The Met Office Fire Severity Index

Contents

- Overview of MOFSI
- Future Plans
- July 2006
- Q&A

Overview

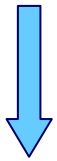
Causes of UK Countryside Fires – A Literature Review

ADAS Report on Developing a Forecast System

Report on Choosing a Fire Severity Index

Operational Implementation

CROW Act 2000 inc. Fire Prevention Restrictions



Countryside Agency: www.openaccess.gov.uk

Criteria for Success

- Is the index drawn from a sound scientific base of evidence?
- Does the index emphasise the high risk periods and increase noticeably/dramatically?
- Can the index pick out the increased risk caused by prolonged drought?
- Can the index pick out risk due to combinations of high winds/low humidity/warm temperatures when drought is absent or not severe?
- Are all the weather inputs required for the index available from forecast data?
- Is the index based on physical process modelling with a documented scientific backup?
- Does it discriminate well statistically against observations of fire risk?
- Has it been used successfully elsewhere in the world?

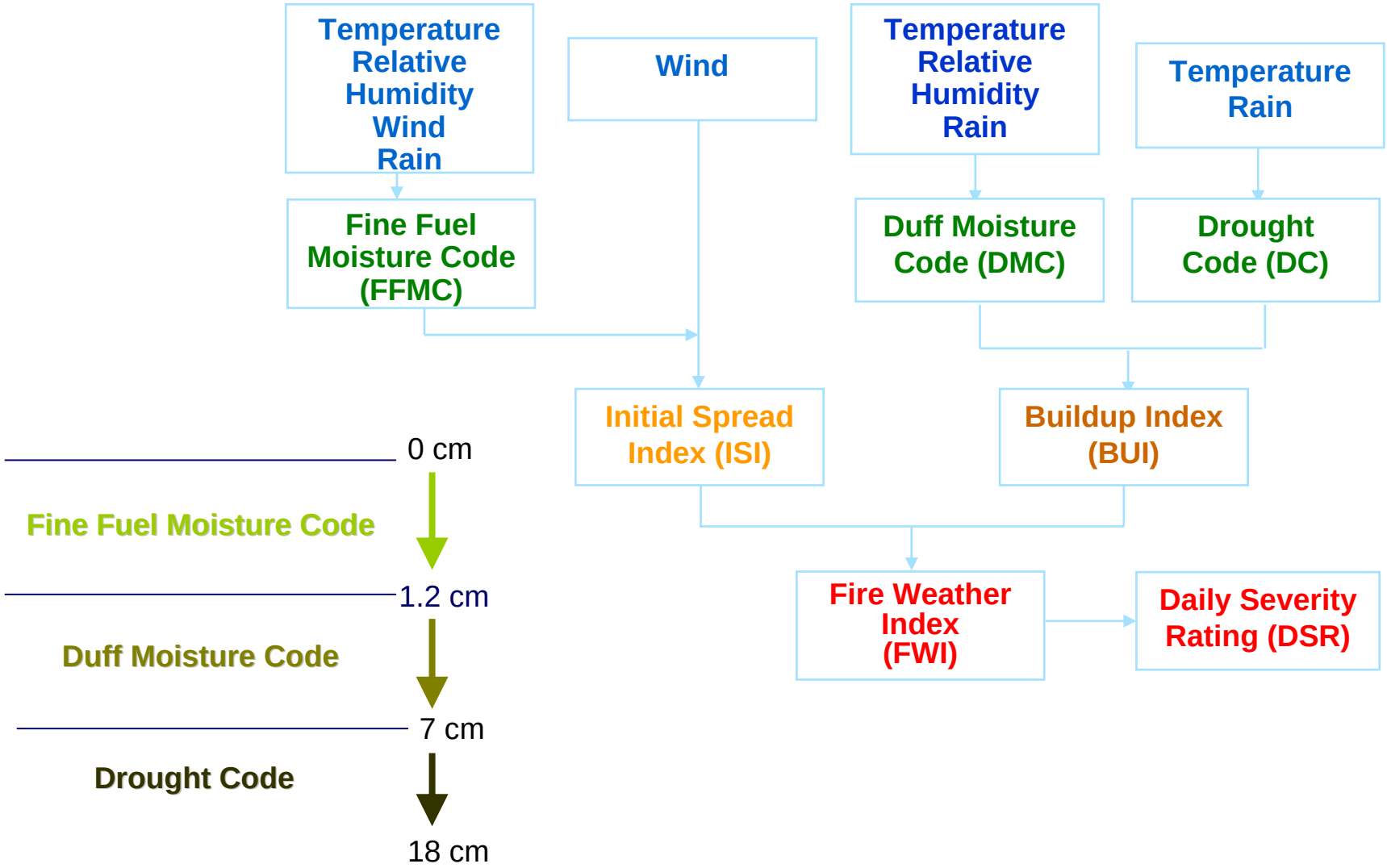
Why Canadian DSR?

