

## ***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 2008

### **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
UK Partner Institution(s)	
Host country Partner Institution(s)	South African National Biodiversity Institute; Cape Nature
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 2007 - 31 March 2008 Annual Report 1
Project Leader Name	Jonathan Silvertown
Project website	
Author(s), date	Jonathan Silvertown; Yoseph Araya  6 May 2008

### **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. Most recently, with funding from the Leverhulme Trust we have piloted a trial of the methods that have proved successful in English meadows in the fynbos habitats of the Cape. We have 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 Global Change Research Group at SANBI 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 a new South Africa based Darwin Initiative postdoctoral research employee (Dr. Nicholas Walker). 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 will provide extensive help to the project in the form of staff time and logistical support. In response, field rangers and Reserve Managers will be trained by us in the methods of acquiring and interpreting ecohydrological data and will then monitor sites for us (first training planned for July 2008).

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**

We started the project with a logistics meeting in Cape Town on 4th of October 2007 between the UK and South African partners (SANBI and Cape Nature) as well as a representative from University of Cape Town. During this visit the project milestones were discussed and collaboration details addressed.

The next day we paid a consultancy visit to head of hydrology at CSIR (Ms. Christine Colvin).

During the months of October and November, we established four new sites, roughly 60 to 75 km from Cape Town within the Cape Floristic Region. The sites are near enough to our base in Cape Town to make bi monthly hydrological monitoring possible for the full duration of the project. Site establishment

entails setting up an array of 9 dip wells at the corners of the study plot (usually 50 x 50 m). Soil moisture in the profile is monitored using soil moisture probe on specially established access tubes (3 per site). Hydrological monitoring site visits are conducted bimonthly. To aid monitoring in the intervening period automatic logging equipment ('divers') are installed in a subset of these (3 per site).

The hydrological monitoring was started after site establishment on all four new sites. We also carried on monitoring hydrology on four sites previously established under our Leverhulme pilot project. We also completed topographical and botanical surveys of two of the four new sites. Topography was surveyed using a total station and full botanical composition was recorded in 200 – 300 1m x 1m quadrats. A local botanist and an expert on the Restionaceae family was employed to do the field identification. Field herbaria of all plant samples encountered were kept for future reference.

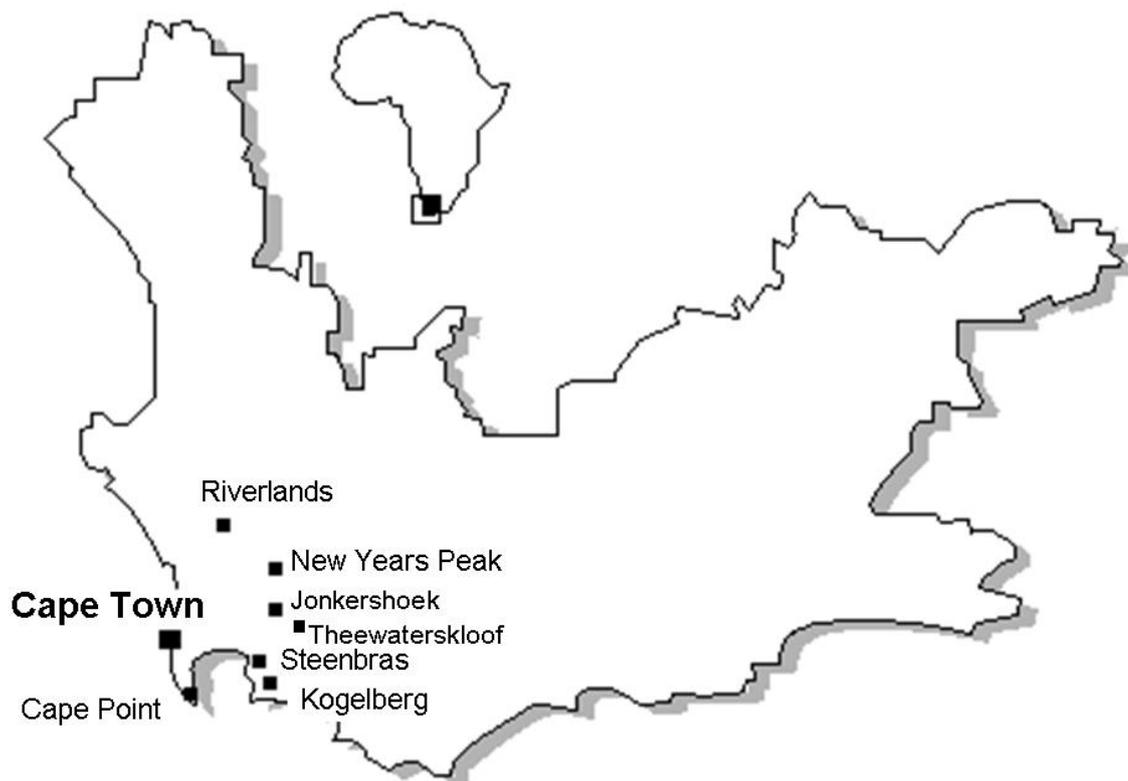
All our sites, except the two plots at Cape Point are administered by Cape Nature.

