



Dorpspruit River Walk Report

14th to 17th July 2014



Background

All impacts were recorded by GPS, Dictaphone and photograph and Mini SASS river health assessment and Index of Habitat Integrity (IHI) tests were done as often as possible. This report is the record of these observations.

It was a very chilly morning on Monday the 14th of July 2014 when six individuals started their trek up the Dorpspruit River initially starting their walk from the confluence of the Dorpspruit and uMsunduzi rivers. Sanele Vilakazi, Siyabonga Ndlovu, Kholosa Magudu, Leeth Singh, Sashin Naidoo and Adowa Awuah walked well over 11kms along the Dorpspruit River for four days. The Dorpspruit River is one of the major tributaries of the UMsunduzi River which is a major trunk stream of the city of Pietermaritzburg in terms of economic importance. The walk as a whole was undertaken to assess the state of the rivers' health and to also promote DUCT's river custodianship project which aims to promote the adoption of certain stretches of the river by neighbouring landowners. The findings of this walk will be used to assist in carrying out the above mentioned project forward and further assisting willing landowners to solve certain problems along their river stretch. As previously mentioned the walk began on Monday the 14th of July at the confluence near the Musson's rapids. The walk ended on Thursday the 17th of July at what we felt was the source nearly a kilometre from World's View road.

We attempted at all times to stay beside the river, and when that was not possible due to steep terrain or thick bush, we always kept the river in sight. All impacts were recorded by GPS, photograph, a Spectra mobile mapper (loaned to us by the Midlands Conservancies Forum) and Mini SASS river health assessment tests were done only at numerous points of the tributary. This report is the record of these observations.

Acknowledgements

Our thanks to:

- NT3C toll concession in partnership with the Midlands Conservancies Forum
- The Worldsvieview Conservancy
- The Winterskloof Conservancy
- Terry Strachan of the Royal Agricultural Society
- Gcina Nene of the SANBI Botanical Gardens
- All the friendly landowners & passers-by along the river
- The greater Pietermaritzburg community members

Please feel free to use the information contained herein – we only ask that you credit the DUCT Mayday for Rivers Team and quote the report: *DUCT Dorpspruit River Walk Report, July, 2014; Sanele Vilakazi*

Electronic copies of the report are available on the DUCT website: www.duct.org.za

Sanele Vilakazi
July 2014

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1 Area description

GPS Co-Ordinates

Start: -29.3459.40 30.1935.50

Finish: -29.36121 30.24417

Altitude drop

1075m to 621m- 454metre drop



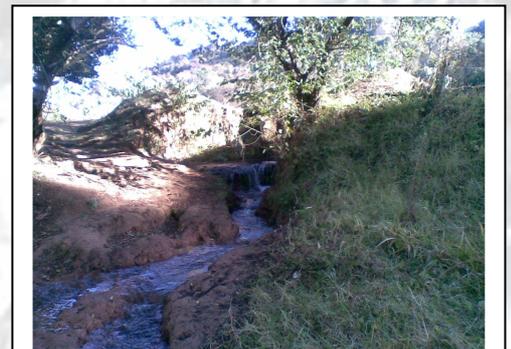
General Description

The Dorpspruit is a stream, located in Province of KwaZulu-Natal, South Africa, a body of running water moving to a lower level in a channel on land.

From the confluence the river moves from an upper foothill environment being moderately steep and consisting of a cobble-bed or mixed bedrock-cobble bed channel, to an environment with a very steep gradient dominated by bedrock and boulders with cobble and coarse gravels in the river channel.

Surrounding land use within the river is predominantly for residential and industrial purposes as the river itself flows mostly through the urban jungle of Pietermaritzburg. In the upper reaches of the Dorpspruit this gradually changes as agricultural activities start to take centre stage. Both of these land uses have heavy impacts on the river due to the numerous activities that the river is witness/exposed to.

The Dorpspruit River is north-west of the city centre. It flows through the suburban areas of Wylie Park, Hilton, Worldsvie, Mayor's Walk, Prestbury and the urban jungle of Pietermaritzburg. The Dorpspruit's flow and conditions are much more affected by precipitation levels than its neighbouring tributaries. In times of heavy rains it can be very productive. The Dorpspruit River runs through wooded areas, forestry, residential establishments and right through the various small suburbs to be later listed



Top: Lower stretches of the Dorpspruit

Bottom: River walk team on-site

2 Wild Animals

Red-billed Teal <i>Anas erythrorhyncha</i>
Hottentot Teal <i>Anas hottentota</i>
Cape Teal <i>Anas capensis</i>
Southern Pochard
White-fronted Plover <i>Charadrius marginatus</i>
Chestnut-banded Plover
Wattled Lapwing <i>Vanellus senegallus</i>
Black-bellied (Grey) Plover <i>Pluvialis squatarola</i>
American Golden Plover <i>Pluvialis dominica</i>
Lesser Sand Plover <i>Charadrius mongolus</i>
Greater Sand Plover <i>Charadrius leschenaultii</i>
Caspian Plover <i>Charadrius asiaticus</i>
Kittlitz's Plover <i>Charadrius pecuarius</i>
Common Ringed Plover <i>Charadrius hiaticula</i>
Three-banded Plover <i>Charadrius tricollaris</i>

3 Terrestrial Vegetation / Least impacted riparian buffer areas

- The Dorpspruit River is 11 kilometres long, thus there are 11 kilometres of river bank along the length of the river.
- Of the 11 kilometres comprising both banks there are only 7 kilometres of either intact or have a relatively un-impacted riparian buffer. These areas occur in separate locations.
- The single longest un-impacted / low impact stretch on the river measures 4 km (total of both banks)
- Additionally, indigenous vegetation beyond the riparian buffer only occurs for approximately 1.5 kilometres of the rivers length

