



Supplement of

Historic hydrological droughts 1891–2015: systematic characterisation for a diverse set of catchments across the UK

Lucy J. Barker et al.

Correspondence to: Lucy J. Barker (lucybar@ceh.ac.uk)

The copyright of individual parts of the supplement might differ from the CC BY 4.0 License.

Table S1: The 108 LFBN catchments used in this study, their hydroclimate region and area (from: National River Flow Archive, 2019). For more information about catchments see the National River Flow Archive (www.nrfa.ceh.ac.uk/). The nine case study catchments are marked with an asterisk.

NRFA Station Number	Catchment Name	Hydroclimate Region	Area (km ²)
3003	Oykel at Easter Turnaig	WS	330.7
7001	Findhorn at Shenachie	WS	415.6
8004	Avon at Delnashaugh	ES	542.8
8009	Dulnain at Balnaan Bridge	ES	272.2
12001	Dee at Woodend	ES	1370
12005	Muick at Invermuick	ES	110
16003	Ruchill Water at Cultybraggan	ES	99.5
17005	Avon at Polmonthill	ES	195.3
*18001	Allan Water at Kinbuck	ES	161
20007	Gifford Water at Lennoxlove	ES	64
21017	Ettrick Water at Brockhoperig	ES	37.5
21024	Jed Water at Jedburgh	ES	139
22001	Coquet at Morwick	NEE	569.8
23004	South Tyne at Haydon Bridge	NEE	751.1
24004	Bedburn Beck at Bedburn	NEE	74.9
25006	Greta at Rutherford Bridge	NEE	86.1
26003	Foston Beck at Foston Mill	NEE	57.2
*27035	Aire at Kildwick Bridge	NEE	282.3
27042	Dove at Kirkby Mills	NEE	59.2
27047	Snaizholme Beck at Low Houses	NEE	10.2
27051	Crimple at Burn Bridge	NEE	8.1
27071	Swale at Crakehill	NEE	1363
27073	Brompton Beck at Snainton Ings	NEE	12.9
28046	Dove at Izaak Walton	ST	83
28072	Greet at Southwell	ST	46.2
*29003	Lud at Louth	ANG	55.2
29009	Ancholme at Toft Newton	ANG	27.2
30004	Lymn at Partney Mill	ANG	61.6
30012	Stainfield Beck at Cream Poke Farm	ANG	37.4
30015	Cringle Brook at Stoke Rochford	ANG	50.5
32003	Harpers Brook at Old Mill Bridge	ANG	74.3
33018	Tove at Cappenham Bridge	ANG	138.1
33029	Stringside at Whitebridge	ANG	98.8
34011	Wensum at Fakenham	ANG	161.9
36003	Box at Polstead	ANG	53.9
37005	Colne at Lexden	ANG	238.2
38026	Pincey Brook at Sheering Hall	SE	54.6
*39019	Lambourn at Shaw	SE	234.1
39020	Coln at Bibury	SE	106.7
39025	Enborne at Brimpton	SE	147.6
39028	Dun at Hungerford	SE	101.3
39034	Evenlode at Cassington Mill	SE	430
40011	Great Stour at Horton	SE	345
41022	Lod at Halfway Bridge	SE	52
41025	Loxwood Stream at Drungewick	SE	91.6

NRFA Station Number	Catchment Name	Hydroclimate Region	Area (km²)
41027	Rother at Princes Marsh	SE	37.2
41029	Bull at Lealands	SE	40.8
42003	Lymington at Brockenhurst	SE	98.9
42008	Cheriton Stream at Swards Bridge	SE	75.1
43014	East Avon at Upavon	SE	85.78
44006	Sydling Water at Sydling St Nicholas	SE	12.4
45005	Otter at Dotton	SWESW	202.5
46005	East Dart at Bellever	SWESW	21.5
47009	Tiddy at Tideford	SWESW	37.2
48003	Fal at Tregony	SWESW	87
49004	Gannel at Gwills	SWESW	41
50002	Torridge at Torrington	SWESW	663
52010	Brue at Lovington	SE	135.2
52016	Currypool Stream at Currypool Farm	SE	15.7
53006	Frome (Bristol) at Frenchay	SE	148.9
53008	Avon at Great Somerford	SE	303
53009	Wellow Brook at Wellow	SE	72.6
53017	Boyd at Bitton	SE	47.9
*54008	Teme at Tenbury	ST	1134.4
54018	Rea Brook at Hookagate	ST	178
54025	Dulas at Rhos-y-pentref	ST	52.7
54034	Dowles Brook at Oak Cottage	ST	40.8
55014	Lugg at Byton	SWESW	203.3
55016	Ithon at Disserth	SWESW	358
55026	Wye at Ddol Farm	SWESW	174
55029	Monnow at Grosmont	SWESW	354
56013	Yscir at Pont-Ar-Yscir	SWESW	62.8
*57004	Cynon at Abercynon	SWESW	106
60002	Cothi at Felin Mynachdy	SWESW	297.8
60003	Taf at Clog-y-Fran	SWESW	217.3
62001	Teifi at Glanteifi	SWESW	893.6
65001	Glaslyn at Beddgelert	NWENW	68.6
65005	Erch at Pencaenewydd	NWENW	18.1
66004	Wheeler at Bodfari	NWENW	62.9
67018	Dee at New Inn	NWENW	53.9
68005	Weaver at Audlem	NWENW	207
72005	Lune at Killington	NWENW	219
72014	Conder at Galgate	NWENW	28.5
73005	Kent at Sedgwick	NWENW	209
73011	Mint at Mint Bridge	NWENW	65.8
*75017	Ellen at Bullgill	NWENW	96
76014	Eden at Kirkby Stephen	NWENW	69.4
77004	Kirtle Water at Mossknowe	WS	72
78004	Kinnel Water at Redhall	WS	76.1
79002	Nith at Friars Carse	WS	799
79004	Scar Water at Capenoch	WS	142
*81002	Cree at Newton Stewart	WS	368
81004	Bladnoch at Low Malzie	WS	334

