Data Article

WEPPcloud hydrologic and erosion simulation datasets from 28 watersheds in US Pacific Northwest and calibrating model parameters for undisturbed and disturbed forest management conditions

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\textbf{A R T I C L E  I N F O}

\textbf{Article history:}  
Received 1 April 2022  
Revised 2 May 2022  
Accepted 4 May 2022  
Available online 10 May 2022

\textbf{Keywords:}  
Hydrologic model outputs  
Water Erosion Prediction Project (WEPP)  
Forested watersheds  
Calibration  
Decision-support tool  
WEPPcloud

\textbf{A B S T R A C T}

The WEPPcloud interface is a new online decision-support tool for the Water Erosion Prediction Project (WEPP) model that facilitates data preparation and model runs, and summarizes model outputs into tables and maps that are easily interpretable by users. The interface can be used by land and water managers in United States, Europe, and Australia interested in simulating streamflow, sediment and pollutant loads from both undisturbed and disturbed (e.g. post-wildfire or post-treatment such as thinning or prescribed fires) forested watersheds. This article contains full hydrologic model runs for 28 forested watersheds in the U.S. Pacific Northwest with the WEPPcloud online interface. It also includes links to repositories with the individual model runs, a table containing default model parameters for disturbed conditions, and figures with model outputs as compared to observed data.

DOI of original article: 10.1016/j.jhydrol.2022.127776
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https://doi.org/10.1016/j.dib.2022.108251
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The data in the repositories include all the raw data input and output from the model as well as the processed data, which can be accessed through tables and shapefiles to provide additional insights into the model outputs. Lastly, the article describes how the data are organized and the content of each folder containing the data. These model runs are useful for anyone interested in modeling forested watersheds with the WEPPcloud interface.

