3.7. Climate

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Abstract

Rainfall data from Bureau of Meteorology recording stations located near *Western Shield* fauna monitoring sites in southwestern Australia were plotted as annual, monthly, winter and summer rainfall with line plots for long-term averages as a reference. Visual comparison of the data with capture rates of woylies and other medium size mammals at fauna monitoring sites suggests that there may be a weak link with decline in rainfall and population decline in the lower rainfall sites in the wheatbelt but the link is less apparent in the higher rainfall sites in the jarrah forest. The evidence suggests that climate is not a primary causative agent in the decline of woylies at least in the Upper Warren region.

3.7.1. Introduction

It is generally recognized that climatic factors such as rainfall can drive the population dynamics in some animal species such as granivorous rodents. The amount and timing of rainfall generally determines the amount of seed production of local plant species and therefore determines the amount of food resources available for these rodents. Other factors such as predation may also influence the population dynamics but in some systems rainfall seems to be the driving force and has a stronger influence than other climatic factors.

When population declines of woylies in Dryandra were first reported during the review of *Western Shield* in 2003 it was postulated that these declines might be associated with below average rainfall in recent years combined with other factors such as predation (Orell, 2004). Examination of rainfall data over the seven year period in which dramatic declines followed large population peaks seemed to support the hypothesis.

Anecdotal evidence from South Australia suggests that the declines in woylies observed on Venus Bay Peninsula (VBP) beginning in 2005 may be attributed to a food resource decline associated with postulated woylie over-population and drought conditions in combination with predation by feral cats. Extreme and uncharacteristic weather (a series of six severe frosts in a week) may also have contributed to the woylie declines at VBP (Section 4.6 PCS Expansion).

The experiences in both Western Australia and South Australia suggested that climate could be a likely factor in the observed declines and was worthy of closer examination.

3.7.2. Methods

Bureau of Meteorology (BOM) weather recording stations in the south west of WA were selected on the basis of their proximity to *Western Shield* fauna monitoring sites and the consistency of data recorded. Of the data available, rainfall appeared to be the most consistently recorded data for all the stations selected and was therefore chosen for further investigation.

Rainfall data from the following recording stations was sourced from BOM.

Pingelly (January 1990 – December 2005) as data for Tutanning Nature Reserve;

Cuballing (January 1990 – December 2005) as data for Dryandra Woodland;

Pingrup (January 1990 – December 2005) as data for Lake Magenta Nature Reserve;

Valern (January 1990 – December 2005) as data for Batalling Forest; and

Westbourne (January 1975 – December 2005) as data for Perup.

The data were plotted as: monthly rainfall together with a line plot of the monthly average since records were started; annual rainfall with a line plot of the annual average since records were started; winter (May to October) rainfall with a line plot of the average winter rainfall since records were started; and summer (November to April) rainfall with a line plot of the average summer rainfall since records were started.

These plots were examined for potential patterns that might be correlated with the observed declines at the respective fauna monitoring sites. No statistical analyses were undertaken.

3.7.3. Results

A visual examination of the plots of rainfall data in comparison with the fauna monitoring data for the respective sites suggests that the declines observed in Dryandra (Fig.3.7.1), Tutanning and Lake Magenta (Fig.3.7.2) could be partly explained by a decline in winter rainfall since 2000. Near average rainfall in 2003 and above average rainfall in 2005 was recorded in Pingrup (Fig.3.7.2) and this appears to correlate with an increase in koomal and chuditch captures from May 2004. A similar pattern in rainfall, but lower in relation to the average rainfall, was observed in Pingelly but a continued decline in capture rates of mammals occurred at Tutanning.

The rainfall data for Valern (Fig.3.7.3) and Westbourne (Fig.3.7.4) do not show any visible correlation with capture rates of woylies at either Batalling or Perup respectively. Increases in woylie captures occurred despite periodic declines in rainfall.

3.7.4. Discussion

While a cursory examination of rainfall data from recording stations in south west WA suggests that declines observed in wheatbelt populations might be partly associated with a decline in rainfall, the association is much weaker in the higher rainfall sites in the jarrah forest.

A spatial analysis of rainfall data and woylie trapping results from 1995 to 2002 by Criddle (2004) at the same sites as discussed here suggested there was no link between rainfall and woylie population decline, though the data available was insufficient to draw firm conclusions.

