**Table 1.** Characteristics of sampled plot. Lat = latitude; Long = longitude. Dbh and height of all trees, Basal Area (BA), Density and SRD (Size ratio proportional to distance) are computed for all trees within a 10-m radius of focal trees (see methods). Temp.: annual average of minimun and maximum temperatures. Values shown here correspond to site averages. Standard deviations are shown in parentheses. Different letters indicate statistically significant differences between sites (Kruskal-Wallis test followed by Dunn’s test, p<0.05).

|  |  |  |  |  |  |  | ***Cored trees*** | | | | ***Competence*** | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Lat (°)** | **Long (°)** | **Elevation (m)** | **Slope (°)** | **Prec. (mm)** | **Temp. (° C)** | **# trees (# cores)** | **Dbh (cm)** | **Height (m)** | **Age (years)** | **Dbh all (cm)** | **Height all (m)** | **BA (m2/ha)** | **Density (trees/ha)** | **SRD** |
| CA-High | 36.97 | -3.42 | 1846 - 1884 | 12.11 (3.28) | 674 | 6.4 - 17.1 | 15 (30) | 69.8 (20.5) a | 15.4 (1.8) a | 161.0 (32.2) | 34.1 (24.3) a | 10.8 (4.4) a | 39.13 (24.31) a | 348.0 (147.1) a | 0.91 (0.63) a |
| CA-Low | 36.96 | -3.42 | 1691 - 1751 | 12.86 (2.98) | 674 | 6.4 - 17.1 | 15 (30) | 45.9 (8.6) a | 12.6 (1.6) b | 148.5 (16.5) | 21.7 (14.4) b | 9.0 (2.8) b | 18.02 (7.11) ab | 409.6 (226.0) a | 0.89 (0.44) a |
| SJ | 37.13 | -3.37 | 1322 - 1474 | 27.33 (5.59) | 635 | 7.4 - 16 | 20 (48) | 31.9 (3.7) b | 11.8 (2.3) b | 72.6 (11.1) | 20.6 (8.1) b | 9.7 (3.6) ab | 11.64 (5.47) b | 339.0 (130.3) a | 1.11 (0.52) a |

**Table 2.** Characteristics of the mean tree ring chronologies. Values of the length year in parenthesis indicate years replicated more with than five series. RW = mean annual ring width (standard deviation in parenthesis). MS = mean sensitivity. AR(1) = mean autocorrelation of raw series. Rbt = mean correlation between series. EPS = mean expressed population signal. EPS and Rbt are calculated for the mean residual chronologies of growth indices.

| **Site** | **First year** | **Last year** | **# trees** | **# cores** | **RW (mm)** | **MS** | **AR(1)** | **Rbt** | **EPS** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA-Low | 1836 | 2016 | 15 | 30 | 1.253 (0.781) | 0.208 | 0.799 | 0.563 | 0.897 |
| CA-High | 1819 | 2016 | 15 | 30 | 1.500 (0.879) | 0.203 | 0.827 | 0.513 | 0.907 |
| SJ | 1921 | 2016 | 20 | 48 | 1.725 (1.207) | 0.319 | 0.692 | 0.797 | 0.959 |

##### 

**Table 3.** Robust two-way ANOVAs of the resilience metrics of greenness (EVI) and tree-growth (BAI) for the two factors drought events (in 2005 and 2012) and site.

|  |  |  | **Resistance** | |  | **Recovery** | |  | **Resilience** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Factor** |  | **F** | **p** |  | **F** | **p** |  | **F** | **p** |
| EVI | Drought event |  | 799.900 | *0.001* |  | 312.000 | *0.001* |  | 207.200 | *0.001* |
| Site |  | 153.200 | *0.001* |  | 105.400 | *0.001* |  | 29.800 | *0.001* |
| Drought event:Site |  | 234.700 | *0.001* |  | 364.300 | *0.001* |  | 6.100 | 0.014 |
| BAI | Drought event |  | 6.000 | 0.019 |  | 29.500 | *0.001* |  | 44.300 | *0.001* |
| Site |  | 59.300 | *0.001* |  | 53.100 | *0.001* |  | 1.300 | 0.534 |
| Drought event:Site |  | 32.200 | *0.001* |  | 4.400 | 0.134 |  | 30.000 | *0.001* |

##### 

**Table S1.** Robust measures of central tendency of resilience indices for greenness (EVI) groupped by drought events, site and interaction. Measures of central tendency are M-estimators based on Huber’s Psi (see material and methods). 95 % confidence intervals using 3000 bootstrap are included in parentheses.

|  |  | **2005** | | |  | **2012** | | |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Oak populations** |  | **Resistance** | **Recovery** | **Resilience** |  | **Resistance** | **Recovery** | **Resilience** |  | **Resistance** | **Recovery** | **Resilience** |
| *Northern slope* |  | 0.819 | 1.169 | 0.955 |  | 0.947 | 1.042 | 0.986 |  | 0.884 | 1.102 | 0.970 |
|  | (0.814 - 0.824) | (1.161 - 1.177) | (0.951 - 0.960) |  | (0.942 - 0.952) | (1.036 - 1.047) | (0.980 - 0.990) |  | (0.878 - 0.889) | (1.096 - 1.108) | (0.967 - 0.974) |
| *Southern slope* |  | 0.902 | 1.066 | 0.962 |  | 0.939 | 1.071 | 1.004 |  | 0.921 | 1.069 | 0.983 |
|  | (0.896 - 0.907) | (1.058 - 1.074) | (0.957 - 0.966) |  | (0.934 - 0.944) | (1.067 - 1.075) | (1.000 - 1.008) |  | (0.917 - 0.925) | (1.065 - 1.073) | (0.980 - 0.986) |
| *All* |  | 0.858 | 1.120 | 0.958 |  | 0.943 | 1.057 | 0.995 |  |  |  |  |
|  | (0.854 - 0.863) | (1.113 - 1.126) | (0.955 - 0.962) |  | (0.940 - 0.947) | (1.054 - 1.060) | (0.991 - 0.998) |  |  |  |  |

