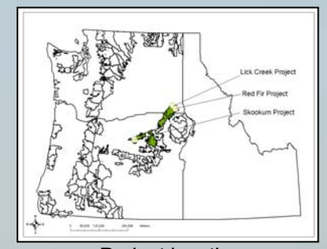
Effects of Prescribed Fire and Fuels Treatments on Water Quality and Aquatic Habitat in the Blue Mountains, Oregon and Washington

Clifton, Catherine F.[1], Harris, Robin M. [2], and Steven M. Wondzell[3]

Prescribed fire and fuels treatments are being implemented to reduce long-term risks to forests from wildfire. In the interior Columbia Basin, proposed treatments are often motivated by potential threats to water quality and threatened or endangered salmonids. Management plans for the basin assume that the direct effects of wildfires, as well as wildfire-related erosion and sedimentation of streams, are greater threats to water quality and fish habitat than are the effects of fuels treatments. However, there is limited empirical data to support this assumption. We summarize results from 4 years of study of prescribed fire and fuels treatment project effects.

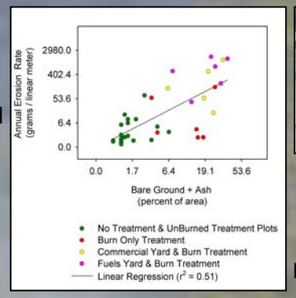


Project location

FINDING → Measured effects of prescribed fire and fuels treatments are small and/or non-detectable under normal weather and standard operating conditions:

- Without large storm events in the first years after prescribed fire, measured erosion rates were very low. Differences in hillslope erosion between burned and unburned plots were only significant at one of two treatment areas and at that site, erosion rates were higher on mechanically treated plots than on burn-only or no-treatment plots.
- The significant relationship between bare ground and erosion rates, demonstrates the role of soil cover in controlling surface erosion.
- The hillslope area contributing sediment to the erosion fences was very small, extending no more than a few meters upslope of the fence apron. Most erosion resulted from bioturbation by small mammals and elk.
- In general, current riparian buffer design criteria (no ignition within riparian, only allowing fires to "back into") appears effective in preventing hillslope sediment from entering riparian areas and delivering to streams.

Plot before and after treatment

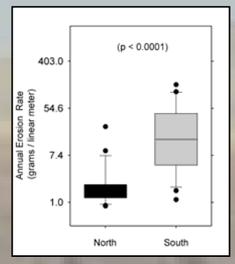


Lick project results

Installing silt fence

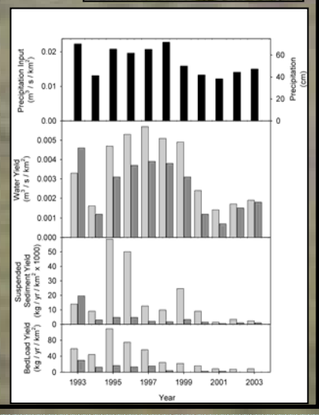
FINDING → Spatial and temporal variability of hillslope erosion rates is related to and dominated by local environmental conditions:

- Background hillslope erosion rates were significantly higher on south-facing slopes.
- Estimates of background hillslope erosion rates suggested that low amounts of sediment are delivered to valley floors within each catchment, as measured with the silt fences located in toe-slope positions.
- The Disturbed WEPP model (http://forest.moscowfsl.wsu.edu/fswepp/) over-predicted soil erosion on hillslopes with low-severity prescribed fire and under-predicted erosion rates on undisturbed hillslopes with heavy vegetative cover. Although the Disturbed WEPP results generally varied from the measured sediment yield results by about an order of magnitude, the trend of small predicted erosion rates agreed with the small amounts of sediment yield measured in the field.
- WEPP modeling results offered a calibration check on the ability of the Disturbed WEPP model to predict sediment yield, particularly at low erosion rates.



FINDING → Complex response including spatially variable and lagged response times at the watershed-scale influences detection of treatment effects beyond the site scale:

- The Skookum paired watersheds provide 13 years of "background" spanning a period of variable weather conditions and significant forest mortality.
- Annual sediment yields were highly variable. Watershed sediment budgets show that episodic erosion events most likely control sediment delivery to streams but sediment storage in valley floors and bank erosion loss influences annual sediment yields over the long term.
- Sediment may be stored on valley floors for long periods of time; continued erosion of stored sediment elevates sediment loads in streams, even when little erosion is occurring on upland sites.
- Prescribed fire and fuels treatments in uplands implemented under normal operating conditions are unlikely to be measurable, or detectable in tributaries because effects are small and well with the range of variability.



FINDING → Implementing prescribed fire and fuels treatments in complex fuel types and controversial settings continues to be a challenge especially in landscapes which support TES and/or provide municipal water supply.

- Results validate the design of treatments for no effect to aquatics under "normal" operation and weather conditions.
- Avoiding active treatment within riparian areas may, over the short term, prevent direct effects of sedimentation to streams but riparian conditions, including fuel loading, may or may not meet desired conditions.
- Treatment of the Skookum project, planned for 2003, was deferred because of changed fuel conditions and overall Forest priorities.
- Research based on Forest-level project plans faces continued uncertainty in terms of the likelihood of projects being implemented, yet remains dependent on Forest projects for opportunities to perform "live" experiments.

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[1] Umatilla National Forest, 2517 SW Hailey Ave, Pendleton, OR 97801, cclifton@fs.fed.us, [2] Water Resources Department, Confederated Tribes of the Umatilla Indian Reservation, P.O. Box 638, Pendleton, OR 97801, robinharris@ctuir.com, [3] Pacific Norwest Research Station, Olympia Forestry Sciences Lab, 3625 93rd Ave SW, Olympia, WA 98512, swondzell@fs.fed.us