

A Bristlecone Pine Forest from the Early Oligocene of Southwestern New Mexico, USA: Evidence for Vegetation Response to the Eocene-Oligocene Transition

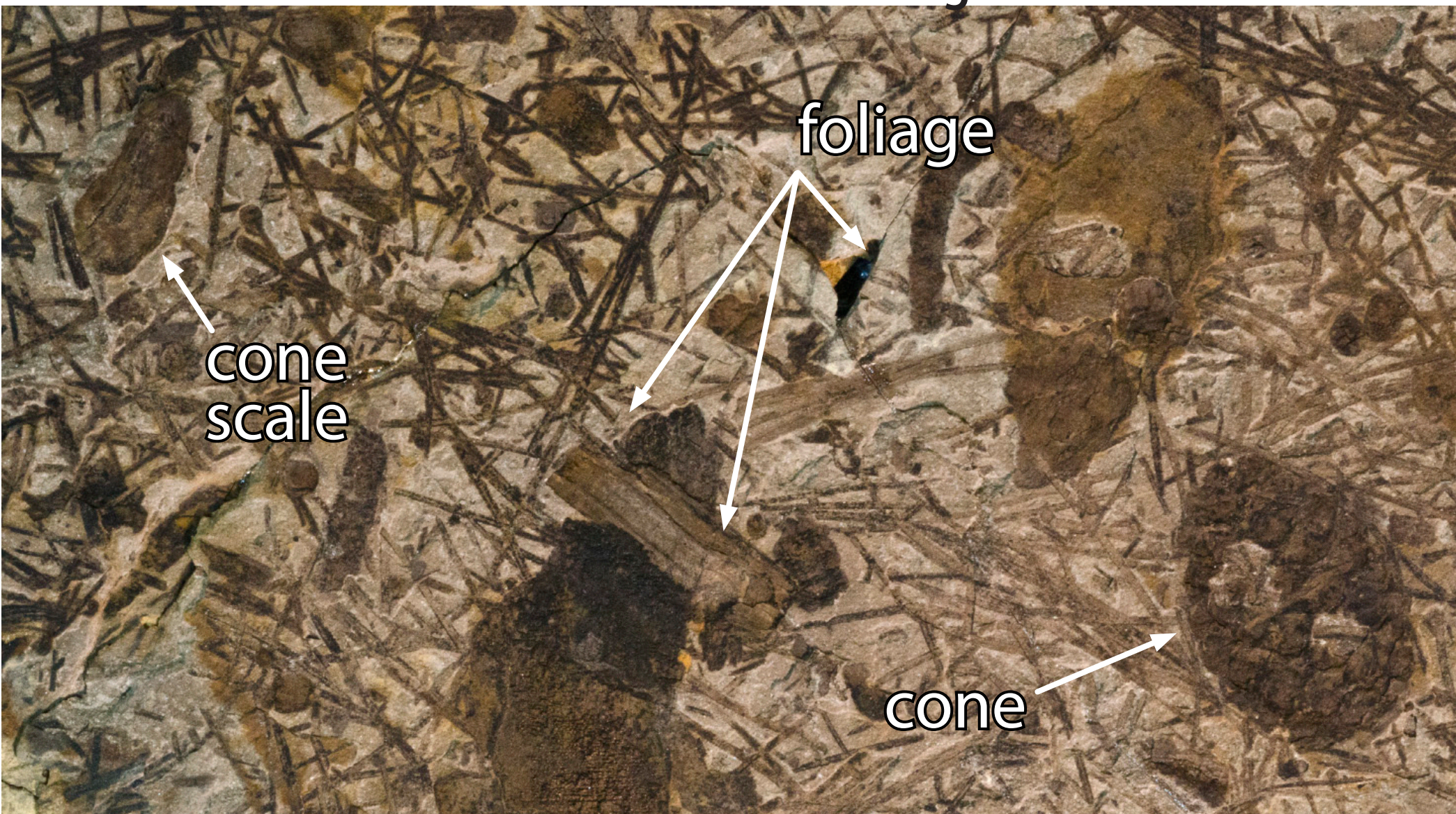
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Geologic Setting and Age

- Lacustrine tuffaceous shale associated with volcanic rocks post-dating the primary eruptive phases of the Emory cauldron
- Radiometric dates:
 - Hermosa 33.6 (± 1.0) Ma
 - Dated from ash-flow tuff above the fossil shale
 - Hillsboro 28.1 (± 0.6 Ma) – 31.7 Ma
 - Bracketed between basaltic andesite and Caballo Blanco Tuff
- Earliest Oligocene



Fossil Plant Assemblage



The floras are dominated by abundant foliage, cones, and cone scales of *Pinus crossii*, with some *Mahonia*

Macroflora

Conifers

- *Pinus crossii* (dominant)
- Comprises 99% of the assemblage
- Deciduous bundle sheath is characteristic of Haploxylon pines (“soft pines”)
- The association of five-needled fascicles lacking persistent bundle sheaths along with cone scales bearing dorsally oriented umbos indicates an affinity with the subsection Balfourianae, which includes the extant bristlecone and foxtail pines.
- The fossil specimens are assigned to *Pinus crossii*, originally described from the late Oligocene Creede flora of Colorado. The fossil record of this group is known from other western American floras as old as late middle Eocene.

