

Kennewick Man

Chapter 1

The Initial Scientific Examination, Description, and Analysis of the Kennewick Man Human Remains

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Introduction

Between 25 February and 1 March 1999, a team of physical anthropologists, archeologists, curators, and conservators conducted a detailed examination of human remains from Kennewick, Washington, that have been the subject of anthropological, cultural, and legal controversies since their recovery in 1996.

The three following chapters of this report are the descriptive and analytical reports of the expert team that examined the remains in February and March of 1999. They are presented here as part of the commitment to make the examination data and reports

of the scientific team available and accessible to educators, reporters, scientists, and interested citizens.

This chapter describes the administrative, legal, and regulatory background for the government's investigation of the Kennewick remains, now being carried out by the National Park Service (NPS) and Department of the Interior (DOI). The planning for the investigation, a summary of the results of the nondestructive studies, and future plans are presented here.

Members of the scientific team included Dr. Joseph F. Powell of the University of New Mexico, Dr. Jerome C. Rose of the University of Arkansas, Dr. Julie K. Stein of the University of Washington, Dr. Gary Huckleberry of Washington State University and Dr. John L. Fagan, President of Archaeological Investigations, Inc., in Portland, Oregon. Professional conservators, Dr. Vicki Cassman of the University of Nevada-Las Vegas and Dr. Nancy Odegaard of the University of Arizona, under the direction of the chief curator for the U. S. Army Corps of Engineers (COE) Dr. Michael Trimble, worked with the examination team to monitor and care for the remains during the examination. Also involved in the investigation were Ms. Laura Phillips, Archaeological Collections Manager for the Burke Museum and Ms. Rhonda Lueck and Ms. Terri Militello of the COE. Dr. Karl Hutterer, Director of the Burke Museum, Dr. James Nason, and other members of the museum staff, were very accommodating to the scientific team during their investigation. The University of Washington Medical Center generously provided for x-rays and CAT-scans of some of the skeletal remains.

The measurements and analysis done as part of this investigation establish a

detailed scientific baseline that serves as basic archeological documentation of the remains, as required by the Archaeological Resources Protection Act (ARPA) and the Native American Graves Protection and Repatriation Act (NAGPRA). Both laws (ARPA, Section 4; 16 U. S. C. 470cc; and NAGPRA Section 3(c)(1); 25 U. S. C. 3002(c)(1)) require careful description and appropriate analysis of such remains when they are excavated or removed from federal land. The results of the examination also helped the DOI determine whether or not the remains should be considered "Native American" under the legal definition used in NAGPRA.

After a thorough assessment of the data and reports produced by the examining team, the DOI, which is assisting the COE in determining what disposition is appropriate for the remains, determined that radiocarbon testing was needed to adequately establish the chronological placement of the remains. Non-destructive tests alone were insufficient to answer the question of the age of the skeletal remains reasonably. In September, 1999, two small samples of bone were extracted from the remains, subdivided to ensure unbiased results, and submitted to three radiocarbon laboratories for dating. The results of these tests are expected in late October or early November.

The next task is for the DOI to determine whether the remains are subject to NAGPRA. We expect to make this determination by mid-November. If the remains are subject to NAGPRA, the DOI, as part of the agreement with the COE, will proceed to determine whether the remains are culturally affiliated with any modern day tribe or tribes to which they should ultimately be repatriated under the law. By using scientific methods, techniques and interpretations as part of its efforts to resolve this difficult case, the DOI is attempting to demonstrate that NAGPRA is flexible enough to allow good science to go forward at the same time respecting the dignity and recognizing the importance of traditional tribal beliefs.

Background

The human remains that have come to be referred to as the Kennewick Man, or the Ancient One, were found in July, 1996 below the surface of Lake Wallula, a pooled part of the Columbia River behind McNary Dam (Nickens 1998). The remains were found under the water, but close to the river terrace that contains Columbia Park in Kennewick, Washington. It is inferred that erosion caused by boat traffic and variation in pool levels behind McNary Dam caused the terrace margin that originally contained the remains to "calve" into the river edge (Wakeley et al. 1998:58). Water action then scattered the remains so that when they were discovered, they were incomplete, disarticulated, and distributed over an area of 300 square feet or more, about 10 feet offshore and in about 18 inches of water (Nickens 1998).

