE. The present nationwide project scales up this prior work in PfB's Rio Bravo area. PfB have already received our new digital mapping for the savannas under their protection and are presently evaluating this. PfB hosts some of our field based training courses at their Hill Bank Research Station. Staff from other partners attend these training courses at PfB and learn techniques they can take back to train others in their own organisation.

FD is the National Focal Point for the CBD in Belize, responsible for reporting Belize's progress in meeting its target for curbing biodiversity loss and reducing degradation of national ecosystems. FD is presently responsible for maintaining Belize's National Herbarium and has signed an MOU laying out a plan for the eventual transfer of the herbarium to a purpose built facility that the ERI plan to construct by 2020. In preparation for this eventual transfer to the ERI, the existing collections must be systematically re-organised, with the collections given more space by being expanded to occupy additional storage cabinets. The re-curation of the existing savanna plant specimens and the incorporation of specimens newly collected by our project will be one of the legacies of this Darwin project. As a member of the National Protected Areas Secretariat, FD can ensure that the outputs and recommendations from this project are communicated to government agencies including the Ministry of Natural Environment.

Regular contact is maintained with all our local partners by email and telephone and in person by our Belizean and UK staff. With UK staff spending a total of 27 weeks in Belize this year and our Darwin botanist being in Belize throughout the year (except for one month of training in the UK), it is possible to maintain regular communication with our partners. We hold two meetings a year of the project partners, one in the UK and one in Belize. The UK partners held two further meetings this year in Edinburgh to monitor overall progress, with additional staff meetings at roughly two-monthly intervals to report progress, adjust activity schedules and plan fieldwork. In the last year, the Director of the ERI and the Belize Darwin Botanist have both attended training opportunities in the UK and have both participated in project planning meetings held in the UK and in Belize.

### 3.2 New partnerships and collaborations

This year we were pleased to welcome Belize Tropical Forest Services (BTFS) as a new project partner. BTFS maintains the Belize Environmental Resource Data Service (BERDS), the *de facto* clearing house for all environmental data in Belize. BTFS has also produced the two previous editions of the National Ecosystems Maps for Belize in 2000 and 2005, which are widely used by NGOs and for national land use policy making. We have been working increasingly closely with BTFS over the last year since they agreed to be the custodian for the new savanna mapping produced by this project and pledged to maintain and disseminate the data within Belize. BTFS is leading a UNDP-commissioned project to create a *National Integrated Planning Framework for Land Resource Development* and a *National Land Use Policy* for the Government of Belize (<http://www.landusepolicy.bz/>). During year 3, BTFS will use the mapping produced from this Darwin project to inform the land suitability mapping in this government supported project. BTFS will then assimilate our mapping into the next edition of the National Ecosystems Map to be published in 2012.

During this second year, we have also developed closer collaborations with a number of NGOs operating in remoter parts of Belize. Our botanists have undertaken joint fieldwork with staff from the Toledo Institute for Development and Environment (TIDE) who manage the extensive savannas in the Payne's Creek Nature Reserve in the south of the country. TIDE offered their Ranger Station facility for us to use for our savanna plant identification training course in November 2010, which we delivered in conjunction with another NGO from the south of the country, the Belize Foundation for Research and Environmental Education (BFREE). This and other training courses were advertised to all NGOs in the country through the Association of Protected Areas Management Association (APAMO), who we maintain regular contact with and invite to our in-country meetings. Furthermore, on 19<sup>th</sup> May 2010, the Project PI and staff from BBG met with Mr Chris Aird, Chief Education Officer from the Ministry of Education, who approved our plans for educational materials to support the school curriculum and granted BBG permission to trial these in selected schools in the Cayo District in year 3 of the project.

In the UK this year we have developed closer collaborations with the Department of Plant Science at the University of Oxford. In June 2010, Dr Elma Kay from the ERI visited Oxford to take part in a course on plant databases and since January 2011 Dr Denis Filer and colleagues have assisted us to host the Darwin savanna plant database online at their well known site

We also maintain regular contact with the other DI project presently running in Belize (*17012: large mammal corridor project*). The PIs of both these Darwin projects (Stuart, Doncaster) gave talks together at the Annual Conference of the UK-Belize Association, held at the University of Oxford in September 2010. Staff from Darwin project 17012 routinely attend our partner meetings and training courses in Belize. The two projects co-operate in a number of ways, such as by sharing of our mapping and imagery and a recent proposal staff from project 17012 to assist us in creating a Fact Sheet about the mammals living within the savanna.

## 4. Project progress

### 4.1 Progress in carrying out project activities

Activity 1.1 Project website launched and periodically updated;

The project website (<http://www.eeo.ed.ac.uk/sea-belize>) was initially launched in July 2009 and is updated regularly by project staff with news items, educational materials and reports. The website was redesigned by Dr Iain Cameron during September 2010 to provide easier navigation and to make the growing number of resources being produced by the project more accessible for download. The website has proved an effective means for rapidly disseminating project information, such as news about project activities, advertising of training opportunities and for sharing resources with our colleagues in Belize. The website now has links to the new Savanna Ecosystem Map 2010 and the online Savanna Plant Database, as well as a growing number of photographic identification guides and educational fact sheets.

Activity 1.2 Annual meeting of project partners

There have been several meetings of project partners this year. Following bilateral meetings to review activities and plan budgets between the PI and each project partner from the 10<sup>th</sup>-12<sup>th</sup> May, the Annual Meeting of all project partners was held on 14<sup>th</sup> May 2010 at the University of Belize (Minutes attached as Appendix 11). A meeting of UK partners was held on 27<sup>th</sup> July 2010 to coincide with a visit to Edinburgh by Dr Kay, Director of the ERI, our lead partner. A second meeting of UK partners was held on 23<sup>rd</sup> February 2011 to coincide with a visit to the UK and allow attendance by the Belize Darwin Botanist, German Lopez.

### **Output 1 Enhancing capacity for field surveys, plant collecting and curating specimens.**

Activity 1.3 Plant diversity and vegetation habitat surveys conducted in lowland savanna areas;

This year the remaining botanical surveying work has been completed. Rapid botanical surveys were conducted at seventy lowland savanna sites by botanists Zoë Goodwin and German Lopez in two field seasons from April – June and from October – December 2010. At each site within an area of approximately 25 x 25m a full vegetation description and species list was compiled, with known species recorded and unknown or unusual species collected. This focused species list was augmented with wide patrolling around the core area. 600 plant specimen collections and around 2,000 species observations were made across the seventy survey sites (with a mean of 36 taxa recorded at each site). In January 2011, the Biodiversity and Taxonomy of Plants field course in Belize led by RBGE staff and the Belizean Darwin Botanist collected quantitative data on pine woodland structure supervised by project staff, in addition to collecting a further 62 plant specimens from the savanna and surrounding forest.

Collecting activity is described in greater detail in the *Second Annual Report* supplied separately by RBGE and in their *Report on Year 2 Field Work* that forms Appendix 1.

