



# David Styles

## Vegetation Surveys, Advice and Consulting

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Dear Luvanya

### **ASSESSMENT OF VEGETATION WITHIN AND SURROUNDING THE FOOTPRINT OF A PROPOSED PEDESTRIAN BRIDGE BETWEEN UMLAZI AND EMANSOMINI**

#### **1. Introduction**

I have been asked by the Sivest Environmental Division on behalf of the eThekweni Municipality: Engineering Unit to present a report assessing vegetation within and next to the footprint of a proposed pedestrian bridge across the Mbokodweni River. Two alternative positions were provided for investigation, for which a single GPS position was provided respectively.

#### **2. Methodology**

The two proposed footprints were investigated on foot on 6 August 2014 according to a reconnaissance survey approach during which notes and photographs also taken. Much of the grassy and wetland vegetation had been more recently burned off. This creates more difficulty for an assessment, but enough was still evident to form an opinion about its quality.

#### **3. Vegetation /Ecosystem types – National Vegetation Map / National List of Threatened Ecosystems**

The site is situated within a vegetation type designated as KwaZulu-Natal Coastal Belt Grassland (Scott-Shaw & Escott 2011) corresponding with the KwaZulu-Natal Coastal Belt of Mucina & Rutherford (2006). According to Scott-Shaw & Escott (2011) it is Critically Endangered. It is a: "Long and in places broad coastal strip along the KwaZulu-Natal coast, from near Mtunzini in the north, via Durban to Margate and just short of Port Edward in the south. Altitude ranges from about 20–450 m."

It is described as comprising:

Highly dissected undulating coastal plains which presumably used to be covered to a great extent with various types of subtropical coastal forest (the remnants of one of

which are described as ... Northern Coastal Forest). Some primary grassland dominated by *Themeda triandra* still occurs in hilly, high-rainfall areas where pressure from natural fire and grazing regimes prevailed. At present the KwaZulu-Natal Coastal Belt is affected by an intricate mosaic of very extensive sugarcane fields, timber plantations and coastal holiday resorts, with interspersed secondary *Aristida* grasslands, thickets and patches of coastal thornveld.

The site also falls within a Critically Endangered listed ecosystem, namely Interior South Coast Grasslands, KZN 7 (SANBI 2009). According to SANBI (2009) it is listed according to Criterion F because it comprises: "Priority areas for meeting explicit biodiversity targets as defined in a systematic biodiversity plan" with "[v]ery high irreplaceability and high threat."

This ecosystem is situated in the KwaZulu-Natal Coastal Belt and is an amalgam six vegetation types including: KwaZulu-Natal Coastal Forest, KwaZulu-Natal Sandstone Sourveld, Ngongoni Veld, KwaZulu-Natal Coastal Belt, Pondoland Scarp Forest, Pondoland-Ugu Sandstone Coastal Sourveld. Key biodiversity features include 17 plant species, however most have distributions to the south of the Interior South Coast Grasslands ecosystem and none were seen closely proximate to the two footprints.

It appears that some vegetation types were omitted from the account, however, as Scarp Forest (Mucina & Rutherford 2006) that is not Pondoland Scarp Forest occurs along rock faces and sides along the river. There are also major problems with mapping and floristic resolution of KwaZulu-Natal Sandstone Sourveld in the National Vegetation Map (Mucina & Rutherford 2006), and the Natal Group sandstone geology of the bridge footprint area indicates that grassland that once occurred in this area was probably KwaZulu-Natal Sandstone Sourveld, although only shown in the map as occurring east of this site. However, grassland in proximity to the crossings is now so transformed it cannot be referred on floristic composition to a particular type.

#### **4. Field observations**

Field observations are made according to each alternative. The western alternative is addressed first.