The land where the remains were found is under the management of the U.S. Army Corps of Engineers (COE) in Kennewick, Washington. As federal land, if these remains are Native American, NAGPRA applies as the legal and regulatory framework for determining the disposition of the remains.

A careful legal analysis of the judicial decisions by the Indian Land Claims Commission and the Court of Claims shows that the land where the remains were discovered has not been judicially determined to be the exclusive aboriginal territory of any modern Indian tribe. This means that Section 3(a)(2)(C) of NAGPRA (25 U. S. C. 3002(a)(2)(C)) that permits disposition of Native American remains recovered from federal lands that have been subject to such a decision does not apply in this case. It is recognized by many, including the tribes, that the area around Kennewick was used heavily by many tribes and bands, so much so that the Commission found that no single tribe had a claim to exclusive use or occupancy.

The remains were turned over to the COE in September, 1996, and initially housed at the Hanford Reservation in Richland, Washington. They were moved to the Burke Museum of Natural History & Culture in Seattle in October, 1998.

The interagency agreement between the COE and the DOI, signed in March, 1998, delegated responsibilities under NAGPRA from the COE to the DOI for certain decisions related to the set of human remains from Columbia Park, Kennewick, WA. The agreement calls for the DOI to investigate and resolve two basic issues. First, DOI must determine whether or not the remains meet the definition of "Native American" according to the legal definition implied by NAGPRA. Second, if the remains are Native American, the DOI will make a determination of the disposition of the remains under the requirements of NAGPRA.

As used in NAGPRA, "Native American" refers to human remains and cultural items relating to tribes, peoples, or cultures that resided within the area now encompassed by the United States prior to the historically documented arrival of European explorers, irrespective of when a particular group may have begun to reside in this area, and irrespective of whether some or all of these groups were or were not culturally affiliated or biologically related to present-day Indian tribes. If it is determined that this set of remains fits within the category of "Native American," the provisions of NAGPRA apply to its treatment and disposition. If the law applies to these remains, determination of cultural affiliation, or an absence of cultural affiliation will be highly relevant to how disposition of the remains should be accomplished. One of the kinds of information that can be used to help determine cultural affiliation is information about biological relationships between a set of remains and modern Indian tribes.

Geomorphologic and sedimentological investigations of the river terrace, from which the remains are thought to have eroded, were conducted in December, 1997, by the COE Waterways Experiment Station (WES) under the direction of Dr. Lillian Wakeley (Wakeley et al. 1998). These investigations, along with a parallel investigation headed by Dr. Gary Huckleberry of Washington State (Huckleberry et al. 1998), have established that the river terrace contains soil layers sufficiently old to have contained remains dated to about 9000 years ago. This age is important because a radiocarbon date of approximately 8340 to 9200 calendar years B.P. (Taylor et al. 1998; CAMS#29578/UCR#3476) has been obtained on a small sample of bone removed from the remains prior to any detailed examination and before they were turned over to the COE.

Part of the planning for the initial scientific examination included legally required consultation with the potentially culturally affiliated Indian tribes. On 12 May and 14 July 1998, meetings were held with representatives of Indian tribes that have claimed the remains. NAGPRA and its implementing regulations, in particular 43 CFR 10.4(d)(iv), require Federal agencies to consult with Indian tribes on whose aboriginal lands the discovery was made, or that are or are likely to be culturally affiliated with the remains, or that have a demonstrated cultural relationship with the remains (43 CFR 10.5(a)). In this case, the tribes represented at one or both of the meetings were: the Confederated Tribes of the Colville, the Nez Perce Tribe, the Confederated Tribes of the Umatilla, the Wanapum Band, and the Confederated Tribes and Bands of the Yakama Indian Nation. Following the July meeting, written comments were received from the Colville, Umatilla, and Yakama. As part of the May and July consultation meetings and in response to concerns raised by each of the tribes in their written comments, the government agreed to continue consulting with representatives of the concerned tribes. Government representatives also agreed to consider designing the initial investigation in stages that would first attempt to gather necessary information using non-destructive methods and techniques. A second stage of investigation using destructive methods and

techniques would be considered if the non-destructive phase did not provide sufficient information. The tribes also were offered an opportunity to have someone to serve as an observer of the examination. This courtesy also was extended to the scientific plaintiffs in the lawsuit that has been raised regarding the treatment of the remains.

