

GCRCD TULE ELK HABITAT PROJECT

Elk Samples for ancient DNA Project – Tule vs. Roosevelt vs. Rocky Mtn elk subspecies determination

MO - Muwekma Ohlone Ancestral Heritage Sites – Alan Leventhal alan.leventhal@sjsu.edu, (408) 761-4516

MVZ – Berkeley Museum of Vertebrate Zoology – Chris Conroy PhD ondatra@berkeley.edu, (510) 643-7709

MSC – Santa Clara University Mission Santa Clara – Linda Hylkema MA lhylkema@scu.edu

CAS – California Academy of Sciences – Maureen “Moe” Flannery mflannery@calacademy.org, (415) 379-5371

SU – Stanford University

	Collection ^{reference}	Site #	Catalog #	Skeletal Element	Location	Dated	Depth	Remarks
1	MO ¹	CA-ALA-677	24-7	Phalange (medial)	'Ayttakiš 'Éete Hiramwiš Trépam-tak [Place of Woman Sleeping Under the Pipe Site], CA-ALA-677/H Sunol, Alameda County	AMS dates from International Chemical Analysis, Inc. of associated human bone collagen 1385 ±30 CE	Screen	Roosevelt Elk
2	MO ²	CA-SCL-128	1-1	Canon bone	[Holiday Inn/Guadalupe River Site] (now Hyatt Place Hotel/ San Jose, Santa Clara County	AMS C ¹⁴ dates from Beta Analytic of associated human bone collagen 1440 ±30 CE	Burial 1	Tule Elk
3	MO ³	CA-SCL-134		Antler Feature Antler	Santa Clara, Santa Clara County	Radiocarbon human burial remains between ~1000 BCE – CE 505		Roosevelt? Elk

	Collection ^{reference}	Site #	Catalog #	Skeletal Element	Location	Dated	Depth	Remarks
4	MO ⁴	CA-SCL-869	9-61	Thoracic 6 or 7	5912 Cahalan Avenue, Fire Station # 12 San Jose, Santa Clara County, California	Radiocarbon dating four human burial samples 244-346 CE	TU 1 20-40 cm	Tule Elk
5	MO ⁴	CA-SCL-869	9-30	Prox. Femur	“	“	TU 1 40-60 cm	Tule Elk
6	MO ⁴	CA-SCL-869	9-42	Metacarpal	“	“	TU 1 40-60 cm	Cervus sp?
7	MO ⁴	CA-SCL-869	14-1	Antler	“	“	TU 2 20-40 cm	Cervus sp?
8	MO ⁴	CA-SCL-869	14-2	Humerus distal	“	“	TU 2 20-40 cm	Roosevelt Elk
9	MO ⁴	CA-SCL-869	110-1	Manus left	“	“	Isolate	Possible Roosevelt Elk
10	MO ⁴	CA-SCL-869	130-8	Metacarpal/Cannon Bone	“	“	Isolate	Tule Elk
11	MVZ ⁵		MVZ 130107 - under V6203 at UC Museum Paleontology		Laguna Alta/Pacifica, San Mateo County			

	Collection ^{reference}	Site #	Catalog #	Skeletal Element	Location	Dated	Depth	Remarks
12	MVZ ⁵		MVZ 13018 - under V6203 at UC Museum Paleontology		Laguna Alta/Pacifica, San Mateo County			
13	MVZ ⁵		MVZ 130109 - under V6203 at UC Museum Paleontology		Laguna Alta/Pacifica, San Mateo County			
14	MSC	CA-SCL-30H			Mission Santa Clara, Santa Clara, Santa Clara County	1781-1834 CE dates for the Tamien Ohlone middens		
15	MSC	CA-SCL-30H			“	“		
16	MSC	CA-SCL-30H			“	“		
17	MSC	CA-SCL-30H			“	“		
18	CAS	W.H. Pratt 1951 found in Alta Laguna bog	California Academy of Sciences CAS/MAM9 845	Bone sample; SK	Purisima Creek, one mile from coast (just south of Half Moon Bay, San Mateo County			
19?	SU?							
20?	SU?							

