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MAYDAY FOR RIVERS

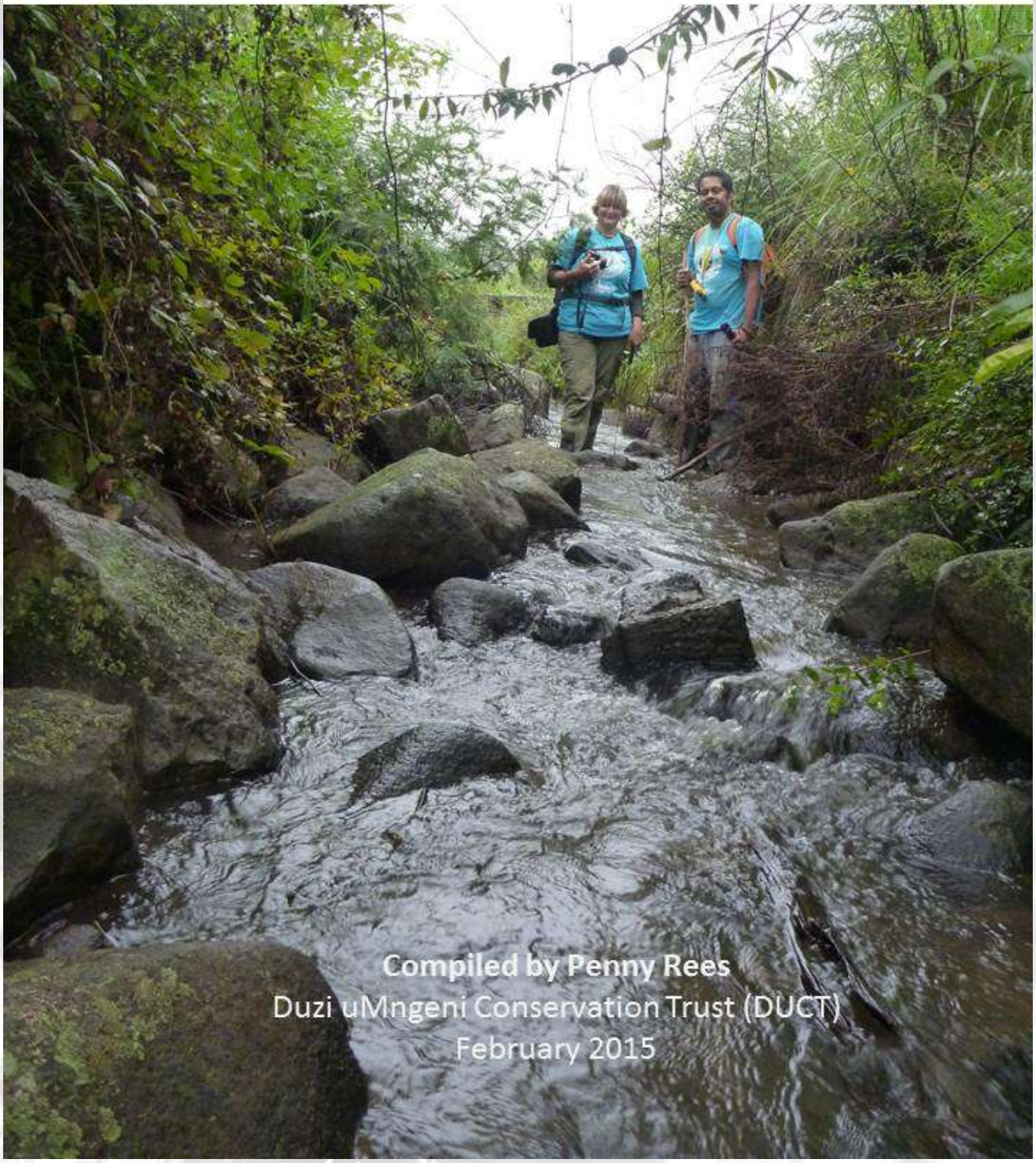
DUCT

DUZI UMNGENI CONSERVATION TRUST

the fellowship

Dargle River Walk Report

9th to 12th January 2014



Compiled by Penny Rees
Duzi uMngeni Conservation Trust (DUCT)
February 2015

Background

Having walked just over 300 kilometres down the uMngeni River, and around 90 kilometres down the Lions River, our team felt that the 20 odd kilometres down the Dargle to record all impacts would be a walk in the park. A couple of days and we would be done and dusted, and would then have an understanding of any impacts on this river that is, although small and short, nevertheless a part of the upper uMngeni River catchment.

Thus, on the 9th January 2014, Pandora Long, Preven Chetty and I set off for the source of the Dargle in the company of Mike Farley, who had walked the uMngeni River with us, and this time round would be our morning driver dropping us off at the days start. The Dargle "walk" promptly taught us to never, ever assume anything about river conditions before walking a river. Our planned two day stroll turned into 3 and a half days of mostly either hacking our way through thickets of invasive plants, or wading down long reaches of the river to avoid said invasive plants. Additionally, we had to circle half of the indigenous forest near the source in order to negotiate a sheer set of cliffs, which resulted in us entering said forest approximately 1 kilometre downstream of the cliffs, necessitating a walk back up the river to the foot of the cliffs in order to restart the walk only 200 metres downstream of the source spring! River walks are always filled with surprises.

Except for one short 200 metre long section, we managed by this means to always have the river in sight (or around and under our boots). All impacts were recorded by GPS, Dictaphone and photograph and Mini SASS river health assessment tests were done as often as possible. This report is the record of these observations.

Reference to left or right bank: a very un-technical, easy to understand direction, especially considering the meanderings of the river whose banks can be on all four of the cardinal points umpteen times in the space of a kilometre! Left bank refers to the left bank of the river as if going downstream, and right bank refers to the right bank as if going downstream.

Acknowledgements

Our thanks to:

- NT3C toll concession and the Midlands Conservancies Forum for making the funds available to walk the Dargle River.
- All the friendly and helpful landowners along the river
- Will Griffin for taking us to the source of the Dargle
- Carl Bronner for the luxurious accommodation besides a beautiful patch of indigenous forest at The Cairn of Old Kilgobbin
- Dargle Conservancy for all their support and delicious pizzas
- Barry and Rose Downard and Ashley Crooks for an evening filled with laughter
- Nikki Brighton, who somehow managed not only to get our blog “live” each night, but who, as part of the Dargle Conservancy rolled her sleeves up and got involved with the walk, not only collecting us on what was supposed to be the last afternoon, but also visiting us each evening, helped prepare dinner, and joined us on the last leg of the walk as well as assisting with the last two Mini SASSes.

Our thanks to our support crew who had long waits in the afternoons and extremely early hours in the mornings: Mike Farley – it was good to share a cuppa with you at dawn before departure: thanks for getting us to the start on time each day. Doug Burden, thank you for coming out of your way in the afternoons to collect us and get us back to base.