List of indigenous plants recorded

Maytenus peduncularis
Maytenus senegalensis
Maytenus undata
Mimusops obovata
Acacia caffra
Obetia tenax
Acacia xanthophloea
Ochna natalitia
Ochna serrulata
Olea capensis subsp. enervis
Acacia sieberiana
Olea europaea subsp. africana

Ormocarpum trichocarpum umSindandlovana
Chrysophyllum viridiflorum
Clivia miniata

4 Wetlands

Wetlands are nature's water storage and purification works and they are an integral part of natural systems. They slow down the flow of water, thus providing flood prevention; they supply downstream areas with water due to the fact that they store water and slowly release it; wetland plants remove contaminants from water, thus "polishing" or purifying the water, and of course wetlands provide an extensive habitat for a large variety of birds, mammals and amphibians.

Wetlands within the Dorpspruit have become a focal issue for conservation due to the ecosystem services they provide. More people are obtaining their basic water needs from inland freshwater wetlands.

DUCT supports the conservation and rehabilitation of wetlands through the Working for Wetlands program. The aim of this program is to encourage the protection, rehabilitation and sustainable use of South African wetlands through co-operative governance and partnerships. The program is also a poverty relief effort, providing employment in wetland maintenance

5 Negative Impacts

Riparian Buffer Zone

The riparian buffer is a 32 metre belt of land stretching from the river bank outwards (both banks). Rivers and the land function together and impacts on one have a direct effect on the other. Thus a healthy buffer zone will have positive impacts on the health of the adjacent river. It is for this reason that disturbance in the buffer zone is illegal. Exemptions to this are historical activities (e.g. decade's old pastures planted to the river's edge).

Many developments neighbouring the Dorpspruit do not respect/obey the 32 metres buffer, either by constructing buildings, erecting fences/walls, by planting of timber, informal settlements, gardens, lawns and uncontrolled invasive plants. From our observations the river water was found to have great excess nutrients from various types of urban/industrial effluent. This was clearly evident from the change in water colour of the river itself. Some stretches of the river were found to be algae green robbing the waters of the Dorpspruit of oxygen. However, it is not all doom and gloom for the Dorpspruit. With implementing the correct evasive/control action, large stretches of the Dorpspruit can be healed.

Terrestrial Invasive Vegetation

Invasive alien plants (IAP) are recognized as one of the biggest threats to South Africa's biological diversity, water security, the ecological functioning of natural systems and the productive use of land as a result of this in SA it is a legislative

requirement that IAP species, as identified by the Conservation of Agricultural Resources act 43 of 1983 (CARA) and the National Environmental Management Act (NEMA) and the Biodiversity Act 10 of 2004 (NEMBA), are controlled.

Notwithstanding the legislative and certification requirements, DUCT is committed to dealing with IAP's.

Pine and Wattle trees are allelopathic - they release chemicals which change the soils chemical composition to suite themselves, so by dominating by harming or killing other plants growing there. Thus in areas of wattle infestation the soil is generally bare of any vegetation other than the wattles. Thus biodiversity is drastically reduced, and the bare soil is exposed to erosion

Additionally clumps of large invasive trees shade out the land and river, changing the water temperature and depositing excess detritus on the river bed all of which has negative impacts on the rivers ecology and health.

From confluence to source, river left and right of the Dorpspruit comprises of vast alien vegetation and few indigenous and pristine stretches. There are few un-impacted areas consisting of natural vegetation along the river

Along the Dorpspruit River, alien plants inhibit the ecosystem functioning of riparian habitats limiting the goods and services provided by these ecosystems (e.g. flood attenuation). The establishment of more than 200 alien plant species on the Dorpspruit River is unnatural and poses a very serious threat to its natural integrity. Plant communities within the riparian habitat of the Dorpspruit River have undergone drastic changes because of alien invasives. These changes however, will take time to recover naturally after the initial AIP clearing is done. In some areas change will unfortunately be irreversible due to the overwhelming number of invasive alien species which are currently disrupting the natural succession processes in plant communities. This often ends up resulting in there being serious consequences for the river itself.

10 of the 11 kilometres of river bank on theRiver (both banks), are infested with invasive plants, varying from a narrow band only 5 metres wide, to the entire buffer of 32 metres width.

Invasive vegetation in the riparian buffer comprises either planted vegetation (Kikuyu pastures and gardens), or self-seeded timber species and other invasives characteristic to the Midlands (Wattle, Bramble, Bug weed etc.).

Appendix 2 contains maps and lists of all invasive and alien plants recorded in the buffer.

Construction

The only major construction activity that the team spotted on their trek up the Dorpspruit was that of the recently opened Brookside Mall located in downtown Pietermaritzburg. This is a huge development that will no doubt have a major impact on the integrity of the river in times to come.

Erosion

Elevated, unnaturally high levels of silt in a river reduce or block sunlight penetration, which impacts negatively on aquatic plants and animals. Plants need sunlight to produce their food and silt levels block the visibility of aquatic creatures, effecting hunting and fleeing behaviour. Fish and many other aquatic insects have gills which can be clogged by silt. All this has a profound impact on the health of a river. Natural erosion takes place during floods and in the meandering incised river channels as the river erodes the outer banks and deposits silt on the inner banks.

The energies of the Willowfontain River have caused a great deal of erosion. Some of the bed and banks of the Dorpspruit have been eroded making it wider, deeper and longer. Headward erosion makes a river longer. This erosion was apparent near its source. Surface run-off and throughflow caused erosion at points where the water entered the valley head.

