

Jonkershoek – preserving 73 years of catchment monitoring data

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History

- Afforestation (grassland or fynbos) using exotic species, particularly pines and acacias
- Programme of research into “the influences of forests on water conservation and allied problems” developed – 4th Empire Forestry Conference (1935) held in Cape Town
- Dr. C.L. Wicht, founder and Research Director of the Jonkershoek Forestry Research Centre, initiated construction of gauging weirs in 1936 in the Jonkershoek State Forest



Design

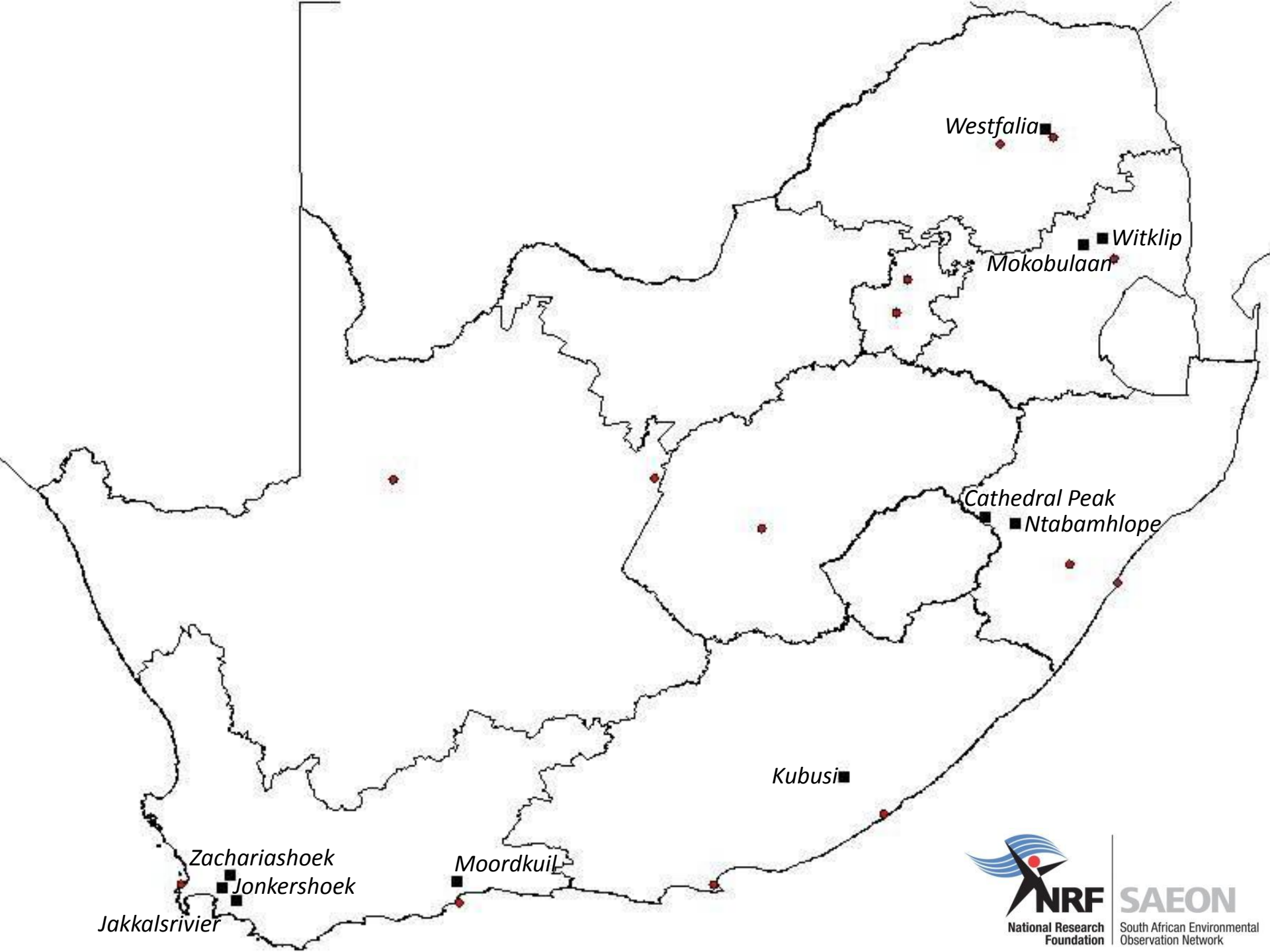
- Based on the paired-catchment principle used at Emmental – Switzerland and Wagon Wheel Gap, Colorado – USA
- Streamflow under plantations and natural vegetation compared
- 6 catchments remain operational at Jonkershoek – 5 under plantation and one fynbos



