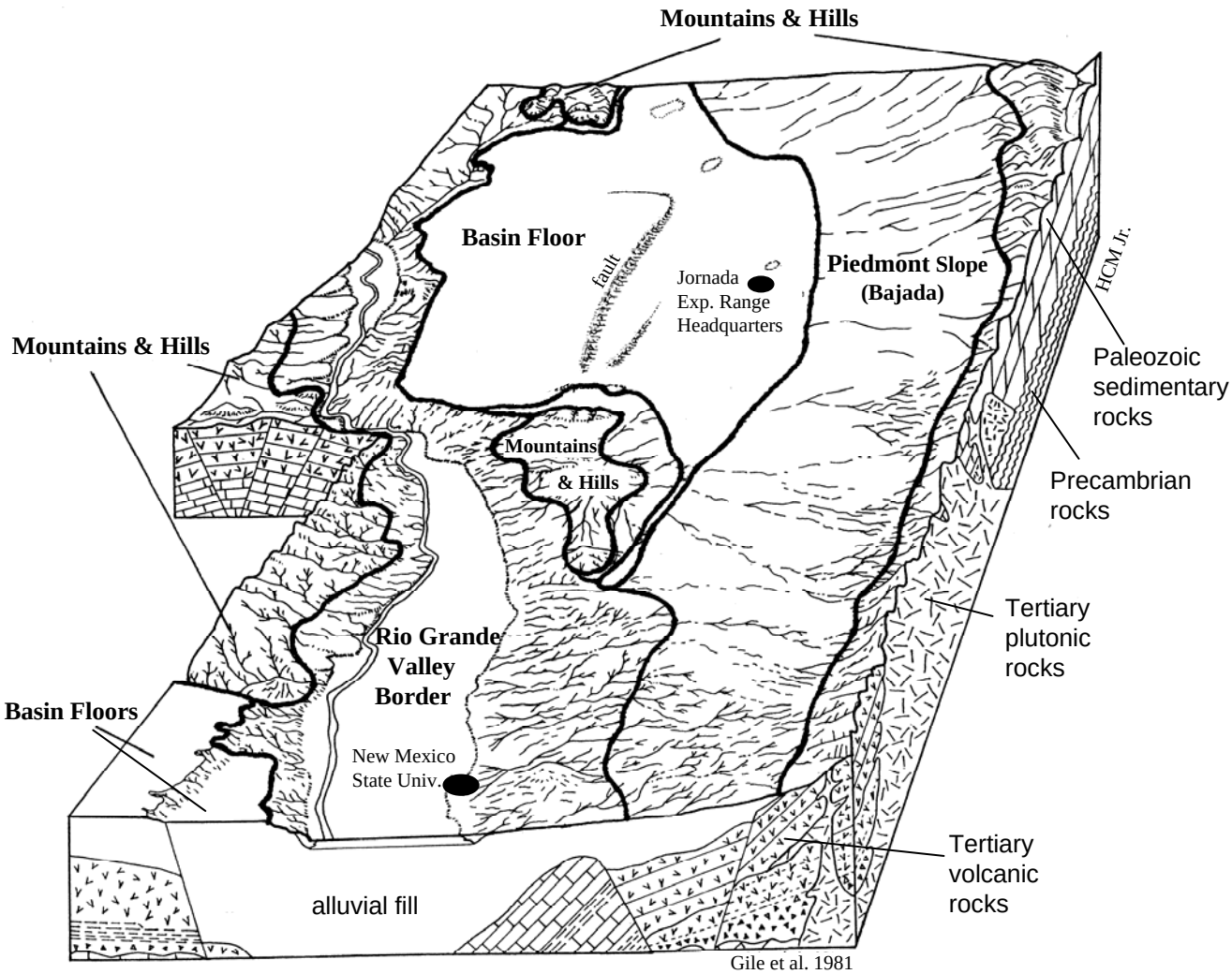
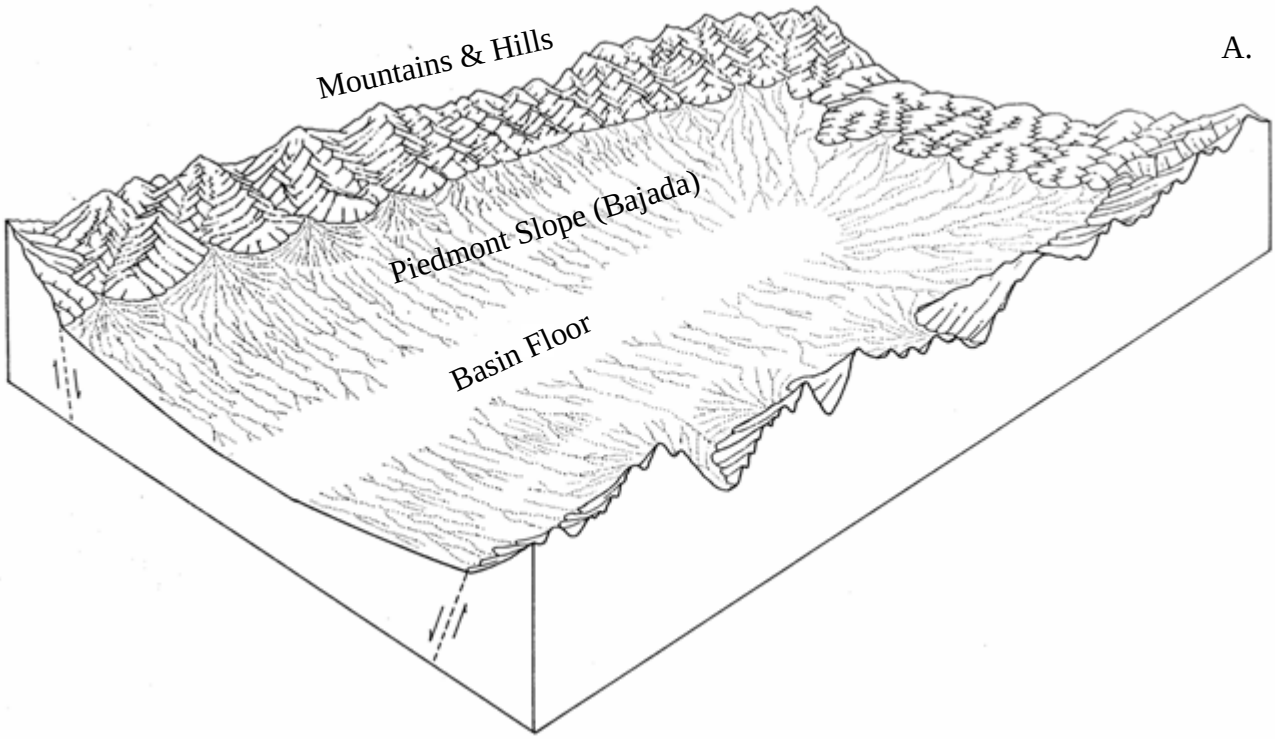
Paleoclimate and Landscape Evolution