NRFA Station Number	Catchment Name	Hydroclimate Region	Area (km²)
83006	Ayr at Mainholm	WS	574
83010	Irvine at Newmilns	WS	72.8
84022	Duneaton at Maidencots	WS	110.3
85003	Falloch at Glen Falloch	WS	80.3
90003	Nevis at Claggan	WS	69.2
93001	Carron at New Kelso	WS	137.8
94001	Ewe at Poolewe	WS	441.1
96002	Naver at Apigill	WS	477
201008	Derg at Castlederg	NI	335.4
202002	Faughan at Drumahoe	NI	273.1
203028	Agivey at Whitehill	NI	100.5
*203042	Crumlin at Cidercourt Bridge	NI	55.3
204001	Bush at Seneirl Bridge	NI	299.2
205008	Lagan at Drumiller	NI	84.6
206001	Clanrye at Mountmill Bridge	NI	120.3

Table S2: Catchments and months with missing SSI-3 values

NRFA Station Number	Catchment Name	Months with missing SSI-3 values	Impact
29003	Lud at Louth	2007-09	No impact on the extracted drought events
40011	Great Stour at Horton	1921-12	Splits a drought event which without the missing value would be the longest (and most severe in terms of accumulated deficit) event in this catchment
54034	Dowles Brook at Oak Cottage	2007-07; 2007-08	No impact on the extracted drought events
72014	Conder at Galgate	1907-07	No impact on the extracted drought events

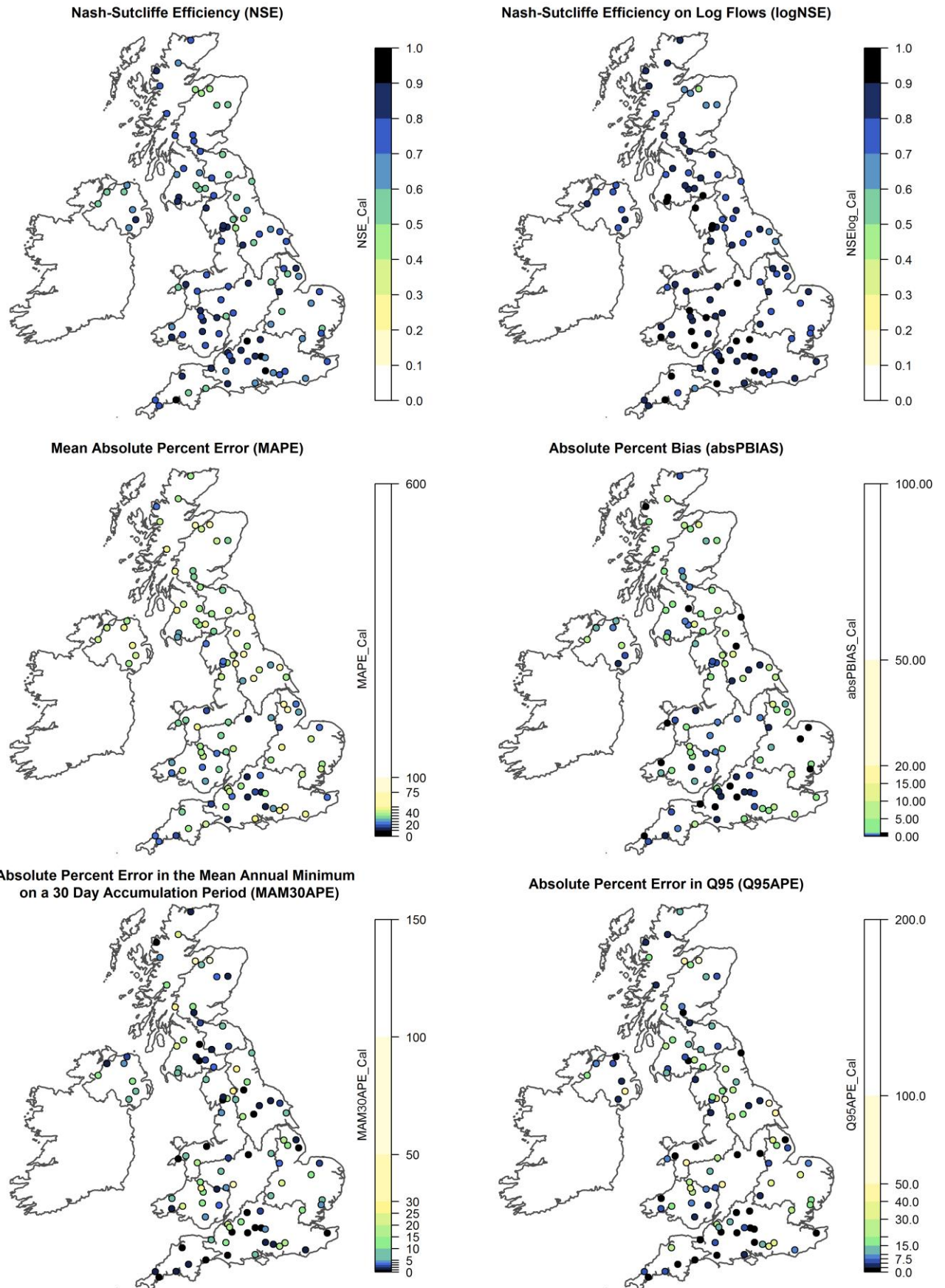


Figure S1: Model performance metrics from Smith et al. (2018) for the 108 LFBN catchments used in this study. Darker colours indicate better model performance.