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Specifications Table

| Subject | Hydrology and Water quality |
|---------|-----------------------------|
| Specific subject area | Decision-support tools in hydrology, soil erosion, and water quality |
| Type of data | Table, Graphs, Figures, Model input and output, GIS shapefiles |
| How the data were acquired | Data were acquired with WEPPcloud, a new decision-support tool developed to facilitate simulations of streamflow, sediment and phosphorus yield from forested watersheds. |
| Data format | Raw model input and output, Analyzed model output data |
| Description of data collection | Both the raw input and output datasets were generated with the WEPPcloud (https://wepp.cloud/) interface and a modified version of the WEPP model. The raw input data were processed via WEPPcloud from a series of free primary national databases. |
| Data source location | All modeled watersheds are located in the United States: Lake Tahoe, California/Nevada: 39.0968° N, 120.0324° W Bull Run Watershed, Oregon: 45.4812° N, 121.9567° W Cedar River, Washington: 47.3431° N, 121.6086° W Mica Creek, Idaho: 47.1695° N, 116.2525° W The primary datasets used in WEPPcloud were accessed from: Topography: 10- and 30-m National Elevation Dataset (NED) https://www.usgs.gov/core-science-systems/national-geospatial-program/national-map Soils: SSURGO/STATSGO https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_053627 Climate: PRISM http://prism.oregonstate.edu Climate: Daymet https://daymet.ornl.gov Climate: gridMET http://www.climatologylab.org/gridmet.html Landuse: 2016 National Land Cover Database https://www.usgs.gov/centers/eros/science/national-land-cover-database?qt-science_center_objects=0#qt-science_center_objects |
| Data accessibility | Repository name: Hydroshare Data identification number (DOI): Shared as part of the URLs. See below. Direct URLs to the datasets: WEPPcloud interface https://doi.org/10.4211/hs.47a190100b254a4993c11c2abcded411c Lake Tahoe, California/Nevada Third Creek https://doi.org/10.4211/hs.3fa7ac7454ff441792177a4347be7958 |
Glenbrook
https://doi.org/10.4211/hs.979a22cdf762468aca0f098367c6c839f
Logan House
https://doi.org/10.4211/hs.b2d20dfff60f94cea9fdd38840b0eb6d
General Creek
https://doi.org/10.4211/hs.50be0bc4d59748f6b9d94d4563cde478
Blackwood Creek
https://doi.org/10.4211/hs.12f5ce010911045f5b879730ad1f38388
Incline Creek
https://doi.org/10.4211/hs.7b93d165af88413894a13a5c5fc918c
Incline 2 Creek
https://doi.org/10.4211/hs.23a77c5d77e84c0e8712e33f6bb74a2c
Incline 3 Creek
https://doi.org/10.4211/hs.d116c1dc20b4992b595ab770de8423
Upper Truckee 1
https://doi.org/10.4211/hs.b275f72c1e645449345dcb55061c99
Upper Truckee 2
https://doi.org/10.4211/hs.92eb264323141c9a0d1bd5ab339e51
Upper Truckee 5
https://doi.org/10.4211/hs.1783240ce834ea88b547757ff372f651
Ward Creek
https://doi.org/10.4211/hs.1336ldada0dccc642438a976d92b5a8c762
Ward Creek 3
https://doi.org/10.4211/hs.7df31ac48217470e857ab6627753bc4
Ward Creek 7
https://doi.org/10.4211/hs.01df9b2f8c2f4002a3ca3e994f8cabc
Trout Creek 1
https://doi.org/10.4211/hs.431e9c210447c1a851ecfc951a95e5c0
Trout Creek 2
https://doi.org/10.4211/hs.5b3e5368d3aa4e7d80eea703baa70d2
Trout Creek 3
https://doi.org/10.4211/hs.30e00298b6611412990a1f39a277bb3c1
Bull Run Watershed, Oregon
Blazed Alder
https://doi.org/10.4211/hs.39c85133d24446d2a398f1afbee97a7
Bull Run near Multnomah
https://doi.org/10.4211/hs.f3f78c7029b34170a12da890d69dd34f
Cedar Creek
https://doi.org/10.4211/hs.8b7ef268c81a4e92bf986643102323c
Fir Creek
https://doi.org/10.4211/hs.3a96ca9cf0d4019b5da19cd888fc914c
Little Sandy
https://doi.org/10.4211/hs.30c1694ee686a437814374a2afcc0ef
North Fork
https://doi.org/10.4211/hs.acf71f920a384658a3648c4130810ac8
South Fork
https://doi.org/10.4211/hs.525c512ee899485baa22cde46ee24d6b
Cedar River Watershed, Washington
Upper Cedar River
https://doi.org/10.4211/hs.592190aa103c474faca8188d00c5db08
Taylor Creek
https://doi.org/10.4211/hs.729297e575b2405c92e2fd6937a12d8
Mica Creek, Idaho
Watershed 3
https://doi.org/10.4211/hs.8c7dc32a87bc4c4bd04c05262875d04
Watershed 6
https://doi.org/10.4211/hs.5758f9322b514671b870a3d339ef80c8

Related research article
Dobre, M., A. Srivastava, R. Lew, D. Chinmay, E.S. Brooks, W.J., Elliot, P.R. Robichaud (2022) WEPPcloud: An online watershed-scale hydrologic modeling tool. Part II. Model performance assessment and applications to forest management and wildfires. J. Hydrol. 127776.
https://doi.org/10.1016/j.jhydrol.2022.127776.
Value of the Data

• These datasets contain: 1) model simulation data from the WEPPcloud online interface. Specifically, they provide simulated daily streamflow and annual sediment and phosphorus yield for undisturbed forested conditions; 2) graphs of model data as compared to United States Geological Survey (USGS) data observed at the outlet of watersheds; and 3) a table with default model parameters.
• These datasets offer insight into the WEPPcloud’s capability to simulate daily streamflow, and annual sediment and phosphorus yield from undisturbed forests with minimal calibration.
• Main beneficiaries of these resources are land and water managers and researchers interested in the accuracy of the WEPPcloud interface as well as anyone learning about the WEPP model and the WEPPcloud interface.
• Users can either recreate and run the watersheds in WEPPcloud or they can run the model with the provided files.

1. Data Description

These data were used in a WEPPcloud model assessment study: WEPPcloud: An online watershed-scale hydrologic modeling tool. Part II. Model performance assessment and applications to forest management and wildfires [1] and are also part of an additional study on the impacts of future forest management options on water quality in the Lake Tahoe, California/Nevada [2].