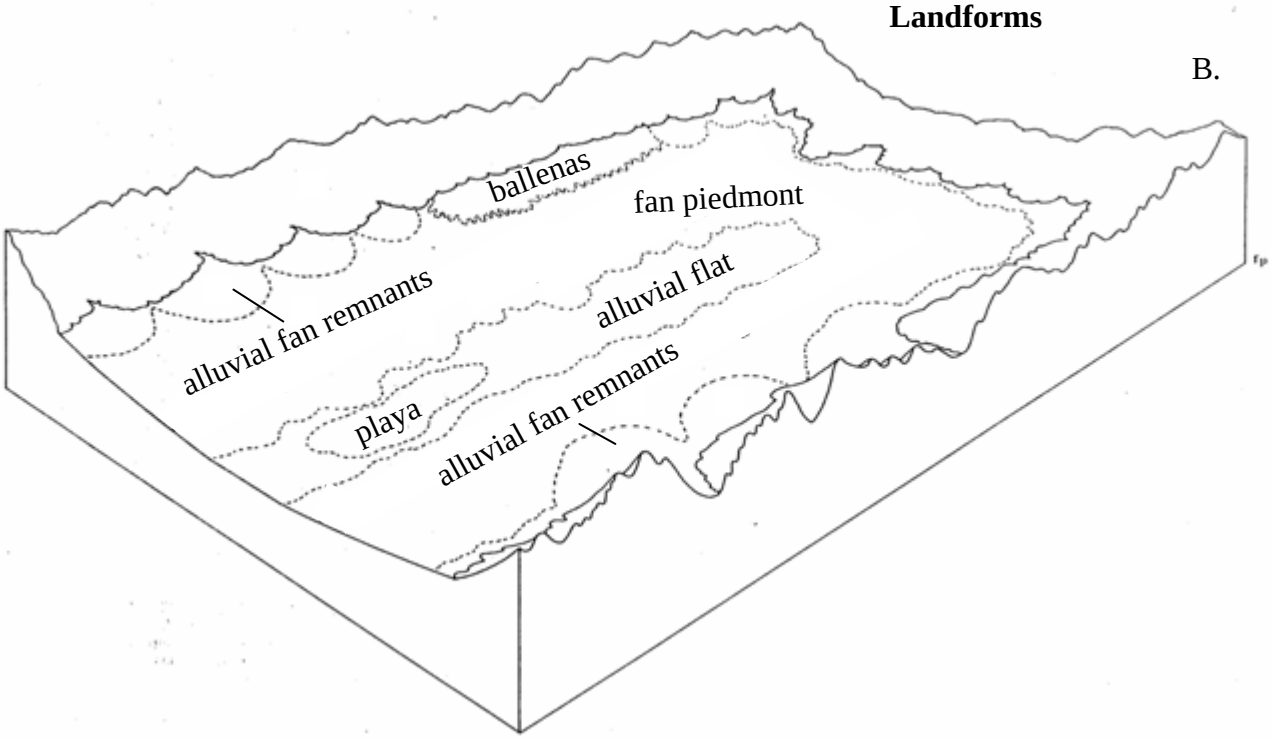


Gile et al. 1981

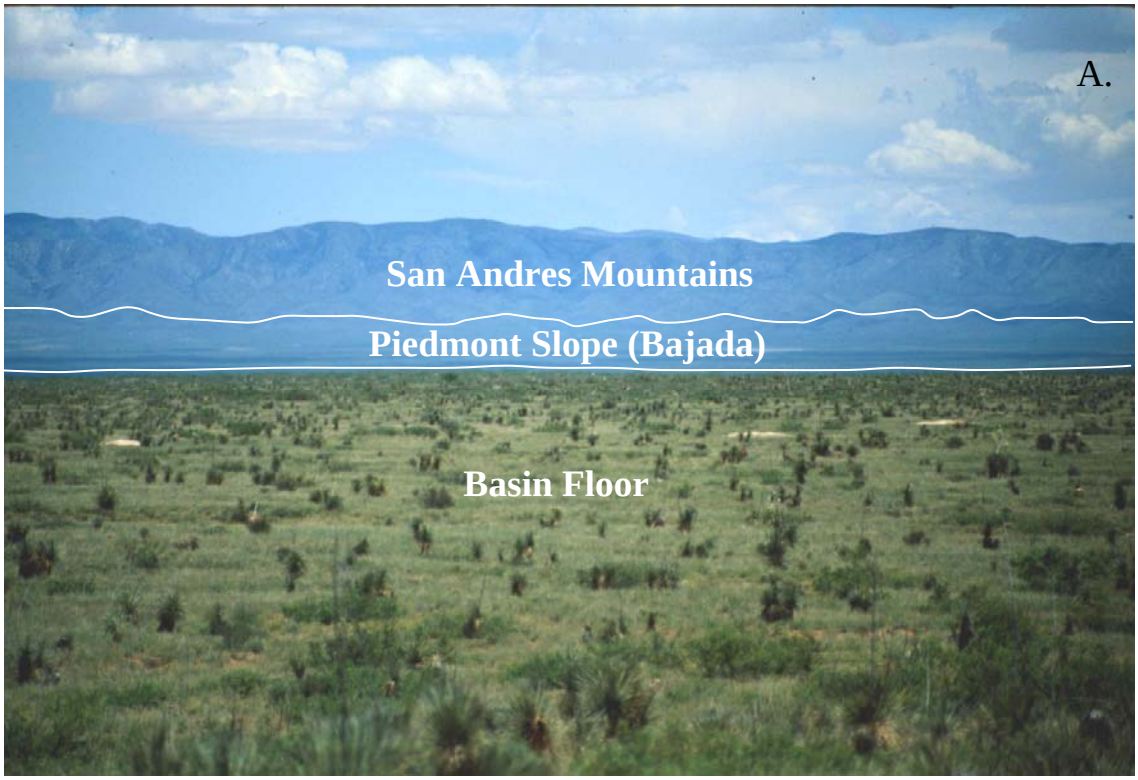
Major Landscape Components

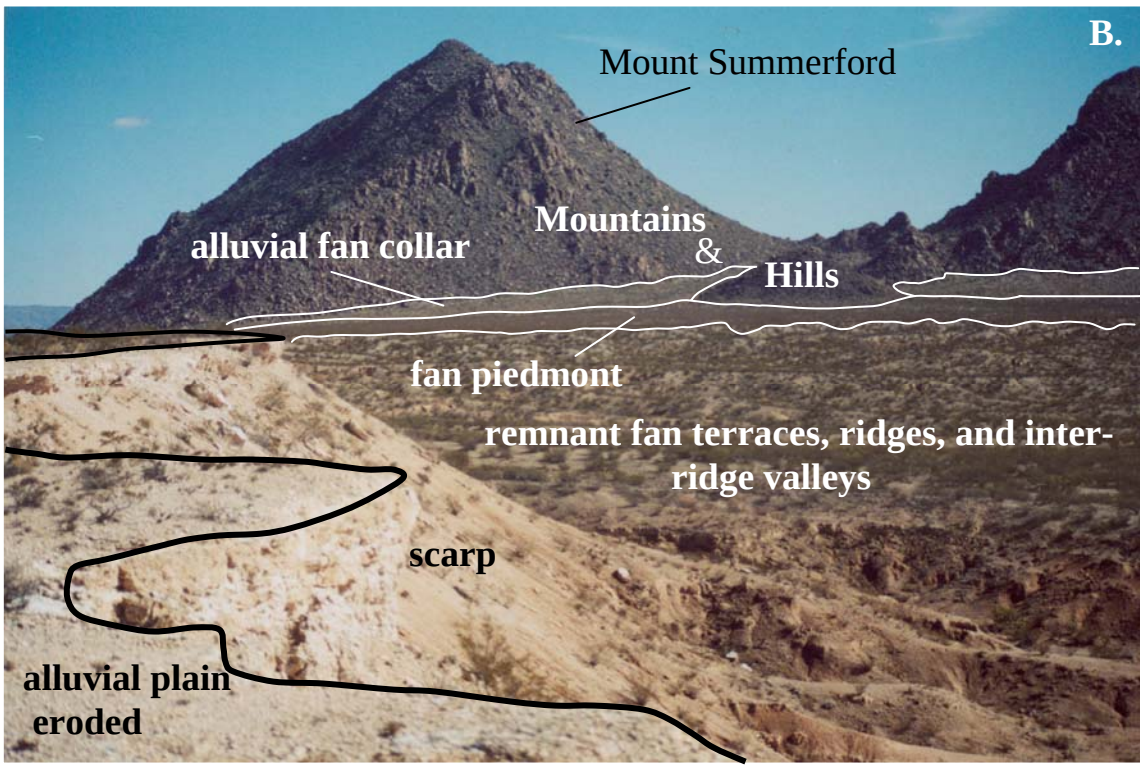


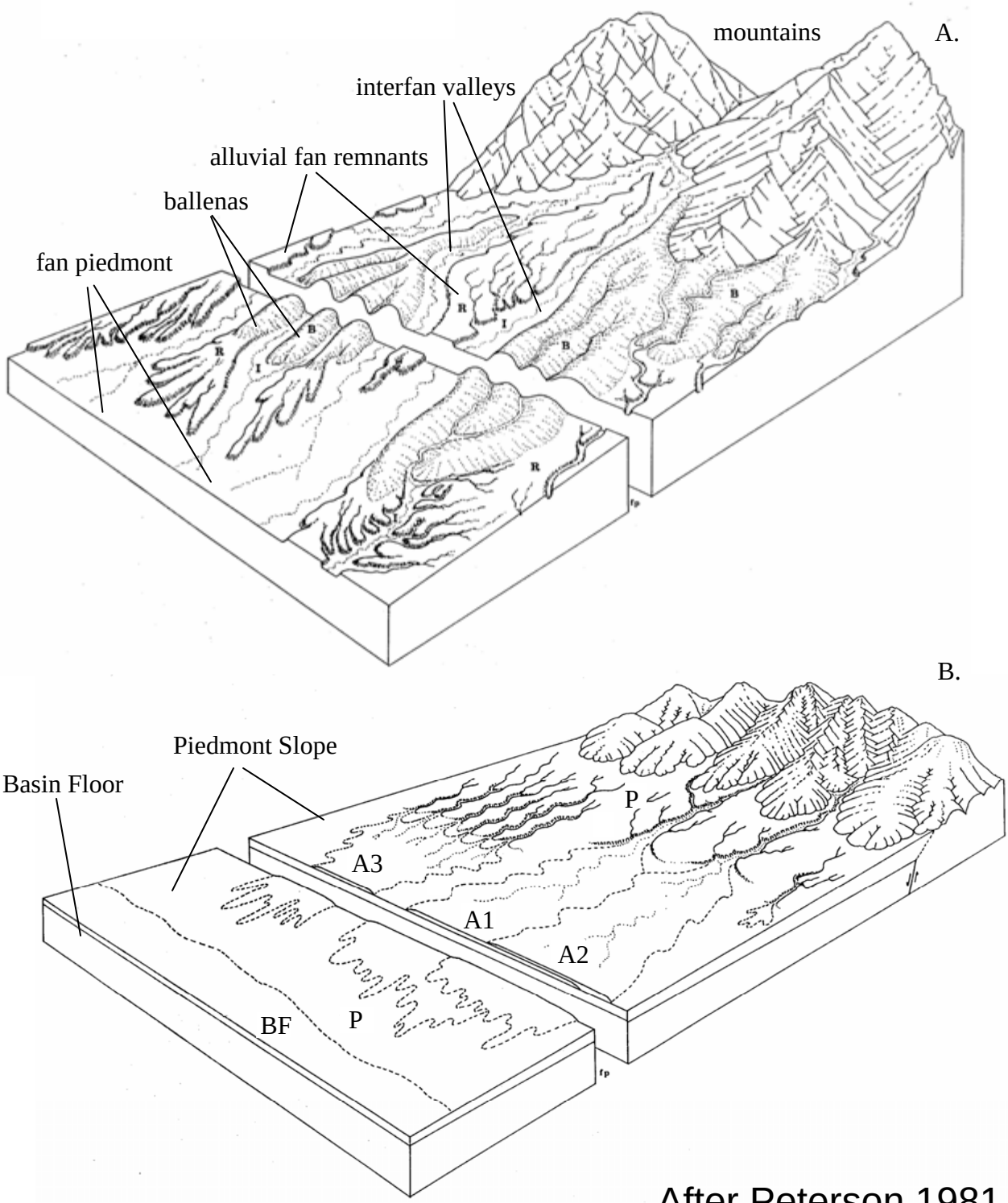
Landforms



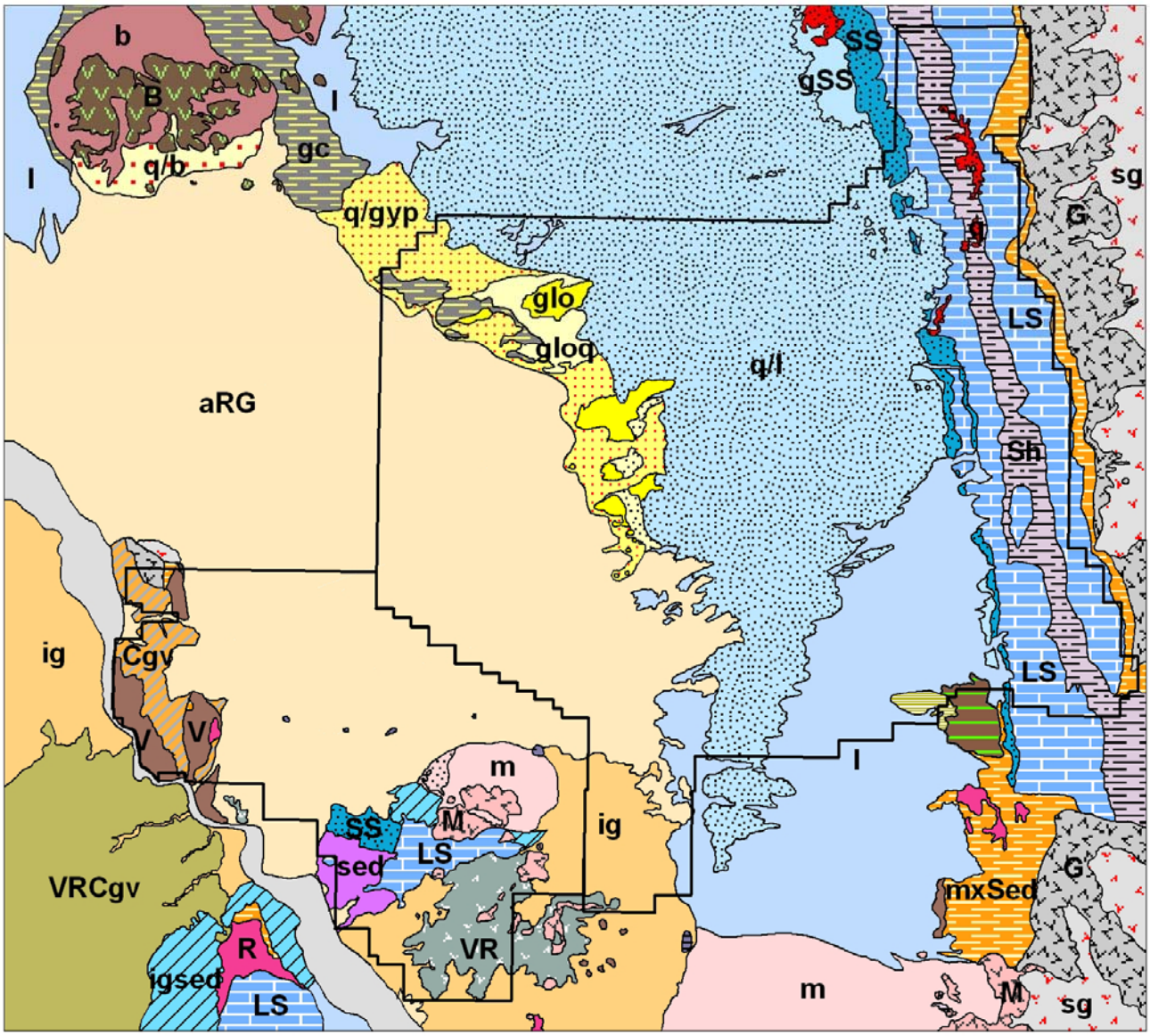
After Peterson 1981


A.
San Andres Mountains
Piedmont Slope (Bajada)
Basin Floor


B.
Mount Summerford
Mountains
&
Hills
alluvial fan collar
fan piedmont
