

ANALYSIS OF DROUGHT CHARACTERISTICS

FROM 1900-2012

FOR IMPROVED UNDERSTANDING OF A WATER SUPPLY SYSTEM



COMPILED BY
AMY LENNARD
AT THE
SCHOOL OF ENVIRONMENTAL SCIENCES



ABSTRACT- Droughts are a reoccurring feature of the European climate; recent drought events (2004-2006 & 2010-2012) in the UK have highlighted a continued vulnerability to this hazard. The period 2010-2012 was characterised by departures from typical seasonal climatic conditions, this highlighted the need for further understanding of extreme drought events, particularly from a water resource perspective. The UK has a rich source of historical rainfall data that has been underutilised in the analysis of drought characteristics at a regional scale. Variations in drought duration and severity across a region may have significant implications for water resource management during and after a drought event. A better understanding of regional drought characteristics is achievable by using historical data providing insight for the prediction of future of drought events.

1. INTRODUCTION

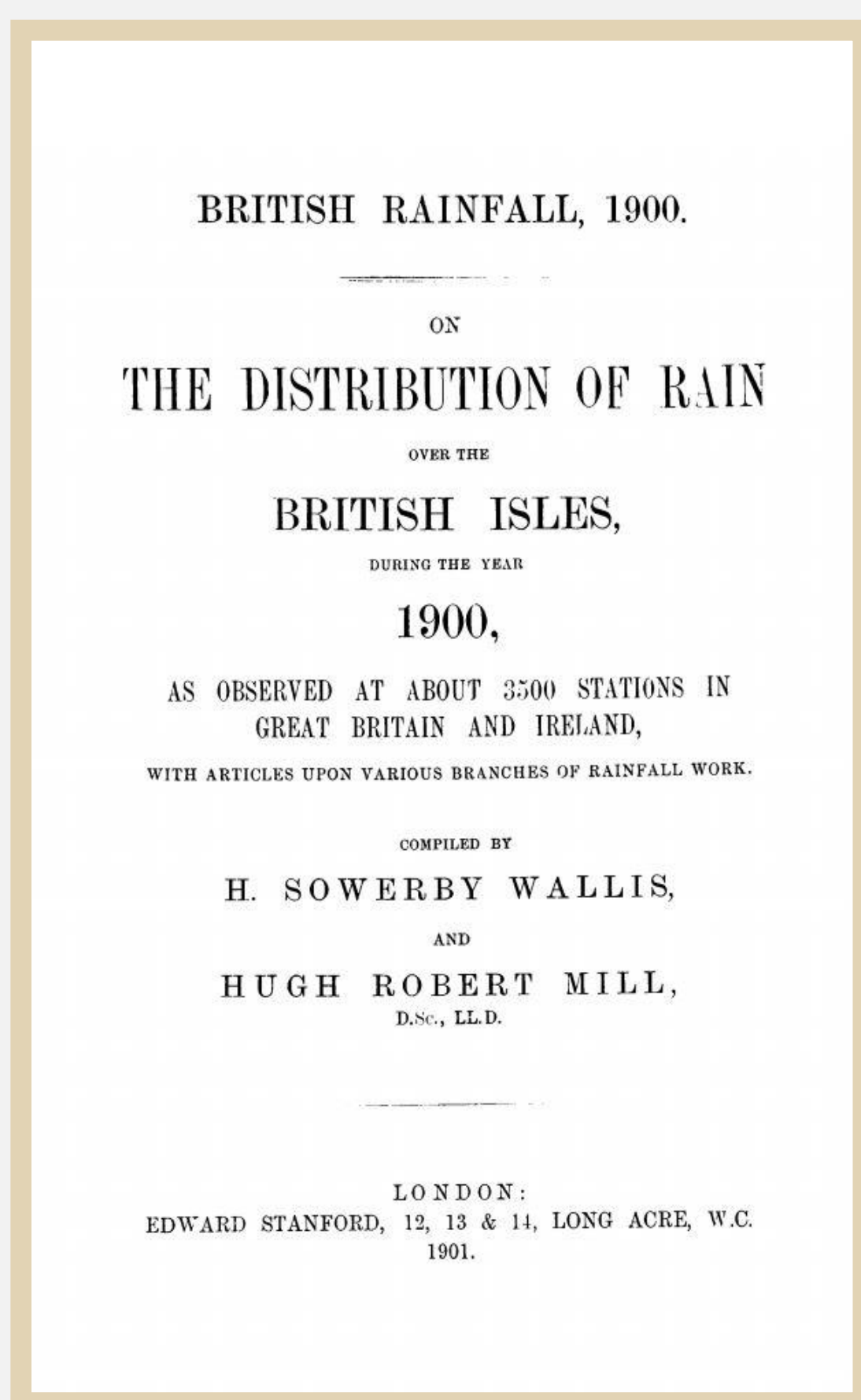
Drought is a complex and poorly understood natural hazard with many multifaceted environmental and socio-economic impacts.

