Dear authors, Thank you for revising your manuscript. After sending it to reviewers, they found your revision to be satisfactory, pending minor revisions. I agree with the reviewer's evaluation.

Copied below are the comments for your information. Please makes sure to provide link to data if they are available somewhere.

Thank you for your careful attention to the comments.

We sincerely thank the Associate Editor and the reviewer for their constructive evaluation of the revised manuscript. We are pleased that the main concerns raised in the previous round have been satisfactorily addressed. We have carefully addressed all remaining comments, and our point-by-point responses are provided below.

Reviewer's evaluation:

The revised manuscript is substantially improved. The authors have addressed the central concern raised in the previous round regarding the effect of pollarding on the climate signal. In particular, the new supplementary figure showing the temporal distribution of pollarding events supports the authors' interpretation that management effects were largely diluted at the stand level because events were highly asynchronous among trees. Before publication, however, I recommend minor revisions, mostly related to clarity, reproducibility, and consistency.

Main comments:

1. The detrending sensitivity analysis should be included in the manuscript or Supplement. The response to the editor presents a useful comparison of different detrending approaches, including the reviewer-suggested alternative. This is exactly the type of evidence needed to justify the selected method. However, the analysis currently appears only in the response document. Because detrending choice was a major review concern, the comparison should be added to the Supplement, with the acronyms defined clearly, including Fixed-50, ADC/ADCS, PT, and non-PT. The authors should also state briefly in the Methods or Supplement that the correlations with FIC and CRU are not significantly different among detrending choices, preferably reporting the Fisher z-test result or a concise summary.

   The detrending sensitivity analysis, as suggested, is now incorporated as a new supplementary table (Table S1), with all acronyms clearly defined, and added a brief statement in the Section 2.2 of the manuscript (Methods) as follows:

   "A sensitivity analysis comparing four detrending variants (a fixed-frequency spline with a 50-year cutoff and an age-dependent changing spline, each applied with and without prior power transformation) showed that correlations of the resulting LWI chronologies with FIC and CRU precipitation were not significantly different from those obtained with the selected method (pairwise Fisher z-tests (Fisher, 1921), $p > 0.05$ in all cases; Table S1).”

Table S1. Sensitivity of the LWI chronology–precipitation relationship to detrending method. Detrending variants were compared against the selected method: a cubic smoothing spline with a 50% frequency-response cutoff at two-thirds of the individual series length, applied without power transformation (non-PT). Fixed-50: cubic smoothing spline with a fixed 50-year frequency cutoff applied regardless of series length. ADC: Age-Dependent Changing Spline, whose rigidity decreases as a function of the number of rings in each series. PT: power transformation applied to raw series prior to detrending to stabilize variance. non-PT: no power transformation applied. Values in the second column are Pearson's correlations between each alternative LWI chronology and the selected LWI chronology, reported for the instrumental period (1902–2020) and the full chronology length (1649–2023), respectively. Remaining columns show Pearson's correlations between each LWI chronology and November–June precipitation from the FIC (1952–2020) and CRU (1952–2020 and 1902–2022) gridded datasets. None of the pairwise differences in climate correlations were statistically significant (Fisher z-test, $p > 0.05$ in all cases).

Detrending method	Selected chronology (1902–2022 / 1649–2023)	FIC (1952–2020)	CRU (1952–2020)	CRU (1902–2020)
Selected: 2/3 spline, non-PT	1.000 / 1.000	0.834	0.832	0.760
Fixed-50, PT	0.958 / 0.927	0.820	0.794	0.746
Fixed-50, non-PT	0.957 / 0.925	0.810	0.790	0.748
ADC, PT	0.928 / 0.834	0.803	0.799	0.733
ADC, non-PT	0.930 / 0.829	0.815	0.777	0.747

2. Please clarify the reconstruction workflow and bias correction. The revised manuscript now includes a cross-dataset calibration-validation framework using FIC for calibration and CRU for validation, followed by final calibration over the full FIC period and quantile mapping. This is a reasonable approach, but the order of operations could be explained more transparently. In particular, the authors should distinguish between: (1) the raw regression reconstruction used to assess model skill, (2) the quantile-mapped reconstruction used to improve the distribution and identify extremes, and (3) the independent validation against CRU. The current text sometimes gives the impression that these steps overlap. I recommend adding a short workflow paragraph or schematic explanation in Sect. 2.4.3. Please also specify exactly which period was used to train the quantile mapping correction and whether the correction was applied unchanged to the full 1649-2023 reconstruction.

