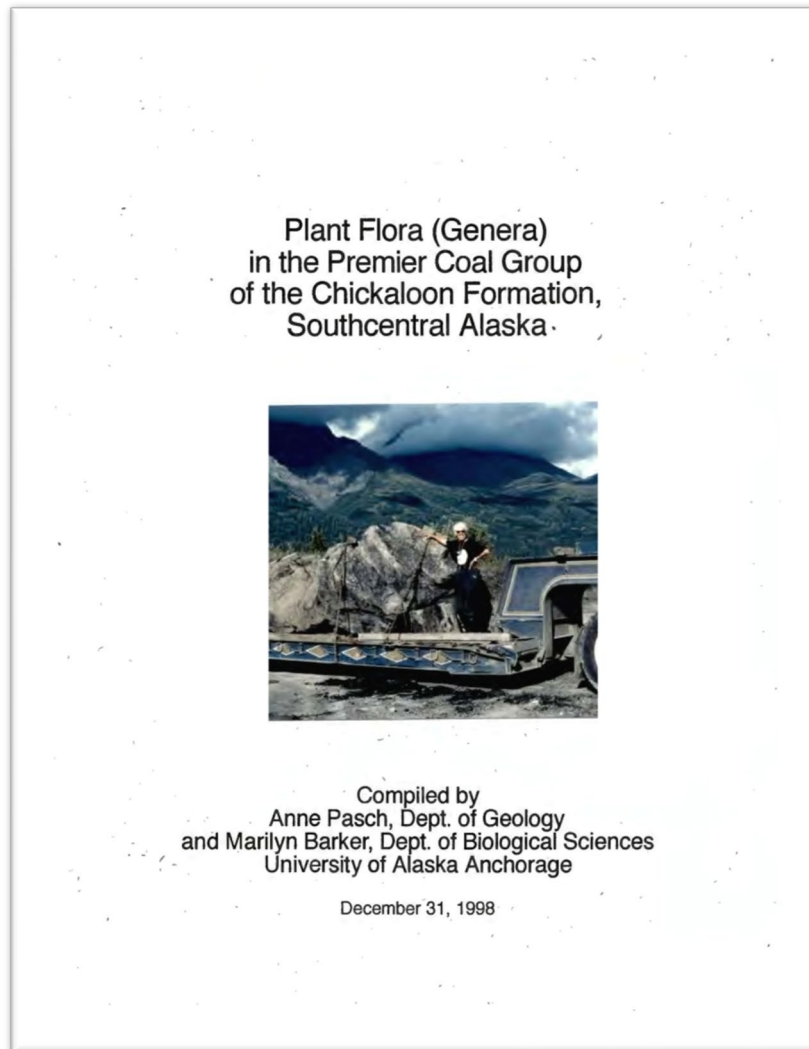


Plant flora (genera) in the Premier coal group of the Chickaloon Formation, Southcentral Alaska

Anne D. Pasch and Marilyn Barker

MP 179C



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**Plant Flora (Genera)
in the Premier Coal Group
of the Chickaloon Formation,
Southcentral Alaska.**



**Compiled by
Anne Pasch, Dept. of Geology
and Marilyn Barker, Dept. of Biological Sciences
University of Alaska Anchorage**

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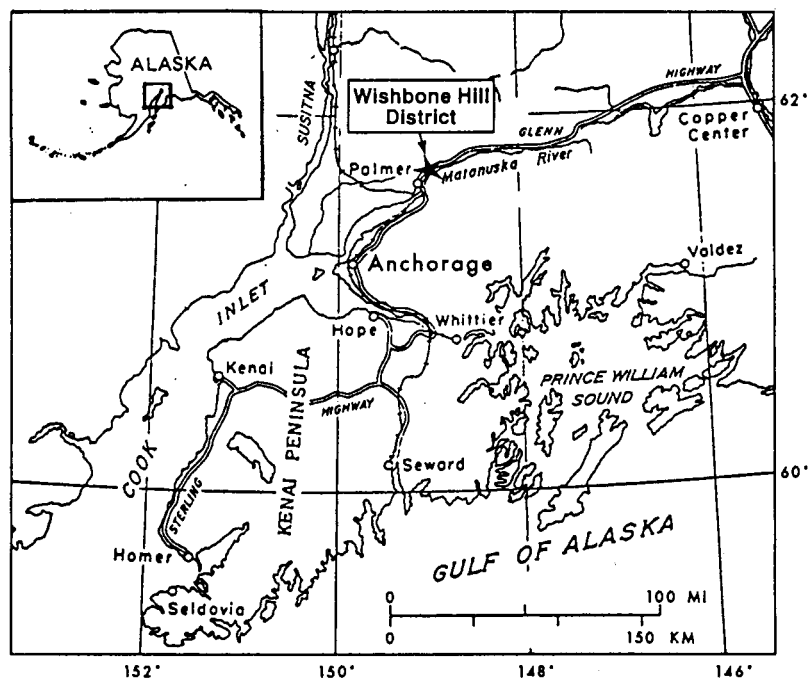


Fig. 1. Geographic location of the Wishbone Hill coal mining district.

