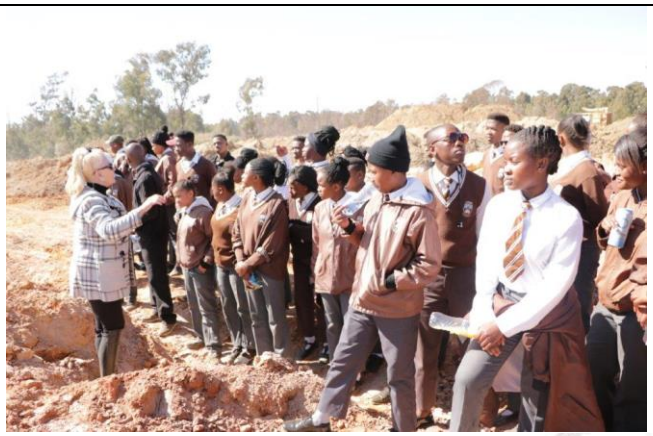
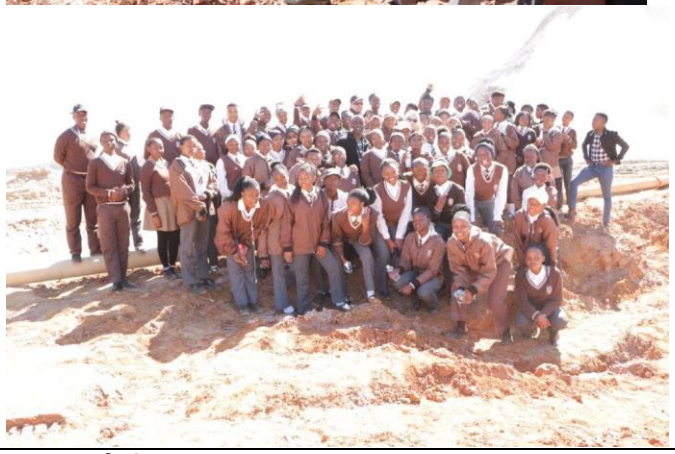
REPORT FOR JULY 2018

2 July	Tour with Mr Nick Holland, the CEO of Gold Fields, of the West Rand gold fields and South Deep Mine 
3July	Written contributions re Water Situation within the Crocodile West/Limpopo North West WMA (Annexure "A")
7 July	Participation in the Federation of South African Association of Flyfishers (FOSAF) AGM Assistance to IAPS – Prospecting Right Application: Daggafontein 125IR, Grootvaly 124 IR
8 July	Contributions to the Uranium mining: risks and impacts workshop in Namtumbo, Tanzania, 9 – 12 July 2018. In association with SOMO (Centre for Research on Multinational Corporations)
10 July	Contributions to the Climate Change Bill provincial consultations – North West Province
13 July	Engagement with Bishop Paul Verryn (Methodist Church) re relocation of Marievale Community
16 July	Interviews with Oxpeckers Investigative Journalist, Mark Olalde re Mintails' https://oxpeckers.org/2018/08/mintails-collapse/ Meeting with Legal Resource Centre regarding future legal actions and interventions: • Tudor Shaft Informal Settlement – Removal of radioactive material • Mintails • Prospecting and Mining Applications in protected areas and areas of highest biodiversity importance • Other matters

18 July	Spilpunt article on Wetlands (Annexure "B")
19 July	Tour of the West Rand gold fields with Dr Tanya Zack et al
21 July	Establishment of the Mercia Komen Environmental Trust. The main objectives of the environmental trust are to: • Expand and consolidate conservation corridors and areas enjoying protection, including international agreements and areas defined under the Protected Areas Act • Facilitate rehabilitation where such work will enhance biodiversity, ecosystem services and improve conservation value in support of objective 1
23 July	Meeting with the Regional Manager of the Department of Mineral Resources (Free State Region) and officials re Tja Naledi-, Sweet Sensations and Winners Point Trading Sand Mines within the Vaaloewer area
24 July	Meeting as member of the South African Water Caucus (SAWC) & DWS' task team on water related issues
25 July	Participation in the Roundtable consultation on the Responsible Mining Index
26 July	Legal Interventions and engagement with Melissa Fourie (CER) – Atha Africa Ventures matter; Lucien Limacher (LRC) – Mintails
27 July	Lecture on Environmental Issues and Tour of the West Rand gold fields and South Deep Minewith the Kgothalang School (Grade 11 learners) 

	 
30 July	Research Assistance: • John Wesson (WESSA) • Jaco du Toit (DRA) re Tau Industries and Protea Mine
31July	Contributions as member of the Project Steering Committee of the Environmental Management Framework for the Bojanala Platinum District Municipality and NorthWest, Marico

ANNEXURE "A"

DESCRIPTION OF THE PRESENT ECOLOGICAL STATUS OF THE RIVERS AND DAMS WITHIN THE CROCODILE WEST/LIMPOPO WATER MANAGEMENT AREA

The Reserve, which has priority over other water uses, provides for two components; (1) basic human needs, ensuring that the essential needs of individuals served by the water resource directly are provided for; and (2) **the ecological reserve** ensuring that the water required to protect aquatic ecosystems of the water resources is provide for. Providing for the ecological water requirements is a **legal priority**. **Implementation of the Ecological Reserve is expected to result in serious deficits in the Crocodile West/Limpopo Water Management Area**.

