CEPF FINAL PROJECT COMPLETION REPORT

I. BASIC DATA

Organization Legal Name: Wildlife Conservation Society

Project Title (as stated in the grant agreement): Madagascar Biodiversity Network (REBIOMA)

Implementation Partners for this Project:

Project Dates (as stated in the grant agreement): Feb 1st 2004 > Dec 31st 2005

Date of Report (month/year): 28th March 2007

II. OPENING REMARKS

Provide any opening remarks that may assist in the review of this report.

Madagascar has long been recognized as one of the most important countries in the world for biodiversity conservation, due to its exceptionally high species diversity and levels of endemic flora and fauna. This biodiversity remains under severe threat from deforestation and fragmentation. Since the 1980s a concerted effort by Malagasy and international conservation professionals has been underway to address the threats.

One result of this effort has been a great increase in our knowledge of the species distributions of many different animal and plant groups. REBIOMA (Réseau de la Biodiversité de Madagascar) has made substantial inroads into narrowing the time lag between data collection in the field in Madagascar and it's use in species distribution modeling and conservation planning for terrestrial ecosystems. We have achieved this at a critical time, providing direct support to the "Durban Vision"; a 'pillar' of the Madagascar National Environmental Action Plan (and now in the Madagascar Action Plan), which encompasses the identification, prioritization and definition of legal and spatial limits for 4 million hectares of new conservation areas. Of the target of 4 million hectares a total of 2 million hectares have now been awarded temporary protection status and are moving towards full protection, whilst mining and forestry activities have been suspended in a further 4 million hectares to accommodate conservation planning exercises that will identify the final 2 million hectares.

The goal of the Réseau de la Biodiversité de Madagascar (REBIOMA) project is to develop a dynamic data base to which a number of analytical tools will be linked. A web-portal will provide ready access to the conservation tools and biodiversity data necessary to allow conservation planners/managers to set conservation targets in a systematic manner for species, site, corridor and regional-scale objectives.

To achieve long-term conservation results, our efforts include on-the-ground applications at the local and regional levels, and capacity building at all levels. We have been supported and guided by a consortium of national and international conservation and scientific organizations. Successfully developing REBIOMA in Madagascar is serving as a powerful model and test case for the larger conservation community for managing biodiversity data, setting conservation targets, defining outcomes, and monitoring results in a transparent, accountable and reproducible manner.

III. ACHIEVEMENT OF PROJECT PURPOSE

***Project Purpose**:* The conservation community utilizes biodiversity data and conservation planning tools to improve efficiency and effectiveness in local, regional and national conservation planning exercises.

Planned vs. Actual Performance

Indicator	Actual at Completion
Purpose-level:	
Within two years, REBIOMA is used successfully (e.g. contributes to producing cost-effective, efficient conservation plans balancing wildlife and human needs) for the national level planning and at least 2 regional and 2 local conservation planning exercises.	REBIOMA has become central to the Durban Vision conservation planning exercise which has recently expanded the protected area network from ~2million to ~4 million hectares. REBIOMA staff have provided leadership and technical support to the Système d'Aires Protégées de Madagascar (SAPM) group who are charged with the quantitative conservation analyses for the Durban Vision Process. In August 2006, Dimby Razafimpahanana (REBIOMA data-base manager) presented the results of the prioritization group's analyses to the SAPM and GDRN (Gestion Durable des Ressources Naturels) commissions. After that, a series of follow up meetings were held to incorporate the feedback and improve the results, and to think about the best way to present the maps. The first product is a map that has been used to determine which regions of the country were awarded an extension of existing temporary legislation that has suspended the issue of mining permits. This suspension of mining is intended to allow the conservation planners time to decide where to situate the final new protected areas. REBIOMA has supplied data and technical assistance to several regional planning exercises (including: the Ankenhiheny-Zahamena Corridor, Fandrina-Vondroso Corridor, and Makira-Masoal landscape) for the purpose of boundary refinement and internal management zoning.
Within five years, REBIOMA is used successfully (as above) first to assess the status of national parks and key threatened species and then to improve the national system of protected areas.	GAP analyses to monitor the proportions of target species (Threatened vertebrate species listed by the Global Mammal Assessment, Global Amphibian Assessment, and BirdLife International), represented within the expanding protected area network have been repeated periodically. A presentation and short report was provided to the Durban Vision committee which included a review of the effectiveness of the 2004 protected area network, as well as of the 2005/6 additions. It also proposed additional areas for future expansion. This report is now being updated and elaborated.
Within two years, the principal Malagasy environmental agencies (e.g. ANGAP, MEF, ONE) are familiar with and using REBIOMA; within five years, additional agencies and NGOs are also using it.	REBIOMA conservation planning products are being channeled to these organizations via the SAPM group, but we are aware that more work needs to be done to engage directly with ANGAP, the forestry sector, and the University of Antananarivo, and have been extending direct invitations to these organizations to send representatives to our range of training activities.

