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LANDSCAPE CHANGE, FIRE, AND EROSION

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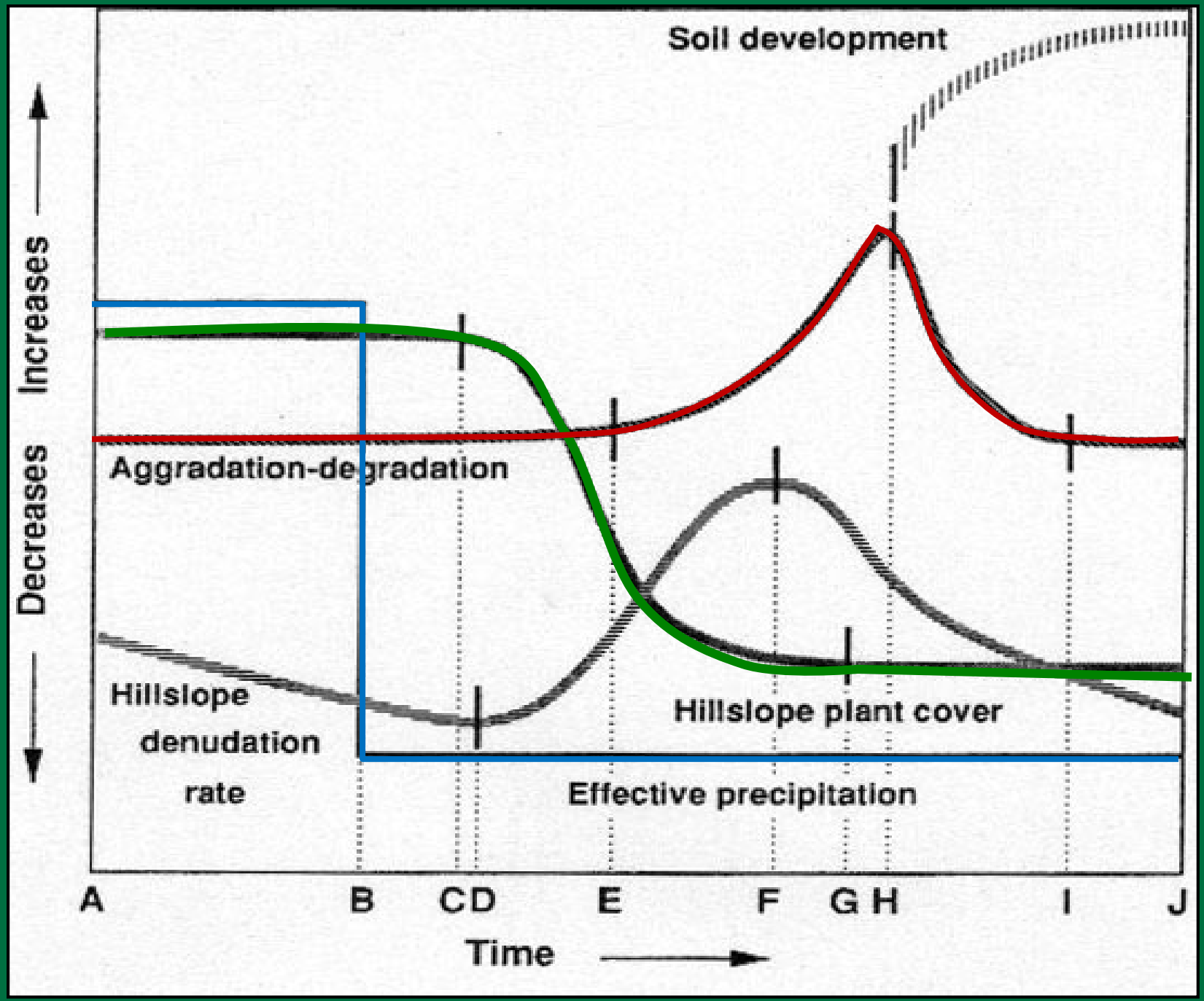
Landscapes are linked to climate

Climate change

Vegetation change

Landscape change



Geomorphic Response to Climate Change (Bull, 1991)

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Wildfire Frequency and Climate

Warming temperatures lead to more, larger, and hotter wildfires (Westerling, 2016; Williams et al, 2013)

Increased burn severity enhances the propensity for and magnitude of surface runoff generation (Robichaud et al, 2000).