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 Dargle River Walk Report, February 2015; P.S Rees (author)*

Penny Rees
Howick
February 2015

The Duzi uMngeni Conservation Trust (DUCT)
Dedicated to the health of the uMsunduzi and uMngeni Rivers

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Contents

1 Area description

GPS Co-Ordinates
Start: -29.472294 29.998684
Finish: -29.492034 30.107973

Altitude drop
441 metres: 1,512 to 1,071 metres above sea level

General Description
The source of the Dargle River lies in the Kwa-Zulu Natal Midlands at the top end of an area known as The Dargle, approximately 20 kilometres north west of Howick and Midmar Dam and 12 kilometres south of the village of Nottingham Road. On a plateau hidden from sight in a small depression of Mistbelt Grasslands lies the source - a small seep that gives life to the Dargle River.

Enough water oozes from this spring to form a small stream that after only a couple of hundred metres disappears over a cliff into a beautiful indigenous forest. The stream falls over cascades in the deep coolness of the forest where the light filters down past giant trees, bird calls echo amongst monkey rope creepers, moss covers damp rotting logs splashed with bright colours of fungi and verdant green ferns nod in the breeze alongside small flowering wild Begonias besides the burbling, clear water.

As the steep terrain levels out, the stream emerges from the forest in a small valley which opens out into gently contoured rolling countryside. The river begins to meander, its banks becoming vertical as it flows slowly onwards.

Top: Where grassland and forest meet
Upper Middle: Inside the indigenous forest
Lower Middle: View downstream from the forest edge
Bottom: The Dargle River winding over a small floodplain

Meanders alternate with shallow fast flowing waters gushing over black dolerite rocks. Indigenous forest is never far away, as for most of its length the Dargle flows across a valley, whose sides to the north form a long ridge blanketed in this green and beautiful forest.

After spilling out into a wetland dotted with Helichrysum and Verbena flowers the river again carves its way past rolling green grasslands dotted with Agapanthus and Pelargonium flowers. An old stone wall runs straight as a dye up a hillside, the black rocks a stark contrast against the bright green grass. The river rushes over small cascades, past cliffs thickly clad in indigenous bush, before once again slowing and meandering lazily in a chocolate brown swirl.

We wade on rocks in the river where the vertical banks reach above our heads, finally emerging to discover we are on the very edge of the indigenous forest which gives way to more green grasslands dotted with wild Pelargonium, Watsonia and Satyrium flowers. No wonder the first settler here named the area after his Irish home – The Dargle. It cant possibly get greener! A wetland follows as do beautiful grassed river banks dotted with Crocosmia flowers (Falling Stars) before a stunning waterfall appears as the Dargle takes its last plunge before winding across floodplains to meet the uMngeni River.

2 Wild Animals

Animals

Otter (spoor)
Water mongoose
Yellow Bill Kite
Water Mongoose
Red Bishop
Sakabula

3 Terrestrial Vegetation / Least impacted riparian buffer areas

- The Dargle River is 20 kilometres long, thus there are 40 kilometres of river bank along the length of the river.
- Of the 40 kilometres comprising both banks there are only approximately 9 kilometres that are either intact or that have a relatively un-impacted riparian buffer. These areas occur in 6 separate locations.

Top: Wild flowers in grassland near dam
Upper Middle: The final drop off before the confluence with the uMngeni
Bottom: The confluence of the Dargle and uMngeni rivers

- The single longest un-impacted stretch on the river measures 5 km (total of both banks)
- The remaining un-impacted areas vary between only 100 to 800 metres in length per bank
- An additional area of just over two and a half kilometres (both banks) of riparian area have recently been cleared of invasives by landowners as well as the Dargle Conservancy. If the correct follow up procedures are applied and these areas rehabilitate fully this will bring to 11.5 kilometres the total of intact riparian area – just over a quarter of the Dargles river banks

Appendix 2 contains maps of the areas cleared of invasive plants that are described below:

Area 1
Place: Grasslands around source
Distance from source: 0km
Length: 150 metres
Vegetation: Moist Midlands Mistbelt Grassland

Area 2
Place: Forest below source
Distance from source: 200 metres
Length: 800 metres
Vegetation:
Right bank - Indigenous Podocarpus forest for 600 metres
Left bank - Indigenous Podocarpus forest for 800 metres

Area 3
Point: Thicket downstream of forest
Distance from source: +-1.5km
Length: 100m
Vegetation: Thicket of indigenous species

Top: Area 1 - Source grasslands
Middle: Area 2 - Source forest
Bottom: Area 3 - Thicket

Area 4

Point: Wetland upstream of two large earth dams
Distance from source: +-4.5km
Length: 600 metres
Vegetation: Wetland
Right bank: Wetland with indigenous grassland.
Left bank: Wetland with indigenous grassland and 100 metres of Poplars

Area 5

Place: Upstream area of 1st timber plantation
Distance from source: +-5.5km
Length: 600 metres
Vegetation: Indigenous grassland

Area 6

Place: Extending from+-1km south of Dargle / Impendhle road
Distance from source: +-12.5km
Length: +-2.4kilometres
Vegetation: Grasslands and thicket

- An additional area needs to be investigated – the only place where we did not have sight of the river having had to walk on a hill above the river due to the steep bank and almost impenetrable thicket. From what we saw this may be a stretch of +-200 metres length with no invasives. The area is situated between areas 4 and 5 discussed above.

Top: Area 4 - Wetland
Upper Middle: Area 5 – Upstream of first timber
Lower Middle: Area 6 - South of the Dargle road
Bottom: Area to be investigated

- On one section of the Dargle River an indigenous forest stretches away from the rivers north bank whilst the south bank originally comprised Mistbelt Grasslands. The south bank has been invaded by Bug Weed on a large and dense scale, and many of the Bugweed trees are over 2 metres in height. Thus not only the river is being shaded out by the Bugweed, but also the grassland. This change seems to have created the ideal conditions for Podocarpus (Yellowwood) trees, and there is an area on the south bank approximately 100 metres long that is filled with young Yellowwood Trees growing up amongst the Bugweeds – it is a Yellowwood nursery on a grand, natural scale. The parent trees were visible: a few large Yellowwoods a short distance from the river on the north bank.

  What is known as succession is taking place here in an unusual way. Succession refers to the process of vegetative change after an area has been disturbed whereby over many decades the vegetation proceeds through a series of changes from pioneer to climax stage. These changes are known as succession. Pristine grasslands or indigenous forest are examples of areas where the vegetation is in climax stage Thus the first pioneer plants to appear on disturbed ground are what we generally call weeds, although in reality these are tough, hardy plants that can live in poor soil and are improving and preparing the soil for less hardy plants. The pioneer stage is followed by a succession of other stages until the perfect vegetation mix is achieved for the area and conditions – this is known as the climax stage. The Bugweeds seem to have created the ideal conditions to allow for the Yellowwoods to thrive, and thus perhaps one day, the indigenous forest will cross the river if and when other forest species take root.

