



### Final Report

**1. CLP project ID & Project title:** Project ID 01282416

CLP Project Title: "Protecting the Endangered Flora of Papenkuils Wetland in South Africa"

**2. Host country, site location and dates in the field:**

South Africa, Rawsonville, Nov 2016 - Apr 2017

**3. Institutions Involved:**

World Wide Fund for Nature South Africa (WWF-SA), Living Lands, Land Life Company

**4. Overall Aim:**

Using new water-saving technology to create a tree buffer zone for the protection of the Papenkuils Wetland, South Africa.

**5. Full names of authors:**

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**7. Date when the report was completed:** 20/10/2017

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# Section 1

## Summary

The Papekuils Wetland Conservation project is located between Rawsonville and Worcester along the Breede River, Western Cape, South Africa. The purpose of this project is to (1) mitigate the impact of surrounding areas on the threatened flora of the wetland by planting tree buffer zone/s on highly impacted areas and (2) build wider-community involvement in protecting the wetland by engaging them in planting events and sharing knowledge and skills on the planting technology and wetland's functioning. The key results and main impacts are,

- Successful stakeholder engagement and buy-in resulting in long-term commitment from local residents to conserve the wetland,
- Training of two planting teams creating a thoroughly trained crew for rehabilitation planting in the area,
- BioBlitz: documented species in the wetland and found an IUCN red-listed plant (*Skiatophytum tripolium*) we didn't know grew there,
- Successful planting days which resulted in increased plant biodiversity along the edge of the wetland which contributes a buffer effect from human impact,
- Erecting an information board for the wetland which increases awareness and understanding of the uniqueness of the wetland, and
- Environmental education for residential adults, school children and youth from the surrounding area.

The greatest challenge to the project's success was the extreme drought conditions experience in the project area. Our objective of successfully establishing indigenous trees/shrubs was only 50% successful.

## Introduction

The Papekuils Wetland, a biodiversity hotspot located along the Breede River, experiences frequent runaway fires. The wetland is situated between the towns of Rawsonville and Worcester in the Western Cape Province (southwestern South Africa). It forms part of the endangered Breede Alluvium Fynbos Biome within the Worcester District in the Breede River Valley. The fires threaten the fauna and flora of the wetland, of which 7 are IUCN red-listed species. The aim of this project is to mitigate the impact of runaway fires and to create an incentive for local stakeholders to contribute to long term conservation of the wetland.

As designated by the UNESCO and WWF, this location has very high priority conservation status as it is a highly biologically diverse area. Yet it lacks any formalized conservation management plans for this area, which directly threatens the continued survival and protection of the fauna and flora that make up the endangered Breede Alluvium Fynbos Biome.

Wetland plant species, and the animals that depend on these areas for habitat and survival, are particularly sensitive to changes in the environment, specifically in the decrease of water availability throughout different seasons and increased temperatures. These are two very real foreseen consequences of climate change within the Western Cape in South Africa. Not only will the endangered, threatened and vulnerable plant species probably go extinct (or their populations become unrecoverable), it will have a massive knock on effect on the rest of the plants, and thus animals, in the wetland.

Tree buffer zones are planted in strategically located transition zones around areas with sensitive plant species. Stakeholders are engaged in various social learning events about the value and importance of the wetland during planting days.

This project will contribute to the overall conservation and protection of the Papenkuils wetland and the endemic and endangered flora & fauna present. It supports a formalized management plan that has been co-created by the landowners, WWF-SA and CapeNature.

The key partners include WWF-SA, Living Lands and Land Life Company working as environmental conservation and rehabilitation organisations and business in the area. Other valuable collaborators include the Western Cape Government (Department of Agriculture and Dept. of Environmental Affairs and Development Planning), Stellenbosch University, South African National Biodiversity Institute and Merwida Wine Estate.



Map of South Africa, with an aerial view lifted of the Papekuils wetland (shaded in green), between the towns Rawsonville and Worcester in the Western Cape Province.

## Project Members

<b>Name (age)</b>	<b>Qualifications</b>	<b>Experience</b>	<b>Current Occupation, Employer</b>	<b>Main role</b>
Lyndre Nel (26)	MSc Conservation Ecology	Project management, environmental scientist, local stakeholder engagement	Landscape Mobiliser, Living Lands	Project co-manager and local coordinator and stakeholder engager
Ingeborg Magi (28)	MSc Environment and Resource Management	Nature restoration practitioner	Project Manager, WWF	Project co-manager, specialist on the Cocoon tree planting technology
Roderick Juba (26)	PhD Conservation Ecology	Scientific research in environmental restoration	PhD Student, Stellenbosch University	Environmental scientist (PhD candidate) and species surveyor, specializing in riparian restoration
Michelle Duncan (27)	BA (Honours) Social Dynamics	Environmental education and community engagement	Masters Student, Stellenbosch University	Social scientist (Honours student), specializing in community involvement and participation

## Section 2

### Summary of Main Aim, Objectives, Activities and Outputs

The main aim of this project is two-fold: (1) mitigate the impact of surrounding areas on the threatened flora of the wetland by planting tree buffer zone/s on highly impacted areas and (2) build wider-community involvement in protecting the wetland by engaging them in planting events and sharing knowledge and skills on the planting technology and wetland’s functioning.

<p><b>Objective 1:</b> Planting a buffer zone of 300 native trees and shrubs on highly impacted areas along the wetland’s border that poses the greatest threat to wetland health, with the input and assistance from local stakeholders (i.e. landowners &amp; nature conservation agencies).</p>		
Activities	Outputs	Results
<ul style="list-style-type: none"> <li>- Consulted landowners and conservation practitioners in the area on target planting sites</li> <li>- Scouted wetland margins bordering various land-use zones and identify top sites with best impact-mitigating value</li> <li>- Planted 270 indigenous shrubs with local planting teams from the community (invited landowners and local government,).</li> <li>- Follow-up monitoring: Documented state of highly impacted zones during and after planting tree buffer zones (monitoring vegetation cover).</li> </ul>	<ul style="list-style-type: none"> <li>- Increased plant biodiversity in wetland margins</li> <li>- Documented plant species at planting sites</li> </ul>	<ul style="list-style-type: none"> <li>- 80 plants have survived.</li> <li>- Continued follow-up monitoring of plants.</li> </ul>
<p>Methodology:</p>		

- Planting trees

Indigenous shrub species were hand-selected from a nursery providing locally sourced plants. Shrubs were planted using the novel Cocoon® technology to enhance establishment rate while minimizing energy and water inputs. Species used include *Searsia undulata*, *Searsia angustifolia*, *Clifortia strobilifera*, *Freylina lanceolata* and *Diospyros glabra*. The shrubs were planted in a sandy, well-drained soil in summer and autumn separately to test effectiveness of the Cocoon® in extreme hot conditions and in cooler periods. Shrubs were planted in accordance with proposed methods by the Land Life Company, producer of the Cocoon®. These methods include digging a hole of about 70cm in diameter and 40cm deep. The hole is wetted with a hose, after which the shrub (between 15 and 50 cm tall) is placed in the middle. The Cocoon® is placed over the plant so the leaves protrude out the top. If plants are too short, a small heap is made in the middle of the hole to help elevate the plant to have access to sunlight. After the Cocoon® is inserted into the hole with the wicks positioned to direct water flow to plant roots it is filled with up to 25 liters of clean water. The sides of the Cocoon® were supported with excess soil to minimize distortion of its shape. Care was taken to keep soil out of the Cocoons to maximize water transport potential of wicks. The Cocoon® is closed with a biodegradable paper lid and completely covered and surrounded by locally sourced soils. Excess soil is spread around the hole. Plants were not watered after initial planting.

