Dear Dr. de Rooij,

Thank you for your handling of our submission and the opportunity to revise our manuscript.

In this response letter, we implement our specific and targeted revisions provided previously to the reviewers in our responses online. We do not deviate from those in our revisions. A point-by-point listing is provided below.

Yours on behalf of the authors,

Andy Baker

RC1

The reviewer did not recommend any revisions.

RC 2

The reviewer's comment on the figures was "*Most of the figures—especially Figure 1—are visually unappealing and difficult to interpret*" and we agree. We have implemented our changes as described below. All revised figures and updated figure captions are appended at the end of this response.

Figure 1 has been revised (line 71 of the revised track changed manuscript). We agree that panel d was overly large and did not have a high information content. We have removed panel d, which has enabled us to enlarge the other three panels so that the features referred to in the text can be discerned. The Fig 1b image is unchanged, as this is a true colour image. We have improved Fig 1b by only including the outer administrative boundary of the reserve – the internal boundaries are not relevant to the paper. The revised caption now reads:

Figure 1. a). Photograph of the surface above the cave one day after the fire (source: Andy Baker). b) Australia with karst overlay (black), yellow triangle indicates the study site (WOKAM; from Chen et al (2017). c) Sentinel S2 visible image, with outer bounds of the Wombeyan Karst Reserve. SentinelS2 True Colour image [2024]. Retrieved from Copernicus Dataspace [7 December 2024], processed by Copernicus. Wombeyan karst conservation reserve boundary: State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water 2000, NSW National Parks and Wildlife Service (NPWS) Estate, accessed from The Sharing and Enabling Environmental Data Portal [https://datasets.seed.nsw.gov.au/dataset/9bad468a-c2a6-4c90-bfaa-8ae8af72e925], date accessed 2024-11-07.

We have corrected the incorrect date in the caption to Figure 2 to read 1961-1990. Further changes have been made to this figure caption after RC3 comments (line 100 of the revised track changed manuscript). Please refer to our RC3 response.

We have redrawn Figure 4, using a similar format and colours for Fig 4b as for Figure 6 to separate the pre- and post- fire rainfall (line 153 of the revised track changed manuscript). We have also updated the colours of Figs 6, 7, A1 and A2 to match, along with the figure captions (lines 185, 213, 399 and 403 of the revised track changed manuscript). See our CC1 response for the revised captions.

The reviewer suggested that "*the manuscript would benefit from a broader contextualization of the results. I would like to have a broader discussion of the results and on the implications of fire impacts on the hydrological cycle, an area of increasing interest*". We agree, and have expanded the discussion to provide a broader contextualisation of the results and thank the reviewer for alerting us to two recent publications. Guzmán-Rojo et al. (2024) is a substantive review of the current understanding of groundwater recharge processes relevant to hydrological modelling. We have cited this paper and a reference cited therein and add a new final paragraph (line 282-287 of the revised track changed manuscript):

"Pre- and post-fire hydrological datasets, such as ours, that can be used to calibrate or validate water balance models of groundwater recharge are rare (Guzmán-Rojo et al., 2024). Our data provides quantified information on the evolution of the post-fire response, including the length of time post fire where surface ash enhanced overland flow and limited recharge, and the subsequent decreased rainfall recharge threshold due to soil loss and enhanced fracturing that occurs after the ash had been transported from the land surface. This hydrological response is consistent with ParFlow simulated surface and subsurface water balance changes for a water limited site and high fire severity (Atchley et al., 2018)."

Two new references have been added:

Atchley, A.L., Kinoshita, A.M., Lopez, S.R., Trader, L., and Middleton, R.: Simulating Surface and Subsurface Water Balance Changes Due to Burn Severity. Vadose Zone J. 17, 180099. https://doi.org/10.2136/vzj2018.05.0099, 2018

Guzmán-Rojo, M., Fernandez, J., d'Abzac, P. and Huysmans, M. Impacts of Wildfires on Groundwater Recharge: A Comprehensive Analysis of Processes, Methodological Challenges, and Research Opportunities. Water, 16, 2562, https://doi.org/10.3390/w16182562, 2024

We have corrected all the secondary comments suggested by RC2, including removing an additional period on line 19 and line 106, a missing t in et al in the reference on line 43, a rephrasing of the depth below surface statement on line 68, and hyphenating pre-fire on line 122. We have modified Table 1 as suggested to use a symbol rather than italics, the Table is appended at the end of this response and can be found at line 171 of the revised track changed manuscript. The spelling of Climate (Köppen-Geiger) is corrected in Table 2 (line 233 of the revised track changed manuscript).

CC1 (Bryce Belanger)

The reviewer asked if "*there a way to present this data so the reader can more clearly see the daily precipitation (mm) to drip rate relationships and responses? At the very least it could be helpful to plot precipitation and drip rate next to each other so it is easier for the reader to note the drip rate response to precipitation events…"*. We agreed that it would be easier for the reader to see the drip rate response to rainfall events by changing the order of the panels in Figure 3. The revised figure is appended at the end of this response and can be found on line 149 of the revised track changed manuscript). The revised figure caption is (line 152 of the revised track changed manuscript):

Figure 3. Daily AET (from the AWRA-L), daily precipitation (light blue when outside the monitoring period) with timing of recharge events shown by red asterisks, and average 15 min total drips.

The reviewer commented that the numbers presented in Fig 4b were unclear, and we agreed in our response. Figure 4b shows the distribution of the 48 h precipitation for all 41 recharge events, grouped by before fire and after fire. We revised the caption as follows (line 155 of the revised track changed manuscript):

"Figure 4 a) 48 h antecedent rainfall classified by month and whether before or after fire. B) box and whisker plots of 48 h rainfall amounts for all 22 recharge events before the fire (black) and 19 recharge events after the fire (red)."

The reviewer asked that we "*Explain more clearly what is being plotted here and why*" in Figure 6. We have revised Figure 6 so that the monthly minimum rainfall charge thresholds are clearer. The revised Figure 6 is shown at the end of this response and we have expanded the caption to clarify the content of this figure (line 186 of the revised track changed manuscript):

Figure 6: Minimum 48 hr precipitation required for recharge to occur for each month. Black indicates that the minimum recharge threshold occurred pre-fire, while red indicates that the minimum recharge threshold occurred post-fire. These values are bolded in Table 1.