Examination, Recording, and Analysis in the Initial Phase of the DOI Investigation

The investigation had two goals. The first was to provide appropriate documentation of the remains; the second was to provide a basis for reaching a determination of whether they are "Native American" for the purposes of NAGPRA.

Although there are some scientific techniques useful for providing information related to the second goal, for example by determining the age of the human remains through radiocarbon dating, these techniques typically require the destruction of small amounts of remains. Almost all tribal representatives objected to such destruction. The DOI investigation was organized in phases beginning with nondestructive investigations in part to recognize this tribal concern, but also because the nondestructive investigation as a first phase was a reasonable scientific approach to provide necessary information. It was possible that, on its own, this phase might generate sufficient information to make a determination of whether the remains are Native American or not.

The nondestructive investigations carried out during the first phase involved comparisons of the physical characteristics of the Columbia Park remains with those of known pre-Columbian Native American populations. Comparisons will be based upon metric and nonmetric morphological, paleopathological, and other kinds of characteristics. The recording procedures used here are based upon nationally recognized standards and guidelines compiled by Buikstra, Rose, Ubelaker, and colleagues to standardize the recording and analysis of human skeletal remains (Buikstra and Ubelaker 1994; Rose et al. 1991).

The DOI investigation required a careful physical examination, recording, and analysis carried out by a well-qualified scientific team in order to document the remains adequately and to interpret the coherence of the remains. The totally disarticulated and disturbed context of the discovery and sporadic nature of the collections made careful examination and recording essential. The initial description and analysis, carried out during the few short weeks following the discovery and the existing written description of these efforts and results are very brief. Existing first-hand documentation about the recovery actions, items and remains recovered, location of the recoveries, and initial examination of the remains consists of 13 pages of hand-written, difficult to interpret, and incomplete field notes. There is no map of the recovery site showing, even approximately, where the various remains were recovered. This body of work was considered very preliminary and to be used with caution.

During the month following the discovery, a few basic osteological measurements and nonmetric observations were made, however, the method and techniques used for this recording have not been described. For example, fragments of some of the bones and the skull apparently were glued together. How such reconstruction may have affected the measurements and interpretations could not be determined due to the lack of description of the method and techniques used. Metric analysis require that precise definitions be provided for each measurement. The degree to which measurement error has been minimized and checked also is essential for careful, detailed comparative analysis. For these remains, very limited information was available concerning the measurements originally made. The method, techniques,

and estimated precision of the measurements taken had not been reported. The documentation of this activity and the results are 14 pages of sketchy typed notes listing measurements made on various parts of the remains. This documentation was not adequate for the DOI to proceed with making decisions in this matter.

Specific activities for the first phase of the DOI investigation included, careful, detailed physical examination, recording, documentation of measurements and appearance, and analysis. This research and results are described in detail in Chapters 2, 3, and 4 of this report. This phase of the DOI investigation concentrated on three aspects of the remains: (1) the skeletal remains themselves (see Chapter 2 by Powell and Rose); (2) the sediments adhering to the remains and packed into various spaces within the bones (see Chapter 3 by Huckleberry and Stein); and, (3) the lithic artifact that is embedded within the right ilium, one of the pelvic bones (see Chapter 4 by Fagan).

Examining the Skeletal Remains: The investigation of the skeletal remains included three aspects. First was the physical examination of the remains and modification of the detailed inventory conducted by Dr. Trimble and his team from the COE and Dr. Douglas Owsley of the Smithsonian Institution in October, 1998, immediately prior to the transfer of the remains from Richland, Washington, to the Burke Museum in Seattle. The examination by Drs. Powell and Rose confirmed that the remains were those of a single individual, an important fact that needed to be established carefully given the extremely disturbed context within which the remains were found originally.

