DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NORTHWESTERN DIVISION
PO BOX 2870
PORTLAND OR 97208-2870

Native American Determination for Kennewick Man

Based upon review and analysis of new information related to the skeleton known as Kennewick Man, and in particular, evidence provided by recently published DNA and skeletal analyses, I find that there is substantial evidence to determine that Kennewick Man is related to modern Native Americans from the United States. Therefore, the human remains are Native American under the Native American Graves Protection and Repatriation Act (NAGPRA), as described below.

Background

The U.S. Army Corps of Engineers (USACE or Corps), Northwestern Division, controls the collection from site 45BN495, which includes the skeletal remains of Kennewick Man. The collection is presently housed at the Burke Museum of Natural History and Culture on the University of Washington campus. The skeleton was discovered on July 28, 1996, by two young men walking along the Columbia River near Kennewick, Washington. The discovery was reported to the police who called a local archaeologist, James Chatters, to investigate and collect the remains. Upon determination that the site was located on federal property (USACE, Walla Walla District), the Corps was notified. While the physical characteristics of the remains led to an initial belief that the remains were from an early European settler, the discovery of a stone projectile point embedded in the hip bone suggested a much earlier time period. Initial radiocarbon dating placed the skeleton between 8,340 and 9,200 years old.

Based on the presence of the projectile point and the age of the remains, USACE took control of the remains and made a determination that the custody of the remains should be transferred to a group of claimant tribes pursuant to NAGPRA. The claimant tribes included four federally recognized Indian tribes (the Confederated Tribes of the Colville Reservation; the Confederated Tribes of the Umatilla Indian Reservation; the Confederated Tribes and Bands of the Yakama Nation; and the Nez Perce Tribe), and one federally unrecognized tribe (the Wanapum Band). Subsequent to the transfer decision, the following events occurred:

- The decision to transfer was challenged in October 1996 by eight scientists who wanted to study the remains.
- In 1997, the District Court of Oregon found the Corps had acted before it had all required evidence and remanded the case to the Corps for further consideration.
- In March 1998, the Corps entered into an agreement with the Department of the Interior (DOI) whereby DOI would decide whether the remains were “Native American” under NAGPRA and the Corps would determine their proper disposition.
- After two years of examination, analysis, and study, DOI determined the remains to be Native American in January 2000 and culturally affiliated with the claimant tribes in September of that same year.
- The Corps again made a determination that the custody of the remains should be transferred to the claimant tribes. This was again challenged by the scientists in 2001.
- In August 2002, the District Court of Oregon found DOI’s decision that the remains were Native American to be arbitrary and capricious. The Court held that the remains were not “Native

American" as defined by the statute, nor could they be culturally affiliated with the claimant tribes.

- The Court ordered the Corps to grant access to the plaintiff scientists to study the remains subject to "reasonable terms and conditions."
- In September 2002, the tribes intervened for purposes of the appeal to challenge the District Court's decision.
- In October 2002, The United States appealed the "Native American" decision to the Ninth Circuit Court of Appeals.
- In April 2004, the Ninth Circuit Court of Appeals affirmed the District Court of Oregon's decision and remanded the case.
- Following the Ninth Circuit decision, the plaintiffs submitted a study plan to the Corps along with subsequent study requests. The Corps approved the majority of these requests, allowing the plaintiffs to have access the collection to perform a series of studies, as ordered by the Court. Terms and conditions were placed on each of these studies to protect and preserve the research potential of the collection. The Corps has responded to all requests from the plaintiff scientists and the plaintiffs completed all approved studies.
- One of the members of the plaintiff's team also requested access to conduct ancient DNA (aDNA) analysis on already sampled portions of the skeleton, which was approved by the Corps in August 2011.
- In September 2014, results of the plaintiffs' studies were published in *Kennewick Man: The Scientific Investigation of an Ancient American Skeleton*, edited by Douglas W. Owsley and Richard L. Jantz, Texas A&M University Press.
- On June 18, 2015, the results of aDNA testing of the skeleton were published in "The Ancestry and Affiliations of Kennewick Man," by Morten Rasmussen et al., in the Journal *Nature*.
- In April of 2016, the Rasmussen results of aDNA testing were independently validated by John Novembre et al. in a technical report titled, "Assessment of the genetic analyses of Rasmussen et al. (2015)."