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 studied sites

No.	Site name	Location	Altitude /m a.s.l.	Quadrats recorded
1	Cape Point *	S 34°17'41.1" E 18 ° 26'18.7"	120	225
2	Riverlands *	S 33°29'12.8" E 18 ° 35'43.3"	120	305
3	New Years Peak *	S 33°41'19.7" E 19°06'02.9"	1080	235
4	Steenbras *	S 34°11'39.7" E 18° 52'14.0"	350	172
5	Theewaterskloof	S 33° 58.906', E 19° 07.887'	347	200
6	Jonkershoek	S 33 ° 59.600' E 18° 57.174'	350	201
7	Kogelberg	S 34° 16.745' E 19 ° 00.508'	131	
8	Cape Point	S 34 ° 18.705' E 18 ° 25.901'	112	

\* Indicates sites, established previously as pilot, but still being monitored in the frame of this project



### 3.2

**Figure 1.** Location of 8 sites so far established in the Western Cape Province, South Africa. There are two sites at Cape Point.

### 3.3 Progress towards Project Outputs

Six months into the project, we have made good progress in all planned activities and outputs. We have fully involved our project partners, employed key research staff (including a climate modeller), established field sites and are actively collecting data.

One adjustment we made, after careful discussions with our local partners, was to postpone our ranger training event from November 2007 to July 2008. This is because the rangers for the training were very busy with the Southern hemisphere summer fire season.

However, we still are on target to train the desired number of rangers in two training sessions, 14 rangers 2008 and another 10 in July 2009. This training course was designed and trialled with field workers in April 2008.

### 3.4 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	Total planned from application
Established codes							

6A, 6B	Field Rangers trained		14	10		0	24
8	Person/weeks fieldwork	20	35	30	20	20	105
New - Project specific measures							

## Publications

No publications have yet come out from this project in the last six months. However, a paper and conference submission entitled "Using hydrological niches for conservation planning under present and future climates" Walker, Araya et al. has been made to the 9th WaterNet/WARFSA/GWP-SA Symposium (29 – 31 October 2008) Johannesburg, South Africa.

Writing of scientific papers as well as a practitioner's manual for eco-hydrological monitoring are in progress.

### 3.5 Progress towards the project purpose and outcomes

Six months 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). Our climate and species modeller has been employed and is processing data (output ii). Final arrangements for training rangers in July 2008 have been made (output iii). Progress towards output iv, is expected later, using inputs of i and ii.

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

At this early stage of the project (just 6 months in) 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

Data collection and project running by local partners are regularly followed up from UK based postdoc (Yoseph Araya).

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

Not applicable.

### 6. Other comments on progress not covered elsewhere

Not applicable.

### 7. Sustainability

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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 as well as local institutes of higher learning (University of Cape Town and Stellenbosch University).

## 8. Dissemination

To date dissemination has been 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). As the project progresses we aim to expand our such network and involved the public media.

## 9. Project Expenditure

**Table 2** Project expenditure during the reporting period (Defra Financial Year 01 April to 31 March)

Item	Budget as in Grant Claim Form submitted up to 31/12/07	Expenditure	Balance
Rent, rates, heating, overheads etc			
Office costs (eg postage, telephone, stationery)			
Travel and subsistence			
Printing			
Conferences, seminars, etc			
Capital items/equipment			
Others			
Salaries (specify): Y.Araya, J.Silvertown, D.Gowing, K.McConway, N.Walker			
TOTAL			

Transfers and carry-forwards of balances shown have all been agreed with Defra by e-mail.

Highlight any agreed changes to the budget and explain any variation in expenditure where this is +/- 10% of the budget.

**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 ECTF and the Darwin Secretariat to publish the content of this section](#) (please leave this line in to indicate your agreement to use any material you provide here)

Not applicable at this stage.

## Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2007/08

Project summary	Measurable Indicators	Progress and Achievements April 2007 - March 2008	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</i></p> <p><i>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><i>(do not fill not applicable)</i></p>
<p><u>Purpose</u></p> <p>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.</p>	<p>Inclusion of eco-hydrological data in impact assessments and conservation management plans for fynbos habitats.</p>	<p>It is too early in the project for this to have been achieved, but the enthusiastic cooperation we have received from Cape Nature, SANBI and CSIR in South Africa indicates that our results are eagerly awaited and will be used when available.</p>	<p>We will continue with the planned programme of research and training.</p>
<p><u>Output 1.</u></p> <p>A database of eco-hydrological requirements of endemic species</p>	<p>Number of species and sites for which eco-hydrological parameters have been entered in the database.</p>		
<p>Activity 1</p>		<p>Good progress has been made. We have data on about 50 species of Restionaceae at 6 sites. Restionaceae are keystone species in fynbos and are the focus of our work. We had hoped that data on Proteaceae could also be collected, but it is beginning to look as though much larger field plots than are practical for this project would be required to obtain statistically sound samples for</p>	

		these plants, many of which are large shrubs.
Output 2. Enhanced models of the distribution of species in the Proteaceae and Restionaceae.	Comparison of the performance of models with and without eco-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 modeling 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, consulted Ernst Baard at Cape Nature to check that it is appropriate and piloted the course with nature conservation staff in England. The first course will be run in South Africa in July with 14 field rangers who work for Cape Nature.
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
<p><b>Goal:</b></p> <p>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</p> <ul style="list-style-type: none"> <li>• the conservation of biological diversity,</li> <li>• the sustainable use of its components, and</li> <li>• the fair and equitable sharing of benefits arising out of the utilisation of genetic resources</li> </ul>			
<p><b>Purpose</b></p> <p>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.</p>	<p>Inclusion of eco-hydrological data in impact assessments and conservation management plans for fynbos habitats.</p>	<p>Impact assessments and management plans for fynbos habitats</p>	<p>Impact assessments and management use an evidence-based approach.</p>
<p><b>Outputs</b></p> <p>(i) A database of</p>	<p>(i) Number of</p>	<p>(i) Reports and</p>	<p>Sufficient staff of the right</p>

<p>eco-hydrological requirements of endemic species</p> <p>(ii) Enhanced models of the distribution of species in the Proteaceae and Restionaceae.</p> <p>(iii) Trained staff.</p> <p>(iv) Improved decision-making tools.</p>	<p>species and sites for which eco-hydrological parameters have been entered in the database.</p> <p>(ii) Comparison of the performance of models with and without eco-hydrological parameters.</p> <p>(iii) Number of trained staff.</p> <p>(iv) Comparison of new decision-making tools with previous practice.</p>	<p>publication of peer-reviewed papers.</p> <p>(ii) Test models against observed distributions of species with and without inclusion of eco-hydrological parameters.</p> <p>(iii) Independent verification by Cape Nature &amp;/or allied bodies.</p> <p>(iv) Testing and use of decision-making tools.</p>	<p>grades obtain training, so as to permanently enhance the capacity of conservation managers in eco-hydrology,</p>
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<b>Activities</b>	<b>Activity Milestones</b>	<b>Assumptions</b>
<p>(i) Acquisition of quantitative data on the eco-hydrological requirements of endemic species in fynbos habitats of the Western Cape.</p> <p>(ii) Incorporation of the data acquired into regional models of the distribution of species in the Proteaceae and Restionaceae.</p> <p>(iii) Training of South African nature conservation staff in the principles and practice of eco-hydrology as applied to fynbos.</p>	<p>(i) Number of species and sites for which eco-hydrological parameters have been measured</p> <p>(ii) New or modified models that include eco-hydrological parameters.</p> <p>(iii) Identification of key personnel for training &amp; decision-making; training of those personnel; utilization of training in conservation management &amp; planning.</p>	<p>A set of decision-making tools can be devised that are sufficiently simple to use so that they can be readily adopted by conservation managers.</p>
<p>(iv) Design of tools for use in eco-hydrology to be incorporated into decision-making</p>		

**Annex 3 onwards – supplementary material (optional)**

### ***Checklist for submission***

	Check
<b>Is the report less than 5MB?</b> If so, please email to <a href="mailto:Darwin-Projects@ectf-ed.org.uk">Darwin-Projects@ectf-ed.org.uk</a> putting the project number in the Subject line.	YES
<b>Is your report more than 5MB?</b> If so, please advise <a href="mailto:Darwin-Projects@ectf-ed.org.uk">Darwin-Projects@ectf-ed.org.uk</a> that the report will be send by post on CD, putting the project number in the Subject line.	NO
<b>Do you have hard copies of material you want to submit with the report?</b> If so, please make this clear in the covering email and ensure all material is marked with the project number.	NO
Have you completed the Project Expenditure table?	YES
Do not include claim forms or communications for Defra with this report.	noted