  This should by no means be used as a reason not to clear invasive species in the riparian buffer. Having walked over 200 kilometres of rivers in the Midlands, this is the first time we have seen this happening – up to now such an infestation of Bugweed has been seen to exclude all other vegetation.

Top, Middle & Bottom: Bug Weed and young Yellowwood trees

List of indigenous plants recorded

Acacia siberiana Paperbark acacia
Agapanthus spp
Begonia spp
Bracken Fern
Buddleja spp Wild sage
Clivia spp
Crocosmia spp
Cussonia spicata Cabbage Tree
Combretum erythrophyllum River bush willow
Dalbergia obovata Climbing Flat Bean
Helichrysum spp
Hypericum spp
Leucocidea sericea Ouhout
Maiden Hair Fern
Pelargonium spp
Plectanthrus spp
Podocarpus latifolius Yellowwood
Papaver spp Wild poppy
Satyrium longicauda Blushing Bride
Xanthoxylum capense Knob wood
Vangueria infausta Velvet Wild Medlar
Vigna unguiculata Wild Cow Pea
Wahlenbergia spp
Watsonia spp
Widdringtonia
Zantedeschia Arum Lilly
Ziziphus mucronata Buffalo Thorn

4 Wetlands

Wetlands are natures 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.

Historically, wetlands were not seen in such a positive light, and farmers were encouraged to drain them in order to increase arable land acreage. One farmer commented that “30 years ago we were told to drain the wetlands, today they ask us to rehabilitate them”. It is now illegal to make any new drains, wetland however it is permitted to keep historical drainage ditches functioning. Draining a wetland is not a once off action – drainage ditches need to be kept open so that the water which constantly seeps out of the wetlands can be channelled away from the dried out area, down the drainage ditches and into the nearby river.

Top: Satyrium longicauda
Bottom: Watsonia in grassland with indigenous forest in background

There are three wetlands on the Dargle River. The first lies immediately upstream of an earth dam, and seems to be a remnant of a far larger wetland that was drained historically and is now under pastures and centre pivot. The wetland seems to be in good condition and its riparian buffer on the right bank comprises beautiful grasslands that were dotted with Wahlenbergia, Helichrysum and other wild flowers, as well as a multitude of birds calling from the reed beds and a Water Mongoose that ran across our path.

The second wetland lies south of the Dargle / Impendhle road, and seems to be part of a network of long narrow wetlands parallel to each other that alternate with ploughed fields and at least one historical drain. The right bank of the wetland has ploughed lands that intrude +- 27 metres into the buffer. The left bank is infested with Wattle and Blue Gum trees for approximately half its length.

The third wetland is not far from the confluence with the uMngeni River. It lies on a floodplain upstream of a point where a small dam wall was constructed between the narrow, vertical river banks. This wall, which seems to be extremely old, has trapped silt over the decades, and as a result wetland plants have become established forming a wetland that spreads back across the floodplain.

Top: First wetland – situated at foot of slope at rear of picture
Middle: Second wetland – situated between cabbage fields and Wattle trees
Bottom: Third wetland on floodplain upstream of small dam wall

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 (for example decades old pastures planted to the rivers edge)

Terrestrial Invasive Vegetation

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 bio diversity 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.

31 of the 40 kilometres of river bank on the Dargle (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).

Top: Bamboo infestation in buffer
Middle: Bramble infestation in buffer
*Bottom: O*vergrown Kikuyu pastures and Willow tree in river buffer

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

Drainage ditches / dykes / diversions
One small wetland drainage ditch was observed.

Construction / buildings
Cattle holding pens within the buffer.

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.

Soil erosion on the river banks results in soil being washed in to the river. Most of the erosion on the Dargle River was localised to nineteen points where cattle have access to the river and their paths have eroded into gulleys. Of the 19 points, five were in a 400 metre stretch of river and twelve were in a 1.3 kilometre stretch of river. The soil was evident as a layer of silt on the river bed at the sites themselves, however it was not apparent beyond +-30 metres downstream. One other site was eroding where overflows from an off stream dam were running back to the river.

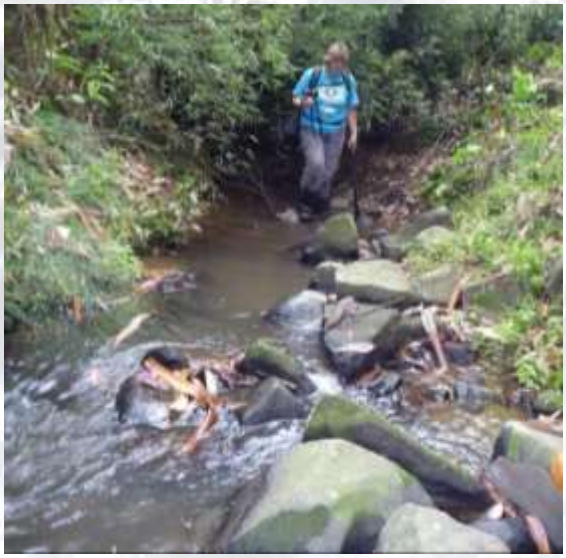
Roads
Dirt roads immediately adjacent to the river were seen in two locations.

Top: Stock pen and historical Kikuyu pasture in buffer
Middle: Gully erosion caused by livestock accessing river
Bottom: Silt on river bed and rocks

Sand Mining
None observed

Dumping
One rubbish pit was recorded on the edge of the buffer.

In-stream Impacts
Extraction / Water Demand
When comparing a point 1.5km from the source to a point 13 kilometres farther on (14.5km from source) there is little obvious increase in the size of the Dargle River. We crossed or saw a few very small tributaries which may be so small due to the presence of timber plantations on the hills that border the southern side of the Dargle valley. Planted timber uses such quantities of underground water that timber companies pay a water use levy per hectare of trees. Thus these plantations are likely to be a part of the reason why the Dargle Rivers tributaries have such low flows of water. The second reason is likely due to extraction for agricultural and domestic purposes.



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.

Top: Rubbish pit on buffer edge
Middle: Dargle *River* 1.5 kilometres from the source
Bottom: Dargle River 14.5 kilometres from source – barely any difference in size

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.

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 or disappear completely.

On the Dargle River, signs of nutrification were minimal and extremely localised – elevated levels of Diatoms were observed on a poultry farm and at some of the points where cattle have access to the river. At one place with increased diatoms and algae we were unable to gain any understanding of the source of the nutrients. The following signs of elevated nutrient loads were seen:
Water weed in earth walled dam
Diatoms on river bottom & submerged rocks
Algae

Top: Diatoms on river bed and submerged rocks with a small amount of algae
Middle: Flourishing unidentified aquatic plants in dam
Bottom: Algae on rocks from unidentified source

Dams / Weirs / diversions

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 currants that stir up detritus on the dam bed.

Five earth dams, two weirs, one diversion and the small wall described under point 4 (wetlands) above were observed.