Legal Standard

NAGPRA became federal law in 1990. It provides for the disposition and repatriation of "Native American" human remains and certain cultural items that have been either inadvertently discovered on federal lands or curated in museums receiving federal funding. 25 U.S.C. §§ 3001-3013. "Native American" is a specifically defined term that triggers the applicability of the statute. The definition is "of, or relating to, a tribe, people, or culture that is indigenous to the United States." 25 U.S.C. § 3001(9). The statutory definition of "Native American" has been determined to be unambiguous in its meaning. *Bonnichsen v. United States*, 217 F. Supp. 2d 1116, 1136 (D. Or. 2002) (Bonnichsen I); *Bonnichsen v. United States*, 367 F.3d 864, 875-76 (9th Cir. 2004) (Bonnichsen II). The Ninth Circuit determined that to be Native American under the statute, human remains and cultural items must "bear some relationship to a presently existing, tribe, people, or culture." *Bonnichsen II*, 367 F.3d at 875. The Ninth Circuit acknowledged that NAGPRA does not specify precisely what kind, or how strong, a relationship is required in order to make a Native American determination, but the court was clear that age alone is not a sufficient basis for determining that remains are Native American, although it can be a factor that is considered.

A Native American determination must be made on a finding that substantial evidence supports the agency's decision. *Bonnichsen II*, 367 F.3d at 779-80. Substantial evidence is more than a mere

scintilla of evidence. It means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion, even if it is possible to draw two inconsistent conclusions from the same evidence. *See Bonnichsen II*, 367 F.3d, at fn. 19, fn. 20; *Richardson v. Perales*, 402 U.S. 389, 401 (1971); *Landes v. Royal*, 833 F.2d 1365, 1371 (9th Cir. 1987). Determining remains to be Native American is, therefore, distinct from determining cultural affiliation. Cultural affiliation, the second step of the NAGPRA process, is required before transfer may occur. *See Bonnichsen II*, 367 F.3d at 875 (the first inquiry asks "whether the human remains are Native American" and the second inquiry asks "which American Indians or Indian tribe bears the closest relationship to Native American remains"). This determination does not address cultural affiliation nor does it propose a transfer of custody of the remains.

To establish cultural affiliation, there must be a preponderance of evidence that there is a "relationship of shared group identity which can be reasonably traced" between a present day Indian tribe and an identifiable earlier group. 25 U.S.C. § 3001(2); *see also* 25 U.S.C. § 3005(a)(4). First, substantial evidence is a lower threshold of proof than preponderance of the evidence. Substantial evidence is essentially a reasonableness standard ("such evidence as a reasonable mind might accept as adequate to support a conclusion"), whereas preponderance of the evidence requires the conclusion being drawn as being more likely than not true. Second, to be Native American under NAGPRA, there needs to be merely a connection to a presently existing tribe, people, or culture. For cultural affiliation, there needs to be shared group identity with a tribe. A tribe, people, or culture is significantly broader than only a tribe; likewise a "connection" is more ephemeral than a "shared group identity."

The District Court clarified that it is "not the role of the court to determine whether Kennewick Man is or is not 'Native American' under the terms of NAGPRA….The court is simply concluding that the record will not support the Secretary's affirmative finding that the remains are 'Native American.'" *Bonnichsen I*, 217 F. Supp. 2d at 1139, fn. 41.

My decision here centers on the recently published information, which provides sufficient and substantial evidence that will now support a Native American determination, as outlined below.

Original Native American Determination and Studies

This Native American determination is based on significant new evidence that was not available until recently and not considered in the original Native American determination. The Corps is required to continue to uphold is responsibilities under both NAGPRA and the Archaeological Resources Protection Act and evaluate all new evidence. The prior court rulings inform the Corps responsibilities under these laws.

On January 11, 2000, the Department of the Interior determined that there was "sufficient information to determine that [the Kennewick skeletal] remains should be considered 'Native American' as defined by NAGPRA." Memorandum from Francis P. McManamon to Assistant Secretary, Fish and Wildlife and Parks, Determination That the Kennewick Human Skeletal Remains are "Native American" for the Purposes of the Native American Graves Protection and Repatriation Act [hereafter January 2000 DOI Memo]. DOI used primarily age and geography to indicate Native American ancestry. Additional radiocarbon dating of the bones by DOI at three separate laboratories confirmed that the remains were older than 6,000 years (January 2000 DOI Memo). The chronological age obtained through radiocarbon dating was further confirmed and refined by DOI through geomorphologic and sedimentary investigations of the river bank (Huckleberry et al. 1998; Wakeley et al. 1998), analysis of the remains themselves (Powell and Rose 1999), comparison of sediments adhering to the remains and in the river bank profile

(Huckleberry and Stein 1999), and information from the analysis of the lithic artifact lodged in the ilium (Fagan 1999). In all, information derived using the methods and techniques of archaeology, geomorphology, physical anthropology, sedimentology, and other scientific disciplines supported a determination that the remains were probably between 8,500 and 9,500 years old (January 2000 DOI Memo).