Picea sp.

Angiosperms (rare)

- *Mahonia* sp. (*M. marginata*-*M. aceroides* lineage)
- *Crataegus* sp.

Palynoflora

- Dominated by Pinaceae

- Pinus* sp. (incl. *P. aristata*)
- Picea*
- Ephedra* cf. *nevadensis*
- Juglans*
- Carya*
- Ulmoideae
- Mahonia*-type
- Sarcobatus*
- Quercus*?
- Gramineae



Pinus-type



Picea



Mahonia-type



Sarcobatus



Ulmaceae



Hermosa (UCMP)
Picea

Angiosperms



Hillsboro (USGS) Hillsboro (UCMP)

Mahonia

1 cm
(2x scale)

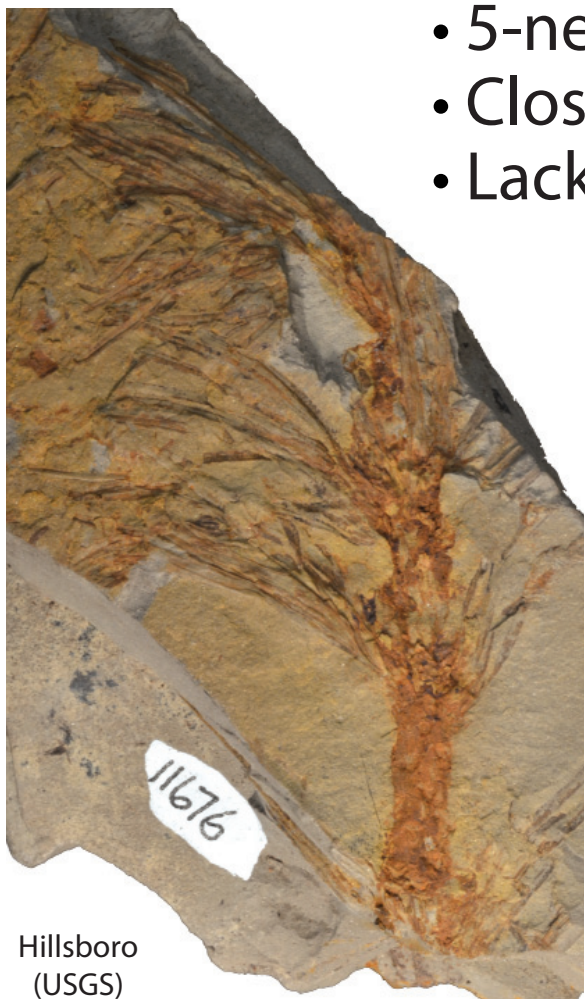


Hermosa (UCMP)
Crataegus

Pinus crossii

Foliage Characteristics

- 5-needled fascicles
- Closely clustered incurved needles
- Lacks bundle sheath (deciduous)



Hillsboro (USGS)



Pinus fascicles (Hermosa) courtesy of (USGS)



bundle sheath deciduous



Hermosa fascicles (5)

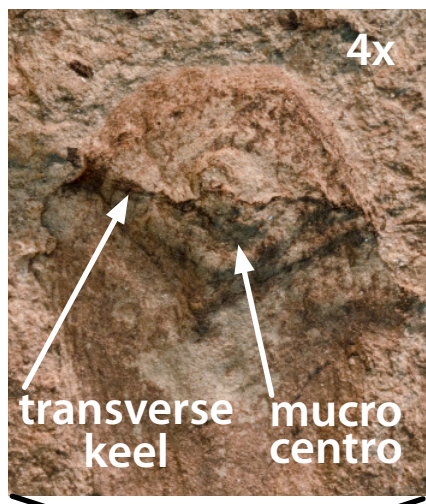


mature
Pinus
cone

Hermosa (USGS)

Pinus crossii Ovulate Cone Characteristics

- Cone scales have dorsally- oriented umbos



Hillsboro (USGS)



Hermosa (USGS)



Hermosa (USGS)



Hermosa (USGS)
immature cone



Hermosa (USGS)



Hillsboro (USGS)
abraded mature
Pinus cone