

KWAZULU-NATAL

LAND & WATER USE



TABLE 1
Areas and percentage change of land cover groups between 1990 and 2013/14 for KwaZulu-Natal.

Land cover group	1990 Area (km²)	2013-14 Area (km²)	Change (%)
Waterbodies (WB)	1590	1491	-0.139
Wetlands (WTL)	1392	1118	-0.384
Indigenous Forest (INF)	1054	1173	0.168
Thicket / Dense bush (TDB)	12298	14631	3.280
Woodland / Open bush (WOB)	3725	4492	1.078
Grassland (GRS)	29926	25112	-6.767
Low shrubland (LSB)	539	469	-0.098
Mines (MNS)	40	42	0.002
Bare non-vegetated (BNV)	254	521	0.375
Plantations / Woodlots (PWD)	5181	5361	0.254
Cultivated commercial annuals (CCA)	5590	3501	-2.935
Cultivated perennial (CPE)	186	3280	4.348
Cultivated subsistence (CSB)	3079	4013	1.312
Low shrubland (LSB)	0	0	0.000
Urban	6296	5945	-0.494

WARMS DATABASE (updated up to August 2016)

Most water volumes are registered in KwaZulu-Natal for taking water (2.56 billion m³ a⁻¹), afforestation (0.44 billion m³ a⁻¹) and storing water (0.31 billion m³).

By water resource types, water is taken mainly from water schemes (55.6%), rivers/streams (30.2%), dams (11.7%), lakes (1.5%) and boreholes (0.7%).

The highest water withdrawals per sector were for agricultural irrigation (1.26 billion m³ a⁻¹ or 49.2% of the total), water supply services (1.08 billion m³ a⁻¹ or 42.3%) and non-urban industry (0.12 billion m³ a⁻¹ or 4.9%).

KwaZulu-Natal is the country's province with the highest water withdrawals and volume reductions from afforestation, water supply services and non-urban industry water use.

NATIONAL LAND COVER (NLC) MAPS of 1990 & 2013/14:

The largest areas in KwaZulu-Natal are covered by grassland (25,112 km²) and thicket/dense bush (14,631 km²) (Figure 1).

The main changes in land cover between 1990 and 2013/14 occurred for cultivated perennials (+4.348%), thicket/dense bush (+3.280%), cultivated subsistence farming (+1.312%) and woodland/ open bush (+1.078%) at the expense of grassland (-6.767%) and cultivated commercial annuals (-2.935%) (Table 1).

ETLOOK ANNUAL EVAPOTRANSPIRATION (ET) DATA (from August 2014 to July 2015):

ET is in the high range due to higher rainfall compared to the rest of the country, although variable spatially (Figure 2).

Besides waterbodies, the highest median annual water use per unit area was from plantations/woodlots (819 mm a⁻¹), cultivated perennials (813 mm a⁻¹), indigenous forests (763 mm a⁻¹) and cultivated cane (759 mm a⁻¹), and the lowest from mines (350 mm a⁻¹) (Table 2).

In absolute terms, the largest water use was from grassland (3,223 Mm³ a⁻¹) and cultivated commercial annuals (2,340 Mm³ a⁻¹).

FIGURE 1
Land cover groups based on the National Land Cover (NLC) map of 2013/14 for KwaZulu-Natal.