**Objective 2:** Involve local stakeholders in the planting process (i.e. locating planting spots, digging holes and planting trees), through social learning events with the purpose to share knowledge and skills on planting technology and the wetland’s functioning.

Activities	Outputs	Results
<ul style="list-style-type: none"> <li>- Wetland planting site scouting with land owner and local wetland scientist</li> <li>- Local planting team and local government attended Cocoon planting days.</li> <li>- Organized an environmental awareness day at the wetland for</li> </ul>	<ul style="list-style-type: none"> <li>- Local planting team received training on planting in wetlands, to increase biodiversity and functioning of wetlands.</li> <li>- No fires have occurred in the wetland since our engagement efforts.</li> </ul>	<ul style="list-style-type: none"> <li>- Less incidence of fires in the wetland due to the support and participation of key stakeholders through effective wetland management and conservation.</li> </ul>



<p>about 40 school children (aged 10) from schools nearby.</p>		<ul style="list-style-type: none"> <li>- We have engaged 60 stakeholders.</li> <li>- We have seen more commitment from some people directly linked to the wetland to conserve it.</li> </ul>
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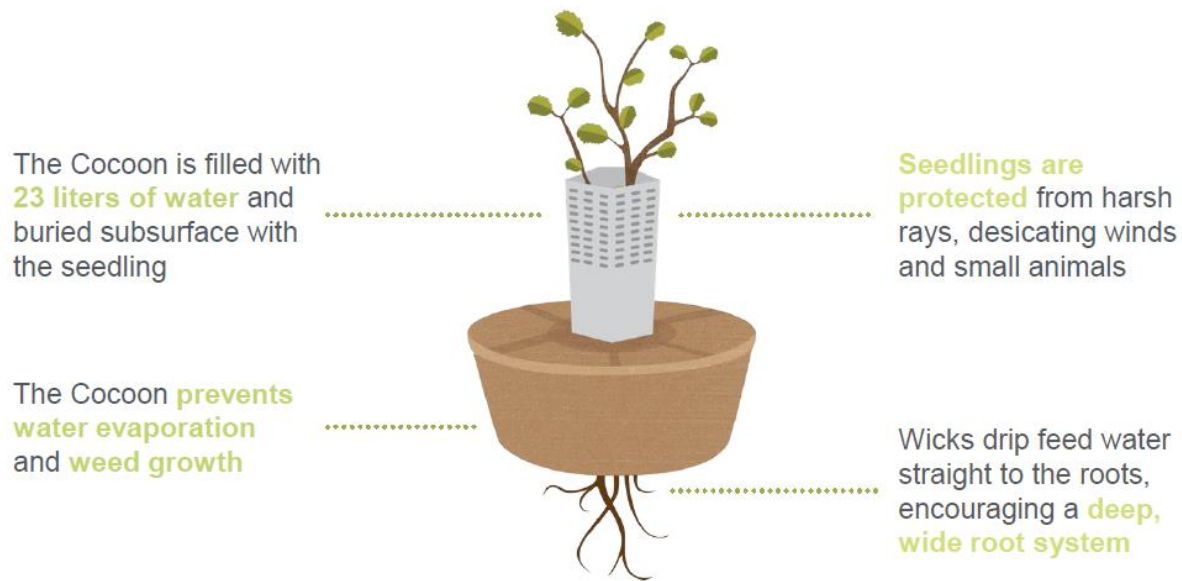
**Objective 3:** Ensure 80-90% survival rate of the tree seedlings within the first most crucial 6 months by using the Cocoon technology

Activities	Outputs	Results
<ul style="list-style-type: none"> <li>- Seedling selection of a mix of 7 pioneer shrub species (local species, healthy seedlings)</li> <li>- Organized and selected local planting teams from Land Care</li> <li>- Preparation of the site (e.g. digging and pre-watering the holes) by local planting teams</li> <li>- Planted with the Cocoon with stakeholders from the wider community</li> <li>- Evaluation and follow-up</li> </ul>	<ul style="list-style-type: none"> <li>- 30% survival rate of all planted trees</li> </ul>	<p>There were 2 planting events at the Papenkuils wetland at Worcester, Western Cape. 150 Cocoons and 80 control (no Cocoon) plants were planted in October 2016. By January 2017, all the plants had perished due to extreme heat and dryness (ave. 28 - 34 Celsius with no rain). The second planting event, 120 Cocoons and 120 control plants were planted by end-May 2017, a few weeks before the awaited rainy season. The Cocoons are performing very well in helping trees establish and then function as an incubation unit once the rainy season sets in. On-going monitoring is still providing data on survivability and new growth.</p>

Methodology:

### The Cocoon Technology

Cocoon technology that will be used for the planting procedure is highly relevant for the project as we aim to create a healthy buffer zone. The current measure of irrigating trees is highly resource inefficient and makes the trees addicted to water which results in high costs on water, irrigation technology and labour. By using the Cocoons, we will avoid this scenario by ensuring high seedling survival in a drought-stricken area.



- Planting Cocoons (see Appendix 4.4 for full instructions)

The planting process is an integral part of the COCOON's success (step-for-step manual seen on next page). This consists of several considerations:

- **Inspection and selection of the planting site.** The soil and terrain are analysed to assess soil fertility and to determine whether soil amendments are required, e.g., to establish a minimum level of organic material or to neutralize excess concentrations of elements.
- **Selection of appropriate species.** To select the right tree or plant, we consulted local experts. Native species adapted to local conditions are preferred.
- **Sourcing of high-quality seedlings.** We worked with a local nursery to provide seedlings of the right quality, size and hardiness to suit this project.
- **Planting logistics and infrastructure.** Designing the planting map, defining the water supply and distribution of the COCOONS, identifying additional infrastructure and sourcing machinery and labour for the planting.

- **Execution.** Oversight and on the ground support.
- **Monitoring.** On the ground follow-up, initially we visited weekly and now we check up every month.