We have also used bold font in Table 1 to highlight the data used in Figure 6. The revised Table 1 is shown at the end of this response, and we have extended the Table 1 caption to read (line 176 of the revised track changed manuscript):

The monthly minimum recharge thresholds presented in Figure 6 are in bold.

This reviewer and RC3 asks us to define BOM on the first use, and we refer to our RC3 response for this correction.

The reviewer suggests that we “Expand the Fig. 7 caption to make it more clear that 7C and 7D are showing the same exact data, just grouped differently based on seasons”. We have expanded the Fig. 7 caption to make it clearer that 7C and 7D are showing the same data at 7A and 7B, just grouped differently based on seasons. The new caption reads (line 218 of the revised track changed manuscript):

Figure 7. Comparison of recharge thresholds pre-and post-fire using BOM data. A) all recharge events B) all recharge events grouped by three-month season C) all recharge events grouped by six-month seasons summer/autumn and winter/spring D) all recharge events grouped by six-month seasons autumn/winter and spring/summer. Note that sample sizes are different depending on seasonal grouping, most comparable for panel d, where Autumn/Winter have 9 samples for pre-fire, 8 samples for post-fire, and spring/summer have 13 samples for pre-fire, 11 samples for post-fire.

The reviewer asked for an expanded discussion, with two specific comments:

- *Lines 39-47 contain great background information on post-fire processes and how ash influences hydrology. It would be helpful to see these ideas presented in the introduction worked back into the discussion and related to what you see at Wildman’s Cave*
- *Bian et al. (2019) presents a wealth of geochemical data related to the same fire event discussed in this study. It could be helpful to link some of your interpretations related to ash and recharge back to the geochemical data presented in Bian et al. (2019). Do their trace element and stable isotope results support the model you present in Figure 8? A thorough discussion of this would be helpful.*

We have expanded the Discussion as suggested, splitting the second paragraph to allow an expanded comparison with the results of Bian et al (2019) and a more thorough comparison with post-fire ash processes. We have also lightly edited the conceptual figure (Figure 8) to align better with the new text and to make small improvements. We label the panels A to C to allow reference to these in the new text. We refer to widened fractures in panel B rather than panel C, as this is when that process occurred. We allow for a more realistic progressive change in rainfall recharge threshold over time that occurs as ash is removed from the land surface. We remove some of the ash fill in the fracture in panel B to allow for the short duration and peaky hydrographs observed in this time by Bian et al (2019). The revised Figure 8 and caption is at the end of this response and line 278 of the revised track changes manuscript.

Our new and revised text is underlined below, other text is existing text from line 200 in the preprint. Starting at line 238 of the revised track changes manuscript:

"The effect of the intense fire on the rainfall recharge threshold is evident, with a decrease in the amount of rainfall needed post-fire, with this most evident in spring / summer, from three months after the fire. The decreased rainfall recharge threshold coincides with changed hydrograph characteristics observed by Bian et al., (2019), where post-fire recharge event hydrographs had higher peaks and were of shorter duration. Bian et al. (2019) also observed a rapid post-fire shift in cave drip water stable isotope (δ^2H, δ^{18}O) composition, interpreted as indicating that significant loss of existing soil and near-surface karst water had occurred during the fire due to evaporation. The isotope data took six months to return to the pre-fire baseline, suggesting that the epikarst water stores took six months to replenish and mix. Only limited evidence of ash-derived solutes was observed in the drip water post-fire, interpreted as an effect of volatilisation due to fire intensity.

We hypothesise that a post-fire loss of soil water storage would allow runoff generation to be more effective across areas of bare limestone to the zones of focused recharge (Fig. 8). Figure 8A presents our conceptualisation of the pre-fire hydrology, with patchy soil and soil filled fractures retarding overland flow and storing water. Recharge occurs when overland flow occurs to focused recharge zones. The decrease in rainfall recharge threshold starts to be observed post-fire, when the land surface above the cave was covered with thick ash deposits (see Fig. 1). Our observations at the site showed a thick and widespread ash cover immediately post fire (Fig.1) which was absent four months post fire (Fig. A3), with bare rock and absence of shrubby vegetation observed one year post-fire (Fig. A4). This is compatible with the presence of ash produced by the high-severity experimental burn, combined with the moderate rainfall experienced in the days immediate post-fire (10.4 mm in the week following the experimental fire), resulting in the formation of an ash crust. The presence of an ash crust (Figure 8B), combined with clogging of any remaining soil pores, is likely to have altered overland flow pathways to the recharge zones (Woods and Balfour, 2008; Balfour et al., 2014). Bian et al. (2019) demonstrate that recharge events at this time had peakier and shorter duration hydrographs and an altered water isotope composition than pre-fire (Bian et al. 2019). We conceptualise this period as one where recharge and associated recharge thresholds could be impacted by the ash cover, and when recharge occurred, it was through fractures that were relatively free of soil, vegetation and water and which had been potentially widened during the fire.

When this ash was subsequently transported from the surface above the cave, as observed four months after the fire (Fig. A3), the loss of the retarding effects of the ash crust, combined with the effect of soil removal and karst fracture enhancement, resulted in enhanced infiltration and consistently reduced rainfall recharge thresholds (Figure 8C). Recharge events that occurred at this time still had peakier and shorter duration hydrographs than pre-fire (Bian et al., 2019) due to the loss of surface soil and increased area of bare rock and associated loss of soil storage and retardation of overland flow. Drip water isotope composition during this post-fire period returns to the pre-fire baseline, indicative of the replenishment of water in subsurface karst fractures and voids. Despite this replenishment, the combination of peakier and short duration hydrographs and decreased rainfall recharge thresholds suggests a longer-term change in hydrology, due to soil loss, increased bare rock, and widened fractures, the combination of which enhanced overland flow and fracture flow."

RC3

We respond to the reviewer comments here, noting that several of the reviewer comments were already raised by the previous reviewers and have been responded to earlier in this response.

The reviewer asked if it is possible to estimate quantitative effects of fire on recharge and overland flow through measurements of parameters such as evaporation, transpiration and leaf area index, although also noting that given the nature of the data, this might not be doable. We confirm that our experimental design was focused on the downward flux of water to a shallow cave system. This allowed us to quantify the timing of recharge, and the amount of precipitation needed. Data was not collected to additionally quantify the amounts of recharge or overland flow. No changes are made.

