|  |
| --- |
| **Title** |

A Meta-Analysis of the Influence of Climate, Time-Since-Fire and Burn Extent on Stream Biogeochemical Responses to Wildfire

|  |
| --- |
| **Summary** |

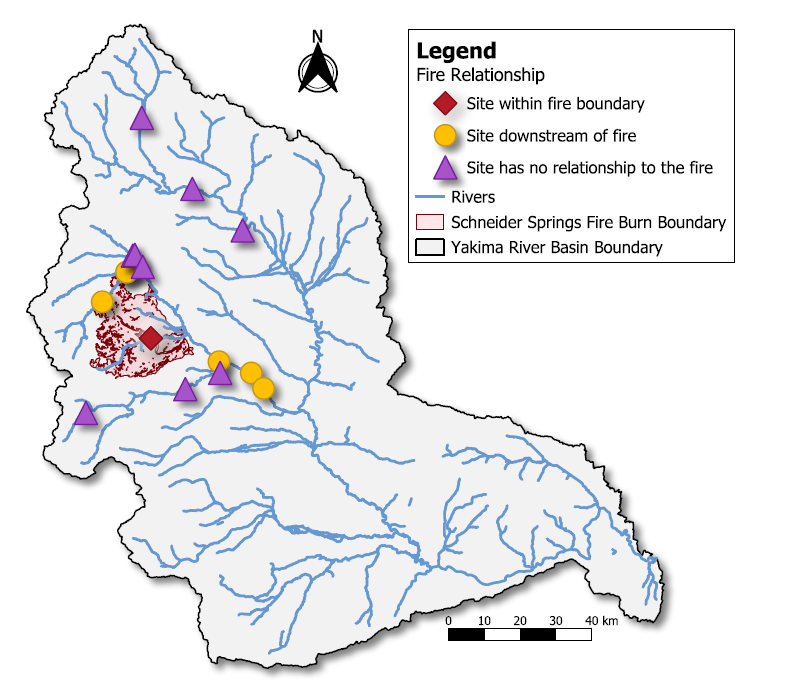
This data package is associated with the publication “A Meta-Analysis of the Influence of Climate, Time-Since-Fire and Burn Extent on Stream Biogeochemical Responses to Wildfire” submitted to ***GEOPHYSICAL RESEARCH LETTERS (CAVAIANI ET AL., 2024).*** This study is a synthesis of previously published literature investigating the effects of wildfires across spatial and temporal scales. The study aims to understand the cumulative effects of wildfires across gradients of climate, time-since-fire, and burn extent. This study uses meta-analytical techniques to evaluate the effect of wildfire on in-stream responses from reference and fire-impacted sites. This study compiles data and metadata from 18 total publications that includes 1) surface water geochemistry data (dissolved organic carbon; nitrate), 2) climate classifications, 3) year of the wildfire, 4) the time lag between when the fire occurred and when the sampling occurred, and 5) study design of the publication. In total, this meta-analysis draws data from 18 publications spanning 8 climate guilds, 62 watersheds, and 20 unique wildfires. A pseudo yield metric was calculated to facilitate intercomparisons across watersheds of different sizes. To analyze the proportional difference between burned and unburned in-stream solute concentrations, we calculated the effect size statistical metric. The dataset also includes a summary file that consists of site level metadata, climate characteristics and the effect size calculated for each site included in the study. Subsequent statistical analysis was conducted to capture the effects across climate, time-since-fire, and burn extent. All scripts are in R and the associated data can be found at this data repository: <https://github.com/river-corridors-sfa/rc_sfa-rc-3-wenas-meta>.

|  |
| --- |
| **Brief Overview of Methods** |

We performed a systematic literature search in September 2023 on Scopus and Web of Science using keywords: “wildfire” OR “fire” AND “dissolved organic carbon” OR “nitrate” AND “concentration” AND “export” OR “discharge” OR “stream” OR “river” OR “creek” OR “watershed”

We monitored diurnal dissolved oxygen dynamics and water pressure at 1-minute intervals from May-July in 2023 using in stream sensors at 17 sites by 2-person teams in multiple rivers within the Yakima River Basin. Each site was instrumented with a MiniDOT Oxygen Logger (PME) and HOBO Water Level Data Logger (Onset) during the week of May 15-20, 2023. In stream sensors were deployed either on a cinderblock lying on the bottom of the streambed placed as close to the thalweg as possible, on a piece of rebar installed in the stream, or both. Teams collected sample data, additional sensor data, qualitative metadata, and environmental context photos, at the same 17 sites during the week of May 22-25, 2023. Sensors from May deployments were retrieved by teams during the week of July 18-27. Due to high flow conditions, the sensors at one site were unable to be retrieved during the week of July 18-27 so a team went out to that site on September 25, 2023. Upon arrival, the team was only able to recover one HOBO Water Level. Due to high flow conditions throughout the deployment period, all sensors at 2 of the 17 sites were washed away and not recovered. At an additional 3 sites, sensors installed on the cinderblock were lost; however, the rebar sensors were recovered. The same teams also measured depth and velocity measurements along multiple transects using both manual measurements with a Swoffer Wading Rod, and the Float method during the week of July 18-27. See SSF\_Field\_Protocol.pdf for field method details. Surface water samples were processed and analyzed in the laboratory after field collection. For details regarding laboratory methods, see the alphanumeric methods codes located in the header rows of the chemistry data csv file and their associated definitions in SSF\_Methods\_Codes.csv.