Causeways

Two causeways were observed, one well built with a large pipe allowing the water to continue to flow, whilst the second was constructed with building rubble and had obstructed the flow of the water and created a pool
1st timber area pic 785
Causeway below begonias creating dam effect 804, 805

Litter / dumping

Two sites were noted where old logs and rubbish had been dumped in the water course.

Sand Mining

None observed

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.

Top: Dam on Dargle River
Middle: Road in buffer
Bottom: Dumping area in river bed

During the walk, all impacts were recorded and photographed, and regular Mini SASS, Methylene Blue and Turbidity tests were undertaken. Mini SASS is a general indicator of river health, Meth Blue indicates levels of bacterial & oxygen (the higher the level of bacteria the lower the amount of oxygen in the water) and turbidity indicates levels of suspended solids in the water.

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

We carried out seven Mini SASS tests, the results of which are as follows:

- *Seriously / critically modified / very poor condition:* three sites (scoring 4.71, 4.75 & 4.9)
- *Largely modified / poor condition:* two sites (scoring 5.1 & 5.9)
- *Moderately modified / fair condition:* one site (scoring 6.6)
- *Largely natural Few modifications / good condition (7.1)*

Of the seven Mini SASS tests conducted on the river, none scored Natural condition. The highest score was 7.5 Largely natural (Few modifications) / Good condition whilst the lowest score was 4.71 Seriously / Critically modified, Very Poor condition.

Site 1: Mini SASS

Site description: Approximately 1km from source, inside the lower end of indigenous forest. Cattle access to river for drinking purposes

Surrounding Land use: Indigenous forest accessed by cattle

Surrounding Vegetation: Right bank: Indigenous forest with dense stand of Blue Gums and Bug Weed on outer edge of buffer. Left bank: indigenous forest

Turbidity: Water 100% clear

Siltation on river bed and submerged rocks: None

Meth Blue: +- 40% oxygen, 60% bacteria - quite polluted

Mini SASS score: 5.9 Largely modified, Poor condition

River Health negatively impacted due to:

- Recent cattle access to river
- Blue Gums and Bug Weed on buffer edge

Site 2: Mini SASS

Site description: Approximately 1.5km from source, downstream of cattle pastures
Surrounding Land use: Recreational club
Surrounding Vegetation: Right bank: overgrown gardens, predominantly Bamboo and Periwinkle; left bank: overgrown Blue Gum plantation
Turbidity: Water 100% clear
Siltation on river bed and submerged rocks: Elevated silt level
Mini SASS score: 4.75 Seriously / Critically modified, Very Poor condition
River Health negatively impacted due to:

- Buffers comprising 100% invasive and alien species including Canna, Firethorn, Bamboo, Periwinkle, Wandering Jew, Wild Ginger

Site 3: Mini SASS

Site description: +-3.5km from source, downstream from arable lands and overgrown kikuyu pastures
Surrounding Land use: Veld & Maize lands
Surrounding Vegetation: Right bank: Indigenous grasses, Bugweed & Bramble; left bank +-90% Bugweed
Turbidity: Water 100% Clear
Siltation on river bed and submerged rocks: None
Meth Blue: 90% oxygen, little to no bacterial contamination
Mini SASS score: 4.9 Seriously / critically modified, Very poor condition
River Health negatively impacted due to :

- Invasive vegetation in buffer
- Possible contamination from pesticides, herbicides

There was no suspended or settled silt and no signs of elevated levels of nutrients or effluent release

Site 4: Mini SASS

Site description: +-9km from source, downstream of cattle grazing area and low level bridge
Surrounding Land use: Veld grazing
Surrounding Vegetation: Bramble
Turbidity: Water 100% clear
Siltation on river bed and submerged rocks: None
Mini SASS score: 4.71 Seriously / critically modified, Very poor condition

River Health negatively impacted due to:

- Heavy infestation of bramble on river banks at site – shading much of the river
- Kikuyu pastures upstream intrude into the buffer to the rivers edge
- Bramble in buffer upstream of site
- Gully erosion from cattle access +-50 metres upstream of site
  Water extraction

Site 5: Mini SASS

Site description: +-16km from source, downstream of indigenous grassland grazed by cattle on a rotational system
Surrounding Land use: Cattle farm – buffer fenced off
Surrounding Vegetation: Natural veld, thicket and forest
Turbidity: Water 100% clear
Siltation on river bed and submerged rocks: None
Meth Blue: 90% little to no bacterial contamination
Mini SASS score: 7.5 Largely natural (few modifications), Good condition
River Health is not negatively impacted, as livestock do not have access to the river, the entire buffer zone not only at the test site but for approximately one and a half kilometres upstream is intact and there are no effluent releases.

Site 6: Mini SASS

Site description: +-18km from source, downstream of dairy and livestock pastures
Surrounding Land use: Intense livestock
Surrounding Vegetation: Kikuyu pasture to edge of river banks
Turbidity: Water 50 – 75% clear
Siltation on river bed and submerged rocks: Extremely elevated levels of silt
Meth Blue: 60% small amount of bacteria
Mini SASS score: 5.1 Largely modified, Poor condition
River Health negatively impacted due to :

- Lack of indigenous vegetation in buffer areas
- Eroded banks from cattle access to river

Site 7: Mini SASS

Site description: +-18.5km from source, downstream of dairy, livestock pastures & small wetland

Surrounding Land use: Intense livestock

Surrounding Vegetation: Right bank – veld grass & kikuyu mix; left bank indigenous bush with +-10% Bramble and Pine trees

Turbidity: Water +-80% clear

Siltation on river bed and submerged rocks: None

Meth Blue: 80% little to no bacteria

Mini SASS score: 6.6 Moderately modified, Fair condition

River Health negatively impacted due to:

- Small dam wall upstream of site (which may, conversely, be preventing silt from moving downstream)
- Kikuyu and other invasives in buffer

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	Oxygen Level (Meth Blue)	Mini SASS
1	1km	Indigenous Forest	Forest / cattle access	Indigenous Forest	Gums, Bugweed	100% clear	None	40%	5.9 Largely modified Poor condition
2	1.5km	Poultry Farm Cattle pastures	Recreational club	Invasive	Bamboo & various other garden plants	100% clear	Elevated	Not tested	4.75 Seriously/Critically modified Very poor condition
3	3.5km	Arable lands, Pastures	Arable lands	Natural & Invasive	90% Bug weed and Bramble	100% clear	None	90%	4.9 Seriously/Critically modified Very poor condition
4	9km	Grazing	Cattle grazing	Grasslands, thicket	Bramble	100% clear	None	Not tested	4.71 Seriously/Critically modified Very poor condition
5	16km	Grassland grazed by cattle on a rotational system	Cattle grazing	Indigenous veld, thicket and forest	None	100% clear	None	90%	7.5 Largely natural, Few modifications Good condition
6	18km	Livestock, dairy, timber	Livestock	Kikuyu pastures	Kikuyu pastures, Bramble	50%	High	60%	5.1 Largely modified Poor condition
7	18.5	Livestock, dairy, wetland	Livestock	Kikuyu / veld / indigenous	Kikuyu, Pine, Bramble	80%	None	80%	6.6 Moderately modified Fair condition

Reasons for poor river health

As a result of the impacts described in 1.6 above, the health of the Dargle River varies between critically modified (very poor condition) to largely natural, good condition.