- Fig. 1 shows the location of the modeled watersheds in the Western U.S.
- Table 1 contains information on modeled watersheds, including watershed name, USGS watershed name and station, and web links to model runs in WEPPcloud. The model runs are also archived in the HydroShare repository and contain both the input and the output data from the model, among other useful information. The watershed names reflect the watershed names used in other studies, which provided the observed water quality data for model assessment [3]. The streamflow for Mica Creek watersheds, MC3 and MC6, were recorded with flumes. Details regarding data collection can be found in [4].
- Table 2 contains key soils and management parameters used to parameterize WEPPcloud by management and three soil types (i.e. granitic, volcanic, alluvial), for the modeled watersheds. These values were summaries from various field studies conducted by the United States Department of Agriculture (USDA), Forest Service, Rocky Mountains Research Station and from published research papers.
- Figs. 2–10 show daily streamflow and annual sediment and phosphorus yield model outputs as compared to observed data. Modeled streamflow was compared to data from the USGS gauging stations for watersheds in the Lake Tahoe basin, Bull Run, and Cedar River watersheds, and data measured with flumes in the Mica Creek Experimental Watersheds, Idaho. Modeled sediment and phosphorus yield was compared to flow-weighted annual observations processed by [3].
- Figs. 11–13 show interpolated estimated values of baseflow, deep seepage recession coefficients, critical shear, and phosphorus concentrations in runoff, lateral flow, and baseflow for Lake Tahoe basin watersheds in California/Nevada. These values were manually interpolated based on the calibrated values at the 17 watersheds in Lake Tahoe with long-term USGS streamflow data.
- All the model runs including all the data input and output can be accessed from the web links provided in Table 1 and are also stored in public repositories (see Data Accessibility).
- Model runs folder contains a list and description of all the folders in these model runs, which are archived as .zip files. The data structure in these folders is similar for all WEPPcloud model runs.
| No. | Name | USGS station | USGS Name/Watershed Name | Location |
|-----|------|--------------|--------------------------|----------|
| **California** | | | | |
| 1 | WC8 | 10336676 | WARD C AT HWY 89 NR TAHOE PINES | https://wepp.cloud/weppcloud/runs/it_202012_63_Ward_Creek_CurCond/cfg/ |
| 2 | WC7A | 10336675 | WARD C AT STANFORD ROCK TRAIL XING NR TAHOE CITY | https://wepp.cloud/weppcloud/runs/it_202012_63_Ward_Creek_WC3A_CurCond/cfg/ |
| 3 | WC3A | 10336674 | WARD C BL CONFLUENCE NR TAHOE CITY | https://wepp.cloud/weppcloud/runs/it_202012_63_Ward_Creek_WC7A_CurCond/cfg/ |
| 4 | BC1 | 10336660 | BLACKWOOD C NR TAHOE CITY | https://wepp.cloud/weppcloud/runs/it_202012_62_Blackwood_Creek_CurCond/cfg/ |
| 5 | GC1 | 10336645 | GENERAL C NR MEEKS BAY | https://wepp.cloud/weppcloud/runs/it_202012_66_General_Creek_CurCond/cfg/ |
| 6 | UTR1 | 10336610 | UPPER TRUCKEE RV AT SOUTH LAKE TAHOE | https://wepp.cloud/weppcloud/runs/it_202012_44_Upper_Truckee_River_Big_Meadow_Creek_CurCond/cfg/ |
