Darwin Initiative Annual Report

Important note:

To be completed with reference to the Reporting Guidance Notes for Project Leaders – it is expected that this report will be about 10 pages in length, excluding annexes

Submission deadline 30 April 2009

Darwin Project Information

Project Ref Number	16-003
Project Title	Tools, training and research for managing eco-hydrology of Cape flora
Country(ies)	South Africa
UK Contract Holder Institution	Open University
Host country Partner Institution(s)	South African National Biodiversity Institute; Cape Nature
Other Partner Institution(s)	
Darwin Grant Value	£325,540.05
Start/End dates of Project	01.09.07 / 31.08.10
Reporting period (1 Apr 200x to 31 Mar 200y) and annual report number (1,2,3..)	1 April 2008 – 31 March 2009 Annual Report 2
Project Leader Name	Jonathan Silvertown
Project website	www.open.ac.uk/fynbos
Author(s) and main contributors, date	Jonathan Silvertown; Yoseph Araya 30 April 2009

1. Project Background

The Cape Floristic Region (CFR) of South Africa is an internationally recognised biodiversity hotspot, where 70% of the 9,000 plant species are endemic. The most important habitat of the CFR is the fynbos (a mixture of dwarf shrub and herbaceous species.) This diversity is protected by a network of nature reserves in the management or oversight of Cape Nature and South African National Parks, but rapid population growth and economic development in the Western Cape region are placing increasing demands upon water resources. To meet the urban demand for water, increased abstraction from the sandstone aquifers underlying important fynbos habitats is planned. Currently, very little is known about how such abstraction might affect the Cape flora and there is almost no information at all about the eco-hydrology of Cape plants. Our team has been studying the eco-hydrology of diverse plant communities in English meadows for many years and has devised methodologies that now successfully inform their management. With funding from the Leverhulme Trust we previously piloted a trial of the methods that have proved successful in English meadows in the fynbos habitats of the Cape. We discovered that fynbos species segregate along hydrological gradients, just as meadow species do in England. The significance of this is that the diversity of the community is dependent upon hydrological processes. There is now, therefore, a pressing need to quantify precisely how species of the fynbos flora respond to fine-scale hydrological gradients. This information then needs to be both disseminated among nature-conservation managers and understood by all stakeholders, such as water abstractors, involved in the management of the unique fynbos habitat. Cape Nature reserve managers have shown great interest in our research to date and using this Darwin project we aim to provide them with the opportunity to extend the scope of the research, to learn the methods of data collection, to implement the findings on the ground and to spread the knowledge they have gained through the conservation community.

2. Project Partnerships

One of our two main partners is the South African National Biodiversity Institute. Dr Guy Midgley, head of the Climate Change & Bio-adaptation Division (http://www.sanbi.org/frames/gcrg.htm) conducts world-class research on the impact of climate change on plant communities and has played a full part in the development of our pilot project and current project. He is supported by South Africa based Darwin Initiative postdoctoral research employee. In addition, SANBI provides our project with office accommodation for the UK postdoc (Dr. Yoseph Araya) and laboratory facilities at its Kirstenbosch research facility in Cape Town. SANBI staff help in laboratory work and field monitoring and have already been trained by us in use of the equipment. The equipment and the technical skills required to use it and to interpret the data will become a permanent addition to SANBI's research capacities.

Our second project main partner is the Scientific Services Division (SSD) of Cape Nature, headed by Dr Ernst Baard. The division makes an input into the evaluation of environmental impact assessments (EIAs) for new developments in the region. Cape Nature has been an active collaborator in terms of providing research sites (the exception is Cape Point which is managed by National Parks). Cape Nature also provide extensive help to the project in the form of staff time and logistical support. In response, field rangers of reserves have been trained by us in the methods of acquiring and interpreting ecohydrological data. This has enabled them to monitor sites for us. More recently we have extended our ranger training and monitoring collaboration with South African National Parks i.e. SANPARKS (http://www.sanparks.org/), another major conservation organization in South Africa.

We continue to benefit from collaboration with Prof. Peter Linder, a South African botanist now based at University of Zurich, who is a world expert on Restionaceae and on fynbos ecology.

3. Project progress

3.1 Progress in carrying out project activities

Since our last report, we have undertaken full botanical and topographic survey of 2 more sites (bringing our total surveyed sites to 8). We also secured permits and established further 2 more research sites (bringing the total sites being monitored to 10). *[Details on site establishment and survey are provided in our Annual Report 1, of May 2008.]*

The sites chosen with brief locations are given in Table 1. Map of Site locations is also given in Figure 1.

