New 'droughty' soils model for Pacific Northwest could aid forest health in changing climate

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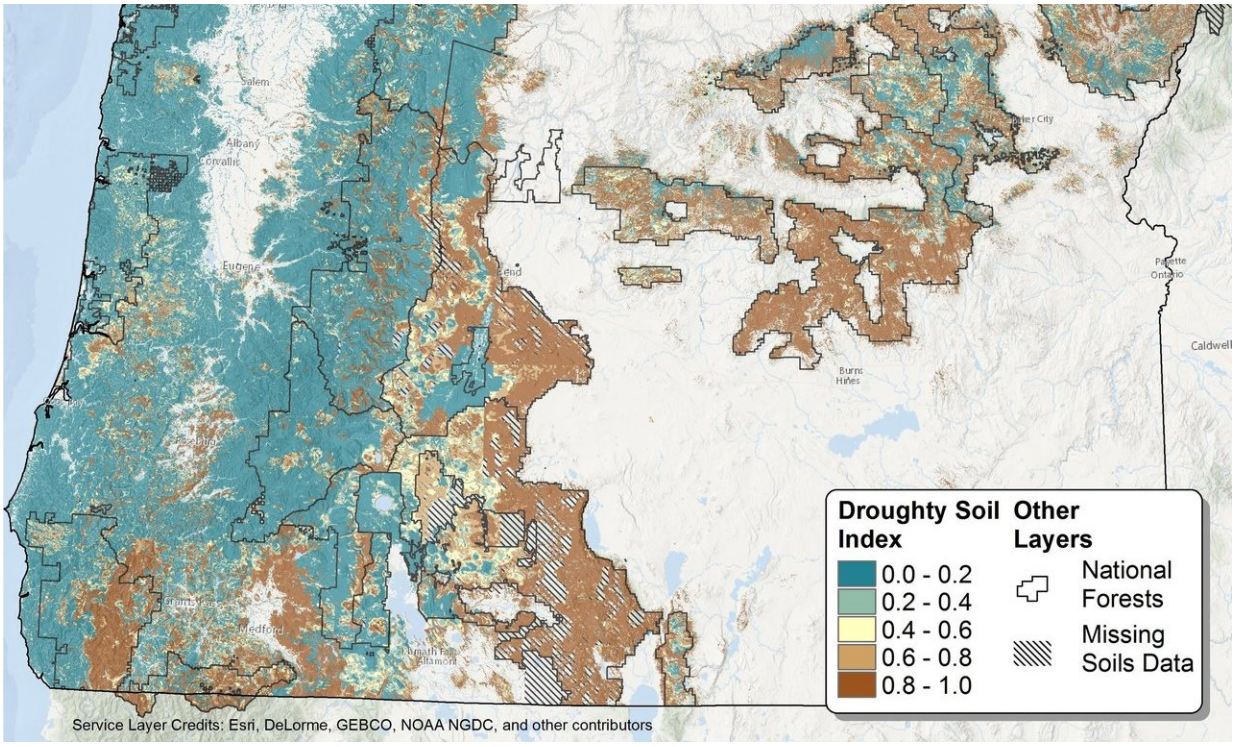

Credit: Oregon State University

Scientists have developed a new approach to modeling potentially drought-prone soils in Pacific Northwest forests, which could aid natural resource managers to prepare forested landscapes for a changing climate.

The study, published in the journal *Forest Ecology and Management*, presents a "droughty" soil index model that can aid land management activities that enhance forest health and productivity, said study lead author Chris Ringo, a senior faculty research assistant at Oregon State University.

"There are widely different abilities of different soil types to absorb, store, and supply moisture to vegetation throughout the year," Ringo said. "We demonstrated that the combination of climatic information and information on physical soil characteristics does a better job of identifying soils that experience prolonged periods of low summer moisture levels than either set of information does by itself."

The study, a collaboration of OSU and the U.S. Department of Agriculture Forest Service, defines droughty soils as those that have a propensity to dry out during the summer months and thus may be particularly vulnerable when prolonged drought occurs.

Knowing how much moisture forest soils hold is important in the Pacific Northwest, as over two-thirds of the region's annual precipitation occurs between October and March. An average of less than two inches of rainfall occur in the summer months.

The model can also help fire managers identify sites to install soil moisture sensors to assist in fire danger modeling.

In addition, the model can assist the Forest Service as it targets areas in the Pacific Northwest that are degraded for landscape restoration, said Ringo, a researcher in OSU's College of Agricultural Sciences.

Low soil moisture in combination with high temperatures can induce significant stresses on forests, increasing vulnerability to attacks of insect and disease, as well as increasing wildfire risk.

To model the likelihood that soils experience prolonged summer drying, researchers used readily available spatial datasets depicting available water supply, soil depth, and evapotranspiration—the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.

To calibrate the model, they examined soil profile descriptions, lab data, and soil moisture curves for 25 sites throughout the Pacific Northwest and estimated the average annual number of days that soil moisture drops to levels at or below the permanent wilting point, a theoretical lower limit of plant-available water.

Using this approach, they found statistically significant relationships between the independent variables and broad classes of soil moisture levels representing the highest and lowest levels of plant-available moisture.

More information: Chris Ringo et al. Modeling droughty soils at regional scales in Pacific Northwest Forests, USA, *Forest Ecology and Management* (2018). DOI: 10.1016/j.foreco.2018.04.019

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