remnant fan terraces, ridges, and inter-ridge valleys
scarp
alluvial plain eroded



After Peterson 1981


b
B
q/b
l
gc
l
q/gyp
SS
gSS
sg
G
glo
gloq
q/l
LS
aRG
Sh
ig
Cgv
V
V
LS
l
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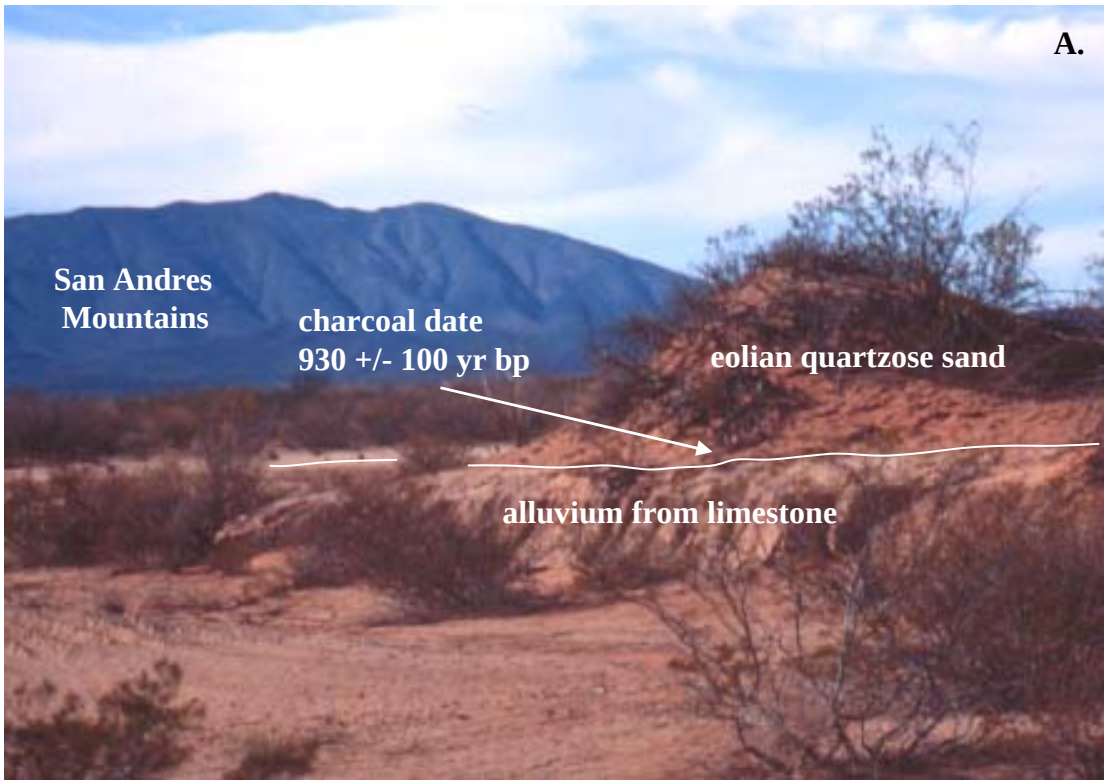
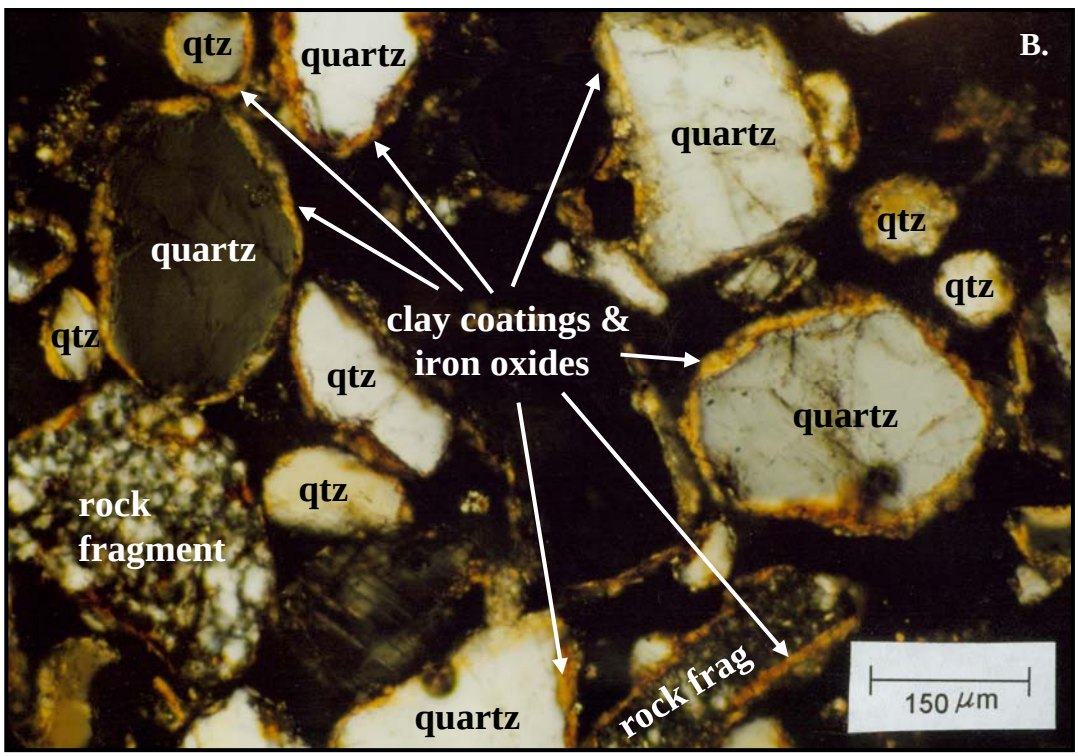
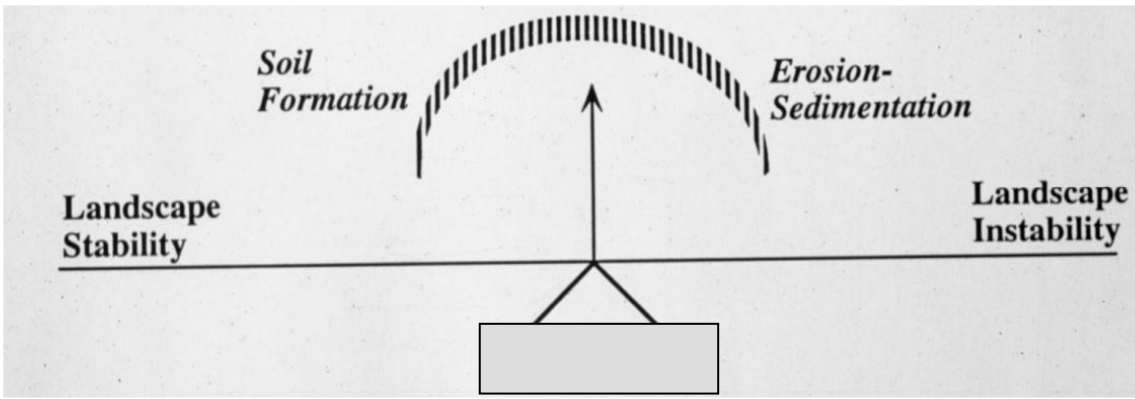
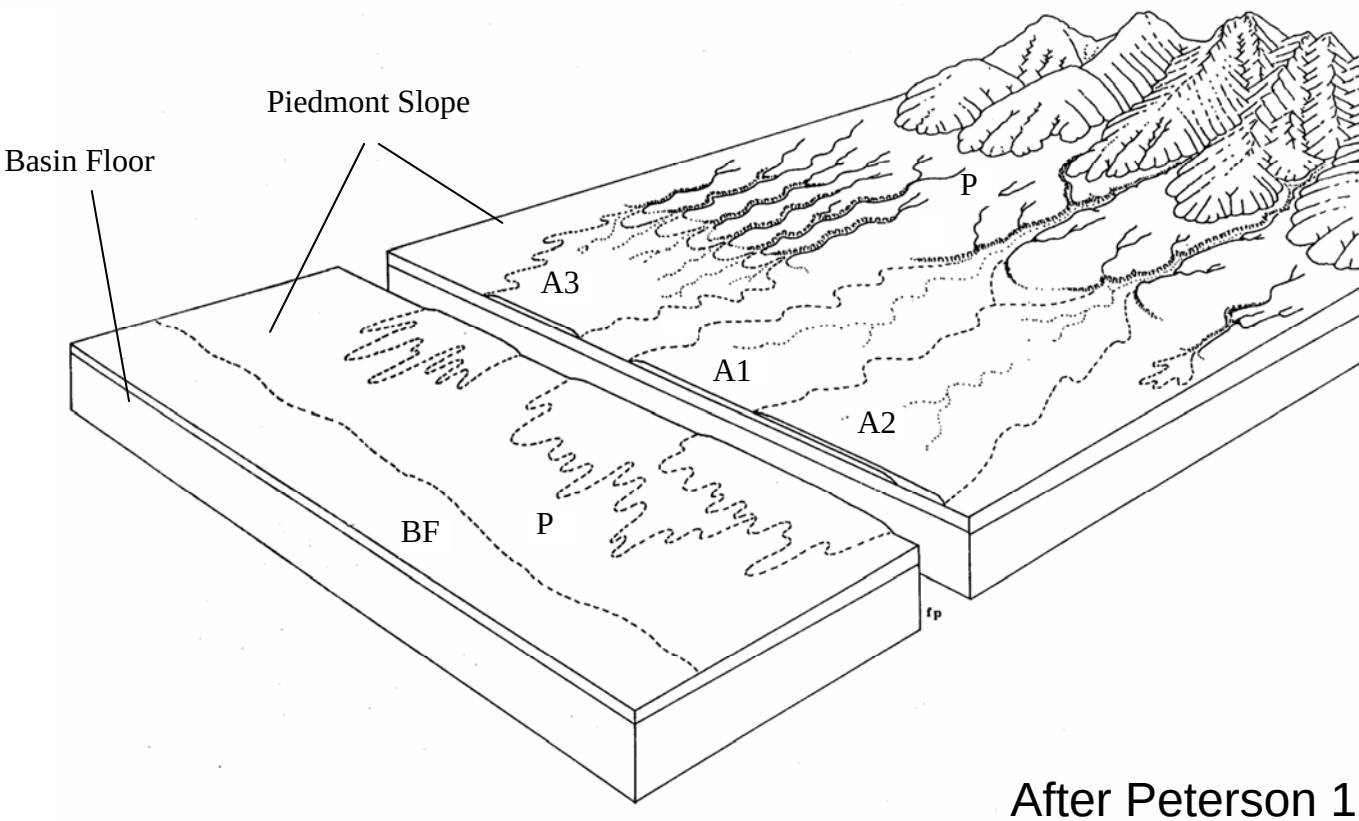
VR
igsed
LS
m
M
sg