## Changes to original project plan

- Planting sites area focused to a highly impacted area
- Change of planting dates due to drought (October 2016 & May 2017): Extreme heat and drought was experienced over the Oct/Nov 2016 period and singed all the trees and shrubs that we planted. We planned to plant again a month before the onset of winter rain, usually April, but it only rained a month after and also inconsistently. We planted 3 weeks before the winter rain began in June.
- Changes to target youth on holiday as opposed to the community living nearby. Our team gained information from local authorities that fires occurring in the wetland were started by school children on holidays, who had nothing else to do. The local fire department, municipality and local civil groups have been running effective after-school and holiday programs for local youths. Since then there has been a dramatic decrease in fires occurring in the wetland. Our team has supported these efforts by hosting in-field environmental days with local school groups and farm workers children.
- Project finalizing date extended to end May due to extreme weather patterns. We were advised by our project advisers and other scientists that we should split our planting into two separate time periods; 1. In the summer, and 2. In Autumn. This would account to establishing plants in a “plant succession” fashion and to use the weather to our advantage should the summer be drier than usual (which it was).

## Communication & Application of results

- Information dissemination
  - Regular meetings were held with landowners and project partners to update them on project implementation progress and results.
  - Brief informational posts on the Papenkuils Facebook page kept the wider community in the loop.

- Two newspaper articles on the project explained what we are doing and what results will be achieved, as well as how the community can get involved.
- Results applied to address conservation problem
  - We gained the trust of the landowners and build relationships with them around the conservation of the wetland.
  - After the Bioblitz, researchers were increasingly interested in the Papenkuils Wetland and returned more than two times to search for new plants and map the occurrence of plant species.
  - From our plant survival rates, we have established most favourable rehabilitation planting time and sites. This information will inform future rehab work in the wetland.
  - Our project shed light on the lack of education and awareness provided to local communities around the Papenkuils Wetland. This issue has been brought to the attention of other environmental education groups working in the area and local government.

## Monitoring & Evaluation

- Monitoring Plant Survival
  - Trees were evaluated after 1 month, 3 months, 6 months and 1 year after their initial planting in order to see the effectiveness of the restoration. Tree/shrub height, vigour and animal damage were observed to make conclusions on favourable planting conditions, i.e. timing, plant species, planting site, etc.
- Evaluating environmental education
  - Observational evaluation was done during and after the environmental educational days held at the wetland. We looked for present and absent behaviour before and after the children had learnt something, e.g. children run through fields, the facilitator educates them on small and sensitive plants that occur in the fields and are damaged by running, afterwards the children step carefully and become excited when they see a small flower.
  - Content check was done throughout and after the educational days. This is where facilitators informally check the understanding of the content learned with the children. For example, “Does the wetland like fires?”, if the learner replies with a

negative then it is confirmed that they understand that fires cause damage to wetlands.

- We received feedback from teachers and supervisors that attended the educational days. We adapted a few learning activities to reflect learning methods which the children are familiar with.

## Achievements and Impacts

- A Bioblitz was held on 15 October 2016 where new plant species were found to occur in the wetland by botanists and the event was attended by the landowner and press (see Appendix 4 for photos).
- Indigenous shrubs were planted in Cocoons in buffer zones around the wetland, where the planting team received training beforehand. By using the local planting team, we contributed to a local business and local economy of the area.
- Effective engagement with all stakeholders, local authorities, youth leaders and counselors. Many stakeholders were interested and involved in our planting days and environmental education days. We continue to engage with all role-players to work toward improved conservation efforts of the Papenkuils wetland.
- We have held two environmental education days with youth from the surrounding area. For the one event we had a fun day out with school children to teach them about the wetland, and its functioning and relevance. Afterwards, the school children (aged 9-11) started an environmental club, supported by the South African National Biodiversity Institute.
- Our team leader, Lyndre, was asked to attend a government environmental protection workshop to improve the Breede River and its ecological infrastructure, such as the Papenkuils wetland. Papenkuils wetland will be featured, and promoted for protection status. Without the team having engaged with the government and local residents, people would not have been aware of the status of the wetland.
- Our team member, Roderick Juba, won an award at the National Wetlands Indaba in October 2017 for his work at the Papenkuils Wetland. This award celebrates young professionals who make significant contributions to the conservation and protection of wetlands in South Africa.

## Capacity Development and Leadership Capabilities

Team Member	Development
Lyndre Nel	Advanced project management and implementation skills. Development of capacity for responsibility towards project implementation. Developed leadership skills and advanced my interpersonal team skills by leading my team to implement and complete the project. Also, supporting Roderick’s interests in continuing work in the Papenkuils wetland.
Ingeborg Magi	Project management and implementation skills. Developed international leadership skills and team working ability. Hands on field work skills. Learnt more about stakeholder engagement through practical experience.
Roderick Juba	Learned to work with the “Cocoon”. It added another dimension to my knowledge of ecosystem restoration, and in an ever-changing field, such new knowledge could prove to be invaluable. Benefited in learning about the power dynamics around nature and between people through the sharing of knowledge and asking questions. Will continue working with community nearby the wetland on sustainable resource management.
Michelle Duncan	Brought an insight into the complexity of social dynamics and political ecology to the team. With knowledge about South Africa’s history, land, the history of nature conservation, political ecology, poverty and inequality, race relations and power dynamics, I was able to ask questions about who should be considered stakeholders and give voice to the power dynamics in stakeholder meetings. In doing so, I and we moved to include all stakeholders in a manner that communicated they have an equal stake in the future of the Papenkuils Wetland.

## Section 3

### Conclusion

The implementation of this project has certainly brought awareness to the existence of the Papenkuils wetland. While it is a landscape that many people pass over daily, many in the community surrounding it did not know it had a name or about its abundance of life. The erection of an information board about the Papenkuils Wetland in Merwida wine's offices serves to notify farmers, winemakers and visitors alike that vineyards and mountains are not the only natural features in this area. It also serves to remind people how important healthy and functioning wetlands are.

The project highlighted the challenges of conserving a natural resource in a landscape of high unemployment, poverty and inequality. Stakeholders around the wetland have varying knowledges about the wetland and its biodiversity, and all engage with it in one manner or another. Their economic status however, largely determines the manner of this interaction. It would be incorrect though to determine that people living in poverty have the worst impact on the wetland, in comparison to more wealthier individuals. They do however, often not have the luxury of choice - the choice to find another means of income or source of feed for their livestock. Environmental education alone will not alter people's behaviour and use of resources. There are wider social reasons that lead to people's use of resources that need to be addressed as well. Further work with the community endeavours to address these needs and, ultimately, conserve the valuable life and services of the Papenkuils Wetland.

### Problems encountered and lessons learnt

- Which project activities and outcomes went well and why?
  - Planting of indigenous shrubs: we had a specialist wetland scientist, botanist, and rehabilitation specialist working with us which ensured that the right plant choice was made and good planting location was chosen.
  - Effective stakeholder engagement was done due to a rigorous stakeholder analysis made prior to engagement. From the CLP training, our team thoroughly developed the stakeholder matrix, which allowed us to identify all the people that we needed to meet with, and who we needed to include in our project.