The DOI study also identified morphological characteristics that are considered Native American, including a large malar tubercle, blurred nasal sill, zygomatic posterior tubercle, slight nasal depression, moderate prognathism, elliptical dental arcade, straight palatine suture, and what appeared to be an angled zygomaticomaxillary suture (Powell and Rose 1999). However, morphological studies completed also indicated that Kennewick Man's cranium was unlike any modern Native American group and more like crania from the south Pacific and Polynesia (Powell and Rose 1999).

When the Corps recovered the remains in 1996, Dr. David Glenn Smith was attempting to perform a series of DNA extractions to determine the presence or absence of certain haplogroups. Affidavit of David Glenn Smith (*Bonnichsen v. United States*), May 19, 1997, at ¶ 4. In subsequent correspondence, Dr. Smith stressed that DNA studies are important to demonstrate that there is a direct ancestor/descendant relationship between modern Native Americans and Paleoindians. *E.g.*, Letter from David Glenn Smith to Colonel Donald R. Curtis, dated May 29, 1997. DNA testing, therefore, became a critical component of DOI's analysis of Kennewick Man in 2000. As indicated by DOI, "DNA analysis will be useful to the Department in determining if a shared group identity or cultural affiliation can be made between these very ancient remains and Indian tribes that have historically inhabited the Upper Plateau region in Washington State." DOI Press Release, dated February 18, 2000. In a report to DOI, scientists looked at the potential for DNA analysis of the Kennewick remains (Tuross and Kolman 2000). At the time, despite expressing concerns over low levels of human bone collagen and possible complexities in extracting the DNA, the report stated that it was also "possible that mitochondrial DNA analyses of the skeleton will allow assignment of the skeleton to the biological grouping of American Indian (Tuross and Kolman 2000:4)."

DOI, therefore, incorporated DNA testing into its study plan for determining cultural affiliation of the Kennewick remains. DOI developed a plan for conducting DNA testing with the goal of extracting, amplifying, analyzing, and interpreting ancient DNA from the remains "to determine the mitochondrial DNA haplogroup and Y-chromosome genetic characteristics of the individual." *See* United States, Federal Defendant's Submission of Work Plan for DNA Analysis, submitted to District Court of Oregon on April 10, 2000, at Exhibit 1, Attachment 1, page 1]. DOI worked with independent scientists on implementation of the plan, while other scientists assured that appropriate samples were extracted and were tied to other examinations of the remains, such as the broader taphonomic studies. *Id*. The selected laboratories were unable to isolate uncontaminated DNA from the Kennewick remains at that time (Kaestle et al. 2000; Merriwether *et al*. 2000; Smith *et al*. 2000).

The Court noted the reliance on age (over 8,000 years old) and geography (Columbia Plateau) in the determination of Native American ancestry. "The decision [that Kennewick Man was Native American] was premised on only two facts: the age of the remains, and their discovery site within the United States." *Bonnichsen I*, 217 F. Supp. 2d at 1130. The Court found that some relationship between remains or cultural items and an existing tribe, people, or culture that is indigenous is necessary for a Native American determination. *Id.* at 1136. The Court reviewed the results of craniometric studies of Kennewick Man and other early Holocene crania, none of which appear similar to modern Native Americans. *Id.* at 1137-1139. "The physical features of the Kennewick Man appear to be dissimilar to all

modern American Indians…that does not preclude the possibility of a relationship between the two. However, absent a satisfactory explanation for those differences, it does make such a relationship less likely, and suggests that the Kennewick Man might have been part of a group that did not survive or whose remaining members were integrated into another group." *Id.* at 1146. The Court reviewed the administrative record for information that would provide evidence of a relationship and found that "a thorough review does not reveal the existence of evidence from which that relationship may be established." *Id.* at 1138. The Ninth Circuit affirmed these conclusions, finding that the "[t]he administrative record contain[ed] no evidence, let alone substantial evidence, that Kennewick Man's remains are connected by some special or significant genetic or cultural relationship to any existing indigenous tribe, people, or culture." *Bonnichsen II*, 367 F.2d at 880.

Lacking DNA evidence comparing Kennewick Man's genetics to modern Native Americans and other modern populations, the courts instead used cranial morphology to reflect genetics—"differences in appearance may reflect genetic differences between ancient samples and more recent American Indians and northern Asian populations." *Bonnichsen I*, 217 F. Supp. 2d at 1137. Because Kennewick Man's cranial morphology did not reflect modern Native American morphology and because the court found no other evidence of a relationship with a present-day tribe people or culture indigenous to the United States, the court concluded that the "Secretary did not have sufficient evidence to conclude that the Kennewick Man remains are "Native American" under NAGPRA." *Id.* at 1138; *see also Bonnichsen II*, 367 F.2d at 880.