The reviewer asked about any observations of ash filling fractures at our site. We have photographic evidence of the presence of an ash crust, observed on our visits to the site post-fire, and provided in the Supplemental section of the pre-print. We infer that this ash would also have accumulated in fractures, however, to limit disturbance of the research site whilst we were monitoring in the underlying cave, we could not investigate this further. We also note that in response to comments made by CC1, and to better align our conceptual model with the results presented in Bian et al. (2019), we modified our conceptual figure and associated text as described previously to no longer include the requirement for ash filled fractures.

The reviewer asked if we could extract more information from the data. For example, they ask if a comparison with stream discharge would be useful? Such data does exist (for example, an increase in discharge post-fire observed by Scott and Van Wyk, 1990). However post-fire responses can be highly variable and site-specific (see the review of Moody et al. 2013), varying from no-response to catastrophic floods. We have added a sentence in the Discussion at line 249 of the track changed manuscript:

"These observations are consistent with the post-fire response in surface streams, which can include an increase in peak flow rates post-fire (Scott and Van Wyk), noting that the post-fire response of surface streams is variable and site specific (Moody et al., 2013)."

Two references have been added:

Scott, D.F. and Van Wyk, D.B.: The effects of wildfire on soil wettability and hydrological behaviour of an afforested catchment. J. Hydrol. 121, 239-256, 1990

Moody, J.A., Shakesby, R.A., Robichaud, P.R., Cannon, S.H. and Martin, D.A.: Current research issues related to post-wildfire runoff and erosion processes. Earth Sci. Rev. 122, 10-37, 2013.

The reviewer also asked if we observe ash in the drip zones. We confirm that we do not observe ash deposits in the drip zones in the cave, consistent with the nature of karst systems and the filtering effect of water movement through fractures in the unsaturated zone. Dissolved and less than 100 nm particles (environmental nanoparticles and colloids) are most likely to be transported from the surface to the cave drip waters. We do not add any new text from this point.

The reviewer stated that the captions of the figures and tables are insufficiently informative, and we agree. This was also the view of reviewer RC2 and CC1 and revisions have already been made as described earlier in our response. The only addition here is an expanded caption to Figure 2 which provides the source of the precipitation data (line 100 of the revised track changed manuscript):

Figure 2. Total BOM monthly precipitation, 1961-1990. Aggregated from daily rainfall data from Wombeyan Caves (BOM Station number 63093).

The reviewer also identifies acronyms not defined at first use, as did CC1. We now define AWRA-L and BOM in the main body of the text on line 88 (new text is underlined):

Annual precipitation at the site over the last ten years has a long-term average of 802 mm, annual areal potential evapotranspiration (PET) is 1228 mm, and modelled actual evapotranspiration (AET) is 680 mm (precipitation data is from the Bureau of Meteorology (BOM) and evapotranspiration data from the Australian Water Landscape Model (AWRA-L) v7, Frost and Shokri, 2021).

All following instances of Bureau of Meteorology are replaced by BOM (lines 112, 114, 139, 157, 158, 161, 180 of the revised track changed manuscript).

The reviewer asks why Figure 6 has no whiskers on the box and whisker plot, and we previously confirmed that Figure 6 has no whiskers because the outliers are >1.5IQR away from the hinge, and so cannot be used as whiskers. No changes are made.

The reviewer asks how the ash is removed from the fractures in Figure 8. We note again that this figure and associated text was modified in our AC3 to CC1, which resulted in the fractures remaining open for water movement despite the presence of ash. In this revised model, any ash in the fractures does not need to be removed.

The reviewer had a number of minor comments, which we have corrected.

Double periods (..) were also identified by RC2 and these have been removed. We have also added a missing article on line 226 of the revised track changed manuscript (‘the’ is missing in ‘…using the same…’)

The typos in the text in Figure 8 have been removed in the revised version of this figure provided in our response to CC1.

The reviewer asked us to more rigorously separate any discussion from the results. We agree that the text from line 158 in the original manuscript contains some discussion of methods, and we propose to add a new methods section and revise the existing text. The new methods text now includes a new paragraph starting on line 135 :

“To investigate whether rainfall recharge thresholds were altered by an intense experimental burn, we qualitatively compared recharge thresholds calculated for the pre- and post-fire intervals. Because 48 h thresholds may be overestimated due to both the coarse sampling interval and the impact of extreme events, we first compared the minimum recharge threshold calculated for each month pre- and post-fire. We then quantitatively analyzed the 48 h rainfall recharge thresholds for all events before and after the fire using the BOM station data. To overcome the different lengths of monitoring data before and after the fire, we undertook a stratified qualitative analysis with data aggregated by season (DJF, MAM, JJA, SON) and 6-monthly periods (Summer/Autumn and Winter/Spring and Autumn/Winter and Spring/Summer).”

The shortened text, and starting on line 191 of the revised track changed manuscript, now reads:

“48 h rainfall recharge thresholds were compared before and after the fire. Fig. 6 shows a qualitative reduction in the recharge threshold postfire using the minimum recharge in each month. The median 48 h rainfall needed to generate recharge was 22.1 mm before the fire (n=22) and 16.4 mm after the fire (n=19) (Fig. 7a). The pre- and post-fire monitoring periods were of different lengths, with no reliable post-fire monitoring in the late summer / early autumn of 2017, when rainfall recharge thresholds might be expected to be higher due to enhanced evapotranspiration, and a Kruskal-Wallis ANOVA indicates these rainfall recharge thresholds are not significantly different at the 95% level.

Considering December to February (DJF, summer), March to May (MAM, autumn), June to August (JJA, winter) ....”

On line 128, the text “indicating that any observed differences in rainfall recharge thresholds is unlikely to be due to differences in daily precipitation.” is better suited for the discussion, and have moved this to the start of the discussion on line 224 of the revised track changes manuscript:

“Figure 5 demonstrated very little difference in the daily rainfall distribution before and after the fire, indicating that these differences in rainfall recharge thresholds is unlikely to be due to differences in daily precipitation.”

On line 178, there is an interpretation” This is likely owing to the absence of post-fire MAM data due to the cessation of monitoring.”. We could not identify a suitable location for this text in the discussion and we have deleted this text as it does not affect the results (now line 211 of the revised track changed manuscript).

The reviewer asked us to better define what we meant by carrying capacity, and on line 42 we have replaced carrying capacity to better define this term as the capacity to hold water, with the new text:

“...in general ash has a higher capacity to hold water than soil (Bodí et al., 2014)”.