| 7 | UTR3 | 103366092 | UPPER TRUCKEE RV AT HWY 50 ABV MEYERS | https://wepp.cloud/weppcloud/runs/it_202012_44_Upper_Truckee_River_UT3_CurCond/cfg/ |
| 8 | UTR5 | 10336580 | UPPER TRUCKEE RV AT S UPPER TRUCKEE RD NR MEYERS | https://wepp.cloud/weppcloud/runs/it_202012_44_Upper_Truckee_River_UT5_CurCond/cfg/ |
| 9 | TC4 | 10336780 | TROUT CK NR TAHOE VALLEY | https://wepp.cloud/weppcloud/runs/it_202012_43_TROUT_Creek_CurCond/cfg/ |
| 10 | TC2 | 10336775 | TROUT CK AT PIONEER TRAIL NR SOUTH LAKE TAHOE | https://wepp.cloud/weppcloud/runs/it_202012_43_TROUT_Creek_TC2_CurCond/cfg/ |
| 11 | TC3 | 10336770 | TROUT CK AT USFS RD 12N01 NR MEYERS | https://wepp.cloud/weppcloud/runs/it_202012_43_TROUT_Creek_TC3_CurCond/cfg/ |
| **Nevada** | | | | |
| 12 | LH1 | 10336740 | LOGAN HOUSE CK NR GLENBROOK | https://wepp.cloud/weppcloud/runs/it_202012_31_Logan_House_Creek_CurCond/cfg/ |
| 13 | GL1 | 10336730 | GLENBROOK CK AT GLENBROOK | https://wepp.cloud/weppcloud/runs/it_202012_29_Glenbrook_Creek_CurCond/cfg/ |
| 14 | IN1 | 10336700 | INCLINE CK NR CRYSTAL BAY | https://wepp.cloud/weppcloud/runs/it_202012_19_Incline_Creek_CurCond/cfg/ |
| 15 | IN2 | 10336695 | INCLINE CK AT HWY 28 AT INCLINE VILLEG | https://wepp.cloud/weppcloud/runs/it_202012_19_Incline_Creek_IN2_CurCond/cfg/ |
| 16 | IN3 | 10336693 | INCLINE CK ABV TYROL VILLAGE NR INCLINE VILLAGE | https://wepp.cloud/weppcloud/runs/it_202012_19_Incline_Creek_IN3_CurCond/cfg/ |
| 17 | TH1 | 10336698 | THIRD CK NR CRYSTAL BAY | https://wepp.cloud/weppcloud/runs/it_202012_18_Third_Creek_CurCond/cfg/ |
| **Oregon** | | | | |
| 18 | BA1 | 14138800 | BLAZED ALDER CREEK NEAR RHODODENDRON | https://wepp.cloud/weppcloud/runs/portland_BlazedAlder_CurCond.202009.cl532_gridmet.chn_cs50/cfg/ |
| 19 | BR1 | 14138850 | BULL RUN RIVER NEAR MULTINOMAH FALLS | https://wepp.cloud/weppcloud/runs/portland_BullRunNearMultnomah_CurCond.202009.cl532_gridmet.chn_cs200/cfg/ |
| 20 | CC1 | 14139700 | CEDAR CREEK NEAR BRIGHTWOOD | https://wepp.cloud/weppcloud/runs/portland_CedarCreek_CurCond.202009.cl532_gridmet.chn_cs150/cfg/ |
| 21 | FC1 | 14188870 | FIR CREEK NEAR BRIGHTWOOD | https://wepp.cloud/weppcloud/runs/portland_FirCreek_CurCond.202009.cl532_gridmet.chn_cs150/cfg/ |
| 22 | LS1 | 14141500 | LITTLE SANDY RIVER NEAR BULL RUN | https://wepp.cloud/weppcloud/runs/portland_LittleSandy_CurCond.202009.cl532_gridmet.chn_cs110/cfg/ |
| 23 | NF1 | 14138900 | NORTH FORK BULL RUN RIVER NEAR MULTINOMAH FALLS | https://wepp.cloud/weppcloud/runs/portland_Northfork_CurCond.202009.cl532_gridmet.chn_cs140/cfg/ |
| 24 | SF1 | 14139800 | SOUTH FORK BULL RUN RIVER NEAR BULL RUN | https://wepp.cloud/weppcloud/runs/portland_Southfork_CurCond.202009.cl532_gridmet.chn_cs160/cfg/ |
| **Washington** | | | | |
| 25 | CR1 | 12115000 | CEDAR RIVER NEAR CEDAR FALLS | https://wepp.cloud/weppcloud/runs/seattle_k_Cedar_River_CurCond.2020.Ced32_gridmet.chn_cs200/cfg/ |
| 26 | TC1 | 12117000 | TAYLOR CREEK NEAR SELLECK | https://wepp.cloud/weppcloud/runs/seattle_k_Taylor_Creek_CurCond.2020.Ced32_gridmet.chn_cs100/cfg/ |
| **Idaho** | | | | |
| 27 | MC3 | 12545000 | MICA CREEK EXPERIMENTAL WATERSHED WS3 | https://wepp.cloud/weppcloud/runs/oct1000_legged-make-believe/0 |
| 28 | MC6 | 12545000 | MICA CREEK EXPERIMENTAL WATERSHED WS6 | https://wepp.cloud/weppcloud/runs/srivas42_legged-make-believe/0 |