New Evidence for Native American Determination

Over the last two years, published scientific analyses of Kennewick Man's skeleton have provided new evidence informing on the ancestry and lifestyle of Kennewick Man (Owsley and Jantz 2014). Primarily, there have been significant advances in the extraction and sequencing of ancient DNA, and Kennewick Man's DNA has been analyzed (Novembre et al. 2016; Rasmussen et al. 2015). The Corps has reviewed this new evidence, along with all previously completed studies, in order to determine if the new evidence supports a determination that Kennewick Man is Native American.

Craniometric and Skeletal Evidence

Recently published studies of Paleoindian[1] crania, describe difficulties in interpreting population affinities for a single specimen such as Kennewick Man. Craniometric studies of Kennewick Man and other Paleoindian human remains reaffirm that their cranial morphology is distinct from historic Native Americans (Hackenberger 1999; Jantz and Owsley 1997; Jantz and Spradley 2014; Powell and Rose 1999; Spradley et al. 2014; Rasmussen et al. 2015). Overall, Paleoindian crania do not look like modern Native American crania. Recent studies, however, warn against an oversimplification of the complexities of microevolution over time and space and the role played by genetic drift on morphological changes (Edgar 2007; Powell 2005; Powell and Neves 1999).

Thomas and Larsen (2015:782) point to the "voluminous experimental, epidemiological, and skeletal biological record" that show the importance of biocultural circumstances on skeletal plasticity. Behavioral, cultural, and environmental circumstances can influence morphology over generations (e.g.,

[1] For the purposes of this document, "Paleoindian" refers to the earliest inhabitants of North and South America dating to before 8,000 years ago.

Armelagos and Van Gerven 2003; Auerbach 2012; Jantz and Meadows Jantz 2000). Expecting cranial remains that are over 8,000 years apart to look exactly the same ignores these types of changes (Auerbach 2012). As noted by Edgar et al. (2007:106), "the ultimate cause for the dissimilarity between Paleoindians and contemporary Native Americans is time—Paleoindian and other post-Pleistocene humans are simply not contemporary, which one might imagine is a source for diversity from a variety of evolutionary factors," over thousands of years and many generations (*id.*).

In addition to the fact that the morphology of a population changes over time, scientists have recently challenged the validity of the interpretations of ancestor-descendant relationship using a single specimen such as Kennewick Man—"Stating a fossil is similar to a particular recent group is not the same as saying the fossil belongs to that group. It is simply a statement of similarity" (Jantz and Spradley 2014:475). "Morphological similarity can arise not only through shared descent but also through convergent evolution or phenotypic plasticity coupled with similar environments" (Skoglund et al. 2015:104).

The use of a single specimen to infer ancestor-descendant relationships was reviewed by Rasmussen et al. (2015). They analyzed the worldwide modern human data set that was used for the initial comparisons to Kennewick Man (including Howells' 1973, 1989 and 1996 data for prehistoric and modern populations [hereafter Howells' Data Set]). Rasmussen *et al*. found that while the craniometric analysis shows similarity to Polynesians and Ainu, "Kennewick Man's pattern of craniometric affinity falls well within the range of affinity patterns evaluated for individual Native Americans" (Rasmussen et al. 2015:458). The authors conclude that a reliable reconstruction of the biological population affinities for Kennewick Man cannot be completed because there are not enough independent phenetic markers and within group population variation is too large to produce reliable results. Kennewick Man is "part of the male Amerind craniometric variation" (Rasmussen et al. 2015, Supplementary Information: 13); he just might not look like the "average" modern Native American. Therefore, Kennewick Man should not be ruled out as a Native American because his cranial morphology differs from the average modern Native American.

Jantz and Spradley (2014:474) point out that Howells' Data Set has poor representation of Native American crania stating that "such a limited comparative set could in no way adequately reflect the morphometric diversity of North America." Tasa and Vogel (2016) also observed that Howells' Data Set has poor representation of Native American crania from the Pacific Northwest, the geographic location of Kennewick Man. Tasa and Vogel used measurements from 179 late pre-contact to contact period known Pacific Northwest Native American crania to determine if Howells' Data Set would identify these individuals as Native American using discriminant function analysis. Using the least stringent level of typicality (likelihood that the individual belongs to the selected group), only 21 of the Native American individuals (12%) were reliably classified as Native Americans. Using the most stringent typicality, only 4 (2%) of the Pacific Northwest Native American individuals were reliably classified as Native American. The results show that Howells' samples are insufficient to make assignments for more recent Native American skeletons, let alone for a cranium such as Kennewick Man that is over 8,000 years old.