Activity 1.4 Live plant collecting for the Belize Botanic Garden Trail

During field seasons from April – June and from October – December 2010, Zoë Goodwin and German Lopez assisted four staff members from Belize Botanic Gardens (BBG) to make five field excursions to collect live plants for the Savanna Trail at BBG and to identify further species found to have self-seeded naturally along the Trail. Apart from minor collecting that must be anticipated next year to replace plants that perish, this activity is now considered complete. Further details are described in the attached *BBG Annual Report 2010*.

Activity 1.5 Determination of savanna collections using UK herbaria and research literature;

Over 300 further savanna specimens in the existing savanna collections held at RBGE and BRH have been identified by Zoë Goodwin and German Lopez during year 2. One week was spent consulting the savanna collections of the NHM in London to aid determinations. During February 2011, the Belizean Botanist spent a week at the NHM in London and two weeks in the RBGE herbarium in Edinburgh increasing his understanding of herbarium procedures. This second visit to the UK was made possible due to overall cost savings made within the project. These periods of training in the UK have proven particularly valuable in developing the Belizean botanist's skills and understanding of the functioning of large herbaria.

Activity 1.6 Re-curating savanna collections at the Belize National Herbarium

This activity was started in April–June 2010, with 800 specimens re-curated, equivalent to approximately 1 herbarium cabinet (For details of species and families, see Appendix 2). This work was continued throughout October–December 2010 when a further 6 of the 11 cabinets were completely curated, totalling 3,800 herbarium specimens from Acanthaceae to Melastomataceae (112 families). In addition 1,200 recently mounted savanna specimens were incorporated into the collection. The expansion and re-curation of these collections means that the material previously held in 7 cabinets now occupies 12 cabinets. Re-curation work will be completed in year 3. Work to date is described in Appendix 3.

Activity 1.7 Developing the Belize savanna plant database

In year 1, collection data for some 4000 pre-existing savanna specimens were collated and imported into a database from three herbaria: Missouri Botanical Garden (MO), RBGE (E) and the Natural History Museum, London (BM). This year, additional specimen information has been added to the Belize savanna plants database to give a total of 5,409 specimens for 4,640 botanical records. The specimens in the database are now derived from records from nine institutions. For seven botanical institutions the data was derived from online resources (most of the data from Edinburgh and Missouri was obtained in year 1); the data from the British Museum and Belmopan is from specimens seen. Data from the Belmopan Herbarium (BRH) is the main addition in year 2. Further details are in RBGE's *Second Annual Report*.

Activity 1.8 Training in plant identification, taxonomy, herbarium use and field survey.

A total of 75 person-days of botanical training were delivered to Belizeans during year 2. Eleven local professionals attended the *Introduction to the Vascular Plants of the Belizean Savanna* course run in November 2010 for three days (Appendix 4). A newly developed course in *Botanical Resources for Conservation and Taxonomy* was run at the ERI in January 2011 for three days and was attended by four Belizean professionals (Appendix 5) including the Darwin Botanist, German Lopez. Three Belizeans received 10 days of botanical training from UK staff during the RBGE *MSc Biodiversity & Taxonomy of Plants* field course in January 2011 (Appendix 6). The feedback from all three courses was very positive. In particular, resources such as the photographic guides to plant identification that have been developed by the project were found to be particularly valuable for teaching plant identification to rangers and other NGO staff who have no formal taxonomic experience. Appendices 4-6 provide example materials used in these courses and summarise the feedback obtained from the attendees.

At the request of the ERI, UoE staff led by Duncan Moss who works for the Ordnance Survey provided training from 19-21<sup>st</sup> May to four staff members in setting out plots using GPS and in general field surveying methods. This training has subsequently been used by the ERI to set up plots for long-term monitoring of mangroves. Also, from 21<sup>st</sup> May-2<sup>nd</sup> June 2010, the Belizean Darwin Botanist received in-country training in soil surveying from UoE staff.

The Belizean Botanist German Lopez has also received ongoing experiential training from the UK Darwin botanist throughout the year, particularly through joint field collecting, but also more formally through a 4 week visit to the UK in February 2011 to gain experience working in the herbaria of the Natural History Museum in London and the RBG Edinburgh. German Lopez also received training in forestry stock assessment methods, including tree mensuration for carbon stock assessment from another in-country partner, the Forest Department. Further details of this training are described in the *ERI Annual Report*.

#### Activity 1.9 Database available on-line

A copy of the savanna plant database was made available online in March 2010, hosted by the Department of Plant Sciences, University of Oxford on the BRAHMS online website (<http://www.ox.ac.uk/bol/seabelize/>). We are grateful to Denis Filer for making this possible. A link has been posted on the project website. It is anticipated that the copy of the database hosted by the University of Oxford will be the final archive version of the database representing the outputs of the Darwin project, whilst a second copy of the database which we have recently delivered to the ERI will continue to be updated and maintained beyond the end of the project by the ERI (<http://www.eriub.org/>).

### **Output 2 Checklist of savanna plants highlighting threatened rare and endemic species.**

#### Activity 2.1 Developing a checklist of savanna plants

A checklist of Belizean savanna plants has now been prepared for a peer-reviewed publication. The checklist will be published in year 3 as an article discussing the classification of the Belizean savanna, its past collection history, collection patterns and species of conservation importance. The checklist will provide an indication of habit (tree, shrub, herb etc), habitat preference (forest, savanna, wetland etc) and a list of voucher specimens by district and geographical location (A near-final version of the full checklist is supplied at Appendix 7).

### **Output 3 Updated mapping of savanna habitats to support field collecting and identification of priority areas for conservation**

#### Activity 3.1 Mapping of savanna areas to guide field data collection;

Following a 'soft launch' at the *First Annual Belize GIS User Conference* on 26th January 2011 (<http://www.gis.com.bz/>), where the project was represented by Jan Meerman of BTFS, the new mapping of the lowland savannas (now entitled the Savanna Ecosystem Map 2010) by Iain Cameron at UoE was published on [http://www.eeo.ed.ac.uk/sea-belize/savanna\\_map.html](http://www.eeo.ed.ac.uk/sea-belize/savanna_map.html) and also on the Belize Environmental and Resource Data Service of Belize (BERDS) website <http://www.biodiversity.bz/find/resource/profile.phtml?dcid=121384>

The Savanna Ecosystem Map 2010 is provided as ESRI shapefiles and as Google Earth KML. The mapping comes with full metadata, *Release Notes* to help users get started with the mapping quickly and a *Technical Report* which explains how the mapping was made.

Activity 3.1 was completed in February 2011 with the handover of the digital mapping to BTFS.

#### Activity 3.2 Mapping of plant diversity and habitat variety to support recommendations for priority conservation areas within the lowland savannas;

UoE have now carried out overlay analysis of the Savanna Ecosystems Map 2010 with a variety of other geographical data sets including elevation and drainage, the locations of roads and settlements, agricultural and aquaculture developments and land ownership data in order



to determine which of the remaining areas of savanna are not presently within protected areas and which may be at greater risk of degradation. The first stage has been to calculate the proportion of the remaining savanna areas that are within protected areas. This analysis has been completed, with savanna areas broken down nationally according to protected area and also by major watershed. (Appendix 10 presents an example of such analysis).