Table 1. Location and details of study sites to date

No.	Site name	Location	Altitude /m a.s.l.	Quadrats recorded
1	Cape Point	S 34 º17'41.1" E 18 º 26'18.7"	120	225
2	Riverlands	S 33 º29'12.8" E 18 º 35'43.3"	120	305
3	New Years Peak	S 33 º41'19.7" E 19º 06'02.9"	1080	235
4	Steenbras	S 34 º 11'39.7" E 18 º 52'14.0"	350	172
5	Theewaterskloof	S 33 º 58.906', E 19 º 07.887'	347	200
6	Jonkershoek	S 33 º 59.600' E 18 º 57.174'	350	201
7	Kogelberg	S 34 º 16.745' E 19 º 00.508'	131	200
8	Cape Point	S 34 º 18.705' E 18 º 25.901'	112	201
9	Silvermine	S 34 º 06.555' E 18 26.901'	378	
10	Bastiaanskloof	S 33 º 32.434' E 19 º 09.130'	358	

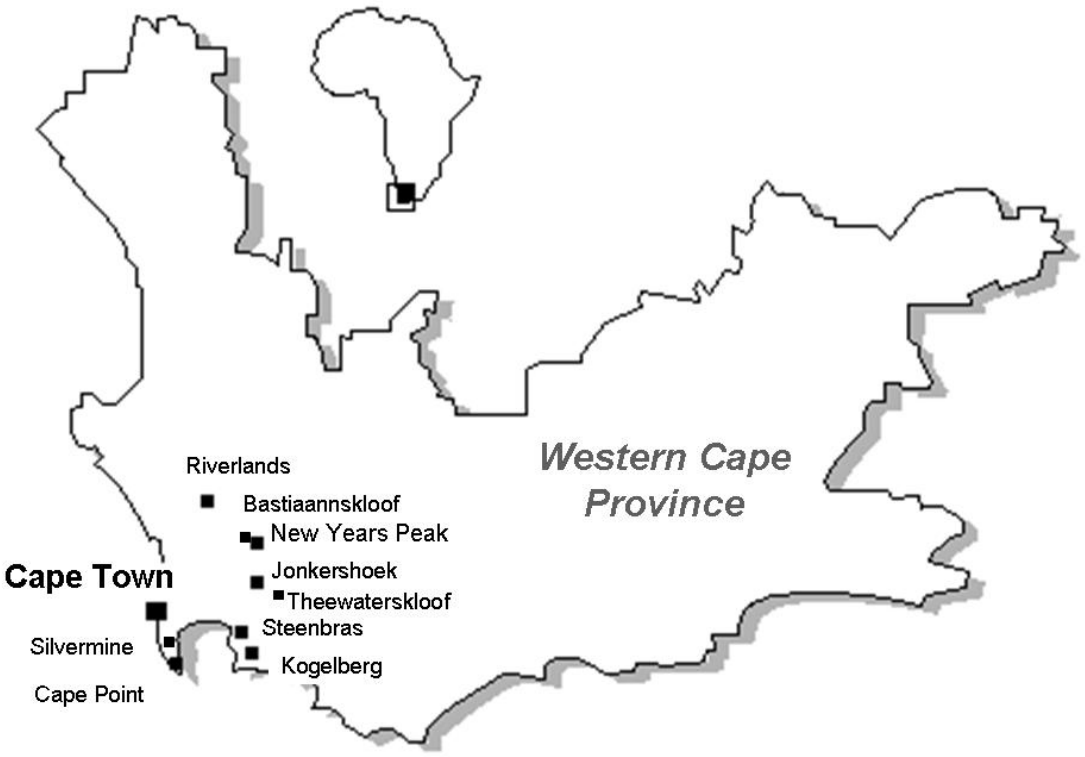

Figure 1. Location of the 10 sites established in the Western Cape Province, South Africa. Note that there are two sites at Cape Point.

We have consolidated further our good cooperation with nature conservation bodies (Cape Nature and SANPARKS), specifically by having our monitoring work incorporated into their routine conservation activities.

We have undertaken training of nature reserve rangers in two rounds: July 2008 (8 persons) and October 2008 (13 persons), representing staff at 9 different locations. The training involves theoretical and practical work, conducted in the lab and field. Trainees are assessed with practical quizzes and we also collect their feedback to improve on our subsequent training. We intend to run another training session in October 2009.