##### 

**Table S2.** Robust measures of central tendency of resilience indices for tree-growth (BAI) groupped by drought events, site and interaction. Measures of central tendency are M-estimators based on Huber’s Psi (see material and methods). 95 % confidence intervals using 3000 bootstrap are included in parentheses.

|  |  | **2005** | | |  | **2012** | | |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sites** |  | **Resistance** | **Recovery** | **Resilience** |  | **Resistance** | **Recovery** | **Resilience** |  | **Resistance** | **Recovery** | **Resilience** |
| *CA-High* |  | 0.892 | 0.887 | 0.790 |  | 0.753 | 1.107 | 0.813 |  | 0.816 | 0.996 | 0.798 |
|  | ( 0.809 - 0.975) | ( 0.800 - 0.973) | ( 0.691 - 0.888) |  | ( 0.686 - 0.820) | ( 1.026 - 1.188) | ( 0.741 - 0.885) |  | ( 0.755 - 0.876) | ( 0.917 - 1.075) | ( 0.744 - 0.851) |
| *CA-Low* |  | 0.901 | 0.832 | 0.730 |  | 0.926 | 0.952 | 0.876 |  | 0.921 | 0.897 | 0.817 |
|  | ( 0.813 - 0.989) | ( 0.733 - 0.932) | ( 0.612 - 0.849) |  | ( 0.900 - 0.953) | ( 0.889 - 1.015) | ( 0.839 - 0.913) |  | ( 0.883 - 0.958) | ( 0.843 - 0.951) | ( 0.755 - 0.879) |
| *SJ* |  | 0.445 | 1.112 | 0.489 |  | 0.769 | 1.446 | 1.031 |  | 0.612 | 1.282 | 0.769 |
|  | ( 0.375 - 0.516) | ( 1.000 - 1.224) | ( 0.421 - 0.556) |  | ( 0.684 - 0.853) | ( 1.322 - 1.569) | ( 0.930 - 1.132) |  | ( 0.539 - 0.685) | ( 1.179 - 1.386) | ( 0.652 - 0.886) |
| *All* |  | 0.721 | 0.946 | 0.653 |  | 0.819 | 1.161 | 0.911 |  |  |  |  |
|  | ( 0.644 - 0.798) | ( 0.879 - 1.013) | ( 0.585 - 0.721) |  | ( 0.776 - 0.863) | ( 1.081 - 1.240) | ( 0.865 - 0.957) |  |  |  |  |

##### 

##### 

**Appendix S3.** Drought events for Sierra Nevada based on SPEI index (12 months scale). A drought event starts in the month when SPEI falls below the threshold of -1.28 (Páscoa et al. 2017). A drought event is considered only when SPEI value are below threshold for at least two consecutive months (*e.g.* Spinoni et al. 2015, 2017, Páscoa et al. 2017). The ***duration*** of a drought event is the number of consecutive months with the SPEI lower than a certain threshold. ***Severity*** of a drought event is the sum of the SPEI values (absolute values) during the duration of the drought event. ***Intensity*** and ***Lowest SPEI*** refer to the mean and lowest value of SPEI respectively during the drought event duration. SPEI data were obtained for all 0.5º grid cells covering Sierra Nevada.

| **Duration  (months)** | **Intensity** | **Severity** | **Lowest  SPEI** | **Months** | **Year** |
| --- | --- | --- | --- | --- | --- |
| 11 | -1.581 | 17.392 | -2.024 | Nov - Sep | 1913-1914 |
| 11 | -1.957 | 21.524 | -2.585 | Jan - Nov | 1995 |
| 9 | -1.823 | 16.409 | -2.427 | May - Jan | 1945-1946 |
| 9 | -1.764 | 15.880 | -2.056 | Dec - Aug | 1998-1999 |
| 8 | -1.482 | 11.859 | -1.654 | Feb - Sep | 1983 |
| 6 | -1.728 | 10.367 | -1.906 | Mar - Aug | 2012 |
| 5 | -1.905 | 9.527 | -2.300 | Jan - May | 1925 |
| 5 | -1.493 | 7.463 | -1.537 | May - Sep | 1985 |
| 5 | -1.385 | 6.926 | -1.444 | Apr - Aug | 1991 |
| 5 | -1.522 | 7.611 | -1.571 | May - Sep | 2005 |
| 4 | -1.363 | 5.453 | -1.441 | May - Aug | 1927 |
| 4 | -1.714 | 6.855 | -1.833 | May - Aug | 1931 |

Páscoa, P., C. Gouveia, A. Russo, and R. Trigo. 2017. Drought trends in the iberian peninsula over the last 112 years. Advances in Meteorology:ID4653126.

Spinoni, J., G. Naumann, J. V. Vogt, and P. Barbosa. 2015. The biggest drought events in europe from 1950 to 2012. Journal of Hydrology: Regional Studies 3:509–524.

Spinoni, J., J. V. Vogt, G. Naumann, P. Barbosa, and A. Dosio. 2017. Will drought events become more frequent and severe in europe? International Journal of Climatology.