***Buffer Vegetation*:**

Only one site (site 5) had 100% intact buffer vegetation combined with a lack of cattle access and resultant lack of excess nutrients and siltation.

Siltation on river bed and submerged rocks:

Siltation was localised at cattle access points only

Turbidity:

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

Bacteria:

Methalyne Blue tests confirmed an increase in bacteria (and a proportionate drop in oxygen) in areas where cattle access the river.

Nutrients:

As with turbidity, elevated nutrient levels were very localised and due to the fact that the nutrient levels were very low, did not seem to impact the river downstream of the effected sites. These nutrient loads seem to originate predominantly from areas where there is intense livestock farming and one area of poultry farming.

Conclusion:

The fact that the healthiest section of the river was not only 16 kilometres from the source, but also downstream of very unhealthy sections, proves as we have previously seen on other rivers, that rivers can and do heal if they have a long enough section without impacts.

Some of the areas that scored low Mini SASS scores had no apparent siltation, nutrification or effluent problems – the only visible impacts were the dense invasive vegetation in the buffer and the low water level, with the highest scoring site the only site that had no invasive plants in the buffer. Thus the Dargle River also shows us that healthy riparian buffer zones enable healthy rivers.

It is entirely possible to clear invasive plants from the buffer, although it takes time – but such actions will go a long way towards improving the health of the Dargle

7 Green Corridor

Potential Stewardship / Conservancy Sites

The source area is already a Stewardship site, and there are a total of five other areas along the river with the potential for Stewardship / Conservancy status, as follows:

- *Large wetland* upstream of large earth dam
- *Timber area* downstream of abovementioned wetland where buffer has been cleared

- Assuming that the section we could not see during the walk is invasive free (situated between Areas 4 and 5 under section 3 above) this area could link the upstream wetland and dam with the downstream area cleared through the timber area mentioned above
- *North bank of river* comprising Mistbelt grasslands dotted with patches of indigenous forest situated immediately upstream of the bridge where the Dargle / Impendhle Road crosses the Dargle River.
- Ar*ea south of Dargle / Impendhle road* already cleared of invasives

River hiking way potential

There are some beautiful areas along the Dargle 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. Two possible solutions could be:

- Limited access to hiking clubs who often conduct day hikes led by responsibly trained leaders
- 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.

Findings and Recommendations

Findings

Impacts

The Dargle River, on its short 20 odd kilometres is a small river that, although negatively impacted in places, has the potential to be restored, as the majority of the impacts are localised, and it is possible to remove the invasive vegetation at least in the buffer zones, if not beyond.

Water Quality - Mini SASS

Mini SASS tests are an effective means of monitoring river health and can be carried out by almost anyone if they have had basic training.

Catchment Management

Lack of adequate catchment management has meant that terrestrial invasive plants have become rampant near the river. These plants utilise ground water which would otherwise enter the river system, and in many cases block the sunlight from the river, changing the whole ecology of the river and damaging bio diversity.

Fortunately, role players are becoming increasingly aware of the importance of maintaining a healthy river catchment and the Dargle River is no exception. The Dargle Conservancy has cleared one area of invasives along the river; one landowner has done the same over +-600 metres; a second landowner has, over the years, cleared and maintained a section of over two and a half kilometres in length and a third landowner has recently cleared some sections of his river banks.

Recommendations

Buffer lengths (as opposed to buffer widths)

As noted time and again, given enough space, the health of the river will improve if there is enough length without impact. Some may argue that then contamination is not a problem, but it should be kept in mind that a tipping point could be reached whereby there is so much contamination that the river will be unable to heal.

Durban City is at the downstream end of all the contamination of the uMngeni River catchment, with many riverine users and landowners between the source and Durban.

Recommendation 1:
In order to increase the resilience and health of the Dargle River it would thus make sense to implement buffer lengths (in addition to the current 32 metre buffer width) in all planning programs - municipal and other, in order to ensure that the river water is able to rejuvenate. Areas identified as being potential contamination sources, no matter how much of an effort is made to avoid such contamination, could then have a sufficient buffer length downstream that should be guaranteed / protected. The areas we noted for this purpose include:

- Areas 4 & 5 (section 3 above) could be linked together by the area between them, most of which is already cleared of invasives, although some follow up

is needed). This would give a total length of 2 kilometres (4 kilometres both banks) comprised as follows:
Area 4 (wetland): 600m
Dam: 300m
Dam wall to area 5: 500 metres
Area 5: 600m

- The area where the Dargle Conservancy have already cleared Bramble and Wattle could be extended upstream for approximately two kilometres. This section comprises occasional Wattles trees and predominantly Bramble which seems to occur only on the immediate river bank in a narrow band +- 5 metres wide.

Large Invasive Trees

Over enthusiastic felling of all large invasive trees down the river needs to be approached with caution. Due to development, be it urban or for agricultural purposes, suitable nesting sites are disappearing or have already disappeared, particularly for raptors, and in some cases the large invasives along the river are the only suitable nesting sites as they are the only large trees left in some areas. Thus the wholesale removal of all large trees could result in the disappearance of especially the raptor species.

Recommendation 2:
Teams who work the river clearing invasives should be trained to find and identify raptor nests, and a scientific guideline should be drawn up with criteria for the eradication choices concerning these large trees. For example, the Crowned Eagle will have a nest in one tree, but as a security measure will often alight on a nearby large tree prior to approaching the nest. Thus if all trees other than that which holds the nest are felled, this will also impact these birds ability to nest and raise their young. Many of the Fish Eagle nests seen during the walk were placed in large gum trees, and many of the raptor sightings were of these birds perched in the large trees.

Invasive plants

Invasive vegetation in the buffer of the Dargle River seems to be the single largest contributor to the general poor river health.

Recommendation 3:
Being such a short river, it seems entirely feasible that the entire Dargle River could be cleared of invasive plants. The two areas mentioned in recommendation 1 above would be good places to begin.

Erosion from cattle paths

There were areas on the Dargle River where there were multiple points within metres of each other where cattle have accessed the river, resulting in eroded river bans and a silted river.

Recommendation 4:
Perhaps landowners could put their thinking caps on and devise ways to prevent this erosion. The following options have either been suggested to us by landowners or observed during our river walks, and most are dependent on a single strand electric fence 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

Extraction

Extraction seems to be a problem which will only be exacerbated as time gos by and more pumps are installed. Landowners downstream could thus face the scenario seen on other rivers – where suddenly they do not have sufficient water, and the problem worsens for landowners farther downstream.

