

Stream Succession: Channel Changes After Fire Disturbance

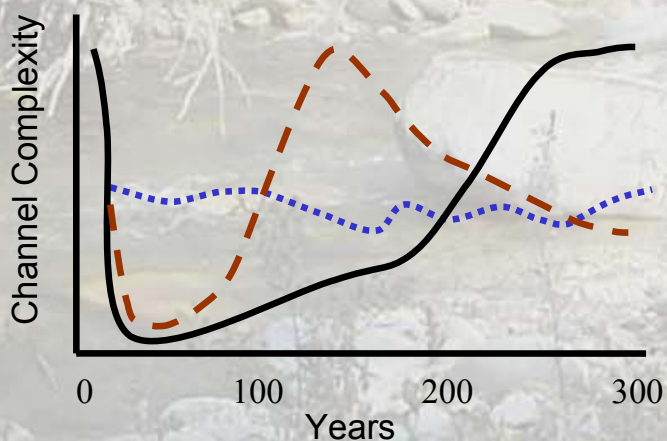
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Introduction

How do channels change over time following disturbance? In forest communities we see systematic changes in the soils and vegetation after fire disturbance. There is no analogous data for streams, although there is a clear notion among watershed professionals that streams "recover" after disturbances such as fire. What does the initial perturbation look like and what does the recovery look like? Limited data from the Oregon Coast Range provide an empirical hypothesis but do not demonstrate that channel succession occurs broadly. There is a need to see if this is truly a general behavior, or just a perception.

There are a variety of views about how channels might change and the time scale of response. A simple view is that the aquatic habitat quality is degraded by fire and resultant floods, and over time it recovers (solid black line). Whether this occurs over a few years or a few hundred years is not clear. A more complex hypothesis is that it degrades temporarily from a long term condition, "recovers" to a better condition, and gradually returns to the long term "equilibrium" (dashed brown



line). Where gravel availability is limiting, this is a popular notion. A simple alternative is that there is no pattern in habitat condition with time (dotted blue line), which might be expected in low gradient streams that are buffered from direct impacts of post-fire debris flows.

Objectives

Objective 1. Determine whether successional trends in channel characteristics can be recognized as a function of time since fire.

Objective 2. Develop sampling protocols and metrics for describing the trends in channel and habitat conditions following fire.

Study Design

The study was designed using a space-for-time substitution. We considered three different forest age classes, representing three different times since fire: recent (15-20 yrs), mid (90-130 yrs), and old (>150 yrs). Variables independent of fire and potentially confounding (elevation, drainage area, valley slope) were controlled to isolate the effect of fire on channel characteristics. The initial phase of work examines low-gradient floodplain channels, which excludes direct impacts from post-fire debris flows and allows us to focus on post-fire changes in basin hydrology, sediment supply, and proximal riparian characteristics (supply of wood debris, bank strength from roots, etc.). Channel characteristics of interest included measures of channel morphology (channel width, depth, pool size, substrate size), riparian canopy (tree density, basal area per unit area), and large woody debris characteristics (amount, location, function, size).

Preliminary Results

We found no statistical difference in channel characteristics between age classes. This could mean that the no-pattern hypothesis is the best description for low gradient systems, or that the other patterns play out over such short time scales that we did not pick up the changes because our most recent samples were 15-20 years after fire.

Comparison to steeper streams may clarify the issue by providing a stronger initial perturbation. Although floods occur in low gradient systems after fire, there is seldom the violence seen in higher-gradient systems prone to debris flows. Moreover, because large wood may stay longer in low gradient systems, it may work with the increased water and sediment immediately following fire to structure habitats, in a way that is not possible for the comparatively wood-poor steep systems.

More information available from cluce@fs.fed.us, and our web site at <http://www.fs.fed.us/rm/boise>.