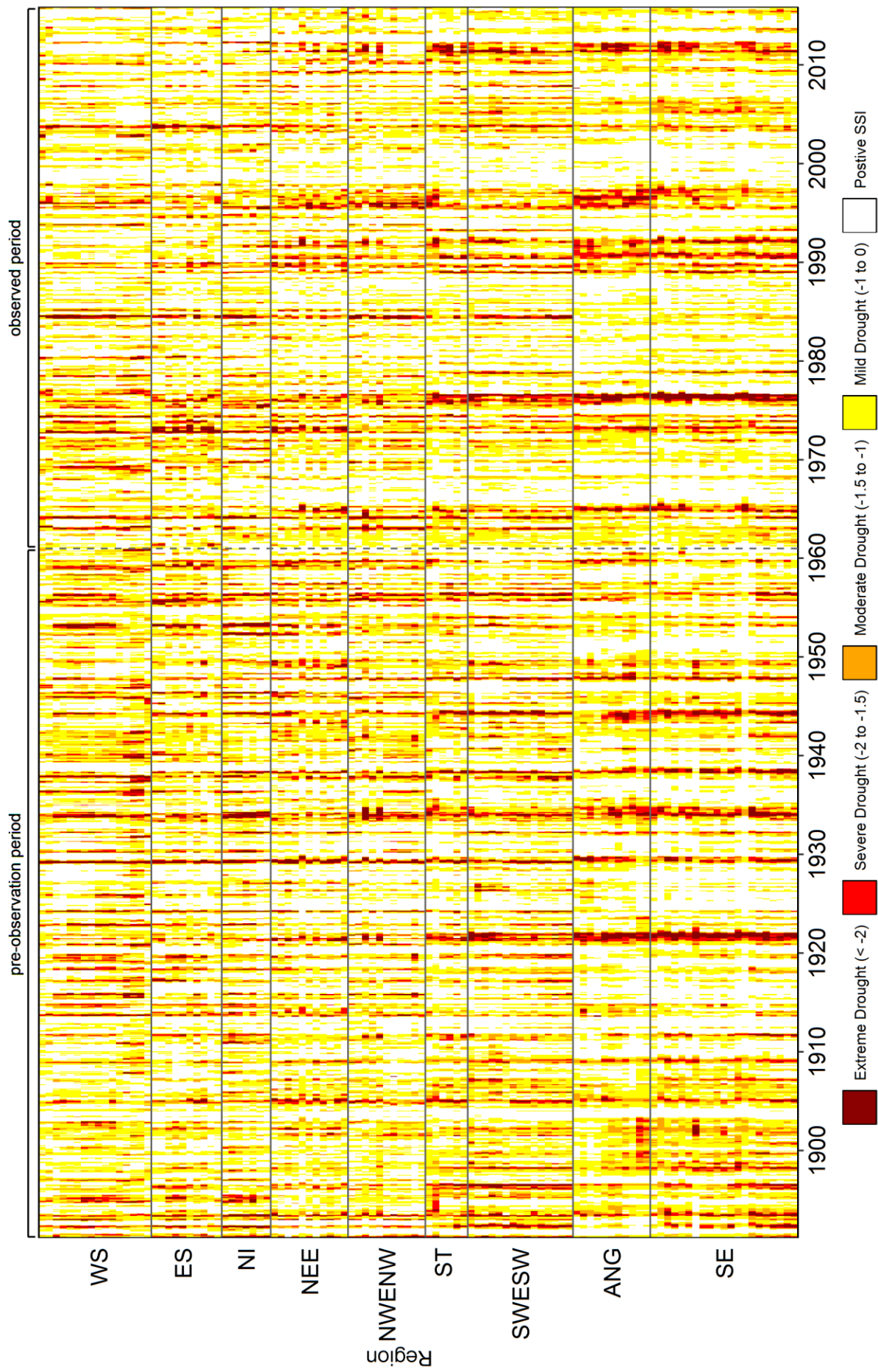


Figure S2: Heatmap of SSI-3 for LFBN catchments (arranged roughly from north to south on the y-axis with one row per catchment and regions marked for clarity) from 1891 to 2015.