- Effecting change through fully understanding the problems, by developing the Log Frame. While our team developed this project's log frame, we each personally became aware of the underlying complexity in changing human behaviour (i.e. stopping fires from being set). The Log Frame allowed us to frame the challenges in such a way so as to set a solution for each, which informed all our activities and enabled us to be successful in making an impact.
- Which project activities and outcomes have been problematic and in what way, and how has this been overcome?
  - We had a great challenge with Activity 3 (Ensure 80-90% survival rate of the seedlings within the first most crucial 6 months by using the Cocoon technology) due to the extreme drought that has been experienced in the Western Cape since October 2016 up to this date. We have had a seedling success rate of less than 10% due to a lack of water. We refilled the Cocoons with water a month after planting to help the plants, but over the following 5 months, no ground water was available for the seedlings to grow. We tried to improve survival by planting shrubs in Cocoons just before the winter rains set in in May 2017. We have a planting week planned for the first week in May, where we will be replanting indigenous plants into the buffer zones. Our advisors and other botanists advised that this is the best route to take with regards to ensuring the success of the seedlings. Survival rate of the 2<sup>nd</sup> planting is at 70% in October 2017.
  - Engagement with residents from the local community, Avian Park, proved to be a dangerous activity as the community held a few protests on government service delivery during the past 8 months, as well as increased gang violence associated with drug trafficking. Our team decided to meet with youth leaders, councilors and community leaders from that community that could be engaged with outside the potentially dangerous areas. Local authority also engaged with these role-players, and provided a good platform on which to discuss the protection of the Papenkuils wetland.
- Assessment of specific project methodologies and conservation tools used:
  - Rehabilitation Planting: There were 2 planting events at the Papenkuils wetland at Worcester, Western Cape. The first planting event, 150 Cocoons and 80 control (no Cocoon) plants were planted in October 2016. By January 2017, all the plants had perished due to extreme heat and dryness (ave. 28 - 34 Celsius with no rain). The second planting event, 120 Cocoons and 120 control plants were planted by end-May 2017, a few weeks before the awaited rainy season. In general, the



Cocoons seem to be performing very well in helping trees establish and then function as an incubation unit once the rainy season sets in. On-going monitoring is still providing data on survivability and new growth.

- Stakeholder Engagement:
- Important lessons which have been learnt through the course of the project so far:
  - Environmental restoration is a very complex science; planting time, seasonality, plant species, amount of seedlings and planting sites all have to be considered carefully and used optimally for best results.
  - When going up against extreme environmental factors such as the drought experienced in the Western Cape, it makes projects outcomes seem unreachable. The drought is terrible for plant growth as nothing will proliferate and many will die, but it is a very useful event in promoting awareness about water and its importance to us as humans, amongst the general public, local community, land owners and farm workers. Due to strict water restrictions enforced on many landowners, we have had improved engagement with them during our visits, as they now see the benefits we bring in conserving nature, and ecological infrastructure, such as the Papenkuils wetland.

## In the Future

- Our team member, Roderick, has set up a new non-government organization, Generation 7 (see [www.facebook.com/generation7CfD/](http://www.facebook.com/generation7CfD/)) which will continue to engage with the local community nearby the wetland around sustainable resource use.
- The wetland landowners and Merwida Wine Estate has shown commitment to conserving the Papenkuils wetland and will continue to raise awareness in the community and with visitors to the area.
- Continued conservation work will be carried out by other environmental protection agencies working in the area, namely WWF-SA, CapeNature, Breede Gouritz Catchment Management Agency and LandCare.

# Financial Report

Itemized expenses	Total CLP Requested (USD)*	Total CLP Spent (USD)	% Difference	Details & Justification <small>(Justification must be provided if figure in column D is +/- 25%)</small>	Proposed Spending <small>(Preliminary Report Only)</small>
<b>PHASE I - PROJECT PREPARATION</b>					
Communications (telephone/internet/postage)					
Field guide books, maps, journal articles and other printed materials					
Insurance					
Visas and permits					
Team training					
Reconnaissance	250,00	298,08	19%	overspent	-48,00
Other (Phase 1)					
<b>EQUIPMENT</b>					
	3 250,00				76,00
Scientific/field equipment and supplies		2623,53	-19%	Underspent. The Cocoons we bought for the planting cost less than we expected. It was cheaper due to the fluctuating exchange rate between Euro and South African Rand (ZAR). We previously budgeted \$3250 and only paid \$2623. We would like to move the surplus budget (\$627) towards other budget lines as requested below.	
Photographic equipment					
Camping equipment					
Boat/engine/truck (including car hire)					
Other (Equipment)					
<b>PHASE II - IMPLEMENTATION</b>					
	800,00				
Accommodation for team members and local guides		1423,61	78%	Overspent. It proved difficult to stay within budget as previously thought as accommodation rates near the planting site and in town (Worcester) were higher than expected and, in addition, we accommodated students that assisted with the planting and educational awareness days. We overspent this budget line by \$624.	74,00
Food for team members and local guides		1122,95		Overspent. Due to the surplus in budget lines for field equipment and planting costs, it was possible for us to cover the food costs for our team, students and planting team that all assisted in the planting and educational awareness days held. In addition, we used this surplus to cover the cost of food during meetings with local and provincial authorities while discussing strategic planning for the conservation of the Papenkuils wetland and increased support for environmental awareness days.	140,00
Travel and local transportation (including fuel)	4 562,00	4562,08	0%	Surplus has been allocated to last planting days (seedlings, transport, fuel, delivery, labour), and environmental awareness day in May.	693,00
Customs and/or port duties					
Workshops					
Outreach/Education activities and materials (brochures, posters, video, t-shirts, etc.)	550,00	740,19	35%	Surplus has been allocated to environmental awareness days in May (food, transport, learning materials, educational entertainment, photos)	288,00
Other (Phase 2)	2 839,00	1192,39	-58%	Underspent. Our project partner, the Western Cape Dept. of Agriculture (LandCare), sponsored the transport and labour needed for our first planting week. Setting apart the rest of the allocated budget to be spent on the second planting event happening in May 2017, this gives a surplus of \$1800 that can be used in other budget lines as suggested here. Previously, we budgeted \$2839 for all planting costs which included tree seedlings, plant delivery, labour and transport.	496,00
<b>PHASE III - POST-PROJECT EXPENSES</b>					
Administration					
Report production and results dissemination					
Other (Phase 3)	200,00	482,52	141%	Use surplus budget on 'low hanging fruit' opportunities to advance the wetlands' conservation between April and June i.e. local environmental groups, putting up fire awareness signage, etc.	750
<b>Total</b>	<b>12 451,00</b>	<b>12 445,35</b>		<b>5,65</b>	<b>2 469,00</b>

## Acknowledgements (Partners & Collaborators)

- Conservation Leadership Program, for the financial sponsorship, training and general support
- Dr. Donovan Kotze & Johann van Biljon, for independent supervision and guidance
- Western Cape Government, for supporting the project and inviting our team to attend policy integration meetings
  - Dept. of Environmental Affairs and Development Planning - Jason Mingo, for independent consultation and advising
  - Dept. of Agriculture, LandCare - Rudolph Roscher & Chris Meintjies, for independent consultation and advising and photo taking
- Linda and Henry Jansen and their planting team, for helping us plant the Cocoons successfully
- CREW - Ismael Ebrahim and others, for help arranging and undertaking the Bioblitz
- Gerhard van Deventer, for facilitating the environmental learning days
- WWF-SA - Shelly Fuller & Joan Isham, for continued support and guidance
- Living Lands - Liezl Le Roux & Marijn Zwinkels, for continued support and guidance
- Land Life Company - Arnout Asjes, for continued support and guidance
- SANBI Karoo Desert Botanical Garden, for supporting the environmental learning days
- CapeNature, for supporting the project



Thank you very much to our planting team, their hard work and effort greatly contributed to our successful planting!