* Streamflow recorded with flumes; there were no USGS gauging stations available for these watersheds.
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**Model runs folder**
- **climate** (folder) contains:
  - the climate files generated by hillslope in .prn and .cli formats
  - the watershed climate file
  - the original daymet/gridmet data that were used to generate the .cli files
- **dem** (folder) contains:
  - the 10- or 30-m Digital Elevation Map (DEM) derived from the National Elevation Dataset
  - topaz folder containing the watershed delineation and all the maps created during the watershed delineation
- **export** (folder) contains channels and subcatchments files in GIS format containing topographic characteristics (such as slope, aspect, or length), input data (soil and management), and output information (runoff, lateral flow, baseflow, sediment, pollutant, etc.). The file also contains several GeoTIFF maps used in the model run.
- **landuse** (folder) contains landuse map (e.g. ascii map with the 2016 National Land Cover Database (NLCD) for US Locale. The NLCD codes are translated into WEPP-equivalent management files based on the mapping for the configuration.
- **observed** (folder) contains observed data (if) provided by the user
- **soils** (folder) contains the soil files in WEPP format by mapunit key (mukey) and a ssurgo soils map in ascii format
- **watershed** (folder) contains files with slope information for each channel and hillslope

![Watershed Names](image)

Fig. 1. Location of the gauged study watersheds in the Western U.S.
Table 2
Key hillslope soils and management parameters used to parameterize the WEPPcloud interface by management and soil types for the modeled watersheds.