- Good at picking out periods of greatest risk in
  - Hot dry summers
  - Wet summers
  - Springtime
- Strong scientific basis
- More sensitive with greater value range
- Can identify fire risk from a range of different weather scenarios
- Applicable across vegetation types
- Used successfully outside Canada

Met. Office Rainfall and Evaporation Calculation System

- Gives information on evaporation and soil moisture not fire risk
- Can be used to indicate vegetation stress
- Only valid on day of forecast
- Produced weekly
- Results averaged over 40kmx40km sq.
- Does not take into account high winds, warm temp & air humidity

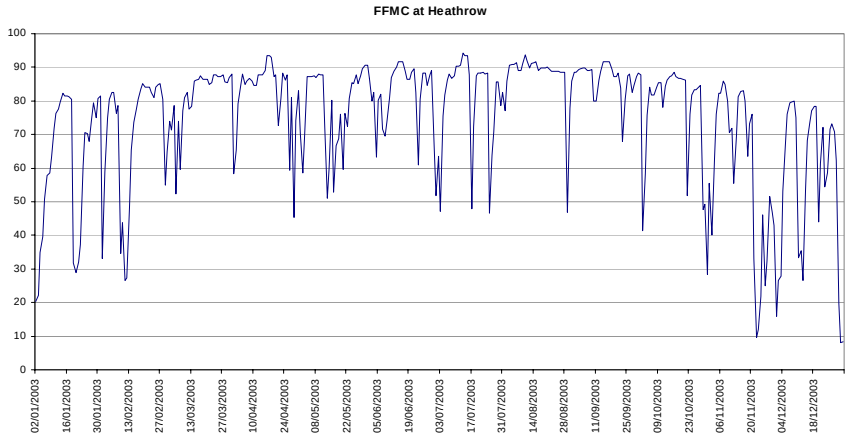
Canadian Danger Rating System



Moisture Codes (1)

Fine Fuel Moisture Code

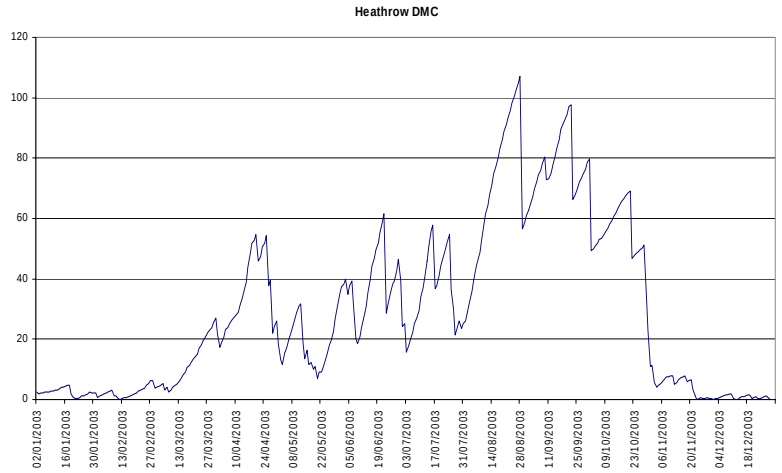
- Moisture content of litter layers down to 1.2 cm in depth
- Designed to predict daily peak fire danger
- Related to ease of ignition
- Rainfall key to reduction in value
- Memory of a few days