We have shared our project findings at two international conferences: Ecological Society of America (Milwaukee, WI) and International Association for Vegetation Science (Stellenbosch, South Africa) and at a knowledge exchange workshop (Oxford, UK) to good reception. Our project technician from SANBI, has also conducted a presentation of our work at the Cape Nature managers annual meeting.

3.2 Progress towards Project Outputs

A year and half into the project, we have made good progress in all planned activities and outputs. We have fully involved our project partners, trained their rangers, established field sites and are actively collecting data.

We have established 6 new sites and completed full botanical and topographical surveys at 4 of these. The remaining two will be completed in October 2009 (although hydrological monitoring has been running at these since October 2008).

We have developed hydrological models for all surveyed sites (8 in total) and are making the final adjustments before incorporating the results in our vegetation data analysis.

We have made up for the time delay in ranger training (due to seasonal issues) and trained 21 so far. Due to the popularity of the scheme we aim to train more rangers than originally planned (32 instead of the targeted 24) to meet the demand.

During December 2008 and March 2009, wildfires occurred at two of our sites (Steenbras and Jonkershoek). However, as both sites had already been fully surveyed, there has been no negative impact on this project, apart from the need to replace burnt equipment. Hydrological monitoring of the sites continues.

3.3 Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	Total to date	Number planned for this reporting period	Total planned from application
Established codes								
6A, 6B	Field rangers trained	14	10	11		21	10	24
15a, 15b	Local press release in SA	1	1	1		0	1	3
New - Project specific measures	n/a							

Table 2 Publications

Type (eg journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (eg contact address, website)	Cost £
Training Manual	Practical ecohydrological monitoring techniques, Araya, 2008	Open University, Milton Keynes	www.open.ac.uk/fynbos	-
Abstract	Evolution of hydrological niches in Restionaceae-a project update (Araya, et al., 2008) In: Frontiers of Vegetation Science – an evolutionary angle, eds. Mucina *et al.* 230 pp.	Keith Phillips Images, Somerset West	www.iavs.org	
Journal article	Understanding how water resources shape our flora, Araya & Walker, *June 2009*	Botanical Society of South Africa	www.botanicalsociety.org.za/	

Conference presentations:

Araya, Silvertown, Gowing, McConway, Linder and Midgley; *Does variation in $\delta^{13}C$ correlate with niche position among plants growing along a hydrological gradient?* Ecological Society of America Annual Meeting, Aug 3-8, 2008; Milwaukee, WI

Araya, Silvertown, Linder, Gowing, Midgley and McConway; *Evolution of hydrological niches in Restionaceae - a project update*. International Association of Vegetation Science Symposium; Sept. 7-12, 2008; Stellenbosch, South Africa

Araya and Gowing; Ecohydrology of wet fynbos habitats in the Cape Floristic region;

Wetland and Aquatic Ecosystems: Their functions and values; 24 - 25 November 2008; Worcester College, University of Oxford

3.4 Progress towards the project purpose and outcomes

Half-way into the project, we have made good progress and are on track with the collection of data to enable the provision of sufficient quantitative data for fynbos management (output i).

The climate modeller employed by SANBI from November 2008-November 2009 made little progress in processing climate data and has now left. A replacement has been found and should begin in May 2009 (output ii).

Two rounds of ranger training have been completed (output iii).

Progress towards output iv, is expected later, using inputs of i and ii.

3.5 Progress towards impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

At this stage it is too early to evaluate these benefits, but a good start has been made and we are on schedule to deliver our knowledge, research and training objectives. Cooperation from South African partners has been excellent and they already appreciate the benefits of this project to their organizations.

4. Monitoring, evaluation and lessons

In addition fieldwork visits, we have regular phone and e-mail communication with partners in South Africa. Data collection and project progress by local partners are regularly monitored by the PIs and the UK-based postdoc (Yoseph Araya).

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

"Apparent delay in dip well installation and commencement of monitoring at 4 of 8 new sites."

This was due to the difficulty in finding suitable, secure and accessible sites at the start of the project. We have now overcome this problem and established another 6 suitable sites. All 10 sites lie within 60-90 km from our base in Cape Town. The proximity of sites was a major deciding factor as it impacts on the work schedule of our local partner (SANBI) which requires fortnightly trips to each site for monitoring by one of their technicians. Delayed installation of dipwells had no budgetary impact on the DI grant.