Recent drought events (2010-2012) have highlighted the UK's continued vulnerability to hydrological extremes.

There is a need for further understanding of drought events from a water resources perspective.

The UK has wealth of long series rainfall data that can be used to investigate drought characteristics.

Rainfall data from 1900-2012 for 7 locations in the English Midlands and Central Wales is analysed using a drought metric.

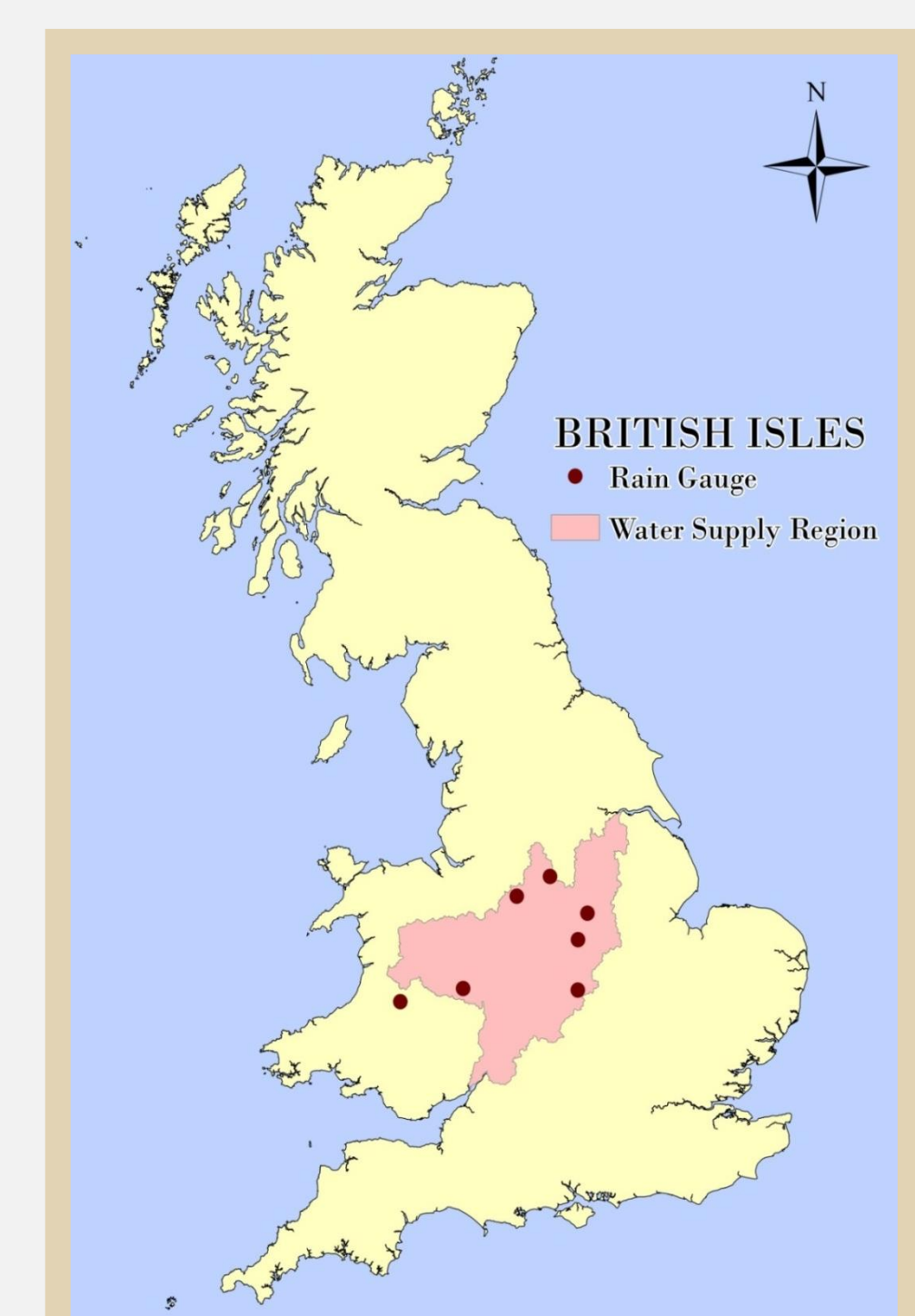
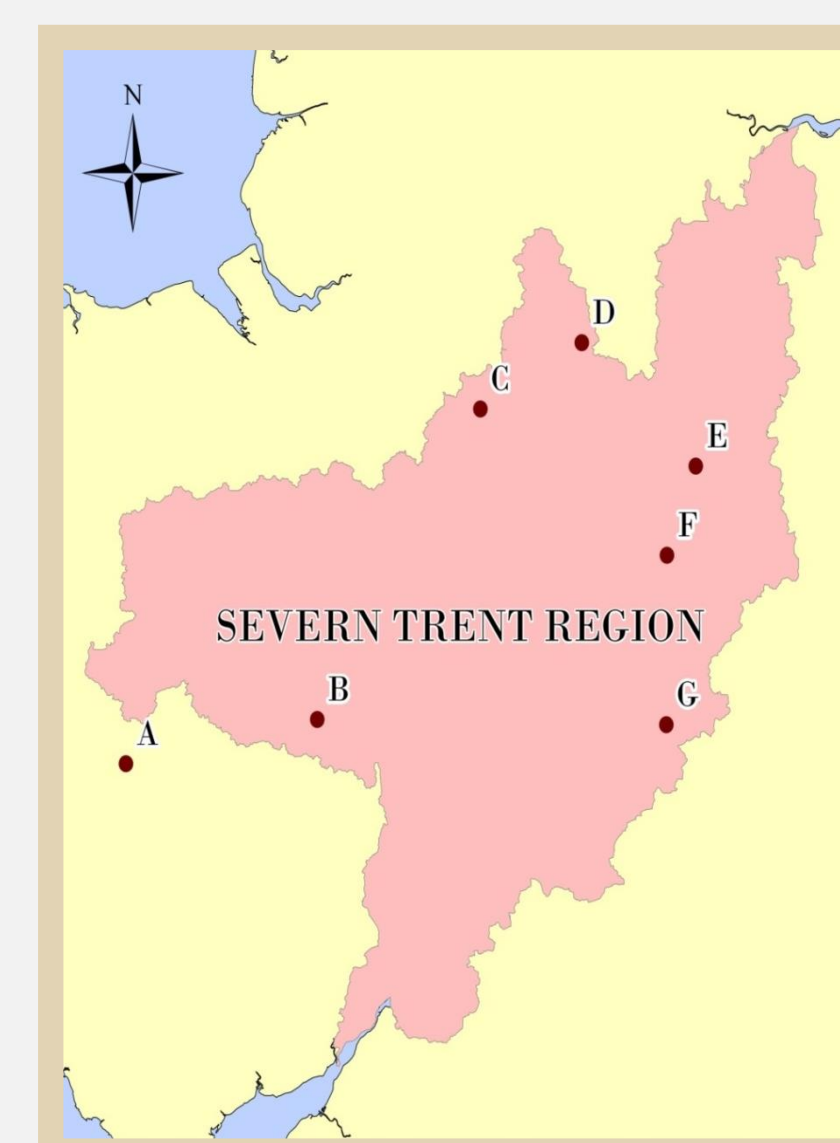