The overall present ecological status of this Water Management Area[1] is a D/E category[2] due to industrial (including current mining activities), domestic and commercial effluents, sewage, dysfunctional Waste Water Treatment Works' (WWTWs), agricultural run-off and litter, over-abstraction of groundwater and eutrophication problems. Much of the area has low rainfall with significant inter-dependencies for water resources between catchments and with neighbouring Water Management Areas, e.g. the Vaal.

A large part of future potential mining is in areas of water scarcity. In some areas water is already 'flowing' from agriculture to mining. The biggest impact of mines is on water quality -a threat to the resource that cannot be brushed away.

The DWS' Report on the Classification of Significant Water Resources in the Crocodile (West) Marico WMA and Matlabas and Mokolo Catchments: Limpopo WMA and the DWS' Business Case for the Limpopo CMA (September 2013) show a dramatic increase in water demands in this Area as a result of:

1. Current mining activities and proposed mining activities
2. Sasol's proposed Maphuta coal to liquid fuel projects
3. The exploitation of the vast coal reserves in the Waterberg;
4. The expansion of the Grootegeluk mine to supply the new Medupi Power Station with coal; and
5. Matimba and Medupi - three new Eskom power stations in the future

Many of the rivers in this Water Management Area host important wetland systems, freshwater ecosystem priority areas and are important for water supply and biodiversity.

Poor water quality does not only affect associated sediments and aquatic life, but has an effect on terrestrial ecosystems and the economy as well. Polluted water may also pose health threats to recreational and domestic water.

Quantity of water is inextricably linked to water quality. Polluted water is not treated at source but is allowed to flow into rivers. South Africa is a water poor country with only 8.6% of its rainfall being available as surface water. There is therefore no opportunity for the dilution of polluted water.

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[1] The catchment areas lie predominately within the North West Province and include the northern part of Gauteng as well as the south-western portion of the Limpopo Province. Towards the north west the area borders on Botswana. The main river systems within the catchment (Crocodile, Marico, Mokolo and Matlabas rivers) flow northwards to join the Limpopo River. Major tributary systems include the Pienaars, Apies, Moretele, Hennops, Jukskei, Magalies, Elands, Klein Marico, Molopo, and Ngotwane rivers.

The Pilanesburg Nature Reserve, the Cradle of Humankind Heritage Site, the Marakele Nature Reserve, the Bafokeng Tribal area, the dolomitic wetland or eye systems and large dams such as the Hartbeespoort, Vaalkop, Roodekopjes, Klipvoor, Roodeplaat, Molatedi and Mokolo Dams are all very important features in the catchment area. The Pilanesburg Nature Reserve, the Cradle of Humankind Heritage Site and Hartbeespoort Dam are key tourist attractions in South Africa.

[2] A D-Category indicates a largely modified river system and an E category indicates a seriously modified resource.

The DWS developed the National Water and Sanitation Master Plan, the classification of water resources, the determination of Resource Quality Objectives and the determination of the Reserve for the major water management areas such as the Crocodile West/Limpopo and Vaal Water Management Areas, the National Water and Sanitation Water Quality Strategy and Policy, the Mine Water Management Policy, etc. **All these plans, strategies and policies exist in vain if they are not delivered through action and through the recognition that "*you cannot drink paper plans*".**

PRESENT ECOLOGICAL STATUS OF THE MOKOLO, MATLABAS, CROCODILE (WEST) AND MARICO CATCHMENTS IN THE LIMPOPO NORTH WEST WATER MANAGEMENT AREA[3]

Upper Hennops and Rietvlei Rivers to inflow to Rietvlei Dam

This is a threatened system. It includes wetland freshwater ecosystem priority areas, pans, peatlands and valley bottom wetlands. The present ecological status of the river is a D/E category due to urbanisation, return flows and poor water quality. The river reach is significantly impacted by agricultural activities, industrial and urban effluent discharges.

The aquifer is highly impacted by land based activities and pollution.

Rietvlei Dam

This dam supplies Tshwane with raw water. Water quality impacts remain a threat to the system. Flow into the dam is supported by Waste Water Treatment Works (WWTW) discharges. The dam is located within the Rietvlei Nature reserve, which is an important protected area. The Rietvlei wetland system is situated immediately upstream of the Rietvlei Dam within the Rietvlei Dam Nature Reserve. The wetland is a peatland.