REGIONAL GEOLOGY

(modified from a paper by Heather Pierce)

The Wishbone Hill coal district lies in the Matanuska River Valley northeast of Cook Inlet. The Castle Mountain Fault lies to the north of the valley and adjacent to the Talkeetna Mountains which are made up of volcanic, sedimentary, granitic, and gneissic rocks. South of the valley lie the Chugach Mountains which are made up of greenstone, diorite, and interbedded slate and graywacke.

The major units exposed in the Wishbone Hill district are the Wishbone and Chickaloon Formations. The Chickaloon Formation is 1,500 meters thick and consists primarily of interbedded sandstone, conglomeratic sandstone, siltstone, mudstone, carbonaceous shale, and coal. It sits unconformably on the Cretaceous Matanuska Formation and is conformably overlain by the Wishbone Formation. The Wishbone Formation is 900 meters thick and consists primarily of conglomerate, sandstone, and a small amount of siltstone and mudstone (Flores and Stricker, 1993). This formation shows local unconformable basal contacts where the conglomerate and sandstone cut into the underlying Chickaloon Formation.

The most outstanding structural feature of the Wishbone Hill area is the canoe-shaped outcrop of the Wishbone Hill plunging syncline. Northeast left-lateral, oblique-slip faults have cut across it. Flores and Stricker (1993) suggest these faults were active from the early stages of the deformation of the Castle Mountain Fault, during Mesozoic through Tertiary time, when the Chickaloon Formation was deposited.

The Chickaloon Formation is of economic importance because of its coal-bearing members. From 1915 to 1967, the Wishbone, Chickaloon, and Anthracite Ridge coal districts produced as much as 6,130,000 metric tons of coal (Flores and Stricker, 1993). Surface and underground coal mines were localized in the Wishbone Hill District (Barnes and Payne, 1956). The coal beds are located in the upper 425 meters. There are a few thin coal beds in the lower section. The upper portion is subdivided into four coal-bearing zones: Jonesville, Premier, Midway, and Eska. The coal seams are interbedded with carbonaceous shale, bony coal, mudstone, tonstein (ash) beds, and ironstone concretions.

Flores and Stricker conducted a detailed sedimentological study of the Chickaloon Formation in 1993. They described lithologies, sedimentary structures, sedimentary lateral and vertical facies. They reported that the mudstones and siltstones contained root marks, plant stems, tree trunks, leaves, and animal burrows. The coal and carbonaceous shale sections contain ironstone concretions. Facies sequences were deposited by west-southwest flowing meandering to anastomosing streams which were affected by seasonal changes in discharge. Stream channel positions may have been controlled by local oblique-slip faults. A high rate of subsidence triggered rapid deposition in the down dropped blocks.

THE TERTIARY FLORA

Early Tertiary floras in Alaska occur in the upper Cook Inlet area, the northern foothills of the Brooks Range, on the Alaska Peninsula, and in the southeastern part of the state. The Tertiary plant fossils in the Cook Inlet area have been described in detail only by Hollick (1936) and Wolfe and others (1966). Wolfe studied 50 collections of fossil plants in the Cook Inlet Region and concluded that they documented a gradual cooling trend in the area from the Paleocene to the Pliocene. He used leaf morphology (smooth leaf margins, drip tips, and palmate venation) as indicators for a warm temperate climate lacking frost. He also compared the degree of diversity in three plant divisions showing that there was a correlation between decreasing plant diversity and decreasing temperatures.

	Wolfe (1966)	Pasch (1998)
Vascular Plants		
Seedless plants	Filicinae (ferns)	Sphenophyta (horsetails) Filicinae (ferns) Cycadophyta (cycads) ?
Seed plants	Gymnospermae (conifers) Angiospermae (flowering plants)	Gymnospermae (conifers) Angiospermae (flowering plants)
Invertebrates	Mollusca (fresh water pelecypods and gastropods)	Mollusca (fresh water pelecypods and gastropods)*
Vertebrates		Chordata (fresh water turtle)

Fig. 2. Diversity of Chickaloon paleoflora: fauna, divisions and phyla.

Wolfe described four floral stages in the Cook Inlet region from older to younger: 1) an unnamed stage from the Chickaloon Formation, 2) the Seldovian, 3) Homerian and 4) Clamgulchian. The Seldovian flora, named for exposures near Seldovia, represents less diversity than the Chickaloon, but still contain a rich, diverse, flora containing deciduous dicots which do not currently grow in Alaska. It suggests a warm temperate climate similar to that of east-central Asia and the southeastern United States today. The Homerian assemblage (named after an exposure near Homer) shows a marked decrease in diversity during the Miocene/Pliocene. Only one of the dominant families is not extant. Wolfe interprets this as evidence for a dramatic shift to cool-temperate conditions. The youngest, Clamgulchian, is Pliocene(?) and named after exposures in a bluff along the eastern side of Cook Inlet near Clam Gulch. This flora has the least diversity and though dominated by willow and birch of the extant forest, is still not an exact match. It represents the ancestors of the modern tree taxa living in a cool temperate climate.

The plant fossils occur as carbonized remains, impressions, casts and molds. The diagenetically flattened carbonaceous films preserve the more resistant parts of the plant structure. The best leaf impressions preserve venation patterns, leaf margins, and leaf shape. Other structures include carbonized cones, seeds, fruits, branches, tree trunks, and roots.

TAXONOMY OF THE WISHBONE HILL FLORA

Plantae

Sphenophyta

Equisetales

Equisetaceae

Equisetites ?