## Section 4

Appendix 4.1. CLP Monitoring & Evaluation Measures Table

Output	Number	Additional Information
Number of CLP Partner Staff involved in mentoring the Project	0	
Number of species assessments contributed to (E.g. IUCN assessments)	0	
Number of site assessments contributed to (E.g. IBA assessments)	0	
Number of NGOs established	1	Generation 7 established by team member, Roderick Juba
Amount of extra funding leveraged (\$)	1000	Land owners and Western Cape Government contributed towards planting indigenous shrubs.
Number of species discovered/re-discovered	1	During the Bioblitz, the vulnerable red-listed plant <i>Skiatophytum tripolium</i> was found to be growing in the wetland.
Number of sites designated as important for biodiversity (e.g. IBA/Ramsar designation)	0	
Number of species/sites legally protected for biodiversity	0	
Number of stakeholders actively engaged in species/site conservation management	10	

Number of species/site management plans/strategies developed	1	Environmental Management plan developed by land owners and WWF-SA.
Number of stakeholders reached	287	At least 287 people through Facebook page.
Examples of stakeholder behaviour change brought about by the project.	1	The owners of the Papenkuils Wetland have actively started promoting the conservation of the Papenkuils wetland at their wine tasting room and at public meetings.
Examples of policy change brought about by the project	1	The Western Cape Government specifically included the Papenkuils Wetland as ecological infrastructure that will need “maintenance” in their Breede River Improvement Plan. This allows for a budget to be approved for the upkeep and conservation of the wetland in the future.
Number of jobs created	14	Two local planting teams were contracted over a 10 day period for 2 planting events during the project.
Number of academic papers published	0	
Number of conferences where project results have been presented	0	

## Appendix 4.2. Media articles relating to the project



(above) “Experience ecological wonders of the wetlands” in Kazi Vision on 14 October 2016.


The Bioblitz event was advertised in a widely read local newspaper, Kazi Vision. A few local residents attended the Bioblitz, along with the specialized botany group, CREW, during which 2 new plant species were found to grow in the Papekuils wetland.



(above) “Wetland cherishes dwarf water flower” article appeared in the local district newspaper, the Worcester Standard, on 27 October 2016. The article reported on the Bioblitz event held, the aims of the event, feedback from the landowner and the unique plants found in the wetland. The reporter attended the Bioblitz with us and interviewed all the important stakeholders part of this event.



(above) A proof of the information board that has been put up in the Merwida Winery's tasting room, the landowner's wine business which is on the doorstep to the Papenkuils wetland (seen below). It is to be used to inform tourists about the natural environment around the farm, and the conservation efforts of their farm. Our team worked with WWF-SA in contributing text and pictures for this board to be designed. This board was sponsored by the Table Mountain Fund and WWF-SA.



**THINKING BIG** | AFRICA

# WETLAND WONDERLAND

## Conserving South Africa's key ecosystems for the future

**Papenkuils Dream team.**  
Ingeborg Mägi, Roderick Juba,  
Lyndre Nel behind Michelle Duncan



**OVER 120 DIFFERENT INDIGENOUS PLANT SPECIES LIVE HERE AND SEVEN OF THESE ARE IUCN RED LIST**

**Across the planet there are certain geographical areas that are not only extremely beautiful, but also of extreme importance to the balance of life on Earth. These 'biodiversity hotspots' host large numbers of endemic species found only in these locations. Unfortunately, in some cases habitat loss and other human-induced damage have caused their populations to decline to the verge of extinction.**

The 800 hectares of beautiful Papenkuils wetland is one of these 'biodiversity hotspots'; over 120 different indigenous plant species live here and seven of these are Red listed by the IUCN as endangered species. Papenkuils wetland is part of Table Mountain Fund's Climate Corridor. Protecting the flora and fauna of the wetland can have an enormous impact on protecting biodiversity in South Africa and beyond.

The young Conservation Leadership Program team: Lyndre, Michelle, Roderick, and Ingeborg will be using the Cocoon to mitigate the impact of runaway fires on the wetland and its inhabitants. Equally important is establishing community ownership to ensure long-term success. The neighboring Merwida Winery is actively involved in the conservation efforts. The Papenkuils Wetlands Restoration Project shows how successful large-scale restoration can be achieved; setting out a clear vision, incorporating a scalable solution and ensuring local ownership.

(above) "Wetland Wonderland" article in the Land Life Magazine, Issue 2 of 2016. The article tells the story of the Papenkuils wetland and how it is being restored through our Conservation Leadership Programme project. It focused on the use of the Cocoons to plant the shrubs with, to ensure their survival in the first few, harsh, months after being planted.





(left) Out team member, Roderick Juba, won an award at the National Wetlands Indaba in Durban on 18 October 2017 for his work at the Papenkuijs Wetland. We are so proud! (right)

The Conservation Champion Merwida Wine Estate has put 900 ha of private land, the Papenkuijs wetland, aside for land stewardship. This year October 2017 Merwida brought out a special wine series of Papenkuijs Wine for a niche market in the Netherlands, which features the unique 'dwerg waterblommetjie' on its label and tells its conservation story.

### Appendix 4.3. Plant species list of Papenkuils wetland

Table 1. Full plant species list as collected by a group of botanists during the Bioblitz event to identify more plant species in the Papenkuils wetland, Western Cape, South Africa. List provided by Dr. Donovan Kotze.