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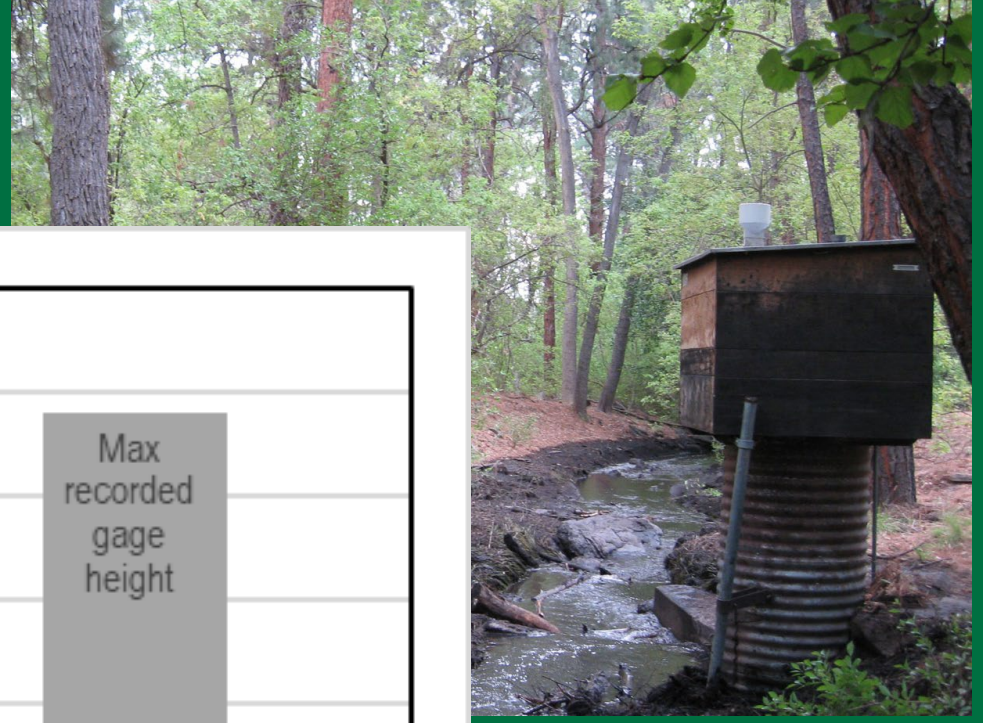
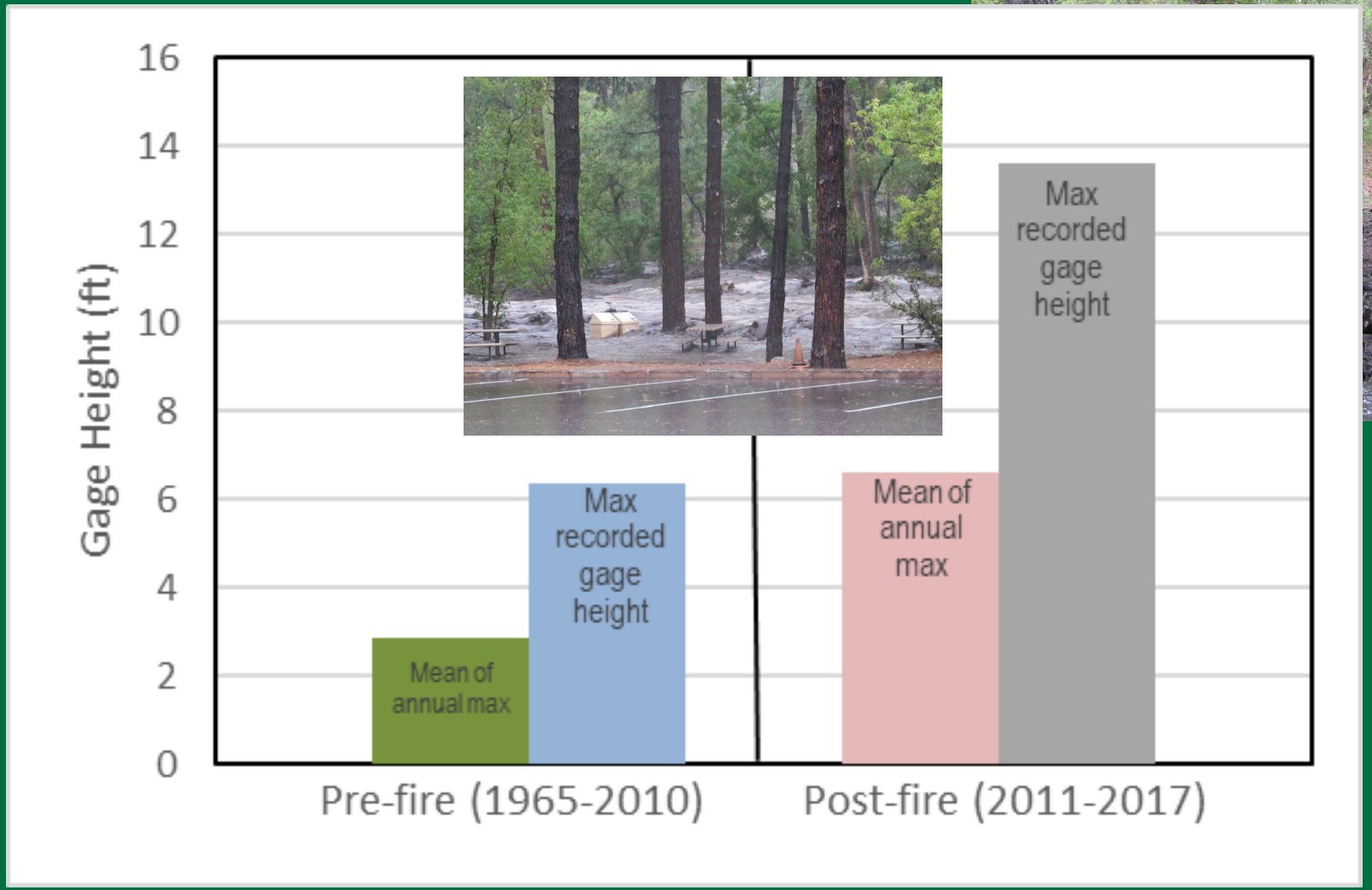
Frijoles Canyon Headquarters gage