As suggested by anecdotal evidence from South Australia, a combination of factors, including other climatic variables like temperature, may be playing a role in the decline of woylie populations. A further investigation into variables like temperature, evapotranspiration and ground water levels may be worth while in gaining a better understanding of the environment in which these declines are occurring.

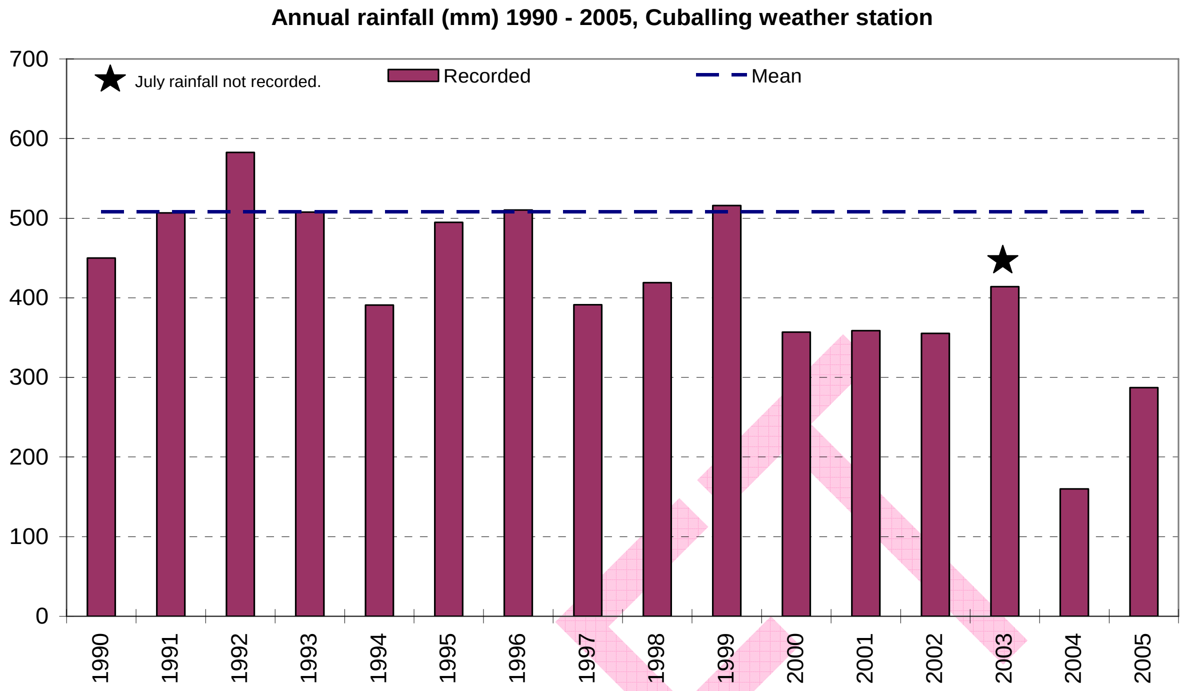
3.7.5. Conclusion

There appears to be a weak link between the observed declines in woylie populations in southwestern Australia and rainfall but this cannot be substantiated without more detailed data and statistical analysis. However, the evidence suggests that rainfall or climate is not a primary factor in the decline of woylie populations

3.7.6. References

Criddle, L. 2004. Analysis of woylie distribution through the south west of Western Australia. Student project report, Curtin University of Technology, Bentley, Western Australia.

Orell, P. 2004. Fauna monitoring and staff training: *Western Shield* review – February 2003. *Conservation Science W. Aust.* **5** (2): 51-95.