The reviewer suggested we consider our use of ‘very high’ on line 88 when referring to the high rainfall from offshore lows. We have changed this to ‘unusually high’ and added a reference to Figure 2, to enable the reader to link outliers shown in this Figure to this sentence (now on line 96 of the revised manuscript).

The reviewer asked that we better separate new results from those summarising Bian et al. (2019). We agree that we should better clarify in the methods section where we summarise those from Bian et al. (2019), and have added a leading sentence at the start of the paragraph on line 116 of the revised manuscript:

“Summarizing the main results of the pre-fire and post-fire hydrological and geochemical monitoring of the site presented in Bian et al. (2019), ...”

We thank the reviewer for their comment on the difference between BOM and AWRA-L 48-h precipitation totals. There was a mistake on line 135, the difference between two data sources considering all recharge events where BOM data is available and presented in Figure 1 is 17% and not 28% as stated. Therefore we obtain similar results between methods for all recharge events, including infilled data, as stated on lines 148-154 of the original manuscript. For clarity, line 159 in the revised manuscript has been edited:

"for those events where both BOM and AWRA-L data is available (data is presented in Table 1) suggest that AWRA-L 48 h precipitation is on average 17% lower than the Bureau of Meteorology gauge. No correction was applied."

Additional revisions

One reference (Osborne) was out of alphabetical order and was moved. One reference (Rohde et al.) was uncited and was removed. We found a few inconsistencies in our formatting of et al. in the main text. All are visible in the track changes document.

Pre-fire				Post-fire			
Event	Date	48 h precip-itation (mm) BoM	48 h precip-itation (mm) AWRA-L	Event	Date	48 h precip-itation (mm) BoM	48 h precip-itation (mm) AWRA-L
1	25/12/2014	**22.4**	28.7	24	4/06/2016	107.6	76.1
2	11/01/2015	60.5	55.5	25	18/06/2016	**11.8**	14.8
3	24/01/2015	64.4	30.9	26	24/06/2016	18	13.6
4	27/01/2015	19.8*	19.8	27	6/07/2016	**8.1***	8.1
5	20/04/2015	35.8	32.4	28	20/07/2016	18.6	23
6	25/04/2015	**14.2**	15.5	29	22/07/2016	43	22.2
8	19/05/2015	**16.2**	14.6	30	2/08/2016	12.9*	12.9
9	18/06/2015	42.2	38.3	31	24/08/2016	39.8	33.1
10	13/07/2015	12.2	9.8	32	2/09/2016	35.2	28
11	16/07/2015	18.1*	18.1	33	14/09/2016	11	6.3
12	12/08/2015	**10.2**	5.9	34	18/09/2016	16.4	13.9
13	25/08/2015	88.2	80.5	35	21/09/2016	18.4	16.6
14	3/09/2015	**9.8**	8	36	29/09/2016	12.2	12.1
15	22/10/2015	27	20.8	37	4/10/2016	10.6	9.1
16	5/11/2015	**23.4**	23.6	38	11/10/2016	**8**	6.4
17	21/12/2015	30	36.6	39	22/10/2016	12.2	12.7
18	6/01/2016	12.6	13.1	40	9/11/2016	25.2	13.7
19	15/01/2016	20.3*	20.3	41	16/12/2016	24.8	20.5
20	21/01/2016	21.8	16.2	42	10/01/2017	**11**	12.3
21	29/01/2016	34.6	17.2				
22	4/02/2016	**24.2**	20.9				
23	8/05/2016	21.8	18.4				

Table 1. Summary of recharge events. Data with asterisks: incomplete returns for the BOM station on these dates. AWRA-L data was used. Recharge event 7 occurred on 4th

May 2015 and was a local rainfall event not captured in the gauge. The monthly minimum recharge thresholds presented in Figure 6 are in bold.

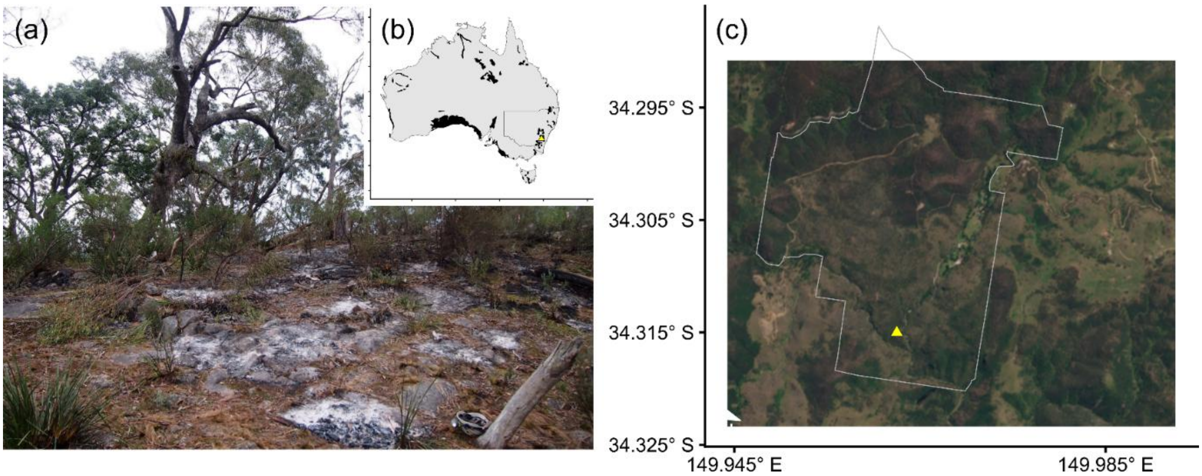

Figure 1. a). Photograph of the surface above the cave one day after the fire (source: Andy Baker). b) Australia with karst overlay (black), yellow triangle indicates the study site (WOKAM; from Chen et al (2017). c) Sentinel S2 visible image, with outer bounds of the Wombeyan Karst Reserve. SentinelS2 True Colour image [2024]. Retrieved from Copernicus Dataspace [7 December 2024], processed by Copernicus. Wombeyan karst conservation reserve boundary: State Government of NSW and NSW Department of Climate Change, Energy, the Environment and Water 2000, NSW National Parks and Wildlife Service (NPWS) Estate, accessed from The Sharing and Enabling Environmental Data Portal [https://datasets.seed.nsw.gov.au/dataset/9bad468a-c2a6-4c90-bfaa-8ae8af72e925], date accessed 2024-11-07.