Vertical erosion makes a river channel deeper. These were happening more in the upper stages of the river.

Lateral erosion makes a river wider. These events occurred mostly in the middle and lower stages of the river.

Roads

Roads are built to provide access for the removal of the sand as well as to provide access for inspection and maintenance. Roads are one of the major causes of soil erosion and land degradation. Research tells us that roads should be planned according to principles of water runoff and should be positioned on a watershed or ridge. Due to the sand being highly sensitive there have been changes to many access routes. Degradation is further exacerbated by the steep slopes of the access routes (slopes should not exceed 7%).

Areas that have erodible soils/sands as well as areas in the vicinity of watercourses such as the Dorpspruit require special measures

In-stream Impacts

Nutrification

Nutrification is the process whereby excess loads of nutrients enter a river. Sources include agricultural fertilisers, human and livestock faeces, industrial waste, insecticides and herbicides involving a variety of elements such as ammonia, nitrites, nitrates, phosphates, organic carbon and nitrogen. This can occur via poor management of effluent, incorrect application, dumping, leaks and spills.

When water courses are contaminated with excess nutrients there are visible indicators of over nutrification: "sludge" (actually elevated levels of microscopic organisms called Diatoms) is sometimes evident on submerged rocks and is a sign that there are increased levels of nutrients. The second obvious sign is the occurrence of large numbers of various invasive aquatic plants which flourish in nutrient enriched water, and can actually smother the entire surface of the river if there are enough nutrients for them to multiply sufficiently. The third sign can be large amounts of green algae

There are a number of indicators of over nutrification in the Willowfontain River, the most obvious being firstly “sludge” (actually elevated levels of microscopic organisms called Diatoms) on the river bed or submerged rocks and secondly various aquatic plants which flourish in nutrient enriched water, and can actually smother the entire surface of the river if there are enough nutrients for them to multiply sufficiently.

High levels of these aquatic plants can negatively impact the river as follows:

- By covering the surface of the water, they block sunlight penetration which in turn decreases visibility for aquatic creatures and deprives naturally occurring plants of sunlight
- The creatures living on the river bed and rocks can be smothered by excess Diatoms
- In the case of algae the water is robbed of oxygen which is needed by other residents of the river

It should be kept in mind that rooted and floating invasive aquatic plants are actually removing nutrients from the water and substrate. By removing the source of nutrients, these plants will naturally dissipate

The river at certain stretches showed signs of acquiring a high concentration of nutrients, most especially phosphates and nitrates. This then typically promoted excessive growth of algae. These high levels of organic matter and the decomposing organisms have greatly depleted the river waters of available oxygen, causing the death of other organisms, such as fish. The nitrification process is a natural, slow-aging process has been greatly accelerated by human activity.

Dams / Weirs

Dams negatively impact on river health by reducing flows, depositing water of a different temperature into the river and depositing silt either via outlet releases or when changing water temperatures during spring and autumn cause currents that stir up detritus on the dam bed. None were spotted during this river walk.

Litter / dumping

Unfortunately a most frequent sighting throughout the entire river walk. River litter and debris constantly enter this aquatic environment from a variety of sources. In short, the locals misplace their waste and trash. It is a highly pervasive and visible form of pollution that has harmful impacts on wildlife and human health of those found to be near this water source.

The Dorpspruit is under considerable pressure from human activities, including incorrect disposal of trash. While the world's oceans are vast, they do not have an infinite ability to safely absorb our wastes. Preserving and restoring the quality of freshwater and marine environments requires that we understand how much trash we create, what we do with that trash, and how we can prevent it from entering our waterways.

6 River Health

One needs to keep in mind the difference between water quality and river health. Water quality is defined as “to describe the physical, chemical, biological and aesthetic properties of water that determines its fitness for a variety of uses and for the protection of the health and integrity of aquatic systems” (SA Water Quality Guidelines)

River health on the other hand, comprises a far broader range taking in the entire ecological system of the river and interconnected land; of not only the water, but also the physical river (river bed and river banks) as well as flora and fauna communities in the river and occurring on the banks.

During the walk, all impacts were recorded and photographed, and regular Mini SASS & Index of Habitat Integrity (IHI) tests were undertaken. Mini SASS is a general indicator of river health whilst IHI indicates the percentage of disturbance to river and buffer.

Mini SASS

Mini SASS is a very simple and enjoyable way of determining the health of the river, and the results give an overall picture of river health that is often missed by laboratory tests, for the pure and simple reason that a lab test, if taken say a week after a chemical contamination, may not reveal any chemicals whilst the Mini SASS gives an overall picture of the rivers health at any time. With Mini SASS, aquatic insects are caught, identified and classed according to tolerance levels of pollution and a simple scoring method results in an accurate picture of river health.

Mini SASS scores are broken down as follows:

Under 5.1 = Seriously / critically modified, very poor condition

5.1 – 6.1 = Largely modified / poor condition

6.1 – 6.8 = Moderately modified / fair condition

6.8 – 7.9 = Largely Natural / few modification GOOD condition

+7.9 = Unmodified / Natural condition

The team of six conducted Mini-SASS activities at various nodes of the Dorpspruit to determine the health of the river and give us a detailed picture of the Dorpspruit's ecological standing. These informal assessments (Mini-SASS) allow one to have a hands-on experience to find out what the current state of the river is (a very timeous process). With such assessments one is able to monitor water pollution levels at any point of the river using the classification/scoring of certain aquatic invertebrates found in the waters.