The second part of the investigation carried out by Drs. Powell and Rose was the metric recording of dental and skeletal elements. Measurement of the human crania, post cranial skeleton, and dentition are tasks that have been used for more than a century to describe and investigate variation among human remains of various ethnic groups (e.g., Drossler 1981; Key 1983, 1994; Owsley and Jantz 1994; Sciulli 1990; Steele and Powell 1994; White and Folkens 1991). There are several hundred measurements that have been used and are reported in the literature. Databases of Native American skeletal characteristics exist for some regions and have been profitably employed in studies of genetic distances and ethnic affiliations. Such comparisons were used to determine the extent to which the physical characteristics of the Columbia Park remains resemble those of existing recorded Native American and other skeletal populations. It is recognized that variation among individuals within a population can be substantial and no single individual is likely to match all the average measurements or indices for the population. However, comparisons of the physical characteristics of the Kennewick remains with known Native American populations provides one nondestructive means of gathering evidence about whether the remains can reasonably be determined to be Native American. In this analysis, the characteristics of a number of recent, historic, and ancient Native American skeletal populations have been utilized.

The third aspect of investigation of the skeletal remains was the observation and recording of non-metric dental and skeletal characteristics. The usefulness of this kind of information lies in the patterns that have been observed in the nonmetric dental and skeletal remains of humans of different ethnic categories, including Native Americans. Interpretation of these physical characteristics is another kind of evidence useful for determining whether or not these remains are of an individual of Native American descent. The skeleton and teeth display morphological characteristics linked to Native Americans by other studies. Observations of inflammation, trauma, toxins, dental wear and caries, and other stressors also have been recorded and will be interpreted to form an idea of the health and way of life of the individual. Investigations of ancient Native American skeletal populations have identified characteristic traits linked to health and occupation. Certain patterns of

skeletal trauma, tooth wear, and other nonmetric characteristics of the remains can be used as evidence concerning whether or not the remains indicate someone of Native American descent based on comparisons with other sets of data from skeletal populations (e.g., Bridges 1991; Edgar 1997; Kennedy 1989; Larsen 1982, 1887, 1997; Martin et al. 1985; Merbs 1983; Ortner and Putschar 1981; Powell 1988; Smith 1984).

Examining the Sediments: The second major component of the DOI scientific examination was the removal, description, and analysis of sediments from the skeletal remains. For the Kennewick remains careful examination of the sediment provided one possible means of linking the remains to dated soil layers in the river terrace in which the remains are thought to have been buried originally. A series of radiocarbon dates and related stratigraphic chronological data have been obtained for the soil horizons along the edge of the river terrace immediately adjacent to the discovery site by the WES study of the terrace soil profile (Wakeley et al. 1998). Samples of the adhering sediments were collected carefully by Drs. Huckleberry and Stein for analysis and comparison with sediment samples from the profile of the river terrace. Sedimentological samples collected and curated by WES were used for these comparisons.

Examining the Lithic Artifact: The third and final major component of the DOI scientific investigation of the Kennewick remains focused on the lithic object lodged in the right ilium of the pelvis. The object, which probably is a projectile point, was examined, documented, and analyzed in place by Dr. Fagan, an expert in lithic artifacts and materials of the Pacific Northwest. Dr. Fagan analyzed the lithic material type and likely formal point type. In concert with Drs. Powell and Rose, he considered the way in which the object came to be lodged in the pelvis, the bone growth around it, and implications for the health of the individual. His interpretation includes an estimate of the chronological period(s) in which the lithic object may have been manufactured and used.

Results of the Non-Destructive Phase of the Investigation

The results of the descriptions and analysis of the expert scientific team were reviewed and evaluated by the DOI. The results provide an excellent baseline describing the remains and making basic inferences about the individual they represent. The first goal of the non-destructive phase was met, the remains have been appropriately documented and much of this documentation is presented in the chapters of this report. However, the non-destructive information was not adequate for the DOI to make a determination of whether or not these remains are "Native American" for the purposes of NAGPRA. This is because there is not sufficient reliable chronological information that could be gleaned from the non-destructive examination and results.