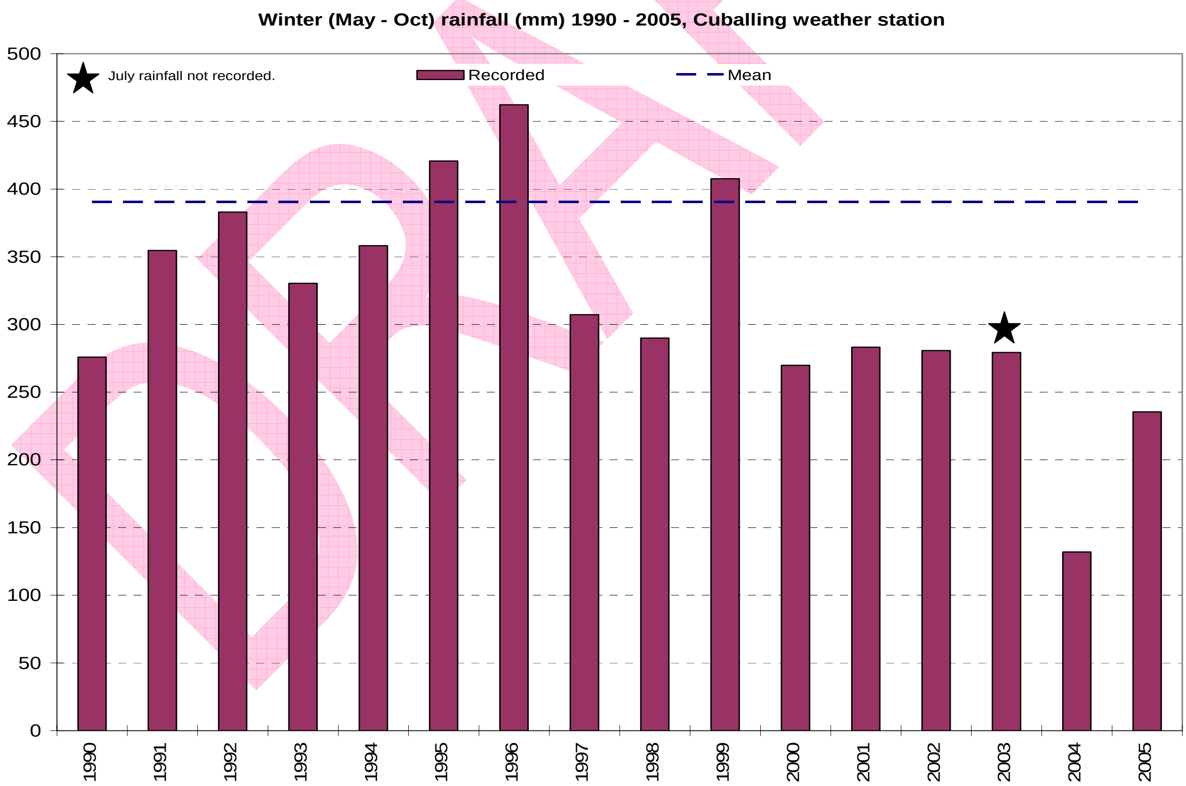