Moisture Codes (2)

Duff Moisture Code

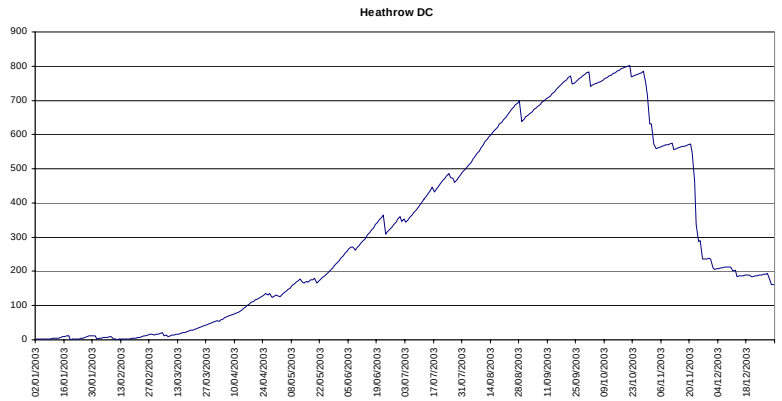
- Moisture content of litter layers down to 7cm in depth
- Fermentation layer of the soil
- Rainfall key to reduction in value
- Duff consumption main source of energy produced by moving flame front
- Daylength adjustment
- Timelag of ~12 days



Moisture Codes (3)

Drought Code

- Measures long term seasonal drought effects
- Tends to rise gradually throughout the warm part of the season and fall when cool weather starts
- Deep organic layers down to 18cm
- Risk from smothering combustion
- Rainfall key to reduction in value
- Captures moisture reversal
  - Wetter on surface than in deep duff
- Daylength adjustment
- Timelag of ~53 days



Initial Spread and Build Up Indices

Initial Spread Index

- combines the effects of wind speed and FFMC on fire spread
- Basic rate at which a fire will spread when fine fuel is dry
- ISI doubles for every 14km/h increase in wind speed

Build Up Index

- total amount of fuel available for combustion
- combines DMC and DC
- Gives a limited variable weighting to DC
- In general
  - if DMC = 0, BUI = 0
  - DC weighting is variable
  - Tend to get higher BUI in autumn than spring

Indices

Fire Weather Index

- total amount of fuel available for combustion
- combines DMC and DC

Daily Severity Rating

- relates to Fire Weather Index
- Weights fire danger days in terms of fire behaviour and resistance to control
- Gives fire load averaged over a period of time

$$DSR = 0.02725\, f^{1.77}$$

Exceptional Conditions

- Aim to find a critical value to indicate exceptional risk regardless of geography or location

- Bandings
  - Exceptional
  - High
  - Moderate
  - Low
  - Very Low

- Initially derived from observational data based on
  - 1976 and 1995
  - Spring 2003 fire risk trial period
  - 30 years of data
  - Dates of fires at Canford Heath (Dorset)

Amended thresholds to 4 for spring / autumn and 6.4 for summer

Restrictions Process

For the start of an exceptional period

- The Met Office daily FSI for day 0 or day 1 (the current or following day) should be at exceptional.

For the end of an exceptional period

- The Met Office daily FSI for day 0 must be Very Low, Low, Moderate, or High for 5 consecutive days.

Or

- The Met Office daily FSI for day 0 must be Very Low or Low for 3 consecutive days.