The project planning meeting on 27<sup>th</sup> July 2010 agreed that due to the good progress with Activity 3.1 and with the new partnership established with BTFS during year 2, it would be beneficial to continue Activity 3.2 during year 3 with further work to ensure the Savanna Ecosystem Map 2010 is assimilated into national land use and conservation policies and plans. BTFS have recently agreed to further validate the mapping, to use it in formulating the National Land Use Policy for the Government of Belize (<http://www.landusepolicy.bz>) and to assimilate it into the National Ecosystems Map of Belize in 2012.

#### Activity 3.4 Consultative Workshop on Savanna Biodiversity and Conservation Priorities.

UofE and RBGE will produce in year 3 maps of the distribution of rare, endemic and other important savanna species and investigate botanical distributions within the savannas. The partners have agreed that this mapping should be presented along with botanical and other biological information about the fauna of the savannas to a Consultative Meeting of researchers and land managers in Belize during year 3. The aim of this meeting will be to exchange knowledge so that diverse and otherwise valuable areas of the savannas may be recognised and the scope and mechanisms for protecting them can be discussed in relation to initiatives such as the National Land Use Strategy (NLUS).

This workshop has been arranged for 13<sup>th</sup> April 2011 at the Tropical Education Center at Belize Zoo. A report from this meeting, including recommendations for savanna areas of high conservation value will be drafted by BTFS (who are leading the NLUS) for review by the invitees to the meeting (Activity 3.3). The finalised report will then be sent Forest Department and to the Government's National Protected Areas Secretariat (Activity 3.5).

#### Output 4 Reports, Papers and other outputs.

Four major project reports were written this year. Two reports have been written for the Government of Belize Forest Department describing progress with the re-curation work in the National Herbarium (September 2010, appendix 2; March 2011, Appendix 3).

In September 2010, a report on the savanna mapping was submitted to Planet Action, as a condition of their supply to us of satellite imagery. The report was reviewed by Planet Action and featured on their website as an example project for several months. The project report is at <http://www.planet-action.org/web/88-project-publications.php?type=contributions&projectID=2831>

In February 2011, we published a comprehensive Technical Report describing the creation and intended uses for the Savanna Ecosystem Map, as well as a set of Release Notes at [http://www.eeo.ed.ac.uk/sea-belize/data/sav\\_eco\\_2011/sea-belize\\_sav-eco-map-2011\\_tech-report.pdf](http://www.eeo.ed.ac.uk/sea-belize/data/sav_eco_2011/sea-belize_sav-eco-map-2011_tech-report.pdf)

A poster paper entitled "Botanical Surveys of the Belizean Savannas" was presented at the Annual Natural Resource Management Symposium in Belize by German Lopez, the Darwin Botanist on 17<sup>th</sup> August 2010.

Between May – August 2010 three Masters Dissertations supervised by project staff were successfully completed, providing supplementary scientific data that was handed over to the ERI in Oct 2010:

1. Alex Trevaskis 'Extent to which soil properties contribute to oak (*Quercus oleoides* Schltld. & Cham.) distribution within the lowland savannas of Belize' (Supervisors: Furley, Harris, Haston & Goodwin)



2. Lizzie Oldroyd 'Illustrated user-friendly identification key to the Cyperaceae of Belize' (Supervisors: Harris, Haston & Goodwin).
3. Jason van Warmerdam 'Comparing MODIS Active Fire and Burnt Area products for detecting fire in the ecosystems of Belize' (Supervisors: Stuart & Cameron)

The identification key produced by Lizzie Oldroyd has been extensively field tested in Belize to great success by students of the MSc field course and by project staff on the specimens collected during the project. The data collected by Alex Trevaskis will be combined with further field work conducted in April 2011 by Prof. Furley and vegetation data gathered throughout the project by Zoë Goodwin and German Lopez to produce a paper on savanna soil relationships in Belize. The burnt areas mapped by Jason van Warmerdam will be used to assess the frequency of fires within the lowland savanna compared to other ecosystems in Belize.

The project presented two posters and made an oral presentation on the 24<sup>th</sup> September 2010 at the 13<sup>th</sup> Annual Conference of the UKBA Association at the University of Oxford, in an afternoon session shared with a presentation by Dr Doncaster, PI of Darwin Project 17012. The posters are [http://www.eeo.ed.ac.uk/sea-belize/outputs/posters/ukbza\\_savmap\\_2010.pdf](http://www.eeo.ed.ac.uk/sea-belize/outputs/posters/ukbza_savmap_2010.pdf) and [http://www.eeo.ed.ac.uk/sea-belize/outputs/posters/ukbza\\_botany\\_2010.pdf](http://www.eeo.ed.ac.uk/sea-belize/outputs/posters/ukbza_botany_2010.pdf) whilst a news item about the meeting is at <http://www.geos.ed.ac.uk/research/eo/sea-belize/news.html>

The project botanists were featured by the Belize press and radio during the year. One feature published in the *San Pedro Sun* newspaper is available at <http://sanpedrosun.net/old/10-224.html>

#### Activity 4.1 Paper on flora of Belizean savannas written and (Activity 4.2) submitted

The results of a survey of one disjunct area of savanna within the Chiquibul Forest Reserve was revised, updated and completed by Zoë Goodwin and submitted to *Edinburgh Journal of Botany* in March 2010. The paper describes the San Pastor Savanna, a disjunct patch of savanna in the Chiquibul Forest of Belize; 125 species of vascular plants were found including one new species for the country and 28 species new to the Chiquibul. The paper also states the case for a full investigation into the savanna flora of Belize, which is currently in progress. (See Appendix 7). This paper was accepted in August 2010 by *Edinburgh Journal of Botany*. It has been revised to address reviewers' comments and is due to be published early in project year 3.

#### Output 5 Photographic Field Guide to the savanna flora created and published online

##### Activity 5.1 Photographic field guide to savanna plants developed and field tested

Several photographic guides to the savanna plants have been developed during year 2. One photoguide for casual users is supplied in Appendix 9 as an illustration. The photoguides have proved to be a useful teaching aid for both undergraduate students and for protected area wardens, allowing non-specialists to perform field identifications of common species.

Positive feedback from field-testing such during the field course in November 2010 encouraged the supplementary development of a more technical field guide that includes leaves and other distinguishing characters, in addition to existing flower-based guides. A positive response was also received to the *Photoguide to Endemic or Rare Savanna Species* that was field-tested this year by several protected area management organisations. Laminated copies of the *Casual User* and *Endemic Plant* photoguides were provided this year to attendees of the *Introduction to the Vascular Plants of the Belizean Savanna* and the *Botanical Resources for Conservation and Taxonomy* courses.

These photoguides also proved extremely useful for training in plant identification (see Activity 1.8) during the *Introduction to the Vascular Plants of the Belizean Savanna* course. They were also commended by staff and students of the University of Belize BSc Natural Resource

Management programme who used the photoguides this year during their field course held in the upland savannas of Mountain Pine Ridge.

Activity 5.2 Photographic field guide completed and made available online.

The photoguides are at <http://www.geos.ed.ac.uk/research/eeo/sea-belize/education.html>.