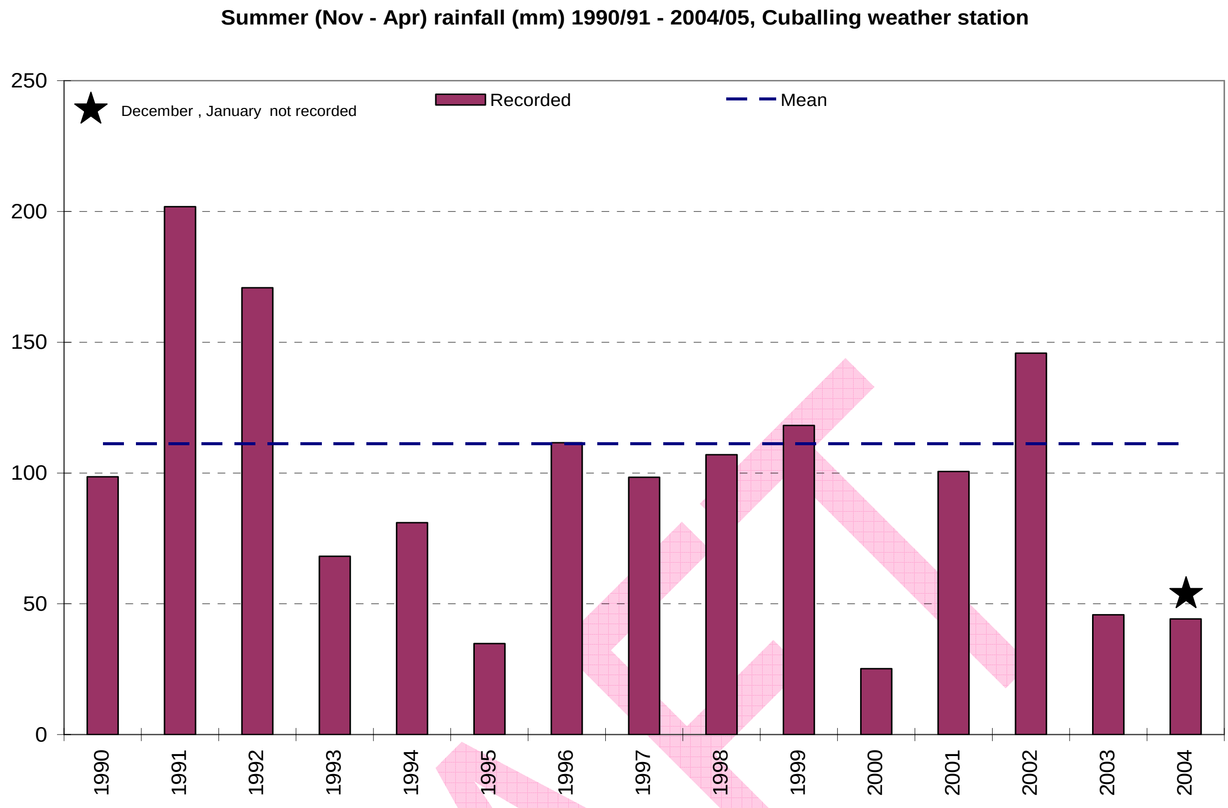