Within five years, before and after comparisons show a significant increase in representation of underrepresented species and biotic assemblages within Madagascar's protected area network.	Our analyses show that there has been a significant increase in the representation of underrepresented species and biotic assemblages within Madagascar's protected area network. The details are available in a power point presentation and accompanying short report, which were presented at a meeting of SAPM. A more detailed paper is currently being drafted for publication.

Describe the success of the project in terms of achieving its intended impact objective and performance indicators.

REBIOMA has been accepted as one of the major tools in the implementation of the "Durben Vision" in Madagascar - specifically it will provide a "home" for the biodiversity data to be used in planning the new conservation areas both at a national and regional level. This has meant that REBIOMA is more closely linked to the Durban Vision Group and the associated Government mandated process. It has become clear to all the partners in Madagascar working on the Durban Vision (35 national and international institutions) that REBIOMA is key to the science based planning (and also to adaptive management and monitoring) that is necessary for the implementation of the 6 million hectares of new conservation areas.

Were there any unexpected impacts (positive or negative)?

In 1995, during Phase II of the National Environmental Action Plan, Madagascar branched out from its terrestrial focus to develop marine conservation activities. Accordingly, marine activities and conservation planning lag considerably behind terrestrial in Madagascar. Recent surveys by WCS, CI and WWF have shown that the marine environments surrounding Madagascar contain 318 of the estimated 340 coral species of the western Indian Ocean, as well as 829 fish species from 338 genera, and 525 mollusk species. This level of diversity exceeds that of the Hawaiian Islands or French Polynesia, and is the highest recorded in the western Indian Ocean. The marine ecosystems are under as much anthropogenic pressure as the terrestrial ecosystems and the Durban Vision has recently set a target to establish a network of 1 million hectares of marine protected areas. This will require a marine biodiversity data-base, and analytical support framework analagous to that which REBIOMA has already established to support the terrestrial aspects of the Durban Vision.

REBIOMA has been asked to adapt the data base structure and increase the capacity, to handle marine data, and to provide technical support to the marine conservation planning component of the Durban Vision.

IV. PROJECT OUTPUTS

Project Outputs*: Enter the project outputs from the Logical Framework for the project*