Activity 5.2 was completed in March 2011 with the hand over of the materials to the ERI for them to update and develop further photoguides as they require. The materials are now available for general use, providing acknowledgement is given to the Darwin Initiative. During year 3, a number of partners are exploring the idea of developing local versions of the photoguides for their specific location. For example, BBG plan to create a photoguide for the plants found on their Savanna Trail.

Output 6 Darwin Savanna Trail to be established at Belize Botanic Gardens

Activity 6.1 Belize Botanic Garden Savanna Trail landscaped, planted and interpreted.

The stages of levelling, soil compaction and marking out were completed in April 2010. A boardwalk was constructed in May. Live plants were collected by BBG staff with assistance from project botanists ZAG and GL from April– June (refer Activity 1.4). Site drainage was improved in June and planting out of nursery specimens began in July, with weeding out of non-savanna species in August. Further plant collecting and planting took place between October–December 2010. Planting lists were created and a list of named species entered into a database from which plant labels were produced in January and have now been installed. A set of 5 interpretive signs were designed in February and these have now been manufactured and are due for installation before the Trail officially opens to visitors in April 2011. In year 3, we plan to install similar signage for other institutions managing savanna lands in other parts of the country. A fuller account of the stages of work to develop the Trail is presented in the project's half-year report (October 2010) and in the attached *BBG Annual Report*.

Activity 6.2 Belize Botanic Garden Savanna Trail Open to the public

The Trail is now complete and open to the public. In year 3 BBG will focus on facilitating visits to the Trail by the general public and also by local schoolchildren (Activity 6.3).

Output 7 Educational resources for school and university use drafted, created and delivered.

Activity 7.1 Educational resources designed for school curriculum

Staff at Belize Botanic Gardens who have considerable experience of creating educational resources have designed a series of materials for schoolchildren. The materials are primarily developed for children aged from 5 – 15 and can be used in a variety of settings, including the classroom, at home or in combination with a visit to the Savanna Trail at BBG. The materials reinforce learning about the plants and animals of the savanna and the value of this ecosystem.

This year, BBG have designed:

- a savanna board game
- colouring sheets for savanna animals and plants
- an educational video about the savanna
- an insert to the Guide to the Gardens aimed specifically at visitors to the Savanna Trail

As the BBG Annual Report illustrates, the design of the board game and the colouring sheets is complete and these are now ready for production. A photoguide to the plants on the Savanna Trail is being developed based on the template already available from Activity 5.2. The video concept, script and puppet characters have been developed this year and filming has begun. In year three, the video will be finished and with approval already obtained from the Government Ministry of Education, these materials can be distributed for teachers to use in the classroom.

#### Activity 7.2 Educational resources designed for university curriculum

RBGE, UoE and BBG staff have worked together during the year to create an initial set of ten educational Fact Sheets covering various aspects of the flora, fauna, geography, geology and soils of the savannas in Belize. The idea is to create during years 2 and 3 of the project a modular set of resources that students can use as starting points for further study of particular aspects of the savanna. The Fact Sheets are written by project staff with particular expertise of the subject, and are reviewed and edited internally to achieve a consistent level and style. The present set of Fact Sheets can be viewed at <http://www.eeo.ed.ac.uk/sea-belize/education.html>

Our aim is to create a set of 20 Fact Sheets by the end of the project that can be used at High School/ University level. The materials will be tested on Belizean undergraduate students taking Biology and Natural Resources Management degrees who need to acquire background knowledge about various aspects of the savanna in preparation for field courses. Material from the Fact Sheets may also be reproduced in other forms, for example as slides that university staff can use to support their lectures.

## 4.2 Progress towards Project Outputs (bracketed numbers refer to Activities in the Logframe)

All the training courses (1.8) for year 2 have been delivered as planned. We also provided an additional month of training for the Belize Darwin Botanist in the UK this year. By delivering 24 rather than a planned 16 weeks of training over the last two years, we have already exceeded our expectation for the delivery of training under output 1 (enhancing local staff capacity).

One of the major activities completed this year by the project botanists were the plant diversity surveys (1.3) and the associated live plant collecting (1.4) with our partners BBG for their Savanna Trail. Reference collections have been consulted (1.6) so that the savanna plant database activity is now felt to be complete (1.7). It has been published online by Oxford University (1.9). With the botanical database now complete, the final checklist (output 2) has been produced and is now being written up for publication (4.1, 4.2).

A second major activity completed this year has been the production of the Savanna Ecosystems Map 2010 (3.1) and publishing this online. The digital data has been transferred to BTFS for further validation and assimilation into the National Ecosystem Map and the National Land Use Strategy. The botanical data and mapping are now being analysed by UoE to reveal the distributions of selected endemic or important species and to indicate remaining areas of savanna under pressure from development (3.2). This map analysis will form an input, along with other key biological and land ownership data into a Consultative Workshop on Savanna Biodiversity and Conservation Planning that will be held in Belize in April 2011 (3.4).

The Photographic Field Guides (photo-guides for short) have been extensively tested in the field this year with the intended local users (5.1). Instead of the single photo-guide to savanna plants originally envisaged, a set of 4 photo-guides aimed at different types of users have now been published online (5.2). Our expectations for Output 5 have therefore been exceeded.

Belize Botanic Gardens have made excellent progress completing the construction and also the interpretation of the Darwin Savanna Trail (6.1) so that it is now open to the public (6.2).

Work has also begun on designing the Educational Materials that will be produced in the third year of the project. BBG have completed the design of the schools materials and begun filming

the educational video, whilst all the partners have been involved in creating the first 10 of a planned set of 20 Educational Fact Sheets for High School/University students (7.1).

**Table 1 Assessment of progress towards completion of each Output**

Output	1	2	3	4	5	6	7
% complete	70%	100%	70%	40%	100%	70%	20%

The main activities to be completed in year 3 will be: to finish re-curation of the National Herbarium (output 1); to convene a consultative science meeting and report its outcomes (output 3); to write two academic papers (output 4); to conduct school visits to the Savanna Trail (output 6) and to complete and deliver the educational materials for school children and for university teaching (output 7). All the assumptions about outputs still hold true. The project appears to be on course to successfully deliver the planned outputs before the end of year 3.