| Soil Type       | Management Name          | Critical Shear (Pa) | Interill Erodibility (kg s m⁻¹) | Rill Erodibility (s m⁻¹) | Canopy Cover (fraction) | Interill Cover (fraction) | Rill Cover (fraction) |
|-----------------|--------------------------|---------------------|---------------------------------|--------------------------|--------------------------|--------------------------|------------------------|
| Granitic        | Old Forest               | 4                   | 250000                          | 0.00015                  | 0.9                      | 1                        | 1                      |
| Granitic        | Young Forest             | 4                   | 400000                          | 0.00002                  | 0.8                      | 1                        | 1                      |
| Granitic        | Forest Thinning 96% cover| 4                   | 400000                          | 0.00004                  | 0.4                      | 0.96                     | 0.96                   |
| Granitic        | Forest Thinning 93% cover| 4                   | 400000                          | 0.00004                  | 0.4                      | 0.93                     | 0.93                   |
| Granitic        | Forest Thinning 85% cover| 4                   | 400000                          | 0.00004                  | 0.4                      | 0.85                     | 0.85                   |
| Granitic        | Forest Prescribed Fire   | 4                   | 100000                          | 0.0003                   | 0.85                     | 0.85                     | 0.85                   |
| Granitic        | Forest Low Severity Fire | 4                   | 100000                          | 0.0003                   | 0.75                     | 0.8                      | 0.8                    |
| Granitic        | Forest Moderate Severity Fire | 4 | 100000 | 0.0003 | 0.4 | 0.5 | 0.5 |
| Granitic        | Forest High Severity Fire| 4                   | 180000                          | 0.0005                   | 0.2                      | 0.3                      | 0.3                    |
| Granitic        | Shrubs                   | 4                   | 141100                          | 0.000873                 | 0.7                      | 0.9                      | 0.9                    |
| Granitic        | Shrub Prescribed Fire    | 4                   | 170100                          | 0.000149                 | 0.7                      | 0.75                     | 0.75                   |
| Granitic        | Shrub Low Severity Fire  | 4                   | 170100                          | 0.000149                 | 0.5                      | 0.7                      | 0.7                    |
| Granitic        | Shrub Moderate Severity Fire | 4 | 170100 | 0.000149 | 0.3 | 0.5 | 0.5 |
| Granitic        | Shrub High Severity Fire | 4                   | 948600                          | 0.0004343                | 0.05                     | 0.3                      | 0.3                    |
| Granitic        | Bare Slope               | 4                   | 300000                          | 0.005                    | 0.05                     | 0.2                      | 0.2                    |
| Granitic        | Sod Grass                | 4                   | 196700                          | 0.0004446                | 0.4                      | 0.6                      | 0.6                    |
| Granitic        | Bunch Grass              | 4                   | 196700                          | 0.0004446                | 0.6                      | 0.8                      | 0.8                    |
| Alluvial        | Old Forest               | 1                   | 300000                          | 0.0001                  | 0.9                      | 1                        | 1                      |
| Alluvial        | Young Forest             | 1                   | 500000                          | 0.00015                 | 0.8                      | 1                        | 1                      |
| Alluvial        | Forest Thinning 96% cover| 1                   | 500000                          | 0.00003                  | 0.4                      | 0.96                     | 0.96                   |
| Alluvial        | Forest Thinning 93% cover| 1                   | 500000                          | 0.00003                  | 0.4                      | 0.93                     | 0.93                   |
| Alluvial        | Forest Thinning 85% cover| 1                   | 500000                          | 0.00003                  | 0.4                      | 0.85                     | 0.85                   |
| Alluvial        | Forest Prescribed Fire   | 1                   | 150000                          | 0.0002                   | 0.85                     | 0.85                     | 0.85                   |
| Alluvial        | Forest Low Severity Fire | 1                   | 150000                          | 0.0002                   | 0.75                     | 0.8                      | 0.8                    |
| Alluvial        | Forest Moderate Severity Fire | 1 | 150000 | 0.0002 | 0.4 | 0.5 | 0.5 |
| Alluvial        | Forest High Severity Fire| 1                   | 200000                          | 0.0004                  | 0.2                      | 0.3                      | 0.3                    |
| Alluvial        | Shrubs                   | 1                   | 141100                          | 0.000873                 | 0.7                      | 0.9                      | 0.9                    |
| Alluvial        | Shrub Prescribed Fire    | 1                   | 170100                          | 0.000149                 | 0.7                      | 0.75                     | 0.75                   |
| Alluvial        | Shrub Low Severity Fire  | 1                   | 170100                          | 0.000149                 | 0.5                      | 0.7                      | 0.7                    |
| Alluvial        | Shrub Moderate Severity Fire | 1 | 170100 | 0.000149 | 0.3 | 0.5 | 0.5 |
| Alluvial        | Shrub High Severity Fire | 1                   | 948600                          | 0.0004343                | 0.05                     | 0.25                     | 0.25                   |
| Alluvial        | Bare Slope               | 1                   | 750000                          | 0.004                   | 0.05                     | 0.2                      | 0.2                    |
| Alluvial        | Sod Grass                | 1                   | 196700                          | 0.0004446                | 0.4                      | 0.6                      | 0.6                    |
| Alluvial        | Bunch Grass              | 1                   | 196700                          | 0.0004446                | 0.6                      | 0.8                      | 0.8                    |
| Volcanic        | Old Forest               | 1.5                 | 300000                          | 0.00005                 | 0.9                      | 1                        | 1                      |
| Volcanic        | Young Forest             | 1.5                 | 600000                          | 0.0001                  | 0.8                      | 1                        | 1                      |
| Volcanic        | Forest Thinning 96% cover| 1.5                 | 600000                          | 0.00002                 | 0.4                      | 0.96                     | 0.96                   |
| Volcanic        | Forest Thinning 93% cover| 1.5                 | 600000                          | 0.00002                 | 0.4                      | 0.93                     | 0.93                   |
| Volcanic        | Forest Thinning 85% cover| 1.5                 | 600000                          | 0.00002                 | 0.4                      | 0.85                     | 0.85                   |
| Volcanic        | Forest Prescribed Fire   | 1.5                 | 100000                          | 0.0002                  | 0.85                     | 0.85                     | 0.85                   |
| Volcanic        | Forest Low Severity Fire | 1.5                 | 100000                          | 0.0002                  | 0.75                     | 0.8                      | 0.8                    |
| Volcanic        | Forest Moderate Severity Fire | 1.5 | 100000 | 0.0002 | 0.4 | 0.5 | 0.5 |
| Volcanic        | Forest High Severity Fire| 1.5                 | 150000                          | 0.0003                  | 0.2                      | 0.3                      | 0.3                    |
| Volcanic        | Shrubs                   | 1.5                 | 134500                          | 0.0008864               | 0.7                      | 0.9                      | 0.9                    |
| Volcanic        | Shrub Prescribed Fire    | 1.5                 | 162200                          | 0.0001444               | 0.7                      | 0.75                     | 0.75                   |
| Volcanic        | Shrub Low Severity Fire  | 1.5                 | 162200                          | 0.0001444               | 0.5                      | 0.7                      | 0.7                    |
| Volcanic        | Shrub Moderate Severity Fire | 1.5 | 162200 | 0.0001444 | 0.3 | 0.5 | 0.5 |
| Volcanic        | Shrub High Severity Fire | 1.5                 | 904400                          | 0.0004209               | 0.05                     | 0.3                      | 0.3                    |
| Volcanic        | Bare Slope               | 1.5                 | 600000                          | 0.003                   | 0.05                     | 0.2                      | 0.2                    |
| Volcanic        | Sod Grass                | 1.5                 | 187600                          | 0.0004309               | 0.4                      | 0.6                      | 0.6                    |
| Volcanic        | Bunch Grass              | 1.5                 | 187600                          | 0.0004309               | 0.6                      | 0.8                      | 0.8                    |