We were thus able to carry out 9 Mini SASS tests, the results of which are as follows:

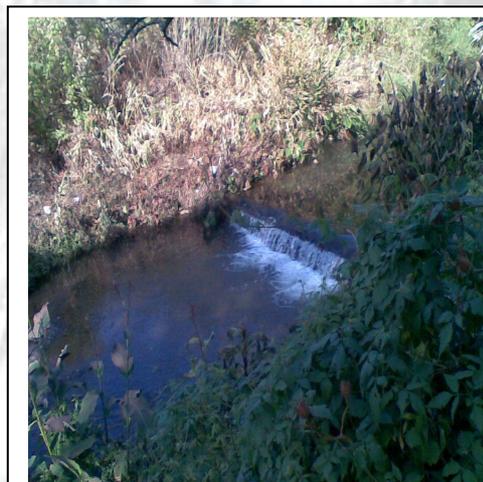
- *Seriously / critically modified / very poor condition*: 5 sites (scoring 4.5, 3.5, 4.3, 4 & 4.3)
- *Largely modified / poor condition*: four sites (scoring 5.1, 5.7, 6 & 5.5)

Of the nine Mini SASS tests conducted on the river, none scored Natural or Good condition. The highest score location was only 6 (poor condition) whilst the lowest score of 4 (critically modified) was a mere 4 kilometres from the confluence.

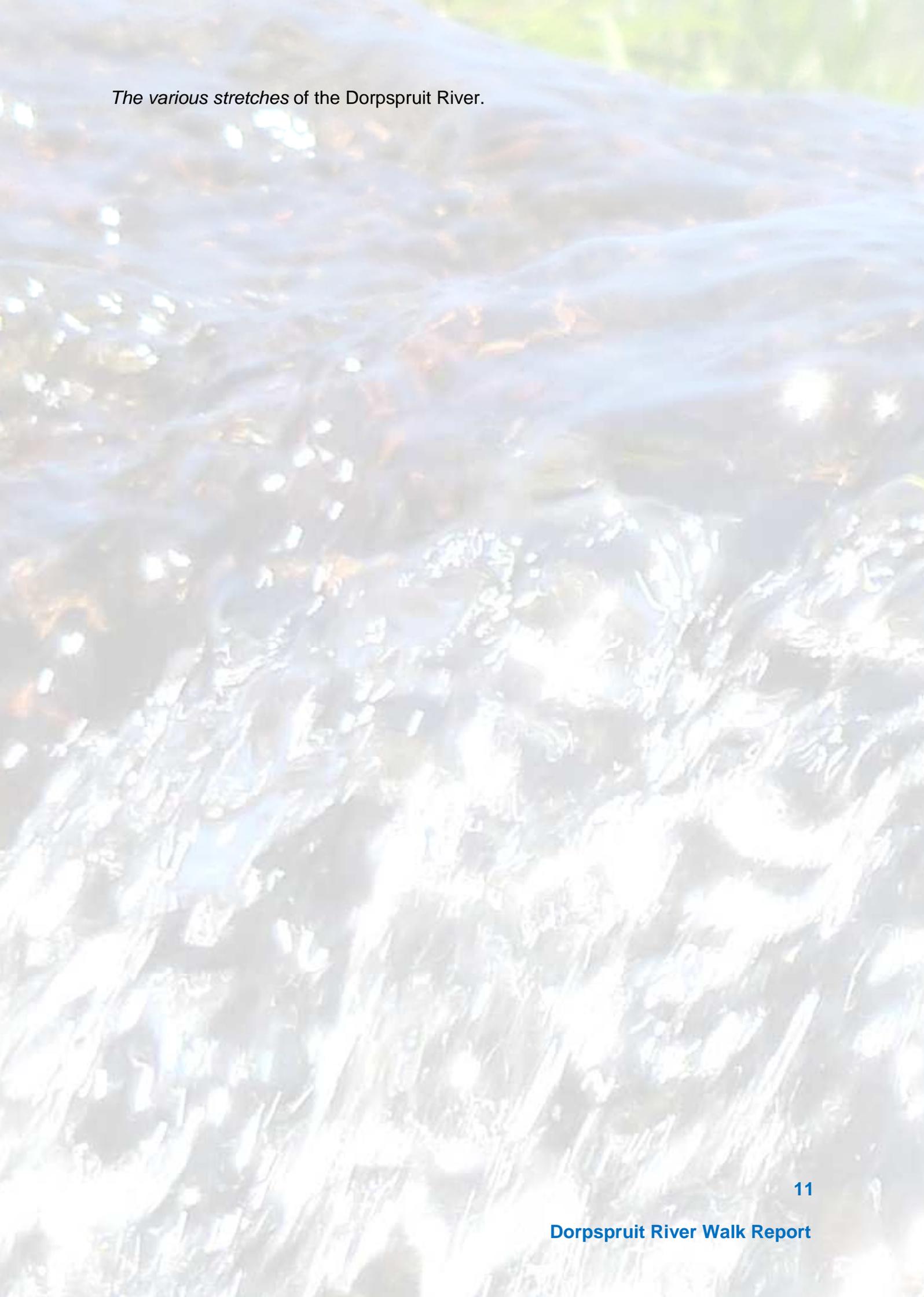
IHI Assessments

An Integrity of Habitat Index (IHI) assessment closely looks at the habitat characteristics of a river both from an in-stream and riparian zone perspective. The assessment as a whole tasked us as individuals to look and assess the overall composition of the river looking at the ecological state of the Dorpspruit. These assessments were done at separate 200m stretches of the river. Instream and riparian zone aspects of the river were assessed separately and each were graded accordingly. After the walk itself, all individuals involved in the walk are to come together and conduct a workshop, collectively assessing the ecological state of the Dorpspruit using the IHI criteria.