2. STUDY REGION & DATA

Severn Trent Water supply water to 7.4 million people in a 21,100 km² area in the English Midlands and Central Wales.

Water is supplied from varying sources consisting of approximately 40% river abstractions, 30% from reservoirs and 30% groundwater.

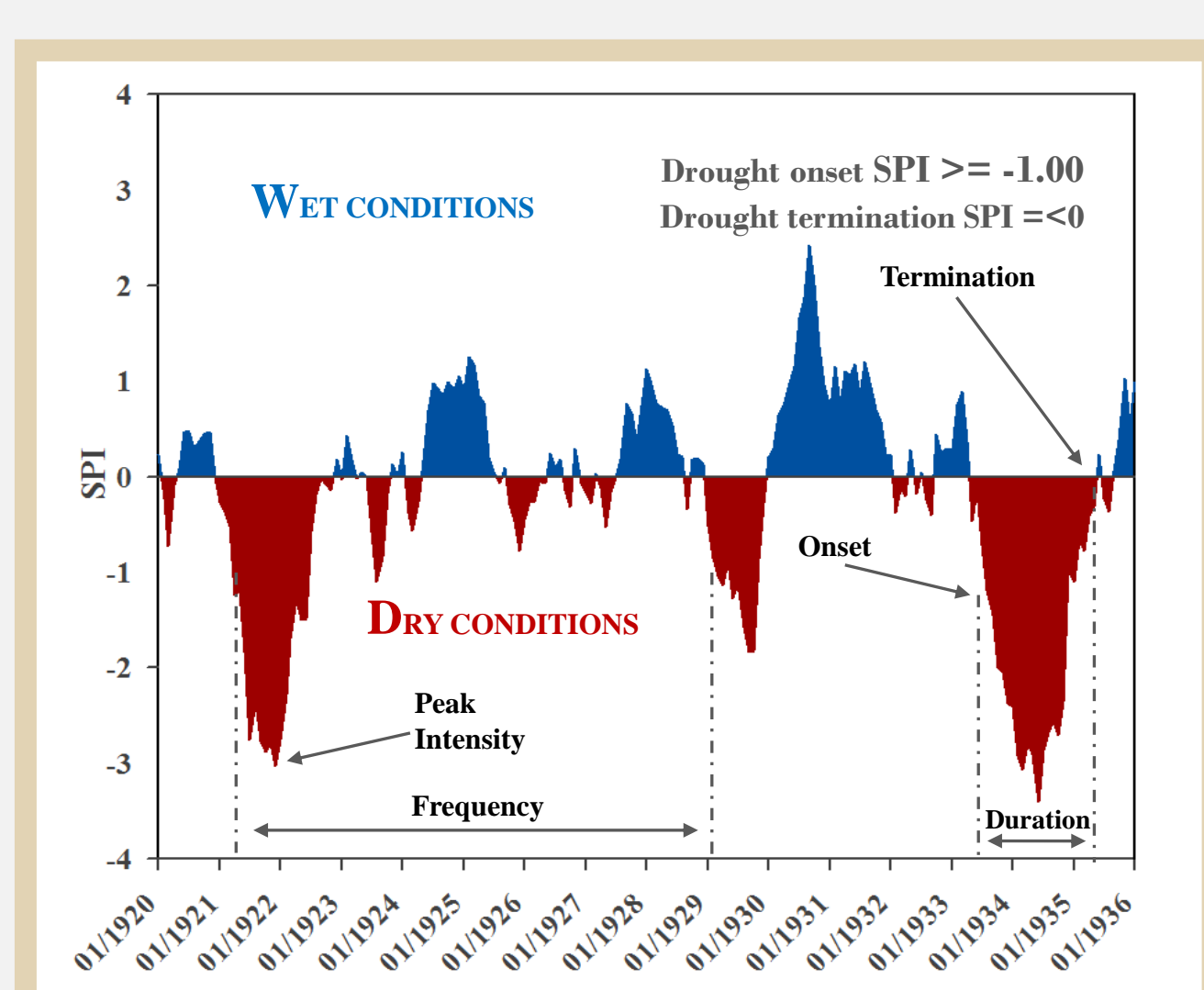
The maps show the Severn Trent region and the 7 rainfall records labelled A-G used in the analysis.



3. DROUGHT CHARACTERISTICS

Drought characteristics include- frequency, intensity, duration, magnitude, spatial extent, onset and termination.

The Standardised Precipitation Index (SPI) is a commonly used metric to characterise and monitor droughts.



- Extremely wet SPI= 2.00 or more
- Very wet SPI= 1.50 to 1.99
- Moderately wet SPI= 1.00 to 1.49
- Near normal SPI= -0.99 to 0.99
- Moderate drought SPI= -1.00 to -1.49
- Severe drought SPI = -1.50 to -1.99
- Extreme drought SPI = -2.00 or less