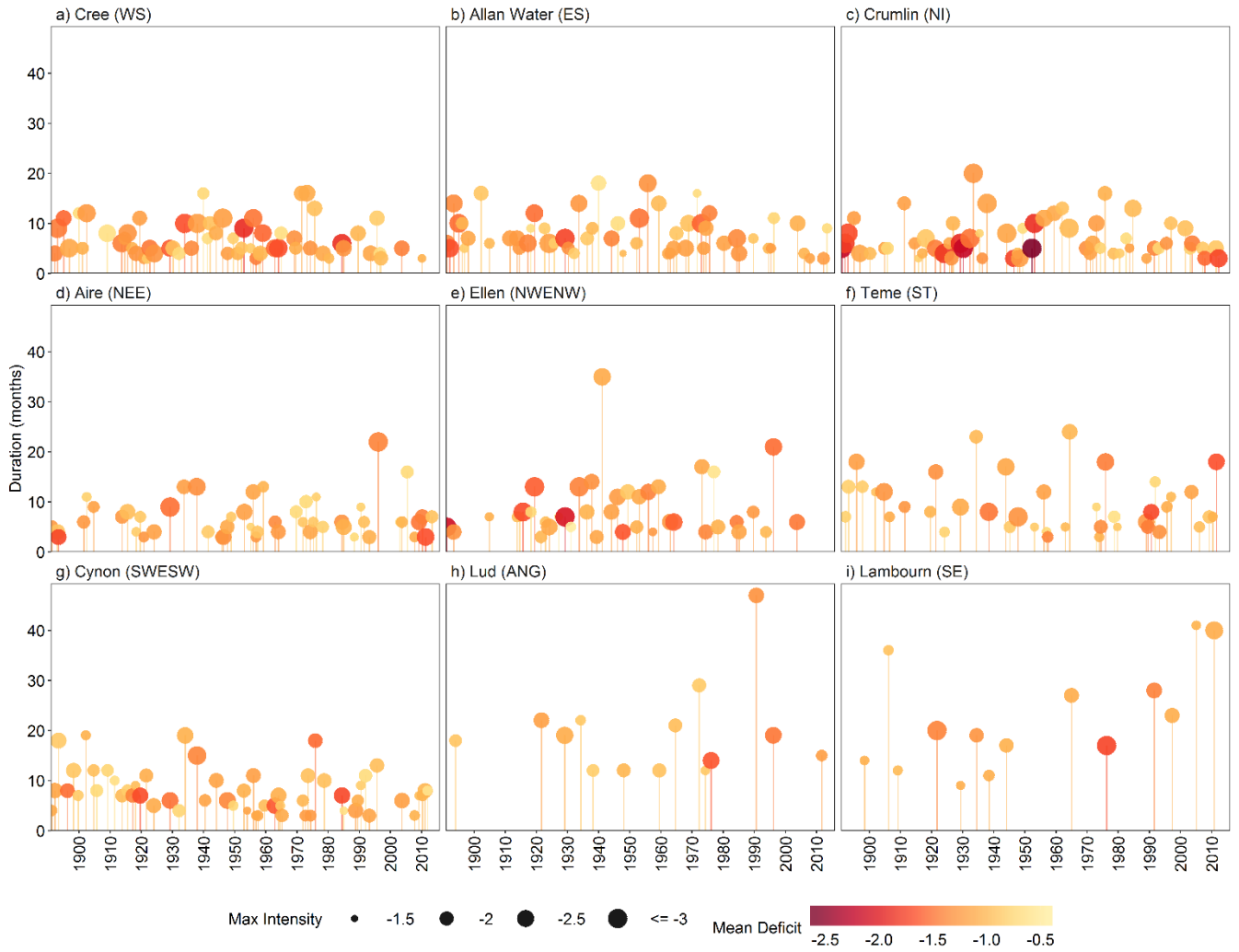


Figure S3: Extracted events from SSI-3 and their characteristics for the nine case study catchments, plotted at the midpoint of the event. The size of each point is proportional to the maximum intensity and the colour indicates the mean deficit.

