What kind of data has been collected in the Andrews Experimental Forest, where is it stored, and is it publicly accessible?

Long-term hydrology and aquatic biogeochemistry data from H. J. Andrews Experimental Forest, Cascade Mountains, Oregon

Citation Johnson, S. L., Henshaw, D., Downing, G., Wondzell, S., Schulze, M., Kennedy, A., Cohn, G., Schmidt, S. A., & Jones, J. A. (2021). Long-term hydrology and aquatic biogeochemistry data from H. J. Andrews Experimental Forest, Cascade Mountains, Oregon. Hydrological Processes, 35:e14187. https://doi.org/10.1002/hyp.14187

Have you ever wondered what happens in the HJ Andrews Experimental Forest and whether you can access the data?

What types of research have been conducted in HJA? What is the installation history of environmental research gauges in land and stream locations in the H. J. Andrews Research Forest (HJA)? Did data collection procedures differ during different research periods and across environmental conditions? Are there existing long-term, publicly-available datasets and associated metadata? Hydrology research had been ongoing for 70 years at the time of publication.

What have been the main foci of research conducted in the Andrews Forest?

- The HJA has supported studies on forest harvest and management regimes on short- and long-term responses in forest dynamics and hydrology at the watershed scale. The long-term data collection also provides insight into climate-related processes.
- Studies in the HJA have been important for understanding water residence time and flow patterns, and how physical stream attributes and nutrient cycling dynamics are influenced by the hyporheic zone, the water-saturated level of the streambed, in mountain stream networks.
- Water chemistry, and nutrient cycling and dynamics in small watersheds are influenced by forest disturbance and succession (reforestation stages), precipitation, and temperature.

Does forest management influence carbon sequestration and water cycling?

- Carbon production and sequestration levels are high in Pacific Northwest forests but the in-stream concentration of dissolved organic carbon is low. Levels of dissolved nitrogen in streams and precipitation is also low. Discharge of carbon and nitrogen increased with precipitation.
- Studies at treatment (harvested) and reference forested watersheds have detailed forest-water relationships, such as the effect of management regime on snowpack accumulation or precipitation effects on flood events, and predicted the potential influence of climate change on biogeochemical processes.

How valuable are the datasets and what can they be used for?

- The value of these long-term, publicly-available datasets focused on hydrologic and biogeochemical processes in watersheds with and without harvest histories will increase as they cover longer time scales.

- These data can be the basis for evaluating watershed process dynamics and changes in those dynamics, such as those caused by natural disturbances, climate change, fire, and human-caused impacts.

As a manager, how can these datasets benefit my work?

- The large amount of published data and analyses available at https://andrewsforest.oregonstate.edu/publications can be used by managers and policy makers to inform harvest or recovery plans or study design and implementation.

- The publicly-available datasets (https://environmentaldatainitiative.org/edi/ and https://andrewsforest.oregonstate.edu/data) can be used for continuing research, to evaluate management options, or in novel ways to answer questions related to forest water and nutrient storage, cycling, and dispersal. Additional datasets are listed in the paper.

Research Approach/Methods

The authors describe the types of projects completed in the HJ Andrews Experimental Forest and the many areas of research that have benefitted from these projects.

They describe the location, geology, climate, forest tree species, and the small watershed experiments.

They then detail the field sampling protocols and lab processing methods for data collection of stream discharge and stream water and precipitation.

Keywords long-term data, precipitation chemistry, research catchments, small watersheds, stream chemistry, stream discharge, hydrologic climate effects, nutrient cycling, nutrient dynamics, harvest and reference watersheds

