



Air, Water and Aquatic Environments Science Program

Rocky Mountain Research Station



Sediment Sources and Yields in the Idaho Batholith

Research

Key Findings:

- Sediment delivery in the Idaho batholith is dominated by episodic pluses associated with post-fire thunder storms.
- The magnitude of fire-related sediment delivery is greater than the supply from roads.
- Historically warmer, drier climates were associated with wild-fires and resulting sediment pulses.
- Present climatic trends may lead to increased sediment yields; quantifying this magnitude will benefit future management.

Technology Transfer

Challenge

Sediment production to mountain rivers is essential to habitat formation for aquatic organisms, but also decreases reservoir capacity and increases flood risk near dams. Managing these different and sometimes conflicting uses of our rivers is further complicated by a poor understanding of the relative contributions of natural vs. anthropogenic sediment inputs and their likely responses to changing climatic conditions.

Context

As a result of reservoir sedimentation upstream from the Lower Snake River dams, the U.S. Army Corps of Engineers (USACE) has enlisted the regional staff of the USFS and RMRS scientists to examine potential mitigation strategies as alternatives to current dredging operations. Sediment produced from various sources in mountain basins may be delivered via infrequent massive pulses (floods, debris flows) or in small chronic amounts (roads, hillslope creep), both of which may be affected by management activities. Understanding the magnitudes and relative contributions of these sources to the overall sediment budget, given high spatial and temporal variability, will address the feasibility of management alternatives for the USACE. It also remains unclear how climate change will affect sediment production and what the consequences are for management of basin resources (e.g. fish, clean water, hydropower).

Actions

As part of this collaborative effort we are synthesizing available data and information related to sediment production and delivery to the Snake River upstream of Lower Granite Dam. By examining the sources (e.g. road vs. fire-generated sediment), magnitudes and processes of sediment delivery within the Idaho batholith, our analysis will inform fisheries and reservoir management and provide insight into expected sediment yield changes resulting from changing climate.

Results

Review of the existing literature indicates that sediment delivery from fire-induced debris flows is greater in magnitude, but lower in frequency compared to the chronic supply from roads. The projected trends in warming, increased wildfire, and changing hydrology are likely to increase sediment yields.

Science Application



Road Sediment Production

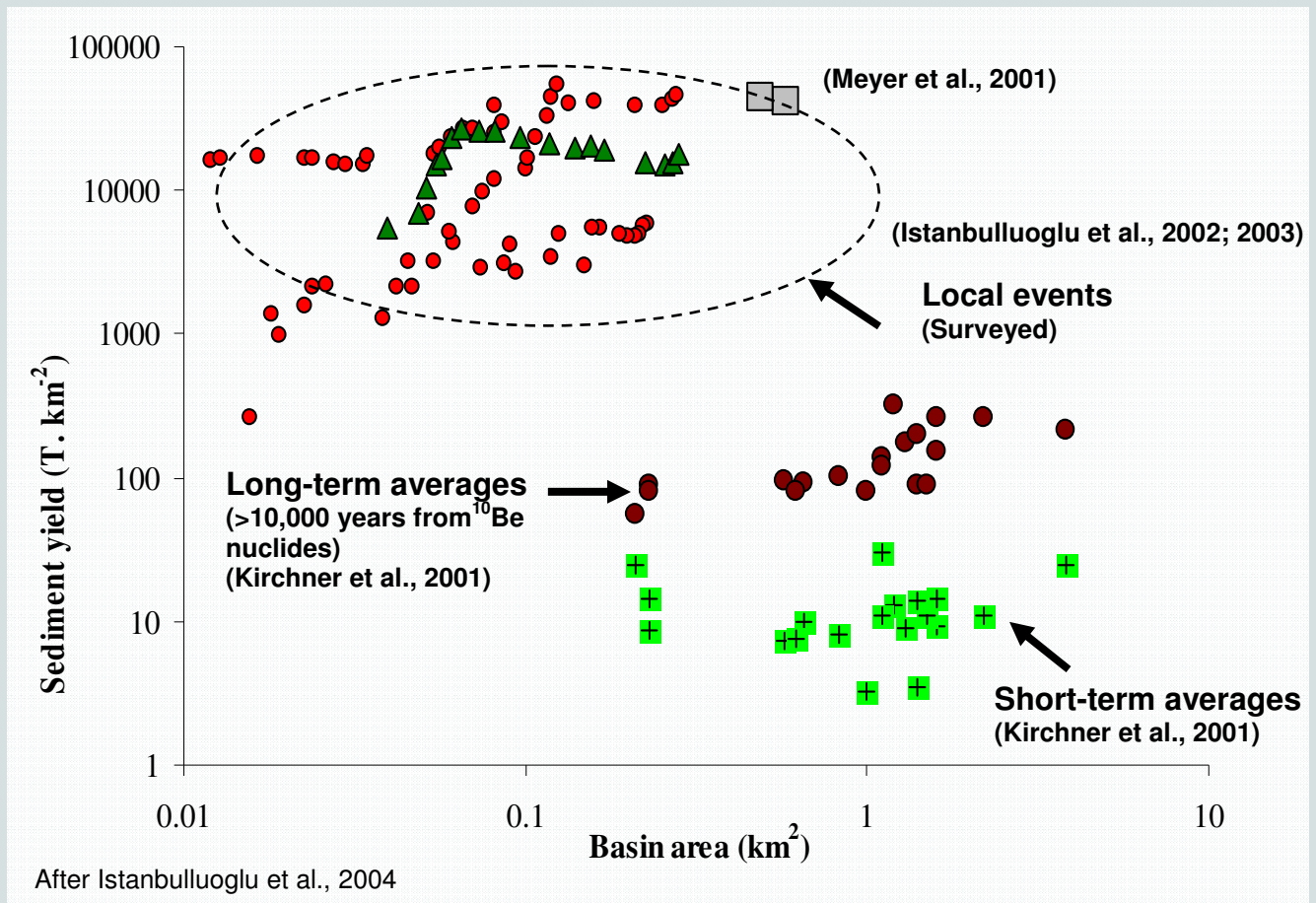


Fire-related tributary debris flow



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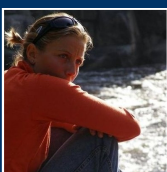
Magnitudes of sediment yield in the Idaho Batholith

Related Publications

Istanbulluoglu, E., D.G. Tarboton, R.T. Pack, and C.H. Luce (2004), [Modeling of the interactions between forest vegetation, disturbances, and sediment yields](#). *Journal of Geophysical Research* 109, F01009, doi:10.1029/2003JF000041

Luce, C. H., and Z. A. Holden (2009), [Declining annual streamflow distributions in the Pacific Northwest United States, 1948–2006](#). *Geophys. Res. Lett.*, 36, L16401, doi:10.1029/2009GL039407.

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