##### **4.1 Western alternative**

Vegetation in proximity to the bridge crossing has been disturbed both through water action (close to the river banks) and human activity. Well-worn pedestrian paths exist on both sides of the river close to the crossing and numbers of people were seen walking through it while the survey occurred. An existing, broken-down pedestrian bridge already exists at this point. The vegetation appears to be well grazed, shown by cropping of new grass and sedge growth and cowpats. While the vegetation appears to hardly be suitable for grazing, in the experience of the author in township edge situations, it is common for cattle and goats to be kept, with animals pushed into and through any available open space, irrespective of land ownership, ability of veld to sustain the animals, or environmental degradation that results from overgrazing/ over-browsing. At the bridge sites, the grazing pressure is sufficient, or alternately there is so little grazing available to animals, that even the large sedge *Cyperus dives* is grazed well down – these are plants that are usually avoided by grazers due to serrated leaves that contain rich silica deposits, which wear down teeth and can cause injury to animals' mouths.

Vegetation at this crossing consists of a mix of different vegetation that is so interpolated that it cannot be discretely mapped. This vegetation comprises:

- Wetland plants, much burned comprising *Phragmites australis* (Common Reed) and the sedge *Cyperus dives* and to a much smaller extent *Typha capensis* (Bulrush), which are larger species better able to tolerate disturbance. Only two other wetland species were seen, namely *Ludwigia octovalvis* and *Persicaria attenuata* subsp. *africana*. The alien hydrophytic herb *Nasturtium officinale* (Watercress) is common in shallow water and banks along the river.
- Dryland alien plants, with the following species common: *Ambrosia artemissifolia* (Ragweed), *Chromolaena odorata* (Chromolaena), *Lantana camara* (Lantana), *Senna didymobotrya* (Peanut-butter Senna), *Solanum mauritianum* (Bugweed), *Tecoma stans* (Yellow Bells) and *Tithonia diversifolia* (Mexican Daisy).
- Secondary grassland devoid of all herbs except weeds of disturbance.

Only two other patches of vegetation were seen not in these categories, as follows:

- Open, tattered, woody vegetation well invaded by alien species but including a number of indigenous trees including: *Acacia robusta*, *Dalbergia obovata* (Climbing Flatbean), *Phoenix reclinata* (Wild Date Palm) and numbers of *Millettia grandis* (Umzimbeet). The *Millettia grandis* trees are being chopped down for poles or firewood, and it likely that this patch comprised denser growth of indigenous trees in the past but now reduced by cutting and felling. This patch containing the Umzimbeet trees is mapped in Appendix 1. *Millettia grandis* is protected by the provincial conservation ordinance, probably because it is endemic to the semi-coastal area of KwaZulu-Natal and the northern Eastern Cape and its timber is highly prized. As a result trees in KwaZulu-Natal may not be damaged or destroyed without permit authorisation from Ezemvelo KwaZulu-Natal Wildlife, the provincial conservation authority. However, it appears possible for construction to avoid this patch. Curiously, *Millettia grandis* is assessed as facing threat in national Red List (Raimondo et al 2009), which is probably an omission.
- A patch of dry Scarp Forest (based on species composition it is not in the opinion of the author Northern Coastal Forest) that has suffered disturbance and reduction on the edges. There is clearing and cutting down of trees, including *Millettia grandis*, where the terrain is less steep. Some of the forest though is protected from this activity by steep slopes and rock faces. Most of the felling appears to originate from less formal settlement north of the river, but a bridge that provided better access to the forest for those on the south side of the river would probably increase this activity to a certain extent. This forest is however much smaller and accessible parts in worse condition than forest close to the western alternative crossing (see below), where a broken-down pedestrian bridge already occurs.

#### 4.2 Eastern alternative

The eastern alternative is exactly as the western alternative, except for the following:

- Due to greater channelling on either side of the river, there is less wetland vegetation.