Finally, Kennewick Man exhibits traits that can reasonably be considered Native American, as was originally noted by Powell and Rose (1999) during the DOI studies. These morphologies include a large malar tubercle, blurred nasal sill, zygomatic posterior tubercle, slight nasal depression, moderate prognathism, elliptical dental arcade, straight palatine suture, and what appeared to be an angled zygomaticomaxillary suture. Additional analysis has also shown Kennewick Man exhibits coalition (union) between the third metatarsal and third cuneiform (two normally separate foot bones) in both feet.

This trait occurs in higher frequencies among Native American groups than among individuals of European or African ancestry, and shows good evidence of heritability (Case 2014). A reanalysis of the dentition shows that there is "no dental evidence to rule him out as a descendant of the Siberian Sinodonts who were direct ancestors of later Indians of North and South America" (Turner 2014:192). In addition, the short broad palate and great palatal depth exhibited by Kennewick Man are common among people of Eurasian origin and various Native American populations (Gill 2014:506).

In summary, the newest scientific data on Kennewick Man and skeletal analyses of Paleoindian skeletons support the following:

- Kennewick Man's skeleton exhibits traits that can reasonably be considered Native American.
- Kennewick Man's cranium falls within the range of affinity patterns for individual Native Americans.
- Significant biocultural factors influence changes in morphology over nearly 8,000 years, and expecting the crania of a population not to change over time is unreasonable.
- Comparing an individual cranium like Kennewick Man to population-mean data does not provide reliable results for ancestry relationships, and should not form a basis for excluding Kennewick Man from Native ancestry.
- The Howells' Data Set cannot reliably assign known Pacific Northwest Native American crania to Native American populations, and should not be used to exclude Kennewick man from Native ancestry.

DNA Evidence for Native American Determination

Over the last ten to fifteen years, the field of paleogenomics has seen large growth due to the improvements in the extraction, isolation, sequencing, and analysis of ancient DNA (e.g., Carpenter et al. 2013; Chatters et al. 2014; Kempt and Schurr 2010; Paabo et al. 2004; Potter et al. 2014; Prufer et al. 2014; Rasmussen et al. 2010; Rasmussen et al. 2014; Smith et al. 2005; Shapiro and Hofreiter 2014; Tackney et al. 2015). Ancient DNA from the Americas continues to provide data for research on Native American population genetics, including the timing of the population of the Americas, migration patterns, and migration routes (e.g., Chatters et al. 2014; Goebel et al. 2008; Kaestle and Smith 2001; Kemp et al. 2007; Kitchen et al. 2008; Skoglund et al. 2015; Raghavan et al. 2015).

The Corps approved another attempt to extract aDNA from Kennewick Man in 2011, using a previously sampled section of hand bone. On June 18, 2015, the results of the analysis of DNA recovered from the hand bone were published (Rasmussen et al. 2015). The researchers extracted, amplified, and compared Kennewick Man's DNA to modern populations. The results were based on autosomal DNA, mitochondrial DNA, and Y-chromosome data, as compared to worldwide genomic data (Rasmussen et al. 2015). To validate the results, the Corps contracted for an independent review of the 2015 DNA analysis (Novembre et al. 2016). That review concurred with the findings of Rasmussen et al. (2015).

Although the potential for contamination is often noted as a concern for any DNA study, including for aDNA studies, and for the Kennewick DNA studies in particular (e.g., Owsley and Jantz 2014:645), Rasmussen et al. (2015) and Novembre et al. (2016) both addressed this concern. Novembre et al. concluded that the "damage patterns we observed are typical of aDNA and, together with the analyses of mtDNA and X chromosome reads, argue against the possibility of extensive modern Native American contamination driving the results (Novembre et al. 2016:17)."

Geneticists use the term "Native American" to refer to indigenous peoples of North, Central, and South America. Finer levels of genetic structure exist within Native Americans, and as a result, it is possible to distinguish between Native American groups or populations that inhabit a particular geographic area or have a specific group/tribal affiliation (Novembre et al. 2016). For Kennewick Man to be considered "Native American" under NAGPRA, the genetic evidence should provide reasonable evidence of a connection to any North American Native American group from the United States.

First, the new genomic evidence rejects the hypothesis that Kennewick Man is more closely related to Ainu or Polynesians than to Native Americans (Rasmussen et al. 2015). Second, as reported by both Rasmussen and Novembre, the autosomal DNA, mitochondrial DNA, and Y chromosome data all consistently show that Kennewick Man is genetically closer to modern Native Americans than to any other population worldwide.