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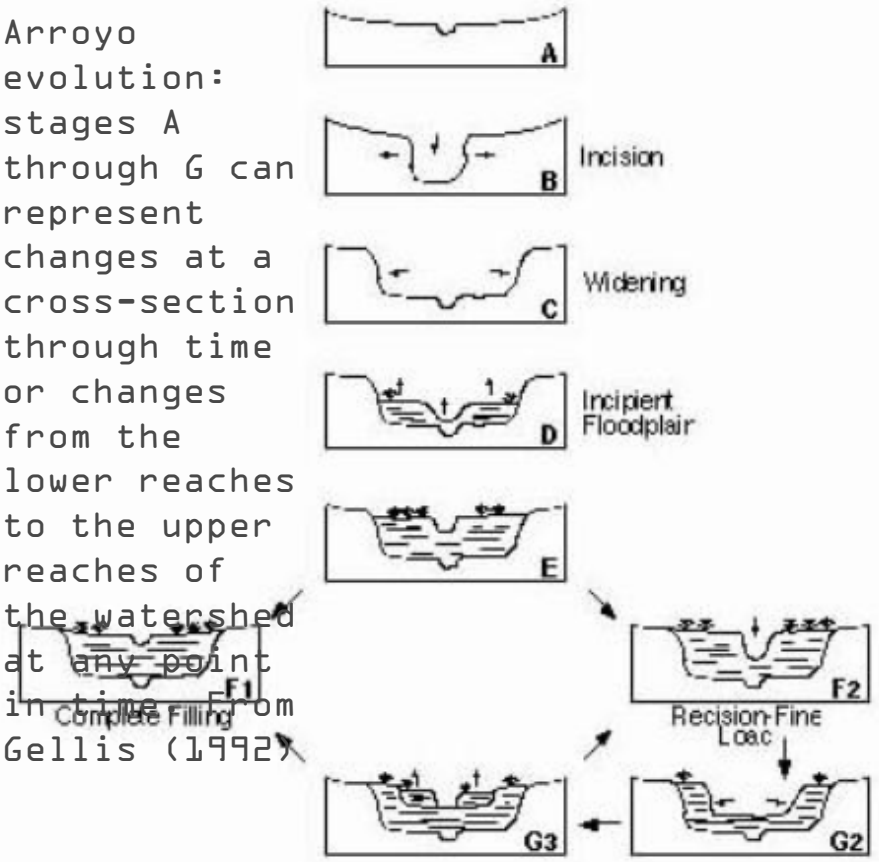
Mouth of Frijoles Canyon September 13, 2011