Recommendation 5:

- Form a Water Users Association, so that all the water users on the river can work together to distribute the water fairly.
- Re-look irrigation regimes – there is an oft quoted case of a farmer in the upper uMngeni catchment who, after the 1980's drought continued using the drought irrigation routine for many years as he found that he had better results with his crops, had less leaching of his soils and of course used far less water.

Monitor River Health

Recommendation 6:

Each landowner / occupier learn to do Mini SASS, and undertake regular Mini SASS tests on their stretch of river (four times per annum), thus they will each be able to monitor their impact on the river, and take remedial action if necessary

Mini SASS is an activity that the whole family can take part in, and is always great fun for adults and children alike. More information can be accessed on www.minisass.org

Limitations

- This was not a scientific data collecting expedition, and thus our records, although accurate, are not complete. There were occasions where we would have to detour away from the river due to either heavy bramble infestations or terrain challenges, which restricted our ability to keep records.

- It is impossible to physically record and photograph every single negative impact seen, although the majority of impacts were recorded.

- We have attempted to compile this report for ease of reference for both laymen and those with environmental backgrounds.

- We hope that our efforts assist in not only raising awareness regarding the plight of the Lions River, but also inspire rehabilitation and care of this precious resource for the benefit of all those "downstream"

Conclusion

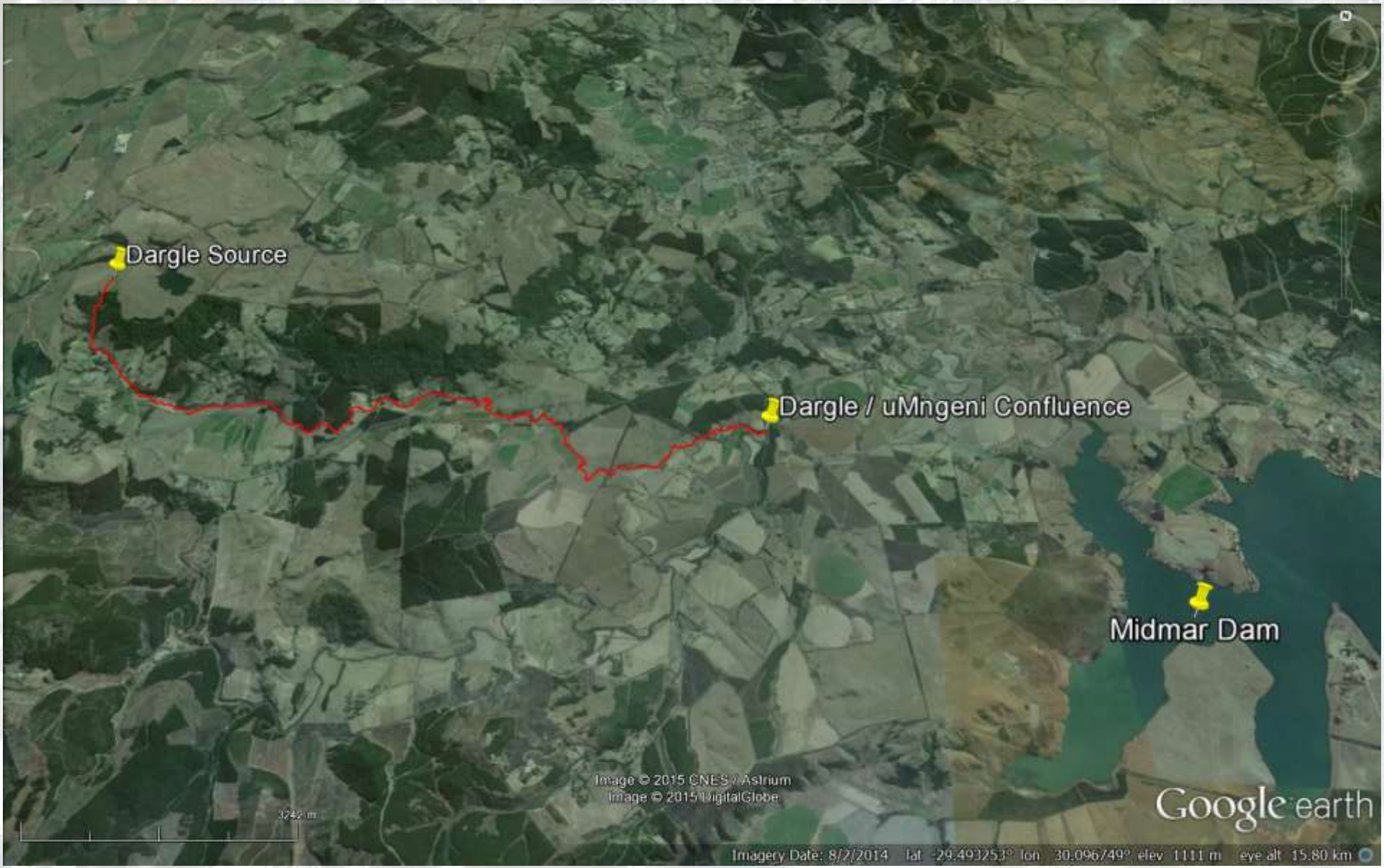
The Dargle River, although only 20 odd kilometres long, is negatively impacted like so many other South African rivers. However, being so short, and having some wonderfully enthusiastic landowners alongside, we hope that our river walk and this subsequent report will be a motivation to undertake a restoration of this small but beautiful river.

Penny Rees
February 2015
pennyduct@vodamail.co.za River Walk Blog: uMngeni riverwalk.wordpress.com