- Possibly due to less disturbance, the wetland vegetation is also slightly more diverse (the larger sedge *Eleocharis limosa* occurs, which was not seen at the eastern alternative). Though less commonly encountered than *Cyperus dives* and *Phragmites australis*, *Eleocharis limosa* is not a rare species, however. *Persicaria senegalensis* also occurs, which was not seen at the western alternative.
- There is a greater amount of the alien invader *Tecoma stans* (Yellow Bells), while a small number of *Sesbania punicea* (Red Sesbania) also occurs not seen at the eastern alternative (although it is possible this was masked by burning and scorching at the western alternative). However, large amounts of alien vegetation occur in proximity to both.
- The river is infested with the alien invasive aquatic plant *Eichhornia crassipes* (Water Hyacinth). However, as these plants are mobile and populations are dynamic it can be expected that it occur upriver at the nearby eastern alternative in future.
- There are much larger areas of Scarp Forest, much still in good condition on rock faces and steep slopes edges along the river. This forest is separated from the proximate area of less formal settlement south of the river by the river. Although this forest is not very close to the proposed crossing, and so not at risk of direct damage or disturbance as a result of construction, it is probable that if better access were provided to the north side of the river, there would probably be an increase in harvesting of timber and firewood from this forest, although some would be protected from such activity by steep terrain.

## 5. Rare and Red Listed species

No rare or Red Listed species, as recorded in Raimondo et al (2009) occur at or in close proximity to either crossing. However, and as noted the protected tree *Millettia grandis* occurs in a patch of woody vegetation near the western crossing and is present in all the occurrences of Scarp Forest.

## 6. Impact assessment

The alternatives are further assessed below according to an impact assessment methodology required by Sivest as follows.

### Western alternative

The proposed development will destroy, damage or alter some vegetation. Impacts will occur within and close to the footprint, but indirect and cumulative impacts will probably also occur further away, particularly if better access is facilitated to Scarp Forest where timber and firewood can be gathered.	
<b>EXTENT (GEOGRAPHICAL)</b>	
Site	Yes, particularly direct destruction and disturbance during construction.
Local / district	Yes, probably some cumulative and indirect impacts a further distance from the site (increased pedestrian and other human activity, disturbance to vegetation and spread of alien

	species) and encouragement of new settlement in the vicinity, and most importantly enabling better access to the Scarp Forest, particularly if the eastern alternative is selected.
Province / region	No
International and international	No
<b>DURATION</b>	
Construction period / Short term	Yes, with most of the impact during the construction phase
Medium term (up to 6 years after construction)	Yes, probably some cumulative and indirect impacts a further distance from the site, including disturbance to vegetation and an increase in alien vegetation (in response to increased activity at the selected crossing. More important is some cumulative impact on the Scarp Forest (see the cumulative and significance ratings part of this table).
Long term (more than 6 years after construction)	Yes, as above.
<b>PROBABILITY</b>	
Definite	Direct impacts
Probable	Indirect and cumulative impacts
Possible	-
Unlikely	-
<b>REVERSIBILITY</b>	
Reversible	Some of the construction related impacts are reversible.
Irreversible	However, some of the construction related impacts will be irreversible, while probable indirect and cumulative impacts also likely irreversible and will extend beyond the life of any management plan (assuming such could be implemented at the crossing), which in any event could not well address these.
<b>IRREPLACEABLE LOSS OF RESOURCES</b>	
High	Although impacts on the Scarp Forest could be high if the eastern alternative is selected, this is probably better assessed as medium – see below.
Medium	Although vegetation in close proximity to the eastern crossing comprises common or alien species, there could be indirect and cumulative impacts on Scarp Forest more distant from the crossings, particularly if the eastern alternative is utilized. The reason for this is that informal settlement is mainly situated on the south side of the Mbokodweni River and the Scarp Forest on the north side, with the river forming a barrier. A bridge will enable direct access to the Scarp Forest and it is assumed there will then be at least some harvesting of timber (poles)