Figure 3.7.1a Cuballing (Dryandra) rainfall – total annual and winter rainfall.



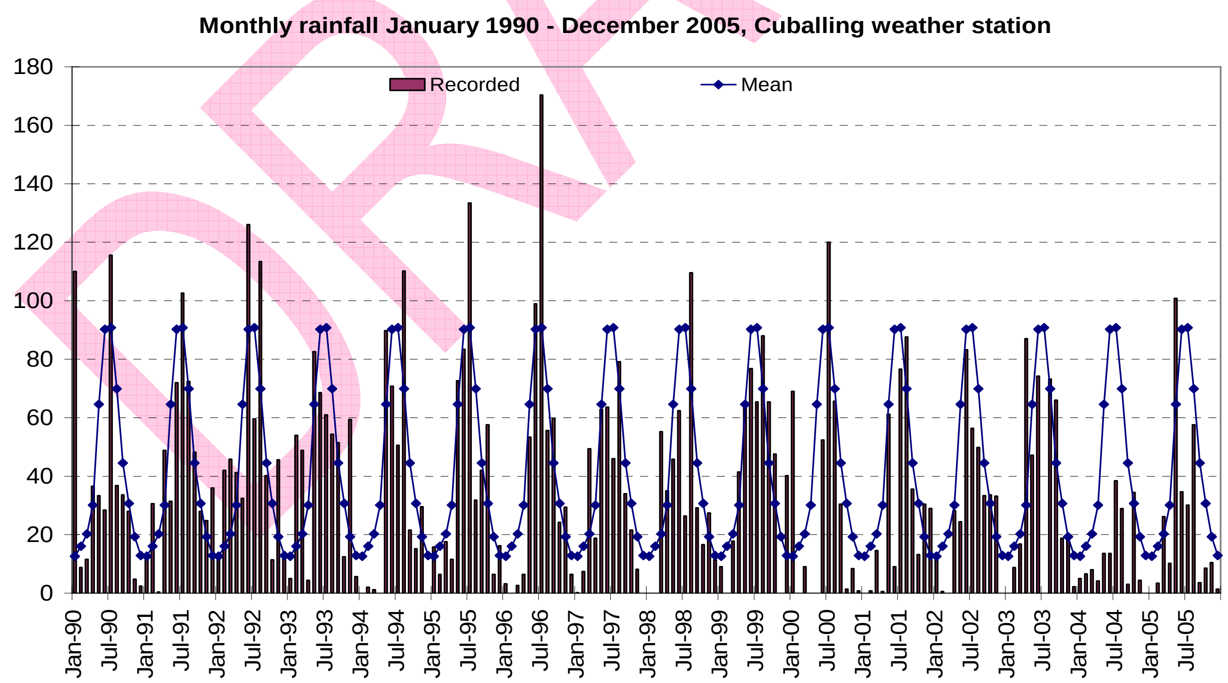
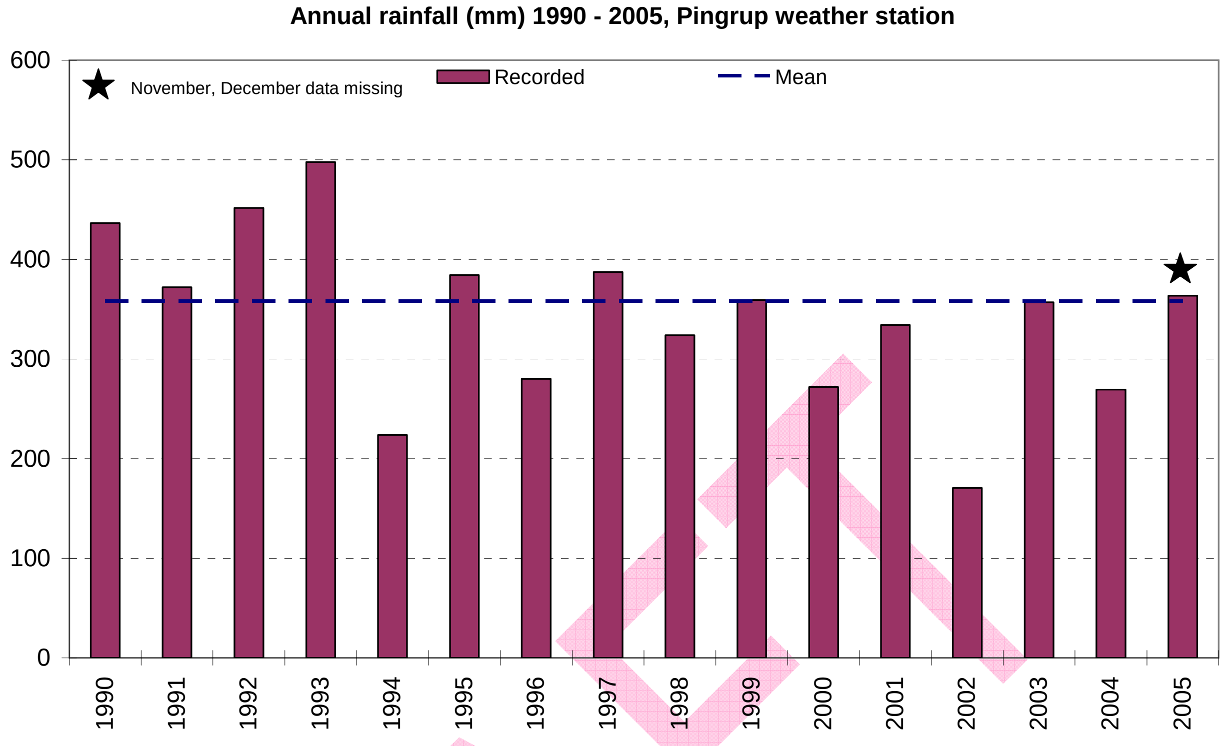