Results of the Dorpspruit on the IHI can be found in the Appendix 4



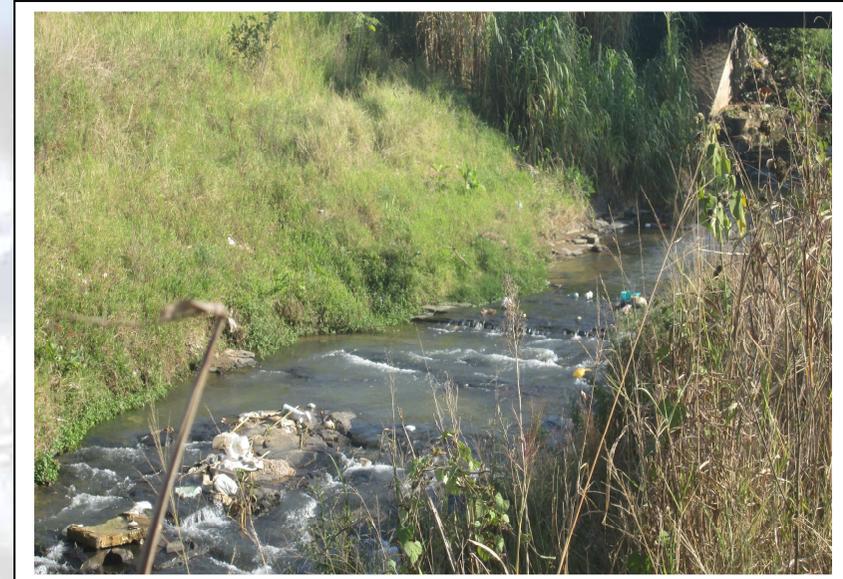
The various stretches of the Dorpspruit River.



Summary of River Health Tests

Site	Distance From source	Upstream Land Use	Adjacent Land Use	Buffer vegetation	Invasive Vegetation in buffer	Turbidity (Visibility)	Silt on bed	Mini SASS
1	10.5 km	Residential	Industrial	Giant reed	75% Giant reed	80%	Bed and some rocks not visible. Elevated diatoms	4.5 Seriously / critically modified, VERY POOR condition
2	10.58 km	Urban residential	Informal residence	Giant reed	35% Peanut butter cassia	80%	Not apparent	3.5 Seriously / critically modified, VERY POOR condition
3	9.53 km	Urban residential	School	grasslands	25% Mauritius thorn	90%	Bed and some rocks not visible. Elevated diatoms	4.3 Seriously / critically modified, VERY POOR condition
4	8.33 km	Heavy industrial	Municipal open space	Grasslands	20% Pom Pom weeds	35%	Not apparent	4 Seriously / critically modified, VERY POOR condition
5	8.01 km	Urban residential	Industrial	Bramble	30 % kikuyu grass	80%	Bed and some rocks not visible. Elevated diatoms	5.1 Largely modified / POOR condition
6	7.05 km	Light industrial	School	Grasslands	60% Bug weed	60%	Not apparent	4.3 Seriously / critically modified, VERY POOR condition
7	1.77 km	Urban residential	Light industrial	Giant reed	40% Lantana	45%	Bed and some rocks not visible. Elevated diatoms	5.7 Largely modified / POOR condition
8	4.37 km	Forestry	Urban residential	Grasslands	80% Bug weed	56%	Not apparent	6 Largely modified / POOR condition
9	3.57 km	Forestry & urban residential	Forestry	Grasslands/Gum Tree	80% Gum trees	70%	Bed and some rocks not visible. Elevated diatoms	5.5 Largely modified / POOR condition

Mini-sass activities were conducted at various points along the Dorpspruit. We were able to conduct numerous assessments due to the fact that the majority of the river is naturally shallow with us being able to walk in-stream for a great part of the walk. This, in most cases made accessibility very simple and with the Dorpspruit being fairly rocky we had no lack of rapids and riffles which are essential environments for conducting Mini-SASS. Average readings that we received from all our assessments indicated that the river was in a fair condition (moderately modified). Readings varied from a poor to fair condition.



Top Left: Sashin Naidoo assessing the river terrain

Top Right: Lower reaches of Dorpspruit

Botton: Dorpspruit river valley bottom

Reasons for poor river health

As a result of the impacts described above, the health of the Dorpspruit River varies between very poor to poor condition. Aside from the source area, there are no sections of the river that are in Natural or good condition

Surrounding land use within the river is predominantly for residential and industrial purposes as the river itself flows through mostly the urban jungle of Pietermaritzburg. In the upper reaches of the Dorpspruit this gradually changes as agricultural activities start to take centre stage. Both of these land uses have heavy impacts on the river due to the numerous activities that the river is witness/exposed to. What was clearly apparent from this walk is that the majority of the river is choked with alien invasives. The river constantly showed signs of nutrification as the river waters were very murky whilst passing through urban areas. Large patches of bramble and poplar plantations were observed within the final stretches of the Dorpspruit-nearing its source.

Siltation on river bed and submerged rocks:

Siltation was localised at various river access points

Turbidity:

Apart from areas with natural turbidity where the Dorpspruit River meanders over floodplains, there was little siltation except at localised places where there was clear access the river.

Some turbidity is caused by silt from “natural” erosion (a direct result of low water levels in the river caused by drained wetlands and heavy extraction) however there were areas where we witnessed effluent causing turbidity (from effluent being disposed of directly into the river; from cattle defecating in the river or from treated industrial effluent being disposed of directly into the river). Turbidity from erosion was soil coloured, whilst the effluent turbidity was a grey colour.