	and firewood from the forest, causing it damage. As the forest appears well developed and to comprise old growth, if such impacts were relieved, recovery from damage done could take a long time (more than one human generation).
Low	This is considered lower for the western alternative as most of those in less formal settlement can already obtain access to the smaller area of Scarp Forest closer to this point, access across the river is already possible via an existing though broken-down pedestrian bridge and accessible parts have already been degraded to an extent.
No Loss	-
<b>CUMULATIVE EFFECTS</b>	
High	Although impacts on the Scarp Forest could be high, particularly if the eastern alternative is selected, it is probably better assessed as medium – see below.
Medium	Cumulative effects are assessed as for the irreplaceable loss of resources section, for the eastern alternative, as there could be indirect and cumulative impacts on Scarp Forest more distant from the crossings. This is considered medium for the eastern alternative. The reason for this is that informal settlement is mainly situated on the south side of the Mbokodweni River and the Scarp Forest on the north side, with the river forming a barrier. A bridge will enable direct access to the Scarp Forest and it is assumed there will then be at least some harvesting of timber (poles) and firewood from the Scarp Forest, causing it damage. Recovery from damage done could take a long time (more than one human generation).
Low	The cumulative effects of the western crossing are considered lower as access is then not as easy to the Scarp Forest.
<b>SIGNIFICANCE RATINGS</b>	
High	The significance rating is not exactly known for the Scarp Forest, as the effect of better access across the river to this resource for those in more informal dwellings is difficult to foretell. Although it could be high, it is more likely medium if the eastern crossing is selected.
Medium	The significance ratings are assessed as medium for cumulative impacts on the Scarp Forest, if better access is provided to this part of the river.

Low	For this parameter, significance ratings are considered lower for the western alternative as Scarp Forest near this crossing is much smaller, more degraded and access to Scarp Forest near the eastern crossing is more difficult, and access over the river is already provided via an existing pedestrian bridge, though it is broken-down and in disrepair.
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**7. Assessment of alternatives**

Based on impacts as assessed in the table above, impacts on vegetation are very similar for vegetation in close proximity to the crossings (because the vegetation is in fact very similar), but the impacts are greater for the Scarp Forest if the eastern crossing is selected as this creates much better access to larger and better area of forest, particularly to occupants of more informal settlement on the south side of the Mbokodweni River.

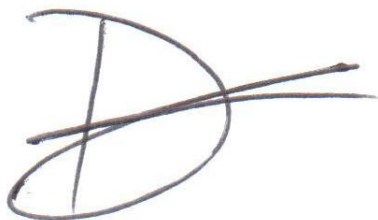
**8. Mitigation**

The main possibility the development provides mitigation is control of alien vegetation. However, rivers are dynamic systems, cattle graze and trample ground in the area and there is already much pedestrian movement. As there is also a large amount of alien vegetation in close proximity to the crossings, it is easy for seed and vegetative material to move to and grow on ground which is disturbed on an ongoing basis and is relatively moist. As a result, while alien control work can occur during and after the construction, once this ends alien plant invasion will resume. However, it is not suggested that no alien control work occur during construction or for a period afterwards as this would be beneficial, diminishing the amount of alien vegetation or deferring its increase.

If access is facilitated to the Scarp Forest, particularly if the eastern alternative is selected, this cannot be feasibly mitigated, as it would be difficult to control the movement and activity of people resident near the crossings.

Should you have any queries, please do not hesitate to contact me through details above.