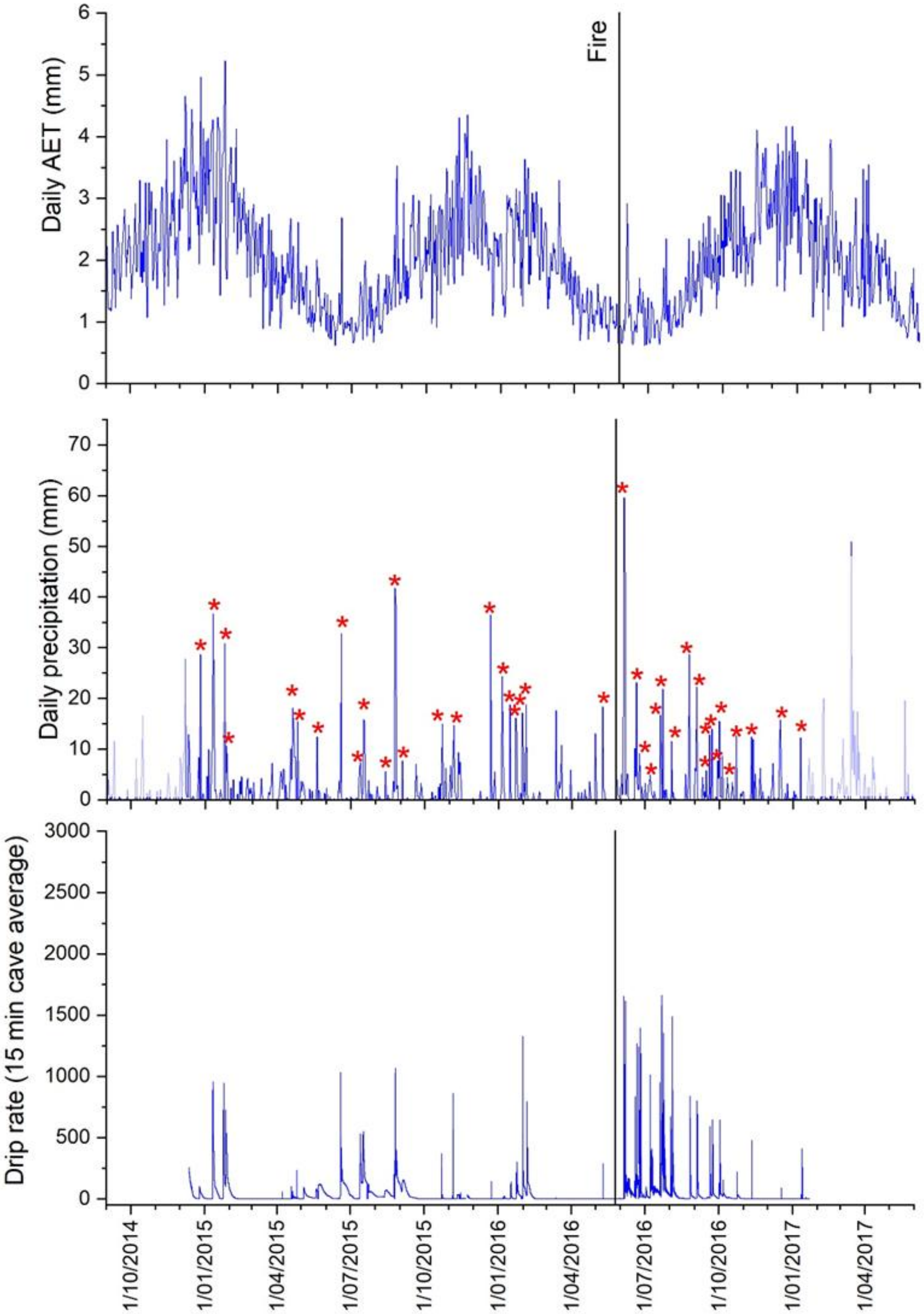

Figure 3. Daily AET (from the AWRA-L), daily precipitation (light blue when outside the monitoring period) with timing of recharge events shown by red asterisks, and average 15 min total drips.