The mtDNA haplogroup for Kennewick Man is haplogroup X2a (Rasmussen et al. 2015; Novembre et al. 2016). This haplogroup has only been observed in Native Americans (Novembre et al. 2016). The Y-chromosome haplogroup was established to be hgQ-M3, "a lineage observed exclusively among Native Americans and in Northeast Siberia (Rasmussen et al. 2015, Supplemental Information: 8). Using methods to assess admixture proportions, the ancestry profile of Kennewick Man is most similar to that of living Native Americans from North America (Novembre et al. 2016; Rasmussen et al. 2015). Using a measure of genetic similarity, a few populations of living Native Americans from South American samples are also similar to the Kennewick sample (*id*.). This result is not unique to Kennewick and is seen in another ancient sample from North America (*i.e.*, Anzick) (*id*.). Additionally, the pattern observed in Kennewick Man is mirrored in the Colville Tribe (Rasmussen *et al.* 2015:456). "Among the groups for which we have sufficient genomic data, we find that the Colville…show close affinities to that individual [Kennewick Man] or at least to the population to which he belonged." (Rasmussen et al. 2015:458). The Colville were one of the original claimant tribes. A comparative genetic sample was not available for the other claimant tribes, and therefore, there are no data available for their specific relationship to Kennewick Man.

These genetic results show that Kennewick Man is closely related to present-day Native North American populations, including those from the same geographic region, which implies some genetic continuity between ancient and modern populations in the Pacific Northwest and Columbia Plateau (Raghavan et al. 2015).

In summary, the newest genetic evidence supports the following:

- Kennewick Man is genetically related to contemporary Native Americans.
- Kennewick Man's ancestry profile is most similar to several Native North American populations, including the Colville Tribe.
- Kennewick Man is more closely related to Native Americans than to any other worldwide population, including the Ainu or Polynesian groups.

Conclusion

The recent results provided by skeletal and statistical analyses of Kennewick Man and other Paleoindians, along with the DNA analysis has lead me to review the evidence for Kennewick Man's Native American ancestry. This new evidence supports the following:

- Kennewick Man's skeleton exhibits traits that can reasonably be considered Native American.
- Kennewick Man's cranium fits within the affinity patterns seen in individual Native American crania.
- Genetic evidence establishes that Kennewick Man is more closely related to modern Native Americans, including the Colville, than to any other group.
- Biocultural influences on morphology, genetic drift, mutation, and natural selection over 8,000 years impact the differences seen between all Paleoindian crania and modern Native American groups.
- The original evidence used to exclude Kennewick Man from the Native American groups—craniometric analysis—has been shown not be to be a reliable indicator of ancestry.

Based on this new skeletal, statistical, and genetic evidence, together with evidence previously considered by DOI, it is reasonable to conclude that Kennewick Man is "of, or relating to, a tribe, people, or culture that is indigenous to the United States." 25 U.S.C. § 3001(9). Therefore, I find that Kennewick Man is Native American and subject to the processes and procedures outlined in the Native American Graves Protection and Repatriation Act.

The Corps will next review the priority of custody pursuant to 43 C.F.R. § 10.6, including cultural affiliation.[2] At present, there has been no decision to transfer the remains.

Scott C Spellmon

Date 26 April 2016

Scott A. Spellmon
Brigadier General, US Army
Division Commander

[2] Any additional and substantial evidence discovered during the review of the priority of custody that is relevant to this Native American determination will be addressed and included in the record.

References

Armelagos, George J., and Dennis P. Van Gerven.
2003 A century of skeletal biology and paleopathology: contracts, contradictions, and conflicts. *American Anthropologist* 105(1):53–64.

Auerbach, Benjamin N.
2012 Skeletal variation among early Holocene North American Humans: Implications for origins and diversification in the Americas. *American Journal of Physical Anthropology* 149:525–536.

Carpenter, Meredith L., Jason D. Buenrostro, Cristina Valdiosera, et al.
2013 Pulling out the 1%: Whole-genome capture for the targeted enrichment of ancient DNA sequencing libraries. *The American Journal of Human Genetics* 93:1–13

Case, D. Troy
2014 Bones of the Hand and Feet. *In Kennewick Man: The Scientific Investigation of an Ancient American Skeleton*, edited by Douglas W. Owsley and Richard L. Jantz, pp. 249–278. Texas A&M University Press, College Station.

Chatters, James C., Douglas J. Kennett, Yemane Asmeronet, et al.
2014 Late Pleistocene Human Skeleton and mtDNA link Paleoamericans and Modern Native Americans. *Science* 344:750–754.

Edgar, Heather J. H., Edward A. Jolie, Joseph F. Powell, and Joe E. Watkins.
2007 Contextual Issues in Paleoindian Repatriation: Spirit Cave Man as a Case Study. *Journal of Social Archaeology* 7:101–122.

Fagan, John L.
1999 Analysis of lithic artifact embedded in the Columbia Park remains. Report prepared for the Department of the Interior, National Park Service, Washington, D.C.