Equisetites sp. (Brown, 1962, p. 45; Hollick, 1936, p. 41;
Newberry, 1898, p. 14; Tidwell, 1998, p. 72)

Filicophyta

Filicales

Matoniaceae

Matonia sp. ? (Tidwell, 1998, p. 82)

Schizaeaceae

Anemia gunni (Wolfe, 1977, p. 52)

Polypodiaceae

Astralopteris (Tidwell, 1998 p. 84)

Cycadophyta

Cycadales

Cycadaceae

Dioon ? (Hollick, 1936, p. 43)

Nilssonia or *Podozamites* sp. ?

Gymnospermae

Coniferophyta

Taxodiaceae

Glytostrobus europaeus (Hollick, 1936, p. 51)

Metasequoia occidentalis (Tidwell, 1998, p. 111; Brown, 1962, p. 49)

Parataxodium sp.

Taxodium ?

Taxodium sp.

Taxodium dubium longifolium (Hollick, 1936 p. 49)

Pinaceae

Abietites sp. (Newberry, 1998 p. 18)

Angiospermophyta

Dicotyledonae

Salicales

Salicaceae

Populus ?

Populus sp.

Populus acerifolia (Newberry, 1898, p. 37)

Populus amblyrhyncha ? (Hollick, 1936, p. 63)

Populus glandulifera (Hollick, 1936, p. 65)

Populus latior (Hollick, 1936, p. 64; Wolfe, 1966, p. B11)

Populus obscura (Hollick, 1936, p. 68)

Populus richardsoni (Hollick, 1936, p. 61)

Salix sp.

Juglandales

Juglandaceae

Carya sp.

Carya antiquorum (Brown, 1962, p. 55; Hollick, 1936, p. 83;
Wolfe, 1966, p. B8)

Juglandales

Juglandaceae

Carya sp.

Carya antiquorum (Brown, 1962, p. 55; Hollick, 1936, p. 83;
Wolfe, 1966, p. B8)

Hicoria magnifica (Hollick, 1936, p. 83)

Juglandicarya sp. (Hollick, 1936, p. 56)

Juglans sp. ?

Juglans nigella (Hollick, 1936, p. 81)

Juglans salicifolia (Hollick, 1936, p. 79)

Pterocarya septentrionale (Hollick, 1936, p. 84)

Fagales

Betulaceae

Alnus alaskana (Newberry, 1898, p. 65)

Carpinus cobbi ? (Wolfe, 1966, p. B23)

Carpinus grandis (Newberry, 1898, p. 59)

Fagaceae

"*Quercus*" ?

"*Quercus*" *banksiaefolia* ? (Newberry, 1898, p. 69)

"*Quercus*" *elliptica* ? (Newberry, 1898, p. 74)

"*Quercus*" *greenlandica* (Brown, 1962, p. 58)

"*Quercus*" *grönlandica* (Newberry, 1898, p. 75)

"*Quercus*" *juglandina* ? (Hollick, 1936, p. 101)

"*Quercus*" *pseudocastanea* (Hollick, 1936, p. 98)

"*Quercus*" *sullyi* (Brown, 1962, p. 59)

Ulmaceae

"*Planera*" *microphylla* (Brown, 1962, p. 60; Newberry, 1898, p. 114;
Wolfe, 1966, p. B9,)

Ulmus newberryi (Knowlton, 1902, p. 54)

Polygonales

Polygonaceae

Coccolobis chapini (Hollick, 1936, p. 112)

Rosales

Hydrangeaceae

Hydrangea cf. *H. alaskana* (Hollick, 1936, p. 122)

Eucommiaceae

Eucommia serrata (Brown, 1962, p. 72, Newberry, 1898, p. 66)

Platanaceae

Platanus sp.

Platanus aceroides latifolia ? (Lee & Knowlton, 1917, p. 321)

Platanus aspera ? (Newberry, 1898, p. 102)

Platanus rectinervis (Hollick, 1936, p. 123)

Platanus nobilis (Newberry, 1898, p. 106)

Rosaceae

Spiraea sp. ? (Wolfe, 1966, p. B24)

Papilionaceae

Sophora cf. *S. multiformia* (Hollick, 1936, p. 129)

Rhamnales

Vitaceae

Ampelopsis acerifolia (Brown, 1962, p. 78)

Sapindales

Aceraceae

Acer sp.

Rulac crataegifolium? (Knowlton, 1902, p. 77)

Celastraceae

Celastrus comparabilis (Hollick, 1936, p. 132)

Malvales

Tillaceae

Tilia sp.

Grewia orbiculata ? (Hollick, 1936, p. 145)

Sterculiaceae

Pterospermites sp. ?

Pterospermites sp.

Pterospermites conjunctivus (Hollick, 1936, p. 152)

Pterospermites cordatus (Brown, 1962, p. 82)

Pterospermites cf. *P. dentatus* (Wolfe, 1966, p. B12)

Parietales

Dilleniaceae

Dillenia alaskana (Hollick, 1936, p. 153)

Oleales

Oleaceae

Fraxinus inordinata (Hollick, 1936, p. 163)

Fraxinus juglandina (Hollick, 1936, p. 163)

Fraxinus lateralis (Hollick, 1936, p. 164)

Umbellales

Araliaceae

Hedera sp. (Hollick, 1936, p. 156)

Cornaceae

Nyssidium ekmani (Hollick, 1936, p. 159)

Rubiales

Caprifoliaceae

Viburnum sp. ?