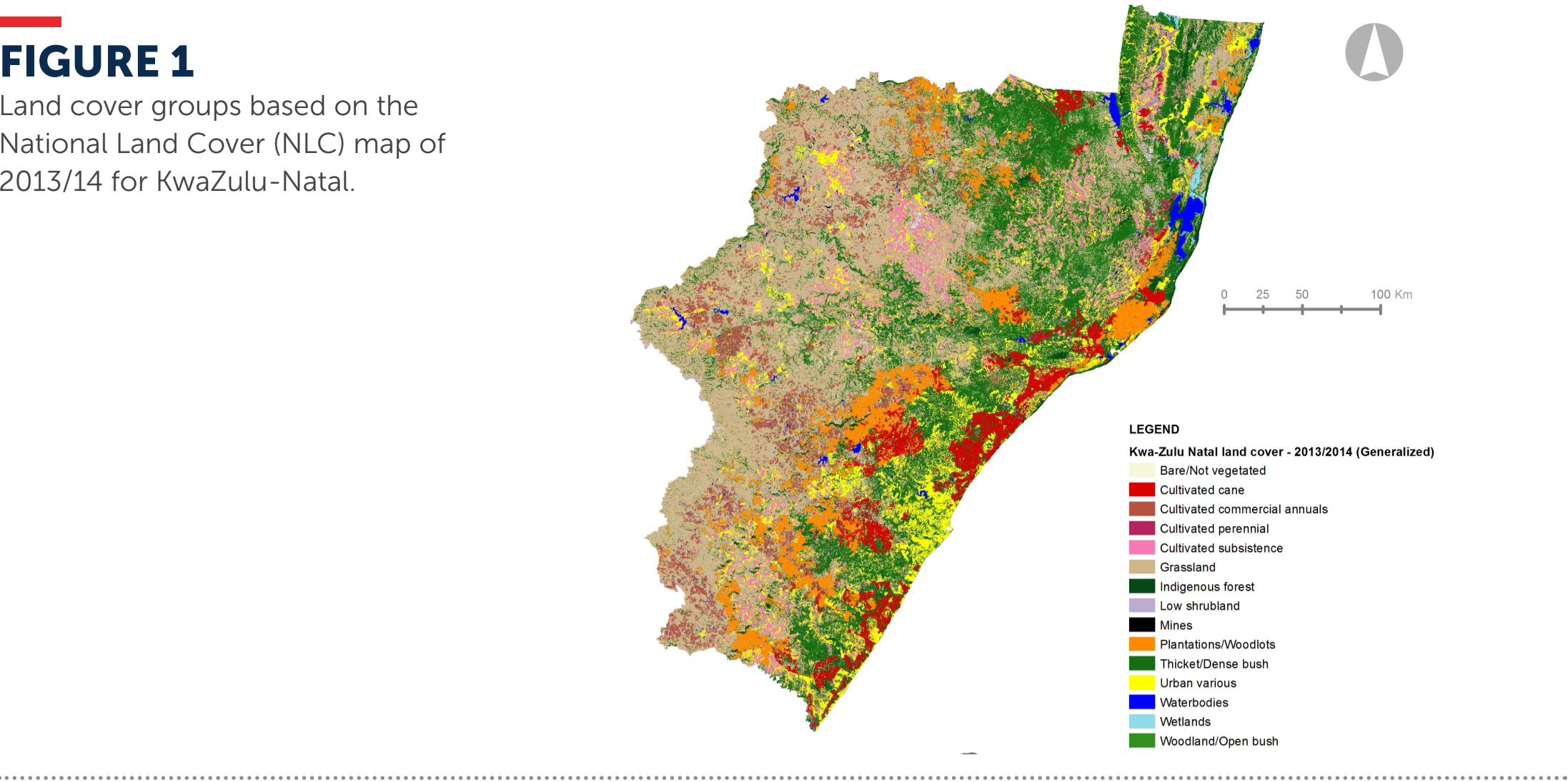


FIGURE 2
Annual ETLook evapotranspiration (ET) in 2014/15 for KwaZulu-Natal.