Yours sincerely



David Styles

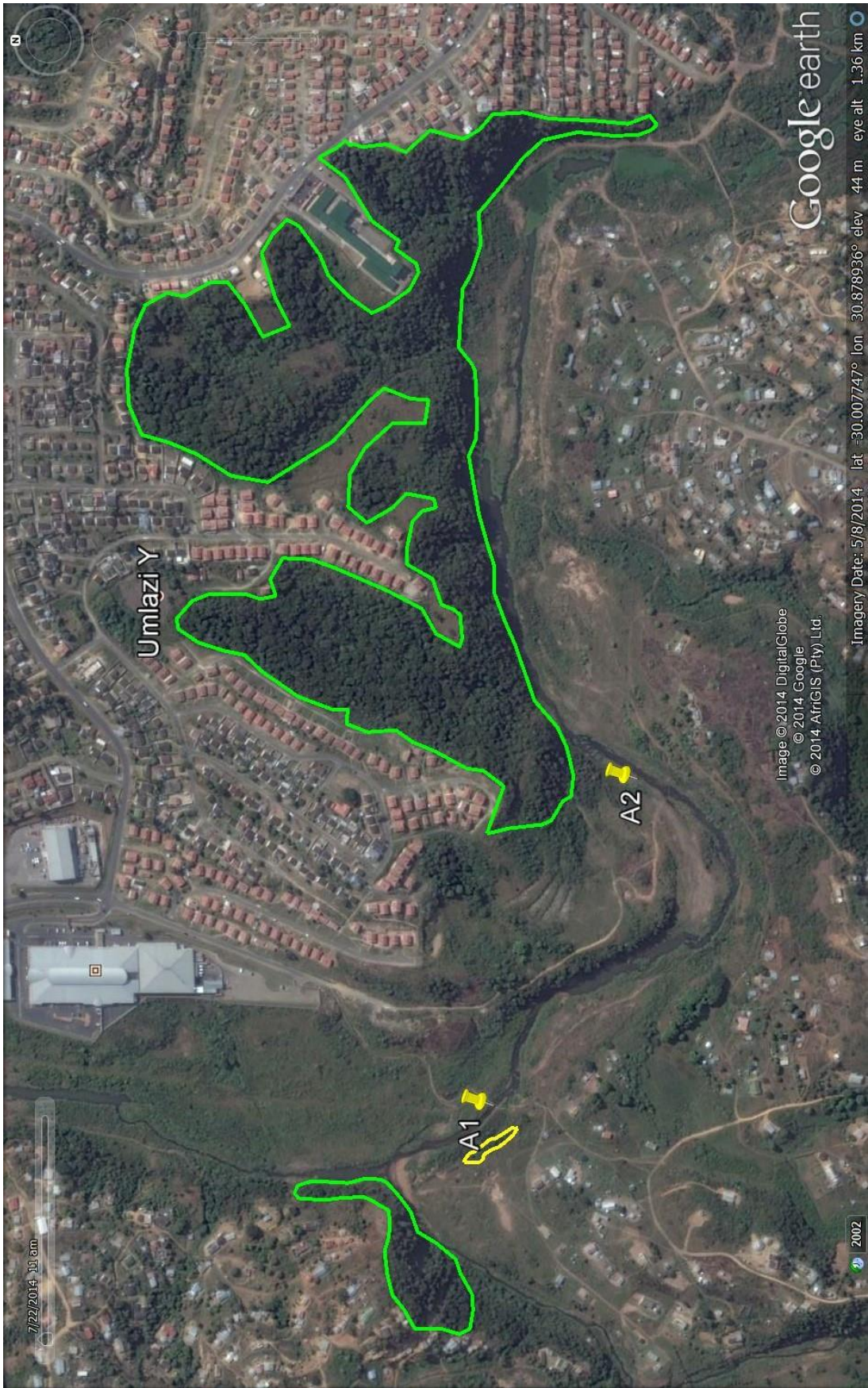
## References

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Raimondo, D.; Von Staden, L.; Foden, W.; Victor, J.E.; Helme, N. A.; Turner, R. C.; Kamundi, D. A. & Manyama, P. A. (eds) 2009. Red list of South African plants. *Strelitzia* 25. South African National Biodiversity Institute, Pretoria.



APPENDIX 1: Vegetation map



**Closer view of the woody patch in which *Millettia grandis* (Umzimbeet) trees occur**



**KEY TO APPENDIX 1**

**A1** – Western alternative for pedestrian bridge

**A2** – Eastern alternative for pedestrian bridge

**Yellow polygon** – patch of woody vegetation in which *Millettia grandis* (Umzimbeet) occurs, trees being felled for poles or firewood.