Gill, George W.
2014 Morphological Features that Reflect Population Affinities. *In Kennewick Man: The Scientific Investigation of an Ancient American Skeleton*, edited by Douglas W. Owsley and Richard L. Jantz, pp. 503–508. Texas A&M University Press, College Station.

Goebel, Ted, Michael R. Waters, and Dennis H. O'Rourke
2008 The Late Pleistocene dispersal of modern humans in the Americas. *Science* 319:1497–1502.

Hackenberger, Steven
1999 Cultural Affiliation Study of the Kennewick Human Remains: Review of the Bio-Archaeological Evidence. Report prepared for the Department of the Interior, National Park Service, Washington, D.C.

Howells, W. W.
1973 Cranial Variation in Man. *Papers of the Peabody Museum of Archaeology and Ethnology*. Harvard University Press, Cambridge.

1989 Skull Shapes and the Map. Craniometric Analysis in the Dispersion of Modern Homo. *Papers of the Peabody Museum of Archaeology and Ethnology*. Harvard University Press, Cambridge.

1996 Howells' Craniometric data on the Internet. *American Journal of Physical Anthropology* 101:441–442.

Huckleberry, Gary, Thomas W. Stafford, and James C. Chatters
1998 Preliminary Geoarchaeological Studies at Columbia Park, Kennewick, Washington, USA. Report submitted to the U. S. Army Corps of Engineers, Walla Walla District.

Huckleberry, Gary, and Julie K. Stein
1999 Analysis of sediments associated with human remains found at Columbia Park, Kennewick, WA. Report prepared for the Department of the Interior, National Park Service, Washington, D.C.

Jantz, Richard L., and Douglas Owsley
1997 Pathology, Taphonomy, and Cranial Morphometrics of the Spirit Cave Mummy. *Nevada Historical Society Quarterly* 40:62–84.

Jantz, Richard L., and Lee Meadows Jantz.
2000 Secular change in craniofacial morphology. *American Journal of Human Biology* 12(3):327–338.

Jantz, Richard L. and M. Katherine Spradley
2014 Cranial Morphometric Evidence for Early Holocene Relationships and Population Structure. *In Kennewick Man: The Scientific Investigation of an Ancient American Skeleton*, edited by Douglas W. Owsley and Richard L. Jantz, pp. 472–491. Texas A&M University Press, College Station.

Kaestle, Fredericka
2000 Report on DNA Analysis of the Remains of "Kennewick Man" from Columbia Park, Washington. Report prepared for the Department of the Interior, National Park Service, Washington, D.C.

Kemp, Brian M., and Theodore G. Schurr
2010 Ancient and modern genetic variation in the Americas. In *Human variation in the Americas: The integration of archaeology and biological anthropology* edited by Benjamin M. Auerbach. Southern Illinois University, Carbondale.

Kitchen, Andrew, Michael M. Miyamotoa, and Conni J. Mulligan
2008 A three stage colonization model for the peopling of the Americas. *PloS.one* 3:e0001596.

Merriwether, D. Andrew, Graciela S. Cabana, and David M. Reed
2000 *Kennewick Man Ancient DNA Analysis: Final Report Submitted to the Department of the Interior, National Park Service*. Report prepared for the Department of the Interior, National Park Service, Washington, D.C.

Novembre, John, David Witonsky, and Anna Di Rienzo
2016 Technical Report: Assessment of the genetic analysis of Rasmussen et al. (2015). Report provided to the U.S. Army Corps of Engineers, St. Louis District. (unpublished report, on file with the U.S. Army Corps of Engineers, Mandatory Center of Expertise for the Curation and Management of Archaeological Collections).

Owsley, Douglas W., and Richard L. Jantz
2014 Who was Kennewick Man? *In Kennewick Man: The Scientific Investigation of an Ancient American Skeleton*, edited by Douglas W. Owsley and Richard L. Jantz, pp. 622–650. Texas A&M University Press, College Station.

Paabo, Svante, Hendrik Poinar, David Serre, et al.
2004 Genetic Analysis from ancient DNA. *Annual Review of Genetics* 38:645–679.

Potter, Ben A., Joel D. Irish, Joshua D. Ruther, and Holly J. McKinney.
2014 New Insights into Eastern Beringia mortuary behavior: a terminal Pleistocene double infant burial at Upward Sun River. *Proceedings of the National Academy of Science* 111(48):17060–17065.

Powell, Joseph F., and Jerome C. Rose
1999 Report on the Osteological Assessment of the Kennewick Man Skeleton (CENWW.97.Kennewick). Report prepared for the Department of the Interior, National Park Service, Washington, D.C.

Prufer, Kay, Fernando Racimo, Nick Patterson, et. al.
2014 The complete genome sequence of a Neanderthal from the Altai Mountains. *Nature* 505: 43–49.