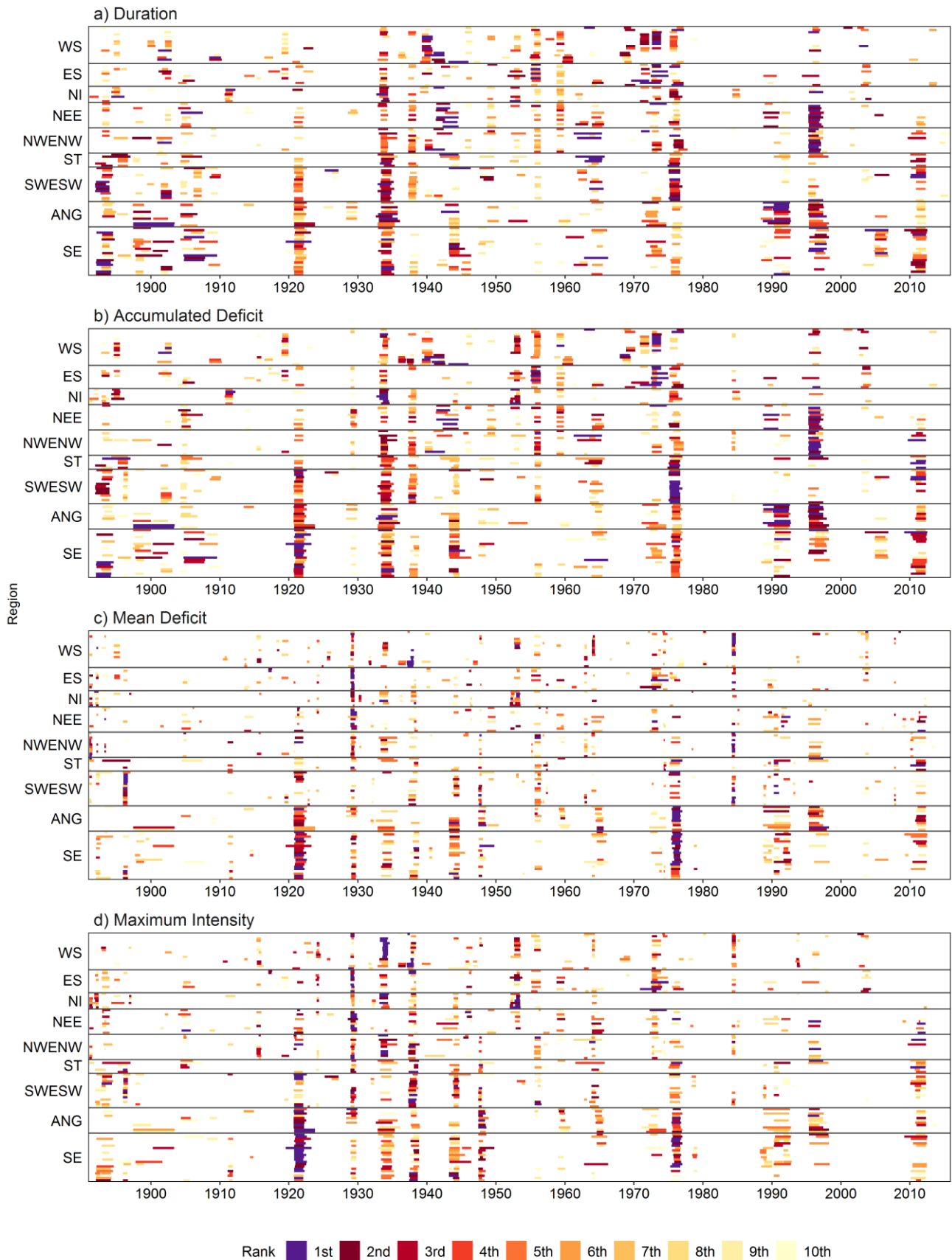


Figure S4: Top 10 extracted events from SSI-3 using a threshold of -1.5 for each drought event characteristic. Catchments are arranged roughly from north to south on the y-axis with each row representing a catchment. Bars represent the top 10 events and are coloured according to the event rank; darker shades represent higher ranking (i.e. more severe) events.

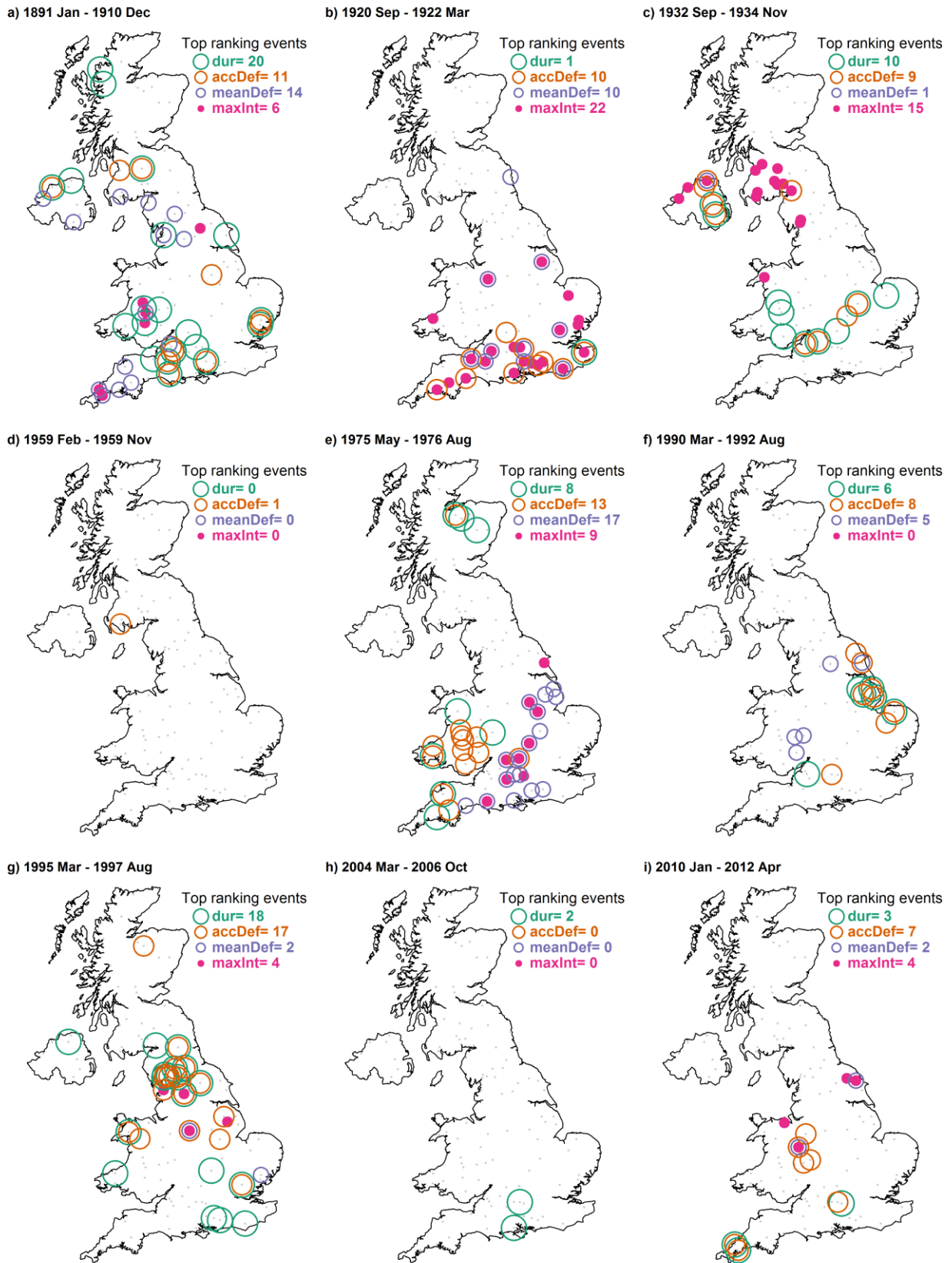


Figure S5: Location and number of LFBN catchments where the top ranking SSI-3 event corresponds to major events (Table 1) for duration (dur), accumulated deficit (accDef), mean deficit (meanDef) and maximum intensity (maxInt). Each of the nine maps represents one of the major drought events listed in Table1. Each point on the maps represents the location of the 108 LFBN catchments. Points are coloured pink where the particular event was ranked most severe according to maximum intensity for that catchment. Similarly, points are circled in purple, orange and turquoise to indicate catchments where the particular event was ranked most severe in terms of mean deficit, accumulated deficit and duration, respectively. The numbers in the top right of each map show the number of catchments ranked as most severe for each characteristic for that particular event.