Viburnum sp. (Hollick, 1936, p. 165; Newberry, 1898, p. 128)

Angiosperm genera not assigned to families

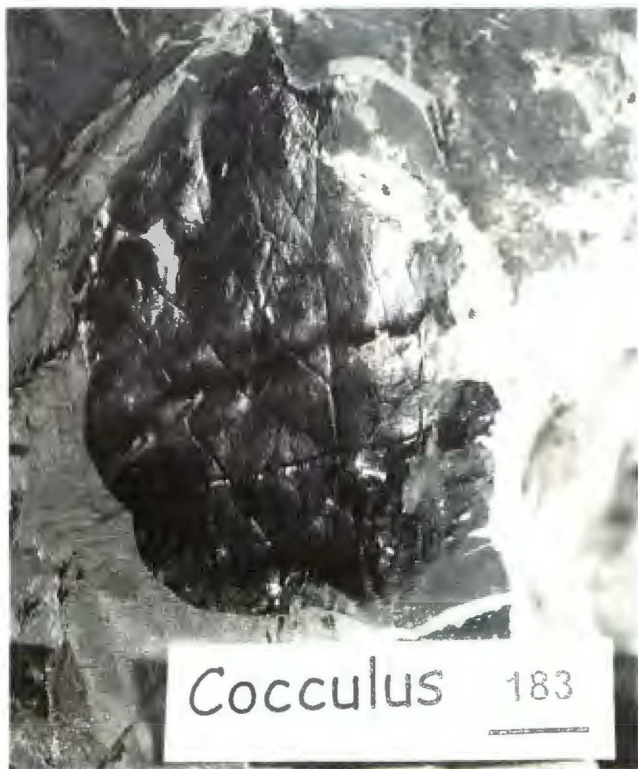
Cocculus sp.

Cocculus flabella (Wolfe, 1966, p. B9)

Dicotylophyllum flexuosa (Wolfe, 1966 p. B11)

Dicotylophyllum alaskana (Wolfe, 1966, p. B11)

"*Ficus*" *ratonensis* (Tidwell, 1998, p. 172; Lee & Knowlton, 1917, p. 306)