A.
San Andres
Mountains
charcoal date
930 +/- 100 yr bp
eolian quartzose sand
alluvium from limestone

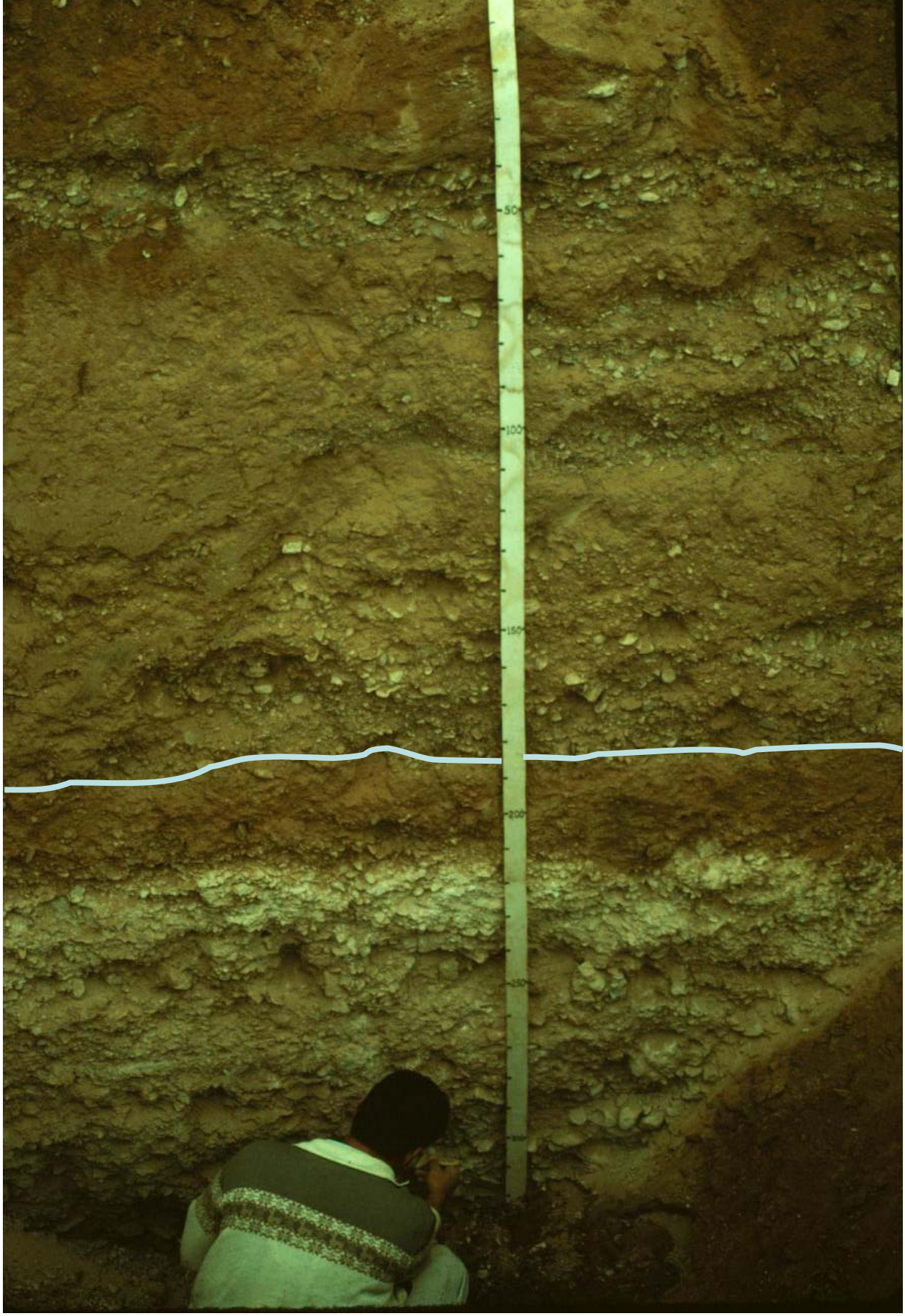

B.
qtz
quartz
quartz
quartz
qtz
qtz
qtz
clay coatings &
iron oxides
qtz
quartz
qtz
rock
fragment
quartz
rock frag
150 μm


Soil
Formation
Erosion-
Sedimentation
Landscape
Stability
Landscape
Instability



After Peterson 1

1
2
3
4
5

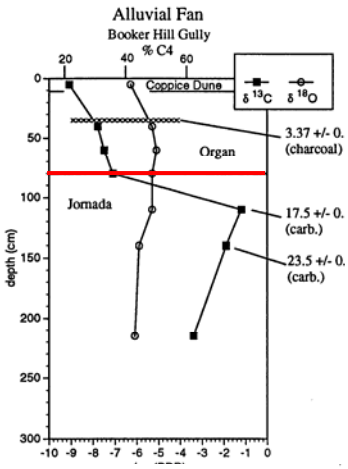


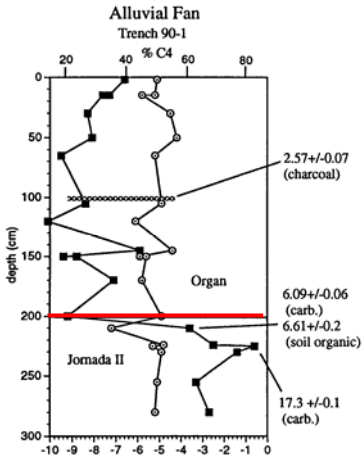
Before Desertification

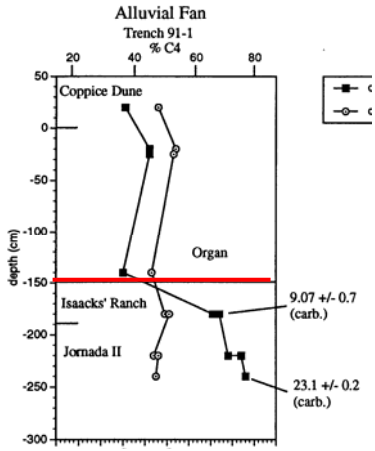
After Desertification

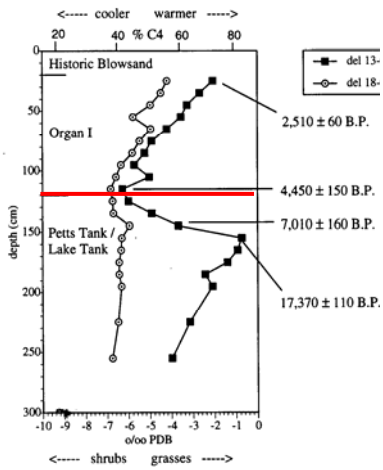
Before Desertification

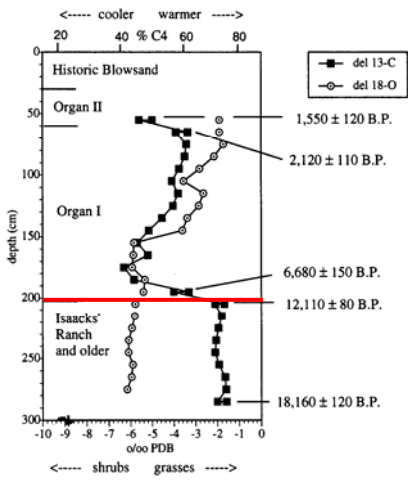
After Desertification

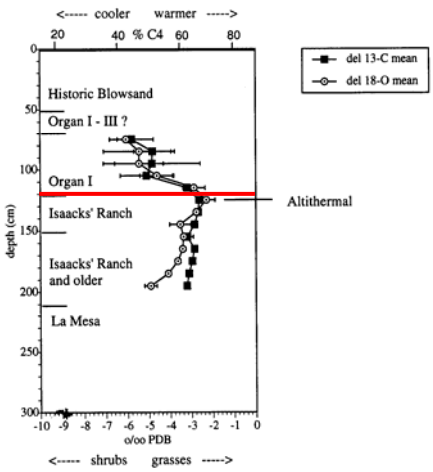

Alluvial Fan
Booker Hill Gully
% C4
Coppice Dune
δ 13C
δ 18O
3.37 +/- 0.
(charcoal)
Organ
Jornada
17.5 +/- 0.
(carb.)
23.5 +/- 0.
(carb.)
depth (cm)