<b>Plant Species Name</b>	<b>Red List Status (0 = not threatened, vu = vulnerable, nt = nearly threatened, en = endangered, cr = critically endangered)</b>
<i>Acacia mearnsii</i>	0
<i>Agrostis avenacea</i>	0
<i>Agrostis lachnantha</i>	0
<i>Aponogeton angustifolius</i>	Vu
<i>Aponogeton distachyos</i>	0
<i>Arctotis acaulis</i>	0
<i>Arctotis bellidifolia</i>	0
<i>Aristea africana</i>	0
<i>Aristida junciformis s. junciformis</i>	0
<i>Aspalathus ericifolia s. ericifolia</i>	0
<i>Aspalathus spinosa</i>	0
<i>Babiana stricta</i>	Nt
<i>Briza maxima</i>	0
<i>Briza minor</i>	0
<i>Bulbinella triquetra</i>	0
<i>Calopsis paniculata</i>	0
<i>Carpha capitellata</i>	0
<i>Carpha glomerata</i>	0
<i>Chlorophytum undulatum</i>	0
<i>Chondropetalum nudum</i>	0
<i>Cliffortia strobilifera</i>	0
<i>Conyza albida</i>	0
<i>Corycium orobanchoides</i>	0
<i>Cotula coronopifolia</i>	0

<i>Cotula eckloniana</i>	0
<i>Cotula filifolia</i>	Cr
<i>Cotula pusilla</i>	Nt
<i>Cotula turbinata</i>	0
<i>Crassula decumbens</i>	0
<i>Crassula glomerata</i>	0
<i>Crassula natans</i>	0
<i>Cyanella hyacinthoides</i>	0
<i>Cynodon dactylon</i>	0
<i>Cyperus denudatus</i>	0
<i>Cyperus fastigiatus</i>	0
<i>Cyperus species</i>	0
<i>Cyperus sphaerospermus</i>	0
<i>Cyperus tenellus</i>	0
<i>Cyphia linarioides</i>	0
<i>Digitaria eriantha</i>	0
<i>Dimorphotheca sinuata</i>	0
<i>Diplachne fusca</i>	0
<i>Disperis villosa</i>	0
<i>Drosera capensis</i>	0
<i>Drosera cistiflora</i>	0
<i>Drosera species</i>	0
<i>Drosera trinervia</i>	0
<i>Ehrharta capensis</i>	0
<i>Elegia capensis</i>	0
<i>Elegia filacea</i>	0
<i>Elegia thyrsoifera</i>	0
<i>Elegia verreauxii</i>	Vu
<i>Eleocharis limosa</i>	0
<i>Eragrostis capensis</i>	0

<i>Eragrostis plana</i>	0
<i>Eragrostis planiculmis</i>	0
<i>Eragrostis racemosa</i>	0
<i>Eriospermum capense</i>	0
<i>Eriospermum species</i>	0
<i>Erodium botrys</i>	0
<i>Ficinia indica</i>	0
<i>Ficinia species</i>	0
<i>Fuirena coerulescens</i>	0
<i>Geissorhiza ornithogaloides</i> s.	0
<i>Geissorhiza ornithogaloides</i>	
<i>Geissorhiza species</i>	0
<i>Grammatotheca bergiana</i>	0
<i>Helichrysum dasyanthum</i>	0
<i>Helichrysum difficile</i>	0
<i>Helichrysum helianthemifolium</i>	0
<i>Heliophila pusilla</i>	0
<i>Hemarthria altissima</i>	0
<i>Hesperantha falcata</i>	0
<i>Hesperantha species</i>	0
<i>Hydrocotyle verticillata</i>	0
<i>Hypochaeris radicata</i>	0
<i>Ischyrolepis macer</i>	0
<i>Ischyrolepis sieberi</i>	0
<i>Ischyrolepis species</i>	0
<i>Ischyrolepis sporadica</i>	0
<i>Ischyrolepis wallichii</i>	0
<i>Isolepis cernua</i>	0
<i>Isolepis incomptula</i>	0
<i>Isolepis marginata</i>	0

<i>Isolepis species</i>	0
<i>Isolepis striata</i>	0
<i>Isolepis trachysperma</i>	0
<i>Juncus capensis</i>	0
<i>Juncus effusus</i>	0
<i>Juncus exsertus s. exsertus</i>	0
<i>Juncus kraussii s. kraussii</i>	0
<i>Juncus lomatoophyllus</i>	0
<i>Juncus oxycarpus</i>	0
<i>Juncus punctorius</i>	0
<i>Lachenalia contaminata</i>	Nt
<i>Lachenalia contaminata</i>	0
<i>Lachenalia species</i>	0
<i>Lachenalia species</i>	0
<i>Lampranthus aureus</i>	Vu
<i>Lampranthus debilis</i>	En
<i>Leersia hexandra</i>	0
<i>Leucadendron corymbosum</i>	Vu
<i>Leucadendron linifolium</i>	Vu
<i>Lichtensteinia obscura</i>	0
<i>Limosella inflata</i>	0
<i>Lolium multiflorum</i>	0
<i>Lolium perenne</i>	0
<i>Lotus subbiflorus s. castellanus</i>	0
<i>Lythrum hyssopifolium</i>	0
<i>Mariscus tabularis s. tabularis</i>	0
<i>Mariscus thunbergii</i>	0
<i>Medicago laciniata</i>	0
<i>Merxmuellera species</i>	0

<i>Merxmuellera stricta</i>	0
<i>Micranthus junceus</i>	0
<i>Monopsis debilis</i>	0
<i>Monopsis variifolia</i>	0
<i>Moraea fugacissima</i>	0
<i>Moraea longistyla</i>	0
<i>Moraea miniata</i>	0
<i>Moraea species</i>	0
<i>Moraea virgata</i>	0
<i>Mossia species</i>	0
<i>Wurbea stricta</i>	0
<i>Ornithogalum dubium</i>	0
<i>Ornithogalum species</i>	0
<i>Oxalis depressa</i>	0
<i>Oxalis falcatula</i>	0
<i>Oxalis obtusa</i>	0
<i>Oxalis purpurea</i>	0
<i>Oxalis species</i>	0
<i>Oxalis species</i>	0
<i>Oxalis versicolor</i>	0
<i>Pelargonium iocastum</i>	0
<i>Pelargonium rapaceum</i>	0
<i>Pennisetum macrourum</i>	0
<i>Persicaria decipiens</i>	0
<i>Phragmites australis</i>	0
<i>Poa pratensis</i>	0
<i>Polypogon monspeliensis</i>	0
<i>Prionium serratum</i>	0
<i>Pseudognaphalium luteo-album</i>	0
<i>Psoralea species</i>	0

<i>Pycneus nitidus</i>	0
<i>Pycneus polystachyos</i>	0
<i>Relhania relhanioides</i>	0
<i>Resnova species</i>	0
<i>Restio species</i>	0
<i>Restio tetragonus</i>	0
<i>Romulea rosea</i>	0
<i>Rubus rigidus</i>	0
<i>Rumex cordatus</i>	0
<i>Ruschia species</i>	0
<i>Satyrium candidum</i>	0
<i>Satyrium coriifolium</i>	0
<i>Satyrium species</i>	0
<i>Schoenoplectus muricinux</i>	0
<i>Selaginella pygmaea</i>	0
<i>Senecio littoreus</i>	0
<i>Senecio paarlensis</i>	0
<i>Sonchus oleraceus</i>	0
<i>Sparaxis grandiflora s. grandiflora</i>	En
<i>Spergularia media</i>	0
<i>Spiloxene aquatica</i>	0
<i>Spiloxene capensis</i>	0
<i>Sporobolus virginicus</i>	0
<i>Stipagrostis zeyheri s. zeyheri</i>	0
<i>Stoebe plumosa</i>	0
<i>Syncarpha species</i>	0
<i>Tenicroa filifolia</i>	0
<i>Themeda triandra</i>	0
<i>Trachyandra filiformis</i>	0
<i>Trachyandra revoluta</i>	0