Hennops River from outflow Rietvlei Dam to the A21B catchment (including Sesmylspruit, Kaalspruit and Olifantspruit tributaries)

This system is degraded owing to upstream waste water treatment works (WWTW). Includes the Sesmylspruit, Kaalspruit and Olifantspruit tributaries. **The present ecological status of the river is a D/E category due to urbanisation, return flows and poor water quality**.

Upper Pienaars River, Edendalespruit and Moretlele Rivers to Roodeplaat Dam

This system supports the supply of water to Roodeplaat Dam. Abstraction by Magalies Water indirectly tunnel (used by Tshwane). This system is degraded owing to upstream waste water treatment works (WWTW). **The present ecological status of the river is a E category due to urbanisation, return flows and poor water quality**. FEPA wetlands are present. The system is overall degraded with a present

Upper Crocodile/Hennops/Hartebeespoort

[3] Reference: Determination of Resource Quality Objectives in the Mokolo, Matlabas, Crocodile (West) And Marico Catchments in the Limpopo North West Water Management Area (WMA 01) Resource Quality Objectives And Numerical Limits Report Report No.: RDM/WMA01/00/CON/RQO/0516. 2016.

This dam is eutrophic with algal blooms impacting on the taste of the water. The dam is depended upon for the supply of raw water. It is a conservation area, and supports a wide range of recreational activities (international training for canoeists during summer). Toxic algal blooms are present. **Severely impacted by WWTWs discharges, urbanisation and industrial effluent.**

Upper and middle reaches of Apies River, Skinnerspruit, Pienaars River from outflow Roodeplaat Dam to Boekenhoutpruit confluence, Roodeplaatspruit, Boekenhoutspruit

The upper parts of the catchment are impacted by urbanization, irrigation runoff and WWTWs. The Ecological Importance and Sensitivity (EIS) is high.

Jukskei, Klein Jukskei, Modderfonteinspruit

It includes the headwaters of Jukskei. WWTWs located both upstream and downstream of these systems which includes the transfers for Mokolo (Lephalale). The systems are highly impacted from nutrient input thus threatening the biotic integrity of the systems. **Serious water quality problems exist as the river is severely impacted by WWTWs discharges (from nine WWTWs), urbanisation and industrial effluent. The present ecological status is an E category.**

Upper reaches of Crocodile River and Bloubank Spruit

This is the headwaters of the Crocodile River. Tourism activities are high. Water users include agriculture. The serious threat to the system is mining and the high salinity from the neutralised AMD from the western basin. The Tweelopiespruit flows into the Bloubankspruit and forms part of the Krugersdorp Game Reserve and the Cradle of Humankind World Heritage Site. The groundwater is heavily impacted by historic mine dewatering and historic discharges of acid mine drainage (AMD) into Tweelopiespruit and further downstream. **Percy Stewart and Randfontein WWTWs discharge into this river system.**

Radioactive pollution has been identified. There is also excessive sedimentation of the rivers, and aquatic weed infestation.

IUA 3 – Crocodile/Rooodekopjes

Crocodile River from outflow Hartebeespoort Dam to inflow Roodekopjes Dam, Rosespruit, Ramogatla and Kareespruit

The water resources are in a degraded state owing to the changes in the flow regime as a result of the Hartebeestpoort Dam just upstream. Madibeng and Magalies Water are dependent on this reach for water supply for consumers. The Rosespruit and Kareespruit are have water quality impacts (degradation due to mining impacts, informal settlements, irrigation return flows, industrial, chrome smelters). There are impacts from the Brits area as well. Hyacinth growth observed in the Crocodile river below Brits. Encroachment and sedimentation is extensive.

Roodekopjes Dam

Dam is a source of domestic water supply (25% allocated to Magalies water – transfer to Vaalkop via canal). T Impacted by surrounding activities (irrigation, mining and industrial).

Hex/Waterkloofspruit/Vaalkop

Sterkstroom from outflow Buffelspoort Dam to inflow Roodekopjes Dam, Maretwane, Tshukutswe

Area forms part of the Magaliesberg Biosphere Reserve. Resources are impacted by mining activities, settlements along the river and WWTWs discharges.

Olifantsnek Dam

Some water quality impacts are present in the dam.

Hex River outflow Olifantsnek Dam to inflow Bospoort Dam, Sandspruit

The water resources of the Hex River have been degraded due to the Olifanstsnek, Bospoort and Vaalkop Dams situated on the river. Rustenburg and extensive mining and agriculture in the middle reaches of the catchment further impacts on the water resources, both quality and quantity. Further impacts include urbanisation, irrigation return flows and discharges from WWTWs.

Bospoort Dam

Poor water quality currently present in the dam.

Hex River outflow Bospoort Dam to inflow Vaalkop Dam

The water resources of the Hex River have been degraded due to the Olifantsnek, Bospoort and Vaalkop Dams situated on the river, as well as upstream impacts. This reach includes localised subsistence use, game farms and domestic water supply. High conductivity observed. Impacts also due to settlements along river.