Nutrients:

Nutrient loads in the river seem excessively high. This is indicated by

- the excessive loads of diatoms on river rocks
- by physical matter on the river bed
- contamination of rivers with sewage
- manipulation of river flow
- destruction of riverine and other wetland vegetation

Nutrient loads in the Dorpspruit River seem to originate from the following:

- *Industrial Effluent*
 - Two industries were observed disposing effluent directly into the river
 - Cattle access to the river cause additional nutrients from faeces
 - Fertilisers such as phosphates that are used on arable lands wash into the river. Although invisible in the river water, they leave evidence by means of crystal like stains on the rocks.
- *Sewage*
 - the urban metropolis has a high density of small holdings, all on an ever ageing/failing municipal sewer line which has frequent sewer blockages which are contaminating the river
 - The Jika Joe informal settlement is situated near the confluence of the Dorpspruit and uMsunduzi rivers and there are a number of pit toilets only two or three metres from the river bank.

Conclusion:

7 Green Corridor

There are some beautiful areas along the Dorpspruit River, and in some areas the terrain is conducive to a hiking path. It would obviously be up to the individual landowners to decide if they were prepared to allow walkers on their properties. A possible solution could be limited access to either hiking clubs who often conduct day hikes led by responsibly trained leaders or controlled groups led in a manner similar to current Midlands Conservancy Forum walks whereby landowners conduct short walks on their properties on a monthly basis for the public.

8 Interesting information / history

The Dorpspruit River traverses through Hilton and Pietermaritzburg.

Much of upper parts of the catchment have has been taken over by commercial plantations resulting in reduced water flow in original streams and various other natural water courses.

The original route used by the Voortrekker wagons passes through the river and is of historical significance. Major issues faced by the river include illegal dumping, invasive alien vegetation and erosion caused by motorbikes, all of which contribute to the decline in wildlife and river health.

Findings and Recommendations

Findings

Impacts

The cumulative impacts on the Dorpspruit River are extensive and cause the river to be in an unhealthy state. Impacts range from riparian and wetland habitat destruction to various types of contamination of the river itself all of which are exacerbated by the reduced flows.

The Water of the Dorpspruit is a stream system which has been extensively modified. Most modifications have occurred in the lower reaches and protect those areas which are of most monetary value. Increased residential buildings (houses), which brings with it

may argue that then contamination is not a problem, but it should be kept in mind that a tipping there is so much contamination that the river will be unable to heal.

Pietermaritzburg City is at the downstream end of all the contamination of the uMsunduzi River catchment and landowners between the source and Pietermaritzburg.

Recommendation 1:

In order to increase the resilience and health of the Dorpspruit River it would thus make sense (in addition to the current 32 metre buffer width) in all planning programs - municipal and other, in order to be able to rejuvenate. Areas identified as being potential contamination sources, no matter how much such contamination, could then have a sufficient buffer length downstream that should be guaranteed.

Large Invasive Trees

Over enthusiastic felling of all large invasive trees down the river needs to be approached with caution. For urban or for agricultural/forestry purposes, suitable nesting sites are disappearing or have already disappeared. Raptors, and in some cases the large invasives along the river are the only suitable nesting sites as seen in some areas. Thus the wholesale removal of all large trees could result in the disappearance of essential nesting sites.

Recommendation 2:

Teams who work the river clearing invasives should be trained to find and identify raptor nests, and a plan drawn up with criteria for the eradication choices concerning these large trees. For example, the Crows are on one tree, but as a security measure will often alight on a nearby large tree prior to approaching the nest. If that which holds the nest are felled, this will also impact these birds ability to nest and raise their young. The nests seen during the walk were placed in large gum trees, and many of the raptor sightings were in large trees.

Invasive plants

Erosion from cattle paths

Perhaps landowners could put their thinking caps on and devise ways to prevent this erosion. There have been suggestions to us by landowners or observed during our river walks, and most are dependent on the path run along the top edge of the river bank:

- Limit access points
- Provide drinking troughs away from the river
- Electric fence strand to keep cattle from the river banks
- Allow access only where there are natural sheets of rock on the river bed
- Place rubber matting on the river bed to prevent disturbance
- Only allow access where the banks are not steep to minimise erosion

Sewage education

There exists a dire need to stop the high levels of sewage pollution incurred through the abuse and misuse of the broader Pietermaritzburg metropolitan area. This pollution threatens health and results in massive environmental damage.

The main objective of educating people is to create a better understanding of the workings of these services in our communities, especially first time users of these services. There should be emphasis on the provision of these services needs to be accompanied by responsibilities on the part of the consumers. This can be done through educational interventions, which encourage interactive and participative learning.

Extraction

Extraction seems to be a problem which will only be exacerbated as time goes by and more people move downstream could thus face the scenario seen on other rivers – where suddenly they do not have water. This worsens for landowners farther downstream.

Recommendation 3:

- Form a Water Users Association, so that all the water users on the river can work together to manage the river.

- planting the riverbank – for example, with natives.