Alluvial Fan
Trench 90-1
% C4
2.57+/-0.07
(charcoal)
Organ
6.09+/-0.06
(carb.)
6.61+/-0.2
(soil organic)
Jornada II
17.3 +/-0.1
(carb.)
depth (cm)

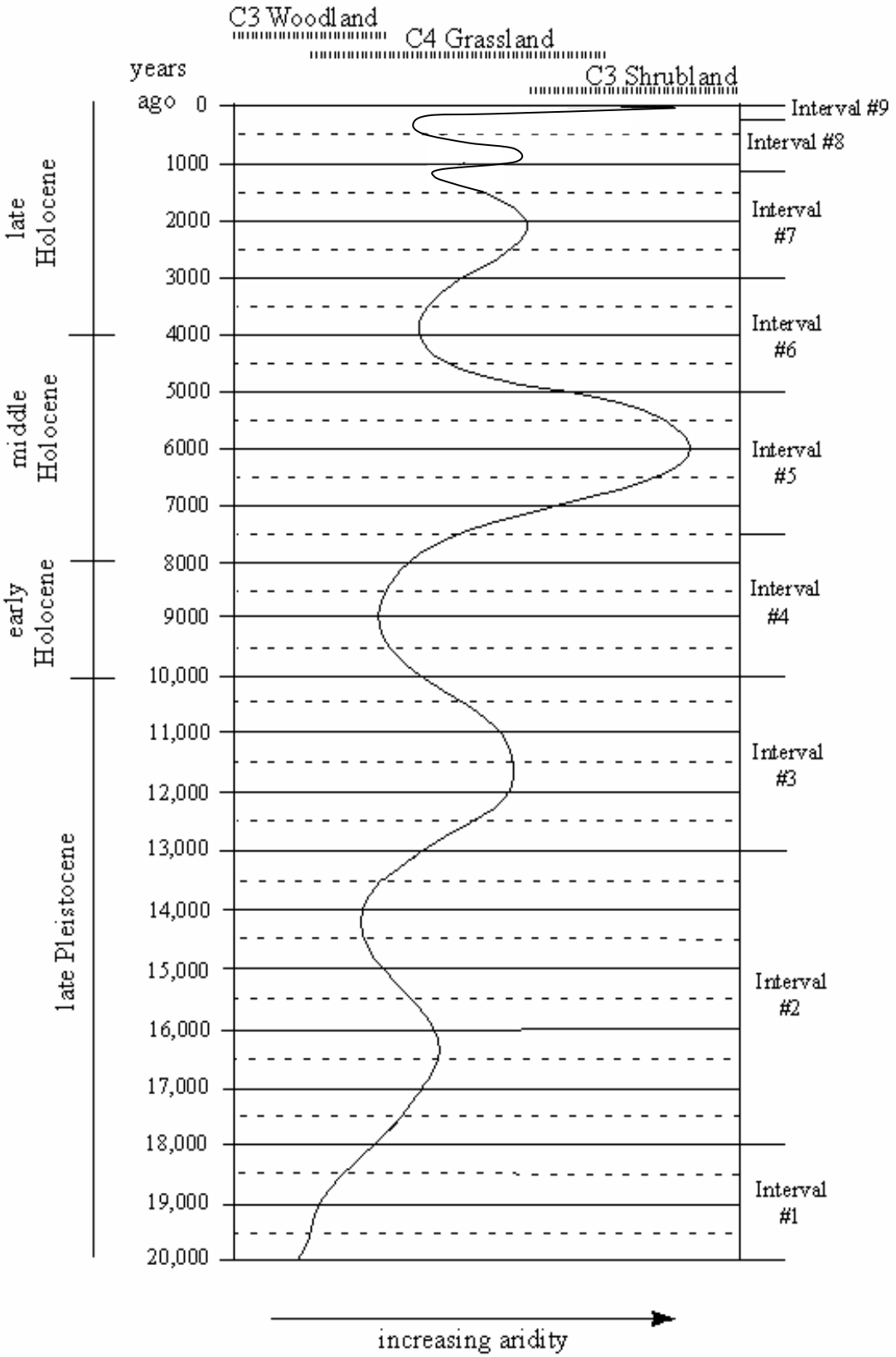

Alluvial Fan
Trench 91-1
% C4
Coppice Dune
Organ
Isaacks' Ranch
9.07 +/- 0.7
(carb.)
Jornada II
23.1 +/- 0.2
(carb.)
depth (cm)


Rattlesnake Trench
<----- cooler warmer ----->
% C4
Historic Blowsand
Organ I
2,510 ± 60 B.P.
4,450 ± 150 B.P.
7,010 ± 160 B.P.
Petts Tank /
Lake Tank
17,370 ± 110 B.P.
depth (cm)
o/oo PDB
<----- shrubs grasses ----->
del 13-
del 18-

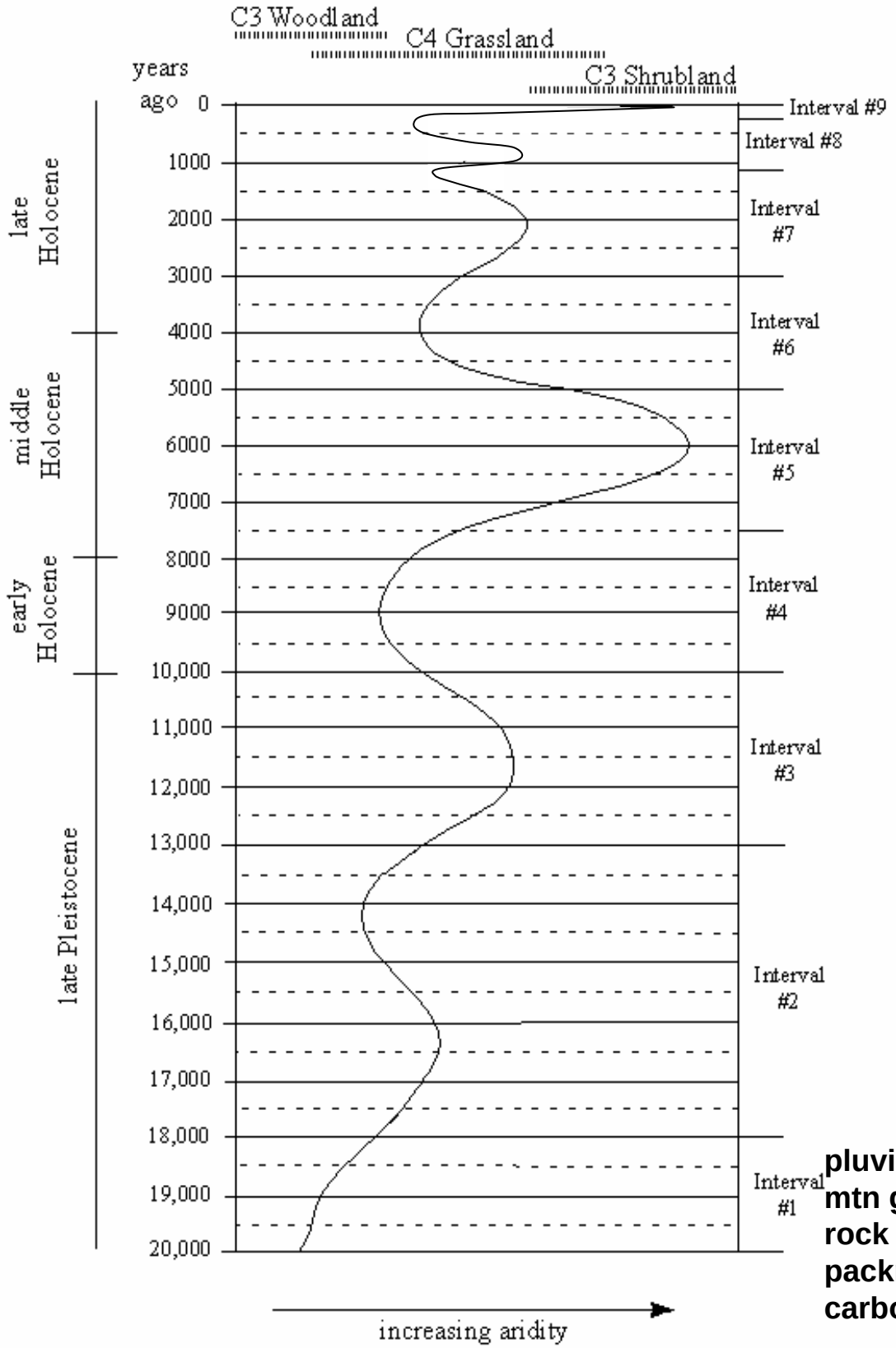

Mesquite Trench
<----- cooler warmer ----->
% C4
Historic Blowsand
Organ II
1,550 ± 120 B.P.
2,120 ± 110 B.P.
Organ I
6,680 ± 150 B.P.
12,110 ± 80 B.P.
Isaacks'
Ranch
and older
18,160 ± 120 B.P.
depth (cm)
o/oo PDB
<----- shrubs grasses ----->
del 13-C
del 18-O


Wormwood Trench
<----- cooler warmer ----->
% C4
Historic Blowsand
Organ I - III ?
Organ I
Altithermal
Isaacks' Ranch
Isaacks' Ranch
and older
La Mesa
depth (cm)
o/oo PDB
<----- shrubs grasses ----->
del 13-C mean
del 18-O mean