**Small green polygon** – Scarp Forest near the western alternative

**Large green polygon** – Scarp Forest, much in good condition, near the eastern alternative

## APPENDIX 2: Species list

Name	Plant form / description (A = Alien, F = Fern, H = Herb, Rd – Reed, Rs – Rush, S – Shrub, Sd = Sedge, T = Tree)
Acacia natalitia	T
Acacia nilotica (Scented Thorn)	T
Acacia robusta (Sweet Thorn)	T
Ageratum conyzoides	A, H
Ageratum houstonianum	A, H
Ambrosia artemissifolia (Ragweed)	A, H
Centella asiatica	A, H
Chenopodium sp.	
Chromolaena odorata (Chromolaena)	A, S
Colocasia antiqorum	A, H
Commelina benghalensis	H
Cyperus dives	Sd
Cyperus latifolia	Sd
Dalbergia obovata (Climbing Flatbean)	T
Dichrostachys cinerea (Sickle Bush)	T
Eichhornia crassipes (Water Hyacinth)	A, H
Eleocharis limosa	Sd
Helichrysum panduratum	H
Ipomoea alba	H
Lantana camara (Lantana)	A, S
Leonotis leonorus	S
Ludwigia octovalvis	H
Melia azedarach (Syringa)	T
Milletia grandis (Umzimbeet)	T
Nasturtium officinale (Watercress)	A, H
Persicaria attenuata subsp. africana	H
Persicaria senegalensis	H
Phoenix reclinata (Wild Date Palm)	T
Phragmites australis (Common Reed)	Rd
Senecio madagascariensis	A, H
Senecio polyanthemoides	H
Senna bicapsularis (Rambling Senna)	A, S
Senna didymobotrya (Peanut-butter Senna)	A, T
Senna septemtrionalis	A, T
Sesbania punicea (Red Sesbania)	A, T
Solanum mauritianum (Bugweed)	A, T
Strelitzia nicolai (Wild Banana)	T
Tagetes minuta (Khaki Weed)	H
Tecoma stans (Yellow Bells)	A, T
Tithonia diversifolia (Mexican Daisy)	A, S
Triumfetta rhomboidea	H
Typha capensis	Rs
Vangueria infausta	T
Xanthium strumarium	A, H



#### APPENDIX 4: Photographs



**Top:** View of path down to the western crossing, comprising secondary grassland, weeds of disturbance and some sedges (*Cyperus dives*) cropped low from grazing.



**Middle:** View of the same, with some *Typha capensis* emerging in the middle ground. It appears that in addition to grazing, vegetation was burned earlier in the season.



**Bottom:** Banks close to the crossing point, which has been recently burned. Grasslike plants are in fact the sedge *Cyperus dives*, nearly unrecognizable after the burn.





**Top:** View of river banks close to the crossing, with ground churned by trampling by cattle. On the far side of the bank is part of the patch of tattered woody vegetation that includes protected *Millettia grandis* (Umzimbeet) trees that are being cut down, apparently for poles or firewood.



**Middle:** Closer view of the patch, showing one of the *Millettia grandis* trees cut to stumps, mixed with alien vegetation. This patch was probably more closed with more indigenous trees but has been reduced by felling over time.



**Bottom:** View of the river close to the eastern crossing point, with more informal settlement and mango trees on the south bank, a band of grassy vegetation infiltrated by alien plants (here mainly *Tecoma stans*, *Chromolaena odorata*, *Lantana camara* and *Senna didymobotrya*). This then leads to the bank on which there are *Cyperus* dives sedges cropped by grazing. In the water are the alien aquatics/hydrophytes *Eichhornia crassipes* (Water Hyacinth) and *Nasturtium officinale* (Watercress).





**Top:** Another view of the same.



**Middle:** View upriver, from the eastern crossing looking towards the western alternative, with grassy vegetation dominated by alien shrubs and small trees just above the river banks.



**Bottom:** View of the Scarp Forest not far and within easy walking distance of the eastern crossing. Only part of the forest is visible, with most out of view. Most appears to be in still good condition.





**Top:** The most common hydrophyte along the river banks is *Nasturtium officinale* (Watercress). In spite of being a culinary herb, this is a serious invader of riverine habitats in eastern South Africa.



**Middle:** The aquatic and highly invasive alien *Eichhornia crassipes* (Water Hyacinth) in the river at the eastern crossing. The population will likely fluctuate and extend further upriver, particularly as water volumes increase in the summer, without control.



**Bottom:** Burned sedge *Cyperus dives* with newer green growth now with leaf ends cropped by grazing.