Planned vs. Actual Performance

Indicator	Actual at Completion
Output 1: A biodiversity database is assembled comprising a number of conservation indicator groups (flora and fauna). Conservation indicator groups are defined as taxa (family level or above) that are taxonomically well-known and have been well-sampled across the island.	
1.1. 9 conservation indicator groups (e.g. butterflies; birds; 5 plant families; 1 spider family, 1 ant family) are included in database by year 1; 20 groups are included by 2nd year (addition of 4 plant families; 4 freshwater fish families; 1 ant family; small mammals; 1 spider family).	**EXPERT ESTIMATES OF SPECIES DISTRIBUTIONS (EXTENT OF OCCURRENCE POLYGONS):** For threatened vertebrate species we provided GIS expertise to assist a variety of working groups to update Extent of Occurrence polygons, which is a very time consuming process: Mammals (Global Mammal Assessment 63 polygons); Birds (Birdlife 31 polygons); Amphibians (Global Amphibian Assessment 51 polygons); Reptiles (50 polygons); Freshwater Fish (53 polygons). **POINT DATA AND STATISTICAL DISTRIBUTION MODELS FROM POINT DATA:** We have created an access data base with features to assist with data importation, cleaning and management. A total of 19 collaborators have agreed to share georeferenced and taxonomically validated point distribution data, for the following numbers of endemic species, for specific conservation planning analyses. Ants 154, Butterflies 309, Frogs 199, Geckos 48, Lemurs 45, Plants 1401, Which is an overall total of 2382 species. We have produced distribution models for 829 of these which had sufficient numbers of records and we have conducted conservation planning using these models. The other1499 have insufficient records to model their distributions, but we have developed a new method to combine their point localities with the models of the more common species in conservation planning. **REMAINING TARGETS:** A large effort has been made to synthesize available bird distribution data. However, the spatial accuracy of the data is not good. Much of the available data is in the form of species lists per protected area and does not have exact lat/long data. Many of the protected areas are very large and encompass multiple habitats, so this data is poor for modeling species distributions and estimating representation. This is surprising considering that birds are taxonomically well known and that field ornithologists are common. Birds will require further biodiveristy surveys and careful preparations to standardize data quality.
1.2. 75% or more of the individual records are coded for their taxonomic accuracy and geographic accuracy.	The point data mentioned above is already geo-referenced and represents at least 75% of the available data for those taxa. A substantial quantity of additional data, for other taxonomic groups, has been collated for future geo-referencing. Geo-referencing training was obtained from HerpNet at UC Berkeley in 2006 for 4 Malagasys. Dimby Razafimpahanana and Andry Rakotomanjaka from REBIOMA, and two others: Tendro Rahamitra and Helian Ratsirarson who are currently PhD students at UC Berkeley.

	All 4 received training in manual geo-referencing and then progressed to prepare training data for a new automatic geo-referencing tool called BioGeoMancer (http://www.biogeomancer.org/). The aim was to "enable" BioGeoMancer to run in the French language on Madagascar data sets, and this was achieved. This will increase geo-referencing output for the region. We have recently established a geo-referencing training program for Malagasy university students, who we then hire on hourly pay to manually geo-reference data. They will geo-reference random sets of data, which have also been geo-referenced by BioGeoMancer, for cross validation to test the reliability of the tool. Our students started by manually geo-referencing the entire set of HerpNet (www.herpnet.org/) data for Madagascar. Our training will also be extended to staff of other institutions in Madagascar as geo-referencing is always best done by people who have an intimate knowledge of the data concerned.
Output 2: REBIOMA contributes to national and ecoregional planning for priority areas.	
2.1. Species-level data are used to define national priorities for conservation & ecoregional priorities for the Eastern Humid Forest based on REBIOMA.	REBIOMA has supplied species and environmental data as well as analytical assistance to several regional planning exercises including: the Ankenhiheny-Zahamena Corridor, Fandrina-Vondroso Corridor, and Makira-Masoal landscape, for the purpose of boundary refinement and internal management zoning.
2.2. Species-level data from REBIOMA is used to generate a representation and irreplaceability layer for two corridor conservation planning processes	Our data and technical assistance were used to derive these layers for each of the above regional planning exercises.
Output 3: A detailed plan for establishing an electronic information system for accessing, updating, and utilizing the biodiversity database is created, and its implementation is initiated.	
3.1. A detailed plan is developed and is approved through a peer-review process by recognized bioinformatics experts.	In 2006 we hired a Malagasy website designer with experience serving searchable data-bases online. The website is now live at www.rebioma.org. We were initially reticent about hiring a website consultant, and would have preferred to internalize the skills by recruiting a new permanent staff member, but we could not find anyone available with the relevant skills. Instead, we made it a condition that our staff should learn as much as possible from the consultant during the process. Our Madagascar staff collected the materials (text, pictures, and data) together and then worked closely with the designer to learn about site architecture and programming for data base queries. The website now allows users to search our data base using simple queries (by species, site, date, etc) and to download tables of data. However, linking our data base to collaborators' data bases for automatic update, and connecting species distribution modeling methods for automatic update proved to be very tricky, and required greater technical and financial resources and expertise than were available in 2004-2006. In order to move forward to add the capacity for people to add data online, to automatically update models, and to visualize spatial information with a GIS style interface we drafted a systems interaction diagram to raise interest from potential collaborators and circulated it for comments in April 2006. In July