Images

RANK 1

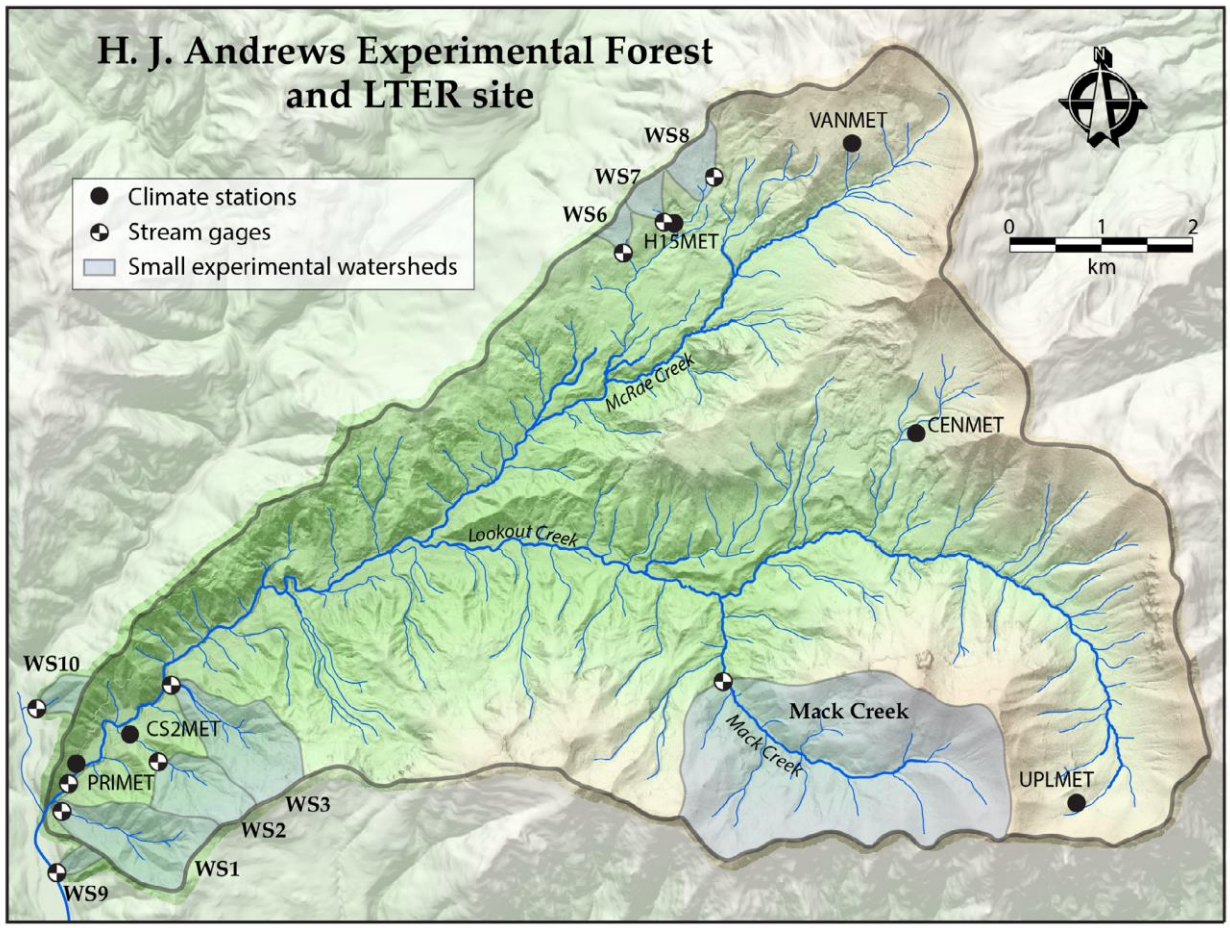

Figure 1 in Johnson et al. 2021. Map of H. J. Andrews Experimental Forest, Blue River, Oregon, showing experimental watersheds, stream gage locations and weather stations. LTER refers to the Long Term Ecological Research grant begun in 1980. Climate state site names are defined in Table 2.

RANK 2

Watershed	Gaged area (ha)	Gage Elev. (m)	Max Elev. (m)	Age of forest (year)	Management history	Stream gage start	Stream chemistry start
1	96	439	1027	50	100% Clearcut 1962–1966; burned 1967; no roads	1952	2003
2	60	545	1079	500	Reference, no harvest	1952	1981
3	101	476	1080	Mixed	25% Patch clearcut 1963; 6% roads 1959	1952	–
6	13.0	878	1029	45	100% clearcut 1974; 9% roads	1963	1971–1987; Restart 2002
7	15.4	918	1102	mixed	60% Overstory harvest 1974; remaining 40% removed 1984; 12% non-commercial thin 2001	1963–1987; Restart 1995	1971–1987; Restart 2002
8	21.4	962	1182	170	Reference, no harvest	1963	1971
9	8.5	426	731	500	Reference, no harvest	1968	1968
10	10.2	461	679	44	100% Clearcut 1975	1968	1968
Mack	580	755	1626	500	13% Harvest and road on ridgeline 1962	1979	1980
Lookout	6242	422	1627	mixed	25% Harvest 1952–1985; 10% roads	1949	2005

Note: For more details https://andrewsforest.oregonstate.edu/research/infrastructure/watersheds.

Table 1 in Johnson et al. 2021. Characteristics of stream gage watersheds, average age of dominant overstory vegetation, and timing of start of gaging and stream chemistry analyses.

Site code	Site name	Most relevant to	Elev. (m)	Precip. start	Precip. chemistry	Air temp. start	Wind, radiation start
CS2MET	Climatic Station at Watershed 2	WS 1, 2, 3, Lookout Ck	482	1957	NA	1958	NA
PRIMET	Primary Met. Station	WS 1, 2, 3, 9, 10, Lookout Ck	436	1979	1968–present	1972	1972
H15MET	High 15 Met. Station	WS 6, 7, 8, Lookout Ck	909	1963	1972–present	1992	NA
GSMACK	Mack Creek Gaging Station	Mack Ck, Lookout Ck	755	1979	NA	1987	NA
CENMET	Central Met. Station	Lookout Ck	1028	1995	NA	1995	1995
UPLMET	Upper Lookout Met. Station	Lookout Ck	1284	1994	NA	1994	1994
VANMET	Vanilla Leaf Met. Station	Lookout Ck	1268	1987[a]	NA	1987	1987
VARMET	Vanilla Leaf Meadow Met. Station	Lookout Ck	1300	1998	NA	2009	NA

Note: For more details: https://andrewsforest.oregonstate.edu/research/infrastructure/climate.

[a]Site used a prototype of a stand-alone gage until 1998, when VARMET was established as a more reliable precipitation record for this area.

Table 2 in Johnson et al. 2021. Elevation and timing of start of precipitation, air temperature and other measurements at climate stations.

RANK 3

Figure 2 in Johnson et al. 2021. (a) Photo of Lookout Creek near the USGS gaging station. (b) Photo of headwater stream under dense vegetation. S. L. Johnson, photographer.