Time Line

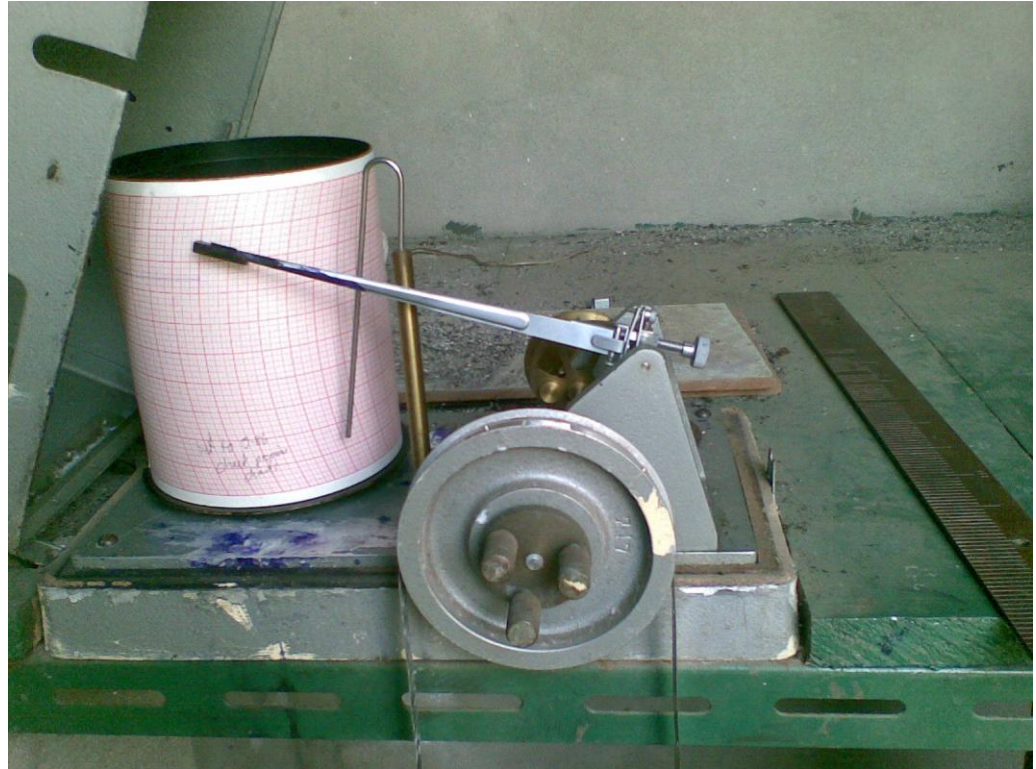
- 1938: Commissioned by South African Forestry Research Institute (SAFRI)
– Department of Forestry
- Early 1990's: SAFRI incorporated into Council for Scientific and Industrial Research (CSIR)
- Department of Water Affairs and Forestry (DWAF) contracted monitoring to the CSIR
- 2009: SAEON became custodians of the project





Data collection

- Streamflow – water height flowing through V-notch weir
- Kent then Belfort charts used
- Continuous trace recorded which is digitized and converted into hourly streamflow volume (m^3)
- All Digitizing done using ACSYS (Autographic Chart Digitizing System)



Data collection

- Rainfall data collected using Nipher shield and Casella gauges
- Continuous trace recorded which is digitized into hourly rainfall (mm)
- Temperature and relative humidity also digitized
- Automated weather data – Swartboschkloof weather station (Agricultural Research Council since 2009).