Figure 3.7.1b Cuballing (Dryandra) rainfall – total summer rainfall and monthly rainfall.



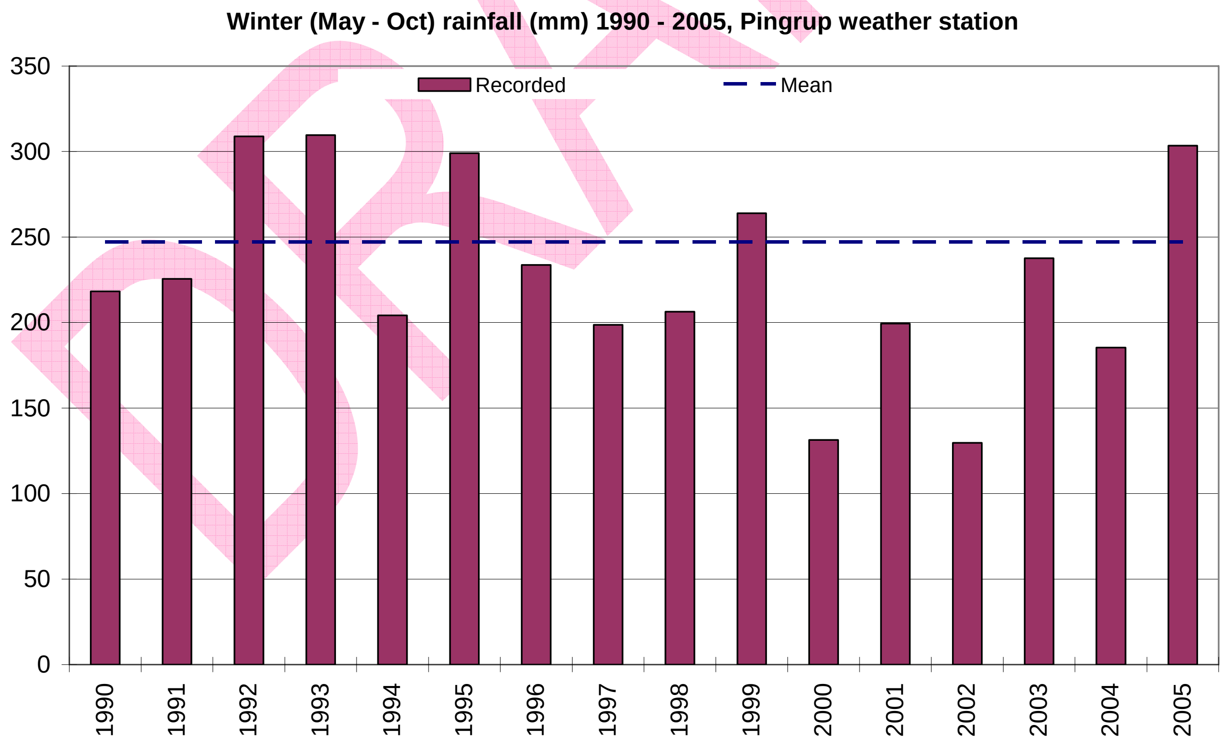
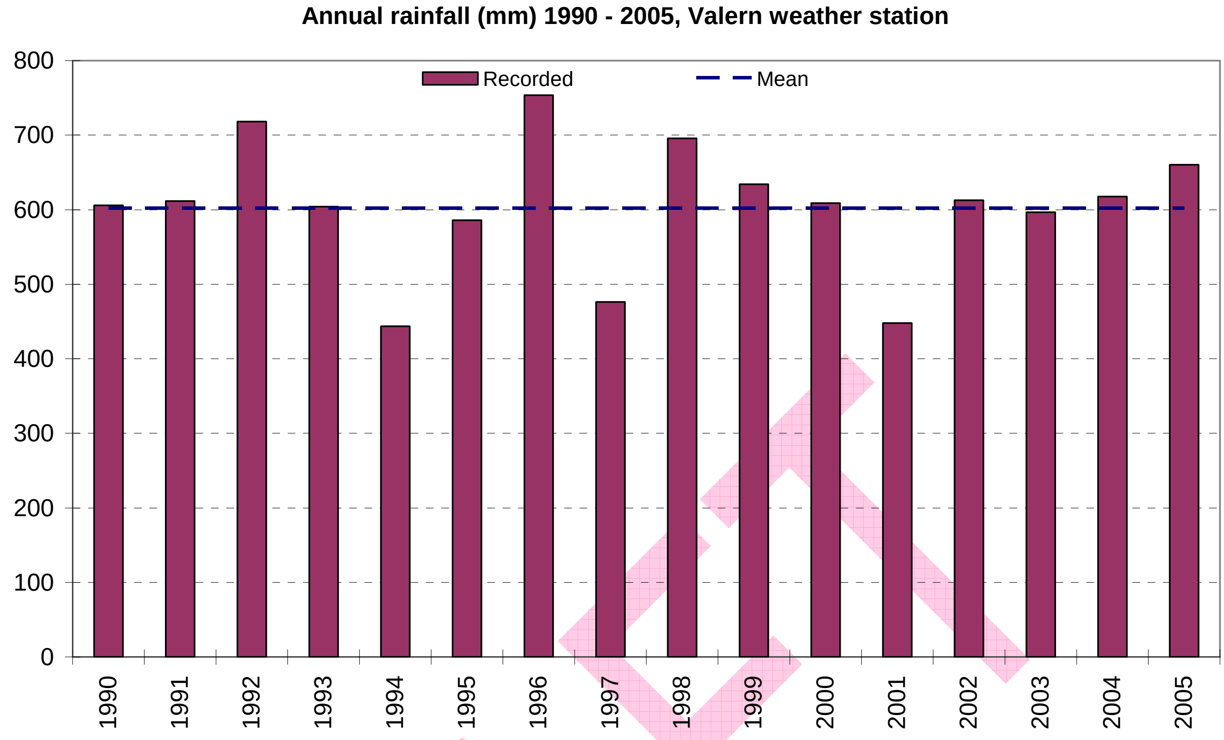


Figure 3.7.2. Pingrup (Lake Magenta) rainfall – total annual and winter rainfall.