Arroyo research in New Mexico

Arroyo evolution: stages A through G can represent changes at a cross-section through time or changes from the lower reaches to the upper reaches of the watershed at any point in time from Gellis (1992)



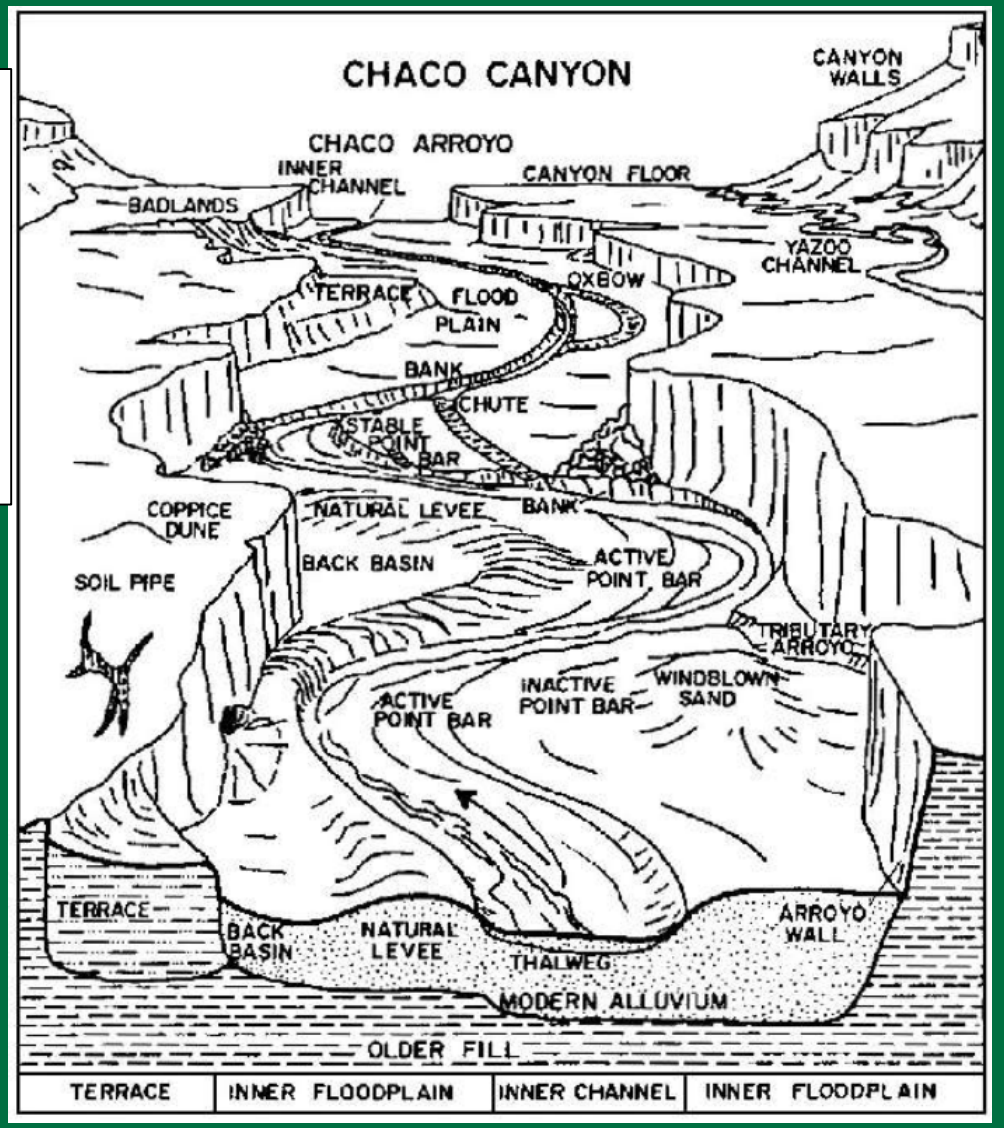
Bryan, 1925, Science

DATE OF CHANNEL TRENCHING (ARROYO CUTTING) IN THE ARID SOUTHWEST[1]