Vaalkop Dam

Magalies Water has requested more releases from Bospoort and Olifantsnek Dam to improve water quality in Vaalkop dam. Need to improve drinking water quality. Water quality is impacted due to industrial pollution, return flows, mining impacts, nutriennts (eutrophication).

Elands/Vaaalkop

Upper reaches of Elands to Swartruggens Dam

Some sedimentation due to slate mining. Flow impacts present and poor sanitation is also impact on river system.

Elands river downstream Swartruggens Dam to Lindleyspoort Dam

This reach of the Elands River is located below dam. The reach is impacted upon by the WWTWs, urban activities, and diamond mining. Water quality deterioration is observed.

Lindleyspoort Dam

The upstream impacts include WWTWs.

Upper Koster to Koster Dam, Rooikloofspruit

Impacts include WWTWs, intensive cattle and poultry farming and unauthorised abstraction.

Elands River outflow Lindleyspoort Dam to inflow Vaalkop Dam, Brakkloofspruit, Roosspruit, Sandspruit Mankwe. Leragane, Molapongwamonga na

The Mankwe tributary is protected in the Plianesburg National Park. These rivers are however surrounded by mining activities on Leragane (impacted). Tanneries are present in the town. WWTWs discharges impact on water quality.

Klein Marico

Upper Klein Marico to inflow Klein Maricopoort dam, Rhenosterfonteinspruit, Malmanieloop, Kareespruit

Impacts on Kareespruit from WWTW, irrigation and over abstraction. Mining activities are present. Groundwater: Significantly impacted by bulk groundwater abstractions for municipal supplies; thus quantity and due to agricultural activities, quality may become an issue in future.

Klein Maricopoort Dam

Water quality impacts present.

Klein Marico downstream Klein Maricopoort Dam to Kromellenboog Dam, Wilgeboomspruit

Impacts include irrigation and over abstraction. Poor water quality due to irrigation return flows.

Kromellenboog Dam

Dam is impacted by upstream siltation, erosion, and nutrients.

Groot Marico

Groot Marico, Polkadraaispruit

There is mine prospecting activities in the area and some settlements forming part of the town of Marico, agricultural activities present. Water quality is impacted in the lower reaches of the Marico river.

Kaloog-se-Loop

Marico Eye, Kaaloog-se-Loop, Bokkraal-se-Loop, Ribbokfontein-se-Loop, Rietspruit (southern eye), Kuilsfontein, Syferfontein and Bronkhorstfontein

Groundwater: Large abstractions for mining, agriculture and municipal supplies - current problems with high groundwater level recession rates in the Lichtenburg Area. There are some sedimentation impacts due to mining in the area. Mine prospecting is also underway.

Malmaniesloop

Malmanie Eye, Dolomites

Groundwater: Huge impact on groundwater sustainability due to growing demand for municipal and

Bodibe Eye (Polfonteinspruit and Lotlhakane tributary catchment area)

High groundwater abstraction in the area resulting in a decrease in groundwater which has further resulted in spontaneous combustion underground and the peatland oxidised and been burning for several years now, resulting in a loss of the peatland, and poses a health and safety hazard for people and livestock. Impacts include urban and settlement activities and cement mining. Serious depletion of groundwater levels in this area (~25m) due to over-utilisation. Large eyes (springs) already impacted and dry.

Molopo Eye, Grootfontein Eye, Molopo headwaters to inflow Modimola dam

Impacts include a cement factory and urban development (Mahikeng). Groundwater resources and wetlands are priority (unchannelled valleybottom wetlands and peatlands). The Molopo eye is a peatland and important for water supply and biodiversity support. Grootfontein aquifer not productive anymore, and all Mahikeng's water is sourced from Molopo's Eye, thus it is vital that the flow is maintained. Recreational activity in the area is also impacting on the eye.

Molopo River mainstem only from Modimola Dam to Disaneng Dam

Highly impact from urban settlement in Mahikeng which has resulted in a E present ecological status category. Serious problem with water pollution in Mahikeng and catchment of the Modimole Dam (WWTWs). Important wetland systems are present in this reach.

Setumo (Modimola) Dam

The WWTWs of Mahikeng is located just upstream of the dam which is impacting on the dam water quality. Poor water quality.

Dinaseng Dam

Discharge from Dinaseng for downstream trans-boundary use (into Botswana) is important.

Dinokana Eye/Ngotwane Dam

Upper Nogotwane, Donokana Eye

Two important wetland systems occur namely the Dinokana eye and Ngotwana wetland (high biodiversity wetland in semi-arid climate with its source in Botswana) which both supply water for livelihood support for people, livestock and wildlife. Groundwater priority area. Groundwater related subsistence use. Water balance in this area is a concern as this is a sole-aquifer system for Dinokana and Zeerust. Water level of eye has dropped due to over abstraction.

Ngotwane Dam

Limited irrigation and supports downstream domestic water supply for villages. Dam is impacted from WWTWs discharge from Botswana. Water quality is a threat.