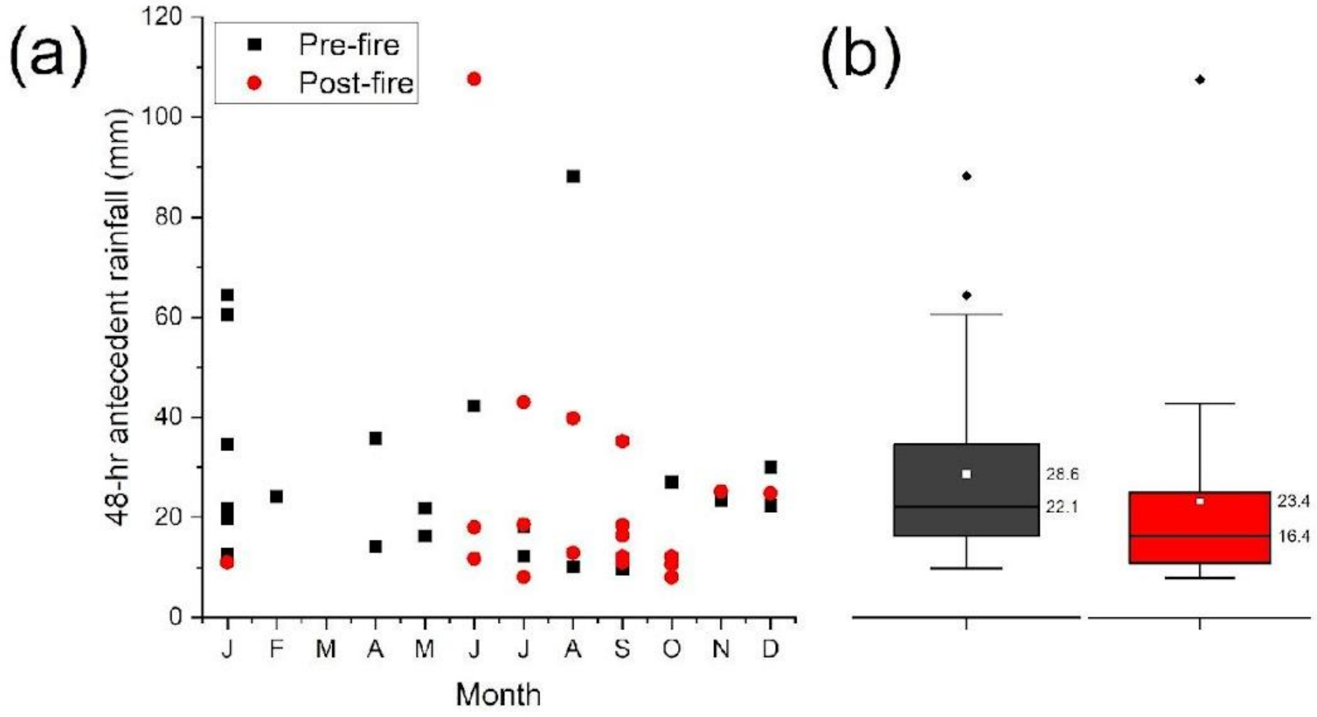

Figure 4 a) 48 h antecedent rainfall classified by month and whether before or after fire. B) box and whisker plot of 48 h rainfall amounts for before the fire (black) and after the fire (red).

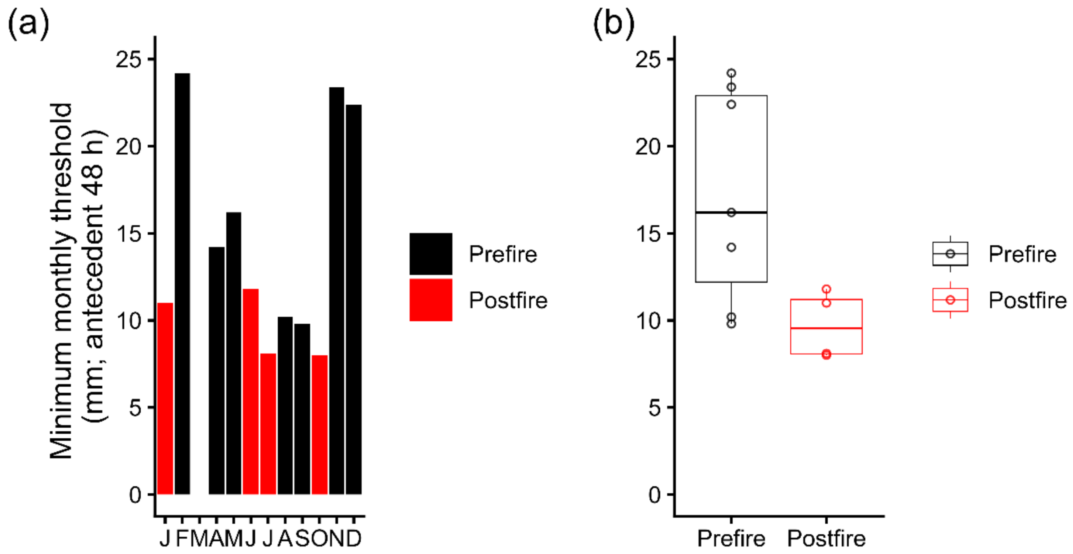

Figure 6: Minimum 48 hr precipitation required for recharge to occur for each month. Black indicates that the minimum recharge threshold occurred pre-fire, while red indicates that the minimum recharge threshold occurred post-fire. These values are bolded in Table 1.