	2006 we were then able to capitalize upon the number of potential collaborators who were visiting San Jose for the Society of Conservation Biology annual meeting and invited a team to meet at UC Berkeley to outline a technology proposal. We then elaborated this into a full proposal titled "Technological innovations to conserve biodiversity and plan for climate change in Madagascar" that was awarded $390,000 by the MacArthur Foundation. This grant started in January 2007 and is funding collaborations with the world's leading bioinformatics, distribution modeling, and conservation planning experts to create a sequence of automatically updating tools for data collation, geo-referencing, species distribution modeling, and conservation planning, the results of which will be made available through a web portal.
3.2. Implementation of the plan is initiated in collaboration with partners (CI-CABS, MANIS/Species Analyst).	We have been successful in establishing links with HerpNet and GBIF who have both provided specialist training for our staff. With regard to technical developments we have found that the bio-informatics community linked with large museums (such as the Museum of Vertabrate Zoology in Berkeley) have been most willing to build collaborations and partnerships with REBIOMA.
Output 4.: Analytical tools for modeling species distributions and using this information in conservation planning are either developed or assembled and project personnel are trained in their use.	
4.1. Several methods for modeling species distributions are available in easy-to-use formats compatible with Arcview (e.g. minimum convex polygon, GARP, climate-modeled distributions).	REBIOMA provided a two day training workshop in Antananarivo on species distribution modeling, focusing on Maxent. 15 people attended from a broad spectrum of conservation NGO's and at least 5 of the attendants have gone on to use the methods to model species distributions in their regular work. Andry Rakotomanjaka, of REBIOMA, also attended a GBIF species distribution modeling training course in India during 2006, so that he can provide ongoing technical support for species distribution modeling efforts in Madagascar.
4.2. Several methods for utilizing species-level data in conservation planning are available (Worldmap, C-Plan, Tamarin).	Alison Cameron of REBIOMA jointly taught a conservation planning workshop to the SAPM group members in Antananarivo in 2005 with Tom Allnutt of WWF. Two methods, Zonation and Marxan were taught. Throughout 2006 Alison and Tom provided continuing technical support to the SAPM group in quantitative conservation planning exercises for the Durban Vision process.
4.3. Two staff at the Conservation Data Support Unit (see below) are well-versed in the utilization of these software programs.	The general training outlined above was designed to build a baseline knowledge of quantitative conservation planning methods across multiple organizations in Madagascar. Additional training was provided to our own staff to ensure that they can provide a high level of technical support in Madagascar. Dimby Razafimpahanana and Andry Rakotomanjaka attended a short conservation planning workshop before the Society for Conservation Biology annual meeting in the USA. They have also received regular assistance and advice from Alison Cameron and Tom Allnutt relating to analyses with Zonation and Marxan for the SAPM group.

Describe the success of the project in terms of delivering the intended outputs.

REBIOMA has been highly successful in delivering the intended outputs. We have custom built an access data base to manage point locality records, have collated and geo-referenced data for over 2382 endemic species, have modeled 829 of these species, and have supported training and technical support for conservation planning efforts. REBIOMA has overcome the stumbling block of past conservation planning efforts in Madagascar by establishing its self as an effective biodiversity database and service, and by providing tools and expertise to the conservation community. In this way REBIOMA has become central to the Durban Vision process.

Were any outputs unrealized? If so, how has this affected the overall impact of the project?

It was clear that it would be impossible to realize all our long term goals with our CEPF funding but we have achieved all of the more immediate objectives that were set for the CEPF funding period. In addition to the direct contribution that the CEPF funding made to our progress it should be noted that the CEPF grant catalyzed additional funding from MacArthur for 2004 – 2007, and so shares a good deal of responsibility for the broader achievements of REBIOMA for this period.

The complete networking of distributed data-bases has always been our overall objective, but as it is highly ambitious it was not a primary target of the CEPF proposal, and has not yet been achieved. Instead we chose to construct and manually maintain a biodiversity data base, and to focus our effort on obtaining and customizing individual components (automated geo-referencing tools, species distribution modeling software, conservation planning software) that will eventually be integrated into a seamless network. We have placed a strong emphasis on training our staff and the wider conservation community in the use of our components, and consider this to have been highly successful. In this way we have established a strong foundation from which to proceed; as when the technology components are finally linked together and the web applications are fully implemented the community of users in Madagascar will already have a highly developed appreciation of the ways in which it REBIOMA can assist in conservation planning and monitoring.