Summary of Non-destructive Results: Examination and analysis indicated a number of characteristics related to age, stature, musculature, trauma and recovery, all of which can be summarized from different aspects of the physical appearance of the remains. These characteristics are described in detail in Chapter 2. The physical appearance of the remains lacks characteristics that are typical of bone that has been scavenged by wild predators. This suggests that the remains were quickly buried at death, rather than left on the surface. Whether this burial was the result of a natural process, perhaps related to river flooding, or a cultural interment cannot be determined with certainty. While these observations are quite interesting and inform us about the life and times of Kennewick man, they do not reveal the chronological information needed by DOI for making the "Native American" determination.

Analysis of metric and nonmetric skeletal traits suggests various biological

relationships or lack of them between the Kennewick remains and known human populations. Comparisons were made between the Kennewick remains and modern populations for which extensive sets of measurements exist. Comparison also between these remains and Native American remains known to come from archeological contexts dated to thousands of years ago, although in the latter case, Drs. Powell and Rose point out, relatively small numbers of remains are available for comparison. For these latter comparisons, the amount of statistical variation is greater and more quantitative manipulation of the data are necessary to assess similarities or differences, making conclusions more tentative.

Powell and Rose did a comparative analysis of metric and nonmetric characteristics of known worldwide human populations, using the Howells and Hanihara databases which mainly include recent human populations, including craniometric data for 380 populations (N=8,833). This analysis indicates that the Kennewick remains are not very similar to any modern ("late Holocene") human populations, although the shape is most similar to Northern Asian populations (e.g., the Ainu).

Further comparisons were made, but limited to a much smaller number of populations and individual sets of remains, including pre-Columbian Native American populations (13 populations, N=304; dated 8,000-1,900 B.P.). This resulted in a closer mathematical measure, showing certain craniometric characteristics of the Kennewick remains that are similar to the Chukchi population from Siberia, an Eskimo population, and a several thousand year old Native American burial population from the Midwest. However, this same analysis showed a lack of similarity to several other ancient Native American populations. Additional mathematical manipulation of the data to take into account small sample size and wide intergroup variation showed some relationship among the Kennewick remains with a mid-Holocene Native American burial population from the eastern US and the Ainu of Northern Japan. These mathematical comparisons of metric traits are interesting and suggestive, but not clear chronological indicators upon which DOI could base a determination that the Kennewick remains are "Native American."

The second component of the initial phase examination was the removal, description, and analysis of sediments from the skeletal remains. Our original hope in using the sediments was that enough organic material from the original burial context of the remains could be obtained from the sediment adhering to the skeleton for a radiocarbon date to be made on it. However, during analysis it could not be determined with sufficient reliability that the sediments were not from the river or that they were not older sediments into which the Kennewick remains had been buried. Both possibilities created contextual problems that made radiocarbon dating of the sediment problematic.

Additional analysis of the sediments was undertaken in an attempt to associate the sediments from the skeletal remains with sediments from samples taken from the river terrace. A series of radiocarbon dates and related stratigraphic chronological data have been obtained for the soil horizons along the edge of the river terrace immediately adjacent to the discovery site by the 1998 Waterways Experiment Station study of the terrace soil profile. The natural soil profile of the river terrace can be divided into two major units based upon radiocarbon dating of a volcanic ash lens and shell fragments found in the profile. These upper soil layer dating to before about 7,000 years ago and the lower layer before 7,000 years ago.

Five different scientific techniques were used. In three of the five tests (grain size, grain shape, and trace element analysis), the sediments from the bone could not be linked exclusively with any dated part of the natural soil profile. For two of the tests, measuring the percentages of mineral/organic content of sediments and the crystalline mineral characteristics of the sediments, analysis indicated a similarity

between the skeletal sediments and sediments in the natural profile dated to between about 7,000 and 9,000 years ago.

There are problems, however, with assuming that the inferred date range for the natural profile sediments is also the date of the human remains. The skeletal analysis suggests strongly that the skeleton was buried at the time of death. This burial may have been dug into existing soil. Therefore, the formation of the soil layer and sediments that came to adhere to the bone might predate by some period of time the burial of the human remains.

The process by which the sediments came to adhere so strongly to the bone suggests that a considerable period of time elapsed between the burial and the erosion of the remains into the river bed. However, very localized geological, hydrological, and pedological conditions affect the rate of such processes. Since we do not know the original depth of the human burial or its exact location along the profile, we cannot inspect the original location to investigate these conditions. Although suggestive, results of the sediment analysis were not a sufficient basis for the DOI to make the "Native American" determination.