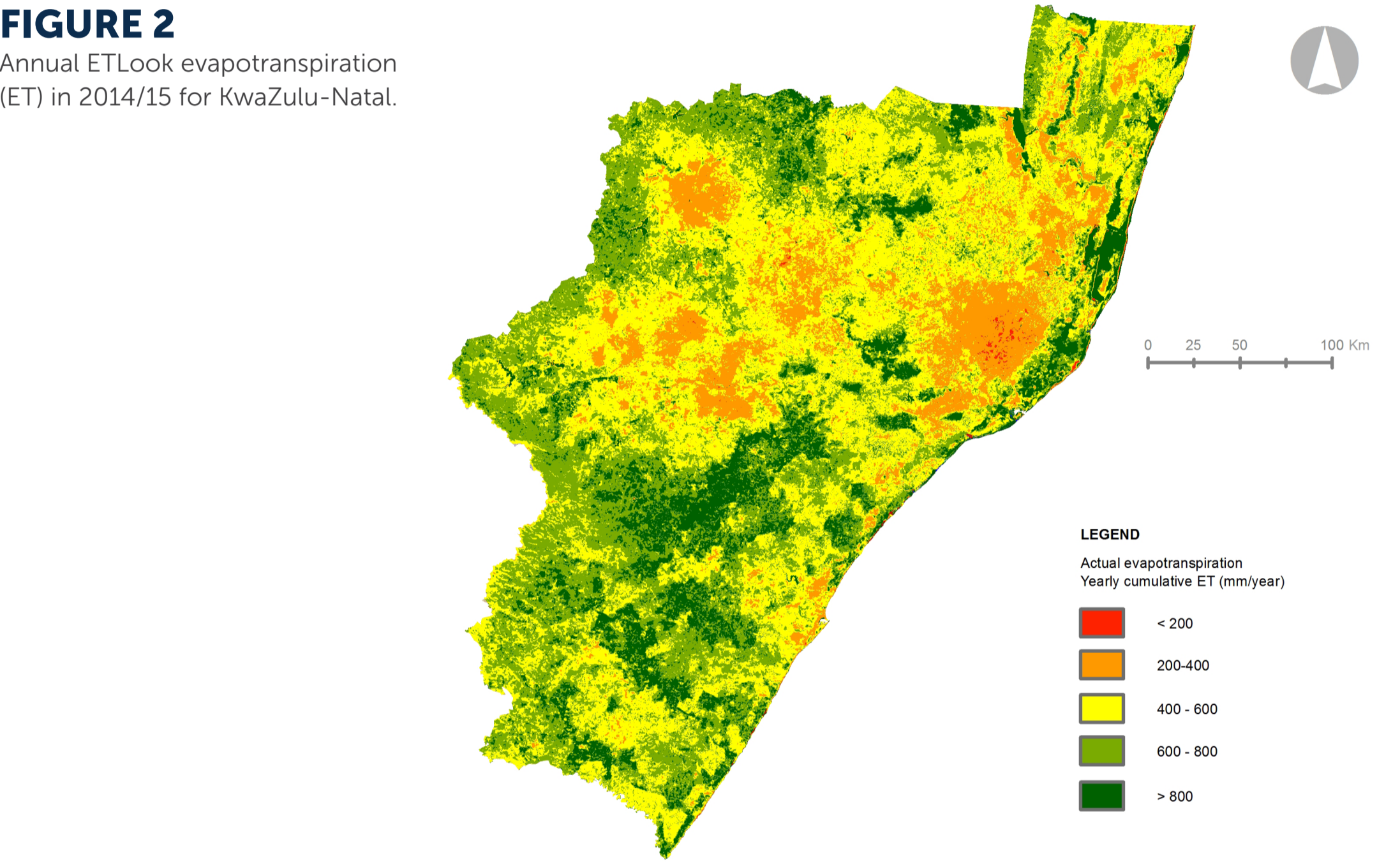


TABLE 2
Water use statistics for land cover groups based on annual ETLook data in 2014/15 for Kwazulu-Natal:

Land use	Water use statistics						
	MEAN mm (a ⁻¹)	MEDIAN (mm a ⁻¹)	MIN (mm a ⁻¹)	MAX (mm a ⁻¹)	STD (mm a ⁻¹)	AREA (km²)	CUM (Mm³ a ⁻¹)
Waterbodies (WB)	1532	1706	34	2380	499	952	1624
Wetlands (WTL)	817	739	52	2702	358	1505	1112
Indigenous Forest (INF)	771	763	34	2629	196	1464	1117
Thicket / Dense bush (TDB)	565	560	34	2615	153	19128	10706
Woodland / Open bush (WOB)	510	499	41	2380	143	5968	2977
Grassland (GRS)	575	581	34	2279	142	33030	19204
Shrubland fynbos (SHF)	-	-	-	-	-	-	-
Low shrubland (LSB)	435	417	40	2132	141	616	257
Cultivated commercial annuals (CCA)	732	715	156	2135	165	4956	3544
Cultivated perennial (CPE)	837	813	238	2021	271	247	201
Cultivated subsistence (CSB)	517	506	72	2279	147	5014	2535
Cultivated cane (CC)	756	759	145	2030	165	4062	3082
Plantations / Woodlots (PWD)	806	819	56	2123	170	6793	5566
Mines (MNS)	359	350	71	2032	151	56	19
Bare non-vegetated (BNV)	454	423	34	2301	213	668	282
Urban industrial (UIND)	395	377	122	2057	132	93	35
Urban commercial (UC)	391	355	174	1922	140	92	33
Urban residential (UR)	406	403	158	1733	83	356	143
Urban sport and recreation (ORS)	480	462	121	1924	499	521	241
Urban informal (UINF)	585	559	142	1838	358	88	49
Urban Others (UO)	458	459	127	2056	196	6453	2961