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

Appendix 1

Area Description

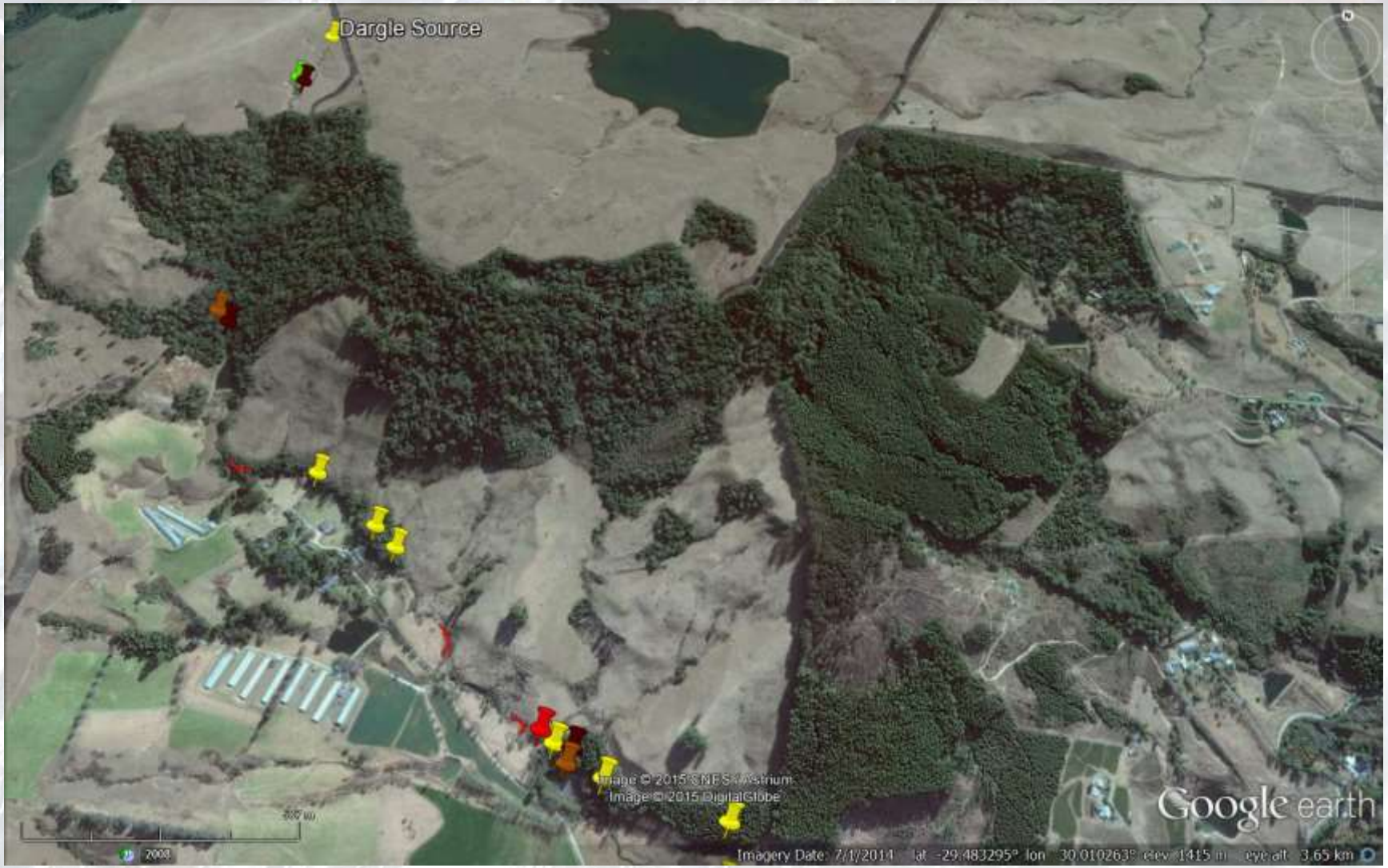

Dargle Source
Dargle / uMngeni Confluence
Midmar Dam
Image © 2015 CNES / Astrium
Image © 2015 DigitalGlobe
Google earth
Imagery Date: 8/2/2014 lat -29.493253° lon 30.096749° elev 1111 m eye alt 15.80 km

Appendix 2

Invasive Vegetation

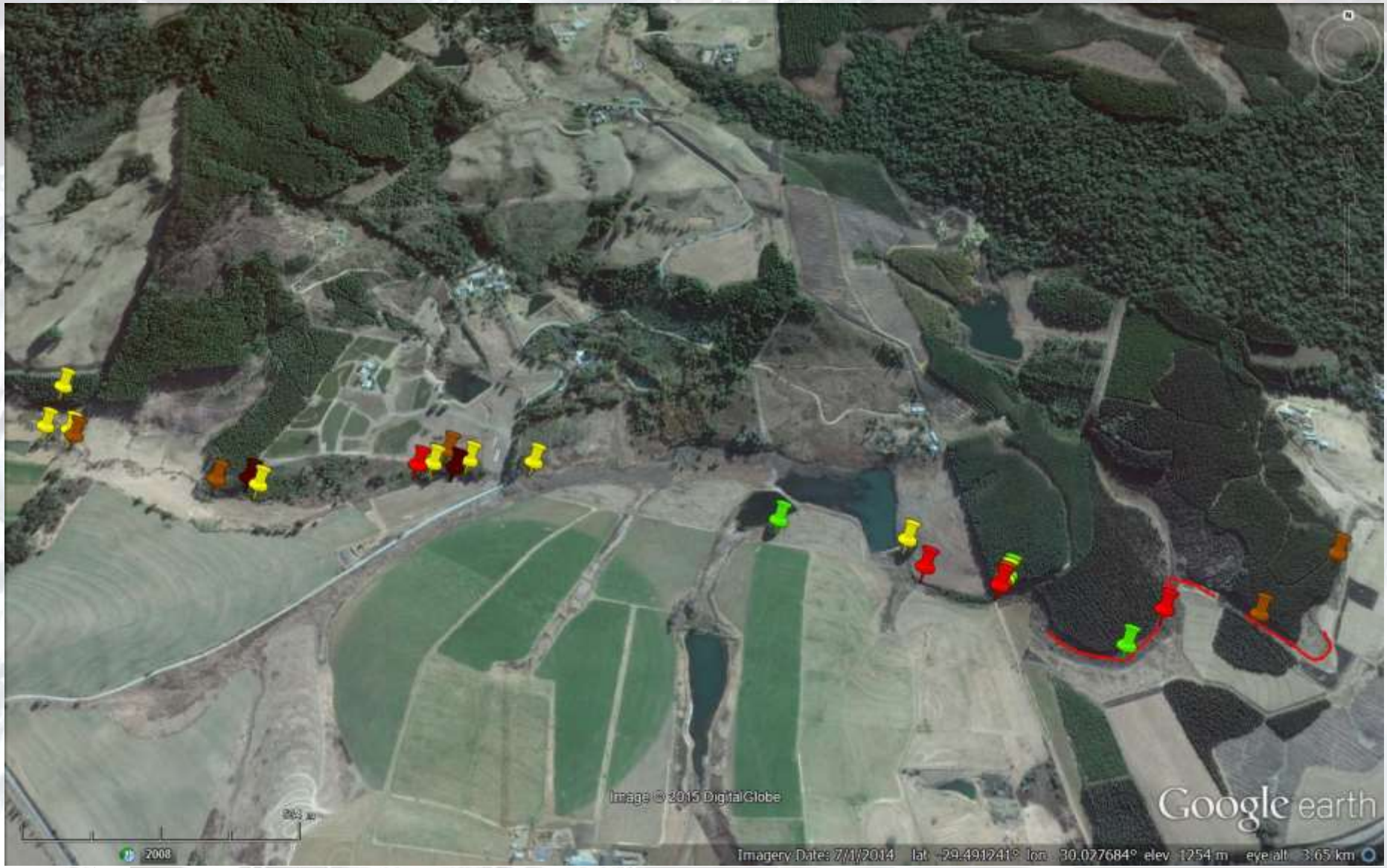
Invasive Plants and Weeds Identified

Wattle	Acacia dealbata / mearnsii
Crofton Weed	Ageratina adenophora
Bamboo	Bamboosa balcooa
Indian shot / canna	Canna indica / generalis
Blue Gum	Eucalyptus
Mulberry	Morus nigra
Honey Locust	Gleditsia triacanthos
Wild Ginger	Hedychium gardneranum
Privet	Ligustrum japonicum
Pine	Pinus spp
Poplar	Populus
Firethorn	Pyracantha
Bramble	Rubus fruticosus
Weeping willow	Salix babylonica
Peanut butter cassia	Senna didymobotrya
Bug weed	Solanum mauritianum
Climbing Rose	Rosae
Wandering jew	Tradescantia spp