The third component of the investigation of the Kennewick remains focused on the lithic object lodged in one of the pelvic bones. The object, which probably is a projectile point, was examined, documented, and analyzed in place. CT scans were essential to this part of the investigation. The descriptive information could not have been determined in any other nondestructive manner. They revealed that the object is at least 5.6 cm long and 2 cm wide at widest end, tapering to 3mm wide at narrowest end. The object has two convex faces with a wide, rounded base and a narrow tapering tip. There is no evidence of notches or stem. The exposed portion of the object, around the middle is 6-5.5 mm thick. Based upon comparative analysis with other specimens in collections at the Burke Museum and the Oregon State Museum, Fagan inferred that the size, shape, and raw material give the object the appearance of a Cascade projectile point. However, these characteristics are not exclusive to Cascade points. The possibility that this object is a Cascade point is particularly interesting because archeological sites containing such points are common throughout the Pacific Northwest. These site components often are associated with deposits of volcanic ash that originated during the eruption of Mt. Mazama approximately 7,600 years ago.

The descriptive interpretation by Fagan is an important addition to our understanding of these remains and suggests a pre-Columbian date. Cascade points also were used and reused subsequent to the early time period during which they were most common, so the identification of this point as probably Cascade does not assure that the event resulting in it being embedded in the hip of the Kennewick man occurred 7,000 years ago. Again, the results are suggestive but not sufficient to base the DOI determination upon.

Need for Additional Testing: The initial phase examination has provided the basic documentation of the remains that is required by NAGPRA and other resource management and protection laws and regulations (e.g., the National Historic Preservation Act and Archaeological Resources Protection Act). This documentation will be useful for resource management purposes as well as any further NAGPRA requirements.

The information about the skeleton, sediments, and lithic artifact is suggestive of the chronological determination needed for the government to make a decision regarding whether or not these remains should be considered "Native American" for the purposes of NAGPRA. However, the inferences from the non-destructive phase investigation are not sufficient for a reasonable determination without additional

tests. There is enough uncertainty to cloud the reasonableness behind making a decision that the remains are "Native American." Alternative interpretations exist to counter each of the kinds of evidence the DOI has collected and used in the initial examination. It is, therefore, important and necessary that DOI conduct additional tests, specifically radiocarbon dating of small samples of bone from the Kennewick remains.

By undertaking an additional kind of test DOI is not seeking "scientific certainty", rather, we are following standard procedures for trying to construct a reasonable argument that the remains are indeed "Native American." There are a number of reasons for doing this:

1. Additional radiocarbon dating is standard archeological practice to confirm a date as unexpected as the date reported by the original collector.
 - Rose, et al. (1991:11), one of the national standards for recording human skeletal remains "...recommend...that at least three radiocarbon dates be obtained for each coherent skeletal series."
 - Buikstra and Ubelaker (1994:164-166), another national standard for recording recommend a series of dating tests for skeletal remains.
2. The experts the government hired to do a peer review of the DOI plan for investigation of the Kennewick remains in November, 1998, both supported the phased approach described in the plan, however each of them stated that radiocarbon dating probably would be needed.
 - Larson (1998, Review of DOI plan for Kennewick study): "I recommend [radiocarbon dating]...early on in the research...this has important implications for ancestry and ethnic identity...I recommend having more than one date determination; three or four would be ideal."
 - Smith (1998, Review of DOI plan for Kennewick study): "I think that in the end, it will be necessary to proceed on to Phase 2 'destructive' methods, and to obtain one or more additional...radiocarbon dates from the assemblage of human skeletal remains...Without additional dates, argument and controversy will only intensify regarding the age of the skeletal remains. If additional dates are obtained, however, this aspect of the Kennewick Man debate, at least, will be clearly and completely resolved. I would recommend one or two more samples... drawn, if possible, from the pelvis containing the projectile point fragment, and from another skeletal element with significant morphological information regarding possible ethnic/biological/cultural affiliation of the individual."
3. If DOI determines that the remains are "Native American", DOI will need more precise information about the chronological placement of the remains when investigating the cultural affiliation of the remains. Whether a set of remains is several hundred years old or several thousand years old makes a significant difference in determining whether or not there is a reasonable cultural affiliation. Radiocarbon dating will be needed for this interpretation.