### 4.3 Standard Measures

**Table 2 Project Standard Output Measures**

Code No.	Description	Year 1 Total	Year 2 total	Plan for year 2	Total planned
2	Number of people attaining MSc qualification	1	3	3	4
4A	Number of undergraduates receiving training	2	1	1	4
4B	Number of weeks provided per student in 4A	2	3	2	6
4C	Number of postgraduates to receive training	16	18	15	40
4D	Number of weeks provided per student in 4C	2	2	2	6
6A	Number of Belizean professionals to receive other education or training (not categories 1-5)	16	22	15	40
6B	Number of person-weeks of training this year	12	12	8	16
7	Number of different training materials produced (e.g. checklists, guides, factsheets, new course books)	1	8	4	5
8	Number of weeks spent by UK project staff on project work in the host country	26	27	24	60
10	Number of photoguides and checklists created	0	5	2	2
11A	Number of papers published in peer reviewed journals	0	0	0	2
11B	Number of papers submitted to peer reviewed journals	1	1	1	2
12B	Number of computer based databases to be enhanced and handed over to host country	0	1	1	1

13B	Number of species reference collections to be enhanced and handed over to host country	0	1	1	1
14A	Number of consultation meetings/workshops organised to present/disseminate findings	2	0	0	3
14B	Number of conferences/seminars attended where findings from DI project were presented	1	4	2	3
15B	Number of local press releases in host country	2	1	1	3
15C	Number of national press releases in UK	1	0	0	2
15D	Number of local press releases in UK	1	0	0	2
17A	Number of dissemination networks established	1	0	0	1
17B	Number of dissemination networks enhanced	1	0	0	1
18C	Number of TV features in host country	0	0	0	1
19A	Number of radio interviews in host country	1	0	0	2
20	Estimated value (£'s) of physical assets handed over to host country	£ 1,300	£ 800	£ 200	£ 1,500
21	Number of permanent educational/research organisations established to continue after EoP	1	0	0	1
23	Value of resources raised from other sources (in addition to Darwin funding) for project work	£ 45k	£11k	£ 11k	£ 45k

**Table 3 Publications**

Type	Detail (title, author, year)	Publisher	Available from	£
Online Database	"Belize Savanna Plant Database" Goodwin, Z. et al 2010	University of Oxford	<a href="http://dps.plants.ox.ac.uk/bol/seabelize/Home/Index">http://dps.plants.ox.ac.uk/bol/seabelize/Home/Index</a>	Nil
Digital Mapping	"Savanna Ecosystems Map of Belize 2010" Cameron, I., Stuart, N.	University of Edinburgh	<a href="http://www.eeo.ed.ac.uk/sea-belize/savanna_map.html">http://www.eeo.ed.ac.uk/sea-belize/savanna_map.html</a>	Nil
Report	"Savanna Ecosystem Map of Belize 2010" Cameron, I., Stuart, N. & Goodwin Z. 2010	University of Edinburgh	<a href="http://www.eeo.ed.ac.uk/sea-belize/data/sav_eco_2011/sea-belize_sav-eco-map-2011_tech-report.pdf">http://www.eeo.ed.ac.uk/sea-belize/data/sav_eco_2011/sea-belize_sav-eco-map-2011_tech-report.pdf</a>	Nil
Report	"A new interpretation of the savanna ecosystem in Belize by SPOT imagery: Report to Planet Action", Cameron, I & Stuart, N. 2010	University of Edinburgh	<a href="http://www.planet-action.org/web/88-project-publications.php?type=contributions&amp;projectID=2831">http://www.planet-action.org/web/88-project-publications.php?type=contributions&amp;projectID=2831</a>	Nil
Poster Paper	"Botanical Inventory of the Lowland Savannas of Belize" Goodwin, Z., Lopez, G., Bridgewater, S., Harris, D, Cameron, I., Stuart, N. & Kay, E. 2010	University of Edinburgh	<a href="http://www.eeo.ed.ac.uk/sea-belize/outputs/posters/ukbza_botany_2010.pdf">http://www.eeo.ed.ac.uk/sea-belize/outputs/posters/ukbza_botany_2010.pdf</a>	Nil

Poster Paper	"Savanna Ecosystems Map of Belize 2010" Cameron, I., Stuart, N., Furley, P. Bridgewater, S. & Goodwin, Z. 2010	University of Edinburgh	<a href="http://www.eeo.ed.ac.uk/sea-belize/outputs/posters/ukbza_savmap_2010.pdf">http://www.eeo.ed.ac.uk/sea-belize/outputs/posters/ukbza_savmap_2010.pdf</a>	Nil
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#### 4.4 Progress towards the project purpose and outcomes

This year the project has completed the baseline vegetation mapping and botanical surveying which will yield the primary scientific information (maps and checklists) needed to identify priority areas for conservation within the lowland savanna ecosystem. We have now effectively completed and delivered the scientific data required for the purposes of the project. We also have identified the key organisations to which our results must be presented in year 3 in order for the project to influence land use decisions and attitudes towards the use of savanna areas.

The measurable indicators of progress remain relevant. The number of new collections to be made and the proportion of specimens remaining to be curated in the national herbarium have provided useful yardsticks by which our staff have evaluated their progress with the priority task for this year of completing adequate botanical fieldwork and also for them to monitor progress with the ongoing task of re-curating the Belize National Herbarium by EoP.

The fact that we have already exceeded (by 50%) our training goal of providing 16 person-weeks of training to Belizeans during the course of the project and by observing the quality of the work that the Belizean Darwin Botanist is achieving, including his increasing capacity to work without close supervision, we see that the project is making good progress to build up the capacity of our partners and a network of conservation professionals in Belize to undertake plant collecting and to conduct future monitoring of savanna plant diversity and condition.

The project-level assumptions are still largely holding true. We describe in section 8 (sustainability) various actions which we have taken over the last year to ensure external influences upon the project remain positive and supportive of the overall project purpose.

#### 4.5 Progress towards impact on biodiversity, sustainable use or sharing of biodiversity benefits

The partners believe it is too early to see a positive impact from this project on attitudes towards the savanna ecosystem. By working through our partners and engaging in wider consultative meetings with all major stakeholders involved in the management of savanna areas during year 3, we hope to increase the awareness, uptake and eventual influence of our findings. Our potential impact on biodiversity conservation in Belize in the long term may be considerable if the staff trained by our project remain in Belize and form a network with the skills to collect data, monitor the savannas and to educate people about their value.

Our main partner, the ERI was established during this project with DI support. Its mission is to provide science to inform national conservation strategies and to assist the Belize Government to fulfil its obligations to the CBD. The ERI has established various formal channels by which the outputs from projects such as ours can be communicated to Government Agencies.

Through our work to re-curate the national herbarium this year, we have established a close working relationship with the Government Forest Department, who have now recognised the need to maintain this biodiversity resource in the future.

The addition of BTFS as a project partner this year offers another means by which our project data can be assimilated into national land use and conservation planning. BTFS already works closely with Government agencies on land use planning and will use our new mapping to argue for the non-sustainability of using savanna areas for agriculture within the new National Land Use Planning Framework commissioned for the Government of Belize by UNDP.



## **5. Monitoring, evaluation and lessons**

The hierarchy established last year for monitoring and reporting the progress of activities continues to work well. Each staff member employed full time on the project has a monthly work plan and provides a brief activity report every two weeks to their line manager. Line managers alert the PI to achievements, setbacks or issues requiring action. These activity logs form the basis of six-monthly progress reviews for the full-time project staff.

This year, the UK partners held three project monitoring meetings in the UK, with Belizean colleagues able to attend two of these. In addition, the regular annual meeting of all the project partners was held in Belize in May 2010.

Regular contact is maintained with the Dr Kay, the lead partner in Belize (ERI) and also with John Pixler & Judy Duplooy (BBG) and Jan Meerman (BTFS). We primarily use email and telephone calls. VOIP services such as Skype are blocked within Belize so video conferencing is not possible. UK project staff worked in Belize for 27 weeks during the last year, making it possible to directly observe the progress of activities and make positive corrections. With the Belize Darwin Botanist working at the ERI, the project has a continuous presence in Belize which enables us to respond quickly to agree minor adjustments to activity schedules.