	Collection ^{reference}	Site #	Catalog #	Skeletal Element	Location	Dated	Depth	Remarks
21?	⁶ Archeological Resource Managemt Doug Jones armcartier@aim.com (408) 295-1373	CA-SCL-619 The Elk Site			Santa Clara, Santa Clara County	1645 ±90 CE by radiocarbon Beta-Analytic		

References

¹ Leventhal et al. 2017 Report on the Analysis and Temporal Placement of an Ancestral Muwekma Ohlone Burial Recovered from CA-ALA-677

² Leventhal et al. 2015 Final Report on the Burial and Archaeological Data Recovery Program Conducted on a Portion of Thamien Rummeytak [Guadalupe River Site], (CA-SCL-128- Hyatt Place Hotel)

³ CA-SCL-134

⁴ Leventhal and Arrelano 2000 Final Report on the Burial and Archaeological Data Recovery Program Conducted on a Portion of a Middle Period Ohlone Indian Cemetery, Katwáš Ketneyma Waréptak (The Four Matriarchs Site) CA-SCL-869

⁵ McCullough 1965 Elk Deposit on the San Francisco Peninsula, Journal of Mammalogy 46(2):347-348

⁶ Carrico and Cartier 1987 The Archeological Recovery at the Elk Site SCL-619, at the Mill Creek Improvement Project in the City of Santa Clara, County of Santa Clara

UC Irvine – Keck Lab Radiocarbon Dating Sample Submission

<https://www.ess.uci.edu/~ams/Sample%20Submission%201.htm>

The Keck-CCAMS facility was set up to expand UC and US capabilities for ^{14}C measurements in support of research into the carbon cycle and its links to climate. One of the aims was to minimize measurement cost by emphasizing large scale projects plus encouraging users to carry out sample processing at their own institutions. Researchers from other fields or submitters with fewer than ten samples are encouraged to contact other AMS facilities or commercial dating services: small batches or samples from other fields will be run by special arrangement only. Contact information for other laboratories can be found at the Radiocarbon journal web site, at www.radiocarbon.org.

Submission process

To send samples to Keck-CCAMS at the UCI for analysis, the following steps are required:

1. Submitters, and in particular those making their first application, must make contact with the laboratory to discuss their requirements prior to actually submitting samples. See [contacts](#) for more info.
2. A submission form plus a sample list provided must be filled out (see guidance document) for each group of samples submitted and sent to us via mail, fax or e-mail. A hard copy of both must also accompany the samples.
3. The AMS prep. laboratory is currently equipped to handle routine processing of charcoal, wood, seed, carbonates, animal remains, etc. However, it is up to the submitter to define and select the materials to be dated: for example, since you know your samples far better than we do, it's your job to pick out the macrofossils or charcoal to be dated from within the sediment or peat matrix. Specialized services such as pollen or foram picking or individual compound separation are not offered. We discourage the dating of bulk soil, peat, or sediments, because those materials are often a mixture of components with widely differing ages. The preferred minimum sample size for a ^{14}C measurement is 1 mg carbon. The sample sizes quoted in the table below will yield approximately this amount, if the samples are well preserved. If this is not the case, more sample material will be required.

Typical Sample Sizes for AMS-Radiocarbon Dating

Carbon dioxide	2cc (STP)
Carbon-rich organic material	
Not requiring pre-treatment (dry weight)	2.5 mg
For Pre-treatment:	
Wood, Charcoal, Seeds, Macrofossils	5 mg
Lake sediments and peat	10 mg
Carbonates (not requiring leaching)	
Shells, Forams, Corals, etc.	10 mg
Proteins	
Bone (well preserved)	25 mg
Collagen	2.5 mg

4. For low-carbon organic material the carbon content can vary widely and no estimate for the preferred minimum sample size can be given. Note that smaller sample sizes can be dated at a reduced precision. For more details contact us.