"What are the implications of "much larger field plots than are practical being required to obtain statistically sound samples for Proteaceae species" for the project?" Does it change the project and its value substantively? Can Restionaceae still be used as a proxy of Proteaceae distribution as suggested in the application document?

Restionaceae have been used as indicators of habitat type for research on Proteaceae by others, but without the detailed knowledge of the ecological requirements of the Restionaceae

that we are now collecting. Although our plots are necessarily relatively small we *are* recording which proteas occur in them. Data at a larger scale have been collected in the Protea Atlas Project run by Tony Rebelo at SANBI and it will be possible to use the two datasets together. For this reason, and because the restios are key indicator species in their own right, the value of the project is not substantively affected by our chosen scale of sampling.

"The annual review should provide details of publicity generated to communicate the work, particularly where this is cited as outputs against dates. Links to partner websites which detail the work would be useful."

We have written a popular article that will soon be published in the Botanical Society of South Africa's magazine *Veld & Flora*. We also have started a blog about the project on the BBC/Open University platform www.open2.net. So far we have not had much success with local South African media, but we hope to break into this in the next months.

We always mention our activities on our project website (www.open.ac.uk/fynbos). Although we have submitted information for our partners' websites, these are not frequently updated and nothing about our work has yet appeared there.

"Fuller exploration of the policy and regulatory implications of the work at an early stage, and identification of key end users of knowledge generated may improve the design of outputs (particularly decision support tools). Some form of stakeholder analysis could inform this and enhance the potential of the project impact and legacy. In particular, who develops water abstraction policy and designs and administers regulatory processes for abstractions? How could the project bring added value by influencing these processes/stakeholders and what kind of information is needed to do this and improve decision making? The terminology used by the project is of the *potential* impacts of abstractions on fynbos. Can the project say anything more substantive about the risks?"

Water issues are notoriously complicated and can be highly political. To engage with them in South Africa at the depth suggested by this question is beyond a project that is focussed upon providing the ecological information that our partners at Cape Nature and SANBI say they need in order to improve their own decision making and evaluate ecological risks of changing hydrology. To answer the question of how we influence processes/stakeholders would require a different kind of project and it's not certain that such an approach would be welcomed by South African agencies. On the matter of risk, what we can say at the moment is that fynbos plant communities are very sensitive to hydrology and that changes to this, whether from climate change or by water abstraction, certainly threaten to alter these communities and their endemic plants. Cape geology and hydrology is very complicated and CSIR in Stellenbosch has conducted research on how connected aquifers are with surface conditions. We have spoken to Dr Christine Colvin at CSIR who directs this research and our understanding is that the connections they have found so far are rather weak. However, CSIR have not studied fynbos plant communities in the kind of detail that we have done so, it is almost certain that they have underestimated the risk. Dr Colvin said that they would be very interested in our results and her Department have been helpful to us. All the indications are that the results will be of practical value to the conservation partners with whom we are collaborating.

6. Other comments on progress not covered elsewhere

One potentially serious problem has arisen with one of our South African partners. The postdoc working for SANBI on the modelling part of the project has performed poorly and left. We are currently talking to SANBI about how the modelling objectives of the project can be achieved. To do this we anticipate replacing the Postdoc with a suitable PhD student who will start work in early May. We are currently waiting approval for this change from the Darwin Initiative secretariat.

We are aiming to forgo establishment of another 2 more sites, due to lack of secure and suitable sites close to the base of research assistants. Moreover, we will use the money to replace damaged field equipment at the two burnt sites.

In response to the fires that occurred at two of our study sites, we applied for and obtained an urgency grant from NERC (£) to study post-fire regeneration of fynbos species on those sites. This grant will enable us to extend the scope of our research into the origin of the patterns that we have discovered in fynbos vegetation.

7. Sustainability

Local partners and staff will ensure the project carries on beyond UK partner's project involvement. To date we have received enthusiastic support and involvement from all partners involved (Cape Nature, SANBI and SANPARKS) as well as local institutes of higher learning (University of Cape Town and Stellenbosch University).

8. Dissemination

To date dissemination has been mostly restricted to visiting nature reserve sites/managers, nature reserve organizations (Cape Nature, South African National Parks) and academic/research institutions (CSIR, University of Cape Town, Stellenbosch University).

We have recently submitted a popular science summary of our work to be published in *Veld & Flora*, the official journal of the Botanical Society of South Africa As the project progresses we aim to expand such network and be more involved the public media.

