



Reconstruction of Fire and Erosion over 13,000 Years

Importance: Increase knowledge about past fire in semiarid pinyon-juniper ecosystems

Fires in pinyon-juniper (PJ) are typically stand-replacing so they do not produce fire scars for fire history reconstructions. Recently, PJ woodlands have increased in density and expanded into threatened sagebrush ecosystems. Gaining a stronger understanding of past fire and fire-related erosion in PJ systems during past climate shifts is important as projected climate changes alter vegetation and related fire regimes.



Survey Objectives: Compare alluvial charcoal fire record to packrat midden vegetation record

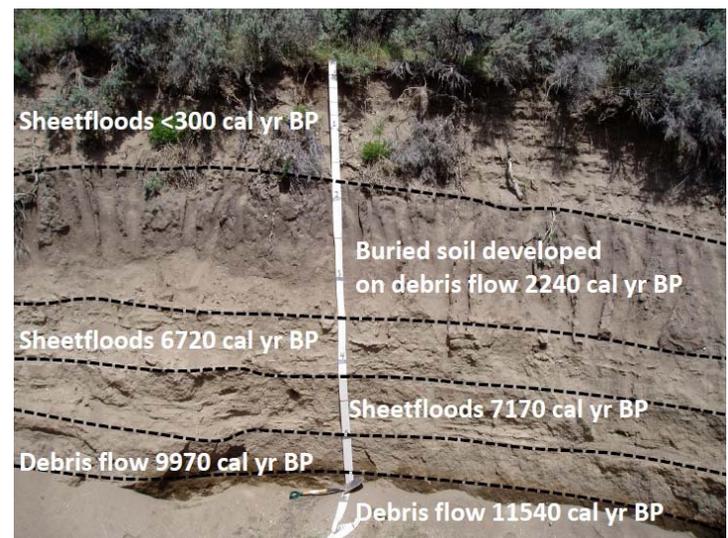
Charcoal preserved in stream and alluvial deposits (alluvial charcoal) are dated using ¹⁴C isotopes, which estimate the timing of past fires. Erodible granite at City of Rocks provides an excellent record of past fire-related deposition (i.e. sheetfloods vs. debris flows). Fire-related deposits are exposed in streambanks and arroyos throughout the reserve. Packrat middens, common in overhangs and crevices, are fossilized collections of vegetation that animals collected from around their nest. Comparison of the fire history with the vegetation record helps clarify past relationships among climate, vegetation, fire and fire-related erosional response.



Recent Sheetflood Deposit in Reserve

Results: Timeline of past climate, vegetation, fire and fire-related erosion at City of Rocks

- **10,700-9500** yrs ago **frequent fires** burned following deglaciation ~12,800 yrs ago
- **7200-6700** yrs ago **frequent fires** burned during prolonged drought ~8200-4000 yrs ago
- Climate became cooler and wetter ~4000 yrs ago
- **2400-2000** yrs ago **fires** burned following Pinyon-Juniper colonization
- **Fires were most frequent 850-700** and **500-400** yrs ago during Pinyon-Juniper expansion
- Fire-related debris flows were most frequent and widespread beginning ~2400 yrs ago when Pinyon-Juniper woodlands expanded



Management Applications:

Recent Pinyon-Juniper expansion suggests that fire risk is elevated. In the event of fire, increased debris flow hazards may threaten park structures and infrastructure that extend beyond the burned area.

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