Cocculus 183



Carpinus 34B



Eucommia 320



Ampelopsis 196



Alnus 360



Dillenia? 053





Unknown 198



Coccolobis 322



Cocculus 255



Dicotylophyllum 179



Dicotylophyllum 384



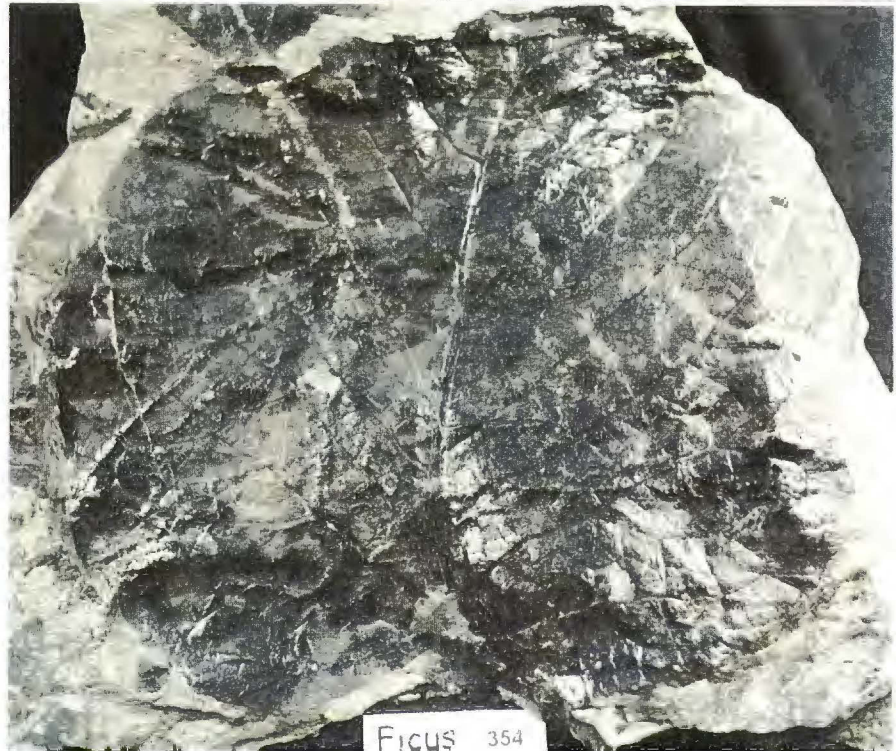
Rhus ? 173



Viburnum 281



Dicotylophyllum 175



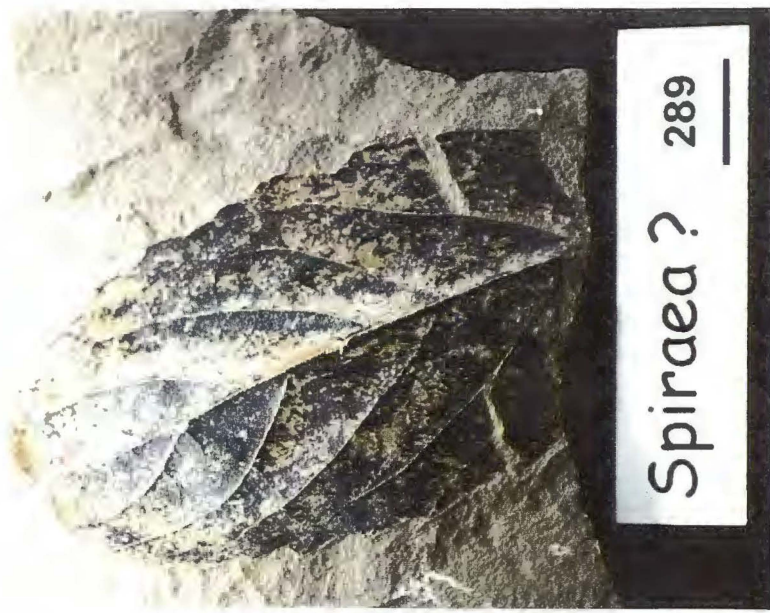
Ficus 354



Carya 074



Hedra 362



Spiraea? 289



Hedra 362



Hicoria 351



Liriodendron 350