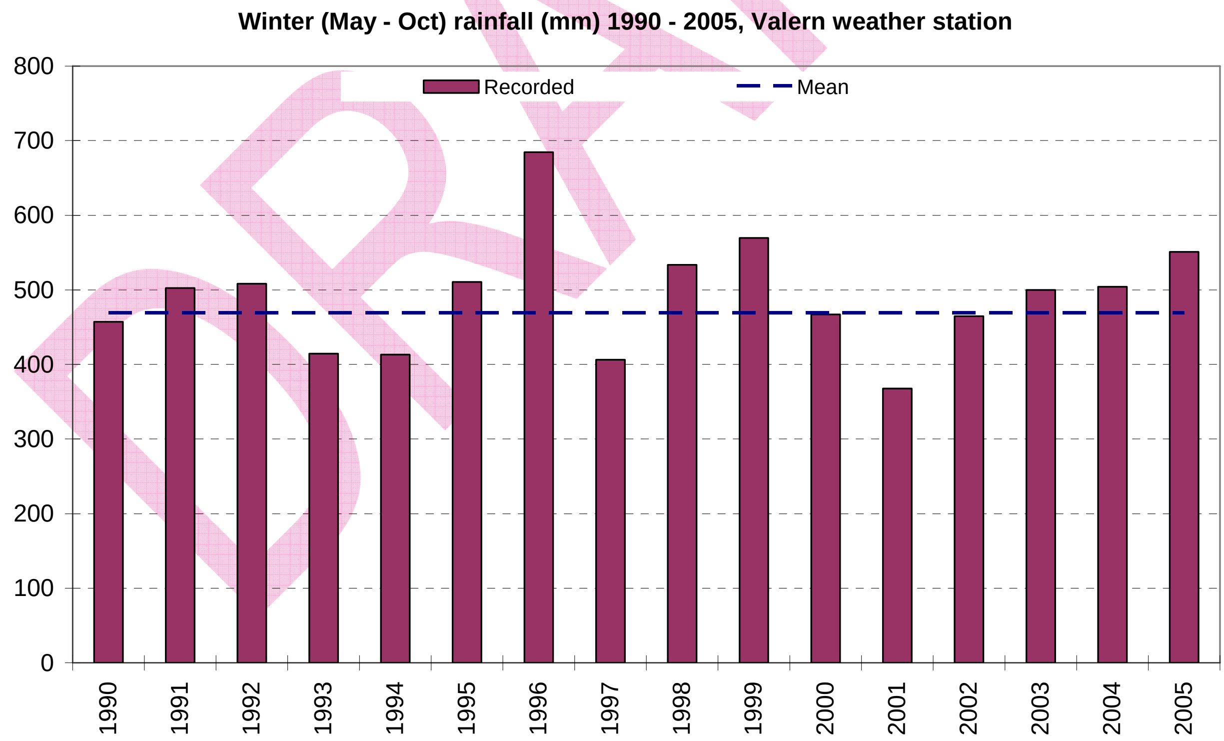
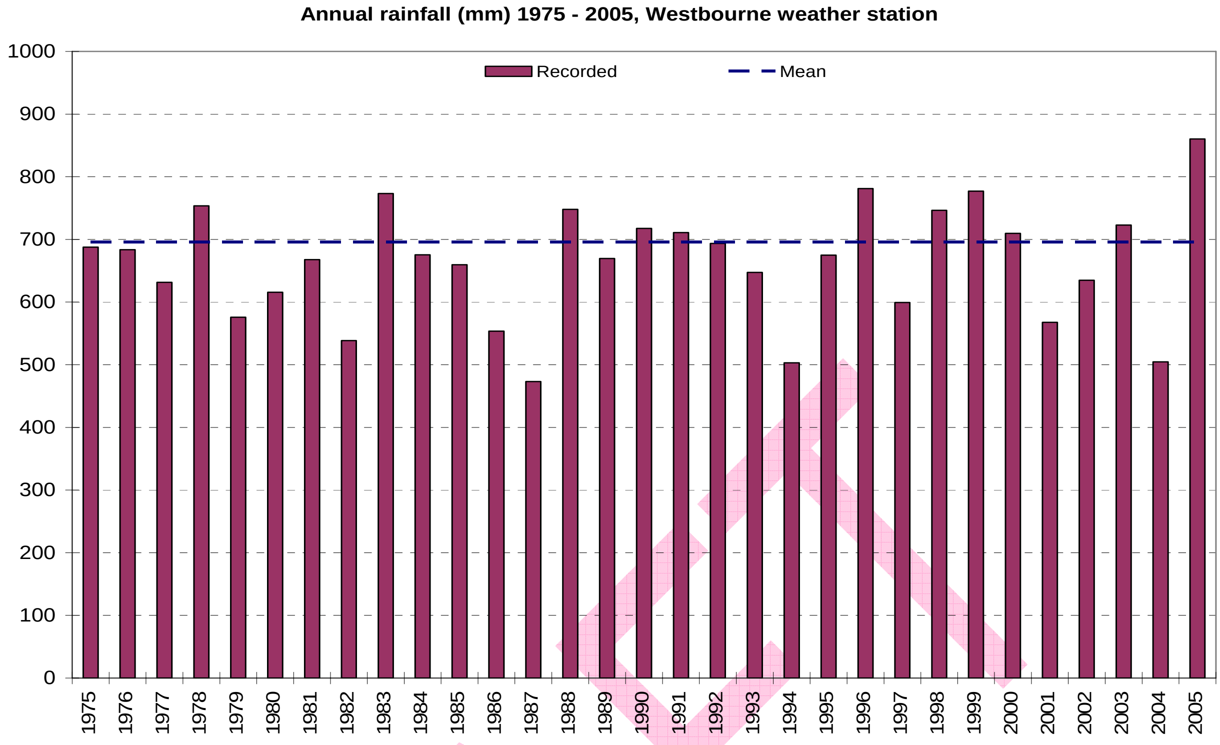