Groot Marico/ Molatedi Dam

Groot Marico from outflow Marico Bosveld Dam to Molatedi Dam, all tributaries

The land area is degraded due to over grazing and development. Smaller dams are present on the tributaries supplying water to local communities (Pella Dam, Madikwe, Sehujane Dam). Water quality must be protected.

Molatedi Dam

Releases are made in respect of meeting the international obligations with Botswana and for downstream

Groot Marico/ Seasonal tributaries

Groot Marico mainstem, outflow Molatedi Dam, Rasweu, Maselaje rivers

Impacts are primarily as a result of the Molatedi Dam upstream and the release pattern from the Tswasa Weir for irrigation purposes. Tributaries are mostly dry, recently there has been no releases made for Botswana. Riparian zone is heavily grazed. High sedimentation following rainfall events due to heavy erosion and overgrazing.

Bierspruit

Wilgespruit, Bofule, Kolobeng, Magoditshane, Motlhabe

Area is very important from an ecotourism point of view (includes the Pilansberg National Park). The water quality is degraded due to mining activities, town development and irrigation in the catchment. Severe water quality impacts on the some of the tributaries, viz. Mothlabe and Wilgespruit. Water quality must be addressed.

Bierspruit outflow Bierspruit Dam to confluence with the Crocodile River, Brakspruit, Phufane, Sefatlhane, Lesobeng, lower reach Bofule

The water quality is degraded due to platinum mining, town development (sewage effluent), irrigation

Lower Crocodile

Crocodile River outflow Roodekopjes Dam to upstream Sand River confluence, Sleepfonteinspruit, Klipspruit tributaries

Return flows are a major impact on the system.

Proximity of mines to the aquifers could lead to dewatering of the aquifer.

Sand River to confluence with the Crocodile River to Bierspruit confluence, Sondags, Vaalwaterspruit

Irrigation return flows are a major impact.

Lower Crocodile from Bierspruit confluence to the Botswana border (Limpopo River)

The Thabazimbi WWTW discharges impacts on the water quality of the Crocodile River.

There are also mining activities in the area.

Tolwane/Kulwane/Moretele/Klipvoor

Apies River, Tshwane tributary

Water quality issues are prevalent, due to localised and upstream urban impacts.

Pienaars River from Boekenshout confluence to Apies River confluence

Magalies Water abstracts water for domestic supply on Boekenshoutspruit (klipdrift). The area includes sprawling peri-urban villages. Land use impacts include catlle in river habitat, and impacts from solid waste and sewage effluent. Important resource for the adjacent community.

Moretele (Pienaars) River from Plat River confluence to Klipvoor Dam, Kutswane to Klipvoor Dam

Water quality impacts are primarily a result of urbanization, specifically deterioration in water quality due to WWTWs discharges.

Currently too much water is released from the Rietgat WWTW.

Pienaars River from Klipvoor Dam to Crocodile Riverconfluence, Tolwane tributary

The rivers are impacted by urban development and irrigated agriculture. The Tolwane river is significantly impacted. The rivers are impacted by high nutrient levels and eutrophication is evident. Extensive sand mining is also occurring in the area (largely unauthorised).

Upper Mokolo

Moloko River , Sand River and Klein Sand, Brakspruit, Sondagsloop, Heuningspruit, Dwars, Jim se loop tributaries

The main impact on the water resource is irrigation return flows, WWTWs discharge from town and piggeries. The area is important as it plays a role as a corridor for fish (FEPA

rivers). Important fish include CPRE, AURA and AMOS (flow dependent and water quality dependent fish species). Extensive wetland systems occur in the Sand River catchment which form important habitat for Blue Cranes. Important valley bottom and hillslope wetlands present forming part of the Waterberg system (unique combination of flora and faunal associations).

Mokolo River to inflow Mokolo Dam, Taaibosspruit, Malmanies and Bulspruit tributaries

Water quality issues present due to septic tanks used by the game lodges.

Grootspruit and Sandspruit tributaries (Mokolo headwater catchment)

The main impact on the water resource is irrigation return flows and WWTWs discharge from town of Alma. Extensive wetland systems occur in the area coupled with the area being a fish support area. Important habitat for Blue Cranes (which have been identified within the Sand River catchment).

Sandloop

Catchment area includes the Medupi and Matimba power stations, Grootegeluk coal mine, Maropong and Lephalale towns. Impacts on this system include coal mining, the power stations, coal bed methane extraction, impacts from the towns as well as agriculture. Water quality impacts are a concern, with deterioration observed. Serious impacts of local groundwater resources due to dewatering and future acid mine drainage discharges.

Mokolo mainstem - Mokolo from below EWR3 to the Tamboti confluence

Major sand mining is occurring within the Mokolo mainstem catchment. This has resulted in siltation and loosening of substrate.

Mokolo mainstem - from Tamboti confluence to Limpopo

Abstraction activities is high in this mainstem with sand mining being a considerable issue in the Lepahlale area.