Wepp (folder) with sub-folders:
- wepp/flowpaths contains model input and output based on the flowpaths option, if selected. If the flowpath option is selected, the WEPP model will be run for each map pixel. This folder contains the runs folder with all the input data and an output folder with the runoff and soil loss for each flowpath.
Fig. 2. Simulated and observed daily streamflow at watersheds from the Lake Tahoe basin in California/Nevada.

Fig. 3. Simulated and observed daily streamflow from the Bull Run Watershed in Oregon and at Cedar River and Taylor Creek Watersheds in Washington.

- **wepp/output** contains the main model outputs for each hillslope and for the watershed. Most of these files are self-explanatory, however, we encourage users to check the WEPP user manual [5] for additional information.
- **wepp/plots** contains maps of gridded soil loss following a flowpath run [6]
- **wepp/runs** contains all the main WEPP input files
- **nodb** files, which are JSON serialized instances of wepppy.nodb classes used by WEPPcloud. These contain metadata related to the project. They are viewable in FireFox/Notepad++, etc.
**Fig. 4.** Simulated and observed daily streamflow at the Mica Creek Experimental Watersheds in Idaho.

**Fig. 5.** Simulated and observed total annual streamflow from the Bull Run Watershed in Oregon, Cedar River, and Taylor Creek Watersheds in Washington.
Fig. 6. Simulated and observed total annual streamflow at watersheds from the Mica Creek Experimental Watershed in Idaho.

Fig. 7. Simulated and observed total mean annual sediment load for watersheds in Mica Creek Experimental Watershed in Idaho.
Fig. 8. Simulated and observed total mean annual particulate phosphorus (PP) loads at watersheds from the Lake Tahoe basin in California/Nevada.

Fig. 9. Simulated and observed total annual soluble reactive phosphorus (SRP) loads at watersheds from the Lake Tahoe basin in California/Nevada.
Fig. 10. Simulated and observed total annual particulate phosphorus (PP) loads at watersheds from the Lake Tahoe basin in California/Nevada.