Figure 3.7.3. Batalling rainfall – total annual and winter rainfall.



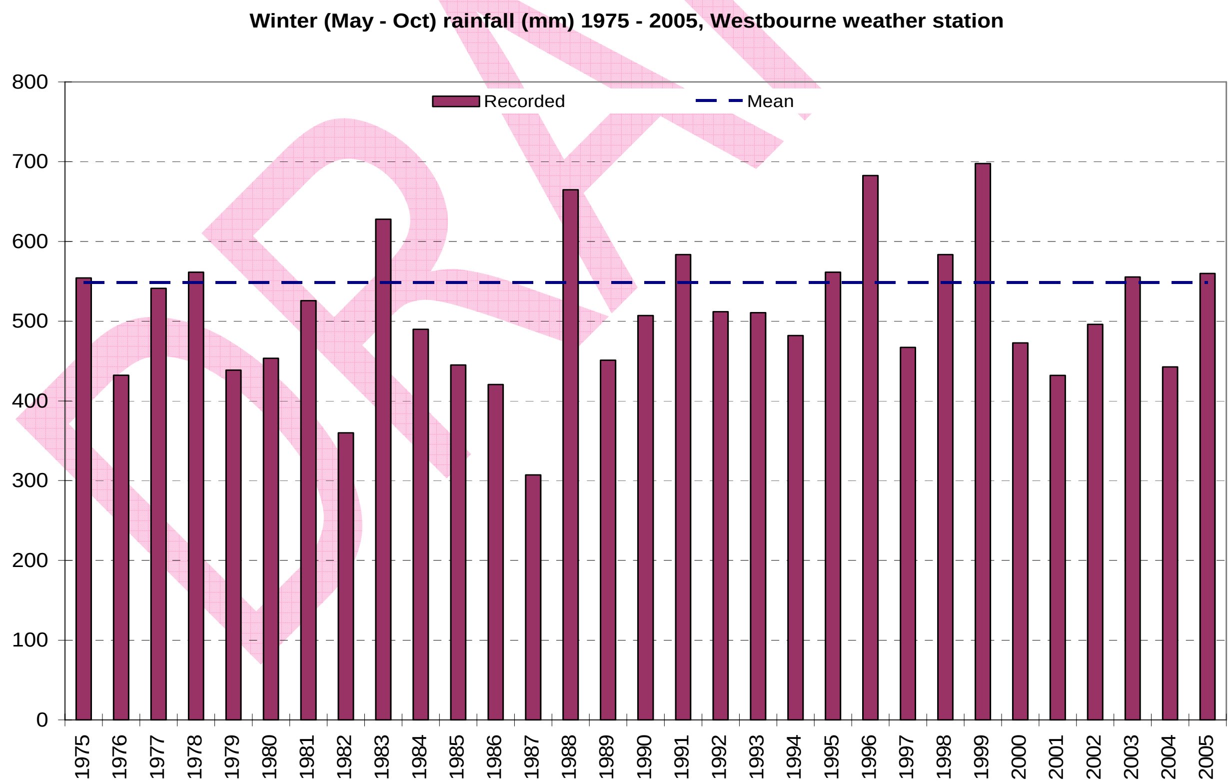


Figure 3.7.4. Perup rainfall – total annual and winter rainfall.