SELECTING AN APPROPRIATE BASELINE March 2022, revised June 2022

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Baseline- A set of data that are used as a reference to gauge the direction and extent of change.

If we wish to compare current observations with past performance, we need to establish a set of relevant data, or baseline. The baseline selected by the Water Corporation for rainfall and streamflow comparisons in Western Australia is the period 1911-1975.

Since the 1970's Climate Change attributed to rising levels of carbon dioxide has been promoted as the cause of lower rainfall, falling water-tables, reduced stream-flow and the collapse of vegetation in the forested catchments of the South –West. World-wide reduction in carbon dioxide levels is usually offered as the only solution. As an example, the Water Corporation' advertisement (Weekend West 12/06/2021) claims that "Perth's rainfall is declining due to "Climate Change" and shows a graph of lower stream-flows into Perth dams as convincing proof that "Climate change is real". Such claims deserve scrutiny.

Rainfall data. An analysis of rainfall should use all of the available data sets, not only those since 1911. I have reviewed BOM rainfall data for Jarrahdale, located close to the Wungong and Serpentine catchments, from 1882. This sequence provides an additional 29 years of rainfall and shows an average rainfall of 1177 mm pa with a very wide range, from 607 to 2169 mmpa.

During this 132 year period, six out of seven of the very high rainfall years (greater than 1604mm) occurred between 1915 and 1965 and seven out of nine the very dry years(less than 828mm) either before 1915 or after 1965. Recalculating the averages from 1882-1910, 1911-1975 and post 1975 the means are: 1100mm, 1251mm and 1054mm.

The data show a natural, longer-term cycle in rainfall for Jarrahdale (Fig 1)and similar trends were observed for Perth airport (Fig 2),Mundaring and Dwellingup. Surely the several very dry years recorded before 1915 at Perth and Jarrahdale should not be attributed to "Climate Change". The sequence of dry years around 1900 led to concerns that the newly constructed Mundaring Weir was not filling as fast as expected. Five thousand of hectares of forest were felled or ring-barked to enhance streamflow, resulting in increased salinity and sedimentation.

Dendrocronological data collected by UWA on tree rings at Lake Deborah reveal evidence of cyclic trends in rainfall with several multi-decadal very dry periods extending back well before European settlement in Western Australia. The authors conclude that the first half of the 20th Century was the wettest period since 1350 CE.

It is clear that the 64 year period selected by the Water Corporation as its baseline was unusually wet and resulted in observable changes in catchments, forests and farmland. These include: Occasional overflow in dams; Potential collapse of the Harvey weir in 1964 leading to the evacuation of the town; elevated watertables, waterlogging and associated Phytophthora impacts in the jarrah forest, especially in gully-heads; Invasion of high-quality jarrah sites by bullich (E megacarpa), a species that prefers water-gaining sites; Accelerated erosion, rising water tables and increased salinity in farmland and damage to infrastructure in several wheatbelt towns. Rising and then falling watertables in the Gnangara groundwater mound (Fig 2).

Catchments. There have been many changes to these forested water catchments during the past 150 years. These include extensive and repeated logging, large-scale bauxite mining and revegetation, wildfire, prescribed burning and eucalypt decline associated with phytophthora. Research by various agencies has shown that younger, smaller trees transpire at about twice the rate of older-growth and that about half of the reduction in stream-flow is the result of changes in vegetation. Thinning of the overstocked stands in research catchments has shown to significantly increase streamflow for several years, but the small-sized produce is unable to be sold economically in large quantity. There is however a significant water and environmental benefit that should be valued. The key is on-going, professional management of the regrowth.

Streamflow. Water Corporation's streamflow data into dams are shown to commence in 1911, however none of the major dams feeding the city of Perth were operational before the Canning dam was completed in 1940. The earlier inflows were inferred by mathematical modelling. They rely on once-daily measurement of flow at a few sampling sites. A more extensive system of continuous stream monitoring was not established until the mid 1960's. The inferred data may well be inaccurate or at the very least have a large error term.

Domestic water consumption has increased markedly with population growth since 1911. Efforts by the Water Corporation to make Perth's water supply less dependent on annual rainfall by encouraging water conservation, desalination and injection of treated water into aquifers are sound. However their assertions of a direct link between rainfall, streamflow and "climate change" are unsubstantiated and misleading. I have contacted the Corporation and the Board by letter on several occasions and offered to meet, without success.

Of concern is that most of the research and monitoring of ecosystems in the south-west and forests of WA has been done since the 1960's and has measured a "receding tide". Care must be taken when interpreting results such as falling water-tables, reduced streamflow, changes in aquatic biodiversity and tree health, but this reality is ignored in many recent scientific publications.

Long-term monitoring of vegetation (1973-2021) in the 31 mile brook catchment has shown only a slight xeric shift in species composition, especially in gully-head sites, despite major changes in hydrology. Drought scorch and some mortality were observed in summer 2011 and 2020, following very dry winters. Affected sites were located on steep slopes, shallow soils and adjacent to exposed basement rock. It is likely that species that expanded their range during the long and unusually wet cycle are now simply retreating back to their "preferred habitats".