Data Challenges



- Wind data – very difficult to digitize and has many extreme changes during one time period
- Many rain gauges are inaccessible except on foot
- Manual data collection
- Digitizing from paper charts is time consuming and prone to errors
- Potential for automated data loggers



Data archive

- Over half a million streamflow data records per decade recorded for the 6 currently operational weirs
- Total database
 - Streamflow – 11 947 396
 - Rainfall – 7 458 464
 - Temperature – 399 990
 - Humidity – 399 990
- Microsoft Access database



SAEON's role

- Take over custodianship of the project and data from the CSIR
- Long-term preservation of valuable datasets spanning 7 decades
- Data downloaded from stand-alone PC with restricted access, slow download process, Y2K and dated technology complications
- Metadata searchable on SAEON Data Portal <http://data.saeon.ac.za> and Metacat <http://saeonocan.co.za/knb>



data repository nodes

All Nodes

SAEON

Arid Zone SAEON Node

Egagasini SAEON Node

Elwandle SAEON Node

Fynbos SAEON Node

Grassland, wetland and
forests SAEON Node

Ndlovu SAEON Node

SANParks

Addo Elephant National
Park

Agulhas National Park

Augrabies Falls National
Park

Bontebok National Park

Camdeboo National
ParkGolden Gate Highlands
National Park

Karoo National Park

Data Set Citation**SAEON.Jonkershoek Streamflow.**[victoriag.19.3](http://saeonocean.co.za/knb/metacat/victoriag.19.3/saeon) (<http://saeonocean.co.za/knb/metacat/victoriag.19.3/saeon>).*Metadata download:* **Ecological Metadata Language (EML) File****Data Set Owner(s):***Organization:* SAEON*Position:* **Fynbos Node***Address:* Private Bag X7,
Claremont, Western Cape 7735 South Africa*Phone:* 0217998745 (voice)*Email Address:* victoria@saeon.ac.za**Abstract:**

During the 1930s South Africa pioneered long-term catchment monitoring by establishing one of the first experimental catchment projects worldwide. In 1935, at the fourth Empire Forestry Conference hosted in South Africa, concerns of farmers were raised that plantation forestry was drying up rivers. Swift action followed with the establishment of a forestry research station that year at Jonkershoek near Stellenbosch, with Dr CL Wicht as research leader. The first streamflow gauging weirs began monitoring water runoff in 1938. Several weirs were established in first order catchments to measure streamflow. These were based on the "paired catchment" concept that lay behind the Wagon Wheel Gap monitoring project in the USA and the Emmental project in Switzerland. However, since none of the catchments at Jonkershoek were identical, the approach was that a baseline would first be established for water production by natural catchments. Today six of the original weirs are still operational at Jonkershoek, five monitoring catchments under plantations and one in a Fynbos catchment. The streamflow data consist of hourly readings of the water volume flowing over a v-notch weir.

Keywords:

- SAEON, South Africa
- Streamflow

Data Requirements

- Digitize outstanding raw data from charts
- Ensure that the database is user-friendly
 - Metadata is available and easily searchable online
 - Datasets are easily accessible and documented
 - Strict data quality
- Investigate automated loggers and data download
- Potential to reinstate streamflow monitoring at other catchments



Historic Results

- Exotic trees use more water than indigenous vegetation
- Woody invasive species reduced run-off by 7%
- Regulation of the forestry industry to secure this water which is a valuable resource for the country
- Working for Water programme
- Extensive Fynbos research conducted in the Jonkershoek valley



Future Potential...

- This dataset is unique – only 3 other streamflow monitoring projects around the world compare in length to Jonkershoek: All of these from the Northern Hemisphere
- This makes the dataset *invaluable*

BUT...

We have to avoid Environmental Myopia

Silvertown, J. et al. (2010) Trends in Ecology and Evolution, 25, 547-618.



Acknowledgments

- Department of Water Affairs
- Department of Science and Technology
- CSIR
- Eric Prinsloo & Greg Forsyth
- MTO Forestry
- National Research Foundation
- Agricultural Research Council



Questions??

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