Planera 130



Ulmus 041



Platanus 321



Platanus 126



Platanus 177B



Populus 195



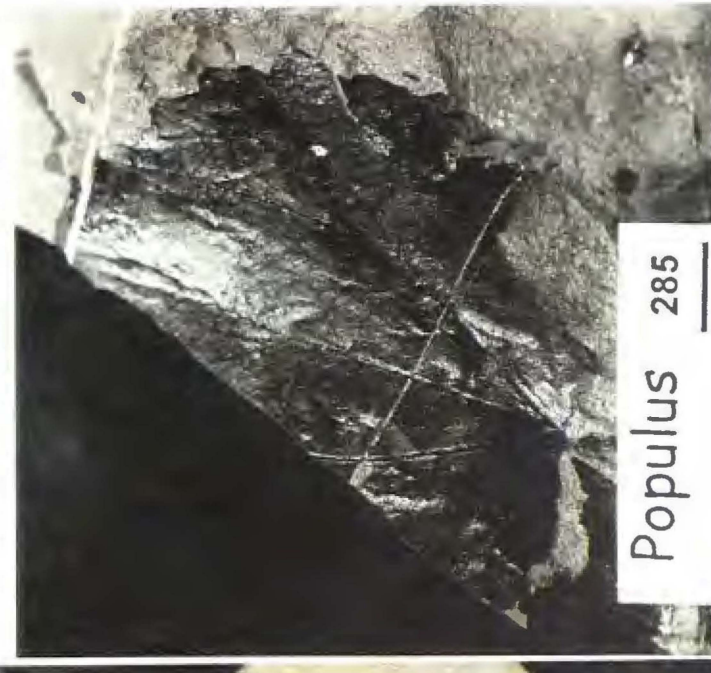
Populus 193



Populus 303



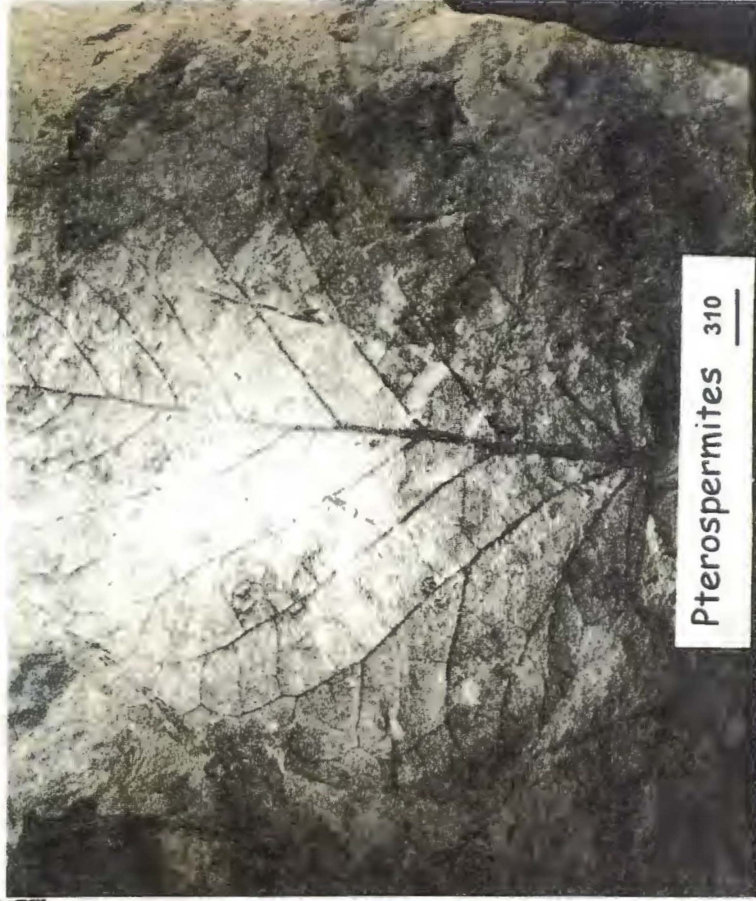
Populus 145



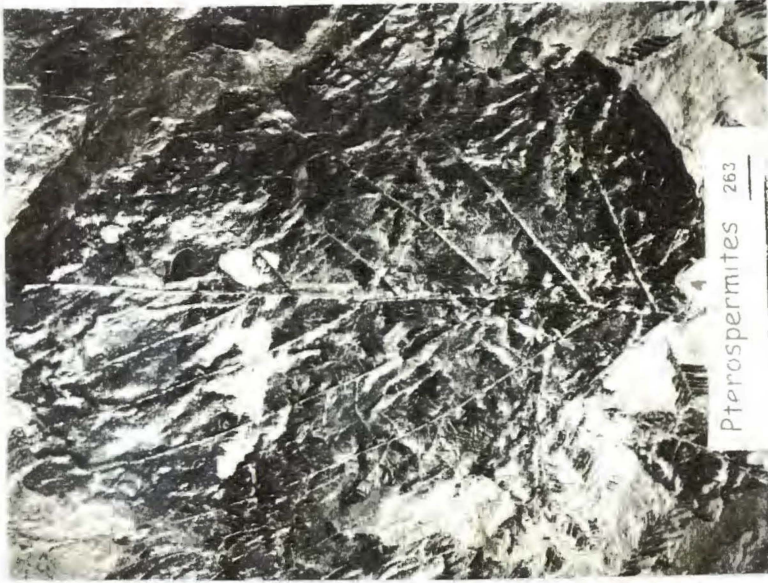
Populus 285



Pterosperrmites 186



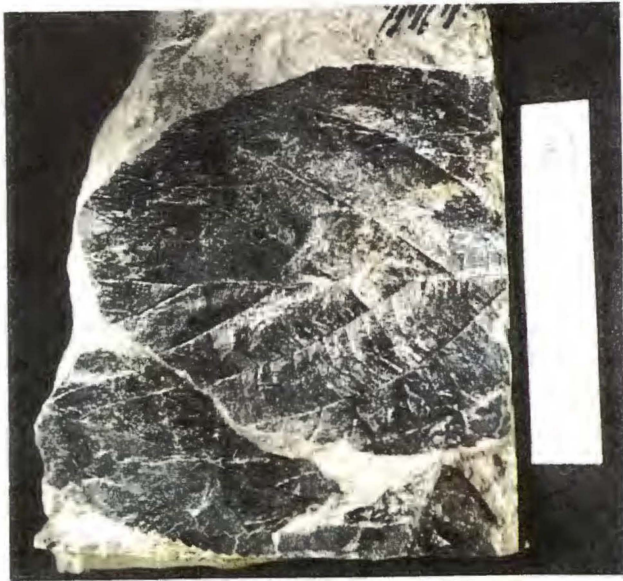
Pterosperrmites 310



Pterosperrmites 263



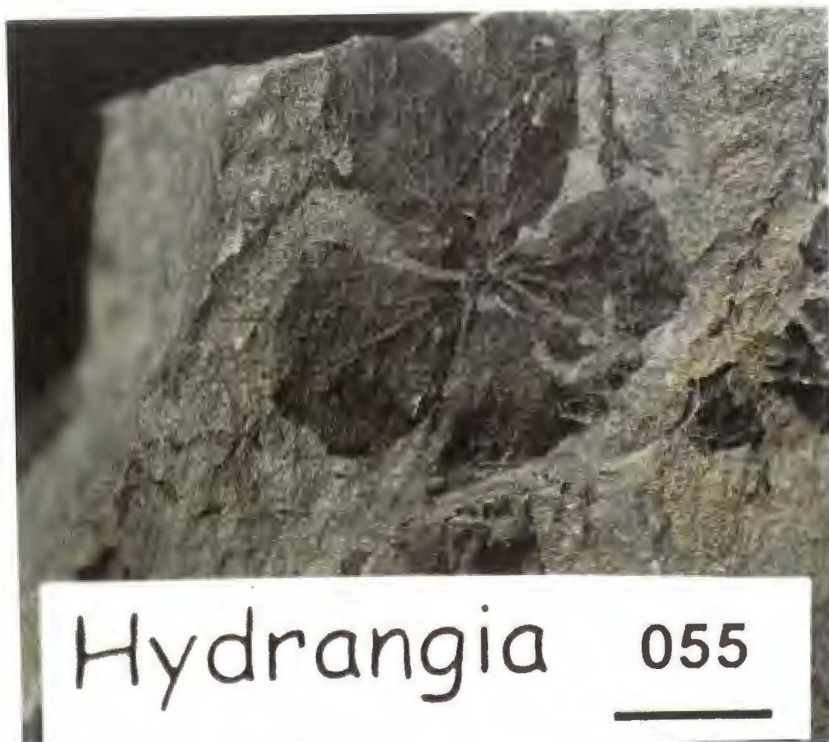
