Soil hillslope erosion modelling

Supporting water management decisions after a fire

The modeled mean annual hillslope erosion rates (Mg ha−1 yr−1) across New South Wales Local Land Service (LLS) regions, Australia.
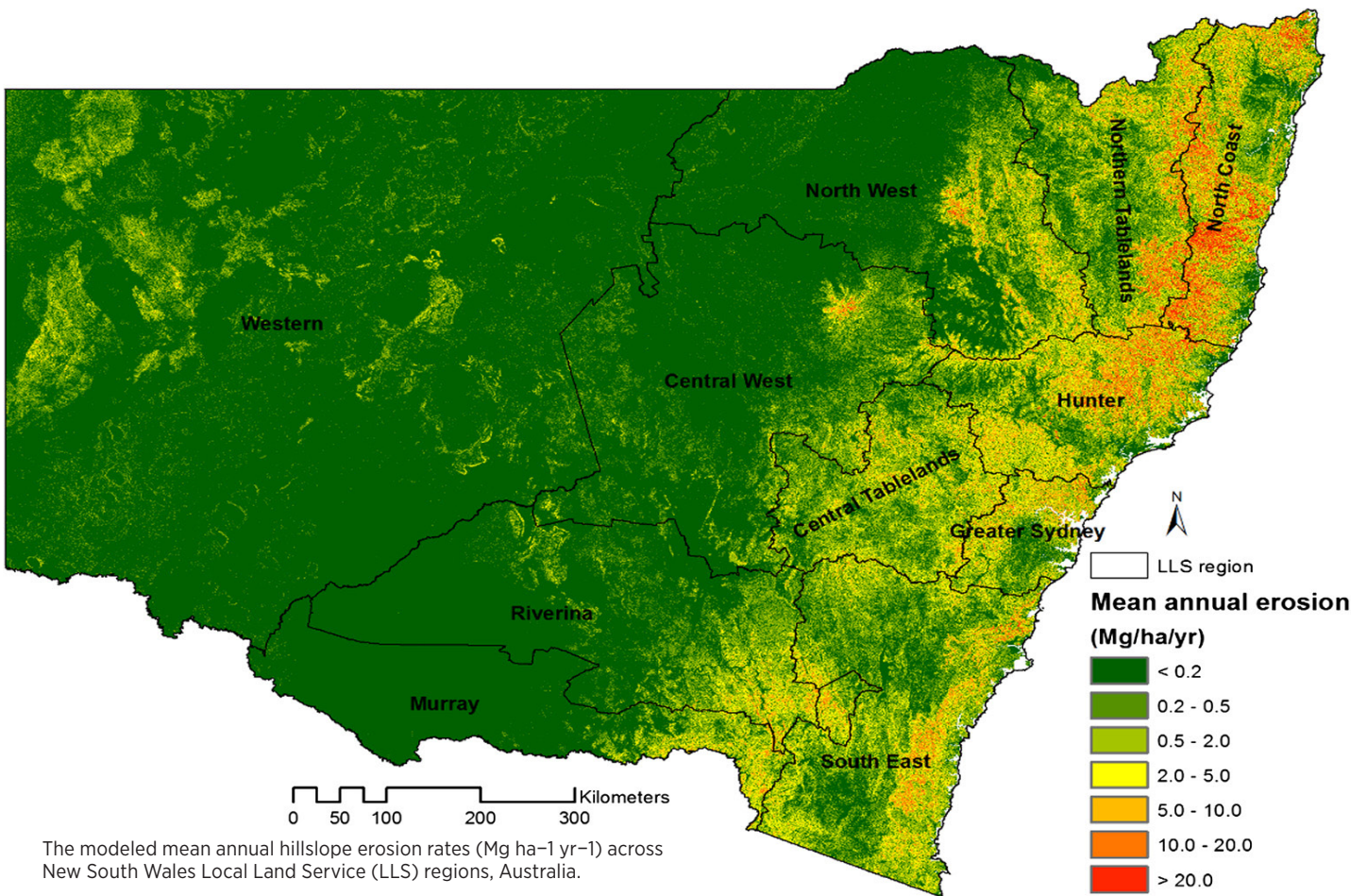
Science Division (Environment Energy and Science Group) are working with organisations like National Parks and Wildlife Service (NPWS), WaterNSW, Environmental Protection Agency, Department of Primary Industry, and Soil Conservation Service, providing event-based erosion modelling to help with post-fire assessment and water management decisions.

How does the modelling help?

Erosion is a widespread natural hazard which often causes land and water quality degradation. Fires can trigger major erosion events as heat and vegetation loss change the capacity of landscapes to retain soil.

Building on research and outputs from the Warrumbungle soil and water recovery project, Science Division developed an event-based erosion modelling tool to assist post-fire erosion risk assessment across New South Wales.

The tool is able to model predictive erosion risks across New South Wales and is currently being used to support land and water management decisions in catchment areas.

How does the erosion assessment work?

The current erosion assessment has two stages:

- Stage-1 estimates the potential hillslope erosion risk based on existing mean annual erosion

data and scenarios of fire severity. This was completed to assist land and water decision making in areas impacted by recent fires.

- Stage-2 uses rainfall and fire event data to estimate the actual erosivity values and the near real-time hillslope erosion for given events. These are produced once event data is available.

What has Stage-1 modelling revealed?

Areas with the highest erosion risk in NSW are currently the North Coast, Hunter and Greater Sydney regions with erosion rates of 4.0, 3.7 and 3.0 tonnes per hectar per year (t/ha/yr) respectively.

Area-specific modelling was done for the Warragamba Catchment to support WaterNSW.

The models found:

- with low fire severity, the mean annual hillslope erosion is predicted to be 1.2 t/ha/yr

- with high fire severity, the mean annual hillslope erosion is predicted to be 7.9 t/ha/yr

- with extreme fire severity, the mean annual hillslope erosion is predicted to be 54.1 t/ha/yr

- February is predicted to have the highest erosion risk, followed by January and March

- there have been significant changes in hillslope erosion in the past 18 years ranging from 0.7 (in 2006) to 2.8 (in 2012) t/ha/yr.

Cover photo: The modeled mean annual hillslope erosion rates (Mg ha−1 yr−1) across New South Wales Local Land Service (LLS) regions, Australia, DPIE.
Right: Predictive modelling of Warragamba Catchment soil erosion produced for WaterNSW January 2020, DPIE.