Figure 1

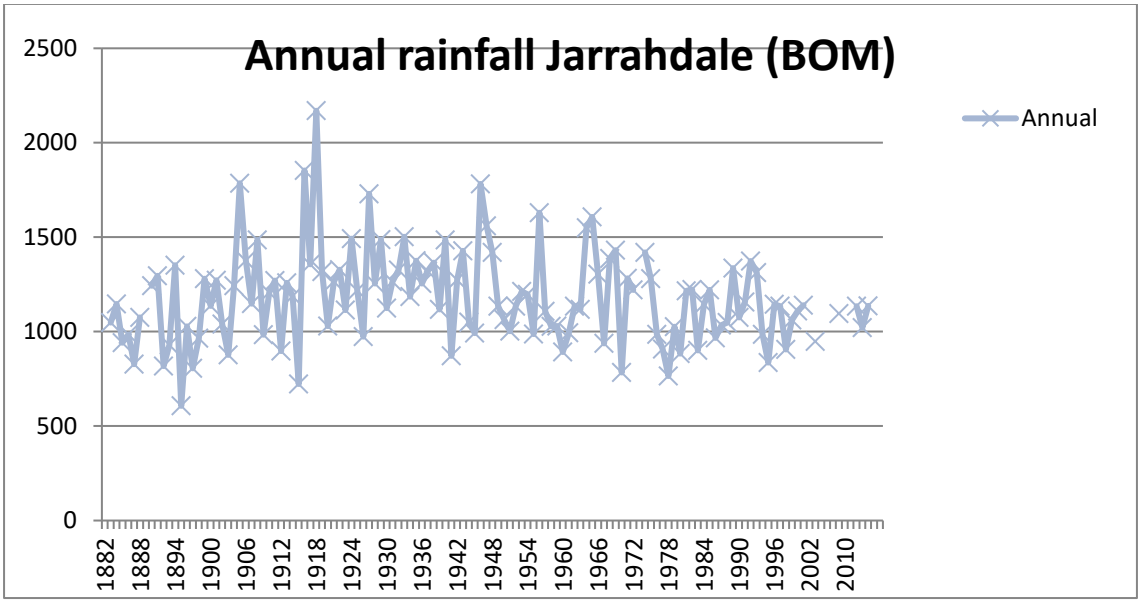
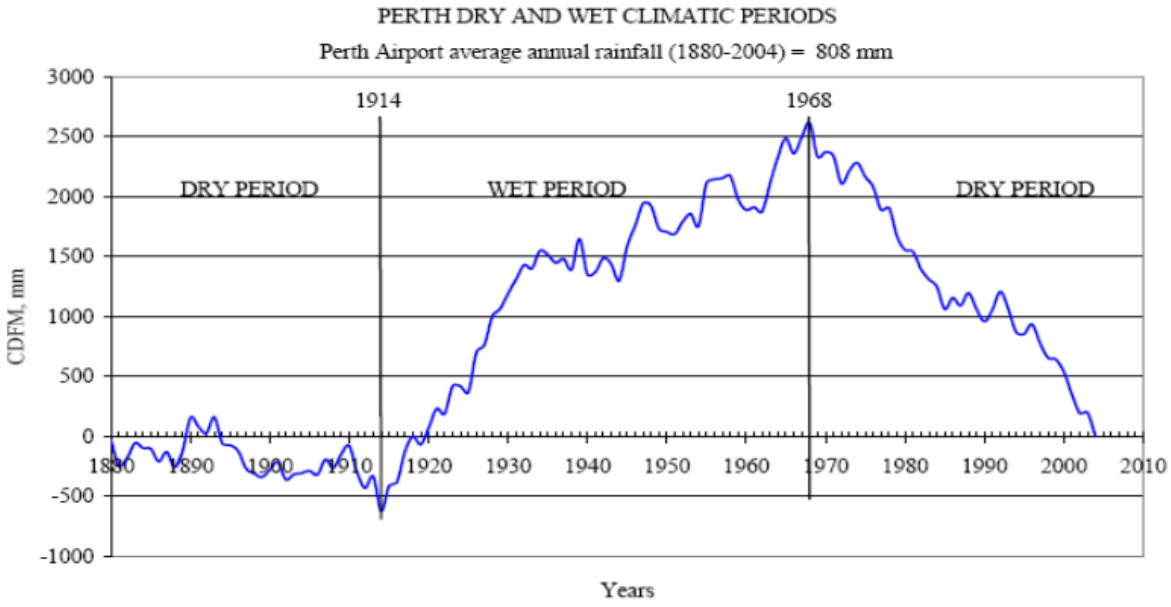


Figure 2 Fluctuations in rainfall and groundwater table, Gnangara groundwater mound..



Rainfall 735mm Rainfall 862mm Rainfall 776mm