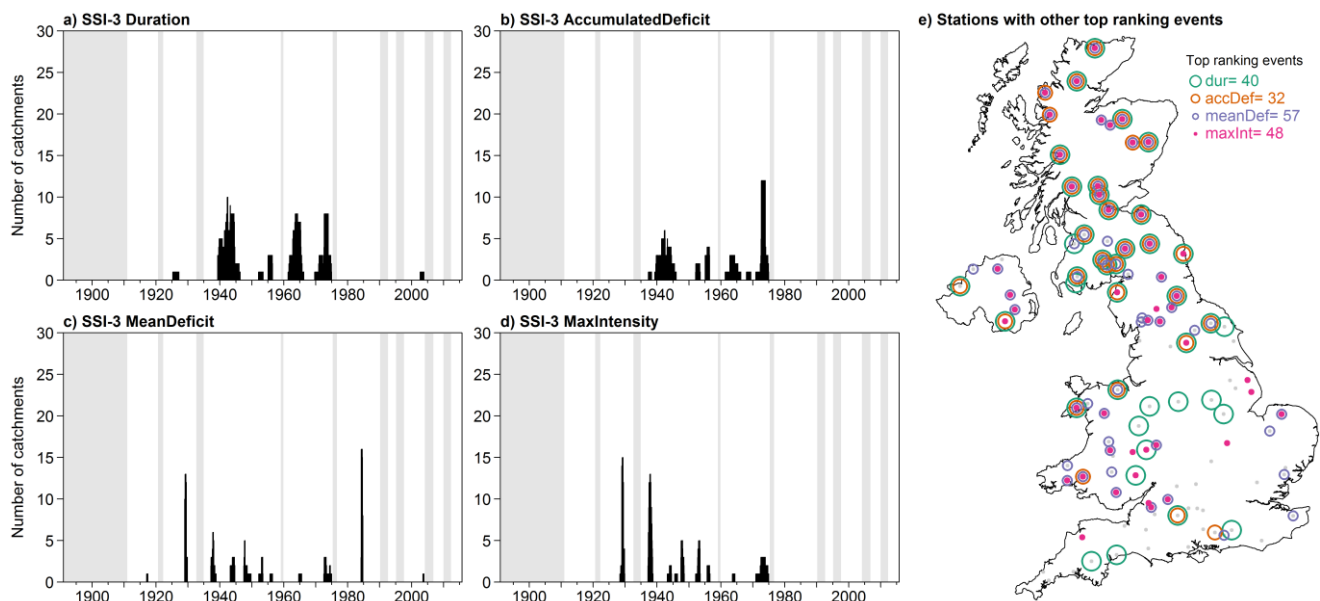
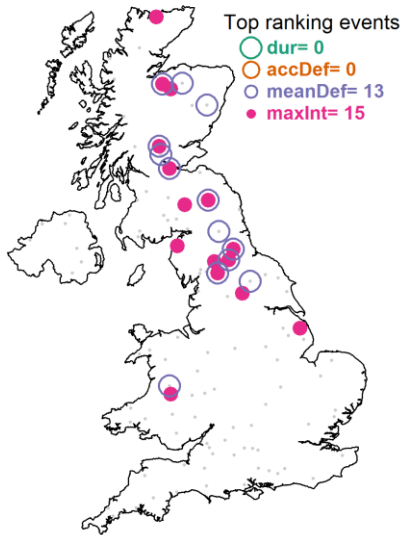
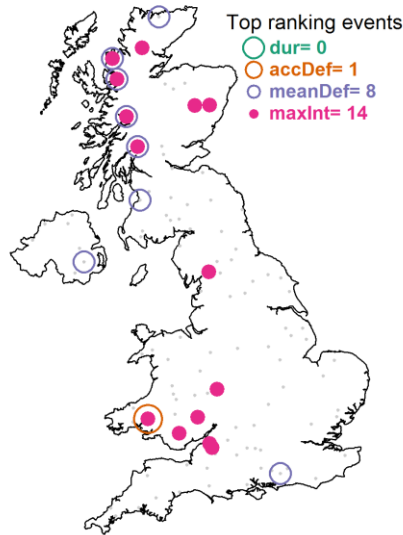


Figure S6: Months when SSI-3 top ranked events occurred outside of the major events (shaded in grey) for the LFBN catchments and each event characteristic (a-d), and e) the location and number of catchments with other top ranking events for each event characteristic. Points are coloured as described in the caption for Figure S5.

