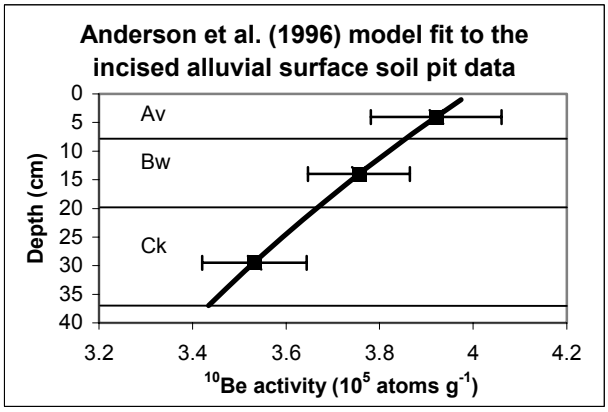
APPENDIX DR1: ALLUVIAL SURFACE AGE ESTIMATE

The incised alluvial surface, 5 km to 9 km from the mountains, has similar nuclide activities for samples CMT-5F, CMT-7F, and CMT-9F (Data repository, Table 1). Similar nuclide activities, for the incised alluvial surface, suggest similar near-surface exposure histories, most likely a simultaneous depositional event that blanketed the piedmont from 5 to 9 km. Thus, we interpret the nuclide data as representing a common age for the entire alluvial surface. There are two ways to estimate the age of the depositional surface 1) using a cosmogenic nuclide modeling approach (Anderson et al., 1996) (shown at left) and 2) using established soil profile development index techniques. The nuclide modeling approach (black line in graph) fits the data (black squares with error bars representing 1 sigma analytical error) well and suggests a surface age of 26 ky. The 26 ky age is approximately 20 ky older than an age suggested by the observed Av – Bw – Ck horizonation (based on Birkeland, 1999). The nuclide modeling most likely does not represent the surface age because sediment at different depths is sourced from different up gradient geomorphic units (Chemehuevi Mountains, Sawtooth Range, the pediment, and older fan deposits) and thus does not have a common nuclide inheritance, a requirement for the Anderson et al. (1996) model. Thus, based on weak soil development exposed in the 10 m long soil trench, moderate rock varnish, and moderate pavement development, we conclude that the incised alluvial surface of the



Chemehuevi Mountain piedmont is probably mid-Holocene when compared to other dated soils in the Mojave Desert (Harden et al., 1991; McDonald, 1994; McFadden and McAuliffe, 1997). A soil pre-dating the Holocene in the Mojave Desert would exhibit stronger soil development. Since the surface has uniform nuclide activities (5 to 10 km), we use 5 ky as the age of the entire (4 km wide by 5 km long) incised surface. This age estimate is probably only accurate to within several 10s of percent, but is more accurate than nuclide based age estimate.

References:

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Harden, J.W., Taylor, E.M., McFadden, L.D., and Reheis, M.C., 1991, Calcic, gypsic, and siliceous soil chronosequences in arid and semiarid environments, *in* Nettleton, W.D., ed., Occurrence, characteristics, and genesis of carbonate, gypsum, and silica accumulations in soils., Volume 26, Soil Science Society of America, Madison, WI, p. 1-16.

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McFadden, L.D., and McAuliffe, J.R., 1997, Lithologically influenced geomorphic responses to Holocene climatic changes in the southern Colorado Plateau, Arizona; a soil-geomorphic and ecologic perspective: Geomorphology, v. 19, p. 303-332.

TABLE DR1. COSMOGENIC NUCLIDE ACTIVITIES, CHEMEHUEVI MOUNTAIN PIEDMONT

Sample*	Elevation† (m)	Northing§ (m)	Easting§ (m)	^{10}Be# (10^6 atoms g^{-1})	^{26}Al# (10^6 atoms g^{-1})	^{26}Al:^{10}Be	Area** (km^2)
Amalgamated basin samples							
CMV-123	790	3832763	718571	0.132 ± 0.004	0.82 ± 0.054	6.22 ± 0.46	0.4
		3832571	718796				
		3832263	718885				
CMV-456	790	3831700	719904	0.128 ± 0.004	0.82 ± 0.051	6.40 ± 0.45	1.1
		3831491	719954				
		3831059	720463				
SRV-123	590	3828280	716955	0.462 ± 0.018	2.71 ± 0.160	5.87 ± 0.42	1.5
		3830310	716253				
		3830057	716353				
Amalgamated bedrock samples							
CMT-1B	670	3829529	720542	0.216 ± 0.007	1.25 ± 0.061	5.78 ± 0.34	6
		3832482	717860				
CMT-3B	600	3828156	719046	0.381 ± 0.011	2.16 ± 0.134	5.67 ± 0.39	4
		3821125	716328				
Amalgamated colluvium samples							
CMT-1S	670	3829529	720542	0.287 ± 0.034	1.32 ± 0.074	4.60 ± 0.61	2
		3832482	717860				
CMT-3H	600	3828156	719046	0.546 ± 0.017	3.21 ± 0.154	5.88 ± 0.34	4
		3821125	716328				
Amalgamated ephemeral channel samples							
CMT-1C	670	3829529	720542	0.195 ± 0.005	1.16 ± 0.072	5.92 ± 0.41	
		3832482	717860				