FIGURE 3
Daily average air temperatures for different land covers in KwaZulu-Natal based on NASA/GMAO Modern Era Retrospective Analysis (MERRA) from 2000 to 2012.

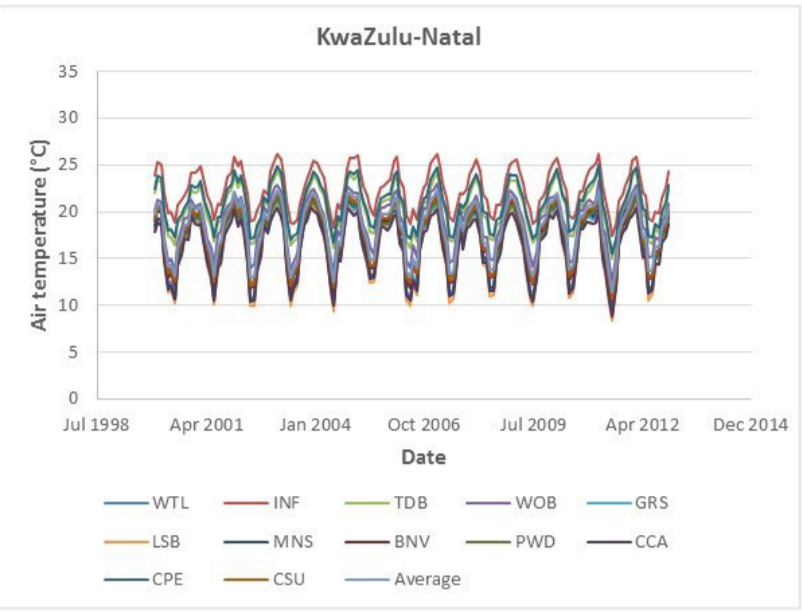


FIGURE 4
Monthly rainfall at representative stations in KwaZulu-Natal (South African Weather Services) from 2000 to 2012.