Matlabas

Matlabas River

This area has been earmarked for future coal mining developments. FEPA wetlands are present. Migratory corridor to the Limpopo for the bird species. There is the Matlabas peatland/mire and valleybottom wetlands present.

Catchment area including Steenbokpan

The Steenbokpan area has been earmarked for future coal mining in this area.

Die waarde van vleilande

Mariette Liefferink

Federasie vir 'n Volhoubare Omgewing

Vleilande het baie onderskeidende kenmerke. Die mees opvallende kenmerk is die teenwoordigheid van water op of naby die oppervlak, kenmerkende hidromorfe gronde, sowel as plantegroei wat aangepas, of tolerant is, ten opsigte van water-versadigde gronde.

Die volgende hidrogeomorfiese tipes binnelandse vleilande word onderskei:

- 'n vloedvlakte
- die onderkant van 'n vallei met 'n kanaal
- die onderkant van 'n vallei sonder 'n kanaal
- 'n heuwelhang-hidrosypeling verbind met'n stroomkanaal
- 'n geïsoleerde heuwelhang-hidrosypeling en
- laagtes, insluitende panne.

Vleilandkenmerke

- Die *terrein-eenheidskenmerk* help om die dele van die landskap te identifiseer waar vleilande waarskynlik sal voorkom.
- Die *grondvormkenmerke,* soos gedefinieer deur die Grondklassifikasiewerksgroep (1991), wat verband hou met verlengde en gereelde versadiging met water.

- 'n Permanente vleilandsone sal altyd óf Champagne-, Katspruit-, Willowbrook- óf Rensburggrondvorme teenwoordig hê.
- Die seisoenale of tydelike vleilandsones sal een of meer van die volgende grondvorme bevat:
  - Kroonstad, Longlands, Wasbank, Lamette, Estcourt, Klapmuts, Vilafontes, Kinkelbos, Cartref, Fernwood, Westleigh, Dresden, Avalon, Glencoe, Pinedene, Bainsvlei, Bloemdal, Witfontein, Sepane, Tukulu, Montagu of
  - Inhoek, Tsitsikamma, Houwhoek, Molopo, Kimberley, Jonkersberg, Groenkop, Etosha, Addo, Brandvlei, Glenrosa, Dundee.
- Die *grondnatheidskenmerk*, wat die morfologiese tekens wat in die grondprofiel ontwikkel het as gevolg van verlengde en gereelde versadiging met water, identifiseer.
- Die *plantegroeikenmerk* wat die hidrofiliese plantegroei, wat verband hou met grond wat gereeld waterversadig is, identifiseer.

Volgens die definisie wat die nasionale waterwet gebruik, is die primêre kenmerk van 'n vleiland *plantegroei*, wat teenwoordig moet wees onder normale omstandighede. In die praktyk is die *grondnatheidskenmerk* egter die belangrikste en die ander drie kenmerke word gebruik ter bevestiging. Die rede hiervoor is dat plantegroei relatief vinnig op veranderinge in die grondvogrégime of -bestuur reageer en omskep mag word, terwyl die

morfologiese kenmerke in die grond meer permanent is en die tekens van gereelde waterversadiging lank na die vleiland gedreineer is, behoue bly (soms verskeie eeue lank).

Rivieroewers
Rivieroewers verrig ook belangrike ekologiese en hidrologiese funksies, waarvan sommige ooreenstem met die funksies van vleilande. Dit is dus belangrik dat beide vleilande en rivieroewergebiede in aanmerking geneem word in verpligtende bestuursvoorwaardes wat waterbron- en biodiversiteit beïnvloed.

Rivieroewers kan ook onderskei word van aangrensende gronde deur die teenwoordigheid of afwesigheid van 'n paar sleutelaanwysers. Alhoewel sekere rivieroewers wel vleilandaanwysers vertoon, is ander nie lank genoeg of dikwels genoeg versadig om vleilandkenmerke te ontwikkel nie. As gevolg hiervan is ‘n unieke stel aanwysers ontwikkel om te help om hierdie gebiede af te baken.

Wat is ‘n vleiland?

Die woord ‘vleiland’ is ‘n versamelnaam vir ‘n verskeidenheid van ekosisteme wat wissel van riviere, fonteine, syferwater, en moddergebiede in die boonste opvangsgebiede, tot midlandmoerasse en -vleie, oop panne en vloedvlaktes, tot kusmere, mangrove-moerasse en riviermondings aan die onderkant van die opvanggebied.

Al hierdie ekosisteme deel ‘n algemene primêre determinant: water. Die langdurige teenwoodigheid van water in vleilande is ‘n fundamentele bepaler van die grondeienskappe en die samestelling van plant- en dierespesies. Enige deel van die landskap waar water lank en gereeld genoeg versamel om plante, diere en die grond in die gebied te beïnvloed, is dus ‘n vleiland.