Quercus 057



Quercus 114







Hydrangia 055



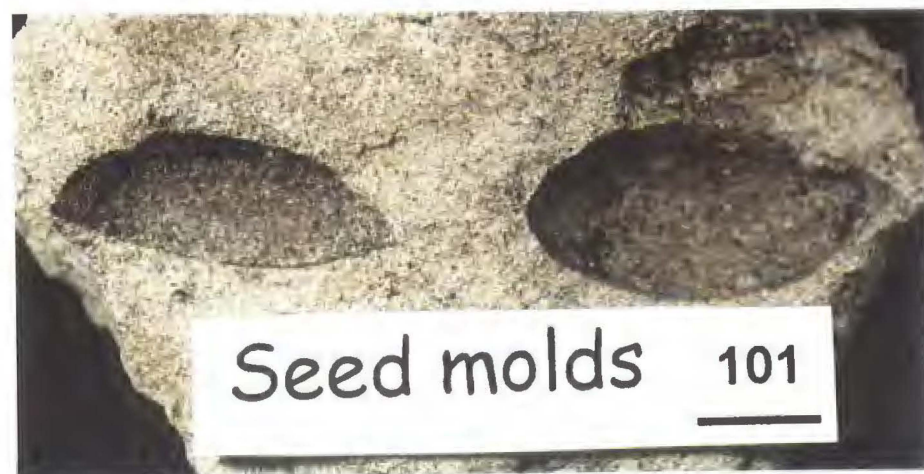
Samara 333



Seed Pod 129



Sycamore receptacle 166



Seed molds 101



Seed Pod 030



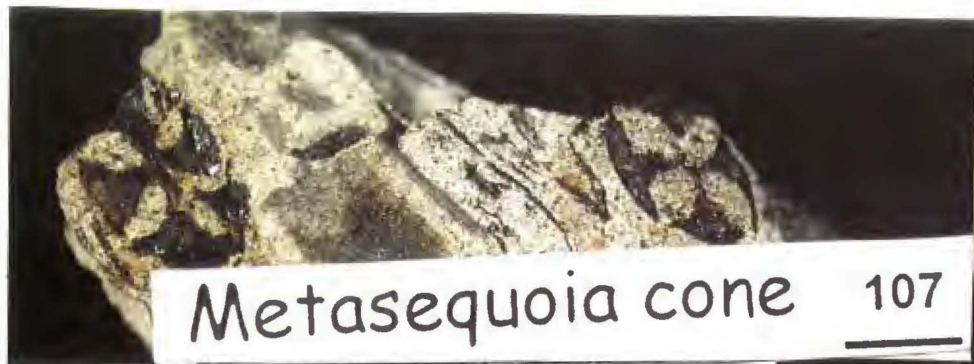
Seed Pod 097



Seed Pod 338



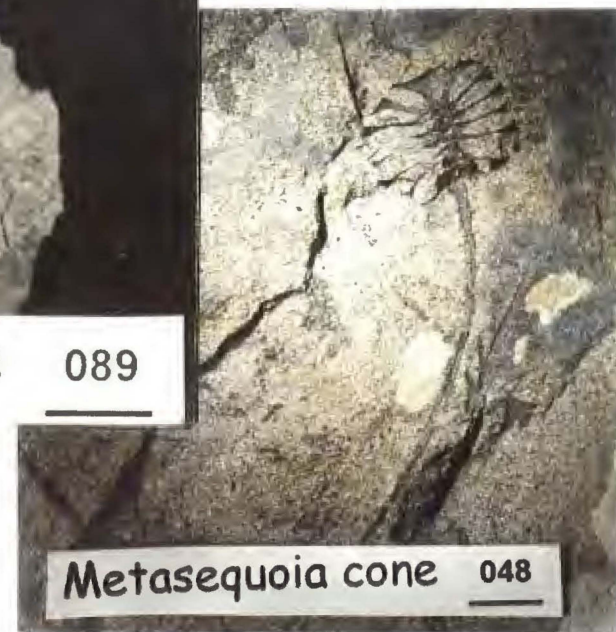
Seed Pod 039



Metasequoia cone 107



Metasequoia cone 089



Metasequoia cone 048



Metasequoia 085



Metasequoia 166