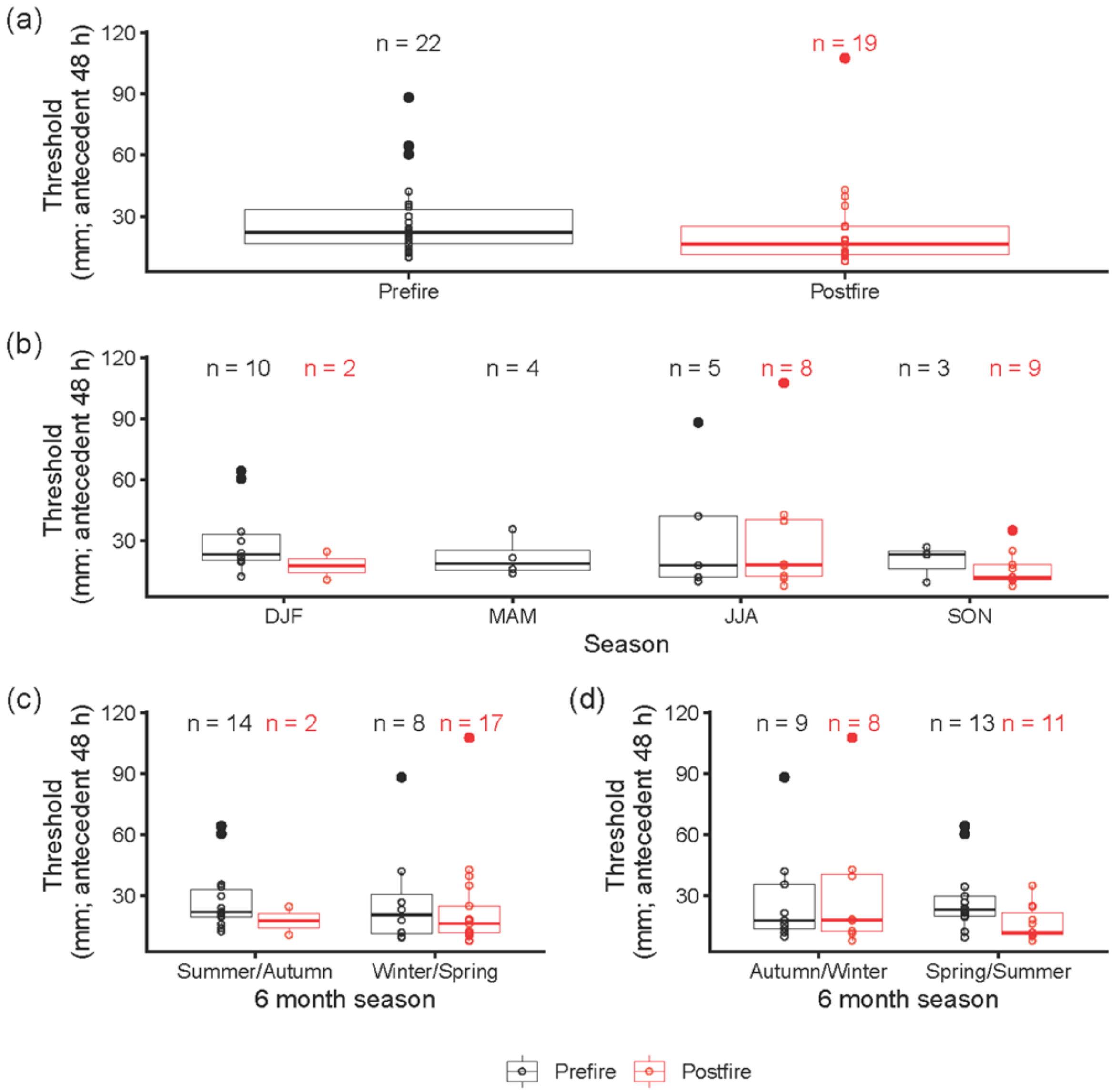

Figure 7. Comparison of recharge thresholds pre-and post-fire using BOM data. A) all recharge events B) all recharge events grouped by three-month season C) all recharge events grouped by six-month seasons summer/autumn and winter/spring D) all recharge events grouped by six month seasons autumn/winter and spring/summer. Note that sample sizes are different depending on seasonal grouping, most comparable for panel d, where Autumn/Winter have 9 samples for pre-fire, 8 samples for post-fire, and spring/summer have 13 samples for pre-fire, 11 samples for post-fire.

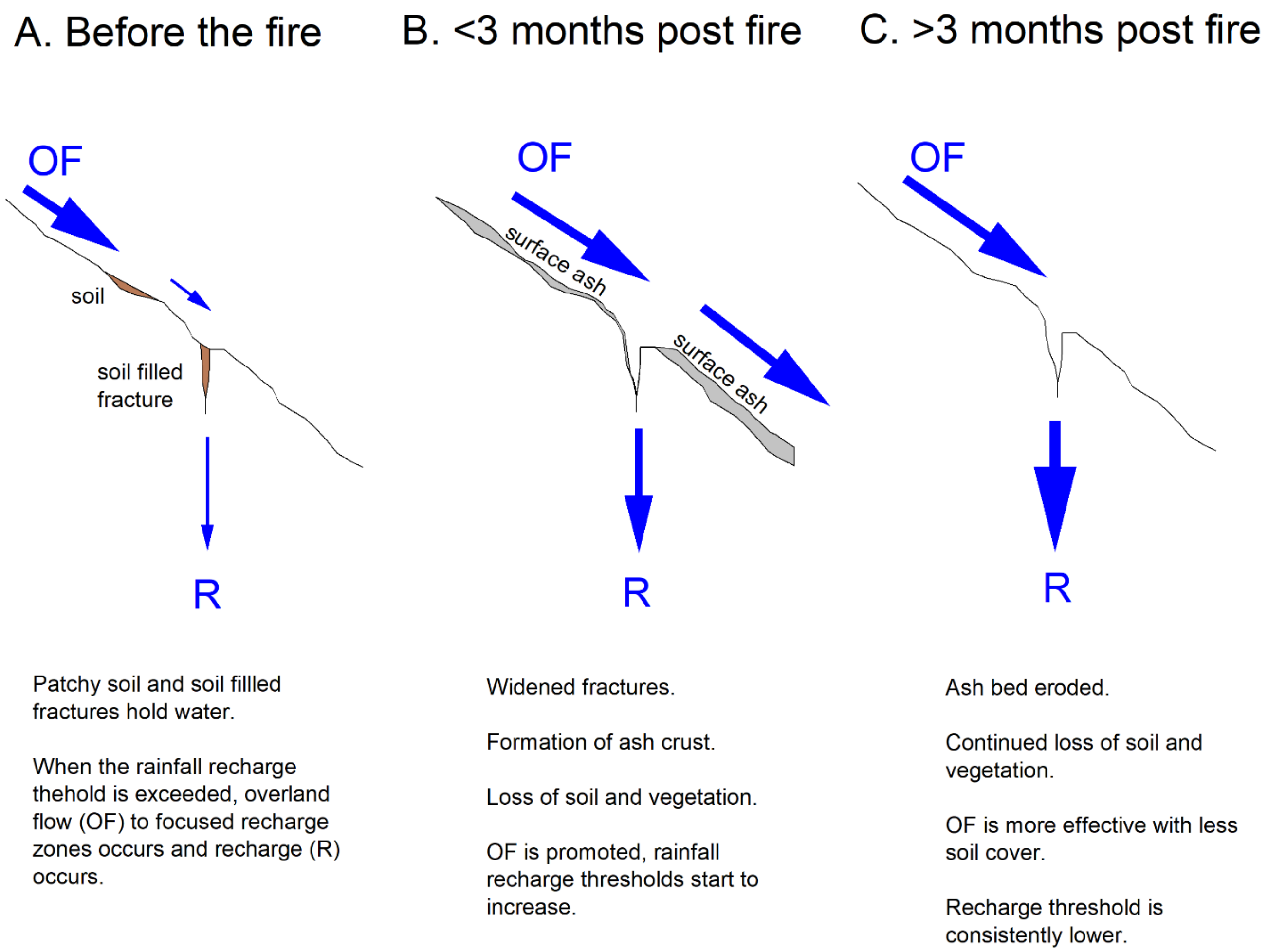

Figure 8. Conceptual figure of the recharge processes (A) before the fire (B) less than three months after the fire and (C) more than three months after the fire.