INTRODUCTION

NEARLY all streams in southwestern United States flow between vertical banks of alluvium that vary in height from ten to as much as one hundred feet. Although subject to great floods, these streams no longer overflow their banks, nor build up their adjacent flood-plains. Floods merely deepen and widen the channels (arroyos) which continually grow headward into the undissected valley floors of headwater valleys and tributaries. The details of this process of dissection (channel trenching) have been elabo-

Changes in **climate variables**, which are closely tied to vegetation, are frequently cited as perturbations of arroyo systems leading to activation of the system (onset of erosion or deposition)



Arroyo morphology as seen in Chaco Arroyo, New Mexico. From Love (1983)

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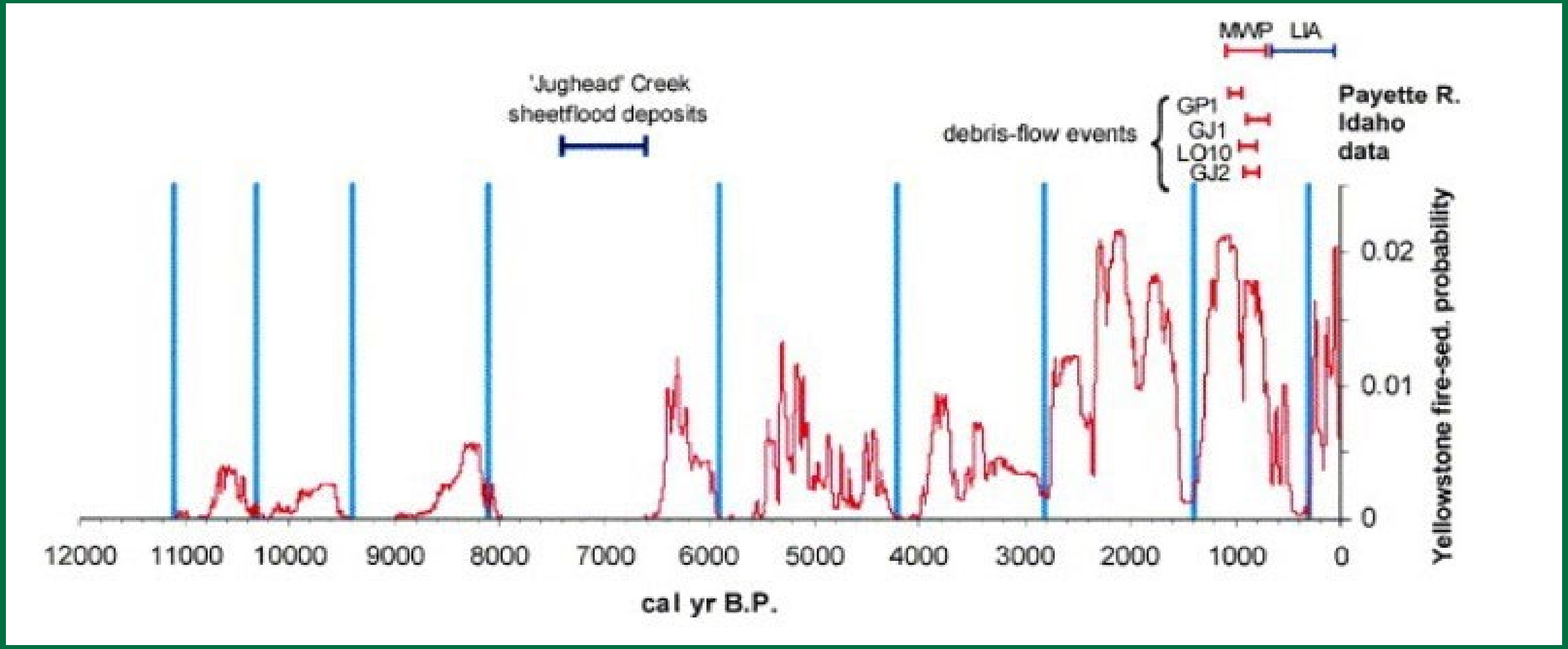
Wildfire frequency and severity are linked to climate



