

# Remote sensing tools for monitoring hydrological benefits of the removal of invasive species in South Africa

Location	Western Cape and KwaZulu-Natal, South Africa
Contractor	Working for Water (WfW), Department of Water
	Affairs and Forestry (DWAF)
Period	2009

## Scope of the project

The Working for Water (WfW) program aims at protecting the water resources of South Africa (SA) through controlling (clearing) Alien Invasive Plants (AIPs). AIPs have a negative impact on the water resources of SA but to quantify the impact of AIPs on the consumptive water use (or water resources) remains difficult, especially for larger areas. The WfW needs a method to asses the past, present and future impact of AIP control on the water resources. The objective of this project was to asses the water consumption over a 8-year period for areas in the Western Cape and KwaZulu Natal that were cleared by the WfW program and to compare the water consumption of areas with different AIPs.

#### **Study approach**

In order to assess the actual water consumption (ET) of AIP over the period January 1999 – December 2006 a two-step approach was used. First the water consumption of AIP's for 3 selected years (a dry, wet and average) were analysed using SEBAL in combination with MODIS. Secondly these 3 years were extended to a 8-year period using the relationship of the crop coefficient (KcKs) of AIPs with the NDVI of the SPOT-Vegetation archive. The crop coefficient defines the relation between actual ET and the grass reference  $ET_{0}$ .

### Results

WfW provided maps of the location of AIPs and moments of treatment (clearing) in vector polygons, but due to the low resolution of the satellite imagery only part of these areas could be used. The evapotranspiration rates obtained from SEBAL showed that the annual water consumption of AIP infested areas is similar to forest plantations and higher than most of the indigenous vegetation biomes. When indigenous vegetation is replaced by AIP the annual water consumption increases significantly. To assess the water consumption of AIP's over a longer time period (~8 years, using the available NDVI-SPOT archive) and look for trends (e.g. trends of in/decreasing ET) is found to be more complex and inconclusive.



Annual ET of the dominant AIPs in KwaZulu Natal

#### Conclusions

WfW-clearing activities have a positive impact on the available water resources in South Africa. The largest impact of AIPs is found in Western Cape, as the incremental water consumption of AIP compared to the indigenous vegetation is larger than for KZN. Any relationship between the number of clearings and the linear trends of NDVI, ET and biomass are inconclusive. Reasons may be the pixel size compared to the size of the WfW polygons, mixing of AIP species and clearing dates. Furthermore, it seems that the seasonal changes and longer term trends in rainfall (climatology) are more dominant than the selective clearing strategy of WfW.