TEACHING BURNT TREES NEW TRICKS: APPLYING FIRE HISTORY METHODS TO ARCHAEOLOGICAL RESEARCH QUESTIONS

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Overview

- Introduction
- Modern impacts of wildland fires
- Using fire histories to reconstruct the past
- Discussion and Research Directions
Greybull River Sustainable Landscape Ecology Project (GRSLE)

2006 Little Venus Fire

- Nearly 35,000 acres burned
- Provides unique opportunity to study fire history and a rich archaeological record
Impacts of the 2006 Little Venus Fire on the Archaeological Record in the Present

1.) Artifact destruction

2.) Increase visibility

3.) Interpretations and formation processes

Contrasting artifacts found on soil burned during the Little Venus summer of 2006. Sites 027-7, 025-07, 016-07, 015-07, 06-20, and 039-07 were area previously surveyed but no sites were found until after the burn.
Comparison of known sites before and after the Little Venus fire. Site numbers ending with "-7" represent data collected the summer after the fire.

**48PA2772**

- Before LV fire:
  - 5559 surface artifacts recorded in 2003
  - Diagnostics: Archaic and Late Prehistoric
- Post LV Fire:
  - 919 surface artifacts recorded in 2007
  - Diagnostics: Archaic, Late Prehistoric, Protohistoric, and PaleoIndian

Documentation areas:

- 2003 = Entire site = 6.9 ha = 809 artifacts/ha
- 2007 = 5m $r^2$ Oxidized Sediments = .19 ha = 29491 artifacts/ha
- Archaeological sites are not static entities
  - Dynamic, integrated, and evolving set of process of between biotic (including humans) and abiotic forces
- Landscapes
  - Also products of non static dynamic interactions between cultural, biological, and abiotic forces
- Taphonomy
  - Transition from the biosphere to the lithosphere

Fire as an Ecological Process

- Keystone Evolutionary Process
  - For ecosystems
    - Fire adapted traits such as thick bark and serotiny
  - Also for humans
    - First extrasomatic technology
    - Center point for activity
- Always important to remember scale when examine role of disturbances such as fire
Reconstructing the Past

1. What is the Fire History of the Piney Creek Drainage?

2. What is the relationship between the Protohistoric occupation Piney Creek drainage and the timing of prehistoric fires?

Question 1: Methods

- Constructing a fire history
Archaeological Data: Upper Piney Creek Site

- Protohistoric site
  - Glass trade beads
  - Metal fragments
  - Processed faunal material
  - Bone Collagen
    - 200±40 BP
    - (More dates in the mail)
  - 19 features (including hearths and bone clusters)

Dendrochronological Data

<table>
<thead>
<tr>
<th>Code</th>
<th>Common Names</th>
<th>#</th>
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</thead>
<tbody>
<tr>
<td>5N</td>
<td>Limber pine + Whitebark pine</td>
<td>256</td>
</tr>
<tr>
<td>PIEN</td>
<td>Engelmann spruce</td>
<td>44</td>
</tr>
<tr>
<td>ABLA</td>
<td>Subalpine fir</td>
<td>6</td>
</tr>
<tr>
<td>PSMEG</td>
<td>Douglas fir</td>
<td>56</td>
</tr>
<tr>
<td>Aspen</td>
<td>Aspen</td>
<td>5</td>
</tr>
<tr>
<td>999</td>
<td>No Data</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>380</td>
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</tbody>
</table>

26 Cross Sections for Scar Crossdating
Question 2: How the Fire History Compares to Human Occupation

- Upper Piney Creek Site
  - Protohistoric
  - RC date 200±40 BP

<table>
<thead>
<tr>
<th>Tree Number</th>
<th>Year of Scar</th>
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<tbody>
<tr>
<td>TC-079</td>
<td>1821</td>
</tr>
<tr>
<td>TC-226</td>
<td>1921</td>
</tr>
<tr>
<td>TC-247</td>
<td>1931</td>
</tr>
<tr>
<td>TC-038A</td>
<td>1954</td>
</tr>
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<td>TC-192</td>
<td>1954</td>
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<td>TC-249A</td>
<td>1954</td>
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<tr>
<td>TC-184</td>
<td>1973</td>
</tr>
<tr>
<td>TC-073</td>
<td>1648, 1797, 1931</td>
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<td>TC-046</td>
<td>1951, 1971</td>
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</tbody>
</table>

- Occupation vs Fire sequence

- Fires are driven by three forces
  - Climate, Fuel, and Ignition
- Little Venus Fire was ignited by lightning strike
Variability in Fire Regimes

- Some areas at low and high elevations have evolved with different types of fire regimes
  - Frequent, low intensity surface fires typify environments such as ponderosa pine and coastal redwood forests in lower elevations
  - Native American burning practices played a role in development in areas like coastal redwood forests where ignition sources such as lightning strikes were low
- Recent anthropogenic alterations to these ecosystems has introduced crown fire into surface fire system

Variability in Fire Regimes continued...

- Infrequent, high severity fire regimes typify higher elevation subalpine settings
  - Dominated by species such as lodgepole pines, mixed conifer, and spruces
- Because these areas are remote, post contact suppression rarely occurred
- This does not mean that other types of anthropogenic alteration have not impacted these areas
Case Studies
Climate and Fire Regimes: Potential Changes

- Using Canadian regional Climate Model (RCM), Amiro et al. 2001 predicted possible changes to fire weather within the next few decades
  - Temperatures increase as much as 5°C
  - Precipitation could decrease as much as 20%
  - Fire Weather Index could rise as much as 20% in many areas

Increasing temperatures influence fire season as documented in the Northern Rockies by Westerling et al. 2006

- Time series of 1166 large forest wildfires from 1970 to 1986 and 1987 to 2003
  - 61% from western forested areas
  - 80% above 1370m
- Found only increased in the mid 1980s in forested areas
  - Frequency of wildfires 4 times average of 1970 to 1986
  - Total area burned 6.5 times the previous level
- Temperatures for 1987-2003 were 0.87°C higher than 1970-1986
Piney Creek: Where to go From Here?

- Were the previous fires during times of drought?
  - Reflected in the dendrochronological record?
- Contrast with ethnographic accounts
  - Climate and beetles?
- “Plugging” people into the mean fire intervals

Discussion and Research Direction

- Dualism of archaeological research methods
- Modern processes influence what we see and interpret
  - Implications for management
- Fire history as proxy dataset
  - Compare to archaeological datasets to reconstruct past environments
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