Based upon this information and reasoning, DOI decided in July, 1999, that additional tests were needed to provide a clear chronological placement for the Kennewick remains. It was decided that two bone samples would be extracted from the Kennewick remains for radiocarbon dating. Radiocarbon dating is the simplest and most accurate means of obtaining chronological information in this situation (Taylor 1987, 1997: 65-66; Aitken 1990:1-4).

Procedures for Radiocarbon Dating the Kennewick Remains

In order to minimize the destructive impact on the Kennewick remains and the adverse affect on the Indian tribes claimants, without compromising the reliability of chronological results, the Department of the Interior has determined that the Accelerator Mass Spectrometry (AMS) radiocarbon test is the most appropriate technique to utilize (Radiocarbon Web-Info 1999; Taylor 1997:78-91; Aitken 1990:82-84; Hedges and Gowlett 1986:105-107; Hedges and Van Klinken 1992). The highly accurate chronological information supplied by an AMS radiocarbon test, in particular its ability to obtain results from smaller samples of bone compared to other radiocarbon methods, makes this technique the most suitable procedure for obtaining the chronological information needed in this case.

Selection of Radiocarbon Laboratories to Perform the AMS Radiocarbon Tests: The selection of qualified radiocarbon laboratories to perform the AMS testing on bone samples from the remains has been made based upon a variety of factors. These factors include, but are not limited to: (1) past experience working with human bone, procedures utilized in the pre-treatment and examination of bone samples; (2) availability of laboratory facilities and experienced personnel; (3) ability to perform the radiocarbon test in a timely fashion; (4) capability to record the processes and methods applied to the bone sample; (5) ability to return bone residue upon completion of the tests; and, (6) willingness to work within the procedures established by the government for these tests.

Recommendations of potentially suitable radiocarbon laboratories were sought from the claimant Indian tribes and bands, the plaintiff scientists, the Corps of Engineers, and the scientific experts who worked with the DOI and COE on the initial Kennewick examination. Additionally, the DOI performed independent research to identify radiocarbon laboratories that can perform AMS testing. Finally, the recommended and identified radiocarbon laboratories were contacted and their experts were questioned about technical issues related to dating the bone samples. These experts were also asked to provide the names of other radiocarbon facilities they believed were qualified to conduct the chronological testing of the remains.

Based upon the recommendations and research, and discussion with representatives of the laboratories considered for the dating, three laboratories in the United States were selected:

- Beta Analytical, Inc., Miami, FL
- NSF - Arizona AMS Facility, University of Arizona, Tucson, AZ
- University of California, Riverside , Radiocarbon Laboratory, Department of Anthropology, Riverside, CA

A fourth lab, Stafford Research Laboratory in Boulder, CO, also was asked to date one of the subsamples from the Kennewick remains. However, negotiations concerning ultimate release of the test information could not be agreed to between the DOI and the lab and the lab decided not to do the date. On 9 and 10 September, following the extraction and splitting of the bone samples at the Burke Museum, DOI and COE personnel delivered subsamples to the labs. The labs have indicated that they can provide final dating results within 6-8 weeks. The labs will return all bone residues to the COE and Burke Museum for curation with the non-sampled remains.

The Next Step

If the remains are found to be Native American, as defined by NAGPRA, subsequent investigation and related studies will be undertaken to provide background for determining the ultimate disposition of the remains. If the remains prove to be as ancient as suggested by the radiocarbon date that was obtained on one bone fragment, it would not be possible for any relationship of lineal descent, as

defined by NAGPRA, to be made.

If the remains can be reasonably demonstrated to be Native American, as defined by NAGPRA, subsequent investigations and studies will focus on the possible cultural affiliation of the remains with present day Indian tribes. Within the legal context of NAGPRA, "cultural affiliation" means that there is a relationship of shared group identity which can be reasonably traced historically or prehistorically between a present day Indian tribe and an identifiable earlier group. A wide variety of geographical, kinship, biological, archeological, linguistic, folklore, oral tradition, historical, and other information will be examined as part of any cultural affiliation investigation.

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