We are also sharing fynbos related research on the BBC/Open University - Science & Nature blog: http://open2.net/blogs/scitechnature/index.php/. The first one was published February 3, 2009. We aim to do so every 3 months.

9. Project Expenditure

Table 3 Project expenditure during the reporting period (Defra Financial Year 1 April 2008 to 31 March 2009)

Item	**Budget** (please indicate which document you refer to if other than your project application or annual grant offer letter)	Expenditure	Variance
Rent, rates, heating, overheads etc			
Office costs (e.g. postage, telephone, stationery)			
Travel and subsistence			
Printing			
Conferences, seminars, etc			
Capital items/equipment (specify)			
Others (specify)			
Salaries (specify by individual)			
TOTAL			

10. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes

I agree for LTS and the Darwin Secretariat to publish the content of this section

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2008/09

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
Goal: *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,* *The sustainable use of its components, and* *The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources*			*(do not fill not applicable)*
Purpose: To provide a quantitative, scientific basis for the incorporation of eco-hydrology in the management of fynbos habitats in the Cape Floristic Region potentially threatened by water abstraction.	Inclusion of eco-hydrological data in impact assessments and conservation management plans for fynbos habitats.	It is early in the project for this to have been achieved, but the enthusiastic cooperation we have received from Cape Nature, SANBI, SANPARKS and CSIR in South Africa indicates that our results are eagerly awaited and will be used when available.	We will continue with the planned programme of research and training.
Output 1. A database of eco-hydrological requirements of endemic species	Number of species and sites for which eco-hydrological parameters have been entered in the database.		
Activity 1		Good progress has been made. We have data on more than 60 species of Restionaceae at 8 sites. Restionaceae are keystone species in fynbos and are the focus of our work.	
Output 2. Enhanced models of the distribution of species in the	Comparison of the performance of models with and without eco-		

Proteaceae and Restionaceae.	hydrological parameters.	
Activity 2		We have scoped the problem and decided how the models will be built. We are currently tackling the issue of how we connect the local scale at which we are making hydrological measurements with the geographical scale appropriate for the modelling of species' distributions. This is being done by looking at the empirical correlation between rainfall and soil water availability. In addition to the work we are doing ourselves, more data on actual geographical distributions of Restionaceae will be collected by our collaborator in Zurich (Peter Linder) and climate envelopes will be computed for his data.
Output 3. Trained staff.	Number of trained staff.	
Activity 3		We have designed the training course, written course materials and undertaken training twice (July 2008 and October 2008). 21 rangers from Cape Nature and SANPARKS have successfully completed. They are already helping in monitoring.
Output 4. Improved decision-making tools.	Comparison of new decision-making tools with previous practice.	
Activity 4.		This activity is planned for later in the project.

Annex 2 Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilisation of genetic resources			
Purpose To provide a quantitative, scientific basis for the incorporation of eco-hydrology in the management of fynbos habitats in the Cape Floristic Region potentially threatened by water abstraction.	Inclusion of eco-hydrological data in impact assessments and conservation management plans for fynbos habitats.	Impact assessments and management plans for fynbos habitats	Impact assessments and management use an evidence-based approach.
Outputs (i) A database of eco-hydrological requirements of endemic species (ii) Enhanced models of the distribution of species in the Proteaceae and Restionaceae. (iii) Trained staff. (iv) Improved decision-making tools.	(i) Number of species and sites for which eco-hydrological parameters have been entered in the database. (ii) Comparison of the performance of models with and without eco-hydrological parameters. (iii) Number of trained staff. (iv) Comparison of new decision-making tools with previous practice.	(i) Reports and publication of peer-reviewed papers. (ii) Test models against observed distributions of species with and without inclusion of eco-hydrological parameters. (iii) Independent verification by Cape Nature &/or allied bodies. (iv) Testing and use of decision-making tools.	Sufficient staff of the right grades obtain training, so as to permanently enhance the capacity of conservation managers in eco-hydrology,

Checklist for submission

	Check
Is the report less than 5MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	Y
Is your report more than 5MB? If so, please advise Darwin-Projects@ltsi.co.uk that the report will be send by post on CD, putting the project number in the Subject line.	N
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Y
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	N
Have you involved your partners in preparation of the report and named the main contributors	Y
Have you completed the Project Expenditure table fully?	Y
Do not include claim forms or other communications with this report.	