- System reviewed by Brian Stocks – Canadian expert
- Programme to develop more vegetation specific components
- Collaboration with universities e.g. Edinburgh
- Discussion at conferences e.g. Portugal
- Drawing on international expertise

Peat Model

- Research has found correlations between the Build Up Index and smouldering in peat
- Ignition point of peat links to DMC and DC values
- Work with Edinburgh University will look at:
  - Peat moisture content – combines laboratory and fieldwork to understand changes in moisture and construct drying curves and moisture profiles which can be used in the FSI model
  - Peat ignition and combustion – compare research on ignition levels of peat to UK conditions and understand smouldering to be applied to numerical models of peat fire danger which can be linked to FSI
- Timescales
  - August 06 – August 08
  - Preliminary report Feb 07
  - FSI Upgrades prior to start of fire season each year based on verification and definable improvements compared to current model

Firebeaters Phase 1

Funded work packages

1. Extension of MOFSI to Scotland
2. Database of management and wildfire records
3. Development of Muirburn Model
   a. A fuel moisture model for heather
   b. Additional experimental fires
   c. Validation fires
4. Implementation

See www.firebeaters.org.uk for further information

Timeline

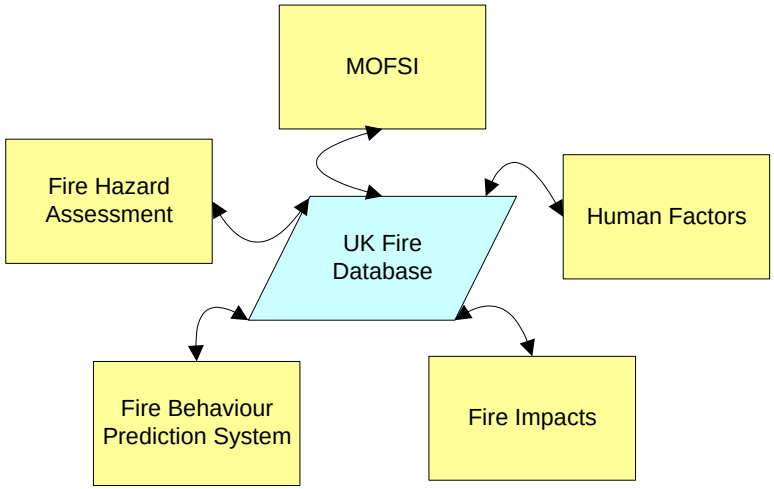
Firebeaters Proposed Phase 2

Aims to provide a range of tools to predict:

- the likelihood of wildfires

- the behaviour and controllability of fires once ignited

- the impact of fires on both people and the environment



Potential applications:

- improve MOFSI to maximise use of different bands and subcomponents for planning and land management

- forecast risk of fires occurring to take action and plan resources

- identify conditions for management burning

minimise risk and maximise benefits of prescribed burns

July 2006

- Brief Presentation to:
  - Summarise the weather in July 2006
  - Put July 2006 in Context of Previous years
  - Look at the preceding months and how they compare to other years
  - Consider how 2006 compared to 1976 and other exceptional fire years
  - Provide an overall of the FSI during July 2006
  - Analyse some key features of the FSI to inform later discussions