Raghavan, Maanasa, Matthias Steinrucken, Kelley Harris, et. al.
2015 Genomic evidence for the Pleistocene and recent population history of Native Americans. *Science* 349 (6250).

Rasmussen, Morten, Yingrui Li, Stinus Lindgreen, et. al
2010 Ancient human genome sequence of an extinct Palaeo-Eskimo. *Nature* 463:757–762.

Rasmussen, Morten, Sarah L. Anzick, Michael R. Waters, et. al.
2014 The genome of a Late Pleistocene human from a Clovis burial site in western Montana. *Nature* 506:225–229.

Rasmussen, Morten, Martin Sikora, Anders Albrechtsen, et al.
2015 The ancestry and affiliations of Kennewick Man. *Nature* 523:455–458.

Reich, David, Nick Patterson, Desmond Campbell, et. al
2012 Reconstructing Native American population history. *Nature* 488:370–374.

Shapiro, Beth, and M. Hofreiter
2014 A Paleogenomic Perspective on Evolution and Gene Function: New Insights from Ancient DNA. *Science* 343.

Skoglund, Pontus, Swapan Mallik, Maria Catira Bortolini, et al.
2015 Genetic evidence for two founding populations of the Americas. *Nature* 525:104–108.

Smith, David Glenn, Ripan S. Malhi, Jason A. Eshleman, and Frederika A. Kaestle
2000 Report on DNA Analysis of the Remains of "Kennewick Man" from Columbia Park, Washington. Report prepared for the Department of the Interior, National Park Service, Washington, D.C.

Smith, D. G., R. S. Malhi, J. A. Eshleman, F. A. Kaestle, and B. M. Kemp
2005 Mitochondrial DNA Haplogroups of Paleoamericans in North America. In *Paleoamerican Origins: Beyond Clovis*, edited by Robson Bonnichsen, Bradely T. Lepper, Dennis Stafford, and Michael Waters. Center for the Study of First Americans, College Station, Texas.

Spradley, M. Katherine, Katherine E. Weisensee, and Richard L. Jantz
2014 Two-Dimensional Geometric Morphometrics. In *Kennewick Man: The Scientific Investigation of an Ancient American Skeleton*, edited by Douglas W. Owsley and Richard L. Jantz, pp. 492–502. Texas A&M University Press, College Station.

Stafford, Thomas W.
2014 Chronology of the Kennewick Man Skeleton. In *Kennewick Man: The Scientific Investigation of an Ancient American Skeleton*, edited by Douglas W. Owsley and Richard L. Jantz, pp. 59–89. Texas A&M University Press, College Station.

Tackney, Justin C., Ben A. Potter, Jennifer Raff, Michael Powers, W. Scott Watkins, Derek Warner, Joshua D. Reuther, Joel D. Irish, and Dennis H. O'Rourke
2015 Two contemporaneous mitogenomes from terminal Pleistocene burials in eastern Beringia. *Proceedings of the National Academy of Sciences* 112(45):13833–13838.

Tasa, Guy L. and Juliette Vogel
2016 The Use of the Howells' Craniometric Dataset in Determining Ethnicity in Pacific Northwest Native Crania: Implications for Kennewick Man. Paper presented in the Symposium, *The Ancient One: The 20 Year Anniversary of the Discovery of Kennewick Man*, Northwest Anthropological Association Conference, March 2016.

Thomas, David Hurst, and Clark Spencer Larsen
2015 Review of Kennewick Man: The Scientific Investigation of an Ancient American Skeleton, edited by Douglas W. Owsley and Richard L. Jantz. Texas A&M University Press, College Station. *American Antiquity* 80:781–783.

Turner, Christy G. II
2014 Dentition. Stable Isotopic Evidence for Diet and Origin. In *Kennewick Man: The Scientific Investigation of an Ancient American Skeleton*, edited by Douglas W. Owsley and Richard L. Jantz, pp. 187–194. Texas A&M University Press, College Station.

Tuross, Noreen, and Connie J. Kolman
2000 Potential for DNA Testing of the Human Remains from Columbia Park, Kennewick, Washington. Report submitted to the Department of Justice and Department of Interior, Wahington, D.C.

Wakeley, Lillian D. William L. Murphy, Joseph B. Dunbar, Andrew G. Warne, Frederick L. Bruier, and Paul R. Nickens
1998 Geologic, Geoarchaeologic, and Historical Investigation of the Discovery Site of Ancient Remains in Columbia Park, Kennewick, Washington. Prepared for the U.S. Army Corps of Engineers District, Walla Walla. *U.S. Army Corps of Engineers, Waterways Experiment Station, Technical Report GL-98-13*. Vicksburg, Mississippi.