

Title

Data and scripts associated with “When do Riverine Systems 'Feel the Burn'? Simulating How Burn Extent and Severity Modulate Hydrologic Controls on Biogeochemical Export” (v2)

Summary

This data package is associated with the publication “When do Riverine Systems 'Feel the Burn'? Simulating How Burn Extent and Severity Modulate Hydrologic Controls on Biogeochemical Export” published in Water Resources Research (Wampler et al. 2025; preprint: <https://doi.org/10.22541/essoar.174438106.63564767/v1>).

This study used the Soil and Water Assessment Tool (SWAT), a process based model to explore the impacts of area burned and burn severity on streamflow, nitrate, and dissolved organic carbon (DOC) in two test basins: a semi-arid, mixed land use basin and a humid, primarily forested basin. We developed 1800 wildfire scenarios that we ran in each basin: 20 different burn extents (5 to 100% by 5%), 3 different burn severities (low, moderate, and high), and 30 different post-fire precipitation scenarios. We also ran an additional 30 scenarios associated with no wildfire for the 30 post-fire precipitation scenarios. For each scenario we were interested in the change in runoff ratio (streamflow) and average concentration and annual loads (nitrate and DOC) across the wildfire scenarios.

This data package contains the data and scripts required to build SWAT models for the two test basins, create and run the wildfire scenarios, and generate the data summaries and figures used in the associated manuscript.

This data package was originally published in March 2025. It was updated in January 2026 (v2; new and modified files) to include the final files after the manuscript went through reviews. See the change history section below for more details.

For details on how to navigate data packages generated by this project, see <https://data.ess-dive.lbl.gov/portals/PNNLRiverCorridorSFA/About>.

Brief Overview of Methods

The Soil and Water Assessment Tool (SWAT) model was implemented using publicly available data and R was used for processing and analysis. Publicly available data were pulled directly in R from National Land Cover Database (USGS NLCD), Monitoring Trends in Burn Severity (USGS/USDA MTBS), Moderate Resolution Imaging Spectroradiometer (NASA MODIS), Shuttle Radar Topography Mission (NASA SRTM), Soil Survey Geographic Database (USDA SSURGO), Daymet (ORNL), and the National Hydrography Dataset (USGS NHDPlus). Detailed model setup and execution steps are outlined in “thresholds_workflow.pdf”

Critical Details

- While not required to generate the results from this paper, as calibrated parameters have been provided, a third-party software SWAT-CUP (2W2E GmbH, 2019) was used to determine the calibration parameters found in “inputs/calibration-parameters.csv”.

Data Package Structure

This dataset contains (1) file-level metadata; (2) data dictionary; (3) data package readme; (4) workflow documentation; (5) a folder with model input data (“inputs”); (6) a folder with model output data (“outputs”); and (7) a folder with scripts needed to create and run the models and analyze the outputs (“scripts”). The input data folder contains the following items: (1) a DOC/wildfire module where the DOC outputs are in kilograms per time step (Wampler et al. 2023); (2) a DOC/wildfire module where the DOC outputs are in milligrams per liter; (3) a modified SWAT-CUP (<https://www.2w2e.com/home/SwatCup>) file with absolute parameter values; (4) a .csv file with calibrated parameter values for both models; (5) a .txt file called “model.in” with updated parameters for the DOC module; and (6) a .pdf with directions for using the wildfire module. The folder with model output data contains three subfolders: (1) “data”, which contains the processed model outputs; (2) “figures”, which contains the figures from the manuscript; and (3) “summary-outputs”, which contains summarized data used to create tables and results for the manuscript. This package contains the following file types: csv, exe, in, txt, pdf, R, png.

Citations and Acknowledgements

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.

Cite this data package with the appropriate DOI. Cite the associated manuscript in any work that that uses analyses or conclusions presented in the manuscript. To cite the preprint:

Katie A Wampler, Allison Myers-Pigg, Hyunwoo Kang, et al. Thresholds of Area Burned and Burn Severity for Downstream Riverine Systems to 'Feel the Burn'. *ESS Open Archive* . April 11, 2025.

DOI: [10.22541/essoar.174438106.63564767/v1](https://doi.org/10.22541/essoar.174438106.63564767/v1)

Citations:

- Wampler, K. A., Bladon, K. D., & Faramarzi, M. (2023). Modeling wildfire effects on streamflow in the Cascade Mountains, Oregon, USA. *Journal of Hydrology*, 621, 129585. <https://doi.org/10.1016/j.jhydrol.2023.129585>
- 2W2E GmbH. (2019). SWAT-CUP. Zürich, Switzerland: Water Weather Energy Ecosystem. Available from <https://www.2w2e.com/home/SwatCup>
- Dewitz, J. (2020). National Land Cover Database (NLCD) 2016 Products [Data set]. U.S. Geological Survey. <https://doi.org/10.5066/P96HHBIE>
- MTBS Project. (2021). MTBS Data Access: Fire Level Geospatial Data. [Data set]. USDA Forest Service/U.S. Geological Survey. Retrieved from <http://mtbs.gov/direct-download>
- Myneni, R., Knyazikhin, Y., & Park, T. (2015). MOD15A2H MODIS/Terra Leaf Area Index/FPAR 8-Day L4 Global 500m SIN Grid V006 [Data set]. NASA EOSDIS Land Processes Distributed Active Archive Center. <https://doi.org/10.5067/MODIS/MOD15A2H.006>
- NASA Shuttle Radar Topography Mission (SRTM). (2013). Shuttle Radar Topography Mission (SRTM) Global. OpenTopography. <https://doi.org/10.5069/G9445JDF>
- Running, S. W., Mu, Q., Zhao, M., & Moreno, A. (2021). MODIS/Terra Net Evapotranspiration Gap-Filled 8-Day L4 Global 500m SIN Grid [Data set]. NASA EOSDIS Land Processes Distributed Active Archive Center. <https://doi.org/10.5067/MODIS/MOD16A2GF.061>

- Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. (n.d.). Soil Survey Geographic (SSURGO) Database [Data set]. Retrieved from <https://sdmdataaccess.sc.egov.usda.gov>
- Thornton, M. M., Shrestha, R., Wei, Y., Thornton, P. E., Kao, S.-C., & Wilson, B. E. (2022). Daymet: Daily Surface Weather Data on a 1-km Grid for North America, Version 4 R1 (Version Version 4.4) [Data set]. ORNL Distributed Active Archive Center. <https://doi.org/10.3334/ORNLDAAAC/2129>
- U.S. Geological Survey. (n.d.). Water Data for the Nation [Data set]. Retrieved from <https://waterdata.usgs.gov/nwis>

Contact

Katie Wampler, katie.wampler@oregonstate.edu

Change History

Change history:

Data Package Version	Changes
Version 1 <i>March 2025</i>	Original data package publication
Version 2 <i>January 2026</i>	Files were changed, added, and removed in response to manuscript reviewer comments. All changes were tracked in version control and can be reviewed in the GitHub commit history (https://github.com/river-corridors-sfa/rc_sfa-rc-3-wenas-modeling).