Inferred Bioclimatic Changes on Piedmont Slopes at the Jornada LTER Site

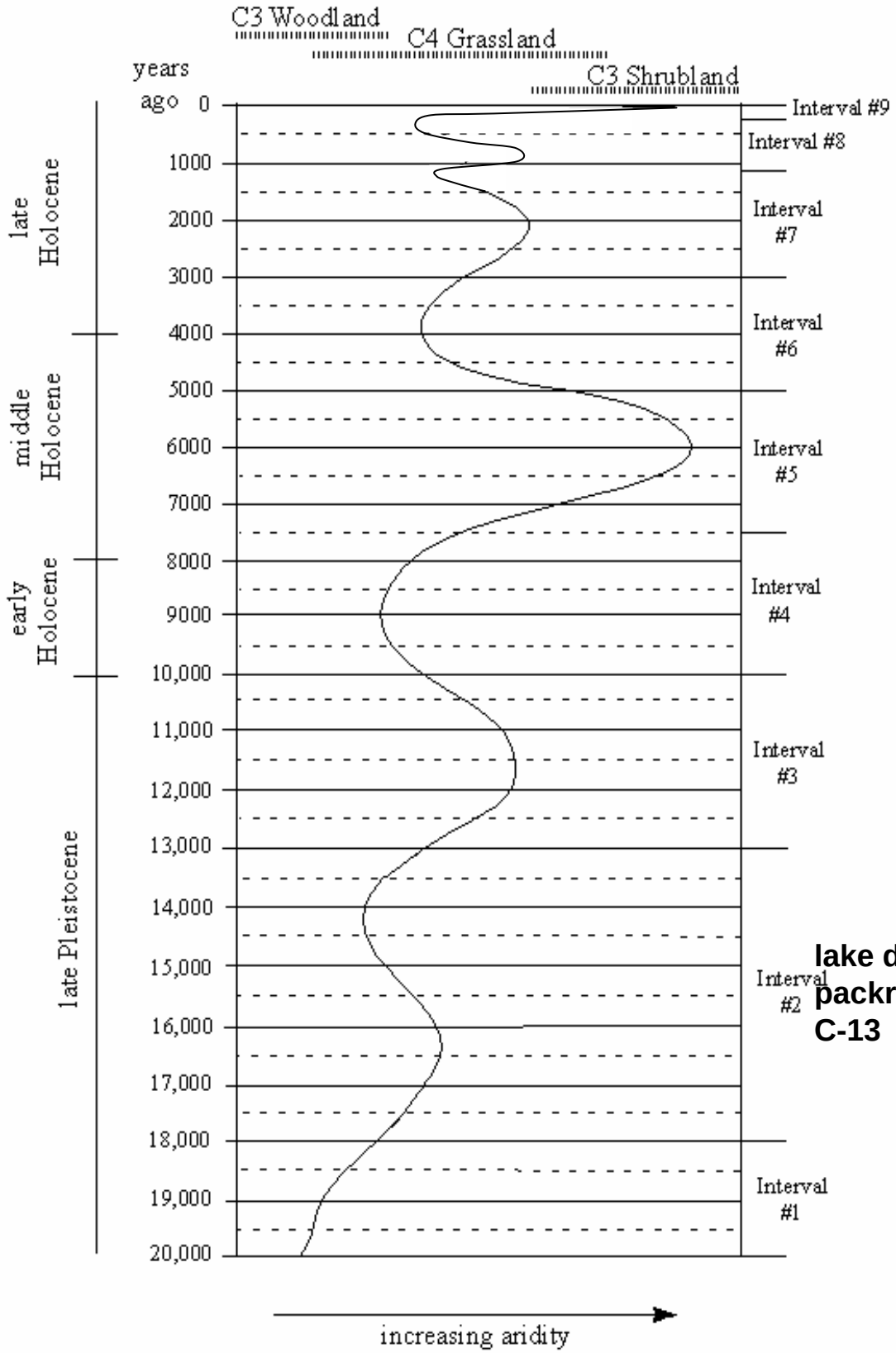


Inferred Bioclimatic Changes on Piedmont Slopes at the Jornada LTER Site

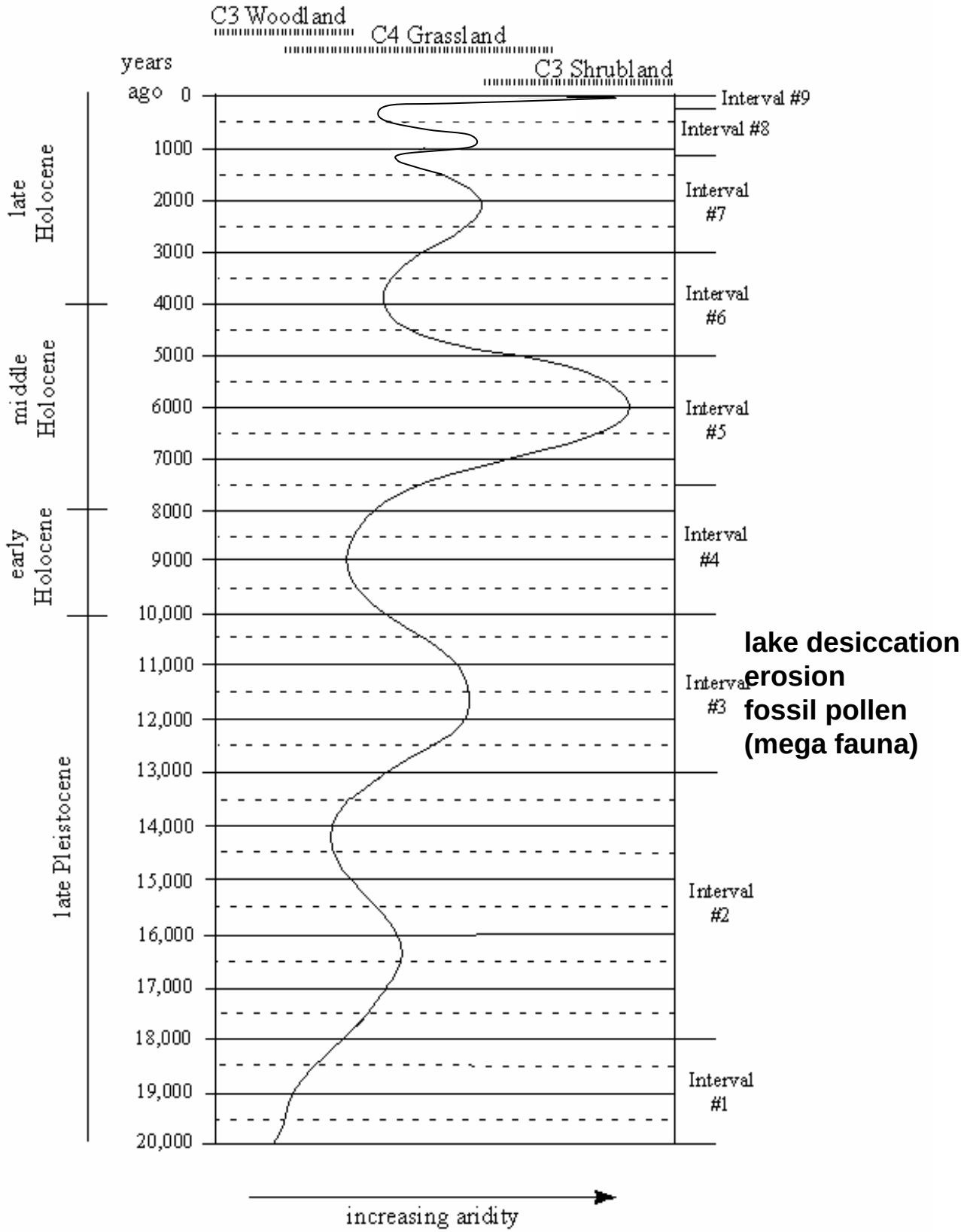


pluvial lakes
mtn glaciers
rock glaciers
packrat middens
carbon-13

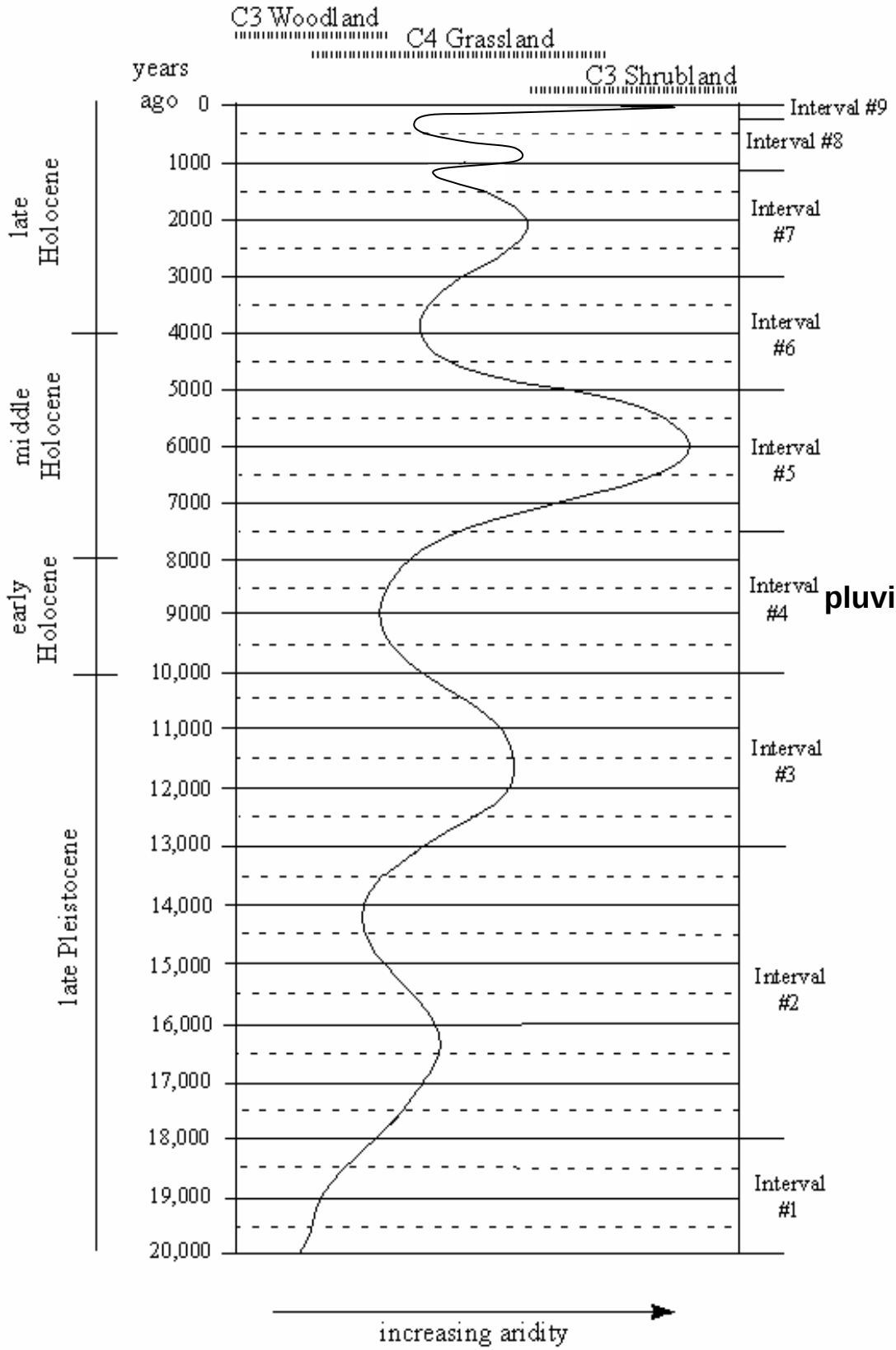
Inferred Bioclimatic Changes on Piedmont Slopes at the Jornada LTER Site