For annual reporting, each project partner provides their own individual report on progress. These are appended in full as supplemental information to this summary annual report. The individual reports allow each partner to highlight issues of priority or concern for them.

All training activities are monitored by collecting attendance records and individual feedback forms from those attending field courses or training workshops. The comments are summarised to evaluate the quality of the training, the value of the content to the participants and suggestions from attendees and trainers as to how future training could be improved. Feedback reports from this year's courses are included in the Appendices.

Two lessons we learnt last year were that 1) project plans sometimes have to be altered on account of unexpected situations and 2) by being flexible, this can create unexpected benefits. In our case, the sudden illness of the UK Botanist meant that we had to reschedule most of the field work into this second year, whilst using some of last year's resources to bring the Belize Darwin botanist to the UK for training. We then observed that this training at UoE and at RBGE had significantly augmented his skills and so we further adjusted work-plans and resources so that German Lopez could make a second one-month visit to the UK this year, to gain further experience working in UK institutions.

## **6. Actions taken in response to previous reviews (if applicable)**

The reviewer of our previous report asked us to confirm whether the Logical Framework was employed as a Monitoring and Evaluation tool. Along with a range of other methods (described in 5 above), we do use the measurable indicators in the Framework as one way to monitor progress towards the project purpose. Examples of this are given in section 4.4.

## **7. Other comments on progress not covered elsewhere**

Last year, the first period of botanical field collecting originally planned for September – December 2009 unfortunately had to be terminated prematurely due to an unexpected illness of the UK Darwin Botanist which necessitated her return to the UK in October 2009. When it became clear the UK Botanist would not be fit to return to Belize until April 2010, the work plan was adjusted in consultation with LTS. DEFRA approved a carry forward of resources into this financial year to enable the UK Botanist to travel to Belize for two periods of plant collecting in April and then again in October 2010 in order to allow us to still achieve a nominal target of 1,000 new collections to be made from sites throughout the country.

As a result of two very productive fieldwork periods this year, the field collecting target has been achieved. Over 600 new plant specimen collections and a further 2,000 species observations were made at 70 sites by botanists Zoë Goodwin and German Lopez in two field seasons from April – June and from October – December 2010. Combined with over 300 collections made in year 1 and a further 60 collections made in January 2011 as part of the field training course at Hill Bank, more than 1,000 new collections have now been made by botanists during this project. Through careful targeting of areas for this field collecting in relation to the national mapping of savanna extents and subtypes, we are confident that the aim of collecting across the full geographical range of savannas in Belize and sufficiently from each of the savanna vegetation subtypes has now been met.

Last year, to ensure the Belizean Botanist still received the training planned for him with the UK botanist despite her necessary return to the UK, we re-allocated resources so German Lopez was able to make a four week visit to the UK in February 2009 to work in the Herbarium of the RBGE and to undertake GIS training at UoE. This UK-based training was particularly effective in building up his experience and practical skills which needs so that he will ultimately be able to take over from the UK botanist and complete the re-curation of the Belize National Herbarium during year three of the project. Through our programme of staff progress monitoring and review, the project partners recognised that a second period of intensive training in the UK for the Belizean Botanist would be desirable to deepen and develop these skills. Given his excellent progress against his agreed work plan and targets during year 1, we agreed to re-allocate resource in year 2 to allow German to make a second visit to the UK in February-March 2010. German was able to spend 1 week at the Natural History Museum in London learning how to use large reference collections and 2 weeks at RBG Edinburgh where he was given hands-on practice in the preparation, labelling and mounting of herbarium specimens.

## **8. Sustainability**

By extending the geographical reach of our training activities and our consultations to organisations in all parts of the country and this year by particularly making effort to involve organisations from the remoter southern districts, by the end of this second year this project can now claim to have achieved nationwide recognition among Government Agencies and NGOs involved in the management of savanna areas.

Over the year we have worked with all the major organisations in Belize with an interest in savanna conservation to promote the project purpose. We arranged on-site training courses at the field stations of the two NGOs PfB and TIDE which manage significant savanna areas; these organisations have acted as training nodes for northern and southern Belize respectively, allowing staff from other smaller local organisations to access training more efficiently and affordably. We co-ordinated these outreach activities through APAMO – the Association of Protected Area Management Organisations and through the networks of the ERI and BTFS, which has ensured that our events were well attended. In Belmopan, the capital city we have run courses, contributed to national conferences and held a variety of consultative meetings through which we have developed the profile of the project with the Government Ministries of the Natural Environment and the Ministry of Education. We have established a trusted working relationship between our partners and the Forest Department, witnessed by the recent signing of a memorandum of understanding with the FD which establishes an agreement for the ERI to take over the long term custodianship of the National Herbarium.

The project identity has been reinforced through annual meetings at the invitation of the Belize High Commissioner in London and the British High Commissioner in Belize, and through invited presentations to various meetings such as the Government of Belize *Land Information Center's GIS Day* each January in Belize and the *UK-Belize Association Annual Meeting*, held last September at Oxford University.

Although the project will leave a legacy through the network of people who have participated in training, the project has invested significantly in capacity building through key individuals such as the Belize Darwin Botanist, German Lopez. The long term sustainability of the project is linked in part with the success of the new Environmental Research Institute created during this project at the University of Belize. The Darwin Botanist from this project and a second member of staff funded by Darwin project 17012 will be employed until March 2012, after which it is hoped they will be taken on as permanent staff of this Institute. The vision of this project is to build up capacity in the form of human resources so that once the baseline data collection is completed by this project, the ERI will have staff with the skills to continue this work.

As part of this project's evolving exit strategy, we have agreed this year with our Belizean partners who will become the custodian of the various project outputs, responsible for their maintenance and ongoing revision after the end of this project. The ERI has agreed to take over and maintain the savanna plant database and the university level educational materials; BTFS has agreed to take over and maintain the digital mapping, whilst BBG will retain rights to develop the educational materials for schools. We have also established medium term (5-10 year) agreements with Oxford University to host a copy of the botanical database and for University of Edinburgh to keep an archived version of the digital mapping. These UK data holdings are intended as permanent archives of the data sets created during the project. They are not intended to be updated, but rather to serve as back-up copies 'frozen' at the end of the project, with ownership of the 'top copies' being transferred at that point to our partners in Belize. These UK archives would enable our partners in Belize to recover data up to that point in time in the unfortunate event they themselves suffered any data loss or corruption.

With the support of our partners, we have worked over the past year to ensure that the project continues to receive recognition and support by the Belizean Government. We have obtained approval from the Government Ministry of Education to trial our educational materials in local schools in year 3. Our partnership with BTFS means our mapping will be used to inform several current national land use and conservation planning projects that have Government backing. Another positive development is that the Government Forestry Department has this year signed a memorandum of understanding with the ERI which agrees a plan for the long term maintenance of the National Herbarium. The above actions all improve the prospects of the project outputs being maintained and indeed built upon in the future.