CMT-3C	600	3828156 3821125	719046 716328	0.217 ± 0.006	1.30 ± 0.067	6.03 ± 0.36
CMT-5C	550	3826824 3829774	717558 714858	0.275 ± 0.008	1.83 ± 0.123	6.66 ± .049
CMT-7C	500	3825471 3828427	716069 713399	0.381 ± 0.011	2.38 ± 0.114	6.25 ± 0.35
CMT-9C	470	3824108 3827076	714583 711926	0.395 ± 0.010	2.43 ± 0.124	6.13 ± 0.35
CMT-12C	430	3822084 3825029	712374 709667	0.471 ± 0.015	2.74 ± 0.130	5.81 ± 0.33
<u>Amalgamated incised alluvial fan samples</u>						
CMT-5F	550	3826824 3829774	717558 714858	0.455 ± 0.011	2.58 ± 0.121	5.67 ± 0.30
CMT-7F	500	3825471 3828427	716069 713399	0.434 ± 0.012	2.65 ± 0.127	6.09 ± 0.34
CMT-9F	470	3824108 3827076	714583 711926	0.430 ± 0.011	2.47 ± 0.116	5.75 ± 0.31
CMT-12F	430	3822084 3825029	712374 709667	0.497 ± 0.013	2.97 ± 0.162	5.99 ± 0.36
<u>Depth profile samples</u>						
CP1 0-8	520	3826877	715949	0.392 ± 0.014	2.48 ± 0.146	6.32 ± 0.44
CP1 8-20				0.376 ± 0.011	2.35 ± 0.112	6.27 ± 0.35
CP1 20-39				0.353 ± 0.011	2.27 ± 0.108	6.42 ± 0.37

Note: *CM = Chemehuevi Mountain, V = valley sample, triple numbers after V indicate amalgamation of three valley samples, SR = Sawtooth Range, T = transect sample, single number after T indicates distance from the mountain front, B = bedrock, S and H = colluvium, C = channel sediment, F = terrace sediment, CP1 = soil pit samples with depth ranges listed in centimeters.

[†]Elevations are determined by hypsometric average elevations for mountain valleys and average elevations for transects.

[§]Northing and Easting values are NAD 27 zone 11S UTM datum. Coordinates are listed for all valley samples. Endpoint coordinates are listed for transect samples.

[#10]Be and [26]Al error is counting statistics from AMS with 2% uncertainty for stable Be and 4% uncertainty for stable Al, combined quadratically.

**Area of bedrock sediment source. Basin areas are calculated for the 4 km transect length. Bedrock and colluvium are areas represent total area within 8 km section of pediment (2 km long by 4 km wide).

TABLE DR2. INCISED ALLUVIAL CHANNEL VOLUMES

Transect	Number of channels*	Average width (m)	Average depth† (m)	Total Channel volume§ (10^5 m^3)
5	42	7.8	1.5	5.0
6	89	6.7	1.2	7.5
7#	131	3.8	1.2	6.0
8#	170	2.9	0.8	4.0
9	229	2.0	0.4	1.8
10	263	1.8	0	0
11	284	1.6	0	0
12	308	1.5	0	0

*Number of channels counted along 4 km transects.

†Weighted average depth of through going channels and channels that form on alluvial surface. Depth = 0 for transects 10 – 12 because entire surface is reworked.

§Length is assumed as 1000 m, the distance between transects.

#All data for transects 7 and 8 are linearly extrapolated from the other data.

TABLE DR3. COSMOGENIC NUCLIDE ACTIVITIES OF CHANNEL SEDIMENT BASED ON MASS BALANCE

Distance (km)	Geomorphic unit*	Mass added[†] (kg y^{-1})	Percent of channel sediment mass[§]	Nuclide activity of channel sediment (10^5 atoms g^{-1})	Modeled nuclide activity[#] (10^5 atoms g^{-1})	Percent difference
0	Chemehuevi basins	162000	100%	1.30	1.30	0%
2	Bedrock and colluvium	432000	73%	1.95	2.06	5%
4	Bedrock and colluvium	194000	25%	2.17	2.70	24%
5	Sawtooth Range	50800	6%	2.75	2.83	3%
7	Incised alluvium	390000	32%	3.81	3.46	-9%
9	Incised alluvium	310000	20%	3.95	3.74	-5%
12	Incised alluvium	58600	4%	4.71	4.72	0%

Note: *Geomorphic unit of sediment source. Bedrock and colluvium pediment sources are combined.

[†] Mass added from each geomorphic unit based on nuclide models for source basins and the pediment, and based on channel dimensions and surface age for the incised alluvium.

[§]Percent that the added mass represents when added to the channel sediment.

[#]Modeled nuclide activity based on weighting the sediment mass flux from each geomorphic unit by the ^{10}Be activity and adding nuclide dosing during sediment transport.