<i>Trianoptiles capensis</i>	0
<i>Tribolium uniolae</i>	0
<i>Trifolium arvense</i>	0
<i>Triglochin bulbosa</i>	0
<i>Triglochin bulbosa</i>	0
<i>Triglochin striata</i>	0
<i>Typha capensis</i>	0
<i>Ursinia anthemoides</i>	0
<i>Ursinia anthemoides s. anthemoides</i>	0
<i>Vellereophyton dealbatum</i>	0
<i>Villarsia capensis</i>	0
<i>Wachendorfia paniculata</i>	0
<i>Watsonia meriana</i>	0
<i>Watsonia species</i>	0
<i>Wurmbea inusta</i>	0
<i>Zantedeschia aethiopica</i>	0



## Appendix 4.4. Papenkuils Wetland Planting Site Monitoring

<i>Planting 1 Oct 2016</i>		
Survival	Control	Cocoons
1 week	100 %	100 %
3 weeks	60 %	80 %
10 weeks	0 %	0 %
<i>Ave. High/Low Temperature in Degree Celsius</i>		
Oct 2016	26/14	
Nov 2016	29/16	
Dec 2016	33/20	
Jan 2017	33/20	

<i>Planting 2 May 2017</i>		
Survival	Control	Cocoons
1 week	100 %	100 %
3 weeks	90 %	100 %
10 weeks	40 %	95 %
15 weeks	20%	92 %
20 weeks	10%	70%
<i>Ave. High/Low Temperature in Degree Celsius</i>		
May 2017	23/12	
June 2017	17/9	
July 2017	19/5	
Aug 2017	20/6	
Sep 2017	22/8	

## Appendix 4.5. Method for planting Cocoons

**LAND LIFE COMPANY** **Cocoon Planting Manual**

**Seedling selection**

Select healthy, <1 year old hardened tree seedlings. Make sure they fit within the inner cone of the Cocoon. While choosing the right seedling, don't forget to make sure that it is adapted to local growing conditions (in terms of temperature regime, salinity etc.). Carefully check shoot and roots for the following:

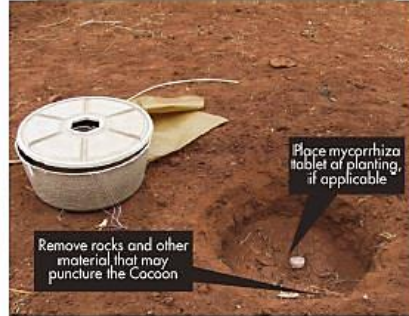
**Shoot**

- Healthy green, non-wilting foliage, free of insects and diseases.
- Short shoot (<25 cm), with ideally few, small and low-transpiring leaves
- Good trunk taper from the roots to the branches. Codominant stems are no good.
- Check for mechanical damage. Plants with injured trunks are no good.

**Roots**

- Healthy root growth, well rooted, preferably air-pruned rootball ~20cm long, ø 5-10cm.
- Trunk flare should be visible.
- Roots that are brown or black or have a foul odor indicate a health problem, do not plant.
- Circling or kinked roots are not to be used. J-roots should be pruned, but if enough seedlings are on site use another.

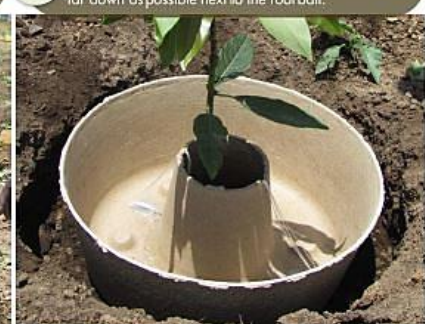
- 1** Dig a pit 55cm in diameter & 25cm deep. Keep removed soil next to the pit. Flatten the bottom surface. Prewater (~20l) 1 day before planting if needed.
- 2** Place seedling. Dig down/add soil to obtain the required height level. Create a mound of soil around the seedling's root ball & firmly press soil.



- 3** Gently place Cocoon over the plant while holding both wicks into position.



- 4** Cocoon should be level and properly supported by soil underneath. Place wicks through the slits and insert as far down as possible next to the root ball.



- 5** Pack soil around the sides of the Cocoon and fill the void between the Cocoon and the root ball. Only insert soil next to the root ball, not on the top! Press firmly.



- 6** Water the seedling (1 liter) and gently press down the soil to eliminate air pockets. Fill the Cocoon to the rim.



- 7** Place the lid firmly on the reservoir.



- 8** Place tree shelter and push down for a snug fit, as far down as it will go. Sides of tree shelter should be firmly in contact with inner edge of Cocoon.



- 9** Cover the Cocoon with ~5 cm of soil.



## Appendix 4.6. Papenkuils Wetland Conservation Project Images



(above) Planting took place from 10 to 14 October 2016, with Linda Jansen's planting team and Department of Agriculture's Chris Meintjies. Trees were planted in buffer zones between pristine wetland areas and highly impacted zones.



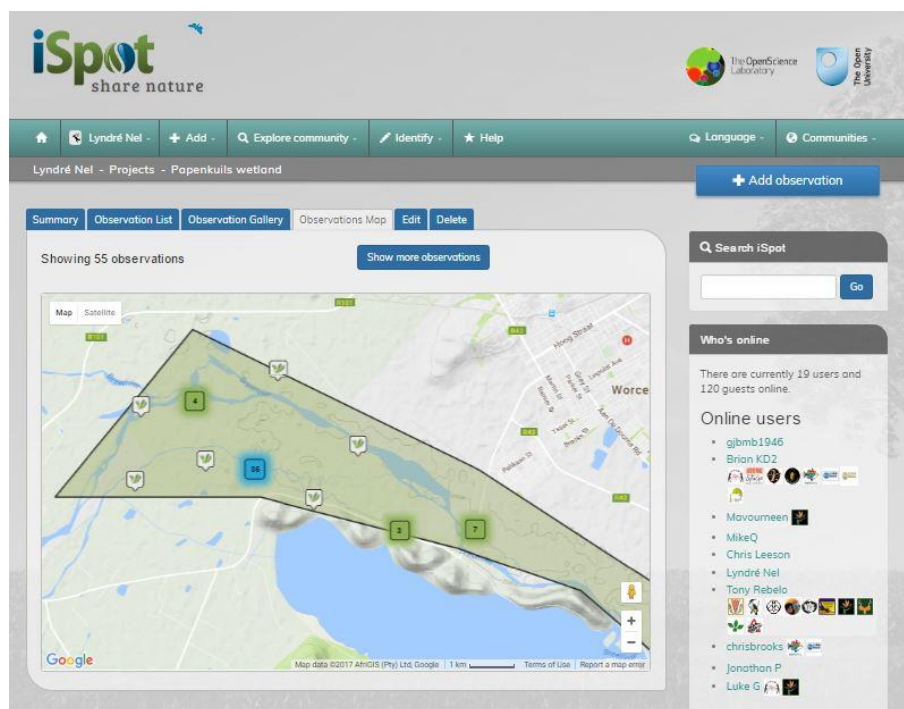
(above) Roderick Juba and Lyndre Nel planting a tree with the Cocoon. Behind, the tractor can be seen pulling the water truck. Planters would fill watering cans at the truck and use the cans to fill the Cocoons.