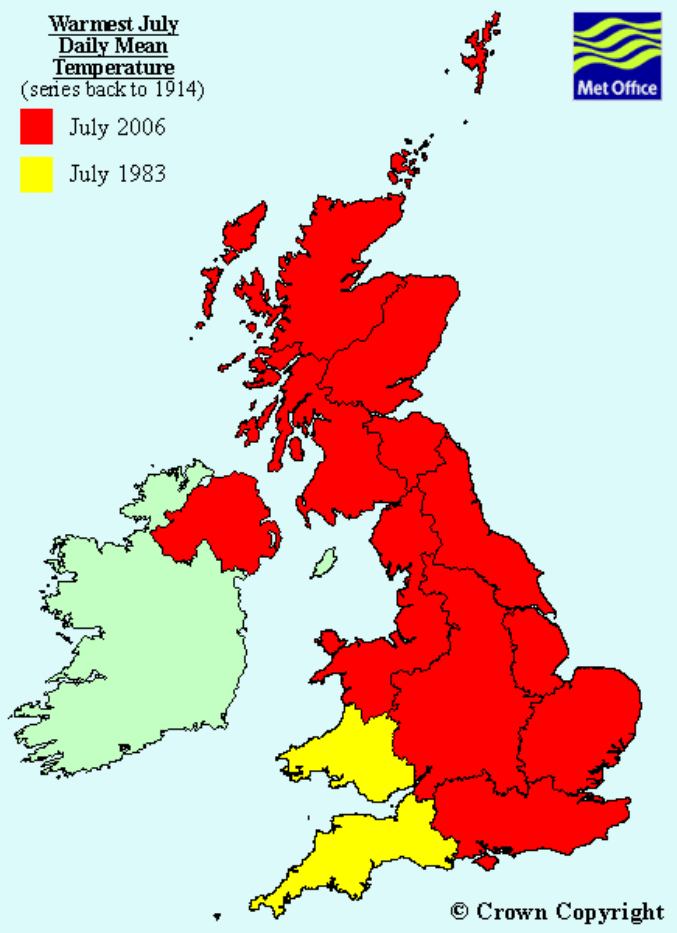
July 2006

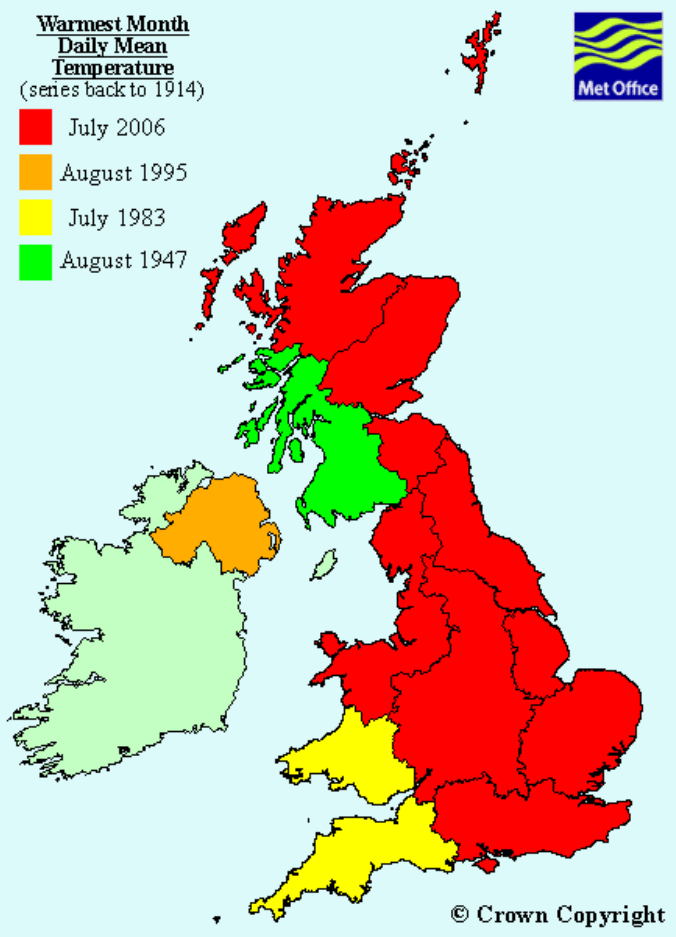
Summary: exceptionally warm and sunny with below average rainfall but …

- Variation across the country
- Rainfall was often thundery, heavy when it did occur and isolated
- Early part of the month was sunny with warm southeast winds. Some rainfall:
  - Rochdale 43.8mm in 12 hours on 2nd
  - St Bee's Head in Cumbria 18.6mm in one hour on 3rd
  - Brize Norton in Oxfordshire 54mm in 12 hours on 6th
  - Shap in Cumbria 23mm in 24 hours on 9th
- Mid July was warm and sunny for most but with thundery showers especially in the east and south
- End of the month saw more rain over northern England but generally high temperatures
- Maximum July temperature ever recorded at Wisley in Surrey (36.5C) on 19th July.