|  |
| --- |
| **Critical Details** |



1 – Map of the Yakima River Basin overlaid with the Schneider Springs Fire boundary. Sites that were within the fire boundary or their watershed is within the fire boundary are indicated by the red diamond. Sites that were downstream of the fire boundary or their watershed is downstream of the fire boundary are indicated by the orange circle. Sites and their watersheds that have no relationship to the fire are indicated by the purple triangle. Due to close proximity of some sites, not all sites are visually distinguishable on the figure. The fire boundary was acquired from the USDA Forest Service, Geospatial Technology and Applications Center, BAER Imagery Support Program (https://fsapps.nwcg.gov/afm/baer/download.php)

2 – Each sampling event has a unique Parent\_ID in the format SSF\_#. The field metadata and data files all contain these unique IDs and can be mapped across each other accordingly. The Parent\_ID may have other indicators appended when referring to samples. See figure below for details.

Panel 1 - Name: Parent_ID; Example: SSF_01; Description: All samples from one sampling event start with the Parent_ID. Parent_ID can be found in the sensor data files and SSF_Field_Metadata.csv.

Panel 2 - Name: Sample_Name; Example: SSF_01_Water; Description: When referring to all samples of a given material from one sampling event, the Sample_Name consists of the Parent_ID followed by an indicator of the material. An example of this can be found in SSF_Metadata_IGSN-Mapping.csv.

Panel 3 - Name: Sample_Name; Example: SSF_01_TSS-1, SSF_01_OCN-1, SSF_01_OCN-2, SSF_01_OCN-3; Description: When referring to individual samples, the Sample_Name consists of the Parent_ID followed by an analysis-specific indicator code and may include the replicate number. An example of this can be found in SSF_Water_TSS.csv and SSF_Water_NPOC_TN.csv. Please note that the sample types and example files listed are non-exhaustive 

3 – Each physical site has a "Site\_ID" that remains the same through time and across studies. Each sampling event in time at that Site has a "Parent\_ID" that changes for each sampling event (i.e., during the 2022 Spatial Study (SSS), Site\_ID S01 was sampled, and the resulting Parent\_ID of the samples was SSS045. During the 2023 Schneider Spring Study, Site\_ID S01 was sampled again, and the resulting Parent\_ID of the sample was SSF\_01). The sensor files include both the Site\_ID and the Parent\_ID to indicate which site the sensor was deployed (Site\_ID) and which sampling event the data is most relevant to (Parent\_ID). The identifier most relevant to the data user will depend on the specific analyses being conducted.

|  |
| --- |
| **Data Package Structure** |

This dataset is comprised of one folder with field photos and one main data folder with six subfolders. The main data folder consists of (1) file-level metadata; (2) data dictionary; (3) field metadata; (4) total suspended solids (TSS) data; (5) dissolved organic carbon (DOC, measured as non-purgeable organic carbon, NPOC) data and averages; (5) total dissolved nitrogen (TN) data and averages; (6) field protocol; (7) readme; (8) methods codes; (9) international generic sample number (IGSN) mapping file; (10) sensor installation methods summary; (11) stream depth and averages; and (12) stream velocity. The BarotrollAtm (barometric pressure; temperature), DepthHOBO (water pressure; temperature), MantaRiver (specific conductivity; turbidity; pH; chlorophyll A; temperature), EXO (specific conductivity; pH; temperature), miniDOT (dissolved oxygen; temperature), and miniDOTManualChamber (dissolved oxygen; temperature) subfolders contain time-series data, plots, and summary files. All files are .csv, .pdf, .jpg, .jpeg, or .mov.

|  |
| --- |
| **Acknowledgements and Citations** |

This research was supported by the U.S. Department of Energy (DOE) Office of Science, Biological and Environmental Research (BER) Program, Environmental System Science (ESS) Program (<https://ess.science.energy.gov/>) through the Pacific Northwest National Laboratory (PNNL) River Corridor Science Focus Area (SFA). PNNL is operated by Battelle Memorial Institute for the DOE under Contract No. DE-AC05-76RL01830.

|  |
| --- |
| **Contact** |

Allison Myers-Pigg, allison.myers-pigg@pnnl.gov

|  |
| --- |
| **Change History** |

|  |  |  |
| --- | --- | --- |
| Version 1 | March 2024 | Original data package publication |