We agree that the order of the operations was not sufficiently transparent in the previous version. We have restructured section 2.4.3 to clearly distinguish the three sequential components of the analysis, and to specify the training period and target dataset of the quantile mapping correction:

“The reconstruction workflow comprised three sequential steps: (1) testing four calibration–validation schemes to identify the preferred modelling framework and assess model skill; (2) fitting the final regression model over the full FIC period and generating the raw reconstruction for 1649–2023; and (3) applying quantile mapping bias correction, trained against the CRU distribution over 1902–2022, to the entire reconstruction period. The bias-corrected series was then compared against the full CRU record as an evaluation of long-term consistency.

For step 1, we used the LWI chronology as the predictor and prior November–current June precipitation as the response variable, selecting this seasonal window because it showed the strongest relationship among all tested combinations (Sect. 3.2). We adopted a cross-dataset calibration–validation approach using FIC data for late calibration (1962–2020) and CRU data for early validation (1902–1961), as this scheme provided the highest explained variance among the four alternatives tested (Table S8). Within each scheme, quantile mapping (QM) bias correction (Gudmundsson et al., 2012; Robeson et al., 2020) was applied using the RQUANT algorithm in the qmap R package (Gudmundsson, 2016), with the observed climate of the respective validation period as the target; the statistics in Table S8 therefore reflect the distributional fit of the QM-corrected series. Model performance was evaluated using adjusted R^2, Pearson's r, reduction of error (RE), coefficient of efficiency (CE), and root-mean-square error (RMSE); positive RE and CE values indicate model skill (Fritts, 1976). Prediction intervals at the 95% confidence level were calculated using the predict() function from R's base stats package. For step 2, the final model was calibrated over the full available FIC period (1952–2020) to maximize temporal coverage and sample size. For step 3, QM was applied to the full raw reconstruction to correct distributional biases and better capture extreme values in the reconstruction, with the correction trained by mapping the raw reconstruction onto the observed CRU distribution over 1902–2022 and then applied unchanged to the entire 1649–2023 period.”

3. The detrending-method sentence needs revision. The Methods currently state that age-related growth trends were removed using “cubic smoothing splines with a 50% frequency cutoff set to two-thirds of the series length.” This is difficult to parse, I think. Please rewrite this sentence so the detrending choice is unambiguous. For example, state whether each individual series was

detrended using a cubic smoothing spline with a 50% frequency-response cutoff at two-thirds of the individual series length, and whether this was applied identically to RW, EW, and LW.

We agree that the original phrasing was ambiguous. We have revised the sentence in section 2.2. as follows:

"To isolate the climate signal in tree-ring data, age-related growth trends were removed from individual RW, EW, and LW series using a cubic smoothing spline with a 50% frequency-response cutoff set at two-thirds of the respective series length (Cook, 1985; Fritts, 1976). This procedure was applied identically to all three ring-width components and was implemented using the dplR package in R (Bunn, 2008, 2010; R Core Team, 2024)."

4. Ameliorate the data and code availability statement. The current statements, "Code will be made available upon request" and "Data will be made available upon request," are not ideal for reproducibility. Copernicus requires a data availability statement explaining how the underlying research data can be accessed, and recommends depositing data and related metadata in FAIR-aligned repositories with persistent identifiers. Copernicus also encourages software, algorithms, and model code to be deposited in FAIR-aligned repositories and cited with a DOI where possible. At minimum, the authors should provide repository links or accession information for the tree-ring chronology, reconstructed precipitation series, and scripts needed to reproduce the main analyses and figures. If FIC data cannot be redistributed, the access conditions should be stated clearly.