Weather in Context – July 06

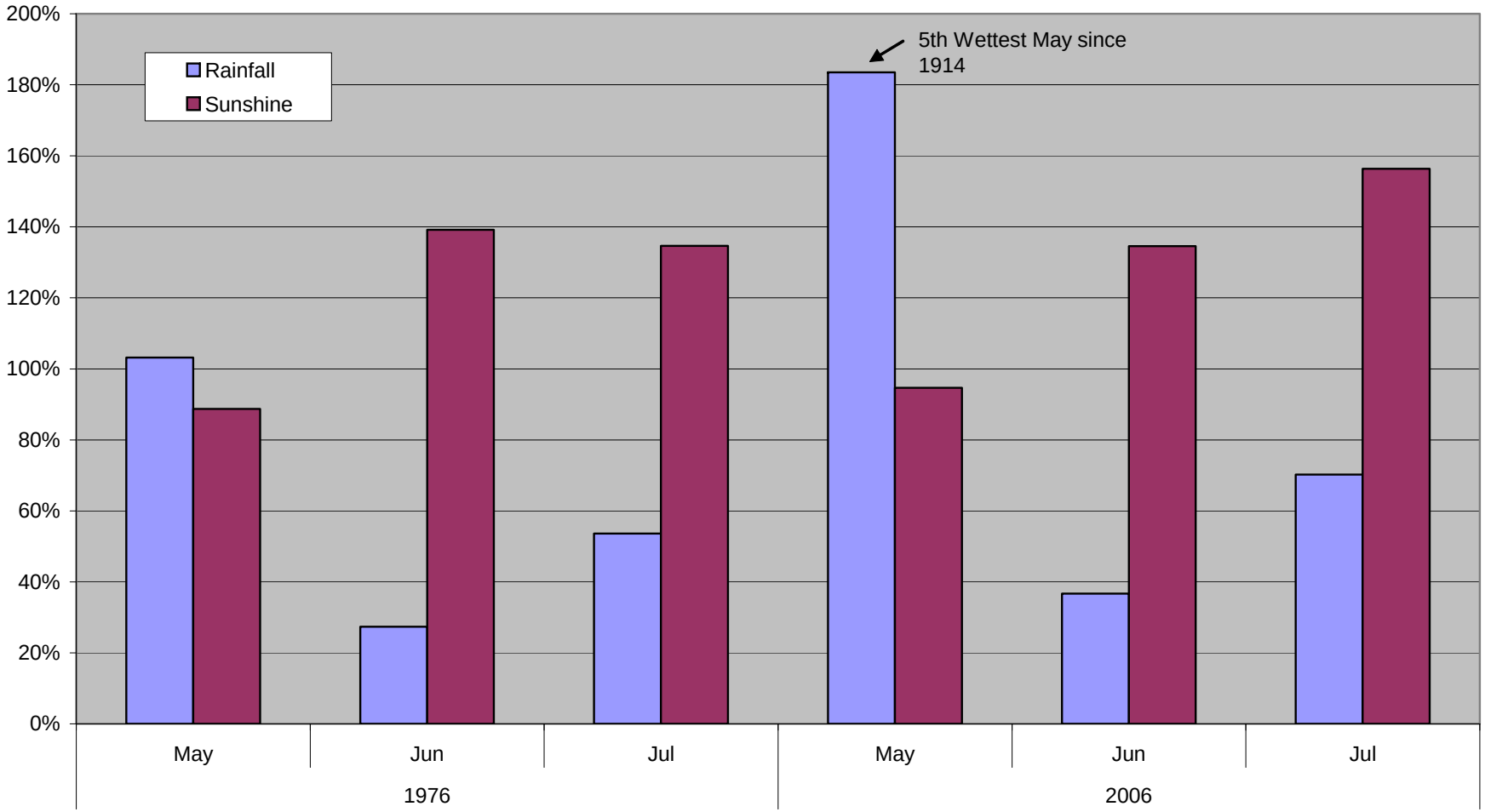
- July 2006 was the warmest July and warmest month ever in most of the country