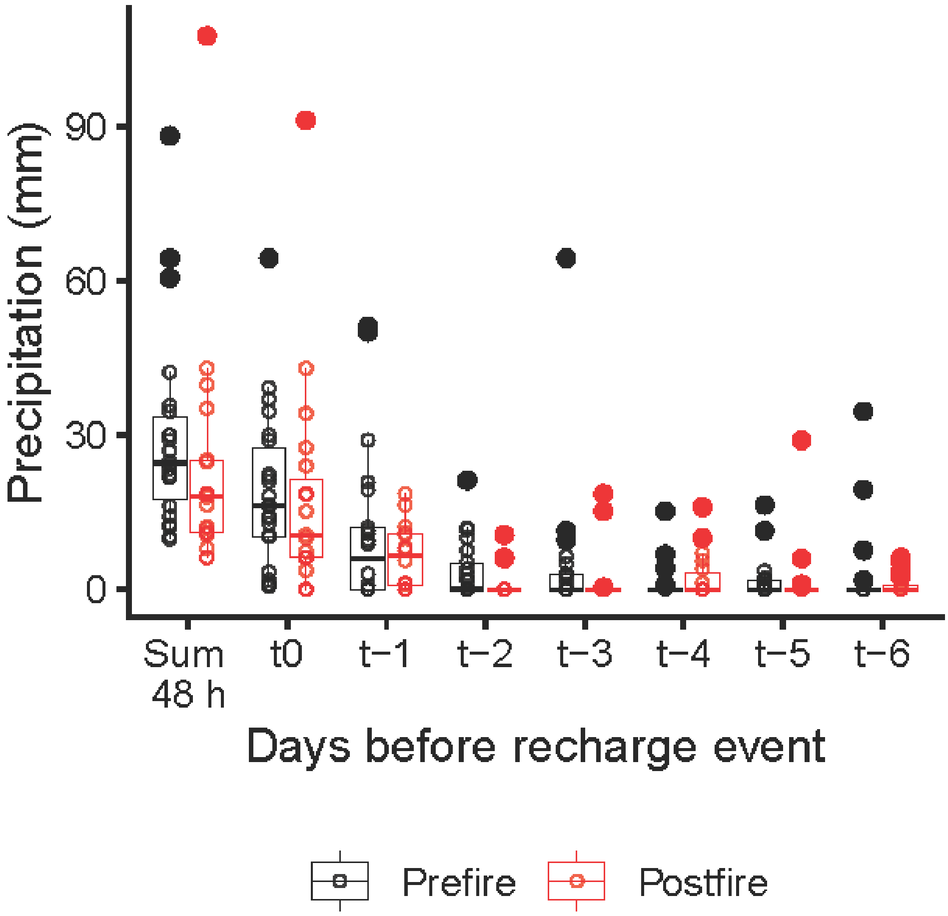

Figure A1. The amount of precipitation summed over the 48 hours prior to recharge compared to the amount of rainfall in each of the seven days prior to recharge. Precipitation data is shown for recharge events pre-fire (black) and post-fire (red).

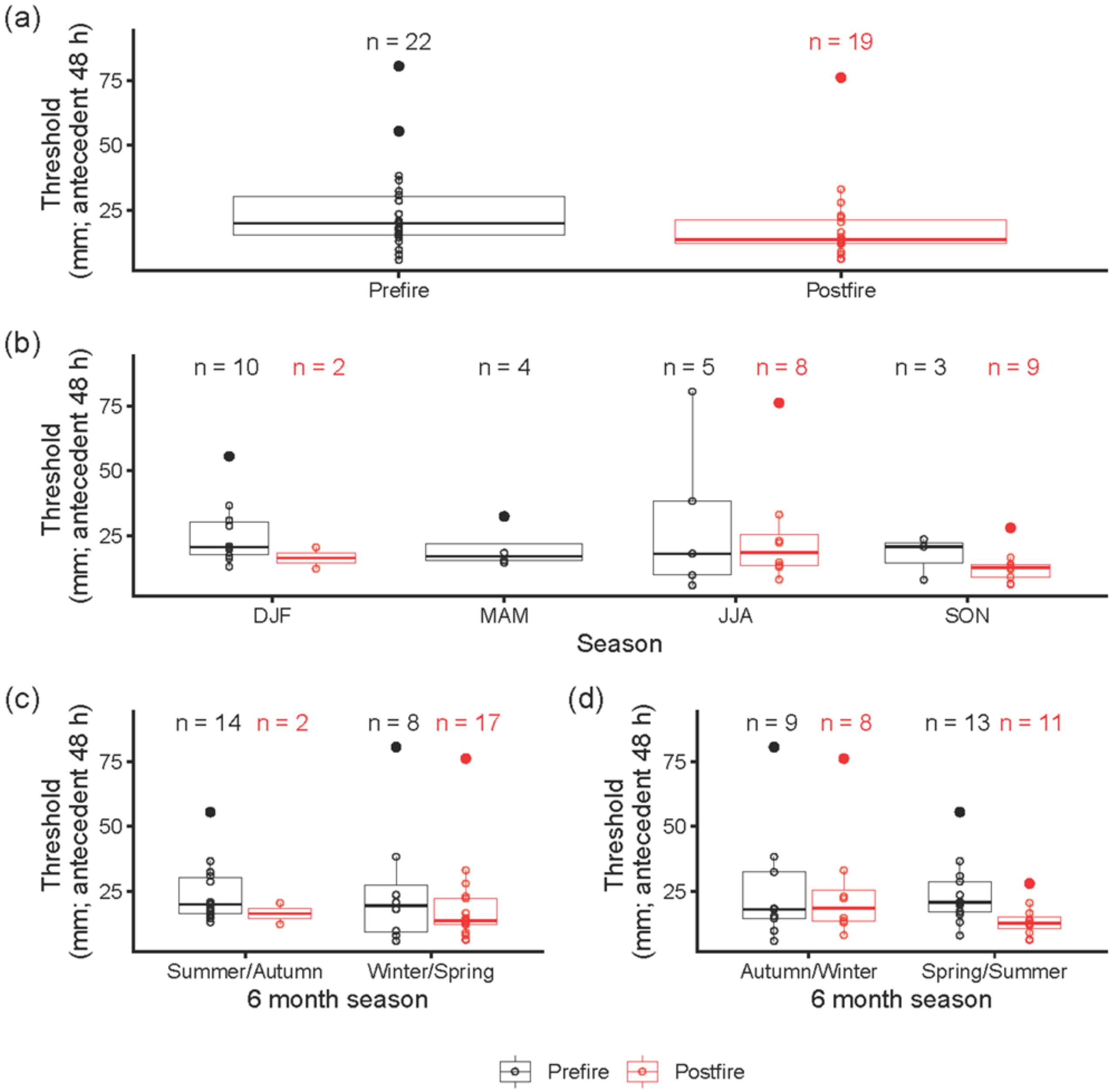

Figure A2. Comparison of recharge thresholds pre-and post-fire using AWRA-L data. Note that sample sizes are different depending on seasonal grouping, most comparable for panel d, where Autumn/Winter have 9 samples for pre-fire, 8 samples for post-fire, and spring/summer have 13 samples for pre-fire, 11 samples for post-fire.