Metasequoia 174



Wood 036



Metasequoia 091



Metasequoia 086



Metasequoia 087



Metasequoia 248





Equisitites 123



Sequoia 028



Equisitites 119



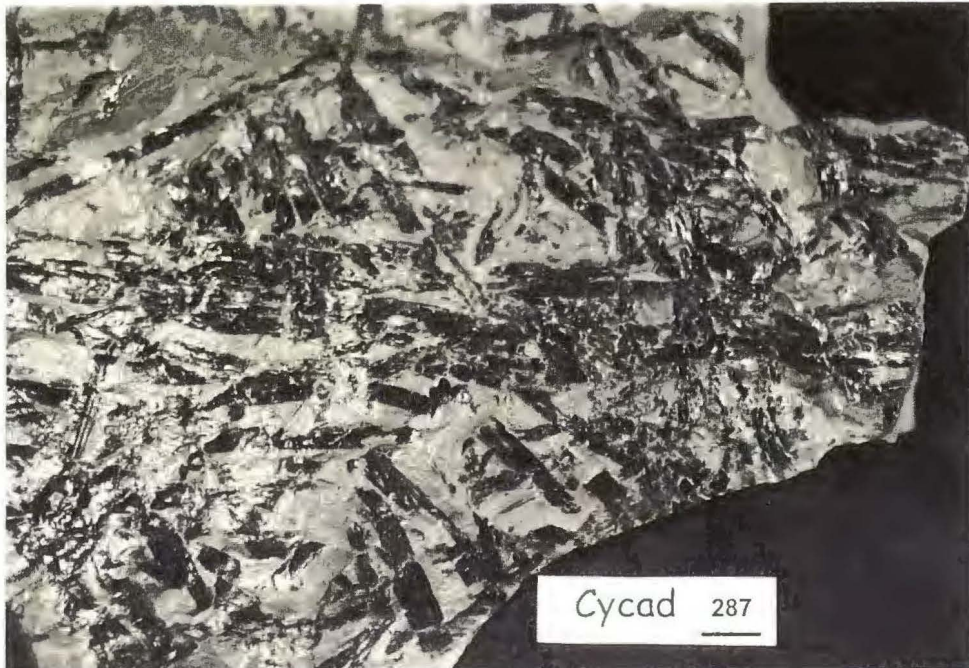
Equisitites 168



Cycadales ? 122



Dioon ? 385

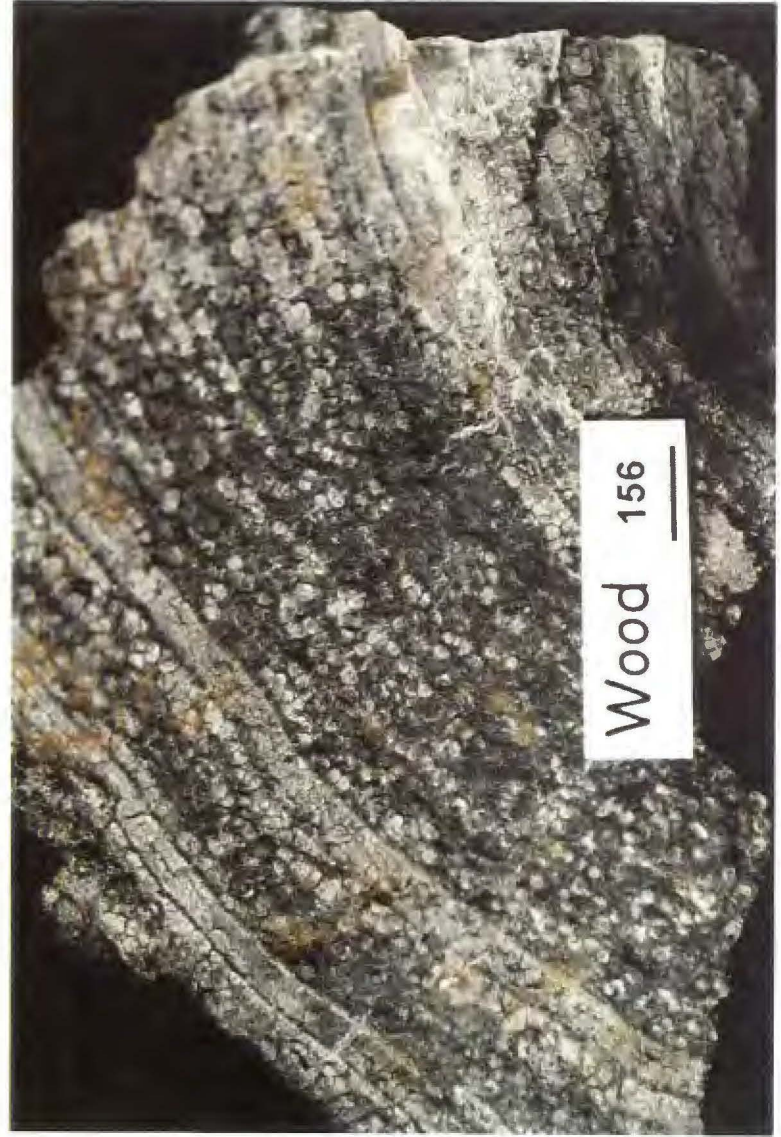
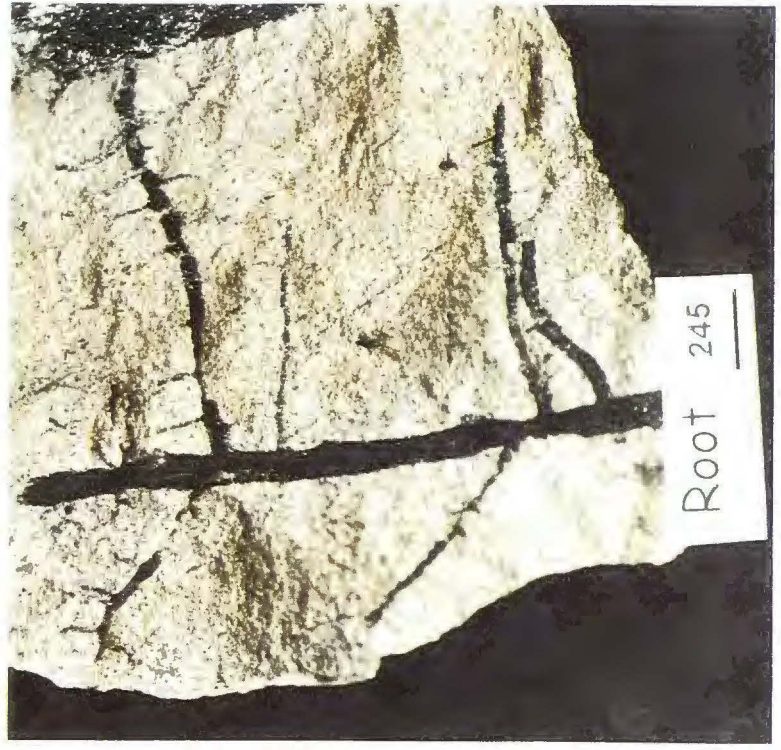


Cycad 287



Cycadales 286





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