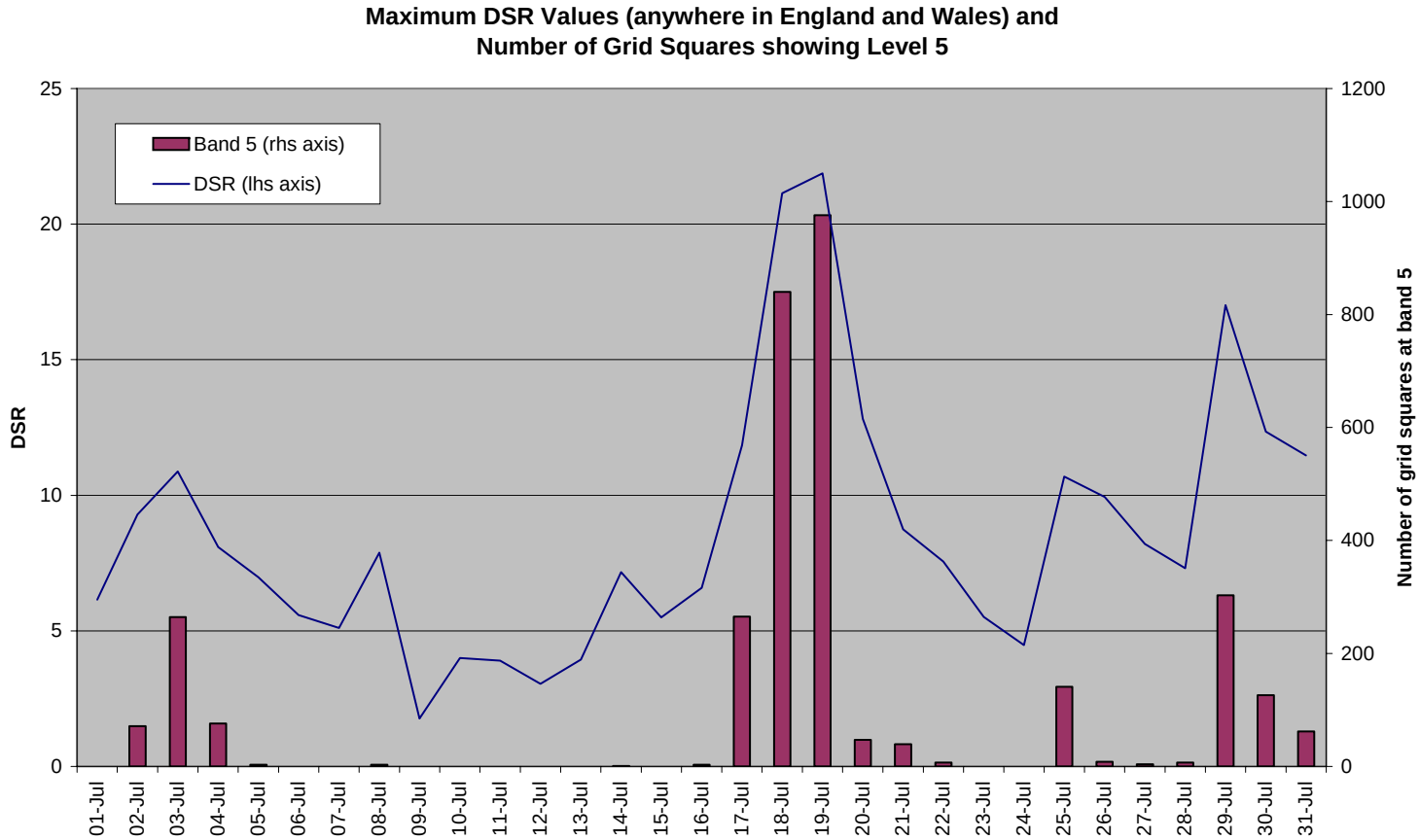


% of LTA

% of 1971-2000 Long Term Averages for 1976 and 2006 for England



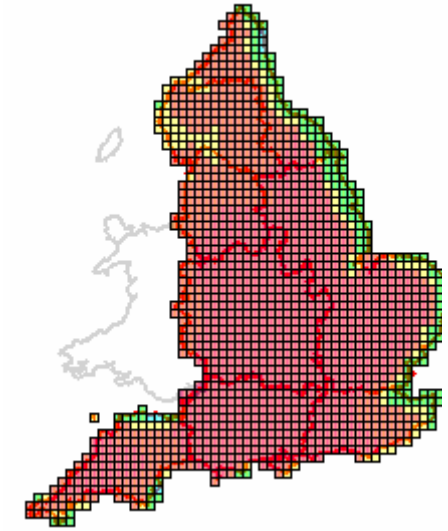
All England Pattern of FSI Values



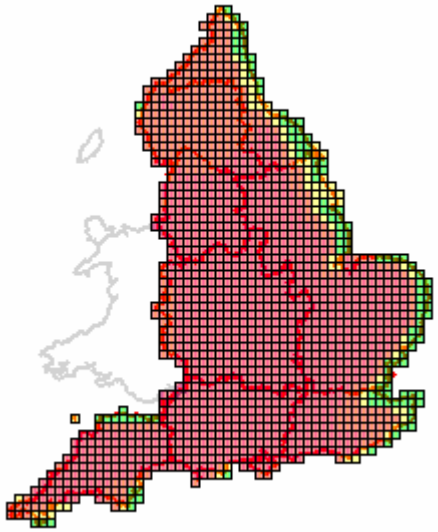
- Somewhere in England was level 5 for much of July