Die Nasionale Waterwet (wet 36 van 1998) definieer ‘n vleiland as volg:

'Grond wat oorganklik is tussen grond- en watersisteme waar die watertafel gewoonlik by of naby die bogrond is, of waar die grond periodiek met vlak water bedek is, en welke grond wat onder normale omstandighede plantegroei, wat tipies tot lewe in deurdrenkte grond aangepas het,ondersteun of kan ondersteun.' Vleilande moet een of meer van die volgende eienskappe hê:

- Hidromorfiese grond wat eienskappe vertoon wat die gevolg is van langdurige waterversadiging.
- Die teenwoordigheid – ten minste soms – van hidrofiete (plante wat lief is vir water).
- ‘n Hoë watervlak wat lei tot waterversadiging, op of naby die oppervlak en wat aanleiding gee tot die ontwikkeling van anaërobiese toestande in die boonste 50 cm van die grond.

Waarom is vleilande belangrik?

Min mense verstaan wat aan die hart van vleilandbewaring lê, naamlik werklike en direkte ekonomiese waarde. Vleilandsisteme het enorme monetêre waarde en maak 'n groot en direkte bydrae tot nasionale ekonomieë en menslike welsyn. *Nature* – een van die mees gerespekteerde wetenskaplike joernale ter wêreld – het berig dat die waarde van vleilande wêreldwyd op $4 triljoen gereken word.

Waarom is vleilande so belangrik? Weens vleilande se primêre funksie om water te prosesseer en afloop te reguleer.

Daar word beraam dat al vier rivierkomme in Suid-Afrika teen 2025 absolute waterskaarsheid sal vertoon. Sonder voldoende water is dit nie moontlik om die ekonomie te ontwikkel, werk te skep, voldoende gewasse te produseer, of die groei van die industrie en mynbou, asook die ontwikkeling van 'n groeiende toerisme-industrie, te ondersteun nie. Ons ekonomie is dus totaal afhanklik van 'n deurlopende voorsiening van water van voldoende kwaliteit en hoeveelheid.

Vleilande beskerm en reguleer waterbronne.

- Vleilande tree op as reuse sponse. Vleilande hou water terug tydens vloede en laat die water vry tydens droë periodes. In 'n droë land soos Suid-Afrika is dit noodsaaklik. Deur watervloei gedurende storms te reguleer, verminder vleilande vloedskade en help dit met die voorkoming van gronderosie.
- Vleilande herlaai grondwaterbronne en verwyder besoedelingstowwe uit die water. Vleilande, synde natuurlike filtreringstels, help om water te suiwer deur baie besoedelingstowwe, insluitend sediment, swaar metale en organismes wat siektes veroorsaak, vas te vang.
- Sekere vleilande, soos riviermondings, dien as belangrike teelareas vir oseaniese vis.
- Baie vleilande (soos vloedvlaktes) kan, indien dit op 'n volhoubare basis bestuur word, gebruik word as weidingsgebiede.
- Afgesien van hierdie belangrike funksies wat verrig word teen minimale finansiële koste, dien vleilande, tesame met toepaslike bufferstroke, as natuurlike skure vir biodiversiteit. Vleilande verskaf lewensondersteuning aan 'n wye verskeidenheid spesies, waarvan sommige heeltemal afhanklik is van vleilande vir hul oorlewing.

Die Mabola Beskermende Omgewing is 'n 8 722 hektaar sone van beskermde vleilande, panne en 'n bedreigde grasveld-ekosisteem, wat tesame die Enkangala Drakensberg strategiese waterbrongebied vorm.

Die ongelyste Indiese maatskappy, Atha-Africa Ventures (Edms) Bpk, se aansoek vir 'n steenkoolmyn in die Mabola Beskermde Omgewing is goedgekeur deur die departmente van omgewingsake en minerale hulpbronne.

Agt nie-regeringsorganisasies, waaronder die Federasie vir 'n Volhoubare Omgewing, wat verteenwoordig word deur die *Centre of Environmental Rights* (CER), staan die aansoek teen.

Nogtans is vleilande vandag een van die mees bedreigde habitatte ter wêreld. In sekere opvanggebiede in Suid-Afrika het studies getoon dat meer as 50% van vleilande alreeds vernietig is. Dit is hoofsaaklik te wyte aan die dreinering van vleilande vir die aanplanting van gewasse en weiding, swak bestuurde brande en weiding wat lei tot erosie, die aanplanting van uitheemse bome in vleilande, mynbouaktiwiteite, besoedeling en stedelike ontwikkeling.

Hierdie aktiwiteite verander die vloei van water en die watergehalte, wat 'n vleiland óf beskadig, óf vernietig.

Ons kan nie voortgaan om vleilande te besoedel of te dreineer, of om vleilande te ontneem van water, of om vleilande onvolhoubaar uit te buit vir voedsel en korttermyn-ekonomiese ontwikkeling, sonder om op die lange duur 'n ernstige prys te moet betaal nie. Voortgesette vernietiging van vleilande sal lei tot minder suiwer water, minder betroubare watervoorrade, toenemende ernstige vloede, laer landbouproduktiwiteit en meer bedreigde spesies.