Radiocarbon based wildfire sedimentation probability curve (red line) with time plotted with North Atlantic minimum temperatures (Bond et al., 1997) shown as vertical blue lines. Modified from Meyer and Pierce, 2003

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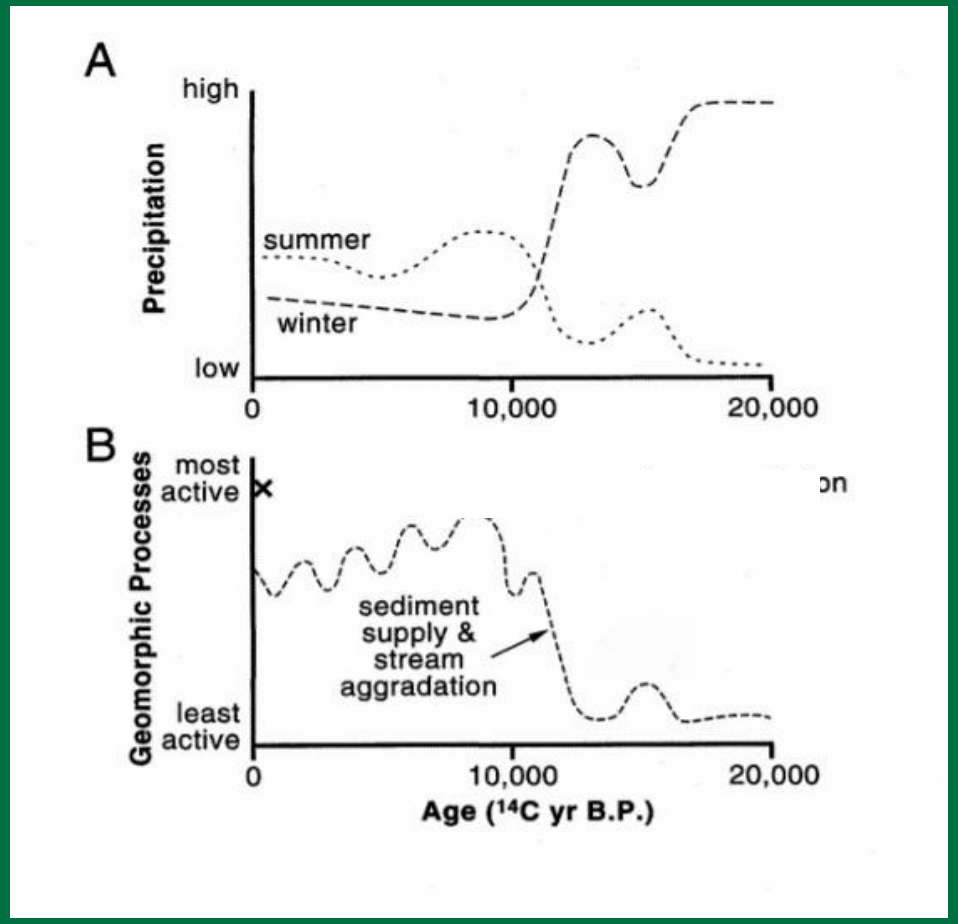
Landscapes respond when climate changes

Cycles of Erosion and Deposition



Graph showing geomorphic processes active in the Pajarito Plateau with time and precipitation. Adapted from Reneau, 1996.

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As New Mexico gets warmer, the landscapes are responding in a variety of ways, many of which, will lead to increases in sediment mobilization

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Landscape change due to climate change

- Loss of vegetation due to reasons other than wildfire (drought, disease, pests, grazing, human alterations, etc.) can lead to similar accelerated landscape change.
- Rain is more erosive than snow so more precipitation falling as rain means increased erosion.
- It is not feasible to predict how every setting in the state will respond to climate change, but we can say that a change in temperature and precipitation patterns will likely lead to a direct response of some kind in sensitive landscapes throughout New Mexico.

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Questions?

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