but not necessary land with outline directions on it.
- Very high values mid July (peaks 18th and 19th)

FSI Maps from CA Website

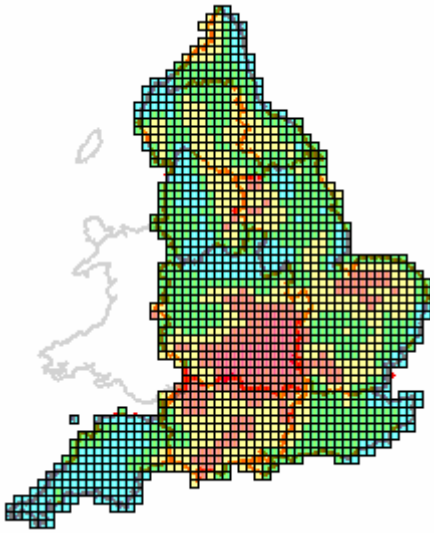
18th July 2006



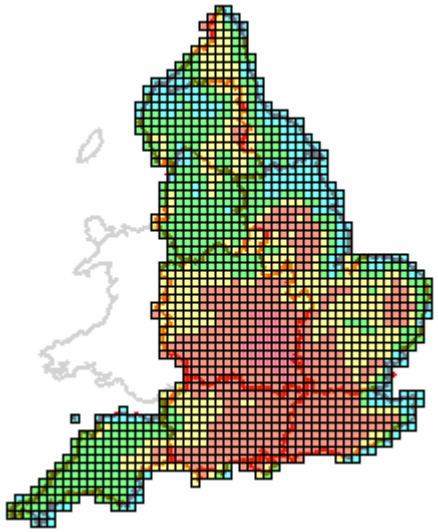
19th July 2006



20th July 2006



21st July 2006



Questions