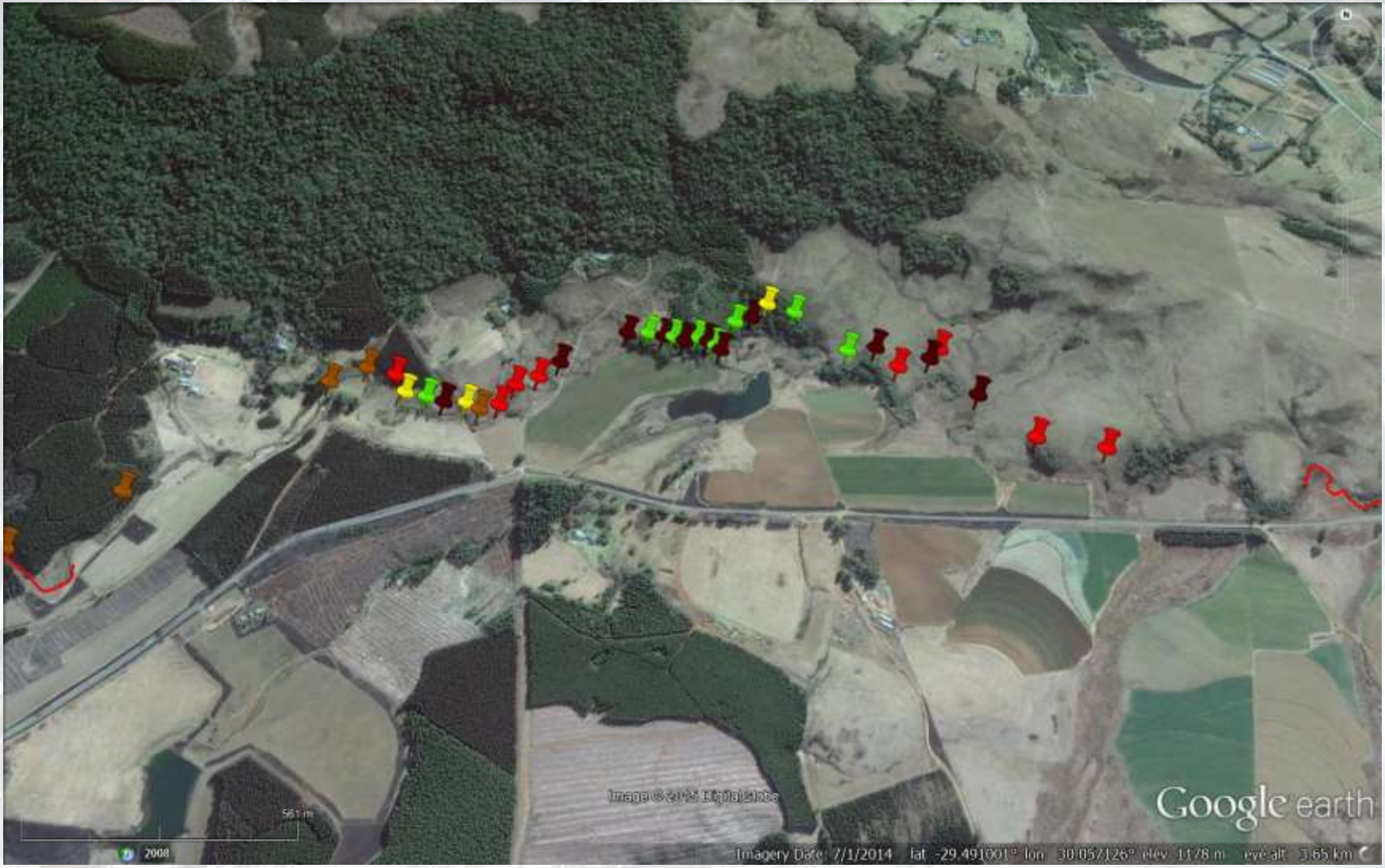
Key

Red	Bramble	**Brown**	Pine & or Blue Gum
Green	Wattle	**Olive Green**	Aquatic invasive: Fine Oxygen Weed, Water Cress
Purple	Bugweed	**Red line**	Riparian zone recently cleared of invasive vegetation
Yellow	Other alien or invasive species: Crofton Weed, Honey Locust, Wandering Jew, Peanut Butter Cassia, Bamboo, Plane Trees, Willow Trees, Periwinkle, Canna, Pyracantha, Ginger, Climbing Rose		



Key

Red	Bramble	**Brown**	Pine & or Blue Gum
Green	Wattle	**Olive Green**	Aquatic invasive: Dense Oxygen Weed, Water Cress
Purple	Bugweed	**Red line**	Riparian zone recently cleared of invasive vegetation
Yellow	Other alien or invasive species: Canna, unknown tree, Bramble, Willow, Bugweed, Peach, Indian Shot, Privet, Poplar		



Key

Red	Bramble	**Brown**	Pine & or Blue Gum
Green	Wattle	**Olive Green**	Aquatic invasive: Dense Oxygen Weed, Water Cress
Purple	Bugweed	**Red line**	Riparian zone recently cleared of invasive vegetation
Yellow	Other alien or invasive species: Indian shot, Bramble		

Key

Red	Bramble	**Brown**	Pine & or Blue Gum
Green	Wattle	**Olive Green**	Aquatic invasive: Dense Oxygen Weed, Water Cress
Purple	Bugweed	**Red line**	Riparian zone recently cleared of invasive vegetation
Yellow	Other alien or invasive species: Privet, Mulberry, Willow		

Appendix 3

River Health Test Sites


Dargle Source
MS 1
MS 2
MS 3
MS 4
MS 7
MS 6
MS 5
Dargle / uMngeni Conflue
Image © 2015 CNES / Astrium
Image © 2015 DigitalGlobe
2450 m
2008
Google earth
Imagery Date: 8/2/2014 lat -29.489920° lon 30.068990° elev 1191 m eye alt 12.67 km

Appendix 4

Potential Stewardship, Conservancy and Hiking Way


Dargle Source
Dargle / uMngeni C
Image © 2015 DigitalGlobe
Image © 2015 CNES / Astrium
2379 m
2008
Google earth
Imagery Date: 7/1/2014 lat -29.498133° lon 30.058812° elev 1242 m eye alt 12.39 km

Appendix 5

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Downloaded March 2014
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