## 9. Table 4: Dissemination and outreach activities

Date	Activity/Location	Audience
1 <sup>st</sup> March – 30 <sup>th</sup> May 2010	<i>"Behind the Scenes at the Botanics: the Belize savanna plant collection"</i> . A series of weekly demonstrations by Jane Corrie. RBGE Visitor Centre, UK	General Public
26 <sup>th</sup> April 2010	Annual project liaison meeting with the Belize High Commission, London	Belize High Commissioner to the UK
14th May 2010	Review Meeting for Year 1 Project Activity – University of Belize, Belmopan	Darwin Partners, NGOs and Government Agencies.
19 <sup>th</sup> May 2010	Annual project liaison meeting with British High Commission, Belmopan.	Pat Ashworth, British High Commissioner in Belize.
3 <sup>rd</sup> June 2010	Botanical fieldwork by project botanist featured in <i>San Pedro Sun</i> Newspaper.	General Public

22 <sup>nd</sup> July 2010	Belize Darwin Botanist participates in “REDD project planning workshop’ Fort George Hotel, Belize City	Government staff, Belizean NGOs and researchers.
17 <sup>th</sup> August 2010	Belize Darwin Botanist presents poster paper entitled “ <i>Botanical Surveys of the Belizean Savannas</i> ” at the Annual Natural Resource Management Symposium in Belize.	Government Ministry of Natural Resources, Belizean NGOs and researchers.
24 <sup>th</sup> September 2010	Project PI presents two posters and an oral presentation to the 13 <sup>th</sup> Annual Conference of the UKBA Association, University of Oxford.	Researchers, government staff and general public.
26 <sup>th</sup> January 2011	BTFS announce the publication of the new Savanna mapping at the <i>First Annual Belize GIS User Conference</i> in Belmopan, Belize.	Government of Belize staff, Land Surveyors, GIS specialists and users from NGOs.
23 <sup>rd</sup> February 2011	Darwin project staff (seminar on the project to the <i>University of Edinburgh Tropical Ecology Research Group</i> . Institute of Geography.	International academic researchers in Tropical Ecology.
March 2011	Belize Darwin Botanist joins the <i>Botanical Expedition to the Bladen Nature Reserve</i> , organised by Ya’axche Conservation Trust	Researchers and staff from NGOs including BFREE, TIDE and YCT.

**10. Outstanding achievements of your project during the reporting period  
(We agree for LTS & Darwin Secretariat to publish the content of this section)**

‘Savanna Plant Database’ produced and made available online;  
‘Savanna Ecosystem Map of Belize 2010’ published and made available online;  
‘Darwin Savanna Trail’ completed at Belize Botanic Gardens and open to the public;  
Darwin Botanist German Lopez is trained sufficiently to take over the task of completing the re-curation of the Belize National Herbarium in year 3.

## Annex 1 Progress and achievements against Logical Framework for Financial Year 2010/11

Project summary	Measurable Indicators	Progress & Achievements April 2010 - March 2011	Actions required/planned for next period
<p><b>Goal:</b> <i>To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve the conservation of biological diversity.</i></p> <p><i>The sustainable use of its components, and</i></p> <p><i>The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources</i></p>	<p>The scientific baseline data collections required for the project purpose (i.e. a botanical database, species checklist and savanna land cover mapping) have all been completed this year.</p> <p>Belize Botanic Gardens have completed and opened the Darwin Savanna Trail.</p> <p>Several further organisations have joined and actively participated in the project</p>	<p>More than half the savanna specimens in the National Herbarium have now been re-curved and re-housed into new cabinets.</p> <p>Plant collecting has now been completed. The Savanna Plant Database has been published online and delivered to the ERI.</p> <p>The Savanna Ecosystem Map 2010 has been completed, published online and the digital data handed over to BTFS.</p> <p>Five photo-guides have been completed and published online.</p> <p>Training goals (weeks of training to be delivered) have been attained.</p> <p>Belizean Darwin Botanist has completed a second period of training at UK institutions.</p>	<p>Re-curation of the Herbarium will be completed in year 3.</p> <p>Botanical and map data will be used together with data from local researchers in a consultative meeting in year 3 to determine priority areas for conservation.</p> <p>Mapping will be integrated into National Land Use Strategy &amp; National Ecosystems Map</p> <p>Educational materials will be completed for school children and for university students</p>
<p><b>Purpose</b></p> <p>To identify priority areas for conservation within the lowland savannas of Belize, by undertaking baseline taxonomic research and vegetation mapping of this ecosystem and enhancing the capacity of local institutions to continue this activity</p>	<p>Savanna specimens in National Herbarium to be re-curved;</p> <p>Partners' capacity in taxonomy, field collecting and mapping to be increased by working with UK partners;</p> <p>Plant database and checklist to be created and published.</p> <p>Photo-guide to savanna plants to be published;</p> <p>Data and mapping to be handed over to ERI and other relevant agencies managing savanna lands by EoP.</p>	<p>Re-curation of the Herbarium will be completed in year 3.</p> <p>Botanical and map data will be used together with data from local researchers in a consultative meeting in year 3 to determine priority areas for conservation.</p> <p>Mapping will be integrated into National Land Use Strategy &amp; National Ecosystems Map</p> <p>Educational materials will be completed for school children and for university students</p>	

<p>Output 1. Capacity enhanced to conduct savanna field surveys, collect and name plants and curate specimens.</p>	<p><b>Measurable Indicators</b></p> <p>Savanna specimens in national herbarium to be re-curated in years 2 and 3;  ~1,000 new collections made and names determined;  ~40 local Belizean staff in total trained in plant collecting, curation and GPS/GIS as appropriate to their needs.</p>	<p>7 of the 11 original cabinets in the Belize National Herbarium, representing 3,800 existing herbarium specimens have now been re-curated. An additional 1,200 recently mounted savanna specimens have also been incorporated into the collection. Re-organisation to create more space has meant that the material previously held in these 7 old cabinets now occupies 12 new cabinets.</p> <p>1,080 specimen collections and around 2,200 species observations have now been made from over seventy field survey sites distributed across the country.</p> <p>12 person-weeks of training were delivered again this year, bringing the total to 24 person weeks (against a target of 16 weeks). 22 individual Belizeans have benefited from training this year, for periods ranging from 2 day short courses up to 2 weeks for the residential training course in plant taxonomy.</p> <p>We have now trained 38 local Belizean staff in a mix of plant collecting, curation and GPS/GIS as appropriate to their needs.</p>
<p>Activity 1.3 Plant diversity surveys and vegetation habitat surveys conducted in lowland savanna areas;</p>		<p>Plants have been collected from over 70 sites. Cross-checking with the mapping of savanna land cover and with locations of pre-existing plant collections suggests that an adequate coverage of the lowland savannas has been obtained.</p>
<p>Activity 1.4 Live plant collections made for the Savanna Trail at Belize Botanic Garden</p>		<p>During April–June and October–December 2010, Darwin botanists assisted staff from BBG on 5 fieldtrips to collect live plants for the Savanna Trail.</p>
<p>Activity 1.5 Determination of savanna collections using UK herbaria and international research literature;</p>		<p>Over 300 further savanna specimens in the existing savanna collections held at RBGE and BRH have been identified by Zoë Goodwin and German Lopez during year 2, bringing the total of new identifications during the project to over 500.</p>
<p>Activity 1.6 Re-curation of savanna collections in Belize’s national herbarium;</p>		<p>7 of the 11 original cabinets in the Belize National Herbarium, representing 3,800 existing herbarium specimens have now been re-curated.</p> <p>The remainder will be re-curated by the Belize Darwin Botanist during year 3.</p>
<p>Activity 1.8 Training workshops in field botany, taxonomy, herbarium curation and GPS/GIS;</p>		<p>12 person-weeks of training courses were delivered this year to 22 individual Belizeans. In addition, the Belize Darwin Botanist worked with the UK Botanist for approximately half of the last year, for a period of intensive field collecting from April–June, undertaking curation work and further plant collecting from October–December 2010 and during a visit to the UK in February–March 2011.</p>
<p>Activity 1.9 Savanna Plant Database available on-line</p>		<p>The savanna plant database was published in March 2010 on the BRAHMS online website hosted by the Department of Plant Sciences, University of Oxford</p>