   We agree that transparency on data and code availability is important for reproducibility. We have deposited the chronology and the reconstructed November–June precipitation series (1649–2023) in the open repository of the Universidad de Valladolid (https://uvadoc.uva.es/handle/10324/84943). The aggregated monthly precipitation series derived from the FIC high-resolution gridded data (1 km^2, 1951–2020) for the study area used for calibration is also deposited in the same repository (https://uvadoc.uva.es/handle/10324/84995). The original FIC gridded precipitation data are proprietary and cannot be redistributed; access should be requested directly from the Fundación para la Investigación del Clima (www.ficlima.org). CRU TS4.08 data are freely available as described in Harris et al. (2020). Regarding code, all analyses were performed in R using open-source packages that are fully cited in the Methods section (dplR, treeclim, SPEI, among others). No custom code was developed. Given that the complete analytical workflow is described in the Methods and all required packages are freely available, we consider that the deposited chronology, reconstruction and climate series, combined with the methodological description, provide sufficient basis for reproducing the main results. The data and code availability statements have been updated accordingly in the manuscript as follows:

“Data and code availability: The LWI chronology and the reconstructed November–June precipitation series (1649–2023) are deposited in the open repository of the Universidad de Valladolid (https://uvadoc.uva.es/handle/10324/84943). The aggregated monthly precipitation series derived from the FIC high-resolution gridded data (1 km^2, 1951–2020) for the study area is also deposited in the same repository (https://uvadoc.uva.es/handle/10324/84995). The original FIC gridded precipitation data are proprietary and cannot be redistributed; researchers wishing to access these data should contact the Fundación para la Investigación del Clima directly (www.ficlima.org). CRU TS4.08 gridded precipitation data are freely available (Harris et al., 2020). No custom code was developed for this study. All statistical analyses were performed in R (R Core Team, 2024) using open-source packages fully described and cited in the Methods section (dplR, treeclim, and SPEI, among others). These packages are freely available through the Comprehensive R Archive Network (CRAN; https://cran.r-project.org).”

Minor comments and editorial corrections:

The new pollarding asynchrony figure is helpful. In the main text, please specify that the reported percentages are calculated relative to the number of trees available in the chronology in each year. Please check figure captions for final wording. Figure 5 should clearly distinguish raw reconstruction, bias-corrected reconstruction, instrumental FIC/CRU data, calibration period, validation period, and prediction intervals. Please clarify whether “extreme” dry and wet years are defined by the ±1.5 SD criterion, the 5th/95th percentiles, SPI categories, or by agreement among all three. The revised manuscript now uses all three approaches, which is good, but the wording should avoid implying that there is a single definition unless one is selected as primary.

We have addressed all minor comments as follows:

(i) Pollarding asynchrony percentages → In Section 3.1, we have clarified that the reported percentages are calculated relative to the number of trees available in the chronology in each year: “75% of detected events involved fewer than 6% of the trees available in the chronology at that time…”

(ii) Figure 5 caption→ We have revised the caption to clearly distinguish the raw reconstruction as follows: “Figure 5: (a) Validation results (CRU, 1902–1961) of the November–June precipitation reconstruction derived from pollarded oak LWI data in northcentral Spain. The red curve shows observed CRU precipitation; the dark grey solid curve shows the bias-corrected reconstruction; the light grey dotted curve shows the raw reconstruction; the shaded area represents the 95% prediction interval of the calibration model. (b) Scatterplot of the linear regression between the LWI chronology and FIC precipitation (1962–2020; calibration). (c) Scatterplot of the linear regression between the bias-corrected reconstruction and CRU precipitation (1902–1961; validation). (d–e) Frequency distributions of the bias-corrected reconstruction and CRU precipitation, respectively (1902–1961)”.

(iii) Definition of extreme years→ We agree that the wording required clarification. The primary result (years identified consistently by all three methods, i.e. eight dry, nineteen wet) is already established as such in the Abstract and Section 3.6. What was missing was explicit specification in the figure captions of which criterion or combination of criteria defines the plotted elements. We have revised the captions of Figure 6 and Figure S11 accordingly and clarified in Section 3.6 that the documentary validation encompasses all years flagged by at least one criterion (Table S11), with the agreement holding regardless of threshold choice.