You can help look after the health of our Willowfontain River by:

- managing stock to keep them out of rivers and other waterways
- planting vegetation to protect and stabilise river banks
- maintaining vegetation to prevent waterway obstruction
- managing animal and plant pests.
- Where appropriate, reduce the impact of stock on the riparian zone by fencing and providing
- revegetate/encourage regeneration of eroded riverbanks with native indigenous trees, shrub

Limitations

- This was not a scientific data collecting expedition, and thus our records, although accurate on occasions where we would have to detour away from the river due to either heavy bramble or other vegetation which restricted our ability to keep records.
- It is impossible to physically record and photograph every single negative impact seen, although many were recorded.
- We have attempted to compile this report for ease of reference for both laymen and those with a scientific background.
- We hope that our efforts assist in not only raising awareness regarding the plight of the river but also the rehabilitation and care of this precious resource for the benefit of all those “downstream”

Conclusion

Rivers hold cultural, recreational and aesthetic value. They are a source of water and are home to many plants.

By managing rivers and streams we help protect our quality of life.

Watercourses such as the Dorpspruit are integral to the entire river/water management system, and are a key part of the City's biodiversity network, and represent an essential element in restoring the urban fabric of the City and economic opportunities. A well-managed watercourse is a valuable resource for improving the nature of an urban area and provides benefits for public health, recreation and economic growth. This is in the context of changing weather patterns and the associated local, national and international strategies

Sanele Vilakazi

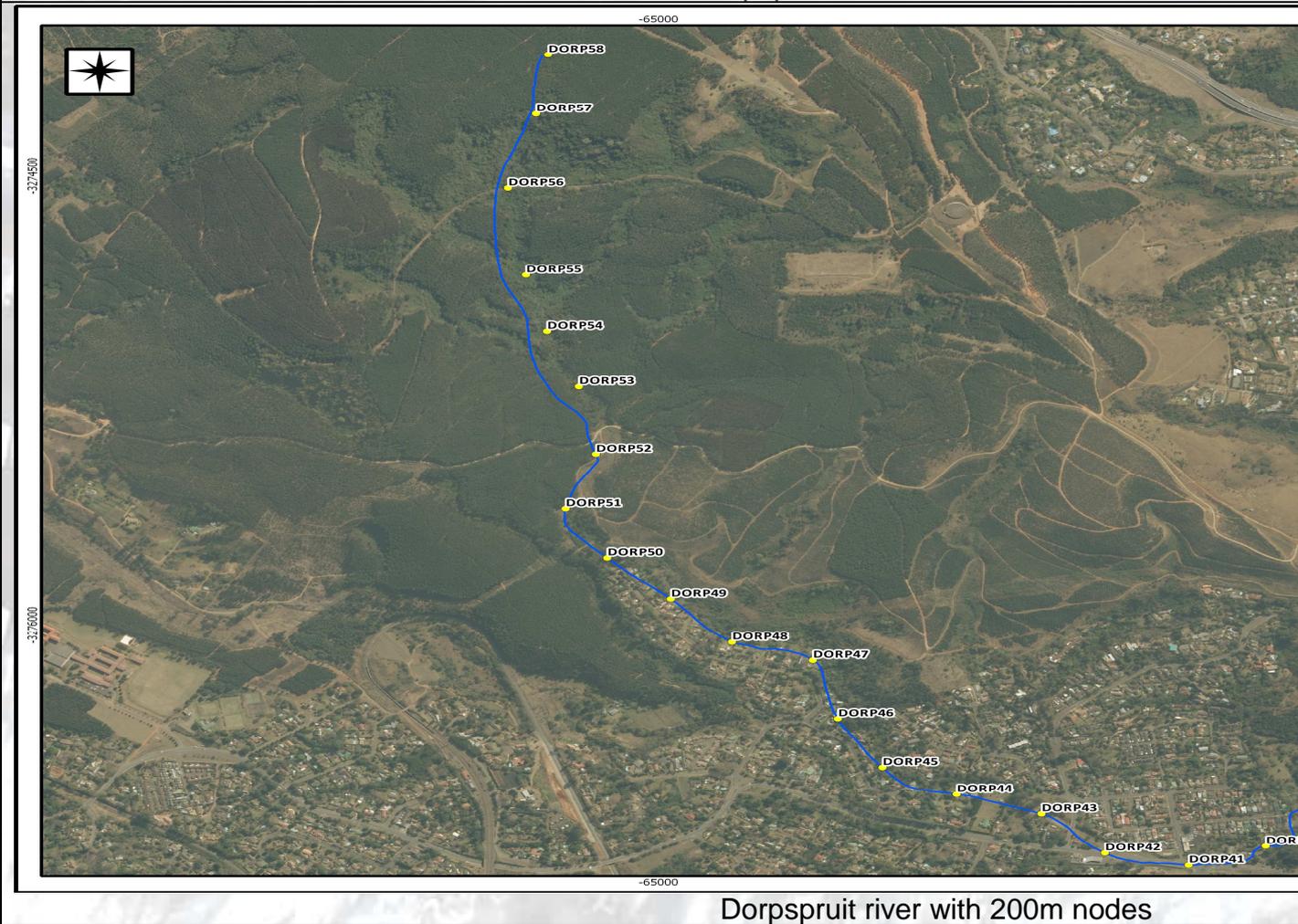
July 2014

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With these hands and with this heart
this water is now blessed
Removing and transmuting all impurities and
returning them to the light forever
Peace.
Kuan Yin Water Blessing