Output 2. Checklist of savanna plants highlighting threatened, rare and endemic species.	<p>Measurable Indicators</p> <p>Checklist drafted in year 1; revised by EoP.</p>	
Activity 1.7 Database developed of savanna plant distributions and habitats;		<p>This year, further specimen information has been added to the Belize savanna plants database to give a total of 5,409 specimens for 4,640 botanical records. The specimens in the database are now derived from records from the herbaria of nine institutions. The largest addition this year was the specimen records from the Belize National Herbarium. Where possible, records have also been attributed with the characteristic habitat where the plant is typically found.</p> <p>The checklist will be published in year 3 as an article discussing the classification of the Belizean savanna, its past collection history, collection patterns and species of conservation importance. The checklist will provide an indication of habit (tree, shrub, herb etc), habitat preference (forest, savanna, wetland etc) and a list of voucher specimens by district and geographical location (A near-final version of the full checklist is supplied at Appendix 7)</p>
Activity 2.1 Checklist of savanna plants drafted in year 1, Updated and revised by EoP based on field usage.		
Output 3 Updated mapping of savanna habitats and conservation priority areas.	<p>Measurable Indicators</p> <p>Mapping to guide field collecting produced in yr1; Maps identifying priority areas for conservation in yr2</p>	<p>Draft mapping was produced in September 2009 to guide botanical fieldwork, but has been refined further by using additional imagery. This has improved the accuracy of the classification of some savanna subtypes. The accuracy has been checked against ground data collected in September 2009 and January 2010 and using information extracted from recently acquired IKONOS images.</p>
Activity 3.1 Interpretation of remote sensing of savanna areas to guide field data collection programme;		<p>The Savanna Ecosystem Map 2010 was published on 1<sup>st</sup> February 2010 on the project website and on the website of BERDS. Full metadata, <i>Release Notes</i> and a <i>Technical Report</i> have also been published. Activity 3.1 was completed in February 2011 with the handover of the digital mapping to BTFS.</p>
Activity 3.2 Maps produced of diversity, habitat variety and recommended priority conservation areas within lowland savannas;		<p>Maps have been produced showing savanna land cover subtypes broken down according to protected area and also by major watershed. (Appendix 10) This mapping will be one of the inputs to the consultative meeting on savanna conservation to be held in Belize in year 3. Activity 3.2 will continue during year 3 since BTFS have agreed to validate the mapping and assimilate it into the National Ecosystems Map of Belize due to be published in 2012.</p>

Output 4 Scientific Reports and Papers	<p>Measurable Indicators</p> <p>2 articles published in peer reviewed journals by EoP; At least 3 reports produced by EoP.</p>	<p>Two reports on the savanna mapping have been published this year and three poster papers have been presented at conferences (refer table 3). A further two reports have been submitted this year to the Forest Department describing progress with the re-curation of the National Herbarium (appendices 2 and 3).</p> <p>3 Masters theses on topics related to the project have been completed this year. Each provides useful botanical, pedological and fire history data about the Belizean savannas which has been delivered to the ERI.</p>
Activities 4.1 & 4.2 Paper on flora of Belizean savannas written and submitted for publication		<p>The results of a survey of one area of savanna within the Mountain Pine Ridge Reserve have been written up by Hicks and Goodwin. This was accepted in August 2010 by <i>Edinburgh Journal of Botany</i>. The paper was now been edited to address reviewer comments and is due to be published early in project year 3.</p>
Output 5 Photographic Field Guide to the commoner savanna plants, trees and shrubs created and distributed.	<p>Measurable Indicators</p> <p>Photo-guide published in year 2; final version by EoP; Number created and distributed reported.</p>	
Activities 5.1, 5.2 Photographic field guide to savanna plants developed, tested and distributed		<p>The Photographic Field Guides (photo-guides for short) have been extensively tested in the field this year with the intended local users (5.1). Instead of the single photo-guide to savanna plants originally envisaged, a set of 4 photo-guides aimed at different types of users have now been published online (5.2).</p>
Output 6 Darwin Savanna Trail established at BBG	<p>Measurable Indicators</p> <p>Trail constructed and open to public</p>	<p>Belize Botanic Gardens have made excellent progress this year completing the construction and also the interpretation of the Darwin Savanna Trail (6.1) so that it is now open to the public (6.2). In year 3 BBG will focus on facilitating visits to the Trail by the general public and also by local schoolchildren (Activity 6.3).</p>
Output 7. Educational materials prepared for higher education, schools and for general public.	<p>Measurable Indicators</p> <p>Reports on materials generated by partners (UB, BBG) and wider NGO community.</p>	<p>With approval now granted by the Ministry of Education, BBG have completed the design of the schools materials and begun filming an educational video. All the partners have been involved in creating the first 10 of a planned set of 20 Educational Fact Sheets for High School/University students (7.1).</p>

## Annex 2 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

<p>Activity Reports are attached from the two principal project partners who have had staff employed full time during this reporting period- RBGE in the UK and the ERI in Belize. ERI's report includes details of the training received by the Darwin botanist. Belize Botanical Gardens have been a very active partner this year and have produced a report providing evidence of the building and opening of the Savanna Trail, their plant collecting and labelling work and the interpretive signage that they designed and which is presently being installed at the Savanna Trail.</p>
<p>3.1 Activity report from Royal Botanic Garden Edinburgh (RBGE)</p>
<p>3.2 Activity report from the ERI at the University of Belize</p>
<p>3.3 Activity report from Belize Botanic Gardens</p>
<p>Other outputs which have already been completed and published during the year can be viewed and downloaded from the project website <a href="http://www.eeo.ed.ac.uk/sea-belize">http://www.eeo.ed.ac.uk/sea-belize</a>.            These main published outputs are the Savanna Ecosystems Map 2010, Savanna Plant Photo-Guides and Fact Sheets and a link to the Online Database of Savanna Plants that has been published on the University of Oxford's well-known site for plant science <a href="http://dps.plants.ox.ac.uk/bol/seabelize/Home/Index">http://dps.plants.ox.ac.uk/bol/seabelize/Home/Index</a></p>