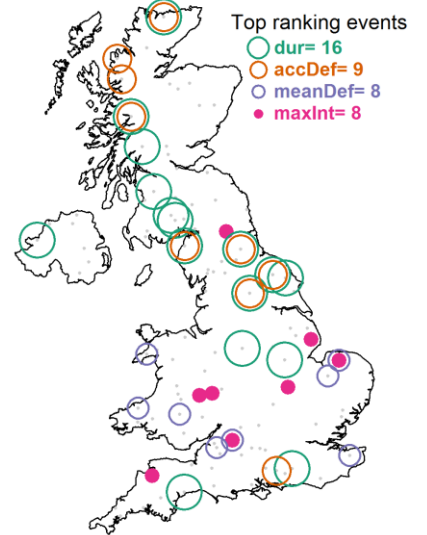
a) 1928 Jan - 1929 Dec



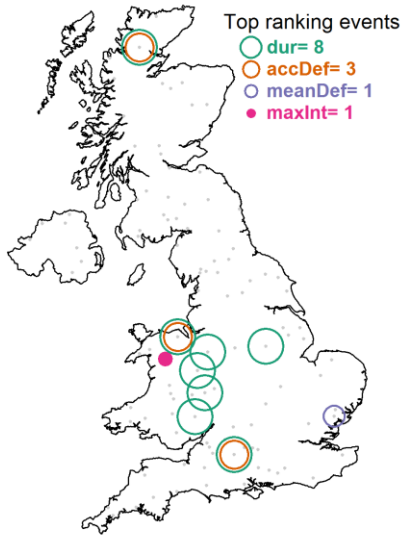
b) 1937 Jan - 1938 Dec



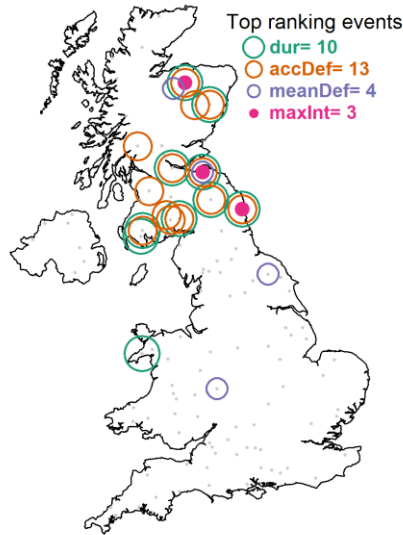
c) 1940 Jan - 1949 Dec



d) 1960 Jan - 1966 Dec



e) 1968 Jan - 1975 Apr



f) 1984 Jan - 1984 Dec

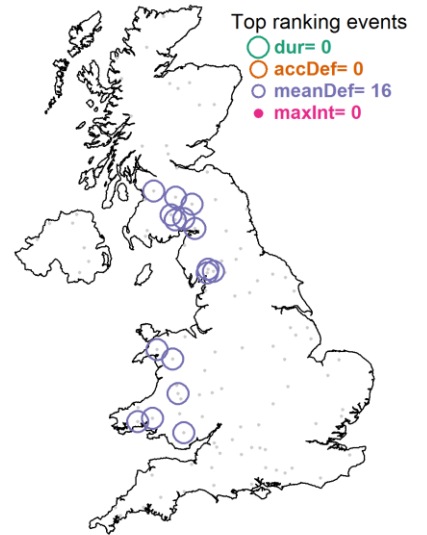


Figure S7: Location and number of LFBN catchments where the top ranking SSI-3 events for each event characteristic occur in periods outside of the major drought events: a) 1928-129, b) 1937-1938, c) 1940-1949, d) 1960-1966, e) 1968-1975 and f) 1984. Points are coloured as described in the caption for Figure S5.