Inferred Bioclimatic Changes on Piedmont Slopes at the Jornada LTER Site



Inferred Bioclimatic Changes on Piedmont Slopes at the Jornada LTER Site



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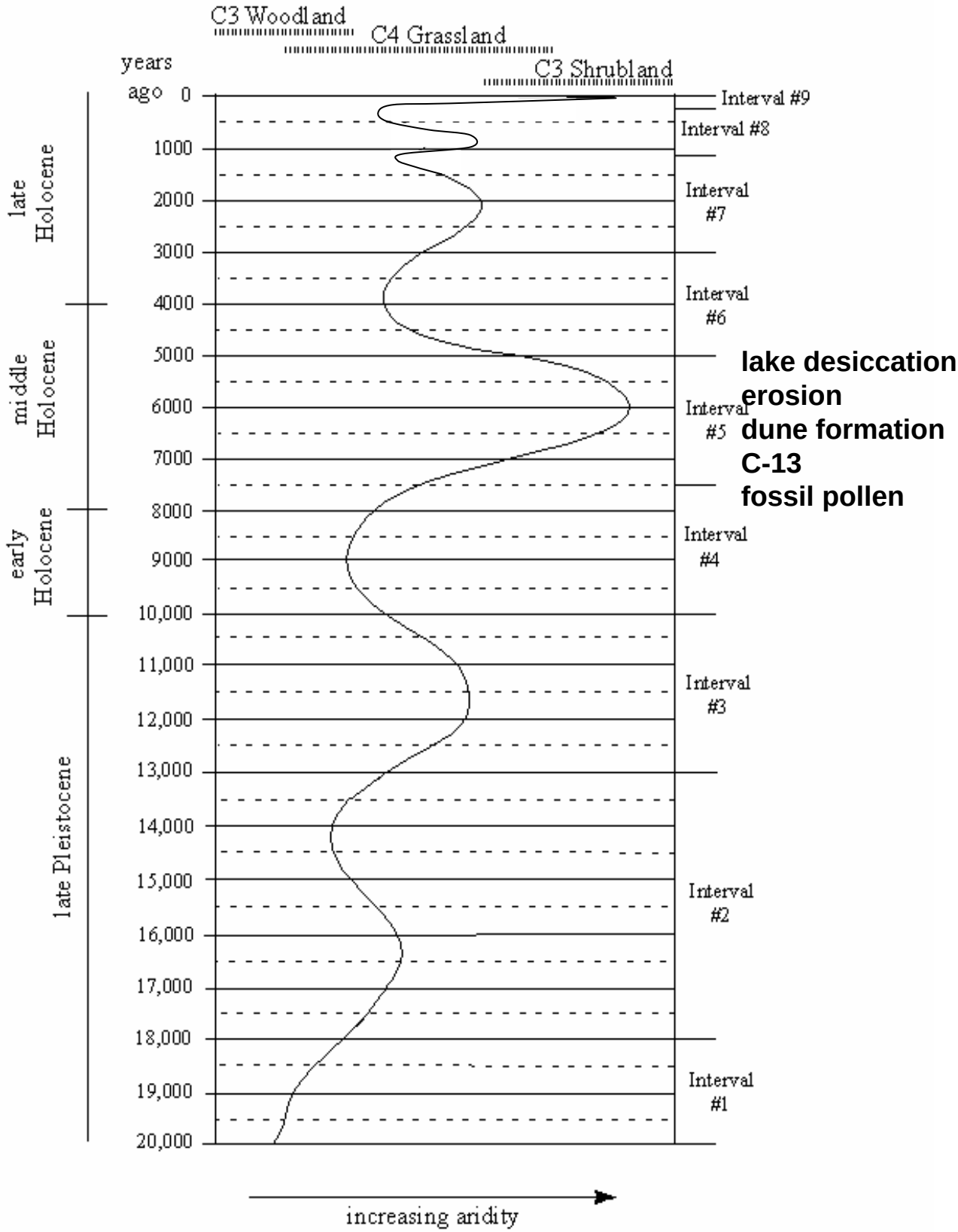
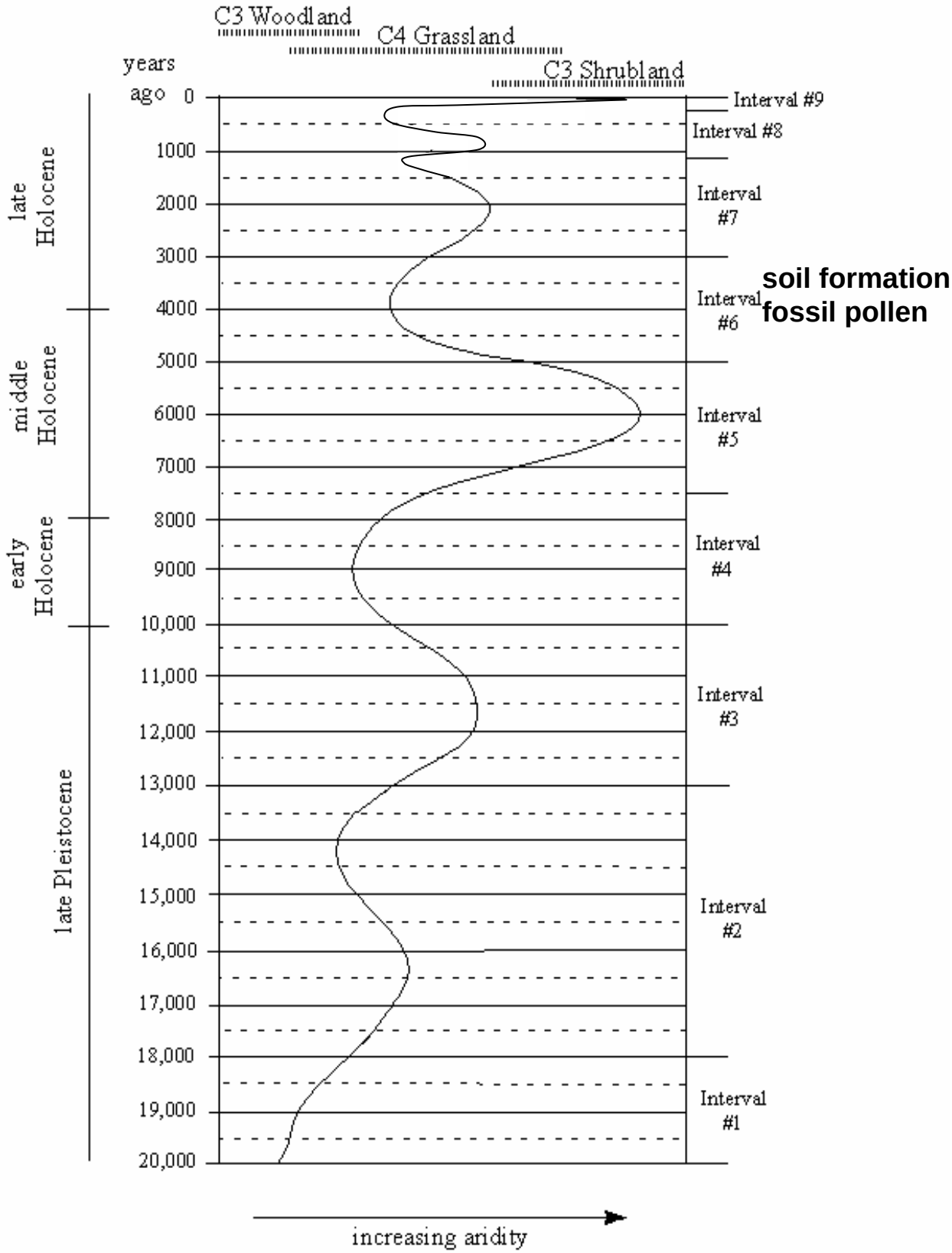
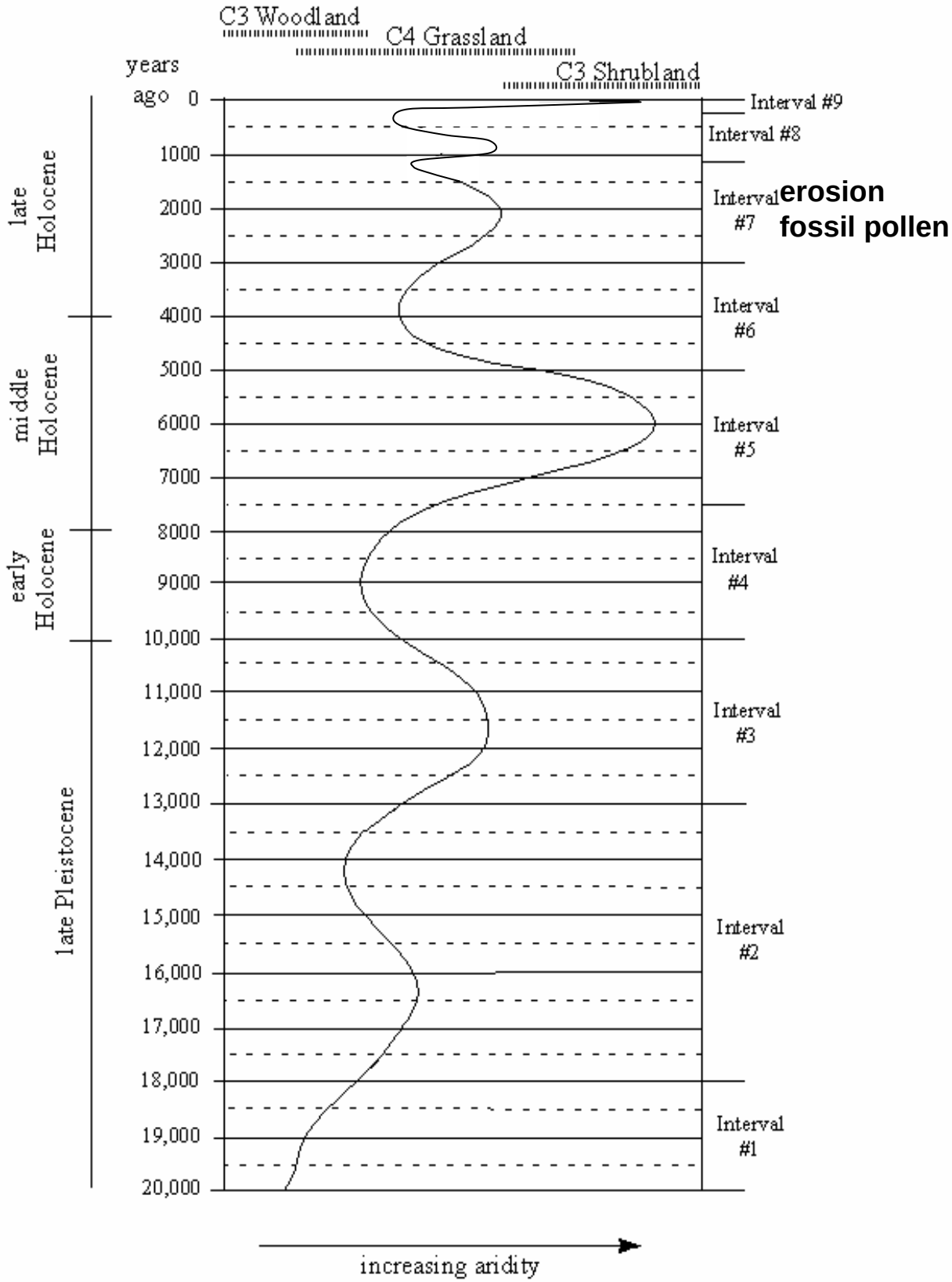