4. ANALYSIS OF CHARACTERISTICS

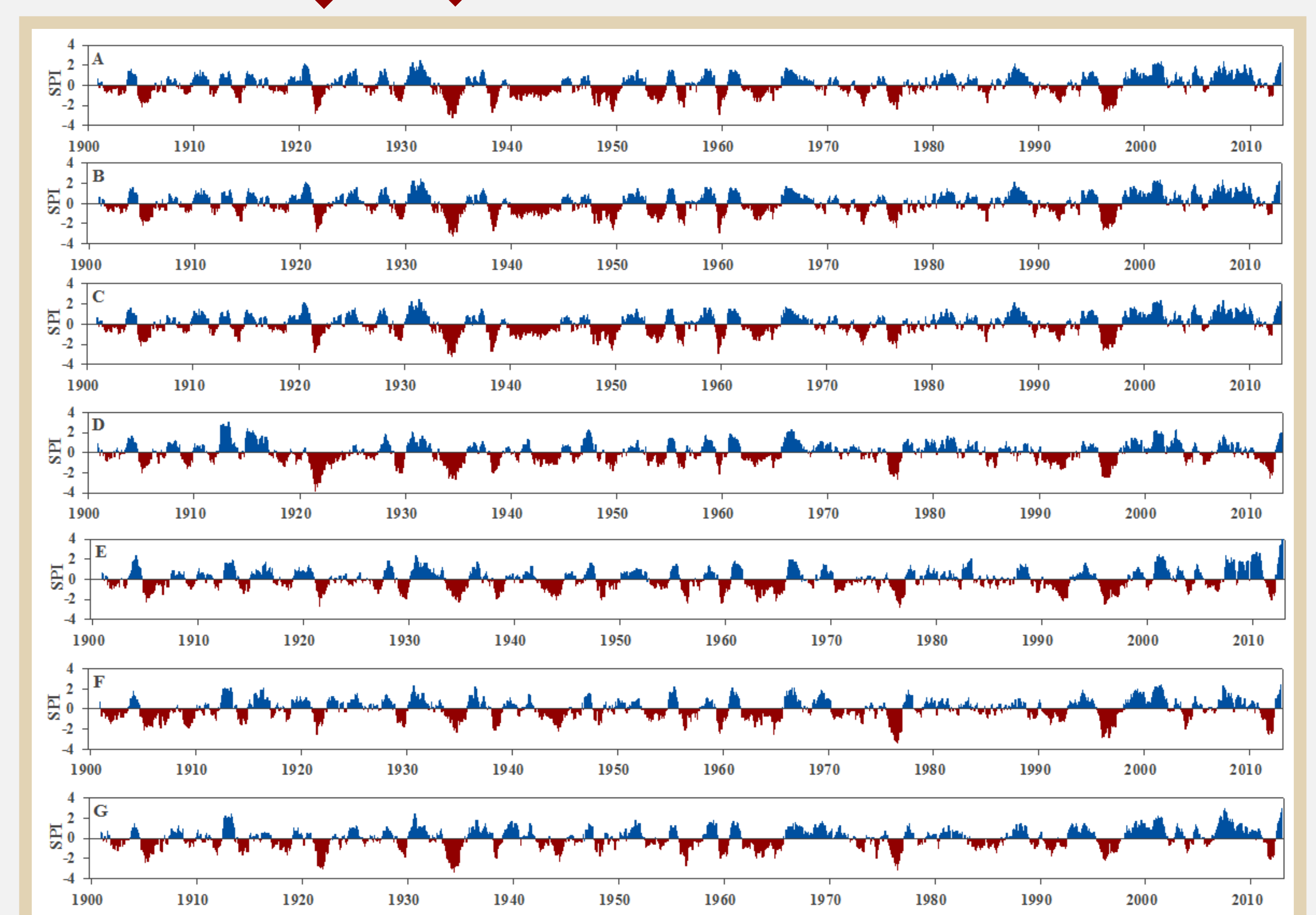
4 'extreme' droughts lasting longer than 12 months in 113 year record.

Regional variability- spatial variability in drought severity and duration across the study region.

Spatial variability in drought characteristics between sites suggests divisions in the drought climatology across the region.

1921-1922 'extreme' drought
Duration from 36 months to 15 months
Peak Severity from -3.89 to -2.56

1933-1934 'extreme' drought
Duration from 27 months to 17 months
Peak Severity from -3.40 to -2.35



1975-1976 'extreme' drought
Duration from 20 months to 16 months
Peak Severity from -3.42 to -2.41

1995-1996 'extreme' drought
Duration from 31 months to 23 months
Peak Severity from -2.83 to -1.50

5. IMPLICATIONS FOR WATER RESOURCES

Reconstructing drought characteristics for past events improves our understanding of drought characteristics and the development of drought conditions in a water supply system.

Analysis of drought characteristics for the water supply region may have implications for water resource management.

Variability could alter recovery times of reservoirs and groundwater supplies.

Variation in drought onset and termination could impact on customer demand across the region.

Understanding the features of past key drought events may be used to inform future management decisions.