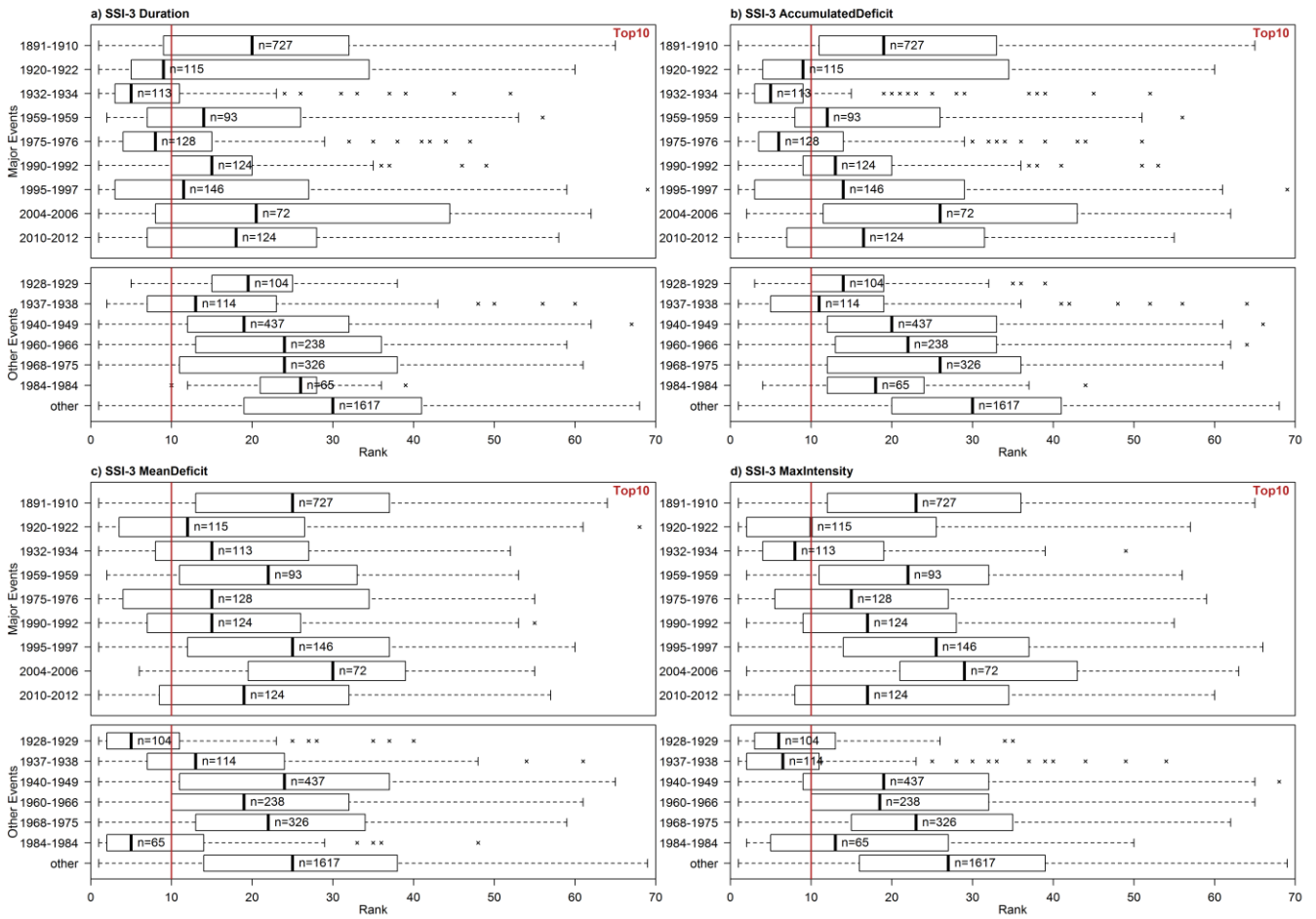


Figure S8: Boxplots showing the ranks of all extracted SSI-3 events where they overlap with the major drought events (top panel for each event characteristic) and identified ‘other’ events (bottom panel for each event characteristic). Within each box, n refers to the total number of events (across the LFBN) identified that occurred within this period. As multiple events can occur within each given period in individual catchments, it is possible for the value of n to be greater than the number of catchments (i.e. 108).

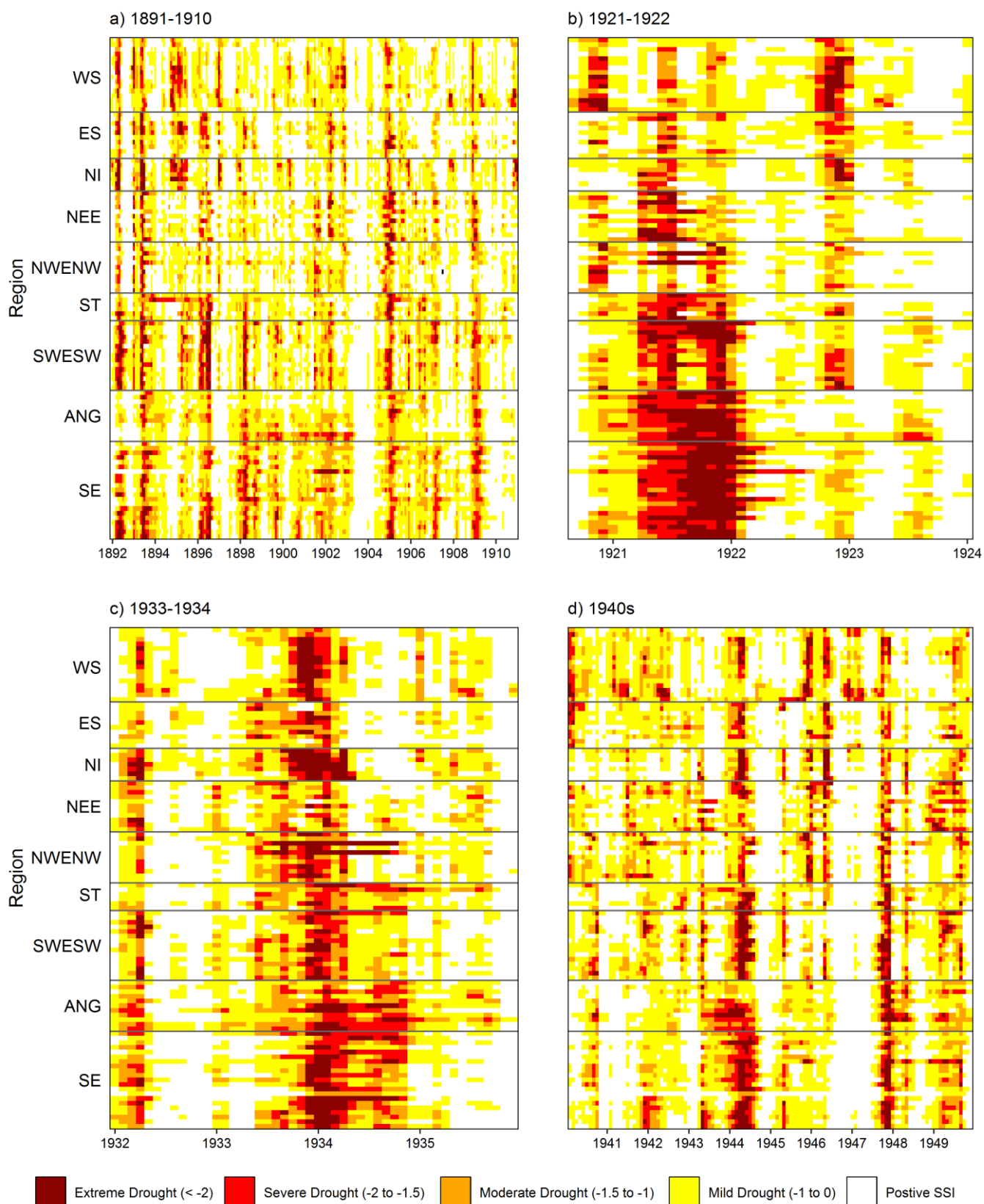


Figure S9: Heat maps of reconstructed SSI-3 for LFBN catchments, arranged roughly from north to south with one row per catchment and regions marked for clarity for a) the ‘Long Drought’ period (1890s-1910s), b) 1921-1922, c) 1933-1935 and d) the 1940s.

References

National River Flow Archive: <https://nrfa.ceh.ac.uk/>, last access: 27 September 2019.

Smith, K. A., Tanguy, M., Hannaford, J., and Prudhomme, C.: Historic reconstructions of daily river flow for 303 UK catchments (1891-2015), NERC Environmental Information Data Centre, 10.5285/f710bed1-e564-47bf-b82c-4c2a2fe2810e, 2018.