5. It is important to try to avoid storage and packing methodologies that may contaminate your sample. Please follow the guidelines described below:

_____ Never store material under conditions that might allow fungal or bacterial growth: If possible, try to keep samples frozen or dry.

_____ Never handle samples in, or use implements and tools from, labs where tracer ^{14}C might have been used.

_____ Wrap and label each sample individually.

_____ Avoid wrapping samples in paper, or packing in containers that are lubricated with oil, waxes or any other organic materials. We prefer to receive samples in small glass or plastic vials, or wrapped in aluminum foil.

6. If you intend to send samples to us and there is any possibility that somebody could have used ^{14}C tracer in your facility (even in the past) contact us first. If necessary we will send you a monitoring kit for swiping your laboratory and suspect areas, to test for tracer contaminations. This procedure is important for avoiding serious consequences involving contamination of your samples and our laboratory. Check Swipe Protocol ([PDF file](#)) for more information. Also check the useful tips to avoid ^{14}C tracer epidemics ([PDF file](#)).

7. If samples require additional processing, the submitter will be informed of the added cost before work proceeds.

8. Results are routinely corrected for isotopic fractionation using AMS-measured delta ^{13}C ratios, but precise IRMS delta ^{13}C measurements can be provided at additional cost. In this case, try to include at least an additional 10% of raw material. Check price list for more information.

9. Unused sample material will be not being archived or returned, except by special arrangement.

10. Shipments from U.S. and Canada, we recommend shipping by airmail, priority mail, or courier. Foreign shipments should be sent by airmail or international air courier. All samples which must pass through U.S. Customs should be clearly labeled on outside pack "SCIENTIFIC SAMPLES - NO COMMERCIAL VALUE". Each shipment should contain a packing list of samples inside the main box, including the name and address of the shipper. In addition, the identification code of the sample, laboratory sample code (when sample was previous treated outside our lab), type of material and any other relevant information.

11. Our prices for sample preparation and AMS measurement vary depend on the submitter (UC /non-UC), sample material, pretreatment required, etc. See our price list or contact us.

12. For payment, see billing and payment procedures.

Please contact us for any question or further details.

IMPORTANT: Do not send any sample before contacting the Keck-CCAMS personnel.

Guidance document

Please fill out the [sample submission form](#) and provide the following additional information:

A. Brief (a few sentences) description of the project including overall objectives, reason for ^{14}C measurements, any relevant previous dating work, etc.

B. Brief description of sampling methodology and any pre-treatment already applied (eg, forams picked from marine sediments, sonicated in alcohol, etc).

C. Sample list: your lab number for each sample; a descriptive ID if is available (containing eg, stratigraphic information, species/sample material, etc – core 58PC, 325 cm , bulloides); sample type (CO_2 , macrofossil, graphite, HPLC fraction, etc); measured or estimated carbon content; approximate expected age (eg bomb ^{14}C , modern, Holocene, ca. 40ka, etc).

D. Assessment of possible problems in interpretation, if applicable.

THE SUBMISSION FORM AND SAMPLE LIST SHOULD BE SENT VIA HARD COPY AND ELECTRONICALLY TO:

For Terrestrial Carbon Cycle applications:

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Price List

	UC Staff rates	Non-UC, non-profit	Non-UC, commercial
Organics:			
Sample Cleaning and chemical pretreatment	\$50.00	\$75.00	N/A
Combustion	\$30.00	\$45.00	N/A
Carbonates:			
Sample cleaning and hydrolysis	\$40.00	\$60.00	N/A
Gas samples:			
CO ₂ extraction from air	\$60.00	\$90.00	N/A
Conversion of graphite (all sample types)	\$40.00	\$60.00	\$90.00
14C measurement (all sample types)	\$80.00	\$120.00	\$180.00
Optional:			
IRMS 13C measurement (all samples)	\$10.00	\$30.00	N/A

Billing and Payment Procedures

Submitters should arrange for a purchase order to be sent to the Keck-CCAMS contact. The account officer will then send an invoice when the results are completed.