Fig. 11. Interpolated estimated values of baseflow and deep seepage recession coefficients for the Lake Tahoe basin watersheds in California/Nevada.
Fig. 12. Interpolated channel critical shear for the Lake Tahoe basin watersheds in California/Nevada.
Fig. 13. Interpolated phosphorus concentrations in runoff, lateral flow, baseflow and sediment from the Lake Tahoe basin watersheds in California/Nevada.
2. Experimental Design, Materials and Methods

The hydrologic simulations were performed with the WEPPcloud interface [7,8] for 28 relatively undisturbed watersheds in the U.S. Pacific Northwest (Lake Tahoe basin, CA/NV; Bull Run Watershed, OR; Cedar River and Taylor Creek, WA, and two watersheds in Mica Creek Experimental Watershed, ID) and compared model outputs such as streamflow, sediment and phosphorus yield to observed data recorded at USGS gaging stations and recorded with flumes (Table 1; [1]). Each model run (including data input and output) can be viewed either online by accessing the web links in Table 1 or by accessing the zipped folders stored in the HydroShare repository. The WEPPcloud allows users to view most of the model input selections directly on the main page of the model run or in the PowerUser Panel (Fig. 14). The NoDbs folders contain model selections, while the wepp/runs and wepp/output folders contain all the input and output raw data files. The HydroShare repositories contain the same data in similar folders.

2.1. Model calibration

All model runs were performed initially with the WEPPcloud default parameters. We further minimally calibrated the model by downloading all the model input data, manually changing key calibrating parameters, and then rerunning the models with wepppy-win-bootstrap [9], a free Python package developed to facilitate model runs on Windows computers. Lastly, we reran the models on the WEPPcloud interface with the calibrating parameters. The calibration involved altering the linear baseflow recession coefficient (k_b in /wepp/runs/gwecoeff.txt files), the saturated hydraulic conductivity of the underlying geology (K_sub in /wepp/runs/[.].sol files), the rain/snow temperature threshold (T_rain/snow in /wepp/runs/snow.txt file) for streamflow, channel bed critical shear stress (\( \tau_c \)) in /wepp/runs/pw0.chn file) for sediment yield, and phosphorus concentrations in surface runoff, lateral flow, baseflow, and attached to sediment for phosphorus yield (in /wepp/runs/phosphorus.txt file). The minimal calibration was preferred to minimize
potential issues with equifinality and to demonstrate model's predictive capabilities. Values for daily modeled streamflow at all watersheds and annual sediment and phosphorus yield at watersheds from the Lake Tahoe basin were compared to observed data (Figs. 2–10). Goodness-of-fit statistics (Nash-Sutcliffe Efficiency, the Kling-Gupta efficiency, and percent bias) and additional graphs can be found in [1].

2.1. Basin-scale model runs

In the Lake Tahoe Basin, we were interested in applying the WEPPcloud interface to all 63 watersheds that flow into the lake and further run the models for disturbed conditions (thinning, prescribed fire, wildfire, simulated fire) [1,2], however, the model calibration was performed only for 17 watersheds with long-term USGS data. Therefore, we manually distributed the calibrating parameters to the remaining watersheds based on the watersheds’ similarities, parent material, and proximity (Figs. 11–13).

CRediT Author Statement

Mariana Dobre: Conceptualization, Methodology, Data curation, Formal analysis, Visualization, Funding acquisition, Writing - Original Draft; Anurag Srivastava: Conceptualization, Methodology, Formal analysis, Software. Roger Lew: Conceptualization, Methodology, Software. Chinmay Deval: Data Curation, Visualization; Erin S. Brooks: Conceptualization, Methodology, Funding acquisition; William J. Elliot: Conceptualization, Methodology, Resources, Investigation, Funding acquisition, Writing - Review & Editing; Peter R. Robichaud: Conceptualization, Resources, Investigation, Funding acquisition, Writing - Review & Editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Logan House (Original data) (HydroShare).

Acknowledgments

This work was supported with partial funds from the following sources: USDA AFRI-NIFA program, grant 2016-67020-25320/project accession 1009827, NSF award DMS-1520873, USDA Forest Service Rocky Mountain Research Station and Pacific Southwest Research Station, and Portland Water Bureau. We thank the Potlach Deltic Corporation for providing the observed streamflow and sediment data, the Portland Water Bureau for providing additional soil, landcover, and previous hydrologic studies on the Bull Run Watershed, and the Forest Service Pacific Southwest Research Station for providing pebble count observations from streams in Lake Tahoe. We are also grateful to the USDA Agricultural Research Service, National Soil Erosion Laboratory for ongoing support in the development of the WEPPcloud interface. The findings and conclusions in this article are those of the author(s) and should not be construed to represent any official USDA or U.S. Government determination or policy.
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