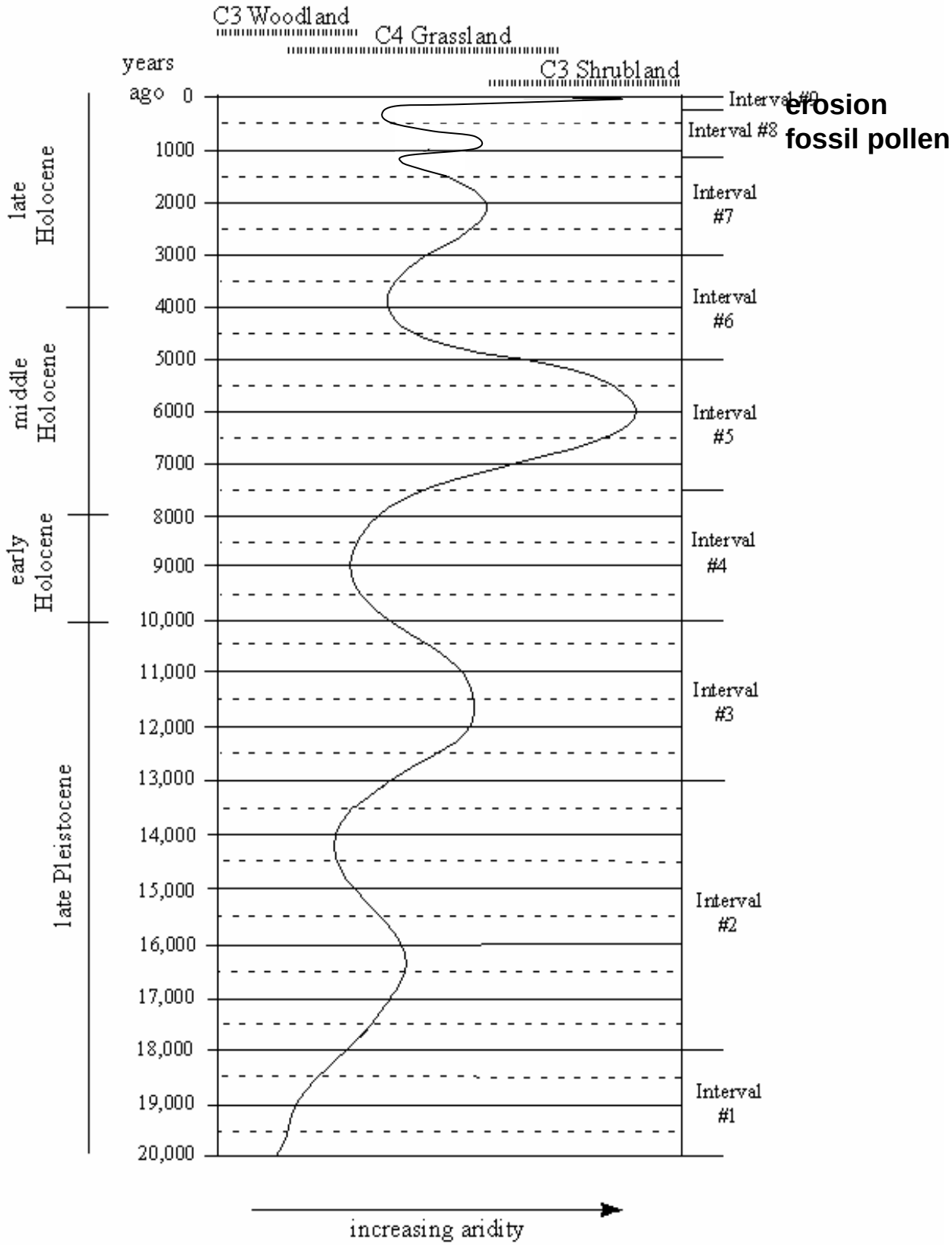
Inferred Bioclimatic Changes on Piedmont Slopes at the Jornada LTER Site

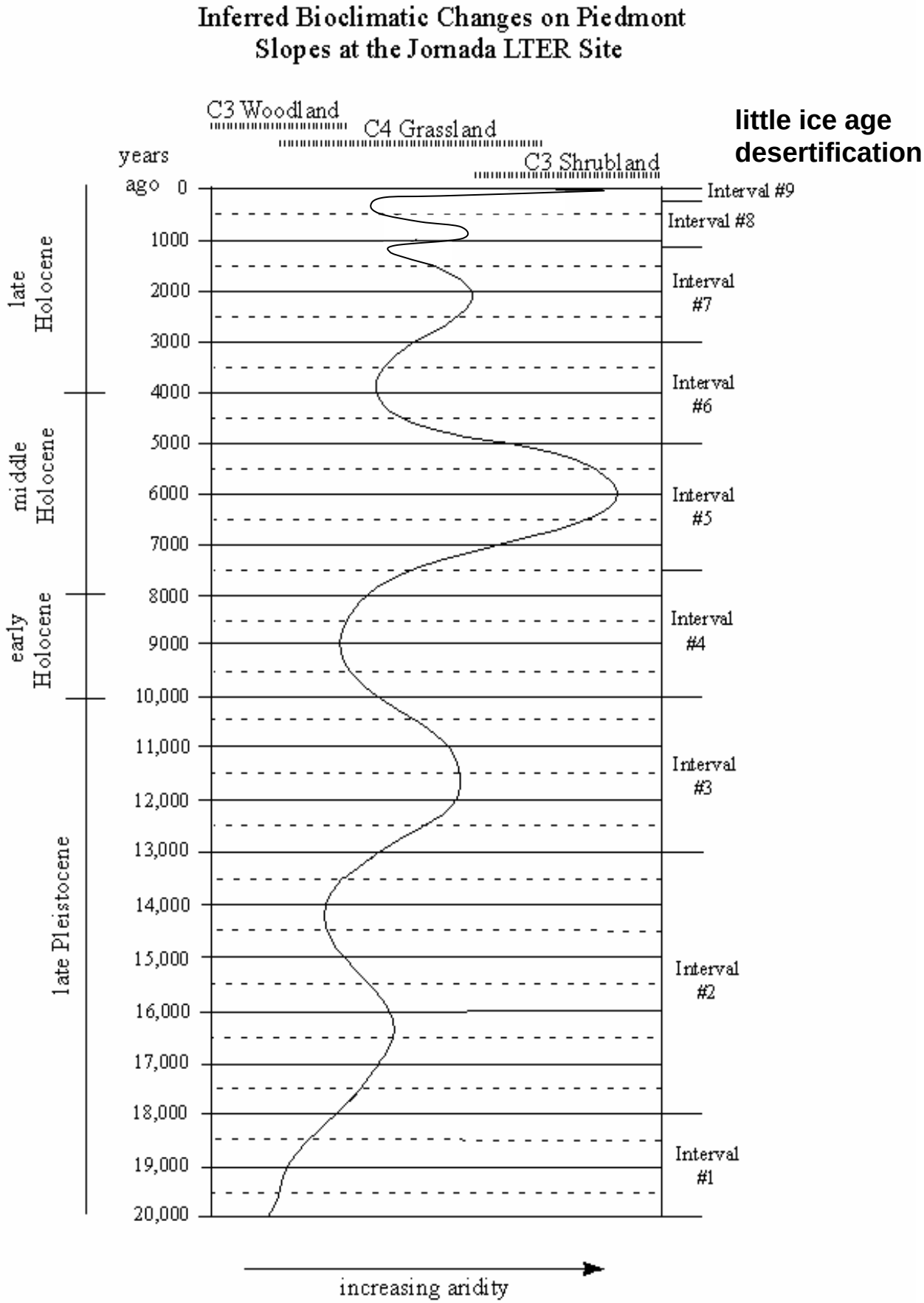


Inferred Bioclimatic Changes on Piedmont Slopes at the Jornada LTER Site



Inferred Bioclimatic Changes on Piedmont Slopes at the Jornada LTER Site




Inferred Bioclimatic Changes on Piedmont Slopes at the Jornada LTER Site
C3 Woodland
C4 Grassland
C3 Shrubland
little ice age desertification
years ago
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10,000
11,000
12,000
13,000
14,000
15,000
16,000
17,000
18,000
19,000
20,000
late Holocene
middle Holocene
early Holocene
late Pleistocene
Interval #9
Interval #8
Interval #7
Interval #6
Interval #5
Interval #4
Interval #3
Interval #2
Interval #1
increasing aridity