(above) School visit to the Papenkuils wetland with the South African National Biodiversity Institute for World Wetlands Day on 2 February 2017. We try to hold an environmental educational day with youth from the nearby schools regularly, every 2 months.



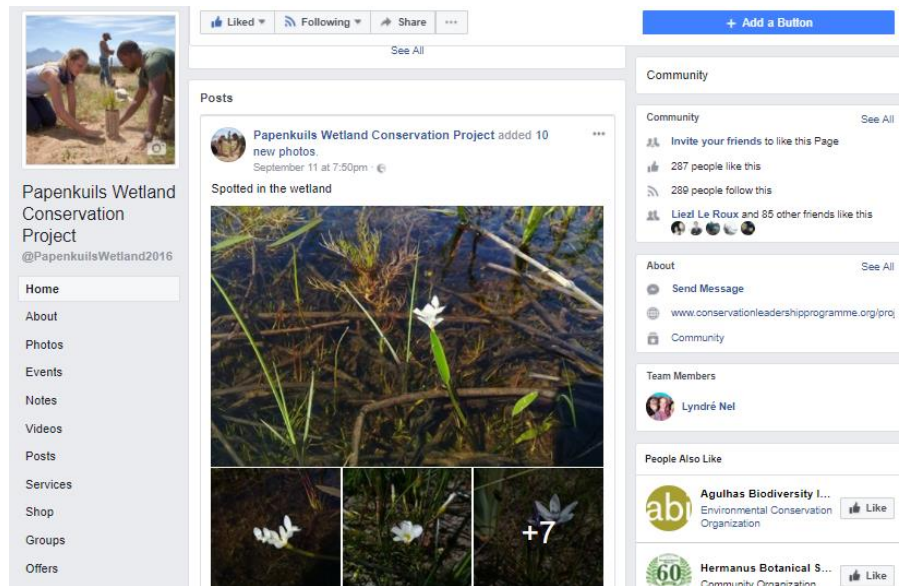
(above) On Saturday, 15 Oct 2016, the CLP team hosted a Bioblitz at the Papekuils Wetland with the support of WWF South Africa and Custodians of Rare and Endangered Wildflowers (CREW). It was a great day out for young and old!



(above) After the Bioblitz, more than 50 sightings of recording species name and location were uploaded to ISpot ([www.ispotnature.org/projects/papekuils-wetland/observations/map](http://www.ispotnature.org/projects/papekuils-wetland/observations/map)). This is an open access platform for anyone to view where species occur and population densities are noted. The picture shows the outline of the wetland, and the numbers indicate species logged.



(above) On Saturday, 13 May 2017, the CLP team hosted an environmental learning day in the Papekuils wetland for farm worker's children from the nearby area. The fun learning day was led by experience youth educator, Gerhard van Deventer, who took the children through many learning activities to understand how wetlands function, the importance of biodiversity and conservation of water.



(above) The Papenkuils Wetland Facebook page has grown in popularity in the last few months. With 287 likes that was generated organically, and engagement with the public through the page happens often.

## Bibliography

### Documents

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5. Erwin, K. L. (2009). Wetlands and global climate change: the role of wetland restoration in a changing world. *Wetlands Ecology and management*, 17(1), 71-84.

### *Address list*

- Marijn Zwinkels, Living Lands ([marijn@livinglands.co.za](mailto:marijn@livinglands.co.za)) - senior stakeholder engagement specialist, senior colleague of L Nel
- Arnout Asjes, Land Life Company ([a.asjes@landlifecompany.com](mailto:a.asjes@landlifecompany.com)) - certified ISA arborist, leads Land Life Company's restoration work along the Berg river in South Africa, experienced project manager for large-scale nature restoration. Senior colleague of Ingeborg Magi, has committed to supporting her in leading her first solo implementation of the Cocoon technology in the Papenkuils Wetland
- WWF SA- (Shelly Fuller: [SFuller@wwf.org.za](mailto:SFuller@wwf.org.za) and Joan Isham: [JIsham@wwf.org.za](mailto:JIsham@wwf.org.za)), implementers of the WWF Conservation Champion program and the direct contacts for working with the landowners of the Papenkuils wetland. Living Lands works with this team around stakeholder engagement and land stewardship.
- CapeNature (Garth Mortimer: [gmortimer@capenature.co.za](mailto:gmortimer@capenature.co.za)), conservation agency led by scientists that can assist and guide the project implementation and viability, and help ensure the most successful and/or significant results. Do not know this person individually.
- LandCare (Rudolph Röscher: [RudolphR@elsenburg.com](mailto:RudolphR@elsenburg.com)), a nationwide agricultural land-use program that is present in the Breede River Valley that can assist and support the planting activities, sourcing of the indigenous tree species and assisting in the propagation of threatened and endangered plant species. Living Lands works with Rudolph on several projects that they implement.
- Dept. Environmental Affairs and Development Planning (Jason Mingo: [Jason.Mingo@westerncape.gov.za](mailto:Jason.Mingo@westerncape.gov.za)), safeguarding the natural environment of the Western Cape for future generations while sustainably developing the landscape in which we live. Living Lands works with this Department on river rehabilitation programs.
- Intaba Environmental Services (Johann van Biljon: [johann@greenintaba.co.za](mailto:johann@greenintaba.co.za)), a local seedling planting and propagation expert with experience of working in the area. Will provide input and support on seedling selection and planting of trees. Living Lands works with Johann on several projects that they implement.



## Web Links

<b>Item</b>	<b>Link</b>
Papenkuils wetland Conservation Project Facebook Page	<a href="http://www.facebook.com/PapenkuilsWetland2016/">www.facebook.com/PapenkuilsWetland2016/</a>
Generation 7 Conservation for Development	<a href="http://www.facebook.com/generation7CfD/">www.facebook.com/generation7CfD/</a>
Living Lands	<a href="http://www.livinglands.co.za">www.livinglands.co.za</a>
Land Life Company	<a href="http://www.landlifecompany.com">www.landlifecompany.com</a>
WWF South Africa	<a href="http://www.wwf.org.za">www.wwf.org.za</a>