Wat is hidrofiete?

Vleilande word gekenmerk deur verskillende omgewingstressors wat plante nie eintlik kan hanteer nie. Akwatiese plante is byvoorbeeld nie toegerus vir oorlewing tydens periodieke uitdroging nie, wat wel in baie vleilande voorkom, terwyl landelike plante nie langdurige periodes van oorstromings kan hanteer nie.

Die grootste stressor in vleilande is moontlik die anaërobiese grondtoestande, wat gepaard gaan met uitgerekte periodes van waterversadiging. Onder hierdie omstandighede kan wortels nie respireer deur normale metaboliese paaie nie, sekere voedingstowwe word onbeskikbaar vir plante en die konsentrasie van sekere elemente kan toksiese vlakke in die grond bereik.

Nieteenstaande hierdie beperkinge het sekere plantspesies, bekend as hidrofiete, meganismes ontwikkel om hierdie stressors te hanteer. Deur morfologiese, fisiologiese, of reproduktiewe aanpassing het hierdie spesies die vermoë ontwikkel om in anaërobiese grondtoestande te groei, mee te ding, te reproduseer en voort te bestaan. Voorbeelde van hierdie aanpassings is die teenwoordigheid van lugruimtes in wortels en stamme, wat diffusie van suurstof van blootgestelde dele van die plant na die wortels toelaat, asook onvoorsiene wortels (wortels wat vanuit ongewone plekke groei), vlak wortelstelsels, groot interne porieë (hipertrofiese lentikels) en saadverspreidingsmeganismes deur water.

Hidofiliese spesies verskil in die mate wat hulle afhanklik is van, of beperk is tot vleilande. Sekere spesies word slegs gevind in vleilandomgewings, en word dus verpligte(Engelse woord: obligate hydrophytes) hidrofiete genoem, terwyl andere voorkom in beide vleiland- en nie-vleilandgrond, en staan bekend as fakultatiewe (Engelse woord: facultative hydrophytes) hidrofiete.

Wat is hidomorfe grond?

Hidromorfe grond vertoon unieke eienskappe wat die gevolg is van langdurige en herhaalde versadiging. As grond vir 'n uitgebreide tydperk versadig is, verteer die wortels en mikroörganismes geleidelik die suurstof wat teenwoordig is in die porieruimtes in die

grond. In onversadigde grond kan die suurstof weer aangevul word deur diffusie van die lug op die oppervlak van die grond. Aangesien suurstof egter 10 000 keer stadiger deur water as deur lug diffundeer, is die proses om uitgeputte suurtof in die waterversadigde grond aan te vul aansienlik stadiger. Wanneer die suurstof in versadigde grond uitgeput is, bly die grond gevolglik anaërobies.

Hierdie anaërobiese toestande maak vleilande egter hoogs doeltreffend vir die verwydering van baie besoedelingstowwe uit die water, aangesien die chemiese meganismes waardeur dit gedoen word plaasvind in die afwesigheid van suurstof.

Langdurige anaërobiese grondtoestande veroorsaak 'n verandering in die chemiese eienskappe van die grond. Sekere grondkomponente, soos byvoorbeeld yster en mangaan, wat onoplosbaar is in aërobiese toestande, los op wanneer die grond anaërobies word en kan dus uit die grondprofiel loog.

Yster is een van die mees oorvloedige elemente in grond en is verantwoordelik vir die rooi en bruin kleure van grond. Weens die vermindering van yster in die grond as gevolg van langdurige anaërobiese toestande, kry die grondmatriks 'n gryserige, groenerige of blouerige kleur, en word daarna verwys as 'gleygrond'.

'n Fluktuerende watertafel – wat algemeen is in vleilande wat seisoenaal of tydelike versadig is met water – veroorsaak 'n verandering in die anaërobiese en aërobiese toestande in die grond. Die verlaging van die watertafel veroorsaak 'n verandering van anaërobiese na aerobiese grondtoestande, wat veroorsaak dat die opgeloste yster weer terugkeer na 'n onoplosbare toestand en gedeponeer word in die vorm van kolle of vlekke in die grond. Die herhaling van hierdie siklus van benatting en droging oor baie dekades konsentreer hierdie helder, onoplosbare ysterverbindings. Gleygrond, wat baie vlekke en kolle het, kan dus 'n sone aandui wat seisoenaal of tydelik versadig is met water.

Dit is egter belangrik om daarop te let dat nie alle grond wat geassosieer is met vleilande, hierdie kenmerkende vlekke toon nie. Langdurige natheid mag ook gekenmerk word deur 'n oorvloedige opeenhoping van organiese koolstof in die bogrond. Hierdie organiese koolstof breek nie af nie.

Met erkenning aan die destydse departement van water en bosbou se publikasie: '*A practical field procedure for identification and delineation of wetlands and riparian areas*.' September 2005.