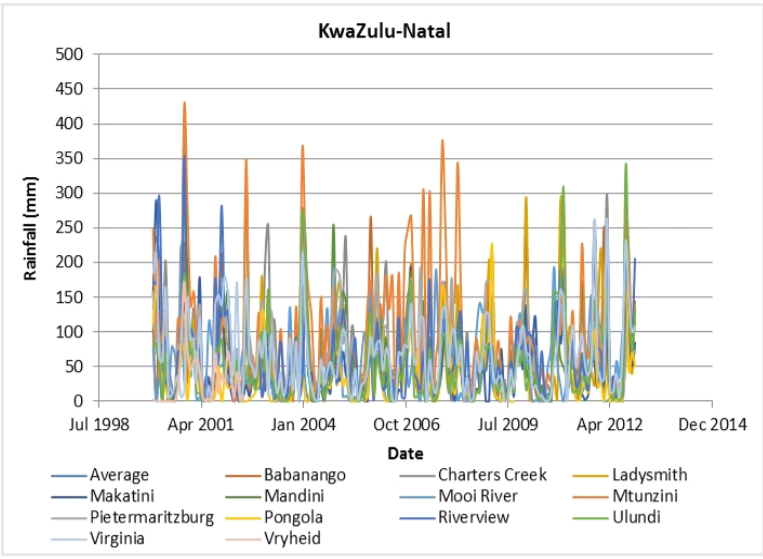
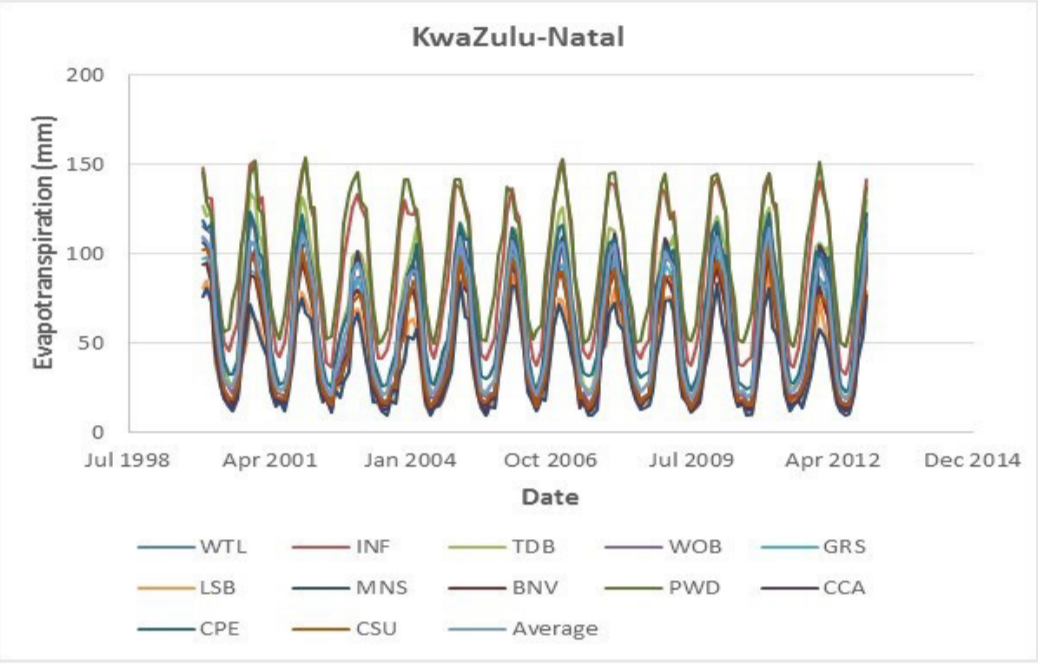


FIGURE 5
Monthly MOD16 evapotranspiration for different land cover groups in KwaZulu-Natal from 2000 to 2012.



MOD16 MONTHLY EVAPOTRANSPIRATION (ET) DATA (FROM 2000 TO 2012)

- Daily average air temperatures in KwaZulu-Natal are rather variable ranging from below 10°C (especially in low shrubland) to more than 25°C (especially in indigenous forests and cultivated perennial crops) (Figure 3).
- Monthly rainfall shows a large variability with irregular peaks >350 mm month⁻¹ (Figure 4).
- MOD16 ET range from below 20 mm month⁻¹ in winter up to peaks >150 mm month⁻¹ in summer, especially in plantations/woodlots and indigenous forests (Figure 5).

GUIDELINES AND RECOMMENDATIONS

- Discharging wastewater and disposing waste are substantial water uses due to industrial activities.
- The existing pool of wastewater streams can potentially become a valuable water–reuse source (currently 0.5% of water abstracted is re-used for wastewater irrigation). It is recommended that industries try and remediate wastewater and re-use it for irrigation and power generation in close vicinity to the waste generating streams.
- The limited use of boreholes leaves scope for increased groundwater use and conjunctive use of surface water and groundwater.
- KwaZulu-Natal is the province with the highest registered flow reduction from afforestation, yet forestry is an important industry over vast areas (water use of 5,566 Mm³ a⁻¹ of plantations/woodlots). More profitable perennial crops (water use 813 mm a⁻¹) are replacing annual crops (water use 715 mm a⁻¹). This will put more pressure on water resources and smart water use measures need to be implemented both in forestry and agriculture, including limiting encroachment by thicket/dense bush.

ACKNOWLEDGMENTS AND SOURCES OF INFORMATION:
Water Authorisation and Registration Management System (WARMS)
National Land Cover (NLC) maps for 1990 and 2013/14
Satellite-derived images and products (ETLook and MOD16 evapotranspiration)
Ground measurements of climatic variables (SAWS)
NASA/GMAO Modern Era Retrospective Analysis (MERRA)