V. SAFEGUARD POLICY ASSESSMENTS

Provide a summary of the implementation of any required action toward the environmental and social safeguard policies within the project.

VI. LESSONS LEARNED FROM THE PROJECT

Describe any lessons learned during the various phases of the project. Consider lessons both for future projects, as well as for CEPF's future performance.

- We were initially disappointed by lack of progress in getting data suppliers to sign MOU's for data sharing with REBIOMA. Then realized that it would be more productive to focus on developing products (such as data base tools, geo-referencing tools, and our web site) for potential partners to see and use, and that this would stimulate interest and co-operation. The launch of our website (www.rebioma.org) has addressed this in part, and has stimulated interest from many potential data suppliers. We predict that the completion of our new MacArthur technology grant activities will be the final motivating factor that will ensure that MOU's are secured.

- Delays in recruitment of REBIOMA staff at the beginning of the grant, and reticence about spending money meant that we had to apply to CEPF for an extension, and had to work hard to spend the remaining proportion of our budget in the last nine months of the project. The extension period taught us that accelerated spending can produce faster and higher impact results.

Project Design Process: (aspects of the project design that contributed to its success/failure)

Although considerable thought went into the initial project design we have maintained a flexible attitude towards our aims, objectives, and work plan and review these regularly. The majority of our staff were hired after the proposal was written so this flexibility has allowed them to incorporate their ideas into the project design and work plan. Our emphasis has been on exercising our combined expertise in the most productive ways possible and this has been very successful.

Project Execution: (aspects of the project execution that contributed to its success/failure)

We had limited funds for travel but were able to be highly flexible with our annual work plans, so we capitalized on international meetings were groups of collaborators and experts were brought together. We gathered a very impressive team of bio-informaticists together, after the 2006 SCB meeting in California, for a workshop to write a proposal for a MacArthur technology development grant - which we were awarded.

VII. ADDITIONAL FUNDING

Provide details of any additional donors who supported this project and any funding secured for the project as a result of the CEPF grant or success of the project.

Donor	Type of Funding*	Amount	Notes
MacArthur Foundation	A	$120,000	2004-2007
Society for Conservation GIS	A	~$2800	2006 funded international travel, provided free training, and free registration for the SC-GIS annual meeting
MIARO	C	$10,000	2007
MacArthur Foundation	C	$390,000	2007-2008 Technology Development Grant
ESRI	C	$50,000	2007-2008 To be donated in form of training, free software, and services of ESRI systems architects.

****Additional funding should be reported using the following categories:***

A *Project co-financing (Other donors contribute to the direct costs of this CEPF project)*

B *Complementary funding (Other donors contribute to partner organizations that are working on a project linked with this CEPF funded project)*

C *Grantee and Partner leveraging (Other donors contribute to your organization or a partner organization as a direct result of successes with this CEPF funded project.)*

D *Regional/Portfolio leveraging (Other donors make large investments in a region because of CEPF investment or successes related to this project.)*

Provide details of whether this project will continue in the future and if so, how any additional funding already secured or fundraising plans will help ensure its sustainability.

Although REBIOMA has made good progress this project is far from complete and we are committed to its continuing development. Our greatest uncertainty in our long term sustainability has always been how to secure a flow of funds. Our recent success with the MacArthur technology grant, and our current MacArthur grant provides us with one year (2007) of base line salary funds for our Madagascar staff. Following that we will have funds for the technology development, which will principally be taking place in the USA, and can only provide salaries for a few months of salaries of our Malagasy staff. We have invested a huge amount in training our Malagasy staff and it is absolutely critical that we find funds to continue to employ and train them.

VIII. ADDITIONAL COMMENTS AND RECOMMENDATIONS

We wish to thank the CEPF staff for their interest and guidance which has greatly exceeded our expectations. John Watkin and Monali Patel deserve particular thanks for their ongoing enthusiasm, approachability, and attention to detail.

VIII. INFORMATION SHARING

CEPF aims to increase sharing of experiences, lessons learned and results among our grant recipients and the wider conservation and donor communities. One way we do this is by making the text of final project completion reports available on our Web site, www.cepf.net, and by marketing these reports in our newsletter and other communications. Please indicate whether you would agree to publicly sharing your final project report with others in this way.

YES

If yes, please also complete the following:

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