Dorpspruit river trail with 500m buffer



Dorpspruit river with 200m nodes



Dorpspruit river with 200m nodes



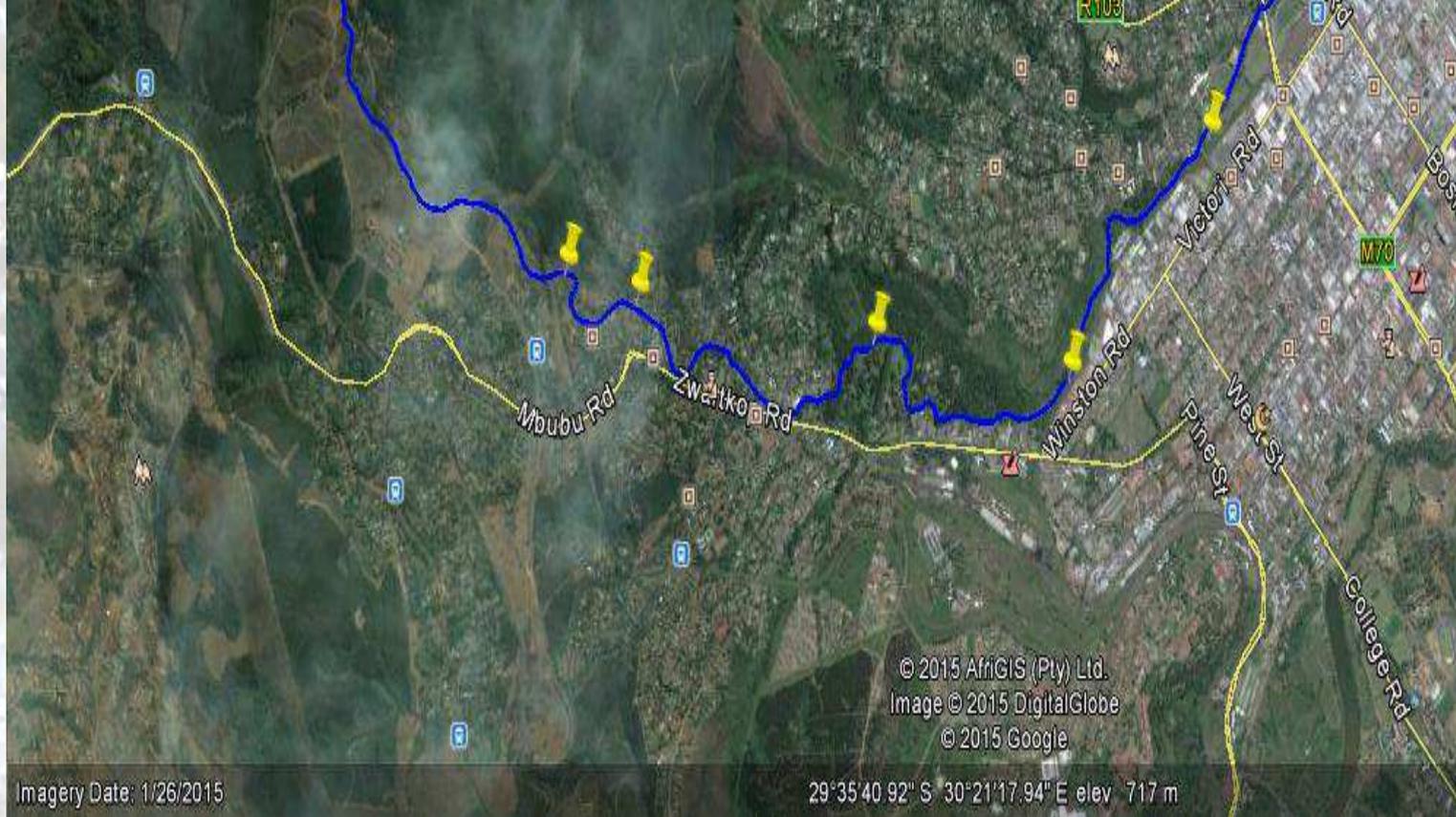
Dorpspruit river with 200m nodes



Dorpspruit river with 200m nodes

<i>Acacia mearnsi</i>
<i>Callistemon viminalis</i>
<i>Casuarina cunninghamiana</i>
<i>Casuaria equisetifolia</i>
<i>Cinnamomum camphora</i>
<i>Ziziphus mucronata</i>
<i>Eucalyptus grandis</i>
<i>Leucaena leucocephala</i>
<i>Melia azedarach</i>
<i>Morus alba</i>
<i>Pinus sp.</i>
<i>Phytolacca dioica</i>
Shrubs
<i>Rhus lucida</i>
<i>Chromolaena ordata</i>
<i>Diospyros lycioides</i>
<i>Lantana camara</i>
<i>Ricinus communis</i>
<i>Rubus cuneifolius</i>
<i>Solanum mauritianum</i>
<i>Senna didymobotrya</i>
<i>Senna occidentalis</i>
<i>Senna septemtrionalis</i>
<i>Sesbania punicea</i>
Bulbs
<i>Bulbine abyssinica</i>
<i>Crinum bulbispermum</i>
<i>Hypoxis hemerocallidea</i>
<i>Watsonia densiflorus</i>
Orchid
<i>Eulophia ovalis</i>
Aloes
<i>Aloe maculata</i>
Herbaceous perennials
<i>Ageratum conyzoides</i>
<i>Amaranthus hybridus</i>

Grasses & Sedges*Aristida junciformis**Bambusa balcooa**Cortadeira selloang**Cynodon dactylon**Imperata cylindrical**Piennisetum clandestinum**Pennisetum purpureum**Paspalum urvillei***Perennial Aquatic***Pistia stratiotes***Climber***Aristolochia elegans**Caesalpinia decapetala**Cardiospermum grandiflorum**Dolichandra unguis-cati**Impomoea indica**Passiflora suberosa**Solanum seafortianum***Reed***Arundo donax*



u20j	21.83		dorp 6	d	16	16	7	3	6	3	7	3	6	3	3	3
u20j	21.83		dorp 7	d	16	16	15	3	8	3	15	3	8	3	3	3
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